

## Chapter 8

### Additional technical investigations since EIS





## 8. Additional technical investigations since the EIS

This chapter provides details of technical investigations that have been undertaken since the exhibition of the Environmental Impact Assessment (EIS). The technical assessments presented in this chapter are unrelated to the technical assessments conducted as a result of the amendments to the proposal (which are reported in Chapter 7 – *Proposed amendments to the development* of this Response to Submissions Report).

### 8.1 Biodiversity offset planning

#### 8.1.1 Changes to the Biodiversity Offset Strategy since the EIS

The Biodiversity Offset Strategy (BOS) has changed in response to changes to the proposed biodiversity offset areas and in response to the submission provided by the Office of Environmental Heritage (OEH). This section discusses the changes to the BOS since the EIS exhibition and incorporates:

- changes in the application of the Framework for Biodiversity Assessment (FBA) methodology to further consider the revised southern rail access corridor;
- changes to the Version 1.03 (Office of Environment and Heritage 2014a) credit calculator used in the Technical Paper 3 – *Ecological Impact Assessment* in Volume 4 of the EIS; and
- changes to Version 4.0 credit calculator used in January 2015.

In summary, the revised BOS has incorporated:

- further assessment of the measures 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 matters 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.

The detailed BOS is provided in Appendix C of this report.

### 8.1.2 Changes in the boundary and extent of the proposed biodiversity offset areas

In addition to presenting changes to the proposed biodiversity offsets areas the revised BOS also provides an estimate of ecosystem and species credits generated from these offset areas (refer to Figure 8.1).



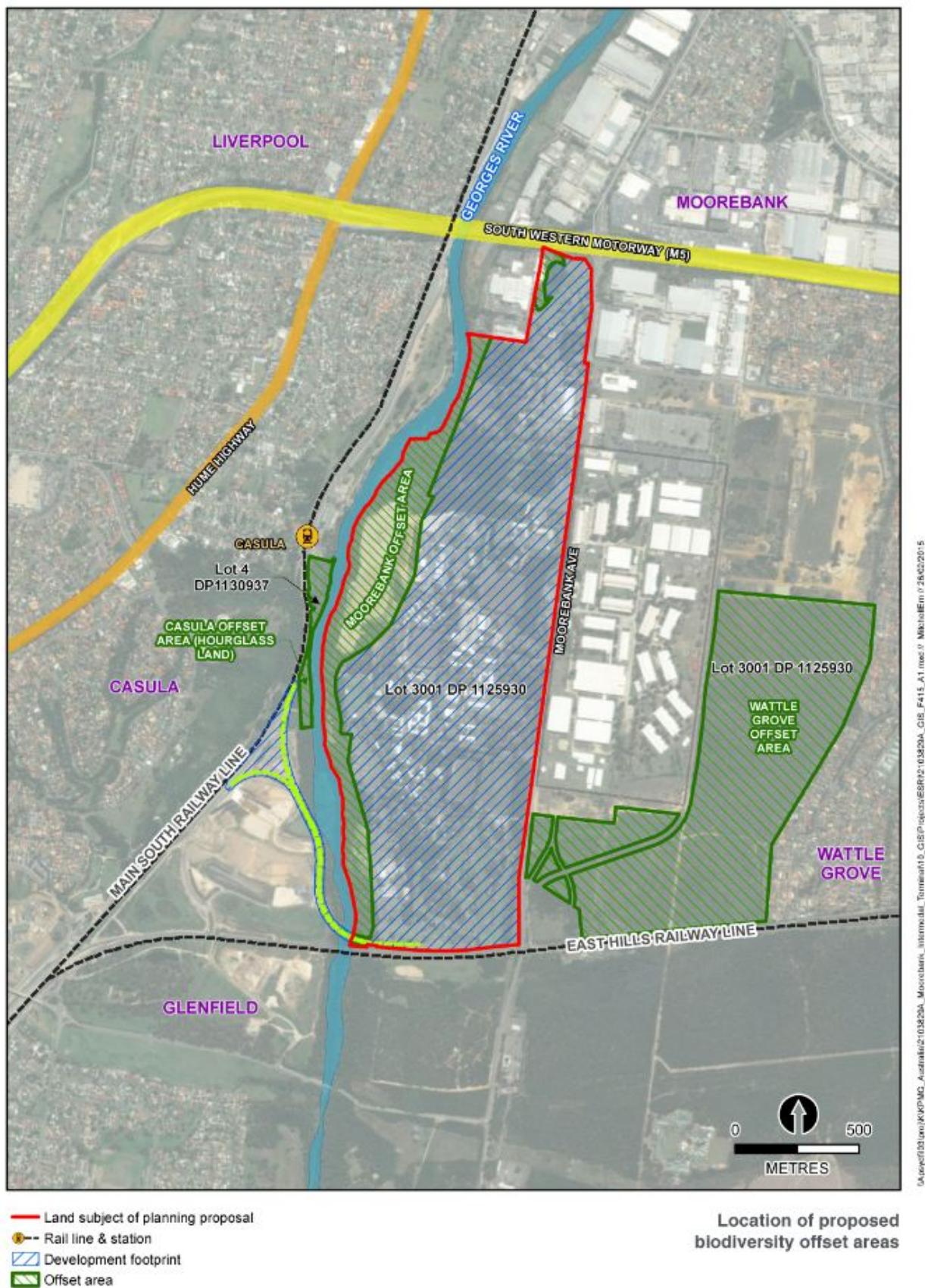


Figure 8.1 Location of proposed biodiversity offset areas

A summary of the changes in the areas and credit generated for the proposed biodiversity offsets include the following:

- an increase in the width of the onsite Moorebank conservation area, extending east of the 1% flood line and therefore increasing the future conservation and riparian corridor to a total area of 32.9 ha, incorporating 20.8 ha of remnant Riparian Forest and Alluvial Woodland vegetation;
- an increase in the area of the Wattle Grove offset to include additional lands to the north of the 'boot toe', incorporating approximately 10 ha of additional Castlereagh Swamp Woodland and Castlereagh Scribbly Gum Woodland as well as additional populations of the threatened flora species *Persoonia nutans* and *Grevillea parviflora*;
- a decrease in the estimated Alluvial Woodland credits generated from the Moorebank and Casula offsets from 183 to 70 due to temporarily excluding the generation of credits on the proposed 'low condition' Alluvial Woodland areas identified for rehabilitation. These areas will provide ecosystem credits; however, the quantification of the credits generated requires further field data and will be subject to a formal assessment under Chapter 12 of NSW BioBanking Assessment Methodology 2014 (BBAM) (in particular Table 6, Equation 7 and, where appropriate, Appendix 7) in the development of a BioBanking agreement for the final offset package;
- an increase in the number of Castlereagh Swamp Woodland credits from 180 to 213 corresponding with the increased areas of the Wattle Grove offset;
- an increase in the number of Riparian Forest credits from 129 to 255 corresponding with changes to the areas of the Moorebank and Casula Offsets and revised FBA credit calculator;
- an increase in the number of Castlereagh Scribbly Gum Woodland credits from 260 to 301 corresponding with the increased areas of the Wattle Grove offset; and
- provision of 852 species credits for *Persoonia nutans* and 14,200 species credits for *Grevillea parviflora subsp. Parviflora*, incorporating the results of additional targeted field surveys within the Wattle Grove offset by GHD and Hyder in 2014, as well as the increased areas of the Wattle Grove offset.

A summary of the revised impacts and proposed offsets in areas (ha) and credits is provided below in Table 8.1 for ecosystems and Table 8.2 for species.

Table 8.1 Summary of vegetation 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	<i>Threatened Species Conservation Act 1995 (TSC Act) E</i>	844	84.4	703	4.9	-774	-78.0
Riparian Forest	ME044 Sydney Blue GumXBangalay – Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin <sup>1</sup>	Wet Sclerophyll Forests (45)	3.6	Yes <sup>2</sup>	TSC Act E	91	9.1	2,553	15.9	164	16.4
Endangered Ecological Community (EEC) RFEF <sup>4</sup>			31.7			935	93.5	325	20.8	-610	-64.5
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 <sup>2</sup>	TSC Act V	444	44.4	301	33.6	-143	-14.3
<b>TOTAL</b>			<b>48.7</b>			<b>1,409</b>	<b>140.9</b>	<b>8,363</b>	<b>77.6</b>	<b>-753</b>	<b>-75</b>

**Note:** <sup>1</sup> indicates closest available similar vegetation type in the BBAM calculator.

<sup>2</sup> indicates that a threatened ecological community could not be selected in the calculator despite the observed communities being threatened ecological communities

<sup>3</sup> 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.

<sup>4</sup> = Riparian Forest and Alluvial Woodland vegetation communities have been considered the same vegetation formation in accordance with OEH submission comments provided 5/12/14.

Table 8.2 Summary of species to be impacted and FBA credits required to offset the impacts

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



### 8.1.3 Changes in the proposed application and flexibility of the FBA variation rules

The BOS no longer proposes a modified application of the FBA variation rules and identifies only the quantum of ecosystems credits within the proposed offsets that directly address the Projects impacts and 'like for like' requirements.

The BOS does however include the Riparian Forest vegetation as a 'like for like' ecosystem swap for the Alluvial Woodland vegetation, as referred by OEH.

### 8.1.4 Summary of short fall 'like for like' and residual offset requirements

The proposed offset areas do not currently meet the entire quantum of ecosystem credit requirements for the Project's development impacts under the FBA methodology. The shortfall in ecosystem credits provided by the proposed offsets is associated with the Alluvial Woodland and Castlereagh Scribbly Gum Woodland vegetation communities. A summary is provided below in Table 8.3.

Table 8.3 Summary of shortfall of ecosystem credits and vegetation types to be impacted

<b>Vegetation community or species</b>	<b>Assigned Biometric vegetation type</b>	<b>Vegetation formation</b>	<b>Percent cleared in CMA</b>	<b>Conservation Status</b>	<b>Deficit credits required</b>
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
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

### 8.1.5 Commitment to take all reasonable steps in searching for residual 'like for like' offsets for the project in accordance with the FBA.

The BOS has identified that despite the currently proposed biodiversity offsets, the Project has a residual offset requirement for Alluvial Woodland and 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:

- checking the BioBanking public register and placing an expression of interest for credits wanted for at least six months;

- liaising with OEH (or Fisheries NSW office for aquatic biodiversity) and relevant local councils to obtain a list of potential sites that meet the requirements for offsetting;
- considering properties for sale in the required area; and
- providing evidence of why offset sites are not feasible.

If MIC can demonstrate that all reasonable steps listed above have been undertaken but if specific ecosystem or species credit requirements still cannot be found, MIC will discuss the shortfall with the consent authority. If agreed by the consent authority that '*all reasonable steps to secure a matching ecosystem credit have been taken by the proponent*', then alternative offset arrangements will be provided. These may include:

- variation of the offset rules for matching ecosystem credits, by allowing ecosystem credits created for a Plant Community Type (PCT) from the same vegetation formation as the PCT to which the required ecosystem credit relates to; or
- a supplementary offset for the PCT where the PCT is associated with an Endangered Ecological Community (EEC) or a Critically Endangered Ecological Community (CEEC).

In summary, the proposed BOS consists of a dual offsets approach including offsets within and outside the Project site to achieve an improved conservation outcome, which combines 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 underpinned by sound ecological principles to improve or maintain the existing biodiversity values of the local area. Three offset sites have been identified which provide 121.7 ha of land suitable for use as offsets for the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and TSC Act listed Threatened species and Endangered ecological communities. The revised offsets areas were proportionate to the impact in both size and scale, providing between 107% and 236% of the offset requirements for affected biodiversity under the EPBC Act.

The maximum offset requirements of the Project under the NSW Offsets Policy 2014 were quantified using the FBA Credit Calculator Version 4.0 (Office of Environment and Heritage 2014a) as up to **1,409** ecosystem credits or approximately 140 ha and **1,004** species credits.

The proposed offsets meet some of the Project's ecosystem credit requirements in accordance with the FBA and NSW Offset Policy 2014. The revised BOS has identified that despite the proposed biodiversity offsets, the Project has a residual offset requirement for 610 Alluvial Woodland credits and 143 Castlereagh Scribbly Gum Woodland credits in accordance with the FBA.

MIC is committed to undertaking all reasonable steps to secure the matching ecosystem credits and providing an offset package that meets the quantum of the offset requirements in accordance with the FBA.

## 8.2 Heritage

### Aboriginal heritage

Chapter 20 – *Aboriginal heritage* of the EIS provides an assessment of the Aboriginal heritage items including an assessment of the cultural heritage significance and potential impacts.

The cultural heritage significance and potential impacts on Aboriginal heritage values were assessed by undertaking:

- a literature and database review;
- an archaeological field survey of the site;
- subsurface testing;
- an Aboriginal consultation program; and
- significance and impact assessment.

Section 20.1 of Chapter 20 – *Aboriginal heritage* and section 3 of the Technical Paper 10 – *Aboriginal Heritage Impact Assessment* in Volume 7 of the EIS provide a detailed description of the assessment approaches. Two data gaps were identified in Technical Paper 10 – *Aboriginal Heritage Impact Assessment* in Volume 7 of the EIS:

- subsurface testing at Moorebank Representative Sample area 2 (MRSAR2); and
- scar tree assessment.

MIC is committed to addressing these data gaps during its response to submissions and this assessment is provided below.

### *Additional subsurface testing at MRSAR2*

The findings of the literature review and field surveys were used to identify potential archaeological deposits (PADs) and archaeological sensitive landforms for subsurface testing. Subsurface testing was undertaken in September 2012 on the main intermodal terminal (IMT) site and in July/August 2013 on the Northern Powerhouse Land. Due to health and safety concerns associated with MRSAR2, it was not possible to access and test at this location.

In August 2014, subsequent test excavations within MRSAR2 were completed at seven locations with pit depths varying between 17 and 50 cm depth.

During this test program a total of 34 artefacts were recovered, consisting of untouched flakes and one retouched flake confirming the archaeological potential of the area. The testing of MRSA2 further supports the results of the 2012 excavation program, which indicated that intact deposits do occur upon the Tertiary terrace edge within the Project site. Following the findings of the subsurface testing at MRSA2, the sample area and surrounding area has been re-designated as MA14.

The testing program at MRSA2 confirms the significance assessment of the Moorebank IMT study area and supports the conclusion of the Technical Paper 10 – *Aboriginal Heritage Impact Assessment* (Volume 7 of the EIS), which showed that the areas of greatest Aboriginal significance and research value are the landforms within and immediately bordering the Georges River.

The full results, including photographic evidence, are documented in the Moorebank IMT *Aboriginal Heritage Assessment – Addendum, Archaeological Subsurface Testing – MRSA2* (NOHC, September 2014) in Appendix J of this Response to Submissions report.

#### *Additional scar tree assessment*

During the 2010 archaeological field survey of the Moorebank IMT site and adjacent lands, eight archaeological recordings were made. These consisted of three scarred trees of possible Aboriginal origin (MA6, MA7 and MA8). A summary description of these sites is presented in Table 8.4.

Table 8.4 Summary of 2010 Aboriginal scarred trees field survey results

Site	Description
MA6	The scarred tree is an old growth Eucalyptus in fair to good health, with a number of hollows and missing limbs. The scar was of an irregular and asymmetrical shape and was assessed to be of possible Aboriginal origin.
MA7	The scarred tree was recorded as a smooth barked Eucalyptus (Red gum). The tree is located close to a playing field and the Tertiary terrace edge, and is approximately 80–100 m from the river. The scar regrowth is irregular and the age of the tree and the scar may be post-European settlement. It was assessed to be of possible Aboriginal origin.
MA8	<p>The scarred tree was recorded as a rough barked Eucalyptus, becoming smooth barked two-thirds of the way up the trunk. The tree is located approximately 60 m from the river. The scar may have been caused by machinery during the cutting and benching of the area. A possible Aboriginal origin is supported by the possible age and symmetrical shape of the scar, the amount of scar regrowth and the tree type, as well as its proximity to the Georges River.</p> <p>MA8 is outside the construction footprint, so it was not considered further as part of the assessment of potential scar trees.</p>

The Aboriginal heritage assessment undertaken for the EIS concluded there was uncertainty about the origin of the scars at MA6 and MA7 and their scientific and educational value. As such, further assessment was proposed. As MA8 is located within the conservation zone and outside the construction footprint, no further assessment was undertaken, although its significance as a potential scar tree remains.

In 2014, draft methodology for the further assessment of MA6 and MA7 was prepared by Navin Officer Heritage Consultants (NOHC) and presented to the Registered Aboriginal Parties for consultation and then to the NSW Department of Planning and Environment (NSW DP&E) for approval, as part of the environmental assessment. Following feedback and agreement of the methodology from the Registered Aboriginal Parties, the methodology was further developed further and additional data was obtained on the trees and scar sizes in November 2014. The data was analysed by dendrologist Dr Matthew Brookhouse and can be summarised as follows:

- Core samples were taken from both trees, at locations adjacent to and distant from each tree's scar.
- Detailed data were taken on scar size and location, on the diameter of each tree, and the depth of each scar.



- Estimating the age of a scar involved calculating the difference in tree diameter between the scar surface and the current outer surface of the tree (in other words, the amount of growth that has occurred since the formation of the scar), and measuring the rate at which the post-scar growth has occurred, by measuring the width of tree rings evident in the core samples and calculating the amount of growth per year that the tree has experienced. This enables an estimate of the period of time, in years, over which the post-scar growth has occurred. This period represents the number of years between the formation of the scar and the present day.
- Of eight core samples taken, five were unusable due to fractures that occurred during the coring process.
- One usable core sample was obtained from MA6, and two usable core samples were obtained from MA7. The limitations in the data did not prevent an estimate of the age of both scars to be made.
- The core sample from MA6 showed a slow rate of growth consistent with the observations that the tree is mature and senescent (approaching the end of its lifespan). The scar is estimated to be between 265 and 219 years old, placing the creation of the scar either in the pre-contact period, or shortly after European contact.
- The core sample from MA7 showed a faster rate of growth consistent with the observations that the tree is healthy and growing vigorously with no signs of dieback. The scar is estimated to be 86 years old, placing the creation of the scar in 1928.
- Aerial photography shows the two trees were present on the site in the 1930s, which is consistent with the estimated age of the two scars indicating that the trees pre-date the 1930s.
- The age estimates obtained are considered as maximum ages for the two scars (265 years for MA6 and 86 years for MA7).

Options for managing MA6 and MA7 should be explored in consultation with the RAPs. Management of the two trees is contingent upon the trees' cultural value, which can only be comprehensively assessed by the Aboriginal community.

If a scar is considered not to be of Aboriginal origin, and consequently the tree is not held to have any cultural value, then destruction of the tree could proceed without constraint.

If a scar is considered to be of Aboriginal origin, and is considered to hold cultural value as a result, then several alternative management strategies could be considered including:

- conservation of the tree(s) in situ, which would involve designing the Project to ensure that the tree(s) would not be impacted; and/or
- salvage and conservation of the tree(s), or the scarred portion of the tree's trunk, at a location outside the Project area.

If consensus cannot be reached among the RAPs, a precautionary approach is recommended. This would involve acting upon statements of the tree(s) holding cultural value, even if only a minority of Registered Aboriginal Parties view either or both trees as holding cultural value.

The full result of the scarred tree assessment is presented in Appendix I of this Response to Submissions report, with a summary analysis provided by NOHC (2015) in Appendix J.

## European heritage

Chapter 21 – *European heritage* of the EIS provides an assessment of the European heritage items, including an assessment of cultural heritage significance and the potential impacts on European heritage values as a result of the Project. The cultural heritage significance and potential impacts on European heritage values were assessed by undertaking:

- a literature and database review of statutory and non-statutory listings;
- initial field surveys of the built environment and non-built environment (potential for sub-surface deposits) of the Project site;
- archaeological test excavation;
- assessment of cultural landscape and social values; and
- assessment of the heritage significance and heritage impacts for individual items and the Project site as a whole.

The assessment concluded that the Project would have impacts on European heritage items within and adjacent to the proposed construction footprint. The assessment also identified that an impact mitigation program would include archival recording of all those items of Commonwealth, state and local significance in the Project area not already included in a program of archival recording for the Moorebank Unit Relocation (MUR) Project.

During the assessment the following items were identified as requiring archival recording prior to development:

- Cullen Universal Steel Truss (CUST));
- Royal Australian Air Force (RAAF) STRARCH Hangar;
- Royal Australian Engineers (RAE) Museum and Australian Army Museum of Military Engineering Collections;
- Transport Compound Workshop (Building 99);
- Explosives Detection Dog Cemetery and Memorial (MH1);
- Commemorative Gardens (MH6); and
- remaining elements of the RAE Chapel.

To fulfil the requirements of the mitigation measure presented in the EIS, NOHC undertook a field survey in July 2014 to record the salient physical aspects of the Moorebank Cultural Landscape, including those items identified above. The significance of the items was assessed against:

- NSW assessment criteria – defined by the NSW Heritage Branch for the assessment of cultural heritage significance of items and places not including Aboriginal heritage from the pre-contact period (NSW Heritage Office & DUAP 1996, NSW Heritage Office 2000); and

- Commonwealth Heritage Criteria (SEWPAC 2011) – the Commonwealth Heritage List is a register of natural and cultural heritage places owned or controlled by the Australian Government. These may include places associated with a range of activities such as communications, Customs, Defence or the exercise of government. The EPBC Act establishes this list and nominations are assessed by the Australian Heritage Council.

A full description of the assessment criteria is provided in the *School of Military Engineering Steele Barracks, Moorebank NSW; Cultural Heritage Archival Recordings* (NOHC, 2014) appended to this report (Appendix K).

The archival recording involved:

- preparation of scale site plans as required, including the measurement of important dimensions, aspects and materials;
- creation of a digital photographic record, including recording required metadata;
- limited additional research of documentary and oral sources;
- data review, processing and compilation; and
- report writing and production.

The significance assessment was undertaken using the NSW assessment criteria.

- Table 8.5 summarises the results of the significance assessment.

Table 8.5 Summary of the significance assessment

Item	Significance
Moorebank Cultural Landscape	<p>The Moorebank Cultural Landscape is the product of numerous phases of landscape occupation and use spanning Indigenous occupation (pre-European settlement) through to the present day. Many of these phases of use and associated cultural history patterns are evidenced within different portions of the landscape. The toponyms, buildings, spatial organisation, memorials, archaeological deposits and elements of the natural landscape have various strong and/or special associations with Thomas Moore, the Australian Army (particularly the School of Military Engineering (SME)) and the Aboriginal community. Furthermore, the archaeological deposits identified within the Project area have the potential to yield information that would contribute to an understanding of its cultural history. The landscape as a whole is also notable as a locally distinct and representative cultural landscape.</p> <p>This item is significant at a local level against NSW criteria.</p> <p>This item is significant against Commonwealth heritage listing criteria.</p>
CUST Hut	<p>The oldest surviving building in the SME site. It is a rare example of a Cullen Unified Steel Truss (CUST) building still in use, and more so in military ownership in NSW. The building has historic significance to the SME site and technical significance of an increasingly rare construction system for clear span vaulted warehouses.</p> <p>The site has strong and special association with Lieutenant Colonel D.R. (Dan) Cullen and is important in the history and development of the SME site. The integrity and intactness of this structure provides for a high level of technical significance. The possible subsurface integrity of this site represents significant archaeological research potential at a local level.</p> <p>This site is significant against NSW criteria.</p> <p>This site is significant against Commonwealth heritage listing criteria.</p>

Item	Significance
RAAF STRARCH Hangar	<p>The integrity and intactness of this structure provides for a high level of technical significance, albeit without associated archaeological research potential. Refer to the Museum Collection regarding items within the structure.</p> <p>This site has local and state significance against NSW criteria.</p> <p>This site is significant against Commonwealth heritage listing criteria.</p>
Transport Compound Workshop (Building 99)	<p>The Transport Compound Workshop is locally rare, within the context of the Moorebank Cultural Landscape, as a WWII era building that remains in situ. This building also contributes to the historical significance of the Moorebank Cultural Landscape.</p> <p>This item is significant at a local level against NSW criteria.</p> <p>This item does not meet the threshold for listing against any Commonwealth Heritage List criteria.</p>
Commemorative Gardens (MH6)	<p>The Commemorative Garden, as a memorial, possesses significant social value at a local level albeit without archaeological research potential.</p> <p>This site is significant against NSW criteria.</p> <p>This site is significant against Commonwealth heritage listing criteria.</p>
Explosives Detection Dog Cemetery and Memorial	<p>These values relate to the history, development and practice of dog training and handling within the SME corps. The cemetery and Memorial possess significant historical and social value at a local level albeit without archaeological research potential.</p> <p>This site is significant against NSW criteria A, B, and D.</p> <p>This site is significant against Commonwealth heritage listing criteria.</p>

The full archival recording, photographic records and assessment of significance is documented in the *School of Military Engineering Steele Barracks, Moorebank NSW; Cultural Heritage Archival Recordings* (NOHC, 2014) appended to this report (Appendix K).