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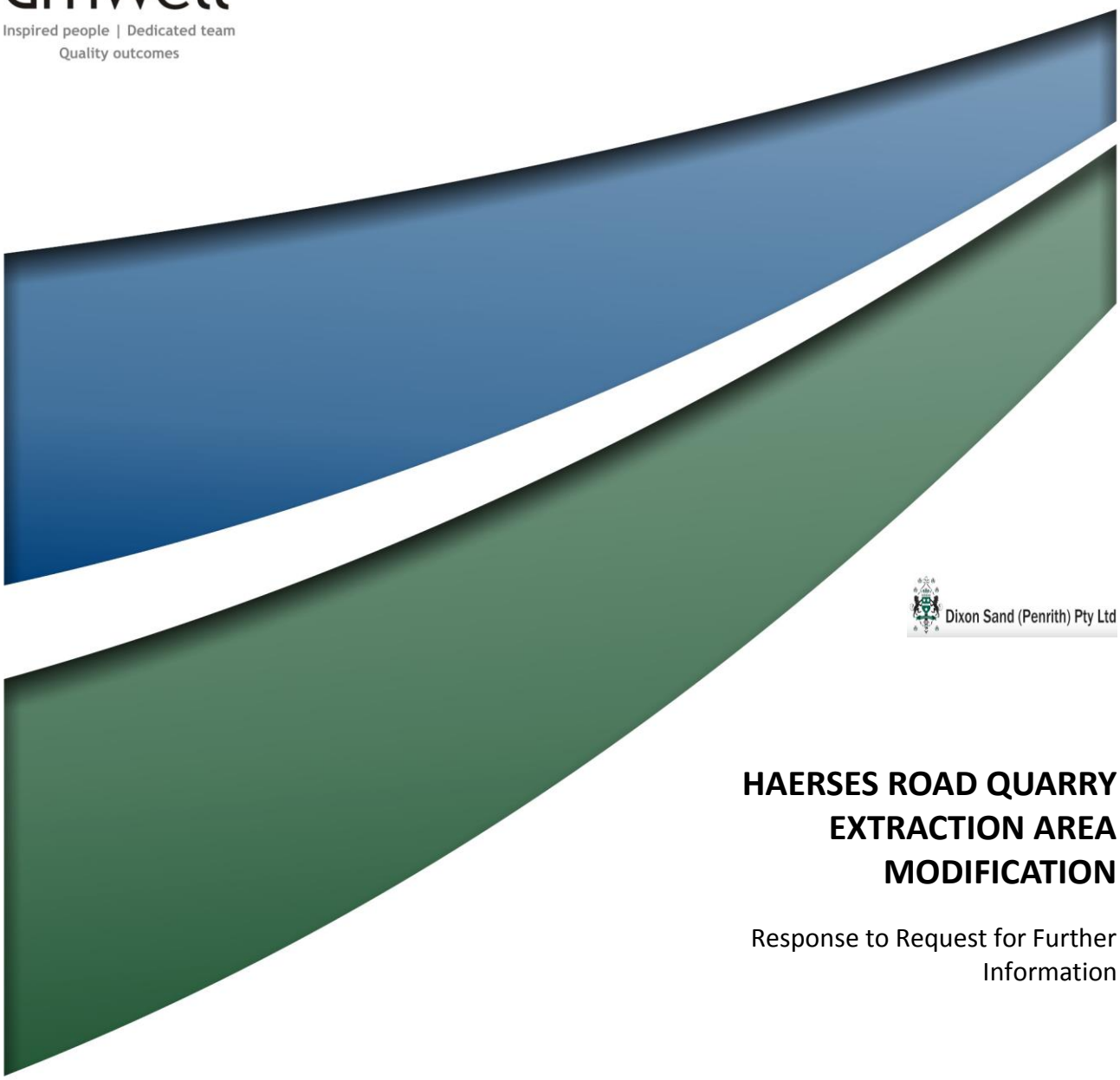

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Response to Request for Further Information

October 2017

Dixon Sand (Penrith) Pty Ltd

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Response to Request for Further Information

Prepared by
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on behalf of
Dixon Sands

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Report No.	3479/R07_Final
Date:	October 2017

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	**Date**	**Name**	**Date**
Final	John Merrell	18/10/17	John Merrell	18/10/17

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1.0 Introduction

Dixon Sand (Penrith) Pty Limited (Dixon Sand) is seeking approval for proposed changes to Haerses Road Quarry through a modification to development consent (DA 165-7-2005) in accordance with Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The modification, if granted, will be the first modification of the Haerses Road Quarry development consent.

The Environmental Assessment (EA) for the proposed Haerses Road Quarry Extraction Area Modification (the Modification) was exhibited from 12 October 2016 to 10 November 2016. A Response to Submissions (RTS) was prepared to address the issues raised in the submissions received during the public exhibition period.

Eight agencies have responded to the RTS report. Of these, four had no further comments including:

- The Hills Shire Council
- Resources and Energy
- Heritage Council – no further comment after clarification was provided as to the location of the additional heritage information contained in the RTS
- Roads and Maritime Services – no further comment, however, noted that the RTS identified that 'the upgrades will be completed prior to the commencement of product delivery from the additional extraction area'. RMS also restated its comment provided on the EA – 'the design plans of the CHR treatment and proposed works for the intersection upgrade are to be submitted to Roads and Maritime for approval prior to the issue of a Construction Certificate and commencement of any road works'.

Four agencies made comment or raised issues for further consideration including:

- Department of Planning and Environment (DP&E)
- Environment Protection Authority (EPA)
- NSW Rural Fire Service
- Department of Primary Industries (DPI) Water

This document responds to the matters raised by DPE and the other agencies as directed by DPE.

2.0 Responses

2.1 Department of Planning and Environment

2.1.1 Biodiversity

DP&E requested that a Biodiversity Offset Strategy be submitted and that further detail be provided in relation to the Assessment of Commonwealth Matters to address the Commonwealth Department of Environment and Energy's Environmental Assessment Requirements (EARs).

Appendix 1 provides the updated Biodiversity Offset Strategy for the Modification. Dixon Sand is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Modification. The Biodiversity Offset Strategy has been developed in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) Framework for Biodiversity Assessment (OEH 2014b). The credit requirements of the Project have been calculated as part of the Biodiversity Assessment Report completed by Umwelt (2016) and updated following further consultation with the NSW Office of Environment and Heritage (OEH) in 2017. Two sites are proposed for in-perpetuity conservation through the establishment of proponent-managed BioBank sites, achieved through the retirement of credits. These include the Haerses Road BioBank Site and the Porters Road BioBank Site which are discussed in detail in **Appendix 1**. These sites have been surveyed and offset credits calculated following the NSW Framework for Biodiversity Assessment (FBA) methodology. Both of these sites are owned by Dixon Sands and are therefore available for a BioBanking Agreement to be put in place.

As outlined in **Appendix 1**, the proposed offsets provide the majority of the offsetting needs of the Modification. All of the credits for Stages 1A to 5A, which covers the full extent of the proposed quarrying area excluding the 100 metre buffer zone to the Maroota Tertiary Sands Groundwater Source (MTSGS), are in place except for small deficits relating to the Dural Land Snail (18 credits required) and Sydney Sandstone Heath (52 credits required). As discussed in the EA, no quarrying in the MTSGS buffer area will be undertaken until sufficient groundwater monitoring has been undertaken in this area to confirm that such quarrying can be undertaken without impacting on the MTSGS. As this monitoring will take some time, no quarrying is expected to occur in the buffer area for several years and consultation with DP&E would occur prior to any quarrying in this area.

Importantly, all of the credits required for Stages 1A and 2A which provide for approximately five years of quarrying are available on these two sites, with the exception of the additional 18 credits required for the Dural Land Snail which Dixon Sands plans to source prior to the commencement of quarrying. Should Dixon Sands be unable to source the additional 18 credits required for Stages 1A and 2A prior to the intended quarrying commencement date, the quarry staging will be revised to first quarry in Stages 3A to 5A which do not impact on Dural Land Snail habitat. This would provide several years of quarrying during which time the remaining credits for the snail could be sourced, with all required credits to be sourced prior to quarrying in Stages 1A and 2A.

As also outlined in **Appendix 1**, the two proposed offset sites contain all of the credits required for the proposed Modification except for the Dural Land Snail, Eastern Pygmy Possum and Sydney Sandstone Heath. The remaining offsets required for these three species will be sourced utilising one of the range of mechanisms available under the FBA including:

- further land based offsets secured by a BioBanking Agreement
- securing the required credits through the open credit market

- the potential use of the new Offsets Fund to be established under the NSW *Biodiversity Conservation Act 2016*.

In terms of the program for securing the offsets required for the Modification, Dixon Sands commits to:

- source the remaining 18 credits required for the Dural Land Snail prior to the commencement of quarrying, or, change the sequence of quarrying so that no quarrying occurs in Stages 1A or 2A which contain Dural Land Snail habitat until the remaining 18 credits have been sourced

- retire the credits required for the initial five years of quarrying (nominally Stages 1A and 2A, subject to the possible changes to quarry staging discussed in the point above) within 12 months of the approval of the Modification. This period provides sufficient time for the required BioBanking agreements to be put in place for the proposed offset sites

- retire the required credits for the subsequent A Stages of the quarry prior to the commencement of quarrying in these areas, and

- retire the required credits for Stages 1B to 5B prior to the commencement of quarrying in these areas.

Appendix 2 provides the revised Assessment of Commonwealth Matters report which has been updated to address the comments provided by DP&E. This report responds to the Commonwealth Department of the Environment and Energy (DoEE) assessment requirements contained within Attachment 1 of the DP&E's EA Requirements letter (dated 12 February 2016). The updated assessment includes the requested additional information and assessments of significance.

2.1.2 Visual

DP&E requested further information be provided in relation to the location and potential visual impact of the proposed earth bunds including identifying the location of the earth bunds on figures.

The seven metre high earth bunds and/or acoustic fencing would be located within extraction Cells 4 and 5 as shown in **Figures 2.1** to **2.6**. As shown in **Figures 2.1** to **2.6** the earth bunds/acoustic fencing would not be visible from the surrounding publicly accessible locations or from the residences. As such, the noise mitigation provided by these structures would not result in an associated visual impact.

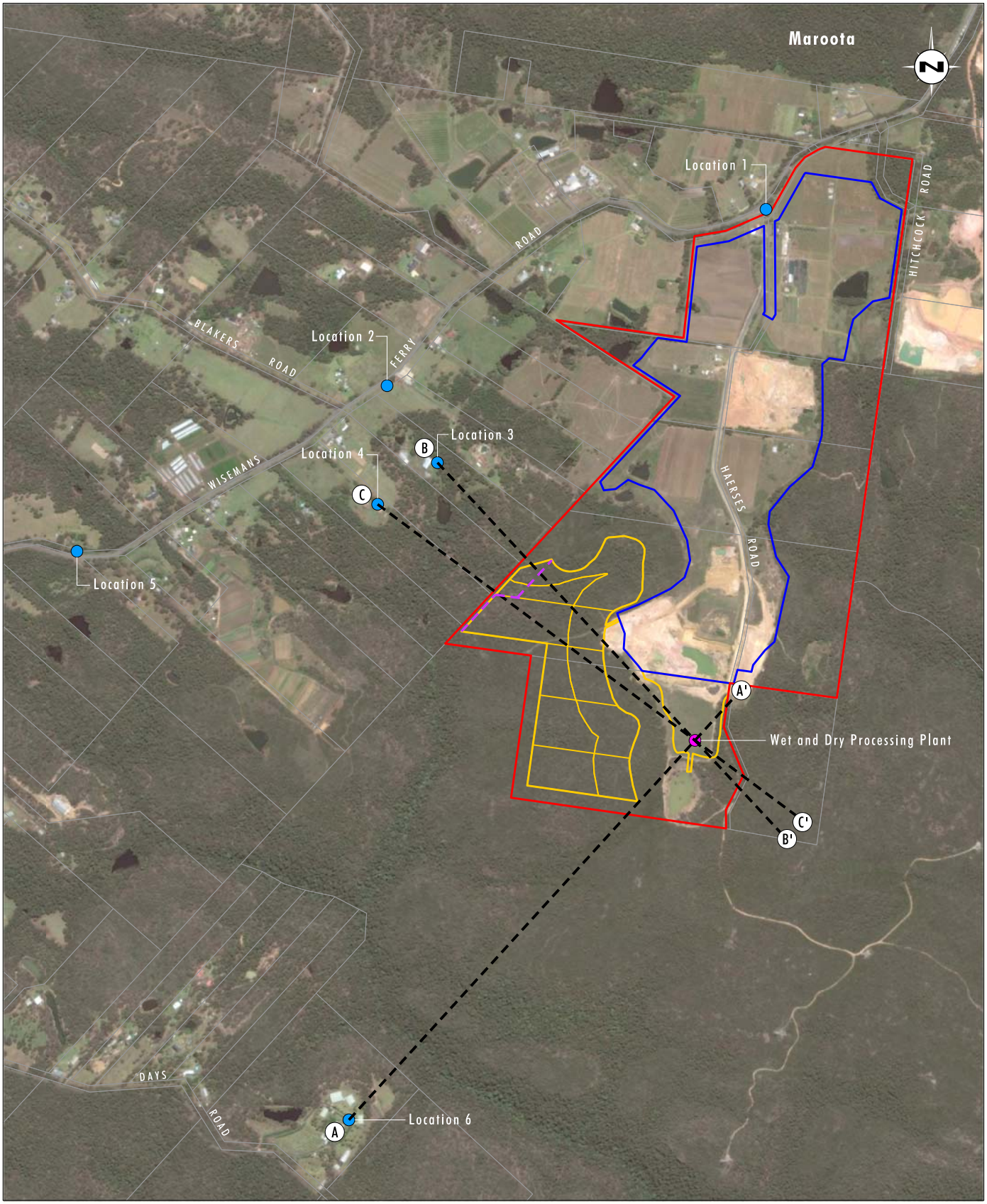

Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Earth Bund
- Transcript Location

FIGURE 2.1

Visual and Transect Locations

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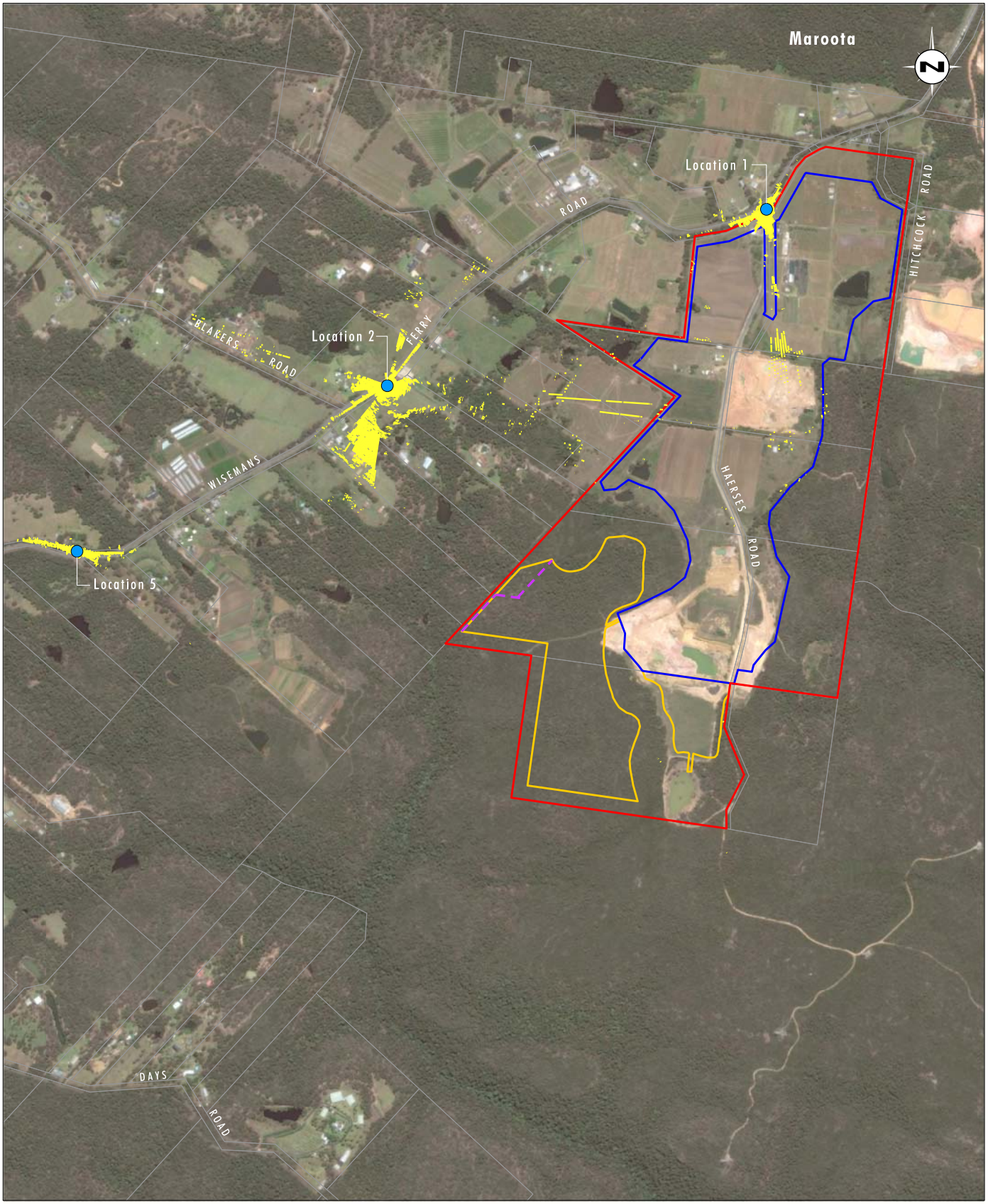

Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Earth Bund
- Radial Analysis

FIGURE 2.2

Visual Assessment Locations 1, 2 and 5

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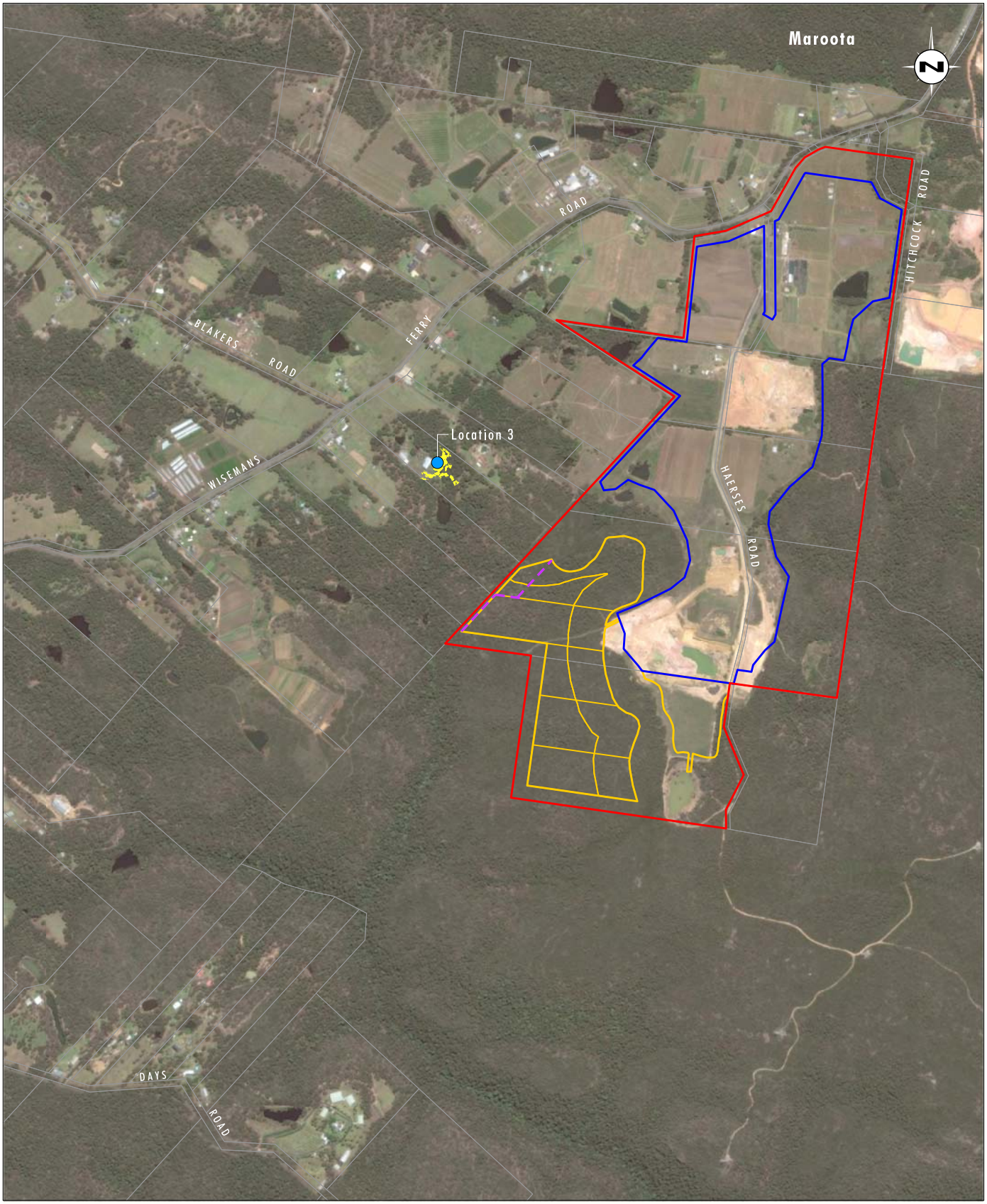

Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

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1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis
- Earth Bund

FIGURE 2.3

Visual Location 3

File Name (A4): R06/3479_079.dgn
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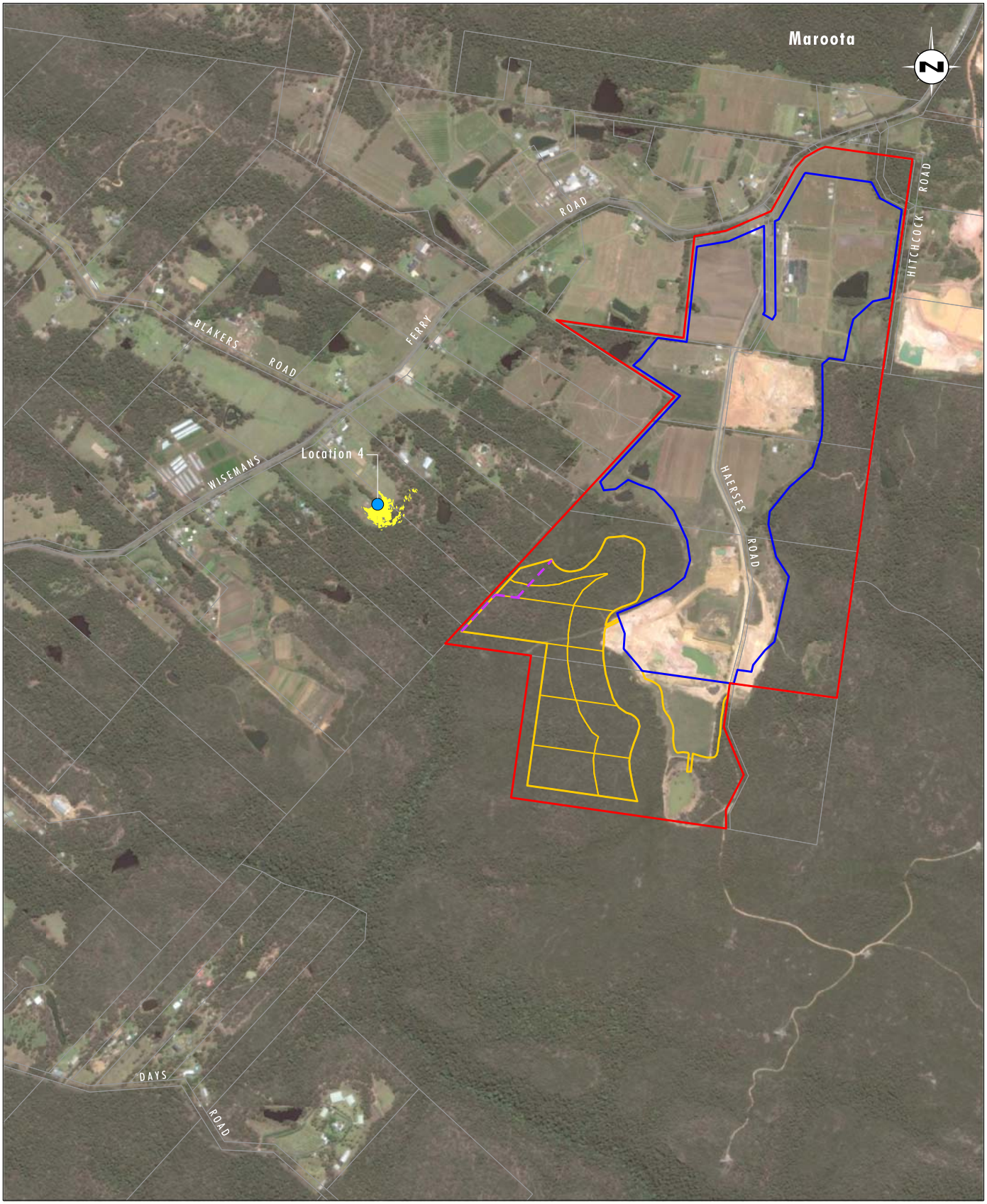

Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis
- Earth Bund

FIGURE 2.4

Visual Location 4

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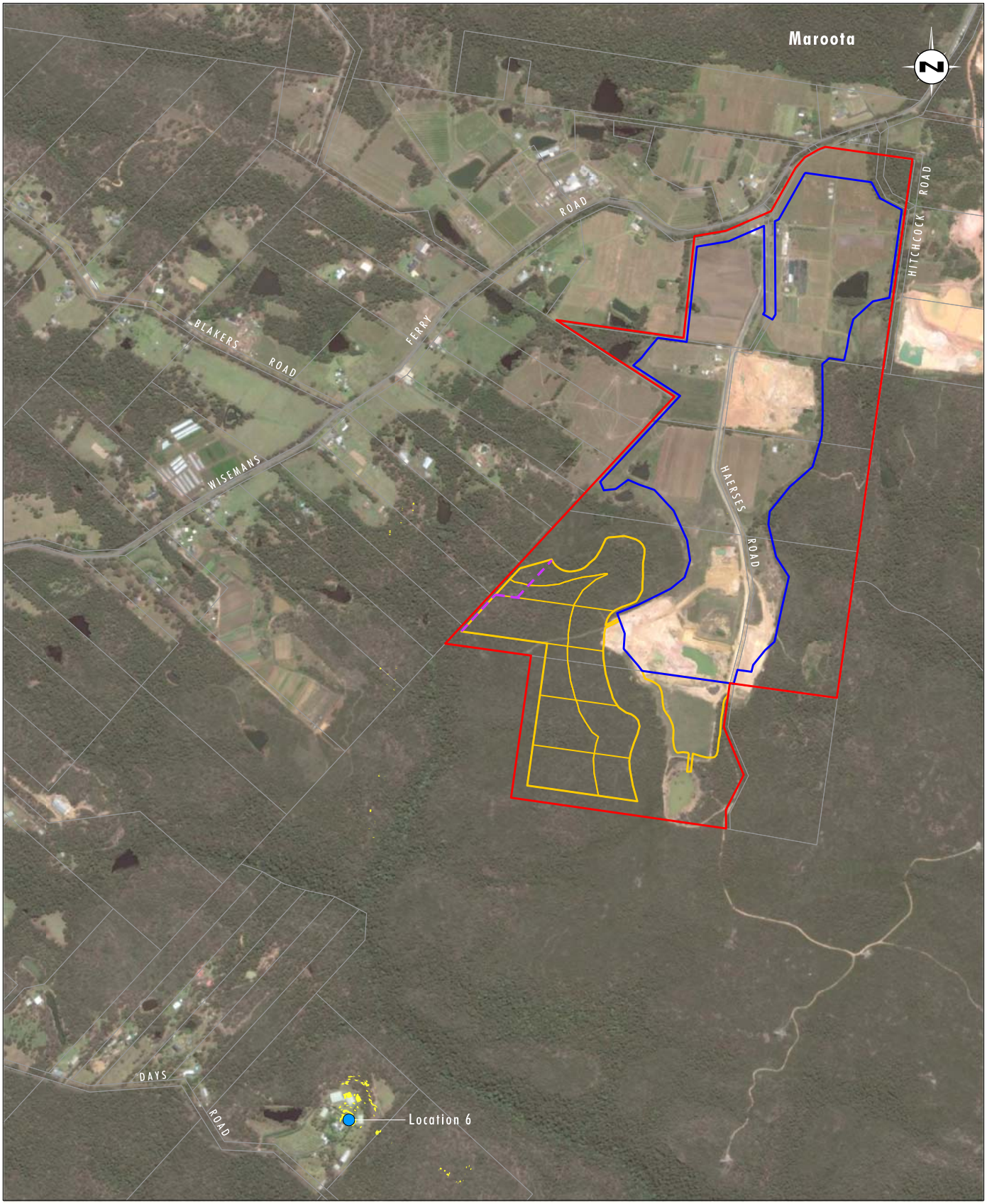

Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis
- Earth Bund

FIGURE 2.5

Visual Location 6

File Name (A4): R06/3479_081.dgn
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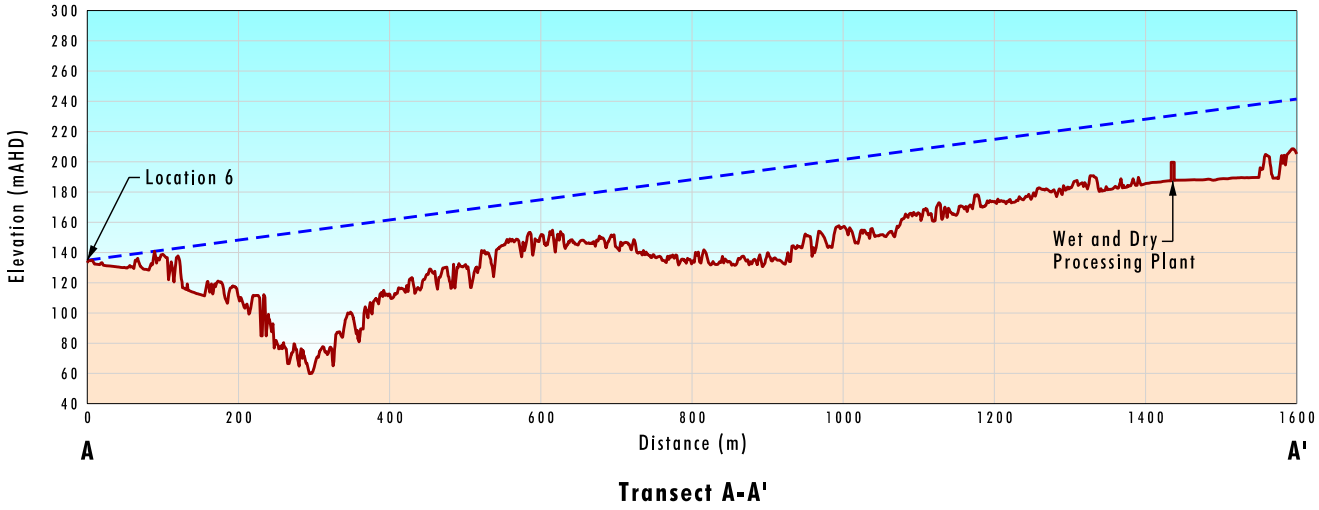
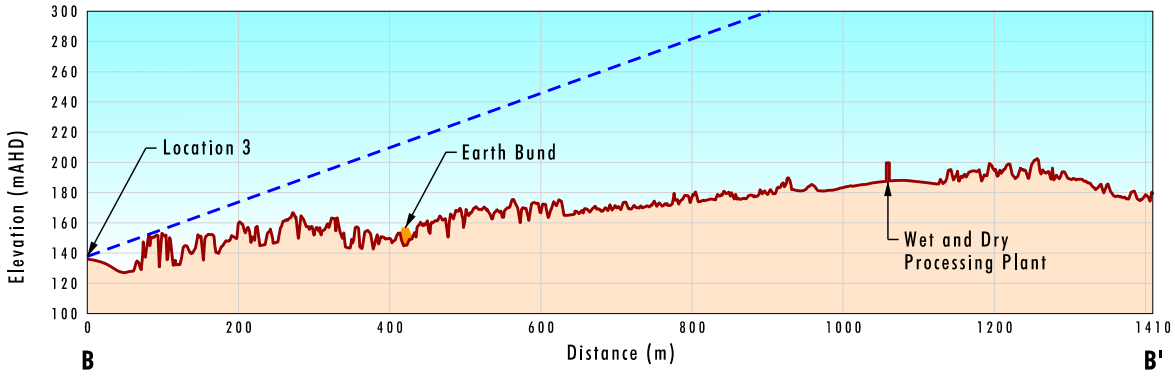
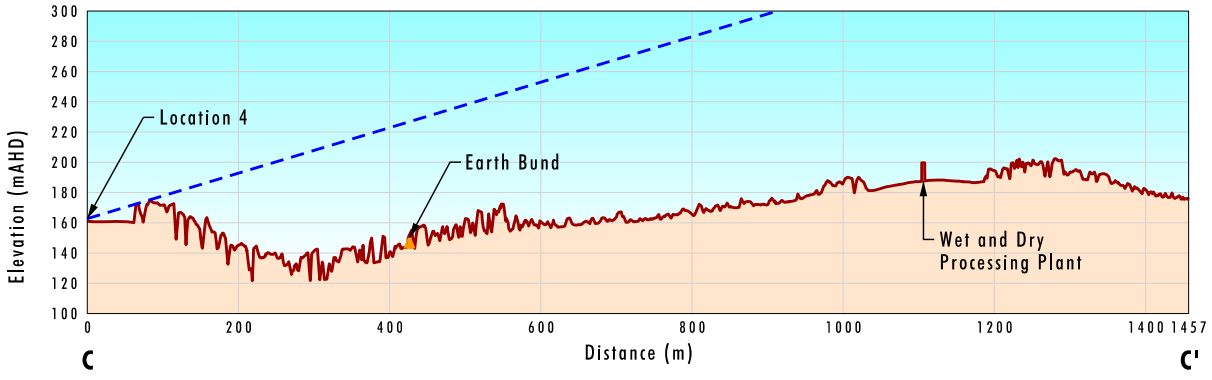


Transect A-A'



Transect B-B'



Transect C-C'

Legend

Natural Surface with Canopy

View Line

0 100 250 500m

Horizontal Scale 1:10 000

0 50 125 250m

Vertical Scale 1:5 000

Note: Vertical Exaggeration 2:1

FIGURE 2.6

Visual Transects

File Name (A4): R06/3479_090.dgn
20170711 11.05

2.2 Environment Protection Authority

2.2.1 Air Quality

The EPA recommended that the air quality assessment be revised to demonstrate that additional control measures would be effective in preventing the one additional exceedance of the PM_{10} 24 hour criteria predicted in the modelling.

The air quality assessment has been updated as requested by the EPA with the revised modelling including the additional control measures committed to in the RTS. The updated assessment is provided in **Appendix 3**. With the additional controls included in the modelling there are no predicted exceedances of the PM_{10} 24 hour criteria.

2.2.2 Noise

The EPA identified DP&E's preference that the noise limits reflect the noise predictions in the Environmental Assessment (except for bund construction). The EPA provided revised noise conditions and limits which align with the EA for three additional receivers and retain the existing noise conditions for other receivers.

Noted.

2.3 NSW Rural Fire Service

The NSW Rural Fire Service (NSW RFS) noted that it was not originally consulted in relation to the Modification. NSW RFS recommended that a bush fire assessment report be prepared identifying the extent to which the Modification complies with the relevant provisions of *Planning for Bushfire Protection* and which sets out the appropriate bush fire protection measures for the site.

A Bushfire Management Plan has been prepared for the Dixon Sand sites at Haerses Road and Old Northern Road, Maroota. The plan assesses the bush fire risk, describes the protection measures for each site and was prepared in consultation with the NSW RFS. A copy of the Bushfire Management Plan is provided in **Appendix 4**. Dixon Sands commits to update this existing Bushfire Management Plan to include the Modification should the Modification be approved.

2.4 Department of Primary Industries – Water

DPI considered that the commitments made to expand the groundwater monitoring network are appropriate and identified that the proponent should consult with DPI Water regarding specific bore locations at the management plan stage.

Noted.

Aquifer testing should be undertaken via pumping tests to increase confidence in the accuracy of the hydraulic conductivity information provided.

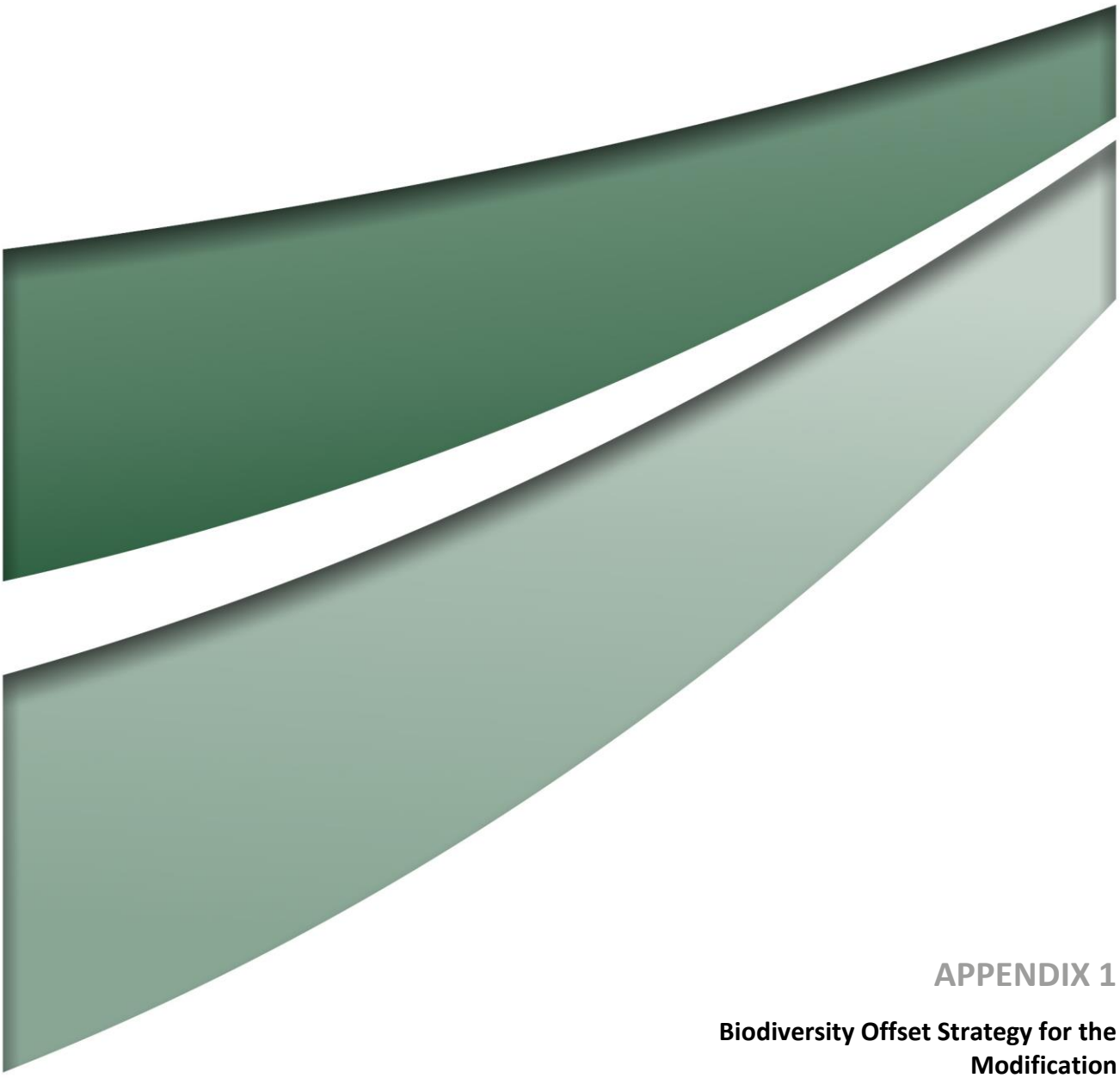
Dixon Sands commits to undertaking the requested pumping tests and believes that they can be appropriately completed following the determination of the Modification and suggests that a consent condition requiring this could be included in the consent.

It is noted that Dixon Sands has already committed to a 100 metre buffer zone from the mapped edge of the MTSGS with a detailed monitoring program proposed within this buffer zone to confirm that quarrying can be undertaken within the buffer zone without adversely impacting on groundwater. It is considered that this is an appropriate groundwater protection mechanism and that with this commitment, completion of the pumping tests post consent is appropriate. Detailed commitments relating to groundwater and the monitoring proposed have been made by Dixon Sands in the Environmental Assessment and RTS.

It is further noted that to implement the pumping tests requested by DPI Water to gain the information required for the Modification will require the establishment of bores within the 100 metre buffer zone. This will require clearing of native vegetation and would therefore most appropriately be undertaken following approval of the Modification when approvals for this clearing would be in place along with the required offset strategy to offset the impacts of the clearing. An email from the groundwater specialist Peter Dundon suggesting that the proposed testing can be appropriately completed post determination of the Modification is included as **Appendix 5**.

If approved, a condition should require that the proponent develop the Water Management Plan in consultation with DPI Water.

Noted.



APPENDIX 1

Biodiversity Offset Strategy for the Modification

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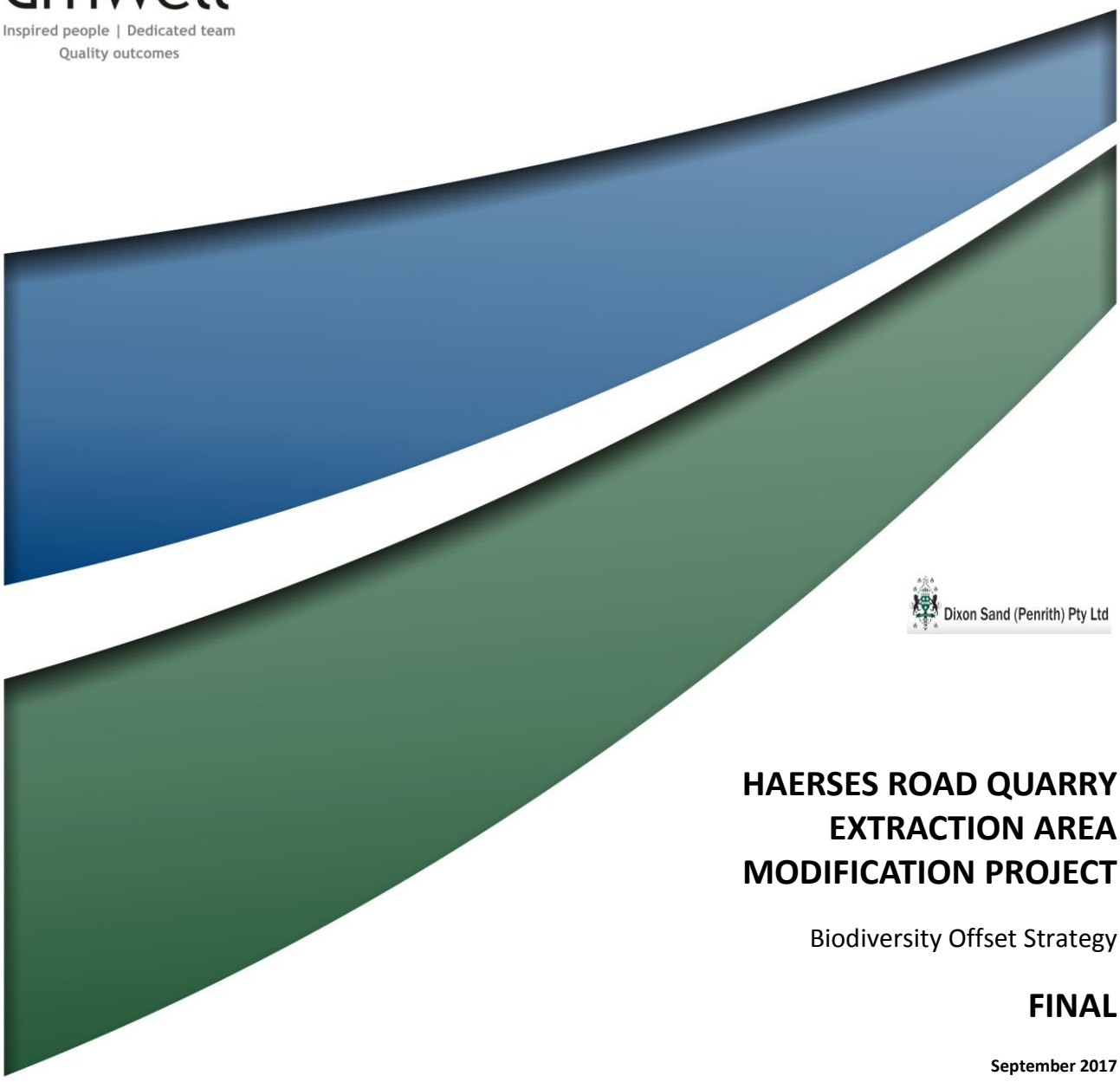

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION PROJECT

Biodiversity Offset Strategy

FINAL

September 2017

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION PROJECT

Biodiversity Offset Strategy

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Dixon Sand (Penrith) Pty Ltd

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Technical Director:	Travis Peake
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	**Date**	**Name**	**Date**
1	John Merrell	31/08/2017	John Merrell	31/08/2017
2	John Merrell	28/09/2017	John Merrell	28/09/2017

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1.0 Background

Dixon Sand (Penrith) Pty Ltd (Dixon Sand) is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Haerses Road Quarry Extraction Area Modification Project (hereafter referred to as 'the Project'). The following biodiversity offset strategy has been developed in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) Framework for Biodiversity Assessment (OEH 2014b). The credit requirements of the Project have been calculated as part of the Biodiversity Assessment Report completed by Umwelt (2016) and updated following further consultation with the NSW Office of Environment and Heritage (OEH) in 2017. Two sites are proposed for in-perpetuity conservation through the establishment of proponent-managed BioBank sites, achieved through the retirement of credits. These include the Haerses Road BioBank Site and the Porters Road BioBank Site which are discussed in further detail below.

1.1 Revised approach to defining Dural Land Snail Habitat within the Development Site and Modification Area

The Biodiversity Assessment Report (Umwelt 2016) prepared for the Project mapped potential habitat for Dural woodland snail (Pommerhelix duralensis) within the Development Site and Modification Area using an area-based approach. Since Dural woodland snail individuals were recorded within heath vegetation of the Development Site and Modification Area a species habitat polygon was generated based on the vegetation mapping extent of HN582 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion, along with the adjacent HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion. However, consultation with OEH led to a refined approach to mapping the species habitat polygon for Dural woodland snail through targeted surveys.

Targeted surveys for Dural woodland snail habitat were undertaken in July 2017 and consisted of diurnal searches, nocturnal searches and mapping of microhabitat features. These surveys revealed a number of microhabitat features likely to be favourable to supporting the Dural woodland snail. These microhabitat features formed the basis for defining and mapping species habitat polygons within both the Development Site and Modification Area. This methodology was provided to OEH for comment and the approach agreed.

Figure 1.1 shows the suitable habitat for Dural woodland snail identified within the Development Site. The total area of suitable habitat is approximately 2.99 hectares. The revised area of potential habitat for the Dural woodland snail within the Development Site has been reviewed and approved by OEH. According to this revised area of habitat, the revised number of species credit species required is 230.

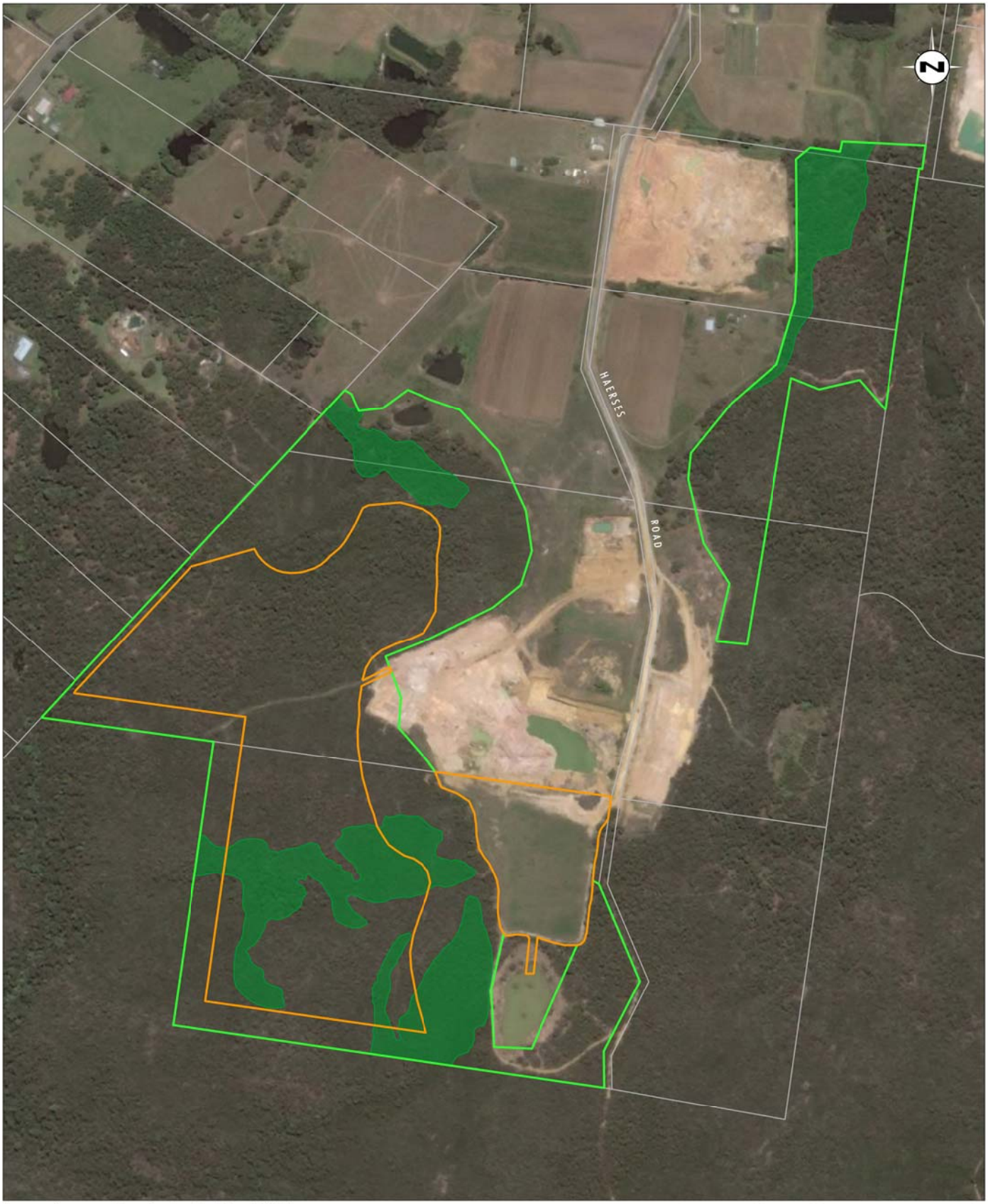


Image Source: Google Earth (Nov 2016)
Data Source: Department of Finance, Services & Innovation (2017)

0 100 200 400m
1:7500

Legend

- Development Site
- Proposed Haerses Road BioBank Site
- Dural Woodland Snail Potential Habitat

FIGURE 1.1

Dural Woodland Snail Potential Habitat within the Development Site and Proposed Haerses Road BioBank Site

2.0 Haerses Road BioBank Site

The proposed Haerses Road BioBank Site will conserve an important area of intact vegetation and habitats proximate to the Development Site. The proposed Haerses Road BioBank Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 10.53 hectares of Red Bloodwood - Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion in Moderate to Good condition (Plant Community Type (PCT) 1083; HN566);
- 2.98 hectares of Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion in Moderate to Good condition (PCT 1181; HN586);
- 12.94 hectares of Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion in Moderate to Good condition (PCT 1134; HN582);
- 0.95 hectares of Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion (PCT 978;HN560);
- Woodland and heath habitat suitable for key threatened species including *Darwinia biflora*, *Tetratheca glandulosa*, eastern pygmy-possum (*Cercartetus nanus*) and Dural woodland snail (*Pommerhelix duralensis*), all of which have been recorded on site; and
- Proximity to the impacts of the Project (adjoins the Modification Project associated with Haerses Road Quarry).

2.1 Site Details

The Haerses Road BioBank Site is a proposed offset that will be subject to a BioBank agreement and which adjoins the Modification Project associated with Haerses Road Quarry. It comprises land owned by Dixon Sand, located in the Maroota area, approximately 40 kilometres north of Parramatta, NSW. Haerses Road BioBank Site is located within the Sydney Basin IBRA bioregion and the Yengo IBRA subregion.

Table 2.1 below provides a summary of the Haerses Road BioBank Site and **Figure 2.1** shows the location.

Table 2.1 Haerses Road BioBank Site Details

Haerses Road BioBank Site	
IBRA Bioregion	Sydney Basin
IBRA Subregion	Yengo
Major Catchment Area	Hawkesbury/Nepean
Rivers, Creeks, etc	1st order steams
Mitchell Landscape	Hornsby Plateau
LGA	The Hills

Haerses Road BioBank Site	
Zoning	RU1 - Primary Production
Size	28.18 hectares
Lot/DP	Lot 216/DP752039 (in part) Lot 170/DP664767 (in part) Lot 177/DP752039 (in part) Lot176/DP752039 (in part) Lot B/DP407341 (in part)
Land Use History	Although zoned as a RU1 – Primary Production there is no evidence of recent grazing or fire. Although approximately 0.65 hectares is cleared, the majority of Haerses Road BioBank Site comprises intact vegetation with disturbances limited to fire trails and access tracks.
General Description	The Haerses Road BioBank Site is 28.18 hectares in size and largely comprises intact vegetation. The site is underlain by soils derived from Hawkesbury Sandstone with rocky outcrops, a prominent ridgeline and several gullies. Vegetation communities include Sandstone Heath, Wet Heath, Sydney Sandstone Ridgetop Woodland and Sydney Sandstone Gully Forest. The Haerses Road BioBanking Site is connected to expansive areas of remnant native vegetation.

2.2 Survey Effort and Methods

Surveys in May 2017, July 2017 and surveys as part of Umwelt (2016a) of the proposed Haerses Road BioBank Site included the following methods:

- Detailed floristic and vegetation mapping surveys including 11 systematic plot-based surveys and collection of biometric site attribute data in accordance with the BioBanking Assessment Methodology (BBAM) 2014 (OEH 2014c).

- Targeted surveys and habitat mapping for *Darwinia biflora*, *Grevillea parviflora* subsp. *supplicans, Tetratheca glandulosa,* Dural woodland snail (*Pommerhelix duralensis*) and eastern pygmy possum (*Cercartetus nanus*). The *Darwinia biflora*, *Tetratheca glandulosa* and Dural woodland snail were surveyed via meandering transects in areas of suitable habitat. Nocturnal spotlighting was also undertaken targeting the eastern pygmy possum and Dural woodland snail. The eastern pygmy possum was surveyed through the use of baited remote cameras and baited hair funnels.

- Floristic data obtained from plot-based surveys was used to assign vegetation communities to a Biometric Vegetation Types (BVTs) and vegetation zone in accordance with the requirements under BBAM (OEH 2014c).

- Vegetation communities identified in each BioBank site were compared to threatened ecological communities (TEC) listings under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and NSW *Threatened Species Conservation Act 1995* (TSC Act). This included an assessment of similarity between vegetation community floristics, landform and geographic distributions with those provided by the NSW Scientific Committee Final Determinations and the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice for TECs.

- Following discussions with OEH, targeted diurnal and nocturnal surveys for Dural woodland snail were undertaken in July 2017 to provide a more comprehensive survey for the species and identify microhabitat features which could be used to refine the mapping of areas of suitable habitat. Previous records of Dural woodland snail were re-visited to note microhabitat features likely providing suitable habitat. Meandering transects with targeted searches for similar microhabitat features were then undertaken across the Proposed Haerses Road BioBank Site. A total of 46 habitat assessments were undertaken across Haerses Road BioBank Site.

2.3 Results

2.3.1 Landscape Value

The Haerses Road BioBank Site contains intact vegetation that is connected to expansive areas of remnant native vegetation in the broader area and hence has been scored a high percent native vegetation cover and patch size (refer to **Figure 2.2**). The landscape score for the Porters Road BioBank Site receives a value of 12.

2.3.2 Vegetation Zones within the Haerses Road BioBank Site

Vegetation zones were aligned with the equivalent PCTs/BVTs described as part of the NSW Vegetation Information System (VIS) 2.1 classification database (OEH 2017), the Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al.* 2010) and the natural asset mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001). Each vegetation zone represented a single condition state of Moderate to Good (refer to **Figure 2.3**).

Surveys of the Haerses Road BioBank Site identified four PCTs and BVTs being:

- PCT 978/HN560 – Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion (refer to Table 7.5 of the Biodiversity Assessment Report – Umwelt 2016a).

- PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion (refer to Table 7.6 of the Biodiversity Assessment Report – Umwelt 2016a).

- PCT 1134/HN582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion (refer to Table 7.7 of the Biodiversity Assessment Report – Umwelt 2016a).

- PCT 1181/HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion (refer to Table 7.8 of the Biodiversity Assessment Report – Umwelt 2016a).

For detailed descriptions of these BVTs refer to Section 7.2 and subsequent tables of the Biodiversity Assessment Report (Umwelt 2016a).

2.3.3 Threatened Ecological Communities

Refer to Section 3.2.3 of the Biodiversity Assessment Report (Umwelt 2016a) for a detailed analysis of TECs identified within the Haerses Road BioBank Site.

2.3.4 Species Credits

Species credit species recorded within the Haerses Road BioBank Site by Umwelt as part of the current study, Umwelt (2016a), Cumberland Ecology (2014a and 2014b) and Greenloaning Biostudies (2002) include:

- *Darwinia biflora* (based on area of habitat)
- Eastern pygmy-possum (*Cercartetus nanus*) (based on area of habitat)
- Dural woodland snail (*Pommerhelix duralensis*) (based on area of habitat)
- *Grevillea parviflora* subsp. *supplicans* (based on number of individuals)
- *Tetratheca glandulosa* (based on area of habitat).

Figure 2.3 shows the locations of records of these species.

Numerous individuals of *Darwinia biflora* and *Tetratheca glandulosa* were recorded in PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion and PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion.

The eastern pygmy possum (*Cercartetus nanus*) was recorded by photographs from two remote cameras at two separate locations in PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion.

A total of four Dural woodland snails (*Pommerhelix duralensis*) were recorded during targeted searches undertaken in December 2015, May 2017 and July 2017. One live individual was recorded in PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion during December 2015, along with another individual (snail shell) recorded in the same community nearby in July 2017. One individual (snail shell) was recorded in PCT 1181/HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion in May 2017, along with another individual (snail shell) recorded in the same community nearby in July 2017. Photographs of the snail specimens were sent to the Australian Museum Malacology Department and confirmed as the Dural woodland snail.

An area based approach was used to calculate credits for each of the aforementioned species, except for *Grevillea parviflora* subsp. *supplicans* which was calculated based on the number of individuals, in the BioBanking Calculator. An area based approach was deemed more appropriate (as opposed to a number of individuals approach) to calculate species credits for those species that are considered ephemeral species (*Darwinia biflora* is considered a fire ephemeral species) and clonal species (*Tetratheca glandulosa* is a cryptic clonal species). The NSW Guide to Surveying Threatened Plants (OEH 2016) states that threatened species can be assessed based on an area of habitat approach (rather than a number of individuals based approach) as long as the surveyor considers the history of land use and/or disturbance and previous surveys of the species at the site. In addition to this, the draft Biodiversity Assessment Method (BAM) reference data spreadsheet for the BAM calculator lists *Darwinia biflora* and *Tetratheca glandulosa* as species that will be assessed by area of habitat in the future under this scheme.

The area based approach used for Dural woodland snail was based on prior knowledge of Dr Chris Allen (10 years as a malacologist at the Australian Museum) and microhabitat features identified for where there are known records in the Proposed Haerses Road BioBank site. The following microhabitat features were used to define the extent of suitable habitat (refer to **Figure 1.1**) and hence provide species habitat polygons within the Haerses Road BioBank Site:

- Aspect NE – E – SE – S – SW - W (i.e. 45° – 0° – 180°) or slope <2° (fall of 1 metre in 30 metres)
- Not within 3 metres upslope of cliff slope >20° (fall of 2 metres in 5 metres)
- Not treeless
- Not bare rock
- Broad moisture dry to very moist (not wet, i.e. not creek lines or semi-permanent water)
- Micro habitat moisture (leaf litter) moist to very moist
- Large (>200mm dia) moist rotting logs present
- Evidence of fungi (fruiting bodies or hyphae)
- Preferably not Banksia leaves in litter and definitely not Allocasuarina leaves in litter
- Presence of rotting litter (leaf preferred over bark) with a humus layer >=5mm.

Areas for the BioBanking Calculator were based on the total area of suitable habitat within the Proposed Haerses Road BioBank Site.

2.3.5 Credits Generated

Table 2.2 below outlines the ecosystem and species credits generated at the Haerses Road BioBank Site.

Attachment 1 includes a full Biodiversity Credit Report for the Haerses Road BioBank Site.

Table 2.2 Ecosystem and Species Credits Generated at the Haerses Road BioBank Site

Veg Zone	Plant Community Type/Biometric Vegetation Type *Condition Class*	Area (ha)	Credits Generated
Ecosystem Credits			
1	PCT 978/HN560 - Needlebush – banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion *Moderate to Good*	0.95	11
2	PCT 1083/HN566 - Red Bloodwood - scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion *Moderate to Good*	10.53	118
3	PCT 1134/N582 - Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion *Moderate to Good*	12.94	92
4	PCT 1181/HN586 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion *Moderate to Good*	2.98	29
Species Credits			
NA	*Darwinia biflora*	23.0[1]	163
NA	Eastern Pygmy possum (*Cercartetus nanus*)	12.94	92
NA	Dural Woodland Snail (*Pommerhelix duralensis*)[2]	5.39	38
NA	*Tetratheca glandulosa*	23.0[3]	163
NA	*Grevillea parviflora* subsp. *supplicans*	204[4]	1,448

[1]Credits for this species were calculated in the BBCC based on a total area of suitable habitat approach. The total area of habitat was found to be 23.47 ha however the calculator only allowed a whole integer to be entered as the unit for calculation cannot be changed from a number of individuals units. As such, 23.47 was rounded down to 23.0.

[2] This species was not able to be added to the list of threatened species within the BBCC because the BBCC did not allow for it. Instead Mitchells rainforest snail (*Thersites mitchellae*) was entered into the BBCC as it has the same Threatened Species Offset Multiplier as the Dural woodland snail of 7.7.

[3] Credits for this species were calculated in the BBCC based on a total area of suitable habitat approach. The total area of habitat was found to be 23.47 ha however the calculator only allowed a whole integer to be entered as the unit for calculation cannot be changed from a number of individuals unit. As such, 23.47 had to be rounded down to 23.0.

[4] Credits for this species were calculated in the BBCC based on the number of individuals.

2.3.6 Improvements in Site Values

There are no pre-existing conservation obligations in relation to the proposed Haerses Road BioBank Site.

Standard management actions according to the requirements of BioBanking include:

- management of grazing for conservation
- weed control
- ecological fire management
- management of human disturbance
- retention of regrowth and remnant native vegetation
- replanting or supplementary planning where natural regeneration is not sufficient
- retention of dead timber
- erosion control
- retention of rocks.

Additional management actions according to the requirements of BioBanking, as detailed in **Attachment 1**, include:

- Feral and/or over‑abundant native herbivore control
- Fox control
- Exclude miscellaneous feral species
- Control of feral pigs
- Exclude commercial apiaries.

Averted Loss was included in the calculations of site values for management zones given that the native vegetation on the Haerses Road BioBank Site is considered to have a high risk of decline if not used as an offset. This is because the Haerses Road BioBank Site is zoned as RU1 – Primary Production.

Table 2.3 includes the gains in site value for each of the management zones at the Haerses Road BioBank Site.

Table 2.3 Gain in Site Value Scores for Management Zones at the Haerses Road BioBank Site

Veg Zone	Plant Community Type *Condition Class*	Management Zone	Site Value Score			
			Current	Future	Gain	Averted Loss
1	PCT 978/HN560 - *Moderate to Good*	1	56.52	81.88	25.36	9.42
2	PCT 1083/HN566 - *Moderate to Good*	2	70.83	89.93	19.10	13.89
3	PCT 1134/N582 - *Moderate to Good*	3	73.96	79.51	5.55	10.77
4	PCT 1181/HN586 - *Moderate to Good*	4	67.15	80.43	13.28	13.41

Image Source: Google Earth (2016)

Legend

- Development Site
- BioBank Site Boundaries
- National Park and Conservation Area
- IBRA Sub-region

FIGURE 2.1

Proposed Haerses Road and Porters Road BioBank Sites

Image Source: Google Earth (2014)
Data Source: LPI (2011)
Note: Site within Baulkham Hills Local Government Area and Yengo IBRA Subregion Boundary

0 0.5 1.0 1.25km
1:25 000

Legend

- Development Site
- Haerses Road BioBank Site Boundary
- 1000 Ha Assessment Circle
- 100 Ha Assessment Circle
- Native Vegetation

FIGURE 2.2

Haerses Road BioBank Site
Native Vegetation Extent

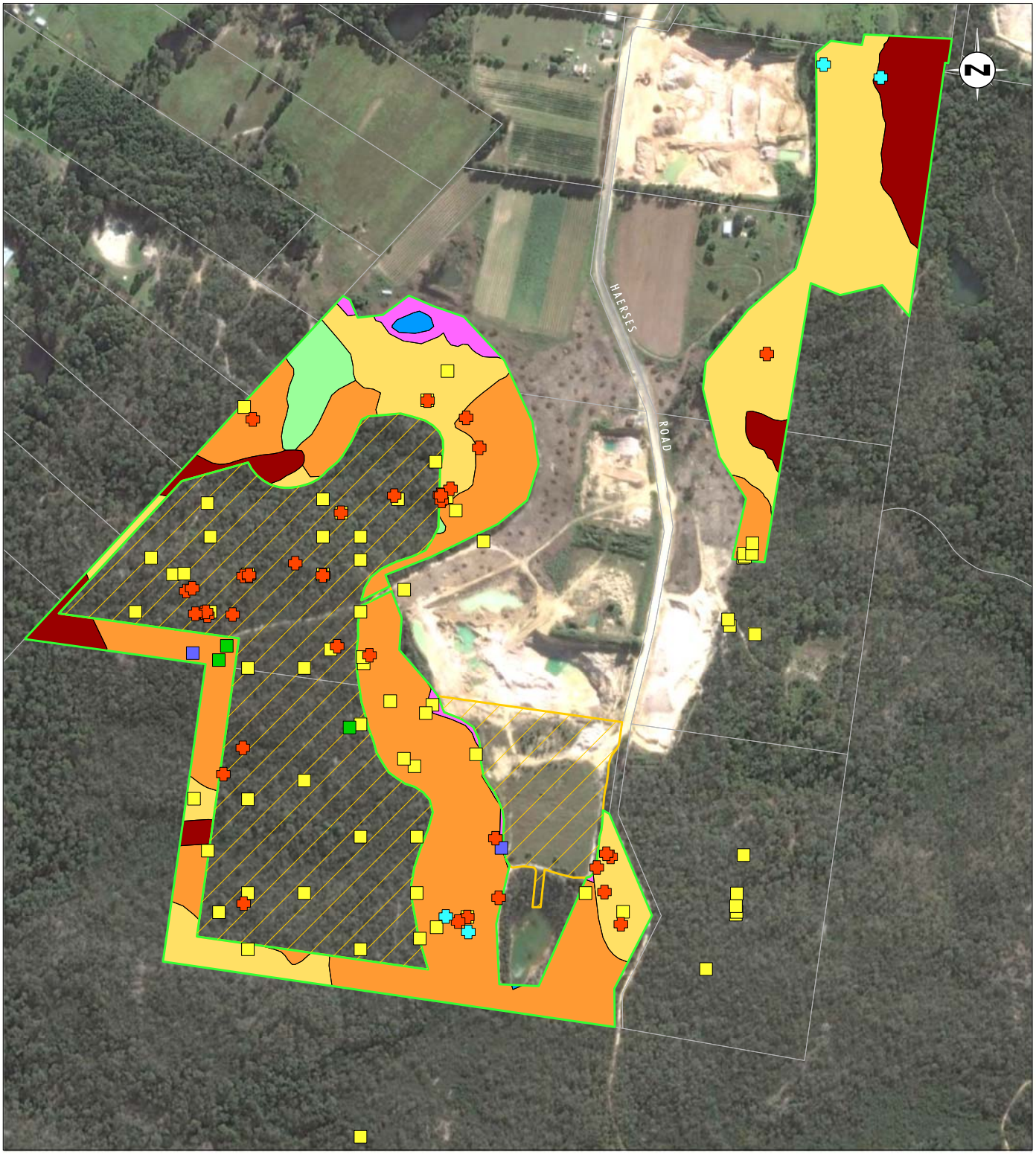


Image Source: Google Earth (2014)
Data Source: LPI (2011), Umwelt (2016, 2017), Cumberland Ecology (2014a, 2014b), Greenloaning Biostudies (2002)
Note: Site within Baulkham Hills Local Government Area and Yengo IBRA Subregion Boundary

0 100 200 400m
1:7500

Legend

- Development Site
- Haerses Road BioBank Site Boundary
- Cleared
- Dam
- Dural Woodland Snail
- Eastern pygmy-possum
- *Darwinia biflora*
- *Tetratheca glandulosa*
- *Grevillea parviflora* subsp. *supplicans*
- Zone 1: PCT 978 - HN560 – Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion – Moderate to Good Condition
- Zone 2: PCT 1083 - HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion – Moderate to Good Condition
- Zone 3: PCT 1134 - HN582 – Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion – Moderate to Good Condition
- Zone 4: PCT 1181 - HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion – Moderate to Good Condition

FIGURE 2.3

Haerses Road BioBank Site Biometric Vegetation Types (BVTs) and Threatened Species

File Name (A4): R06/3479_089.dgn
20170719 14.15

3.0 Porters Road BioBank Site

The proposed Porters Road BioBank Site conserves an important area of intact vegetation and habitats close to the Development Site. The proposed Porters Road BioBank Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 29.65 hectares of Red Bloodwood - Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion in Moderate to Good condition (PCT 1083; HN566).
- 15.68 hectares of Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion in Moderate to Good condition (PCT 1181; HN586).
- 7.86 hectares of Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion in Moderate to Good condition (PCT 1134; HN582).
- 1.52 hectares of Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion in Moderate to Good condition (PCT 1237; HN596).
- Woodland and heath habitat suitable for key threatened species including *Darwinia biflora*, *Tetratheca glandulosa*, eastern pygmy-possum (*Cercartetus nanus*) and Dural woodland snail (*Pommerhelix duralensis*), all of which have been recorded on site.
- Proximity to the impacts of the Project (approximately 20 kilometres due south of the Project).

3.1 Site Details

The Porters Road BioBank Site is a proposed offset that will be subject to a BioBank agreement and which is located approximately 20 kilometres due south of the Project. It comprises land owned by Dixon Sand, located in the Kenthurst area, approximately 30 kilometres north of Parramatta, NSW. Porters Road BioBank Site is located within the Sydney Basin IBRA bioregion and the Yengo IBRA subregion. **Table 3.1** below provides a summary of the Porters Road BioBank Site and **Figure 2.1** shows the location.

Table 3.1 Porters Road BioBank Site Details

Porters Road BioBank Site	
IBRA Bioregion	Sydney Basin
IBRA Subregion	Yengo
Major Catchment Area	Hawkesbury/Nepean
Rivers, Creeks, etc	Two 3rd order tributaries of Scaly Bark Creek occur in the west of the Porters Road BioBank Site and two 3rd order tributaries of O'haras Creek occur in the north and east of the Porters Road BioBank Site.
Mitchell Landscape	Majority of the Porters Road BioBank Site occurs in Blaxlands Ridge landscape, with a small portion occurring in the Hawkesbury - Nepean Channels and Floodplain

Porters Road BioBank Site	
LGA	The Hills
Zoning	RU2 – Rural Landscape
Size	54.7 hectares
Lot/DP	Lot 1/DP565423
Land Use History	Although zoned as RU2 rural landscape there is no evidence of recent grazing or fire. The Porters Road BioBank Site comprises intact vegetation. Disturbances to the site are limited to fire trails and access tracks.
General Description	The Porters Road BioBank Site is 54.7 hectares in size and largely comprises intact vegetation. The site is underlain by soils derived from Hawkesbury Sandstone with rocky outcrops, a prominent ridgeline and a gully. Vegetation communities include Sandstone Heath, Sydney Sandstone Ridgetop Woodland, Sydney Sandstone Gully Forest and Blue Gum Forest. The Porters Road BioBanking Site is connected to expansive areas of remnant native vegetation to the north.

3.2 Survey Effort and Methods

Surveys in April 2017 and July 2017 of the proposed Porters Road BioBank Site included the following methods:

- Detailed floristic and vegetation mapping surveys including 11 systematic plot-based surveys and collection of biometric site attribute data in accordance with the BBAM 2014 (OEH 2014c).
- Targeted surveys and habitat mapping for *Darwinia biflora*, *Tetratheca glandulosa,* Dural woodland snail (*Pommerhelix duralensis*) and eastern pygmy possum (*Cercartetus nanus*). The *Darwinia biflora*, *Tetratheca glandulosa* and Dural woodland snail were surveyed via meandering transects in areas of suitable habitat. The eastern pygmy possum was surveyed through the use of 20 baited remote cameras and 30 baited hair funnels.
- Floristic data obtained from plot-based surveys was used to assign vegetation communities to a BVT and vegetation zone in accordance with the requirements under BBAM (OEH 2014c).
- As per correspondence with OEH, targeted diurnal and nocturnal surveys for Dural woodland snail were undertaken in July 2017 to provide a more comprehensive survey for the species and identify microhabitat features which could be used to refine the mapping of areas of suitable habitat. Previous records of Dural woodland snail were re-visited to note microhabitat features likely providing suitable habitat. Meandering transects with targeted searches for similar microhabitat features were then undertaken across the Proposed Porters Road BioBank Site. A total of 21 habitat assessments were undertaken across the Proposed Porters Road BioBank Site.

3.3 Results

3.3.1 Landscape Value

The Porters Road BioBank Site contains intact vegetation that is connected to expansive areas of remnant native vegetation in the broader area and hence has been scored a high percent native vegetation cover and patch size (refer to **Figure 3.1**). The landscape score for the Porters Road BioBank Site receives a value of 12.

3.3.2 Vegetation Zones within the Porters Road BioBank Site

Vegetation zones were aligned with the equivalent PCTs/BVTs described as part of the NSW Vegetation Information System (VIS) 2.1 classification database (OEH 2017), the Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al.* 2010) and the natural asset mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001). Each vegetation zone represented a single condition state of Moderate to Good (refer to **Figure 3.2**).

Surveys of the Porters Road BioBank Site identified four Biometric Vegetation Types (BVTs) being:

- PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion (refer to **Table 3.2**)
- PCT 1134/HN582 - Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion (refer to **Table 3.3**)
- PCT 1181/HN586 – Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion (refer to **Table 3.4**)

  PCT 1237/HN596 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion (refer to **Table 3.5**)

Table 3.2 Zone 1: PCT 1083 - HN566 – Red Bloodwood - Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion – Moderate to Good Condition

Feature	Description
Name	Red Bloodwood - Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion
Condition	Moderate to Good
BVT ID	HN566
PCT ID	1083
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests
Hectares in Porters Road Offset Site	29.65
Equivalent Mapping Unit from the Native Vegetation of Southeast NSW (Tozer *et al.* 2010)	DSF p31: Coastal Sandstone Ridgetop Woodland

Feature	Description
Equivalent Mapping Unit from the Natural Asset Mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001)	Sydney Sandstone Ridgetop Woodland
Plots/Transects Undertaken	Four (P05, P06, P07 and P08)
Floristic Description	This vegetation zone occurs on the ridgeline and exposed slopes of the Porters Road BioBank Site. This vegetation zone is characterised by a prominent canopy of scribbly gum (*Eucalyptus haemastoma*), red bloodwood (*Corymbia gummifera*), grey gum (*Eucalyptus punctata*) and yellow bloodwood (*Corymbia eximia*). The mid-storey is dense comprising a diverse sclerophyll shrub layer. Common mid-storey species include old-man banksia (*Banksia serrata*), grey spider-flower (*Grevillea buxifolia*), needlebush (*Hakea sericea*), mountain devil (*Lambertia formosa*) and hairpin banksia (*Banksia spinulosa*). The ground layer varies from sparse to mid-dense and is dominated by sedges. Common ground layer species include black bog-rush (*Schoenus melanostachys*), curly wig (*Caustis flexuosa*), pale mat-rush (*Lomandra glauca*) and wiry panic (*Entolasia stricta*).
TSC Status	None.
EPBC Status	None.
Photo	

Table 3.3 Zone 2: PCT 1134 - HN582 - Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion – Moderate to Good Condition

Feature	Description
Name	Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion
Condition	Moderate to Good
BVT ID	HN582
PCT ID	1134
Vegetation Formation	Heathlands
Vegetation Class	Sydney Coastal Heaths

Feature	Description
Hectares in Porters Road Offset Site	7.86
Equivalent Mapping Unit from the Native Vegetation of Southeast NSW (Tozer et al. 2010)	Coastal Sandstone Plateau Heath
Equivalent Mapping Unit from the Natural Asset Mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001)	Sydney Sandstone Heath
Plots/Transects Undertaken	Three (P09, P10 and P11)
Floristic Description	This vegetation zone occurs occupies the flat rock outcrops of the Porters Road BioBank Site. This vegetation zone is characteristically dense with scrub and heath with occasional emergent trees occurring where deeper soil is present. Emergent canopy species are generally stunted with a mallee growth form. Emergent canopy species include scaly bark (*Eucalyptus squamosa*), yellow bloodwood (*Corymbia eximia*) and scribbly gum (*Eucalyptus haemastoma*). The dense mid-storey is dominated by dwarf apple (*Angophora hispida*), heath-leaved banksia (*Banksia ericifolia*), broad-leaved drumsticks (*Isopogon anemonifolius*), hairpin banksia (*Banksia spinulosa*), slender-tea tree (*Leptospermum trinervium*) and old man banksia (*Banksia serrata*). The ground layer is generally sparse with exposed sandstone. Common ground layer species include wiry panic (*Entolasia stricta*), curly wig (*Caustis flexuosa*), pale mat-rush (*Lomandra glauca*) and *Xanthorrhoea* sp.
TSC Status	None.
EPBC Status	None.
Photo	

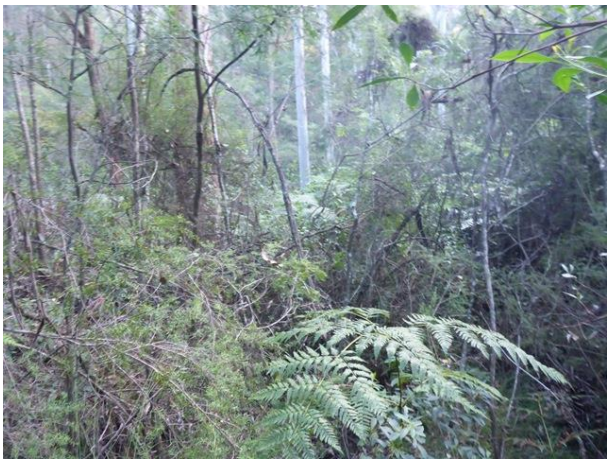
Table 3.4 Zone 3: PCT 1181 - HN586 – Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion – Moderate to Good Condition

Feature	Description
Name	Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion
Condition	Moderate to Good
BVT ID	HN586
PCT ID	1181
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests
Hectares in Porters Road Offset Site	15.68
Equivalent Mapping Unit from the Native Vegetation of Southeast NSW (Tozer et al. 2010)	DSF p142: Coastal Sandstone Gully Forest
Equivalent Mapping Unit from the Natural Asset Mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001)	Sydney Sandstone Gully Forest
Plots/Transects Undertaken	Three (P01, P02 and P04)
Floristic Description	This vegetation zone occurs beneath the ridgeline of the Porters Road BioBank Site. This vegetation zone is characterised by a sparse tree layer dominated by Sydney red gum (*Angophora costata*), Sydney peppermint (*Eucalyptus piperita*) and yellow bloodwood (*Corymbia eximia*) with grey gum (*Eucalyptus punctata*) and red bloodwood (*Corymbia gummifera*), occurring less frequently. A small tree layer of black she-oak (*Allocasuarina littoralis*) is typically present above a dense mid-storey dominated by sclerophyllous shrubs dominated by needlebush (*Hakea sericea*), narrow-leaved Geebung (*Persoonia linearis*), prickly Moses (*Acacia ulicifolia*) and dwarf cherry (*Exocarpos strictus*). The ground layer is diverse supporting a diversity of ferns, sedges, rushes, forbs and grasses. Common species include bracken (*Pteridium esculentum*), spiny-headed mat-rush (*Lomandra longifolia*), blue flax-lily (*Dianella caerulea*), kangaroo grass (*Themeda triandra*) and wiry panic (*Entolasia stricta*).
TSC Status	None.
EPBC Status	None.

Feature	Description
Photo	

Table 3.5 Zone 4: PCT 1237 - HN596 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion

Feature	Description
Name	Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion
Condition	Moderate to Good
BVT ID	HN596
PCT ID	1237
Vegetation Formation	Wet Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	North Coast Wet Sclerophyll Forests
Hectares in Porters Road Offset Site	1.52
Equivalent Mapping Unit from the Native Vegetation of Southeast NSW (Tozer et al. 2010)	WSF p153: Blue Gum High Forest
Equivalent Mapping Unit from the Natural Asset Mapping for Baulkham Hills Shire Council (AES Environmental Consultancy 2001)	Blue Gum High Forest
Plots/Transects Undertaken	One (P03)
Floristic Description	This vegetation zone occurs occupies the alluvial flats associated with an unnamed ephemeral tributary of O'Hara's creek in the northern portion of the Porters Road BioBank Site. This vegetation zone is characterised by a tall sparse tree canopy dominated by Sydney blue gum (*Eucalyptus saligna*) and blackbutt (*Eucalyptus pilularis*) with turpentine (*Syncarpia glomulifera*) and grey gum (*Eucalyptus punctata*) occurring less frequently. This community generally contains a small tree layer dominated by she-oak (*Allocasuarina* sp.), Christmas bush (*Ceratopetalum gummiferum*) and *Acacia* spp. The mid-storey is mid-

Feature	Description
	dense and is dominated by shrubs and vines such as red ash (*Alphitonia excelsa*), *Leptospermum polygalifolium*, large-leaf hop-bush (*Dodonaea triquetra*), old man's beard (*Clematis aristata*), giant water vine (*Cissus hypoglauca*), sweet sarsaparilla (*Smilax glyciphylla*) and snake vine (*Stephania japonica* var. *discolor*). Other species in the mid-storey recorded at lower abundance and indicative of this PCT include coffee bush (*Breynia oblongifolia*) and elderberry panax (*Polyscias sambucifolia*). The ground layer is dense and diverse comprising ferns, forbs and grasses. Ferns include rainbow fern (*Calochlaena dubia*), bracken (*Pteridium esculentum*) and common maidenhair (*Adiantum aethiopicum*) while grasses include blady grass (*Imperata cylindrica*), weeping grass (*Microlaena stipoides*), bordered panic (*Entolasia marginata*), basket grass (*Oplismenus aemulus*) and couch (*Cynodon dactylon*).
TSC Status	Consistent with *Blue Gum High Forest in the Sydney Basin Bioregion* listed as a Critically Endangered Ecological Community (CEEC)
EPBC Status	Consistent with *Blue Gum High Forest of the Sydney Basin Bioregion* listed as a CEEC
Photo	

3.3.3 Threatened Ecological Communities

One of the vegetation zones described above and mapped within the Porters Road BioBank Site conforms to a State and Commonwealth listed TEC. This vegetation zone, vegetation Zone 4 PCT 1237/HN596 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion, was found to align with *Blue Gum High Forest in the Sydney Basin Bioregion* listed as a CEEC under both the EPBC Act and TSC Act.

Vegetation Zone 4 was found to conform to the State listed CEEC based on the following attributes which are consistent with the NSW Scientific Committee Final Determination (NSW Scientific Committee 2011):

- Presence of key indicator species within the upper, mid and lower strata as well as vegetation structural affinities

- While the CEEC typically occurs on soils derived from Wianamatta Shale, the listing does not exclude occurrences of the community in adjacent areas underlain by Hawkesbury Sandstone

- While the CEEC typically occurs more than 100 metres above sea level, the listing does not exclude occurrences of the community in areas that are less than 100 metres above sea level

- Geographic location within the Sydney Basin Bioregion and in particular, the Baulkham Hills local government area (LGA) (now known as The Hills LGA).

Vegetation Zone 4 was found to conform to the Commonwealth listed CEEC based on the following attributes which are consistent with the Threatened Species Scientific Committee Listing (TSSC 2014) and Conservation Advice (TSSC 2005):

- Presence of key indicator species within the upper, mid and lower strata as well as vegetation structural affinities

- While the CEEC typically occurs on soils derived from Wianamatta Shale, the listing does not exclude occurrences of the community in adjacent areas underlain by Hawkesbury Sandstone

- Vegetation Zone 4 is greater than 1 hectare in size and has a canopy cover greater than 10%

- While the CEEC typically occurs more than 100 metres above sea level, the listing does not exclude occurrences of the community in areas that are less than 100 metres above sea level

- Geographic location within the Sydney Basin Bioregion and in particular, the Baulkham Hills local government area (LGA) (now known as The Hills LGA).

3.3.4 Species Credits

Species credit species recorded within the Porters Road BioBank Site by Umwelt as part of the current study and South East Environmental (2016 and 2017), refer to **Figure 3.2**, include:

- *Darwinia biflora* (based on area of habitat)

- Eastern pygmy-possum (*Cercartetus nanus*) (based on area of habitat)

- Dural woodland snail (*Pommerhelix duralensis*) (based on area of habitat)

- *Tetratheca glandulosa* (based on area of habitat).

A total of 41 individuals of *Darwinia biflora* were recorded by Umwelt during surveys in April 2017. A total of 40 Individuals were recorded in PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion and 1 individual was recorded in PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion. No individuals were recorded in ecotone areas of vegetation communities.

A number of small mammals were captured on the remote cameras within the Porters Road BioBank Site during the surveys undertaken by Umwelt in April 2017. However, only 1 of these individuals could be identified as likely to be the eastern pygmy possum (*Cercartetus nanus*). This individual was recorded from the remote camera positioned in PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion. Of the 30 hair funnels placed in the Porters Road BioBank Site, 19 had hairs present which were identified by Barbara Triggs as brown antechinus (*Antechinus stuartii*).

A total of two Dural woodland snails (*Pommerhelix duralensis*) were recorded during targeted searches undertaken by Umwelt in May 2017 and July 2017, and by South East Environmental in April 2017. One live individual was recorded by Melissa Mass of South East Environmental during spot light surveys undertaken in April 2017 (South East Environmental 2017). This individual was found within PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion. The second individual (snail shell) was found by Umwelt during targeted searches undertaken in July 2017. This individual was also found within the PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion. Photographs of the snail specimen were sent to the Australian Museum Malacology Department and the specimen was confirmed to be Dural woodland snail.

A total of 4 individuals of *Tetratheca glandulosa* were recorded by Umwelt and Melissa Mass during surveys of May 2017. These individuals were recorded within the PCT 1134/N582 – Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion, however PCT 1083/HN566 – Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion also provides suitable habitat for this species.
A voucher specimen was sent to the Royal Botanic Gardens Sydney Herbarium by Melissa Mass of South East Environmental and confirmed as *Tetratheca glandulosa*.

An area based approach was deemed more appropriate (as opposed to a number of individuals approach) to calculate species credits for those species that are considered ephemeral species (*Darwinia biflora* is considered a fire ephemeral species) and clonal species (*Tetratheca glandulosa* is a cryptic clonal species). The NSW Guide to Surveying Threatened Plants (OEH 2016) states that threatened species can be assessed based on an area of habitat approach (rather than a number of individuals based approach) as long as the surveyor considers the history of land use and/or disturbance and previous surveys of the species at the site. In addition to this, the draft BAM reference data spreadsheet for the BAM calculator lists *Darwinia biflora* and *Tetratheca glandulosa* as species that will be assessed by area of habitat in the future under this scheme.

The area based approach used for Dural woodland snail was based on prior knowledge of Dr Chris Allen (10 years as a malacologist at the Australian Museum) and microhabitat features identified for where there are known records in the Proposed Porters Road BioBank site. The following microhabitat features were used to define the extent of suitable habitat (refer to **Figure 3.3**) and hence provide species habitat polygons within the Porters Road BioBank Site:

- Aspect NE – E – SE – S – SW - W (i.e. 45° – 0° – 180°) or slope <2° (fall of 1 metre in 30 metres)
- Not within 3 metre upslope of cliff slope >20° (fall of 2 metres in 5 metres)
- Not treeless
- Not bare rock
- Broad moisture dry to very moist (not wet, i.e. not creek lines or semi-permanent water)
- Micro habitat moisture (leaf litter) moist to very moist
- Large (>200mm dia) moist rotting logs present
- Evidence of fungi (fruiting bodies or hyphae)
- Preferably not Banksia leaves in litter and definitely not Allocasuarina leaves in litter

- Presence of rotting litter (leaf preferred over bark) with a humus layer >=5mm.

Areas for the BioBanking Calculator were based on the total area of suitable habitat within the Porters Road BioBank Site.

3.3.5 Credits Generated

Table 3.6 outlines the ecosystem and species credits generated at the Porters Road BioBank Site.

In addition to the species credits listed in **Table 3.6**, the following threatened flora species have previously been recorded by Melissa Mass of South East Environmental (South East Environmental 2016 and South East Environmental 2017) within the Porters Road BioBank Site and could be used in the future to generate species credits should the need arise:

- Giant burrowing frog (*Heleioporus australiacus*)
- Bynoes wattle (*Acacia bynoeana*)
- *Epacris purpurascens* subsp. *purpurascens*
- *Hibbertia superans*
- *Lasiopetalum joyceae*.

Attachment 2 includes a full Biodiversity Credit Report for the Porters Road BioBank Site.

Table 3.6 Ecosystem and Species Credits Generated at the Porters Road BioBank Site

Veg Zone	Plant Community Type/Biometric Vegetation Type *Condition Class*	Area (ha)	Credits Generated
Ecosystem Credits			
1	PCT 1083/HN566 - Red Bloodwood - Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion *Moderate to Good*	29.65	276
2	PCT 1134/HN582 - Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion *Moderate to Good*	7.86	89
3	PCT 1181/HN586 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion *Moderate to Good*	15.68	125
4	PCT 1237/HN596 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple Moist Shrubby Open Forest on Shale Ridges of the Hornsby Plateau, Sydney Basin Bioregion[5] *Moderate to Good*	1.52	18
Species Credits			
NA	*Darwinia biflora*	38.0[6]	270
NA	Eastern pygmy possum (*Cercartetus nanus*)	7.86	56
NA	Dural woodland snail (*Pommerhelix duralensis*)[7]	8.39	60
NA	*Tetratheca glandulosa*	38.0[8]	270

[5] Conforms to *Blue Gum High Forest in the Sydney Basin Bioregion* listed as a Critically Endangered Ecological Community (CEEC) under both the EPBC Act and TSC Act.

[6] Credits for this species were calculated in the BBCC based on a total area of suitable habitat approach. The total area of habitat was found to be 37.51 ha however the calculator only allowed a whole integer to be entered as the unit for calculation cannot be changed from a number of individuals unit. As such, 37.51 was rounded up to 38.

[7] This species was not able to be added to the list of threatened species within the BBCC. Instead Mitchells rainforest snail (*Thersites mitchellae*) was entered into the BBCC as it has the same Threatened Species Offset Multiplier as the Dural woodland snail of 7.7.

[8] Credits for this species were calculated in the BBCC based on a total area of suitable habitat approach. The total area of habitat was found to be 37.51 ha however the calculator only allowed a whole integer to be entered as the unit for calculation cannot be changed from a number of individuals unit. As such, 37.51 had to be rounded up to 38.

3.3.6 Improvements in Site Values

There are no pre-existing conservation obligations in relation to the proposed Porters Road BioBank Site.

Standard management actions according to the requirements of BioBanking include:

- management of grazing for conservation
- weed control
- ecological fire management
- management of human disturbance
- retention of regrowth and remnant native vegetation
- replanting or supplementary planning where natural regeneration is not sufficient
- retention of dead timber
- erosion control
- retention of rocks.

Additional management actions according to the requirements of Biobanking, as detailed in **Attachment 2**, include:

- Feral and/or over‑abundant native herbivore control
- Fox control
- Exclude miscellaneous feral species
- Control of feral pigs
- Exclude commercial apiaries

Averted Loss was included in the calculations of site values for management zones given that the native vegetation on the Porters Road BioBank Site is considered to have a high risk of decline if not used as an offset. This is because the Porters Road BioBank Site is zoned as RU2 – Rural Landscape.

Table 3.7 includes the gains in site value for each of the management zones at the Porters Road BioBank Site.

Table 3.7 Gain in Site Value Scores for Management Zones at the Porters Road BioBank Site

Veg Zone	Plant Community Type *Condition Class*	Management Zone	Site Value Score			
			Current	Future	Gain	Averted Loss
1	HU566 - *Moderate to Good*	1	61.28	78.30	17.02	8.24
2	HU582- *Moderate to Good*	2	48.65	77.08	27.43	5.90
3	HU586 - *Moderate to Good*	3	69.81	77.05	7.24	12.56
4	HU596 - *Moderate to Good*	4	64.58	89.06	24.48	10.15

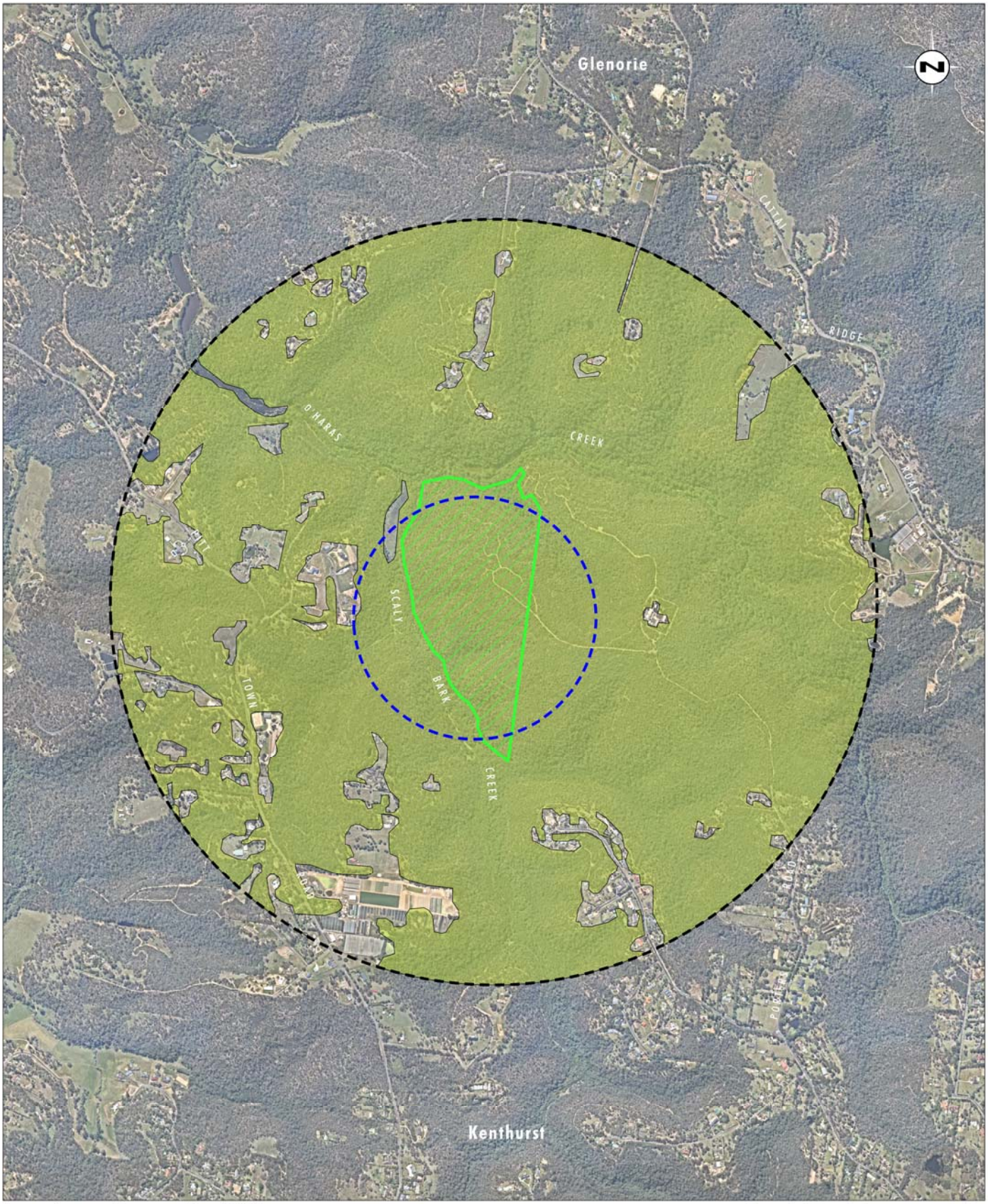


Image Source: Nearmap (Mar 2017)
Data Source: OEH (2013)
Note: Site within Baulkham Hills Local Government Area and Yengo IBRA Subregion Boundary

0 0.25 0.5 1.0km
1:25 000

Legend

- Porters Road BioBank Site Boundary
- 1000 Ha Assessment Circle
- 100 Ha Assessment Circle
- Native Vegetation

FIGURE 3.1

Porters Road BioBank Site Native Vegetation Extent

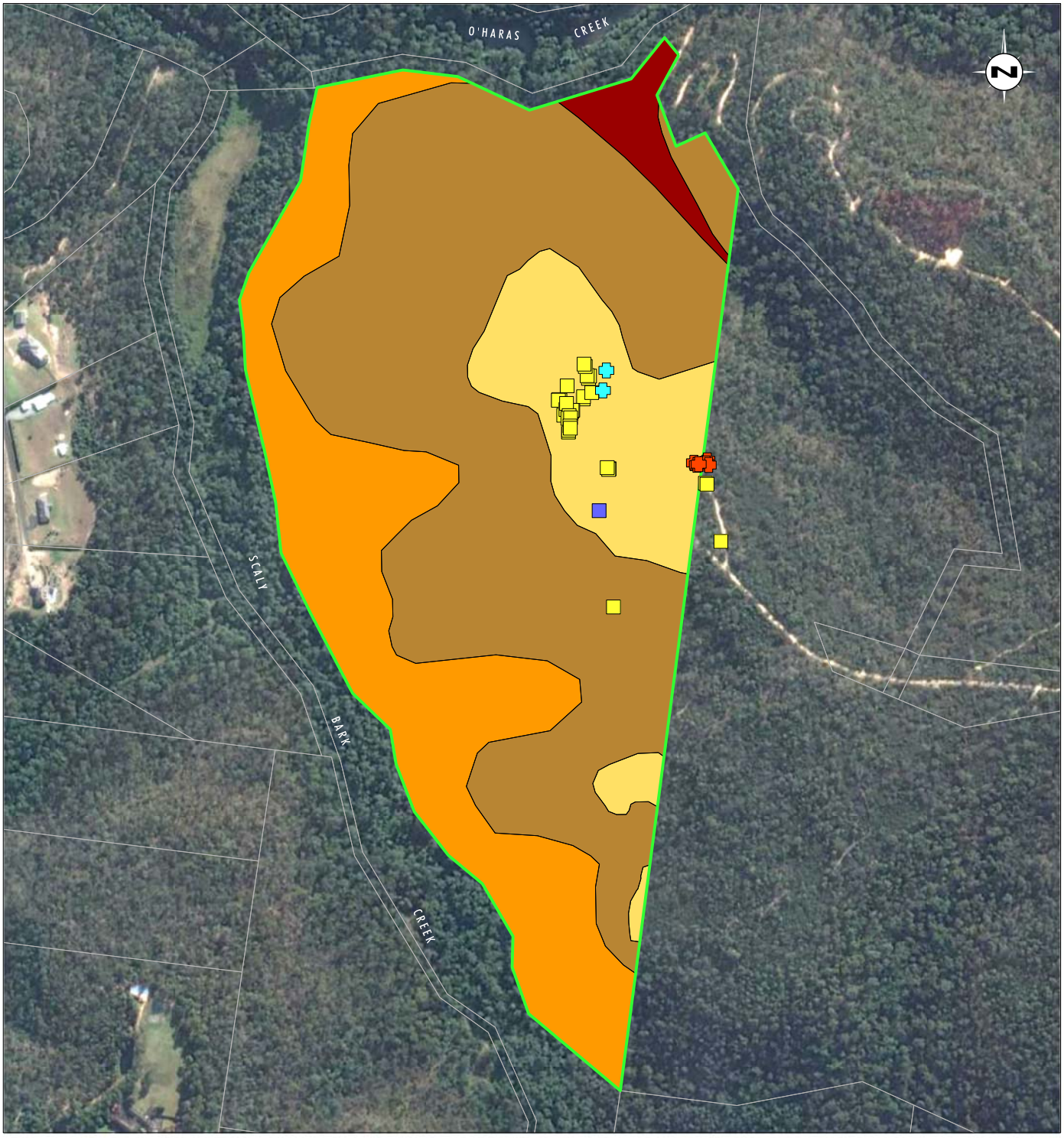


Image Source: Google Earth (2015)
Data Source: LPI (2011), Umwelt (2017), South East Environmental (2016, 2017)
Note: Site within Baulkham Hills Local Government Area and Yengo IBRA Subregion Boundary

0 100 200 400m
1:7 500

Legend

- Porters Road BioBank Site Boundary
- Zone 1: PCT 1083 - HN566 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin - Moderate to Good Condition
- Zone 2: PCT 1134 - HN582 - Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion - Moderate to Good Condition
- Zone 3: PCT 1181 - HN586 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion - Moderate to Good Condition
- Zone 4: PCT 1237 - HN596 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion - Moderate to Good Condition
- Dural Woodland Snail
- Eastern pygmy-possum
- *Darwinia biflora*
- *Tetratheca glandulosa*

FIGURE 3.2

Porters Road BioBank Site Biometric Vegetation Types (BVTs) and Threatened Species

File Name (A4): R06/3479_085.dgn
20170714 15.18

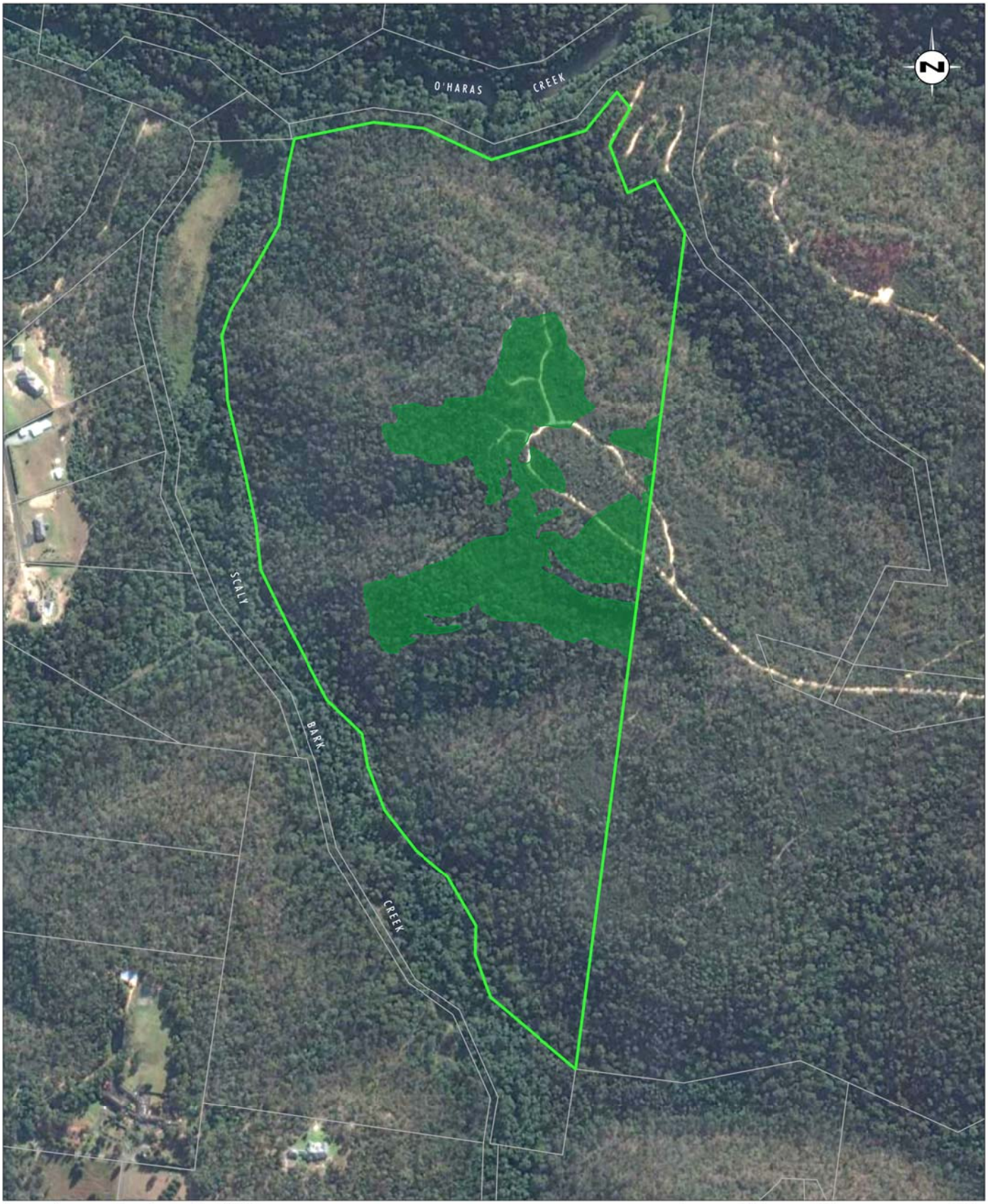


Image Source: Google Earth (2015)
Data Source: Department of Finance, Services & Innovation (2017)

0 100 200 400m
1:7 500

Legend

- Proposed Porters Road BioBank Site
- Dural Woodland Snail Potential Habitat

FIGURE 3.3

Dural Woodland Snail Potential Habitat within the Proposed Porters Road BioBank Site

4.0 Credit Requirements

Table 4.1 includes a comparison of the credits required as part of the Haerses Road Quarry Extraction Area Modification Project according to the Biodiversity Assessment Report (Umwelt 2016) under the Framework for Biodiversity Assessment (FBA) pathway, with an amendment to the number of species credits required for the Dural woodland snail. Credits required are presented for the complete Development Site and for only cells 1A to 5A as shown on Figure 1.3 of the Environmental Assessment (Umwelt 2016b).

The majority of threatened species and plant community types have their offset requirements met through the Haerses Road BioBank Site and the Porters Road BioBank Site. One plant community type (PCT 1134/N582) and Dural woodland snail (*Pommerhelix duralensis*) credit requirements are not fully met for the complete Development Site or only cells 1a to 5a (the initial stages of extraction). The eastern pygmy-possum (*Cercartetus nanus*) has a credit shortfall for the complete Development Site only, however the species credits required are met for the cells 1A to 5A impacts. Bolded cells represent a credit shortfall. Dixon Sand will discuss with OEH opportunities for meeting these shortfalls through the range of mechanisms provided for under the BioBanking methodology.

Table 4.1 Credits Required Versus Credits Generated for the Haerses Road Quarry Extraction Area Modification Project

Regional Vegetation Community Name	Plant Community Type/Biometric Vegetation Type/Threatened Species	Total Credits Required in the Complete Development Site	Total Credits required in 1A to 5A	Porters Road	Haerses Rd Onsite Offsets	Total Offsets	Credit Balance - Complete Development Site	Credit Balance - Cells 1A to 5A
Ecosystem Credits								
Wet Heath	PCT 978/HN560 Needlebush – Banksia Wet Heath on Sandstone Plateaux of the Sydney Basin Bioregion (Moderate/Good)	3	0	0	11	11	8	11
Sydney Sandstone Ridgetop Woodland	PCT 1083/HN566 Red Bloodwood – Scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion (Moderate/Good)	377	224	276	118	394	17	170
Sydney Sandstone Heath	PCT 1134/HN582 Scribbly Gum – Hairpin Banksia – Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion (Moderate/Good)	538	233	89	92	181	**-357**	**-52**
Sydney Sandstone Gully Forest	PCT 1181/HN586 Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest on Slopes of Dry Sandstone Gullies of Western and Southern Sydney, Sydney Basin Bioregion (Moderate/Good)	44	29	125	29	154	110	125
Blue Gum Forest	PCT 1237/HN596 Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	0	0	18	0	18	18	18

Regional Vegetation Community Name	Plant Community Type/Biometric Vegetation Type/Threatened Species	Total Credits Required in the Complete Development Site	Total Credits required in 1A to 5A	Porters Road	Haerses Rd Onsite Offsets	Total Offsets	Credit Balance - Complete Development Site	Credit Balance - Cells 1A to 5A
Species Credits								
NA	*Darwinia biflora**	360	175	270	163	433	73	258
NA	eastern pygmy-possum (*Cercartetus nanus*)*	223	97	56	92	148	**-75**	51
NA	*Grevillea parviflora* subsp. *supplicans*	338	0	0	1448	1448	1110	1448
NA	Dural woodland snail (*Pommerhelix duralensis*)*#	230	116	60	38	98	**-132**	**-18**
NA	*Tetratheca glandulosa**	288	141	270	163	433	145	292

*Species credit calculated by habitat area.

#Revised number of credits generated for the Dural woodland snail based on targeted habitat mapping of the Development Site and the proposed Haerses Road and Porters Road BioBank sites.

Note: the remaining ecosystem credits from HN560, HN566, HN586 or HN596 cannot be used to offset the credits requirements for HN582 under either 'like for like' or 'variation' rules under the FBA Methodology as the vegetation formations do not match.

5.0 References

AES Environmental Consultancy (2001) Natural Asset Mapping for Baulkham Hills Shire Council Plant Communities in Baulkham Hills Shire.

Cumberland Ecology (2014a) Haerses Road Extraction – Preliminary Constraints and Opportunities, May 2017.

Cumberland Ecology (2014b) Dixon Sand Modification 4 – Offset Investigation, May 2017.

Greenloaning Biostudies (2002) Proposed Sand Extraction at Haerses Rd, Maroota – Constraints Associated with Flora and Fauna of the Site. Prepared for Dixon Sands Pty. Ltd, May 2017.

NSW Scientific Committee (2011) Blue Gum High Forest in the Sydney Basin Bioregion - critically endangered ecological community listing, May 2017.

Office of Environment and Heritage (OEH) (2014a) NSW Biodiversity Offsets Policy for Major Projects, September 2014

Office of Environment and Heritage (OEH) (2014b) Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects, September 2014

Office of Environment and Heritage (OEH) (2014c) BioBanking Assessment Methodology, May 2017.

Office of Environment and Heritage (OEH) (2016) NSW guide to surveying threatened plants, May 2017.

Office of Environment and Heritage (OEH) (2017) NSW Vegetation Information System (VIS) 2.1, May 2017.South East Environmental (2016) Environmental Assessment Brief for DP 565423 Porters Road Kenthurst, March 2016.

South East Environmental (2017) Targeted Species Assessment, DP 565423, Porters Road Kenthurst, April 2017.

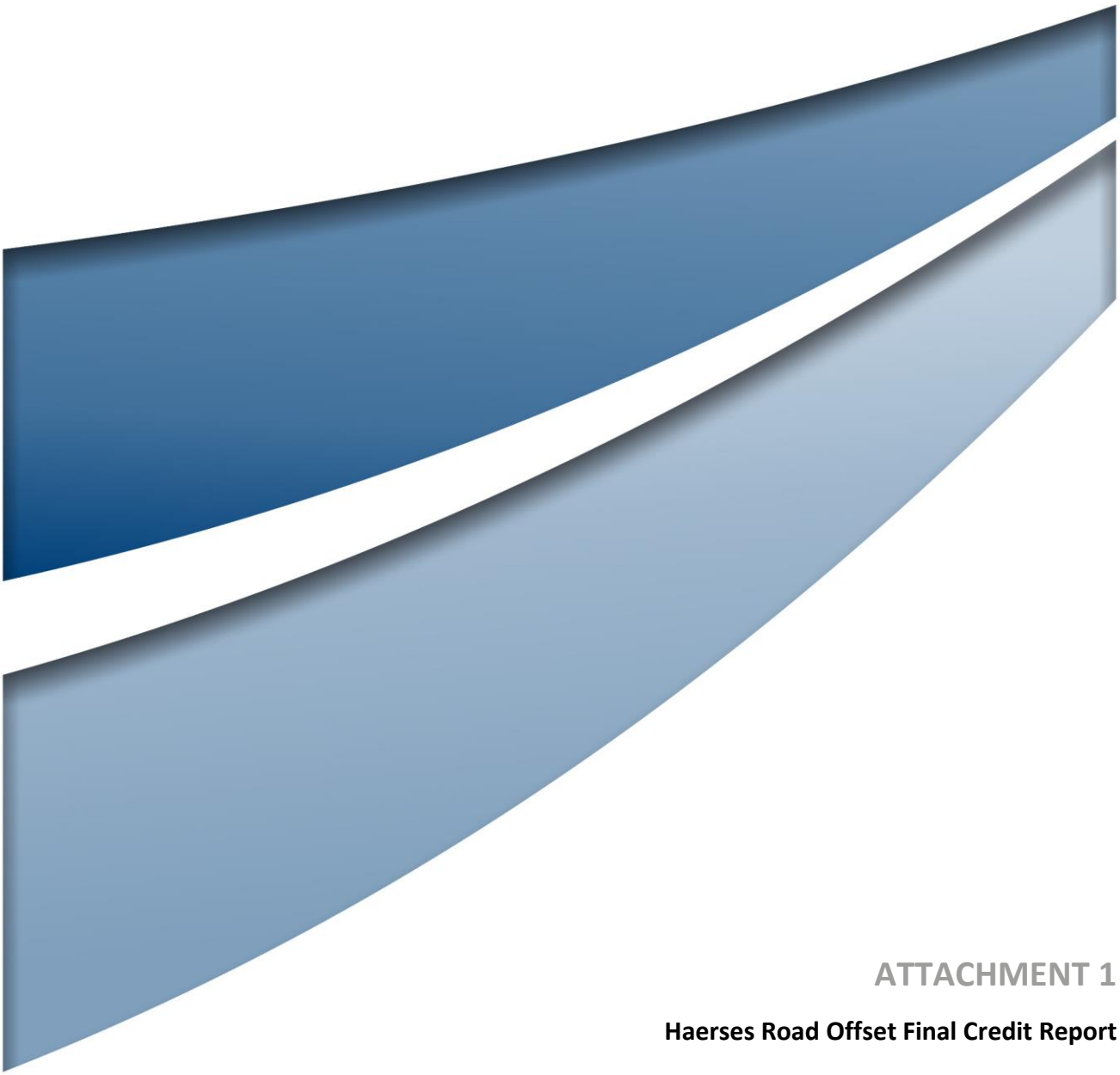
Threatened Species Scientific Committee (TSSC) (2014) Approved Conservation Advice for Blue Gum High Forest of the Sydney Basin Bioregion, Canberra: Department of the Environment, May 2017.

Threatened Species Scientific Committee (TSSC) (2005) Commonwealth Listing Advice on Blue Gum High Forest of the Sydney Basin Bioregion, May 2017.

Tozer M.G., Turner K., Keith D.A., Tindall D., Pennay C., Simpson C., MacKenzie B., Beukers P. and Cox, S. (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands, *Cunninghamia* 11(3): 360-406.

Umwelt (Australia) Pty Limited (2016a) Haerses Road Quarry Extraction Area Modification Project: Biodiversity Assessment Report, Final. A report prepared on behalf of Dixon Sand.

Umwelt (Australia) Pty Limited (2016b) Haerses Road Quarry Extraction Area Modification: Environmental Assessment Report, Final. A report prepared on behalf of Dixon Sand.



ATTACHMENT 1

Haerses Road Offset Final Credit Report

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 22/08/2017 Time: 10:24:20AM Calculator version: v4.0

Biobank details

Proposal ID:	0020/2016/3573B
Proposal name:	Haerses Road Offset
Proposal address:	Haerses Road Maroota NSW 2756
Proponent name:	Dixon Sand (Penrith) Pty Ltd
Proponent address:	PO Box 148 Penrith NSW 2750
Proponent phone:	02 45 668348
Assessor name:	Travis Peake
Assessor address:	75 York St Teralba NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0020

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	0.95	11.00
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	10.53	118.00
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	12.94	92.00
Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	2.98	29.00
Total	27.40	250

Credit profiles

1. Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion, (HN566)

Number of ecosystem credits created	118
IBRA sub-region	Yengo - Hawkesbury/Nepean

2. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion, (HN586)

Number of ecosystem credits created	29
IBRA sub-region	Yengo - Hawkesbury/Nepean

3. Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion, (HN582)

Number of ecosystem credits created	92
IBRA sub-region	Yengo - Hawkesbury/Nepean

4. Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion, (HN560)

Number of ecosystem credits created	11
IBRA sub-region	Yengo - Hawkesbury/Nepean

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Eastern Pygmy-possum	Cercartetus nanus	12.94	92
Darwinia biflora	Darwinia biflora	23.00	163
Mitchell's Rainforest Snail	Thersites mitchellae	5.39	38
Tetratheca glandulosa	Tetratheca glandulosa	23.00	163
Grevillea parviflora subsp. supplicans	Grevillea parviflora subsp. supplicans	204.00	1,448

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Darwinia biflora	Feral and/or over-abundant native herbivore control
Eastern Pygmy-possum	Fox control
Grevillea parviflora subsp. supplicans	Feral and/or over-abundant native herbivore control
Mitchell's Rainforest Snail	Exclude miscellaneous feral species
Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	Control of feral pigs
Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	Exclude miscellaneous feral species
Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	Fox control
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Control of feral pigs
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Exclude commercial apiaries
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Exclude miscellaneous feral species
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Fox control
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Control of feral pigs
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Exclude miscellaneous feral species

Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Fox control
Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Control of feral pigs
Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Exclude commercial apiaries
Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Exclude miscellaneous feral species
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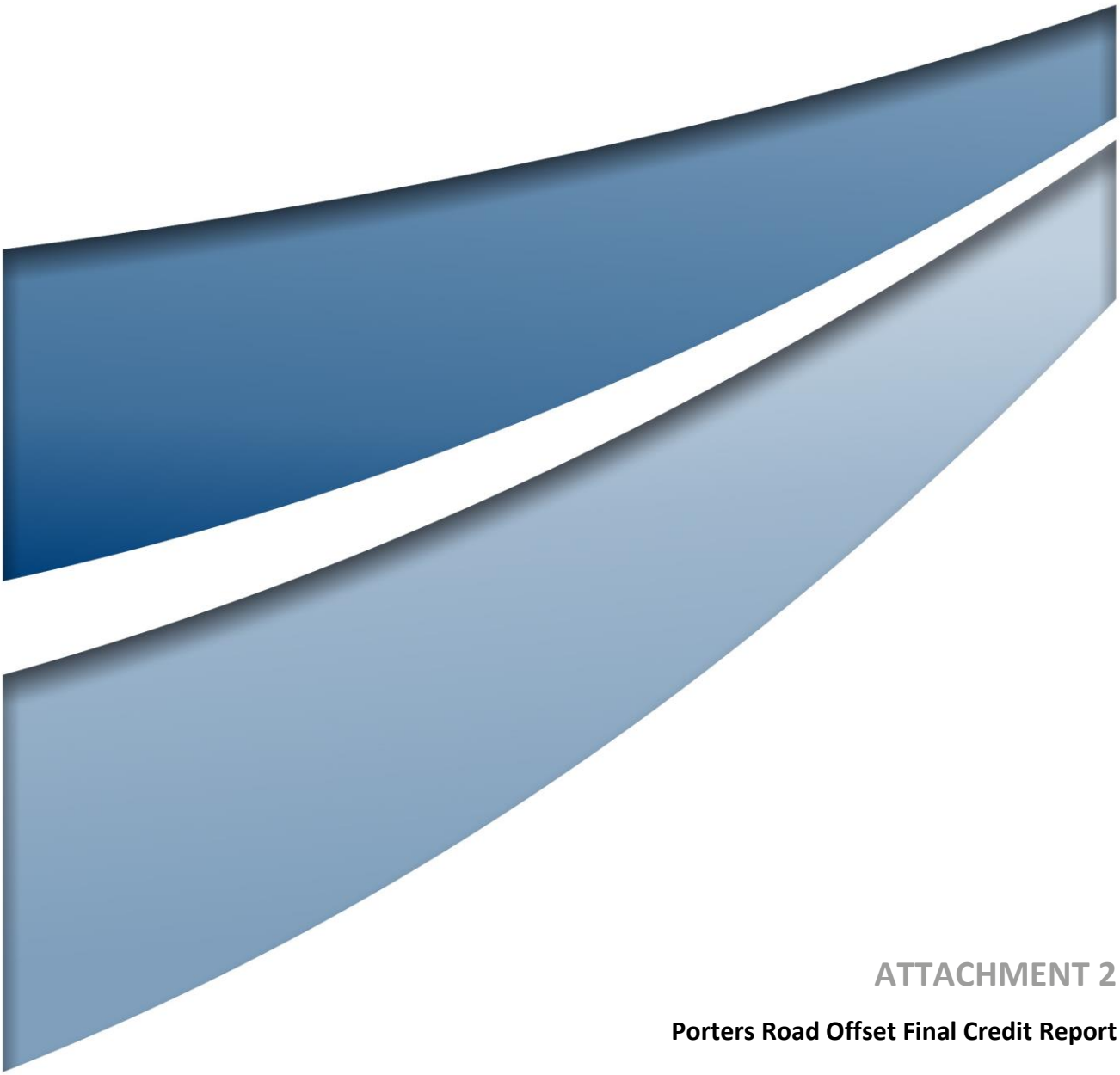
Tetratheca glandulosa	Feral and/or over-abundant native herbivore control



ATTACHMENT 2

Porters Road Offset Final Credit Report

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 22/08/2017 Time: 10:25:26AM Calculator version: v4.0

Biobank details

Proposal ID:	0020/2016/3576B
Proposal name:	Porters Road - Dixon Offset
Proposal address:	75 York Street Teralba NSW 2284
Proponent name:	Dixon Sand (Penrith) Pty Ltd
Proponent address:	PO Box 148 Penrith NSW 2750
Proponent phone:	02 45 668348
Assessor name:	Travis Peake
Assessor address:	75 York St Teralba NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0020

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	29.65	276.00
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	7.86	89.00
Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	15.68	125.00
Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	1.52	18.00
Total	54.71	508

Credit profiles

1. Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion, (HN596)

Number of ecosystem credits created	18
IBRA sub-region	Yengo - Hawkesbury/Nepean

2. Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion, (HN566)

Number of ecosystem credits created	276
IBRA sub-region	Yengo - Hawkesbury/Nepean

3. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion, (HN586)

Number of ecosystem credits created	125
IBRA sub-region	Yengo - Hawkesbury/Nepean

4. Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion, (HN582)

Number of ecosystem credits created	89
IBRA sub-region	Yengo - Hawkesbury/Nepean

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Darwinia biflora	Darwinia biflora	38.00	270
Tetratheca glandulosa	Tetratheca glandulosa	38.00	270
Eastern Pygmy-possum	Cercartetus nanus	7.86	56
Mitchell's Rainforest Snail	Thersites mitchellae	8.39	60

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Darwinia biflora	Feral and/or over-abundant native herbivore control
Eastern Pygmy-possum	Fox control
Mitchell's Rainforest Snail	Exclude miscellaneous feral species
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Control of feral pigs
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Exclude commercial apiaries
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Exclude miscellaneous feral species
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
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Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Exclude miscellaneous feral species
Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
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Tetratheca glandulosa	Feral and/or over-abundant native herbivore control

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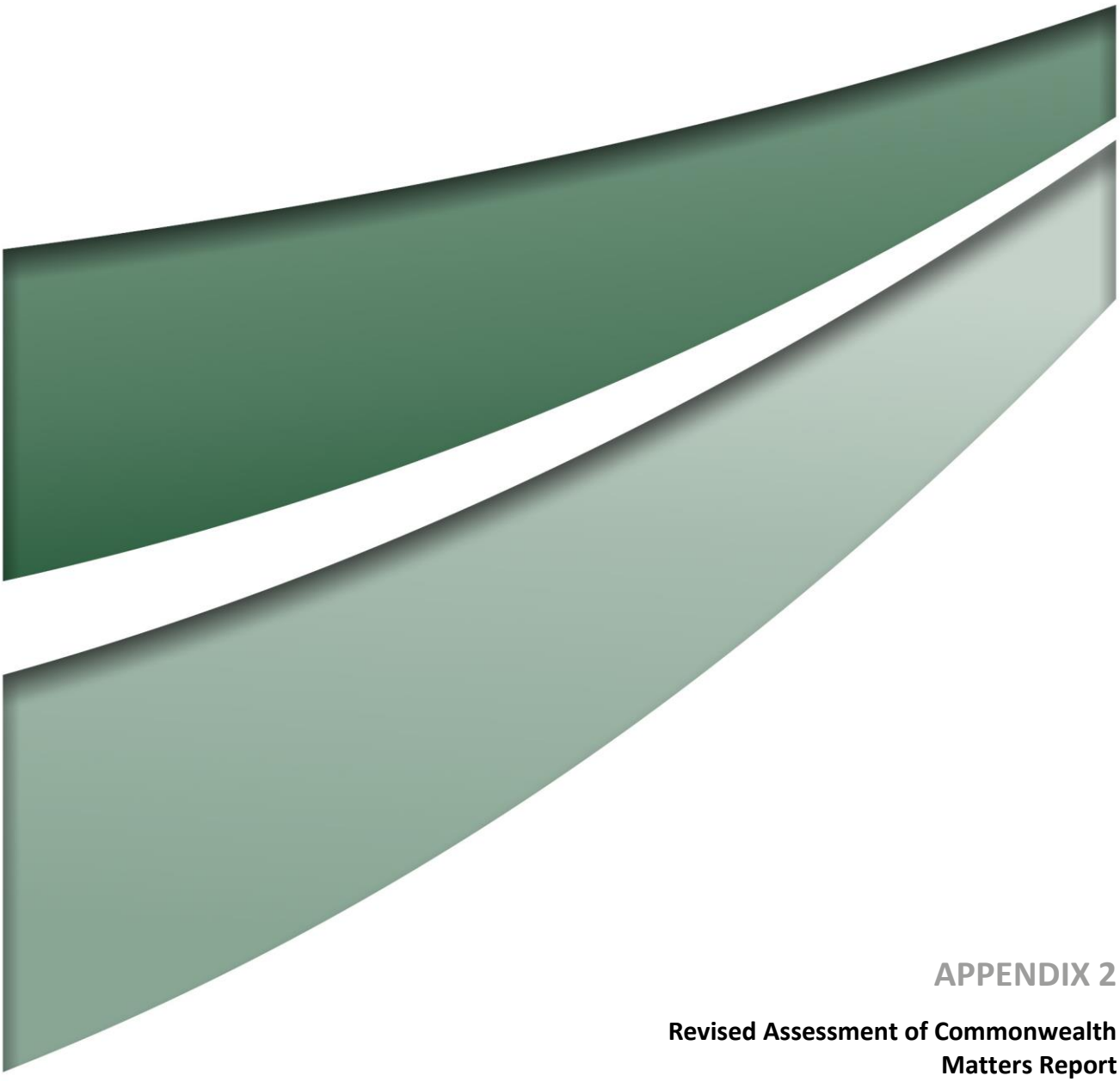

APPENDIX 2

Revised Assessment of Commonwealth Matters Report

umwelt

Inspired people | Dedicated team
Quality outcomes

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Assessment of Commonwealth Matters

FINAL

September 2017

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Assessment of Commonwealth Matters

FINAL

Prepared by
Umwelt (Australia) Pty Limited
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Report No. 3479/R07
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	**Date**	**Name**	**Date**
Final	John Merrell	29 September 2017	John Merrell	29 September 2017

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1.0 Introduction

This report responds to the Commonwealth Department of the Environment and Energy (DoEE) assessment requirements contained within Attachment 1 of the NSW Department of Planning and Environment's Environmental Assessment (EA) Requirements letter (dated 12 February 2016) for the Haerses Road Quarry Extraction Area Modification Project (hereafter referred to as the 'Modification'). Relevant sections of the Biodiversity Assessment Report (Umwelt 2016a) and the Environmental Assessment (Umwelt 2016b) are referenced in this report to address various matters. Where required additional information and assessments of significance are provided on relevant Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.0 DoEE Assessment Requirements

Table 2.1 below details each of DoEE assessment requirements for the Modification according to Attachment 1 of the NSW Department of Planning and Environment's EA Requirements letter (2016) and indicates where they are addressed in either the EA or this report.

Table 2.1 DoEE Assessment Requirements and Responses

DoEE Assessment Requirements	Response
General Requirements	
4. the precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.	See Sections 3.2 to 3.5 and Figures 1.3 and 6.16 to 6.19 of the EA (Umwelt 2016b)
5. how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	See Sections 3.2 to 3.5 and Figures 1.3 and 6.16 to 6.19 of the EA (Umwelt 2016b)
6. an assessment of the relevant impacts of the action on threatened species and communities; Including: (i) a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; (ii) a statement whether any relevant impacts are likely to be known, unpredictable or irreversible; analysis of the significance of the relevant impacts; (iii) any technical data and other information used or needed to make a detailed assessment of the relevant impacts; and (iv) a comparative description of the impacts of alternatives, if any, on the threatened species and communities.	6 (i) The nature and extent of likely direct impacts on MNES with the potential to be significantly impacted by the Modification is detailed in **Section 2.1** below. Further assessment of those MNES likely to be significantly impacted are addressed in **Section 2.2** below. The Modification involves the removal (long term impact) and direct disturbance to approximately 19 hectares of native vegetation which provides potential habitat for some species that are MNES. As discussed in further detail in Section 4.5 of the Biodiversity Assessment Report (Umwelt 2016a) the Modification is not expected to result in any substantial indirect impacts on biodiversity values or MNES in surrounding lands during the construction or operational phases. Indirect impacts considered included noise, dust, weed and feral animal impacts. Of note is the provision of a 50 metre buffer around the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* endangered ecological community (EEC) in the adjacent onsite offset. This buffer area has been provided to avoid impacts to groundwater which is essential to the long-term survival of this EEC. 6 (ii) The impacts of the Modification are considered to be known as they relate to clearing of native vegetation and quarrying which are well understood impacts. An analysis of significance provided in **Section 2.1** below. 6 (iii) All relevant data is provided in the Biodiversity Assessment Report (Umwelt 2016a). 6 (iv) No alternatives to the Modification are proposed.

DoEE Assessment Requirements	Response
7. information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: (i) a description of the proposed avoidance and mitigation measures to deal with the relevant impacts of the action; (ii) assessment of the expected or predicted effectiveness of the mitigation measures; (iii) the cost of the mitigation measures; (iv) a description of the outcomes that the avoidance and mitigation measures will achieve; (v) a description of the offsets proposed to address the residual adverse significant impacts and how these offsets will be established.	7 (i) Refer to Section 4.0 Avoidance and Minimisation Measures of the Biodiversity Assessment Report (Umwelt 2016a). This includes avoidance and minimisation measures for the site selection/planning phase, construction phase and operational phase. 7 (ii) The potential impacts associated with the Modification are well understood and can generally be predicted with a high level of certainty. The mitigation measures proposed are tried and tested methods that have been implemented successfully on numerous other projects. It is predicted that the proposed mitigation measures will be successful in managing the potential impacts associated with the Modification. 7 (iii) In regard to the cost of the mitigation measures, these costs have been included within the operating costs of the Project. This includes the costs of mitigation measures, biodiversity monitoring and rehabilitation costs. There will also be additional costs associated with establishing and managing biodiversity offsets for the Project. 7 (iv) Refer to Section 4.0 Avoidance and Minimisation Measures of the Biodiversity Assessment Report (Umwelt 2016a). In summary the avoidance measures put in place include modifying the Development Site several times to reduce impacts on the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC under the EPBC Act. In particular, the revision to the boundary of the Development Site was made to provide a minimum 50 metre buffer around this EEC that occurs in the proposed onsite offset area that occurs north of the Development Site. The other MNES *Darwinia biflora* likely to be significantly impacted by the Modification could not be avoided by the Modification and is intended to be offset using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects*. The mitigation measures intend to manage arboreal species and habitat, weeds, sediment and erosion, noise, dust and feral animals through the various phases of the Modification. 7 (v) Refer to Section 8 Offsetting Comparison in the Biodiversity Assessment Report (Umwelt 2016a) and Haerses Road Quarry Extraction Area Modification Project (Umwelt 2017). As discussed in further detail in these documents, the Biodiversity Offset Strategy for the Modification is currently being finalised and will include onsite and offsite offsets secured under the Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects along with the potential purchase of credits on the BioBanking market. As discussed in the main text of this Response to Submissions report, Dixon Sands is currently refining the offset strategy for the Modification in consultation with DPE and OEH and the final offset strategy will be submitted as an addendum to the Response to Submissions Report.

DoEE Assessment Requirements	Response
Key Issues – Biodiversity	
8. The EIS must address the following issues in relation to Biodiversity including separate: - identification of each EPBC Act listed threatened species and community likely to be significantly impacted by the development. Provide evidence why other EPBC Act listed threatened species and communities likely to be located in the project area or in the vicinity will not be significantly impacted in accordance with the Matters of National Environmental Significance - Significant lmpact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Significant lmpact Guidelines).	Refer to **Section 2.1** below.
9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate: (i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and (ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements. (iii) description of the impacts of the action having regard to the full national extent of the species or community's range.	Refer to **Section 2.2** below.
10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate: (i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account. (ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts;	Refer to **Section 2.2** below.

DoEE Assessment Requirements	Response
(iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites. [Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.]	
11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy. http://www.environment.gov.au/epbc/publications/epbc-actenvironmental-offsets-policy. [Note if the EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community you may wish to seek further advice from the Department of Planning and Environment.	Refer to **Section 2.2** below.

2.1 Assessment of Significance under the EPBC Act

Revised assessments of significance were undertaken for MNES potentially significantly impacted by the Modification, as identified in Attachment A of Attachment 1 Commonwealth Department of Environment Assessment Requirements as part the letter detailing Environmental Assessment Requirements (NSW Department of Planning and Environment 2016). These revised impact assessments (according to the significant impact guidelines 1.1 – Department of the Environment 2013) have been updated from the Referral (Umwelt 2015) taking into account changes to the design of the Modification since that time and the requirements of Attachment 1 Commonwealth Department of Environment Assessment Requirements. The following assessments of significance include the terminology of 'Development Site' and 'Modification Area' as per the Biodiversity Assessment Report (Umwelt 2016a). The DoEE considers *Darwinia biflora* (vulnerable) and *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC as likely to be significantly impacted and additional assessment requirements are addressed in **Section 2.2**.

In addition to this, a revised EPBC Act Protected Matters Reports (DoEE 2017a) was undertaken to ensure any potentially significantly impacted MNES are addressed since the preparation of the Referral (Umwelt 2015). Four additional terrestrial (non-marine) MNES were listed as part of this search including, greater glider (*Petauroides volans*), downy wattle (*Acacia pubescens*), Illawarra greenhood (*Pterostylis gibbosa*) and austral toadflax (*Thesium australe*). These species were not recorded at the site and are considered unlikely to be impacted by the Modification based on either unsuitable habitat and/or being not recorded as part of flora and fauna surveys. As these species have been assessed as unlikely to be impacted, no further assessments of these MNES have been made.

2.1.1 Endangered Species

The following EPBC Act listed endangered/critically endangered species are considered in this assessment:

- Dural land snail (*Pommerhelix duralensis*) – Endangered
- Eastern bristlebird (*Dasyornis brachypterus*) – Endangered
- Swift parrot (*Lathamus discolor*) – Critically Endangered
- Regent honeyeater (*Anthochaera phrygia*) – Critically Endangered
- Spotted-tailed quoll (SE mainland population) (*Dasyurus maculatus maculatus*) – Endangered
- Southern brown bandicoot (Eastern) (*Isoodon obesulus obesulus*) – Endangered

Of the above species, only the Dural land snail has been recorded in the Modification Area.

An assessment in accordance with the Commonwealth's *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (Department of the Environment 2013) is provided below for these species. Species descriptions, in the Assessments of Significance below, are referenced from the Office of Environment and Heritage (OEH 2017a) and DoEE (2017b) online species profiles, unless otherwise noted.

Dural land snail (*Pommerhelix duralensis*)

The Dural land snail is a medium sized snail endemic to New South Wales, Australia. This species is associated with shale-influenced soils, occurring at low densities along the northwest fringes of the Cumberland Plain (TSSC 2015). The species is known to occur in a number of conservation areas, including Blue Mountains National Park, Marramarra National Park, Yengo National Park, Berowra Valley Regional Park, Parr State Conservation Area and Yellomundee Regional Park (TSSC 2015). This species occurs at low abundance and individuals are solitary, sheltering under rocks, logs and bark (TSSC 2015). The main food sources are hyphae and fruiting bodies of native fungi, and possibly other detritus.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

Due to its restricted local distribution, the Dural land snail is considered likely to form part of a population, or a collection of local populations, that occurs within a particular bioregion. A single individual of this species was recorded during targeted surveys undertaken in December 2015. This species was recorded outside the Development Site (the area to be impacted by the Modification) in the Modification Area (which is now being set up as an offset site); however suitable habitat within the Development Site has been identified. In addition to this, recent surveys in May and July 2017 identified this species as present at the proximate onsite offset area with the discovery of three shells (refer to **Figure 2.1**). According to the Conservation Advice (Threatened Species Scientific Committee 2015) '*The species is known to occur as far north as St Albans. Moving southwest from St Albans, the species occurs in East Kurrajong and then south along the footslopes of the Blue Mountains as far south as Mulgoa. Southeast from St Albans, the species is found across The Hills Shire Local Government Area and south to Parramatta*.' Thus this species is considered a population, or collection of local populations, that occurs within a particular bioregion, being the Sydney Basin Bioregion.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

The Dural land snail was recorded as part of targeted surveys within the Modification Area, from a location adjacent to the Development Site in December 2015. A single individual was recorded from this location. From this record an assessment of similar broad habitat based on vegetation communities present within the development site determined that approximately 17.82 hectares of potential habitat would be removed, as detailed in the Biodiversity Assessment Report (Umwelt 2016a). Since the original mapping of potential habitat, Umwelt have consulted with OEH to better define habitat for this species.
Additional targeted surveys were undertaken in May and July 2017, which involved diurnal and nocturnal searches and habitat assessments (refer to **Figure 2.1**). Habitat across the Development Site and proposed offset sites was assessed for suitable Dural land snail habitat. Habitat was defined by a number of criteria, including:

- Aspect NE – E – SE – S – SW - W (i.e. 45° – 0° – 180°) or slope <2° (fall of 1 metre in 30 metres)
- Not within 3 metres upslope of cliff slope >20° (fall of 2 metres in 5 metres)
- Not treeless
- Not bare rock
- Broad moisture dry to very moist (not wet, i.e. not creek lines or semi-permanent water)
- Micro habitat moisture (leaf litter) moist to very moist
- Large (>200mm diameter) moist rotting logs present
- Evidence of fungi (fruiting bodies or hyphae)
- Preferably not *Banksia* leaves in litter and absence of *Allocasuarina* leaves in litter
- Presence of rotting litter (leaf preferred over bark) with a humus layer >=5mm.

The core habitat for this species was assessed as being 2.99 hectares within the development site (refer to **Figure 2.1**). Further details are documented in the biodiversity offset strategy for the Modification.

According to the Conservation Advice (Threatened Species Conservation Advice 2015) an estimated 191,400 individuals occur in the wild at a maximum recorded density of three individuals per hectare. Based on these numbers, the removal of potential habitat from the Development Site would result in a maximum of 9 individuals or 0.004 per cent of the known population being removed. This small loss is not considered to lead to a long-term decrease in the population size of this species. Additionally extensive areas of similar habitat surround the Modification in several large conservation areas along with crown and freehold land. This species has previously been recorded in the nearby Marramarra National Park which occurs approximately 2 kilometres to the east and the Parr State Conservation Area which occurs approximately 8 kilometres to the north (TSSC 2015).

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the Dural land snail through the removal of up to approximately 2.99 hectares of habitat from the Development Site. The removal of up to 2.99 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat this species.

The Dural land snail has an estimated upper area of occupancy of 638 square kilometres according to the conservation advice (Threatened Species Conservation Advice 2015). As a result the removal of potential habitat within the Development Site represents an approximate 0.005 per cent reduction to area of occupancy and is thus considered to cause a negligible loss of area of occupancy for this species.

- **fragment an existing population into two or more populations, or;**

Due to the relatively small area of potential habitat (approximately 2.99 hectares) for the Dural land snail to be removed from the Development Site and the availability of large areas of similar habitat adjoining the Development Site, the Proposed Action is unlikely to fragment an existing population into two or more populations. Although the Dural land snail dispersal is extremely slow, the records of this species are outside the impact footprint and the location of the record of this species is with the proposed onsite offsets which are well connected to surrounding suitable habitat.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the relatively small area of potential habitat (approximately 2.99 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the Dural land snail.

- **disrupt the breeding cycle of a population, or;**

Due to the relatively small area of potential habitat (approximately 2.99 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to disrupt the breeding cycle of a population of the Dural land snail.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (approximately 2.99 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Dural land snail is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the Dural land snail becoming established in this species' habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the Dural land snail.

- **interfere with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the Dural land snail as a relatively small amount of potential habitat is being removed from the local area.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the Dural land snail.

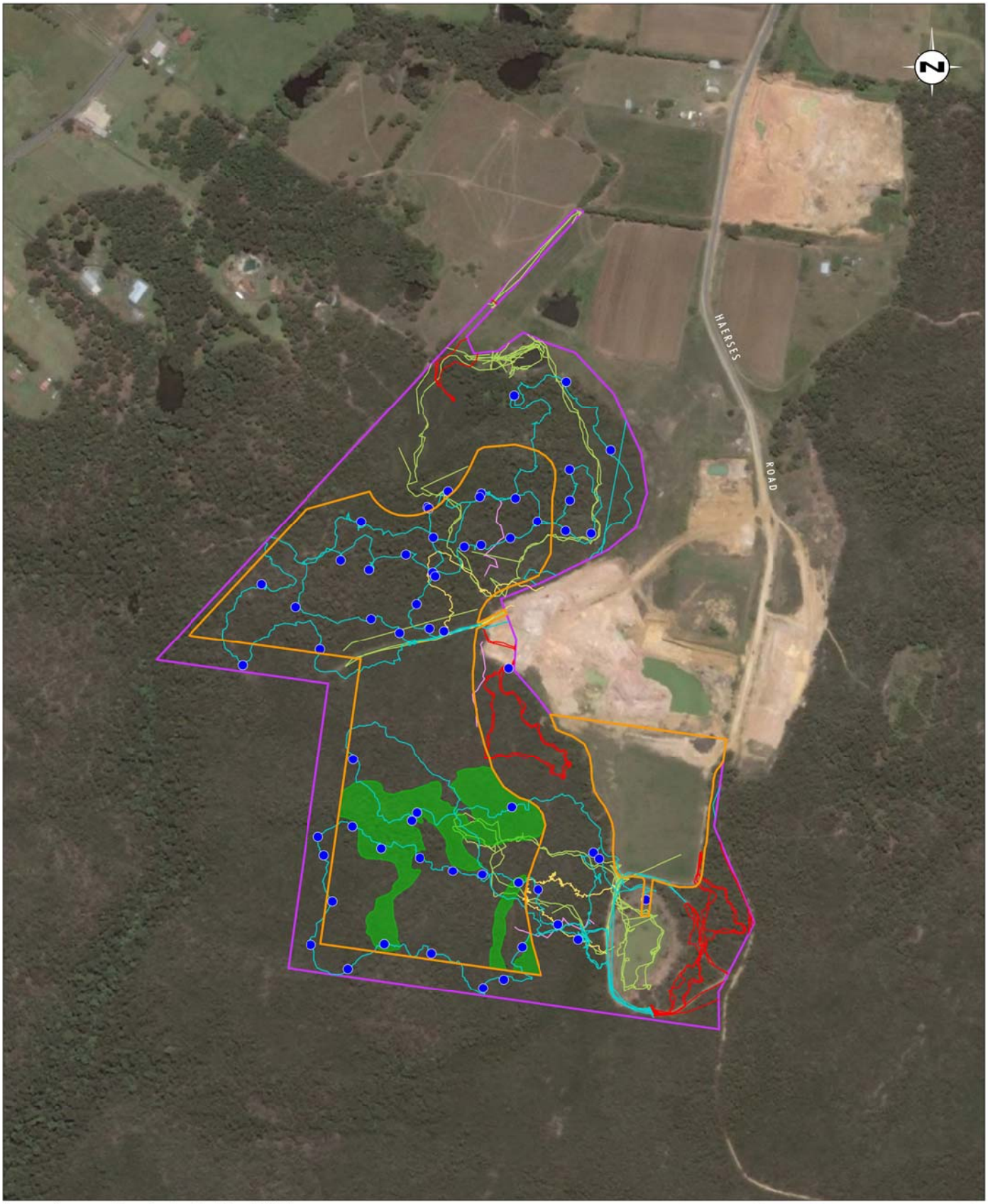

Image Source: Google Earth (Nov 2016)

0 100 200 400m
1:7500

Legend

- Development Site
- Modification Area
- Haerses Road Offset Site
- Dural Woodland Snail Habitat
- Nocturnal Woodland Snail Search December 2015
- Diurnal Woodland Snail Search July 2017
- Nocturnal Woodland Snail Search July 2017
- Habitat Assessment

FIGURE 2.1

Suitable Habitat for Dural Woodland Snail *(Pommerhelix duralensis)* within the Development Site and Modification Area

File Name (A4): R06/APP/3479_094.dgn
20170929 11.37

Eastern bristlebird (*Dasyornis brachypterus*)

The eastern bristlebird species occurs in a variety of habitats, however, it is relatively rare and occurs in three disjunct, localised coastal populations, comprising one in the Queensland/NSW border area, one in the Illawarra and Jervis Bay area and one in the NSW/Victoria border area.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

The eastern bristlebird was not recorded in the Modification Area. If the eastern bristlebird is present it could be part of a population, or a collection of local populations, that occurs within a particular bioregion, however this is considered to be very unlikely.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

No populations of eastern bristlebird have been recorded within the Modification Area. The nearest record of this species to the Modification Area is approximately 70 kilometres to the south-east of the development site near Holsworthy according to the Atlas of NSW Wildlife (OEH 2017b). Potential habitat for this species is broad, comprising grassland, sedgeland, heathland, swampland, scrubland, grassy sclerophyll forest and woodland, and rainforest (OEH 2012). Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. However, this species was not recorded as part of targeted surveys and the Modification Area does not occur near the three known populations of this species (comprising the North, Central and Southern populations) (OEH 2012). In addition, extensive areas of similar habitat in the form of forest, woodland and heath vegetation surrounds the Modification in several large conservation areas along with Crown and freehold land. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park.

Given that no populations of eastern bristlebird have been recorded within the Modification Area, the large areas of similar habitat in the local area and that there are no known nearby records of the species, the proposed action is unlikely to lead to a long-term decrease in the size of a potential population of eastern bristlebird.

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the eastern bristlebird through the removal of up to 19 hectares of habitat from the Development Site. However the removal of up to 19 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat for this species and given that there are no known nearby records of the species.

- **fragment an existing population into two or more populations, or;**

The eastern bristlebird is mobile and it is unlikely that the Proposed Action will create a significant barrier the movement of the species. It is unlikely that the Proposed Action will result in the fragmentation of an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the eastern bristlebird.

- **disrupt the breeding cycle of a population, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to disrupt the breeding cycle of a population of the eastern bristlebird.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the eastern bristlebird is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the eastern bristlebird becoming established in this species' habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the eastern bristlebird.

- **interfere with the recovery of the species.**

The long-term objective of the National Recovery Plan for Eastern Bristlebird (OEH 2012) is the recovery of all populations of the eastern bristlebird to a position where all four populations are stable. The northern population will be enhanced to increase to a viable level. The central populations will remain stable. An additional southern population will be established in Victoria, bringing the southern population to a viable size.

The Proposed Action is unlikely to interfere substantially with the recovery of the eastern bristlebird as a relatively small amount of potential habitat is being removed from the local area. No significant effect on the recovery of the eastern bristlebird is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the eastern bristlebird.

Swift parrot (*Lathamus discolor*)

The swift parrot breeds in Tasmania and moves to mainland Australia for the non-breeding season (usually arriving between February and March). Most of the population winters in Victoria and New South Wales. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region. However, evidence is gathering that the forests on the coastal plains from southern to northern NSW are also important. They return to Tasmania in spring (September-October). The movements of this species on the mainland are poorly understood, but it is considered to be nomadic and irruptive, moving in response to food supply. Upon reaching their core non-breeding range there is no known geographical pattern of movement. During the non-breeding season, the home-range varies tremendously between individuals and between years.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

The swift parrot was not recorded in the Modification Area. If present, the swift parrot in NSW is considered to form part of the national migratory population (Saunders and Tzaros 2011) that forages in eastern Australia during the winter months and returns to Tasmania to breed during spring.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

No populations of swift parrot have been recorded within the Modification Area. Due to the small area of potential marginal habitat (up to 7.66 hectares eucalypt dominated woodland and forest) to be removed and the large areas of similar habitat in the local area, the proposed action is unlikely to lead to a long-term decrease in the size of the swift parrot. The Development Site does not contain any key tree species according to the National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) and thus the native vegetation to be removed is not considered to be primary foraging habitat for this species.

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the swift parrot (not primary foraging habitat) through the removal of up to 7.66 hectares of habitat (eucalypt dominated woodland and forest) from the Development Site. However the removal of up to 7.66 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat for this species.

- **fragment an existing population into two or more populations, or;**

The swift parrot is highly dispersive and it is unlikely that the Proposed Action will create a significant change to the species' dispersal capacity or create a significant barrier the movement of the species.

It is unlikely that the Proposed Action will result in the fragmentation of an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or**;

According to the National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) no key foraging tree species for this species occur within the Modification Area. Due to the relatively small area of potential habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the swift parrot.

- **disrupt the breeding cycle of a population, or;**

The swift parrot breeds and nests exclusively in Tasmania and migrates to mainland Australia during the non-breeding season. There is no potential for breeding habitat to occur in the Modification Area.

The Proposed Action is not expected to disrupt the breeding cycle of the swift parrot.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the swift parrot, is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the swift parrot becoming established in the species habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

Beak and feather disease is an infectious disease affecting parrots, caused by the beak and feather disease circovirus. This common disease is capable of causing very high death rates in nestlings, and the potential effects of the disease on parrot populations vary from inconsequential to devastating, depending on environmental conditions, and the general health and immunity of the parrots. The beak and feather disease virus can be introduced to parrots via the movements of common species carrying the disease. Lesions suggestive of the virus have been reported in the swift parrot.

It is considered unlikely that the Proposed Action will introduce beak and feather disease or any other disease that may cause the swift parrot to decline.

- **interfere with the recovery of the species.**

The National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) contains an overall objective to prevent the further decline of the population and to achieve a sustained improvement in the quality and quantity of swift parrot habitat to increase the carrying capacity for the species.

The Proposed Action will involve the removal of potential marginal habitat (up to 7.66 hectares eucalypt dominated woodland and forest). No significant effect on the recovery of the swift parrot is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the swift parrot.

Regent honeyeater (*Anthochaera phrygia*)

The regent honeyeater inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. There are only three known key breeding regions remaining; in north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. Regent honeyeaters tend to disperse once breeding is complete. Dispersal begins with short distance movements (up to 30 kilometres) into forests on adjacent talus slopes during November and December. More extensive movements begin to occur in February, but the distances and destinations of these movements have yet to be documented. In NSW the species distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

The regent honeyeater was not recorded in the Modification Area. Although there appears to be minor behavioural differences between regent honeyeaters in the three main areas inhabited by the species (the Bundarra-Barraba area in NSW, the Capertee Valley in NSW, and north-eastern Victoria), the direction and extent of movements, including evidence of movement between breeding sites, and a lack of discernible genetic differences between the sites suggest that the species occurs as a single, contiguous population (Garnett & Crowley 2000).

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

No populations of regent honeyeater have been recorded within the Modification Area. Due to the small area of potential marginal habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) to be removed and the large areas of similar habitat in the local area, the proposed action is unlikely to lead to a long-term decrease in the size of a potential population of the regent honeyeater. The Development Site does not contain any key tree species according to the National Recovery Plan for the Regent Honeyeater (DoE 2016) and thus the native vegetation to be removed is not considered to be primary foraging habitat for this species.

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the regent honeyeater (not primary foraging habitat) through the removal of up to 7.66 hectares of habitat (eucalypt dominated woodland and forest) from the Development Site. However the removal of up to 7.66 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat for each species.

- **fragment an existing population into two or more populations, or;**

The regent honeyeater is highly dispersive and it is unlikely that the Proposed Action will create a significant change to the species' dispersal capacity or create a significant barrier the movement of the species'.

It is unlikely that the Proposed Action will result in the fragmentation of an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

According to the National Recovery Plan for the Regent Honeyeater (DoE 2016) no key foraging tree species for this species occur within the Modification Area. Due to the relatively small area of potential habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the regent honeyeater.

- **disrupt the breeding cycle of a population, or;**

The regent honeyeater mainly breeds in three key sites from the Bundarra-Barraba area in NSW, the Capertee Valley in NSW, and north-eastern Victoria. The regent honeyeater has not been recorded breeding or nesting in the Development Site or in any areas in the locality.

The Proposed Action is not expected to disrupt the breeding cycle of the regent honeyeater.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the regent honeyeater, is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the regent honeyeater, becoming established in their habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the regent honeyeater.

- **interfere with the recovery of the species.**

National Recovery Plan for the Regent Honeyeater (DoE 2016) contains two key objectives:

  - Reverse the long-term population trend of decline and increase the numbers of regent honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to

  - Enhance the condition of habitat across the regent honeyeater range to maximise survival and reproductive success, and provide refugia during periods of extreme environmental fluctuation.

The Proposed Action will involve the removal of a relatively small area of potential marginal habitat (up to 7.66 hectares of eucalypt dominated woodland and forest) for the regent honeyeater. No significant effect on the recovery of the regent honeyeater is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the regent honeyeater.

Spotted-tailed quoll (SE mainland population) (*Dasyurus maculatus maculatus*)

In NSW the spotted-tailed quoll is generally confined to within 200 kilometres of the coast from the Queensland border to Kosciuszko National Park. According to the National Recovery Plan for the Spotted-tailed quoll (DELWP 2016) the spotted-tailed quoll has been recorded from a wide range of habitats, including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas. The spotted-tailed quoll is predominantly nocturnal and shelters in dens (such as hollow logs, tree hollows, rocky outcrops or caves) during the day. The species requires large areas of relatively intact vegetation to forage for food.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

The spotted-tailed quoll was not recorded in the Modification Area despite targeted remote camera surveys for the species. No populations of spotted-tailed quoll have been recorded within the Modification Area and no records of the species occur within 6 kilometres of the site. Records of the spotted-tailed quoll in the wider locality are likely be part of a population, as per the guidelines above, that extends west to the Blue Mountains National Park, Wollemi National Park and beyond.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

No populations of spotted-tailed quoll have been recorded within the Modification Area. The nearest record of this species to the Modification Area in approximately 6 kilometres to the north of the development site, along with a number of records surrounding the site within approximately a 10 kilometre radius or further according to the Atlas of NSW Wildlife (OEH 2017b), as shown on **Figure 2.2** According to the National Recovery Plan for the Spotted-tailed quoll (DELWP 2016) the spotted-tailed quoll has been recorded from a wide range of habitats, including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas. Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. Extensive areas of similar habitat in the form of forest, woodland and heath vegetation surrounds the Modification in several large conservation areas along with crown and freehold land, as shown on **Figure 2.2**. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. Given the large areas of similar habitat in the local area, the proposed action is unlikely to lead to a long-term decrease in the size of a potential population spotted-tailed quoll.

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the spotted-tailed quoll through the removal of up to 19 hectares of habitat from the Development Site. However the removal of up to 19 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat for this species.

- **fragment an existing population into two or more populations, or;**

The spotted-tailed quoll is highly mobile and would readily disperse into expansive areas of suitable habitat surrounding the Development Site. It is considered unlikely that the Proposed Action will create a significant change to the species' dispersal capacity or create a significant barrier to the movement of the species. It is unlikely that the Proposed Action will result in the fragmentation of an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the spotted-tailed quoll.

- **disrupt the breeding cycle of a population, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site, the availability of large areas of similar potential habitat adjoining the Development Site and the potential den sites were not recorded as part of surveys, the Proposed Action is unlikely to disrupt the breeding cycle of a population of the spotted-tailed quoll.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the spotted-tailed quoll is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the spotted-tailed quoll becoming established in this species' habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the spotted-tailed quoll.

- **interfere with the recovery of the species.**

The overall objective of the National Recovery Plan for the Spotted-tailed Quoll (DELWP 2016) is to reduce the rate of decline of the spotted-tailed quoll, and ensure that viable populations remain throughout its current range is eastern Australia. Specific objective include:

1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices.

2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.

3. Reduce the rate of habitat loss and fragmentation on private land.

4. Evaluate and manage the risk posed by silvicultural practices.

5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.

6. Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.

7. Reduce deliberate killings of Spotted-tailed Quolls.

8. Reduce the frequency of Spotted-tailed Quoll road mortality.

9. Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.

10. Determine the likely impact of climate change on Spotted-tailed Quoll populations.

11. Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

The Proposed Action is unlikely to interfere substantially with the recovery of the spotted-tailed quoll as a relatively small amount of potential habitat is being removed from the local area. No significant effect on the recovery of the spotted-tailed quoll is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the spotted-tailed quoll.

Southern brown bandicoot (Eastern) (*Isoodon obesulus obesulus*)

The southern brown bandicoot is rare and restricted to coastal areas in NSW from south of the Hawkesbury River to the Victorian border. Two main populations are recognised, including the Ku -ring-gai Chase and Garigal National Parks just north of Sydney and the far south-east corner of the state including Ben Boyd National Park, East Boyd State Forest, Nadgee Nature Reserve, Nadgee State Forest, South East Forest National Park and Yambulla State Forest. This species occurs in a variety of habitats, including heathland, shrubland, sedgeland, heathy open forest and woodland usually associated with infertile sandy soils

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or

- A population, or collection of local populations, that occurs within a particular bioregion.

The southern brown bandicoot was not recorded in the Modification Area despite targeted remote camera surveys for the species. If present, the southern brown bandicoot could be part of a collection of local populations. No populations of southern brown bandicoot have been recorded within the Modification Area and no records of the species occur within 20 kilometres of the site. Records of the southern brown bandicoot in the wider locality are likely be part of a population, as per the guidelines above, that extends east to the Ku-ring-gai Chase and Garigal National Parks.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population, or;**

No populations of southern brown bandicoot have been recorded within the Modification Area. The nearest record of this species to the Modification Area in approximately 20 kilometres to the south-east of the development site, with the majority of proximate records approximately 25 kilometres to south-east according to the Atlas of NSW Wildlife (OEH 2017b), as shown on **Figure 2.2**. This species occurs in a variety of habitats, including heathland, shrubland, sedgeland, heathy open forest and woodland usually associated with infertile sandy soils. Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. Extensive areas of similar habitat in the form of forest, woodland and heath vegetation surrounds the Modification in several large conservation areas along with crown and freehold land, as shown on **Figure 2.2**. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park where one of the main populations of this species is known to occur. Given the large areas of similar habitat in the local area, the proposed action is unlikely to lead to a long-term decrease in the size of a potential population southern brown bandicoot.

- **reduce the area of occupancy of the species, or;**

The Proposed Action would result in a reduction in the area of potential occupancy for the southern brown bandicoot through the removal of up to 19 hectares of habitat from the Development Site. However the removal of up to 19 hectares of habitat is considered unlikely to significantly impact on a potential population of this species due to the local availability of similar potential habitat for this species.

- **fragment an existing population into two or more populations, or;**

The southern brown bandicoot is mobile and would readily disperse into expansive areas of suitable habitat surrounding the Development Site. It is considered unlikely that the Proposed Action will create a significant change to the species' dispersal capacity or create a significant barrier to the movement of the species. It is unlikely that the Proposed Action will result in the fragmentation of an existing population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the southern brown bandicoot.

- **disrupt the breeding cycle of a population, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to disrupt the breeding cycle of a population of the southern brown bandicoot.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the southern brown bandicoot is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the southern brown bandicoot becoming established in this species habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the southern brown bandicoot.

- **interfere with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the southern brown bandicoot as a relatively small amount of potential habitat is being removed from the local area. No significant effect on the recovery of the southern brown bandicoot is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the southern brown bandicoot.

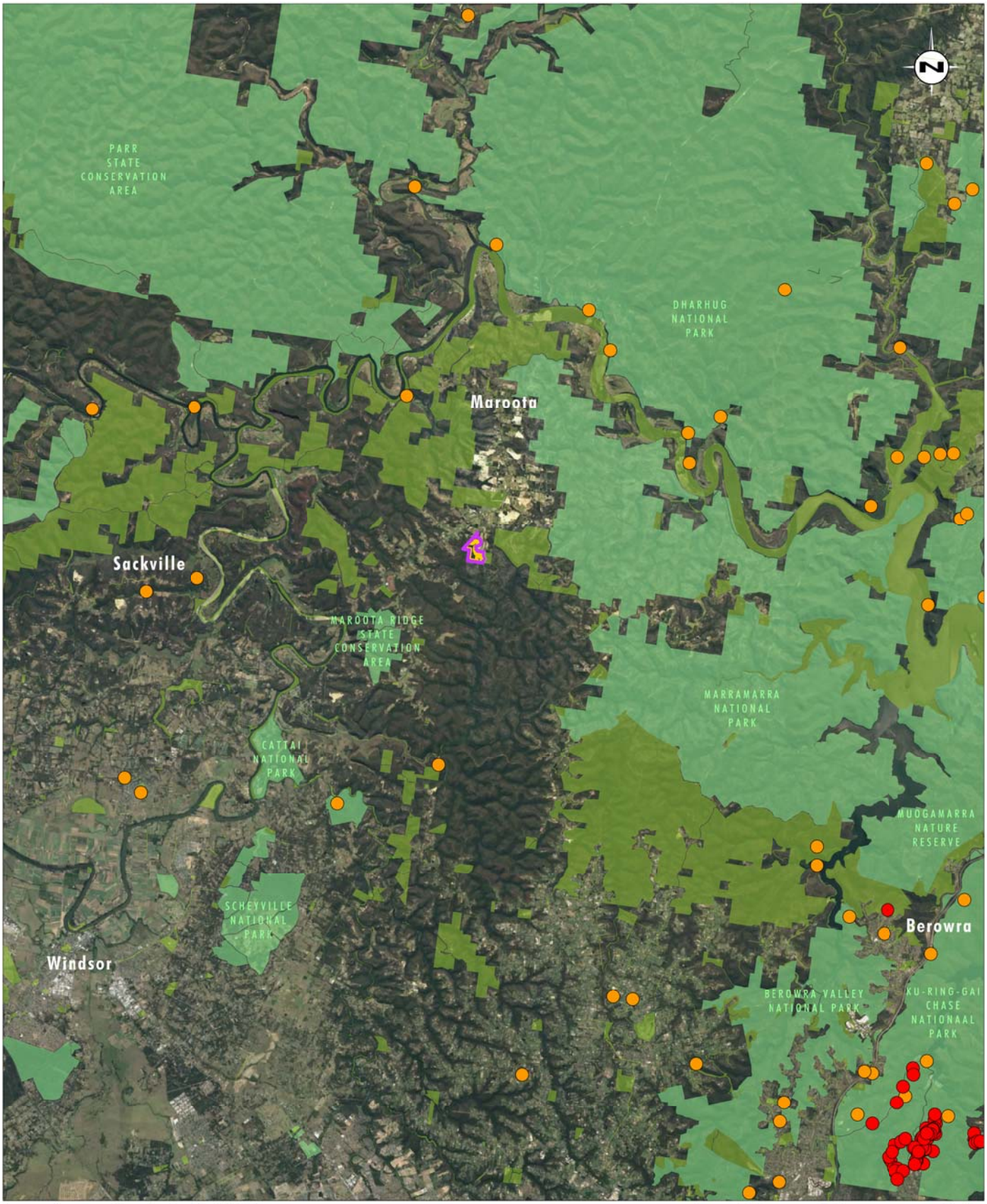

Image Source: Google Earth (2016)
Data Source: LPI (2017)
Note: Crown Land data obtained from Blacktown LGA, Central Coast LGA, Hornsby LGA and Hawkesbury LGA cadastral data.

0 2.0 5.0 10.0km
1:200 000

Legend

- Development Site
- Modification Area
- NSW National Parks and Conservation Areas
- Crown Land
- Southern Brown Bandicoot
- Spotted-tailed Quoll

FIGURE 2.2

Spotted-tailed Quoll and Southern Brown Bandicoot Atlas of NSW Wildlife Records in the Local Area and Surrounding Conservation Areas

2.1.2 Vulnerable Species

The following EPBC Act listed vulnerable species are considered in this assessment:

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Giant Burrowing Frog (*HeIeiporus australiacus*)
- Littlejohn's Tree Frog (*Litoria littlejohni*)
- Broad-headed Snake (*Hoplocephalus bungaroides*)
- Koala (*Phascolarctos cinereus*)
- Long-nosed Potoroo (*Potorous tridactylus tridactylus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- New Holland Mouse (*Pseudomus novaehollandiae*)

An assessment in accordance with the Commonwealth's *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (Department of the Environment 2013) is provided below for these species. Species descriptions, in the Assessments of Significance below, are referenced from the Office of Environment and Heritage (OEH 2017a) and DoEE (2017b) online species profiles, unless otherwise noted.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

The large-eared pied bat current distribution is poorly known. Records exist from Shoalwater Bay, north of Rockhampton, Queensland, through to the vicinity of Ulladulla, NSW in the south. The National Recovery Plan for the large-eared pied bat (DERM 2011) states that habitat critical for the survival of the species requires the presence of diurnal roosts and shelter habitat, usually in the form of sandstone cliffs and adjacent fertile woodland valley foraging habitat. The majority of records of the species occur within several kilometres of clifflines or caves.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The large-eared pied-bat was recorded north of the Development Site within the Modification Area (Umwelt 2016a). It was recorded through use of bat echolocation recordings using an Anabat II Bat Detector. These recordings were then professionally identified by Anna McConville of Echo Ecology Pty Limited. The Development Site does not contain any roosting habitat for the species but is considered to comprise marginal foraging habitat for this species as part of a wider foraging range in the locality.

The of large-eared pied bat record within the Modification Area does not constitute the presence of an 'important population' as defined by the criteria listed above, as the record of the species in the Modification Area does not represent a key source population either for breeding or dispersal given that breeding or roosting habitat for the species is absent and the Modification Area represents marginal foraging habitat only. Additionally the Modification Area is not important for the maintenance of genetic

diversity of the species given that the record likely represents a foraging individual that is also utilising the expansive areas of similar habitat in the surrounding freehold land, crown land and large conservation areas. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The National Recovery Plan for the species (DERM 2011) notes that important populations are likely to occur in the sandstone escarpments of the Sydney Basin. The mentioned conservation areas are likely to contain such escarpments. The large-eared pied-bat record within the Modification Area is also not near the limit of the species' range. According to the Atlas of NSW Wildlife (OEH 2017b) this species has been recorded in NSW from the Queensland border in the north, as far west as Dubbo and as far south as Ulladulla. Therefore the Development Site is unlikely to contain an important population of the large-eared pied-bat.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

The Proposed Action will result in the loss of habitat up to 19 hectares marginal foraging habitat for the species and will not impact any cliffline or escarpment habitat that could be used as roosting or breeding habitat. The Development Site is unlikely to comprise an important population of large-eared pied bat and is therefore unlikely that the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares marginal foraging habitat for the species and the Development Site is unlikely to comprise an important population of large-eared pied bat. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the large-eared pied bat and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The National Recovery Plan for the large-eared pied bat (DERM 2011) states that habitat critical for the survival of the species requires the presence of diurnal roosts and shelter habitat, usually in the form of sandstone cliffs and adjacent fertile woodland valley foraging habitat. Sandstone cliffs and fertile woodland valley habitat within proximity of each other is habitat of importance to the species. The habitat in the Modification Area does not contain overhanging clifflines or adjacent fertile woodland valley habitat.

The Development Site is not considered to contain critical habitat for the large-eared pied bat and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

No important populations of the large-eared pied bat are likely to occur in the Modification Area, nor have any breeding populations or roosting habitat for this species been recorded. The Proposed Action is not expected to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Proposed Action will result in the loss of up to 19 hectares of marginal foraging habitat for the species and will not impact any cliffline or escarpment habitat that could be used as roosting habitat.

Given the lack of core habitat in the Development Site for large-eared pied bat, the Proposed Action will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that this species is likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the large-eared pied bat becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the large-eared pied bat to decline.

- **interferes substantially with the recovery of the species.**

The Recovery Plan for the Large-eared Pied Bat (DERM 2011) has an overall objective to ensure the persistence of viable populations of the species throughout its geographic range.

The Proposed Action will result in the loss of up to 19 hectares of marginal foraging habitat. It is not considered that an important population of the species occurs within the Development Site. No significant effect on the recovery of the large-eared pied bat is expected to occur as a result of the Proposed Action.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of large-eared pied bat as the Development Site is not considered to support an important population of this species or contain habitat considered to be critical to the survival of the species according to the National Recovery Plan (DERM 2011).

Giant Burrowing Frog (*HeIeiporus australiacus*)

The giant burrowing frog is confined to the eastern slopes of the Great Dividing Range and coastal regions from near Mt Coridudgy and Kings Cross in Wollemi National Park, New South Wales to Walhalla in the central highlands of eastern Victoria. This species is found in a number of habitat types, including hanging swamps on sandstone shelves and beside perennial creeks, sandy soil on sandstone ridges that support heath vegetation, semi-permanent to ephemeral sand or rock based streams, and constructed dams with a sandy silt or clay base. Giant burrowing frogs are not restricted to watercourses and have been recorded between 50 to 500 metres from water.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The giant burrowing frog was not recorded within the Modification Area (Umwelt 2016a). Small areas of marginal breeding habitat may occur in the form of ephemeral pools or soaks associated with the minor drainage lines within the Development Site. These areas are unlikely to support key source populations for breeding or dispersal. The development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. All the aforementioned conservation areas have records of the giant burrowing frog according to the Atlas of NSW Wildlife (OEH 2017b). The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the giant burrowing frog.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the giant burrowing frog present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential habitat for the species, however the Development Site is unlikely to comprise an important population of giant burrowing frog. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the giant burrowing frog and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the giant burrowing frog and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the giant burrowing frog and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the species would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the giant burrowing frog becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the giant burrowing frog to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the giant burrowing frog.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of giant burrowing frog as the Development Site is not considered to support an important population of this species.

Littlejohn's Tree Frog (*Litoria littlejohni*)

The Littlejohn's tree frog is confined to eastern New South Wales and north-east Victoria. The Frog occurs in scattered locations between the Watagan Mountains, New South Wales, to Buchan in Victoria. This species inhabits forest, coastal woodland and heath from 100 to 950 metres above sea level.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The Littlejohn's tree frog was not recorded within the Modification Area (Umwelt 2016a). The nearest record of this species to the Development Site is approximately 30 kilometres to the north-east according to the Atlas of NSW Wildlife (OEH 2017b). Small areas of marginal breeding habitat may occur in the form of ephemeral pools or soaks associated with the minor drainage lines within the Development Site. These areas are unlikely to support key source populations for breeding or dispersal. The development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the Littlejohn's tree frog.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the Littlejohn's tree frog present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential habitat for the species, however the Development Site is unlikely to comprise an important population of Littlejohn's tree frog. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the Littlejohn's tree frog and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the Littlejohn's tree frog and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the Littlejohn's tree frog and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the Littlejohn's tree frog would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the Littlejohn's tree frog becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the Littlejohn's tree frog to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the Littlejohn's tree frog.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of Littlejohn's tree frog as the Development Site is not considered to support an important population of this species.

Broad-headed Snake (*Hoplocephalus bungaroides*)

The Broad-headed Snake is restricted to the sandstone ranges in the Sydney Basin and within a radius of approximately 200 kilometres of Sydney. The Broad-headed Snake is often found in rocky outcrops and adjacent sclerophyll forest and woodland.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The broad-headed snake was not recorded within the Modification Area (Umwelt 2016a). The nearest record of this species to the Development Site is approximately 10 kilometres to the north in the Dharug National Park according to the Atlas of NSW Wildlife (OEH 2017b). All other records of the broad-headed snake are further than 10 kilometres from the Development Site. Some suitable rocky habitat is present with the Development Site at the interface between woodland/heath vegetation and sandstone gully forest which may provide refuge during cooler months. There are also hollow-bearing trees presents within the woodland and gully forest that may also provide refuge during the warmer months.

Given the paucity of nearby records and the relatively small area of habitat to be removed compared to large areas of surrounding similar habitat, the Development Site is unlikely to support key source populations for breeding or dispersal. The Development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the broad-headed snake.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the broad-headed snake present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential habitat for the species, however the Development Site is unlikely to comprise an important population of broad-headed snake. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the broad-headed snake and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the broad-headed snake and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the broad-headed snake and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the broad-headed snake would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the broad-headed snake becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the broad-headed snake to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the broad-headed snake.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of broad-headed snake as the Development Site is not considered to support an important population of this species.

Koala (*Phascolarctos cinereus*)

The koala is known to occur in eucalypt woodlands and forests from the north-eastern Queensland, along the eastern coast of NSW, to the south-east corner of South Australia. The vulnerable listing for the koala extends from north-eastern Queensland to the Victoria border.

The Assessment of Significance for the koala has been prepared in consideration of the EPBC Act Referral Guidelines for the Vulnerable Koala (DoE 2014).

The Referral Guidelines advise that the assessment of significant impacts on the koala is undertaken primarily through the assessment of habitat critical to the survival of the koala and actions that interfere substantially with the recovery of the koala. This approach aims to avoid and address habitat loss as well as promote a streamlined assessment and approval process.

In accordance with the Referral Guidelines, the habitat assessment tool was applied to the Development Site which determined that the extent of vegetation that contains at least one known koala food tree within the Central Coast CMA. Koala feed trees for the Central Coast CMA (OEH 2014) that occur in the Development Site include:

Primary Food Tree Species:

- Nil

Secondary Food Tree Species:

- Red mahogany (*Eucalyptus resinifera*)
- Grey gum (*Eucalyptus punctata*)

Supplementary Species:

- Narrow-leaved stringybark (*Eucalyptus sparsifolia*)

Two plant community types contain secondary and supplementary food trees. No primary food trees species were recorded in the vegetation communities within the Development Site. Secondary and supplementary food trees were recorded in the Smooth-barked Apple – Red Bloodwood – Sydney Peppermint Heathy Open Forest and Red Bloodwood – Scribbly Gum Heathy Woodland, with a total area of approximately 7.66 hectares.

Table 2.2 below applies the Koala Habitat Assessment Tool as outlined in Table 3 of the EPBC Act Referral Guidelines for the Vulnerable Koala (DoE 2014).

Table 2.2 Koala Habitat Assessment Tool (Table 3 from DoE 2014)

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			Development Site Assessment	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 2 years.	0	Desktop: EPBC PMST report identified the koala or koala habitat as 'known to occur'. Within a 10 kilometre radius of the Development Site there are 11 records in the Atlas of NSW Wildlife (OEH 2017b), ranging from 1988 to 2009. The closest record in the Atlas of NSW
	+1 (medium)	Evidence of one or more koalas within 2 kilometres of the edge of the impact area within the last 5 years.		

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			Development Site Assessment	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
	0 (low)	None of the above.		Wildlife is approximately 2.5 kilometres to the south-east. There is also a record of the koala made in 2002 by Greenloaning BioStudies approximately a kilometre to the north-east of the Development Site. No records are within the last two years. There are also no records of the koala within 2 kilometres of the development site in the last 5 years. On-ground: No evidence of the koala was recorded during the Umwelt surveys of the Development Site.
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	+2	The Development Site contains known koala feed trees for the Central Coast management area, including Red mahogany (*Eucalyptus resinifera*), Grey gum (*Eucalyptus punctata*) and narrow-leaved stringybark (*Eucalyptus sparsifolia*) which are confined to two vegetation communities totalling 7.66 hectares.
	+1 (medium)	Has forest or woodland with only 1 species of known koala food tree present.		
	0 (low)	None of the above.		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	+2	The Development Site is connected to expansive areas of remnant vegetation ≥ 500 hectares.
	+1 (medium)	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.		
	0 (low)	None of the above.		
Key existing threats	+2 (low)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.	+2	No evidence of koala mortality from vehicle strike or dog attack.

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			Development Site Assessment	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR areas which score 0 for koala occurrence are likely to have some degree of dog or vehicle threat present.		
	0 (high)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, OR areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.		
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	0	Desktop: Table 1 of the Draft Referral Guidelines (DoE 2014) prescribes, that for coastal areas, the interim recovery objective(s) are to: *"Protect and conserve large, connected areas of koala habitat, particularly large, connected areas that support koalas that are:-of sufficient size to be genetically robust/operate as a viable sub-population OR free of disease or have a low incidence of disease OR breeding and to maintain corridors and connective habitat that allow movement of koalas between large areas of habitat."* On-ground: The clearing of approximately 7.66 hectares of potential koala habitat will not result in fragmentation of retained habitats and is not likely to influence the interim recovery objectives. Preferred/primary koala habitat will not be directly impacted by the Proposed action.
	+1 (medium)	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		
TOTAL SCORE			**6**	**≥ 5 indicates habitat critical for the survival of the koala.**

A total of 7.66 hectares of suitable woodland and forest habitat (identified as habitat critical for the survival of the koala according to the EPBC Act Referral Guidelines for the Vulnerable Koala (DoE 2014) that support suitable feed trees for the species in the Development Site will be impacted as a result of the proposal.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The koala was not recorded within the Modification Area (Umwelt 2016a). Within a 10 kilometre radius of the Development Site there are 11 of records in the Atlas of NSW Wildlife (OEH 2017b), ranging from 1988 to 2009. The closest record in the Atlas of NSW Wildlife is approximately 2.5 kilometres to the south-east. There is also a record of the koala made in 2002 by Greenloaning BioStudies approximately a kilometre to the north-east of the Development Site in the land proposed to be used as an onsite offset as part of the current Modification (Cumberland Ecology 2014). No records within a 10 kilometres radius of the Development Site have been made in the last 5 years.

Given the paucity of nearby recent (in last 5 years) records and the relatively small area of habitat to be removed (up to 7.66 hectares) compared to large areas of surrounding similar habitat, the Development Site is unlikely to support key source populations for breeding or dispersal. The Development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the koala.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the koala present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Development Site is unlikely to comprise an important population of the koala and therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the koala and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The assessment of koala habitat within the context of the koala referral guidelines indicates that the proposal site comprises habitat critical to the survival of the species. The removal of approximately 7.66 hectares of koala habitat, is considered a small area in the context of the similar surrounding remnant vegetation in freehold land, crown land and large conservation areas. Additionally this habitat does not contain any primary koala feed trees, there are no recent records of the koala in the local region and this species was not recorded as part of targeted surveys.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the koala and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the koala and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the koala would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the koala becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the koala to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the koala.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of koala as the Development Site is not considered to support an important population of this species.

Although an assessment using the EPBC Act Referral Guidelines for the Vulnerable Koala (DoE 2014) indicates that the Development Site contains habitat critical to the survival of the koala, the Proposed Action is considered unlikely to result in a significant impact on the koala given that no primary food trees have been recorded on the Development Site, the absence of recent records of the koala in the local region, this species was not recorded as part of targeted surveys and the relatively small area of habitat to be removed compared to large areas of surrounding similar habitat.

Long-nosed Potoroo (*Potorous tridactylus tridactylus*)

The long-nosed potoroo (SE Mainland) occurs in Victoria, NSW and Queensland. In Victoria the Long-nosed Potoroo (SE Mainland) occurs in six discrete regions, including the South-western region, Grampians, Otways, Western Port, Wilsons Promontory and east Gippsland. The Long-nosed Potoroo (SE Mainland) is sparsely distributed along the coast and Great Dividing Range of south-east Queensland through NSW. In NSW and Queensland this species can be found in eucalypt forests to coastal heaths and scrubs.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The long-nosed potoroo was not recorded within the Modification Area (Umwelt 2016a). The nearest record of this species to the Development Site is approximately 20 kilometres to the north-east according to the Atlas of NSW Wildlife (OEH 2017b).

Given the lack of nearby records and the relatively small area of habitat to be removed compared to large areas of surrounding similar habitat, the Development Site is unlikely to support key source populations for breeding or dispersal. The Development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the long-nosed potoroo.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the long-nosed potoroo present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential habitat for the species, however the Development Site is unlikely to comprise an important population of long-nosed potoroo. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the long-nosed potoroo and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the long-nosed potoroo and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the long-nosed potoroo and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the long-nosed potoroo would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the long-nosed potoroo becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the long-nosed potoroo to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the long-nosed potoroo.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of long-nosed potoroo as the Development Site is not considered to support an important population of this species.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The grey-headed flying-fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. Only a small proportion of this range is used at any one time, as the species selectively forages where food is available. The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The grey-headed flying-fox was not recorded within the Modification Area (Umwelt 2016a). The nearest record of this species to the Development Site is approximately 4 kilometres to the south-west according to the Atlas of NSW Wildlife (OEH 2017b).

Given the relatively small area of habitat (up to 19 hectares) to be removed compared to large areas of surrounding similar habitat, the Development Site is unlikely to support key source populations for breeding or dispersal. The Development Site may be used for opportunistic foraging when suitable tree species are in blossom, however no camp sites for this species are likely are known to occur in the Development Site. The Development Site is also unlikely to comprise populations necessary for maintaining

genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the grey-headed flying-fox.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the grey-headed flying-fox present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential foraging habitat for the species, however the Development Site is unlikely to comprise an important population of grey-headed flying-fox. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the grey-headed flying-fox and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of this species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the grey-headed flying-fox and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the grey-headed flying-fox and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the grey-headed flying-fox would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the grey-headed flying-fox becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the grey-headed flying-fox to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the grey-headed flying-fox.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of grey-headed flying-fox as the Development Site is not considered to support an important population of this species.

New Holland Mouse (*Pseudomus novaehollandiae*)

The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, NSW and Queensland. The species is now largely restricted to the coast of central and northern NSW, with one inland occurrence near Parkes. This species is known to occur in a range of vegetation communities including open heathland, open woodland with a heathland understorey and vegetated sand dunes.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species' range.

The New Holland mouse was not recorded within the Modification Area (Umwelt 2016a). The nearest record of this species to the Development Site is approximately 20 kilometres to the east according to the Atlas of NSW Wildlife (OEH 2017b).

Given the lack of nearby records and the relatively small area of habitat (up to 19 hectares) to be removed compared to large areas of surrounding similar habitat, the Development Site is unlikely to support key source populations for breeding or dispersal. The Development Site is also unlikely to comprise populations necessary for maintaining genetic diversity given the small area to be cleared compared to the available habitat within freehold land, crown land and large conservation areas in the surrounding local area. The Marramarra National Park occurs approximately 2 kilometres to the east, the Dharug National Park occurs approximately 8 kilometres to the north-east, the Parr State Conservation Area occurs approximately 8 kilometres to the north, which collectively provide connectivity to the expansive Yengo National Park to the North and Wollemi National Park to the north-west. In addition, connectivity is provided to the east through the Muogamarra Nature Reserve to the Ku-ring-gai Chase National Park. The Development Site is also not near the limit of the known range of this species. Therefore the Development Site is unlikely to contain an important population of the New Holland mouse.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the New Holland mouse present within the Development Site, the Proposed Action will not lead to a long-term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will result in the loss of up to 19 hectares of potential habitat for the New Holland mouse, however the Development Site is unlikely to comprise an important population of new Holland mouse. Therefore the Proposed Action is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the New Holland mouse and therefore the Proposed Action is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The Development Site is not considered to be critical habitat for this species and consequently the Proposed Action is not expected to adversely affect habitat critical to the survival of the new Holland mouse.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the New Holland mouse and therefore the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the New Holland mouse and therefore the Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the new Holland mouse would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Proposed Action is unlikely to result in an invasive species that is harmful to the New Holland mouse becoming established in this species habitat.

- **Introduce disease that may cause the species to decline.**

The Proposed Action is unlikely to introduce disease that may cause the New Holland mouse to decline.

- **interferes substantially with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the New Holland mouse.

Conclusion

The Proposed Action is not predicted to result in a significant impact upon an important population of New Holland mouse as the Development Site is not considered to support an important population of this species.

2.2 Further Assessment of MNES Potentially Significantly Impacted

As identified in Attachment A of Attachment 1 Commonwealth Department of Environment Assessment Requirements as part the letter detailing Environmental Assessment Requirements (NSW Department of Planning and Environment 2016) the following requirements are addressed for the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC and *Darwinia biflora* which are likely to be significantly impacted according to DoEE.

2.2.1 Coastal Upland Swamps in the Sydney Basin Bioregion EEC

9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

Coastal Upland Swamps in the Sydney Basin Bioregion EEC was recorded as one small patch within the Development Site and a larger patch in the Modification Area which will be setup as an onsite offset. Refer to Section 3.2 of the Biodiversity Assessment Report (Umwelt 2016a) for further details. **Figure 2.3** shows the extent of this EEC in the Development Site. Identification of this EEC involved a detailed assessment against the Conservation Advice (including Listing Advice) provided by the Department of the Environment under the EPBC Act (TSSC 2014a), refer to section 3.2.3.2 of the Biodiversity Assessment Report (Umwelt 2016a). The *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC does not currently have a recovery plan, threat abatement plan, wildlife conservation plans or any other relevant policy statement.

This EEC occurs where groundwater seeps to the surface or where surface waters collect near-surface. The very small area (0.08 hectares) of this EEC to be removed is considered to be a negligible impact and is not considered to represent habitat critical to the survival of this community.

(ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.

Detailed floristic surveys (including systematic plot surveys) were undertaken to identify the occurrences of *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC in 2014. Analysis of consistency with the conservation advice for this EEC was undertaken (Threatened Species Scientific Committee 2014). Within the Modification Area a single detailed floristic 20 x 20 metre plot and a single 10 x 10 metre semi-quantitative rapid sampling plot were used to sample this community. These were completed between 25 and 27 November 2014. The spring timing of these surveys meant that it maximised detectability of cryptic flora species since many species flower during this period. The surveys collected floristic, condition, soil and biophysical characteristics in order to confidently assess the presence of the EEC according to the conservation advice (TSSC 2014a).

(iii) description of the impacts of the action having regard to the full national extent of the species or community's range.

Overall the current extent of this community in Australia is estimated to be approximately 5360 hectares (TSSC 2014a). The removal of this community within the Development Site will result in approximately a 0.0015 per cent reduction within Australia. The Modification involves the complete removal of this community (approximately 0.08 hectares) from within the Development Site.

10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account.

As detailed above, a total of 0.08 hectares of *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC will be removed from the Development Site.

(ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts;

Dixon Sands has completed a Biodiversity Assessment Report (Umwelt 2016a) using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA) for the Development Site along with the inclusion of offset credit calculations for two proposed offset sites as part of a Biodiversity Offset Strategy (Umwelt 2017), comprising the Haerses Road Offset Site and the Porters Road Offset Site. The Biodiversity Assessment Report is currently being finalised in consultation with DPE and OEH with an addendum to be prepared to this report with the final strategy. In summary, the Biodiversity Offset Strategy will likely involve a range of offsetting mechanisms available under FBA, including BioBanking offset lands, purchasing deficit credits from the credit market and/or possible future contributions to an offset fund. With regard to offsetting *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC, the FBA process has been applied to generate surplus ecosystem credits for the same Plant Community Type (PCT) which also meets the *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC under the EPBC Act. That is, the proposed offsets fully address the offset requirement for this EEC. A further detailed response is provided below regarding credit profiles and the condition of this EEC.

(iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.

To offset the impacts on *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC the onsite Haerses Road Offset Site is proposed. According to the FBA assessment the credit profile requires 3 ecosystem credits to offset the impacts of the Modification. The credit profile also lists three plant community types (PCTs) which can be used to offset the impacts in the Yengo – Hawksbury/Nepean IBRA subregion (or any IBRA subregion which adjoins). These requirements are met through the generation of 11 ecosystem credits (a surplus of 8 ecosystem credits) from the equivalent PCT which is also forms part of the Co*astal Upland Swamps in the Sydney Basin Bioregion* EEC meeting like for like rules.

It is also noted that in addition to satisfying FBA offsetting requirements, a preliminary EPBC offset calculator assessment found that the proposed offset provides a 239.04% offset requirement for the impacts. Note that 0.2 hectares is the minimum area for the calculator and this was used instead of the 0.08 hectares of this EEC to be impacted.

11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy.

As discussed above, the proposed Haerses Road Offset Site according to the FBA and the EPBC Act offset calculator fully satisfies the offsetting requirements for the EEC and provides a surplus of credits/land based offsets.

2.2.2 *Darwinia biflora*

9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

According to the Approved Conservation Advice (TSSC 2014) '*This species is found on gentle slopes near the crests of ridges or on sheet rock with moss beds. It exists on Lucas Heights Soil Landscapes meeting colluvial or erosional soil landscapes. Associated species include Lesser Flannel-flower (Actinotus minor), Dwarf Apple (Angophora hispida), Golden Banksia (Banksia ericifolia) and Woolly Tea-tree (Leptospermum trinervium)*'. *Darwinia biflora* does not currently have an adopted recovery plan (according to the Species Profile and Threats Database – Department of the Environment and Energy 2017c), threat abatement plan, wildlife conservation plans or any other relevant policy statement. In any case, the NSW Department of Environment and Conservation (2004) *Darwinia biflora* Recovery Plan was considered in this assessment. According to this recovery plan the vegetation which *Darwinia biflora* can be found in comprises Sandstone Ridgetop Woodland and Sydney Sandstone Scrub-heath complex. This is consistent with much of the Development Site remnant native vegetation.

This species was recorded throughout the Development Site and Modification Area, refer to Section 3.3.2.3 of the Biodiversity Assessment Report (Umwelt 2016a) for further details. The density of *Darwinia biflora* was found to be high and it was impractical to record every individual. This species is a known fire ephemeral and populations fluctuate substantially post-fire with high population numbers after fire and a decrease with time since fire (NSW Department of Environment and Conservation 2004). Instead of a count of the number of individuals, the area of habitat for this species has been mapped within the Development Site according to the NSW Guide to Surveying Threatened Plants (OEH 2016).

The total area of mapped likely habitat for *Darwinia biflora* is 17.82 hectares within the Development Site (as shown on **figure 2.3**), comprising all occurrences of Red Bloodwood - scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion and Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion. As per the assessment of significance undertaken as part of the Referral (Umwelt 2015), the population of *Darwinia biflora* is considered to be an important population. The habitat with the Development Site is however not considered to be critical to the survival of *Darwinia biflora* given that this species is known to be occur in seven conservation areas, with greater than 5,000 individuals present at each of these sites (DoEE 2017b) .

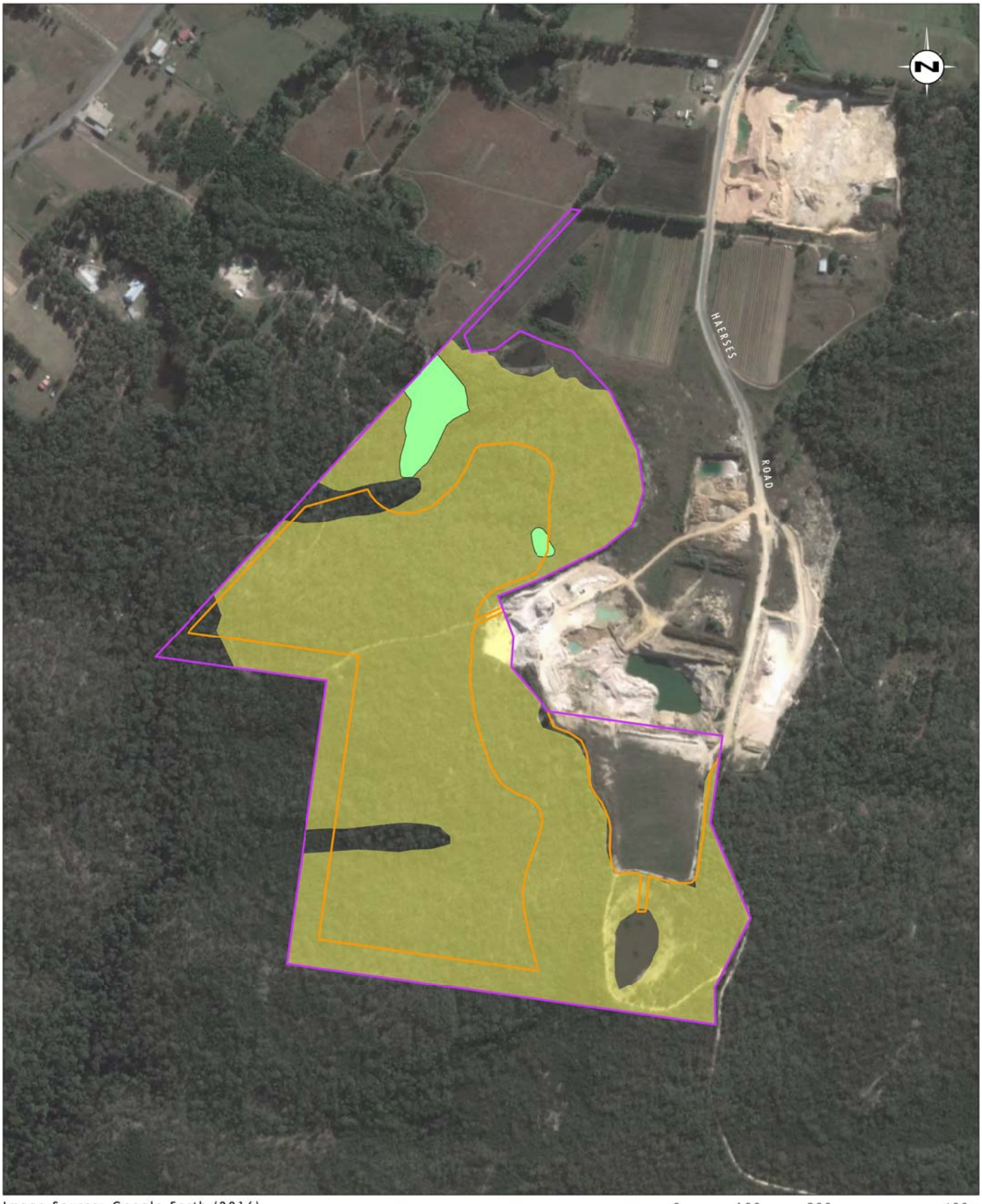

Image Source: Google Earth (2016)

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Legend

- Development Site
- Modification Area
- 'Coastal Upland Swamp in the Sydney Basin Bioregion EEC'
- *Darwinia biflora* Habitat

FIGURE 2.3

Darwinia biflora Habitat and Coastal Upland Swamps in the Sydney Basin Bioregion EEC within the Development Site and Modification Area

(ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.

Targeted surveys were undertaken for *Darwinia biflora* during two separate surveys events in November 2014 and December 2015. For further details refer to Section 2.7 of the Biodiversity Assessment Report (2016). These surveys are consistent with the survey guidelines specified on the Species Profile and Threats Database (Department of the Environment and Energy 2017c), which states that surveys can be conducted all year round. The timing of the surveys within the Modification Area meant that this species was flowering and maximised detection. As noted by the Species Profile and Threats Database (Department of the Environment and Energy 2017b), '*surveys of plants above ground can underestimate populations by not taking into account the potential in the soil seed bank*'. Instead of individual counts, the area of habitat for this species was mapped to assess the impacts.

Given the potential for large numbers of Darwinia biflora present in the Modification Area, it was impractical to count and mark each individual plant. Instead, the numbers of *Darwinia biflora* were counted within standard 10 x 10 metre or 20 x 20 metre plots (depending on density) during the initial survey in November 2014. This species was recorded in the Sandstone Heath (Heath/Woodland Complex) and Sandstone Ridgetop Woodland.

Further targeted survey effort was undertaken for *Darwinia biflora* in the December 2015 survey. This involved a randomised sampling of 10 x 10 metre plots within suitable habitat for the species within the Development Site. The location of plots were randomised using a stratified grid network and between 30 minutes and 60 minutes was spent counting every individual within the plot. The time spent was dependent on how many individuals of the species were present. As the plot locations were randomly stratified, *Darwinia biflora* did not necessarily occur in every plot.

Due to the sporadic nature in which the species occurs in the Modification Area, the impacts to *Darwinia biflora* were assessed by area of habitat rather than the number of individuals. This approach was discussed with OEH during the course of the project.

(iii) description of the impacts of the action having regard to the full national extent of the species or community's range.

As detailed above a total of 17.82 hectares of likely *Darwinia biflora* will be removed.

10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account.

As detailed above a total of 17.82 hectares of likely *Darwinia biflora* will be removed.

(ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts;

As previously discussed, Dixon Sands have completed a Biodiversity Assessment Report (Umwelt 2016a) using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA) for the Development Site along with the inclusion of offset credit calculations for two proposed offset sites as part of a Biodiversity Offset Strategy (Umwelt 2017), comprising the Haerses Road Offset Site and the Porters Road Offset Site. As discussed above, the Biodiversity Assessment Report is currently being finalised in consultation with DPE and OEH. In summary, the Biodiversity Offset Strategy will likely involve a range of offsetting mechanisms available under FBA, including BioBanking offset lands, purchasing deficit credits

from the credit market and/or possible future contributions to an offset fund. With regard to *Darwinia biflora* Dixon Sands have two offset sites which contain habitat for this species and will contribute to offsetting the residual adverse impacts. A further detailed response is provided below regarding credit profiles and the condition of habitat for this species.

(iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.

To offset the impacts on *Darwinia biflora* the onsite Haerses Road Offset Site and the offsite Porters Road Offset Site are proposed. According to the FBA assessment the credit profile requires 360 species credits (based on 17.82 hectares of habitat as opposed to individuals) to offset the impacts of the Modification. The Haerses Road Offset Site provides 163 species credits (comprising approximately 23 hectares of habitat) and the Porters Road Offset Site provides 270 credits (comprising approximately 38 hectares of habitat). A surplus 73 credits are generated using land based offsets.

A preliminary EPBC calculator assessment found that the proposed offsets provide a 214.63 per cent offset requirement for the impacts.

11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy.

As discussed above the proposed offset strategy fully satisfies the offsetting requirements for the species and exceeds the residual impact requirements for *Darwinia biflora* under the FBA.

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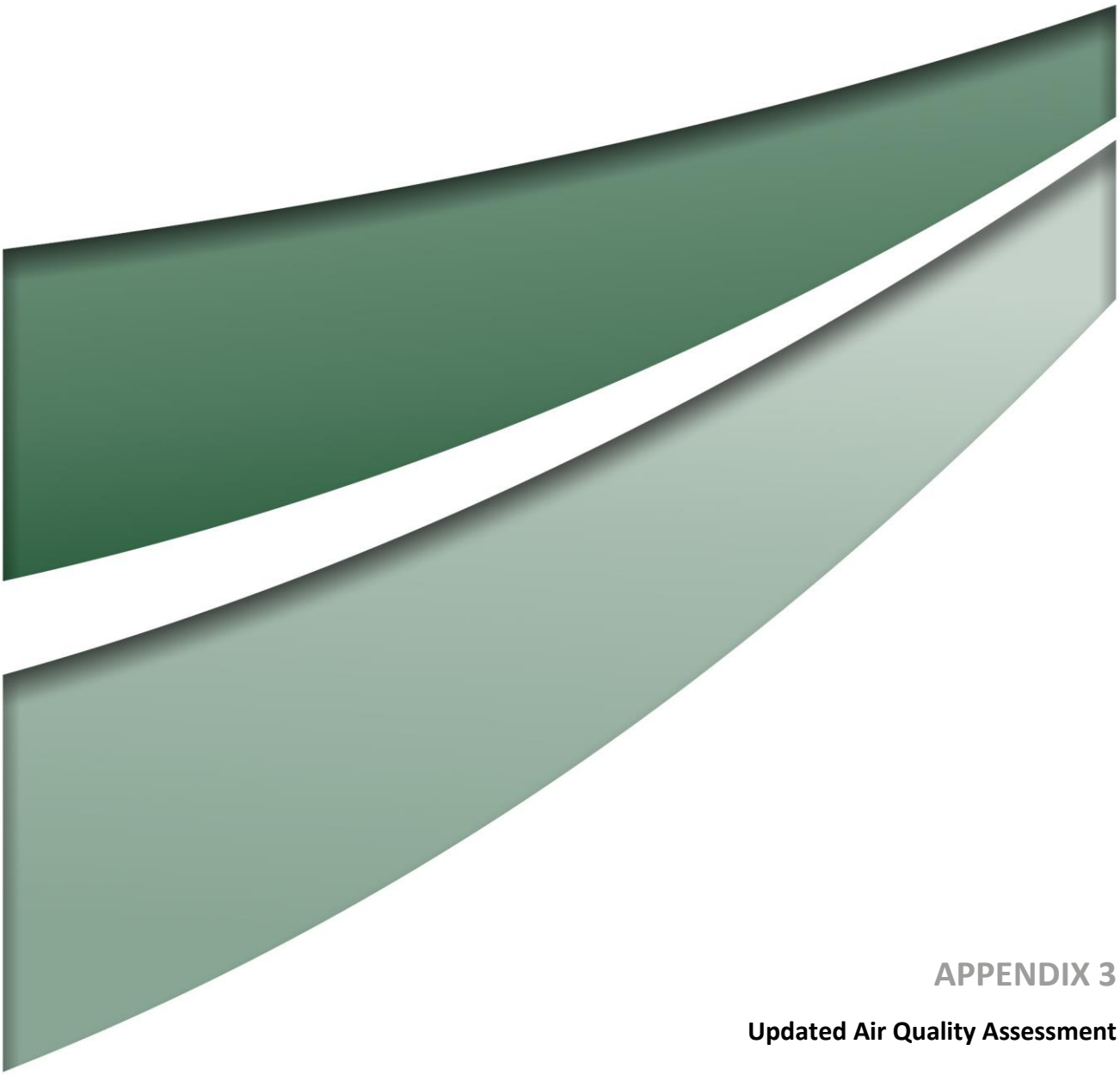

APPENDIX 3

Updated Air Quality Assessment

Lachlan Sweeney
Senior Environmental Consultant
Umwelt (Australia) Pty Limited

Email: lsweeney@umwelt.com.au

5 October 2017

Dear Lachlan

Re: Haerses Road Sand Quarry – Response to EPA

In September 2016 Pacific Environment provided an air quality assessment (AQA) for the proposed Haerses Road Sand Quarry (the Proposal) (Pacific Environment, 2016). In February 2017 Pacific Environment provided a response to submissions following comments from NSW EPA.

Further comments have now been received from NSW EPA (2017) in response to the submissions. The following provides a copy of the full comments from NSW EPA and our response.

EPA comment:

The current NSW EPA comments regarding air quality are per below:

> **Air Quality Impact Assessment**
>
> The EPA has reviewed the AQIA, Dixon Sand Haerses Road Quarry Modification – Haerses Road, Maroota, New South Wales (PEL 2016) and the Response to Submissions (RTS) Report (Umwelt, June 2017). The RTS Report indicates that the proposed extension will cause one additional exceedance of the PM10 24 hour average criterion.
>
> PEL notes that a number of management controls are proposed that were not accounted for in the modelling. PEL further notes that when the predicted concentration due to activities at the site exceeds 8 µg/m3, the background concentration is below 16 µg/m3, and therefore the dust prevention controls specified in Condition M2.4 of the EPL are adequate.
>
> However, dispersion modelling in the AQIA predicts a 24 hour average PM10 concentration of approximately 58 µg/m3 at R6 in October 2015. This exceeds the EPA's impact assessment criterion of 50 µg/m3. Figure 13 of the RTS Report indicates that project related activities contributed approximately 26.5 µg/m3, with background concentration contributing approximately 31 µg/m3. In this circumstance, Condition M2.4 would not have been implemented, and hence would not have prevented the exceedance. Further, R6 is located north-west of the site, and therefore a wind direction of approximately 120°-140° would be required to cause impacts at R6. Since Condition M2.4 applies to winds with direction between 180° and 240°, it would not have been effective in preventing exceedances, regardless of background concentration.
>
> According to the RTS Report, other controls will be implemented at the site that have not been modelled. In order to demonstrate that these controls will be effective in preventing exceedances, the AQIA should be revised to incorporate the controls into the modelling.
>
> **Recommendation**: In accordance with Section 11.2.3 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*, since the AQIA predicts additional exceedances in ground level PM10 concentrations, the proponent must revise the AQIA to demonstrate that additional control measures will be effective in preventing exceedances.

Response:

The additional control measures identified in the February 2017 Response to Submissions were:

- Watering of exposed areas
- Fencing, bunding, shelterbelts or in-pit dump of extraction areas
- Vegetative ground cover
- Use of chemical wetting agents on stockpiles
- Vegetative windbreaks at stockpiles
- Reduction of stockpile height
- Use of wind screens/fences
- Stockpile shaping/orientation
- Application of water at transfers

These have applied to emission calculations for the Proposal as detailed in Table 1 per the recommendations contained in the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly *et al.*, 2011).

The AQA assessment predicted concentrations for two operational scenarios:

- Dry processing outside extraction cells
- Dry processing inside extraction cells

For each of these scenarios, emissions estimation and dispersion modelling was completed for:

- Annual production
- Maximum daily production,

The NSW EPA comments are based on the single predicted cumulative exceedance at Receptor 6. It is noted that the predicted exceedance at this location occurred for the maximum-day operations with dry processing outside the extraction cells. This response is therefore limited to updating the emissions for this scenario (see Table 2 to Table 4) and updating the dispersion modelling for the predictions at R6.

Table 1: *Summary of Best Practice Dust Management*

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
9.2	66	Hauling on Unsealed Roads	Vehicle restrictions	Speed reduction from 75 km/h to 50 km/h	N			
				Speed reduction from 65 km/h to 30 km/h	Y	Not quantifiable	20km/h truck speed limit on unsealed haul road and all quarry areas	
				Grader speed reduction from 16 km/h to 8 km/h	N			
			Surface improvements	Pave the surface	N			
				Low silt aggregate	Y	Not quantifiable	Emission equation contains parameter for silt content of road. Conservative value of 6.4% used.	
				Oil and double chip surface	N			
			Surface treatments	Watering (standard procedure)	Y	75%	Use of watercart and sprinklers. Currently trialling best type of suppressant	
				Watering Level 1 (2 L/m^2/h)	N			
				Watering Level 2 (>2 L/m^2/h)	N			
				Watering grader routes	Y	None		
				Watering twice a day for industrial unpaved road	Y	None		
				Dust suppressants (please specify)	N			

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
			Other	Use of larger vehicles	N			
				Conveyors	N			
9.3	71	Wind Erosion on Exposed Areas & Overburden Emplacements	Avoidance	Minimise pre-strip	Y	Not quantifiable		
			Surface stabilisation	Watering	Y	None	As no control was applied to the emissions, the modelling results are considered conservative	50% control in extraction areas
				Chemical suppressants	N			
				Paving and cleaning	N			
				Application of gravel to stabilise disturbed open areas	N			
				Rehabilitation goals	Y	Not quantifiable		
			Wind speed reduction	Fencing, bunding, shelterbelts or in-pit dump	Y	Not quantifiable	As no control was applied to the emissions, the modelling results are considered conservative.	55% control in extraction areas
				Vegetative ground cover	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	70% control
9.3	72	Wind Erosion and Maintenance - Coal Stockpiles	Avoidance	Bypassing stockpiles	N			
			Surface stabilisation	Water sprays	N			
				Chemical wetting agents	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	85% control on stockpiles
				Surface crusting	N			

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
				agent				
				Carry over wetting from load in	N			
			Enclosure	Silo with bag house	N			
				Cover storage pile with a tarp during high winds	N			
			Wind speed reduction	Vegetative windbreaks	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	30% control on stockpiles
				Reduced pile height	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	30% control on stockpiles
				Wind screens/fences	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	80% control
				Pile shaping/orientation	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.	50% control
				Erect 3-sided enclosure around storage piles	N			
9.4	76	Bulldozers on OB	Minimise travel speeds and distance		N			
			Travel routes and material kept moist		N			
9.5	81	Blasting and drilling	Blasting	Delay shot to avoid unfavourable	N			

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
				weather conditions				
				Minimise area blasted	N			
	82		Drilling	Fabric filters	N			
				Cyclone	N			
				Water injection while drilling	N			
9.6	85	Draglines	Minimise drop height		N			
			Minimising drop height		N			
			Modify activities in windy conditions		N			
			Water sprays		N			
			Minimise side casting		N			
9.7	90	Loading and dumping overburden	Excavator	Minimise drop height	N			
			Truck dumping	Minimise drop height	N			
				Water application	N			
				Modify activities in windy conditions	N			
9.8	95	Loading and dumping ROM coal	Avoidance	Bypass ROM stockpiles	N			
			Truck or loader	Minimise drop height	N			

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
			dumping coal	Water sprays on ROM pad	N			
			Truck or loader dumping to ROM bin	Water sprays on ROM bin or ROM pad	N			
				Three sided and roofed enclosure of ROM bin	N			
				Three sided and roofed enclosure of ROM bin + water sprays	N			
				Enclosure with control device	N			
9.9	96	Conveyors and transfers	Conveyors	Application of water at transfers	N	None	Note washed products are already saturated.	50% control from boom tip water sprays
				Wind shielding - roof OR side wall	N			
				Wind shielding - roof AND side wall	N			
				Belt cleaning and spillage minimisation	Y	Not quantifiable		
			Transfers	Enclosure	N			
9.1	97	Stacking and reclaiming product coal	Avoidance	Bypass coal stockpiles	N			
			Loading coal stockpiles	Variable height stack	N			
				Boom tip water sprays	Y	None	As no control was applied to the emissions, the modelling results are considered conservative	

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments per Pacific Environment (2017) For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?	New Controls Applied
Section	Table							
				Telescopic chute with water sprays	N			
			Unloading coal stockpiles	Bucket-wheel, portal or bridge reclaimer with water application	N			
9.11	-	Train and truck load out and transportation	Limit load size to ensue coal is below sidewalls		N			
			Maintain a consistent profile		N			
			Water sprays		N			
			Use bed liners to minimise seepage		N			
			Cover load with tarpaulin		N			
			Utilise truck wheel wash		N			

Table 2: *TSP emissions inventory*

ACTIVITY	TSP (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Variable 5	Units	Control	Units	Assumptions
Extraction Area																		
Dozer stripping topsoil (from pit 5)	9,312	1,000	h/y	9.3	kg/h	13	silt content in %	4	moisture content (%)									
FEL Loading sand to trucks (from pit 5)	65	310250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)									
Hauling from pit 5 to Processing Area (unsealed)	9,212	310250	t/y	0.119	kg/t	28	t/load	51	Vehicle gross mass (t)	1	km/return trip	3.33	kg/VKT	6.4	% silt content	75	% control	
Processing Area																		
FEL Unloading sand to stockpile	65	310,250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)									
FEL Loading sand from stockpile	65	310,250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)									
FEL Unloading sand to Dry Processing	65	310,250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)									
Crusher (uncontrolled)	6,050	310,250	t/y	0.0195	kg/t													
Transfer (Crusher to Screen) [conveyor transfer point]	33	310,250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control	50% control from application of water at transfers for the boom tip water sprays
Screen (uncontrolled)	3,878	310,250	t/y	0.0125	kg/t													
Transfer (Screen to Wet Processing) [conveyor transfer point]	33	310,250	t/y	0.00021	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control	50% control from application of water at transfers for the boom tip water sprays
Wet Processing (no expected emissions)	-																	
FEL Loading sand from Product Stockpile to haul trucks	18	310,250	t/y	0.00006	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	10	moisture content (%)									
Hauling out of Site (unsealed)	8,940	310,250	t/y	0.115	kg/t	30	t/load	45	Vehicle gross mass (t)	1.1	km/return trip	3.14	kg/VKT	6.4	% silt content	75	% control	
Hauling out of Site (sealed)	2,023	310,250	t/y	0.007	kg/t	30	t/load	45	Vehicle gross mass (t)	2.6	km/return trip	0.08	kg/VKT	0.4	g/m2 silt loadin	0	% control	
Wind Erosion																		
WE - Extraction Area (pit 3)	591	3.0	ha	0.1	kg/ha/h	8,760	h									77.5	% control	50% control from watering and 55% control from fencing, bunding, shelterbets or in-pit dump
WE - (pit 4)	1,314	5.0	ha	0.1	kg/ha/h	8,760	h									70	% control	70% control for vegetative ground cover
WE - (pit 5)	1,340	5.1	ha	0.1	kg/ha/h	8,760	h									70	% control	70% control for vegetative ground cover
WE - Extraction Stockpile	18	0.14	ha	0.1	kg/ha/h	8,760	h									85	% control	85% control on stockpiles for chemical wetting agents
WE - Pre Processing Stockpile	18	0.14	ha	0.1	kg/ha/h	8,760	h									85	% control	85% control on stockpiles for chemical wetting agents
WE - Product Stockpile	18	0.14	ha	0.1	kg/ha/h	8,760	h									85	% control	85% control on stockpiles for chemical wetting agents

Table 3: *PM_{10} emissions inventory*

ACTIVITY	PM10 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Variable 5	Units	Control	Units
Extraction Area																	
Dozer stripping topsoil (from pit 5)	2,271	1,000	h/y	2.3	kg/h	13	silt content in %	4	moisture content (%)								
FEL Loading sand to trucks (from pit 5)	31	310250	t/y	0.00010	kg/t	0.47	average of (wind	4	moisture content (%)								
Hauling from pit 5 to Processing Area (unsealed)	2,487	310250	t/y	0.032	kg/t	28	t/load	51	Vehicle gross mass (t)	1	km/return trip	0.90	kg/VKT	6.4	% silt content	75	% control
Processing Area																	
FEL Unloading sand to stockpile	31	310,250	t/y	0.00010	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
FEL Loading sand from stockpile	31	310,250	t/y	0.00010	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
FEL Unloading sand to Dry Processing	31	310,250	t/y	0.00010	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
Crusher (uncontrolled)	2,327	310,250	t/y	0.0075	kg/t												
Transfer (Crusher to Screen) [conveyor transfer point]	15	310,250	t/y	0.00010	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control
Screen (uncontrolled)	1,334	310,250	t/y	0.0043	kg/t												
Transfer (Screen to Wet Processing) [conveyor transfer point]	15	310,250	t/y	0.00010	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control
Wet Processing (no expected emissions)	-																
FEL Loading sand from Product Stockpile to haul trucks	9	310,250	t/y	0.00003	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	10	moisture content (%)								
Hauling out of Site (unsealed)	2,413	310,250	t/y	0.031	kg/t	30	t/load	45	Vehicle gross mass (t)	1.1	km/return trip	0.85	kg/VKT	6.4	% silt content	75	% control
Hauling out of Site (sealed)	388	310,250	t/y	0.001	kg/t	30	t/load	45	Vehicle gross mass (t)	2.6	km/return trip	0.01	kg/VKT	0.4	g/m2 silt loadi	0	% control
Wind Erosion																	
WE - Extraction Area (pit 3)	296	3.0	ha	0.05	kg/ha/h	8,760	h									77.5	% control
WE - (pit 4)	657	5.0	ha	0.05	kg/ha/h	8,760	h									70	% control
WE - (pit 5)	670	5.1	ha	0.05	kg/ha/h	8,760	h									70	% control
WE - Extraction Stockpile	9	0.14	ha	0.05	kg/ha/h	8,760	h									85	% control
WE - Pre Processing Stockpile	9	0.14	ha	0.05	kg/ha/h	8,760	h									85	% control
WE - Product Stockpile	9	0.14	ha	0.05	kg/ha/h	8,760	h									85	% control

Table 4: *$PM_{2.5}$ emissions inventory*

ACTIVITY	PM2.5 (kg/y)	Intensity	Units	Emission factor	Units	Variable 1	Units	Variable 2	Units	Variable 3	Units	Variable 4	Units	Variable 5	Units	Control	Units
Extraction Area																	
Dozer stripping topsoil (from pit 5)	978	1,000	h/y	0.98	kg/h	13	silt content in %	4	moisture content (%)								
FEL Loading sand to trucks (from pit 5)	5	310250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
Hauling from pit 5 to Processing Area (unsealed)	249	310250	t/y	0.003	kg/t	28	t/load	51	Vehicle gross mass (t)	1	km/return trip	0.09	kg/VKT	6.4	% silt content	75	% control
Processing Area																	
FEL Unloading sand to stockpile	5	310,250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
FEL Loading sand from stockpile	5	310,250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
FEL Unloading sand to Dry Processing	5	310,250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)								
Crusher (controlled)	181	310,250	t/y	0.00059	kg/t												
Transfer (Crusher to Screen) [conveyor transfer point]	2	310,250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control
Screen (controlled)	116	310,250	t/y	0.00038	kg/t												
Transfer (Screen to Wet Processing) [conveyor transfer point]	2	310,250	t/y	0.000015	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	4	moisture content (%)							50	% control
Wet Processing (no expected emissions)	-																
FEL Loading sand from Product Stockpile to haul trucks	1	310,250	t/y	0.000004	kg/t	0.47	average of (wind speed/2.2)^1.3 in m/s	10	moisture content (%)								
Hauling out of Site (unsealed)	241	310,250	t/y	0.003	kg/t	30	t/load	45	Vehicle gross mass (t)	1.1	km/return trip	0.08	kg/VKT	6.4	% silt content	75	% control
Hauling out of Site (sealed)	94	310,250	t/y	0.000	kg/t	30	t/load	45	Vehicle gross mass (t)	2.6	km/return trip	0.00	kg/VKT	0.4	g/m2 silt loading	0	% control
Wind Erosion																	
WE - Extraction Area (pit 3)	44	3.0	ha	0.0075	kg/ha/h	8,760	h									77.5	% control
WE - (pit 4)	99	5.0	ha	0.0075	kg/ha/h	8,760	h									70	% control
WE - (pit 5)	101	5.1	ha	0.0075	kg/ha/h	8,760	h									70	% control
WE - Extraction Stockpile	1	0.14	ha	0.0075	kg/ha/h	8,760	h									85	% control
WE - Pre Processing Stockpile	1	0.14	ha	0.0075	kg/ha/h	8,760	h									85	% control
WE - Product Stockpile	1	0.14	ha	0.0075	kg/ha/h	8,760	h									85	% control

The maximum 24-hour average PM_{10} concentration at R6 applying the updated emissions is is 19.4 µg/m^3, compared with 26.4 µg/m^3 for the previous modelling scenario.

The 24-hour average PM_{10} concentrations at Receptor 6 including the Proposal contribution and the background concentrations at Maroota School are shown in Table 5. Excluding the day when the measured concentrations at Maroota School exceeded the assessment criteria, the maximum predicted cumulative concentrations at R6 for maximum-day activities, when dry processing occurs outside the pit, is 42.6 µg/m^3 when the Proposal is predicted to contribute less than 0.1 µg/m^3.

There are no additional exceedances due to the Proposal when considering the background concentrations recorded at Maroota School.

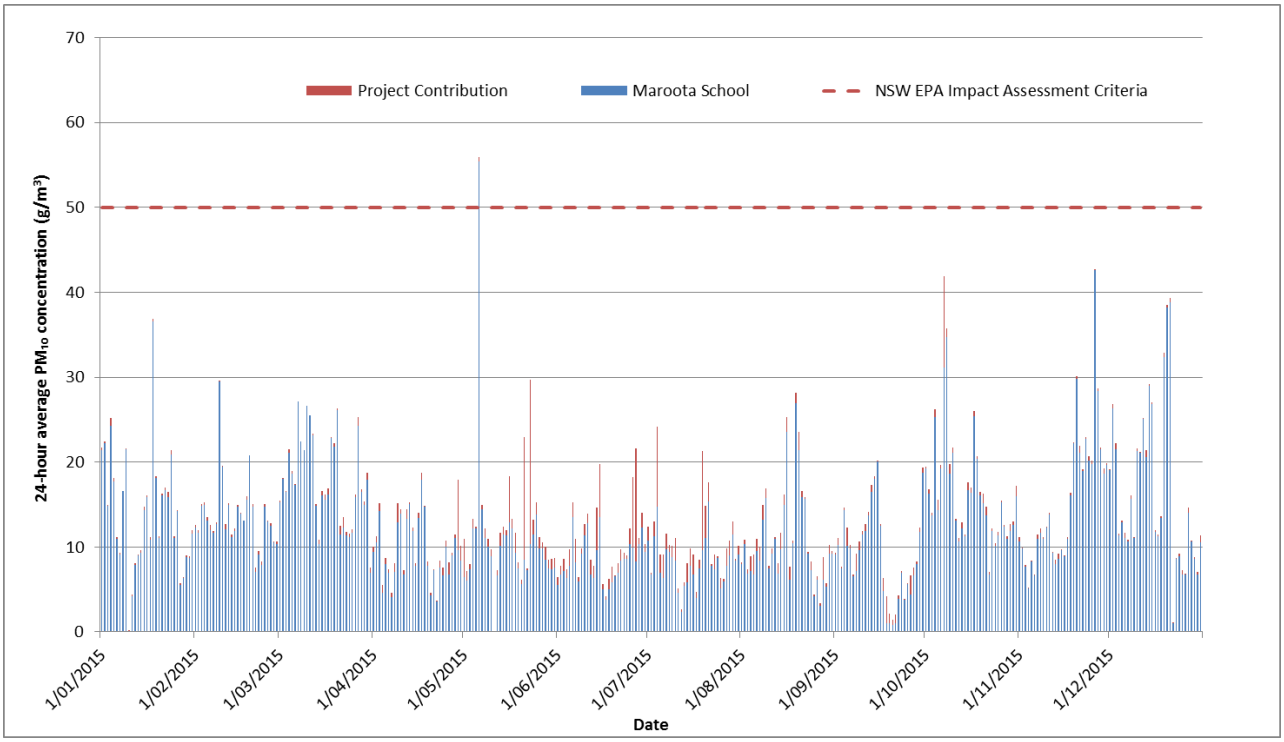

Table 5: *24-hour average PM_{10} concentrations at Receptor 6 including project contribution and background concentrations*

Kind regards

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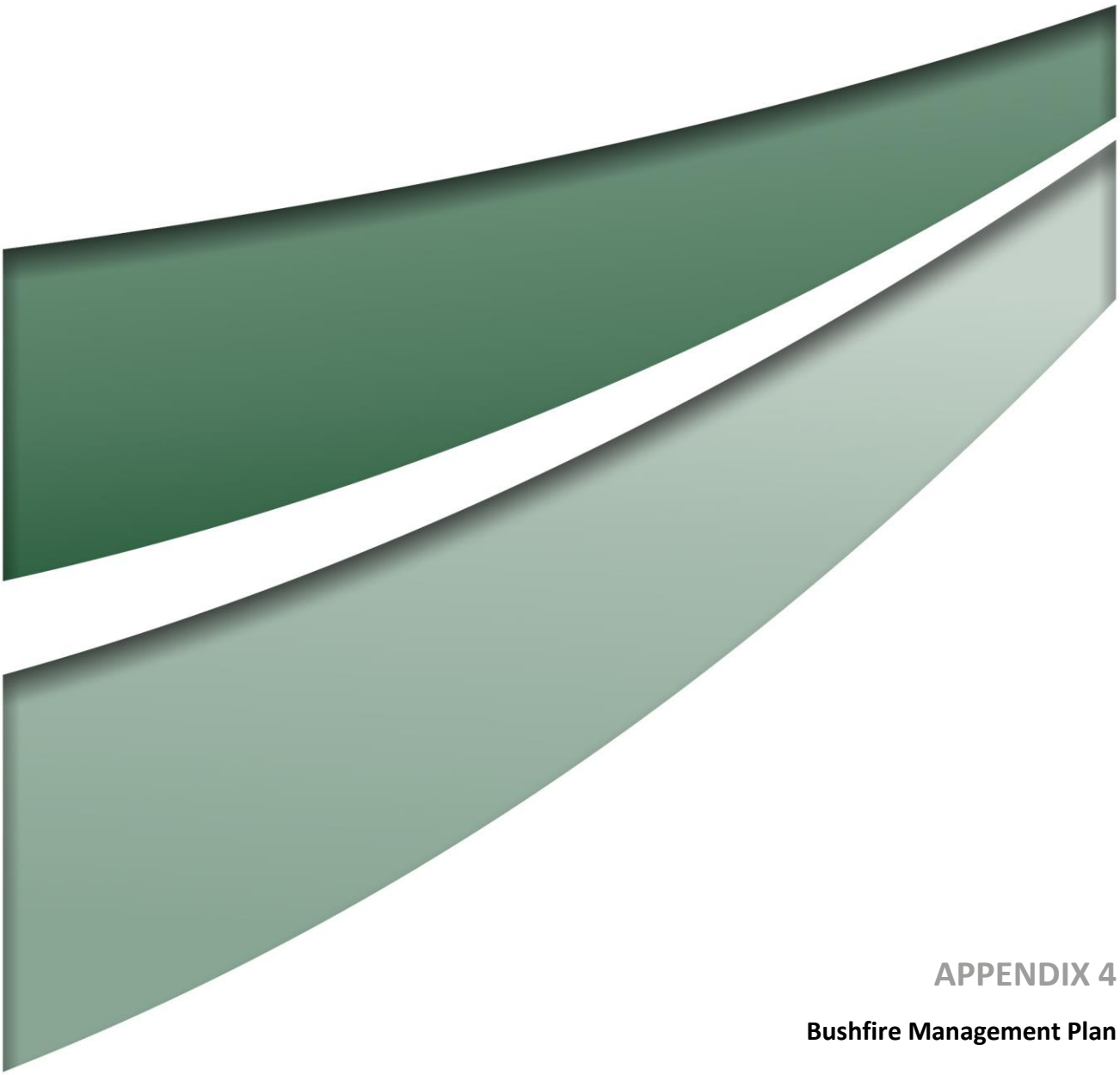

APPENDIX 4

Bushfire Management Plan

Bushfire Management Plan
Part 1 -
Environmental Management

Dixon Sand
Lots 1, 2, 29 & 196,
4610 Old Northern Road and
Haerses Road, Maroota

Dixon Sand (Penrith) Pty Ltd

August 2016

Version	Date	Author	Authorised by:	Comments
0.1	01/06/2016	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Draft for consultation with the RFS and The Hills Shire Council
0.2	12/08/2016	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Second draft for consultation with the RFS
1.0	26/08/2016	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Addressed RFS comments

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ABBREVIATIONS

AHIMS	Aboriginal Heritage Information Management System
BFMP Part 1	Bushfire Management Plan Part 1 – Environmental Management
BFMP Part 2	Bushfire Management Plan Part 2 – Emergency Management and Evacuation Plan
ONR	Old Northern Road
RFS	NSW Rural Fire Service

1. INTRODUCTION

1.1. Background

Dixon Sand (Penrith) Pty Ltd operates two quarry sites in Maroota, NSW. The Old Northern Road (ONR) quarry site was granted development consent 250-09-01 on 24th May 2004 by the Land and Environment Court NSW. The Haerses Road quarry site was granted development consent 165-07-05 on 14th February 2006 by the Minister of Planning pursuant to Schedule 3, Condition 33 which requires the preparation of a Bushfire Management Plan (BFMP). As the ONR and Haerses Road quarry sites are interlinked through material processing and transport procedures, this BFMP has been prepared to address the risk and protection measures of bushfire for both quarry sites.

1.2. Aims and Objectives

This BFMP Part 1 outlines the mitigation measures to prevent the occurrence of unplanned bushfire and to minimise the danger of the spread of bushfires on or from their land. This BFMP Part 1 addresses the requirements of the relevant development consents and forms part of the ONR Site Environmental Management Plan and Haerses Road's Environmental Management Strategy.

The objectives of the BFMP Part 1 are as follow:

- Quarry activities on the site are managed in the way that risk of human-induced fire outbreak is minimised,
- In the event of a bushfire outbreak, mitigation measures are in place to contain and prevents the fire from spreading,
- Have in place an arrangement to liaise with and provide support to the RFS should a fire outbreak occurs on the quarry sites, and
- Undertake appropriate investigation for any outbreak of fire to determine the cause and measures to prevent similar events from occurring.

The BFMP has been prepared in consistent with the Environmental Impact Statements for the Old Northern Road and Haerses Road sites, conditions of development consent, relevant legislation and associated guidelines.

1.3. Criteria and Guidelines

The BFMP has been prepared to address the requirement and guidance of the following documents:

- Development Consent 165-07-05 Schedule 3 Condition 33 requires:
  "Bushfire Management - The Applicant Shall:
  a) Ensure that the development is suitably equipped to respond to any fires on site; and
  b) Assist the Rural Fire Service and emergency services as much as possible if there is a fire on site during the development; and

c) Prepare conservation sensitive Bushfire Management Plan for the site in consultation with, and to the satisfaction of Council and the Rural Fire Service."

- Development Consent 250-09-01 Schedule 2 Condition 6.3f) requires:

  "A **Bushfire Management Plan** for the site, developed in consultation with Council and relevant emergency services. The Plan shall be consistent with any bushfire management measures for State Forests and National Parks in the region";

- *Rural Fire Act* 1997 Section 63 Duties of public authorities and owners and occupiers of land to prevent bush fires
- Rural Fire Regulation 2013.
- The Hills Bushfire Risk Management Plan (The Hills Shire Council, 2010)
- A Guide for Councils, Planners, Fire Authorities and Developers – planning for bush fire protection (RFS, 2006).
- Development Planning – A guide to developing a Bush Fire Emergency Management and Evacuation Plan (RFS, 2014).
- AS/NZS ISO 31000:2009 Risk Management Principles and Guidelines.

1.4. Consultation

This BFMP Part 1 has been prepared in consultation with:

- NSW Rural Fire Service – The Hills Fire Control Centre (Kenthurst), and
- the Hills Shire Council

2. IDENTIFYING AND ASSESSING THE BUSHFIRE RISK

2.1 Bushfire Prone Land Mapping

The ONR and Haerses Road quarry sites are mapped on the Hills Shire Council Bushfire Prone Land Map Sheet 12 (May, 2012) as being on bushfire prone land. Refer to Appendix A.

Parts of the quarry sites are classified as:

- Bushfire Prone Land Vegetation Category 1 (coloured orange) – most hazardous vegetation category and contains the most dense vegetation, and
- Bushfire Prone Land Vegetation Bugger 100m and 30m (coloured red) – Areas adjoining Vegetation Category 1 within a 100m buffer.

The Hills Shire Council Bushfire Management Plan identified the bushfire season from spring to autumn. The start of the bushfire seasons often coincides with the prevailing northwest winds.

2.2 Potential Impact

The BFMP Part 1 has been prepared with a priority to provide for the protection and safety of human life (including quarry staff, contractors, nearby residents and firefighters), properties, quarry assets and the environment.

Dixon Sand (Penrith) ONR and Haerses Road quarry sites are located within the Hills Shire Council jurisdiction and are classified as being in bushfire prone land. A number of bushfire events have previously occurred in the region.

A bushfire has the potential to endanger lives and damage property when left unattended. Bushfires also have the potential to impact upon flora and fauna, including threatened species identified at both quarry sites. Some native species would however, benefit from fire events which enhance their life cycle.

Table 1 identifies the natural and anthropogenic assets at the ONR and Haerses Road sites.

Table 1: Natural and anthropogenic assets identified at the quarry sites

Quarry Site	Asset Type	Asset
Old Northern Road	Natural – threatened flora species	• *Tetratheca glandulosa*, • *Melaleuca deanei*, • *Kunzea rupestris*, and • *Darwinia fascicularis* susp*. Oligantha.*
	Natural – conservation areas	Rehabilitation area (Native vegetation corridor of 6.83 hectares)
	Anthropogenic – quarry assets	• Site office and amenities • Workshop • Tools and equipment • Quarry plant such as excavators, dozers, dump trucks, loaders and screeners/crushers. • Environmental monitoring equipment including groundwater standpipe piezometers, dust gages, weather station and TEOM.
	Anthropogenic – neighbouring properties	• Neighbouring residents and commercial premise • Maroota Public School
Haerses Road	Natural – threatened flora species	*Darwinia biflora*,
	Natural – conservation areas	• Vegetation offset area (minimum 2 hectares pursuant to DA 165-07-05), and • Biodiversity offset (8.70 hectares pursuant to DA 250-09-01).
	Aboriginal Heritage	AHIMS Site #45-2-0081 constituting a rock shelter with white ochre hand stencils, charcoal drawings and stone artefact deposit
	Anthropogenic – quarry assets	• Site office and amenities • Tools and equipment • Quarry plant such as excavators, dozers, dump trucks and loaders. • Environmental monitoring equipment including groundwater standpipe piezometers and dust gages.
	Anthropogenic – neighbouring properties	Neighbouring residents and commercial premise

2.3 Risk Assessment

The process of bushfire risk identification and assessment was established through the Australia/New Zealand Standard AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines. Figure 1 below is a representation of the risk management process.

The bushfire risk assessment is the result of the interaction between the hazard, community and the environment. Identification of the assets at risk is crucial as well as development of a suite of recommended risk treatment options. The risks are to be prioritised in order to protect life, property and the environment respectively, including the preservation of natural features and promote ecological diversity.

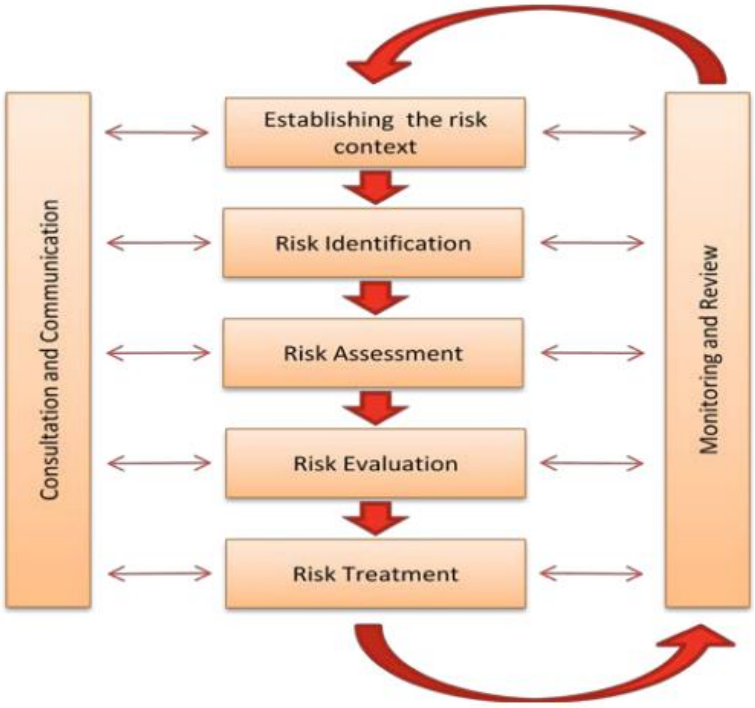


Figure 1 – Risk Management Process (source: NSW RFS 2014)

An annual risk assessment will be undertaken at the quarry sites before the commencement of bushfire season which occurs between October and March. However, the bushfire season may change subject to fuel load and climatic conditions.

The bushfire risk assessment will consider the following:

- Fuel loads at the quarry sites,
- Advice from the RFS,
- Climatic conditions of the preceding year, and
- Planning for Bushfire Protection (RFS, 2006).

2.4 Hazard Assessment

A preliminary hazard assessment to the building infrastructure and assets at the quarry site identified a low hazard exists for quarry operations. The assessment is based upon:

- Existing quarried area, hard stands and roads
- Existing vegetation within the land defined for the development is restricted to the edge of the boundary. As the development progresses it is expected that rehabilitated area will vary between a grassed area and woodland / open shrub.
- Distance between the buildings and vegetation is greater than 100 metres and will result in minimal attack from radiant heat.

3. POTENTIAL SOURCES OF IGNITION AND MITIGATION MEASURES

3.1 Potential Sources of Ignition and Ameliorative Actions

The following potential sources of bushfire ignition have been and ameliorative actions have identified for the quarry sites in Table 2:

Table 2: Sources of ignition, consequence and ameliorative actions.

Sources of Ignition	Consequence	Ameliorative Actions
Quarry Area, Offices, Amenities, Workshop and on-site residents	The risks of bushfire during the construction phase include; ignition from equipment maintenance and repair, unguarded vehicle exhausts, faulty appliances leading to electrical faults.	Vehicles to be restricted to identified vehicle routes in accordance with the quarry traffic plan to reduce the risk of spark emissions. Activities which create sparks or hot particles (such as metal grinding and welding) will be carried out in the designated area and/or workshop with a minimum of 20 metres from vegetation.
Electricity Transmission Line	During hot weather electricity transmission lines may sag, and under windy conditions may come in contact with each other and arc, and may cause sparks to ignite vegetation in the vicinity of the lines.	Electricity transmission line easement will be inspected and the utility owner will be contacted regarding the vegetation management within the easement.
Lightning	Lightning may cause ignition of vegetation surrounding the quarry sites	No specific management practise
Transport Corridors	The quarry sites are situated in close proximity to regional roads with heavy traffic at times. The main risk of ignition is from cigarette butts discarded by the road users.	Access road into the quarry sites will be regularly inspected.
External fires	Bushfire may enter the quarry sites from adjacent lands in the form of ember attack.	The quarry sites themselves act as a firebreak. Rapid and co-ordinate fire- fighting responses to the bushfire at their early stage where feasible.
Others	Other potential sources of ignition are related to human activities including unintentional and wilful acts such as vehicle accidents causing fire, out of control hazard reduction in the region or arson.	The potential sources are unanticipated events and therefore cannot be prevented. Rapid and co-ordinate fire- fighting responses to the bushfire at their early stage where feasible.

3.2 Management Safeguards

The following management safeguards will be implemented:

- Both water site is equipped with water infrastructure to act as a source of water for firefighting:
    - Old Northern Road – 10,000 litre water truck (road registered), mains water, water in tailings ponds.
    - Haerses Road – 25,000 litre water tank with pumps and outlet for fast fill.
- Earth moving equipment
- Portable radios
- Fire extinguishers located at vantage points
- New buildings to comply with Building Code of Australia
- Appropriate maintenance and testing of equipment, plant and electrical appliances
- Keep all access tracks and roads clear to facilitate movement of fire-fighting vehicles
- Staff and contractors will be trained on the bushfire risks, safeguards and fire emergency procedures.

4. RESPONSIBILITIES AND ACCOUNTABILITIES

4.1 Managers

The Managers of the quarry sites have the following responsibilities:

- Ensure that all development consent conditions are followed by employees, contractors and service providers,
- Ensure compliance with all relevant regulations, licenses and approvals,
- Maintain the overall responsibility for activities undertaken at the quarry sites, and
- Undertake regular inspections on the bushfire protection measures and initiate any maintenance required.

4.2 Environmental Officer

The Environmental Officer of the quarry sites has the following responsibilities:

- Implement the procedures contained in this BFMP (Parts 1 and 2),
- Ensure the employees and contractors are appropriately trained and made aware of the fire emergency procedures including firefighting techniques,
- Ensure all procedures detailed in this BFMP are followed by the employees and contractors,
- Organise inspection and risk assessment of bushfire, and
- Report the bushfire risk assessment and any review in the Annual Review document.

4.3 Plant Operators, Contractors and Visitors

The plant operators, contractors and visitors have the following responsibilities:

- Implement all necessary actions to prevent an outbreak of fire / bushfire,
- Assist the RFS in firefighting where feasible, and
- Follow emergency / bushfire emergency and evacuation procedure.

5. FIRE / BUSHFIRE EMERGENCY RESPONSE PROCEDURE

Refer to the Bushfire Management Plan Part 2 – Emergency Management and Evacuation Plan.

6. MONITORING, REPORTING AND REVIEW

6.1 Monitoring

The managers or delegate will appropriately monitor the condition of bushfire protection measures on the quarry site and identify any maintenance required. Monitoring will be undertaken for but not limited to the following:

- Accessibility of roads and tracks with considerations to safety in regards to existing quarried areas and surface constraints,
- Potential interface of vegetation and powerlines,
- Conditions of fire breaks,
- Accessibility to surface water supplies (sediment pond and hydrants),
- Accessibility to earth moving equipment to create fire breaks
- Accessibility to water tankers for transport of water and firefighting, and
- Register of training of employees.

6.2 Reporting

The details of bushfire risk assessment and training will be provided in the Annual Review document.

6.3 Review

The BFMP Parts 1 and 2 will be reviewed after the fire season and after any incidents of bushfire or fire. The review process will ensure ongoing adaptiveness and effectiveness of the BFMP.

7. SUMMARY OF ACTIONS, TRIGGERS, TIMING AND RESPONSIBILITY

Table 3 below summarises the action, timing, triggers, responsibility, monitoring and reporting regime.

Table 3: Summary of action, triggers, responsibility, monitoring and reporting.

Action	Trigger / Timing	Responsibility	Monitoring	Reporting
Annual inspection and bushfire risk assessment	Prior to bushfire season	Managers, Environmental Officer and RFS representative	Bushfire protection measures	
Inspection and maintenance of firefighting equipment	Annually and after a bushfire event	Managers or delegates		
Firefighting training	On appointment	Firefighting Training Contractor or relevant emergency services		
Investigation of fire incidents	After a bushfire event	Police and RFS representative		
Annual reporting on bushfire risk assessment	Annually	Environmental Officer		Environmental Officer
Control of Bushfire		RFS and trained firefighters		Firefighting team

8. REFERENCES

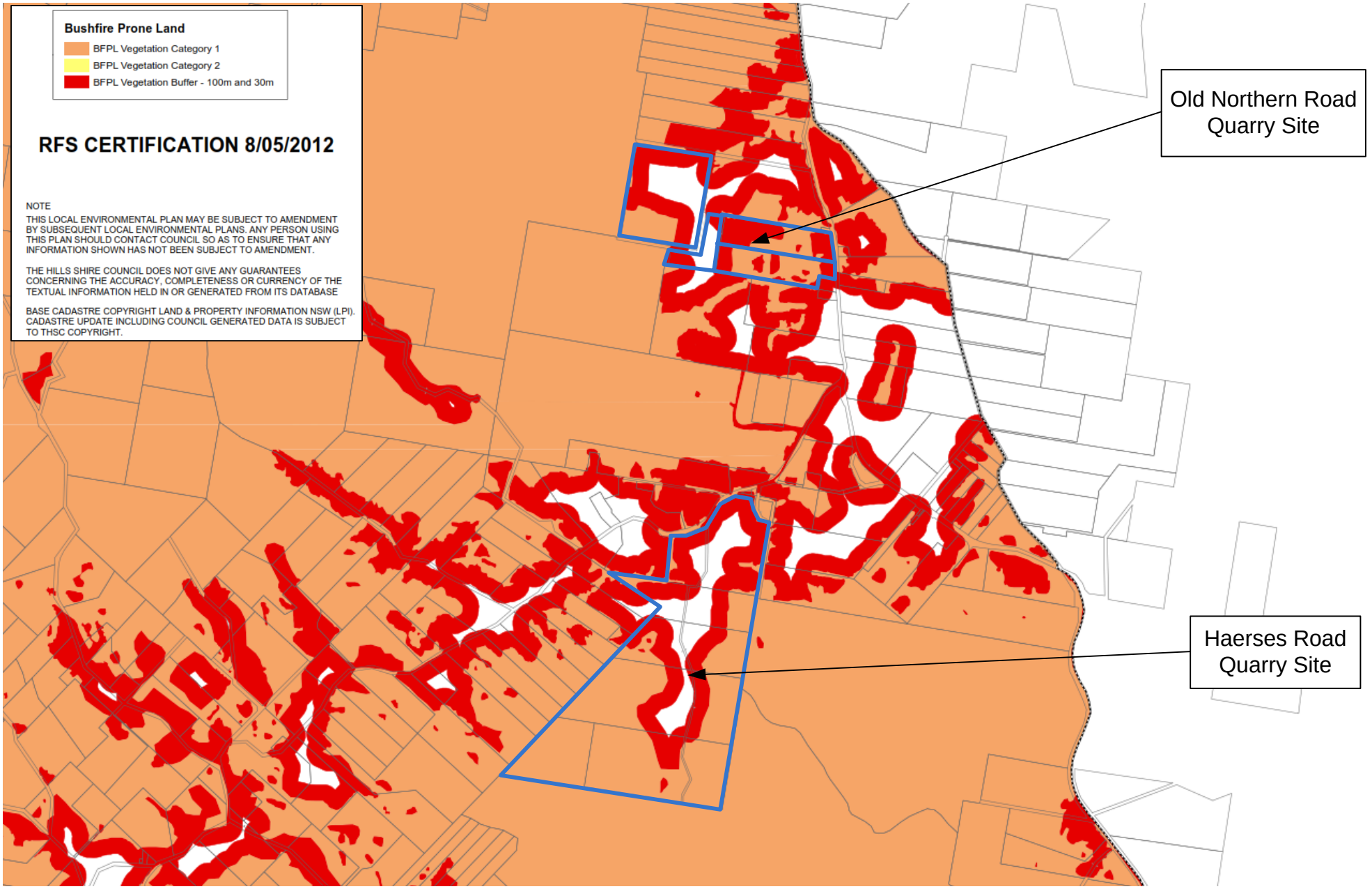
Hills Shire Council, The (2010) The Hills Bushfire Risk Management Plan

Hills Shire Council, The (2012) Bushfire Prone Land Mapping – Sheet 12

Rural Fire Service (2014) Development Planning – A guide to developing a Bush Fire Emergency Management and Evacuation Plan

APPENDIX A

Bushfire Prone Land Mapping



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OnSite Environmental Management

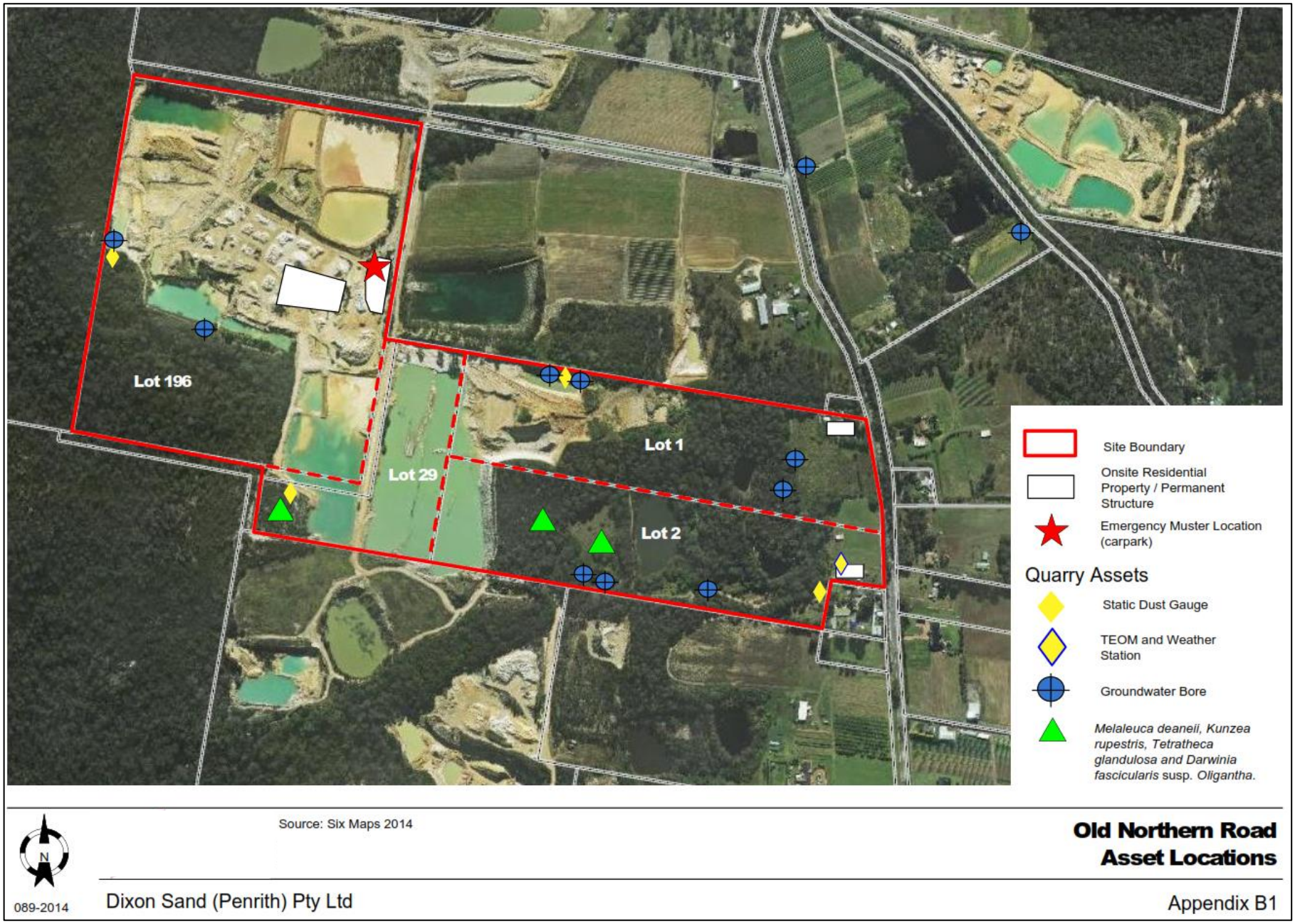
Source: HSC Bushfire Prone Land Sheet 12

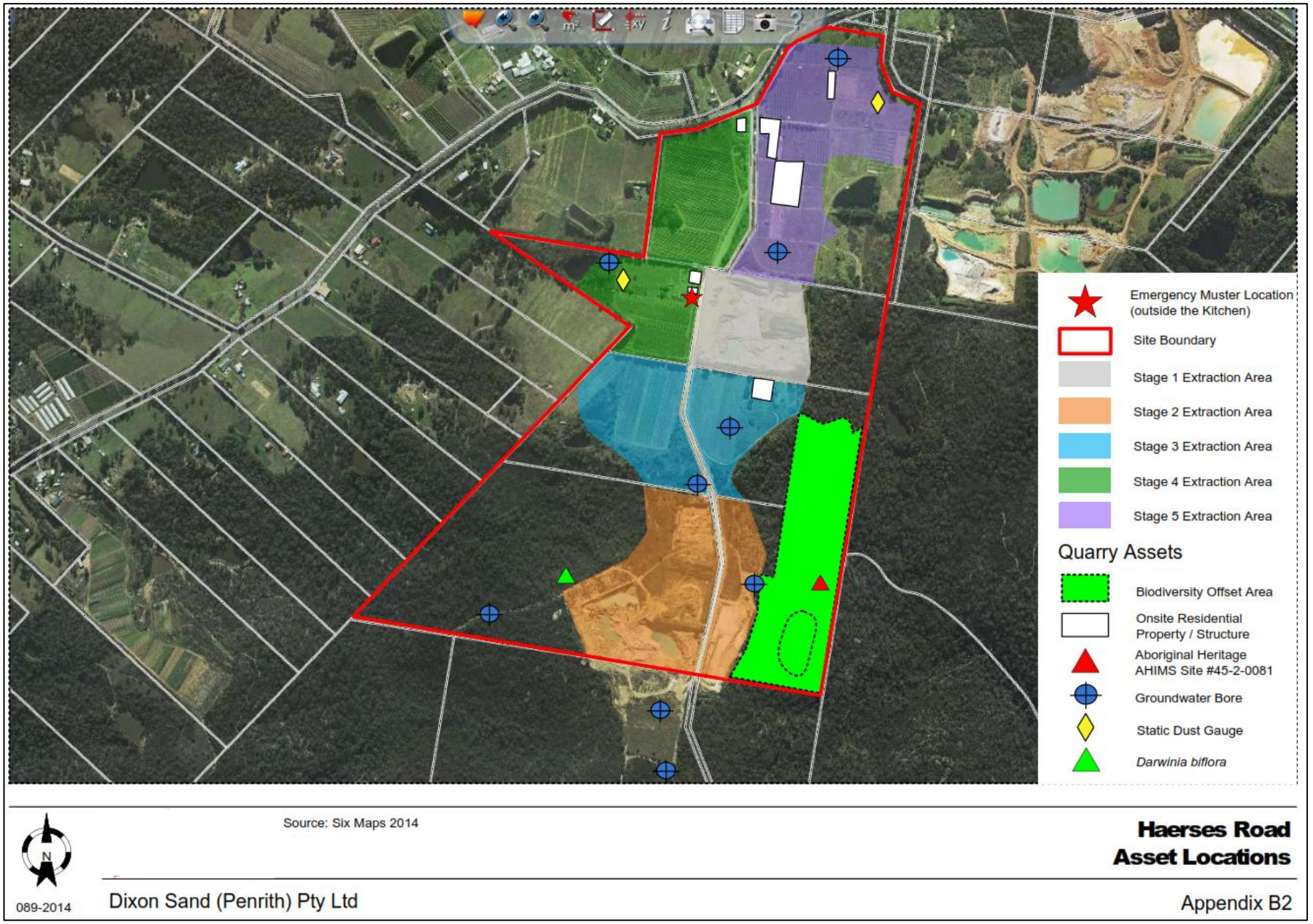
The Hills Shire Council
Bushfire Prone Land Mapping (2012)

APPENDIX B

B1 Locations of Assets at the Old Northern Road Site

B2 Locations of Assets at Haerses Road Site


Lot 196
Lot 29
Lot 1
Lot 2
Site Boundary
Onsite Residential Property / Permanent Structure
Emergency Muster Location (carpark)
Quarry Assets
Static Dust Gauge
TEOM and Weather Station
Groundwater Bore
Melaleuca deaneii, Kunzea rupestris, Tetratheca glandulosa and Darwinia fascicularis susp. Oligantha.
N
Source: Six Maps 2014
Old Northern Road
Asset Locations
089-2014
Dixon Sand (Penrith) Pty Ltd
Appendix B1


Emergency Muster Location (outside the Kitchen)
Site Boundary
Stage 1 Extraction Area
Stage 2 Extraction Area
Stage 3 Extraction Area
Stage 4 Extraction Area
Stage 5 Extraction Area
Quarry Assets
Biodiversity Offset Area
Onsite Residential Property / Structure
Aboriginal Heritage AHIMS Site #45-2-0081
Groundwater Bore
Static Dust Gauge
Darwinia biflora
N
Source: Six Maps 2014
Haerses Road
Asset Locations
089-2014
Dixon Sand (Penrith) Pty Ltd
Appendix B2

APPENDIX C

NEIGHBOURHOOD SAFER PLACES

NSW RURAL FIRE SERVICE

The Hills LGA Neighbourhood Safer Places

Title	Type	Location	LGA
North Rocks Community Centre	Building	Cnr North Rocks Road & Farnell Avenue, Carlingford	The Hills
Hills Community Care	Building	Conie Avenue (Off Seven Hills Road), Baulkham Hills	The Hills
Castle Hill Showground	Open Space	131 Showground Road, Castle Hill	The Hills
George Thornton Reserve	Open Space	42 Hill Road, West Pennant Hills	The Hills
Bernie Mullane Sporting Complex Car Park	Open Space	10 Marella Avenue, Kellyville	The Hills
Wisemans Ferry Park	Open Space	5602-5624 Old Northern Road, Wisemans Ferry	The Hills
South Maroota Community Centre	Building	1 Paul's Road, South Maroota	The Hills
Maroota Public School	Building	4540 Old Northern Road, Maroota	The Hills
Ulinbawn Water Ski Park	Open Space	951 Sackville Ferry Road, Sackville North	The Hills
Dargle Ski Park	Open Space	351-353 River Road, Lower Portland	The Hills
The Hills Centenary Park	Open Space	404 Commercial Road, Rouse Hill	The Hills
Cliftonville Lodge Resort - Kiosk Building	Building	1558 River Road, Lower Portland	The Hills
Glenhaven Community Centre	Building	76 Glenhaven Road, Glenhaven	The Hills
Dural Country Club	Building	662A Old Northern Road, Dural	The Hills
Les Shore Oval - Clubhouse	Building	2658 Old Northern Road, Glenorie	The Hills
Kenthurst Uniting Church	Building	Cnr Kenthurst Road and Jones Road, Kenthurst	The Hills
Dural Mall	Open Space	Kenthurst Road, Dural	The Hills

Bushfire Management Plan
Part 2 -
Emergency Management and Evacuation Plan

Dixon Sand
Lots 1, 2, 29 & 196,
4610 Old Northern Road and
Haerses Road, Maroota

Dixon Sand (Penrith) Pty Ltd

June 2017

Version	Date	Prepared by:	Authorised by:	Comments
0.1	12/08/2016	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	First draft for consultation with the RFS
1.0	26/08/2016	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Addressed RFS comments
2.0	26/04/2017	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Change of nominated Deputy Wardens
3.0	16/06/2017	Hunsamon Churcher Environmental Officer	David Dixon Director – Dixon Sands (Penrith) Pty Ltd	Addressed RFS comment

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Appendix A On-Premise Shelter Refuge Maps

Appendix B Evacuation Refuge Map

1. FACILITIES DETAILS

This plan is for: Dixon Sand (Penrith) Pty Ltd Maroota Quarry Sites:

- Old Northern Road site (ONR) – 4610 Old Northern Road, Maroota NSW 2756
- Haerses Road site (HR) – Haerses Road, Maroota NSW 2756

And has been designed to assist management to protect life and property in the event of a bush fire.

This plan outlines the procedures for both **sheltering** (remaining on-site) and **evacuation** to enhance protection of occupants from the threat of a bush fire.

The decision to shelter or evacuate will be undertaken at the time, taking into account all factors on the day of the event. The decision will be based on maximising the safety of the employees and occupants on site.

Shelter ☐ ✓

(if too late to evacuate)

Evacuate ☐ ✓

(if there is sufficient time based on the trigger points in Section 4.2)

Table 1: Facilities Information

Contact person	David Dixon		
Position / role	Managing Director (Chief Warden)		
Phone number :(BH)	02 4566 8348	**Phone number (AH)**	0414 330 490
Type of facility	Active Quarry	**Number of buildings**	ONR – 5 HR – 5
No. of employees	17 *	**No. of occupants**	ONR – 1 HR – 10
No. of contractors	Varies *	**No. of visitors**	Varies *
Number of occupants with support needs:		Nil	

*Note *: The number of employees, contractors and visitors vary on a daily basis. Refer to the Employee, Contractor and Visitor's Sign-in Registers located at the Weighbridge.*

2. ROLES AND RESPONSIBILITIES

The following outlines who has the responsibility of implementing the emergency procedures in the event of a bushfire.

1.1. Chief Warden

The Chief Warden is responsible for immediately responding to an emergency alarm, determine if an emergency should be declared on the premise, determine what emergency procedures should be implemented, and bring this BFMP Part 2 promptly into action.

The Chief Warden's duty will be to assume control of the occupants (including staff, contractors and visitors) of the premise:

- From the time a bushfire or fire alarm is given,
- Through to the arrival of the emergency response service, and until the emergency response service recommendation is given for premise or building re-entry,
- Be available, or organising cover, for all times that the premise is occupied,
- Organise and distribute to all Wardens and to all occupants of the premise relevant information for use in an emergency,
- Organise and install prominent display evacuation plans for each work zone,
- Maintaining and distributing to all premise occupants a current list of all Wardens and Deputy Wardens (with phone numbers and locations), and
- Provide training or organise training of newly appointed Wardens in emergency procedures outlined in this BFMP Part 2.

On becoming aware of a potential emergency, the Chief Warden shall determine the nature of the emergency and decide on the appropriate action. If the emergency is declared, the Chief Warden shall initiate the emergency procedures which include the following actions:

- Ensure that the appropriate emergency service has been notified,
- Ensure that all on duty Wardens and Deputy Wardens are advised of the situation,
- Initiate the evacuation procedure if necessary, and
- Brief emergency service personnel on their arrival and thereafter act on the instructions of the emergency services' senior officer.

1.2. Deputy Wardens

The Deputy Wardens is responsible for providing assistance to the Chief Warden as required. If the Chief Warden is absent from the premise, the Deputy Warden(s) shall assume the Chief Warden's responsibilities.

Table 2: Appointed Chief and Deputy Wardens

Position	Name	Building / area of responsibility	Contact Details
Chief Warden	David Dixon	ONR HR	UHF Channel 5 02 4566 8348 0414 330 490
Deputy Warden	Chris Day	ONR HR	UHF Channel 5 02 4566 8348 0488 598 491
Deputy Warden	Ben Grogan	ONR HR	UHF Channel 5 02 4566 8348 0458 187 378
Deputy Warden	Mick Munnoch	ONR HR	UHF Channel 5 02 4566 8348 0458 079 241
Deputy Warden	Hunny Churcher	ONR HR	UHF Channel 5 02 4566 8348

1.3. Emergency Contacts

Table 3: Emergency Contacts

Name of Organisation	Office / Contact	Phone Number / Contact Detail
Emergency Police / Fire / Ambulance	Triple Zero Call Centre	000
NSW Rural Fire Service	The Fire Control Centre (Hills District, Kenthurst)	02 9654 1244
NSW Rural Fire Service	Bushfire Information Line	1800 679 737
NSW Rural Fire Service	Website	www.rfs.nsw.gov.au
NSW Police Force	Wisemans Ferry Station	02 4566 4302
NSW Police Force	Castle Hill Station	02 9680 5399
NSW Police Force	Windsor (AH) Station	02 4577 4111
Hospital	Windsor Hospital	02 4560 5555
Hospital	Westmead Hospital	02 9845 5555
Medical Centre	Round Corner Medical Centre	02 9651 1269
Medical Centre	Hills District Medical Centre	02 9634 3344

3. SHELTERING PROCEDURES

Evaluation of the safety of employees and occupants has determined that it would be safer for ALL persons to shelter in a designated refuge.

The following are the designated refuges allocated within the premises.

3.1 Designated Muster Points

Old Northern Road Emergency Muster Point adjacent to the Washout Bay.

Haerses Road Emergency Muster Point outside the Lunch Room.

3.2 Refuge Buildings

Old Northern Road Lunch Room

Haerses Road Lunch Room

3.3 Procedures for sheltering during a bushfire emergency

Table 4: Sheltering Procedures

Trigger	Action
1. Fire Rating Index: • Low – Moderate, • High or • Very High	• Quarry in operation • Wardens to keep informed and monitor conditions. • Be ready to act if necessary.
2. Fire Rating Index: • Severe, or • Extreme	• Quarry in operation • Wardens to keep informed and monitor conditions. • Be ready to act if necessary.
3. First visual observation of smoke in the region.	• For fire situation and updates: ○ Contact the Hills Fire Control Centre regarding up-to-date bushfire information ○ Check local media ○ Check social media (e.g. RFS website, RFS Fires Near Me App) ○ Contact Bush Fire Information Line 1800 679 737 • Inform staff and occupants of the fire situation. • Ensure the person in charge Chief and/or Deputy Warden(s) has a mobile phone and is contactable. • Advise local emergency services that the quarry has made the decision to continue operating. • Designated Fire Warden to standby and keep a close eye on the situation. Note - It is the responsibility of the Quarry to check the status of the bush fire through contact with the Hills Fire Control Centre and local medial, social media and Bush Fire Information Line.
4. Approaching bushfire threatening the premise within 2 hours of all directions, the primary action to shelter will take place, staff (employees and contractors), occupants and visitors shall follow the outlined actions.	• Designated Fire Warden will: ○ take control of the situation ○ remain calm and explain to all occupants what is happening ○ broadcast on the quarry UHF channel for plant operators to manoeuvre their plant to the designated plant parking area: ▪ outside the workshop (ONR) ▪ outside the lunch room (HR) ○ ensure all doors and windows of the buildings on the premises are closed by delegating the task. ○ Move all persons to the designated refuge ○ Ensure all persons are accounted for (refer to employee, contractor and visitor sign-in register) ○ Advise the Hills District Fire Control Centre (02 9654 1244) that the centre is sheltering-in-place (include how many people) • After all occupants have been relocated to refuge, nominate a person to commence contacting relevant families affected (refer to Emergency Contact Register for Staff) • Nominate driver(s) for the water truck(s) to standby. • Maintain situation awareness through radio, NSW RFS website, RFS Information line and smart phone applications • Delegate 2 x persons to make regular exterior visual inspection (wearing appropriate protection from bushfire) of the refuge for embers and extinguish where possible, or call 000 for assistance.

3.4 After the bushfire emergency

1. Contact emergency response services (RFS, Police and RMS) for the “ALL CLEAR” to ensure roads have been re-opened and no immediate dangers associated with travelling from site.
2. Employees, contractors and visitors may vacate the quarry if they wished to do so.
3. All employees to undergo a debrief by the Chief Warden and/or Deputy Wardens.
4. Review the current Bushfire Management Plan and procedures and consult the RFS if required.
5. Undertake bushfire awareness / basic firefighting training on a regular basis.

4. EVACUATION PROCEDURES

Evaluation of the safety of employees and occupants has determined that it would be safer for ALL persons to evacuate to a designated refuge.

The following are the designated refuges allocated close to the premises.

4.1 Procedures for Evacuation in the event it is deemed unsafe to take shelter

Table 5: Evacuation Procedures

Trigger	Action
ONR Site Fire Rating Index Catastrophic and/or Fire events occurring around the area.	• Quarry in operation unless it is UNSAFE for employees to travel to site. • Wardens to keep informed and monitor conditions. • Be ready to act if necessary. • Quarry operation to CEASE if danger is present on site. • Employees to travel home if SAFE to do so. • If travelling home is deemed UNSAFE, follow the "Last Resort – Actions"
Haerses Road Site Fire Rating Index: Catastrophic and/or Fire events occurring around the area.	• Quarry in operation unless it is UNSAFE for employees to travel to site. • Wardens to keep informed and monitor conditions. • Be ready to act if necessary. • Quarry operation to CEASE if danger is present on site. • Employees to travel home if SAFE to do so. • If travelling home is deemed UNSAFE but an evacuation to the ONR site is deemed SAFE, evacuate to the ONR and follow the ONR Evacuation trigger and actions • If travelling home and evacuating to the ONR site are deemed UNSAFE, follow the "Last Resort – Actions"

Last Resort:
 	
Evacuate to Neighbourhood Safer Places
	Prior to Evacuation:
	• Designated Fire Warden to:
	  ○ advise the Hills District Fire Control Centre (02 9654 1244) that the Quarry is being evacuated (including how many people and the location to relocate to)
	  ○ contact the refuge to inform them of pending arrival
	  ○ designate drivers and vehicles for transportation
	  ○ ensure all persons are accounted for prior to evacuation
	  ○ ensure all buildings on the premise have all doors and windows closed prior to leaving the quarry
	Arrival at Neighbourhood Safer Place
	• Designated Fire Warden to:
	  ○ At the arrival, move all persons inside and ensure all persons are accounted for and safe
	• After all persons are accounted for and safe at the designated Neighbourhood Safer Place, nominate staff will commence contacting families affected
	• Maintain situational awareness through radio, NSW RFS website, RFS Fires Near Me App, RFS Information Line 1800 679 737, smart phone applications and local firefighting resources.

4.2 Neighbourhood Safer Places (Last resort)

Location (Primary):

Name:	Maroota Public School
Address:	4540 Old Northern Road, Maroota NSW 2756
Nearest cross street:	Wisemans Ferry Road
Map reference:	NPS1 in Appendix B
Contact Number:	02 4566 8231
Transportation:	Chief Warden to designate drivers of vehicles on site to transport all persons to the refuge.

Location (Alternative 1):

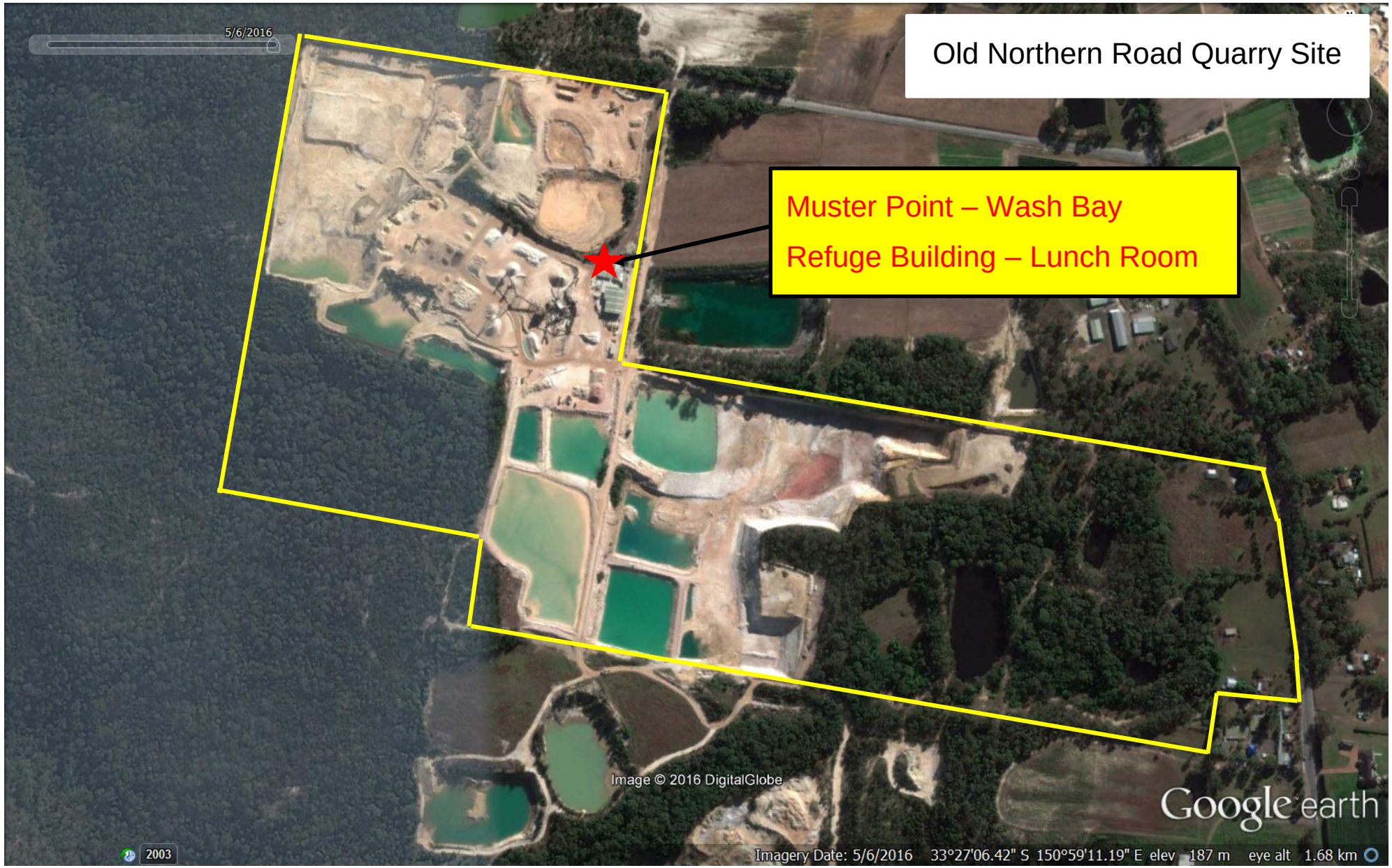
Name:	South Maroota Community Hall
Address:	Corner of Paulls Road and Wisemans Ferry Road, South Maroota NSW 2756
Nearest cross street:	Wisemans Ferry Road
Map reference:	NPS2 in Appendix B
Contact Number:	02 4566 8231
Transportation:	Chief Warden to designate drivers of vehicles on site to transport all persons to the refuge.

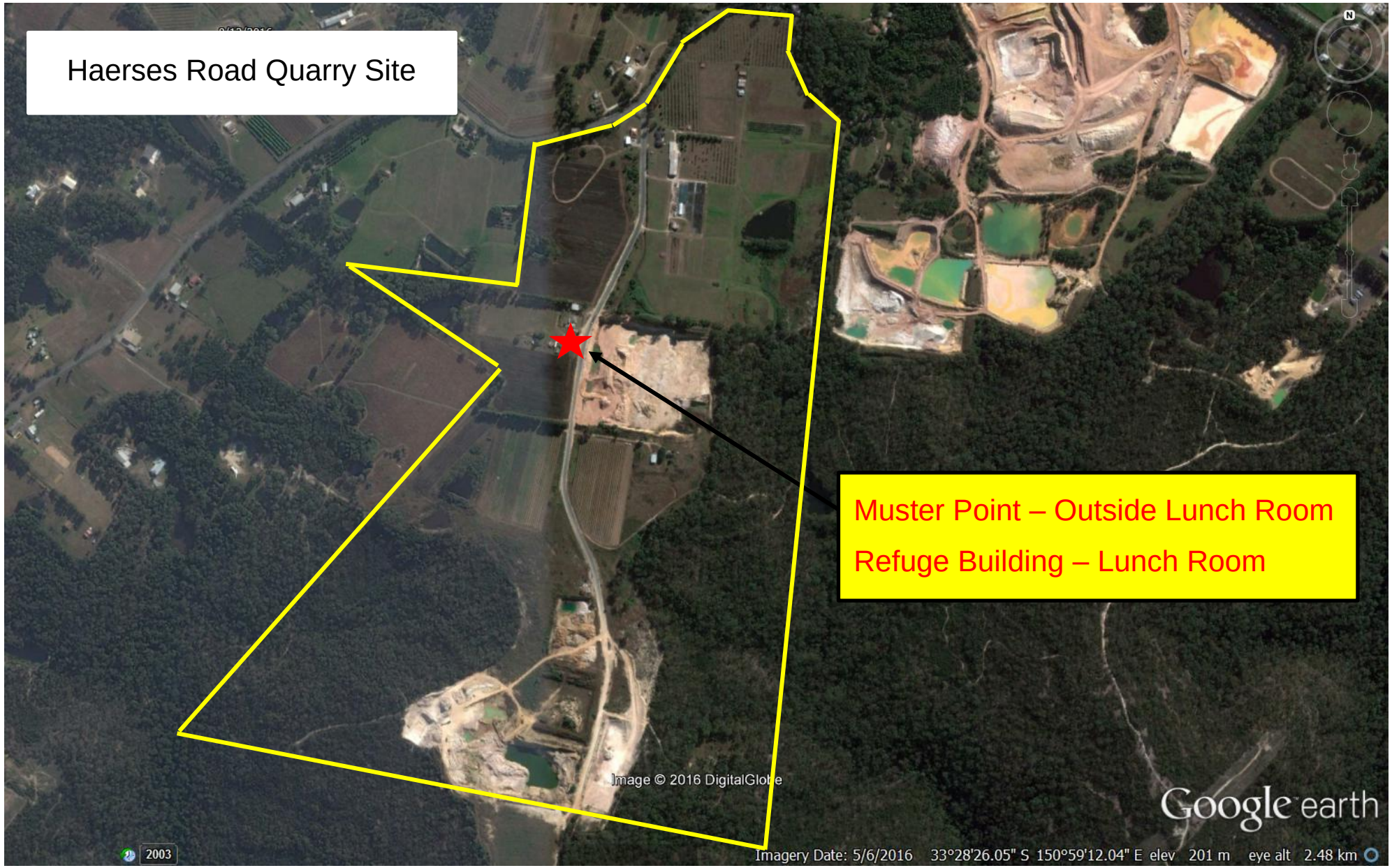
4.3 After the bushfire emergency

1. No person should re-enter the quarry premises until advised by the emergency service
2. The Chief Warden and/or Deputy Warden(s) to arrange for movement of occupants back to the quarry premises and or their separate accommodation.
3. All occupants are to be accounted for on their return.
4. Inform the police/emergency service of the return of persons to the quarry premises.
5. Employees, contractors and visitors may vacate the quarry if they wished to do so.
6. All employees to undergo a debrief by the Chief Warden and/or Deputy Wardens.
7. Review the current Bushfire Management Plan and procedures and consult the RFS if required.
8. Undertake bushfire awareness / basic firefighting training on a regular basis.

APPENDIX A

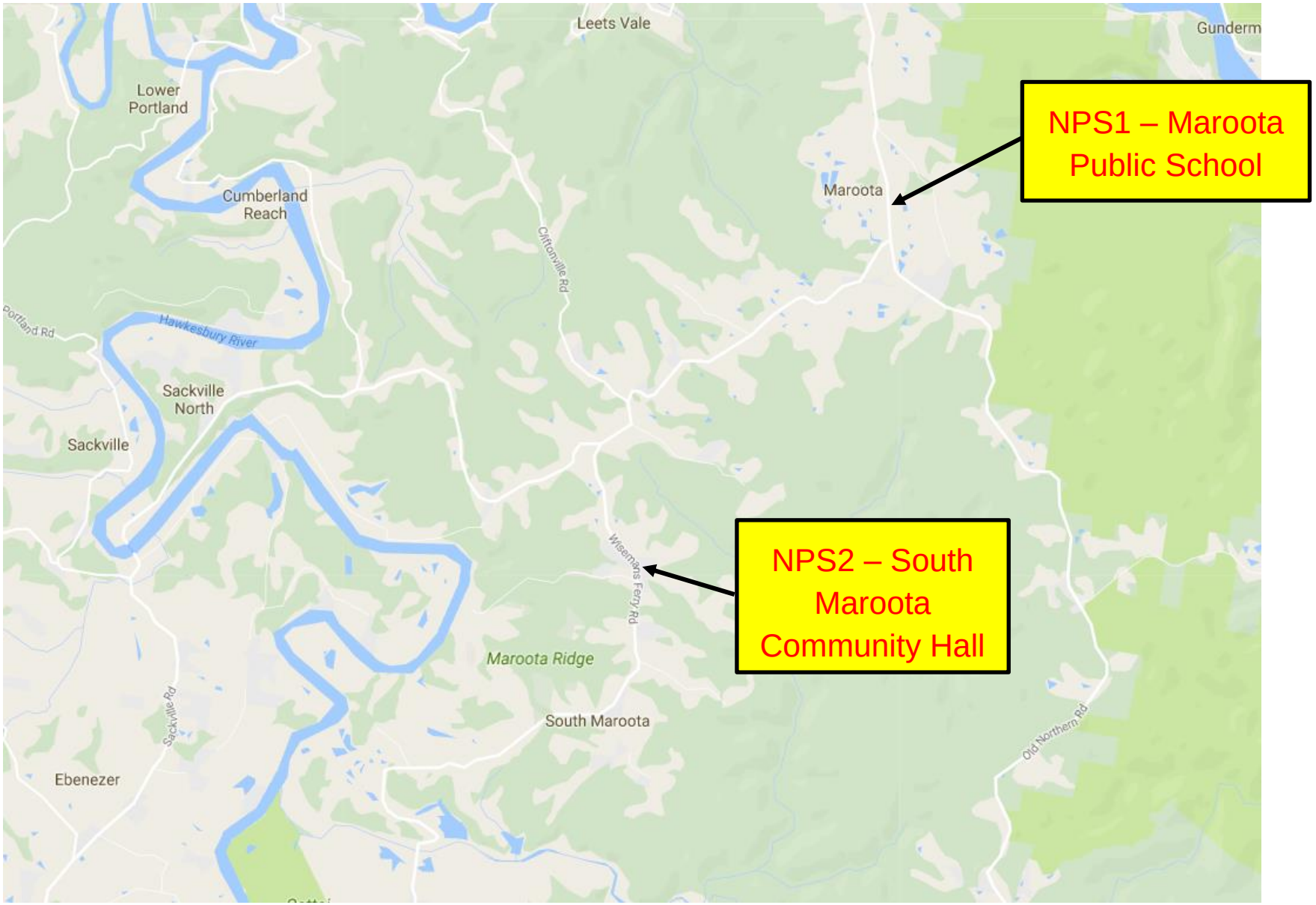
On-Premise Shelter Refuge Map

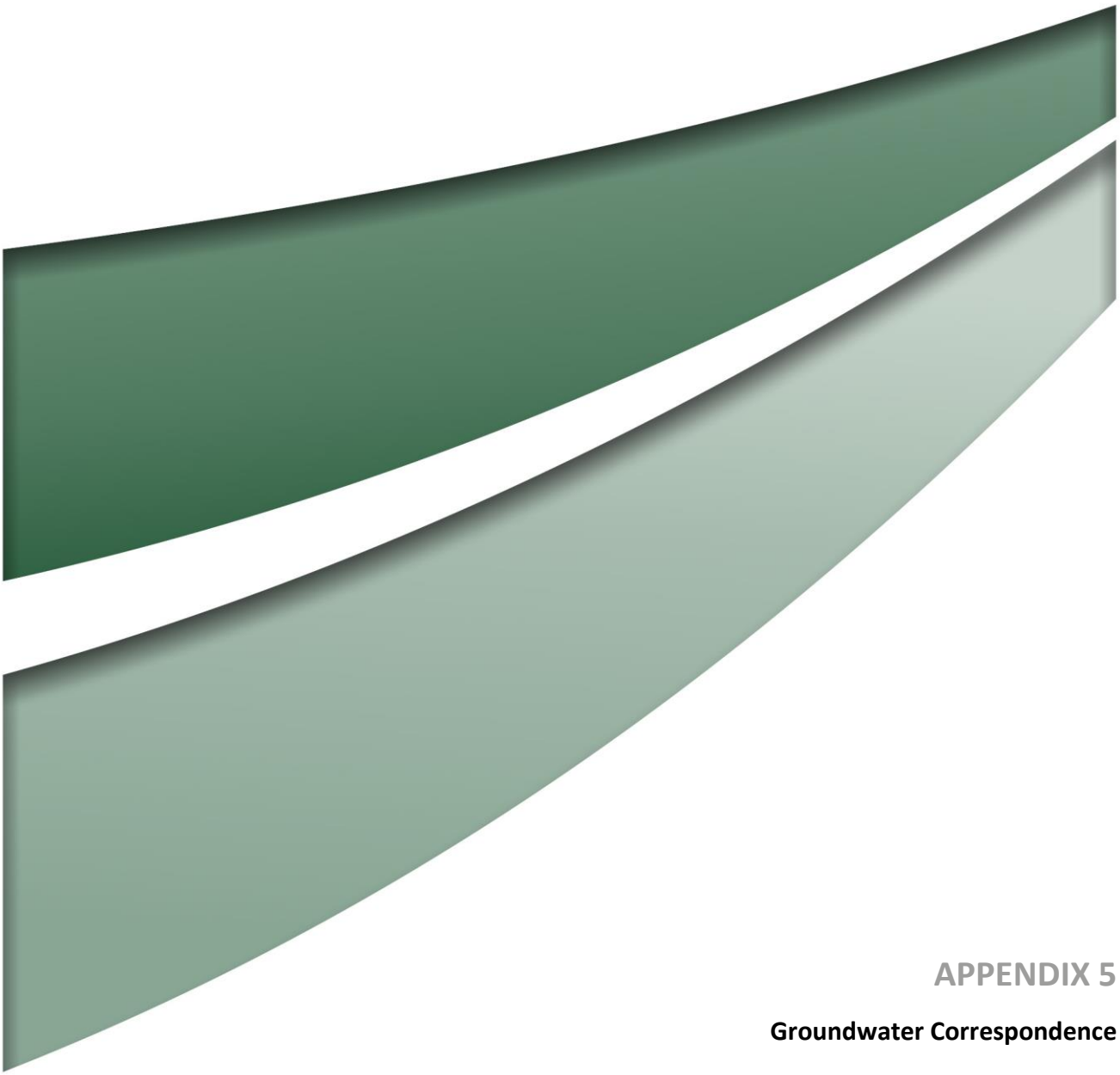

Old Northern Road Quarry Site
Muster Point – Wash Bay
Refuge Building – Lunch Room
5/6/2016
Image © 2016 DigitalGlobe
Google earth
2003
Imagery Date: 5/6/2016 33°27'06.42" S 150°59'11.19" E elev 187 m eye alt 1.68 km


Haerses Road Quarry Site
Muster Point – Outside Lunch Room
Refuge Building – Lunch Room
Image © 2016 DigitalGlobe
Google earth
2003
Imagery Date: 5/6/2016 33°28'26.05" S 150°59'12.04" E elev 201 m eye alt 2.48 km

APPENDIX B

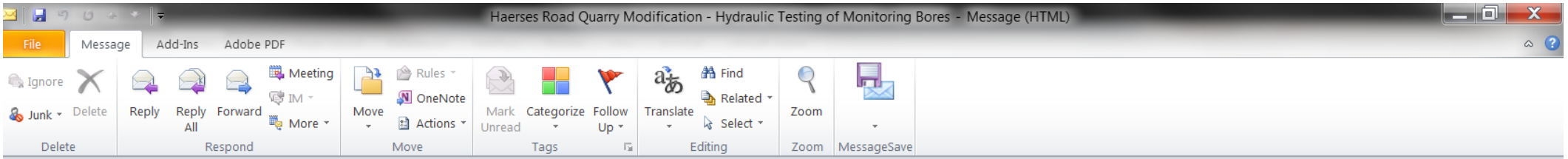
Evacuation Refuge Map


Leets Vale
Gunderm
Lower Portland
Cumberland Reach
Maroota
NPS1 – Maroota Public School
Chiftonville Rd
Portland Rd
Hawkesbury River
Sackville North
Sackville
NPS2 – South Maroota Community Hall
Wisemans Ferry Rd
Maroota Ridge
South Maroota
Sackville Rd
Old Northern Rd
Ebenezer



APPENDIX 5

Groundwater Correspondence



You replied to this message on 18/10/2017 8:57 AM.

From: Peter Dundon <pjdundon@ozemail.com.au>
Sent: Wed 18/10/2017 8:56 AM
To: 'Mark Dixon'
Cc: John Merrell; 'van den Akker, Jason'
Subject: Haerses Road Quarry Modification - Hydraulic Testing of Monitoring Bores

Dear Mark,

Aquifer hydraulic conductivities are typically moderate to low in all formations in the vicinity of the Haerses Road Quarry. This generalisation has been based not only on the drilling on the Haerses Road site, but on other nearby quarry projects as well.

It is necessary to quantify the hydraulic conductivity of the Hawkesbury Sandstone in and around the proposed modification, primarily to ensure that the extraction from the modification area can be carried out without unacceptable adverse impacts on the Maroota Sands regional water table levels. The zone of major interest for this is the proposed 100 metre buffer zone between the mapped edge of the Maroota Tertiary Sands Groundwater Source (MTSGS) and the proposed modification area, within which you have committed to install a number of bore clusters and to not extract below perched aquifer zones in this buffer zone until monitoring has shown that quarrying can be undertaken within that zone without incurring water loss from the MTSGS. The primary purpose of the proposed monitoring bores, apart from adding to the baseline data set, is to monitor during extraction. The deeper bores to the Hawkesbury Sandstone regional aquifer (SBCGS regional aquifer) will also supplement the existing deep monitoring bores BH4 and BH5 to assist in defining the wet weather high groundwater level for the SBCGS.

I consider that the hydraulic testing program should be carried out once the entire network of additional monitoring bores, including the bore clusters, has been completed. The hydraulic testing should include the existing bores BH4 and BH5. The type of hydraulic testing will be determined for each bore based on each bore's yield potential, with any bore deemed capable of sustaining a meaningful yield tested by pumping, and other bores tested by slug falling head tests or other similar method.

I consider it appropriate to undertake all additional drilling and monitoring bore installation, followed by hydraulic testing, after approval of the Modification. The entire monitoring network would be in place and tested prior to any extraction from the proposed modification area reaching any perched groundwater, such that the groundwater conditions will be fully understood when that does occur.

I trust the above comments clarify the situation regarding drilling and hydraulic testing of monitoring bores for the modification.

Regards,
Peter Dundon

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