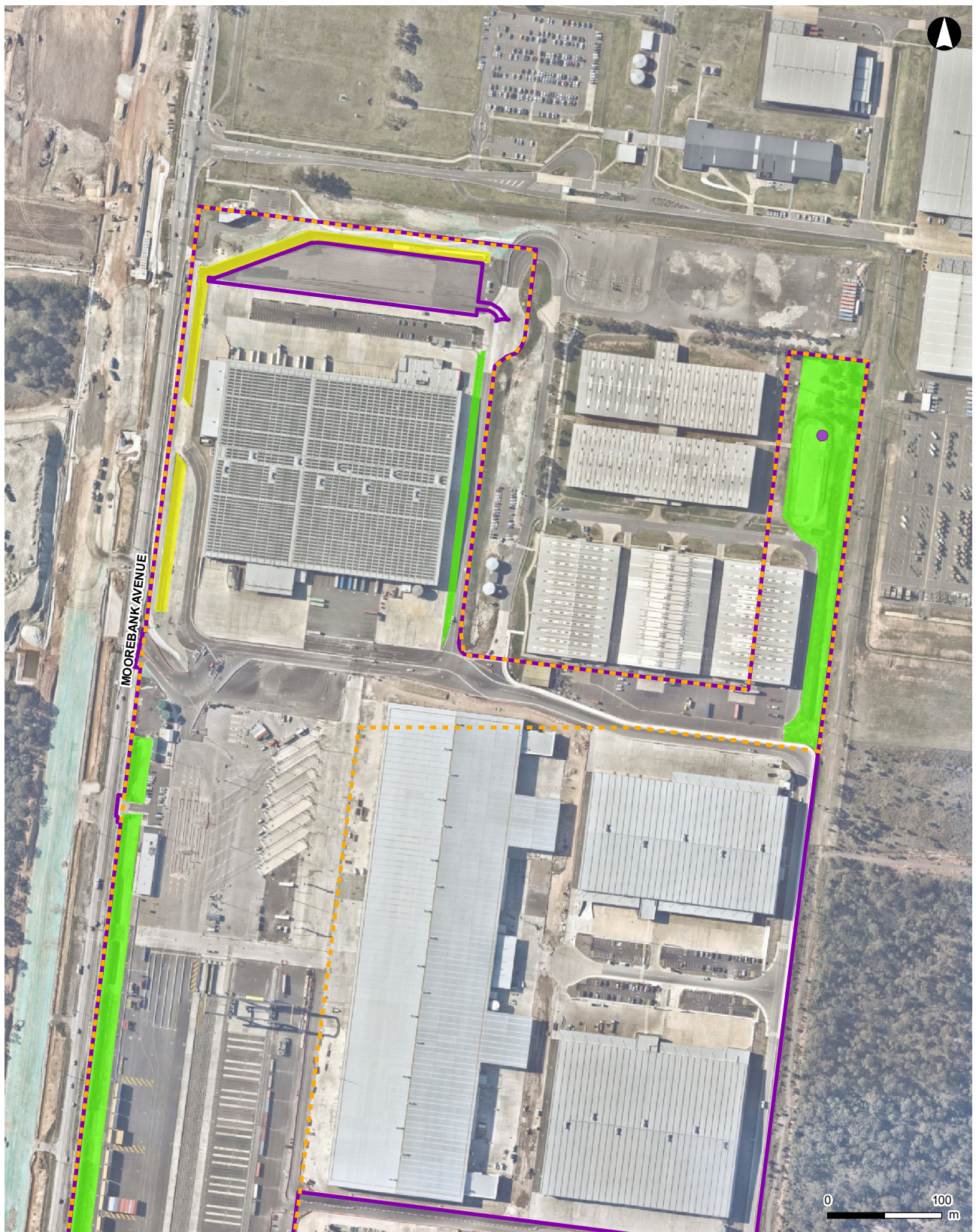




*Plate 5. A section of soft batter which has slumped within the Rail Link*



#### LEGEND

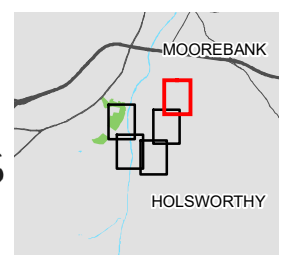
- MPE operational boundary
- Weed monitoring survey extent

- Weed coverage**
- Low
- No weeds recorded

- Priority and notable weeds**
- Golden Wreath Wattle

ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Aerial imagery supplied by nearmap (Oct, 2020)

Page 1 of 5  
 1:5,000 at A4





# LEGEND

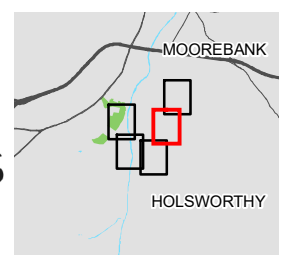
- |                                                                                                                                   |                                                                                                       |                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|  MPE operational boundary                      |  Weed coverage Low |  Priority and notable weeds Golden Wreath Wattle |
|  Weed monitoring survey extent                 |                                                                                                       |  Umbrella Sedge                                  |
|  Remediated batters (weed removal & coir mesh) |                                                                                                       |                                                                                                                                     |
|  Watercourse                                   |                                                                                                       |                                                                                                                                     |

ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Aerial imagery supplied by nearmap (Oct, 2020)

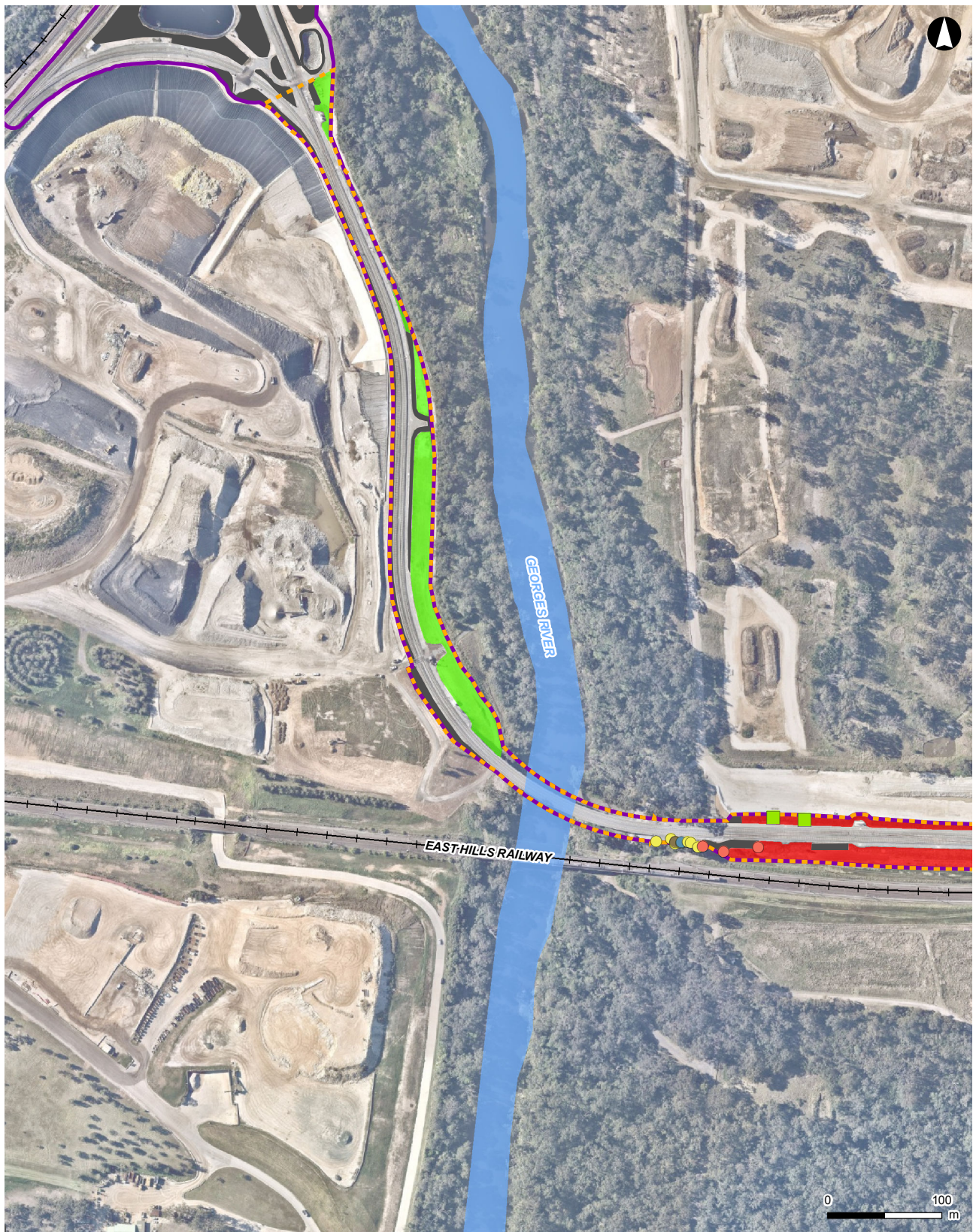
Page 2 of 5  
 1:5,000 at A4

 **ARCADIS**

 **SIMTA** SYSTEMS INTEGRATION  
MANAGEMENT  
ALLIANCE







#### LEGEND

- MPE operational boundary
- Weed monitoring survey extent
- Remediated batters (weed removal & coir mesh)
- Existing railway

- Weed coverage**
- High
- Low
- Erosion issues**
- Slumping batter

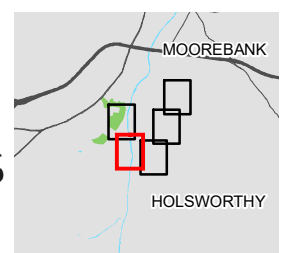
- Priority and notable weeds**
- African Olive
- Lantana
- Castor Oil Plant
- Small-Heaved Privet

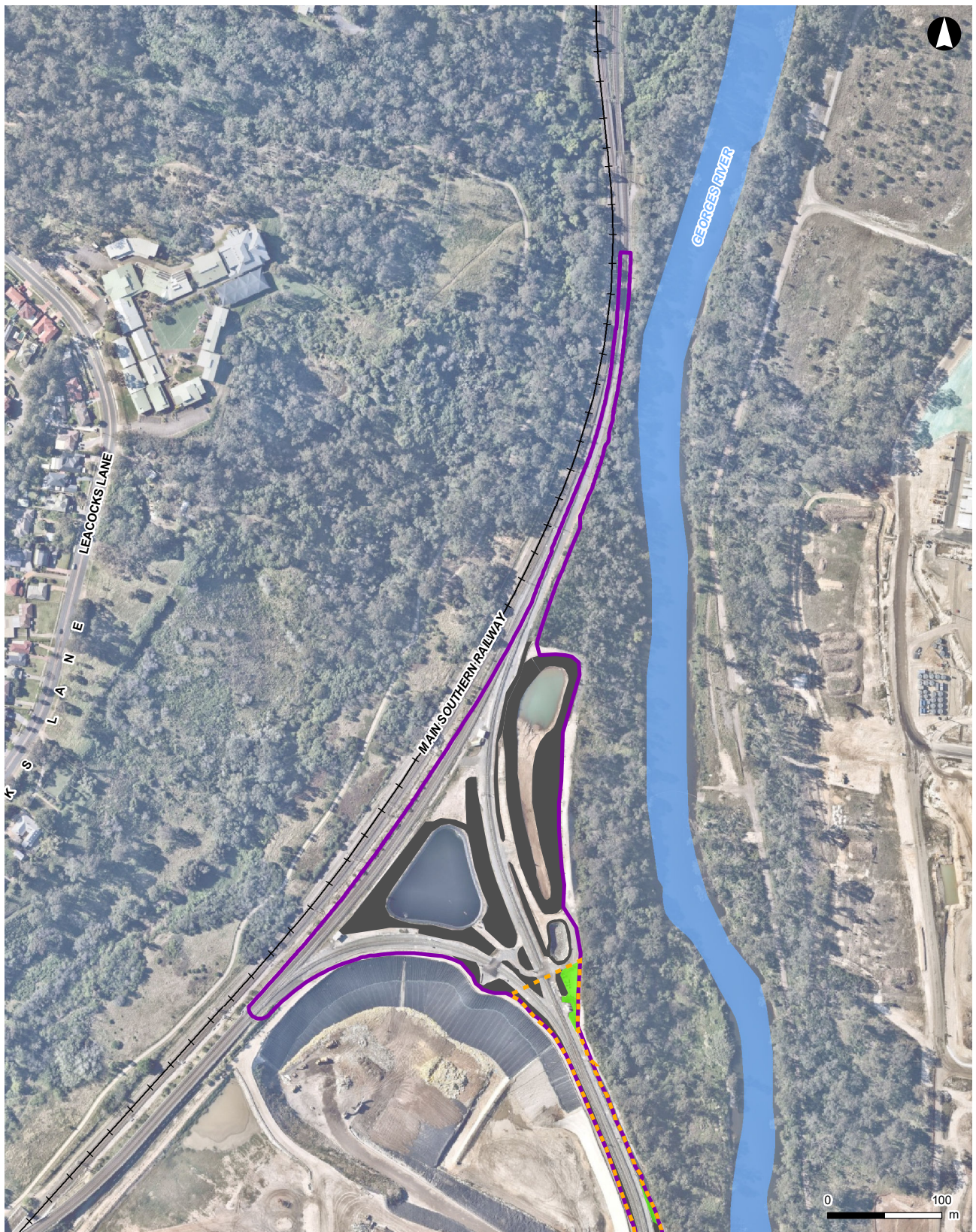
ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Aerial imagery supplied by nearmap (Oct, 2020)

Page 4 of 5  
 1:5,000 at A4

**ARCADIS**

**SIMTA** | STRONG INTERDISCIPLINARY TEAMWORK ALLIANCE





#### LEGEND

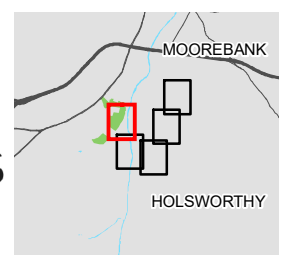
- ▮ MPE operational boundary
- ▮ Weed monitoring survey extent
- ▮ Remediated batters (weed removal & coir mesh)
- +— Existing railway
- Weed coverage**
- ▮ Low

ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Aerial imagery supplied by nearmap (Oct, 2020)

Page 5 of 5  
 1:5,000 at A4

**ARCADIS**

**SIMTA** SYSTEMS  
INTEGRATION  
MANAGEMENT  
ALLIANCE



## Recommendations

Recommended weed control actions resulting from the previous weed monitoring surveys are included in Appendix A: Recommended Actions Catalogue. The catalogue has been reviewed and updated to reflect the works undertaken since the October surveys.

The following actions are recommended based on observations made during the December survey:

- Remove all occurrence of *Acacia saligna* (Golden Wreath Wattle), *Araujia sericifera* (Moth Vine), *Asparagus asparagoides* (Bridal Creeper), *Lantana camara* (Lantana), *Olea europaea* subsp. *cuspidata* (African Olive), *Ricinus communis* (Castor Oil Plant) and *Themeda quadrivalvis* (Grader Grass) within the Rail Link and trunk drainage systems.
- Control the occurrence of *Cyperus eragrostis* (Umbrella sedge) within the channel of the trunk drainage system.
- Treat/removal all colonising weeds within recently remediated areas. Any re-occurring weed growth should be controlled in line with the approved Weed Management Plan prior to revegetation efforts.
- Areas of soft batter which were not subject to recent remediation actions should be made weed free or regularly slashed to prevent exotic species from seeding.
- Soft batters within the trunk drainage system and retention basin/swale should be revegetated with native species to repress colonisation by exotic grasses and herbaceous weeds.

Application of herbicide within the Rail Link, in areas adjacent to the Moorebank biobank site and threatened flora locations, should be conducted in a way which prevents overspray (off target poisoning). Native vegetation outside of the Rail Link fence should not be affected by herbicide during weed control works.

## References

Arcadis (2019a) Urban Design and Landscape Plan. Moorebank Precinct East Stage 1

Arcadis (2019b) Operational Flora and Fauna Management Plan. Moorebank Logistics Park – East Precinct

Arcadis (2019c) Landscape Vegetation Management Sub Plan. Moorebank Precinct East Stage 2

Arcadis (2020) MPE Operational – Weed Monitoring Report October 2020

Arcadis (2020) Urban Design and Landscape Plan. Moorebank Precinct East Stage 2

Bureau of Meteorology (BOM) (2020) Climate Data Online. Weather and Climate: Holsworthy Aerodrome NSW (station 066161) <http://www.bom.gov.au/climate/dwo/IDCJDW2161.latest.shtml>

NSW Department of Primary Industries (DPI) (accessed 2020) NSW WeedWise. Priority weeds for the Greater Sydney. <https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3>

## APPENDIX A. RECOMMENDED ACTIONS CATALOGUE

| Month of logging | Recommended action                                                                                                                                                                                                                 | Status<br>(Not started, Commenced, Complete) | Comments                                                                                                                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| April 2020       | Eradicate Priority weeds species including Bridal Creeper, Chilean Needle Grass, Alligator Weed, Lantana and African Olive                                                                                                         | Commenced                                    | Lantana, African Olive and Bridal Creeper remain within the Rail Link                                                                                                                                                                                                                             |
| April 2020       | Remove notable weed species including Golden Wreath Wattle, Moth Vine, Castor Oil Plant, Small-leafed Privet, Grader Grass and Balloon Vine within Rail Link                                                                       | Commenced                                    | Golden Wreath Wattle, Moth Vine, Grader Grass and Castor Oil Plant remain within the Rail Link                                                                                                                                                                                                    |
| June 2020        | Planning should commence to revegetate soft batters and un-developed areas within the MPE Operational Facility with native species in accordance with the approved Urban Design and Landscaping Plan (Arcadis 2019a, Arcadis 2020) | Commenced                                    | A large portion of the soft batters adjacent to the Rail Link have been remediated through the removal of weeds and stabilisation with coir mesh.<br><br>These areas will be revegetated through hydroseeding as per the UDLP (Arcadis 2020) in the near future.                                  |
| August 2020      | Exotic species, specifically <i>Medicago polymorpha</i> (Burr medic) should be removed from grassland either side of the Rail Link at its eastern extent, closest to the operational area.                                         | Commenced                                    | Weeds on the eastern side of the Rail Link corridor have been removed. Weeds on the western side of the corridor require removal.<br><br>This should only be conducted following a pre-clearing inspection by an ecologist to search for threatened flora, specifically <i>Hibbertia fumana</i> . |
| December 2020    | Remove exotic grasses and herbaceous weeds in areas not remediated within the Rail Link.                                                                                                                                           | Not started                                  |                                                                                                                                                                                                                                                                                                   |
| December 2020    | Control colonisation of <i>Cyperus eragrostis</i> within the channel of the trunk drainage system running along the western boundary of the operational facility.                                                                  | Not started                                  |                                                                                                                                                                                                                                                                                                   |
| December 2020    | Revegetate soft batters surrounding the retention basin / swale at the north-eastern extent of the operational facility                                                                                                            | Not started                                  |                                                                                                                                                                                                                                                                                                   |

| Month of logging | Recommended action                                                     | Status<br>(Not started, Commenced, Complete) | Comments |
|------------------|------------------------------------------------------------------------|----------------------------------------------|----------|
|                  | with native species in accordance with the approve UDLP (Arcadis 2020) |                                              |          |

## APPENDIX B. SITE PHOTOGRAPHS (DEC 2020)

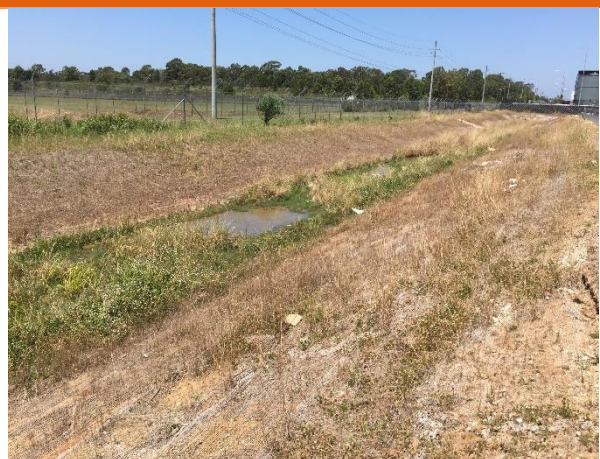
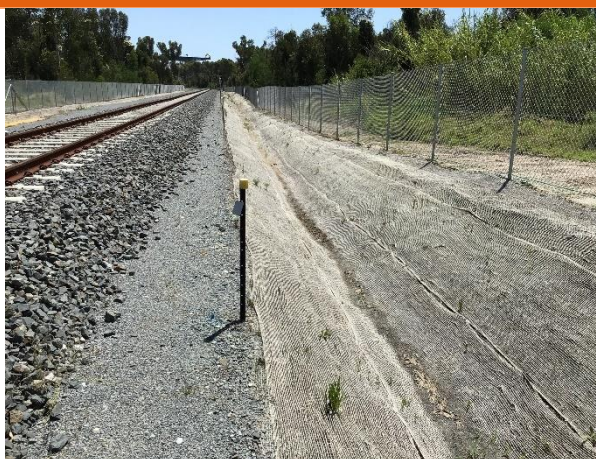


Herbaceous weeds and exotic grasses beginning to colonise remediated areas



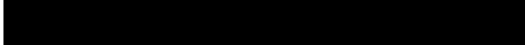
Exotic grasses recently slashed

Soft batter adjacent to Rail Link dominated by weeds



Remediated area suitable for revegetation

Drainage swale sparsely vegetated with Cereal Rye

**Date** 26/02/2021  
**To**   
**From**   
**Copy to**   
**Subject** MPE Operational – Weed Monitoring Report February 2021

---

## Introduction

Arcadis have been commissioned by Tactical on behalf of Qube Holdings to conduct bi-monthly weed monitoring surveys within Moorebank Precinct East (MPE) Operational Facility at Moorebank Logistics Park. The MPE Operational Facility includes the:

- Import and Export Terminal (IMEX)
- Rail Access Land Package (RALP)
- Warehouses, distribution facilities and freight village
- Stormwater trunk drainage infrastructure and landscaping areas

Regular monitoring of the MPE Operational Facility will inform the land manager of weed coverages and the presence of any weeds listed as Priority under the *Biosecurity Act 2015*.

The first monitoring report (May 2020) included a comprehensive baseline assessment of weed coverage within the MPE Operational Area. Subsequent reports, including this report (February 2021), include survey methodology, summarise changes to weed condition and assess weed control actions against previous recommendations listed in Table 2.

## Methodology

Arcadis ecologist Nathan Banks attended the MPE Operational Facility on Wednesday 10 February 2021. The area surveyed by the attending ecologist is presented in Figure 1.

Monitoring involved traversing the MPE operational area on foot surveying landscaped areas, stormwater infrastructure and areas adjoining the Rail Link for the occurrence of weed species and signs of weed control works. Areas that have previously been flagged as requiring remediation works were prioritised to assess the status of these. The following information was collected where weeds were identified:

- Presence of exotic species, including Priority weeds
- Per cent foliage cover of exotic species
- Per cent foliage cover of Priority weeds

The coverage of environmental and Priority weeds was estimated based on the area of cover within a patch and categorised as per Table 1.

Table 1. Categories to describe percent coverage of weeds

| Categories | Percentage cover of weeds within a patch (%) |
|------------|----------------------------------------------|
| Low        | 10 – 25                                      |
| Moderate   | 25 – 75                                      |
| High       | 75 – 100                                     |

The location of weed infestations, Priority weed species and observed weed control works were recorded on an Arc-GIS enabled iPad.

The weather on the day of survey was sunny with a maximum temperature of 25.1°C recorded at Holsworthy Aerodrome (station 066161) (BOM 2020).

## Study Limitations

The data presented within this report is restricted to what was observed and recoded by the attending Arcadis ecologist during the site assessment on the 10 February 2021.

Monitoring of weeds was restricted to operational areas; weeds were not assessed within the bounds of the active construction areas surrounding new warehouses.

Surveys were not undertaken in areas extending beyond the junction between the Qube Rail Link and the Southern Sydney Freight Line (SSFL) as the ecologist was not under the supervision of an Australian Rail Track Corporation (ARTC) Protection Officer (PO). Future surveys will require the attendance of a PO to access these areas.

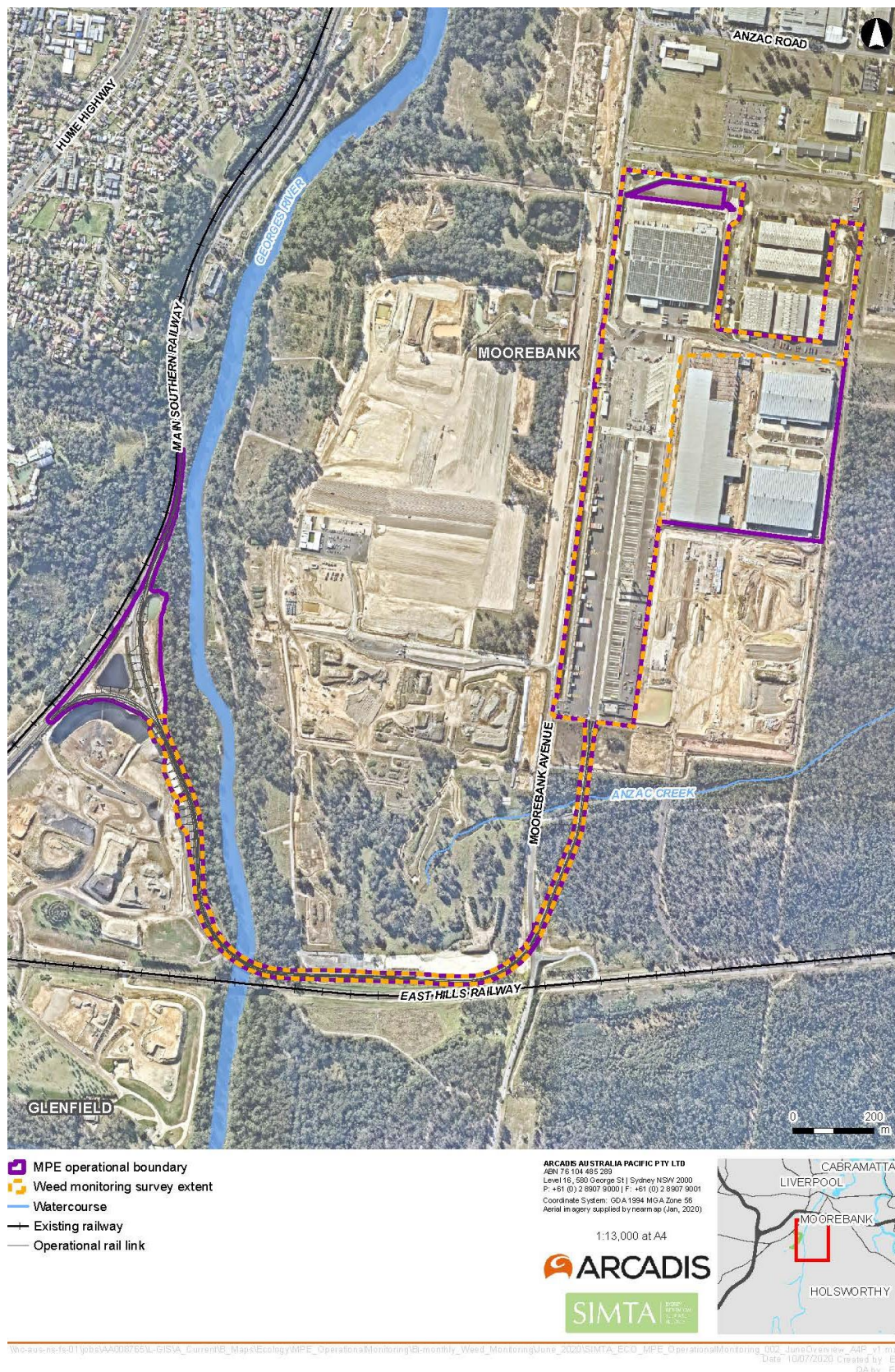


Figure 1. Survey extent within the MPE Operational Facility

## Results

### Weed coverage

No significant changes in weed levels has been observed across the operational facility since the December 2020 survey. The planted garden bed adjacent to the Target warehouse is in good condition with a suit of native species and little to no weed occurrence. Weed presence was more prevalent on soft batters of the trunk drainage system along the western boundary of the operational area, and surrounding drainage basins and swales at the north-eastern extent.

Weed coverage was observed to be increasing at the drainage swales/retention basins at the northern-eastern extent of the MLP facility. Common environmental weeds are beginning to colonise non-vegetated areas. The occurrence of weeds is still relatively low, however without management or imminent revegetation with native species this area could quickly succumb to an infestation. Some native species are regenerating amongst weeds including *Acacia falcata* (Sickle Wattle), *Cynodon dactylon* (Couch grass) and *Paspalum distichum* (Water couch). The Priority weed species *Ludwigia peruviana* (Ludwigia) was identified colonising a drainage swale on the edge of the operation facility at this location. Ludwigia is an exotic aquatic/ephemera weed that will quickly colonise new areas and become established if not controlled.

Within the truck drainage system common environmental weeds and invasive grasses continue to occur. Commonly encountered species include *Conyza* sp, *Melinis repens* (Red Natal Grass), *Phytolacca octandra* (Ink weed), *Setaria* sp. (Pidgeon grass) and *Sida rhombifolia*. Weed levels are not in an overgrown state and are mainly forming a uniform light coverage. At current, invasive grasses and herbaceous weeds are providing the only vegetative coverage along soft batters of the drainage system.

Herbaceous weeds and exotic grasses identified as colonising recently remediated areas during the December 2020 survey within the Rail Link were majorly observed to have been treated with herbicide. Areas of soft batter which were not previously remediated and had a high percent coverage of exotic species were also targeted during herbicide weed control works. Majority of weeds sprayed with herbicide were observed to be dead with the biomass remaining in situ on soft batters (Plate 1; Plate 2).

Soft batters supporting herbaceous weeds and exotic grasses on the southern side of the Rail Link have been treated with herbicide to a lesser extent; within a couple of meters of the track. Significant areas of weed infestation exists beyond what has been treated.

Priority weeds were not sprayed during the recent works and persist within the Rail Link. These species include:

- *Asparagus asparagoides* (Bridal Creeper)
- *Lantana camara* (Lantana)
- *Olea europaea* subsp. *cuspidata* (African Olive)

The location of these Priority weeds as well as the percent coverages of weeds across the MPE operational area is included in Figure 2 - Figure 6.

The status of weeds and weed control works observed during the December 2020 monitoring survey has been compared against a series of recommended actions developed during the baseline monitoring survey (Table 2).

Table 2. Weed control works tracking

| Priority | Action                                                                                       | Action description                                                                                                                                                                                                                             | December performance assessment                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | Eradicate Priority weeds                                                                     | Target Priority weed species through a combination of manual removal and herbicide treatment. Herbicide application should be considerate of timing (i.e. applying herbicide when weeds are actively growing) and best practice methodologies. | <p>The Priority weed species <i>Ludwigia peruviana</i> (Ludwigia) was observed at the north-eastern extent of the operational facility within a drainage swale.</p> <p>Three Priority weed species were identified in the Rail Link: <i>Asparagus asparagoides</i> (Bridal Creeper), <i>Olea europaea</i> subsp. <i>cuspidata</i> (African Olive), <i>Lantana camara</i> (Lantana) (Figure 2 - Figure 6).</p> <p>These should be removed.</p> |
| 2        | Removal of notable weed species                                                              | Notable weed species including Moth Vine, Castor Oil Plant and Grader Grass should be removed from operational areas using a combination of manual and herbicide control.                                                                      | <p>A significant portion of notable weeds were removed during the remediation works conducted in September/October.</p> <p>Scattered individuals of Golden Wreath Wattle, Moth Vine and Castor Oil Plant remain within the Rail Link (Figure 2 - Figure 6).</p> <p>These should be removed.</p>                                                                                                                                               |
| 3        | Suppress further colonisation of environmental weeds and encroachment into areas of bushland | Control of environmental weeds adjacent to biobank areas and natural bushland environments. Manual removal should be adopted in areas adjacent to threatened flora locations.                                                                  | No weeds were observed encroaching on the biobank site and other natural bushland environments.                                                                                                                                                                                                                                                                                                                                               |
| 4        | Slashing of invasive grasses to prevent seeding.                                             | Management of invasive grasses such as Rhodes Grass and African Love Grass through regular mowing or slashing.                                                                                                                                 | A large portion of exotic grasses on the northern batters of the Rail Link have been controlled through herbicide. The remaining biomass should be slashed to prepare for upcoming revegetation works.                                                                                                                                                                                                                                        |
| 5        | Reduce percent coverage of environmental weeds within the Rail Link                          | Reduction in percent coverage of environmental weed infestations by applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019)                                                                  | <p>Remediated areas within the Rail Link have been treated with herbicide to control colonising weeds.</p> <p>Areas not subject to remediation works in September/October have been sprayed with herbicide to reduce coverage of environmental weeds and exotic grasses.</p>                                                                                                                                                                  |
| 6        | Reduce percent coverage of                                                                   | Reduction in percent coverage of environmental weed infestations by                                                                                                                                                                            | Exotic grasses and herbaceous weeds were observed within the                                                                                                                                                                                                                                                                                                                                                                                  |

| Priority | Action                                                                             | Action description                                                                                        | December performance assessment                                                                                                                                      |
|----------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | environmental weeds within the operational area and trunk drainage infrastructure. | applying control methods commensurate with the Operational Flora and Fauna Management Plan (Arcadis 2019) | trunk drainage infrastructure, albeit at low coverage. Removal should be conducted to reduce percent coverages in conjunction with revegetation with native species. |



*Plate 1. Dead weeds along remediated areas following herbicide spraying*



*Plate 2. Dead weeds along soft batters in Rail Link following spraying with herbicide*

## **Erosion**

Batter slumping is still evident at two locations within the Rail Link (Figure 2 - Figure 6). These areas were not remediated during recent works and are completely vegetated with exotic grasses and herbaceous weeds.

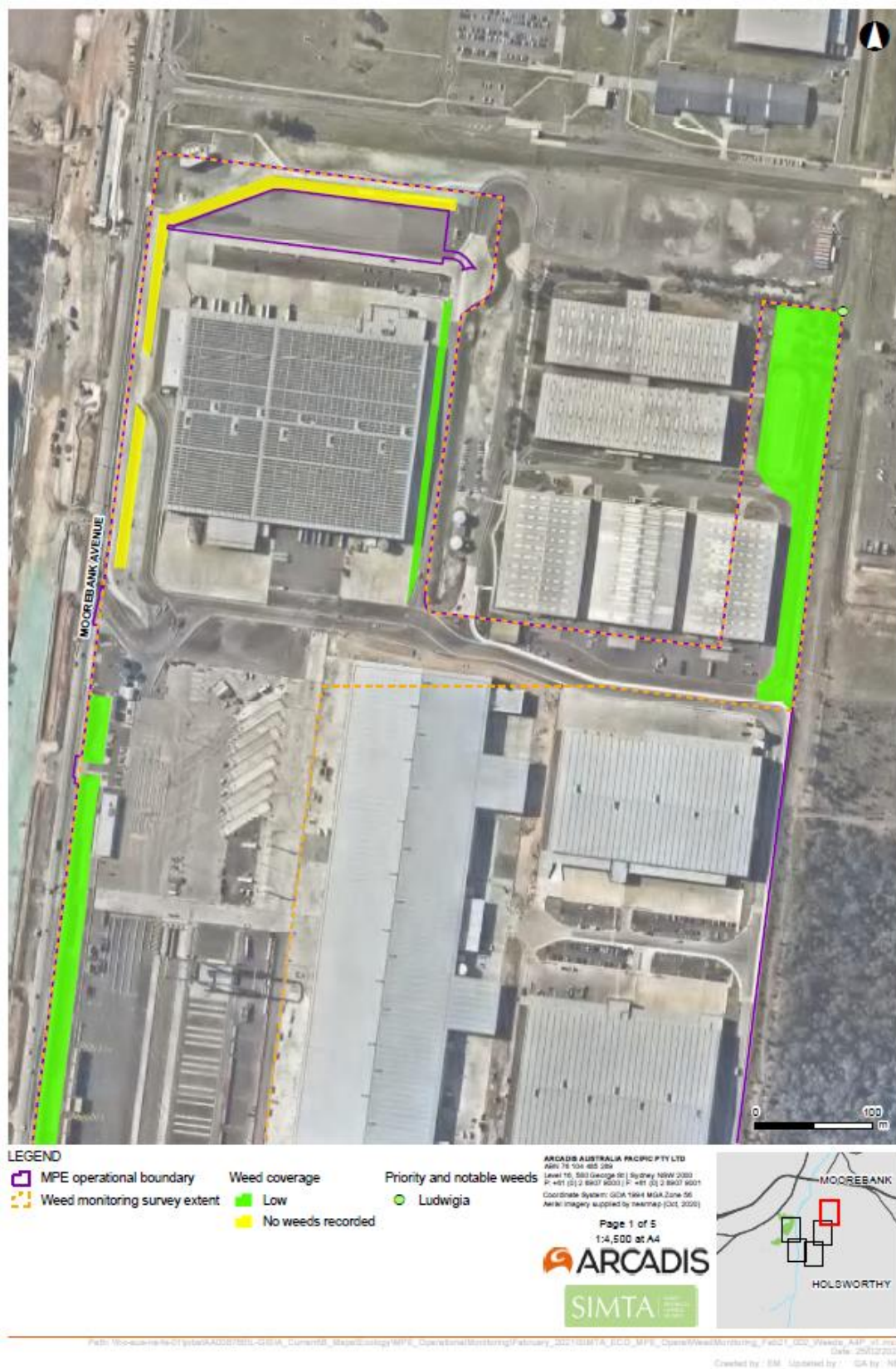


Figure 2. Weed coverages, Priority weeds identified across the MPE Operational Facility (Map 1 of 5)



Figure 3

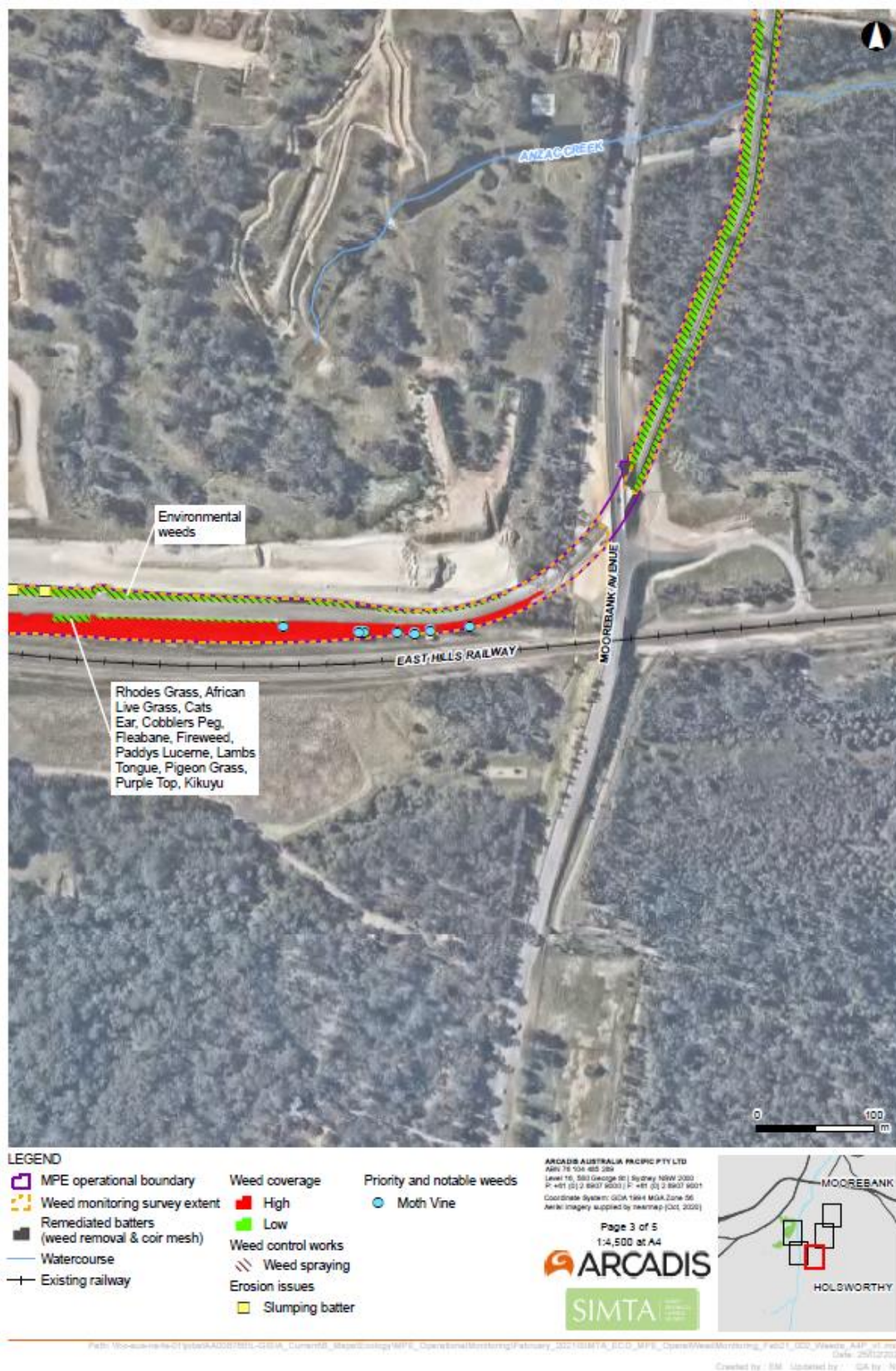


Figure 4





Figure 6

## Recommendations

Recommended weed control actions resulting from the previous weed monitoring surveys are included in Appendix A: Recommended Actions Catalogue. The catalogue has been reviewed and updated to reflect works undertaken since the December surveys.

The following actions are recommended based on observations made during the February survey:

- Remove all occurrence of *Acacia saligna* (Golden Wreath Wattle), *Araujia sericifera* (Moth Vine), *Asparagus asparagoides* (Bridal Creeper), *Lantana camara* (Lantana), *Ludwigia peruviana* (Ludwigia), *Olea europaea* subsp. *cuspidata* (African Olive), *Ricinus communis* (Castor Oil Plant) within the Rail Link and trunk drainage systems.
- Slashing of dead weed biomass along remediated areas of the Rail Link in preparation for revegetation with native species as per the Urban Design and Landscaping Plan (UDLP) (Arcadis 2019a). A follow up treatment of regrowth weeds may be required between now and revegetation activities. Weed control activities should be undertaken in accordance with the approved Weed Management Plan prior to revegetation efforts.
- Soft batters within the trunk drainage system and retention basin/swale at the north-eastern extent of the facility should be inspected for weed growth. Identified weeds should be treated with herbicide in accordance with the approved Weed Management Plan. Revegetation of soft batters within the trunk drainage system and retention basin/swale with a native seed mix should be planned for the upcoming Autumn months as per the Urban Design and Landscaping Plan (UDLP) (Arcadis 2019a).

Application of herbicide within the Rail Link, in areas adjacent to the Moorebank biobank site and threatened flora locations, should be conducted in a way which prevents overspray (off target poisoning). Native vegetation outside of the Rail Link fence should not be affected by herbicide during weed control works.

## References

Arcadis (2019a) Urban Design and Landscape Plan. Moorebank Precinct East Stage 1

Arcadis (2019b) Operational Flora and Fauna Management Plan. Moorebank Logistics Park – East Precinct

Arcadis (2019c) Landscape Vegetation Management Sub Plan. Moorebank Precinct East Stage 2

Arcadis (2020) MPE Operational – Weed Monitoring Report October 2020

Arcadis (2020) Urban Design and Landscape Plan. Moorebank Precinct East Stage 2

Bureau of Meteorology (BOM) (2021) Climate Data Online. Weather and Climate: Holsworthy Aerodrome NSW (station 066161) <http://www.bom.gov.au/climate/dwo/IDCJDW2161.latest.shtml>

NSW Department of Primary Industries (DPI) (accessed 2020) NSW WeedWise. Priority weeds for the Greater Sydney. <https://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=3>

## APPENDIX A. RECOMMENDED ACTIONS CATALOGUE

| Month of logging | Recommended action                                                                                                                                                                                                                 | Status<br>(Not started, Commenced, Complete) | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| April 2020       | Eradicate Priority weeds species including Bridal Creeper, Chilean Needle Grass, Alligator Weed, Lantana, Ludwigia and African Olive                                                                                               | Commenced                                    | Lantana, African Olive and Bridal Creeper remain within the Rail Link<br><br>Ludwigia has been observed within a drainage line at the north easter extent of the facility.<br><br>These weed species should be prioritise for removal.                                                                                                                                                                                                                                                          |
| April 2020       | Remove notable weed species including Golden Wreath Wattle, Moth Vine, Castor Oil Plant, Small-leafed Privet, Grader Grass and Balloon Vine within Rail Link                                                                       | Commenced                                    | Golden Wreath Wattle, Moth Vine and Castor Oil Plant remain within the Rail Link<br><br>These weed species should be prioritise for removal.                                                                                                                                                                                                                                                                                                                                                    |
| June 2020        | Planning should commence to revegetate soft batters and un-developed areas within the MPE Operational Facility with native species in accordance with the approved Urban Design and Landscaping Plan (Arcadis 2019a, Arcadis 2020) | Commenced                                    | Herbicide spraying has been conducted to treat regenerating weeds throughout remediated areas within the Rail Link. The remaining biomass should be removed prior to proceeding with revegetation works. A follow up treatment of germinating weeds with herbicide may be required between now and commencement of revegetation works.<br><br>It is anticipated that revegetation of remediated areas will occur in Autumn months using hydroseeding methodology as per the UDLP (Arcadis 2020) |
| August 2020      | Exotic species, specifically <i>Medicago polymorpha</i> (Burr medic) should be removed from grassland either side of the Rail Link at its eastern extent, closest to the operational area.                                         | Commenced                                    | Weeds have been These areas should be revegetated with native species as per the UDLP to increase native plant coverage and supress weed colonisation.<br><br>This should only be conducted following a pre-clearing inspection by an ecologist to search for threatened flora, specifically <i>Hibbertia fumana</i> .                                                                                                                                                                          |
| December 2020    | Remove exotic grasses and herbaceous weeds in areas not remediated within the Rail Link.                                                                                                                                           | Commenced                                    | Weed infestations along soft batters on the northern side of the Rail Link have been sprayed with herbicide. Majority of                                                                                                                                                                                                                                                                                                                                                                        |

| Month of logging | Recommended action                                                                                                                                                                              | Status<br>(Not started, Commenced, Complete) | Comments                                                                                                                                                                                                                                                                     |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  |                                                                                                                                                                                                 |                                              | <p>weeds have been killed. Weeds on the southern side of Rail Link have been treated to a lesser extent; within 2 meters of the rail track.</p> <p>The next stage would be to remove dead weed biomass and revegetate with native species as per the UDLP (Arcadis 2020)</p> |
| December 2020    | Control colonisation of <i>Cyperus eragrostis</i> within the channel of the trunk drainage system running along the western boundary of the operational facility.                               | Not started                                  | The coverage of <i>Cyperus eragrostis</i> has naturally declined within the channel and trunk drainage system. No evidence of control works was observed. This species should be monitored during future surveys.                                                            |
| December 2020    | Revegetate soft batters surrounding the retention basin / swale at the north-eastern extent of the operational facility with native species in accordance with the approved UDLP (Arcadis 2020) | Not started                                  |                                                                                                                                                                                                                                                                              |

## APPENDIX B. SITE PHOTOGRAPHS (DEC 2020)



Weeds beginning to colonise drainage swales and basins at the north-eastern extent of facility



Majority of weed treated with herbicide along the northern batters of the Rail Link



No weeds were observed in concrete trunk drainage infrastructure at the north-western extent of the facility.



Partial treatment of weeds with herbicide on the southern side of Rail Link



Treatment of regrowth exotic grasses with herbicide

## **APPENDIX B. EPBC OFFSET SITES - 2020 ANNUAL MONITORING REPORT**

# MPE EPBC OFFSET SITE

## EPBC Threatened Flora Monitoring Report

17 MARCH 2021





## CONTACT



Arcadis

Level 16/580 George Street,  
Sydney

# QUBE PROJECT MANAGEMENT SERVICES MOOREBANK LOGISTICS PARK - PRECINCT EAST

## EPBC Threatened Flora Monitoring Report

Author

Checker

Approver

Report No 1.0

Date 17/03/2021

Revision Text B

This report has been prepared for Qube Project Management Services in accordance with the terms and conditions of appointment for Moorebank Precinct East Ongoing Operations dated 22 June 2016. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

## REVISIONS

| Revision | Date       | Description                              | Prepared by  | Approved by |
|----------|------------|------------------------------------------|--------------|-------------|
| A        | 05/03/2021 | First Draft                              | Nathan Banks | Ed Cooper   |
| B        | 17/03/2021 | Final - following comments from Tactical | Nathan Banks | Ed Cooper   |



# CONTENTS

|                                                             |           |
|-------------------------------------------------------------|-----------|
| <b>1 INTRODUCTION.....</b>                                  | <b>1</b>  |
| 1.1 Project background .....                                | 3         |
| 1.2 Requirement to monitor.....                             | 3         |
| 1.3 Project documents .....                                 | 4         |
| 1.4 Establishment of offset sites .....                     | 4         |
| 1.5 Monitoring history.....                                 | 7         |
| 1.6 Summary of 2019 monitoring results .....                | 7         |
| <b>2 METHODOLOGY.....</b>                                   | <b>8</b>  |
| 2.1 Population census .....                                 | 8         |
| 2.2 Habitat Assessment.....                                 | 9         |
| 2.3 Photo points .....                                      | 9         |
| <b>3 RESULTS .....</b>                                      | <b>10</b> |
| <b>3.1 Population census for EPBC threatened flora.....</b> | <b>10</b> |
| 3.1.1 Nodding Geebung .....                                 | 10        |
| 3.1.2 Small-flower Grevillea .....                          | 17        |
| <b>3.2 Habitat assessment .....</b>                         | <b>19</b> |
| 3.2.1 Nodding Geebung .....                                 | 19        |
| 3.2.2 Small-flower Grevillea .....                          | 25        |
| <b>3.3 Photo point monitoring.....</b>                      | <b>26</b> |
| <b>4 REVIEW OF CURRENT MANAGEMENT ACTIONS .....</b>         | <b>27</b> |
| <b>5 DISCUSSION &amp; RECOMMENDATIONS.....</b>              | <b>32</b> |
| 5.1.1 Nodding Geebung .....                                 | 32        |
| 5.1.2 Small-flower Grevillea offset sites .....             | 35        |
| <b>6 REFERENCES.....</b>                                    | <b>37</b> |
| <b>7 APPENDICES.....</b>                                    | <b>38</b> |

# APPENDICES

**APPENDIX A BAM MONITORING QUADRAT DATA SET**

**APPENDIX B BAM QUADRATS VEGETATION SCORE SUMMARY**

**APPENDIX C ANNUAL MONITORING PHOTOGRAPHS**

**APPENDIX D PHOTO POINT DETAILS**

## 1 INTRODUCTION

Arcadis have been commissioned by Tactical on behalf of Sydney Intermodal Terminal Alliance (SIMTA) to implement a program to monitor two threatened plant species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea) and *Persoonia nutans* (Nodding Geebung).

Monitoring of Small-flower Grevillea and Nodding Geebung within designated offset sites is being conducted to satisfy conditional requirements of the Commonwealth Conditions of Approval (CoA) for the Moorebank Logistics Precinct (MLP) East project (EPBC 2011/6229) (hereinafter referred to as MPE). Monitoring commenced in Spring 2019 and is set to continue for the life of the offset which has been anticipated at 20 years.

Objectives of monitoring, survey methodologies, timings and guidelines have been described in the Threatened Flora Offset Management Plan (TFOMP) prepared by Arcadis in 2017 and updated in 2020.

This monitoring report addresses the requirements to monitor Small-flower Grevillea and Nodding Geebung and presents the results of 2020 monitoring surveys for populations of these plants with designated EPBC offset sites (Figure 1).



#### LEGEND

- |                                     |                                           |                       |
|-------------------------------------|-------------------------------------------|-----------------------|
| MPE site                            | EPBC offset site (Small-flower Grevillea) | Operational rail link |
| Wattle Grove offset site (Bootland) | EPBC offset site (Nodding Geebung)        | Existing railway      |
| Creek/River crossing                |                                           | Watercourse           |
| Road crossing                       |                                           |                       |

ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Date issued: March 4, 2021  
 Aerial imagery supplied by Nearmap (Jan, 2020)



Figure 1. EPBC offset sites within Wattle Grove offset area; adjacent to the MLP East Precinct

## 1.1 Project background

SIMTA received Commonwealth approval under the EPBC Act for the construction and operation of the MPE project on 6 March 2014 (EPBC 2011/6229).

Construction of the MPE project commenced in mid-2016 with operations being launched in a staged manner from Q2-2020. The MPE project includes an intermodal terminal facility and warehouse/distribution facility, which offers container storage and warehousing solutions with direct rail access to Port Botany.

Two EPBC Act listed threatened flora species were directly impacted by the MPE Project:

- *Persoonia nutans* (Nodding Geebung), a shrub listed as Endangered under the EPBC Act and *Biodiversity Conservation Act 2016* (BC Act). The MLP East project resulted in the removal of 17 Nodding Geebung.
- *Grevillea parviflora* subsp. *parviflora* (Small-flower Grevillea), a shrub listed as Vulnerable under the EPBC Act and BC Act. The MLP East Project has resulted in the removal of 20 Small-flower Grevillea stems.

Impacts to EPBC threatened flora species have occurred at two locations within the MLP East project footprint:

- within a portion of Stage 1, Package 1: the Rail Link; and
- within the MPE Stage 2 Modification 2 project area: onsite stormwater detention basin (OSD) 2 (which includes a section of the MPE Stage 2 project footprint)

A total of 20 Small-flower Grevillea and 11 Nodding Geebung have been removed from the portion of the Rail Link located directly south of the MPE site and east of Moorebank Avenue. Six additional Nodding Geebung have been removed to facilitate the revised footprint of OSD 2 at the southern extent of the MPE Stage 2 project adjacent to the Moorebank biobank site.

## 1.2 Requirement to monitor

Arcadis prepared a Threatened Species Offset Management Plan (TFOMP) in 2017, which was updated in 2020, specifying how SIMTA would achieve the requirements of the EPBC Act Environmental Offset Policy for impacts to Small-flower Grevillea and Nodding Geebung. The TFOMP is a conditional requirement (Condition 6) of the MPE CoA (EPBC 2011/6229) (Table 1).

Table 1. CoA (EPBC 2011/6229): Condition 6

| CoA | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6   | <p>For the better protection of Nodding Geebung, Small-flower Grevillea (and potentially, <i>Hibbertia</i> sp. Bankstown and Bynoe's Wattle pending the outcome of conditions 3 and 4) the person taking the action must engage a suitably qualified expert to prepare a Threatened Flora Offset Management Plan (TFOMP) (or plans) for the approval of the Minister. The TFOMP must include (but need not be limited to):</p> <ul style="list-style-type: none"><li>(a) Details of a direct offset that satisfies the requirement of the Department's offset policy, in accordance with the offset user guide (including timeframes for the delivery or acquisition of the direct offset);</li><li>(b) Maps (s) and shapefile that identify the location and boundaries of the direct offset;</li><li>(c) Details of the management action and performance objectives which will maintain and enhance the Nodding Geebung and Small-flower Grevillea habitat and/or population covered by the TFOMP (including duration, intensity, and timing of management actions);</li></ul> |

| CoA | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <p>(d) An assessment of the baseline population and distribution for Nodding Geebung and Small-flower Grevillea within the direct offset, including:</p> <ul style="list-style-type: none"> <li>• The number of plants protected and their location; and</li> <li>• Plant and habitat protection</li> </ul> <p>(e) Measures for regular monitoring of the status of individuals of Nodding Geebung and Small-flower Grevillea and their habitat as measured against the baseline population and distribution, including:</p> <ul style="list-style-type: none"> <li>• Fluctuations in population size and distribution; and</li> <li>• response to disturbance and/or management actions</li> </ul> <p>(f) Provisions to revise the approved TFOMP in response to monitoring associated with condition 6 (e)</p> <ul style="list-style-type: none"> <li>• Native vegetation clearance must not occur until the TFOMP has been approved. The TFOMP must be implemented once approved.</li> <li>• Should the action result in, or be likely to result in, residual impacts to <i>Hibbertia</i> sp. Bankstown or Bynoe's Wattle (as determined by the Minister), the TFOMP must also demonstrate how it meets the standards described in (a) and (f), for these two species.</li> </ul> |

This report has been prepared to specifically address CoA 6(e):

*Measures for regular monitoring of the status of individuals of Nodding Geebung and Small-flower Grevillea and their habitat as measured against the baseline population and distribution, including:*

- *fluctuations in population size and distribution; and*
- *response to disturbance and/or management actions*

## 1.3 Project documents

The following project documents have been reviewed prior and throughout the monitoring process to determine monitoring objectives and EPBC offsetting requirements. Documents include, but are not limited to:

- BioBanking Agreement (BA341) for Moorebank Intermodal Terminal Biobank Site (OEH 2017)
- Biodiversity Assessment Report: Biobanking Agreement – Wattle Grove Offset Area, Casula Offset Area and Moorebank Conservation Area (WSP & Parsons Brinckerhoff 2017)
- Biodiversity Management Implementation Plan (Arcadis 2019)
- Conditions attached to the approval: SIMTA Moorebank Intermodal Terminal Facility, Sydney, NSW (EPBC 2011/6229) (DoE 2014)
- Threatened Flora Offset Management Plan (Arcadis 2020a).

## 1.4 Establishment of offset sites

To deliver the required offset for impacts to EPBC listed threatened plants five designated offset sites were established. Offset sites were situated within the Wattle Grove offset area which is a part of the BA341 biobank site. Inclusion of these offset sites within the biobank site affords better protection to these plants, being secured under a conservation agreement which provides in-perpetuity funding for management actions that are tied to a strong regulatory framework of monitoring and auditing.

In accordance with the revised TFOMP (Arcadis 2020a), four offset sites are designated for the conservation of Nodding Geebung and one is for Small-flower Grevillea. It is anticipated that

conservation and management of EPBC offset sites will maintain the initial number of plants/stems of these species and will result in a population increase across a 20-year management period. It is anticipated that the protection and management of the offset sites over a 20 year period, will result in an increase of Nodding Geebung and Small-flower Grevillea by 16 and 17 individuals, respectively.

In order to achieve this population growth within the offset sites, a total of 155 Nodding Geebung and 142 Small-flower Grevillea have been included across the five offset sites (see Table 2).

Offset calculations were prepared for Nodding Geebung and Small-flower Grevillea based on guidance provided in the EPBC Offset Assessments Guide (DOEE 2012). Offset calculations and associated species information (temporal scale, risk scales, future habitat quality, result confidence) has been included within the approved TFOMP (Arcadis 2020a). These calculations have assessed and supported the suitability of the proposed offset sites to achieve 100% of the required EPBC offset for the MPE Project over a period of 20 years.

*Table 2. Details of EPBC offset sites: Nodding Geebung*

| EPBC Offset Site | Area    | Number of plants/stems to be conserved within the offset site per the EPBC Act offset requirement | Offset requirement objective                                                            |
|------------------|---------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| P1               | 0.25 ha | 31 plants of Nodding Geebung                                                                      | Increase Nodding Geebung population within EPBC Offset Sites by 16 plants over 20 years |
| P2               | 0.2 ha  | 46 plants of Nodding Geebung                                                                      |                                                                                         |
| P3               | 0.26 ha | 35 plants of Nodding Geebung                                                                      |                                                                                         |
| P4               | 2.17 ha | 43 plants of Nodding Geebung                                                                      |                                                                                         |
| Total            | 2.88 ha | 155 plants of Nodding Geebung                                                                     |                                                                                         |

*Table 3. Details of EPBC offset sites: Small-flower Grevillea*

| EPBC Offset Site | Area    | Number of plants/stems to be conserved within the offset site per the EPBC Act offset requirement | Offset requirement objective                                                                   |
|------------------|---------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| G1               | 0.24 ha | 142 stems of Small-flower Grevillea                                                               | Increase Small-flower Grevillea population within EPBC Offset Sites by 17 plants over 20 years |

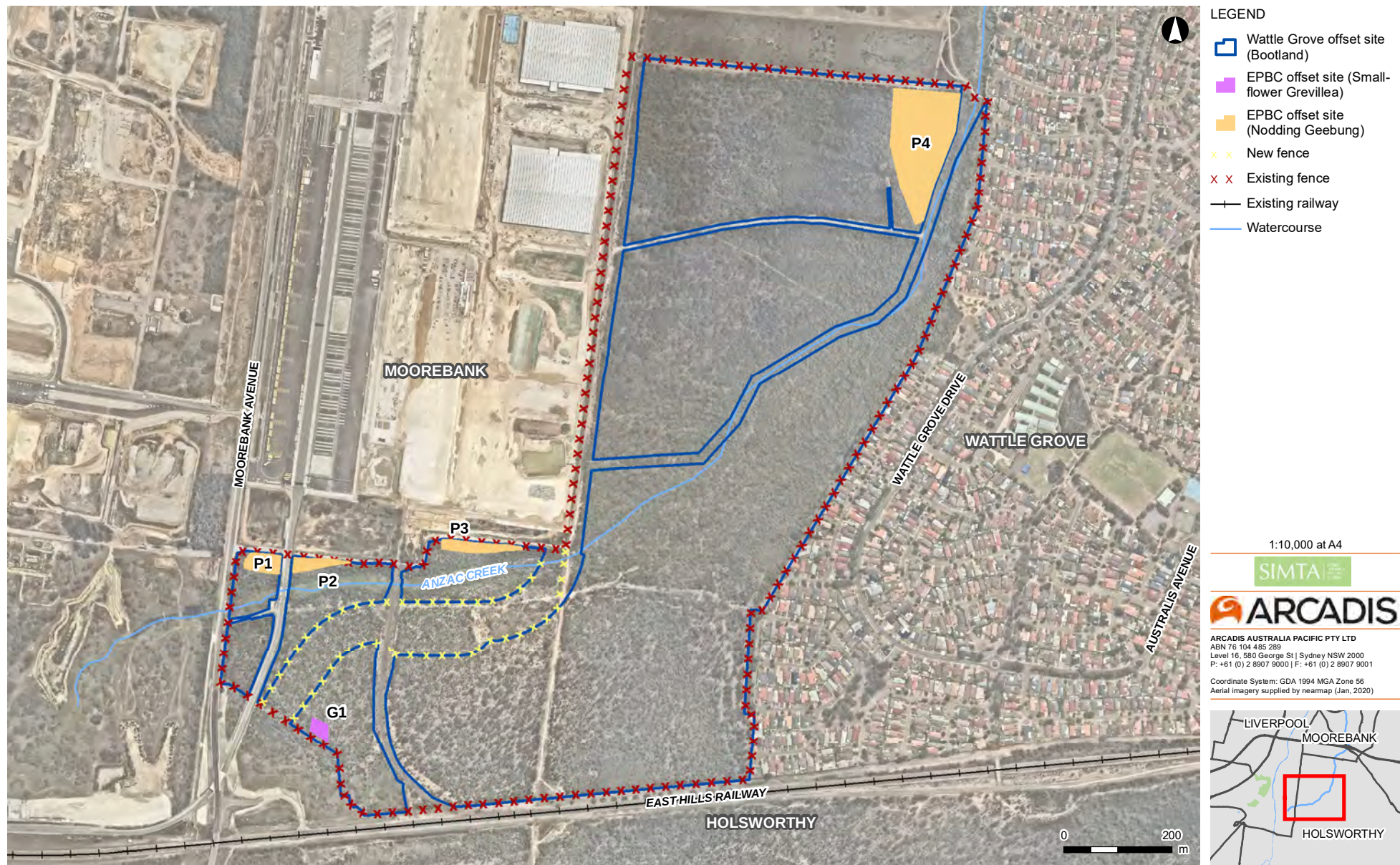


Figure 2. Approved EPBC offset sites within Wattle Grove offset area

## 1.5 Monitoring history

Annual monitoring of EPBC offset sites commenced in 2019, approximately 18 months following a wildfire which burnt the southern portion of Wattle Grove offset area. A summary of the results of first round monitoring is included in Section 1.6.

During the first round monitoring survey the four EPBC offset sites were established in accordance with the Threatened Flora Offset Management Plan (TFOMP) (Arcadis 2017). These four offset sites were established as direct offset sites to compensate for impacts to 11 Nodding Geebung and 20 Small-flower Grevillea from the Moorebank Logistics Park East Precinct project.

In 2020 an additional 6 Nodding Geebung plants were identified as being impacted by the MLP East Stage 2 development and subsequently required offsetting in accordance with the EPBC Offsetting Guide. The TFOMP was updated (Arcadis 2020a) to include the additional impacts and document how the additional offsets would be delivered. It was determined that an additional Nodding Geebung offset site (P4) would be established during the 2020 annual monitoring surveys at the northern extent of Wattle Grove offset area.

During the 2020 monitoring surveys the additional Nodding Geebung offset site (P4) was established and monitored with the existing Nodding Geebung and Small-flower Grevillea offset sites (P1, P2, P3 and G1). This report documents the findings of the 2020 monitoring surveys.

## 1.6 Summary of 2019 monitoring results

In 2019 four EPBC offset sites were established within the Wattle Grove offset area and were monitored; offset sites P1, P2, P3 and G1. All four offset sites were located in areas burnt by the 2018 wildfire. Subsequently, vegetation within offset sites was in the process of regenerating including the target threatened species Nodding Geebung and Small-flower Grevillea.

A total of 112 Nodding Geebungs were recorded within EPBC offset sites P1, P2 and P3 during the 2019 surveys. Of these, 110 were juvenile plants which had regenerated following the 2018 wildfire. Nine and three Nodding Geebung were observed across offset sites P1 and P2 respectively, with the other 100 individuals being recorded in offset site P3. The majority of Nodding Geebung were observed growing in disturbed areas on the periphery of the intact bushland nearest and in some instances on the adjacent vehicle access tracks. The recorded Nodding Geebung were largely in good condition, with no or little signs of insect damage and new growth being evident. Only the two adult plants in P3, which were not burnt by the 2018 wildfire, were observed to be fruiting.

The condition of vegetation across the Nodding Geebung offset sites was observed to be in good condition and showing good signs of recovery following the wildfire. A diversity of native plant species was recorded across all offset sites and exotic species occurrence was restricted to the edges of bushland, specifically on the interface between access tracks and bushland. African Love Grass (*Eragrostis curvula*) was the most encountered weed species.

Despite 112 individual Nodding Geebung being reflective of the pre-fire counts across the offset sites it was noted that there has been a shift in population dynamics, with only two adult plants being recorded. Nodding Geebung juveniles are likely to be fragile and sensitive to changes in their surrounding environment. It was considered in the 2019 annual monitoring report that over the following 12 months juvenile Nodding Geebung will die and/or may also germinate.

A total of 142 individual stems of Small-flower Grevillea were counted in offset site G1 during 2019 population census. All plants were recorded as juveniles as no reproductive material (flowers or seed) was observed during surveys. Stems had a healthy condition and were distributed across most of the offset site.

Vegetation within G1, similarly to the other offset sites, had shown significant recovery since the wildfire. Weed occurrence was low with African Love Grass mainly being evident along the western edge of the offset site, albeit at a low percent coverage. A high diversity of plants was observed across the offset site with no species appearing to be dominating and or at risk of outcompeting other species.

## 2 METHODOLOGY

Annual monitoring of EPBC offset sites was undertaken by Arcadis ecologists over six days between 1 September and 10 November 2020.

Generally, the weather on the dates of survey was sunny and the temperature was mild to warm. Weather records from the nearest weather station, Holsworthy Aerodrome AWS (station 066161) for the surveyed dates are presented in Table 4.

Threatened flora searches were undertaken during sunny, dry weather conditions and during the recommended survey season for Nodding Geebung and Small-flower Grevillea (DPIE 2019a, 2019b), to maximise the chance of detection.

Table 4. Surveying ecologists and climatic conditions during EPBC offset site monitoring

| Date        | Attending Ecologists          | Temperature |          | Rain |
|-------------|-------------------------------|-------------|----------|------|
|             |                               | Min (°C)    | Max (°C) | (mm) |
| 1 Sep 2019  | Nathan Banks,<br>Ed Cooper    | 8.3         | 18.1     | 0    |
| 7 Sep 2019  | Nathan Banks,<br>Kate Carroll | 8.1         | 22.6     | 0    |
| 17 Sep 2019 | Nathan Banks,<br>Jane Rodd    | 10.2        | 30.9     | 0    |
| 21 Sep 2020 | Nathan Banks,<br>Kate Carroll | 12.1        | 29.1     | 8.8  |
| 7 Oct 2020  | Nathan Banks,<br>Kate Carroll | NA          | 16.2     | 0    |
| 10 Nov 2020 | Nathan Banks,<br>Julia Green  | 9.4         | 24.3     | 0    |

### 2.1 Population census

Targeted searches for Nodding Geebung and Small-flower Grevillea were conducted within EPBC offset sites. Transects were walked at three metre spacings, covering the entire offset site. The location of plants were recorded on an Arc-GIS enabled iPad.

Counts were made for Small-flower Grevillea and Nodding Geebung within designated offset sites. Additional information was recorded for Nodding Geebung individuals:

- Size (height and spread)
- General health (i.e. evidence of insect damage)
- Reproductive status (i.e. evidence of flowering and fruiting)

Individual Nodding Geebung were marked with numbered metal tags, to allow individual tracking across monitoring periods.

Juvenile plants were classified as individuals which were small, generally with a height and width less than 50 centimetres, and lacked any reproductive features including flowers and seeds. Adult plants

were generally large shrubs greater than 1 metre in height and width and displaying reproductive features. Most adult Nodding Geebung identified during surveys were observed to be seeding (Plate 1).

## 2.2 Habitat Assessment

Offset sites were evaluated for habitat suitability to Nodding Geebung or Small-flower Grevillea. An assessment of the habitat value of each offset site was determined by quantitatively measuring the condition of native vegetation, noting significant changes to site characteristics (vegetation growth, weed occurrence, erosion) and identifying potential impacts.

The condition of native vegetation within each offset site was measured using vegetation quadrats in accordance with Section 5.3 of Biodiversity Assessment Method (BAM) (OEH 2017). Results of BAM quadrats were used to inform upon the following vegetation attributes:

- Percent foliage cover of canopy species
- Percent foliage cover of shrub species
- Percent foliage cover of ground cover species
- Percent foliage cover of exotic species

A Vegetation Integrity (VI) score was calculated using the result of vegetation quadrats conducted at each offset site. VI scores will be compared between monitoring periods to measure changes to vegetation condition. It is anticipated that the VI score continually improves and the contributing attributes (composition, function etc.) moves towards the benchmark scores for PCT 883 Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion.

Notes were made of any evidence of native vegetation dieback within or surrounding the EPBC offset sites.

## 2.3 Photo points

Four photo points were established on the perimeter of each EPBC offset site and a single photo point was established centrally within the offset site. Photo points on the boundary were captured in a single cardinal direction. In the middle of the plot, four photographs were captured from the central photo point in four cardinal directions.

Photo points are located at permanent metal boundary stakes and a permeant stake in the middle of the offset site. The permanent metal stakes were demarcated with a numbered metal tag identifying the relevant photo point.

Locations of photo points and the orientation of photographs is presented in Appendix D.

## 3 RESULTS

The results of the 2020 monitoring events are summarised within the following sections.

### 3.1 Population census for EPBC threatened flora

The population census results for Nodding Geebung and Small-flower Grevillea are presented below.

#### 3.1.1 Nodding Geebung

A total of 133 Nodding Geebung were identified across Nodding Geebung offset sites during the 2020 survey. Of the 113 plants located, 90 were identified across offset sites P1, P2 and P3, and 43 individuals at offset site P4.

P4 was surveyed for the first time during the 2020 survey and all plants located were marked with numbered metal tags to be tracked in proceeding monitoring events. A thorough search was conducted throughout offset sites P1, P2 and P3 to re-find Nodding Geebung individuals previously tagged during the 2019 survey and any new plants which may have recruited. Searches re-found a total of 61 tagged Nodding Geebung individuals and identified 29 new plants. A total of 50 numbered metal tags were re-found without a Nodding Geebung plant. It is assumed that the 50 previously marked Nodding Geebung individuals died at some time in the following year.

Nodding Geebung within offset sites were observed to be in good condition. No evidence of impacts from mammals (trampling or grazing) was observed, however there was some evidence of historical damage from insects in juvenile plants in offset site P3. The majority of individuals which had signs of historical damage were observed to have produced new growth during the 2020 monitoring period.

Offset sites P1 and P3 mainly supported juvenile Nodding Geebung whereas offset site P4, which was not impacted by the 2018 wildfire, has a Nodding Geebung population consisting of adult plants. Changes to Nodding Geebung populations within each offset site is discussed below.



*Plate 1. Juvenile (left) and adult (right) Nodding Geebung identified during population census*

## Offset site P1

A total of 13 Nodding Geebung were located in offset site P1 during the 2020 survey. All individuals located were juvenile plants showing no signs of seeding or flowering. Of the 13 plants identified six had been recorded and marked with numbered metal tags during the 2019 survey. The additional seven plants are considered new individuals germinating since the previous surveys. Metal tags were re-found at locations where two juvenile Nodding Geebung were identified during the 2019 survey; these two individuals are presumed to have died at some time in the following year. A summary of changes to the Nodding Geebung population within offset site P1 has been presented in Table 5.

Table 5. Summary of changes to Nodding Geebung population in offset site P1

| Offset site P1                           | Count     |
|------------------------------------------|-----------|
| Existing individuals                     | 6         |
| New individuals                          | 7         |
| <b>Total</b>                             | <b>13</b> |
| Individuals not re-found (presumed dead) | 2         |

Nodding Geebung within offset site P1 were located towards the northern boundary of the offset site in disturbed areas near an access track (Figure 3). Nodding geebung were observed growing as individuals and in small groupings on a sandy soil profile interspersed amongst tussocks of *Eragrostis curvula* (African Love Grass), beneath burnt *Petrophile pulchella* (Conesticks). Nodding Geebung were more prevalent in exposed areas with reduced leaf litter and reduced vegetation coverage.

## Offset site P2

No Nodding Geebung were identified within offset site P2. Metal tags were re-found at locations near the northern boundary of the offset site where three juvenile Nodding Geebung were identified during the 2019 survey; these three individuals are presumed to have died at some time in the following year. Changes to the Nodding Geebung population within offset site P2 has been summarised in Table 6.

Table 6. Summary of changes to Nodding Geebung population in offset site P2

| Offset site P2                           | Count    |
|------------------------------------------|----------|
| Existing individuals                     | 0        |
| New individuals                          | 0        |
| <b>Total</b>                             | <b>0</b> |
| Individuals not re-found (presumed dead) | 3        |

## Offset site P3

A total of 77 Nodding Geebung were identified in offset site P3 during the 2020 survey. Two adult plants and 75 juveniles were present. Of the 77 individuals identified 55 had been recorded and marked with numbered metal tags during the 2019 survey. The additional 22 plants are considered new individuals germinating since the previous surveys. A total of 45 juvenile Nodding Geebung recorded during the 2019 surveys were not re-found and are presumed to have died. Majority of metal tags used to identify individuals that were no longer present were recovered. A summary of changes to the Nodding Geebung population within offset site P3 has been presented in Table 7.

Table 7. Summary of changes to Nodding Geebung population in offset site P3

| Offset site P3                           | Count     |
|------------------------------------------|-----------|
| Existing individuals                     | 55        |
| New individuals                          | 22        |
| <b>Total</b>                             | <b>77</b> |
| Individuals not re-found (presumed dead) | 45        |

Majority of individuals were observed growing in dense groupings along the northern boundary of the offset site interspersed amongst tussocks of African Love Grass, beneath stands of *Kunzia ambigua* (Tickbush). Individuals were observed to preference the disturbed edge of the bushland adjacent to an access track. Three plants were found centrally within the offset site in natural areas (Figure 6).

### Offset Site P4

A total of 43 Nodding Geebung were identified in offset site P4 during the 2020 survey. Only adult plants were present most of which were observed flowering and seeding. The 2020 survey marked the first time this offset site has been monitored and subsequently changes to population can't be measured. Results from this survey will form the baseline data set that can be compared against in future monitoring events.

Nodding Geebung within offset site P4 were distributed throughout Hard-leaved Scribbly Gum woodland. Individuals were identified in areas of open woodland with a sparse shrub layer as well as areas densely vegetated with mid-storey species and shrubs. All Nodding Geebung identified were observed to be healthy adult plants and, in most instances, bearing seed.



Figure 3: EPBC offset site P1: Nodding Geebung population monitoring

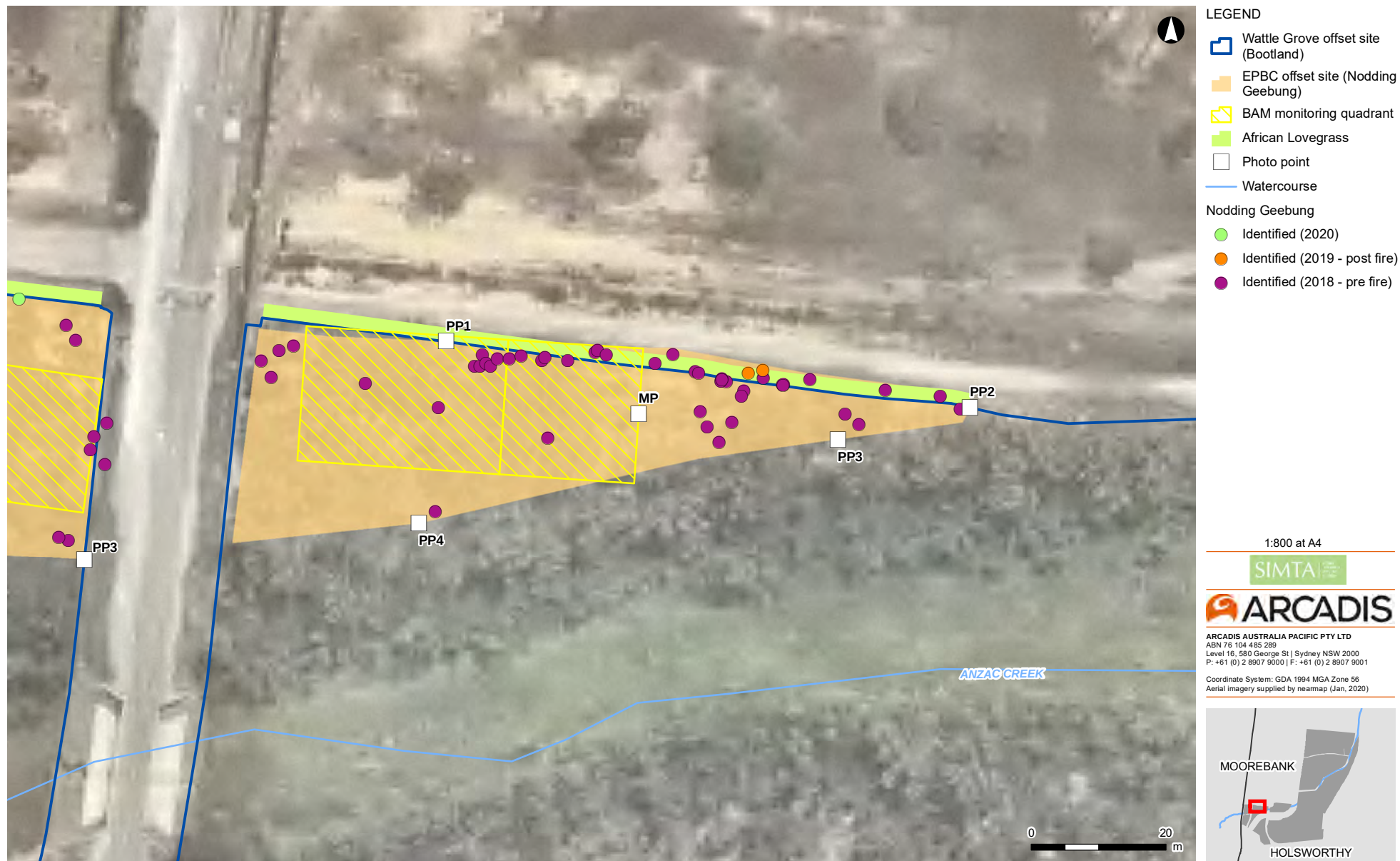


Figure 4: EPBC offset site P2: Nodding Geebung population monitoring

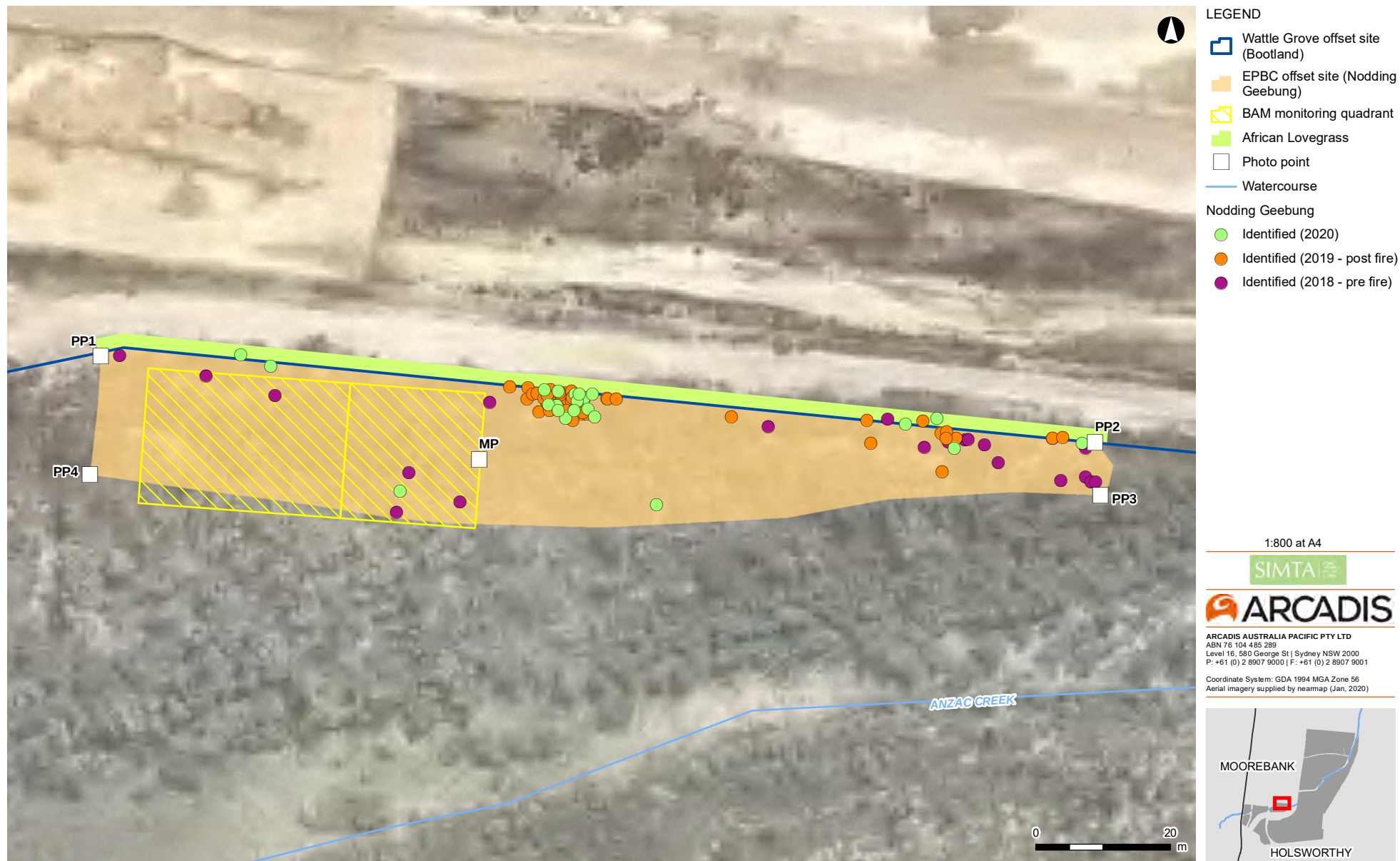


Figure 5: EPBC offset site P3: Nodding Geebung population monitoring

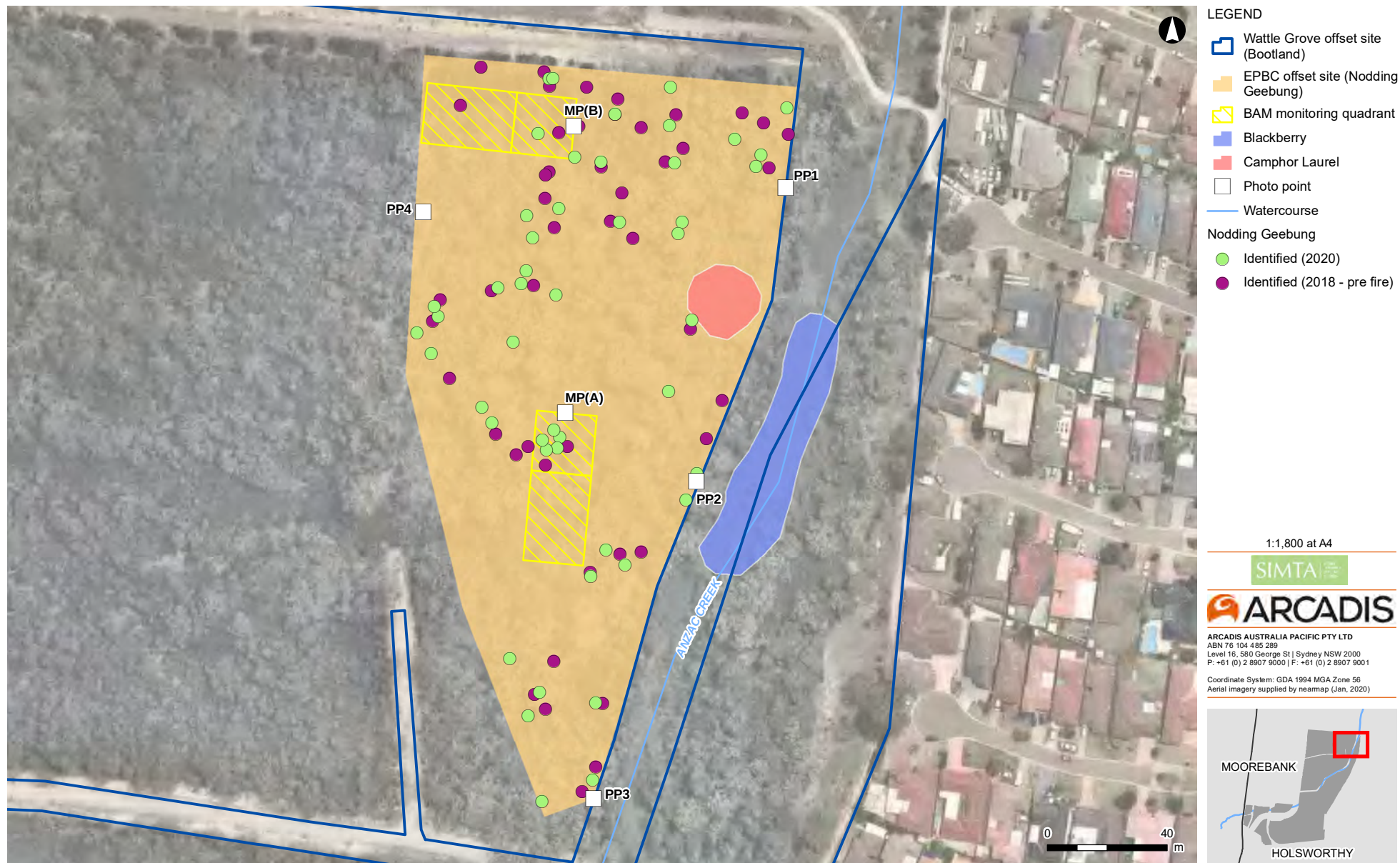


Figure 6: EPBC offset site P4: Nodding Geebung population monitoring

### 3.1.2 Small-flower Grevillea

A total of 60 Small-flower Grevillea stems were identified within offset site G1 during the 2020 survey. Unlike Nodding Geebung, the TFOMP (Arcadis 2020) did not include provisions to mark Small-flower Grevillea individuals during the 2019 survey, therefore, recruitment and death rates within the population can't be accurately determined. It is not suggested that individual plant tracking is conducted for monitoring this species in the future. This is discussed further in Section 5.1.2.

Small-flower Grevillea stems were more prevalent towards the east and west of the offset site with only a small number of plants being distributed centrally.

No Small-flower Grevillea stems were observed to be flowering at the time of survey nor did any appear to have seed present. Plants were generally sparsely scattered, however close groupings of up to five plants was occasionally observed. Individuals appeared to have a healthy condition and displaying new growth. Small-flower Grevillea displayed a habitat preference for exposed areas with reduced vegetation and litter coverage at offset site G1.



Plate 2. Small-flower Grevillea observed to be in flower adjacent to the EPBC Offset Site



Figure 7: EPBC offset site G1: Small-flower Grevillea population monitoring

## 3.2 Habitat assessment

All five EPBC offset sites are situated within Plant Community Type (PCT) 883 Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion.

This community is one of several unique dry shrub woodland communities found on poorly consolidated sand deposits on hinterland plains and valleys of the Sydney region. This community occurs on old stream deposits at Holsworthy (Tozer et al. 2010).

This vegetation has a woodland formation comprising an open, low-growing eucalypt cover dominated by Hard-leaved Scribbly Gum (*Eucalyptus sclerophylla*), Narrow-leaved Apple (*Angophora bakeri*) and Parramatta Red Gum (*Eucalyptus parramattensis* subsp. *parramattensis*). A sparse cover of tall paperbark (*Melaleuca decora*) is often present. Banksias, hakeas, wattles, tea-trees and paperbarks provide a well-developed shrub layer. The ground cover is usually a diverse mix of species typically including a high cover of grasses and sedges (Tozer et al. 2010).

### 3.2.1 Nodding Geebung

#### 3.2.1.1 General habitat preference (OEH, 2019)

The ecology of Nodding Geebung is poorly known and this species has a disjunct distribution. The southern population of Nodding Geebung, which includes this population, is isolated and consists of relatively small populations in the Liverpool, Campbelltown, Bankstown and Blacktown local government areas. The southern populations occupies tertiary alluvium extending onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.

Habitat preference is not well understood however abundance at sites appear to be related to disturbance history. Sites with higher abundance also appear to be more disturbed.

#### 3.2.1.2 Offset Site P1 (Nodding Geebung)



Plate 3. Vegetation within EPBC Offset Site P1

The patch of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset site P1 recorded a VI score of 47.9. This patch of vegetation had a complete structure including native species from each vegetation stratum; canopy, shrub and ground layer. Weed coverage across the offset site was low, with only scattered occurrences of exotic species being present.

The upper stratum was comprised of four tree species *Acacia parramattensis* (Parramatta Wattle), *Angophora bakeri* (Narrow-leaved Apple), *Eucalyptus parramattensis* (Parramatta Red Gum) and *Eucalyptus racemosa* (Hard-leaved Scribbly Gum). The canopy accounted for a cover of 16% across the quadrat.

Native shrubs recorded a coverage of 19 percent across the quadrat with 11 different species identified. The dominant shrub species included *Callistemon rigidus* (Stiff Bottlebrush), *Leptospermum trinervium* (Slender Tea-tree), *Melaleuca linariifolia* (Flax-leaved Paperbark), *Melaleuca nadosa* (Prickly-leaved Paperbark) and *Pimelea linifolia* (Slender Rice Flower).

A total of 19 ground cover species were recorded within the BAM vegetation quadrat, having a combined coverage of 6.8 percent. The dominant ground cover species included *Cyathochaeta diandra*, *Dianella caerulea* (Blue Flax-lily), *Entolasia stricta* (Wiry Panic), *Gahnia aspera* (Rough Saw-sedge), *Microlaena stipoides* (Weeping Grass) and *Xanthorrhoea* sp. (Grass Tree).

One exotic species was identified within the quadrat, *Eragrostis curvula* (African Love Grass). This species was sparse within the bushland however become more prominent on the northern edge of the offset site nearest the access road. The quadrat recorded a total exotic species coverage of 0.2%.

Table 8. Habitat assessment summary: EPBC Offset Site P1

| Attributes                 | PCT Benchmark | Survey results | Dominant species                                                                                         |
|----------------------------|---------------|----------------|----------------------------------------------------------------------------------------------------------|
| Tree cover                 | 28            | 16             | <i>Eucalyptus racemosa</i> (5%)<br><i>Angophora bakeri</i> (5%)<br><i>Eucalyptus parramattensis</i> (5%) |
| Shrub cover                | 82            | 46             | <i>Melaleuca nadosa</i> (30%)<br><i>Pimelea linifolia</i> (10%)<br><i>Leptospermum trinervium</i> (2%)   |
| Ground cover               | 66            | 6.8            | <i>Microlaena stipoides</i> (2%)<br><i>Cyathochaeta diandra</i> (1%)<br><i>Xanthorrhoea media</i> (1%)   |
| Exotic cover               | NA            | 0.1            | <i>Eragrostis curvula</i> (0.1%)                                                                         |
| Vegetation Integrity Score | 100           | 64.8           |                                                                                                          |

### 3.2.1.3 Offset Site P2 (Nodding Geebung)



Plate 4. Vegetation within EPBC Offset Site P2

The patch of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset site P2 recorded a VI score of 52.6. The vegetation assemblage is fully structured with an established canopy, shrub layer and developing ground layer. There is little to no weed occurrence within the core of the offset site. Invasive grasses are present on the northern boundary of the offset site, on the peripheries of natural bushland next to a vehicle access track.

Four species were present within the canopy stratum including Hard-leaved Scribbly Gum, Parramatta Wattle and Narrow-leaved Apple. The canopy recorded a coverage of 47.3 percent across the quadrat.

A total of 13 shrub species were identified in the vegetation quadrat. The dominant shrubs species present include *Exocarpos cupressiformis* (Native Cherry), *Hibbertia aspera* (Rough Guinea Flower), *Melaleuca nodosa*, *Melaleuca linariifolia* (Flax-leaved Paperbark) and *Persoonia pinifolia* (Pine-leaved Geebung). The total shrub cover recoded for the quadrat was 15.7 percent.

The ground stratum had coverage of 22.1 percent including 13 different flora species. The dominant ground covers species included *Dianella revoluta* (Blueberry Lily), *Lomandra longifolia* (Spiny-headed Mat-rush), *Microlaena stipoides* (Weeping Grass) and *Themeda triandra* (Kangaroo Grass).

No exotic flora species were recorded within the quadrat and weeds were generally sparse across the offset site. Patches of African Love Grass are present along the northern boundary of the offset site on the periphery of bushland next to an access track.

Table 9. Habitat assessment summary: EPBC Offset Site P2

| Attribute   | PCT Benchmark | Survey results | Dominant species                                                                                      |
|-------------|---------------|----------------|-------------------------------------------------------------------------------------------------------|
| Tree cover  | 28            | 47.3           | <i>Eucalyptus racemosa</i> (40%)<br><i>Angophora bakeri</i> (5%)<br><i>Acacia parramattensis</i> (2%) |
| Shrub cover | 82            | 15.7           | <i>Melaleuca nodosa</i> (8%)<br><i>Melaleuca linariifolia</i> (2%)                                    |

| Attribute                  | PCT Benchmark | Survey results | Dominant species                                                                                        |
|----------------------------|---------------|----------------|---------------------------------------------------------------------------------------------------------|
|                            |               |                | <i>Exocarpos cupressiformis</i> (1%)                                                                    |
| Ground cover               | 66            | 22.1           | <i>Lomandra longifolia</i> (10%)<br><i>Microlaena stipoides</i> (10%)<br><i>Themeda triandra</i> (0.5%) |
| Exotic cover               | NA            | 0              | NA                                                                                                      |
| Vegetation Integrity Score | 100           | 56.5           |                                                                                                         |

### 3.2.1.4 Offset Site P3 (Nodding Geebung)



Plate 5. Vegetation within EPBC Offset Site P3

The patch of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset site P3 recorded a VI score of 59.6. The assemblage has recovered significantly since the wildfire and contains a diverse shrub and ground cover stratum. Within the natural bushland weed occurrence is sparse. Weed occurrence was only observed on the northern boundary, on the peripheries of bushland adjacent to a vehicle access track.

Three canopy species were identified within the vegetation quadrat including *Acacia binervia* (Coast Myall), *Eucalyptus racemosa* (Narrow-leaved Scribbly Gum) and *Angophora bakeri* (Narrow-leaved Apple). Canopy coverage accounted for 36 percent across the quadrat.

Shrubs accounted for 5.7 percent coverage across the quadrat. A total of 20 native shrubs species were identified including *Bossiaea heterophylla* (Variable Bossiaea), *Bursaria spinosa* (Blackthorn), *Daviesia genistifolia* (Broom Bitter Pea), *Melaleuca thymifolia* (Thyme Honey-myrtle) and *Persoonia linearis* (Narrow-leaved Geebung).

A total of 20 ground cover species was recorded within the vegetation quadrat, accounting for a coverage of 22.9 percent. Groundcover species identified included *Coronidium scorpioides* (Button Everlasting), *Entolasia stricta* (Wiry Panic), *Pomax umbellata* (Pomax), *Patersonia sericea* (Silky Purple-flag) and *Pratia purpurascens* (Whiteroot) and *Trachymene incisa* (Trachymene).

African Love Grass was the only exotic species recorded within the vegetation quadrant. This invasive species recorded a percentage cover of 0.2%. Similarly, to other Nodding Geebung offset sites weed occurrence was mainly restricted to the peripheries of intact bushland adjacent to a vehicle access track.

Table 10. Habitat assessment summary: EPBC Offset Site P3

| Attributes                 | PCT Benchmark | Survey results | Dominant species                                                                                             |
|----------------------------|---------------|----------------|--------------------------------------------------------------------------------------------------------------|
| Tree cover                 | 28            | 36             | <i>Angophora bakeri</i> (30%)<br><i>Eucalyptus sclerophylla</i> (5%)<br><i>Acacia binervia</i> (3%)          |
| Shrub cover                | 82            | 5.7            | <i>Pimelea linifolia</i> (2%)<br><i>Bossiaea heterophylla</i> (0.5%)<br><i>Melaleuca linariifolia</i> (0.5%) |
| Ground cover               | 66            | 22.9           | <i>Microlaena stipoides</i> (10%)<br><i>Cyathochaeta diandra</i> (10%)<br><i>Entolasia stricta</i> (1%)      |
| Exotic cover               | NA            | 0.2            | <i>Eragrostis curvula</i> (0.2%)                                                                             |
| Vegetation Integrity Score | 100           | 59.6           |                                                                                                              |

### 3.2.1.5 Offset site P4 (Nodding Geebung)



Plate 6. Vegetation within EPBC Offset Site P4

The patch of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset site P4 recorded an average VI score of 61.7 across the two vegetation quadrats. Due to the large size of the offset site two vegetation quadrats were conducted to give a representative condition score for vegetation. The results of each quadrat area summarised in Table 11. This patch of bushland was not impacted by the 2018 wildfire. This assemblage has an established canopy and a well-developed tall shrub layer, transitioning between a densely shrubby woodland to a more open woodland. Where shrubs density was less ground covers were more prominent.

The dominant canopy species at offset site P4 is Hard-leaved Scribbly Gum, however a number of other tree species are present albeit at lower abundances including *Allocasuarina* sp., *Casuarina*

*glauca* (Swamp Oak), Narrow-leaved Apple and Parramatta Red Gum. Canopy coverage was recorded at 45 percent and 32.4 percent at two locations within the offset site. Both canopy coverage scores exceed the benchmark tree cover scores for the Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland community.

Shrub cover differs through the offset site, with some areas having a more open shrubby structure and others a dense thicket of shrubs. Shrub cover at two locations recorded 43.9% and 18%. A suite of tall shrub species are common across the site including *Hakea sericea* (Needlebush), *Persoonia laurina* (Laurel Geebung), *Petrophile pulchella* (Conesticks) and *Melaleuca decora*. A total of 23 shrubs species was recorded across vegetation quadrats conducted within the offset site.

A total of 22 ground cover species were recorded across the two vegetation quadrats conducted within offset site P4. The coverage of ground covers differs across the site measuring 8.2% at one location and 25.4% at another. Forbs and twining plants were common within the ground stratum, some species present included *Billardiera scandens* (Hairy Apple Berry), *Hardenbergia violacea* (False Sarsaparilla) and *Cassytha glabella* (Slender Devil's Twine).

Exotic species occurrence across the offset site was generally low. A moderately sized patch (approximately 100 metres square) of the woody weed *Cinnamomum camphora* (Camphor laurel) was observed inside the eastern boundary of the site and the Priority weed species *Rubus fruticosus* sp. agg (Blackberry) was observed encroaching at the southernmost section of the site. No exotic species were recorded within quadrat monitoring (Figure 6).

Table 11. Habitat assessment summary: EPBC Offset Site P4(A)

| Attributes                 | PCT Benchmark | Survey result | Dominant species                                                                                         |
|----------------------------|---------------|---------------|----------------------------------------------------------------------------------------------------------|
| Tree cover                 | 28            | 45            | <i>Eucalyptus racemosa</i> (40%)<br><i>Angophora bakeri</i> (5%)                                         |
| Shrub cover                | 82            | 43.9          | <i>Melaleuca nodosa</i> (25%)<br><i>Petrophile pulchella</i> (5%)<br><i>Leptospermum trinervium</i> (5%) |
| Ground cover               | 66            | 25.4          | <i>Lomandra longifolia</i> (2%)<br><i>Empodisma minus</i> (2%)<br><i>Austrostipa pubescens</i> (20%)     |
| Exotic cover               | NA            | 0             | None                                                                                                     |
| Vegetation Integrity Score | 100           | 73.4          |                                                                                                          |

Table 12. Habitat assessment summary: EPBC Offset Site P4(B)

| Attributes   | PCT Benchmark | Survey results | Dominant species                                                                                          |
|--------------|---------------|----------------|-----------------------------------------------------------------------------------------------------------|
| Tree cover   | 28            | 32.4           | <i>Eucalyptus racemosa</i> (25%)<br><i>Angophora bakeri</i> (5%)<br><i>Eucalyptus parramattensis</i> (2%) |
| Shrub cover  | 82            | 18             | <i>Melaleuca decora</i> (5%)<br><i>Petrophile pulchella</i> (4%)<br><i>Leptospermum trinervium</i> (4%)   |
| Ground cover | 66            | 8.2            | <i>Cyathochaeta diandra</i> (5%)<br><i>Gahnia aspera</i> (1%)<br><i>Xanthorrhoea</i> spp. (0.5%)          |
| Exotic cover | NA            | 50             | None                                                                                                      |

| Attributes                 | PCT Benchmark | Survey results | Dominant species |
|----------------------------|---------------|----------------|------------------|
| Vegetation Integrity Score | 100           | 50             |                  |

## 3.2.2 Small-flower Grevillea

### 3.2.2.1 General habitat preference (OEH, 2019)

Small-flower Grevillea has a habitat preference for sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Populations of Nodding Geebung in the Sydney region usually occur on Tertiary sands and alluvium, and soils derived from the Mittagong Formation.

This species occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Southern Sydney occurrences are typically at 100-300m ASL. Often occurs in open, slightly disturbed sites such as along tracks.

Habitat preference of this species also includes open, slightly disturbed sites such as along tracks.

### 3.2.2.2 Offset Site 4 (Small-flower Grevillea)



Plate 7. Vegetation within EPBC Offset Site 4

The patch of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset site G1 recorded a VI score of 47.

The assemblage has a sparse canopy cover and a well-developed shrub and ground stratum. A diversity of native flora species are present, and the occurrence of weeds is low. A patch of African Lovegrass immediately to the west of the offset site and was observed to be encroaching on the offset site.

The canopy stratum is composed of five different tree species and recorded a coverage of 24% within the vegetation quadrat. Trees species present within the offset site include *Acacia parramattensis*

(Parramatta Wattle), *Banksia integrifolia* (Coast Banksia), Parramatta Red Gum, Narrow-leaved Apple and Hard-leaved Scribbly Gum.

Shrub cover was relatively uniform across the offset site recording a coverage of 21.2 percent. A total of 11 different shrubs species were identified including *Acacia ulicifolia* (Prickly Moses), *Acacia falcata*, *Hakea sericea* (Needlebush) and *Melaleuca erubescens* (Pink Honeymyrtle).

Ground cover species including grasses, forbs, herbs and scrambling plants recorded a coverage of 17% across the vegetation quadrat. A total of 22 different species were identified including *Tricoryne elatior* (Yellow Autumn-lily), *Glossodia major* (Waxlip Orchid), *Patersonia sericea* (Silky Purple-Flag) and *Opercularia varia* (Variable Stinkweed).

The herbaceous weed *Senecio madagascariensis* (Fireweed) was rarely encountered through the offset site and recorded a coverage of 0.1 percent with the vegetation quadrat.

Table 13. Habitat assessment summary: EPBC offset site G1

| Attributes                 | PCT Benchmark | Survey results | Dominant species                                                                                          |
|----------------------------|---------------|----------------|-----------------------------------------------------------------------------------------------------------|
| Tree cover                 | 28            | 24             | <i>Acacia parramattensis</i> (12%)<br><i>Eucalyptus sclerophylla</i> (8%)<br><i>Angophora bakeri</i> (2%) |
| Shrub cover                | 82            | 21.2           | <i>Melaleuca nodosa</i> (10%)<br><i>Pimelea linifolia</i> (5%)<br><i>Pultenaea villosa</i> (0.5%)         |
| Ground cover               | 66            | 17             | <i>Cyathochaeta diandra</i> (8%)<br><i>Microlaena stipoides</i> (2%)<br><i>Entolasia stricta</i> (2%)     |
| Exotic cover               | NA            | 0.1            | <i>Senecio madagascariensis</i> (0.1)                                                                     |
| Vegetation Integrity Score | 100           | 47             |                                                                                                           |

### 3.3 Photo point monitoring

Annual monitoring photographs are presented in Appendix C.

## 4 REVIEW OF CURRENT MANAGEMENT ACTIONS

| Threatened species     | Recovery strategies                          | Timing and duration            | Performance criteria                                  |               | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------|----------------------------------------------|--------------------------------|-------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |                                              |                                | Objective                                             | Status (2020) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Small-flower Grevillea | Restrict access to sites                     | Year 1: 20 years               | Fencing installed and maintained to remain functional | Achieved      | <p>An existing cyclone fence follows the external boundary of the Wattle Grove offset site. All EPBC offset sites are within the Wattle Grove offset site boundary fence.</p> <p>EPBC offset sites have been demarcated with metal pickets. Exclusion fencing for individual offset site has not been erected.</p> <p>All areas within the boundary fence are secure and can only be accessed by relevant personnel with a regulated key managed by Knight Frank.</p> <p>Additional fencing has been installed along the MLP East operational Rail Link passing through the western corner of Wattle Grove offset site delineating the bushland environment from the rail corridor.</p> |
|                        | Create and maintain weed free bushland areas | Primary weed control: Year 1-5 | <5% weed cover                                        | Achieved      | <p>The BAM vegetation quadrat conducted within offset site G1 recorded a weed coverage of 0.1 percent across 400 square metres. Weed coverage within offset site G1 is estimated at less than 5 percent cover.</p> <p>Site inspection did not identify any notable weed infestations. One exotic species was identified within the BAM vegetation quadrat; <i>Senecio madagascariensis</i> (Fireweed) was recorded with a coverage of 0.1%.</p> <p>The aggressive invasive grass species African Love Grass is located immediately to the west of the offset site and was observed to be encroaching on the offset site.</p>                                                            |
|                        | Ensure appropriate fire regimes for species  | Conduct ecological burns       | Monitoring of burn site to be undertaken every 6      | Achieved      | A wildfire directly impacted the EPBC offset site in April 2018.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Threatened species | Recovery strategies                                                                                               | Timing and duration                                   | Performance criteria                                                                                                   |               | Comments                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                                                                                                   |                                                       | Objective                                                                                                              | Status (2020) |                                                                                                                                                                                                                                                                                                                                                                                          |
|                    | (minimum fire free period of 8 - 15 years)                                                                        | every 6-20 years in winter: 20 years                  | months. Net gain in the number of stems over the duration of management to meet the offset obligation                  |               | No ecological burns will be conducted within the EPBC offset site until 2026. At this time, the appropriateness of an ecological burn will be assessed to determine whether it will have a positive impact on the populations of Small-flower Grevillea.                                                                                                                                 |
|                    | Avoid spraying herbicide within the vicinity of the species                                                       | At all times (monitored annually in spring): 20 years | No damage to threatened species through inappropriate herbicide use. Evidence would trigger corrective actions         | Achieved      | No herbicide spraying has been conducted within the offset site during the monitoring year.                                                                                                                                                                                                                                                                                              |
|                    | Monitor species for grazing or damage, this may indicate large macropod overabundance to inform control frequency | Monitored annually in spring: 20 years                | Evidence of excessive grazing would trigger corrective actions under the overabundant herbivore management action plan | Achieved      | No evidence was observed to suggest that Small-flower Grevillea have been impacted through grazing or trampling by large macropods.                                                                                                                                                                                                                                                      |
|                    | Protect individuals from pedestrian traffic along formal tracks, use fencing if required                          | Year 1: 20 years                                      | Fencing installed and maintained to remain functional                                                                  | Achieved      | The location of EPBC offset sites have been demarcated using metal star pickets with secured yellow caps. The delineation of boundaries will act to remind personnel working within the Wattle Grove offset area of a sensitive area.<br>All personnel working with the Wattle Grove offset area should be made aware of sensitive areas during the introductory biobank site induction. |
|                    | Ensure that this species is considered in all works and future planning matters                                   | At all times: 20 years                                | Net gain in the number of stems over the duration of management to meet the offset obligation                          | Achieved      | No activities (works and planning matters) have arose which have required the consideration of the EPBC offset sites                                                                                                                                                                                                                                                                     |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Threatened species | Recovery strategies                                                                | Timing and duration            | Performance criteria                                                                                                                                    |               | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                                                                    |                                | Objective                                                                                                                                               | Status (2020) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Nodding Geebung    | Restrict access to sites                                                           | Year 1: 20 years               | Fencing installed and maintained to remain functional                                                                                                   | Achieved      | <p>An existing cyclone fence follows the external boundary of the Wattle Grove offset site. All EPBC offset sites are within the Wattle Grove offset site boundary fence.</p> <p>EPBC offset sites have been demarcated with metal pickets. Exclusion fencing for individual offset site has not been erected.</p> <p>All areas within the boundary fence are secure and can only be accessed by relevant personnel with a regulated key managed by Knight Frank.</p> <p>Additional fencing has been installed along the MLP East operational Rail Link passing through the western corner of Wattle Grove offset site delineating the bushland environment from the rail corridor.</p> |
|                    | Create and maintain weed free bushland areas                                       | Primary weed control: Year 1-5 | <5% weed cover                                                                                                                                          | Achieved      | <p>Weed levels across Nodding Geebung offset sites is low. BAM vegetation quadrat conducted within offset site P1, P2, P3 and P4 recorded weed coverages of less than five percent; 0.1, 0, 0.2 and 0 respectively. Weed coverages at each Nodding Geebung offset site is estimated at less than 5 percent cover.</p> <p>Weed presence is sparse consisting mainly of scattered individuals on the peripheries of natural bushland. The invasive grass species African Love Grass was observed at the three of the offset areas, P1, P2 and P3. Majority of occurrences of this species was restricted to the disturbed edges of bushland parallel to existing access tracks.</p>       |
|                    | Ensure appropriate fire regimes for species (minimum fire free period of 10 years) | Annually in spring: 20 years   | Monitoring of burn site to be undertaken every 6 months. Net gain in the number of plants over the duration of management to meet the offset obligation | Not achieved  | <p>A wildfire directly impacted the EPBC offset sites in April 2018. This wildfire did not coincide with timings or suitable conditions for ecological burning in respect to Nodding Geebung.</p> <p>No ecological burns will be conducted within the EPBC offset site until 2026. At this time, the appropriateness of an ecological burn will be</p>                                                                                                                                                                                                                                                                                                                                  |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Threatened species | Recovery strategies                                                                                               | Timing and duration                    | Performance criteria                                                                                                                     |               | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                                                                                                   |                                        | Objective                                                                                                                                | Status (2020) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                    |                                                                                                                   |                                        |                                                                                                                                          |               | assessed to determine whether it will have a positive impact on the populations of Nodding Geebung.                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                    | Monitor site for <i>Acacia baileyana</i> , which may outcompete species                                           | Annually in spring: 20 years           | Evidence of encroachment by this species would trigger corrective actions (see Section)                                                  | Achieved      | <i>Acacia baileyana</i> was not identified within the BAM monitoring quadrants undertaken to assess habitat quality nor was it identified in other areas of the offset sites.                                                                                                                                                                                                                                                                                                                                               |
|                    | Monitor species for grazing or damage, this may indicate large macropod overabundance to inform control frequency | Monitored annually in spring: 20 years | Evidence of excessive grazing would trigger corrective actions under the overabundant herbivore management action plan (see Section 7.2) | Achieved      | No evidence was observed to suggest that Small-flower Grevillea have been impacted through grazing or trampling by large macropods.                                                                                                                                                                                                                                                                                                                                                                                         |
|                    | Protect individuals from pedestrian traffic along formal tracks, use fencing if required                          | Year 1: 20 years                       | Fencing installed and maintained to remain functional                                                                                    | Achieved      | The location of EPBC offset sites have been demarcated using metal star pickets with secured yellow caps. The delineation of boundaries will act to remind personnel working within the Wattle Grove offset site of a sensitive area.<br><br>All personnel working with the Wattle Grove offset area should be made aware of sensitive areas during the introductory biobank site induction.                                                                                                                                |
|                    | Ensure that this species is considered in all works and future planning matters                                   | At all times: 20 years                 | Net gain of 16 plants over the duration of management to meet the offset obligation                                                      | Achieved      | Planning has commenced for the removal and remediation a section of disused rail (DURS) at the southern extent of Wattle Grove offset area. The remediation footprint of DURS does not intersect EPBC offset sites, however a proposed access route to the project site may pass along the northern boundary of Nodding Geebung offset site P3.<br><br>The chosen access route will be used by used by demolition machinery, site vehicles and other machines required to remove the old rail track and remediate the area. |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Threatened species | Recovery strategies | Timing and duration | Performance criteria |               | Comments                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------|---------------------|----------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                     |                     | Objective            | Status (2020) |                                                                                                                                                                                                                                                                                                                                |
|                    |                     |                     |                      |               | There is the potential for indirect or inadvertent impacts to the EPBC offset site and individuals of Nodding Geebung if a risk assessment is not conducted. If this route is identified as the preferred option the potential impacts of the access track and any necessary mitigation measures should be considered further. |

## 5 DISCUSSION & RECOMMENDATIONS

The 2020 survey marked the second monitoring event for offset sites P1, P2, P3 and G1. Comparisons can be made between this year's data and the results of the 2019 monitoring event to analyse population dynamics of Nodding Geebung and Small-flower Grevillea within EPBC offset sites, specifically:

- Fluctuations in population size and distribution, and
- Response to disturbance and/or management actions

The condition of vegetation has been scored and a habitat assessment has been conducted for offset sites across monitoring periods to provide more context to changes in Nodding Geebung and Small-flower Grevillea populations.

Changes to Nodding Geebung and Small-flower Grevillea populations across offset sites P1, P2, P3 and G1 have been discussed below. Offset site P4 was established and monitored for the first time during the 2020 monitoring event and cannot be compared with previous data to make an assessment on population dynamics.

### 5.1.1 Nodding Geebung

A comparison of results for Nodding Geebung between the 2019 and 2020 monitoring events has been discussed below.

#### Population assessment

A total of 90 individuals of Nodding Geebung were identified across the three offset sites in comparison to 112 individuals recorded in 2019.

The number of Nodding Geebung individuals in offset site P1 has increased since the 2019 population census whereas populations in P2 and P3 have declined. No Nodding Geebung were identified within P2 despite searches for individuals at their previous locations. A comparison of populations counts at each offset site between the 2019 and the current survey (2020) is presented in Table 14.

Table 14. Results of 2019 population census compared to current survey (2020) census results

| Offset site   | P1   |      |      |      | P2   |      |      |      | P3   |      |      |      |
|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Census survey | 2019 |      | 2020 |      | 2019 |      | 2020 |      | 2019 |      | 2020 |      |
| Life stage    | Adu. | Juv. | Adu. | Juv. | Adu. | Juv. | Adu. | Juv. | Adu. | Juv. | Adu. | Juv. |
| Sub-count     | 0    | 9    | 0    | 13   | 0    | 3    | 0    | 0    | 2    | 98   | 2    | 75   |
| Count         | 9    |      | 13   |      | 3    |      | 0    |      | 100  |      | 77   |      |

Of the 112 individuals recorded during the 2019 surveys 110 were juvenile plants and were considered to be sensitive and having reasonable chance of perishing. During recent surveys 61 of the 110 juveniles marked during 2019 were re-found, equating to a survival rate of 56% for juvenile Nodding Geebung across the monitoring year. Persistence of more than half of Nodding Geebung individuals is considered a reasonable result. It was anticipated in the 2019 annual monitoring report (Arcadis 2020a) that a proportion of the juvenile plants identified would die over the 2020 monitoring year. Juvenile plants were in dense clusters containing many individuals. The death of plants could be result of a natural dieback whereby the strongest plants in the group survive and are able to utilise the available resources. Adult Nodding Geebung are not often observed in close vicinity to one another

across the Wattle Grove offset area. It may be that only a couple of individuals within clusters of Nodding Geebung will persist to become adult plants.

The identification of an additional 29 individuals, which have naturally recruited since the 2019 survey, is a positive sign that Nodding Geebung are continuing to germinate and add to the current population within offset site. New recruitment was observed in offset sites P1 and P3. The majority of new individuals were recorded within or near to existing clusters of juveniles, however recruitment was also observed in areas which did not record Nodding Geebung occurrence in 2019. In offset site P3 two individuals were identified within intact bushland towards the southern boundary, away from the dense clusters of individuals on the northern boundary. An increase in distribution of Nodding Geebung across the site will reduce interspecies competition and may provide a greater chance of individuals persisting to maturity.

It was calculated using the EPBC offsetting policy that 155 Nodding Geebung require conservation and management within offset sites to achieve a net gain of 16 Nodding Geebung individuals over a 20-year period. Due to unforeseen impacts from the 2018 wildfire majority of the Nodding Geebung population within offset sites perished. Regeneration of the species over the past two years has seen a recovery of the population with 133 individuals being recorded during the 2020 survey. It is anticipated that with ongoing management and monitoring the population of Nodding Geebung within offset sites will increase to 171 individuals within the 20 year time frame.

### Habitat assessment and potential impacts

Patches of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within offset sites have achieved a greater VI score than was recorded in 2019 (Table 15). Exotic species coverage was recorded to be low across all EPBC offset sites over the 2020 monitoring period. An increasing vegetation condition does not necessarily reflect an increase in habitat value for Nodding Geebung as the abundance of this species can often be related to disturbance history. Sites with higher abundance also appear to be more disturbed (DPIE 2019).

Table 15. A summary of changes to vegetation condition at offset site P1, P2 and P3 across monitoring periods

| Offset site | Monitoring year | Coverage across BAM quadrat |       |             |        | VI score |
|-------------|-----------------|-----------------------------|-------|-------------|--------|----------|
|             |                 | Tree                        | Shrub | Groundcover | Exotic |          |
| P1          | 2019            | 11.5                        | 47.7  | 4.2         | 0.2    | 52.5     |
|             | 2020            | 16                          | 46    | 6.8         | 0.1    | 64.8     |
| P2          | 2019            | 52.5                        | 4.7   | 19.4        | 0.6    | 51.8     |
|             | 2020            | 47.3                        | 15.5  | 22.1        | 0      | 56.5     |
| P3          | 2019            | 22.5                        | 8     | 17.3        | 0.1    | 51.5     |
|             | 2020            | 36                          | 5.7   | 22.9        | 0.2    | 59.6     |

No obvious signs of impact to Nodding Geebung were observed within the offset sites. Some minor insect damage was observed on a few individuals; however, it appears that this damage may be existing from previous years. Plants observed to have insect damage were also observed as having fresh new green shoots and foliage. There were no signs of impacts (foraging or trampling) upon this species by mammals.

Adult Nodding Geebung are at less risk of being outcompeted by other plant species compared to juveniles. Populations of Nodding Geebung at offset sites P1, P2 and P3 consist mainly of juvenile plants which are more susceptible to being outcompeted by native and exotic plants. Currently there

is significant competition in the shrub and understorey as there is an overabundance of post-fire recruiters like *Acacia decurrens* (Black Wattle), *Imperata cylindrica* (Blady Grass), *Pimelea linifolia* (Slender Rice Flower), *Platysace ericoides*, *Pultenaea villosa* (Hairy Bush-pea) and *Trachymene incisa* (Trachymene). This may be an explanation for why majority of Nodding Geebung individuals in offset sites P1, P2 and P3 are located on the peripheries of intact bushland in disturbed, more open areas, amongst the exotic species African Love Grass.

The coverage of African Love Grass is increasing on the edges of native bushland which may reduce the availability of habitat for Nodding Geebung or directly outcompete juvenile plants in the future. Increases in coverage of African Love Grass should be monitored over the following monitoring year to minimise impacts to Nodding Geebung.

An increase in native shrub and ground stratum vegetation coverage within offset site P1, P2 and P3 may be reducing the availability of space and resources for Nodding Geebung to regenerate. Juvenile Nodding Geebung were observed being smothered by the native vine *Cassytha glabella* (Devils Twine) in offset site P3. Increased competition by native species may contribute to the occurrence of juvenile plants on the edges of intact bushland in more disturbed areas with reduced leaf litter coverage and less competition from other plants.

### Corrective actions

It is evident that Nodding Geebung populations within offset sites that burned in 2018 are fluctuating with new individuals germinating and other plants perishing. This fluctuation is due to the opportunistic nature of post-bushfire vegetation recovery and the high levels of competition amongst post-fire recruitment specialists. Whilst there have been losses of approximately 20% of the plants identified during the 2019 monitoring period, there has also been further recruitment suggesting that the population recovery is ongoing.

As it is the second year of monitoring for this species it is not yet recommended that any alterations are made to existing management actions for Nodding Geebung. Monitoring over the following year will aim to determine whether increases in native and exotic grass coverage in areas supporting Nodding Geebung is having an adverse impact. Weed control works and native vegetation pruning may be implemented in areas where smothering coverage is occurring.

If Nodding Geebung populations across offset sites are observed to continue declining in future surveys the following actions may be considered:

- Disturbance stimulus - a disturbance stimulus may be adopted to promote germinating in areas where viable seed may be present
- Competition control - selective pruning or removal of vegetation surrounding Nodding Geebung plants to encourage survival of juvenile plants
- Translocation effort - seed collection from adult individuals in offset site P3 and P4 which will be propagated at an offsite location, to be installed within offset sites at a later stage as young plants.

Table 16. Recommended corrective actions

| Identified issues                                          | Offset site | Recommended action                                        |
|------------------------------------------------------------|-------------|-----------------------------------------------------------|
| Patch of the woody weed Camphor Laurel with offset site P4 | P4          | Bush regenerators to remove occurrence of Camphor laurel. |

| Identified issues                                                                               | Offset site     | Recommended action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Encroaching Blackberry at offset site P4                                                        | P4              | Blackberry infestation should be monitored and controlled as necessary to prevent encroachment into the offset site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Increased coverage of African Love Grass along the edges of offset sites, nearest access roads. | P1, P2, P3      | <p>Monitoring of African Love Grass adjacent to access roads within EPBC offset sites. If this invasive grass species is thought to be having a negative impact upon Nodding Geebung weed control works maybe implemented.</p> <p>Manual control methodologies should be prioritised unless a targeted herbicide treatment, that has no risk of over spray or off target poisoning, can be used. An example of a selective herbicide that may be suitable for control of African Lovegrass within offset areas is Flupropanate granular herbicide.</p>                                                                                                         |
| Native plant species outcompeting Nodding Geebung (i.e. smothering, occupying open areas)       | All offset site | <p>Monitoring of juvenile Nodding Geebung in plots P1, P2 and P3 should be monitored for smothering from native plant species.</p> <p>On a quarterly basis inspection should be made of juvenile Nodding Geebung with offset site P1, P2 and P3. Any native plants observed to be crushing or smothering individuals should be cut back. i.e. Slender Devils Twine observed on juvenile Nodding Geebung should be removed.</p> <p>Native plants/vegetation in the immediate vicinity of Nodding Geebung which are not crushing, or smothering individuals should not be removed as they provide protections from grazing herbivores and inclement weather.</p> |

### 5.1.2 Small-flower Grevillea offset sites

A comparison of results for Small-flower Grevillea between the 2019 and 2020 monitoring events has been discussed below.

#### Population assessment

The 2020 monitoring survey saw a reduction in the number of stems of Small-flower Grevillea within offset site G1. The population has reduced from 143 to 60 stems; marking a decline of 56%. A reduced distribution of Small-flower Grevillea was observed centrally across the offset site.

A reduction in stem count across the offset site does not necessarily mean that there has been a reduction in the number of Small-flower Grevillea individuals. This species is capable of suckering from rootstock and demonstrates a degree of vegetative spread, particularly after disturbance such as fire (DPIE 2019a). It is feasible that stems may have died back following increased competition over the 2020 monitoring period from an overabundance of post-fire recruiters in the shrub and understory stratum, however the individual is still alive and present within the offset site, albeit with a lesser biomass.

Natural fluctuations in shrub and understorey vegetation cover may reduce the amount of competition and make available habitat resources for Small-flower Grevillea. At this point new individuals may

recruit, or existing individuals may increase in stem count resulting in similar counts as to what was recorded in 2019 surveys.

It was calculated using the EPBC offsetting policy that 142 Small-flower Grevillea require conservation and management within offset sites to achieve a net gain of at least 17 individuals over a 20-year period. Due to unforeseen impacts from the 2018 wildfire all Small-flower Grevillea within the offset site perished. The 2020 survey recorded a total of 60 stems within the offset site. It is anticipated that fluctuations in native vegetation coverage resulting from natural die back and maturing shrubbery will increase habitat resources for Small-flower Grevillea and promote further growth and recruitment. It is anticipated that with ongoing management and monitoring the population of Small-flower Grevillea within offset sites will increase to 162 stems within the 20 year time frame.

## Habitat assessment and potential impacts

The condition of Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland within the offset site has increased in condition as demonstrated by an increasing VI score from 37.7 in 2019 to 47 in 2020. The patch has seen an increase in ground cover vegetation which may have reduced the available habitat for Small-flower Grevillea. Weed coverage has stayed similar across monitoring periods.

Table 17. Changes in vegetation coverage at offset site G1 across monitoring periods (2019 vs. 2020)

|      | Tree | Shrub | Groundcover | Exotic | VI score |
|------|------|-------|-------------|--------|----------|
| 2019 | 9.1  | 22.6  | 9.2         | 0.1    | 37.7     |
| 2020 | 24   | 21.2  | 17          | 0.1    | 47       |

No obvious signs of impacts to this species was observed. Individuals were not observed to have been foraged upon by animals or showing signs of damage from insects. Weed occurrence within the offset area is low and is not impacting upon the occurrence or persistence of this species.

Areas of open woodland with a sparser shrub and ground layer vegetation have healthy populations of Small-flower Grevillea with many individuals. It is evident that numbers of Small flower Grevillea are greatest in open woodland areas with reduced competing shrub and ground covers.

## Corrective actions

It is recommended that the population be monitored for another year prior to implementing any management actions to increase the population of Small-flower Grevillea. It is not suggested that individuals be tracked for monitoring as has been done for Nodding Geebung. Small-flower Grevillea are capable of suckering from a rootstock and most populations demonstrate a degree of vegetative spread, particularly after disturbance such as fire. Therefore, it would be futile trying to track individuals via stems to monitor recruitment and death rates.

Table 18. Recommended corrective actions

| Identified issues                                                                                | Recommended action                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Moderate infestation of African Love Grass beginning to encroach on offset site                  | Infestations of African Love Grass should be monitored and controlled as necessary to prevent encroachment into the offset site.                                                                        |
| Native plant species outcompeting Small-flower Grevillea (i.e. smothering, occupying open areas) | Monitoring of Small-flower Grevillea population over the following year to determine whether individuals are reducing in areas which are becoming increasingly vegetated by other native plant species. |

## 6 REFERENCES

- Arcadis (2017) Moorebank Intermodal Facility: Threatened Flora Offset Management Plan
- Arcadis (2020a) Moorebank Intermodal Facility: Threatened Flora Offset Management Plan. Revised version
- Australian Government: Department of Environment (DoE) (2014) Conditions attached to the approval: SIMTA Moorebank Intermodal Terminal Facility, Sydney, NSW (EPBC 2011/6229)
- Department of Planning, Industry and Environment (DPIE) (2019a) Threatened Biodiversity Data Collection: *Grevillea parviflora* subsp. *parviflora*. Descriptive text and photos: Habitat & ecology
- Department of Planning, Industry and Environment (DPIE) (2019b) Threatened Biodiversity Data Collection: *Persoonia nutans*. Descriptive text and photos: Habitat & ecology
- Department of the Environment and Energy (DOEE) (2012) EPBC Act environmental offset policy. Offset Assessment Guide
- Office of Environment and Heritage (OEH) (2017) BioBanking Agreement (BA341) for Moorebank Intermodal Terminal Biobank Site (Lot 4/-/DP1197707; Lot4/-/1130937; Lot100/-/DP1049508; and Lot1/-/DP1197707)
- Office of Environment and Heritage (OEH) (2017) Biodiversity Assessment Method
- Tozer, M., Turner, K., Simpson, C., Keith, D, Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0;
- WSP & Parsons Brinckerhoff (2017) Biodiversity Assessment Report: Biobanking Agreement – Wattle Grove Offset Area (Part Lot 4 DP 1197707), Casula Offset Area (Part Lot 4 DP 1130937) and Moorebank Conservation Area (Part Lot 100 DP 1049508 and Part Lot 1 DP 1197707)

## **7 APPENDICES**

**Appendix A. BAM monitoring quadrat data set**

**Appendix B. BAM quadrats vegetation score summary**

**Appendix C. Annual monitoring photographs**

**Appendix D. Photo point details**

## **APPENDIX A** **BAM MONITORING QUADRAT DATA SET**

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Scientific name               | Common name               | Exotic | P1    |           | P2    |           | P3    |           | G1    |           | P4(A) |           | P4(B) |           |
|-------------------------------|---------------------------|--------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                               |                           |        | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance |
| <i>Acacia binervia</i>        | Coast Myall               |        |       |           |       |           | 1.0   | 2         |       |           |       |           |       |           |
| <i>Acacia brownii</i>         | Heath Wattle              |        | 0.5   | 15        |       |           | 0.5   | 50        |       |           |       |           |       |           |
| <i>Acacia falcata</i>         |                           |        |       |           | 0.5   | 50        |       |           | 1.0   | 50        |       |           | 0.1   | 1         |
| <i>Acacia longifolia</i>      |                           |        | 0.5   | 10        | 0.5   | 3         |       |           |       |           |       |           |       |           |
| <i>Acacia parramattensis</i>  | Parramatta Wattle         |        | 1.0   | 33        | 2.0   | 50        |       |           | 1.0   | 20        |       |           |       |           |
| <i>Acacia ulicifolia</i>      | Prickly Moses             |        |       |           | 0.2   | 30        |       |           | 0.5   | 50        |       |           |       |           |
| <i>Allocasuarina spp.</i>     |                           |        |       |           |       |           |       |           |       |           |       |           | 0.2   | 1         |
| <i>Angophora bakeri</i>       | Narrow-leaved Apple       |        | 5.0   | 15        | 5.0   | 6         | 30.0  | 50        | 2.0   | 5         | 5.0   | 10        | 5.0   | 15        |
| <i>Anisopogon avenaceus</i>   | Oat Speargrass            |        |       |           |       |           |       |           | 1.0   | 10        |       |           |       |           |
| <i>Aristida ramosa</i>        | Purple Wiregrass          |        |       |           |       |           | 0.1   | 30        |       |           |       |           |       |           |
| <i>Aristida vagans</i>        | Threeawn Speargrass       |        |       |           |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Astroloma humifusum</i>    | Native Cranberry          |        |       |           |       |           |       |           |       |           | 0.1   | 10        |       |           |
| <i>Austrostipa pubescens</i>  |                           |        |       |           |       |           |       |           |       |           | 20.0  | 1         |       |           |
| <i>Banksia integrifolia</i>   | Coast Banksia             |        |       |           |       |           |       |           | 1.0   | 5         |       |           |       |           |
| <i>Banksia oblongifolia</i>   | Fern-leaved Banksia       |        |       |           |       |           | 0.1   | 2         |       |           | 0.1   | 5         | 0.5   | 2         |
| <i>Banksia spinulosa</i>      | Hairpin Banksia           |        | 0.2   | 1         |       |           |       |           |       |           | 0.3   | 5         | 2.0   | 10        |
| <i>Billardiera scandens</i>   | Hairy Apple Berry         |        | 0.1   | 10        | 0.1   | 20        | 0.1   | 10        |       |           | 0.1   | 25        | 0.2   | 50        |
| <i>Bossiaea heterophylla</i>  | Variable Bossiaea         |        |       |           |       |           | 0.5   | 150       |       |           | 0.2   | 10        |       |           |
| <i>Brachyloma daphnoides</i>  | Daphne Heath              |        |       |           |       |           |       |           |       |           | 0.3   | 1         |       |           |
| <i>Burchardia umbellata</i>   | Milkmaids                 |        |       |           |       |           |       |           |       |           | 0.1   | 5         | 0.1   | 10        |
| <i>Bursaria spinosa</i>       | Native Blackthorn         |        |       |           |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Caladenia catenata</i>     | White Caladenia           |        |       |           |       |           |       |           | 0.1   | 5         |       |           |       |           |
| <i>Callistemon linearis</i>   | Narrow-leaved Bottlebrush |        |       |           |       |           | 0.3   | 5         |       |           |       |           |       |           |
| <i>Callistemon pinifolius</i> | Pine-leaved Bottlebrush   |        |       |           |       |           |       |           |       |           |       |           | 0.4   | 10        |

## Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Scientific name                  | Common name                | Exotic | P1    |           | P2    |           | P3    |           | G1    |           | P4(A) |           | P4(B) |           |
|----------------------------------|----------------------------|--------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                                  |                            |        | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance |
| <i>Callistemon rigidus</i>       | Stiff Bottlebrush          |        | 1.0   | 10        |       |           |       |           | 0.1   | 1         |       |           |       |           |
| <i>Cassytha glabella</i>         |                            |        | 0.2   | 100       | 0.2   | 20        | 0.1   | 15        | 0.2   | 50        | 0.1   | 15        | 0.1   | 20        |
| <i>Casuarina glauca</i>          | Swamp Oak                  |        |       |           |       |           |       |           |       |           |       |           | 0.2   | 2         |
| <i>Cheilanthes sieberi</i>       | Rock Fern                  |        | 0.1   | 50        |       |           |       |           |       |           |       |           |       |           |
| <i>Clematis aristata</i>         | Old Man's Beard            |        | 0.1   | 5         |       |           |       |           |       |           |       |           |       |           |
| <i>Coronidium scorpioides</i>    | Button Everlasting         |        | 0.2   | 20        |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Cyathochaeta diandra</i>      |                            |        | 1.0   | 25        |       |           | 10.0  | 1,000     | 8.0   | 250       |       |           | 5.0   | 1,000     |
| <i>Cynodon dactylon</i>          | Common Couch               |        | 0.1   | 5         |       |           |       |           |       |           |       |           |       |           |
| <i>Daviesia genistifolia</i>     | Broom Bitter Pea           |        |       |           |       |           | 0.1   | 10        |       |           |       |           |       |           |
| <i>Daviesia ulicifolia</i>       | Gorse Bitter Pea           |        |       |           | 0.2   | 10        |       |           |       |           |       |           |       |           |
| <i>Dianella caerulea</i>         | Blue Flax-lily             |        | 0.5   | 25        |       |           | 0.2   | 50        |       |           |       |           |       |           |
| <i>Dianella revoluta</i>         | Blueberry Lily             |        |       |           | 0.5   | 10        |       |           |       |           |       |           |       |           |
| <i>Dianella spp.</i>             |                            |        |       |           |       |           |       |           | 0.5   | 50        |       |           |       |           |
| <i>Empodisma minus</i>           |                            |        |       |           |       |           |       |           | 0.5   | 50        | 2.0   | 100       |       |           |
| <i>Entolasia stricta</i>         | Wiry Panic                 |        | 0.5   | 200       |       |           | 1.0   | 300       | 1.0   | 200       | 0.2   | 50        | 0.2   | 200       |
| <i>Eragrostis brownii</i>        | Brown's Lovegrass          |        |       |           |       |           | 0.1   | 20        |       |           |       |           |       |           |
| <i>Eragrostis curvula</i>        | African Lovegrass          | *      | 0.1   | 5         |       |           | 0.2   | 50        |       |           |       |           |       |           |
| <i>Eucalyptus parramattensis</i> | Parramatta Red Gum         |        | 5.0   | 2         |       |           |       |           | 12.0  | 4         |       |           | 2.0   | 2         |
| <i>Eucalyptus racemosa</i>       | Narrow-leaved Scribbly Gum |        | 5.0   | 3         | 40.0  | 10        | 5.0   | 5         | 8.0   | 3         | 40.0  | 2         | 25.0  | 4         |
| <i>Eucalyptus spp.</i>           |                            |        |       |           | 0.3   | 1         |       |           |       |           |       |           |       |           |
| <i>Exocarpos cupressiformis</i>  | Cherry Ballart             |        |       |           | 1.0   | 10        |       |           |       |           |       |           |       |           |
| <i>Gahnia aspera</i>             | Rough Saw-sedge            |        | 0.5   | 20        | 0.1   | 10        | 0.1   | 1         | 0.5   | 25        |       |           | 1.0   | 100       |
| <i>Glossodia major</i>           | Waxlip Orchid              |        |       |           |       |           |       |           | 0.1   | 5         |       |           |       |           |
| <i>Glycine clandestina</i>       | Twining glycine            |        | 0.1   | 20        | 0.1   | 10        |       |           |       |           |       |           | 0.1   | 10        |

## Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Scientific name                    | Common name            | Exotic | P1    |           | P2    |           | P3    |           | G1    |           | P4(A) |           | P4(B) |           |
|------------------------------------|------------------------|--------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                                    |                        |        | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance |
| <i>Gompholobium minus</i>          | Dwarf Wedge Pea        |        |       |           |       |           | 0.1   | 20        |       |           |       |           |       |           |
| <i>Gonocarpus teucrioides</i>      | Germander Raspswort    |        |       |           |       |           |       |           |       |           | 0.1   | 15        |       |           |
| <i>Grevillea parviflora</i>        |                        |        |       |           |       |           |       |           | 0.1   | 25        |       |           |       |           |
| <i>Haemodorum spp.</i>             |                        |        |       |           |       |           |       |           |       |           | 0.1   | 5         |       |           |
| <i>Hakea dactyloides</i>           | Finger Hakea           |        |       |           |       |           |       |           |       |           |       |           | 0.1   | 1         |
| <i>Hakea sericea</i>               | Needlebush             |        | 0.2   | 25        | 0.2   | 30        | 0.2   | 100       | 0.1   | 25        | 3.0   | 12        | 0.5   | 12        |
| <i>Hardenbergia violacea</i>       | False Sarsaparilla     |        | 0.2   | 10        | 0.1   | 20        | 0.2   | 10        |       |           |       |           | 0.1   | 10        |
| <i>Hibbertia aspera</i>            | Rough Guinea Flower    |        |       |           | 1.0   | 50        |       |           |       |           |       |           |       |           |
| <i>Hibbertia puberula</i>          |                        |        |       |           |       |           |       |           |       |           | 0.1   | 5         |       |           |
| <i>Hypericum gramineum</i>         | Small St John's Wort   |        |       |           |       |           |       |           | 0.1   | 20        |       |           |       |           |
| <i>Imperata cylindrica</i>         | Blady Grass            |        | 0.2   | 25        |       |           |       |           |       |           |       |           |       |           |
| <i>Isopogon anemonifolius</i>      | Broad-leaf Drumsticks  |        |       |           |       |           |       |           |       |           | 0.5   | 3         |       |           |
| <i>Kunzea ambigua</i>              | Tick Bush              |        |       |           |       |           | 0.1   | 3         |       |           |       |           |       |           |
| <i>Kunzea capitata</i>             |                        |        |       |           |       |           | 0.2   | 20        |       |           |       |           |       |           |
| <i>Laxmannia gracilis</i>          | Slender Wire Lily      |        | 0.1   | 50        |       |           | 0.1   | 10        |       |           |       |           |       |           |
| <i>Leptospermum parvifolium</i>    |                        |        | 0.5   | 5         | 0.1   | 10        | 0.2   | 25        |       |           | 1.0   | 8         |       |           |
| <i>Leptospermum polygalifolium</i> | Tantoon                |        |       |           | 0.5   | 10        | 0.1   | 10        |       |           |       |           |       |           |
| <i>Leptospermum trinervium</i>     | Slender Tea-tree       |        | 2.0   | 15        |       |           |       |           | 2.0   | 15        | 5.0   | 14        | 4.0   | 20        |
| <i>Leucopogon spp.</i>             | A Beard-heath          |        |       |           |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Lomandra longifolia</i>         | Spiny-headed Mat-rush  |        | 0.2   | 5         | 10.0  | 200       |       |           | 0.2   | 5         | 2.0   | 50        | 0.5   | 20        |
| <i>Lomandra multiflora</i>         | Many-flowered Mat-rush |        |       |           | 0.1   | 10        |       |           |       |           |       |           |       |           |
| <i>Melaleuca decora</i>            |                        |        |       |           |       |           |       |           |       |           |       |           | 5.0   | 5         |
| <i>Melaleuca erubescens</i>        | Pink Honeymyrtle       |        |       |           |       |           |       |           | 0.2   | 10        |       |           | 0.2   | 10        |
| <i>Melaleuca linariifolia</i>      | Flax-leaved Paperbark  |        | 1.0   | 5         | 2.0   | 50        | 0.5   | 20        |       |           |       |           |       |           |

## Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Scientific name                 | Common name               | Exotic | P1    |           | P2    |           | P3    |           | G1    |           | P4(A) |           | P4(B) |           |
|---------------------------------|---------------------------|--------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                                 |                           |        | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance |
| <i>Melaleuca nodosa</i>         |                           |        | 30.0  | 100       | 8.0   | 100       | 0.2   | 10        | 10.0  | 150       | 25.0  | 60        |       |           |
| <i>Melaleuca thymifolia</i>     | Thyme Honey-myrtle        |        |       |           |       |           | 0.1   | 5         | 0.2   | 20        |       |           |       |           |
| <i>Microlaena stipoides</i>     | Weeping Grass             |        | 2.0   | 200       | 10.0  | 500       | 10.0  | 1,000     | 2.0   | 200       |       |           | 0.1   | 20        |
| <i>Notodanthonia longifolia</i> | Long-leaved Wallaby Grass |        |       |           |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Opercularia varia</i>        | Variable Stinkweed        |        | 0.1   | 100       |       |           | 0.1   | 5         | 0.1   | 250       |       |           |       |           |
| <i>Panicum simile</i>           | Two-colour Panic          |        |       |           |       |           |       |           | 0.1   | 1         |       |           |       |           |
| <i>Patersonia sericea</i>       | Silky Purple-Flag         |        |       |           |       |           | 0.1   | 10        | 0.2   | 25        |       |           |       |           |
| <i>Persoonia laurina</i>        | Laurel Geebung            |        |       |           |       |           |       |           |       |           | 0.5   | 3         | 0.5   | 5         |
| <i>Persoonia linearis</i>       | Narrow-leaved Geebung     |        |       |           |       |           | 0.1   | 10        |       |           | 0.5   | 5         | 0.1   | 2         |
| <i>Persoonia nutans</i>         | Nodding Geebung           |        |       |           |       |           | 0.1   | 1         |       |           | 2.0   | 5         | 0.5   | 2         |
| <i>Persoonia pinifolia</i>      | Pine-leaved Geebung       |        |       |           | 1.0   | 15        |       |           |       |           |       |           |       |           |
| <i>Petrophile pulchella</i>     | Conesticks                |        | 0.1   | 5         |       |           | 0.1   | 30        |       |           | 5.0   | 60        | 4.0   | 20        |
| <i>Philothea salsolifolia</i>   |                           |        |       |           |       |           |       |           |       |           | 0.2   | 5         |       |           |
| <i>Pimelea linifolia</i>        | Slender Rice Flower       |        | 10.0  | 500       | 0.5   | 20        | 2.0   | 2,000     | 5.0   | 500       |       |           | 0.1   | 20        |
| <i>Platysace ericoides</i>      |                           |        |       |           |       |           |       |           |       |           | 0.1   | 25        |       |           |
| <i>Pomax umbellata</i>          | Pomax                     |        |       |           | 0.1   | 20        | 0.1   | 15        |       |           | 0.1   | 20        |       |           |
| <i>Pratia purpurascens</i>      | whiteroot                 |        |       |           |       |           | 0.1   | 25        | 0.1   | 20        | 0.1   | 10        |       |           |
| <i>Pteridium esculentum</i>     | Bracken                   |        |       |           |       |           |       |           |       |           | 0.1   | 20        |       |           |
| <i>Ptilothrix deusta</i>        |                           |        |       |           |       |           |       |           | 0.2   | 50        |       |           |       |           |
| <i>Pultenaea villosa</i>        | Hairy Bush-pea            |        |       |           |       |           |       |           | 2.0   | 200       |       |           |       |           |
| <i>Schizaea bifida</i>          | Forked Comb Fern          |        |       |           |       |           | 0.1   | 5         |       |           |       |           |       |           |
| <i>Senecio madagascariensis</i> | Fireweed                  | *      |       |           |       |           |       |           | 0.1   | 10        |       |           |       |           |
| <i>Stackhousia</i> spp.         |                           |        |       |           |       |           |       |           | 0.1   | 10        |       |           |       |           |
| <i>Stylidium</i> spp.           |                           |        |       |           |       |           |       |           | 0.5   | 100       |       |           |       |           |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Scientific name          | Common name        | Exotic | P1    |           | P2    |           | P3    |           | G1    |           | P4(A) |           | P4(B) |           |
|--------------------------|--------------------|--------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|-----------|
|                          |                    |        | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance | Cover | Abundance |
| <i>Themeda australis</i> |                    |        |       |           | 0.5   | 10        |       |           |       |           |       |           | 0.2   | 20        |
| <i>Trachymene incisa</i> | Trachymene         |        |       |           | 0.2   | 50        | 0.1   | 10        | 0.3   | 50        | 0.1   | 20        | 0.1   | 100       |
| <i>Tricoryne elatior</i> | Yellow Autumn-lily |        |       |           |       |           |       |           | 0.1   | 30        |       |           |       |           |
| <i>Tricoryne simplex</i> |                    |        |       |           |       |           |       |           |       |           | 0.1   | 10        |       |           |
| <i>Veronica plebeia</i>  | Trailing Speedwell |        | 0.1   | 5         |       |           |       |           |       |           |       |           |       |           |
| <i>Xanthorrhoea</i> spp. |                    |        | 0.5   | 10        | 0.1   | 30        |       |           | 1.0   | 50        | 0.2   | 15        | 0.5   | 50        |

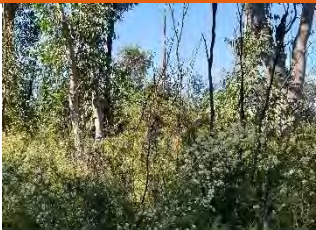
## **APPENDIX B BAM QUADRATS VEGETATION SCORE SUMMARY**

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Vegetation attributes              | P1          |             | P2          |             | P3          |             | G1          |           | P4_A        | P4_B      |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|-------------|-----------|
|                                    | 2019        | 2020        | 2019        | 2020        | 2019        | 2020        | 2019        | 2020      | 2020        | 2020      |
| Total Count Tree (TG)              | 3           | 4           | 3           | 4           | 3           | 3           | 3           | 5         | 2           | 5         |
| Total Count Shrub (SG)             | 11          | 11          | 11          | 13          | 19          | 20          | 12          | 11        | 17          | 14        |
| Total Count Grass & grasslike (GG) | 7           | 7           | 8           | 5           | 7           | 8           | 10          | 9         | 4           | 6         |
| Total Count Forb (FG)              | 6           | 5           | 4           | 3           | 4           | 8           | 9           | 11        | 7           | 2         |
| Total Count Fern (EG)              | 1           | 1           | 0           | 0           | 0           | 1           | 0           | 0         | 1           | 0         |
| Total Count Other (OG)             | 6           | 6           | 3           | 5           | 3           | 3           | 2           | 2         | 3           | 5         |
| Total Cover Tree (TG)              | 11.5        | 16          | 52.5        | 47.3        | 22.5        | 36          | 9.1         | 24        | 45          | 32.4      |
| Total Cover Shrub (SG)             | 47.7        | 46          | 4.7         | 15.7        | 8           | 5.7         | 22.6        | 21.2      | 43.9        | 18        |
| Total Cover Grass & grasslike (GG) | 1.2         | 4.5         | 18.7        | 20.7        | 16.6        | 21.5        | 7.5         | 13.5      | 24.2        | 7         |
| Total Cover Forb (FG)              | 1           | 1           | 0.4         | 0.8         | 0.4         | 0.9         | 1.4         | 2.2       | 0.7         | 0.2       |
| Total Cover Fern (EG)              | 0.1         | 0.1         | 0           | 0           | 0           | 0.1         | 0           | 0         | 0.1         | 0         |
| Total Cover Other (OG)             | 1.9         | 1.2         | 0.3         | 0.6         | 0.3         | 0.4         | 0.3         | 1.2       | 0.4         | 1         |
| Total Cover Exotics                | 0.2         | 0.1         | 0.6         | 0           | 0.1         | 0.2         | 0.1         | 0.1       | 0           | 0         |
| Total Cover High Threat Weeds      | 0.2         | 0.1         | 0.5         | 0           | 0.1         | 0.2         | 0.1         | 0.1       | 0           | 0         |
| <b>Vegetation Integrity Score</b>  | <b>52.5</b> | <b>64.8</b> | <b>51.8</b> | <b>56.5</b> | <b>51.5</b> | <b>59.6</b> | <b>37.7</b> | <b>47</b> | <b>73.4</b> | <b>50</b> |

## **APPENDIX C** ANNUAL MONITORING PHOTOGRAPHS

Monitoring Photographs: Offset Site P1

|                                                                                     |                                                                                      |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |    |
| PP_MP(North) - 2019                                                                 | PP_MP(North) - 2020                                                                  | PP_MP(East) - 2019                                                                    | PP_MP(East) - 2020                                                                    |
|    |    |    |    |
| PP_MP(South) - 2019                                                                 | PP_MP(South) - 2020                                                                  | PP_MP(West) - 2019                                                                    | PP_MP(West) - 2020                                                                    |
|   |   |   |   |
| PP1 – 2019                                                                          | PP1 - 2020                                                                           | PP_2 - 2019                                                                           | PP_2 – 2020                                                                           |
|  |  |  |  |
| PP3 – 2019                                                                          | PP3 - 2020                                                                           | PP_4 - 2019                                                                           | PP4 - 2020                                                                            |

Monitoring Photographs: Offset Site P2



PP\_MP(North) - 2019



PP\_MP(North) - 2020



PP\_MP(East) - 2019



PP\_MP(East) - 2020



PP\_MP(South) - 2019



PP\_MP(South) - 2020



PP\_MP(West) - 2019



PP\_MP(West) - 2020



PP1 – 2019



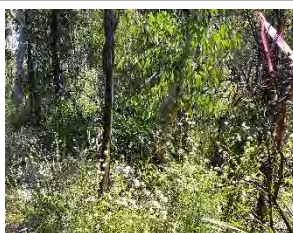
PP1 - 2020



PP\_2 - 2019



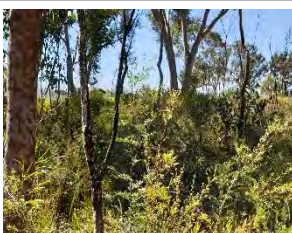
PP\_2 – 2020



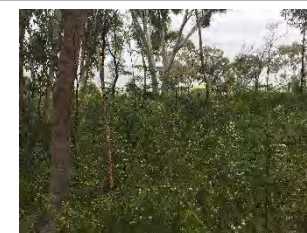
PP3 – 2019



PP3 - 2020



PP\_4 - 2019



PP4 - 2020

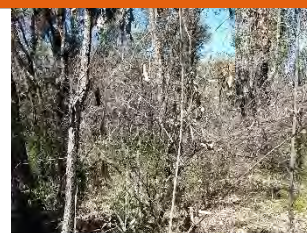
Monitoring Photographs: Offset Site P3



PP\_MP(North) - 2019



PP\_MP(North) - 2020



PP\_MP(East) - 2019



PP\_MP(East) - 2020



PP\_MP(South) - 2019



PP\_MP(South) - 2020



PP\_MP(West) - 2019



PP\_MP(West) - 2020



PP1 – 2019



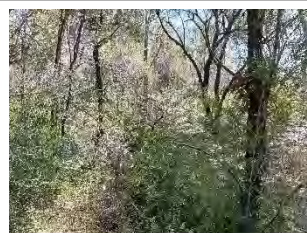
PP1 - 2020



PP\_2 - 2019



PP\_2 – 2020



PP3 – 2019



PP3 - 2020

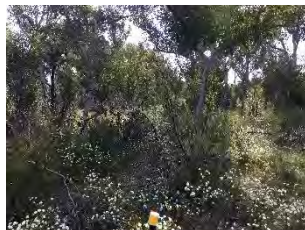
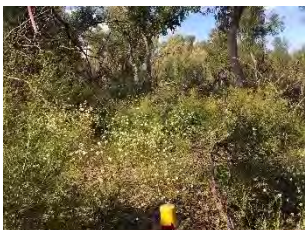


PP\_4 - 2019



PP4 - 2020

| Monitoring Photographs: Offset Site P4                                             |                                                                                     |                                                                                      |                                                                                      |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|   |   |   |   |
| PP_MP(A)_(North) - 2020                                                            | PP_MP(A)_(East) – 2020                                                              | PP_MP(A)_(South) - 2020                                                              | PP_MP(A)_(West) - 2020                                                               |
|   |   |   |   |
| PP_MP(B)_(North) - 2020                                                            | PP_MP(B)_(East) – 2020                                                              | PP_MP(B)_(South) – 2020m                                                             | PP_MP(B)_(West) - 2020                                                               |
|  |  |  |  |
| PP1 - 2020                                                                         | PP_2 – 2020                                                                         | PP_3 - 2020                                                                          | PP_4 – 2020                                                                          |

| Monitoring photo-points: Offset Site G1                                             |                                                                                      |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |    |
| PP_MP(North) - 2019                                                                 | PP_MP(North) - 2020                                                                  | PP_MP(East) - 2019                                                                    | PP_MP(East) - 2020                                                                    |
|    |    |    |    |
| PP_MP(South) - 2019                                                                 | PP_MP(South) - 2020                                                                  | PP_MP(West) - 2019                                                                    | PP_MP(West) - (2020)                                                                  |
|   |   |   |   |
| PP_2 - 2019                                                                         | PP_2 - 2020                                                                          | PP3 - 2019                                                                            | PP3 - 2020                                                                            |
|  |  |  |  |
| PP_4 - 2019                                                                         | PP4 - 2020                                                                           | PP1 - 2019                                                                            | PP1 - 2020                                                                            |

## APPENDIX D PHOTO POINT DETAILS

| Offset Site | Photo point identifier | Location of Photo Point |             | Direction of Photograph<br>(degrees) |
|-------------|------------------------|-------------------------|-------------|--------------------------------------|
|             |                        | Latitude                | Longitude   |                                      |
| P1          | MP (North)             | -33.960619°             | 150.921811° | 0/360                                |
|             | MP (East)              |                         |             | 90                                   |
|             | MP (South)             |                         |             | 180                                  |
|             | MP (West)              |                         |             | 270                                  |
|             | PP1                    | -33.960425°             | 150.921772° | 140                                  |
|             | PP2                    | -33.960478°             | 150.922122° | 200                                  |
|             | PP3                    | -33.960833°             | 150.922291° | 250                                  |
|             | PP4                    | -33.960773°             | 150.921709° | 340                                  |
| P2          | MP (North)             | -33.960663°             | 150.923187° | 0/360                                |
|             | MP (East)              |                         |             | 90                                   |
|             | MP (South)             |                         |             | 180                                  |
|             | MP (West)              |                         |             | 270                                  |
|             | PP1                    | -33.960550°             | 150.922926° | 130                                  |
|             | PP2                    | -33.960670°             | 150.923663° | 250                                  |
|             | PP3                    | -33.960702°             | 150.923512° | 270                                  |
|             | PP4                    | -33.960783°             | 150.922837° | 335                                  |
| P3          | MP (North)             | -33.960451°             | 150.926147° | 0/360                                |
|             | MP (East)              |                         |             | 90                                   |
|             | MP (South)             |                         |             | 180                                  |
|             | MP (West)              |                         |             | 270                                  |
|             | PP1                    | -33.960278°             | 150.925545° | 65                                   |
|             | PP2                    | -33.960469°             | 150.927180° | 260                                  |
|             | PP3                    | -33.960495°             | 150.927074° | 260                                  |
|             | PP4                    | -33.960421°             | 150.925524° | 35                                   |
| P4          | MP(A) (North)          | -33.954026              | 150.93522   | 0/360                                |
|             | MP(A) (East)           |                         |             | 90                                   |
|             | MP(A) (South)          |                         |             | 180                                  |
|             | MP(A) (West)           |                         |             | 270                                  |
|             | MP(B) (North)          | -33.953164              | 150.93527   | 0/360                                |
|             | MP(B) (East)           |                         |             | 90                                   |
|             | MP(B) (South)          |                         |             | 180                                  |
|             | MP(B) (West)           |                         |             | 270                                  |
|             | PP1                    | -33.953362              | 150.93603   | 268                                  |
|             | PP2                    | -33.954238              | 150.93568   | 316                                  |
|             | PP3                    | -33.955183              | 150.93529   | 352                                  |
|             | PP4                    | -33.953414              | 150.93472   | 90                                   |

Annual EPBC Offset Site Monitoring for SIMTA (2020)

| Offset Site | Photo point identifier | Location of Photo Point |             | Direction of Photograph<br>(degrees) |
|-------------|------------------------|-------------------------|-------------|--------------------------------------|
|             |                        | Latitude                | Longitude   |                                      |
| G1          | MP (North)             | -33.963454°             | 150.923047° | 0/360                                |
|             | MP (East)              |                         |             | 90                                   |
|             | MP (South)             |                         |             | 180                                  |
|             | MP (West)              |                         |             | 270                                  |
|             | PP1                    | -33.963401°             | 150.922906° | 50 degrees                           |
|             | PP2                    | -33.963163°             | 150.922886° | 140 degrees                          |
|             | PP3                    | -33.963321°             | 150.923232° | 200 degrees                          |
|             | PP4                    | -33.963650°             | 150.923207° | 320 degrees                          |

## **APPENDIX C. RIPARIAN VEGETATION MANAGEMENT – FLORA INVENTORIES**

| Scientific name                   | Common name              | Exotic | RFEFCF<br>EEC | Quadrat 1 | Quadrat 2 | Quadrat 3 | Quadrat 4 |
|-----------------------------------|--------------------------|--------|---------------|-----------|-----------|-----------|-----------|
| <i>Acacia binervia</i>            | Coast Myall              |        |               |           | X         |           | X         |
| <i>Acacia decurrens</i>           | Black Wattle             |        |               |           |           | X         |           |
| <i>Acacia floribunda</i>          | White Sally              |        |               |           |           | X         |           |
| <i>Acacia parramattensis</i>      | Parramatta Wattle        |        | *             |           |           | X         | X         |
| <i>Alternanthera denticulata</i>  | Lesser Joyweed           |        |               |           | X         |           |           |
| <i>Anagallis arvensis</i>         | Scarlet Pimpernel        | Yes    |               |           |           | X         | X         |
| <i>Austrostipa stipoides</i>      | Coast Spear-grass        |        |               |           | X         |           |           |
| <i>Bidens pilosa</i>              | Cobbler's Pegs           | Yes    |               |           | X         |           |           |
| <i>Billardiera scandens</i>       | Hairy Apple Berry        |        |               |           | X         |           |           |
| <i>Briza maxima</i>               | Quaking Grass            | Yes    |               | X         |           |           |           |
| <i>Bromus catharticus</i>         | Praire Grass             | Yes    |               | X         | X         | X         | X         |
| <i>Bursaria spinosa</i>           | Native Blackthorn        |        | *             | X         |           |           | X         |
| <i>Cardiospermum grandiflorum</i> | Balloon Vine             | Yes    |               | X         |           |           |           |
| <i>Casuarina spp.</i>             |                          |        |               |           |           | X         |           |
| <i>Cayratia clematidea</i>        | Native Grape             |        | *             | X         | X         |           |           |
| <i>Centella asiatica</i>          | Indian Pennywort         |        | *             | X         | X         |           |           |
| <i>Cirsium vulgare</i>            | Spear Thistle            | Yes    |               |           | X         |           | X         |
| <i>Clematis aristata</i>          | Old Man's Beard          |        | *             | X         |           |           |           |
| <i>Commelina cyanea</i>           | Native Wandering Jew     |        | *             | X         | X         | X         |           |
| <i>Convolvulus erubescens</i>     | Pink Bindweed            |        |               | X         |           |           |           |
| <i>Conyza bonariensis</i>         | Flaxleaf Fleabane        | Yes    |               |           | X         |           | X         |
| <i>Conyza spp.</i>                | A Fleabane               | Yes    |               |           | X         |           |           |
| <i>Cyclospermum leptophyllum</i>  | Slender Celery           | Yes    |               | X         | X         |           | X         |
| <i>Cymbopogon refractus</i>       | Barbed Wire Grass        |        | *             |           |           | X         |           |
| <i>Cyperus eragrostis</i>         | Umbrella Sedge           | Yes    |               |           |           |           | X         |
| <i>Dichelachne micrantha</i>      | Shorthair Plumegrass     |        | *             | X         |           | X         | X         |
| <i>Echinopogon ovatus</i>         | Forest Hedgehog Grass    |        | *             |           |           | X         | X         |
| <i>Ehrharta erecta</i>            | Panic Veldtgrass         | Yes    |               | X         | X         |           |           |
| <i>Einadia nutans</i>             | Climbing Saltbush        |        |               |           | X         |           |           |
| <i>Entolasia marginata</i>        | Bordered Panic           |        | *             |           | X         | X         | X         |
| <i>Entolasia stricta</i>          | Wiry Panic               |        | *             |           |           | X         |           |
| <i>Eragrostis leptostachya</i>    | Paddock Lovegrass        |        | *             | X         |           |           |           |
| <i>Eucalyptus botryoides</i>      | Bangalay                 |        | *             |           | X         |           |           |
| <i>Eucalyptus spp.</i>            |                          |        |               | X         |           |           |           |
| <i>Geranium homeanum</i>          |                          |        |               |           |           | X         | X         |
| <i>Hardenbergia violacea</i>      | False Sarsaparilla       |        | *             |           |           | X         | X         |
| <i>Holcus lanatus</i>             | Yorkshire Fog            | Yes    |               |           |           |           | X         |
| <i>Hydrocotyle ranunculoides</i>  | floating marsh pennywort | Yes    |               | X         | X         |           |           |
| <i>Hypochaeris radicata</i>       | Catsear                  | Yes    |               |           |           | X         | X         |
| <i>Imperata cylindrica</i>        | Blady Grass              |        | *             |           | X         |           |           |

| Scientific name                       | Common name             | Exotic | RFEFCF<br>EEC | Quadrat 1 | Quadrat 2 | Quadrat 3 | Quadrat 4 |
|---------------------------------------|-------------------------|--------|---------------|-----------|-----------|-----------|-----------|
| <i>Juncus usitatus</i>                |                         |        |               | X         |           | X         |           |
| <i>Lachnagrostis filiformis</i>       |                         |        |               |           |           | X         |           |
| <i>Lantana camara</i>                 | Lantana                 | Yes    |               |           | X         |           |           |
| <i>Ligustrum sinense</i>              | Small-leaved Privet     | Yes    |               | X         | X         |           | X         |
| <i>Lomandra longifolia</i>            | Spiny-headed Mat-rush   |        | *             | X         | X         | X         |           |
| <i>Melaleuca linariifolia</i>         | Flax-leaved Paperbark   |        | *             | X         | X         |           |           |
| <i>Melaleuca styphelioides</i>        | Prickly-leaved Tea Tree |        | *             |           | X         |           | X         |
| <i>Microlaena stipoides</i>           | Weeping Grass           |        | *             | X         | X         |           |           |
| <i>Modiola caroliniana</i>            | Red-flowered Mallow     | Yes    |               |           |           | X         | X         |
| <i>Olea europaea subsp. Cuspidata</i> | African Olive           | Yes    |               |           |           | X         | X         |
| <i>Oplismenus imbecillis</i>          |                         |        |               |           | X         | X         |           |
| <i>Oxalis exilis</i>                  |                         |        |               |           | X         |           |           |
| <i>Oxalis perennans</i>               |                         |        | *             |           | X         |           |           |
| <i>Pandorea pandorana</i>             | Wonga Wonga Vine        |        |               | X         |           |           |           |
| <i>Pennisetum clandestinum</i>        | Kikuyu Grass            | Yes    |               |           |           | X         |           |
| <i>Persicaria spp.</i>                | Knotweed                |        |               |           | X         |           | X         |
| <i>Phyllanthus spp.</i>               |                         |        |               |           | X         |           |           |
| <i>Phytolacca octandra</i>            | Inkweed                 | Yes    |               |           | X         |           |           |
| <i>Plectranthus parviflorus</i>       |                         |        | *             | X         | X         |           |           |
| <i>Rumex crispus</i>                  | Curled Dock             | Yes    |               |           |           | X         |           |
| <i>Sida rhombifolia</i>               | Paddy's Lucerne         | Yes    |               | X         | X         | X         |           |
| <i>Solanum nigrum</i>                 | Black-berry Nightshade  | Yes    |               | X         | X         |           |           |
| <i>Solanum priophyllum</i>            |                         |        | *             | X         | X         |           |           |
| <i>Sonchus oleraceus</i>              | Common Sowthistle       | Yes    |               | X         | X         |           |           |
| <i>Themeda triandra</i>               |                         |        |               | X         | X         | X         |           |
| <i>Tradescantia fluminensis</i>       | Wandering Jew           | Yes    |               | X         |           |           | X         |
| <i>Trema tomentosa</i>                | Native Peach            |        |               |           |           | X         |           |
| <i>Trifolium repens</i>               | White Clover            | Yes    |               |           |           | X         | X         |
| <i>Verbena bonariensis</i>            | Purpletop               | Yes    |               |           |           |           | X         |
| <i>Vicia sativa</i>                   | Common vetch            | Yes    |               |           |           | X         | X         |
| <i>Viola hederacea</i>                | Ivy-leaved Violet       |        | *             |           |           | X         |           |

## **APPENDIX D. LANDS ADJOINING RAIL LINK - QUADRAT MONITORING DATA**

| Scientific name                  | Common name                | East side of Georges River |           | West side of Georges River |           |
|----------------------------------|----------------------------|----------------------------|-----------|----------------------------|-----------|
|                                  |                            | Cover                      | Abundance | Cover                      | Abundance |
| <i>Acacia brownii</i>            | Heath Wattle               | 0.2                        | 20        | 0.1                        | 5         |
| <i>Acacia bynoeana</i>           | Bynoe's Wattle             | 0.1                        | 2         |                            |           |
| <i>Acacia longifolia</i>         |                            | 0.2                        | 3         | 0.1                        | 5         |
| <i>Angophora bakeri</i>          | Narrow-leaved Apple        | 10.0                       | 40        | 20.0                       | 80        |
| <i>Anisopogon avenaceus</i>      | Oat Speargrass             | 4.0                        | 100       | 2.0                        | 100       |
| <i>Austrostipa pubescens</i>     |                            | 3.0                        | 100       | 0.2                        | 50        |
| <i>Banksia oblongifolia</i>      | Fern-leaved Banksia        | 1.0                        | 10        | 0.2                        | 5         |
| <i>Banksia spinulosa</i>         | Hairpin Banksia            | 1.0                        | 15        | 1.0                        | 15        |
| <i>Bossiaea ensata</i>           | Sword Bossiaea             | 0.1                        | 5         |                            |           |
| <i>Bossiaea heterophylla</i>     | Variable Bossiaea          | 0.3                        | 50        | 0.5                        | 100       |
| <i>Brachyloma daphnoides</i>     | Daphne Heath               | 0.5                        | 5         | 0.1                        | 5         |
| <i>Burchardia umbellata</i>      | Milkmaids                  | 0.2                        | 50        | 0.1                        | 50        |
| <i>Cassytha glabella</i>         |                            | 0.1                        | 5         | 0.1                        | 10        |
| <i>Cheilanthes sieberi</i>       | Rock Fern                  |                            |           | 0.1                        | 10        |
| <i>Cyathochaeta diandra</i>      |                            | 2.0                        | 50        | 0.5                        | 200       |
| <i>Daviesia ulicifolia</i>       | Gorse Bitter Pea           | 0.2                        | 10        |                            |           |
| <i>Dianella caerulea</i>         | Blue Flax-lily             | 0.2                        | 20        | 0.2                        | 20        |
| <i>Empodisma minus</i>           |                            | 0.2                        | 100       | 1.0                        | 300       |
| <i>Entolasia stricta</i>         | Wiry Panic                 | 1.0                        | 500       | 1.0                        | 500       |
| <i>Eragrostis curvulayes*</i>    | African Lovegrass          | 0.1                        | 10        |                            |           |
| <i>Eucalyptus parramattensis</i> | Parramatta Red Gum         | 5.0                        | 1         | 1.0                        | 1         |
| <i>Eucalyptus racemosa</i>       | Narrow-leaved Scribbly Gum | 10.0                       | 5         | 10.0                       | 4         |
| <i>Gahnia aspera</i>             | Rough Saw-sedge            | 0.1                        | 5         | 0.1                        | 5         |
| <i>Gompholobium minus</i>        | Dwarf Wedge Pea            | 0.1                        | 50        | 0.2                        | 50        |
| <i>Goodenia hederacea</i>        | Ivy Goodenia               | 0.1                        | 10        | 0.1                        | 20        |
| <i>Haemodorum planifolium</i>    |                            | 0.2                        | 125       | 0.1                        | 20        |
| <i>Hakea dactyloides</i>         | Finger Hakea               |                            |           | 0.1                        | 1         |
| <i>Hakea sericea</i>             | Needlebush                 | 0.2                        | 50        | 0.2                        | 50        |
| <i>Hardenbergia violacea</i>     | False Sarsaparilla         | 0.2                        | 15        | 15.0                       | 0         |
| <i>Hibbertia puberula</i>        |                            | 0.1                        | 4         | 0.1                        | 1         |
| <i>Hypericum gramineum</i>       | Small St John's Wort       | 0.1                        | 10        | 0.1                        | 100       |
| <i>Hypolaena fastigiata</i>      |                            | 0.2                        | 200       | 0.1                        | 10        |
| <i>Isopogon anemonifolius</i>    | Broad-leaf Drumsticks      | 0.2                        | 1         |                            |           |
| <i>Kunzea ambigua</i>            | Tick Bush                  |                            |           | 0                          | 5.0       |
| <i>Leptospermum parvifolium</i>  |                            | 1.0                        | 25        | 2.0                        | 50        |
| <i>Leptospermum trinervium</i>   | Slender Tea-tree           | 2.0                        | 15        | 2.0                        | 20        |
| <i>Leucopogon virgatus</i>       |                            |                            |           | 0.1                        | 5         |
| <i>Lindsaea linearis</i>         | Screw Fern                 | 0.2                        | 200       | 0.2                        | 200       |

| Scientific name                | Common name            | East side of Georges River |           | West side of Georges River |           |
|--------------------------------|------------------------|----------------------------|-----------|----------------------------|-----------|
|                                |                        | Cover                      | Abundance | Cover                      | Abundance |
| <i>Lomandra filiformis</i>     | Wattle Matt-rush       | 0.2                        | 20        |                            |           |
| <i>Lomandra filiformis</i>     | Wattle Matt-rush       |                            |           | 0.2                        | 100       |
| <i>Lomandra multiflora</i>     | Many-flowered Mat-rush | 0.1                        | 10        |                            |           |
| <i>Lomatia silaifolia</i>      | Crinkle Bush           | 0.1                        | 5         | 0.1                        | 5         |
| <i>Melaleuca nodosa</i>        |                        | 15.0                       | 30        | 25.0                       | 100       |
| <i>Microlaena stipoides</i>    | Weeping Grass          | 0.1                        | 50        | 0.1                        | 50        |
| <i>Opercularia diphylla</i>    | Stinkweed              | 0.1                        | 20        |                            |           |
| <i>Persoonia laurina</i>       | Laurel Geebung         | 0.1                        | 1         |                            |           |
| <i>Persoonia linearis</i>      | Narrow-leaved Geebung  |                            |           | 0.2                        | 5         |
| <i>Petrophile pulchella</i>    | Conesticks             | 0.1                        | 5         | 0.1                        | 5         |
| <i>Philotheca salsolifolia</i> |                        | 0.5                        | 20        | 0.1                        | 5         |
| <i>Pimelea linifolia</i>       | Slender Rice Flower    | 5.0                        | 500       | 0.5                        | 100       |
| <i>Platysace ericoides</i>     |                        | 0.2                        | 50        | 0.1                        | 25        |
| <i>Ptilothrix deusta</i>       |                        |                            |           | 0.1                        | 50        |
| <i>Pultenaea tuberculata</i>   |                        | 0.1                        | 20        | 0.1                        | 5         |
| <i>Schizaea bifida</i>         | Forked Comb Fern       |                            |           | 0.1                        | 5         |
| <i>Stylidium graminifolium</i> | Grass Triggerplant     | 0.2                        | 30        | 0.2                        | 350       |
| <i>Themeda triandra</i>        |                        | 0.2                        | 50        | 0.2                        | 250       |
| <i>Trachymene incisa</i>       | Trachymene             | 0.2                        | 50        | 0.1                        | 50        |
| <i>Tricoryne simplex</i>       |                        | 0.2                        | 50        | 0.1                        | 100       |
| <i>Xanthorrhoea spp.</i>       | Heath Wattle           |                            |           | 1.0                        | 10        |

\* Exotic species

## **APPENDIX E. NEST BOX MONITORING REPORT (SPRING 2020)**

**Date** 12/01/2021  
**To** [REDACTED]  
**From** [REDACTED]  
**Copy to** [REDACTED]  
**Subject** Moorebank Precinct – Nest Box Monitoring Report Spring 2020

---

## Introduction

The Sydney Intermodal Terminal Alliance (SIMTA) and Moorebank Intermodal Company have entered an agreement to develop the Moorebank Precinct East (MPE) Project and Moorebank Precinct West (MPW) Project into the Moorebank Logistics Park (MLP).

The MLP is located approximately 27 kilometres (km) south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany within the Liverpool Local Government Area (LGA), in Sydney's South West Sub-Region, approximately 2.5 km from Liverpool City Centre.

The MLP involves the development of an Import Export (IMEX) terminal on MPE and interstate terminal on MPW including rail links to the Southern Sydney Freight Line (SSFL), warehouse and distribution facilities, freight village, road and intersection upgrades, and ancillary activities such as landscaping and utilities installation and diversion.

Approval for the construction and operation of the MLP is divided into respective east and west precincts as follows:

- Stage 1 (SSD 6766), divided into Package 1 (RALP) and Package 2 (IMEX), and Stage 2 (SSD 7628) of MPE under the MPE Concept Consent (MP10\_0193) was provided in March 2018 (as amended through the Land and Environment Court) and January 2018 respectively. Commonwealth approval (EPBC 2011/6299) was received in March 2014.
- MPW Concept and Stage 1 (SSD 5066) received approval in June 2016, with commonwealth approval (EPBC 2011/6086) in September 2016. MPW Stage 2 (SSD 7709) received approval on 11 November 2019.

## Purpose

Vegetation clearing has been progressively undertaken within both MPE and MPW and included the removal of hollow-bearing trees that provided habitat for hollow-dependent fauna. In accordance with approval requirements, (refer to Table 1), a separate Nest Box Strategy (NBS) (CPB 2017) was developed for MPE Stage 1 – RALP, and MPW Stage 1. The MPE Stage 1 – RALP NBS has also been adapted for implementation for MPE Stage 1 – IMEX and MPE Stage 2.

A review of records and vegetation clearing reports (Arcadis 2019a) for the MLP development has identified a requirement for 171 nest boxes to be installed to offset impacts to hollow-bearing trees; 50 to be installed in the Bootland (Wattle Grove offset area) and 121 in the Georges River Corridor (Moorebank offset area). There is a requirement for these nest boxes to be monitored and maintained to ensure they offer suitable habitat to locally occurring hollow-dependant fauna.

The MPE NBS (based on MPE Stage 1 – RALP) recommended that nest boxes installed for the project should be monitored shortly after installation and then every six months thereafter. The nest box strategy prepared for MPW did not provide any recommendations for nest box monitoring.

The first round of nest box monitoring on the Moorebank Precinct was completed by Arcadis in spring 2018. Arcadis was engaged to undertake the proceeding annual nest boxes spring monitoring surveys within the Moorebank Precinct in 2019 and 2020 (the subject of this report) in accordance with the requirements specified in the MPE NBS. Table 1 below outlines the various conditions that detail the requirements for nest boxes.

*Table 1: Conditions of Consent*

| Condition                                | Conditions of Consent reference | Requirement                                                                                                                                                                                                                                                                                                                                                                          | Where addressed                                                  |
|------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>MPW Stage 1 (SSD 5066)</b>            |                                 |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                  |
| Conditions of Consent                    | D21(d)(ii)                      | <p>The identification of areas to be cleared and details of management measures to avoid residual habitat damage or loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat such as:</p> <ul style="list-style-type: none"> <li>- clearing procedures (including nest box plan)</li> </ul>                                             | MPW Stage 1 Construction Flora and Fauna Management Plan (CFFMP) |
| <b>MPE Stage 1 (SSD 6766)</b>            |                                 |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                  |
| Conditions of Consent                    | E34(d)(ii)(b)                   | <p>The identification of areas to be cleared and details of management measures to avoid residual habitat damage or loss and to minimise or eliminate time lags between the removal and subsequent replacement of habitat such as:</p> <ul style="list-style-type: none"> <li>- clearing procedures (including nest box plan)</li> </ul>                                             | <p>MPE Stage 1 CFFMP (RALP)</p> <p>MPE Stage 1 CFFMP (IMEX)</p>  |
| Final Compilation of Mitigation Measures | 8C                              | A nest box management strategy will be prepared prior to clearing of hollow bearing trees. The strategy will inform the installation of nest boxes in retained native vegetation in the riparian corridor of the Georges River and the woodland in the Southern Boot Land and the on-going monitoring and maintenance of nest boxes through the construction and operational phases. | <p>MPE Stage 1 CFFMP (RALP)</p> <p>MPE Stage 1 CFFMP (IMEX)</p>  |
| <b>MPE EPBC Approval</b>                 |                                 |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                  |
| Commonwealth Mitigation Measures         | 7.4.1.3 n                       | Consider the installation of nest boxes in woodland vegetation in the rail corridor that may offer alternative nesting habitat to                                                                                                                                                                                                                                                    | <p>MPE Stage 1 CFFMP (RALP)</p> <p>MPE Stage 1 CFFMP (IMEX)</p>  |

| Condition | Conditions of Consent reference | Requirement                                          | Where addressed   |
|-----------|---------------------------------|------------------------------------------------------|-------------------|
|           |                                 | hollow dependent species recorded in the study area. | MPE Stage 2 CFFMP |

This memo summarises the results of the third round of nest box monitoring undertaken by Arcadis spring 2020 across the Bootland and Georges River Corridor.

## Nest box details

### Numbers

During the 2019 spring nest box monitoring surveys 253 nest boxes were identified by Arcadis ecologists; 54 in the Bootland and 199 in the Georges River Corridor. During the 2020 surveys 213 of the 253 nest boxes previously identified were re-found and monitored. The disparity in nest box numbers is addressed within this report.

### Installation

Nest boxes in the Bootland and Georges River Corridor were attached to trees using two methods; screwed directly into the trunk of the tree or hanging with a wire ('habisure' method). All nest boxes screwed directly into trees have been mounted correctly and at a height that can be easily accessed using a pole-mounted camera. Several nest boxes mounted using the habisure method were mounted incorrectly are hanging loose or at a severe angle, and above the recommended height of ten metres above the ground. Inspection with the pole-mounted cameras is difficult for incorrectly mounted boxes and, in some cases, not possible.

### Design

A suite of nest box designs are represented across the Bootland and Georges River Corridor to accommodate the different hollow-dependant species known from the locality. The following fauna have been targeted by nest box design: Treecreepers, Feather-tailed Glider, Possum/Arboreal mammal, Lorikeet, Microbat, Cockatoo, Kookaburra, Kingfisher, Wood Duck and Parrot.

Most nest boxes installed have been fitted with a hinged lid to enable inspection, however several boxes had been fitted with fixed lids. Fixed lid nest boxes cannot be internally inspected using a pole-mounted camera.

## Summary of spring 2019 nest box monitoring

A report was prepared by Arcadis for the Spring 2019 nest box monitoring (Arcadis 2019b). The outcomes of the 2019 nest box monitoring survey are summarised below.

A total of 253 nest boxes were located during the 2019 survey, 199 in the Georges River Corridor and 54 in the Bootland. An additional six nest boxes were located during the 2019 survey, which were not detected previously.

The results of the spring 2019 nest box monitoring survey is summarised below:

- A total of 200 nest boxes were inspected internally using a pole mounted camera
- A total of 36 nest boxes were occupied at the time of inspection, five in the Bootland and 31 in the Georges River Corridor.

- Of the nest boxes occupied, five were occupied by introduced fauna at the time of inspection, one in the Bootland and four in the Georges River Corridor. Introduced fauna included European Honey Bee (*Apis mellifera*) and Common Myna (*Acridotheres tristis*).
- No recently (i.e. within the period since the spring 2018 monitoring) deceased fauna were recorded within any of the nest boxes inspected.
- A total of 34 nest boxes were identified as requiring maintenance, three in the Bootland and 31 in the Georges River Corridor.
  - 16 were considered to be 'dysfunctional' due to being damaged/destroyed, fallen from trees and/or mounted incorrectly.
  - 18 nest boxes required relocation to a height below 10 metres to allow for annual internal inspection in accordance with Section 5 of the MPE NBS.

Several issues were identified with nest boxes during the first round of monitoring in 2018 that required redress prior to the 2019 spring monitoring survey. No evidence of corrective action was observed by the attending ecologists during the 2019 surveys.

No management or maintenance of nest boxes in either the Bootland or the Georges River Corridor was considered necessary following the 2019 spring monitoring surveys (Arcadis 2019b).

## Relocation of nest boxes in 2020

Since the 2019 spring monitoring survey a number of nest boxes have been relocated within the Georges River Corridor. Nest box relocation events have been undertaken on two separate occasions; in August 2020 and December 2020. Nest boxes were relocated from bushland immediately adjacent to the Moorebank Precinct West project site to more suitable areas within the Georges River Corridor Moorebank offset area. The details of relocation events are summarised in Table 1. During relocation, any nest boxes which were damaged or in a state of disrepair were decommissioned.

Table 1. Details of nest box relocation within the Georges River corridor

| Timing        | Completed by                        | Number of boxes demounted | Number of boxes relocated           |
|---------------|-------------------------------------|---------------------------|-------------------------------------|
| August 2020   | Niche Environment and Heritage      | 47                        | 42 (five nest boxes decommissioned) |
| December 2020 | Kingfisher Urban Ecology & Wetlands | 13                        | 12 (one nest box decommissioned)    |

During the relocation exercise, nest boxes were inspected, and notes taken on occupation status. The updated locations of nest boxes following the relocation events are presented in Figure 1.

## Methodology

The spring 2020 round of nest box monitoring within the Bootland and Georges River Corridor was undertaken by Arcadis Ecologists Kate Carroll and Nathan Banks over four days in September, October, and November. The dates of survey and weather conditions recorded from the nearest weather station at Holsworthy Aerodrome AWS (station 066161) have been included in Table 2.

Table 2. Dates of survey and weather conditions

| Date              | Min (°C) | Max (°C) | Rain (mm) | Max wind gust (km/h) |
|-------------------|----------|----------|-----------|----------------------|
| 28 September 2020 | 4.4      | 20.7     | 0         | 28                   |
| 9 October 2020    | 9.1      | 29       | 0         | 28 (3pm)             |
| 19 October 2020   | 14.4     | 20.8     | 2.0       | 35                   |
| 18 November 2020  | 16.2     | 22.5     | 0         | 22                   |

A total of 213 nest boxes were located by Arcadis during 2020 monitoring; 52 in the Bootland and 161 in the Georges River Corridor.

Initially each nest box inspected from outside and if no fauna was seen inhabiting the box an internal inspection prevailed using a GoPro (Wi-Fi connected) camera attached to an 8-metre extension pole.

During the 2020 survey numbered metal tags were nailed to trees containing nest boxes to individually identify each nest box. Tree identification tags will make future monitoring surveys more efficient, ensure consistent identification of nest boxes and allow accurate tracking of nest boxes in the case of additional relocation events.

The following information was collected during monitoring, as recommended in Section 5 of the MPE NBS:

- Date and time.
- Nest box number.
- Nest box location (GPS).
- Occupancy status (including species level identification where possible).
- Evidence of previous occupancy by native fauna (such as nesting material, eggs, deceased fauna or feathers).
- Presence or evidence of previous introduced species occupation.
- General condition of the nest box and mount.
- Any recommended maintenance requirements, such as:
  - The need to remove introduced species.
  - Replacement, repair or re-installation of missing, fallen or damaged nest boxes or mounts.
  - Removal of excessive nesting material.
  - Moving nest boxes that are not functioning correctly.
  - Checking that boxes are draining adequately.
- Additional notes such as changes to land use or reasons for low occupancy.

A comparison of results from the spring 2020 monitoring to the spring 2019 monitoring (Arcadis 2019) has been presented in Appendix B. This comparison is provided to measure change over time, and to provide data to determine the success of the nest box program.

## Survey limitations

253 net boxes were located across the Bootland and Georges River Corridor during spring 2019 surveys. 213 of these boxes were relocated during the 2020 surveys. Since the 2019 survey 13 nest boxes have been decommissioned, however a further 27 boxes within the Georges River Corridor could not be located. It is possible that some of these boxes have fallen since the 2019 survey and were subsequently not detected or may have been overlooked during the spring 2020 survey.

These 27 boxes will be maintained in the data set in the expectation that some may be relocated during the spring 2021 surveys.

## Results

Detailed results from the spring 2020 survey is provided in Appendix B. A summary of results is presented below.

A total of 213 nest boxes were located by Arcadis; 52 in the Bootland and 161 in the Georges River Corridor.

A total of 192 nest boxes were inspected internally using a pole-mounted camera. The remaining 21 nest boxes were not inspected internally for the following reasons:

- boxes were occupied by fauna during external inspections. Internal inspections were not undertaken to avoid further disturbance to fauna occupying these boxes.
- boxes were installed too high (i.e. greater than 10 metres above the ground) and could not be reached with a pole-mounted camera.
- boxes were not fitted with hinged lids and could not be accessed with a pole-mounted camera.

Since the 2019 survey 13 nest boxes have been decommissioned. 27 nest boxes monitored in 2019 from the Georges River Corridor were unable to be relocated during the recent survey.

## Nest box occupancy

Nest box 'occupancy' was determined based on the number of nest boxes recorded as currently occupied by native fauna. Only nest boxes that could be internally inspected were assessed for occupancy. Comparisons of occupancy can be made between different monitoring periods, given the occurrence of live animals is independent during each monitoring period.

The following occupancy rates were recorded for nest boxes during the spring 2020 monitoring:

- A total of 47 nest boxes were occupied by native fauna at the time of inspection; 16 in the Bootland and 31 in the Georges River Corridor. Occupying species included Sugar Glide (*Petaurus breviceps*), Ringtail Possum (*Pseudocheirus peregrinus*), Australian Wood Duck (*Chenonetta jubata*), Peron's Tree Frog (*Litoria peronii*), Australian Owlet-nightjar (*Aegotheles cristatus*), Southern Boobook Owl (*Ninox novaeseelandiae*) and Rainbow Lorikeet (*Trichoglossus haematodus*).
- A total of eight nest boxes were occupied by introduced fauna at the time of inspection; one in the Bootland and seven in the Georges River Corridor. Occupying species included European Honey Bee and Black Rat.
- Deceased Rainbow Lorikeet fledglings were recoded from two nest boxes (#8 and #28) in the Bootland. The deceased birds in #8 were recorded during previous surveys (2018/2019), however the deceased bird in nest box #28 has occurred since the 2019 monitoring survey.

A comparison of nest box occupancy by native fauna between spring 2019 and spring 2020 is provided below:

- 31% of nest boxes within the Bootland were occupied by native fauna in spring 2020. This equates to an increase of 22% compared to spring 2019 (9%).
- 19% of nest boxes within the Georges River Corridor were occupied by native fauna in spring 2020. This equates to an increase of 3% compared to spring 2019 (16%).

The occupancy status of nest boxes has been depicted in Figure 1.

## **Nest box utilisation**

Nest box 'utilisation' includes boxes currently or previously occupied by native fauna as well as those showing evidence of use such as deceased animals, eggs and nesting materials. Comparisons of utilisation cannot readily be made between monitoring periods, given some evidence of previous occupation may still be present over multiple monitoring periods. Combining current and previous occupancy with evidence of use does provide a cumulative measure of nest box utilisation over time.

A total of 116 nest boxes out of the 213 nest boxes located have been utilised by native fauna; either being currently (spring 2020) or previously (spring 2019) occupied or displaying evidence of occupancy. This equates to a cumulative utilisation rate of 55% for nest boxes by native fauna to date.

## **Introduced species**

Ten (5%) of the 213 nest boxes inspected were occupied or showed signs of occupation by introduced species. Introduced fauna identified include European Honey Bee, Black Rat and Common Myna. A summary of nest box utilisation by introduced fauna is included below:

- Seven nest boxes (one in the Bootland and six in the Georges River Corridor) were occupied by European Honey Bees; this equates to 3% of the boxes located.
- One Black Rat was observed inhabiting a nest box in the Georges River Corridor; this equates to <1% of the boxes located.
- Three nest boxes (#144, #158 and #161) in the Georges River Corridor exhibited evidence of nesting by Common Myna; this equates to ~1% of the boxes located.

A comparison of nest box occupancy by introduced fauna between spring 2018 and spring 2019 monitoring surveys identified:

- Occupation of nest boxes by European Honey Bees has increase from 2% (2019) to 3% (2020).
- Black Rat as a novel species to inhabit nest boxes.

No nesting Common Mynas were recorded during the spring 2019 monitoring, however, were recorded in 2018 monitoring surveys. Results from 2020 confirm that Common Myna continue to use nest boxes for nesting within the Georges River Corridor, albeit at a low occupation rate.

## **Nest box condition**

Nest box 'condition' includes the structural condition of boxes as well as box mounts.

The majority of nest boxes located during the spring 2020 monitoring surveys showed minor evidence of deterioration due to weathering (e.g. plywood separation).

14 nest boxes, all from the Georges River Corridor, were considered to be 'dysfunctional' for the following reasons:

- Two boxes (boxes #81 and #128) were in a state of disrepair.
- 12 boxes mounted incorrectly (e.g. upside down, unsteady on tree, lids open), including box #55, #68, #80, #91, #92, #93, #95, #101, #102, #133, #136 and #202.
- Three boxes (#8, #24, #14) have resulted in the death of animals due to not having an internal ladder for fauna to exit.

12 nest boxes have been decommissioned since the 2019 survey. These boxes have been collected following falling from trees, detached from fallen trees, significantly damaged or burnt during the 2018 wildfire.

According to Section 5 of the MPE NBS, nest boxes must be installed at a height below 10 metres to allow for visual inspection using an inspection camera and extension pole. A total of 9 nest boxes (#71, #117, #125, #148, #172, #206, #232, #233, #250) in the Georges River Corridor were installed at a height above 10 m and could not be reached using a pole-mounted camera.

## Fledgling fatalities

During nest box monitoring in spring 2018, Arcadis Ecologists discovered deceased fledgling birds within two nest boxes (#8, #14) in the Bootland and one nest box (#133) in the Georges River Corridor. Remains of these dead birds were again recorded during the spring 2019 survey. No additional deaths were recorded in 2019.

*It was suspected that deaths have likely occurred due to the design of larger boxes with smooth sides that prevented smaller fledglings from climbing to the nest box entrances (Arcadis 2019a).*

Recommendations were made in the 2018 report to retrofit these boxes with an internal 'ladder' or similar to enable smaller birds to climb to the nest box entrances.

Recent surveys observed dead Rainbow Lorikeet fledglings in two nest boxes, #8 and #24. The deceased birds in box #8 is thought to be the remains of birds from 2018, however there is no evidence of a retrofitted internal ladder as has been previously recommended (Arcadis 2019a; Arcadis 2019b). The deceased fledgling in box #24 has occurred since the 2019 survey. The deceased fledgling was discovered in the deeper nest box design. It is hypothesised that after the parents had left the nest, the chick has died of starvation/dehydration as it could not exit the nest box.



*Plate 1. Deceased fledgling Rainbow Lorikeets. Note: No internal ladders or grab holds to assist fauna in exiting the nest box*



#### LEGEND

- |                  |                                       |                                     |
|------------------|---------------------------------------|-------------------------------------|
| MPE site         | Moorebank biobank site                | Nest box status: Currently occupied |
| MPW site         | Casula offset area (Hourglass)        | Evidence of use                     |
| Watercourse      | Moorebank offset area (Georges River) | Dysfunctional                       |
| Existing railway | Wattle Grove offset area (Bootland)   | Unoccupied                          |
|                  |                                       | Not located / Unknown               |

ARCADIS AUSTRALIA PACIFIC PTY LTD  
 ABN 76 104 485 289  
 Level 16, 580 George St | Sydney NSW 2000  
 P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001  
 Coordinate System: GDA 1994 MGA Zone 56  
 Aerial imagery supplied by nearmap (Jan, 2020)

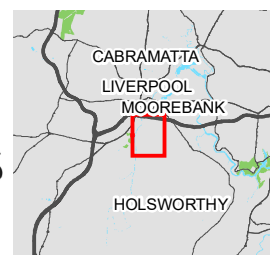


Figure 1: Nest Box locations and occupancy

## Management and maintenance

Nest box occupancy and utilisation by native fauna is considered to be adequate in both the Bootland and the Georges River Corridor. This is based on the assumption that 10% of nest boxes should be occupied by target (native) fauna (Goldingay et al. 2018, Lindenmayer et al. 2017). A comparison between spring 2018 and spring 2019 results indicates that occupancy by native fauna has increased between these two periods.

As stated in the 2018 nest box monitoring report (Arcadis 2019a), *Based on a series of reports and emails... 171 nest boxes had been installed; up to 121 in the Georges River Corridor, and 50 in the Bootland* as a requirement of the MLP development. As such there is a requirement to maintain at least 171 of these nest boxes so that they adequately serve the purpose as habitat for locally occurring hollow-dependent fauna.

A total of 186 nest boxes, 49 in the Bootland and 137 in the Georges River Corridor, are in good condition and providing suitable habitat for hollow dependant fauna. Essential maintenance should be prioritised for nest boxes which have been:

- identified as causing fauna fatalities
- damaged and require removal (decommissioning)
- installed above 10 metres in height and are unable to be internally inspected

Essential maintenance actions for nest boxes has been detailed in Table 3.

Table 3. Essential maintenance actions

| Next box identifier                                 | Maintenance action                                                                          |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------|
| #8, #24                                             | Remove deceased animal and nesting material<br>Retrofit internal ladder                     |
| #14                                                 | Retrofit internal ladder                                                                    |
| #81, 128                                            | Decommission nest box                                                                       |
| #71, #117, #125, #148, #172, #206, #232, #233, #250 | Relocate nest boxes to 8 metres above ground to allow internal inspection in future surveys |

A series of recommended actions have been identified in Table 4 to increase the functionality of nest boxes for native fauna, including the removal of introduced species.

Table 4. Recommended maintenance actions

| Nest box identifier                                                 | Maintenance action                                                                                   |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| #55, #68, #80, #91, #92, #93, #95, #101, #102, #133, #136 and #202. | Remount on trees / Secure nest box lids and close                                                    |
| #144, #158, #161                                                    | Remove nesting material from nest boxes – install anti-myna baffle to prevent access to Common Myna. |

In accordance with the MPE NBS, nest boxes are required to be monitored every 12 months after installation. As such, it is advised that the fourth round of nest box monitoring is undertaken in spring 2021.

## References

Arcadis (2019a) Nest box monitoring report – Spring 2018

Arcadis (2019b) Nest box monitoring report – Spring 2019

CPB Contractors (CPB) (2017) Nest Box Management Strategy. Moorebank Precinct East Stage 1 – Rail Link

Goldingay. R, Thomas. K, Shanty. D, (2018) Outcomes of decades long installation of nest boxes for arboreal mammals in southern Australia

Lindenmayer. D, Crane. M, Evans. M, Maron. M, (2017) The anatomy of a failed offset

## **APPENDIX A. PHOTOGRAPHS FROM NEST BOX MONITORING**



**Sugar Glider**



**Owlet Night-jar**



**Southern Boobook**



**Hive**



**Ringtail Possum**



**Lorikeet chick**



**Peron's Tree Frog**



**Australian Wood Duck eggs**

## **APPENDIX B. RESULTS OF SPRING 2020 NEST BOX MONITORING**

## Wattle Grove

| Location | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required                            |
|----------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|---------------------------------------------|
| Bootland | 1                   | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 2                   | Treecreeper            | 28/09/2020     | Yes              | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied |                                             |
| Bootland | 3                   | Possum/arboreal mammal | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 4                   | Possum/arboreal mammal | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                             |
| Bootland | 5                   | Treecreeper            | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                             |
| Bootland | 6                   | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 7                   | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 8                   | Cockatoo               | 28/09/2020     | Yes              | Deceased Rainbow Lorikeet                     | Animal present     | No                        | Dysfunctional      | Retrofit internal ladder                    |
| Bootland | 9                   | Treecreeper            | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 10                  | Possum/arboreal mammal | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                             |
| Bootland | 11                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 12                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                                             |
| Bootland | 13                  | Feather-tailed Glider  | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | Yes                       | Currently occupied |                                             |
| Bootland | 14                  | Cockatoo               | 28/09/2020     | Yes              | Australian Wood Duck                          | Animal present     | No                        | Currently occupied | Retrofit internal ladder (noted in 2019 MR) |

| Location | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required         |
|----------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|--------------------------|
| Bootland | 15                  | Treecreeper            | 28/09/2020     | None             |                                               | Feaces/whitewash   | No                        | Evidence of use    |                          |
| Bootland | 16                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 17                  | Possum/arboreal mammal | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                          |
| Bootland | 18                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 19                  | Lorikeet               | 28/09/2020     | Yes              | Rainbow lorikeet                              | Animal present     | No                        | Currently occupied |                          |
| Bootland | 20                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 21                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 22                  | Microbat               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 23                  | Feather-tailed Glider  | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | Yes                       | Currently occupied |                          |
| Bootland | 24                  | Cockatoo               | 28/09/2020     | Yes              | Deceased Rainbow Lorikeet                     | Animal present     | No                        | Dysfunctional      | Retrofit internal ladder |
| Bootland | 25                  | Feather tail glider    | 28/09/2020     | Yes              | European Honey Bee*                           | Animal present     | Yes                       | Currently occupied |                          |
| Bootland | 26                  | Possum/arboreal mammal | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                          |
| Bootland | 27                  | Lorikeet               | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                          |
| Bootland | 28                  | Cockatoo               | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                          |
| Bootland | 29                  | Possum/arboreal mammal | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                          |

| Location | Nest box identifier | Nest Box Type         | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required |
|----------|---------------------|-----------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|------------------|
| Bootland | 30                  | Feather-tailed Glider | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | No                        | Currently occupied |                  |
| Bootland | 31                  | Lorikeet              | 28/09/2020     | Yes              | Rainbow Lorikeet                              | Animal present     | No                        | Currently occupied |                  |
| Bootland | 32                  | Treecreeper           | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 33                  | Lorikeet              | 28/09/2020     | Yes              | Australian Owlet-nightjar                     | Animal present     | No                        | Currently occupied |                  |
| Bootland | 34                  | Feather-tailed Glider | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | No                        | Currently occupied |                  |
| Bootland | 35                  | Feather-tailed Glider | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | Yes                       | Currently occupied |                  |
| Bootland | 36                  | Microbat              | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 37                  | Microbat              | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 38                  | Treecreeper           | 28/09/2020     | Yes              | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied |                  |
| Bootland | 39                  | Feather-tailed Glider | 28/09/2020     | Yes              | Sugar Glider                                  | Animal present     | Yes                       | Currently occupied |                  |
| Bootland | 40                  | Microbat              | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 41                  | Microbat              | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 42                  | Feather-tailed Glider | 28/09/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                  |
| Bootland | 43                  | Microbat              | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |
| Bootland | 44                  | Treecreeper           | 28/09/2020     | None             |                                               | None               | No                        | Unoccupied         |                  |

| Location | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use                      | Previous occupancy (2019) | Nest box status     | Actions required |
|----------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------------------------|---------------------------|---------------------|------------------|
| Bootland | 45                  | Possum/arboreal mammal | 28/09/2020     | Yes              | Unidentified                                  | Animal present                       | No                        | Currently occupied  |                  |
| Bootland | 46                  | Treecreeper            | 28/09/2020     | None             |                                               | Leaves/bark/sticks; Faeces/whitewash | No                        | Evidence of use     |                  |
| Bootland | 47                  | Treecreeper            | 28/09/2020     | None             |                                               | Leaves/bark/sticks                   | No                        | Evidence of use     |                  |
| Bootland | 48                  | Lorikeet               | 28/09/2020     | Yes              | Rainbow Lorikeet                              | Animal present                       | No                        | Currently occupied  |                  |
| Bootland | 49                  | Microbat               | 28/09/2020     | None             |                                               | None                                 | No                        | Unoccupied          |                  |
| Bootland | 50                  | Treecreeper            | 28/09/2020     | None             |                                               | Leaves/bark/sticks                   | No                        | Evidence of use     |                  |
| Bootland | 246                 | Cockatoo               | 28/09/2020     | None             |                                               | Leaves/bark/sticks                   | Yes                       | Previously occupied |                  |
| Bootland | 247                 | Lorikeet               | 28/09/2020     | None             |                                               | Feathers                             | Yes                       | Previously occupied |                  |
| Bootland | 248                 | Decommissioned         |                |                  |                                               |                                      |                           |                     |                  |
| Bootland | 249                 | Decommissioned         |                |                  |                                               |                                      |                           |                     |                  |

## Georges River Corridor

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required                                |
|------------------------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|-------------------------------------------------|
| Georges River Corridor | 51                  | Microbat               | 8/10/2020      | None             |                                               | None               | No                        | Dysfunctional       | Move nest box to native tree species; Close lid |
| Georges River Corridor | 52                  | Possum/arboreal mammal | 8/10/2020      | Yes              | Rainbow Lorikeet                              | Animal present     | No                        | Currently occupied  | Move nest box to native tree species            |
| Georges River Corridor | 53                  | Possum/arboreal mammal | 8/10/2020      | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                                                 |
| Georges River Corridor | 54                  | Decommissioned         |                |                  |                                               |                    |                           |                     |                                                 |
| Georges River Corridor | 55                  | Parrot                 | 8/10/2020      | None             |                                               | None               | No                        | Dysfunctional       | Secure nest box on tree                         |
| Georges River Corridor | 56                  | Feather-tailed Glider  | 8/10/2020      | Yes              | Sugar Glider                                  | Animal present     | No                        | Currently occupied  |                                                 |
| Georges River Corridor | 57                  | Microbat               | 8/10/2020      | None             |                                               | None               | No                        | Unoccupied          |                                                 |
| Georges River Corridor | 58                  | Feather-tailed Glider  | 9/10/2020      | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                                                 |
| Georges River Corridor | 59                  | Microbat               | 9/10/2020      | None             |                                               | None               | No                        | Unoccupied          |                                                 |
| Georges River Corridor | 60                  | Feather-tailed Glider  | 9/10/2020      | None             |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                                                 |
| Georges River Corridor | 61                  | Microbat               | 9/10/2020      | None             |                                               | None               | No                        | Unoccupied          |                                                 |
| Georges River Corridor | 62                  | Parrot                 | 9/10/2020      | Yes              | Rainbow Lorikeet                              | Animal present     | Yes                       | Currently occupied  |                                                 |
| Georges River Corridor | 63                  | Feather-tailed Glider  | 9/10/2020      | None             |                                               | None               | No                        | Unoccupied          |                                                 |
| Georges River Corridor | 64                  | Parrot                 | 9/10/2020      | Yes              | Rainbow Lorikeet                              | Animal present     | No                        | Currently occupied  |                                                 |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|----------------------------------------------|
| Georges River Corridor | 65                  | Possum/arboreal mammal | 9/10/2020      | Yes                      | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied  |                                              |
| Georges River Corridor | 66                  | Parrot                 | 9/10/2020      | Yes                      | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied  |                                              |
| Georges River Corridor | 67                  | Feather-tailed Glider  | 9/10/2020      | Yes                      | Sugar Glider                                  | Animal present     | No                        | Currently occupied  |                                              |
| Georges River Corridor | 68                  | Microbat               | 9/10/2020      | Not internally inspected |                                               | NA                 | NA                        | Dysfunctional       | Secure nest box on tree                      |
| Georges River Corridor | 69                  | Microbat               | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied          |                                              |
| Georges River Corridor | 70                  | Possum/arboreal mammal | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 71                  | Cockatoo               | 9/10/2020      | Not internally inspected |                                               | NA                 | NA                        | Unknown             | Relocate to less than 10 metres above ground |
| Georges River Corridor | 72                  | Parrot                 | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 73                  | Feather-tailed Glider  | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                                              |
| Georges River Corridor | 74                  | Possum/arboreal mammal | 9/10/2020      | Yes                      | Rainbow Lorikeet                              | Animal present     | Yes                       | Currently occupied  |                                              |
| Georges River Corridor | 75                  | Microbat               | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied          |                                              |
| Georges River Corridor | 76                  | Feather-tailed Glider  | Not located    | NA                       |                                               | NA                 | Yes                       | Previously occupied | Secure nest box on tree                      |
| Georges River Corridor | 77                  | Possum/arboreal mammal | 9/10/2020      | Yes                      | Common Ringtail Possum                        | Animal present     | Yes                       | Currently occupied  |                                              |
| Georges River Corridor | 78                  | Feather-tailed Glider  | Not located    | NA                       |                                               | NA                 | No                        | Not located         |                                              |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required        |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|-------------------------|
| Georges River Corridor | 79                  | Possum/arboreal mammal | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                         |
| Georges River Corridor | 80                  | Microbat               | 9/10/2020      | None                     |                                               | None               | No                        | Dysfunctional      | Close nest box lid      |
| Georges River Corridor | 81                  | Microbat               | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Dysfunctional      | Decommission nest box   |
| Georges River Corridor | 82                  | Microbat               | 9/10/2020      | Yes                      | Peron's Tree Frog                             | Animal present     | No                        | Currently occupied |                         |
| Georges River Corridor | 83                  | Possum/arboreal mammal | 9/10/2020      | Yes                      | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied |                         |
| Georges River Corridor | 84                  | Feather-tailed Glider  | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                         |
| Georges River Corridor | 85                  | Feather-tailed Glider  | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                         |
| Georges River Corridor | 86                  | Lorikeet/possum        | 9/10/2020      | Yes                      | Rainbow Lorikeet                              | Animal present     | Yes                       | Currently occupied |                         |
| Georges River Corridor | 87                  | Kookaburra             | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied         |                         |
| Georges River Corridor | 88                  | Lorikeet/possum        | 9/10/2020      | Yes                      | Unidentified                                  | Animal present     | No                        | Currently occupied |                         |
| Georges River Corridor | 89                  | Lorikeet/possum        | 9/10/2020      | Yes                      | Rainbow Lorikeet                              | Animal present     | No                        | Currently occupied |                         |
| Georges River Corridor | 90                  | Microbat               | 18/11/2020     | Yes                      | Peron's Tree Frog                             | Animal present     | NA                        | Currently occupied |                         |
| Georges River Corridor | 91                  | Microbat               | 18/11/2020     | Not internally inspected |                                               | NA                 | No                        | Dysfunctional      | Close nest box lid      |
| Georges River Corridor | 92                  | Feather-tailed Glider  | 9/10/2020      | None                     |                                               | None               | No                        | Dysfunctional      | Secure nest box on tree |
| Georges River Corridor | 93                  | Parrot                 | 9/10/2020      | None                     |                                               | None               | No                        | Dysfunctional      | Secure nest box on tree |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required        |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|-------------------------|
| Georges River Corridor | 94                  | Parrot                 | Not located    | NA                       |                                               | NA                 | No                        | Not located         |                         |
| Georges River Corridor | 95                  | Microbat               | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Dysfunctional       | Secure nest box on tree |
| Georges River Corridor | 96                  | Possum/arboreal mammal | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Unknown             |                         |
| Georges River Corridor | 97                  | Cockatoo               | 9/10/2020      | Yes                      | Southern Boobook Owl                          | Animal present     | Yes                       | Currently occupied  |                         |
| Georges River Corridor | 98                  | Feather-tailed Glider  | Not located    | NA                       |                                               | NA                 | No                        | Not located         |                         |
| Georges River Corridor | 99                  | Parrot                 | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied          |                         |
| Georges River Corridor | 100                 | Wood Duck              | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied          |                         |
| Georges River Corridor | 101                 | Microbat               | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Dysfunctional       | Secure nest box on tree |
| Georges River Corridor | 102                 | Microbat               | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Dysfunctional       | Secure nest box on tree |
| Georges River Corridor | 103                 | Feather-tailed Glider  | 9/10/2020      | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                         |
| Georges River Corridor | 104                 | Parrot                 | 9/10/2020      | None                     |                                               | None               | No                        | Unoccupied          |                         |
| Georges River Corridor | 105                 | Microbat               | 18/11/2020     | None                     |                                               | None               | NA                        | Unoccupied          |                         |
| Georges River Corridor | 106                 | Possum                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                         |
| Georges River Corridor | 107                 | Lorikeet               | 18/11/2020     | None                     |                                               | None               | No                        | Unoccupied          |                         |
| Georges River Corridor | 108                 | Cockatoo               | 18/11/2020     | None                     |                                               | Feathers           | Yes                       | Unoccupied          |                         |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|----------------------------------------------|
| Georges River Corridor | 109                 | Possum                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks | Yes                       | Unoccupied          |                                              |
| Georges River Corridor | 110                 | Possum                 | 18/11/2020     | None                     |                                               | None               | NA                        | Unoccupied          |                                              |
| Georges River Corridor | 111                 | Glider                 | 18/11/2020     | Not internally inspected |                                               | NA                 | NA                        | Unknown             |                                              |
| Georges River Corridor | 112                 | Glider                 | 18/11/2020     | Not internally inspected |                                               | NA                 | NA                        | Unknown             |                                              |
| Georges River Corridor | 113                 | Possum                 | Not located    | NA                       |                                               | NA                 | No                        | Not located         |                                              |
| Georges River Corridor | 114                 | Possum                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 115                 | Microbat               | 18/11/2020     | Not internally inspected |                                               | NA                 | No                        | Unknown             |                                              |
| Georges River Corridor | 116                 | Possum/arboreal mammal | 9/10/2020      | Yes                      | Unidentified                                  | Animal present     | No                        | Currently occupied  |                                              |
| Georges River Corridor | 117                 | Possum/arboreal mammal | 9/10/2020      | Not internally inspected |                                               | NA                 | No                        | Unknown             | Relocate to less than 10 metres above ground |
| Georges River Corridor | 118                 | Decommissioned         |                |                          |                                               |                    |                           |                     |                                              |
| Georges River Corridor | 119                 | Decommissioned         |                |                          |                                               |                    |                           |                     |                                              |
| Georges River Corridor | 120                 | Decommissioned         |                |                          |                                               |                    |                           |                     |                                              |
| Georges River Corridor | 121                 | Decommissioned         |                |                          |                                               |                    |                           |                     |                                              |
| Georges River Corridor | 122                 | Feather-tailed Glider  | 18/10/2020     | Yes                      | Unidentified                                  | Animal present     | No                        | Currently occupied  |                                              |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use | Previous occupancy (2019) | Nest box status     | Actions required                              |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|-----------------|---------------------------|---------------------|-----------------------------------------------|
| Georges River Corridor | 123                 | Possum/arboreal mammal | 18/10/2020     | Yes                      | Rainbow Lorikeet                              | Animal present  | Yes                       | Currently occupied  |                                               |
| Georges River Corridor | 124                 | Feather-tailed Glider  | 18/10/2020     | Yes                      | Black Rat*                                    | Animal present  | Yes                       | Currently occupied  |                                               |
| Georges River Corridor | 125                 | Possum/arboreal mammal | 18/10/2020     | Not internally inspected |                                               | NA              | No                        | Unknown             | Relocate to less than 10 metres above ground  |
| Georges River Corridor | 126                 | Parrot                 | 18/10/2020     | None                     |                                               | None            | Yes                       | Previously occupied |                                               |
| Georges River Corridor | 127                 | Microbat               | 18/10/2020     | Not internally inspected |                                               | NA              | No                        | Unknown             |                                               |
| Georges River Corridor | 128                 | Cockatoo               | 18/10/2020     | None                     |                                               | None            | No                        | Dysfunctional       | Decommission nest box                         |
| Georges River Corridor | 129                 | Microbat               | 18/10/2020     | Not internally inspected |                                               | NA              | No                        | Unknown             |                                               |
| Georges River Corridor | 130                 | Possum/arboreal mammal | 18/10/2020     | Yes                      | Rainbow Lorikeet                              | Animal present  | No                        | Currently occupied  |                                               |
| Georges River Corridor | 131                 | Decommissioned         |                |                          |                                               |                 |                           |                     |                                               |
| Georges River Corridor | 132                 | Decommissioned         |                |                          |                                               |                 |                           |                     |                                               |
| Georges River Corridor | 133                 | Kingfisher             | 18/10/2020     | None                     |                                               | None            | No                        | Dysfunctional       | Retrofit internal ladder; Re-install nest box |
| Georges River Corridor | 134                 | Possum/arboreal mammal | 18/10/2020     | None                     |                                               | None            | No                        | Unoccupied          |                                               |
| Georges River Corridor | 135                 | Possum/arboreal mammal | 19/10/2020     | Yes                      | Rainbow Lorikeet                              | Animal present  | Yes                       | Currently occupied  |                                               |
| Georges River Corridor | 136                 | Microbat               | 19/10/2020     | None                     |                                               | None            | No                        | Dysfunctional       | Close nest box lid                            |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use                              | Previous occupancy (2019) | Nest box status     | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|----------------------------------------------|---------------------------|---------------------|----------------------------------------------|
| Georges River Corridor | 137                 | Microbat               | 19/10/2020     | Yes                      | Peron's Tree Frog                             | Animal present                               | No                        | Currently occupied  |                                              |
| Georges River Corridor | 138                 | Feather-tailed Glider  | 19/10/2020     | None                     |                                               | Leaves/bark/sticks                           | No                        | Evidence of use     |                                              |
| Georges River Corridor | 139                 | Parrot                 | 19/10/2020     | None                     |                                               | Leaves/bark/sticks                           | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 140                 | Feather-tailed Glider  | Not located    | NA                       |                                               | NA                                           | Yes                       | Not located         |                                              |
| Georges River Corridor | 141                 | Microbat               | 18/11/2020     | None                     |                                               | None                                         | No                        | Unoccupied          |                                              |
| Georges River Corridor | 142                 | Possum/arboreal mammal | Not located    | NA                       |                                               | NA                                           | No                        | Not located         |                                              |
| Georges River Corridor | 143                 | Parrot                 | Not located    | NA                       |                                               | NA                                           | No                        | Not located         |                                              |
| Georges River Corridor | 144                 | Possum                 | 18/11/2020     | None                     |                                               | Feathers, rubbish and leaves at base of box. | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 145                 | Parrot                 | 19/10/2020     | None                     |                                               | None                                         | No                        | Unoccupied          |                                              |
| Georges River Corridor | 146                 | Feather-tailed Glider  | 19/10/2020     | None                     |                                               | Leaves/bark/sticks                           | No                        | Evidence of use     |                                              |
| Georges River Corridor | 147                 | Decommissioned         |                |                          |                                               |                                              |                           |                     |                                              |
| Georges River Corridor | 148                 | Possum                 | 18/11/2020     | Not internally inspected |                                               | NA                                           | No                        | Unknown             | Relocate to less than 10 metres above ground |
| Georges River Corridor | 149                 | Lorikeet               | 18/11/2020     | None                     |                                               | None                                         | No                        | Unoccupied          |                                              |
| Georges River Corridor | 150                 | Lorikeet               | 18/11/2020     | None                     |                                               | None                                         | No                        | Unoccupied          |                                              |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use              | Previous occupancy (2019) | Nest box status     | Actions required |
|------------------------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|------------------------------|---------------------------|---------------------|------------------|
| Georges River Corridor | 151                 | Feather-tailed Glider  | 19/10/2020     | None             |                                               | Leaves/bark/sticks           | Yes                       | Previously occupied |                  |
| Georges River Corridor | 152                 | Possum                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks           | Yes                       | Previously occupied |                  |
| Georges River Corridor | 153                 | Parrot                 | Not located    | NA               |                                               | NA                           | NA                        | Unoccupied          |                  |
| Georges River Corridor | 154                 | Glider                 | 18/11/2020     | None             |                                               | None                         | No                        | Unoccupied          |                  |
| Georges River Corridor | 155                 | Possum                 | 18/11/2020     | None             |                                               | None                         | No                        | Unoccupied          |                  |
| Georges River Corridor | 156                 | Cockatoo               | Not located    | NA               |                                               | NA                           | No                        | Not located         |                  |
| Georges River Corridor | 157                 | Kingfisher             | Not located    | NA               |                                               | NA                           | No                        | Not located         |                  |
| Georges River Corridor | 158                 | Possum                 | 18/11/2020     | None             |                                               | Rubbish and nesting material | No                        | Evidence of use     |                  |
| Georges River Corridor | 159                 | Parrot                 | 18/11/2020     | None             |                                               | None                         | No                        | Unoccupied          |                  |
| Georges River Corridor | 160                 | Feather-tailed Glider  | 19/10/2020     | Yes              | Sugar Glider                                  | Animal present               | Yes                       | Currently occupied  |                  |
| Georges River Corridor | 161                 | Possum/arboreal mammal | 19/10/2020     | None             |                                               | Leaves/bark/sticks           | Yes                       | Previously occupied |                  |
| Georges River Corridor | 162                 | Possum/arboreal mammal | 19/10/2020     | None             |                                               | Leaves/bark/sticks           | No                        | Evidence of use     |                  |
| Georges River Corridor | 163                 | Possum/arboreal mammal | 19/10/2020     | Yes              | Sugar Glider                                  | Animal present               | Yes                       | Currently occupied  |                  |
| Georges River Corridor | 164                 | Kingfisher             | 19/10/2020     | Yes              | European Honey Bee*                           | Animal present               | Yes                       | Currently occupied  |                  |
| Georges River Corridor | 165                 | Parrot                 | Not located    | NA               |                                               | NA                           | No                        | Not located         |                  |

[illegible]

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required   |
|------------------------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|--------------------|
| Georges River Corridor | 180                 | Microbat               | 18/11/2020     | None             |                                               | None               | NA                        | Unoccupied          |                    |
| Georges River Corridor | 181                 | Kingfisher             | 18/11/2020     | None             |                                               | None               | Yes                       | Unoccupied          |                    |
| Georges River Corridor | 182                 | Parrot                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                    |
| Georges River Corridor | 183                 | Microbat               | 18/11/2020     | None             |                                               | None               | NA                        | Unoccupied          |                    |
| Georges River Corridor | 184                 | Possum/arboreal mammal | 19/10/2020     | None             |                                               | Feathers           | No                        | Evidence of use     |                    |
| Georges River Corridor | 185                 | Glider                 | 18/11/2020     | None             |                                               | None               | No                        | Unoccupied          |                    |
| Georges River Corridor | 186                 | Possum                 | 18/11/2020     | Yes              | Rainbow Lorikeet                              | Animal present     | Yes                       | Currently occupied  |                    |
| Georges River Corridor | 187                 | Glider                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                    |
| Georges River Corridor | 188                 | Possum                 | 18/11/2020     | Yes              | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied  |                    |
| Georges River Corridor | 189                 | Possum                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                    |
| Georges River Corridor | 190                 | Glider                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks | Yes                       | Dysfunctional       | Close nest box lid |
| Georges River Corridor | 191                 | Parrot                 | 18/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                    |
| Georges River Corridor | 192                 | Possum/arboreal mammal | 17/11/2020     | None             |                                               | None               | Yes                       | Previously occupied |                    |
| Georges River Corridor | 193                 | Cockatoo               | 17/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                    |
| Georges River Corridor | 194                 | Microbat               | 17/11/2020     | None             |                                               | None               | No                        | Unoccupied          |                    |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|----------------------------------------------|
| Georges River Corridor | 195                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                              |
| Georges River Corridor | 196                 | Feather-tailed Glider  | 17/11/2020     | Yes                      | European Honey Bee*                           | Animal present     | Yes                       | Currently occupied |                                              |
| Georges River Corridor | 197                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | None               | No                        | Unoccupied         |                                              |
| Georges River Corridor | 198                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                              |
| Georges River Corridor | 199                 | Possum/arboreal mammal | Not located    | NA                       |                                               | NA                 | Yes                       | Not located        |                                              |
| Georges River Corridor | 200                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                              |
| Georges River Corridor | 201                 | Feather-tailed Glider  | 17/11/2020     | Yes                      | European Honey Bee*                           | Animal present     | Yes                       | Currently occupied |                                              |
| Georges River Corridor | 202                 | Lorikeet/possum        | 17/11/2020     | None                     |                                               | Leaves/bark/sticks | No                        | Dysfunctional      | Close nest box lid                           |
| Georges River Corridor | 203                 | Microbat               | Not located    | NA                       |                                               | NA                 | No                        | Not located        |                                              |
| Georges River Corridor | 204                 | Lorikeet               | Not located    | NA                       |                                               | NA                 | No                        | Not located        |                                              |
| Georges River Corridor | 205                 | Microbat               | 17/11/2020     | None                     |                                               | None               | No                        | Unoccupied         |                                              |
| Georges River Corridor | 206                 | Possum                 | 17/11/2020     | Not internally inspected |                                               | NA                 | No                        | Unknown            | Relocate to less than 10 metres above ground |
| Georges River Corridor | 207                 | Glider                 | 18/11/2020     | Yes                      | Sugar Glider                                  | Animal present     | NA                        | Currently occupied |                                              |
| Georges River Corridor | 208                 | Feather-tailed Glider  | 17/11/2020     | None                     |                                               | Leaves/bark/sticks | No                        | Evidence of use    |                                              |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020) | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status     | Actions required |
|------------------------|---------------------|------------------------|----------------|------------------|-----------------------------------------------|--------------------|---------------------------|---------------------|------------------|
| Georges River Corridor | 209                 | Microbat               | 17/11/2020     | None             |                                               | None               | No                        | Unoccupied          |                  |
| Georges River Corridor | 210                 | Possum/arboreal mammal | 17/11/2020     | None             |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                  |
| Georges River Corridor | 211                 | Decommissioned         |                |                  |                                               |                    |                           |                     |                  |
| Georges River Corridor | 212                 | Possum/arboreal mammal | 17/11/2020     | Yes              | European Honey Bee*                           | Animal present     | No                        | Currently occupied  |                  |
| Georges River Corridor | 213                 | Feather-tailed Glider  | 17/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidnece of use     |                  |
| Georges River Corridor | 214                 | Possum/arboreal mammal | 17/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                  |
| Georges River Corridor | 215                 | Parrot                 | 17/11/2020     | None             |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                  |
| Georges River Corridor | 216                 | Parrot                 | 17/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     |                  |
| Georges River Corridor | 217                 | Decommissioned         |                |                  |                                               |                    |                           |                     |                  |
| Georges River Corridor | 218                 | Microbat               | 17/11/2020     | None             |                                               | None               | No                        | Unoccupied          |                  |
| Georges River Corridor | 219                 | Possum/arboreal mammal | 17/11/2020     | Yes              | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied  |                  |
| Georges River Corridor | 220                 | Possum/arboreal mammal | 17/11/2020     | Yes              | European Honey Bee*                           | Animal present     | No                        | Currently occupied  |                  |
| Georges River Corridor | 221                 | Feather-tailed Glider  | 17/11/2020     | None             |                                               | Leaves/bark/sticks | Yes                       | Previously occupied |                  |
| Georges River Corridor | 222                 | Feather-tailed Glider  | 17/11/2020     | None             |                                               | Leaves/bark/sticks | No                        | Evidence of use     | Evidence of use  |
| Georges River Corridor | 223                 | Possum/arboreal mammal | 17/11/2020     | Yes              | Australian Owlet-nightjar                     | Animal present     | Yes                       | Currently occupied  |                  |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use         | Previous occupancy (2019) | Nest box status     | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|-------------------------|---------------------------|---------------------|----------------------------------------------|
| Georges River Corridor | 224                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | None                    | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 225                 | Feather-tailed Glider  | 17/11/2020     | Yes                      | Sugar Glider                                  | Animal present          | No                        | Currently occupied  |                                              |
| Georges River Corridor | 226                 | Possum/arboreal mammal | 17/11/2020     | None                     |                                               | None                    | No                        | Unoccupied          |                                              |
| Georges River Corridor | 227                 | Feather-tailed Glider  | 17/11/2020     | Yes                      | European Honey Bee*                           | Animal present          | Yes                       | Currently occupied  |                                              |
| Georges River Corridor | 228                 | Microbat               | 17/11/2020     | None                     |                                               | None                    | No                        | Unoccupied          |                                              |
| Georges River Corridor | 229                 | Glider                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks      | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 230                 | Possum                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks      | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 231                 | Parrot                 | 18/11/2020     | None                     |                                               | Feathers                | Yes                       | Previously occupied |                                              |
| Georges River Corridor | 232                 | Microbat               | 18/11/2020     | Not internally inspected |                                               | NA                      | NA                        | Unknown             | Relocate to less than 10 metres above ground |
| Georges River Corridor | 233                 | Owl                    | 18/11/2020     | Not internally inspected |                                               | NA                      | NA                        | Unknown             | Relocate to less than 10 metres above ground |
| Georges River Corridor | 234                 | Possum                 | 18/11/2020     | None                     |                                               | Cracked bird egg shells | Yes                       | Unoccupied          |                                              |
| Georges River Corridor | 235                 | Kingfisher             | 18/11/2020     | None                     |                                               | Cracked bird egg shells | Yes                       | Unoccupied          |                                              |
| Georges River Corridor | 236                 | Microbat               | 18/11/2020     | None                     |                                               | None                    | NA                        | Unoccupied          |                                              |
| Georges River Corridor | 237                 | Possum                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks      | Yes                       | Unoccupied          |                                              |

| Location               | Nest box identifier | Nest Box Type          | Date inspected | Occupancy (2020)         | Species present (*denotes introduced species) | Evidence of use    | Previous occupancy (2019) | Nest box status    | Actions required                             |
|------------------------|---------------------|------------------------|----------------|--------------------------|-----------------------------------------------|--------------------|---------------------------|--------------------|----------------------------------------------|
| Georges River Corridor | 238                 | Microbat               | 18/11/2020     | None                     |                                               | None               | NA                        | Unoccupied         |                                              |
| Georges River Corridor | 239                 | Parrot                 | 18/11/2020     | None                     |                                               | Feathers           | Yes                       | Unoccupied         |                                              |
| Georges River Corridor | 240                 | Glider                 | 18/11/2020     | None                     |                                               | Feathers           | Yes                       | Unoccupied         |                                              |
| Georges River Corridor | 241                 | Parrot                 | 18/11/2020     | None                     |                                               | Leaves/bark/sticks | NA                        | Unoccupied         |                                              |
| Georges River Corridor | 242                 | Possum                 | 18/11/2020     | None                     |                                               | None               | No                        | Unoccupied         |                                              |
| Georges River Corridor | 243                 | Owl                    | 18/11/2020     | None                     |                                               | None               | NA                        | Unoccupied         |                                              |
| Georges River Corridor | 244                 | Possum                 | 18/11/2020     | None                     |                                               | None               | No                        | Unoccupied         |                                              |
| Georges River Corridor | 245                 | Microbat               | 18/11/2020     | None                     |                                               | None               | No                        | Unoccupied         |                                              |
| Georges River Corridor | 250                 | Parrot                 | 18/11/2020     | Not internally inspected |                                               | NA                 | No                        | Unknown            | Relocate to less than 10 metres above ground |
| Georges River Corridor | 251                 | Possum/arboreal mammal | Not located    | NA                       |                                               | NA                 | No                        | Not located        |                                              |
| Georges River Corridor | 252                 | Cockatoo               | Not located    | NA                       |                                               | NA                 | No                        | Not located        |                                              |
| Georges River Corridor | 253                 | NA                     | 17/11/2020     | Yes                      | Common Ringtail Possum                        | Animal present     | No                        | Currently occupied |                                              |

## **APPENDIX F. FAUNA SPECIES INVENTORY FROM FERAL ANIMAL AND HABITAT CONNECTIVITY MONITORING**

|                                                      | Habitat Connectivity |  |   |  |  |  |  |  | Feral Animal Monitoring |   |   |   |   |
|------------------------------------------------------|----------------------|--|---|--|--|--|--|--|-------------------------|---|---|---|---|
|                                                      |                      |  |   |  |  |  |  |  |                         |   |   |   |   |
| <b>Aves</b>                                          |                      |  |   |  |  |  |  |  |                         |   |   |   |   |
| Australian Magpie<br>( <i>Gymnorhina tibicen</i> )   |                      |  |   |  |  |  |  |  |                         |   | X |   |   |
| Australian Raven ( <i>Corvus coronoides</i> )        |                      |  |   |  |  |  |  |  | X                       | X |   | X |   |
| Australian Wood Duck<br>( <i>Chenonetta jubata</i> ) |                      |  | X |  |  |  |  |  |                         |   |   |   |   |
| Australian wren<br>( <i>Malurus cyaneus</i> )        | X                    |  |   |  |  |  |  |  |                         |   |   |   |   |
| Common Bronzewing<br>( <i>Phaps chalcoptera</i> )    |                      |  |   |  |  |  |  |  |                         |   | X |   |   |
| Common Myna<br>( <i>Acridotheres tristis</i> )       |                      |  |   |  |  |  |  |  |                         |   |   |   | X |
| Crested Pigeon<br>( <i>Ocyphaps lophotes</i> )       |                      |  |   |  |  |  |  |  |                         |   | X |   |   |
| Currawong<br>( <i>Strepera graculina</i> )           |                      |  |   |  |  |  |  |  | X                       | X |   |   |   |

|                                                       | Habitat Connectivity |   |   |   |  |   |   |   | Feral Animal Monitoring |   |   |   |   |
|-------------------------------------------------------|----------------------|---|---|---|--|---|---|---|-------------------------|---|---|---|---|
| Magpie-Lark<br>( <i>Grallina cyanoleuca</i> )         |                      |   |   |   |  |   |   |   |                         |   | X | X |   |
| Noisy Friarbird<br>( <i>Philemon corniculatus</i> )   |                      |   |   |   |  |   |   |   |                         |   | X |   |   |
| Noisy Miner<br>( <i>Manorina melanocephala</i> )      |                      |   | X |   |  |   |   |   |                         |   | X |   |   |
| White-faced heron ( <i>Egretta novaehollandiae</i> )  | X                    |   |   | X |  |   |   |   |                         |   |   |   |   |
| <b>Mammals</b>                                        |                      |   |   |   |  |   |   |   |                         |   |   |   |   |
| Black Rat<br>( <i>Rattus rattus</i> )                 | X                    | X | X |   |  |   |   |   |                         |   |   |   | X |
| Brushtail Possum<br>( <i>Trichosurus vulpecula</i> )  | X                    |   |   |   |  |   |   |   |                         |   |   |   |   |
| Common Wallaroo<br>( <i>Macropus robustus</i> )       | X                    | X | X |   |  | X | X | X | X                       |   | X | X | X |
| Domestic cat<br>( <i>Felis catus</i> )                | X                    | X |   | X |  |   |   |   | X                       | X | X | X |   |
| Eastern Grey Kangaroo<br>( <i>Macropus Gigantus</i> ) | X                    |   | X | X |  |   |   | X |                         |   | X | X |   |
| European Hare<br>( <i>Lepus europaeus</i> )           | X                    |   |   |   |  |   |   |   | X                       | X | X | X |   |

|                                                            | Habitat Connectivity |   |   |   |   |   |   |   | Feral Animal Monitoring |   |   |   |  |
|------------------------------------------------------------|----------------------|---|---|---|---|---|---|---|-------------------------|---|---|---|--|
| Red Fox ( <i>Vulpes vulpes</i> )                           | X                    | X | X | X | X | X |   | X | X                       | X | X | X |  |
| Ringtail possum ( <i>Pseudocheirus peregrinus</i> )        | X                    | X | X |   |   |   |   |   |                         |   |   |   |  |
| Swamp Wallaby ( <i>Wallabia bicolor</i> )                  |                      |   |   |   | X | X | X | X |                         |   |   |   |  |
| <b>Reptiles</b>                                            |                      |   |   |   |   |   |   |   |                         |   |   |   |  |
| Eastern Water Skink ( <i>Eulamprus quoyii</i> )            | X                    |   |   |   |   |   |   |   |                         |   |   |   |  |
| Red-bellied Black Snake ( <i>Pseudechis porphyriacus</i> ) | X                    |   |   |   |   |   |   |   |                         |   |   |   |  |

## **APPENDIX G. KOALA FENCING AND STRUCTURES ACROSS MOOREBANK LOGISTICS PARK**



**Legend**

- |                                                                                                                                                                     |                                                                                                                                   |                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <span style="display: inline-block; width: 20px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Wattle Grove Offset Site (Bootland)      | <b>Proposed Fencing</b>                                                                                                           | <span style="display: inline-block; width: 10px; height: 10px; background-color: black;"></span> Bridge                                    |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Moorebank Offset Site (Georges River) | <span style="display: inline-block; width: 20px; border-bottom: 2px dashed green;"></span> Existing Cyclone fence                 | <span style="display: inline-block; width: 10px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Gate/Koala Grid |
|                                                                                                                                                                     | <span style="display: inline-block; width: 20px; border-bottom: 2px dashed red;"></span> Existing fence                           | <span style="display: inline-block; width: 10px; height: 10px; background-color: magenta; border: 1px solid black;"></span> Koala Grid     |
|                                                                                                                                                                     | <span style="display: inline-block; width: 20px; border-bottom: 2px dashed magenta;"></span> New Cyclone fence                    |                                                                                                                                            |
|                                                                                                                                                                     | <span style="display: inline-block; width: 20px; border-bottom: 2px dashed black;"></span> New fence                              |                                                                                                                                            |
|                                                                                                                                                                     | <span style="display: inline-block; width: 20px; border-bottom: 2px dashed orange;"></span> New rural fence (5 strand plain wire) |                                                                                                                                            |

Coordinate System: MGA Zone 56 (GDA 94)



Image Source:  
Image © NearMap 2018  
Dated: 2/11/2018

cumberland  
ecology

**Figure 9. Location of Koala Grids and Bridges**

