BELLS LINE OF ROAD CORRIDOR IMPROVEMENT PROGRAM

INFORMATION TO SUPPORT REFERRAL UNDER PART 3 OF *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (EPBC 2014/7346)

Preliminary documentation

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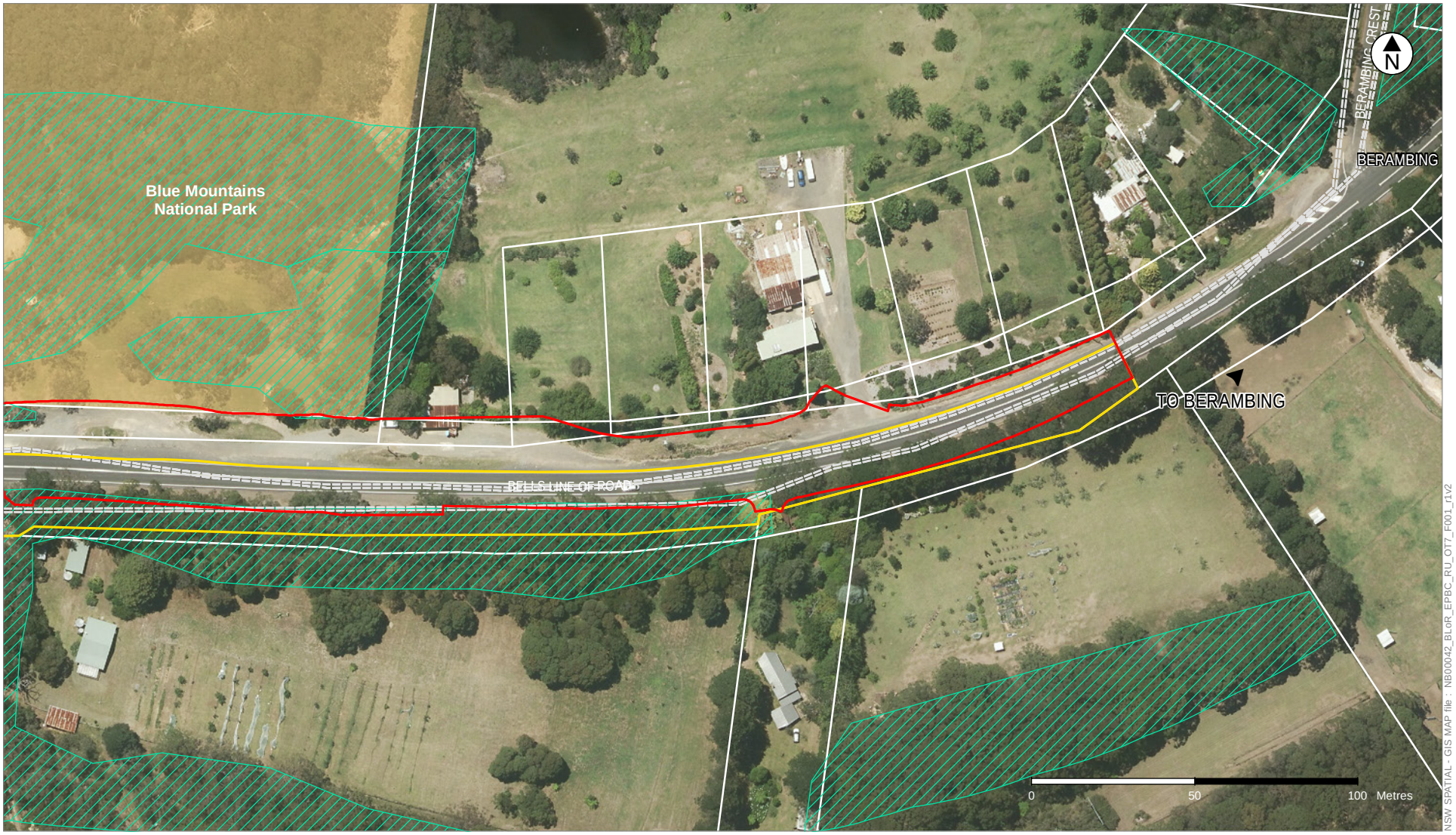


Clearing extents September 2014 referral

Revised clearing extents

National Park

Turpentine Ironbark Forest of the Sydney Basin Bioregion (Critically Endangered, EPBC Act)

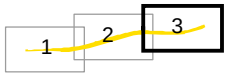


Figure 1.6 Clearing extents of Turpentine Ironbark Forest of the Sydney Basin Bioregion at Site 7 (3 of 3)

2. Community and socio-economic

2.1 Public consultation activities

2.1.1 Consultation – strategic level

Extensive community and stakeholder input was obtained between November 2010 and March 2012 to inform the Bells Line of Road Long Term Strategic Corridor Plan. That process sought to obtain feedback from the community and all levels of government to identify improvement works and set priorities for the next 20 years and beyond. Input was gained through:

- nine staffed information days and 13 static information displays
- twelve meetings and forums with community members
- briefings to councils
- a dedicated project website with an online forum
- advertisements in 9 local newspapers
- thirty-four thousand community updates distributed in Bells Line of Road area
- nine thousand postcards to raise awareness distributed
- toll free number and project email
- feedback forms.

Issues raised by the community, including with respect to Aboriginal heritage matters, are discussed in the Community Issues Report. That report, and further information regarding the community consultation process and feedback, is available at: http://www.rms.nsw.gov.au/projects/sydney-west/blue-mountains/bells-line-of-road-corridor-improvement-program/project-documents.html

2.1.2 Consultation – project level

Seven overtaking lanes are proposed for the corridor between Kurrajong Heights and Mount Tomah with work to be carried out during the next three years to deliver these improvements. One of the overtaking lanes has been built and one other has commenced construction.

Community consultation for the individual overtaking lanes and safety works has been undertaken and will continue. That includes engagement with:

- local community and businesses, including property owners who live within the study area
- local schools
- government agencies, including the Blue Mountains and Hawkesbury City Council, Office of Environment and Heritage (including National Parks and Wildlife Service)
- public transport operators
- Aboriginal community.

Communication tools used to date have included meetings, newsletters, flyers, emails, Roads and Maritime website, post and a toll free project information line. The wide range of communication tools used has ensured that groups and individuals have access to a method of communication best suited to their needs.

To date the following community updates have been issued:

- March 2014 – informing community of the overall corridor plan and commencement of construction on Overtaking lane 4
- July 2014 – providing general project information, project contact details and mechanisms for community and stakeholder feedback

- October 2014 – informing community of the completion of Overtaking lane 4 and commencement of construction for Overtaking lane 1.

Consultation for each of the individual overtaking lanes will include letters distributed to inform the community and stakeholders of upcoming activities, such as any field investigations and noise monitoring. In addition a 'Have Your Say' letter will be distributed and a two week period will be allowed to provide feedback on the proposed works. Stakeholders will be encouraged to contact the project team through the entire design process, through a free call 1800 number and project email. In addition, information on the proposed action will be provided on the Roads and Maritime website.

For overtaking lane 1 currently under construction (and not subject to referral) feedback was received from eleven community members during the comment period. The main issues raised were the potential for business impacts, the need and justification for the project and a number of response noting support for the project. The community will continue to be consulted about the program of works and given their opportunity to provide feedback.

2.2 Socio-economic aspects of the action

2.2.1 Long-term benefits of the action

The Bells Line of Road is an important road corridor within NSW, being one of two main road crossings of the Blue Mountains. The road is used by Blue Mountains and Lithgow residents for local trips as well as for access to communities between the Central West of NSW and the Sydney Metropolitan area and beyond. The road also provides an important function for freight transport and as a tourist route linking metropolitan Sydney to western areas over the Blue Mountains.

The road has a poor crash record with a crash rate that is about twice the typical rate for rural roads in NSW. One of the causes of this elevated crash rate is the insufficient provision of overtaking lane opportunities particularly between Kurrajong Heights and Mount Tomah.

The Bells Line of Road Long Term Strategic Corridor Plan set out the following objectives for the management of the Bells Line of Road corridor:

- Objective 1 Safety – Improve road safety for all road users, including vehicle users, motorcyclists, pedestrians and cyclists
- Objective 2 Transport and access – Provide an efficient road corridor for moving people and goods
- Objective 3 Land use and development – Respond to present and future land uses
- Objective 4 Environment – Respect the natural and built environment and community values.

Based on a number of factors including an economic cost benefit analysis, the Plan concluded that a major upgrade of the entire corridor was not warranted in the foreseeable future. Instead a number of short and medium term improvements focused on the existing corridor should be investigated and progressed.

The Bells Line of Road Long Term Strategic Corridor Plan, of which the proposal comprises, would improve safety of the section of Bells Line of Road between Kurrajong Heights and Mount Tomah. Combined with other proposed improvement works along the length of the road between Bell and Kurrajong Heights, the proposal would also improve travel efficiency.

The Bells Line of Road short term improvement work consists of a prioritised program over the four year period from 2013/14 to 2016/17 utilising funds from the Infrastructure NSW 'Restart NSW' fund and other state government funding sources.

The initiatives proposed in this program are aligned to several NSW Government goals from the following publications:

- Bells Line of Road Long Term Strategic Corridor Plan (Australian Government and NSW Government 2012)
- National Road Safety Strategy 2011-2020 (Australian Transport Council 2011)
- NSW 2021: A plan to make NSW Number One (NSW Government 2011)
- NSW Long Term Transport Master Plan (Transport for NSW 2012)

- A Plan for Growing Sydney (NSW Government 2014).

In summary, the proposal is consistent with the NSW and Australian governments' strategic priority of improving the safety performance and efficiency on the road network.

2.2.2 Economic appraisal of overtaking lanes [1]

The approach to determine economic measures for overtaking lanes used the traffic simulation program TRARR (Traffic on Rural Roads). This model was used to model travel time and fuel consumption impacts of installing overtaking lanes along the Bells Line of Road. The modelling was performed for the AM and PM peak periods, based on traffic volume data collected between August and September 2013.

The proposed overtaking lane projects have an average strategic benefit to cost ratio (BCR) of 1.3. This is expected to improve as the program is further refined through the planning and development process.

It is currently estimated that a supplementary package of road safety works along the corridor will provide additional economic benefits with a preliminary program BCR of 2.0.

From the perspective of individual proposals within the program of works, the BCR for overtaking lane 4 has a net present value (NPV) of $0.8M and a BCR of 1.3 (using a discount rate of 7 per cent).

The NSW Treasury standard discount rate of 7 per cent was used in the BCR analysis, with sensitivity testing at lower (4 per cent) and higher (10 per cent) rates. Costs and benefits were analysed over a 30-year period of operation and discounted to a base year of 2013.

The table below illustrates the range of economic results for the nominated seven overtaking lanes sites when considering the 4, 7 and 10 per cent discount rates.

Table 2-1: Economic analysis of overtaking lanes with different discount rates

Overtaking lane	4%			7%			10%		
	NPV ($M)	BCR	FYRR	NPV ($M)	BCR	FYRR	NPV ($M)	BCR	FYRR
1	4.3	2.4	15.4%	2.1	1.7	14.6%	0.8	4.3	13.8%
2	-2.1	0.6	3.7%	-3.1	0.5	3.5%	-3.6	-2.1	3.3%
3	5.8	2.0	12.2%	2.4	1.4	11.5%	0.4	5.8	10.9%
4	2.3	1.8	10.4%	0.8	1.3	9.9%	-0.2	2.3	9.3%
5	13	3.2	19.4%	7.1	2.2	18.3%	3.7	13	17.3%
6	4.1	2.0	10.5%	1.5	1.4	9.9%	0.1	4.1	9.3%
7	5.4	2.0	10.1%	2.0	1.4	9.5%	0.0	5.4	9.0%

The economic indicators summarised in the table above are based on hourly travel time and fuel consumption savings predicted by TRARR. Where a range of values is shown, it represents the range in results between 0.5% pa and 1.0% pa traffic growth.

2.2.3 Employment opportunities

There are unlikely to be new employment opportunities generated by the project specifically. The workforce would comprise up to 10 personnel during peak periods of construction. The employment of these personnel would be maintained during construction and contribute to the socio-economic benefits of the project.

[1] Strategic Assessment and Business Case Review Report for the Bells Line of Road Improvement Program, INSW 2013

2.2.4 Capital investment and on-going value of the project

In order to fulfil its obligations to improve safety for road users and maintain safe roadside environments, Roads and Maritime proposes to implement a program of works along Bells Line of Road. This includes seven overtaking lanes, in conjunction with road safety improvements, to provide vehicles with a safer road environment along the corridor length.

The NSW Government has committed $48 million to the Bells Line of Road Corridor Improvement Program in the 2013-14 State Infrastructure Plan. The $48 million Bells Line of Road Corridor Improvement Program includes an allowance of $5 million for corridor preservation works which does not form part of the overtaking lanes and safety works to be delivered. Therefore the funding available to deliver these works is $43 million.

The estimated capital investment for construction of the program of works is still being determined by Roads and Maritime based on detailed information collated as the design and associated investigations are undertaken. Therefore ongoing reviews of the work scope and budget may change the final work and budget to be delivered.

The on-going value of the project is consistent with the existing maintenance program that Roads and Maritime is required to implement across the entire Bells Line of Road corridor. An ongoing pavement maintenance cost of $30 per sq metre of additional pavement area was assumed in the economic analysis and a resurfacing period of 10 years was also assumed.[2]

2.2.5 Principles of Ecological Sustainable Development

Integration principle

The integration principle has been considered throughout the process of developing the project and assessing its potential impacts and benefits. Potential long-term and short-term adverse social effects and environmental issues have been afforded equal importance along with economic and engineering issues.

Investigations have been undertaken throughout the development of the project with regard to site selection and concept design to avoid, minimise and mitigate potential environmental impacts. These investigations and community feedback have provided an understanding of the environmental constraints within the study area. The suitability of the design has been assessed against a broad range of social, environmental and economic factors. Consideration of these factors has led to the project being refined to avoid or minimise any potential impacts, where practicable.

The precautionary principle

The detailed assessment of potential environmental impacts has sought to avoid impacts on the environment where at all possible, and minimise impacts where they are unavoidable. Where information has been lacking, a conservative approach has been adopted for the assessment. For example, vegetation survey and analysis used a precautionary approach to the classification of the Turpentine-Ironbark Forest in the Sydney Basin Bioregion. Project development safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal.

Intergenerational equity

The proposed works are part of the joint NSW-Commonwealth Bells Line of Road Long Term Strategic Corridor Plan. That process included consideration of a range of options for delivering the identified corridor objectives, with protection of natural and cultural heritage values afforded high priority. Development of the Plan involved extensive community consultation and involvement.

The proposal would benefit future generations by ensuring that road safety is improved, with this being a positive benefit for all road users.

Conversely, the critically endangered ecological community types to be cleared under this proposal, would reduce their extent for future generations, assuming the regeneration of this vegetation type is decreasing within NSW rather than increasing.

[2] Bells Line of Road_climbing lane options west of Kurrajong Hts, RMS 2013

This loss may be compensated by offsetting the vegetation that would be cleared for the overall program of works. Once in place, the offset for this vegetation will conserve biodiversity entities in perpetuity for future generations.

Conservation of biological diversity and ecological integrity

The alignment of the existing road and surrounding topographical and land use constraints, such as national parks and the Greater Blue Mountains World Heritage Area, present particular challenges in delivering the corridor improvement program. The nature of works, particularly the overtaking lanes, means that it would not be feasible to avoid all impacts, especially with respect to vegetation clearance.

The program of works would require clearing about 2.67 of vegetation which is listed under the EPBC Act. The clearing of this vegetation would result in the loss of fauna habitat, in particular a number of hollow bearing trees, and cause increased fragmentation of large patches of vegetation. It has been assessed that the proposal is likely to significantly impact on the Turpentine –Ironbark Forest in the Sydney Basin Bioregion vegetation community only.

Steps have been taken during the design of road sections along Bells Line of Road to minimise potential impacts, including modifications to limit impacts on biodiversity values. In particular, owing to its status as 'critically endangered' and given its categorisation as a high quality vegetation community, biologically diverse and intact, impacts to Turpentine –Ironbark Forest in the Sydney Basin Bioregion vegetation community have been reduced to the greatest extent possible.

Some sections of the action subject to this referral are in proximity to parts of the Greater Blue Mountains World Heritage Area. A key principle adopted during the development of the project was the avoidance of any national park land (World Heritage Area). The design has been modified a number of times to ensure no direct impact would occur. Potential indirect impacts are not considered likely to be significant and can be managed through appropriate measures and safeguards.

Improved valuation, pricing and incentive mechanisms

The environmental assessments undertaken for each of the overtaking lanes has examined the environmental consequences of the proposal and identified mitigation measures for areas which have the potential to be affected adversely.

Alternatives have also been assessed during development of the detailed design options for each of the sections of work, aiming first to avoid impacts and then to minimise or mitigate any unavoidable impacts.

At all times, Roads and Maritime has sought to provide for design and mitigation measures within the project that balance environmental objectives with road safety objectives and cost practicalities.

2.2.6 Other matters of national environmental significance

Significance assessments have been conducted for threatened species that have been positively identified or that have a moderate or high likelihood of occurring in the study area. Assessments of Significance were carried for 16 species under the EPBC Act, concluding that there is unlikely to be a significant impact on any of the species listed on the Act. Reference is to be made to the full biodiversity assessment carried out for the Bells Line of Road program as provided with the referral application where relevant information regarding the matters of national environmental significance is provided (Bells Line of Road Corridor Improvement Program, Mt Tomah to Kurrajong Heights, Biodiversity Assessment, Jacobs September 2014).

3. Offset Strategy Overview

The DoE requirements indicate that Roads and Maritime is to prepare an offset package to offset anticipated impacts on matters of national environmental significance.

The project will have unavoidable residual impacts to Turpentine-Ironbark Forest in the Sydney Basin Bioregion (TIF) – listed as critically endangered under the EPBC Act. Offsetting the impacts to this community is the focus of the offset package.

Specifically, this offset package has been developed to offset 2.67 hectares of high condition TIF which is subject to this referral. As noted in section 1.2, Roads and Maritime also intends to provide a complementary offset for 0.47 hectares of TIF cleared for overtaking lane 4, which is not part of this referral. In total, Roads and Maritime will offset impacts to 3.14 hectares of TIF.

3.1 Objectives

This biodiversity offset package has been developed to:

- Identify the residual unavoidable impact of the project that is to be offset.
- Identify land that is suitable for use as an offset for the project including details of how the offsets will compensate for the impacts upon MNES resulting from the action.
- Compare the adequacy of chosen offset site(s) to the Commonwealth guidelines and policy for developing offsets.
- Provide recommendations for management measures to be undertaken within the offset site to maintain the vegetation and improve habitat quality.
- Outline the potential for the NSW Office of Environment and Heritage (OEH) to assume future ownership and management of offset sites to ensure conservation in perpetuity, noting that that this will require further consultation and confirmation with OEH.
- Address the requirements issued by the DoE (27 November 2014).

The development of this biodiversity offset package has been guided by the EPBC Act – Environmental Offsets Policy (Department of Sustainability Environment Water Population and Communities 2012).

3.2 Potential offset sites subject to investigation

An initial selection of potential offset sites was identified following consultation with the OEH and assessed with reference to the criteria set out in section 4.1. The properties presented were considered as potential sites for future addition to the OEH reserve system, subject to an assessment of vegetation types, and subject to further discussion with the existing landowners (current information indicates a willingness to sell the properties), and access to these sites for the field surveys was granted by the landowner. The potential offset sites included:

- Three inholding blocks known as “The Islands” (Lot 51 DP 751658, Lot 52 DP 751658, and Lot 140 DP 751658) situated adjacent to Wollemi National Park at Wheeny Creek (refer Figure 3.1).
- Four freehold lots located adjacent to Yellowmundee Regional Park and the Nepean River. These lots were subsequently found not to contain TIF and so are not considered further in this report.

Inholding lots

National Park

Figure 3.1 Location of the three inholding lots located at "The Islands" embedded with Wollemi National Park

4. Offset Strategy Methodology

4.1 Developing criteria for selection of offset sites

As a first step, the potential offset properties were compared against the following criteria to determine their potential suitability as an offset for the project:

- The property must be located close to the development site. This is important for maintenance of local biodiversity values and will be necessary for the site to contain the required vegetation types.
- The property must contain Turpentine-Ironbark Forest in the Sydney Basin Bioregion that is to be impacted by the proposed activity. When determining offsets, they must be targeted and offset the impacts on a 'like for like or better' basis.
- The property must contain vegetation in good condition (according to the OEH native vegetation benchmarks database). Vegetation condition gives an indication of its quality for flora and fauna habitat and long-term viability.
- Vegetation within the offset site will provide connectivity between adjacent areas of vegetation. 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 scale as a wildlife corridor, for dispersal and migration. 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.
- The property must be suitable for ongoing management for conservation through an appropriate legal instrument. Offsets must be enduring and must offset the impact of the development for the period that the impact occurs. The security of tenure and ongoing management of offsets is critical to the long-term viability of offsets and must be carefully considered.
- The property must have minimal site management issues. Although ecological criteria are considered of primary importance, other factors also need to be taken into account. The practical and cost implications of managing offsets in the long-term also need to be considered by relevant land managers.

4.2 Desktop analysis

The properties suggested by Roads and Maritime (listed above in Section 3.2) were initially analysed at a desktop level to identify areas of native vegetation that required more detailed site specific field survey. The methodology used considered the biodiversity characteristics, rehabilitation potential and suitability for offsetting within the locality.

Data used to identify potential offset values and report on the biodiversity conditions included:

- Broad-scale vegetation mapping (St Albans RBG VISmap 2353 (Ryan *et al.* 1996), Hawkesbury LGA 2007 (Ecological Australia 2007), Wollemi VISmap 1849 (Bell 1998)).
- Soil landscapes, geology, elevation data and property cadastre (including the Soil Landscapes of the St Albans 1:100,000 map sheet (McInnes 1997), Sydney Basin 1:500,000 Geological Map (Brunker & Rose 1969), Sydney 1:250,000 Geological Sheet (Bryan 1966)).
- NSW Wildlife Atlas Data.
- Key habitats and corridors where available.
- Adjacent land tenure (i.e. National Park, State Forest, Private).

Aerial photographic interpretation was utilised to assess, where possible, features such as local wildlife corridors, habitat patch sizes and land-use.

4.3 Assessing landscape value

In assessing the landscape values of each of the potential offsets the following factors have been considered according to the methodology outlined in the BioBanking Assessment Methodology (BBAM) (Office of Environment and Heritage 2014):

- Percent native vegetation cover in the landscape
- Connectivity value
- Vegetation patch size
- Strategic location of the site.

4.4 Detailed field assessment of shortlisted sites

4.4.1 Vegetation classification and mapping

The vegetation communities of each potential offset property were identified and classified according to equivalent communities described in the Biometric Vegetation Types Database (Gibbons *et al.* 2008) based on geology, dominant species, locality and landscape position. The classification using the Biometric database was used for consistency in the vegetation mapping used in the biodiversity assessment for the project.

Vegetation community surveys used a range of methods including transect and plot based assessments. Rapid data points, modelled after the quaternary assessment technique described by Neldner *et al.* (2005) were used to rapidly collect sufficient data on a patch of vegetation to determine the correct Biometric vegetation type. Data on the dominant floristic components of each structural layer of the vegetation was collected and the extent of vegetation community boundaries was established. Rapid data points were primarily established in areas of the offset properties outside of areas of shale geology where the target ecological communities were unlikely to occur due to geological and landscape conditions. The rapid data points were also located to ensure adequate survey coverage of the potential offset properties. The location of each rapid data point is outlined in Figure 4.1.

Where areas of shale soils were encountered on the potential offset properties, a detailed vegetation quality assessment was undertaken using the using the BBAM framework as outlined below in Section 4.4.2.

4.4.2 Vegetation quality assessment

Condition and habitat assessment of the proposed offset lands was undertaken to ensure the potential offset sites consist of appropriate vegetation type(s) and that the vegetation is of adequate condition. This assessment was undertaken by ecologists that are experienced with using the BBAM field methodology.

Detailed quantitative site surveys were completed in areas of vegetation located on shale soils that were considered to potentially be representative of Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community. These surveys involved quadrat and transect surveys as outlined in the BBAM so that the results of the surveys could be compared to the results of the surveys on the development site. This would allow a quantitative comparison of vegetation quality and diagnostic characteristics of the ecological communities as well as an assessment of the adequacy of the site as an offset for the vegetation to be removed.

The condition of the vegetation was compared to the regional condition benchmarks for each Biometric vegetation type present. Field data was recorded using the BBAM plot layout, which consists of a 20 x 20 metre plot (0.04 ha), a 20 x 50 metre plot (0.1 ha) and a 50 metre line transect as depicted in Figure 4.2.

Inholding lots
National Park
Bio Bank plots
Rapid plots
Walking/driving transects

Figure 4.1 Location of field survey effort at 'The Islands'

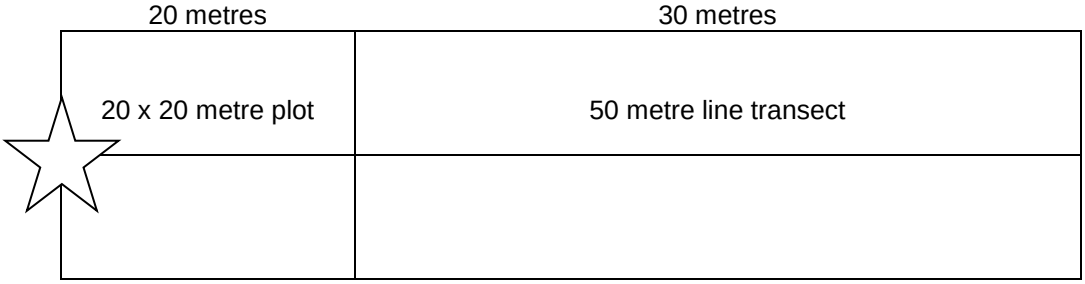


Figure 4.2: Biobanking plot layout used in the field surveys

The condition assessment involved the collection of quantitative plot data on flora diversity, over-storey and mid-storey cover, groundcover attributes including native and exotic species cover, the number of hollow bearing trees, over-storey species regeneration, and length of fallen logs. Native canopy and mid-storey cover were visually estimated at 10 points along the 50 metre line transect to provide an estimated projected foliage cover for the plot. The projected foliage cover (%) of ground covers (native grasses, shrubs, other and exotic species), was calculated by recording their presence/absence at 50 points along the 50 metre line transect.

The location of the field assessment plots are displayed in Figure 4.1. Seven detailed plot assessments were undertaken across two of the Islands properties (Lot 51 DP 751658 and Lot 52 DP 751658) where floristic, vegetation condition and fauna habitat attributes were assessed.

Vegetation condition was broadly categorised and mapped across each potential offset site based on the criteria specified in Table 4.1. These condition classes are associated with condition classes identified in the BBAM, with low condition vegetation being those areas of cleared and/or disturbed land without native vegetation.

Table 4.1: Vegetation/habitat condition classes

Condition class	Description	Criteria			
		Flora diversity	Canopy cover	Mid-storey	Weed abundance
High	Vegetation still retains the majority of native species and structural characteristics of the pre-European equivalent. Such vegetation is usually in a near natural state and displays resilience to weed invasion due to intact ground cover, shrub and canopy layers and lack of soil disturbance. Some limited weed cover is present in edge habitats.	High	Intact	Intact	Absent to low
Moderate	Vegetation generally still retains most of its structural integrity but has been partially disturbed and has lost some component of its original species complement. Weed invasion generally varies from moderate to high.	High to moderate	Intact to partial absence	Intact to absent	Moderate to high
Low	Modified areas where most of the native diversity and vegetation structure has been lost. Includes cleared paddock areas and roadside clearings dominated by exotic species. Some regenerating shrubs and native groundcovers may be present in low to moderate abundance.	Low	Absent to very sparse	Absent to sparse	High

The field survey also allowed for an assessment of required management actions within the offset site(s). Traverses of the properties were made on foot and by vehicle where possible to identify the boundaries of vegetation types, differences in vegetation condition, and the location of any weed infestations.

4.5 Determining adequacy of offsets

4.5.1 EPBC Act Environmental Offsets Policy

The EPBC Act Environmental Offsets Policy (Department of Sustainability Environment Water Population and Communities 2012) outlines eight requirements for a suitable offset. The EPBC Act Offsets Assessment Guide, which accompanies the EPBC Act Environmental Offsets Policy, has been developed in order to give effect to the requirements of this policy.

The field survey was designed to collect sufficient data to allow for calculation of vegetation start quality which is a key input into the EPBC Act Offsets Assessment Guide and Calculator which uses a balance sheet approach to quantify impacts and offsets.

The EPBC Act Offsets Assessment Guide was used to determine the adequacy of offsets for the EPBC Act listed Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community. The proposed biodiversity offsets strategy was also compared to the eight requirements for a suitable offset.

5. Biodiversity values

5.1 The Islands

5.1.1 Geology and soils

5.1.1.1 Lots 51 & 52 751658

Lots 51 & 52 751658 are mapped as containing Hawkesbury Sandstone (map unit Rh) (Brunker & Rose 1969; Bryan 1966) which is Quartz sandstone that may contain some local shale elements. The soils are mapped as the erosional Gymea soil landscape (McInnes 1997) which is known to contain shale lenses.

A shale cap is present on top of the ridge within these two lots.

5.1.2 Lot 140 DP 751658

Lot 140 DP 751658 is mapped as containing Hawkesbury Sandstone (map unit Rh) (Brunker & Rose 1969; Bryan 1966) with the colluvial (Watagan & Hawkesbury) and Erosional (Gymea) soil landscapes (McInnes 1997). Some very small localised shale lenses may be present based on the mapped geology and soil landscapes, however; the dominant geology is sandstone on the gully slopes with colluvial soils towards the bottom of the gully into the drainage line. Detailed field assessment was not undertaken for Lot 140 DP 751658 as the initial desktop analysis indicated it did not contain the appropriate vegetation types.

5.1.3 Vegetation types

5.1.3.1 Lots 51 and 52 751658

The St Albans RBG VISmap 2353 (Ryan *et al.* 1996) maps these two sites as containing Sydney Sandstone Ridgetop Woodland which is a broad map unit applied to many vegetation types on sandstone ridge tops around the Sydney area. The Hawkesbury LGA 2007 mapping (Ecological Australia 2007) follows the St Albans map by mapping Sydney Sandstone Ridgetop Woodland as present on the ridges but also introduces an area of Sydney Sandstone Gully Forest on Lot 52. Sydney Sandstone Gully Forest is a broad map unit applied to vegetation on sandstone gullies in the Sydney region. These mapping units are very broad and considered only accurate at a coarse scale. Finer scale mapping of the area that contains these two sites was undertaken in the Wollemi VISmap 1849 (Bell 1998) which maps the following vegetation types as present:

- Remnant Shale Cap Forest.
- Hawkesbury Arid Exposed Woodland.
- Hawkesbury Sheltered Dry Forest.
- Narrabeen Sheltered Bluegum Forest.
- Sandstone Gorge Warm Temperate Rainforest.

Verification of this vegetation mapping was undertaken during the field survey and the mapping of Bell (1998) was found to largely be correct within Lot 51 and 52 DP 751658. Vegetation that fits the description of Remnant Shale Cap Forest is present on the ridge top. However, the remainder of the mapped vegetation types are absent from the properties. No Bluegum forest is present (signified by the absence of species of Bluegum trees, i.e. *Eucalyptus saligna* and *E. deanei*) and the vegetation on the sandstone slopes is representative of the Hinterland Sandstone Gully Forest as described by Tozer *et al* (2010) which is mapped to the south of the study area on sandstone slopes throughout the lower Blue Mountains region. The vegetation types within Lot 51 and 52 DP 751658 are discussed in greater detail in Section 5.3 where the vegetation is allocated to Biometric vegetation types and analysis of vegetation quality is presented.

5.1.4 Lot 140 DP 751658

The St Albans RBG VISmap 2353 (Ryan *et al.* 1996) and the Hawkesbury LGA 2007 mapping (Ecological Australia 2007) map Lot 140 DP 751658 as containing Sydney Sandstone Ridgetop Woodland and Sydney Sandstone Gully Forest. The more detailed Wollemi VISmap 1849 (Bell 1998) maps the following vegetation types as present:

- Hawkesbury Arid Exposed Woodland.
- Hawkesbury Sheltered Dry Forest.
- Narrabeen East-Wollemi Sheltered Dry Forest.
- Narrabeen Goulburn Valley Exposed Woodland.
- Mellong Sandmass Alluvial Woodland.
- Sandstone Gorge Warm Temperate Rainforest.

Verification of this vegetation mapping was undertaken during the field survey and the mapping of Bell (1998) was found to largely be inaccurate within Lot 140 DP 751658. The variation in vegetation types as mapped by Bell (1998) is not present. Overall, the vegetation on the sandstone slopes is representative of the Hinterland Sandstone Gully Forest as described by Tozer *et al* (2010). The vegetation at the bottom of the gully along the creek line is representative of a warm temperate rainforest as described by Bell (1998). Riparian scrub is also present along the banks of Little Wheeny Creek. The vegetation types within Lot 140 DP 751658 are discussed in greater detail in Section 5.3 where the vegetation is allocated to Biometric vegetation types and analysis of vegetation quality is presented.

5.2 Vegetation and habitat types

The vegetation types mapped on each property were classified and correlated with NSW Biometric Vegetation Types (Gibbons *et al.* 2008). These are described below in Table 5.1 based on the dominant species, landscape position, legal status, cleared estimate, quality, and the approximate area of intact vegetation on the each property. Four vegetation types have been identified and their distribution is illustrated in Figure 5.1. The four vegetation communities include (refer to Appendix A for photos of the vegetation types):

- Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin.
- Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin.
- Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin.
- Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin.

Cleared or heavily modified land has not been mapped as a vegetation type.

National Park

Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin

Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin

Blue Mountains shale cap forest in the Sydney Basin Bioregion (Endangered – TSC Act)
Turpentine-Ironbark Forest in the Sydney Basin Bioregion (Critically Endangered – EPBC Act)

Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin

High vegetation condition

Figure 5.1 Vegetation types, habitat types and condition at 'The Islands'

Table 5.1: Vegetation types on the potential offset sites

Location	Equivalent Biometric type (OEH 2012)	Fauna habitat type	Dominant canopy species	Dominant mid-storey species	Dominant understorey species	Weed species	Landscape Position *	Keith Class (Keith 2004)	Legal Status (EPBC Act)	Cleared Estimate*	Condition	Area (ha)
The Islands												
Lot 140 DP 751658	Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin	Rainforest	*Ceratopetalum apetalum, Syzygium smithii, Doryphora sassafras, Acacia elata, Backhousia myrtifolia* Emergent *Eucalyptus piperita, Angophora costata* and *Syncarpia glomulifera* at edges	*Callicoma serratifolia, Backhousia myrtifolia, Ceratopetalum apetalum, Syzygium smithii, Doryphora sassafras*	*Cyathea australis, Todea barbara, Tasmannia insipida, Morinda jasminoides, Smilax australis, Blechnum cartilagineum, Sticherus flabellatus*	Minimal invasion form *Lantana camara* at edges	Occurs in moist gully heads and sheltered slopes below sandstone cliffs	Northern Warm Temperate Rainforests	Not listed	5%	High	2
Lot 140 DP 751658	Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin	Riparian scrub	*Tristaniopsis laurina, Ceratopetalum apetalum* Emergent *Eucalyptus piperita, Angophora costata* and *Syncarpia glomulifera*	*Lomatia myricoides, Tristania neriifolia, Leptospermum morrisonii*	*Lomandra longifolia, Entolasia stricta, Schoenus melanostachys, Lomandra fluviatilis, Sticherus flabellatus*	Minimal invasion form *Lantana camara*	Occurs on sandy banks and sandstone beds of streams draining sandstone plateaux	Eastern Riverine Forests	Not listed	10%	High	0.2

Location	Equivalent Biometric type (OEH 2012)	Fauna habitat type	Dominant canopy species	Dominant mid-storey species	Dominant understorey species	Weed species	Landscape Position *	Keith Class (Keith 2004)	Legal Status (EPBC Act)	Cleared Estimate*	Condition	Area (ha)
Lot 140 DP 751658	Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin	Dry sclerophyll forest	*Angophora costata, Corymbia gummifera*, and *Eucalyptus piperita* with *Eucalyptus punctata, Eucalyptus agglomerata* and *Banksia serrata*	*Persoonia linearis, P. levis, Phyllanthus hirtellus, Allocasuarina torulosa, Leptospermum trinervium, Lomatia silaifolia, Banksia spinulosa, Lambertia formosa, Platysace linearifolia, Ceratopetalum gummiferum, Acacia ulicifolia, Acacia terminalis*	*Entolasia stricta, Pteridium esculentum, Dianella caerulea, Smilax glyciphylla, Xanthosia pilosa, Lomandra longifolia, Lepidosperma laterale, Lomandra obliqua, Billardiera scandens*	No obvious weed infestations	Occurs in dry sandstone gullies	Sydney Coastal Dry Sclerophyll Forests	Not listed	20%	High	14
Lot 52 DP 751658												7
Lot 51 DP 751658	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin	Dry sclerophyll forest	*Eucalyptus agglomerata, Eucalyptus notabilis, Corymbia gummifera, Angophora costata, Syncarpia glomulifera, Eucalyptus sparsifolia, Eucalyptus crebra, Eucalyptus punctata, Eucalyptus piperita, Eucalyptus paniculata* subsp.	*Allocasuarina torulosa, Persoonia linearis, Pultenaea flexilis, Acacia trinervata, Allocasuarina littoralis, Persoonia levis, Phyllanthus hirtellus, Leptospermum* spp., *Lomatia silaifolia, Acacia ulicifolia, Acacia terminalis, Hakea dactyloides, Lambertia formosa*	*Entolasia stricta, Dianella caerulea, Lepidosperma laterale, Aristida ramosa, Hibbertia diffusa, Lomandra obliqua, Billardiera scandens, Lomandra longifolia, Themeda triandra, Microlaena stipoides, Echinopogon caespitosus, Pratia purpurascens, Dichondra repens, Pseuderanthemum variabile, Imperata cylindrica* var. *major, Oplismenus imbecillis, Eustrephus latifolius,*	No obvious weed infestations	Occurs on a low ridge on shale soils	Cumberland Dry Sclerophyll Forests	**This vegetation type fits the description of Turpentine-Ironbark Forest in the Sydney Basin Bioregion**	90%	High	9
Lot 52 DP 751658												16

Location	Equivalent Biometric type (OEH 2012)	Fauna habitat type	Dominant canopy species	Dominant mid-storey species	Dominant understorey species	Weed species	Landscape Position *	Keith Class (Keith 2004)	Legal Status (EPBC Act)	Cleared Estimate*	Condition	Area (ha)
			paniculata		*Glycine clandestina*							

* derived from Biometric Vegetation Types database (OEH 2012)

5.3 Vegetation and habitat quality

Detailed quantitative site surveys to determine vegetation and habitat quality were only completed in areas of vegetation located on shale soils that were considered to potentially be representative of Turpentine-Ironbark Forest in the Sydney Basin Bioregion. As such, data on vegetation quality within the potential offset properties only exists for vegetation within Lot 51 and 52 DP 751658 at 'The Islands'. As noted in section 4.4.2, Lot 140 DP 751658 was not subject to detailed site survey as it appeared to have lower potential to contain Turpentine-Ironbark Forest in the Sydney Basin Bioregion.

Within Lot 51 and 52 DP 751658, vegetation and habitat quality is high with BioBanking scores ranging from 70.1 to 90.8. Average quality was 80 out of 100. Biobanking condition scores obtained from the field assessments are summarised in Table 5.2.

The lower end of the score range is generally due to the low abundance of large hollow-bearing trees within the vegetation and lack of regeneration of canopy species in some areas. The vegetation within Lot 51 and 52 DP 751658 has been disturbed in the past to a minor extent with evidence of fire present throughout the vegetation (charred tree trunks, coppicing *Syncarpia glomulifera* trees, dense shrub layers dominated by post fire pioneer species including *Dodonaea triquetra* and *Acacia* spp.), evidence of human disturbance from fire trail maintenance and property boundary marking, and horse riding. The vegetation on the ridge top lacked very large old trees in some areas suggesting some level of logging had occurred in the past (however no obvious cut tree stumps were located). A large and well maintained (recently graded) fire trail runs through the middle of the two properties.

As shown in Table 5.2 the condition scores are relatively high across the property with moderate native diversity, good vegetation structure, no exotic species, and the presence of critical habitat features including hollow trees and fallen logs. The mean condition score from seven plots is 80 or equivalent to 8 out of 10 for the purposes of identifying a start quality for vegetation.

Table 5.2 : Biobanking condition plot assessment results

Plot no.	Native plant species	Native canopy cover (%)	Native mid-storey cover (%)	Native ground cover – grass (%)	Native ground cover – shrub (%)	Native ground cover – other (%)	Exotic plant cover (%)	No. of hollow trees	Canopy Regen. (%)	Fallen logs (m)	Biobanking Score (1 to 100)
1	37	21.5	21	18	8	14	0	1	100	15	**83.5**
2	36	20	21.5	44	4	5	0	2	80	42	**77.5**
3	35	21.5	9.5	28	28	26	0	5	100	15	**79.2**
4	36	16.5	13.5	46	26	12	0	1	100	5	**80.1**
5	40	8.5	27	6	6	32	0	0	100	10	**90.8**
6	31	20	15	34	6	6	0	0	0	20	**70.1**
7	38	20.5	11.5	28	0	8	0	0	80	41	**75.8**
Mean score	**36**	**18**	**17**	**29**	**11**	**15**	**0**	**1**	**80**	**21**	**80**

5.4 Fauna habitats

The sites support two broad fauna habitat types (excluding cleared and modified land) as follows:

- Dry sclerophyll forest.
- Rainforest and riparian scrub.

These habitats are described in Table 5.3.

Table 5.3: Fauna habitat on the property and quantification of microhabitat features

Fauna Habitat Type	Corresponding vegetation type(s)	Foraging resources	Sheltering resources	Aquatic habitats	Location
Dry sclerophyll forest	Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Yellow Bloodwood - Narrow-leaved Apple heathy woodland on hinterland plateaux of the Central Coast, Sydney Basin Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin	Good nectar resources from proteaceous shrub layer (*Banksia* spp., *Lambertia formosa*, *Lomatia silaifolia*) and *Leptospermum* spp. Seed resources in grassy ground layer and shrub layer of Fabaceae. Eucalypt canopy providing foraging opportunities for seed eaters. *Allocasuarina torulosa* provides foraging resources for the Glossy Black-Cockatoo Pollen and sap resources from *Corymbia* spp. *Eucalyptus* spp. and dense shrub layer of *Acacia* spp. Summer and winter-flowering trees provide a year round food source Koala primary feed trees (i.e. *Eucalyptus punctata*) are present scattered throughout this habitat type and form stands in places Prey species for larger predators such as large forest owls, raptors and Spotted-tail Quoll.	The steep sandstone gullies provide sheltering opportunities for fauna in the form of caves, overhangs, boulders and crevices A dense shrub layer is present which is likely to provide suitable cover for ground dwelling species of mammal, reptile and amphibian This habitat type contains on average 38 hollow bearing trees and 211 metres of large woody debris per hectare (based off quantitative measurements made within the Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin only)	Limited. Ephemeral drainage lines are present throughout the habitat and were dry at the time of survey. These waterways would fill during times of heavy rain and quickly drain into the valleys below	The Islands
Rainforest and riparian scrub	Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin	Fruit producing tree species including *Syzygium smithii* will provide food for fruit eating bird and mammal species. Koala feed trees (i.e. *Eucalyptus deanei*) are present emergent above the rainforest canopy in the Yellomundee Regional Park Lots. Prey species for larger predators such as large forest owls, raptors and Spotted-tail Quoll.	This habitat provides sheltering opportunities for fauna in the form of caves, overhangs, boulders and crevices The dense canopy provides suitable habitat for a range of bird, mammal, reptile and amphibian species including listed Migratory species such as the Rufous Fantail Moist gully rainforest habitat is likely to be an important refuge for fauna in times of bushfire	Permanent and ephemeral drainage lines including pool and riffle zones. Boulder lined creek channels with areas of sandy banks Likely to provide breeding opportunities for amphibians and foraging opportunities for a range of other fauna groups	The Islands

5.5 Presence of target Threatened Ecological Community

The project will have a residual impact on Turpentine-Ironbark Forest in the Sydney Basin Bioregion – listed as critically endangered under the EPBC Act. As such, offsetting the impacts to this vegetation type is the focus of this offset package. From the desktop investigation and field survey, the results show that two of the lots investigated contain vegetation that is representative of Turpentine-Ironbark Forest in the Sydney Basin Bioregion. A detailed description of this ecological community as it is found in Lot 51 and Lot 52 DP 751658 is provided below. No further analysis was undertaken for Lot 140 DP 751658 as it was not considered likely to contain vegetation representative of the community.

5.5.1 Turpentine-Ironbark Forest in the Sydney Basin Bioregion

The Threatened Species Scientific Committee (2005) states that the tree canopy of the EPBC Act listed Turpentine–Ironbark Forest of the Sydney Basin Bioregion is dominated by species including *Syncarpia glomulifera* and Ironbarks (*Eucalyptus* spp.) however the composition of the tree layer varies with local abiotic conditions. *Syncarpia glomulifera* occurs throughout the community but the co-dominant to sub-dominant canopy tree species vary with geographic location and altitude. On plateau shale caps (such as what is present in 51 and 52 DP 751658 at 'The Islands'), *Eucalyptus notabilis* is common in association with turpentine. The canopy trees in Lots 51 and 52 DP 751658 at 'The Islands' show a transitional form of Turpentine–Ironbark Forest with species from lower altitudes such as *Eucalyptus crebra, Eucalyptus paniculata*, and *Eucalyptus punctata* occurring with *Eucalyptus notabilis* and *Syncarpia glomulifera* (refer to Appendix B for a list of species outlined by the Threatened Species Scientific Committee).

The midstorey of the Lots 51 and 52 DP 751658 at 'The Islands' is heavily influenced by the adjacent sandstone vegetation communities and is not typical of the Turpentine–Ironbark Forest of the Sydney Basin Bioregion critically endangered ecological community as described by the Threatened Species Scientific Committee (2005). The midstorey vegetation in Lots 51 and 52 DP 751658 at 'The Islands' is more sclerophyllous and dry and is composed of shrubs from the Proteaceae, Fabaceae and Myrtaceae families as opposed to the soft leaved shrubs that exist in wetter environments as listed by the Threatened Species Scientific Committee (2005) (refer Appendix B for a list of midstorey species outlined by the Threatened Species Scientific Committee). This variation in the midstorey layer is natural and is considered as natural variation within the community.

The ground layer vegetation of Lots 51 and 52 DP 751658 at 'The Islands' is typical of the Turpentine–Ironbark Forest of the Sydney Basin Bioregion critically endangered ecological community as described by the Threatened Species Scientific Committee (2005) and is dominated by *Entolasia stricta* with *Oplismenus aemulus*, *Pseuderanthemum variabile*, *Echinopogon ovatus, Microlaena stipoides* and *Themeda triandra*.

When compared to the Sydney Turpentine-Ironbark Forest vegetation type as mapped by Tozer *et al.* (2010), the vegetation at 'The Islands' is similar in species composition. According to Tozer *et al.* (2010), a 0.04 hectare plot located within the Sydney Turpentine-Ironbark Forest vegetation type is expected to contain at least 24 positive diagnostic species so that the observer can be 95% confident that the vegetation is representative of Sydney Turpentine-Ironbark Forest. However, one in 20 plots can be expected to contain fewer than 24 positive diagnostic species. The seven plots undertaken on the shale cap at 'The Islands' contain 11 to 20 positive diagnostic species for Sydney Turpentine Ironbark Forest as described by Tozer *et al.* (2010) (refer Table 5.4). In addition, all plots combined contain 30 positive diagnostic species and importantly the diagnostic canopy species *Syncarpia glomulifera*, *Eucalyptus punctata*, and *Eucalyptus paniculata* are present (refer Appendix C).

Table 5.4 : Diagnostic species for Sydney Turpentine-Ironbark Forest in each plot at 'The Islands' as described by Tozer *et al.* (2010)

Family	Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
ACANTHACEAE	*Brunoniella australis*	Blue Trumpet	✓	✓		✓	✓	✓	
	Pseuderanthemum variable	Pseuderanthemum	✓	✓		✓	✓	✓	✓

Family	Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
ANTHERICACEAE	*Arthropodium milleflorum*	Vanilla Lily	✓	✓			✓		✓
CASUARINACEAE	*Allocasuarina torulosa*	Forest Oak	✓	✓	✓	✓	✓	✓	✓
CONVOLVULACEAE	*Dichondra repens*	Kidney Weed	✓					✓	
CYPERACEAE	*Gahnia aspera*	Rough Saw-sedge						✓	
	Lepidosperma laterale	Variable Sword-sedge	✓	✓	✓	✓	✓	✓	✓
DILLENIACEAE	*Hibbertia aspera*	Rough Guinea-flower	✓	✓		✓	✓	✓	✓
	Hibbertia diffusa	Prostrate Guinea-flower		✓					
FABACEAE-FABOIDEAE	*Glycine clandestina* agg.	Twining Glycine	✓	✓		✓		✓	✓
LOBELIACEAE	*Pratia purpurascens*	Whiteroot	✓	✓				✓	
LOMANDRACEAE	*Lomandra longifolia*		✓	✓		✓	✓	✓	✓
MYRTACEAE	*Angophora costata*	Smooth-barked Apple	✓	✓	✓	✓	✓	✓	✓
	Eucalyptus globoidea	White Stringybark			✓				
	Eucalyptus notabilis	Mountain Mahogany			✓	✓	✓		
	Eucalyptus paniculata subsp. *paniculata*	Grey Ironbark		✓					✓
	Eucalyptus punctata	Common Grey Gum		✓					✓
	Syncarpia glomulifera	Turpentine	✓	✓	✓	✓	✓		✓
PHORMIACEAE	*Dianella caerulea* var. *caerulea*	Leafy Blue Flax Lily	✓	✓					
POACEAE	*Aristida vagans*	Three-awned Spear Grass						✓	✓
	Echinopogon caespitosus	Hedgehog Grass						✓	
	Entolasia stricta	Leafy Nineawn	✓	✓	✓	✓	✓	✓	✓
	Imperata cylindrica	Blady Grass	✓	✓		✓			✓
	Microlaena stipoides var. *stipoides*	Weeping Grass						✓	✓
	Panicum simile	Two-colour panic	✓	✓	✓	✓		✓	✓
	Themeda australis	Broad-leaf Paspalum	✓	✓	✓	✓	✓	✓	✓
PROTEACEAE	*Banksia spinulosa* var. *spinulosa*	Hill Banksia			✓		✓		
	Persoonia linearis	Narrow-leaf Geebung	✓	✓	✓	✓	✓	✓	✓
PTERIDACEAE	*Cheilanthes sieberi* subsp. *sieberi*	Slender Cloak-fern	✓			✓	✓		
SAPINDACEAE	*Dodonaea triquetra*					✓			✓
		Total number of species per plot	**19**	**20**	**11**	**17**	**15**	**18**	**19**

The EPBC Act protects the best condition patches of vegetation. In order for the vegetation to qualify as part of the Turpentine–Ironbark Forest of the Sydney Basin Bioregion critically endangered ecological community as described by the Threatened Species Scientific Committee (2005), the vegetation needs to meet certain condition criteria and thresholds as follows:

- The vegetation contains some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey).
- Tree canopy cover is greater than 10% and remnant size is greater than one hectare. These areas have the greatest conservation value and their high quality and size makes them most resilient to disturbance.
- However, remnants with tree canopy cover less than 10% are also included in the ecological community, if the fragments are greater than one hectare in size and occur in areas of native vegetation in excess of 5 hectares in area. These areas enhance the potential for connectivity and viability of the ecological community. They support native flora and fauna species by facilitating gene flow among remnants and buffering against disturbance.

The ecological community excludes patches where either the native midstorey/understorey or native canopy trees are absent. Occurrences of isolated single trees or shrubs characteristic of the ecological community also are excluded from the ecological community.

The vegetation within Lots 51 and 52 DP 751658 at ‘The Islands’ contains characteristic components from all structural layers as the vegetation is in high condition (refer to Table 5.1). The vegetation has more than 10% canopy cover (with the exception of the area around Plot 5 which may be a natural canopy gap - refer Table 5.2). Lots 51 and 52 DP 751658 at ‘The Islands’ contain approximately 25 hectares of Turpentine–Ironbark Forest of the Sydney Basin Bioregion (refer to Table 5.1) and the vegetation within the lots is part of a larger patch of Turpentine–Ironbark Forest vegetation contiguous with the adjacent Wollemi National Park.

As such, the vegetation within Lots 51 and 52 DP 751658 at ‘The Islands’ is considered representative of the EPBC Act listed critically endangered Turpentine–Ironbark Forest of the Sydney Basin Bioregion ecological community.

6. Landscape values

6.1 'The Islands'

6.1.1 Strategic location

The three sites are thought to be in a strategic location according to the BBAM. This is due to the recognition of the Wollemi National Park as forming an integral link in a chain of protected areas surrounding the Sydney Metropolitan area. The Wollemi National Park (and hence the private land at 'The Islands'), together with the Goulburn River, Gardens of Stone, Blue Mountains and Yengo National Parks and Parr State Recreation Area act as a large integrated natural bushland system which preserves the links between the Sydney, Hunter and Central West regions of New South Wales (NSW National Parks & Wildlife Service 2001).

Therefore, the sites are assumed to be in a strategic location and an assessment of connectivity value is not required under the BBAM. The three lots are surrounded on all sides by the Wollemi National Park and have been identified by the OEH as strategic proprieties for acquisition and inclusion as part of the Wollemi National Park to support conservation and park management objectives. This is consistent with the on-going emphasis of the NSW Government on improving the resilience of existing conservation reserves by consolidating land management and improving boundary configuration.

6.1.2 Percentage native vegetation cover

The current percentage native vegetation cover in each assessment circle (refer Figure 6.1) is presented below and based on the Biobanking Assessment Methodology. Predicted future percentage native vegetation cover is not provided as these three sites do not have any potential for increase in vegetation cover as they are already fully vegetated.

Lot 51 751658

100 ha circle = >96% native vegetation cover (score = 10)

1,000 ha circle = >96% native vegetation cover (score = 10)

Lot 52 751658

100 ha circle = >96% native vegetation cover (score = 10)

1,000 ha circle = >96% native vegetation cover (score = 10)

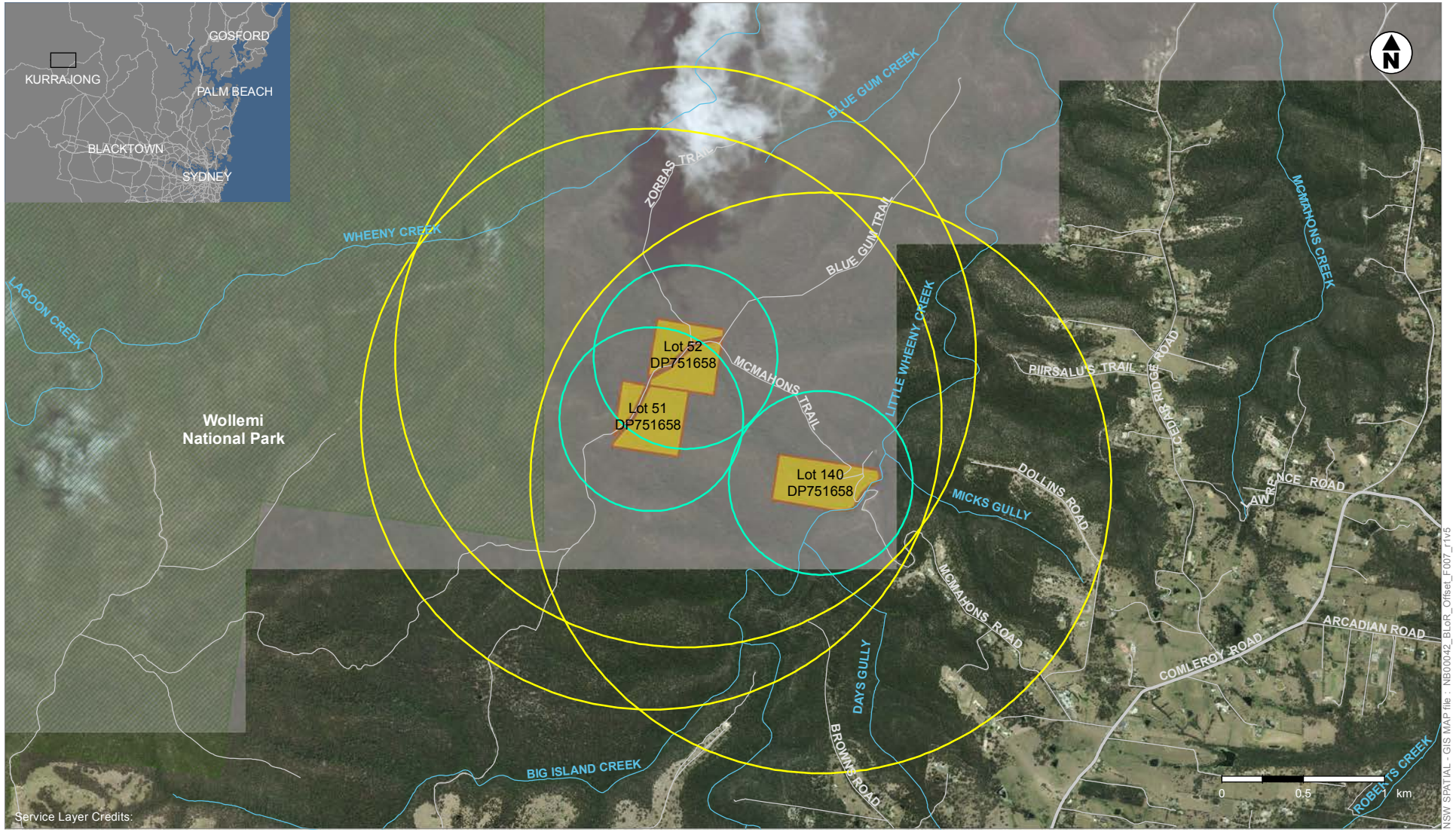
Lot 140 DP 751658

100 ha circle = >96% native vegetation cover (score = 10)

1,000 ha circle = 91-95% native vegetation cover (score = 9.75)

6.1.3 Vegetation patch size

The three lots at 'The Islands' are situated within the Blaxlands Ridge Mitchell Landscape which is 20% cleared. The patch size of vegetation within each site is >1,000 ha. This patch size of vegetation is considered extra-large in the BBAM for this Mitchell Landscape and therefore each property scores maximum points of 12 for patch size.



Inholding lots

National Park

100ha assesment area

1000ha assesment area

Figure 6.1 Landscape assessment circles for 'The Islands'

7. Recommended offsets package

Offset strategies may include both on and off site or local area proposals that contribute to the long term conservation of threatened species and communities. In this instance, the offset strategy chosen for the project is an off-site offset which will involve securing and improving the condition of existing habitats at another site.

Lots 51 and 52 DP 751658 at 'The Islands' contain native vegetation that could be used to offset vegetation to be cleared by the project as the vegetation is representative of the critically endangered Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community as listed under the EPBC Act. This vegetation within Lots 51 and 52 DP 751658 at 'The Islands' would need to be actively managed in order to maintain or improve the condition of the vegetation and habitats.

Roads and Maritime is committed to delivering offsets that are legally secured in-perpetuity and subject to an appropriate management regime in support of improving or maintaining biodiversity values. Roads and Maritime's preferred offset option is to:

- Secure ownership of Lots 51 and 52 DP 751658 at 'The Islands' through further discussion and agreement with the existing landowner
- Transfer these lands to the OEH for future inclusion in the Wollemi National Park
- Reach agreement with OEH on an appropriate contribution to support on-going conservation management of these lands.

The current landowner has indicated a willingness to progress discussions with a view to Roads and Maritime purchase of these lands (refer to Appendix E). Similarly, OEH has provided in-principle support to accept these lands for future reservation as part of the national park (refer to Appendix F). While this is the preferred approach to the offsets, Roads and Maritime recognises that other options may also be considered during these discussions, including the purchase of BioBanking credits. In the event that agreement cannot be reached with either the current landowner or OEH, Roads and Maritime remains committed to providing an alternative offset that meets the requirements of the EPBC Act offsets policy.

7.1 Commitment to offsets for the project

Roads and Maritime make the following commitments as part of this offsets strategy:

- Roads and Maritime are committed to offset the loss of up to 2.67 ha of high condition Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community (EPBC Act) to be impacted as a result of the current action which is subject to the referral.
- Roads and Maritime are also committed to an additional, complementary offset to address the 0.47 ha of Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community cleared at OT4, which is not subject to the referral. This takes the cumulative impact to 3.14 ha.
- Roads and Maritime commit that the offset will meet the requirements of the EPBC Act offsets policy.
- At this stage the preferred offset lands are Lots 51 and 52 DP 751658 at 'The Islands' as supported by use of the *EPBC Act Offsets Assessment Guide* (the availability of these lands are subject to further discussion and confirmation with the landowner (sale) and OEH (future transfer and management)).
- Roads and Maritime commit to provide written evidence of actions being taken to put in place a suitable legally binding mechanism on these or other lands prior to commencement of the action.
- Roads and Maritime commit to securing the protection of these or other lands, or an alternative offset arrangement agreed with DoE, that meet the offsets policy requirements to be finalised within 2 years of the commencement of the action.
- Roads and Maritime commit to supporting appropriate arrangements for on-going management of the offset lands, with details to be confirmed in discussions with the future land manager and advised to the DoE (for example, that may include direct financial contributions for management actions).

7.2 Adequacy of the offset

The vegetation removed for the project was in moderate to high condition with a start quality of 7. The vegetation within the proposed offset properties at 'the Islands' is in higher condition with a start quality of 8 which is adequate as an offset of similar condition to the vegetation to be removed.

7.2.1 EPBC Act Environmental Offsets Policy

The EPBC Act Environmental Offsets Policy (Department of Sustainability Environment Water Population and Communities 2012) recognises an offsets package is a suite of actions that a proponent undertakes in order to compensate for the residual significant impact of a project. In this case, the residual impacts are to Turpentine-Ironbark Forest in the Sydney Basin Bioregion. An offset package can include a combination of direct offsets and other compensatory measures, but offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain.

The EPBC Act Environmental Offsets Policy (Department of Sustainability Environment Water Population and Communities 2012) outlines eight requirements for a suitable offset and the proposed offset strategy is compared to each of these below:

1) *Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter:*

The proposed offsets strategy directly contributes to the ongoing viability of Turpentine-Ironbark Forest in the Sydney Basin Bioregion and delivers an overall conservation outcome that improves or maintains the viability of Turpentine-Ironbark Forest in the Sydney Basin Bioregion compared to what is likely to have occurred under the status quo. The proposed offset is tailored specifically to Turpentine-Ironbark Forest in the Sydney Basin Bioregion. Importantly, the quality of Turpentine-Ironbark Forest in the Sydney Basin Bioregion at the proposed offset sites exceeds the quality of the Turpentine-Ironbark Forest in the Sydney Basin Bioregion at the impact site.

2) *Suitable offsets must be built around direct offsets but may include other compensatory measures:*

This offset strategy provides for a direct offset for Turpentine-Ironbark Forest in the Sydney Basin Bioregion in order to compensate for the residual significant impact of the project. The direct offset exceeds the minimum 90% direct offset requirement as identified by the *EPBC Act Offsets Assessment Guide* (Appendix D and Section 7.2.1) and the Offsets Calculator. No other compensatory measures are required.

It is noted that for direct offsets, the securing of existing unprotected habitat as an offset only provides a conservation gain if that habitat was under some level of threat of being destroyed or degraded, and as a result of offsetting will instead be protected in an enduring way and actively managed to maintain or improve the viability of the protected matter (Department of Sustainability Environment Water Population and Communities 2012).

The Turpentine-Ironbark Forest in the Sydney Basin Bioregion within the potential offset sites is on land currently zoned E4 ('Environmental Living') under the Hawkesbury LEP. The main objective of this planning zone is to provide for low-impact residential development in areas with special ecological, scientific or aesthetic values. Within this zoning a range of uses are permitted without consent including Bed and breakfast accommodation; Environmental protection works; Extensive agriculture; Home occupations, and a number of development that would require vegetation clearing permitted with council consent (eg day care, animal boarding etc.).

As such, while the threat of destruction or degradation is relatively low, some level of risk does exist with the current zoning (this has been taken into account in the *EPBC Act Offsets Assessment Guide* - refer Appendix D and Section 7.2.1).

3) *Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter:*

The offsets required for those protected matters with higher conservation status must be greater than those with a lower status (Department of Sustainability Environment Water Population and Communities 2012). As Turpentine-Ironbark Forest in the Sydney Basin Bioregion is listed as Critically Endangered, it has a very high probability of extinction and as such the *EPBC Act Offsets Assessment Guide* (Department of the Environment 2015) has taken this into account (refer Appendix D and Section 7.2.1) and the proposed offset has been found suitable.

4) *Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter*

Offsets must be proportionate to the size and scale of the residual impacts arising from the action so as to deliver a conservation gain that adequately compensates for the impacted matter (Department of Sustainability, Environment, Water, Population and Communities 2012). Through the *EPBC Act Offsets Assessment Guide*, a number of considerations have been taken into account including:

- the level of statutory protection that applies to Turpentine-Ironbark Forest in the Sydney Basin Bioregion
- specific attributes of the protected matter, or its habitat, being impacted
- quality or importance of the attributes being impacted with regard to the protected matter's ongoing viability
- permanent or temporary nature of the residual impacts
- level of threat (risk of loss) that a proposed offset site is under
- time it will take an offset to yield a conservation gain for the protected matter
- risk of the conservation gain not being realised.

The *EPBC Act Offsets Assessment Guide* (Department of the Environment 2015) was used to consider the above factors and the proposed offset is deemed suitable (refer Appendix D and Section 7.2.1).

5) *Suitable offsets must effectively account for and manage the risks of the offset not succeeding:*

The level of risk considered here relates to whether individual offsets are likely to be successful in compensating for the residual impacts of a particular action over a period of time (Department of sustainability, Environment, Water, Population and Communities 2012). This risk has a bearing on the scale of offset required. As a direct offset is proposed for Turpentine-Ironbark Forest in the Sydney Basin Bioregion, and there are good prospects to secure the land for future transfer to OEH, this approach presents a lower risk than other compensatory measures and is considered likely to result in a conservation gain. The direct offset means that the offset strategy is deemed suitable and successfully manages the risks of the offset not succeeding. Importantly, no perverse outcomes relating to social or economic factors are considered likely to occur.

6) *Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs:*

Offsets must deliver a conservation gain for the impacted protected matter, and that conservation gain must be new, or additional to what is already required by a duty of care or to any environmental planning laws at any level of government (Department of Sustainability Environment Water Population and Communities 2012). It is important to note however that 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 (Department of Sustainability Environment Water Population and Communities 2012). The proposed offset properties are privately owned and are not currently set aside in the conservation estate. While the properties are zoned E4 under the Hawkesbury LEP, a number of developments could occur on the properties with and without Council approval. Based on current available information, the landholder is not currently receiving any funding from a scheme or program (e.g. *Caring for our Country*) to manage the land. All the required state assessment and approval processes have been followed. As such, the proposed offset is considered additional to what is already required.

7) Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable:

Efficient and effective offsets are those that maintain or improve the viability of a protected matter through the sound allocation of resources (Department of Sustainability Environment Water Population and Communities 2012). The proposed offset delivers a streamlined combined offset for state and commonwealth matters as it is suitable also for the Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion ecological community as listed under the TSC Act and the Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community as listed under the EPBC Act. This is considered a sound allocation of resources and therefore an efficient and effective offset.

Offsets should be implemented either before, or at the same point in time as, the impact arising from the action (Department of Sustainability Environment Water Population and Communities 2012). The proposed offset strategy is a vital component of project approvals. As stated in section 7.1, Roads and Maritime is committed to providing evidence of actions being taken to deliver the offset prior to commencement of the action and to securing the required offset within two years of commencement.

Offsets must be based on both scientifically robust and transparent information that sufficiently analyses and documents the benefit to a protected matter's ecological function or values (Department of Sustainability Environment Water Population and Communities 2012). Detailed field investigations were undertaken to determine the start quality of the vegetation posed as an offset. This data was then fed into the *EPBC Act Offsets Assessment Guide and Calculator* which was then used to determine the adequacy of the proposed offset (refer to Appendix D and Section 7.2.1). This is a scientifically robust and transparent approach.

8) Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced:

Offsets must be delivered within appropriate and transparent governance arrangements and proponents must report on the success of the offsets so that conditions of approval can be varied if the offsets are not delivering the desired outcome (Department of Sustainability Environment Water Population and Communities 2012). The offsets for the project will be registered with the DoE and the establishment costs of the offsets will be borne by the proponent. As the proposed offset properties are intended to be transferred to the OEH for incorporation into the Wollemi National Park, an agreement will be sought with OEH as part of the transfer to ensure that any approval conditions are satisfied. If the transfer is agreed and proceeds, then future management will be undertaken by OEH in accordance with the requirements of the *National Parks and Wildlife Act 1974*.

7.2.2 EPBC Act Offsets Assessment Guide and Offsets Calculator

The *EPBC Act Offsets Assessment Guide* (Department of the Environment 2015), which accompanies the EPBC Act environmental offsets policy utilises a balance sheet approach to quantify impacts and offsets. The *EPBC Act Offsets Assessment Guide* (Department of the Environment 2015) is a tool that has been developed to assess the suitability of offset proposals. As such, the adequacy of the proposed offset has been examined through the *EPBC Act Offsets Assessment Guide*.

The overarching test of the *EPBC Act Offsets Assessment Guide* and the EPBC Act environmental offsets policy is that suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the matter at hand, in this case the critically endangered Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community.

The offset package must include as a minimum 90% of direct offsets that correlate to the specific nature of the impact and its timeframe. According the offsets assessment calculator, the 25 hectares of Turpentine-Ironbark Forest in the Sydney Basin Bioregion located at the two lots at 'The Islands' equates to 100.43% of the required percentage of direct offsets required for the project (refer to Appendix D for excerpts from the offsets assessment calculator).

An explanation of the components of the *EPBC Act Offsets Assessment Guide* and the data that was used in the offsets calculator for determining the adequacy of the proposed offset is provided below.

Annual probability of extinction

The annual probability of extinction is an estimate of the average chance that a species or ecological community will be completely lost in the wild each year, given recent rates of decline. The annual probability of extinction is incorporated into the impact and offset calculation process as a discounting factor for aligning activities that occur at different points in time. This figure is derived from the International Union for the Conservation of Nature (IUCN) Red List for threatened species (Department of the Environment 2015). As Turpentine-Ironbark Forest in the Sydney Basin Bioregion is listed as critically endangered under the EPBC Act, it is considered to have an annual probability of extinction of 6.8% when the probability of catastrophe is incorporated.

Protected matter attributes

Protected matter attributes show the various options to calculate a suitable offset depending on a protected matter's habitat or ecology that a proposed action may be likely to impact – in this case area of habitat. As the matter of concern is Turpentine-Ironbark Forest in the Sydney Basin Bioregion, the only attribute applicable to this community is area of the community.

The start area for the proposed offset is 25 ha of Turpentine-Ironbark Forest in the Sydney Basin Bioregion.

Quality

The quality score for area of community is a measure of how well a particular site supports a particular threatened ecological community and contributes to its ongoing viability. The components of quality that are applicable to Turpentine-Ironbark Forest in the Sydney Basin Bioregion are start quality (the quality of the offset site at the time of assessment), future quality without offset (an estimate of quality at a future time based on a business as usual scenario) and future quality with offset (estimated quality at the same future time incorporating the proposed offset activities). The future time is the time at which the ecological benefit of the offset is expected to be realised (time until ecological benefit) (Department of the Environment 2015).

Assessment of quality for threatened ecological communities is not just a score of vegetation pristineness. In this assessment we have considered site condition (i.e. vegetation condition and structure, species richness, presence of habitat features – via field surveys according to the BBAM) and site context (the relative importance of each site in terms of its position in the landscape – according to the landscape assessment portion of the BBAM). The Turpentine-Ironbark Forest in the Sydney Basin Bioregion scores highly in terms of site condition (80 out of 100) and site context (strategically located within the Wollemi National Park, >96% vegetation cover within the landscape, connectivity on all sides with the Wollemi National Park, large vegetation patch size of >1,001 ha refer Section 4). As such, the start quality score was determined to be 8 out of 10 due to the less than perfect nature of the site condition score. Future quality without offset (business as usual scenario) was considered to be the same at 8 out of 10 due to the current management of the properties. The vegetation is assumed to remain in a stable state if no active management was undertaken to improve the vegetation. Future quality with offset was determined to be 9 out of 10 given the implementation of management actions designed to improve the site condition. The quality of the site can be expected to improve with active management.

Time over which loss is averted

This is the foreseeable timeframe (in years) over which changes in the level of risk to the proposed offset site can be considered and quantified (also considered to be the time that any measures for securing a site for conservation purposes, such as conservation covenants on title, are intended to last) (Department of the Environment 2015). Following the *EPBC Act Offsets Assessment Guide*, the time over which loss is averted is taken to be 20 years as this is the maximum allowable risk related time horizon.

Time until ecological benefit

This is the estimated time (in years) that it will take for the habitat quality improvement of the proposed offset to be realised. Time until ecological benefit is considered to be 2 years based on the level of active management proposed for the site. The management of pest and weed species, fire management, maintenance of existing access, and waste management will take a moderate timeframe to result in improvements in ecological

condition. However, management will occur immediately and benefits are expected to be apparent in the short term. A two year time horizon should be sufficient for weed control to be effective (considering the already high quality of the vegetation and low starting weed cover) and for appropriate fire regimes to stimulate germination from the soil stored seed bank of dormant plant species. Due to the low level of weed infestation, within two years the weed control program will have removed all primary weed infestations (i.e. those along track edges and the weed plumes that extend from tracks into the bushland) and a maintenance weeding program will have begun. Once the properties are handed over to the OEH for inclusion into the Wollemi National Park, weed control and other management actions will continue in perpetuity.

Risk of loss (%)

This is a percentage figure that describes the chance that Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community within the proposed offset sites would be completely lost over the foreseeable future (in this case 20 years as outlined in the *EPBC Act Offsets Assessment Guide*). For the business as usual scenario (i.e. without offset), the risk of loss for Turpentine-Ironbark Forest in the Sydney Basin Bioregion is estimated to be only 5%. This is due to the unsuitability of the site for most development activities. While the properties are zoned E4 which allows some forms of development, the properties are considered to only face a low risk of loss without offset. Based on current information there were no pending development applications, mining leases or other activities posed that would indicate development intent or likelihood in the immediate future. With the offset scenario, the risk of loss drops to 1% as there will be minimal chance that the Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community would be lost due to development.

Confidence in result (%)

This is a percentage figure that describes the level of certainty about the success of the proposed offset. The proposed offset actions (acquiring privately owned land that contains the Turpentine-Ironbark Forest in the Sydney Basin Bioregion ecological community and transferring it into the OEH protected areas estate for active management) carries with it a low risk of failure and hence a high confidence in result score.

The proposed offset has been scored at 95% confidence in result. This is based on a high level of confidence in the successful achievement of the proposed change in quality due to management actions. Additionally, confidence is obtained due to the minimal work required to achieve an increase in site quality (i.e. no large scale revegetation is required and the vegetation start quality is high). The fact that Roads and Maritime as a responsible land manager has a policy to offset impacts to biodiversity and has successfully implemented offsets in the past adds to the level of confidence that the result can be achieved.

Net present value (adjusted hectares)

The calculation of the net present value is a form of discounting that incorporates the annual probability of extinction and the relevant time horizons (time over which loss is averted and time until ecological benefit). It is used to reflect the fact that a given benefit (i.e. improving habitat quality or averting loss) today holds more value for a protected matter than the same benefit realised in the future. Discounting is an important component, as it allows impacts and benefits at different times to be compared using equivalent units (Department of the Environment 2015).

The discount factor used in the guide is the annual probability of extinction for specific listed threatened species categories (in this case critically endangered). Discounting by this factor adjusts the value of a future benefit according to the likelihood that the protected matter will be extant at the time that the main benefit of the proposed offset becomes available (Department of the Environment 2015).

The net present value for the proposed offset is calculated to be 2.21.

8. Offset area management framework

8.1 Options for securing the biodiversity offset site(s) in perpetuity

The DoE requirements for the preliminary documentation require the proposed offsets package to provide details of how the offsets will ensure the protection, conservation and management of the protected matters for the life of the project.

Roads and Maritime is committed to delivering offsets that are legally secured in-perpetuity and subject to an appropriate management regime in support of improving or maintaining biodiversity values. As discussed above, Roads and Maritime has identified lands that contain suitable vegetation of sufficient size and quality to offset the impacts of the project on the Turpentine Ironbark Forest EEC in accordance with the EPBC Act environmental offsets policy and calculator.

Roads and Maritime's preferred offset option is to:

- Secure ownership of these lands through further discussion and agreement with the existing landowner
- Transfer these lands to the NSW Office of Environment and Heritage for future inclusion in Wollemi National Park
- Reach agreement with OEH on an appropriate contribution to support on-going conservation management of these lands.

The current landowner has indicated a willingness to progress discussions with a view to Roads and Maritime purchase of these lands. Similarly, OEH has provided in-principle support to accept these lands for future reservation as part of the Wollemi National Park.

Roads and Maritime recognises that other options may also be considered during these discussions, including the use of conservation covenants (for example, BioBank Agreements). In the event that agreement cannot be reached with either the current landowner or OEH, Roads and Maritime remains committed to providing an alternative offset that meets the requirements of the EPBC Act offsets policy.

8.2 Aims and objectives

The primary aim is to preserve in perpetuity the biodiversity values of the site in good condition. The following broad objectives have been identified:

- Protect and preserve vegetation, habitat and threatened populations across the proposed offset area.
- Manage the offset area in such a manner as to protect and enhance conservation values.
- Manage the site in such a manner to ensure threatening processes such as weeds, feral animals and fire risk are managed to protect site values and adjacent properties from these threats.

8.3 Management considerations

Several management actions have been identified as requiring implementation to address threats to biodiversity. The purchase and transfer of the land to the OEH is the preferred option for securing an offset for the project. Upon transfer of the land, the OEH will be responsible for future management in accordance with requirements of the *National Parks and Wildlife Act 1974* (NPW Act), which provides the highest level of secure conservation management in public ownership and subject to strict management and land use requirements. That will include obligations to manage the land in accordance with a statutory plan of management, and related obligations with respect to management of fire, weeds and pest species, and visitor use. In this case, the relevant plan of management is the *Wollemi National park Plan of Management* (NSW National Parks & Wildlife Service 2001).

As the management of the land would fall within the requirements of the NPW Act, it is not possible to be prescriptive in this offsets strategy with respect to the detailed management actions to be undertaken on the land. Instead, management of the key issues identified would be addressed by OEH as part of its broader integrated management planning for the Wollemi National Park. For example, bushfire matters for the offset lands would be considered as part of the fire management plan for the whole national park. Similarly, weed and pest species actions would be undertaken consistent with priorities identified in OEH's regional pest management strategies.

Nevertheless, in the short term and in the lead-up to eventual transfer of the offset lands to OEH, actions will be undertaken to ensure targeted management actions are implemented to protect and improve the quality of the lands. Weed management will be a particular priority during this period (refer section 8.3.3).

It is not possible at this stage to estimate purchase cost for the proposed offset lands as these remain subject to landowner discussion, and is assumed to be accommodated within the overall program of work budget.

Financial contributions by Roads and Maritime to support the ongoing management activities required at the site would be subject to agreement and confirmation with OEH. Roads and Maritime is committed to providing a contribution, as agreed with OEH, that is sufficient to provide for protection and management of the offset lands for an equivalent period of twenty years.

8.3.1 Existing threats to biodiversity at 'The Islands'

A number of threats to biodiversity were noted during the field surveys and these would form the basis of developing site specific management actions in the short-term prior to transfer of the land to OEH. Proactive management of the current threats to biodiversity to the offset area and the overall property would effectively improve the condition of the more disturbed habitats on the site (in this case disturbance is mostly limited to the edges of roads and trails). Table 8.1 summarises the current biodiversity threats on the property.

Table 8.1 : Identified threats to biodiversity

Key threats	Likely cause	Site locations
Weed invasion	General disturbance from previous activities. Fire trail construction and maintenance, use of fire trail by vehicles, horse riding	Exotic flora species are generally in very low density across the properties being restricted to the edges of fire trails. A low abundance of exotic grasses and herbs are present in small clearings and along trails.
Disturbance due to selective logging	Selective logging soil compaction and loss of mature trees with potential to create hollows.	Across the site, few very large trees are present which may suggest a potential history of logging.
Feral animals	Appear uncommon although are likely to occur.	Across the site

8.3.2 Existing infrastructure

Infrastructure present on the property is limited to fire trails and occasional star pickets in the ground.

8.3.3 Interim management framework

As discussed above, if Roads and Maritime is able to secure ownership of these properties following further discussions with the landowner, the intention would be to immediately implement the management measures outlined below in Table 8.2 in order to achieve an ecological benefit within a two year period. This is considered an appropriate and realistic timeframe given existing threats are able to be readily identified and there is likely to be strong support from OEH, as the adjoining land manager and proposed future owner of these properties, to take early management actions.

This interim management framework will ensure that the existing values of the land are maintained and actions taken to improve overall condition by targeting priority issues (such as weed control).

8.3.4 Long term management framework

Roads and Maritime will work with OEH to agree an appropriate contribution to support in-perpetuity management of the offset sites as part of the national park.

That will include consideration of any actions needed with respect to specific monitoring requirements at these locations that may be above and beyond monitoring for the park that is already undertaken by OEH.

The management contribution will be developed applying a twenty year planning timeframe.

Table 8.2 Proposed offset area interim management framework – for implementation during two year period following securing of offset lands

Objective	Strategy	Timeframe for implementation	Measures of success / outcomes
Manage the offset area to maintain and improve biodiversity values	In consultation with OEH, develop a focused interim property management plan to ensure the values of the offset area are maintained and, where practicable, improved. Issue specific strategies and actions below will be incorporated into the plan.	As soon as possible after land purchase. The plan will be implemented in the period prior to handover to OEH, focusing on delivering an ecological benefit within the first two years. The interim management plan will also assist OEH in setting future management directions, as per requirements of the NPW Act	Implement interim property management plan until such time as offset area is transferred to OEH. The plan should preferably be map-based (similar in style to that used by OEH for reserve fire management plans).
Manage pest and weed species	In consultation with OEH, develop and implement a targeted monitoring and management program. Active weed and pest management will be undertaken on site according to a weed and pest management plan that will be developed for the offset properties. As an overview, weed management will focus on eradicating weeds along trails and drainage lines while pest management will focus on fox removal.	Weed and pest management will be undertaken prior to handover to OEH. A weed and pest management plan is prepared by the Roads and Maritime upon purchase of the properties. Priority species and locations requiring management are identified immediately upon transfer of ownership of the land to the Roads and Maritime. Active weed management is to begin upon completion of the weed and pest management plan. Suitably qualified and experienced contractors will be engaged immediately after the weed and pest management plan is completed and approved. OEH are then to manage the properties in perpetuity.	Implement management actions agreed with OEH, such as: targeted weed removal and treatment; pest species control; and monitoring (e.g. weeds along existing tracks) to result in a decrease in weed and pest species prior to handover of the properties to the OEH.
Fire management	In consultation with OEH and Rural Fire Service, identify and implement priority bushfire management measures	Prior to handover to OEH Interim fire management plan is to be developed immediately upon purchase of the properties by Roads and Maritime. Bushfire management measures are implemented immediately upon finalisation of the fire management plan.	Fire management has been implemented according to the fire management plan before handover to the OEH. Fire management has resulted in an increase in species richness within the vegetation on the offset properties. No detrimental effects to vegetation or habitat are caused by inappropriate fire management.

Objective	Strategy	Timeframe for implementation	Measures of success / outcomes
Maintain existing access	Ensure the existing access track is maintained in a suitable condition to support future access for land management and fire protection purposes	Prior to handover to OEH and then in perpetuity. Track maintenance to be undertaken as necessary with the need for maintenance identified through monitoring.	Monitor track condition and if necessary take actions to repair or restore to an appropriate standard.
Waste management	Appropriately manage any waste materials present on the site.	Prior to handover to OEH and then in perpetuity. Waste management to initially be undertaken by Roads and Maritime with responsibility taken by OEH after hand over of the properties. Waste removal undertaken as necessary and will be identified through monitoring.	Identify any waste materials and implement actions to either remove from the site or appropriately manage in-situ.

9. Summary and conclusions

This biodiversity offset package has been developed to:

- Identify the residual impact of the project that is to be offset.
- Identify land that is suitable for use as an offset for the project including details of how the offsets will compensate for the impacts upon MNES resulting from the action.
- Compare the adequacy of chosen offset site(s) to the Commonwealth guidelines and policy for developing offsets.
- Provide recommendations for management measures to be undertaken within the offset site to maintain the vegetation and improve habitat quality.
- Outline the potential for the OEH to assume future ownership and management of offset sites to ensure conservation in perpetuity, noting that that this will require further consultation and confirmation with the landowner and OEH.
- Address the requirements issued by the DoE (27 November 2014).

The three lots at 'The Islands' are densely vegetated and located within a strategic location within the Wollemi National Park. These three properties appear to have suffered little human disturbance and the vegetation at 'The Islands' is in high condition. Lot 51 and Lot 52 DP 751658 contain 25 hectares of the Turpentine-Ironbark Forest in the Sydney Basin Bioregion critically endangered ecological community which is required as an offset for the project. As discussed above, Lot 140 DP 751658 at "The Islands" is not proposed as part of the offset package as initial analysis indicated it did not contain appropriate vegetation types.

The EPBC Act offsets assessment guide and calculator, which accompanies the EPBC Act environmental offsets policy, was used to determine the adequacy of the proposed offsets for the project. The outcome of the assessment was that the proposed offsets at Lot 51 and Lot 52 would meet 100.43 % in offset of the impact of the project and are therefore recommended for purchase and presentation as an offset package.

Table 9.1 below provides a summary of the outcomes from the EPBC Act offsets assessment and calculation.

Table 9.1: Summary outcome of assessment

Attribute	Value	Rationale
IMPACT AREA		
Area (ha)	3.14	Impacts to Turpentine-Ironbark Forest in the Sydney Basin Bioregion adjacent to Bells Line of Road are 3.14 hectares
Start quality (scale of 0-10)	7	Habitat in the impact area is disturbed from edge effects including weed invasion, and habitat connectivity is limited due to the existing Bells Line of Road being a substantial barrier to the movement and dispersal of many flora and fauna species.
OFFSET AREA		
Time over which loss is averted (max. 20 years)	20	This describes the timeframe over which changes to the in the level of risk to a proposed offset site can be considered and quantified. This value is capped at 20 years or the life of an offset whichever is shorter. Considering the offset is proposed to be established in perpetuity, the maximum risk-related time horizon was assigned.
Time until ecological benefit (years)	2	A 2 year period has been allowed for the initial active management actions to be implemented and ecological benefits to be realised. Due to the low weed abundance at the site, two years is a sufficient timeframe for removal all primary weed infestations (i.e. those along track edges and the weed plumes that extend from tracks into the bushland) and a maintenance weeding program will have begun. Once the properties are handed over to the OEH for inclusion into the Wollemi National Park, weed control and other management actions will continue in perpetuity.

Attribute	Value	Rationale
Area (ha)	25	'The Islands' inholding lots embedded within the Wollemi National Park have been proposed as biodiversity offsets. These properties support approximately 25 hectares of Turpentine-Ironbark Forest in the Sydney Basin Bioregion in high-moderate condition.
Start quality (scale of 0-10)	8	Habitat quality on the proposed offset sites has been determined as 8 out of 10.
Risk of loss (%) without offset	5	Considering the existing environmental zoning for these properties habitats are unlikely to be lost, however there is potential for further degradation of habitats.
Future quality without offset (scale of 0-10)	8	Considering the current condition of the vegetation with the background of existing threats, the future quality without the offset is likely to remain stable at 8 out of 10.
Risk of loss (%) with offset	1	An offset site would substantially reduce the risk of loss eliminating the majority of threats to the species, however some residual risk is considered to be present and a value of 1% has been assigned.
Future quality with offset (scale of 0-10)	9	It is envisaged with the implementation of management and restoration measures the future quality of the offset would be improved above existing levels.
Confidence in result (%)	95	There is a high confidence of a potential offset providing an improved outcome for Turpentine-Ironbark Forest in the Sydney Basin Bioregion particularly with the implementation of the proposed management actions. The offset properties will transfer 25 ha of good quality Turpentine-Ironbark Forest in the Sydney Basin Bioregion into the OEH protected areas estate for in perpetuity conservation.
% of impact offset	100.43	This scenario would provide for 100.43% of the required offset.

Roads and Maritime has identified preferred offset lands (Lot 51 and Lot 52 DP751658) and has indicative/in principle agreement from the landowner and OEH to progress discussions on purchase and transfer of the land. If agreement is not able to be reached, Roads and Maritime remains committed to secure an appropriate offset (as set out above), including support for appropriate on-going management.

10. References

Bell, S 1998, *Wollemi National Park vegetation survey. A fire management document. Volumes 1 & 2. Eastcoast Flora Survey. Report to NSW National Parks and Wildlife Service*, Upper Hunter District.

Brunker, RL & Rose, G 1969, *Sydney Basin 1:500 000 Geological Map*, 1st edn, Geological Survey of New South Wales, Sydney,

Bryan, JH 1966, *Sydney 1:250 000 Geological Sheet SI/56-05*, 3rd edn, Geological Survey of New South Wales, Sydney,

Department of Sustainability Environment Water Population and Communities 2012, *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Australian Government, Canberra,

Department of the Environment 2015, *How to use the offsets assessment guide*, Australian Government, viewed 24/02/2015 2015, <http://www.environment.gov.au/system/files/resources/12630bb4-2c10-4c8e-815f-2d7862bf87e7/files/offsets-how-use.pdf>.

Ecological Australia 2007, *Field Validation of Remnant Vegetation within the Hawkesbury LGA Report prepared for Hawkesbury City Council*, Ecological Australia, Sydney,

Gibbons, P, Ayers, D, Seddon, J, Doyle, S & Briggs, S 2008, *BioMetric 2.0. A terrestrial biodiversity assessment tool for the NSW Native Vegetation Assessment Tool* NSW Department of Environment and Climate Change, Canberra.

McInnes, SK 1997, *Soil Landscapes of the St Albans 1:100000 Sheet map and report*, NSW Department of Land and Water Conservation, Sydney,

Neldner, VJ, Wilson, BA, Thompson, EJ & Dillewaard, HA 2005, *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*, The State of Queensland, Environmental Protection Agency, Brisbane.

NSW National Parks & Wildlife Service 2001, *Wollemi National Park Plan of Management*, NSW National Parks & Wildlife Service, Sydney.

Office of Environment and Heritage 2014, *BioBanking Assessment Methodology 2014*, Office of Environment and Heritage for the NSW Government, 59 Goulburn Street, Sydney NSW 2000.

Ryan, K, Fischer, M & Schaeper, L 1996, 'The natural vegetation of the St Albans 1:100 000 map sheet.', *Cunninghamia*, vol. 4, no. 3, pp. 433-82.

Threatened Species Scientific Committee 2005, *Turpentine-Ironbark Forest of the Sydney Basin Bioregion. Advice to the Minister for the Environment and Heritage on amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999*, viewed 5 January 2015, <http://www.environment.gov.au/biodiversity/threatened/communities/sydney-turpentine-ironbark.html.>.

Tozer, M, Turner, K, Keith, D, Tindall, D, Pennay, C, Simpson, C, MacKenzie, B, Beukers, P & Cox, S 2010, 'Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands', *Cunninghamia*, vol. 11, no. 3, pp. 359-406.

Appendix A. Photos of vegetation types within the potential offset properties

Photo A.1 : Example of the Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin vegetation type at 'The Islands'. This vegetation type is representative of the Turpentine-Ironbark Forest critically endangered ecological community (EPBC Act).

Photo A.2 : Example of the Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest in sandstone gullies of western Sydney, Sydney Basin vegetation type along McMahons Trail at 'The Islands'.

Photo A.3 : Example of the Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin vegetation type at the bottom of the steep gully at 'The Islands'.

Photo A.4 : Example of the Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin vegetation type along Little Wheeny Creek at 'The Islands'.

Appendix B. Threatened Species Scientific Committee's description of Turpentine-Ironbark Forest in the Sydney Basin Bioregion

The Turpentine-Ironbark Forest of the Sydney Basin Bioregion originally existed as a forest with either a shrubby or grassy understorey. The characteristic plant species for the Turpentine-Ironbark Forest of the Sydney Basin Bioregion are summarised below as outlined by the Threatened Species Scientific Committee (2005).

Tree canopy: Turpentine (*Syncarpia glomulifera*) and Ironbarks (*Eucalyptus* spp) are dominant. Turpentine occurs throughout the ecological community but the associated tree species varies with local abiotic conditions. Grey Ironbark (*Eucalyptus paniculata*), Narrow-leaved Ironbark (*E. crebra*), Red Ironbark (*E. fibrosa*), and Grey Gum (*E. punctata*) are common tree species in the Cumberland Plain. On the plateaux shale caps, Grey Ironbark and Mountain Mahogany (*E. notabilis*) may become common in association with Turpentine. At the upper end of its rainfall/elevation range the Turpentine-Ironbark Forest of the Sydney Basin Bioregion may be dominated by Blue Gum (*E. saligna*), Mountain Grey Gum (*E. cypellocarpa*), Round-leaved Gum (*E. deanei*) or Grey Gum.

Midstorey: A stratum of small trees may occur, including Sweet Pittosporum (*Pittosporum undulatum*), Native Peach (*Trema aspera*), and Parramatta Wattle (*Acacia parramattensis*). Where present, a shrub layer may include Elderberry Panax (*Polyscias sambucifolia*), Mock Olive (*Notelaea longifolia*), Prickly Beard-heath (*Leucopogon juniperinus*), Rough-fruit Pittosporum (*P. revolutum*), Breynia (*Breynia oblongifolia*), Narrow-leaved Orangebark (*Maytenus silvestris*) and White Dogwood (*Ozothamnus diosmifolius*).

Ground layer: Where present in its natural state, the ground layer may include Basket Grass (*Oplismenus aemulus*), Pastel Flower (*Pseuderanthemum variabile*), Forest Hedgehog-grass (*Echinopogon ovatus*) Weeping Grass (*Microlaena stipoides*) and Kangaroo Grass (*Themeda triandra*).

Appendix C. Species list from 'The Islands'

Family	Scientific name	Common name	Diagnostic species for Sydney Turpentine-Ironbark Forest (Tozer *et al.* 2010)
ACANTHACEAE	*Brunoniella australis*	Blue Trumpet	✓
	Pseuderanthemum variable	Pseuderanthemum	✓
ANTHERICACEAE	*Arthropodium milleflorum*	Vanilla Lily	✓
APIACEAE	*Platysace linearifolia*		
	Xanthosia pilosa	Hairy Xanthosia	
ARALIACEAE	*Astrotricha latifolia*	Broad-leaf Star-hair	
ASTERACEAE	*Lagenophora stipitata*	Bottle-daisy	
	Vittadinia cuneata	Fuzzweed	
BLECHNACEAE	*Blechnum nudum*	Fishbone Water-fern	
CASUARINACEAE	*Allocasuarina littoralis*	Black She-oak	
	Allocasuarina torulosa	Forest Oak	✓
CONVOLVULACEAE	*Convolvulus erubescens*	Pink Bindweed	
	Dichondra repens	Kidney Weed	✓
CUNONIACEAE	*Callicoma serratifolia*	Black Wattle	
	Ceratopetalum apetalum	Coachwood	
CYATHEACEAE	*Cyathea australis*	Rough Tree-fern	
CYPERACEAE	*Cyathochaeta diandra*		
	Gahnia aspera	Rough Saw-sedge	✓
	Gahnia clarkei	Tall Saw-sedge	
	Lepidosperma laterale	Variable Sword-sedge	✓
DILLENIACEAE	*Hibbertia aspera*	Rough Guinea-flower	✓
	Hibbertia diffusa	Prostrate Guinea-flower	✓
ELAEOCARPACEAE	*Elaeocarpus reticulatus*	Blueberry Ash	
	Tetratheca thymifolia	Thyme-leaf Black-eyed Susan	
ERICACEAE	*Dracophyllum secundum*	Dracophyllum	
	Epacris pulchella	Coral Heath	

Family	Scientific name	Common name	Diagnostic species for Sydney Turpentine-Ironbark Forest (Tozer *et al.* 2010)
	Leucopogon lanceolatus var. *lanceolatus*	Lance-leaf Beard-heath	
	Lissanthe sapida	Native Cranberry	
FABACEAE-FABOIDEAE	*Bossiaea obcordata*	Spiny Bossiaea	
	Daviesia ulicifolia	Gorse Bitter-pea	
	Desmodium varians	Slender Tick-trefoil	
	Dillwynia sieberi	Prickly Parrot-pea	
	Glycine clandestina agg.	Twining Glycine	✓
	Gompholobium latifolium	Broad-leaf Wedge-pea	
	Hovea linearis	Narrow-leaf Hovea	
	Podolobium ilicifolium	Prickly Shaggy-pea	
	Pultenaea ferruginea var. *ferruginea*	Large Bronze Bush-pea	
	Pultenaea flexilis	Graceful Bush-Pea	
FABACEAE-MIMOSOIDEAE	*Acacia buxifolia*	Box-leaf Wattle	
	Acacia linifolia	Flax-leaf Wattle	
	Acacia suaveolens	Sweet Wattle	
	Acacia terminalis	Sunshine Wattle	
	Acacia trinervata	three-veined Wattle	
	Acacia ulicifolia	Prickly Moses	
GLEICHENIACEAE	*Sticherus flabellatus*		
GOODENIACEAE	*Goodenia hederacea* subsp. *hederacea*	Ivy-leaf Goodenia	
	Scaevola ramosissima	Purple Fan-flower	
HALORAGACEAE	*Gonocarpus tetragynus*	Creeping Raspwort	
IRIDACEAE	*Patersonia glabrata*	Cauline-leaf Purple-flag	
LAURACEAE	*Cassytha glabella*	Cork Wood	
	Cassytha pubescens	Devils Twine	
LINDSAEACEAE	*Lindsaea linearis*	Screw Fern	
LOBELIACEAE	*Pratia purpurascens*	Whiteroot	✓

Family	Scientific name	Common name	Diagnostic species for Sydney Turpentine-Ironbark Forest (Tozer *et al.* 2010)
LOMANDRACEAE	*Lomandra glauca* subsp. *glauca*	Wattle Mat-rush	
	Lomandra longifolia		✓
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	
	Lomandra obliqua		
LUZURIAGACEAE	*Eustrephus latifolius*	Wombat Berry	
MONIMIACEAE	*Doryphora sassafras*	Sassafras	
MYRTACEAE	*Acmena smithii*	Lilly Pilly	
	Angophora costata	Smooth-barked Apple	✓
	Angophora floribunda	Rough-barked Apple	
	Corymbia gummifera	Red Bloodwood	
	Eucalyptus agglomerata	Blue-leaved Stringybark	
	Eucalyptus crebra	Narrow-leaf Ironbark	
	Eucalyptus globoidea	White Stringybark	✓
	Eucalyptus notabilis	Mountain Mahogany	✓
	Eucalyptus paniculata subsp. *paniculata*	Grey Ironbark	✓
	Eucalyptus piperita	Sydney Peppermint	
	Eucalyptus punctata	Common Grey Gum	✓
	Eucalyptus sparsifolia	Narrow-leaved Stringybark	
	Leptospermum polygalifolium	Yellow Tea-tree	
	Leptospermum trinervium (narrow-leaf form)	Flaky-bark Tea-tree	
	Syncarpia glomulifera	Turpentine	✓
	Tristaniopsis laurina	Water Gum	
ORCHIDACEAE	*Cryptostylis erecta*		
OSMUNDACEAE	*Todea barbara*	King Fern	
PHORMIACEAE	*Dianella caerulea* var. *caerulea*	Leafy Blue Flax Lily	✓
	Dianella longifolia var. *longifolia*	Long-leaf Flax Lily	
PHYLLANTHACEAE	*Breynia oblongifolia*	Breynia	

Family	Scientific name	Common name	Diagnostic species for Sydney Turpentine-Ironbark Forest (Tozer *et al.* 2010)
	Phyllanthus hirtellus	Phyllanthus	
PITTOSPORACEAE	*Billardiera scandens*	Apple-berry	
POACEAE	*Aristida vagans*	Three-awned Spear Grass	✓
	Austrostipa scabra	Spear grass	
	Austrostipa sp.	Spear grass	
	Echinopogon caespitosus	Hedgehog Grass	✓
	Entolasia marginata	Margined Panic	
	Entolasia stricta	Leafy Nineawn	✓
	Eragrostis brownii	Benthams Lovegrass	
	Imperata cylindrica	Blady Grass	✓
	Microlaena stipoides var. *stipoides*	Weeping Grass	✓
	Panicum simile	Two-colour panic	✓
	Themeda triandra	Broad-leaf Paspalum	✓
PROTEACEAE	*Banksia serrata*	Swamp Banksia	
	Banksia spinulosa var. *spinulosa*	Hill Banksia	✓
	Conospermum taxifolium	Cone seeds	
	Grevillea buxifolia subsp. *buxifolia*	Grey Spider-flower	
	Grevillea mucronulata	Grevillea	
	Hakea dactyloides	Broad-leaved Hakea	
	Lambertia formosa	Mountain Devil	
	Lomatia silaifolia	Lomatia	
	Persoonia levis	Broad-leaf Geebung	
	Persoonia linearis	Narrow-leaf Geebung	✓
	Stenocarpus salignus	Scrub Beefwood	
	Telopea speciosissima	Waratah	
	Xylomelum pyriforme	Woody Pear	
PTERIDACEAE	*Cheilanthes sieberi* subsp. *sieberi*	Slender Cloak-fern	✓

Family	Scientific name	Common name	Diagnostic species for Sydney Turpentine-Ironbark Forest (Tozer *et al.* 2010)
RUBIACEAE	*Morinda jasminoides*	Morinda	
	Opercularia aspera	Common Stinkweed	
	Pomax umbellata	Small-leaved Stinkweed	
RUTACEAE	*Correa reflexa*	Common Correa	
SAPINDACEAE	*Dodonaea triquetra*		✓
SMILACACEAE	*Smilax glyciphylla*	Sweet Sarsaparilla	
STACKHOUSIACEAE	*Stackhousia viminea*	Leafless Stackhousia	
STERCULIACEAE	*Lasiopetalum ferrugineum* var. *ferrugineum*	Rusty Velvet-bush	
STYLIDIACEAE	*Stylidium productum*		
THYMELEACEAE	*Pimelea linifolia* subsp. *linifolia*	Swamp Rice Flower	
VIOLACEAE	*Hybanthus monopetalus*		
	Viola hederacea	Tree Violet	
VITACEAE	*Cissus hypoglauca*	Five-leaf Water Vine	
XANTHORRHOEACEAE	*Xanthorrhoea latifolia* subsp. *latifolia*	Broad-leaf Grass-tree	
		Totals	**30***

Note: * = Number of diagnostic species derived in this case from all 7 plots.

Appendix D. Offsets guide calculations

Matter of National Environmental Significance	
Name	Turpentine-Ironbark Forest in the Sydney Basin Bioregion
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Impact calculator							
Impact calculator	**Protected matter attributes**	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
	Ecological communities						
	Area of community	Yes	Turpentine Ironbark Forest	**Area**	3.14	Hectares	Field surveys undertaken for the project impact assessment
				Quality	**7**	Scale 0-10	
				Total quantum of impact	2.20	Adjusted hectares	

Offset calculator																						
Offset calculator	Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
	Ecological Communities																				
	Area of community	Yes	2.20	Adjusted hectares	The Islands' inholding lots embedded within the Wollemi National Park	Risk-related time horizon (max. 20 years)	20	Start area (hectares)	25	Risk of loss (%) without offset	5%	Risk of loss (%) with offset	1%	1.00	95%	0.95	0.25	2.21	100.43%	Yes	$TBC	Detailed field surveys of vegetation type and quality within the potential offset sites
										Future area without offset (adjusted hectares)	23.8	Future area with offset (adjusted hectares)	24.8									
						Time until ecological benefit	2	Start quality (scale of 0-10)	8	Future quality without offset (scale of 0-10)	8	Future quality with offset (scale of 0-10)	9	1.00	95%	0.95	0.83					

Summary								
Summary	Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
						Direct offset ($)	Other compensatory measures ($)	Total ($)
	Birth rate	0				$0.00		$0.00
	Mortality rate	0				$0.00		$0.00
	Number of individuals	0				$0.00		$0.00
	Number of features	0				$0.00		$0.00
	Condition of habitat	0				$0.00		$0.00
	Area of habitat	0				$0.00		$0.00
	Area of community	2.2	2.21	100.43%	**Yes**	$0.00	N/A	$0.00
						$0.00*	**$0.00**	**$0.00**

Note: * = An estimate of the cost associated with purchase of the preferred properties and future management is not included here as discussions are continuing with the existing landowner and OEH respectively.

Appendix E. Letter from landowner of “islands’ property

From: David Magney[redacted]
Sent: Monday, 2 March 2015 1:32 PM
To: FANOUS Joseph
Subject: Lots 51,52 and 140 ("The Islands")

Dear Mr Fanous,
Our client has been liasing with [redacted] of the National Parks and Wildlife Service in respect of the potential sale of the abovementioned blocks of land and [redacted] has requested we make contact with you to confirm our client is agreeable to enter into negotiations for the potential sale of such lots as a potential block to be then handed on to National Parks for possible inclusion into Wollemi National Park.
Regards
David

David Magney
Magney & Magney
Solicitors
Ph: 02 8249 4455
Fac: 02 8249 4908
[redacted] [redacted]
Post: GPO Box 3716 Sydney NSW 2001

Appendix F. Letter of in principle support from the OEH

Office of Environment & Heritage
NSW National Parks & Wildlife Service

Our reference: DOC15/10458

Ms Erica Adamson
General Manager Environment
Roads and Maritime Services
Level 17, 101 Miller St
NORTH SYDNEY NSW 2060

Dear Ms Adamson

Thank you for your letter concerning Roads and Maritime Services' (RMS) corridor improvement program for the Bells Line of Road. I appreciate being consulted on this project.

The areas set out in your letter have been of long-term interest to NPWS for acquisition. The land at Kurrajong (The Islands) would be a suitable addition to Wollemi National Park (NP) as it is a complete inholding and has high biodiversity value. NPWS is interested in accepting this land 'in-principle' as an offset, noting that approval is required from the Minister for the Environment for land transfers. Further discussions would be required in regard to management funding for this property.

The inholdings in the northern part of Yellomundee Regional Park form part of the NPWS strategic land acquisition program for 2014-15 and NPWS has already commenced discussions with the vendors to secure their purchase. Consequently, I understand that RMS is not pursuing these properties as an offset for the Bells Line of Road project.

In addition to the properties you have proposed, [redacted] could meet the offset requirements. This property is being offered for sale via [redacted].

If you have any further questions on possible offsets in this region, Mr Todd Duffy, Senior Team Leader, Reserve Establishment, NPWS can be contacted on 02 6841 0937 or by email at todd.duffy@environment.nsw.gov.au.

Yours sincerely

18 FEB 2015

MICHAEL WRIGHT
Deputy Chief Executive – National Parks and Wildlife Service
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