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Moorebank Precinct East - Stage 2 Proposal

Biodiversity Assessment Report

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

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SYDNEY INTERMODAL TERMINAL ALLIANCE (SIMTA)
MOOREBANK PRECINCT EAST STAGE 2

Biodiversity Assessment Report

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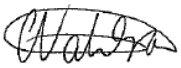
Checker	Claire Vahtra	
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REVISIONS

Revision	Date	Description	Prepared by	Approved by
1	18/10/2016	Draft 1	Jane Rodd	Westley Owers
2	11/11/2016	Draft 2	Jane Rodd	Bradley Searle
3	01/12/16	Final for Public Display	Jane Rodd	Bradley Searle

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1 INTRODUCTION

Concept Plan Approval (MP 10_0193) for an intermodal terminal (IMT) facility at Moorebank, NSW (the Moorebank Precinct East Project (MPE Project) (formerly the SIMTA Project)) was received on 29 September 2014 from the NSW Department of Planning and Environment (DP&E). The Concept Plan for the MPE Project involves the development of an IMT, including a rail link to the Southern Sydney Freight Line (SSFL) within the Rail Corridor, warehouse and distribution facilities with ancillary offices, a freight village (ancillary site and operational services), stormwater, landscaping, servicing, associated works on the eastern side of Moorebank Avenue, Moorebank, and construction or operation of any part of the project, which is subject to separate approval(s) under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Environmental Impact Statement (EIS) is seeking approval, under Part 4, Division 4.1 of the EP&A Act, for the construction and operation of Stage 2 of the MPE Project (herein referred to as the Proposal) under the Concept Plan Approval for the MPE Project, being the construction and operation of warehouse and distribution facilities.

This EIS has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016 (Appendix A).
- The relevant requirements of the Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified) (Appendix A).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant) (Appendix A).

This EIS also gives consideration to the MPE Stage 1 Project (SSD 14-6766) including the mitigation measures and conditions of consent as relevant to this Proposal.

This EIS has been prepared to provide a complete assessment of the potential environmental impacts associated with the construction and operation of the Proposal. This EIS proposes measures to mitigate these issues and reduce any unreasonable impacts on the environment and surrounding community.

1.1 Purpose of this report

This report supports the Environmental Impact Statement (EIS) for the Proposal (refer to Section 1.2 below for an overview of the Proposal) and has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act.

This report has been prepared to address:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7628) for the Proposal, issued by NSW DP&E on 27 May 2016.
- The relevant requirements of Concept Plan Approval MP 10_0913 dated 29 September 2014 (as modified).
- The relevant requirements of the approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6229, granted in March 2014 by the Commonwealth Department of the Environment (DoE)) (as relevant).

The SEARs and the Concept Plan Conditions of Approval and Statement of Commitments relevant to this study, and the section of this report where they have been addressed are provided in Table 1-1 and Table 1-2 respectively.

Table 1-1: Secretary's Environmental Assessment Requirements relevant to this study

Section	Environmental Assessment Requirement	Where addressed in this report
11. Biodiversity – including but not limited to: A Flora and Fauna assessment. The assessment shall:		
a)	assess impacts on the biodiversity values of the site and adjoining areas, including Endangered Ecological Communities and threatened flora and fauna species and their habitat, groundwater dependent ecosystems, impacts on wildlife and habitat corridors, riparian land, and habitat fragmentation and details of mitigation measures. The assessment shall be undertaken in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the *Threatened Species Conservation Act 1995*;	Section 8.2.2
b)	consider of the OEH's Threatened Species Survey and Assessment Guidelines (www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm), any relevant draft or final recovery plans, and Commonwealth Significant Impact Guidelines;	Section 4
c)	assess and document impacts related to the proposed project in accordance with the Framework for Biodiversity Assessment (FBA) (OEH 2014), unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995;	Sections 5 to 10
d)	include a comprehensive offset strategy, in accordance with the NSW Biodiversity Offsets Policy for Major Projects including the Framework for Biodiversity Assessment (OEH 2014), consistent with the 'avoid, minimise or offset' principle.	Section 10

Table 1-2 Concept Plan conditions of approval and Statement of Commitments relevant to this study

Conditions of Approval/Statement of Commitments	Where addressed in this report
Concept plan conditions of approval	
Biodiversity Any future Development Application shall include a Flora and Fauna assessment. The assessment shall: a) assess impacts on the biodiversity values of the site and adjoining areas, including Endangered Ecological Communities and threatened flora and fauna species and their habitat, impacts on wildlife and habitat corridors, riparian land, and habitat fragmentation and details	Sections 10 and 11

Conditions of Approval/Statement of Commitments	Where addressed in this report
of mitigation measures, having regard to the range of fauna species and opportunities for connectivity (terrestrial, arboreal and aquatic) across the rail link between the site and the EHPL;	
b) include a Vegetation Management Plan that has been prepared in consultation with the NSW Office of Water;	See section 11
c) document how impacts to the *Persoonia nutans* and the *Grevillea parviflora* subsp. *parviflora* flora species have been minimised through the detailed design process;	Section 10 and 11
d) include the details of available offset measures to compensate the biodiversity impacts of the proposal where offset measures are proposed to address residual impacts, in particular the following should be considered: i. As stipulated in principle 2 of 'NSW offset principles for major projects (state significant development and infrastructure)', for terrestrial biodiversity, established assessment tools, such as the BioBanking Assessment Methodology (BBAM), are considered best practice; ii. the Biodiversity Offset Strategy will be undertaken in accordance with the 'NSW offset principles for major projects (state significant development and state significant infrastructure)'; and iii. Offsets shall be identified, and demonstrate that they can be secured.	Section 12
Statements of commitment	
The Proponent will undertake further detailed assessment to establish the potential biodiversity impacts of the proposed rail link and measures to mitigate its potential impacts. The investigations shall incorporate the mitigation measures listed within Section 5 of the Flora and Fauna Assessment and as summarised below: <u>Avoid Impacts</u> ▪ Site establishment, earthworks and rail construction <u>Mitigate Impacts</u> ▪ Soil disturbance related to site establishment, earthworks and rail construction	N/A – Proposal does not include rail link

Conditions of Approval/Statement of Commitments	Where addressed in this report
▪ Vegetation clearance for rail construction, access and maintenance tracks Construction in riparian areas/in proximity to watercourse ▪ Construction of pavement, slabs and building structures ▪ Hot works (including vegetation clearing requiring heat producing equipment) ▪ Alteration to air quality and noise environments Operation of the SIMTA proposal	
Management of Threatened Plant Species The Proponent shall prepare and implement a Threatened Species Management Plan for the *P. nutans* and *G. parviflora* subsp. *parviflora* populations within the rail corridor that would be affected by the rail link	N/A - Proposal does not impact threatened plant species
Off-Set Impacts The Proponent will update the *Preliminary Biodiversity Offset Strategy* (Hyder Consulting 2013) and continue to consult with the Department of the Environment (DOTE) and the NSW Office of Environment and Heritage (OEH) through the project approval processes.	Section 12
Aquatic Flora and Fauna The Proponent will implement the following measures to protect the aquatic flora and fauna as part of the applications for the detailed planning applications (where relevant and applicable): ▪ Implementation of design principles for friendly fish passage. ▪ Implementation of Construction and Operation Management Plans for maintenance of structures in riparian and aquatic zones. ▪ Minimise siltation of the Georges River during construction through implementing the water quality mitigation measures detailed within the Stormwater and Flooding section of the Statement of Commitments. ▪ Thorough assessment of any development within the Anzac Creek CSWL community, including potential impacts on groundwater quality and quantity. ▪ Lantana removal within nominated construction zones to reduce degradation of streamside vegetation and offset any potential impacts to aquatic biodiversity.	Mostly not applicable, as there are minimal aquatic impacts. Potential aquatic impacts are addressed in Sections 10 and 11

Conditions of Approval/Statement of Commitments	Where addressed in this report
Riparian ▪ The proposed rail link (located within the rail corridor) is exempt from the requirement for a WM Act controlled activity approval from NOW as a transitional Part 3A project; however the detailed design of the rail link will seek to conform to the objects of the WM Act and its associated guidelines. ▪ The riparian setback for Anzac Creek, as specified by NOW, is 30 metres (20 metre CRZ and 10 metre VB), while for Georges River the riparian setback is likely to be a minimum of 50 metres (40 metre CRZ and 10 metre VB). ▪ Riparian corridors will be appropriately revegetated to restore and/or maintain ecological, functional and habitat values and impede surface flows and drop sediment before it reaches the waterways. ▪ Water quality and quantity issues will be managed during the construction phase through the implementation, inspection and maintenance of best practice soil and water management techniques which will be defined in the CEMP for sedimentation and erosion control during construction. ▪ Water quality and quantity issues will be managed during the operation phase through the implementation, inspection and maintenance of Water Sensitive Urban Design (WSUD) measures such as rainwater tanks, grass filter strips, swales and bio retention.	Mostly not applicable, as there are minimal riparian impacts. Potential riparian impacts are addressed in Sections 10 and 11.

The biodiversity impacts of the MPE Concept Plan and Stage 1 were assessed in an Ecological Impact Assessment (Hyder Consulting 2013) prepared for the MPE Concept Plan EIS, and an assessment of values under the NSW Framework for Biodiversity Assessment (FBA) prepared for the MPE Stage 1 EIS (Hyder Consulting 2015).

The western extent of the Proposal site overlaps the MPW site, and includes areas of native vegetation within the MPW Site. These areas will be cleared as part of the MPW Project, and biodiversity impacts have been assessed in the ecological assessment prepared for the MPW Concept Plan EIS (Parsons Brinckerhoff 2014) and the BAR prepared for the MPW Stage 2 EIS (Arcadis 2016). This assessment assumes that all areas within the MPW Site are cleared of native vegetation.

1.2 Overview of the Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE site boundary and 120 metres south of the southern MPE site boundary.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA, additional ancillary offices and the ancillary freight village
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the Proposal site, including:
  - Stormwater, drainage and flooding infrastructure
  - Utilities relocation and installation
  - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE Stage 2 site
- The Moorebank Avenue upgrade would be comprised of the following key components:
  - Modifications to the existing lane configuration, including some widening
  - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents
  - Raking of the existing pavement and installation of new road pavement
  - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
  - Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder
  - Signalling and intersection works
- Upgrading existing intersections along Moorebank Avenue, including:
  - Moorebank Avenue / MPE Stage 2 access
  - Moorebank Avenue / MPE Stage 1 northern access
  - Moorebank Avenue / MPE Stage 2 central access
  - MPW Northern Access / MPE Stage 2 southern emergency access

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. This transfer of freight would be via a fleet of heavy vehicles capable of being loaded with containers and owned by SIMTA. The fleet of vehicles would be stored and used on the MPE Stage 2 site, but registered and suitable for on-road use. The Proposal is expected to operate 24 hours a day, seven days per week.

An overview of the Proposal is shown in *Figure 1-1*. To facilitate operation of the Proposal, the following construction activities would be carried out across and surrounding the Proposal site (area on which the Proposal is to be developed):

- Vegetation clearance
- Remediation works
- Demolition of existing buildings and infrastructure on the Proposal site
- Earthworks and levelling of the Proposal site, including within the terminal hardstand
- Drainage and utilities installation
- Establishment of hardstand across the Proposal site, including the terminal hardstand
- Construction of a temporary diversion road to allow for traffic management along the Moorebank Avenue site during construction (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road)
- Construction of warehouses and distribution facilities, ancillary offices and the ancillary freight village
- Construction works associated with signage, landscaping, stormwater and drainage works.

Construction works associated with signage, landscaping, stormwater and drainage works. The Proposal would operate 24 hours a day, 7 days a week.

The footprint and operational layout of the Proposal are shown on Figure 9-1. More information relating to the construction and operation of the Proposal is provided in Section 3 and Section 4 of this report, and in Chapter 4 of the MPE Stage 2 EIS.

1.3 Key terms relevant to the Proposal

Table 1-3 provides a summary of the key terms relevant to the Proposal, which are included throughout this report.

Table 1-3 Summary of key terms used throughout this document

Term	Definition
General terms	
The Moorebank Precinct	Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site
Moorebank Precinct West (MPW) Project (formerly the MIC Project)	The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (SSD_5066) and the MPW EPBC Approval (No. 2011/6086).
Moorebank Precinct West (MPW) site (formerly the MIC site)	The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Approval and MPW Planning Proposal. The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.

Term	Definition
Moorebank Precinct East (MPE) Concept Plan Approval (formerly the SIMTA Concept Plan Approval)	MPE Concept Plan Approval (SSD_0193) granted by the NSW Department of Planning and Environment on 29 September 2014 for the development of former defence land at Moorebank to be developed in three stages; a rail link connecting the site to the Southern Sydney Freight Line, an intermodal terminal, warehousing and distribution facilities and a freight village.
Moorebank Precinct East (MPE) Project (formerly the SIMTA Project)	The MPE Intermodal Terminal Facility, including a rail link and warehouse and distribution facilities at Moorebank (eastern side of Moorebank Avenue) as approved by the Concept Plan Approval (MP 10_0913) and the MPE Stage 1 Approval (14_6766).
Moorebank Precinct East (MPE) Site (formerly the SIMTA Site)	Including the former DSNDC site and the land owned by SIMTA which is subject to the Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
Statement of Commitments (SoC)	Recommendations provided in the specialist consultant reports prepared as part of the MPE Concept Plan application to mitigate environmental impacts, monitor environmental performance and/or achieve a positive environmentally sustainable outcome in respect of the MPE Project. The Statement of Commitments have been proposed by SIMTA as the Proponent of the MPE Concept Plan Approval.
MPE Stage 1 Project-specific terms	
Rail Corridor	Area defined as the 'Rail Corridor' within the MPE Concept Plan Approval.
Rail Link	The rail link from the South Sydney Freight Line to the MPE IMEX Terminal, including the area on either side to be impacted by the construction works included in MPE Stage 1.
MPE Stage 1	Stage 1 (14-6766) of the MPE Concept Plan Approval for the development of the MPE Intermodal Terminal Facility, including the rail link at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.
MPE Stage 1 site	Includes the MPE Stage 1 site and the Rail Corridor, i.e. the area for which approval (construction and operation) was sought within the MPE Stage 1 Proposal EIS.

Term	Definition
MPE Stage 2 specific terms	
MPE Stage 2 Proposal/ the Proposal	The subject of this EIS; being Stage 2 of the MPE Concept Plan Approval including the construction and operation of 300,000m^2 of warehousing and distribution facilities on the MPE site and the Moorebank Avenue upgrade within the Moorebank Precinct.
MPE Stage 2 site / development site [1]	The area within the MPE site which would be disturbed by the MPE Stage 2 Proposal (including the operational area and construction area). The MPE Stage 2 site includes the former DSNDC site and the land owned by SIMTA which is subject to the MPE Concept Plan Approval. The MPE site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
The Moorebank Avenue site	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade.
The Moorebank Avenue upgrade	Raising of the vertical alignment of Moorebank Avenue for 1.5 kilometres of its length by about two metres, from the northern boundary of the MPE site to approximately 120 metres south of the MPE site. The Moorebank Avenue upgrade also includes upgrades to intersections, ancillary works and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW site.
Construction area	Extent of construction works, namely areas to be disturbed during the construction of the MPE Stage 2 Proposal (the Proposal).
Operational area	Extent of operational activities for the operation of the MPE Stage 2 Proposal (the Proposal).

[1] Under the FBA, the area subject to impact assessment is referred to as the 'development site'. In this assessment, the development site is considered to encompass the MPE Stage 2 site and construction area as shown on Figure 1 1. For the purpose of this report the term MPE Stage 2 site has been used.

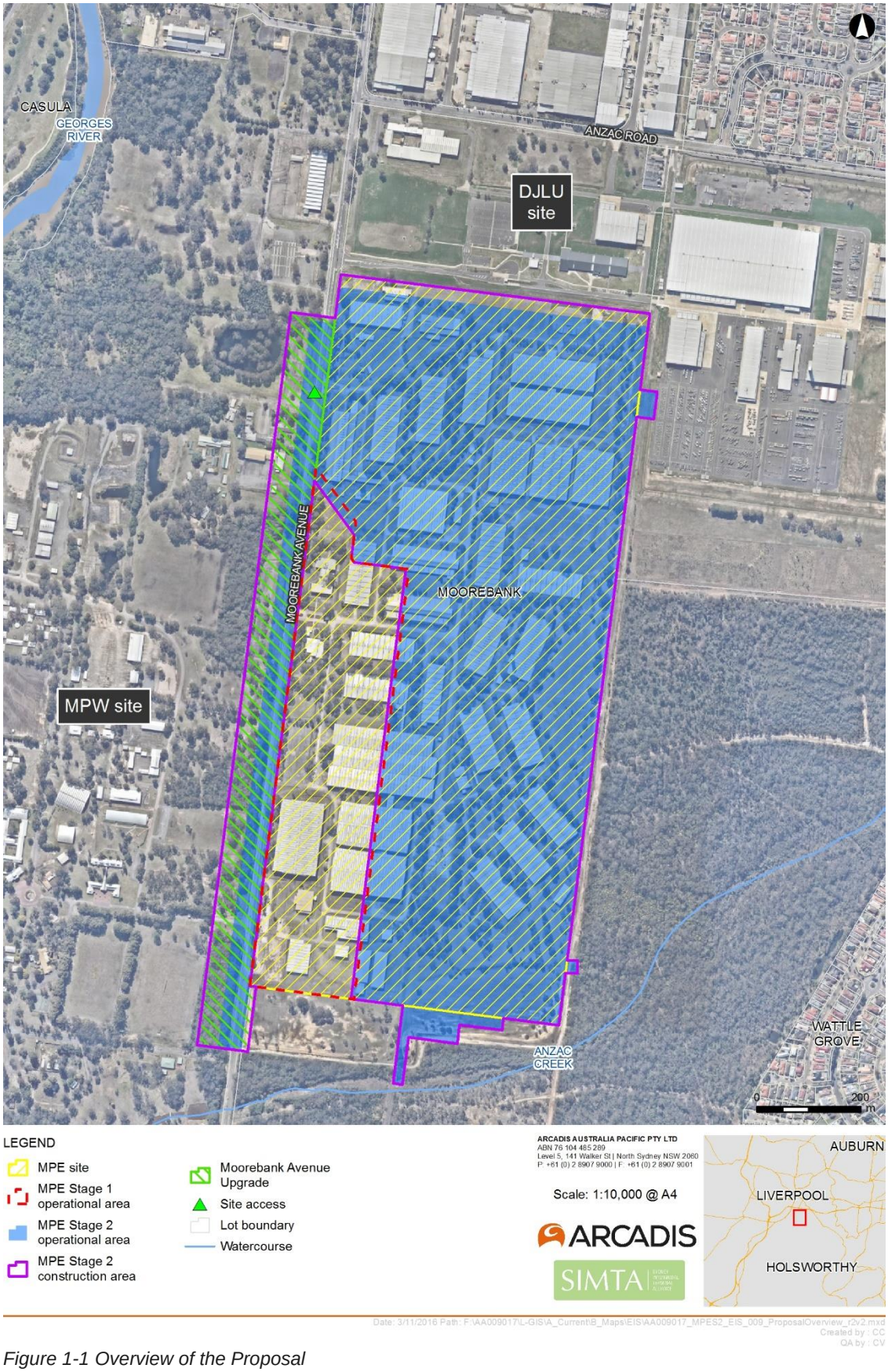

Figure 1-1 Overview of the Proposal

2 SITE DESCRIPTION

2.1 Regional context

The MPE site, including the Proposal site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany. The MPE site is situated within the Liverpool Local Government Area (LGA), in Sydney's South West subregion, approximately 2.5 km from the Liverpool City Centre.

The MPE site is located approximately 800 m south of the intersection of Moorebank Avenue and the M5 Motorway. The M5 Motorway provides the main road link between the MPE site, and the key employment and industrial areas within Sydney's West and South-Western subregions, the Sydney orbital network and the National Road Network. The M5 connects with the M7 Motorway to the west, providing access to the Greater Metropolitan Region and NSW road network. Similarly the M5 Motorway is the principal connection to Sydney's north and north-east via the Hume Highway. The regional context of the Proposal is shown on Figure 2-1.

2.2 Local context

The Proposal site is located approximately 2.5 km south of the Liverpool City Centre, 800 m south of the Moorebank Avenue/M5 Motorway interchange and one kilometre to the east of the SSFL providing convenient access to and from the site for rail freight (via a dedicated freight rail line) and for trucks via the Sydney Motorway Network.

The majority of land surrounding the MPE site is owned and operated by the Commonwealth and comprises:

- The MPW site, formerly the School of Military Engineering (SME), on the western side of Moorebank Avenue directly adjacent to the MPE site (subject to the MPW Concept Plan Approval)
- The Holsworthy Military Reserve, to the south of the MPE site on the southern side of the East Hills Rail Corridor, which is owned and operated by Sydney Trains.

Residual Commonwealth Land (known as the Boot Land), to the east of the MPE site between the site boundary and the Wattle Grove residential area.

Glenfield Waste Services, south-west of the Proposal is proposing to develop a Materials Recycling Facility on land owned by the Glenfield Waste Services Group within the boundary of the current landfill site at Glenfield. The facility is proposed to recycle a maximum of 450,000 tonnes of material per year. The Glenfield Waste Services Proposal is the subject of a DA (SSD_6249) under Part 4, Division 4.1 of the EP&A Act.

The area immediately south of the MPE site, known as the 'Southern Boot Land', includes an existing rail spur within heavily vegetated remnant bushland. The Southern Boot Land to the south of the proposal and forming part of the MPE Stage 1 Proposal site includes a range of vegetation, varying from remnant bushland to the north-east of the Sydney Trains East Hills Rail Corridor.

A number of residential suburbs are located in proximity to the Proposal site. The approximate distances of these suburbs to the MPE Stage 2 site and the Moorebank Avenue site are provided in Table 2-1 below.

Table 2-1 Distance to residential suburbs from the Proposal site

Suburb	Distance to MPE Stage 2 site	Distance to Moorebank Avenue site
Wattle Grove	360 m to the north-east	865 m to the north-east
Moorebank	1300 m to the north	1430 m to the north
Casula	820 m to the west	760 m to the west
Glenfield	1830 m to the south-west	1540 m to the south-west

The closest industrial precinct to the Proposal is at Moorebank, comprising around 200 hectares of industrial development. This area includes (but is not limited to) the Yulong and ABB sites to the south of the M5 Motorway and the Goodman MFive Business Park and Miscellaneous industrial and commercial development to the north of the M5 Motorway. The majority of this development is located to the north of the M5 Motorway between Newbridge Road, the Georges River and Anzac Creek. The Moorebank Industrial Area supports a range of industrial and commercial uses, including freight and logistics, heavy and light manufacturing, offices and business park developments.

There are other areas of industrial development near the Proposal at Warwick Farm to the north, Chipping Norton to the north-east, Prestons to the west and Glenfield and Ingleburn to the south-west.

The local context of the Proposal is shown on Figure 2-2.

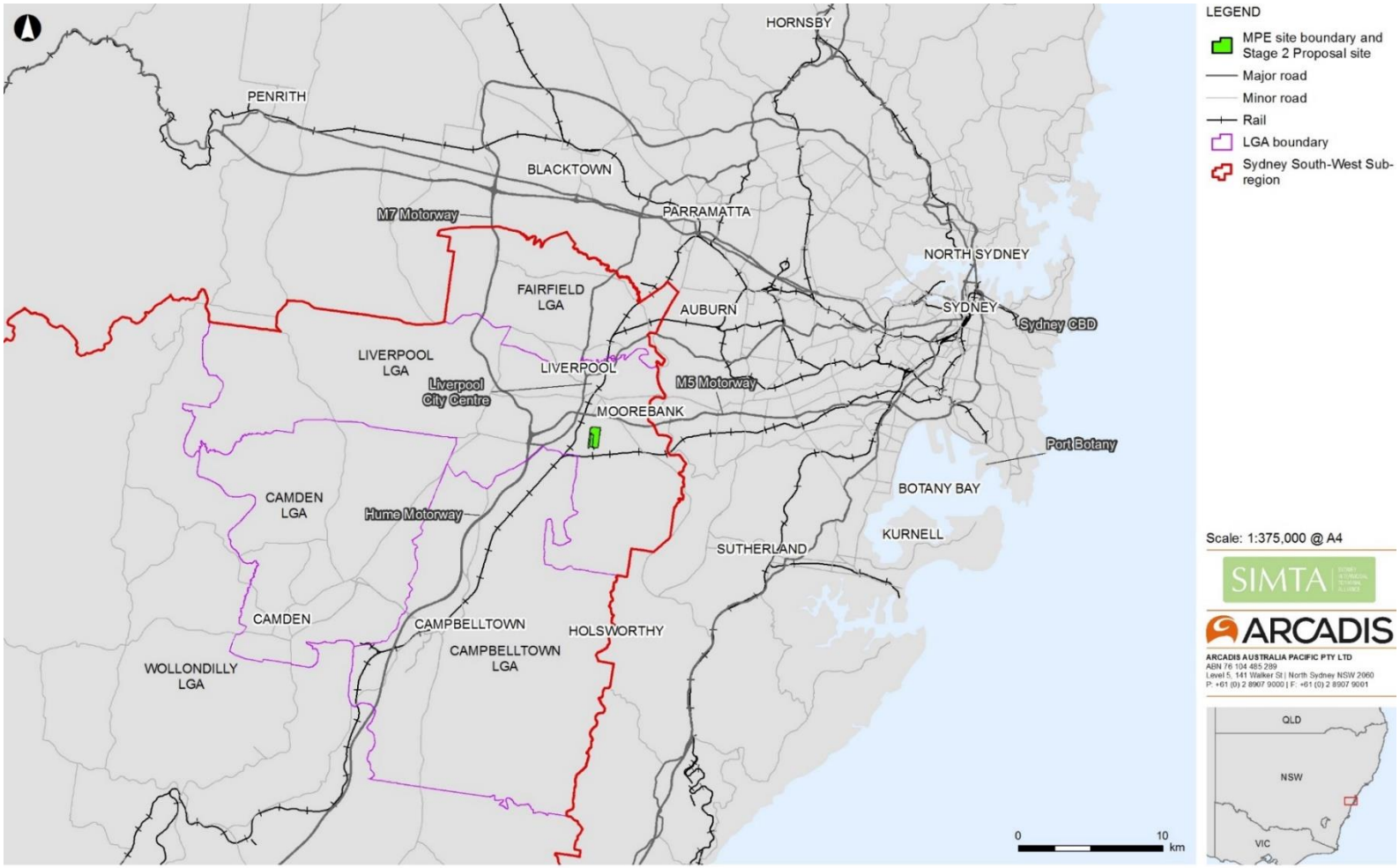

Figure 2-1 Regional context of the Proposal

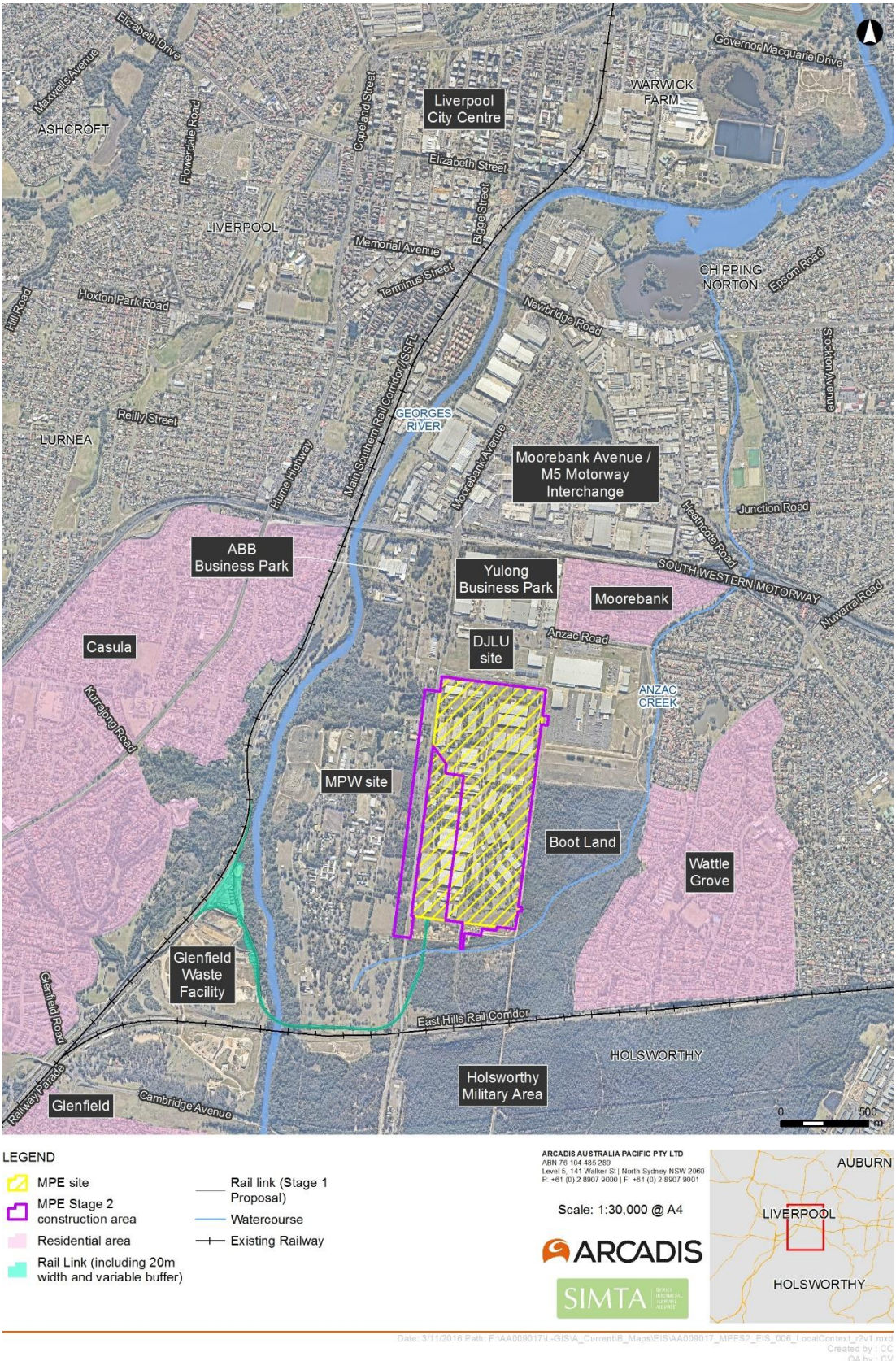

Figure 2-2 Local context of the Proposal

3 CONSTRUCTION OVERVIEW

3.1 Construction program

Construction of the Proposal is proposed to take between 24 and 36 months, commencing in the final quarter of 2017, with the completion of construction in the third quarter of 2019 (should construction take 24 months). The final construction program will depend on the market demand for warehouses to be constructed on the MPE Stage 2 site.

The indicative construction program (based on a 24 month program) is shown in Table 3-1. The construction works have been divided into seven 'works periods' which are interrelated and would potentially overlap. Subject to confirmation from the construction contractor, the order and staging of these construction works periods may change.

Table 3-1 Indicative construction program (based on a 24 month construction period)

Construction works period	2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Works period A – Pre-construction activities												
Works period B - Site Preparation activities												
Works Period C - Construction of the Moorebank Avenue diversion road												
Works period D - Pavement and intersection works along Moorebank Avenue												
Works period E – Bulk earthworks, drainage and utilities												
Works period F - Construction and internal fit-out of warehousing												
Works period G – Miscellaneous construction and finishing works												

3.2 Construction activities

A summary of the indicative construction works and associated activities proposed to be undertaken during each of these works periods is provided in Table 3-2.

Table 3-2 Construction activities to be undertaken within each construction works period

Construction works period	Activity
Works period A – Pre-construction activities	• Establishment of site access points • Importation of fill for site preparation activities • Installation of site fencing • Remediation, where required.
Works period B - Site preparation activities	• Demolition of existing structures • Clearing of vegetation • Raising and levelling of land (to final operational levels) within which the Main Warehousing Compound would be located • Temporary works, including installation of construction environmental management measures (e.g. erosion and sedimentation controls) • Establishment of construction compound fencing and hoardings • Installation of site offices and amenities • Construction of hardstands for staff parking and laydown areas • Establishment of temporary batch plant and materials crushing plant • Construction of access roads, site entry and exit points and security • Establishment of site haulage roads. • Establishment of construction compound(s)
Works period C: Construction of the Moorebank Avenue diversion road	• Stripping of topsoil within footprint of temporary diversion road • Installation of temporary drainage • Placement of fill and temporary road pavement (e.g. gravel) • Construction of interface between temporary diversion road and existing Moorebank Avenue • Installation of temporary road signage, street lighting and signalling • Transfer of traffic onto temporary diversion road from Moorebank Avenue.

Construction works period	Activity
Works period D – Bulk earthworks, drainage and utilities	• Removal of existing pavement and stripping of topsoil within Moorebank Avenue • Importation, stockpiling and placement of approximately 600,000 m^3 of imported clean fill • Installation of on-site detention (OSD) and drainage infrastructure within the MPE Stage 2 site • Construction of retaining walls • Creation of a road formation by general earthworks (by constructing fill embankments) • Bulk earthworks and raising of the Proposal site to final level, including the terminal hardstand • Utilities relocation and installation • Establishment of hardstand areas.
Works period E – Pavement works along Moorebank Avenue	• Placement of select layer of earthworks material on top of the road formation • Placing and compacting the pavement later (concrete, or concrete and asphalt) over the select layer (consisting of a sub-base and base) and potential sealing with bitumen • Traffic switching from diversion road onto final, raised Moorebank Avenue • Removal of construction traffic management and progressive opening of the internal road and warehouse access roads to traffic • Removal of road surface, road signage, street lighting and signalling from temporary diversion road • Commissioning of Moorebank Avenue.
Works period F - Warehouse construction and internal fit-out	• Foundation and floor slab installation • Erection of framework and structural walls • Installation of roof • Internal fit-out of warehouses (racking and associated services).
Works period G – Miscellaneous construction and finishing works	• Pavement construction (internal transfer roads and perimeter road), including forming of new kerbs, gutters, medians (where required) and other structures • Line marking, lighting and sign posting • Installation of road furniture, including traffic signs and pavement markers. • Miscellaneous structural construction • Finishing works, including landscaping and general site rehabilitation, where required. • Commissioning of the Proposal • Decommissioning/Demobilisation of the Proposal site, including removal of construction compound(s) and construction environmental controls.

3.3 Plant and equipment

A range of plant and equipment would be required for the construction of the Proposal. A summary of the indicative plant and equipment likely to be utilised is provided in Table 3-3.

Table 3-3 Indicative construction plant and equipment required for construction of the Proposal

Equipment	Construction works period						
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works
Loaders		✓			✓	✓	✓
Static and vibratory rollers, and high energy impact compaction	✓	✓	✓	✓	✓	✓	
Mobile cranes	✓	✓			✓	✓	
Excavators	✓	✓	✓	✓	✓	✓	
Excavators with hammers		✓			✓		
Backhoes		✓			✓	✓	✓
825 Compactor			✓	✓			
Crushing plant		✓			✓		
Batch plant					✓	✓	
Concrete agitators (or similar)		✓			✓	✓	✓
Concrete pumps		✓			✓	✓	✓
Concrete saws					✓	✓	✓
Air compressors					✓	✓	✓
Jackhammers						✓	✓
Dozers		✓	✓	✓	✓		
Mulchers		✓					

Equipment	Construction works period						
	Works period A – Pre-construction activities	Works period B - Site Preparation activities	Works period C: Construction of the Moorebank Avenue diversion road	Works period E - Road and intersection works to facilitate the raising of Moorebank Avenue	Works period D – Bulk earthworks, drainage and utilities	Works period F - Construction and internal fit-out of warehousing	Works period G – Miscellaneous construction and finishing works
20-40 tonne articulated tipper trucks	✓	✓			✓		
Scrapers		✓			✓		
Graders	✓	✓	✓	✓	✓	✓	
Water trucks	✓	✓	✓	✓	✓	✓	✓
Piling rigs					✓	✓	
Forklifts					✓	✓	✓
Small earthmoving equipment	✓				✓	✓	✓
Welder					✓	✓	✓
Road profiler			✓	✓			
Rubber Roller			✓	✓			

3.4 Construction compounds

Temporary construction compounds would be required to support construction of the Proposal. The locations of these compounds are indicative and subject to confirmation by the construction contractor, once appointed.

It is envisaged that construction of the Proposal would require the use of two construction compounds:

- The Warehousing Compound, within the MPE site
- The Moorebank Avenue Compound, within the MPW site and immediately west of Moorebank Avenue.

The location and indicative layout of the construction compounds are shown in Figure 3-1.

The Main Warehousing Compound and Moorebank Avenue Compound are described in more detail in Section 3.4.1 and 3.4.2 respectively.

3.4.1 Main Warehousing Compound

The main construction compound for the Proposal (herein referred to as the Warehousing Compound) would be located within land proposed to be used as the Stage 1 Proposal's main IMT compound.

It is expected that some additional satellite compounds would be required during the construction of each individual warehouse on the Proposal site; however, the Warehousing Compound would be used for the majority of construction works.

The Warehousing Compound would include:

- A site office(s)
- Staff amenities
- Car parking
- Storage and laydown areas
- Materials testing facilities
- Material crushing facilities
- A concrete batching plant.

The indicative layout of the Warehousing Compound is shown on Figure 3-1.

3.4.2 Moorebank Avenue Compound

The Moorebank Avenue Compound would be located on the western side of Moorebank Avenue, in an existing area of hardstand within the MPW site. This area was previously used as a staff car park and as such, is characterised by large areas of level paved / hardstand surfaces and narrow garden beds that support a small number of trees.

The Moorebank Avenue Compound would include, site offices, car parking, and equipment storage and laydown areas, with some materials such as pre-cast culverts being temporarily stored within the compound area on occasion. The entrance to this compound would be generally at the location of the existing intersection off Moorebank Avenue.

No stockpiles are proposed to be located within the Moorebank Avenue Compound. Some materials such as pre-cast culverts may be temporarily stored within the compound area on occasion. The location of the Moorebank Avenue Compound is shown on Figure 3-1.

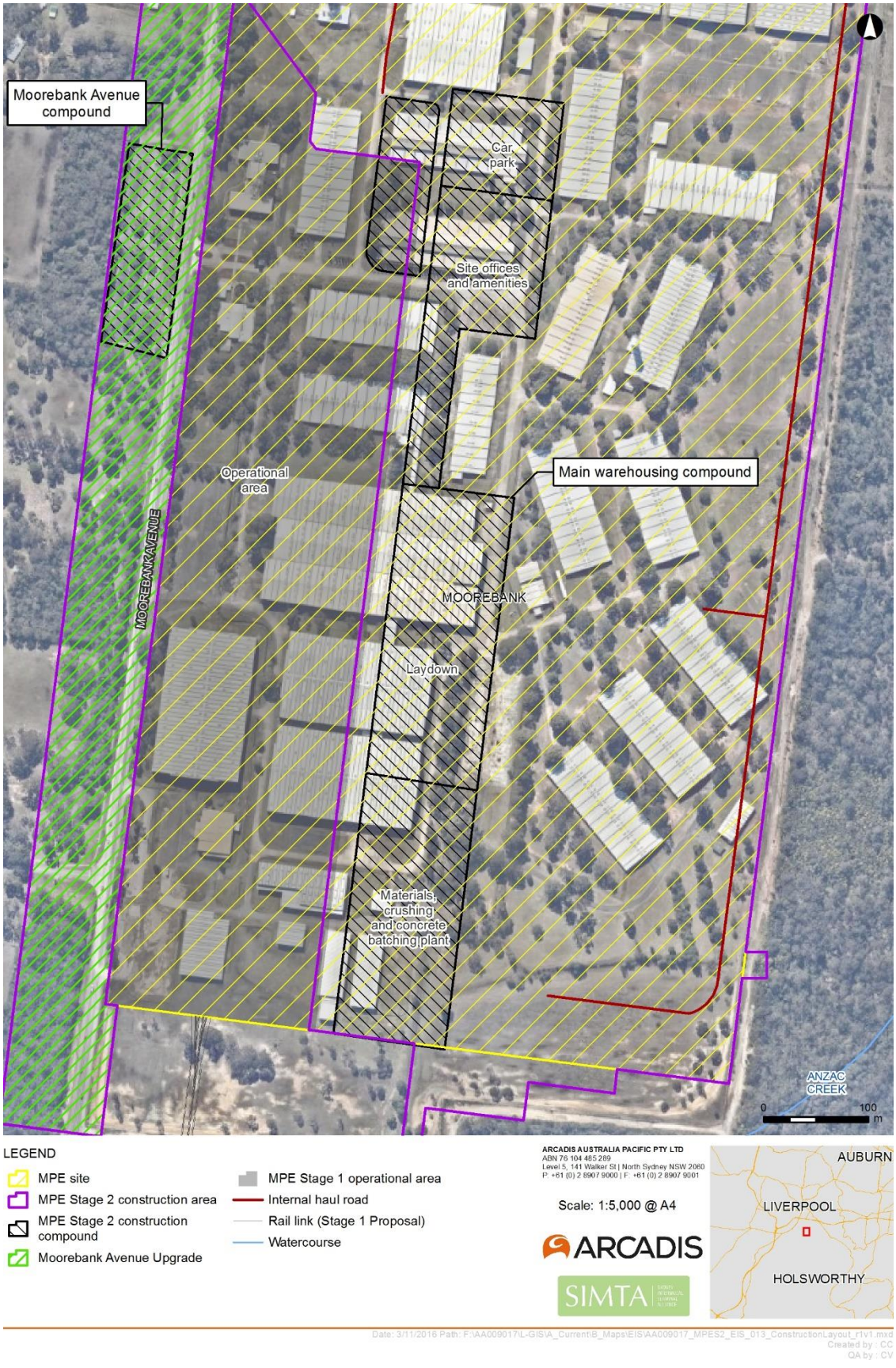

Figure 3-1 Overview of the construction layout for the Proposal

3.5 Construction hours

Construction works would generally be undertaken during standard daytime construction working hours, being:

- 7 am to 6 pm Monday to Friday
- 8 am to 1 pm Saturday
- No works on Sunday or Public Holidays.

Bulk earthworks activities and construction works to facilitate the Moorebank Avenue upgrade during peak construction periods may be undertaken outside of standard construction hours, but not during the night-time (i.e. 10pm to 7am).

The proposed construction hours for activities associated with bulk earthworks and construction of the Moorebank Avenue upgrade are summarised in Table 3-4.

Table 3-4 Construction hours for activities associated with bulk earthworks and the Moorebank Avenue upgrade

Construction activity	Construction hours	
	Weekdays	**Saturdays**
Material Delivery	6am-10pm	7am-6pm
Direct placement	7am-10pm	8am -6pm
Stockpiling	7am-6pm	7am-6pm
Crushing	7am-6pm	8am-1pm
Moorebank Avenue upgrade	6am – 10pm	7am – 6pm

Some additional construction works would be undertaken outside of standard daytime construction working hours, subject to consultation with the relevant authorities and in accordance with the *Interim Construction Noise Guidelines* (DECC, 2009), including:

- Any works which would not result in audible noise emissions at any nearby sensitive receptors.
- The delivery of oversized plant and/or structures that police or other authorities determine require special arrangements to transport along public roads
- Emergency work to avoid the loss of lives, property and/or to prevent environmental harm
- Maintenance and repair of public infrastructure where disruption to essential services and/or consideration of worker safety do not allow work within standard construction hours.
- Public infrastructure works that shorten the length of the project and are supported by noise-sensitive receivers.
- Construction works where it can be demonstrated and justified that these works are required to be undertaken outside of standard construction hours.
- Any other work as approved through the Construction Noise and Vibration Management Plan.

4 OPERATIONS OVERVIEW

4.1 The Proposal

The Proposal involves the construction and operation of Stage 2 of the MPE Project, comprising warehousing and distribution facilities on the MPE site and upgrades to approximately two kilometres of Moorebank Avenue between Anzac Road and 200 metres south of the MPE site.

Key components of the Proposal include:

- Warehousing comprising approximately 300,000m^2 GFA and additional ancillary offices
- Establishment of an internal road network, and connection of the Proposal to the surrounding public road network
- Ancillary supporting infrastructure within the MPE site and along Moorebank Avenue, including:
  - Stormwater, drainage and flooding infrastructure
  - Utilities relocation and installation
  - Vegetation clearing, remediation, earthworks, signage and landscaping
- Subdivision of the MPE site
- Construction of a diversion road to allow for temporary traffic management (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road).
- Raising the vertical alignment of Moorebank Avenue by about two metres, which would involve:
  - Earthworks, including construction of embankments and tie-ins to existing Moorebank Avenue road level at the Proposal's southern and northern extents
  - Raking of the existing pavement and installation of new road pavement
  - Establishment of temporary drainage infrastructure, including temporary basins and / or swales
- Upgrading existing intersections on Moorebank Avenue within the Proposal site including:
  - Moorebank Avenue / Proposal site access (Ch.900)
  - Moorebank Avenue / Chatham Avenue
  - MPW Northern Access / Moorebank Avenue (Ch.770)
  - MPW Southern Access / Moorebank Avenue (Ch. 1,540)

The Proposal would interact with the MPE Stage 1 Project (SSD_6766) via the transfer of containers between the MPE Stage 1 IMT and the Proposal's warehousing and distribution facilities. The vehicle movements associated with the transfer of containers between the MPE Stage 1 IMT and the Proposal would be within the Proposal site only, and would not impact on the surrounding road network.

The Proposal is expected to operate 24 hours a day, seven days per week.

4.2 Built form

4.2.1 Warehousing

The Proposal would provide up to 300,000m^2 of warehousing across the MPE Stage 2 site, with ancillary offices attached. The Proposal would include eight warehouses, which would be up to 21 metres in height and would range in size from 20,350m^2 to 61,500m^2. The Proposal would also include some internal fitout of the warehouses, namely the installation of racking and associated services. The Proposal would seek approval for the construction of these warehouses and also the operation of these warehouses by future tenants.

The indicative layout of the warehouses are shown in Figure 4-1.

Each individual warehouse would consist of the following:

Each individual warehouse would consist of the following:

- A container storage area
- Office and administration facilities
- Amenities
- Car parking
- Truck loading/unloading docks
- Internal parking for pick-up and delivery vehicles (PUD)
- Specialised sortation and conveyor equipment
- Hardstand areas that provide trailer parking spaces, external PUD parking spaces, vehicle manoeuvring areas and access to the main internal site road
- Signage for business identification purposes, including backlit illuminated signage on each warehouse (refer to Architectural drawings at Appendix D)

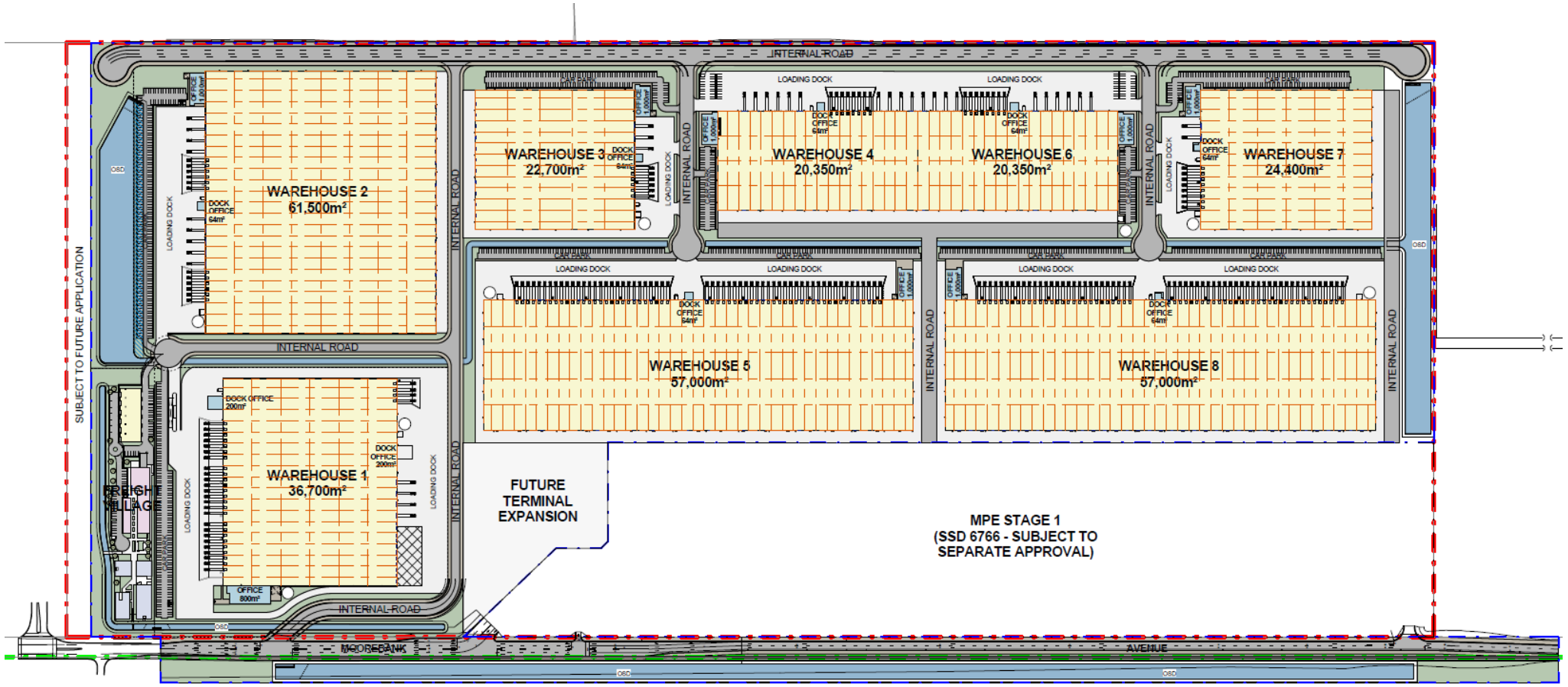

Figure 4-1 Indicative warehousing layout

4.2.2 Freight village

A freight village including amenities would be provided on the MPE site as part of the Proposal. The ancillary freight village would be located in the north-west of the Proposal site, directly north of Warehouse 1 and east of Moorebank Avenue. The freight village would include five buildings which would provide for a mixture of retail, commercial and light industrial land uses, with a combined GFA of approximately 8,000m^2. An overview of buildings within the ancillary freight village is provided in Figure 4-1.

The freight village would also include the provision of:

- Food outlets
- Amenities
- Loading dock(s)
- Services area
- Services corridor
- landscaping,
- Car parking (230 spaces), including basement parking.

The indicative layout of the freight village is show on Figure 4-1.

Buildings and structures within the freight village would be up to 15 m in height and of varying size and design, as detailed in Section 15 of the EIS (visual amenity, landscape and urban design). The Proposal would also include the internal fitout of these buildings, including utilities and services. The Proposal would seek approval for the construction of this freight village and also the operation of these premises by future tenants.

Associated with this built form is a number of ancillary works, which include materials and finishes, signage, lighting, vegetation removal and landscaping, water management works and utilities, which have been discussed throughout this section of the EIS.

4.2.3 Vehicle movement and access

The Proposal would include one site access point, with traffic circulating through the site using internal roads, service roads and internal transfer roads. A description of site access and traffic circulation throughout the Proposal site is described below.

MPE Stage 2 site access

Access to and from the Proposal site would be via the existing DSNDC northern access, to the north of the MPE Stage 1 Project. Site access at this location would allow for vehicular access to warehouse and distribution facilities to enable the direct delivery and dispatch of goods to the warehouses. The site access point is shown on Figure 1-1.

Traffic circulation within the MPE Stage 2 site

Internal roads

The MPE Stage 2 site includes two main internal roads, which provided the main east-west and north-south traffic movements throughout the MPE Stage 2 site. On entering the MPE Stage 2 site, light and heavy vehicles would travel along an east-west oriented internal road (internal road 1). Internal road 1 would connect at its easternmost point to a second north-south oriented internal road (internal road 2).

Internal roads 1 and 2 would connect to three service roads which would provide vehicle access to warehouses, loading docks and car parking.

Internal road 2 would provide for traffic movements along the entire eastern perimeter of the Proposal, and would have a cul-de-sac at both the northern and southern ends to allow vehicles to turn around. The internal roads would be two lanes wide (one lane in each direction) and would be wide enough to accommodate heavy vehicle turning movements, including B-doubles.

Service roads

Three service roads would connect to the internal roads within the MPE Stage 2 site. The service roads would provide access to loading docks at warehouses for heavy vehicles to park and be packed with materials which have been received and stored within the warehouses. Service roads would also enable access to light vehicle parking for users of the warehouses. Each service road would have a cul-de-sac for vehicles to turn around, which would be able to accommodate turning movements of B-doubles.

Service road 1 would connect to internal road 1 via a T-intersection, and would provide access to Warehouse 1, Warehouse 2 and the ancillary freight village. Two additional service roads would connect to internal road 2 via t-intersections; service road 2 would provide access for warehouses 3, 4 and 5, and service road 3 would provide access to warehouses 6, 7 and 8.

Transfer roads

There would be three Transfer roads within the MPE Stage 2 site. These roads would provide connections between the warehouses and the MPE Stage 1 IMT. It is intended that the transfer of freight between the Stage 1 IMT and warehouses would be via an internal fleet of vehicles which would remain on the MPE Stage 2 site and would not use the external road network.

Transfer road 1 would travel mostly along the same path as internal road 1 and provide access between the Stage 1 IMT facility and Warehouses 1, 2 and 3. Transfer road 2 would travel through the centre of the MPE Stage 2 site and would provide access between the Stage 1 IMT facility and Warehouses 4, 5, 6 and 8. Transfer road 3 would travel along the southern boundary of the MPE site, and provide access between the Stage 1 IMT facility and Warehouses 7 and 8.

With the exception of transfer road 1, which travels along the same path as internal road 1, the movement of internal fleet vehicles along transfer roads would be separated from light and heavy vehicles entering and exiting the MPE Stage 2 site to maintain efficiency and to provide for a safe internal road network.

4.2.4 Roadworks – Moorebank Avenue

As part of the Proposal, Moorebank Avenue would be upgraded for about 1.4 kilometres. The Moorebank Avenue upgrade commences from approximately 95 metres south of the northern boundary of the MPE site to approximately 120 metres south of the southern MPE site boundary. The Moorebank avenue upgrade is located within the existing Moorebank Avenue road corridor and along the eastern boundary of the MPW site (refer to Figure 1-1 for extent of works).

The Moorebank Avenue upgrade would be comprised of the following key components:

- Modifications to the existing lane configuration, including some widening
- Signalling and intersection works.
- Raising the vertical alignment by about two metres from the existing levels, including kerbs, gutters and a sealed shoulder

Lane configuration

The Moorebank Avenue upgrade would provide for the integration of the Proposal with the wider Moorebank Precinct works and to tie-in to Moorebank Avenue north of the Anzac Road/Moorebank Avenue intersection.

The arrangement of lanes along Moorebank Avenue as part of the Proposal would include:

- Four lanes from the northern extent of the Moorebank Avenue upgrade to the MPE Stage 1 central access.
- Two lanes between the MPE Stage 1 central access to approximately 120 metres south of the MPE site.

The lanes would generally be 3.5m wide central travel lanes, with 4.2m wide kerbside travel lanes with a 4.5 metre verge along both the northbound and southbound carriageways to allow for the relocation and installation of utilities and services.

Intersection upgrades

The Proposal includes upgrades to four intersections along Moorebank Avenue, including:

- Moorebank Avenue / MPE Stage 2 site access
- Moorebank Avenue / Chatham Avenue
- MPW Northern Access / Moorebank Avenue
- MPW Southern Access / Moorebank Avenue

Road alignment

The horizontal alignment of Moorebank Avenue is not expected to change significantly as a result of the Proposal, with the upgraded road remaining primarily within the existing Lot 2 of DP1197707.

As part of the Proposal, the vertical alignment of Moorebank Avenue within the operational footprint of the Moorebank Avenue upgrade would be raised by approximately two metres. At the northern and southern extents of this work, the vertical alignment would be graded to tie-in to the remainder of Moorebank Avenue.

4.2.5 Ancillary infrastructure

The Proposal would also include ancillary supporting infrastructure to facilitate the efficient operation of the Proposal, to minimise the environmental impact and enhance the visual amenity of the Proposal site. Ancillary infrastructure to be included on the Proposal site would comprise:

- Landscaping within the MPE site and along Moorebank Avenue
- Water management works, including stormwater infrastructure and on-site detention within the MPE site and along Moorebank Avenue
- The installation of signage throughout the Proposal site for the purposes of way finding and access to/from the warehousing facilities.
- The provision of road signage along Moorebank Avenue within the Proposal site
- Lighting around the warehouse entry and exit points, freight village, ancillary offices and along the internal roads.
- Street lighting along Moorebank Avenue
- Relocation and installation of utilities to connect to nearby public utility networks within the MPE site and along Moorebank Avenue
- Subdivision of the Proposal site for the purpose of segregating the intermodal terminal and warehousing, and also for the tenanting of individual warehouses within the facility.

4.3 Operational hours

Movement of freight between the IMT and warehouses within the Proposal site would be undertaken 24 hours per day, seven days a week. The warehouses would generally be operational for 18 hours a day, typically between 7am and 1am, five to seven days a week, depending on the tenant.

5 LEGISLATION AND POLICY

5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as Matters of National Environmental Significance (MNES). MNES identified in the Act include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mines).

In accordance with sections 67 and 67A of the EPBC Act, any works that have the potential to result in an impact on any MNES or on Commonwealth land are considered 'controlled actions' and require a referral to the Federal Minister for the Environment for approval. The MPE Project was determined to be a controlled action under the EPBC Act, as a result of the project's impacts on listed threatened species and communities and Commonwealth land. The MPE Project was granted approval as a controlled action under the EPBC Act in March 2014 (EPBC 2011/6229), subject to conditions.

5.2 NSW Environmental Planning and Assessment Act 1979

On 29 September 2014 Concept Plan Approval was granted, under Part 3A (Transitional), Section 75O of the EP&A Act for the "use of the site [Project Site] as an intermodal facility, including a Rail link to the Southern Sydney Freight Line within an identified Rail Corridor, warehouse and distribution facilities, freight village (ancillary site and operational services), stormwater, landscaping, servicing and associated works".

Notwithstanding this, as indicated in the Conditions of Approval, this Concept Plan Approval does not permit the construction or operation of any part of the MPE Project, which is subject to obtaining subsequent development consent under the EP&A Act. The Concept Plan Approval states that approval to carry out the MPE Project is subject to an application and approval under Part 4, Division 4.1 of the EP&A Act and the environmental assessment requirements specified in Schedule 3 of the Conditions of Approval. These are presented in Table 1-2.

5.2.1 NSW Biodiversity Offsets Policy for Major Projects

The *NSW Biodiversity Offsets Policy for Major Projects* was released in October 2014 and is applicable to projects that are SSD or State Significant Infrastructure (SSI) under the EP&A Act. The NSW Biodiversity Offsets Policy for Major Projects requires proponents to apply the *Framework for Biodiversity Assessment* (FBA) to assess

impacts on biodiversity. The FBA also guides the identification of reasonable measures and strategies that can be taken to avoid and minimise impacts on biodiversity associated with a proposal.

The SEARs for the proposal require that it be assessed under the Framework for Biodiversity Assessment, including an assessment of any potential impacts on riparian vegetation and groundwater dependent ecosystems.

5.3 NSW Threatened Species Conservation Act 1995

The NSW Threatened Species Conservation Act 1995 (TSC Act) provides for the protection and management of threatened species, populations and ecological communities listed under schedules 1, 1A and 2 of the Act. The purpose of the TSC Act is to:

- Conserve biological diversity and promote ecologically sustainable development.
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities.
- Protect the critical habitat of those species, populations and ecological communities that are endangered.
- Eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities.
- Ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

The Proposal could potentially have impacts on threatened species and ecological communities listed under the TSC Act. This report assesses and quantifies the impacts to these threatened entities in accordance with the FBA requirements and outlines the corresponding offsetting requirements.

6 METHODOLOGY

6.1.1 Database Interrogation

Database searches were undertaken to identify State records of threatened entities under the TSC Act and *Fisheries Management Act 1991* (FM Act). Databases interrogated for this purpose were:

- The NSW Threatened Species Profile Database (TSPD) which is managed by OEH.
- The Vegetation Information System (VIS) classification database which is managed by OEH.
- The over-cleared landscapes database (Mitchell landscapes)
- The Directory of Important Wetlands of Australia (DIWA), maintained by the Australian Government.

6.1.2 Literature/mapping Review

A review of relevant information was undertaken to provide an understanding of ecological values occurring or potentially occurring in the Proposal site and wider region. Reports, vegetation maps, topographic maps, aerial photography and literature reviewed included, but were not limited to, the following:

- *Soil Landscapes of the Penrith 1:100 000 Sheet* (Bannerman & Hazelton 1990).
- *SIMTA Stage 1: Biodiversity Assessment Report* (Hyder Consulting 2015)
- *Assessment of the Sydney Intermodal Terminal Facility, Moorebank: Aquatic Ecology* (ALS (2011)
- *Moorebank Intermodal Terminal: Biodiversity Offset Areas Biodiversity Assessment Report* (Parsons Brinckerhoff 2015).
- *The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area* (OEH 2013).

6.1.3 Field assessment

Field assessment of the biodiversity values of the Proposal site has been conducted on a number of occasions between May 2011 and October 2016.

Supplementary field investigations to quantify any changes in site conditions, account for additional impact areas and assess vegetation in accordance with the FBA/BBAM was undertaken during daylight hours by Arcadis ecologists Jane Rodd and Laura Hoffman on 21 June 2016 and Jane Rodd and Kate Carroll on 13 October 2016.

Vegetation Plots

Quantitative (quadrat/transect) site surveys were undertaken on and adjacent to the Proposal site in accordance with the guidelines in Section 5 of the FBA. The structure and floristics of each plant community present in the study area were sampled using three 0.1 hectare quadrats. The quadrats were in the form of a 20 metre x 50 metre plot with a nested 20 metre x 20 metre plot (Figure 6-1).

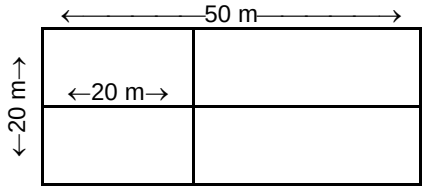

Figure 6-1 Flora quadrat layout

One of the flora quadrats used was sampled by Parsons Brinckerhoff (2015) in the Boot land, as part of assessment of biodiversity credit value of proposed biodiversity offset areas. Quadrat 10 of Parsons Brinckerhoff (2015) sampled vegetation close to the Proposal site, and data from this quadrat was used to support the current assessment.

The other flora quadrats used in the current assessment (Q9 and QA) were sampled by Arcadis in June 2016. Plots should be randomly within each vegetation zone, however given the small size of vegetation fragments in the Proposal site, there were limitations to where the plot could be located. The quadrat locations are shown on *Figure 6-2*.

Floristic data were collected from each plot in accordance with the Table 1 of the FBA (Table 6-1).

Table 6-1 Data collected from vegetation plots

Variable	Data collected
Stratum (and layer)	Stratum and layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name (where applicable)
Cover	A measure or estimate of the appropriate cover measure for each species recorded within the 20 m x 20 m plot. Recorded from 1–5% and then to the nearest 5%. If the cover of a species is less than 1% and the species is considered important, then the estimated cover is entered (e.g. 0.4)
Abundance rating	A relative measure of the number of individuals or shoots of a species within the 20 m x 20 m plot using the following intervals (numbers above about 20 are estimates only): 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required

During the terrestrial flora survey the vegetation condition was assessed and rated according to the degree to which it resembled relatively natural, undisturbed vegetation. The initial condition assessment was based on visual assessment of the current habitat condition for each of the Plant Community Types (PCTs) identified in the study area.

Site attribute data were collected from each plot in accordance with Table 2 of the FBA (Table 6-2).

Table 6-2 Site attribute data collected from vegetation plots

Variable	Data collected
Indigenous plant species richness	Number of indigenous plant species within 20 m x 20 m plot
Native over-storey cover	Estimate of percent foliage cover at 10 points (every 5 m) along the 50 m transect
Native mid-storey cover	Estimate of percent foliage cover at 10 points (every 5 m) along the 50 m transect
Native ground cover (grasses)	At 50 points along the 50 m transect (every 1 m), recorded whether native grass intersects that point.
Native ground cover (shrubs)	At 50 points along the 50 m transect (every 1 m), recorded whether native ground cover (shrub) intersects that point.
Native ground cover (other)	At 50 points along the 50 m transect (every 1 m), recorded whether native ground cover (other) intersects that point.
Exotic plant cover	Measured as total percent foliage cover of all exotics in all strata; exotic cover measured using the same method as for native over-storey, mid-storey and ground cover.
Number of trees with hollows	Count of the number of living and dead trees within the 50 m x 20 m plot that have at least one hollow.
Regeneration	Measured as the proportion of over-storey species present in the zone that are regenerating (i.e. with diameter at breast height < 5 cm).
Total length of fallen logs	Total length of logs at least 10 cm in diameter and at least 0.5 m long.

The vegetation condition data obtained for each vegetation community in quadrats was used to obtain site attribute scores and given a weighting as per Table 2 in the FBA. The scores were assessed against the Vegetation Type Benchmarks for the identified vegetation types in the VIS classification database.

Tree survey

An assessment of trees on the MPE site was undertaken by Jane Rodd and Laura Hoffman in May 2011. Individual trees or groups of trees on the site were documented, with the species, approximate height, diameter at breast height and apparent health noted. Health was assessed by inspection of the tree canopy for dead limbs or diseased/dying leaves, signs of stress including epicormic reshooting, and evidence of bark disease or fungal infection. Tree health was assessed using the following measures:

- Good: Almost all branches living, no evidence of disease or stress.
- Moderate: Some dead branches in canopy, minor bark disease or fungal infestation.
- Poor: Numerous dead branches or limbs, significant bark disease or fungal infestation, signs of stress and/or senescence.

Assessment of the trees within the Moorebank Avenue road reserve was conducted by Jane Rodd and Kate Carroll on 13 October 2016.

Targeted threatened species surveys

Targeted surveys for threatened plant species were undertaken in areas of marginal potential habitat in the south of the Proposal site using random meanders, quadrats and BBAM survey techniques as described above.

Fauna surveys

Numerous fauna field surveys were conducted between 2011 and 2014 as part of assessments for the MPE Concept Plan and Stage 1, including targeted surveys for those threatened species considered likely to occur. The entire Proposal site was traversed on foot and all species and evidence of fauna presence observed was recorded. An inventory of fauna species recorded in the Proposal site was compiled. Fauna survey locations are identified on *Figure 6-2*. The Proposal site was visited again in June 2016 to assess any change to habitat condition.

Diurnal fauna surveys involved:

- Direct visual observations of animal activity
- Aural recognition of bird and frog calls
- Raking leaf litter and turning logs, rocks and other debris
- Inspecting tree hollows, logs and built structures, including under bridges and culverts where access was possible
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings)
- Plot-based fauna habitat assessment. Components of fauna habitat were assessed using 20 x 20m quadrats, randomly located across the Proposal site. Data collected included:
  - Structure and floristics of vegetation
  - Surface drainage features
  - Rocky features
  - Abundance and type of tree and log hollows
  - Foraging resources
  - Microhabitats.

Nocturnal surveys involved:

- Spotlighting from a vehicle and along foot traverses for direct visual observations of animal activity. Spotlight effort comprised of 16 person hours across four nights during the survey period.
- Call-playback for aural recognition of threatened owls and frogs at one site within the study area, on each of four nights during the survey period. Upon arrival, listening for vocalisations for 10 minutes was undertaken. Calls were played intermittently for 15 minutes, followed by another listening period of 10 minutes.
- Searching microhabitats, including turning logs and rocks and searching fringing vegetation of waterbodies.
- Stationary placement of ultrasonic bat call detection equipment (Anabats) in potential flyways. Anabats were placed overnight in four locations within or immediately adjacent to the MPE site during the survey periods.

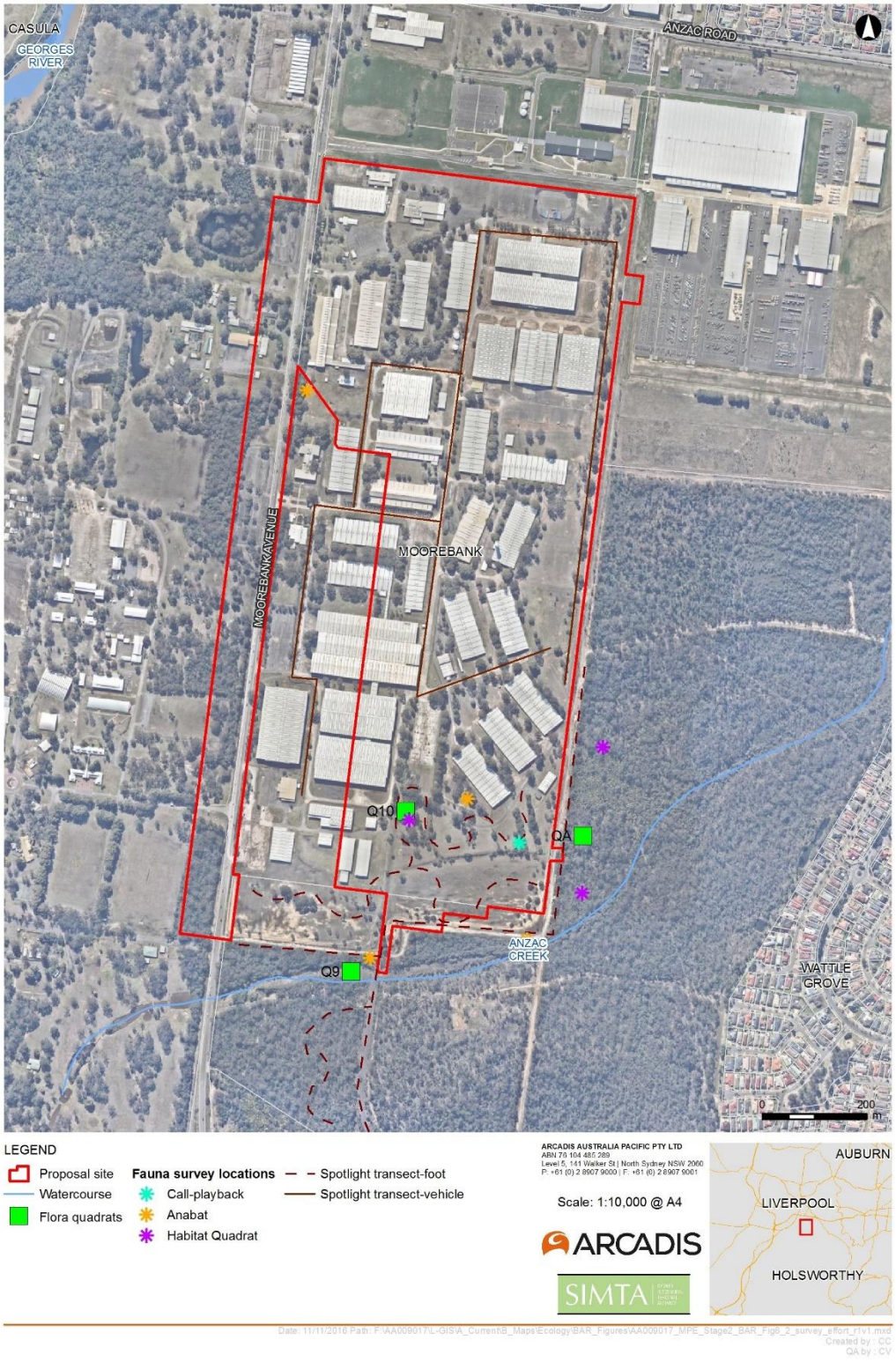

Figure 6-2 Flora and fauna survey locations on the Proposal site

7 LANDSCAPE ASSESSMENT

7.1 Landscape regions

Bioregions and landscapes associated with the Proposal site and outer assessment circle are mapped in Figure 7-1.The Proposal site is located within the Sydney Basin Bioregion and the Cumberland Subregion classified under IBRA (Interim Biogeographic Regionalisation for Australia).

The Proposal site is located within the Sydney Metropolitan Catchment Management Authority (CMA) Area and the Cumberland CMA subregion.

The Proposal site is located within the Georges River Alluvial Plain Mitchell landscape. This Mitchell Landscape is not currently listed in the credit calculator, so the Cumberland Plain Mitchell Landscape was used following advice from OEH (pers. comm. Biobanking Team, OEH, 25 August 2015).

7.2 Assessment circles

Two assessment circles were mapped to enable assessment of landscape values, including the percent current extent of native vegetation cover within and adjacent to the Proposal site. In accordance with the allowable combinations of inner and outer assessment circles in Table 8 of the FBA, an inner circle of 100 hectares and an outer circle of 1000 hectares were used. Both circles were centred on the Proposal site (Figure 7-1).

7.3 Rivers, streams and wetlands

The Proposal site is located within the Georges River catchment, covering approximately 960 square kilometres and managed by the Sydney Metropolitan CMA. Georges River is located between 600 metres to one kilometre west of the Proposal site, where it flows to the north then meanders south-east from Chipping Norton before draining into Botany Bay.

Anzac Creek originates from the MPW site west of Moorebank Avenue and extends to the north-east, to the south of the Proposal site; at its closest point, it is located approximately 70 metres from the south-eastern corner of the Proposal site. The creek flows north past the adjoining suburbs of Wattle Grove and Moorebank before draining into Lake Moore in Chipping Norton, which flows into the Georges River. The section of Anzac Creek to the south of the Proposal site is considered to be a 3rd order stream.

In addition to these named watercourses, there is a network of formalised drainage channels located in the south of the Proposal site. These channels drain into the native vegetation to the east of the MPE site.

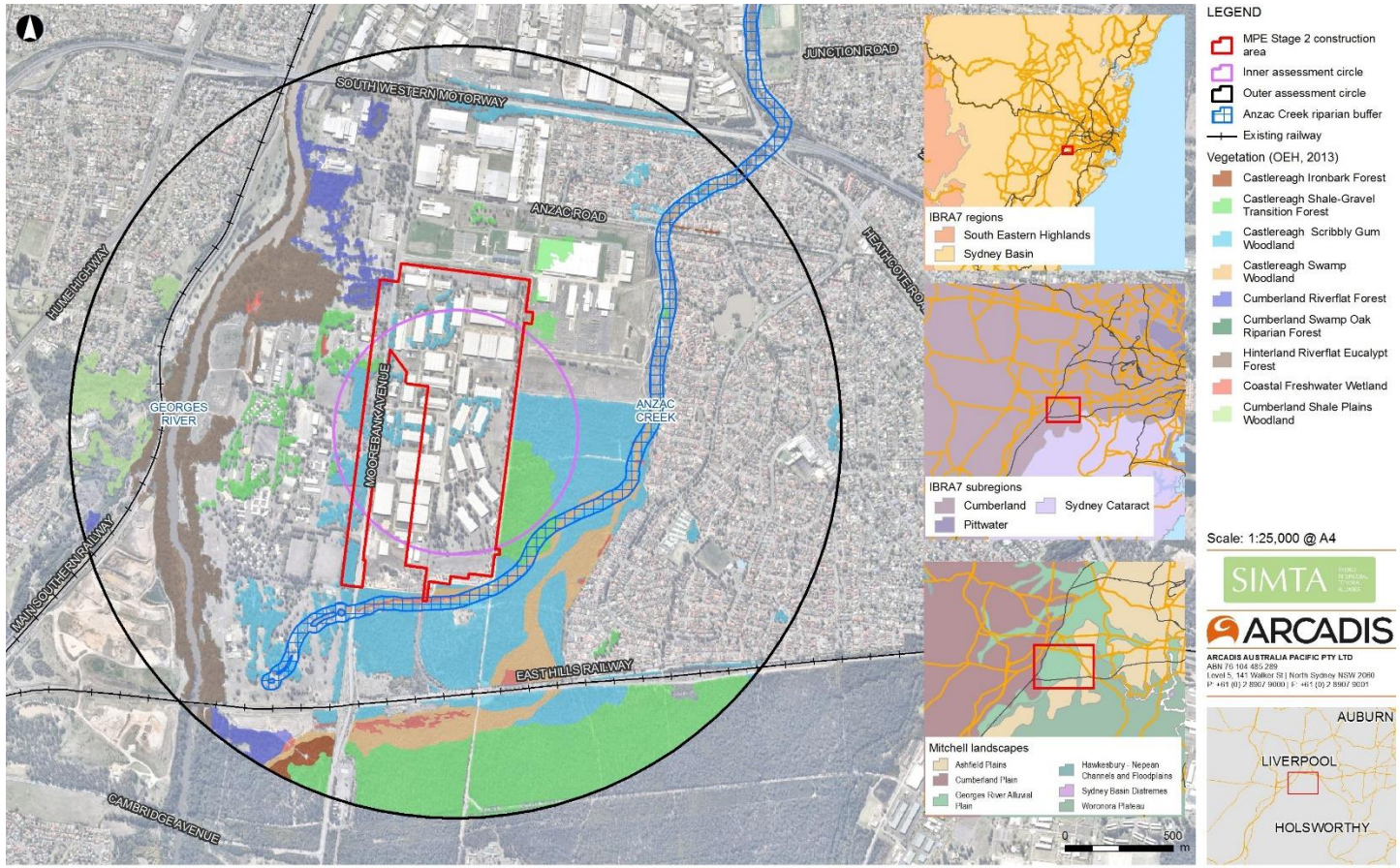

Figure 7-1 Landscape assessment

No local or important wetlands occur in the outer assessment circle. Watercourses and wetlands in the locality are mapped in Figure 7-2.

7.4 Landscape Value Score

The landscape value has been calculated from the site-based methodology outlined in Appendix 4 of the FBA (OEH 2014) by determining the following:

1. Percent native vegetation cover in the landscape – percentage of all land within the inner and outer assessment circles that contains native vegetation is to be calculated for the current extent of cover and future extent of cover once clearing for the development has occurred.
2. Connectivity value – the value determined by identifying connecting links and state or regional biodiversity links. Where the development will impact on more than one connecting link, a connectivity value must be determined for each link based on the linkage widths and conditions. State significant biodiversity links have a connectivity value of 12 and regionally significant biodiversity links have a connectivity value score of 9.
3. Patch size score – determined from the percentage of native vegetation that has been cleared within the Mitchell landscape in which most of the development occurs and the patch size class. The patch size class considers the largest patch of native vegetation occurring within or connecting to the Proposal site and attributing a size class between nil or small to extra large, dependent on the size of the patch in hectares and the percentage of native vegetation cleared.

A discussion of each of these determining factors in relation to the Proposal site is provided below.

7.4.1 Native vegetation cover in landscape

The native vegetation cover in the landscape was determined with reference to the regional vegetation mapping by OEH (2013). All native vegetation types mapped by OEH (2013) within the inner and outer assessment circles were considered to represent the current native vegetation cover. The future native vegetation cover was determined by subtracting the area of native vegetation to be cleared for the Proposal from the current summed native vegetation cover in each circle. Native vegetation cover percentages were calculated as a proportion of all land within each assessment circle that contains native vegetation.

The current and future percentage of native vegetation cover in the inner and outer assessment circles has been provided in Table 7-1. Scores for each percent cover were then determined using the score criteria in Table 9, Appendix 4 of the FBA.

Figure 7-2 Watercourses and wetlands

Table 7-1 Scores for the assessment of landscape value

Criteria	Assessment Circle	% cover	Score
Current native vegetation cover	Inner assessment circle	25-30	4.5
	Outer assessment circle	25-30	7.5
Future native vegetation cover	Inner assessment circle	25-30	4.5
	Outer assessment circle	25-30	7.5

7.4.2 Connectivity value

One connecting link has been identified immediately adjacent to the Proposal site, in the 'Boot land'. The vegetation in this area represents native vegetation in moderate to good condition, has a patch size greater than one hectare and minimal cleared or hostile land features between patches of vegetation.

The Proposal has very minor overlap with areas of vegetation in the Boot land, and would not alter the existing connectivity values, further sever native vegetation or form a hard barrier within the connecting link.

7.4.3 Patch size

The size of the largest patch of native vegetation occurring within the majority of the Proposal site is 0.1 hectares. The very small (0.05 hectare and 0.01 hectare) areas of vegetation within the Boot land that the Proposal site overlaps connects to larger areas of bushland within Holsworthy Military Area to the south, which comprises approximately 18,000 hectares of continuous native vegetation. As such, the vegetation in the Proposal site has been assigned the maximum patch size of 1001 hectares. In accordance with the criteria in Table 15 of Appendix 4 of the FBA, the patch size class is considered to be *very large* with a corresponding patch size score of 12.

8 NATIVE VEGETATION

8.1 Mapped vegetation communities

OEH (2013) mapped the vegetation of the Sydney Metropolitan CMA Area. The Sydney CMA Area encompasses the eastern portions of the Sydney Metropolis, extending from the coastline to the catchments that flow to the Parramatta, Georges and Hacking River.

Seven different native vegetation communities were mapped within the outer assessment circle (*Figure 8-1*) and are listed in Table 8-3*Table 8-1* . All of these communities correspond to TECs as noted in Table 8-1.

Table 8-1 Vegetation communities mapped by OEH (2013) and corresponding TECs

Vegetation map unit (DECCW 2009)	Corresponding TEC	EPBC Act Status	TSC Act Status
Castlereagh Ironbark Forest	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	Endangered
Castlereagh Shale-gravel Transition Forest	Shale/Gravel Transition Forest in the Sydney Basin bioregion	Critically Endangered	Endangered
Castlereagh Scribbly Gum Woodland	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Endangered	Vulnerable
Castlereagh Swamp Woodland	Castlereagh Swamp Woodland Community	Not listed	Endangered
Coastal Freshwater Reedland	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Not listed	Endangered
Cumberland Riverflat Forest	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Not listed	Endangered
Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin bioregion	Critically Endangered	Critically Endangered

In addition to the described vegetation communities were two map units, “Urban_E/N” and “Weed_Ex” that were not described in the report accompanying the map, but are assumed to refer to degraded urban vegetation fragments and vegetation dominated by weeds and exotic species.

Parsons Brinckerhoff (2015) mapped the vegetation of the “Boot land’, which adjoins the Proposal site to the east and south, based on detailed site surveys conducted in 2014 and 2015. Four Plant Community Types (PCTs) were identified on the Boot land, all of which correspond to TECs (Table 8-2).

Table 8-2 Plant Community Types mapped by Parsons Brinckerhoff (2015) and corresponding TECs

Vegetation map unit (Parsons Brinckerhoff 2015)	Corresponding TEC (TSC Act)
Broad-leaved Ironbark – Grey Box – Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin.	Shale/Gravel Transition Forest in the Sydney Basin bioregion
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion
Parramatta Red Gum Woodland on moist alluvium of the Cumberland Plain, Sydney Basin.	Castlereagh Swamp Woodland Community

Hyder Consulting (2015) mapped the vegetation of the southern part of the Boot land for the MPE Stage 1 EIS. Three PCTs were identified on the Boot land, two of which (Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin and Parramatta Red Gum Woodland on moist alluvium of the Cumberland Plain, Sydney Basin) were also mapped by Parsons Brinckerhoff (2015). One additional PCT was identified within Anzac Creek: Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion. This PCT corresponds with the TEC Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregion, listed as Endangered under the TSC Act.

8.2 Vegetation observations

Following site survey and ground-truthing, three vegetation types were identified within the Proposal site: three native vegetation communities (Disturbed Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland, Broad-leaved Ironbark - Melaleuca decora shrubby open forest and Coastal freshwater lagoons) and one modified vegetation type, Planted and disturbed vegetation.

8.2.1 Planted and disturbed vegetation

MPE Site

The MPE site was formerly used for the Defence National Storage and Distribution Centre (DNSDC). The site contains numerous large warehouse buildings and is covered by a network of roads, carparks and other hardstand areas. The site was largely developed between 1939 and 1945 and trees were probably planted at or shortly after this time, as there are distinct rows of tree crowns visible on the 1955 aerial photograph. Further development occurred in the early 1990s (Artefact 2015), whereupon additional plantings or landscaping would have occurred.

There are currently mature and mainly healthy trees lining the roads and paved areas (Plate 1, Plate 2). Planted tree species are typical of cultivated eucalypts that are commonly found as mature street trees in suburban Sydney, with *Eucalyptus microcorys* (Tallowwood), *E. saligna* (Sydney Blue Gum), *Corymbia maculata* (Spotted Gum) and *C. citriodora* (Lemon-scented Gum) frequently recorded.

Plate 1. Mature trees of *Eucalyptus saligna* and *Corymbia maculata* on MPE site

Plate 2. Mature trees of *Eucalyptus microcorys* on MPE site

The ground layer in the non-paved areas of the Proposal site consists of mown grass lawns, dominated by *Cynodon dactylon* (Couch), *Pennisetum clandestinum* (Kikuyu) and other exotic grass species; there was a native grass component persisting in some locations, with native grasses observed including *Paspalidium distans, Austrodanthonia* sp. (Wallaby Grass) and *Eragrostis leptostachya* (Paddock Lovegrass) as well as some small native herbs.

In the south of the Proposal site is a network of drainage channels with some tree plantings and some apparent tree and shrub regeneration. The channels supported a mixture of native, non-local native and exotic trees and shrubs including *E. saligna, E. tereticornis* (Forest Red Gum), *C. maculata, Melaleuca quinquenervia* (Broad-leaved Paperbark), *Casuarina glauca* (Swamp Oak) and *E. parramattensis* (Parramatta Red Gum).

Moorebank Avenue road reserve

The road reserve adjoining Moorebank Avenue is largely entirely cleared, with closely mown grass on the verges. There were some planted trees in sections along the road edge, mainly native eucalypts species; commonly occurring species were *E. microcorys, E. saligna x botryoides, E. camaldulensis* and *E. tereticornis.* The trees ranged in height from 6 to 8 metres, and in diameter at breast height (dbh) from 0.1 to over one metre. Most trees were in good health, although some had dead branches or had been pruned into poor shape.

8.2.2 Disturbed Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland

There was one area adjoining the disused rail line in the south-east of the MPE site that supported native understorey (Plate 3, Plate 4); it is possible that this area has been subject to management as there were mesh tree guards around the bases of two trees. This area supported mature trees of *E. sclerophylla* (Hard-leaved Scribbly Gum) and numerous shrubs of *Acacia* spp., *Allocasuarina littoralis* (Black She-oak), *Hakea salicifolia* (Willow Hakea) and *Melaleuca nodosa* (Ball Honey-myrtle). The ground layer was characterised by native grasses including *Aristida ramosa* (Wiregrass), *Entolasia stricta* (Wiry Panic), *Paspalidium distans* and *Themeda australis* (Kangaroo Grass) and there were a number of small groundlayer herb and shrub species including *Astroloma humifusum* (Cranberry Heath), *Laxmannia gracilis* (Slender Wire Lily), *Pimelea linifolia* (Slender Rice Flower) and *Lomandra* spp. Exotic cover was low, with *Eragrostis curvula* (African Lovegrass) dominating in patches.

Plate 3. Native regrowth near existing rail line in MPE site

Plate 4. Native regrowth near rail spur in southern part of the MPE site

8.2.3 Broad-leaved Ironbark - Melaleuca decora shrubby open forest

A small area of native vegetation within the Boot land falls within the Proposal site along its eastern boundary. This area within the Proposal site adjoins a drainage channel that drains from the MPE site, and forms the disturbed edge of a larger patch of Broad-leaved Ironbark - Melaleuca decora shrubby open forest to the east (Plate 5).

The vegetation in this area consists of dense cover of trees and tall shrubs of *Angophora bakeri* (Narrow-leaved Apple), *Acacia binervia* (Coast Myall), *Acacia parramattensis* (Parramatta Wattle) and *Melaleuca decora* (White Feather Honeymyrtle). The understorey is shrubby and grassy, with *Pultenaea villosa* (Hairy Bush-pea) and *Ozothamus diosmifolius* (White Dogwood) in the shrub layer and *Microlaena stipoides* (Meadow Rice-grass), *Lomandra longifolia* (Spiny-headed Mat-rush), *Imperata cylindrica* (Blady Grass) and the exotic *Eragrostis curvula* abundant, particularly at the cleared edge.

The drainage channel is an open trench, cleared and disturbed at the edge of the easement track, with only scattered groundcover present. Further east within the native vegetation, the channel is adjoined by ferns, mainly *Adianthum aethiopicum* (Maidenhair Fern).

Plate 5. Broad-leaved Ironbark - Melaleuca decora shrubby open forest in the east of the Proposal site

Plate 6. Coastal freshwater lagoons within the Proposal site.

8.2.4 Coastal freshwater lagoons

The section of Anzac Creek that intersects the Proposal site consists of a shallow muddy waterbody, with limited standing water observed at the time of survey, supporting dense stands of *Typha orientalis* (Broad-leaf Cumbungi) and *Bolboschoenus fluviatilis* (Club-rush) with *Alternanthera philoxeroides* (Alligator Weed) abundant in the lower stratum. The area of this PCT within the Proposal site comprises the disturbed edge adjacent to the existing culvert (Plate 6).

8.3 Plant Community Types on the Proposal site

The vegetation within the Proposal site consisted predominantly of planted and disturbed vegetation. Native vegetation within the Proposal site consists of small, fragmented patches of vegetation and the disturbed edges of larger patches.

Three native Plant Community Types (PCTs) were identified following review of existing information and structural and floristic attributes recorded during site assessments (Table 8-3, *Figure 8-1*).

Table 8-3 Plant community types (PCTs) identified on the Proposal site

Vegetation Class (Keith 2004)	PCT ID	Plant Community Type	Estimated clearance of PCT since European settlement	Area (ha) within Proposal site
Sydney Sand Flats Dry Sclerophyll Forests	ME003	Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	50%	0.1 ha
Cumberland Dry Sclerophyll Forests	ME002	Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	95%	0.05 ha
Coastal Freshwater Lagoons	ME007	Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion	70%	0.01 ha

The justification for assigning PCTs is provided below in Table 8-4:

Table 8-4 Justification for identification of PCTs on the Proposal site

Plant Community Type	Species relied upon for ID of PCT	Justification of evidence used to identify a PCT
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	*Eucalyptus sclerophylla*	Previous regional mapping as an equivalent vegetation type Landscape position Characteristic tree species present Structure and species composition is broadly consistent with descriptions in VIS database and published references.
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	*Eucalyptus fibrosa* *Melaleuca decora*	Landscape position Characteristic tree species present Structure and species composition is consistent with descriptions in VIS database and published references.
Coastal freshwater lagoons of the Sydney Basin and South-east Corner	*Typha orientalis* *Bolboschoenus fluviatilis*	Previous regional mapping as an equivalent vegetation type Landscape position Structure and species composition is consistent with descriptions in VIS database and/or published references.

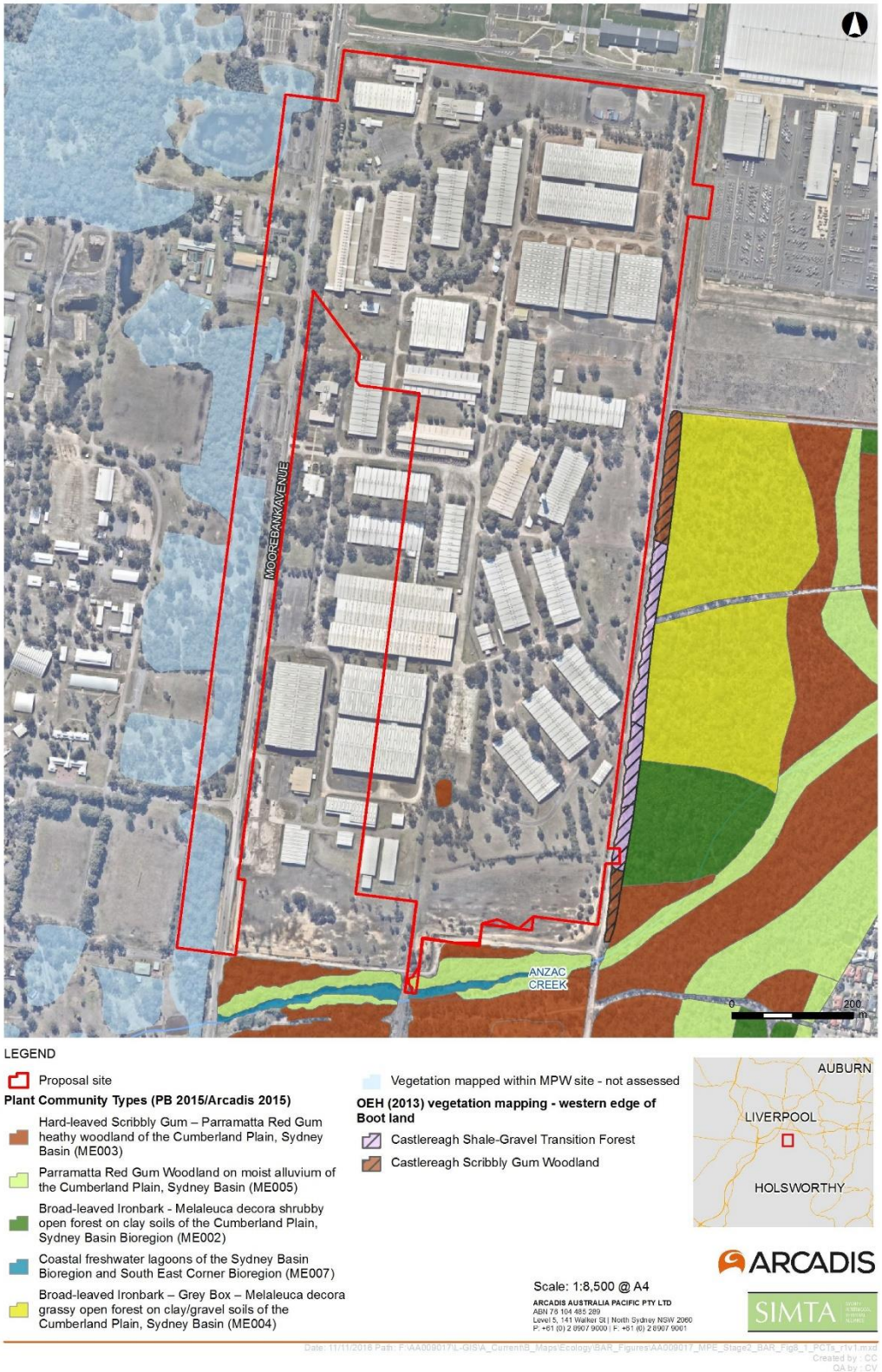

Figure 8-1 Plant Community Types (PCTs) mapped on the Proposal site

8.3.1 Threatened Ecological Communities

The three PCTS identified in the Proposal site fall within the definitions of threatened ecological communities listed under the TSC Act and/or EPBC Act, as per Table 8-5.

Table 8-5 Threatened ecological communities on the Proposal site

Plant Community Type	Equivalent TEC	TSC Act Status	EPBC Act Status
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin (ME003)	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Vulnerable	Endangered
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion (ME002)	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Endangered	Critically Endangered
Coastal freshwater lagoons of the Sydney Basin and South-east Corner (ME007)	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered	Not listed

8.4 Vegetation zones

For the purpose of the FBA assessment, the Proposal site contained three vegetation types in the moderate to good condition category. The vegetation zones are summarised in Table 8-6.

Table 8-6 Vegetation zones on the Proposal site

Vegetation zone	1	2	3
Vegetation class	Dry Sclerophyll forests (Shrub/grass)	Dry Sclerophyll forests (Shrub/grass)	Coastal Freshwater Lagoons
Biometric code	ME003	ME002	ME007
PCT name	Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain	Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain,	Coastal freshwater lagoons of the Sydney Basin and South-east Corner
Condition class	Moderate/Good	Moderate/Good	Moderate/Good
Area (ha)	0.1 ha	0.05 ha	0.01 ha
Plots	QA	Q10	Q9

8.5 Site value scores for vegetation zones

The site value score for each vegetation zone identified in the Proposal site was determined through assessment of site attribute data collected in vegetation plots. The site attribute data was entered into the credit calculator to generate site value scores. The site attribute data entered into the credit calculator is that presented in PB (2014) as shown in Table 8-7.

Table 8-7 Vegetation zone on the Proposal site

Plot Name	Site attributes									
	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL
ME003 Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion: Moderate/Good										
Bench mark	**40**	**10-20**	**23-33**	**12-24**	**0-10**	**12-24**	**-**	**1**	**1**	**30**
QA	29	32.5	13	24	20	18	46	1	0	38
ME002 Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion										
Bench mark	**35**	**9-31**	**6-42**	**12-61**	**6-24**	**9-46**	**-**	**3**	**1**	**30**
Q10	22	51.5	16.5	6	10	30	10	3	1	20
ME007 Coastal freshwater lagoons of the Sydney Basin and South-east Corner										
Bench mark	4	0-5	0-0	0-72	21-58	0-72	-	0	1	0
Q9	8	0	0	0	2	100	24	0	0	0

The site value scores for the vegetation zone are provided in Table 8-8.

Table 8-8 Area and site value score for vegetation zone

Vegetation Zone	Area mapped in Proposal site	Site value score
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin: Moderate/Good (ME003)	0.1 ha	68.23
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion (ME002)	0.05 ha	74.48
Coastal freshwater lagoons of the Sydney Basin and South-east Corner (ME007)	0.01 ha	64.10

8.6 Groundwater Dependent Ecosystems

Geotechnical and Phase 2 investigations of the Proposal site have found groundwater at depths of between 5.2 and 12.4 m BGL (1.7 and 9.11 m Australian Height Datum (AHD)). Groundwater flow is inferred to be west to the north-west towards the Georges River (Parsons Brinckerhoff 2014a).

It is probable, due to local hydrogeology, that groundwater across the Proposal site and the wider region is interconnected. As such, if stygofauna were present they are unlikely to be isolated to the vicinity of the Proposal site.

A search of the Australian Government's Atlas of Groundwater Dependent Ecosystems was undertaken on 7 April 2016. No data on subterranean groundwater-dependent ecosystems (GDEs) is available for the locality. Notwithstanding this, several GDEs with potential reliance on subsurface groundwater were identified in the locality including in the Proposal site (Bureau of Meteorology 2016). Results are mapped in Figure 8-2.

8.7 Fauna habitats

8.7.1 Terrestrial habitats

Landscaped areas occur across the majority of the Proposal site. Native vegetation has been predominantly cleared from these areas and persists as isolated trees amongst expanses of mown exotic and native grasses.

Isolated trees offer potential nesting, sheltering and roosting habitat to birds such as Pied Currawong (*Strepera graculina*) and Noisy Miner (*Manorina melanocephala*). Flowering eucalypts also provide foraging habitat for Grey-headed Flying Fox (*Pteropus poliocephalus)*. A small number of scribbly gums (*Eucalyptus sclerophylla)* located in the south of the Proposal site support small and medium-sized hollows, offering nesting habitat to hollow-dependent species such as Rainbow Lorikeet (*Trichoglossus haematodus*) and Scaly-breasted Lorikeet (*Trichoglossus chlorolepidotus*). Seven eucalypts in the Moorebank Avenue road reserve were identified as containing small hollows or bark fissures that represent habitat for microbats.

A diversity of microchiropteran bat species were recorded in cleared and disturbed areas, including White-striped Mastiff Bat (*Tadarida australis*), Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*), Little Forest Bat (*Vespadelus vulturnus*) and the threatened Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*).

Open grassy areas provide foraging habitat for ground-feeding birds such as White-winged Chough (*Corcorax melanorhamphos*), Red-rumped parrot (*Psephotus haematonotus*) and small terrestrial mammals such as the Brown Hare (*Lupus capensis*).

Scattered native and exotic shrubs and trees associated with the formalised drainage channels in the south of the Proposal site, such as Black She-oak (*Allocasuarina littoralis*), eucalypts, Camphor Laurel (*Cinnamomum camphora*) and *Cotoneaster* sp., offer foraging, sheltering and roosting habitat to birds such as Noisy Miner (*Manorina melanocephala*), Raven (*Corvus coronoides*) and Magpie Lark (*Grallina cyanoleuca*). Other small trees and shrubs throughout the Proposal site that may offer sheltering and nesting habitat to smaller birds are restricted to small areas of horticultural plantings.

Other fauna habitat features such as rocky features, well-developed leaf litter, ground timber and hollow logs are absent from cleared and disturbed areas. As a result, the availability of sheltering and foraging habitat for reptiles and cover-dependent terrestrial mammals is reduced. Depressions in open areas that contain temporary water following rain events offer habitat to colonising amphibians such as Common Eastern Froglet (*Crinia signifera*).

The buildings currently within the Proposal site offer limited habitat features to native fauna, although they may support potential roosting habitat for microchiropteran bats. Given that inspection of these buildings was not possible during site surveys, it is assumed that some of the buildings offer potential fauna habitat. Further discussion on impacts and mitigation is provided in Sections 10.2 and 11 respectively.

8.7.2 Aquatic habitats

Anzac Creek comprises a named waterway with intermittent flow supporting semi-permanent to permanent water in pools and as such, is classified as Class 3 (Minimal Fish Habitat) in accordance with Fairfull and Witheridge (2003).

Aquatic habitat types of Anzac Creek within the study area included soft substrate pools and extensive macrophyte cover. Water in Anzac Creek was mostly static and shallow; small pools were heavily vegetated with floating and emergent macrophytes.

The introduced Gambusia (*Gambusia holbrooki*) was recorded at Anzac Creek. One Long-fin Eel (*Anguilla reinhardtii*) was identified in the upper reaches of Anzac Creek within the MPW site (outside of the study area).

A total of 23 macroinvertebrate families were recorded in Anzac Creek (ALS 2011). Family diversity was generally low and many sensitive taxa were not recorded. Anzac Creek falls into AUSRIVAS Band B, indicating that the macroinvertebrate community was 'significantly impaired'; fewer families than expected were observed. This result may be attributed to a current/existing 'potential' impact on water quality or habitat quality or both (ALS 2011).

There is a network of formalised drainage channels in the south of the Proposal site. These channels do not all support permanent water; some flow only ephemerally following rain. Channels that support aquatic and fringing vegetation, such as *Typha* sp, offer habitat for reptiles and amphibians such as Common Eastern Froglet (*Crinia signifera*).

8.7.3 Habitat connectivity

The Proposal site is located within a relatively industrialised and urbanised landscape. Vegetation of landscaped areas is generally limited to single, isolated trees amongst expanses of mown exotic and native grasses; habitat features of these areas do not maintain connectivity with larger areas of habitat to the east and south.

The fragmented habitat within the majority of the Proposal site is further isolated from adjacent habitat due to the presence of significant barriers to fauna movement. These barriers include Moorebank Avenue and the chain-mesh fencing surrounding the MPE site. The chain-mesh fencing would limit movement into and through the Proposal site to small terrestrial mammals, reptiles, amphibians and birds and bats. Larger terrestrial mammals that may occur in the locality would be excluded from much of the Proposal site as a result.

The small area of the Proposal site that falls within the Boot land contains habitat that is continuous with approximately 83 hectares of native vegetation that maintains habitat connectivity within the Boot land.

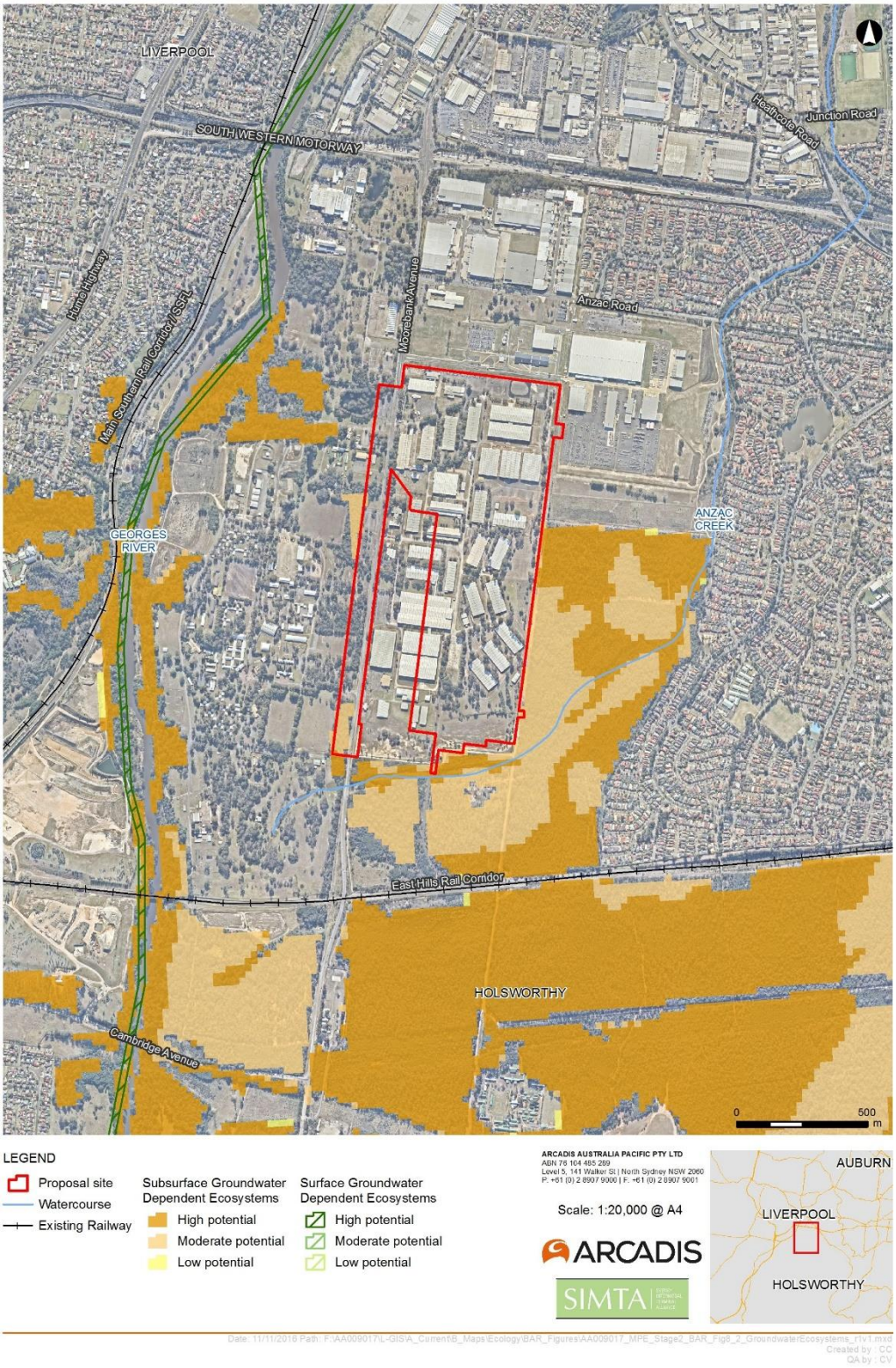

Figure 8-2 Groundwater-dependent ecosystems in the vicinity of the Proposal site (BOM 2016)

9 THREATENED SPECIES

9.1 Predicted Ecosystem credit species

The following species were derived from the PCTs identified on the Proposal site as predicted ecosystem credit species:

- Australian Painted Snipe (*Rostratula australis*)
- Barking Owl (*Ninox connivens*)
- Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis* subsp. *gularis*)
- Black-tailed Godwit (*Limosa limosa*)
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus subsp. victoriae*)
- Bush-stone Curlew (*Burhinus grallarius*)
- Diamond Firetail (*Stagonopleura guttata*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Freetail-bat (*Mormopterus norfolkensis*)
- Flame Robin (*Petroica phoenicea*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*)
- Little Eagle (*Hieraaetus morphnoides*)
- Little Lorikeet (*Glossopsitta pusilla*)
- New Holland Mouse (*Pseudomys novaehollandiae*)
- Painted Honeyeater (*Grantiella picta*)
- Powerful Owl (*Ninox strenua*)
- Scarlet Robin (*Phoenica boodang*)
- Speckled Warbler (*Chthonicola sagittata*)
- Spotted Harrier (*Circus assimilis*)
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
- Swift Parrot (*Lathamus discolor*)
- Varied Sitella (*Daphoenositta chrysoptera)*
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)

Each species has been assessed for potential presence in each of the vegetation zones in the Proposal site in Table 9-1 using information obtained from the Threatened Species Profiles Database (TSPD).

Table 9-1 Predicted ecosystem credit species presence assessment

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Australian Painted Snipe *Rostratula australis* E-TSC Act E-EPBC Act	ME007	<5 ha	0.75	Areas of tussock grass, lignum, reeds, sedges or rushes within 500 m of, and including, shallow wetlands or ephemeral or permanent waterbodies, or inundated grasslands/paddocks.	Yes	Moderate
Barking Owl *Ninox connivens* V-TSC Act	ME002 ME003	25-100 ha	0.325	Foraging habitat includes associated vegetation types and up to 250 m from these into adjoining grassland. Larger trees and hollow trees facilitate a more diverse and abundant prey base, thus improving breeding success. Living or dead trees with hollows >20 cm diameter that are > 4 m above the ground are required for breeding.	Yes	Moderate
Black-chinned Honeyeater (eastern subspecies) *Melithreptus gularis* subsp. *gularis* V-TSC Act	ME002 ME003	5-25 ha	0.75	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares.	Yes	Moderate
Black-tailed Godwit *Limosa limosa* V-TSC Act	ME007	<5 ha	0.375	The species breeds in the northern hemisphere. Foraging and refuge habitat comprise sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	No	Unlikely

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Brown Treecreeper (eastern subspecies) *Climacteris picumnus* subsp. *victoriae* V-TSC Act	ME002	5-25 ha	0.5	Associated vegetation types provide foraging and refuge habitat for the species. Hollows >6cm in live trees or in dead standing or fallen timber provide breeding habitat.	Yes	Unlikely
Bush Stone-curlew *Burhinus grallarius* E-TSC Act	ME002 ME003	25-100 ha	0.375	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Associated vegetation types provide foraging and refuge habitat for the species. Open grassy woodland with fallen dead timber provides breeding habitat.	Yes	Unlikely
Diamond Firetail *Stagonopleura guttata* V-TSC Act	ME002 ME003	<5 ha	0.75	Foraging habitat includes associated vegetation types with native grassy understorey or adjoining native grassland. Does not occur within grasslands which are further than 1.5 km from trees or woodland. Breeding occurs in vegetation with small patches of shrubs.	Yes	Unlikely
Eastern False Pipistrelle *Falsistrellus tasmaniensis* V-TSC Act	ME002 ME003	5-25 ha	0.45	Prefers moist habitats, with trees taller than 20 m. Associated vegetation types provide foraging habitat for the species. Species roosts in live or dead hollow-bearing trees, under bark, caves buildings.	Unlikely – trees generally less than 20m tall	Unlikely
Eastern Freetail-bat *Mormopterus norfolkensis* V-TSC Act	ME002 ME003	5-25 ha	0.45	Associated vegetation types provide foraging habitat for the species. Species roosts in tree hollows, loose bark or man-made structures. Breed in hollows in dead or alive trees.	Yes	High

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Flame Robin *Petroica phoenicea* V-TSC Act	ME002 ME003	25-100 ha	0.75	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense.	No. Species prefers tall forest with clearings or open understorey. This veg zone is not tall or moist.	Unlikely
Gang-gang Cockatoo *Callocephalon fimbriatum* V-TSC Act	ME002 ME003	<5 ha	0.5	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Favours old growth attributes required for nesting and roosting purposes. Uses hollows for breeding >10cm diameter and >9m above the ground.	Yes	Moderate
Greater Broad-nosed Bat *Scoteanax rueppellii* V-TSC Act	ME002 ME003	<5 ha	0.45	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	Yes	Moderate
Hooded Robin (south-eastern form) *Melanodryas cucullata* subsp. *cucullata* V-TSC Act	ME002 ME003	5-25 ha	0.6	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Yes	Unlikely
Little Eagle	ME002 ME003	<5 ha	0.725	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Yes	Moderate

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Hieraaetus morphnoides V-TSC Act				Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.		
Little Lorikeet *Glossopsitta pusilla* V-TSC Act	ME002 ME003	<5 ha	0.575	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	Yes	High
New Holland Mouse *Pseudomys novaehollandiae* V-TSC Act	ME003	<5 ha	0.375	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Lives predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	Marginal	Unlikely
Painted Honeyeater *Grantiella picta* V-TSC Act	ME002	<5 ha	0.75	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	Yes	Unlikely
Powerful Owl *Ninox strenua* V-TSC Act	ME002 ME003	>100 ha	0.325	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation. Nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Yes	Moderate

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Scarlet Robin *Petroica boodang* V-TSC Act	ME002 ME003	25-100 ha	0.75	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Abundant logs and fallen timber are important habitat components.	Yes	Moderate
Speckled Warbler *Chthonicola sagittata* V-TSC Act	ME002 ME003	5-25 ha	0.375	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	Yes	Unlikely
Spotted Harrier *Circus assimilis* V-TSC Act	ME007	<5 ha	0.725	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No	Unlikely
Spotted-tailed Quoll *Dasyurus maculatus* V-TSC Act E-EPBC Act	ME002 ME003	25-100 ha	0.375	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	Yes	Unlikely

Predicted ecosystem credit species	Associated PCTs found on Proposal site	Patch size	Tg value	Habitat requirements (from TSPD)	Ecosystem credit species habitat presence on Proposal site?	Species likelihood of occurrence on Proposal site
Swift Parrot *Lathamus discolor* E-TSC Act E-EPBC Act	ME002 ME003	<5 ha	0.75	Occurs in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	Yes	Moderate
Varied Sittella *Daphoenositta chrysoptera* V-TSC Act	ME002 ME003	5-25 ha	0.75	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Yes	Moderate
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* V-TSC Act	ME002 ME003	<5 ha	0.45	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Yes	Moderate

9.2 Predicted Species credit species

9.2.1 Flora

The following threatened flora species listed under the TSC Act were identified in the credit calculator as predicted flora species credit species:

- *Acacia bynoeana* Bynoe's Wattle
- *Acacia pubescens* (Downy Wattle)
- *Caladenia tessellata* (Thick Lip Spider Orchid)
- *Callistemon linearifolius* (Netted Bottle Brush)
- *Dillwynia tenuifolia*
- *Epacris purpurascens* subsp. *purpurascens*
- *Grevillea parviflora subsp. parviflora* (Small-flower Grevillea)
- *Gyrostemon thesioides*
- *Hibbertia sp. Bankstown*
- *Leucopogon exolasius* (Woronora Beard-heath)
- *Persoonia nutans* (Nodding Geebung)
- *Pimelea curviflora subsp. curviflora*

Table 9-2 assesses the potential for these flora species credit species to be present on the Proposal site using information from the TSPD. It also identifies species that cannot withstand further loss and whether further action is required.

Four of the threatened flora species credit species identified by the credit calculator were recorded in the Boot land to the south and east of the Proposal site: *Acacia bynoeana, Acacia pubescens, Persoonia nutans* and *Grevillea parviflora* subsp. *parviflora.* Another threatened species not identified by the calculator, *Hibbertia puberula* subsp. *puberula,* was also recorded in the Boot land. The locations of the threatened flora species recorded in areas adjacent to the Proposal site are shown on Figure 9-1.

The Proposal site represents low quality habitat for threatened flora species, with highly modified and fragmented native vegetation. Targeted searches for the threatened flora species identified in the calculator, with particular focus on those recorded to the south and east in the Boot land, were conducted in areas of marginal habitat in the south of the Proposal site in June and October 2016. No threatened flora species were identified, and following targeted surveys are considered unlikely to occur.

The locations of *Persoonia nutans* previously identified along the eastern boundary of the MPE site were inspected in October 2016 and found to be completely cleared, with no evidence of the species presence remaining. There are known locations of *Persoonia nutans* in the Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland adjoining the southern extent of the Proposal site (Figure 9-1).

Three threatened flora populations were also identified in the credit calculator as potentially occurring:

- *Acacia prominens* (Gosford Wattle) population, Hurstville and Kogarah local government areas
- *Pomaderris prunifolia* (Plum-leaf Pomaderris) population, Parramatta, Auburn, Strathfiedl and Bankstown local government areas
- *Wahlenbergia multicaulis* (Tadgells Bluebell) population, Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strtahfield local government areas.

None of the identified threatened populations occur within the Liverpool local government area, in which the Proposal site is located.

Table 9-2 Flora species credit species and their presence status

Predicted species credit species	Associated PCTs on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Acacia bynoeana Bynoe's Wattle E-TSC Act V-EPBC Act	ME003	Heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes slightly disturbed sites. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Marginal habitat may be present in ME003	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required
Acacia pubescens Downy Wattle V-TSC Act V-EPBC Act	ME002	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Marginal habitat present in ME002	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required
Caladenia tessellata Thick Lip Spider Orchid E – TSC Act V – EPBC Act	ME002 ME003	Generally found in grassy sclerophyll woodland on clay loam or sandy soils.	Marginal habitat present in ME002	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required

Predicted species credit species	Associated PCTs on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Callistemon linearifolius Netted Bottle Brush V-TSC Act	ME002	For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Marginal habitat present in ME002	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required
Dillwynia tenuifolia V-TSC Act	ME002 ME003	May be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Marginal habitat may be present in ME003	Targeted searches within potential habitat areas	June 2016, October 2016September 2014	Unlikely. The species was not found during targeted surveys.	No	Not required
Epacris purpurascens subsp. *purpurascens* V-TSC Act	ME002	Found in a range of habitat types, most of which have a strong shale soil influence.	Marginal habitat present in ME002.	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required

Predicted species credit species	Associated PCTs on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea V-TSC Act V-EPBC Act	ME002 ME003	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park.	Marginal habitat may be present in ME003.	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely -although populations of the species were recorded to the south and east, it was not found during targeted surveys.	No	Not required
Gyrostemon thesioides E-TSC Act	ME002	Has only been recorded at three sites in NSW, near the Colo, Georges and Nepean River. Grows on hillsides and riverbanks and may be restricted to fine sandy soils.	Habitat in the Proposal site was considered unlikely to be suitable.	N/A – species not targeted as unlikely to occur.	June 2016, October 2016	Unlikely.	No	Not required

Predicted species credit species	Associated PCTs on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Hibbertia sp. *Bankstown* (syn. *Hibbertia puberula* subsp. *glabrescens*) CE-TSC Act CE-EPBC Act	ME002	The species is currently known to occur in only one population at Bankstown Airport. The airport site is very heavily modified from the natural state, lacks canopy species and is currently a low grass/shrub association with many pasture grasses and other introduced herbaceous weeds. Soil at the site is a sandy (Tertiary) alluvium with a high silt content.	Habitat in the Proposal site was considered unlikely to be suitable.	N/A – species not targeted as unlikely to occur.	June 2016, October 2016	Unlikely.	No	Not required
Leucopogon exolasius Woronora Beard-heath V-TSC Act V-EPBC Act	ME003	Occurs in woodland on sandstone.	Marginal habitat may be present in ME003.	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely. The species was not found during targeted surveys.	No	Not required
Persoonia nutans Nodding Geebung E-TSC Act E-EPBC Act	ME002 ME003	This species occupies tertiary alluvium, extending onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	Marginal habitat may be present in ME002 and ME003.	Targeted searches within potential habitat areas	June 2016, October 2016	Unlikely -although populations of the species were recorded to the south and east, it was not found during targeted surveys.	No	Not required

Predicted species credit species	Associated PCTs on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Pimelea curviflora subsp. *curviflora* V-TSC Act V-EPBC Act	ME003	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-*west*. Distribution associated with shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	No. The Proposal site is outside of the known distribution of the species in the Sydney region. Typical habitat does not occur in the Proposal site,	N/A – species not targeted as unlikely to occur.	N/A	Unlikely.	No	Not required

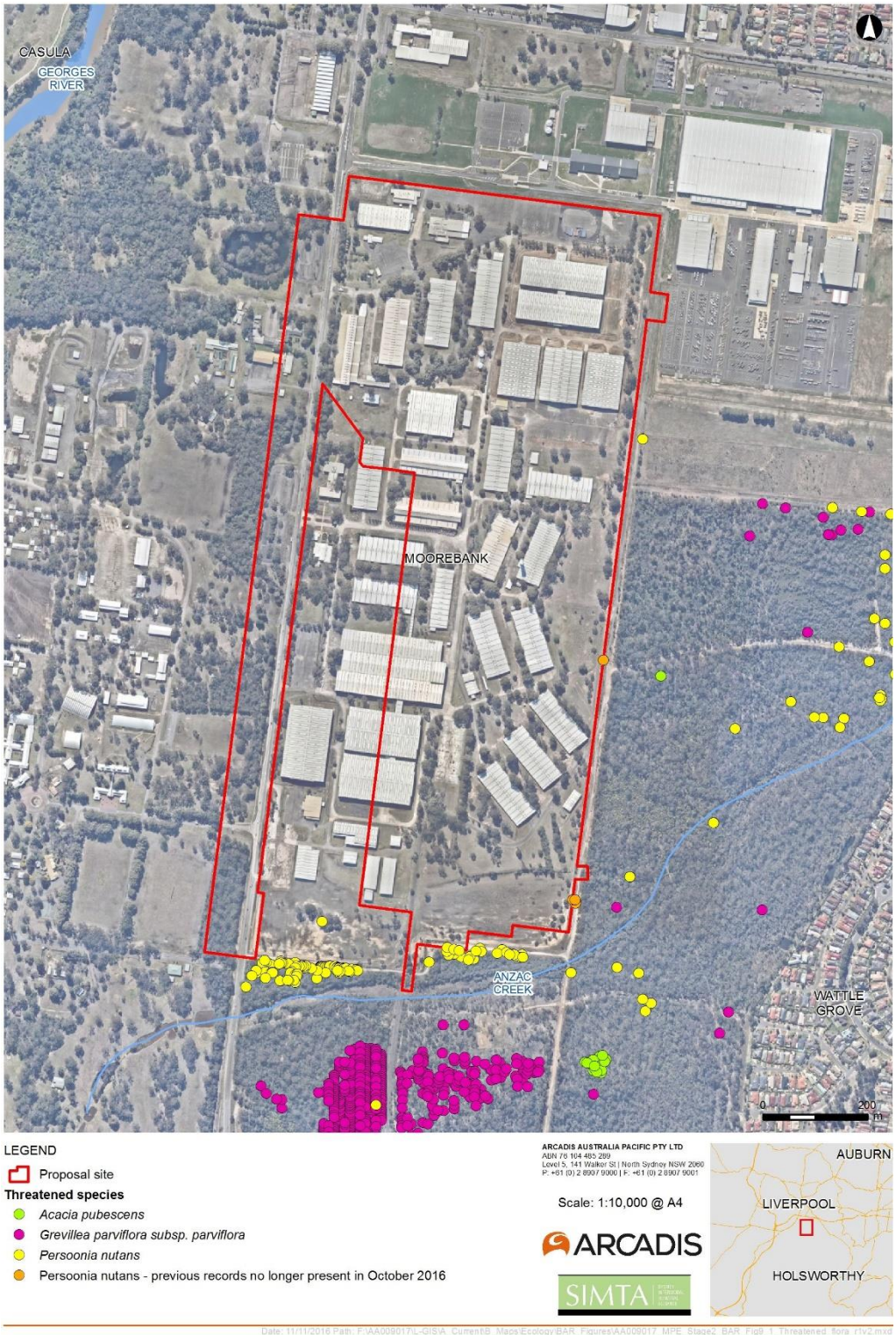

Figure 9-1 Threatened flora species recorded near the Proposal

9.2.2 Fauna

The following were identified in the credit calculator as predicted fauna species credit species:

- Cumberland Plain Land Snail (*Meridolum corneovirens*)
- Eastern Pygmy-possum (*Cercartatus nanus*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Koala (*Phascolarctos cinereus*)
- Regent Honeyeater (*Anthochaera phrygia*)
- Squirrel Glider (*Petaurus norfolkensis*)

Table 9-3 assesses the potential for fauna species credit species to be present on the Proposal site using information obtained from the TSPD. Habitat requirements for each species were assessed against the habitat values on the Proposal site. Habitat information was obtained from OEH's Threatened Species Profiles Database. Where applicable, targeted survey methods and timing for each identified species is noted and an assessment of the presence status of each species was determined based on targeted survey results and habitat presence. Table 9-3 also identifies species that cannot withstand further loss and whether any further assessment is required.

Of the six species, none are considered likely to occur on the Proposal site based on the assessment provided in Table 9-3.

Table 9-3 Fauna species credit species and their presence status

Predicted species credit species	Associated PCTs found on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Cumberland Plain Land Snail *Meridolum corneovirens* E-TSC Act	ME002 ME003	Occurs in bark or leaf litter accumulation in associated vegetation types. Primarily inhabits Cumberland Plain Woodland; also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. It lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	Marginal habitat may be present in ME002 and ME003, however there was minimal leaf litter observed within the small area to be impacted	N/A	N/A	Unlikely.	Yes	Not required
Eastern Pygmy-possum *Cercartetus nanus* V-TSC Act	ME003	Inhabits woodlands and heath, occasionally rainforest where it forages for nectar and pollen of banksias, eucalypts and bottlebrushes. Shelters in tree hollows, rotten stumps, holes in the ground or abandoned bird-nests.	Potential habitat on site in ME003 is unlikely to be occupied by this species due to fragmentation.	N/A	N/A	Unlikely.	Yes	Not required

Predicted species credit species	Associated PCTs found on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Green and Golden Bell Frog *Litoria aurea* E-TSC Act V-EPBC Act	ME002 ME003	Breeding habitat comprises natural and constructed waterbodies including wetlands, stormwater detention basins, marshes, dams and streams-side, preferably those that are unshaded but with fringing vegetation. Forage for invertebrates within grassy habitats near breeding habitat. May shelter under vegetation, rocks and building materials such as fibro, sheet iron or bricks.	Marginal habitat present in basins and drainage lines. Infestation of *Gambusia holbrooki* (a predator of tadpoles) reduces the likelihood of occurrence.	Call playback and night time water body searches in two locations within marginal potential habitat.	May 2011	Unlikely. Habitat is marginal and species not recorded during targeted surveys.	Yes	Not required
Koala *Phascolarctos cinereus* V-TSC Act V-EPBC Act	ME002 ME003	Species inhabits eucalypt woodlands and forests. The species feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Potential habitat on site in ME003 is unlikely to be occupied by this species due to fragmentation. ME002 does not include potential feed trees.	Spotlight survey from a vehicle and along foot traverses for direct visual observations of animal activity	May 2011	Unlikely.	Yes	Not required

Predicted species credit species	Associated PCTs found on Proposal site	Habitat requirements (from TSPD)	Habitat presence on Proposal site?	Targeted survey effort/ methods	Targeted survey timing	Presence status	Can species withstand further loss?	Further action?
Regent Honeyeater *Anthochaera phrygia* CE-TSC Act E-EPBC Act	ME002 ME003	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Only three known key breeding regions remaining: north-east Victoria, and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Potential habitat on site in ME003 is unlikely to be occupied by this species due to fragmentation. May forage sporadically on the site in winter but unlikely to breed locally.	Diurnal visual and aural observations of bird calls by ecologist with experience in bird identification.	May 2011	Unlikely. The species was not found during targeted surveys. Species records within 10km are 20 years old or more.	Yes	Not required
Squirrel Glider *Petaurus norfolcensis* V-TSC Act	ME002 ME003	Inhabits Blackbutt-Bloodwood forest with heath understorey in coastal areas. Require abundant tree hollows for refuge and nest sites. Forages for nectar, sap, invertebrates and pollen.	No. Species requires abundant hollows. Hollows are a limited resource in the Proposal site.	Spotlight survey from a vehicle and along foot traverses for direct visual observations of animal activity	May 2011	Unlikely. The species was not found during targeted surveys.	Yes	Not required

10 AVOID AND MINIMISE IMPACTS

The FBA requires consideration of the steps taken to avoid and minimise the direct and indirect impacts of a development proposal on biodiversity values. Section 8.3.2 of the FBA sets out guidelines for the avoidance and minimisation of impacts to biodiversity during all phases of the project life cycle, comprising:

- Site selection phase
- Planning phase
- Construction phase
- Operational phase

10.1 Measures to avoid impacts

10.1.1 Site selection phase

The guidelines for site selection phase in sections 8.3.2.2 to 8.3.2.6 of the FBA and the biodiversity assessment process undertaken for the Proposal are presented in Table 10-1.

Table 10-1 Site selection phase FBA guidelines for avoidance and minimisation of biodiversity impacts

FBA section	FBA guidelines	Consistency of the Proposal with FBA guidelines
8.3.2.2	Selecting a suitable development site for a Major Project or a route for linear projects, should be informed by knowledge of biodiversity values. An initial desktop assessment of biodiversity values would assist in identifying areas of native vegetation cover, EECs or CEECs, and potential habitat for threatened species.	A desktop assessment of the biodiversity values of the MPE site was undertaken as part of a preliminary assessment of the MPE Project and as part of the Ecological Assessment for the Concept Plan Approval (MP10_0193).
8.3.2.3	Stage 1 of the FBA will provide the preliminary information necessary to inform project planning. Early consideration of biodiversity values is recommended in site selection, or route selection for linear projects, and the planning phase.	Early consideration of biodiversity values was undertaken in preliminary assessments and in the Ecological Assessment for the Concept Plan Approval (MP10_0193).
8.3.2.4	The site/route selection process should include consideration and analysis of the biodiversity constraints of the proposed development site and consider the suitability of the Major Project based on the types of biodiversity values present on the development site.	The majority of the MPE site is located within cleared and disturbed land, with no native vegetation communities and low habitat values for flora and fauna.

FBA section	FBA guidelines	Consistency of the Proposal with FBA guidelines
8.3.2.5	When considering and analysing the biodiversity constraints for the purpose of selecting a development site, the following matters should be addressed: (a) whether there are alternative sites within the property on which the proposed development is located where siting the proposed Major Project would avoid and minimise impacts on biodiversity values (b) how the development site can be selected to avoid and minimise impacts on biodiversity values as far as practicable (c) whether an alternative development site to the proposed development site, which would avoid adversely impacting on biodiversity values, might be feasible.	There were limited alternative options for a viable intermodal facility within the area. The MPE site represents an ideal position for an intermodal facility as: ▪ There is a direct intersection linking the adjacent Moorebank Avenue to the M5 Motorway reducing the need for road works and subsequent additional biodiversity impacts. ▪ It is zoned as industrial land for use as industrial warehousing. ▪ Buffer zones are provided between the facility and nearby residential areas. ▪ It is within the freight catchment for which there is a freight demand, resulting in minimal use of road transport between origins / destinations and the IMT. The location has also been identified in both state and federal strategies as the best and only location for an IMT facility to service a defined catchment in South-Western Sydney.
8.3.2.6	For linear projects, the route selection process must include consideration and an analysis of the biodiversity constraints of the various route options. In selecting a preferred option, loss of biodiversity values must be weighed up and justified against social and economic costs and benefits.	Not applicable – the Proposal is not a linear project.

The Proposal site has been granted approval, in the form of a Concept Plan (MP10_0193), for the development of an intermodal facility and therefore is considered suitable.

10.1.2 Planning phase

The guidelines for planning phase in sections 8.3.2.7 to 8.3.2.8 of the FBA and the biodiversity assessment process undertaken for the Proposal are presented in Table 10-2.

Table 10-2 Planning phase FBA guidelines for avoidance and minimisation of biodiversity impacts

FBA section	FBA guidelines	Consistency of the Proposal with FBA guidelines
8.3.2.7	Once a suitable development site has been selected, further analysis of the biodiversity constraints of the proposed development site can then be used to inform concept planning, project siting and design. This includes the proposed location of temporary construction infrastructure such as roads, camps, stockpile sites and parking bays.	The identified biodiversity constraints have been considered during the development of the MPE Project, and the biodiversity impacts of the Proposal have been approved within the Concept Plan.
8.3.2.8	The Major Project should be located in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower site value) or which avoid an EEC or CEEC. The following matters should be considered for this purpose: 1. siting of the project – the Major Project should be located in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower site value score) or which avoid an EEC or CEEC.	The majority of the Proposal site is located within cleared and disturbed land, with no native vegetation communities and low habitat values for flora and fauna. The areas of native vegetation to be impacted by the Proposal are a fragmented, isolated patch (0.1 ha) and a small area (0.05 ha) at the edge of a much larger patch of native vegetation that will be conserved as part of offsetting for the larger Moorebank Project. A very small area of wetland vegetation (0.01 ha) within Anzac Creek may also be removed.
	2. minimise the amount of clearing or habitat loss – the Major Project (and associated construction infrastructure) should be located in areas that do not have native vegetation, or in areas that require the least amount of vegetation to be cleared (i.e. the development footprint is minimised), and/or in areas where other impacts to biodiversity will be the lowest	Given the location and nature of the Proposal and its context with regard to existing road and rail infrastructure, there is no scope for using alternative locations to entirely avoid impacts on biodiversity. Given the scale and type of development, and the raising of the site levels, there are very few possibilities for the incorporation of small isolated patches of vegetation into the design of a large industrial and warehouse development. The Proposal has minimised clearing and habitat loss, as the Proposal site is largely comprised of cleared and disturbed areas. The very small amount of native vegetation to be impacted (0.16 ha) consists of small, fragmented patches of vegetation and the disturbed edges of larger patches.

FBA section	FBA guidelines	Consistency of the Proposal with FBA guidelines
	3. loss of connectivity – some developments can impact on the connectivity and movement of species through areas of adjacent habitat. Minimisation measures may include providing structures that allow movement of species across barriers or hostile gaps.	The Proposal site is located within an urban area and consists of predominantly cleared former Defence land. The development of the site will not result in a change in the connectivity value of adjoining areas of habitat.
	4. other site constraints – any other constraints that the assessor has considered in determining the siting and layout of the Major Project, e.g. bushfire protection requirements including clearing for asset protection zones, flood planning levels, servicing constraints.	N/A

10.2 Unavoidable impacts

Likely impacts are those impacts that may arise as a result of unmitigated activities associated with the construction of the Proposal. Potential impacts specified in point 11a) of the SEARs as requiring assessment are considered below.

Endangered (and vulnerable) ecological communities

The Proposal will require clearing of all vegetation within the Proposal site, including threatened ecological communities. The threatened ecological communities to be directly impacted and the total areas of impact are listed in Table 10-3.

Table 10-3 Areas of direct impact to threatened ecological communities

Plant Community Type	Equivalent TEC	Conservation status	Area of impact
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Vulnerable (TSC Act) Endangered (EPBC Act)	0.1 ha
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Endangered (TSC Act) Critically Endangered (EPBC Act)	0.05 ha
Coastal freshwater lagoons of the Sydney Basin and South-east Corner	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered (TSC Act)	0.01 ha

The total area of native vegetation to be cleared is 0.16 ha; the areas to be cleared consist of small, fragmented patches of vegetation and the disturbed edges of larger patches. It should be noted that clearing of 0.01 ha of Coastal freshwater lagoons may not be required, and the assessment has assumed a worst case scenario when considering impacts to this PCT.

Ecosystem credits are required to offset the impacts to these threatened ecological communities. The credit requirements are provided in Section 12.1.1.

Threatened flora and fauna species and their habitat

The Proposal will have minimal impact on threatened flora species listed under the TSC Act and EPBC Act. Populations of several threatened plant species have been identified in the Boot land, to the east and south of the Proposal site. Potential habitat for these species in the Proposal site is poor quality, and subject to fragmentation and/or edge effects. Targeted surveys did not identify any threatened flora species in the Proposal site.

There are known locations of *Persoonia nutans* in the Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland adjoining the southern extent of the Proposal site. There is potential for indirect impacts on these individuals, such as increased sedimentation, changes to hydrology and increased risk of weed invasion, from adjoining areas of proposed fill.

The clearing of vegetation will result in the loss of specific fauna habitat components, including live trees, tree hollows, foraging resources, and groundlayer habitats such as ground timber and minor leaf litter. These resources offer sheltering, foraging, nesting and roosting habitat to a variety of fauna, including threatened fauna, occurring within the locality. The Proposal will require removal of seven trees identified as containing small hollows or bark fissures, all of which are located in the Moorebank Avenue road reserve.

The removal of buildings currently within the Proposal site may remove potential marginal roosting habitat for microchiropteran bats; this habitat is not considered likely to be significant. It is recommended that buildings are checked for roosting bats by an ecologist prior to demolition, to avoid potential mortality.

The assessment of ecosystem credit species associated with PCTs on the Proposal site found that two threatened fauna species have a high likelihood of occurrence and 11 have a moderate likelihood of occurrence (Table 9-1). Ecosystem credits are required to offset the impacts to these threatened fauna species; the credit requirements are provided in Section 12.1.1.

The six fauna species credit species identified by the credit calculator were all assessed as being unlikely to occur on the Proposal site.

Groundwater dependent ecosystems

Impacts to groundwater dependent ecosystems, such as drawdown of groundwater from the root zone, may occur as a result of earthworks and geotechnical construction activities. This may have the potential to affect adjacent areas of retained vegetation and habitat that may utilise the shallow groundwater aquifers present. The vegetation adjoining Anzac Creek to the south of the Proposal site has been identified as having high potential for groundwater interaction.

Any impacts are expected to be minor given the limited scope of excavation proposed, particularly in the southern portion of the proposal site. The detailed design process would further consider potential groundwater impacts and effects on groundwater-dependent ecosystems. In most cases, any impacts would be mitigated at the design phase.

Impacts on wildlife and habitat corridors and habitat fragmentation

The small areas of habitat to be removed from within the Proposal site for the Proposal are currently fragmented by the existing development. There is good quality fauna habitat immediately adjacent to the Proposal site, in the Boot land. The Boot land contains approximately 83 hectares of native vegetation in moderate to good condition.

The Proposal has very minor overlap with the Boot land, and would not alter the existing connectivity values, further sever native vegetation or form a hard barrier within the connecting link.

Riparian land and aquatic habitat

Construction activities in proximity to Anzac Creek have the potential to adversely affect aquatic habitat, particularly the potential construction of a swale in the south of the Proposal site to drain stormwater to Anzac Creek. The potential swale is located in the Boot land, in a depression at the base of the existing constructed rail spur, which appears to currently act as an informal drain from the track to the north to Anzac Creek. The construction of the swale is unlikely to increase the volumes of sediments carried downstream or reduce water quality downstream.

Approximately 0.01 hectares of instream vegetation within Anzac Creek may be removed for construction of the swale. Other minor areas of aquatic habitat will be lost, such as the formalised channels/swales in the south of the Proposal site that support aquatic and fringing vegetation and, offer habitat for reptiles and amphibians such as Common Eastern Froglet (*Crinia signifera*).

Anzac Creek generally only flows in periods of rain within the study area and forms large stagnant pools with dense emergent vegetation. Fish passage is unlikely to be impacted during the works at Anzac Creek, but could be affected if flow is high due to recent rainfall and as such construction activities would be timed to avoid high flow and times when rain is forecast.

11 MITIGATION OF IMPACTS

Biodiversity impacts cannot be avoided for many aspects of the Proposal. As such, the measures in Table 11-1 should be implemented to mitigate these impacts during construction and operation.

Table 11-1 Measures to be implemented to minimise impacts on biodiversity

Mitigation measure	Outcome	Timing	Responsibility
A Construction Flora and Fauna Management Plan (CFFMP) would be prepared as part of the CEMP for the Proposal. Native vegetation clearing for southern and eastern swales located outside of the MPE site would not occur until the Flora and Fauna Management Plan is approved. This would include the following: • Clear identification of vegetation exclusion zones • Site induction procedure, including briefings regarding the local threatened flora and local fauna of the site and protocols to be undertaken if they are encountered • A pre-start up check for sheltering native fauna of all infrastructure, plant and equipment and/or during relocation of stored construction materials • Application of speed limits in areas adjacent to native vegetation.	Flora and fauna would be managed in accordance with the requirements of the FFMP; prevention of over clearing of vegetation; prevention of weed establishment and invasion.	Pre-construction and construction	SIMTA and construction contractor

Mitigation measure	Outcome	Timing	Responsibility
The threatened plant populations identified to the south of the Proposal site would be protected by a minimum 10 metre buffer between the edge of the area of occupied habitat and the proposed works. Where a 10m buffer cannot be implemented, further assessment of impacts would be required and alternative mitigation strategies would be considered.	Prevention of indirect impacts to threatened plant species.	Construction	Construction contractor
Potential bat roosting locations in buildings to be demolished would be checked, as far as is practicable, by a qualified ecologist or wildlife carer for presence of bats prior to demolition. Any bats found would be relocated.	Prevents fauna injury/mortality	Construction	Construction contractor
Undertake a two-stage approach to clearing: ▪ Remove non-hollow bearing trees at least 48 hours before habitat trees are removed. ▪ Hollow bearing trees are to be knocked with an excavator bucket or other machinery to encourage fauna to evacuate the tree immediately prior to felling. ▪ Felled trees must be left for a short period of time on the ground to give any fauna trapped in the trees an opportunity to escape before further processing of the trees.	Prevents fauna injury/mortality	Construction	Construction contractor

Mitigation measure	Outcome	Timing	Responsibility
Felled hollow bearing trees must be inspected by an ecologist as soon as possible (not longer than 2 hours after felling).			
Site inductions are to include a briefing regarding the local fauna of the site and protocols to be undertaken if fauna are encountered.	Prevents fauna injury/mortality	Construction	Construction contractor
If any animal is injured, contact the relevant local wildlife rescue agency (e.g. WIRES) and/or veterinary surgery as soon as practical. Until the animal can be cared for by a suitably qualified animal handler, if possible minimise stress to the animal and reduce the risk of further injury by: ▪ Handling fauna with care and as little as possible. ▪ Covering larger animals with a towel or blanket and placing in a large cardboard box. ▪ Placing small animals in a cotton bag, tied at the top. Keeping the animal in a quiet, warm, ventilated and dark location.	Prevents fauna injury/ mortality	Pre-construction, construction and operation	Construction contractor and SIMTA

Mitigation measure	Outcome	Timing	Responsibility
Directional lighting will be used where lighting is required in construction areas.	Minimises disruption to fauna foraging, nesting or roosting behaviours	Construction	Construction contractor
Frequent maintenance of construction machinery and plant will be undertaken to minimise unnecessary noise.	Minimises disruption to fauna foraging, nesting or roosting behaviours	Construction	Construction contractor
A Flora and Fauna Management Plan would be prepared as part of the OEMP for the Proposal. This FFMP would focus on minimising impacts on biodiversity values on the adjacent Boot Land.	Prevention of impacts to flora and fauna within conservation area.	Pre-construction/construction	Construction contractor

12 OFFSETTING IMPACTS

A comprehensive Biodiversity Offset Strategy (BOS) for the MPE Project is required to be prepared and implemented under the MPE Concept Plan Approval. The BOS will be prepared in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* including the Framework for Biodiversity Assessment (OEH 2014), consistent with the 'avoid, minimise or offset' principle.

12.1 Offset credit requirements

Under the *NSW Biodiversity Offsets Policy for Major Projects*, a biobanking agreement is required to be used to secure an offset site. The ecosystem and species credit offset requirements for the biodiversity impacts of the Proposal are detailed below. The full credit reports for both calculations are provided in Appendix A.

12.1.1 Impacts on native vegetation

Loss of landscape and site value for each PCT identified on the Proposal site and its associated ecosystem species, as determined using the credit calculator, is presented in Table 12-1. The PCTs to be offset are shown in *Figure 8-1*.

Table 12-1 Impact summary for PCTs and associated ecosystem credit species requiring offsets and their required credits

Vegetation zone	Associated EECs and/or Threatened Species	Loss in landscape value	Loss in site value score	Number of Ecosystems credits required
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin (ME003): Moderate/Good	Castlereagh Scribbly Gum Woodland of the Sydney Basin bioregion (VEC)	12	68.23	4
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion (ME002): Moderate/Good	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion	12	74.48	3
Coastal freshwater lagoons of the Sydney Basin and South-east Corner (ME007): Moderate/Good	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	12	64.10	1

13 CONCLUSION

This Biodiversity Assessment Report (BAR) has been prepared for the Proposal in accordance with the Framework for Biodiversity Assessment (FBA), as required by the SEARs.

The assessment is based on desktop research and detailed field surveys, undertaken on a number of occasions between 2011 and 2015. Supplementary field investigations of the Proposal site were conducted in June and October 2016. The biodiversity impacts and offset requirements for the Proposal were calculated using the FBA Credit Calculator in accordance with the FBA guidelines.

The vegetation within the Proposal site consisted predominantly of planted and disturbed vegetation. Native vegetation within the Proposal site consists of small, fragmented patches of vegetation and the disturbed edges of larger patches.

Three native Plant Community Types (PCTs) were identified following review of existing information and structural and floristic attributes recorded during site assessments. The three PCTs fall within the definition of threatened ecological communities listed under the TSC Act and/or the EPBC Act, based on analysis of existing vegetation maps and ground truthing:

Table 13-1 Threatened ecological communities on the Proposal site

Plant Community Type	Equivalent TEC	TSC Act Status	EPBC Act Status
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin (ME003)	Castlereagh Scribbly Gum Woodland in the Sydney Basin bioregion	Vulnerable	Endangered
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion (ME002)	Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion	Endangered	Critically Endangered
Coastal freshwater lagoons of the Sydney Basin and South-east Corner (ME007)	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered	Not listed

Twelve threatened flora species were identified in the FBA credit calculator as predicted flora species credit species. None of the predicted threatened flora species credit species were recorded on the Proposal site.

The Proposal site represents low quality habitat for threatened flora species, and targeted searches did not identify any threatened flora species within the Proposal site. There are populations of several threatened flora species in the Boot land to the south and east of the Proposal site. The closest records to the Proposal site are of the endangered species *Persoonia nutans,* which occurs in the native vegetation adjoining the southern extent of the Proposal site.

A total of 25 threatened fauna species were derived from the PCTs identified on the Development site as predicted ecosystem credit species. Assessment of the potential presence of each species in the Proposal site found that two species have a high likelihood of occurrence and 11 have a moderate likelihood of occurrence.

Six threatened fauna species were identified in the credit calculator as predicted fauna species credit species. None of the predicted threatened fauna species credit species were recorded or are considered likely to occur on the Proposal site.

The assessment considered the construction and operational impacts of the Proposal. The potential biodiversity impacts of the Proposal are as follows:

- Clearing of all vegetation within the Proposal site, including threatened ecological communities (TECs). The total area of native vegetation to be cleared is 0.16 ha; the areas to be cleared comprise small, fragmented patches of vegetation and the disturbed edges of larger patches. The total area to be cleared consists of three plant community types (PCTs):
  - 0.1 hectares of Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin. This PCT corresponds with the TEC Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion, which is listed as vulnerable under the TSC Act) and endangered under the EPBC Act
  - 0.05 hectares of Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain. This PCT corresponds with the TEC Cooks River – Castlereagh Ironbark Forest in the Sydney Basin Bioregion, which is listed as endangered under the TSC Act and critically endangered under the EPBC Act
  - 0.01 hectares of Coastal freshwater lagoons of the Sydney Basin and South-east Corner. This PCT corresponds with the TEC Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, which is listed as endangered under the TSC Act.
- Minimal expected impact on threatened flora species listed under the TSC Act and EPBC Act. While populations of several threatened plant species have been identified to the east and south of the Proposal site, potential habitat for these species within the Proposal site is poor quality, and subject to fragmentation and/or edge effects. Targeted surveys did not identify any threatened flora species in the Proposal site. There is potential for indirect impacts on threatened flora populations immediately adjacent to the Proposal site from adjoining areas of proposed fill.
- Some loss of specific fauna habitat components, including live trees, tree hollows, foraging resources, and groundlayer habitats such as ground timber and minor leaf litter. Removal of buildings currently within the Proposal site may remove potential marginal roosting habitat for microchiropteran bats.
- Potential for minor impacts to groundwater dependent ecosystems, such as drawdown of groundwater from the root zone, may occur as a result of excavation during construction. While this may have some potential to affect adjacent areas of retained vegetation and habitat that may utilise the shallow groundwater aquifers present, any impacts are expected to be minor given the limited scope of excavation proposed, particularly in the southern portion of the proposal site. The detailed design process would further consider potential groundwater impacts and effects on groundwater-dependent ecosystems. In most cases, any impacts would be mitigated at the design phase
- The small areas of habitat to be removed from within the Proposal site for the Proposal are currently fragmented by the existing development. There is good quality fauna habitat on land immediately adjacent to the Proposal site, known as the Boot land, which would be retained. The Boot land contains approximately 83 hectares of native vegetation in moderate to good condition which would not be impacted by the Proposal.

- Minimal impact on wildlife and habitat corridors as the Proposal would not alter existing connectivity values and would not further sever native vegetation or form a hard barrier within existing connecting links.
- Construction activities in proximity to Anzac Creek have the potential to adversely affect aquatic habitat, particularly the construction of a swale in the south of the Proposal site to drain stormwater to Anzac Creek. Impacts to aquatic habitat are expected to be minor.

Impacts on the identified ecological values should be avoided as far as practicable. Where impacts cannot be avoided, the scale and extent of impacts has been determined, and a range of mitigation measures have been recommended to ameliorate impacts on the biodiversity values during and following construction.

A comprehensive Biodiversity Offset Strategy (BOS) for the MPE Project is required to be prepared and implemented under the MPE Concept Plan Approval. The BOS will be prepared in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* including the Framework for Biodiversity Assessment (OEH 2014), consistent with the 'avoid, minimise or offset' principle.

The following offset requirements have been determined for the Proposal:

- 4 ecosystem credits for Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin.
- 3 ecosystem credits for Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain. \
- 1 ecosystem credit for Coastal freshwater lagoons of the Sydney Basin and South-east Corner.

There are no requirements for offsets associated with species credits.

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APPENDIX A

BIOBANKING CREDIT REPORT

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 11/11/2016 Time: 11:23:27AM Calculator version: v4.0

Major Project details

Proposal ID:	0023/2016/3787MP
Proposal name:	MPE Stage 2
Proposal address:	Moorebank Avenue Moorebank NSW 2170
Proponent name:	Tactical Group
Proponent address:	Level 15, 124 Walker Street North Sydney NSW 2060
Proponent phone:	89070700
Assessor name:	Jane Rodd
Assessor address:	Level 5, 141 Walker Street NORTH SYDNEY NSW 2060
Assessor phone:	8907 8266
Assessor accreditation:	0023

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	0.05	3.00
Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion	0.01	0.51
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion	0.10	4.00
Total	0.16	8

Credit profiles

1. Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion, (ME002)

Number of ecosystem credits created	3
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion, (ME002)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion, (ME003)

Number of ecosystem credits created	4
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion, (ME003)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion, (ME007)

Number of ecosystem credits created	1
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion, (ME007)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

ARCADIS Design & Consultancy for natural and built assets