Appendix C
Biodiversity Offset Strategy

Moorebank Intermodal Terminal – Biodiversity Offset Strategy

April 2015

Moorebank Intermodal Company

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Appendix A
Framework for Biodiversity Assessment credit report

1. Introduction

The Moorebank Intermodal Terminal (IMT) Project (the Project) involves the development of approximately 220 hectares (ha) of land for the construction and operation of an IMT and associated infrastructure, facilities and warehousing. The Project includes a rail link connecting the IMT site to the Southern Sydney Freight Line (SSFL) and a single road entry and exit point at the intersection of Moorebank Avenue and Anzac Road.

An Environmental Impact Statement (EIS) and ecological impact assessment (EIA) (Technical Paper 3, EIS Volume 4) have been prepared for the Project approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), as a Stage 1 State significant development (SSD).

The Department of Environment (DoE) EIS Guidelines and the revised Secretary's Environmental Assessment Requirements (SEARs) for environmental assessment of the Project, issued 2 July 2014 and 4 June 2014 respectively, include issues relating to biodiversity. The SEARs outline the need for a strategy to offset ecological impacts and native vegetation clearance, consistent with the 'improve and maintain' principle.

The proposed strategy must also demonstrate how it will achieve long term conservation outcomes; and taking into account the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 – Environmental Offsets Policy* (Department of Sustainability Environment Water Population and Communities 2012) and the NSW Biodiversity Offsets Policy for Major Projects (Offset Policy 2014).

Since the exhibition of the EIS, the biodiversity offset strategy (BOS) has been amended in response to changes in proposed biodiversity offset areas and the submissions raised by the Office of Environmental Heritage (OEH). This revised BOS also incorporates changes in the application of the Framework for Biodiversity Assessment (FBA) assessment methodology to further consider the revised Southern rail access corridor, changes to the Version 1.03 (OEH 2014a) credit calculator used in the Technical Paper 3 – Ecological Impact Assessment in Volume 4 of the EIS) and Version 4.0 credit calculator used in January 2015. In particular, the revised BOS has incorporated:

- further assessment of the measures are taken to avoid and minimise the direct and indirect impacts of a development proposal on biodiversity values as required by Section 8 of the FBA and NSW Offset Policy 2014;
- assessment of matter requiring further consideration under the FBA;
- changes in the boundary and extent of the proposed Biodiversity offset areas;
- changes in the proposed application and flexibility of the FBA variation rules; and
- commitment to take all reasonable steps in searching for residual like for like offsets for the project in accordance with the FBA.

This revised report identifies a strategy to offset the residual biodiversity impacts of the Project. Three offset areas, suitable to partially offset the biodiversity impacts of the Project, are described and a detailed method of identifying additional residual offsets is proposed.

This includes offsets for Threatened species listed under the EPBC Act and NSW *Threatened Species Conservation Act 1995* (TSC Act) and Threatened ecological communities listed under the TSC Act.

The development of the offset strategy for the Project has been guided by the *Environment Protection and Biodiversity Conservation Act 1999 – Environmental Offsets Policy* (Department of Sustainability Environment Water Population and Communities 2012), and NSW Offset Policy 2014.

This report outlines the assessment of the measures taken to avoid and minimise the direct and indirect impacts on biodiversity in accordance with the FBA, the residual biodiversity impacts to be offset, identifies a proposed offset strategy specific to the Project, identifies the ecological values of the proposed offset areas, an approach to residual offset requirements and outlines the compliance of the offset strategy with Commonwealth and state offsetting principles.

2. Avoidance of impacts on biodiversity values

This section outlines the actions the Project must undertake to demonstrate reasonable measures are taken to avoid and minimise the direct and indirect impacts of a development proposal on biodiversity values as required by Section 8 of the FBA and NSW Offset Policy 2014.

2.1 Avoidance and minimisation of direct impacts on biodiversity

The Project has considered avoiding or minimising direct impacts to biodiversity throughout the Project lifecycle in accordance with Section 8.3.2 of the FBA guidelines. The Project is currently seeking concept approval for a Stage 1 SSD development of a concept design and future avoidance of vegetation will be investigated during detailed design and Stage 2 SSD development approvals.

The Stage 1 SSD will not result in the direct impacts on vegetation, however the current concept design for the Project (at Full Build) will clear approximately 48 ha of vegetation, including Endangered Ecological Communities, plant community types (PCTs) that contain threatened species and habitats and riparian areas.

While the Project will result in unavoidable direct impacts, the Project has given significant consideration to the avoidance of impacts to sensitive biodiversity areas including:

- Endangered Ecological Communities and Critically Endangered Ecological Communities;
- PCTs that contain threatened species and habitats;
- declared critical habitat;
- riparian areas, important wetlands and estuaries; and
- state significant biodiversity links.

This is demonstrated by the incorporation of the Ecological Integrity Classification presented in Section 2.7 of the EIA (Technical Paper 3, EIS Volume 4) into early concept designs and the development of the Moorebank Conservation area.

The Project has demonstrated further avoidance in the development of the concept design (as presented in Chapter 7 – *Proposed amendments to development* in the Response to Submissions report as part of the proposed amendments to the development) with the revised southern access rail corridor being realigned to coincide with existing disturbed rail corridor crossing of the Georges River and by reducing the corridor width in general.
A summary of these include:

- a narrowing of the proposed southern access rail corridor in the vicinity of the Georges River from 60 to 25–30 m;
- a modified rail alignment utilising more cleared and disturbed lands associated with the Glenfield Waste site and the existing rail corridor; and
- a reduction in the impact to the Riparian and Alluvial vegetation associated with the southern rail access option by approximately 5 ha.

In addition the revised concept design for the Full Build option presented in the Response to Submissions Report (Chapter 7 – *Proposed amendments to the development*) has also increased the width of the onsite Moorebank conservation area, extending east of the 1% flood line and therefore increasing the future conservation and riparian corridor.

2.1.1 Site selection

The site selection for the Project was undertaken prior to the development of the FBA, however the process was generally consistent with the guidelines in Section 8.3.2 of the FBA and incorporated broad desktop assessment of the potential ecological values of the site.

The Project is required to be located close to supporting rail and road infrastructure, industry and warehouse facilities. The Project site is one of the last remaining parcels of suitable land for an Intermodal Terminal in south-western Sydney with close access to road and rail infrastructure. It is the only site within the south-western Sydney area with the capacity to provide both IMEX and interstate capacity. No other sites in south-western Sydney are considered to have the distinct advantages of the Project site, which include:

- extensive size and length of the site;
- flat topography;
- central location relative to the major employment lands;
- location within 1 km of a dedicated rail freight line;
- location adjacent to the M5 Motorway and a major arterial road network;
- potential for development of a freight precinct; and
- currently in Commonwealth Government ownership (which minimises potential acquisition costs and impacts private property).

Chapter 3 – *Strategic context and need for the project* of the EIS provides further justification for why the Moorebank site was selected, including a discussion of the Commonwealth objectives for the Project and why the selected site addresses a number of these objectives.

An assessment of the site selection process addressing matters identified in Sections 8.3.2.5 of the FBA is provided below:

2.1.1.1 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

Vegetation exists along the western edge of the Project site, with riparian vegetation along the banks of the Georges River, and in isolated disturbed patches scattered across the site. The site has previously been extensively developed for Defence industry and training purposes. With the exception of a cleared area that provides a viewing platform to the west, a narrow corridor of riparian vegetation on the Project site (generally 25 m wide) provides a wildlife corridor and a buffer for the protection of soil stability, water quality and aquatic habitats. A wider strip of land (up to approximately 250 m wide) along the western edge of the Project site has been identified as a proposed conservation area that would become a significantly enhanced riparian buffer between the Georges River and the Project site.

The areas of high ecological integrity to be impacted by the proposal (classed as high only because of the presence of threatened flora species and Threatened ecological communities) are restricted to narrow linear remnant adjoining Moorebank Avenue and in proximity to the SIMTA IMT site, that are considered of limited viability for conservation when considering the small fragmented size, high edge to area ratio, and surrounding land uses.

The retention of these isolated patches within an industrial development precinct would provide little long term conservation benefit to the Threatened ecological community species.

The Response to Submissions Report has identified the southern rail access option as the preferred rail access option. However the alignment of the southern rail access option has been revised in the Response to Submissions report to further avoid impacts to the Georges River corridor and associated riparian vegetation.

This revised southern rail access will utilise more of the existing disturbed rail corridor crossing of the Georges River and further minimise impacts on the corridor in general. A summary of these further reduction include:

- Narrowing of the proposed southern access rail corridor in the vicinity of the Georges River from 60 m to 40 m
- a modified rail alignment utilising more cleared and disturbed lands associated with the Glenfield Waste site and the existing rail corridor
- a reduction in the impact to the Riparian and Alluvial vegetation associated with the southern rail access option by approximately 5 ha.

In addition the changed site layout has increased the width of the onsite Moorebank conservation area, extending east of the 1% flood line and therefore increasing the future Conservation and riparian corridor.

The Early Works also include the proposed restoration of the plant and equipment operation training area (referred to as the ‘dust bowl’) within the proposed conservation area. This would create an additional area of Riparian Forest and/or Alluvial Woodland vegetation thereby increasing the biodiversity value of this location. The edge of the Georges River is vegetated; particularly along the eastern bank; and would become a dedicated riparian vegetation buffer between the Georges River and the Project site.

2.1.1.2 How the development site can be selected to avoid and minimise impacts on biodiversity values as far as practicable

Avoidance of vegetation was initially considered in the planning phase of the Project and was supported through the ecological integrity classification (Section 2.7 of the EIA in Technical Paper 3, EIS Volume 4) which ‘classification of ecological values was used in the identification of constraints and evaluation of potential design options for the Project’. This assessment considered the full build development scenario and ensured the high conservation lands were considered for avoidance along with the range of other factors, resulting in the retention of substantial areas of vegetation and habitat contiguous with the riparian vegetation of the Georges River (refer Section 6.4.4 of the EIA in Technical Paper 3, EIS Volume 4).

The scale and type of development provides only limited possibilities for the incorporation of small isolated patches of vegetation into the design of a large industrial and warehouse layout. The EIS is for a Stage 1 SSD development approval of a concept design and future avoidance of vegetation will be investigated during detailed design and Stage 2 SSD development approvals. It is acknowledged that the current proposal will clear approximately 48 ha of Threatened ecological communities; however the majority of this vegetation is made up of small, highly fragmented and disturbed patches of vegetation.

2.1.1.3 Whether an alternative development site to the proposed development site, which would avoid adversely impacting on biodiversity values, might be feasible

As identified in section 2.1.1 above the proposed site is unique in western Sydney with the specific requirements for close supporting rail and road infrastructure, existing industry and warehouse facilities.

The adjoining undeveloped properties to the south and south east of the Project site are significantly more constrained by high biodiversity values associated with other Department of Defence (Defence) owned land. If the Project did not proceed, the Project site would most likely be left vacant until some alternative use is developed, following completion of the Defence Moorebank Units Relocation Project (the MUR Project), which involves relocation of the existing School of Military Engineering (SME) to Holsworthy (due for completion in 2015).

Chapter 3 – *Strategic context and need for the project* and Chapter 6 – *Project development and alternatives* of the EIS provides further justification for why the Moorebank site was selected and what alternatives were considered. The Response to Submissions report provides further justification and analysis in response to community submissions questioning why project alternatives in Western Sydney were not selected.

Alternative locations to the proposed site would require significant additional infrastructure development to provide the required road and rail freight networks. These hypothetical alternatives are likely to require substantially greater disturbance footprints increasing the risk of additional impacts to biodiversity. Potential alternative sites on adjoining lands with available capacity to support the proposed development are restricted to sites to the south and southeast and are dominated by significant areas of remnant vegetation with significantly greater biodiversity values.

2.1.2 Planning

A detailed analysis of layout and functionality options for the Project site has been undertaken as discussed in Chapter 6 – *Project development and alternatives* and Chapter 7 – *Built form and operations* of the EIS. When considering and analysing the Project site layout, the avoidance of vegetation was initially supported through the ecological integrity classification (section 2.7 of the EIA in Technical Paper 3, EIS Volume 4) which classification of ecological values was used in the identification of constraints and evaluation of potential design options for the Project' is in accordance with sections 8.3.2.7 and 8.3.2.8 of the FBA.

In particular the following matters outlined in sections 8.3.2.8 of the FBA were considered:

2.1.2.1 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

The Project is approximately 220 ha of which only 21% (or 48 ha) will be located in areas of existing native vegetation associated with isolated disturbed patches scattered across the site and a rail corridor over Georges River riparian corridor. The poor condition of the vegetation to be impacted within the site is demonstrated by the very low site value scores under the BBAM (refer to Appendix A of this report) for each of the vegetation types below:

- 35 for the Alluvial Woodland;
- 40 for the Riparian Woodland;
- 39 for the Castlereagh Swamp Woodland; and
- 44 Castlereagh Scribbly Gum Woodland.

In contrast, the condition of the remnant vegetation within the onsite Moorebank Conservation area is better, as demonstrated by the higher site value scores for these vegetation remnants:

- 51 for the Alluvial Woodland; and
- 50 for the Riparian Woodland.

2.1.2.2 Minimise the amount of clearing or habitat loss

Given the location and nature of the Project and its context with regard to existing road and rail infrastructure, there is limited scope for using alternative locations to entirely avoid impacts on biodiversity. Given the scale and type of development, there are only limited possibilities for the incorporation of small isolated patches of vegetation into the design of a large industrial and warehouse development.

The Project has generally minimised the area of clearing and habitat loss to those areas of disturbed and fragmented patches of vegetation within the centre and east of the Project site, further consolidating the existing and proposed future industrial development area. Section 2.1.1.1 above demonstrates the additional design changes associated with the rail access corridor within the change in concept design (and reported in the Response to Submissions Report) that have been incorporated to further reduce impacts to the riparian vegetation along the Georges River.

2.1.2.3 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 Project site is located within an urban area and predominantly consists of Defence land, urban development, internal road network and a golf course. The majority of development of the site currently occurs on fragmented remnant vegetation within an urban environment and will not result in change connectivity.

The site is connected to riparian vegetation along Georges River to the west which connects to extensive vegetation in the south and south east. The Project has incorporated the majority of the Georges river riparian corridor within the proposed onsite offset areas which through proposed restoration and management will result in the likely improvement of habitat quality within this corridor and further consolidate the connectivity of this corridor.

The Project will require the construction of a rail access corridor across the Georges River to connect with the SSFL to the west of the Project site. Minimising the impacts of the southern rail access corridor on the Georges River have been considered throughout the planning phase and are detailed in section 2.1.1.1 above.

The residual impacts for the Project to the Georges River riparian corridor is likely to result in a maximum gap of 25–30 m however, this is likely to incorporate a portion of the existing corridor for the East Hills Railway Line and Tarakan Road. The proposed design is currently for a bridge that would facilitate the development of fauna movement structures and not provide any barriers to terrestrial fauna or fish passage in the Georges River itself.

2.1.2.4 Other site constraints

The Project has also considered the flood planning levels, and Georges River riparian zone in the development of the Projects layout, incorporating these areas into the Moorebank and Casula conservation areas. Where possible any new services will also be located adjoining existing service areas or within disturbed areas.

2.1.3 Construction

Detailed flora and fauna mitigation measures have been developed in Section 6 of the EIA (Technical Paper 3, EIS Volume 4) and Chapter 28 – *Environmental management framework*, section 28.3 of the EIS and are in accordance with section 8.3.2.10 of the FBA. A summary of the measures to be implemented as part of the Construction Environmental Management Plan (CEMP) include:

- minimisation of clearing, to maximise vegetation retainment and utilisation of existing cleared areas for the Project;
- establishment of exclusion areas;
- methods for clearing including ecological supervision, pre-clearance surveys and daily fauna surveys;
- construction timing with threatened species torpor and breeding periods;
- environmental inductions and education for site employees; and
- weed, pest and pathogen control and management.

The success and suitability of the CEMP would be progressively reassessed to ensure the mitigation and management measures are effectively managing biodiversity impacts for the Project.

2.1.4 Operation

In accordance with Section 8.3.2.7–8.3.2.8 of the FBA the Project has assessed potential direct impacts to biodiversity that may occur during the Operational phase. Biodiversity mitigation measures for the construction phase of the project are listed in Section 6 of the EIA (Technical Paper 3, EIS Volume 4) and Chapter 28 – *Environmental management framework*, section 28.3 of the EIS.

The Project has made several key considerations applicable to the operation phase of the Project including/but not limited to:

- consideration to the selection and design of infrastructure installed by the Project as to its impact on biodiversity e.g. power lines and bridges impacts on microbats and birds;
- a long-term program of weed removal and riparian vegetation restoration in the Georges River corridor, which would include monitoring landscaped areas for the presence of noxious and environmental weeds;
- installation of nest boxes and compensatory habitat in adjacent habitat to assist displaced fauna. The project would undertake ongoing monitoring and where necessary, relocation of nest boxes to discourage and disperse unfavourable species; and
- preferred selection of species including Threatened species and Threatened species food resources for ongoing revegetation and rehabilitation areas.

2.1.5 Mitigation and avoidance measures

In accordance with section 8.3.1.3 of the FBA appropriate mitigation and management measures have been identified where the Project cannot proceed without impacting on biodiversity values despite seeking to avoid. Industry best practices and standards have been considered in preparing mitigation and management measures presented in Section 6 of the EIA (Technical Paper, 3 EIS Volume 4) and Chapter 28 – *Environmental management framework*, section 28.3 of the EIS.

2.1.5.1 Biodiversity offsetting

Biodiversity offsetting for the Project has been undertaken in accordance with sections 8.3.1.3 and 8.3.1.4 of the FBA. The proposed offset strategy consists of a dual direct offset approach including offsets both within and outside the Project site to achieve an improved conservation outcome, combining the long-term protection and/or enhancement of existing habitat in moderate to good condition with the restoration, rehabilitation and re-establishment of habitat in poor condition.

2.1.5.2 Species specific mitigation

In accordance with section 8.3.1.6 of the FBA the Project will undertake species specific mitigation to minimise direct impacts to Threatened species and communities, these measures have been detailed in Chapter 28 – *Environmental management framework* of the EIS. Species specific mitigation measures for the Project include:

- hollow bearing tree surveys and staged clearing methods to accommodate Threatened hollow dwelling species;
- avoidance and establishment of environmental exclusion areas for EECs;
- potential for translocation of Threatened plant species;
- collection and other genetic material for the Project for propagation of tube stock;
- retain topsoil from seedbank for application in rehabilitation areas on site;

- selective roost box installation for Threatened microbat species such as the Large-footed Myotis;
- selection of winter-flower species in landscaped areas for nomadic and migratory species such as the Grey-headed Flying-fox; and
- as part of the CEMP the Project will prepare and implement a Threatened Species management Plan for *Persoonia nutans* and *Grevillea parviflora*.

2.2 Avoidance and minimisation of indirect impacts on biodiversity

In accordance with section 8.4 of the FBA the EIS provides a detailed assessment of all potential indirect impacts to biodiversity as a result of the Project.

Where indirect impacts could not be avoided by the Project, detailed flora and fauna mitigation measures would be developed and implemented as part of the CEMP and detailed in Section 6 of the EIA (Technical Paper 3, EIS Volume 4) and Chapter 28 – *Environmental management framework* of the EIS. These detailed measures are in accordance with Section 8.4 of the FBA and address the following:

- sedimentation and runoff;
- noise, dust and light spill;
- impacts on adjacent vegetation such as weed, pathogen, pest encroachment;
- bushfire risk management;
- tramping; and
- implementation of short-term and long-term biodiversity and rehabilitation monitoring programs.

These mitigation measures would be implemented throughout the construction and operational phases of the Project and continually reassessed during their implementation to monitor effectivity.

As discussed above, given the location and nature of the Project and its context with regard to existing road and rail infrastructure, there is limited scope for using alternative locations to entirely avoid impacts on biodiversity. Given the scale and type of development, there are only limited possibilities for the incorporation of small isolated patches of vegetation into the design of a large industrial and warehouse development. The EIS is for a Stage 1 SSD development approval of a concept design and future avoidance of vegetation will be investigated during detailed design and Stage 2 SSD development approvals. It is acknowledged that the current proposal will clear approximately 48 ha of TEC; however the majority of this vegetation is made up of small, highly fragmented and disturbed patches of vegetation in low condition. The retention of these isolated patches within an industrial development precinct would provide little long term conservation benefit to the TEC species.

3. Residual biodiversity impacts to be offset

The Project will have direct and indirect impacts on biodiversity during the construction and operation phases. Construction of the Project will require the clearing of vegetation and habitats and this has been identified as the key residual impact in the EIS and biodiversity technical paper.

While a phased development approach is proposed for the Project, the offset strategy has been developed with the intent to meet the 'worst-case' scenario in terms of the Full Build footprint, including the associated construction compounds. This is the combined development area for all Project development phases.

As identified in the Response to Submissions Report (see Chapter 7 – *Proposed amendments to the development*) the final layout and footprint of the terminal is based on the southern rail access option proposed in this EIS. The residual impacts of this option on threatened biodiversity recorded or considered likely to occur within the study area, are listed in Table 3.1, along with an estimate of residual impacts associated with habitat removal. Full details of the existing environment and biodiversity impacts have been outlined in Chapter 13 – *Biodiversity* and the EIA (Technical Paper 3, EIS Volume 4) of the EIS.

Table 3.1 Residual vegetation and habitat removal

Vegetation community/habitat/threatened species	Approx. extent (ha) within Project site	Full Build clearing (ha)
		Preferred Project Option
Vegetation		
Castlereagh Swamp Woodland[1]	0.9	0.9
Castlereagh Scribbly Gum Woodland[2]	16.1	16.1
Riparian Forest (River-Flat Eucalypt Forest)[1]	16.2	3.6
Alluvial Woodland (River-Flat Eucalypt Forest)[1]	35.6	28.1
Total River-Flat Eucalypt Forest[3]	51.8	31.7
Total vegetation	**68.8**	**48.7**
Fauna habitat		
Shrubby eucalypt woodland	17.0	17.0
Tall eucalypt forest	51.8	31.7
Waterbodies	2.0	2.0
Cleared land	130.1	n/a

Notes: 1 – Endangered Ecological Community as listed under the TSC Act;
2 – Vulnerable Ecological Community as listed under the TSC Act;
3 – River flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney basin and South East Corner bioregions.

Threatened biodiversity recorded or considered likely to occur within the study area is listed in Table 3.2 along with an estimate of residual impacts associated with habitat removal. Two EPBC Act listed flora species *Grevillea parviflora* subsp. *parviflora* (Vulnerable) and *Persoonia nutans* (Endangered) will be directly affected by the Project. Approximately 16 *Grevillea parviflora* subsp. *parviflora* and 10 *Persoonia nutans* individuals will be removed. Additionally, the soil seed bank will also be removed.

Table 3.2 Residual impacts to Threatened biodiversity

Threatened biodiversity	Status		Extent (community and habitat) to be removed by the Project (ha) Estimated number of individuals (where applicable)
	EPBC Act[1]	TSC Act[2]	
Threatened ecological communities			
Castlereagh Swamp Woodland	-	E	0.9
Castlereagh Scribbly Gum Woodland	-	V	16.1
River-Flat Eucalypt Forest	-	E	31.7
Threatened flora			
Acacia bynoeana	V	E	17.0
Acacia pubescens	V	V	17.0
Dillwynia tenuifolia	V	V	17.0
Grevillea parviflora* subsp. *parviflora	**V**	**V**	17.0 (≈16 individuals)
Leucopogon exolasius	V	V	17.0
Persoonia hirsuta	E	E	17.0
Persoonia nutans	**E**	**E**	17.0 (≈10 individuals)
Pultenaea parviflora	V	E	17.0
Threatened fauna			
Barking Owl	-	V	31.7
Black-chinned Honeyeater	-	V	48.7
Eastern Bent-wing Bat	-	V	48.7
Eastern False Pipistrelle	-	V	31.7
Eastern Free-tail bat	-	V	48.7
Eastern Pygmy-possum	-	V	48.7
Flame Robin	-	V	48.7
Greater Broad-nosed Bat	-	V	48.7
Grey-headed Flying-fox	V	V	48.7
Koala	V	V	31.7
Large-footed Myotis	-	V	31.7
Little Eagle	-	V	48.7
Little Lorikeet	-	V	48.7
Powerful Owl	-	V	31.7
Regent Honeyeater	E	CE	48.7
Scarlet Robin	-	V	48.7
Spotted Harrier	-	V	48.7
Square-tailed Kite	-	V	48.7
Squirrel Glider	-	V	48.7
Swift Parrot	E	E	48.7
Varied Sittella	-	V	48.7
Yellow-bellied Sheathtail Bat	-	V	48.7

Notes: 1 – V = Vulnerable, E = Endangered (EPBC Act).
2 – V = Vulnerable, E = Endangered, CE = Critically Endangered (TSC Act). Species in bold were recorded in the study area during the ecological assessment.

3.1 Residual Impacts under the FBA

The FBA Credit Calculator Version 4.0 (OEH 2014a) was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the Project (refer to Appendix A of this report). The FBA results are summarised below.

3.1.1 Ecosystem credits

The ecosystem credits required to offset biodiversity impacts associated with the Project based on the vegetation zones identified for the Moorebank IMT site are summarised in Table 3.3 below.

Table 3.3 Ecosystem credits required to offset biodiversity impacts associated the Project based on the vegetation zones for the Moorebank IMT site

Veg code	Vegetation name	Vegetation zone	Vegetation zone area (ha)	Development site vale loss	Number of credits
ME003	Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland – Good Condition	1	16.1	44.3	444
ME005	Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin – Good Condition	2	0.9	39.6	30
ME018	Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin – Good Condition	3	28.1	35.8	844
ME044	Sydney Blue Gum X Bangalay – Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin – Good Condition	4	3.6	40.1	91
TOTAL					**1,409**

3.1.2 Species credits

Species credits were calculated for two threatened flora and recorded during the current and previous targeted surveys (Parsons Brinckerhoff 2011).

The species credits required for development of the Moorebank Development Site are summarised in Table 3.4 below.

Table 3.4 Species credits required for development

Scientific name	Common name	No. of individuals recorded to be impacted	No. of credits required
Persoonia nutans	Nodding Geebung	11	770
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	16	235
Total		27	1,005

3.1.2.1 Species credit species that cannot withstand further loss in the major catchment area

In accordance with Section 6.5.1.13 of the FBA, two species, *Persoonia nutans* and *Grevillea parviflora subsp. parviflora* were identified as species that cannot withstand further loss on the Threatened species profile database. However both of these species were also identified under the Species Recovery loss sheet, as being able to sustain loss within the Catchment Management Authority (CMA) of up to 10%, for a population greater than 500 individuals.

The project impacts on 16 individual of *Grevillea parviflora subsp. Parviflora* is significantly less than the 10% of >2000 individuals considered to form a local population within the development site and adjoining offset areas. Consequently this species is considered to withstand loss.

The project impacts on 10 individual of *Persoonia nutans* is significantly less than the 10% of >120 individuals considered to form a local population within the development site and adjoining offset areas. Given that the 120 individuals on site is less than the CMA population requirement of 500 individuals, as stated above, the species is not considered able to withstand loss. It is acknowledged however, that based on the criteria in Section 9.2.5.2 of the Framework for Biodiversity Assessment (FBA), that *Persoonia nutans* is unlikely to become extinct at subregional level.

3.1.3 Impacts for further consideration by the consent authority

In accordance with Section 9 of the FBA, an assessment of impacts for further consideration by the consent authority has identified one ‘landscape feature’ for further consideration.

3.1.3.1 Landscape features

The Project includes the construction of a new rail access that will connect the Project site with the SSFL. The Response to Submissions Report (see Chapter 7 – *Proposed amendments to the development*) has identified a modified alignment of the southern rail access option presented in to the EIS.

The rail access will include a rail bridge that crosses the Georges River. The proposed crossing will follow but expand on the existing East Hills Railway corridor crossing over the Georges River. There is no direct impact on the Georges River as the proposed crossing is a bridge spanning the width of the river with no new pylons to be constructed in the river bed. Indirect impacts associated with sedimentation, water quality and erosion are proposed to be managed through onsite mitigation.

A small area of highly disturbed Riparian Forest vegetation corresponding with PCT (ME044) Sydney Blue Gum x Bangalay – Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion will be directly impacted by the crossing. The vegetation is consistent with the River-Flat Eucalypt Forest on Coastal Floodplains Endangered ecological community listed under the NSW TSC Act.

On the eastern bank of the Georges River, the southern rail access option traverses a strip of Riparian Forest, which has been previously disturbed during construction of the East Hills Railway Line and Tarakan Road and exhibits a moderate to high level of weed infestation.

The vegetation of the eastern riverbank immediately adjacent to the Georges River exhibits a high degree of weed infestation and is in poor condition. Native vegetation here consists of a canopy of mature eucalypts including *Eucalyptus saligna x botryoides* and *E.longifolia*. The understorey and groundcover layers are dominated by woody weeds (e.g. *Ligustrum sinense* and *Lantana camara*) and vine weeds (e.g. *Cardiospermum grandiflorum* and *Delairea odorata*) (Hyder Consulting Pty Ltd 2012). Vegetation further upslope on the eastern bank is less disturbed and generally dominated by native plants in all layers with the exception of some highly disturbed land associated with East Hills Railway Line and Tarakan Road. In addition to the eucalypt canopy, this vegetation contains a sub-canopy dominated by *Acacia binervia* and moderately diverse native understorey and groundcover layers.

The vegetation on the western bank of the Georges River, within and adjacent to the Glenfield Waste Services (GWS) site, is similar in structure and condition to the vegetation on the eastern bank (Hyder Consulting Pty Ltd 2012). It is mostly in poor condition and weed infested. The southern rail access also includes cleared areas within the GWS site which have been significantly disturbed by extensive sand/gravel extraction activities. Any native vegetation in the cleared areas would only be relatively recent regrowth that is likely to have low ecological conservation value.

The Project impacts to the Riparian Forest vegetation is likely to result in a maximum gap in the existing riparian corridor of 25–30 m, however this incorporates a portion of the already disturbed existing East Hills Railway Line.

The Project also conserves a significant portion of the Riparian Forest vegetation along the Georges River and adjoining the Project site under a dedicated conservation area. The management and restoration of this conservation area is likely to improve the condition of the native vegetation within this corridor, resulting in improvement in water quality and erosion.

4. Proposed offset package

Offset strategies may include both on and off site or local area schemes that contribute to the long term conservation of Threatened species and communities. The offset strategies chosen for the Project include a combination of:

- on-site offsets – securely conserving and improving the condition of existing riparian habitat or providing a buffer to an area of existing habitat within the Project site;
- off-site offsets – securing and improving the condition of existing habitats at other sites in the immediate locality of the Project site; and
- purchase of biodiversity credits under the NSW BioBanking Scheme.

The currently proposed direct land offset areas that have been identified as part of the offset strategy are on land owned by the Australian Government and therefore, state and local legislative obligations do not apply to these lands.

4.1 Identification of off-site offset areas

The offset strategy has identified the need for off-site offsets to supplement the existing on site offset. In identifying these offsets the following criteria has been considered:

4.1.1 Biodiversity and landscape characteristics

The following biodiversity and landscape characteristics will be important considerations in the identification of additional offsets:

- presence of relevant Threatened biodiversity;
- distance from the Project;
- current condition and potential for improvement; and
- connectivity.

These criteria are described in further detail below.

4.1.1.1 Presence of relevant Threatened biodiversity

When determining offsets, they must be targeted and offset the impacts on a ‘like for like or better’ basis. Given that the Project includes clearing of Threatened ecological communities, and threated species the offsets should where possible include these species and communities.

4.1.1.2 Distance from the Project

Biodiversity offsets should be located appropriately and offset the impact in the same region. Ideally, offset habitat areas should be located within the region of the Project.

Choosing offsets within the region of the Project is also consistent with the need to provide compensatory habitat of similar type and quality to that being removed. The integrity of the habitat network and biodiversity values of the locality are retained and habitat is secured and existing corridors consolidated for local flora and fauna populations.

In addition to the ecological benefits, by choosing offsets located within the region of the Project, conservation planning can be integrated with development planning and this is also likely to benefit the reputation of the proponent, particularly with local stakeholders.

4.1.1.3 Current condition and potential for improvement

Habitat condition gives an indication of its quality for flora and fauna habitat and long-term viability. The condition of a remnant is a result of a number of factors including weed invasion, fragmentation, pollution and disturbances including clearing, fire and grazing. The condition provides an index of a site's potential to support Threatened species, populations and communities. Although it is preferable that the condition/habitat quality of offset areas exceeds or matches that of habitat removed, this is not always achievable. Where the condition or quality of the offset is not equivalent to that of the area being cleared, a greater area of offset may be required.

Where the condition of habitats can be improved through changes in management (for example cessation of grazing, weed control), this improvement in condition can be used to offset a development.

4.1.1.4 Connectivity

Connectivity of habitats is essential to the long-term survival of many species because it facilitates movement on a local scale, for foraging and sheltering, as well as on a regional or even national scale as a wildlife corridor for dispersal and migration. Remnants with habitat linkages are more likely to maintain their biodiversity in the long-term because wildlife corridors:

- provide increased foraging area for wide-ranging species;
- provide cover for movement between habitat patches, particularly for cover-dependent species and species with poor dispersal ability and enhance the movement of animals through sub-optimal habitats;
- reduce genetic isolation;
- facilitate access to a mix of habitats and successional stages to those species which require them for different activities (for example, foraging or breeding);
- provide refuge from disturbances such as fire;
- provide habitat in itself; and

- link wildlife populations and maintain immigration and re-colonisation between otherwise isolated patches. This in turn may help reduce the risk of population extinction (Wilson & Lindenmayer 1995).

Connectivity of habitats creates larger remnants that are likely to be of higher quality and support higher biodiversity.

Offsets are likely to be of greater biodiversity value where they are located adjacent to remnant vegetation creating a larger remnant or where they provide linkages within otherwise fragmented landscapes. Compensatory habitat should act to consolidate existing corridors or, occur adjacent to existing areas of native vegetation in order to maintain or increase their habitat quality and long-term viability.

4.1.2 Preliminary desktop identification of possible sites

The first step in identifying potential offsets is to undertake a desktop assessment. This includes a review of readily available information for the western Sydney region including but not limited to:

- vegetation mapping; e.g. *The native vegetation of the Cumberland Plain, western Sydney* (Tozer 2003);
- land use zone mapping;
- other relevant mapping; e.g. Cumberland Plain priority conservation lands mapping (Department of Environment Climate Change and Water 2010);
- regional land management plans and policies;
- broad-scale biodiversity survey reports; e.g. *Threatened and pest animals of Greater Southern Sydney*, (Department of Environment and Climate Change 2007b), *Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region* (Department of Environment and Climate Change 2007a); and
- wildlife databases; e.g. Bionet Atlas of NSW Wildlife (Office of Environment and Heritage 2013).

These data sources would be used to locate areas that:

- Contain the biodiversity values to be offset i.e.:
  - known occurrences of *Persoonia nutans* and *Grevillea parviflora* subsp. *parviflora*
  - potential habitat for the other Threatened species of animals and plants considered likely to occur in the Project area (refer Table 4.3)
  - the same Threatened ecological communities affected by the Project.
- Are not currently protected from development by existing legislation or binding conservation arrangements.
- Exhibit appropriate biodiversity and landscape characteristics (refer section 2).

- Consultation with the OEH and relevant local councils would also be used to identify priority lands for conservation and potential use as offsets.
- These sites would require further refinement, as described below, to identify a short list of potential offset sites.

4.1.3 Assessment and ranking of potential sites

The sites identified during the desktop review would require refinement based on more detailed investigation of issues including:

- tenure and zoning of the potential offset sites;
- current land ownership and availability of land for purchase;
- likelihood of loss without protection as an offset; considering factors such as physical constraints on land use and proposed developments;
- potential interaction with adjacent land uses; e.g. required fire regimes with regard to bushfire hazard reduction and biodiversity conservation; and
- size, shape and connectivity with other vegetation/habitat.

The outcome of the refinement process would be a short list of potential offset sites for detailed investigation ranked in terms of their suitability based on the above criteria.

4.1.4 Site inspection and identification of preferred site/s

Field investigations have been undertaken for the short-listed sites verifying their suitability as offsets with regard to:

- *population estimates of Persoonia nutans and Grevillea* parviflora subsp. *parviflora*;
- habitat suitability for the other Threatened species of animals and plants considered likely to occur in the Project area;
- presence and distribution of the Threatened ecological communities affected by the Project;
- current vegetation/habitat condition and potential for improvement; and
- long-term management issues.

The results of the inspections have been used to further refine the offset sites and for adequacy assessment (refer section 4.1 of this report).

4.1.5 Assessment against offsetting principles

- The sites will also need to be assessed against the *Principles for the use of environmental offsets under the EPBC Act* and *NSW Biodiversity Offsets Policy for Major Projects* (Offset Policy 2014) to determine their suitability for offsetting the impacts of the Project.

4.2 Proposed offset sites

Three areas are currently proposed for direct land offsets (refer Figure 4.1). These areas are described below and detailed in Table 4.5.

4.2.1 Moorebank Conservation area

Moorebank offset area – Georges River riparian zone: restoration and management of the Georges River riparian zone (approximately 32.8 ha) including the eastern side of the river corridor from approximately 300 m south of the M5 Motorway for a length of approximately 2.5 km south to the East Hills Railway Line (refer Figure 4.2). This offset conserves a corridor extending from the Georges River to the boundary of the full build scenario. Restoration and management of this zone is proposed. This area is currently mapped as Environmentally Significant Land and zoned SP2 (infrastructure – Defence) under the *Liverpool Local Environmental Plan 2008*. As such, this land is zoned and reserved for Defence development. A planning proposal has been prepared to rezone this area as E3 which will provide greater environmental protection and improve its conservation value.

4.2.2 Casula Offset area

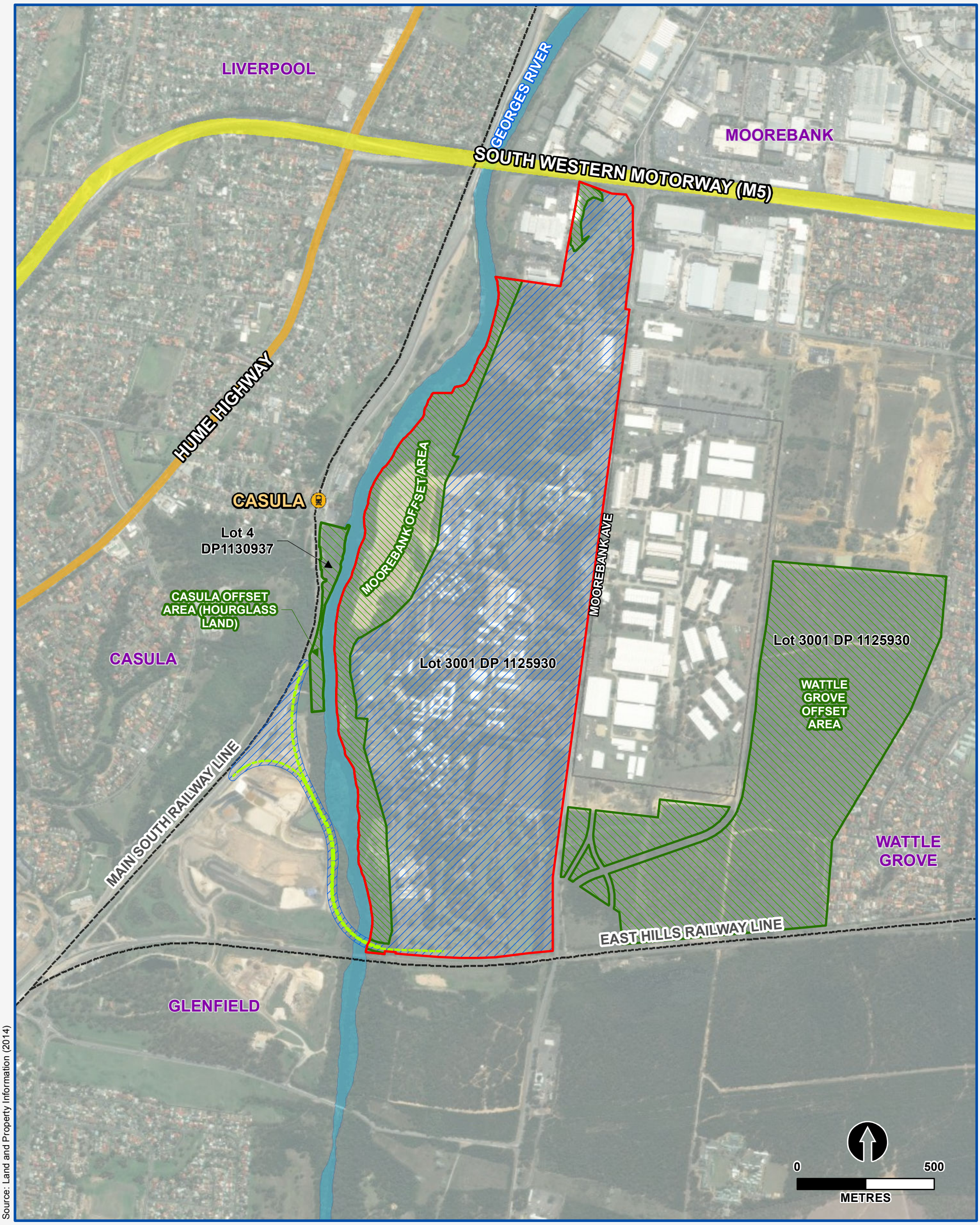
Management and restoration of vegetation within Lot 4 DP 1130937 (Casula Offset Area) is proposed (refer Figure 4.2). The Casula Offset Area (also referred to as the 'hourglass land') is an irregular shaped allotment of approximately 3.2 ha on the western side of the Georges River opposite the Project site.

This area is currently mapped as Environmentally Significant Land and zoned SP2 (infrastructure – Defence) under the Liverpool Local Environmental Plan 2008. As such, this land is zoned and reserved for Defence development.

The site contains native vegetation that would require active management, including weed removal and supplementary planting with native species, in order to improve the condition of the vegetation and habitats contained therein. It also contains a large patch of vegetation dominated by weeds which would require clearing and revegetation with native species.
A planning proposal has been prepared to rezone this area as E3 which will provide greater environmental protection and improve its conservation value.

4.2.3 Wattle Grove Offset area

Part of the eastern portion of Lot 3001 DP 1125930 (east of Moorebank Avenue) contains native vegetation that is proposed to be used to offset vegetation to be cleared for the Project (refer Figure 4.3).This area of approximately 83.0 ha of vegetation adjoins the East Hills Railway Line to the south, land owned by the SIMTA consortium to the northwest, and the residential area of the suburb of Wattle Grove to the east. This area is currently mapped as Environmentally Significant Land and zoned SP2 (infrastructure – Defence) under the Liverpool Local Environmental Plan 2008 and is currently owned by Department of Defence. This land would need to be actively managed in order to maintain or improve the condition of the vegetation and habitats.



Land subject of planning proposal

Rail line & station

Development footprint

Offset area

Figure 4.1 Location of proposed biodiversity offset areas

4.3 Ecological values of the proposed offset areas

The ecological values of the proposed offset areas are outlined in terms of known occurrence of threatened species of plant, fauna habitat potential and vegetation condition.

Detailed ecological surveys and assessments of these offset sites have been undertaken in accordance with the NSW BioBanking Assessment Methodology (BBAM). These surveys included ecological vegetation mapping and preliminary threatened flora surveys and built on previous ecological surveys within the Casula offset area and Wattle Grove Offset Area (GHD 2014) and (Hyder 2014). The general conditions, fauna habitats and vegetation communities of the proposed offset areas are summarised in Table 4.1 below.

Table 4.1 Summary of general conditions, fauna habitat and vegetation communities of the offset areas

Offset areas	General condition of offset sites	Fauna habitat	Vegetation communities	Threatened biodiversity
Moorebank offset area	The mapped vegetation of the site varies from patches with native species dominant in all vegetation layers to patches with the understorey and ground layer dominated by introduced vines and shrubs (e.g. *Lantana camara*).	The fauna habitat of the Georges River riparian corridor consists of a tall eucalypt forest with an understorey varying in its structure and understorey composition. Large mature hollow-bearing trees, potentially hollow-bearing trees and fallen woody debris are moderately abundant in this area. Overall, the fauna habitat in the site is in moderate condition.	Riparian Forest Alluvial Woodland (For list of dominant species refer to Table 4.2).	TSC Act listed Endangered ecological community: ▪ River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
Casula offset area	The vegetation of the site is mapped as Riparian Forest (Tozer 2003). Most of the site is covered by disturbed Riparian Forest with the exception of an area in the north which is dominated by the woody weeds *Ligustrum lucidum*, *Ligustrum sinense* and *Lantana camara*. The Riparian Forest of the site has a largely intact canopy layer with an understorey varying from a mixture of native species to areas dominated by *Lantana camara*. Overall, the native vegetation mapped in the site is in moderate condition.	The fauna habitat of the Casula Offset Area (refer Figure 4.2) consists of a tall eucalypt forest with an understorey varying in its structure and composition. Hollow-bearing trees and fallen woody debris are present in these areas which provide potential microhabitat. Habitat in this area is connected via the riverbank underneath the East Hills railway line to larger areas of vegetation to the south which extend into the Georges River Nature Reserve.	Riparian Forest (For list of dominant species refer to Table 4.2).	TSC Act listed Endangered ecological community: ▪ River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

Offset areas	General condition of offset sites	Fauna habitat	Vegetation communities	Threatened biodiversity
Wattle Grove Offset Area	Mapped areas of native vegetation in this site are generally dominated by native species with only minor weed invasion. Sporadic weed occurrences also exist along track edges in the core of the site. Overall, the native vegetation mapped in the site is in moderate to good condition. Areas with no vegetation mapped generally consist of regrowth native trees and large shrubs with an understorey dominated by introduced species.	The fauna habitat of the Wattle Grove Offset Area consists of eucalypt woodland with an understory varying in its structure and composition understory. Large mature hollow-bearing and potentially hollow-bearing trees occur. Fallen woody debris generally occurs at low density. * Due to its size (83 ha), it is likely to have potential to support viable populations of a variety of fauna species under appropriate management. Overall, the fauna habitat in the site is in moderate to good condition.	Riparian Forest Alluvial Woodland Shale/Gravel Transition Forest Castlereagh Swamp Woodland Castlereagh Scribbly Gum Woodland (For list of dominant species refer to Table 4.3).	TSC Act listed Vulnerable ecological community: ▪ *Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.* TSC Act listed Endangered ecological community: ▪ *Castlereagh Swamp Woodland Community* ▪ *Cooks River Castlereagh Ironbark Forest* ▪ *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* ▪ *Shale Gravel Transition Forest in the Sydney Basin Bioregion* EPBC Act listed Critically endangered ecological community ▪ *Shale Gravel Transition Forest in the Sydney Basin Bioregion* EPBC Act listed species ▪ *Acacia pubescens* ▪ *Persoonia nutans* ▪ *Grevillea parviflora subsp. parviflora*

4.3.1 General condition of offset sites

4.3.1.1 Moorebank Offset area

The mapped vegetation of the site varies from patches with native species dominant in all vegetation layers to patches with the understorey and ground layer dominated by introduced vines and shrubs (e.g. **Lantana camara*). Dirt/gravel vehicle paths, small patches of bare ground with minimal vegetation and concrete pads are also found here. Larger areas of bare ground and introduced grassland are included in the site but are not included in native vegetation mapping (refer Figure 4.2). Overall, the vegetation of the site is considered to be in moderate condition.

Without intervention, it is likely that the condition of vegetation and fauna habitats would continue to decline due to the ongoing reduction of the native shrub layer and lack of tree recruitment due to competition with woody weeds, particularly **Lantana camara*. Under present conditions there is little light pollution affecting the vegetation along the Georges River. Light pollution is likely to be substantially higher during the construction and operation of the Project due to fixed lighting within the facility and lighting from trucks and trains. The proposed vegetation restoration within the riparian corridor and landscape planting in the interior of the site is, however, likely to mitigate light pollution through the screening effects of increased vegetation. The proposed lighting for the site would also be designed to minimise light spill (as explained in the main EIS document), thereby minimising ecological light pollution impacts. With the proposed vegetation restoration, significant ecological light pollution impacts on the offset site are unlikely.

4.3.1.2 Casula Offset area

The vegetation of the site is mapped as Riparian Forest (Tozer 2003). Field verification of the site on 18 February 2013 revealed that most of the site is covered by disturbed Riparian Forest with the exception of an area in the north which is dominated by the woody weeds **Ligustrum lucidum*, **Ligustrum sinense* and **Lantana camara*. The Riparian Forest of the site has a largely intact canopy layer with an understorey varying from a mixture of native species (e.g. *Breynia oblongifolia*) to areas dominated by **Lantana camara*. Overall, the native vegetation mapped in the site is in moderate condition.

Without intervention, it is likely that the condition of vegetation and fauna habitats would continue to decline due to the ongoing reduction of the native shrub layer and lack of tree recruitment due competition with woody weeds, particularly **Lantana camara*.

Existing ecological light pollution is likely to affect the Casula Offset Area due to its location immediately adjacent to the Southern Freight Rail Line. The light conditions here may limit the suitability of the site for some nocturnal animal species; however, some nocturnal species are likely to be habituated to increased light levels and to persist in utilising this habitat.

4.3.1.3 Wattle Grove Offset area

Mapped areas of native vegetation in this site are generally dominated by native species with only minor weed invasion. Areas of more intense weed invasion, where introduced species are dominant in the ground layer, are limited to the periphery of the site and patches of regrowth vegetation in the south-west of the site (refer to areas with no vegetation mapped in Figure 3.5). Sporadic weed occurrences also occur along track edges in the core of the site.

The site is subject to periodic hazard reduction burning for the protection of the adjacent suburban area of Wattle Grove. The frequency and intensity of burning of the vegetation on the site is likely to influence its suitability as habitat for threatened species.

Overall, the native vegetation mapped in the site is in moderate to good condition. Areas with no vegetation mapped generally consist of regrowth native trees and large shrubs with an understorey dominated by introduced species.

4.3.2 Vegetation community composition and condition

Vegetation community composition and condition in the offset areas is described in Tables 4.2 and 4.3. Figures 4.2 and 4.3 outline the distribution of vegetation communities in each offset area.

Table 4.2 Moorebank Conservation Area and Casula Offset area vegetation composition and condition

Vegetation community	Canopy height	Dominant species			Conservation significance	Ecological integrity[2]
		Canopy	Understorey[1]	Ground cover[1]		
Riparian Forest	25–30 m	*Eucalyptus bosistoana*, *Eucalyptus botryoides* x *saligna*, *Angophora floribunda*, *Casuarina cunninghamiana*	*Tristaniopsis laurina*, *Backhousia myrtifolia*, *Stenocarpus salignus*, *Jacksonia scoparia*, *Polyscias sambucifolia*, *Westringia longifolia*, *Santalum obtusifolium*, *Acacia binervia*, *Acacia decurrens*, *Callistemon salignus*, **Arundo donax*, *Melia azedarach*, **Ligustrum sinense*, *Phebalium squamulosum*	*Microlaena stipoides*, **Eragrostis curvula*, **Cardiospermum grandiflorum*, *Leucopogon juniperinus*, *Morinda jasminoides*, *Pteridium esculentum*, **Araujia sericifera*, **Verbena bonariensis*, **Asparagus* spp., *Gahnia aspera*, *Pratia purpurascens*, *Austrostipa ramosissima*	TSC Act listed Endangered ecological community *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Moderate to High
Alluvial Woodland	20–25 m	*Eucalyptus tereticornis*, *Eucalyptus botryoides* x *saligna, Eucalyptus baueriana, Angophora floribunda*	*Acacia decurrens*, *Acacia binervia*, *Ozothamnus diosmifolius*, *Kunzea ambigua*, **Lantana camara*	*Microlaena stipoides*, **Eragrostis curvula*, **Senecio madagascariensis*, **Conyza bonariensis*, *Tricoryne elatior*, *Pratia purpurascens*, **Bidens pilosa*, **Sida rhombifolia*, *Cynodon dactylon*	TSC Act listed Endangered ecological community *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Moderate to High

Notes: 1. Asterisk (*) denotes an introduced species.

2. Refer to Section 2.4.2 of the *Moorebank Intermodal Freight Terminal – Ecological Impact Assessment* for Ecological Integrity definitions

Table 4.3 Wattle Grove Offset area – eastern bushland area vegetation community composition and condition

Vegetation community	Canopy height	Dominant species			Conservation significance	Ecological integrity
		Canopy	Understorey	Ground cover		
Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland	8–12 m	*Eucalyptus sclerophylla*, *Angophora bakeri* *Eucalyptus globoidea, Eucalyptus parramattensis* subsp. *parramattensis, Melaleuca decora*	*Kunzea capitata, Melaleuca nodosa*, *Acacia brownei*, *Banksia spinulosa*, *Banksia oblongifolia, Hakea sericea, Astroloma humifusum, Daviesia acicularis, Petrophile sessilis, Hakea dactyloides, Acacia linifolia, Isopogon anethifolius, Leptospermum polygalifolium, Dillwynia parvifolium, Leptospermum parvifolium, Leptospermum trinervium, Pimelea linifolia, Pultenaea villosa, Callistemon linearis, Pultenaea elliptica,* and *Acacia falcata.*	*Lomandra multiflora, Cyathochaeta diandra, Dianella revoluta, Cheilanthes sieberi, Themeda australis, Laxmannia gracilis, Billardiera scandens, Pratia purpurascens, Eragrostis brownei, Goodenia hederacea var, hederacea, Aristida vagans, Trachymene incisa, Entolasia stricta, Xanthorrhoea minor, Stylidium graminifolium, Microlaena stipoides, Panicum simile, Dampiera stricta, Lepyrodia scariosa, Leptocarpus tenax, Cassytha pubescens* and *Hardenbergia violaceae.*	TSC Act listed Vulnerable ecological community *Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.*	High
Parramatta Red Gum woodland	8–10 m	*Eucalyptus parramattensis* subsp. *parramattensis,* *Angophora floribunda, Melaleuca linariifolia, Melaleuca decora, Angophora bakeri, Eucalyptus sclerophylla*	*Melaleuca thymifolia, Melaleuca erubescens, Leptospermum polygalifolium, Callistemon linearis* and *Pultenaea villosa.*	*Lomandra longifolia, Hakea sericea, Gahnia sp., Pteridium esculatum, Dianella revoluta, Juncus usitatus, Aristida vagans, Pratia purpurascens, Ranunculus inundatus, Imperata cylindrica, Centella asiatica, Goodenia paniculata, Lepidosperma quadrangulatum, Lepyrodia muelleri, Carex appressa Typha orientalis, Leptocarpus tenax. Isolepis inundata, Isolepis cernua, Schoenus brevifolius, Baumea articulata,* and *Chorizandra cymbaria.*	TSC Act listed Endangered ecological community *Castlereagh Swamp Woodland Community.*	High

Vegetation community	Canopy height	Dominant species			Conservation significance	Ecological integrity
		Canopy	Understorey	Ground cover		
Broad-leaved Ironbark – Melaleuca decora grassy open forest	16–20 m	*Eucalyptus fibrosa, Eucalyptus tereticornis, Melaleuca decora, Allocasuarina littoralis, Exocarpus cupressiformis* and *Acacia decurrens.*	*Ozothamnus diosmifolium, Bursaria spinosa, Acacia falcata, Pultenaea villosa, Daviesia ulicifolia, Olearia microphylla, Lissanthe strigosa, Hakea sericea, Dillwynia parvifolia, Melaleuca nodosa, Leucopogon juniperinus, Persoonia linearis,* and *Pomax umbellata.*	*Lissanthe strigosa, Entolasia stricta, Themeda australis Aristida vagans, Austrodanthonia tenuior, Lomandra longifolia, Lomandra multiflora, Dianella revoluta, Hibbertia obtusifolia, Lepidosperma laterale, Cheilanthes sieberi, Gonocarpus tetragynus, Dichondra repens, Centella asiatica, Einadia hastata, Billardiera scandens, Hardenbergia violaceae* and *Glycine clandestina.*	TSC Act listed Endangered ecological community. *Shale Gravel Transition Forest in the Sydney Basin Bioregion.* EPBC Act listed Critically endangered ecological community.	High
Broad-leaved Ironbark – Melaleuca decora shrubby open forest	16–20 m	*Eucalyptus fibrosa, Eucalyptus tereticornis, Melaleuca decora, and Melaleuca nodosa.*	*Melaleuca nodosa, Bursaria spinosa, Acacia falcata, Pultenaea villosa, Notelaea longifolia, Daviesia ulicifolia, Lissanthe strigosa, Lissanthe strigosa, Leucopogon juniperinus, Persoonia linearis,* and *Pomax umbellata.*	*Lomandra filiformis, Lissanthe strigosa, Themeda australis, Entolasia stricta, Aristida vagans, Lomandra longifolia, Lomandra multiflora, Dianella revoluta, Lepidosperma laterale, Pratia purpurascens, Einadia hastata, Hardenbergia violaceae* and *Glycine clandestina.*	TSC Act listed Endangered ecological community *Cooks River/ Castlereagh Ironbark Forest in the Sydney Basin Bioregion.*	High

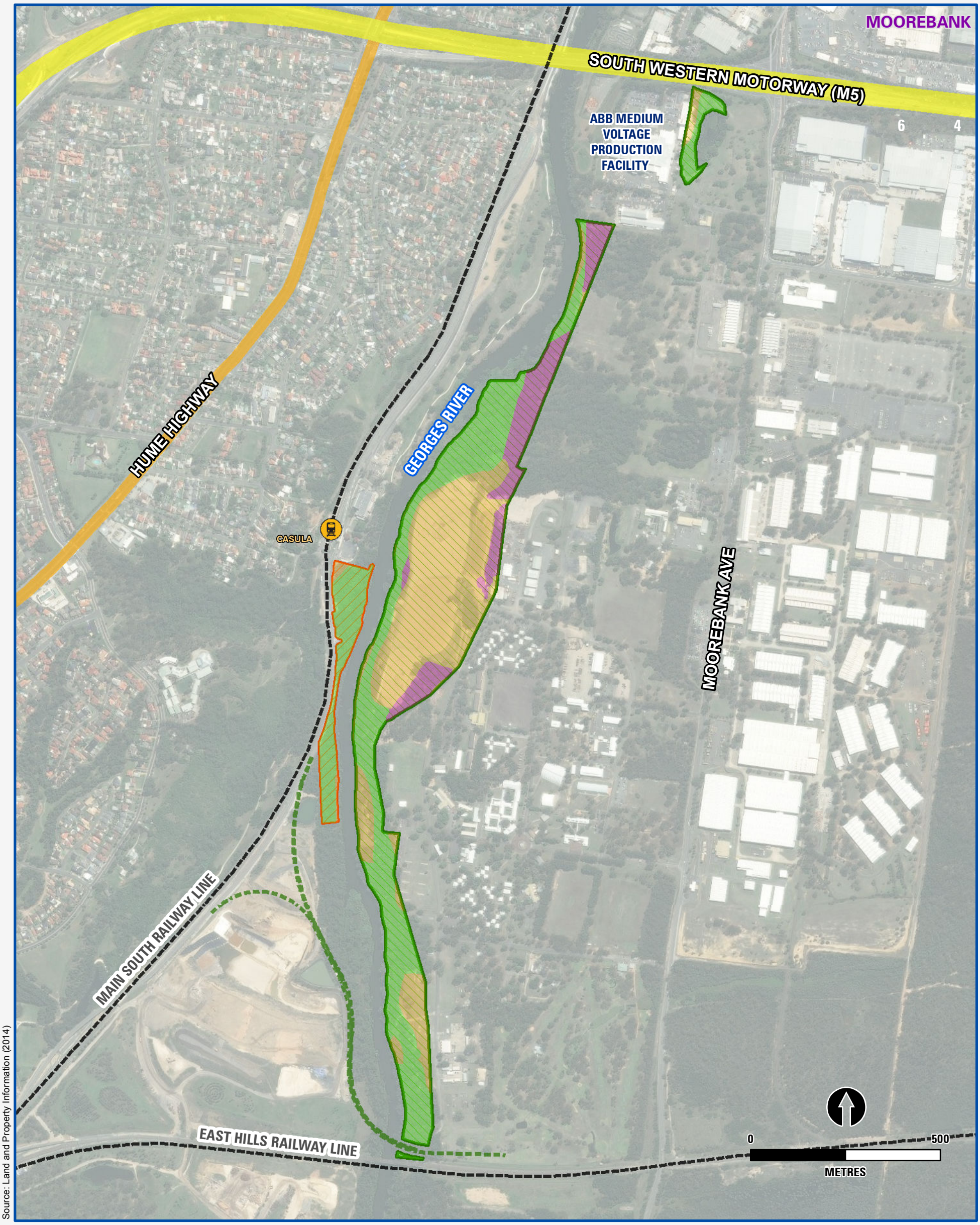


Figure 4.2 Moorebank offset area - Conservation area and Casula offset area - vegetation communities

Figure 4.3 Moorebank offset area - Wattle Grove offset area - vegetation communities and threatened plants

4.3.3 Fauna habitat of offset sites

4.3.3.1 Moorebank Offset area

The fauna habitat of the Moorebank Offset Area consists of a tall eucalypt forest with an understorey varying in its structure and composition including areas with dense weed thickets, diverse native shrubbery and sparse understorey consisting mainly of grasses, leaf litter and scattered shrubs. Large mature hollow-bearing, potentially hollow-bearing trees and fallen woody debris are moderately abundant in this area.

Habitat in this area is connected via the riverbank below the railway line to larger areas of vegetation to the south which extend into the Georges River Nature Reserve. Connectivity to substantial areas of fauna habitat to the north is less pronounced due to the presence of intervening areas with only very narrow bands of riparian vegetation.

Overall, the fauna habitat on the site is in moderate condition.

4.3.3.2 Casula Offset area

The fauna habitat of the Casula Offset Area consists of a tall eucalypt forest with an understorey varying in its structure and composition including areas with dense weed thickets and native shrubbery. Hollow-bearing trees and fallen woody debris are present in these areas which provide potential microhabitat features for a variety of species of animal.

Habitat in this area is connected via the riverbank underneath the railway line to larger areas of vegetation to the south which extend into the Georges River Nature Reserve. Connectivity to substantial areas of fauna habitat to the north is less pronounced due to the presence of intervening areas with only very narrow bands of riparian vegetation. Recent weed removal and replanting with indigenous species in Riparian Forest areas immediately to the north of the site is likely, however to result in a minor improvement in connectivity to the north in the medium term.

4.3.3.3 Wattle Grove Offset area

The fauna habitat of the Wattle Grove Offset Area consists of eucalypt woodland with an understorey varying in its structure and composition including areas with dense thickets of native shrubbery and areas of sparse understorey consisting mainly of grasses, leaf litter and scattered shrubs. Large mature hollow-bearing and potentially hollow-bearing trees occur at low density in this site. Fallen woody debris generally occurs at low density, likely as a result of fuel reduction burning activities in the northern portion of the site. The southern area of the site contained a moderate density of fallen timber debris providing habitat for reptiles and small terrestrial mammals.

Swamp Forest in the form of Parramatta Red Gum Woodland contained sedges and small areas of aquatic habitat such as small wetlands and areas of open water. This contained habitat for reptiles, amphibians and birds.

The site is fenced on the north, east and south of the site, and maintains connectivity to a small area of native bushland to the west. A rail corridor and the fence separate this area from a large area of habitat to the south limiting connectivity for terrestrial and arboreal fauna. Due to its size (83 ha) and proximity to very large remnant patches >1000 ha, it is likely to have potential to support viable populations of a variety of fauna species under appropriate management. If populations of less mobile animal species (i.e. non-flying species) are lost, however, there is limited scope for natural repopulation of this habitat due to its limited connectivity. Overall, the fauna habitat in the site is in moderate to good condition.

4.3.4 Threatened species of plant

Targeted surveys for *Grevillea parviflora* subsp. *parviflora* and *Persoonia nutans* were conducted on the Wattle Grove offset area on 29 November 2012 and May 2014 and to provide further detail regarding the population size and distribution of these species in the offset area. In addition the results of surveys of the Wattle Grove Offset by (Hyder 2014) and (GHD 2014) have been incorporated into the local population estimates in Table 4.4 below.

Table 4.4 Threatened flora populations recorded within the offsets

Offset area	Threatened species population information		
	Grevillea parviflora* subsp. *parviflora	***Persoonia nutans***	**Other species**
Wattle Grove offset area	A minimum population of 2000 individual's recorded but total number likely to be higher as surveys did not cover entire site and count estimates were conservative. Larger concentrations (>50 stems) mostly in the southern half of the site and scattered individuals elsewhere.	Approximately 120 individuals recorded within the offset area. The largest concentration was recorded along the boundary of the offset area between Anzac Creek and the southern boundary of the Defence National Storage and Distribution Centre site (refer Figure 3.3). Scattered individuals recorded elsewhere. A further four individuals were recorded within the perimeter fence but outside the mapped offset boundary.	Three clumps comprising > 300 stems of *Acacia pubescens* recorded.

4.4 Management of currently proposed offset areas

The existing management of the currently proposed offset areas and proposed management are outlined below.

4.4.1 Existing management

The proposed offset sites are currently managed by the Department of Defence (Defence). A Weed Management Plan (WMP) has been prepared for Defence Maintenance Management Pty Ltd (DMM) on behalf of the Defence (AECOM Australia 2010). The scope of the plan was to develop and implement all works related to the management and control of weeds on Liverpool Military Area (LMA) for a period of three years (from 1 February 2010–31 January 2013) (AECOM Australia 2010). The WMP also included an Annual Works Schedule (AWS) providing a framework against which specialist sub-contractors, DMM and Defence personnel, can identify the target weeds, define their priority for control, and implement a cost effective and environmentally sustainable program of control aligned to the

implementation of the required Defence activities at each site (AECOM Australia 2010). The goal of the WMP is to effectively manage weeds so that the site can be fully utilised within legislative responsibilities and sustain the Defence training activities over the long term (AECOM Australia 2010). Current and proposed management of biodiversity values on Defence lands in the LMA primarily involves weed management, with a focus on minimising the spread of environmental weeds (AECOM Australia 2010). The primary goal of weed management in the LMA is to manage the African Lovegrass (**Eragrostis curvula*) population as part of the ongoing management of Threatened flora species and native vegetation. Priority has been given to control of African Lovegrass on access routes to the less disturbed sections of the LMA (AECOM Australia 2010).The control of other environmental and noxious weeds such as Blackberry (**Rubus* spp.) and Green Cestrum (**Cestrum parqui*) is also a key consideration (AECOM Australia 2010).

African Lovegrass is also present at low density in the Moorebank Conservation Area and Casula Offset Area.

The current management regime appears to be focussed on containing the further spread of weeds rather than large scale reduction in existing weed infestation. While possibly sufficient to maintain the current condition of native vegetation and associated Threatened species habitat, current management is unlikely to result in a long-term improvement in biodiversity values without a substantially higher resource investment.

The proposed management described below includes an intensification of weed management and other measures to actively improve the biodiversity values of the offset sites.

4.4.2 Proposed management

4.4.2.1 Restoration and management of the Moorebank Offset area and Casula Offset area

The Moorebank Offset Area restoration site includes the eastern side of the River corridor from approximately 300 m south of the M5 Motorway for a length of approximately 2.5 km south to the East Hills Railway Line. The Casula Offset Area is located on the western side of the Georges River opposite the Project site (refer Figures 4.1 and 4.2).

A riparian restoration plan for this area has been developed (refer Appendix E in Technical Paper 3, EIS Volume 4). The purpose of this restoration plan is to guide the restoration of the riparian landform, vegetation and fauna habitat of the site and to improve the quality of water entering the Georges River. The objectives of the plan include:

- restoration and revegetation of the riparian zone of the site to be consistent with, and complementary to, areas of remnant indigenous vegetation within the Georges River Corridor (approximately 15.5 ha of land to be revegetated);
- long-term eradication and suppression of the most detrimental weed species on the site including vine and woody weeds (approximately 20.7 ha of land to undergo a weed control program);
- consolidation and widening of the existing vegetation corridor of Georges River where feasible. It is currently proposed to revegetate and conserve a corridor extending from the riverbank to the proposed development area;

- improved habitat values for native animals and plants, particularly threatened species; and
- management of undesirable animal species including introduced animal species and some Australian native animals which may be detrimental to the biodiversity of the Project site.

Successful implementation of this strategy would require detailed planning, monitoring and adaptive management.

The detailed planning stage may include management actions involving project management, sourcing of soil and obtaining plants and seeds. A variety of issues may arise in the implementation of the plan which would require actions to be modified or additional actions to be implemented. A monitoring program is thus required to detect issues at an early stage such that appropriate adaptations may be made to strategies to ensure that the relevant objectives can be met. Adaptive management actions may include trial treatments (such as trial weed-control) and subsequent modified and/or substitute actions to find alternative methods to achieve the same outcomes if the proposed actions are unsuccessful.

4.4.2.2 Wattle Grove offset area

The management and restoration of the Wattle Grove offset area will be established under a BioBanking agreement as the area is located offsite.

4.4.2.3 Management of undesirable animal species

Successful management of undesirable animal species requires an integrated approach including habitat manipulation and/or culling programs. Culling of undesirable species over a small spatial area is likely to result in constant re-invasion from adjacent lands and is unlikely to be effective in substantially reducing the impact of these species. Proposed measures to manage undesirable animal species include:

- Monitoring of undesirable animal species. Monitor the site for the presence of introduced and undesirable animal species as part of fauna monitoring;
- Co-operate with government bodies, interest groups and adjacent landowners in regional pest management programs including the NSW Department of Primary Industries, the OEH, and the Invasive Animal Cooperative Research Centre interest groups (e.g. Australasian Pest Bird Network and local landowners);
- Manage the use of nest boxes by undesirable species by removing the eggs and/or young of introduced animals (e.g. Black Rat and Common Myna) found utilising nest boxes under appropriate permit conditions;
- Remove any insect colonies (bees, wasps, termites, ants found in nest boxes); and
- Modify or move nest boxes to discourage use by undesirable species.

4.4.2.4 Proposed ecological rehabilitation requirements in accordance with the FBA

The Project's ecological impacts and the proposed biodiversity offsets have been reassessed and quantified using the BioBanking credit calculator and with reference to the FBA.

The area of proposed rehabilitation within the Moorebank and Casula offset areas adjoining the Georges River contain limited vegetation and are highly disturbed. The proposed revegetation of this area will strengthen the existing riparian corridor and will contribute to long term ecological gain of the Moorebank and Casula offsets. OEH have accepted that these areas may contribute the Projects biodiversity offsets and therefore the quantum of ecosystem credits provided by any such rehabilitation should be calculated using Chapter 12 of BBAM 2014 (in particular Table 6, Equation 7 and, where appropriate, Appendix 7).

There is currently only limited survey data available to adequately assess the potential credits generated from these 'low condition' rehabilitation areas. As such the rehabilitation areas have been temporally excluded from credits generated in the FBA credits calculations for the Moorebank and Casula offsets presented in the BOS.

It is proposed that further surveys incorporating the formal assessment of the Moorebank and Casula offsets under the BioBanking scheme will be undertaken as part of the development of the BOS. These surveys and assessment will determine the quantum of ecosystem credits generated from rehabilitation areas in accordance with Chapter 12 of BBAM 2014. Once the quantum of ecosystem credits generated by the rehabilitation of these 'low condition' areas has been determined they will contribute in part to the residual biodiversity credit requirements identified in this BOS.

4.5 Security of offset lands

Offsets sites need to demonstrate ongoing conservation of land in perpetuity for the benefit of future generations. Offset sites must be enduring and must offset the impact of the development for at least the period that the impact occurs. The security of land tenure and ongoing management of offset site(s) is critical to the long-term viability of offsets and must be carefully considered:

> To ensure the conservation of lands in-perpetuity, the offset strategy will require the dedication of any identified offset sites under a secure conservation arrangement. The preferred option for the conservation of these lands is through the establishment of a BioBanking agreement in accordance with the requirements of the FBA.

4.6 Comparison of vegetation and habitat removal to the extent provided in currently proposed offset areas

Offsets must be proportionate to the impact, in terms of size, scale and habitat type (SEWPaC 2012). The proposed biodiversity offset strategy is based around a dual direct offset approach to achieve an improved conservation outcome by combining the long-term protection of existing habitat in good condition at the IMT site with the restoration, rehabilitation and re-establishment of habitat in poor condition along the Georges River riparian corridor. A ratio (offset: clearing) of 2.5:1 would be achieved through the securing of the currently proposed offsets.

A comparison is provided in Table 4.5 below between the extent of vegetation and habitat removal with that provided in the currently proposed offset areas.

Table 4.5 Comparison of vegetation and habitat removal for the southern rail option

Vegetation community/ habitat type	Extent to be removed by the Project (ha)[1]	Extent provided in offset areas (ha)						Ratio (offset: clearing)
		Moorebank Offset Area – Georges River Riparian Zone		Casula Offset area		Wattle Grove Offset	Combined offset areas	
		Weed control – habitat restoration	Revegetation	Weed control – habitat restoration	Revegetation	Weed control – habitat restoration	Area	
Vegetation								
Castlereagh Swamp Woodland[1]	0.9	-	-	-	-	23.5	**23.5**	26:1
Castlereagh Scribbly Gum Woodland[2]	16.1	-	-	-	-	33.6	**33.6**	2.1:1
Riparian Forest (River-Flat Eucalypt Forest)[1]	3.6	12.9	-	3.0	1.1	-	**17.0**	4.7:1
Alluvial woodland (River-Flat Eucalypt Forest)[1]	28.1	4.9	16.7	-	-	-	**21.6**	0.8:1
Shale/Gravel Transition Forest	-	-	-	-	-	12.9	**13.35**	12.9:1
Cooks River Castlereagh Ironbark Forest	-	-	-	-	-	13.0	**13.23**	13.0:1
Total area	**48.7**	**17.7**	**16.7**	**3.0**	**1.1**	**83.0**	**121.5**	**2.5:1**
Shrubby eucalypt woodland	17.0	-	-	-	-	83.0	83	4.9:1
Tall eucalypt forest	31.7	17.7	16.7	3.0	1.1	-	38.4	1.2 : 1
Total area	**48.7**	**17.7**	**16.7**	**3.0**	**1.1**	**83**	**121.5**	**2.5:1**

Notes: 1 - Endangered Ecological Communities as listed under the NSW *Threatened Species Conservation Act 1995*;
2 – Vulnerable Ecological Community as listed under the TSC Act. 3) Critically endangered ecological community as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

5. Compliance with offsetting principles

This section provides a comparison of the Projects biodiversity offset strategy against the principles for the use of environmental offsets as outlined in the current Environment Protection and Biodiversity Conservation Act 1999 Environmental Biodiversity Offsets Policy (Department of Sustainability Environment Water Population and Communities 2012), and the NSW Biodiversity Offsets Policy for Major Projects.

5.1 Principles for the use of environmental offsets under the EPBC Act

DoE has developed principles for the use of environmental offsets under the EPBC Act which assess any proposed environmental offsets for matters of National Environmental Significance (including Threatened species and communities). This is done to ensure consistency, transparency and equity under the EPBC Act. The applicable principles are as follows:

- suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter;
- suitable offsets must be built around direct offsets but may include other compensatory measures;
- suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter;
- suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter;
- suitable offsets must effectively account for and manage the risks of the offset not succeeding;
- suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs;
- suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable; and
- suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

The eight principles are addressed below in relation to the potential impacts of the Project and the proposed offsets.

1. Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed development

Offsets must deliver an overall conservation outcome that *improves or maintains* the viability of the aspect of the environment that is protected by national environment law and affected by the proposed development (Department of Sustainability Environment Water Population and Communities 2012). As the Project involves the Commonwealth and actions that affect

Commonwealth areas, offsets must be targeted to the aspect of the environment that is being impacted. An improved conservation outcome may be achieved by:

- improving existing habitat for the protected matter;
- creating new habitat for the protected matter;
- reducing threats to the protected matter;
- increasing the values of a heritage place; and/or
- averting the loss of a protected matter or its habitat that is under threat (Department of Sustainability Environment Water Population and Communities 2012).

The proposed offset strategy consists of a dual direct offset approach, including offsets both within and outside of the Project site, to achieve an improved conservation outcome combining the long-term protection and/or enhancement of existing habitat in moderate to good condition with the restoration, rehabilitation and re-establishment of habitat in poor condition.

The proposed BOS is committed to providing a BOS that meets its residual offset requirements in accordance with the NSW FBA Methodology; which provides a transparent and repeatable methodology for assessing impacts on biodiversity through a modified credit calculator, similar to the existing credit calculator used under the BioBanking Assessment methodology (BBAM).

The maximum offset requirements of the Project under the current *Offset Policy 2014* has been quantified using FBA calculator as up to **1,409** ecosystem credits or approximately 140 ha and **1,004** species credits (refer to Table 5.3 and Appendix A of Technical Paper 3 in Volume 4 of the EIS).

The potential ecosystem and species credits generated from the proposed offsets have been quantified using FBA credit calculator and meet some of the Projects ecosystem credit requirements in accordance with the FBA and NSW Offset Policy 2014.

A residual offset requirement of 610 ecosystem credits (approximately 61 ha) of Alluvial woodland and 143 (approximately 14.3 ha) of Castlereagh Scribbly Gum Woodland is required.

MIC is committed to providing an offset that adequately meets quantum of the offset requirements under the FBA and Offset Policy 2014, including any residual offsets for Alluvial Woodland and Castlereagh Scribbly Gum Woodland.

2. Be built around direct offsets but may include other compensatory measures

The proposed offset strategy consists of a dual direct offset approach by combining the long-term protection of existing habitat at the IMT site and two other locations in the locality with restoration, rehabilitation and re-establishment of the degraded habitats along the Georges River riparian corridor. The offset strategy also provides for the conversation of a large area of existing habitat with locally important populations of the threatened plants species impacted by the project.

The maximum offset requirements of the Project under the NSW *Offset Policy 2014* has been quantified using FBA calculator as up to **1,409** ecosystem credits or approximately 140 ha and **1,004** species credits (refer to Table 5.3 and Appendix A of Technical Paper 3 in Volume 4 of the EIS).

MIC is committed to providing a offset package that adequately meets the quantum of the offset requirements under the FBA and Offset Policy 2014, including any residual offsets for Alluvial Woodland and Castlereagh Scribbly Gum Woodland.

3. Be in proportion to the level of statutory protection that applies to the protected matter

Offsets required for protected matters with higher conservation (threat) status must be greater than those with a lower status (Department of Sustainability Environment Water Population and Communities 2012).

4. Be of a scale and size proportionate to the residual impacts on the protected matter

Offsets must be proportionate to the impact, in both size and scale (Department of Sustainability Environment Water Population and Communities 2012). The proposed offset strategy is based around a dual direct offset approach to achieve an improved conservation outcome by combining the long-term protection of existing habitat in good condition at the Wattle Grove and Casula offsets with the restoration, rehabilitation and re-establishment of habitat in moderate condition along the Georges River riparian corridor. The offsets are proportionate to the impact in both size and scale, providing between 90% and 209% of the offset requirements for impacted biodiversity under the EPBC Act, through which a ratio (offset: clearing) of approximately 2.5:1 has been secured under the currently proposed offsets with additional offsets still yet to be determined. No clearing will take place until the additional offsets have been secured.

5. Effectively manage the risks of the offset not succeeding

The proposed offset strategy addresses risk by directly accounting for the residual biodiversity impacts associated with the Project. Direct replacement and management of the same vegetation and habitat types that are to be impacted will occur. The proposed offset areas identified to date are located directly adjacent to the impact site. Using direct offsets to account for the residual biodiversity impacts of the Project in a positive ratio situated, at least in part, adjacent to the Project area should minimise the risks of the offset not succeeding. The biodiversity offset strategy will be implemented as part of the EIS process which minimises the risks of the strategy not being implemented.

Perverse outcomes (environmental, social or economic) are unlikely to occur with the implementation of the proposed offset strategy.

6. Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or projects (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action)

The current planning controls for the Project biodiversity offset areas have been investigated. This investigation concluded that the lands are currently mapped as Environmentally Significant Land and zoned SP2 (infrastructure – Defence under the *Liverpool Local Environmental Plan 2008*. As this land is zoned and reserved for Defence infrastructure, it is not currently protected from development. The proposed offset areas are not agreed to under any other schemes or Projects.

7. Be efficient, effective, timely, transparent, scientifically robust and reasonable

The proposed offset strategy is as follows:

- efficient – the proposed offset areas are close to the development site and are capable of achieving the desired result with the minimum use of resources, time, and effort;
- effective – will result in the intended result (i.e. an improved conservation outcome);
- timely – will be secured and functional prior to vegetation clearing within the Project area;
- transparent – clearly recognisable as to what the offset strategy is trying to achieve;
- scientifically robust – the proposed offset strategy is straightforward and conforms to current thinking in conservation science and ecological restoration; and
- reasonable – the proposed offset strategy does not promise more than is possible or achievable.

8. Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced

The currently proposed offset areas and additional offset areas identified (as described in section 3.5) will be protected by an agreement that will place legal restrictions on the future use and management of the land that would exist within the title for the land in perpetuity. This will ensure that the offsets are enduring and that they will offset the impact of the development for the period that the impact occurs.

MIC is currently proposing to establish BioBanking agreements over the proposed offsets as the preferred method of providing enduring, enforceable and auditable conservation areas.

The proponent or its contractors will report on the success of the offsets to ensure that the offsets are delivering an improved conservation outcome. Annual reports on the success of the offset strategy will be provided to the DoE and the OEH and will be made publicly available. All establishment costs of the proposed offsets will be borne by MIC or a future developer under contractual requirements specified by MIC.

5.1.1 Adequacy assessment of Biodiversity offsets under the EPBC Act

The *Offsets Assessment Guide* (Department of Sustainability Environment Water Populations and Communities 2012) provides the biodiversity offset requirements and decision-making framework for DoE to assess the suitability of biodiversity offsets. The guide assesses the appropriateness and adequacy of the proposed offsets, in alignment to the principles and offset requirements under the EPBC Act, for Threatened species and ecological communities (Department of Sustainability Environment Water Population and Communities 2012).

The key steps in the process under this policy (once impacts have been avoided as far as practicable) are to:

- identify the residual impacts to threatened species, their habitats or threatened ecological communities;

- determine likely offsets required via use of the Offsets Assessment Guide calculator; and
- develop an offset strategy and subsequent offset package to formalise appropriate offsets in consultation with DoE.

The Project biodiversity offsets areas identified to date, has been assessed using the *Offsets Assessment Guide.* The assessment is based on habitat of Threatened biodiversity known and predicted to occur within the Project area. The areas and condition of habitat within the Project will be based on the habitat assessments completed during field surveys for the EIS.

For the Project the following approach was taken:

- current known direct impacts of the northern rail option to threatened species, habitats and ecological communities were confirmed; and
- a flora offset calculation and a fauna habitat calculation were undertaken to determine sufficient offset areas in hectares.

Assumptions for the calculation included:

- The impacts of the project (that will require offsetting) are assumed to be those as identified in Technical Paper 3 – *Ecological Impact Assessment* in EIS Volume 4.
- The flora offset calculation was based on habitat for the endangered *Persoonia nutans* and the vulnerable *Grevillea parviflora*, as the endangered status for *Persoonia* results in the maximum offset requirement for threatened flora overall.
- The fauna offset calculation was based on fauna habitat for recorded species such as the Grey-headed Flying Fox, which is listed as vulnerable under the EPBC Act and potential habitat for endangered species like the Regent Honeyeater and Swift Parrot. These species would utilise any of the forested habitats on the site for potential foraging. The calculation was based on these species likely presence and the assumption that all native forested habitats formed habitat for this fauna species.
- No threatened vegetation communities listed under the EPBC Act were recorded on the site, although the use of fauna habitat for all native forested vegetation impacts ensures that all vegetation impacts are considered for offsetting, whether they are listed as threatened under the EPBC Act or not.

These assessments will also account for the value of habitat to to State-listed Threatened species, populations and ecological communities.

During the assessment a conservative approach will be adopted to ensure adequacy due to information limitations. The assumptions listed in Table 5.1 below have been made when assessing offsets.

Table 5.1 Assumptions of protected matter attributes when assessing adequacy of biodiversity offsets

Protected matter attributes	Assumption	Score
EPBC Act status	The highest status of EPBC Act Threatened species considered likely to occur within the Project area will be used in determining the annual probability of extinction. Three separate assessment have been completed for the Project (refer to Attachment A of this document): ▪ vulnerable plant species; ▪ endangered plant species; and ▪ vulnerable fauna species.	▪ Vulnerable plant species ▪ Endangered plant species ▪ Vulnerable fauna species
Protected matter attributes	While detailed counts of the two recorded threatened flora species exists for the projects impacts, given the potential for a soil seed bank for the species and absence of viable population data within the project for the threatened fauna, a precautionary approach was taken and the presence of habitat was used as the key attribute for assessment.	Habitat
Quality of site habitat	The condition of the sites habitats has been assessed through detailed surveys and assessment in accordance with the NSW BioBanking methodology. These surveys collected data on a range of site condition variables specifically relevant to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features. **Site condition** The site specific date identified condition scores for the vegetation to be impacted between 36–44/100. **Site context** The Project is situated on land in the suburb of Moorebank in a locality that includes the residential suburbs of Casula, Wattle Grove and North Glenfield, as well as industrial, commercial and Defence land. Much of the vegetation of the Project site has been cleared and replaced with roads, buildings, playing fields and exotic grassland, or substantially thinned, leaving only scattered remnant trees. Substantial areas of vegetation remain, however, in the west of the site within the riparian zone of the Georges River and in patches along the eastern boundary of the site adjacent to Moorebank Avenue. **Species stocking rate** The two threatened flora species, *Persoonia nutans* and *Grevillea parviflora* were recorded in relatively low numbers within the development site (10 and 16 respectively) when compared to the significant number (40 and 360 respectively) recorded from the adjoining better quality habitats associated with the Wattle Grove Offset area immediately to the south east of the development.	5
Time over which loss is adverted	It is assumed that the offset areas will be secured for at least 20 years for conservation purposes. It is likely that the offset would be secured in perpetuity, however, the *Offsets Assessment Guide* allows for a maximum of 20 year for offset assessment purposes.	20 years

Protected matter attributes	Assumption	Score
Time until ecological benefit	The proposed biodiversity strategy involves the restoration and rehabilitation of the disturbed areas of the Casula Offset Area and Georges River Riparian Zone as part of the Projects early works program well before any proposed vegetation clearing activities with the Project site (refer to Attachment E of the Biodiversity Technical report, EIS Volume 4). The Wattle Grove Offset area is a large area of relatively undisturbed vegetation and habitats and as such will require very little time before the ecological benefit is made.	2
Risk of loss (%)	The risk of the habitat within the proposed offset sites being completely lost will be assessed based on the following aspects: ▪ Physical constraints – topography and flooding. ▪ Land use zoning. ▪ Surrounding Infrastructure. ▪ Existing development applications. The Casula Offset Area and Georges River Riparian Zone is currently disturbed and subject to significant development pressures from the neighbours industrial, urban development and transport land uses. It is considered these areas are likely to be subject to >50% risk of loss. The Wattle Grove Offset area is currently impacted by only periodic defence developments and edge effects from the adjoining transport corridors. It is considered these areas are likely to be subject to <20% risk of loss. A precautionary approach has been taken to the combined weighting and while the Casula Offset Area and Georges River Riparian Zone are considered to be significantly greater risk of loss a combined weighting of 25% has been applied.	25%

Protected matter attributes	Assumption	Score
Start quality of offset	The condition of the sites habitats has been assessed through detailed surveys and assessment in accordance with the NSW BioBanking methodology. These surveys collected data on a range of site condition variables specifically relevant to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features. **Site condition** The site specific date identified condition scores for the vegetation to be impacted between 56–84/100. **Site context** The Wattle Grove offset consolidated a large are of remnant vegetation on the urban fringe with adjoining large areas of quality habitat associated with defence land. The Casula Offset Area and Georges River Offset area will consolidate an important riparian a corridor through the urban and industrial land use. **Species stocking rate** The two threatened flora species, *Persoonia nutans* and *Grevillea parviflora* were recorded in relatively significant number (40 and 360 respectively) from the Wattle Grove Offset area immediately to the south east of the development. This area and its habitats are considered important local population of these species.	8
Future quality without offset	The future quality of the proposed offset areas will be predicted based on observed threatening processes (e.g. weed invasion) affecting the offset areas and the likely continuation of these processes in the absence of more intense management for conservation.	7
Future quality with offset	The future quality of the proposed offset areas will be predicted based on proposed management (e.g. weed control, assisted natural regeneration and revegetation of disturbed vegetation) within offset areas. **Site condition** The site specific date identified condition scores for the vegetation to be impacted between 85–100/100.	9
Confidence in result (%)	The level of certainty about the success of the proposed offset areas will be estimated by taking into consideration the potential change in habitat quality and adverted loss over time. This includes the degree to which the proposed offset actions can be achieved to benefit the protected matters and the strength and effectiveness of risk-mitigation measures. The relatively minor requirements for the substantial area of the Wattle grove offset and relatively small area of rehabilitation required in the Georges River offset area suggest a high confidence result is likely.	75

A summary of the adequacy of the Project offsets generated by the calculations using the Commonwealth Offset Guide is provided below in Table 5.2.

Table 5.2 Commonwealth offset requirement balance

Vegetation community or species	Area to be Impacted (ha)	Area to be impacted (adjusted hectares)	Estimated offset area required (ha) using Offset Guide	Proposed Offset Area (ha)	% of impact offset
Persoonia nutans habitat (Endangered)	17	8.5	40	83	211%
Grevillea parviflora habitat (Vulnerable)	17	8.5	35	83	236%
Grey-headed Flying Fox habitat (Vulnerable)	48.7	24	100	121.5	121%
Potential Habitat for Swift Parrot and Regent Honeyeater (Endangered)	48.7	24	112	121.5	107%
Total*	**48.7**		**142***	**121.5**	**N/A**

Note: * indicates that the total equates to the total cumulative requirement of the fauna and flora, however the proposed offsets fauna habitat includes the flora habitat requirement.

To compensate for the impact upon threatened flora, a minimum area of suitable habitat of 40 ha is required. The current offsets would provide 83 ha of suitable habitat with demonstrated occurrence of *Persoonia nutans* and *Grevillea parviflora* subsp. *parviflora* and would fulfil this requirement.

In terms of native forest fauna habitat impacts of the project, the calculations have identified that a total offset area of approximately 112 ha needs to be provided. Of this, the current offsets would provide 121.5 ha of similar suitable habitat and would fulfil this requirement.

In summary, the proposed biodiversity offset strategy consists of a dual direct offset approach including offsets both within and outside the Project site to achieve an improved conservation outcome combining the long-term protection and/or enhancement of existing habitat in moderate to good condition with the restoration, rehabilitation and re-establishment of habitat in moderate condition. The offsets are proportionate to the impact in both size and scale, providing between 107% and 236% of the offset requirements for impacted biodiversity under the EPBC Act, through which a ratio (offset: clearing) of approximately 2.5:1 has been secured under the currently proposed offsets.

5.2 Principles for the use of biodiversity offsets in NSW

The NSW Secretary's Environmental Assessment Requirements (SEARs) for the Project suggest the offsets strategy must demonstrate how it achieves the overarching principles of current policy. In March 2014, the Draft NSW Biodiversity Offsets Policy for Major Projects (Draft Policy) was released for public exhibition. The Draft Policy has now been finalised (Offset Policy 2014) and commenced implementation from 1 October 2014 when it became mandatory for all SSD and SSI projects.

The Offset Policy 2014 reduced the number of offset principles to six and introduced the use of a new assessment methodology, the Framework for Biodiversity Assessment (FBA).

The principles outlined in this policy are as follows:

Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.

The Project has considered avoiding or minimising direct impacts to biodiversity throughout the lifecycle of the Project in accordance with Section 8.3.2 of the FBA guidelines. The Project is currently seeking concept approvals for a Stage 1 SSD development of a concept design and future avoidance of vegetation will be investigated during detailed design and Stage 2 SSD development approvals.

Given the location and nature of the Project and its context with regard to existing road and rail infrastructure, there is limited scope for using alternative locations to entirely avoid impacts on biodiversity. Reduction of impacts on areas of high ecological value was considered in the analysis and evaluation of design options for the Project, resulting in the retention of substantial areas of vegetation and habitat contiguous with the riparian vegetation of the Georges River (refer section 1.2 above and 6.4.4 EIA in Technical Paper 3, EIS Volume 4).

Offset requirements should be based on a reliable and transparent assessment of losses and gains.

The FBA Methodology provides a transparent and repeatable methodology for assessing impacts on biodiversity through a modified credit calculator, similar to the existing credit calculator used under the BioBanking Assessment methodology (BBAM).

The maximum offset requirements of the Project under the current *Offset Policy 2014* has been quantified using FBA calculator as up to **1,409** ecosystem credits or approximately 140 ha and **1,004** species credits (refer to Table 5.3 and Table and Appendix A of this report).

The potential ecosystem and species credits generated from the proposed offsets have been quantified using FBA credit calculator and meet some of the Project ecosystem credit requirements in accordance with the FBA and NSW Offset Policy 2014.

A residual offset requirement of 610 ecosystem credits (approximately 61 ha) of Alluvial woodland and 143 (approximately 14.3 ha) of Castlereagh Scribbly Gum Woodland is required.

MIC is committed to providing an offset that adequately meets quantum of the offset requirements under the FBA and Offset Policy 2014, including any residual offsets for Alluvial Woodland and Castlereagh Scribbly Gum Woodland.

Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.

The proposed offsets have been established based on the presence of Like for Like biodiversity values to those values impacted by the Project under the FBA. MIC is committed to providing an offset that adequately meets quantum of the offset requirements under the FBA and Offset Policy 2014.

Offsets must be additional to other legal requirements.

The *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (Department of Sustainability Environment Water Population and Communities 2012) outlines the Commonwealth Government requirements for offsets for matters of national environmental significance. This biodiversity offsets strategy has been designed to conform to the seven principles outlined in this policy.

Offsets must be enduring, enforceable and auditable.

The currently proposed offset areas and additional offset areas identified (as described in section 3.5) will be protected by an agreement that will place legal restrictions on the future use and management of the land that would exist within the title for the land in perpetuity. This will ensure that the offsets are enduring and that they will offset the impact of the development for the period that the impact occurs.

MIC is currently proposing to establish BioBanking agreements over the proposed offsets as the preferred method of providing enduring, enforceable and auditable conservation areas.

Supplementary measures can be used in lieu of offsets.

The offset strategies chosen for the Project include a combination of:

- onsite offsets – securely conserving and improving the condition of existing riparian habitat or providing a buffer to an area of existing habitat within the Project site;
- offsite offsets – securing and improving the condition of existing habitats at other sites in the immediate locality of the Project site; and
- offsite offsets – securing like for like ecosystem credits through the NSW BioBanking Scheme.

The proposed offsets meet some of the Project ecosystem credit requirements in accordance with the FBA and NSW Offset Policy 2014. A residual offset of 610 ecosystem credits (approximately 61 ha) of Alluvial woodland and 143 (approximately 14.3 ha) of Castlereagh Scribbly Gum Woodland is required. MIC is committed to providing an offset that adequately meets quantum of the offset requirements under the FBA and Offset Policy 2014, including any residual offsets for Alluvial Woodland and Castlereagh Scribbly Gum Woodland.

5.3 Adequacy assessment of the biodiversity offsets under the FBA (Offset Policy 2014)

The FBA Methodology provides a transparent and repeatable methodology for assessing impacts on biodiversity through a modified credit calculator, similar to the existing credit calculator used under the BBAM.

The key steps in the process under this policy (once impacts have been avoided as far as practicable) are to:

- Identify the residual impacts (once all avoidance and other mitigation measures have been applied) to threatened species, their habitats or threatened ecological communities.
- Determine likely offsets required via use of the FBA calculator.
- Develop an offset strategy and subsequent offset package to formalise appropriate offsets in consultation with OEH.

The maximum offset requirements of the Project under the current *Offset Policy 2014* has been quantified using FBA calculator as up to **1,409** ecosystem credits or approximately 140 ha and **1,004** species credits (refer to Table 5.3 and Appendix A of Technical Paper 3 in Volume 4 of the EIS).

Table 5.3 Summary of vegetation and plants to be impacted and FBA ecosystem credits required to offset the impacts

Vegetation community or species	Assigned Biometric vegetation type	Vegetation formation (Cleared estimate)	Area or number to be Impacted (ha)	Red Flag	Conservation Status	Estimated credits required	Area (ha)	Estimated credits Provided	Proposed Offset Area (ha)	Balance Credits	Approx. Balance Area
Alluvial Woodland	ME018 Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Coastal Valley Grassy Woodlands (95)16.1	28.1	Yes	TSC Act E	844	84.4	70[3]	4.9	-774	-78.0
Riparian Forest	ME044 Sydney Blue GumXBangalay – Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin[1]	Wet Sclerophyll Forests (45)	3.6	Yes[2]	TSC Act E	91	9.1	255[3]	15.9	164	16.4
EEC RFEF[4]			**31.7**			**935**	**93.5**	**325**	**20.8**	**-610**	**-61**
Castlereagh Swamp Woodland	ME005 Parramatta Red Gum woodland on moist alluvium of the Cumberland Plain, Sydney Basin	Dry Sclerophyll Forests (45)	0.9	Yes	TSC Act E	30	3	213	23.5	183	18.4

Vegetation community or species	Assigned Biometric vegetation type	Vegetation formation (Cleared estimate)	Area or number to be Impacted (ha)	Red Flag	Conservation Status	Estimated credits required	Area (ha)	Estimated credits Provided	Proposed Offset Area (ha)	Balance Credits	Approx. Balance Area
Castlereagh Scribbly Gum Woodland	ME003 Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	Dry Sclerophyll Forests (50)	16.1	Yes[2]	TSC Act V	444	44.4	301	33.6	-143	-14.3
TOTAL			**48.7**			**1409**	**140.9**	**836[3]**	**77.6**	**-753**	**-75.3**

Note: [1] indicates closest available similar vegetation type in the BBAM calculator

[2] indicates that a threatened ecological community could not be selected in the calculator despite the observed communities being threatened ecological communities

[3] credit estimate excludes potential credits generated from low condition areas identified for rehabilitation of Alluvial Woodland. The contribution of these areas to any final offset package will be assessed in accordance with the proposed methodology identified by OEH in the submissions provided 5/12/14 as part of the Biodiversity Offset package and any formal BioBanking agreement

[4] = Riparian Forest and Alluvial woodland vegetation communities have been considered the same vegetation formation in accordance with OEH submission comments provided 5/12/14

5.4 Species credits

Species credits were calculated for two threatened flora and recorded during the current and previous targeted surveys (Section of 3.1 of the EIA in Technical Paper 3, EIS Volume 4). The species credits required for development of the Project site are summarised in Table 5.4.

Table 5.4 Species credits required for development

Scientific name	Common name	No. of individuals recorded to be impacted	No. of credits required	No. of individuals recorded in offsets	No. of credits created in offsets
Persoonia nutans	Nodding Geebung	10	769	120	852
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	16	229	2,000+	14,200
Acacia pubescens		0	0	300+	1,130
Total		26	998	2,420	16,182

5.4.1 Summary of shortfall 'like for like' and residual offset requirements

The proposed offsets areas do not currently meet the entire quantum of ecosystem and species credit requirements for the Project development impacts under the FBA methodology. The short fall in ecosystem credits provided by the proposed offsets is associated with the Alluvial Woodland and Castlereagh Scribbly Gum Woodland vegetation communities. A summary of which is provided below in Table 5.5.

It is proposed that further surveys incorporating the formal assessment of the Moorebank and Casula offset sites under the BioBanking scheme will be undertaken as part of the development of the Biodiversity Offset Package. These surveys and assessment will determine the quantum of ecosystem credits generated from rehabilitation areas in accordance with Chapter 12 of BBAM 2014. Once the quantum of ecosystem credits generated by the rehabilitation of these 'low condition' areas has been determined they will contribute in part to the residual shortfall in biodiversity credit requirements identified in this BOS.

Table 5.5 Summary of shortfall of ecosystem credits and vegetation types to be impacted

Vegetation community or species	Assigned Biometric vegetation type	Vegetation formation	Percent cleared in CMA	Conservation Status	Deficit credits required
Alluvial Woodland	ME018 Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Coastal Valley Grassy Woodlands	95	TSC Act E	-610

Vegetation community or species	Assigned Biometric vegetation type	Vegetation formation	Percent cleared in CMA	Conservation Status	Deficit credits required
Castlereagh Scribbly Gum Woodland	ME003 Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin	Dry Sclerophyll Forests	50	TSC Act V	-143

5.4.2 Proposed process for securing residual offsets requirements

The BOS has identified that despite the currently proposed biodiversity offsets, the Project has a residual offset requirement for Alluvial Woodland, Castlereagh Scribbly Gum Woodland vegetation communities in accordance with The FBA and NSW Offset Policy 2014.

MIC is committed to undertaking all reasonable steps to secure the matching ecosystem credit/species credits in accordance with the FBA, including:

a) checking the BioBanking public register and placing an expression of interest for credits wanted on it for at least six months;
b) liaising with an OEH office (or Fisheries NSW office for aquatic biodiversity) and relevant local councils to obtain a list of potential sites that meet the requirements for offsetting;
c) considering properties for sale in the required area; and
d) providing evidence of why offset sites are not feasible.

Where MIC can demonstrate that all reasonable steps listed above have been undertaken and specific ecosystem or species credit requirements cannot be found and where the consent authority's opinion 'all reasonable steps to secure a matching ecosystem credit have been taken by the proponent', then alternatives offset arrangements in consultation with the consent authority's will be provided. These may include:

- variation of the offset rules for matching ecosystem credits, by allowing ecosystem credits created for a PCT from the same vegetation formation as the PCT to which the required ecosystem credit relates to be proposed as an offset, or

- a supplementary measure to be proposed as an offset for the PCT where the PCT is associated with an EEC or to any outstanding credit requirements for impacts to threatened species habitats.

6. Conclusion

The proposed biodiversity offset strategy consists of a dual direct offset approach including offsets both within and outside the Project site to achieve an improved conservation outcome combining the long-term protection and/or enhancement of existing habitat in moderate to good condition with the restoration, rehabilitation and re-establishment of habitat in moderate condition.

Three offset sites have been identified which provide 121.7 ha of land suitable for use as offsets for the EPBC Act and TSC Act listed Threatened species and endangered ecological communities.

The offsets are proportionate to the impact in both size and scale, providing between 107% and 236% of the offset requirements for impacted biodiversity under the EPBC Act, through which a ratio (offset: clearing) of approximately 2.5:1 has been secured under the currently proposed offsets.

The proposed offsets meet some of the Projects ecosystem credit requirements in accordance with the FBA and NSW Offset Policy 2014. A residual offset of 610 ecosystem credits (approximately 61 ha) of Alluvial woodland and 143 (approximately 14.3 ha) of Castlereagh Scribbly Gum Woodland is required. MIC is committed to providing an offset that adequately meets quantum of the offset requirements under the FBA and Offset Policy 2014, including any residual offsets for Alluvial Woodland and Castlereagh Scribbly Gum Woodland.

The proposed offsets strategy is underpinned by sound ecological principles to improve or maintain the existing biodiversity values of the local area.

7. References

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