Vegetation Management Plan

For

Proposed Rezoning of

Part Lot 51 DP 1195704
165 Louisiana Road, Wadalba NSW

By

EverittEcology - ABN: 78 642 128 782 - 151621

Job Details			
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Type of Contribution	Flora Surveys (Quadrats + random meander)		

Report Versions				
Version Type	Job Number	Date	Reviewer	Notes
Draft	151621	15/06/2016	Nicholas Everitt	
Draft	151621	13/07/2016	Nicholas Everitt	
Final	151621	14/07/2016	Nicholas Everitt	
Final ver.2	151621	13/09/2016	Nicholas Everitt	

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Abbreviations

This report may use the following abbreviations:

- APZ - Asset Protection Zone;
- BOM – Bureau of Meteorology;
- CAMBA - China-Australia Migratory Bird Agreement;
- DECC - Department of Environment & Climate Change NSW (name changed to OEH);
- EP&A Act - Environmental Planning and Assessment Act 1979;
- EPBC Act - Environment Protection and Biodiversity Conservation Act 1999;
- EEC - Endangered Ecological Community;
- EIA - Environmental Impact Assessment;
- FM Act - Fisheries Management Act 1994;
- ha - hectares;
- JAMBA - Japan-Australia Migratory Bird Agreement;
- LEP - Local environmental plan;
- LES - Local Environmental Study;
- LGA - Local Government Area;
- LHCCREMS - Lower Hunter Central Coast Regional Environmental Management Strategy;
- NPWS - National Parks and Wildlife Service;
- NPW Act - National Parks and Wildlife Act 1974;
- NSW - New South Wales;
- OEH - Office of Environment & Heritage (NSW);
- PoM - Plan of management;
- PVP - Property Vegetation Plans;
- RFS - Rural Fire Service;

- ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement;
- SEE - Statement of environmental effects;
- SEPP 14 - State Environmental Planning Policy No. 14–Coastal Wetlands;
- SEPP 19 - State Environmental Planning Policy No. 19– Bushland in Urban Areas;
- SEPP 26 - State Environmental Planning Policy No. 26–Littoral Rainforest;
- SEPP 44 - State Environmental Planning Policy No. 44– Koala Habitat Protection;
- SEPP 71 - State Environmental Planning Policy No. 71 - Coastal Protection;
- SIS - Species impact statement;
- TSC Act - Threatened Species Conservation Act 1995;
- VENM – Virgin Excavated Natural Material (Refer to definition by the NSW EPA);
- WWC – Wadalba Wildlife Corridor; and
- WSC - Wyong Shire Council.

Nomenclature

Plant and animal names used in this report are taken from the NSW Office of Environment and Heritage's Atlas of NSW Wildlife, accessed through www.bionet.nsw.gov.au .

Plant names are crosschecked with those contained within The Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, Australia (version 2.0). This is accessed through http://plantnet.rbgsyd.nsw.gov.au .

All animal and plants names listed as threatened under either the NSW Threatened Species Conservation Act or the Environmental Protection & Biodiversity Conservation Act are also crosschecked with their currently profiles accessed through www.environment.nsw.gov.au and www.environment.gov.au respectively.

1 INTRODUCTION

Everitt Ecology has been engaged by Threshold Developments Pty Ltd to prepare a Vegetation Management Plan (VMP) for land associated with the proposed rezoning of Part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba NSW.

The overall purpose of this VMP is to provide for the long term protection and rehabilitation of native vegetation to be retained on the subject site specifically related to the extension of the WWC contained within the E2 land of the parent lot. This VMP describes the vegetation characteristics of the site, outlines potential vegetation management issues and divides the site into management areas for which specific management actions and monitoring regimes are specified.

This VMP has considered the range of works associated with future residential subdivision that may impact vegetation on the site; including consideration of associated works such as bushfire asset protection and access, rehabilitation of the quarry area, creation of a service easement and drainage works.

The plan has been prepared in accordance with Appendix 8.2 of Wyong Shire Council's Flora and Fauna Survey Guidelines (2014) and also incorporates the relevant requirements of the Wadalba Wildlife Corridor Management Plan (Conacher Travers 2006) and Wyong Shire Council DCP 2005.

All figures and maps are included in Section 7 of this VMP.

1.1 Licensing and Qualifications

This work has been undertaken under the following licenses:

- National Parks & Wildlife Act Section 132c Scientific Licence: SL101494; and
- Animal Research Authority - Department of Primary Industries.

The qualifications and experience of personnel involved in this assessment include:

- Nicholas Everitt – Bachelor of Environmental Science – 10 years experience;
- Danielle Allen – Bachelor of Science (Hons) – 10 years experience;
- Garon Staines – Bachelor in Applied Science (Coastal Management) – Over 20 years experience.

1.2 Site Description

The subject site is located in Wadalba NSW at the north-eastern corner of Stage 1 of the Wadalba Wildlife Corridor. It contains a partially cleared and disturbed area of Narrabeen Dooralong Spotted Gum – Ironbark Forest' (Map Unit 30 - Bell, 2002b) and has a drainage line along the western side. The following Table 1 provides a summary of the site details. The location of the subject site is displayed in Figure 1 in Section 7.

Table 1 – Site Details

Site Details	
Street Address	165 Louisiana Road, Wadalba NSW 2259
Lot and Deposited Plans	Lot 51 DP 1195704
Site Coordinates	E. 357621 N.6317994
Local Government Area	Wyong
Determining Authority	Central Coast Council
Existing Land Use	None. Currently approved for a single dwelling.
Current Zoning	RU6 (Transitional Zone) and E2. Refer to Figure 2.
Elevation	Approximately 30-45m above sea level
Aspect	The majority of the subject site has a north/north-western aspect, with lower areas in the south-eastern corner and western side of the proposed rezoning area draining east and west respectively.

Site Details	
Soils & Geology	Woodburys Bridge Soil Landscape – Narrabeen Group – Clifton Subgroup – Patonga Claystone
Vegetation	'Narrabeen Dooralong Spotted Gum – Ironbark Forest' (Map Unit 30) as described by Bell (2002b)

Photograph – Looking north-west at E2 zoned area from the proposed R2 zone.

1.3 Development Proposal

It is proposed to rezone part of Lot 51 DP1195704 from RU6 (Transitional Zone) to part R2 (Low Density Residential) and part SP2 (infrastructure), retaining an area of existing E2 zoning along the western side. A small area of RU6 in the south-western corner of the rezoning area will be rezoned to E2.

Ensuing approval of this rezoning application, the area of R2 (Low Density Residential) is proposed to be subdivided into nineteen (19) residential lots. A proposed subdivision design is displayed in Figure 2 in Section 7. The subdivision design incorporates Bushfire Asset Protection Zones within the development area and RFS access points. The plans used in this management plan were provided by Everitt and Everitt Consulting Surveyors (Ref no. 17464 dated 27/07/2016).

In regard to the extent of proposed work areas, the current plans state: '*Existing disturbed areas to be re-generated in conjunction with the removal of existing ponds, road construction, low retaining wall and finished upward slope to natural ground level in accordance with the final development design, engineering plans and Vegetation Management Plan (VMP)*' (Ref no. 17464 dated 27/07/2016).

The proposal will secure a 175m long section of environmental corridor on the E2 zoned lands, with the narrowest width being 55m. This corridor will link the Wadalba Wildlife Corridor in the south to retained trees on the oval, which then provide a linkage to vegetation to the north of the Pacific Highway. There will however be earthworks and associated vegetation clearing required in the corridor, specifically rehabilitation of the quarry area, an easement for services and rehabilitation of areas of erosion in conjunction with proposed drainage augmentation at the northern end of the corridor. In these areas revegetation and bush regeneration works will be required to reinstate native vegetation.

2 BACKGROUND INFORMATION

2.1 Planning and Landscape Context

The site is vacant land which contains partially cleared and disturbed native vegetation. Existing disturbances include vehicle tracks, rubbish dumping, drainage works and a quarry area located in the south eastern corner of the site. The previous uses of the subject site include, a poultry farm from as early as the 1930s, a source of pit props as well as cattle grazing.

The site is located on a north-facing slope. A small drainage line is located on the western side of the property. This drainage line is not marked on topographic maps and flows intermittently.

Land use directly to the north (downslope) of the subject site is a sporting facility with a sporting oval. To the west is a recently occupied residential subdivision. Adjoining the site to the south (upslope) is the bushland designated as part of the Wadalba Wildlife Corridor. To the east of the site is the unformed Louisiana Road reserve, bushland and rural development.

The subject site is situated at the southern end of the North Wyong Shire Structure Plan. The Wadalba Wildlife Corridor is mapped as 'Green Corridor' linking Tacoma Wetlands in the south-east to Porters Creek Wetland in the north-west. The area of E2 zoned land on the western section of the subject site is mapped as a 'local conservation link' connecting to an area of 'Green Corridor' on the northern side of the Pacific Highway.

Wyong Shire Council DCP 2005 Chapter 6.17 Warnervale East / Wadalba North West also shows the Environmental Corridor running south to north along the western section of the site. The longer term planning objective is that this E2 zoned environmental corridor on the subject site and retained vegetation on the sporting field will provide a link between the Stage 1 Wadalba Wildlife Corridor and the vegetation to the north of the Pacific Highway (Conacher Travers 2006).

2.2 Existing Native Vegetation and Weeds

2.2.1 Vegetation Mapping

The subject site contains a partially cleared and disturbed area of Tall Open Forest vegetation dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus siderophloia* (Grey Ironbark). Six Maps vegetation

mapping shows that subject site is mapped as 'Narrabeen Dooralong Spotted Gum – Ironbark Forest' (Map Unit 30) as described by Bell (2002b) based on 2008 revisions (OEH, 2015b). Detailed flora surveys undertaken on the site (Everitt Ecology 2016) indicate that the vegetation community within the subject site is consistent with 'Narrabeen Dooralong Spotted Gum – Ironbark Forest' (Map Unit 30).

The most similar community described by Somerville (2009a) is 'Spotted Gum / Grey Ironbark dry open forest of the Central Coast and lower Hunter' (MU63) (Somerville, 2009a). The most similar Biometric Vegetation Type is 'Spotted Gum – Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin (ID13061) (Somerville, 2009a).

The area of the proposed rezoning is considered to be in low condition due to the presence of weeds, clearing and under-scrubbing activities and previous landuse.

2.2.2 Vegetation communities

The subject site contains one (1) vegetation community, Tall Open Forest with a variation between the understorey of the proposed rezoning area (described as understorey variant 1) and the understorey of the E2 zoned area (described as understorey variant 2). The boundaries of the E2 area and the rezoning area are shown in Figure 2 in Section 7. The descriptions of this vegetation community and understorey variants is based on both Quadrat data and random meander surveys (see Everitt Ecology Ecological Assessment 2016 for full detail of survey methodology).

The vegetation community identified within the subject site is not consistent with any endangered ecological community listed under the TSC Act and/or EPBC Act.

Tall Open Forest – understorey variant 1

Summary: Tall Open Forest dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus siderophloia* (Grey Ironbark) in the upper stratum with a very sparse understorey and a moderately dense to dense ground cover dominated by both native and introduced herbs and grasses. The understorey variant 1 of this community occurs throughout the proposed rezoning area.

Structure:

Upper Stratum (Trees) (24-30m high): Dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus siderophloia* (Grey Ironbark) with *Eucalyptus eugenioides* (Thin-leaved Stringybark) also occurring.

Mid-stratum (Small trees) (5-10m high): The mid-stratum of variant 1 has been previously cleared. Some specimens of *Allocasuarina torulosa* (Forest Oak), *Melaleuca nodosa* (Ball Honeymyrtle) and *Acacia falcata* (Hickory Wattle) are present.

Lower-stratum (Shrubs) (1-5m high): The understorey of variant 1 has been previously cleared. A very sparse layer with the occasional specimen including, *Exocarpus cupressiformis* (Native Cherry), *Pittosporum undulatum* (Sweet Pittosporum), *Acacia longifolia subsp. longifolia* (Sydney Golden Wattle), *Breynia oblongifolia* (Coffee Bush), *Daviesia ulicifolia* (Gorse Bitter Pea), *Ligustrum sinense* (Small-leaved Privet) and *Senna pendula*.

Groundcover (incl. small shrubs) (0-1m high): A moderately dense to dense cover dominated by a mixture of native and introduced herbs and grasses. Individual species are generally dominant in patches throughout this stratum.

Native species which are dominant in patches throughout this stratum include, *Imperata cylindrica* (Blady Grass), *Themeda triandra* (Kangaroo Grass), *Juncus usitatus*, *Lomandra longifolia* (Spiny-headed Mat-rush), *Entolasia stricta* (Wiry Panic), *Dichelachne micrantha* (Shorthair Plumegrass) and *Cymbopogon refractus* (Barbed Wire Grass). Other commonly occurring native species include, *Dianella caerulea var. producta* (Blue Flax-lily), *Pratia purpurascens* (Whiteroot) and *Cheilanthes sieberi subsp. sieberi* (Poison Rock Fern).

Introduced species which are dominant in patches include, *Pennisetum clandestinum* (Kikuyu Grass), *Andropogon virginicus* (Whisky Grass), *Chloris gayana* (Rhodes Grass), *Paspalum urvillei* (Vasey Grass) and *Plantago lanceolata* (Lamb's Tongue). Other commonly occurring introduced species include, *Senecio madagascariensis* (Fireweed) and *Briza maxima* (Blowfly Grass).

Condition: This area is considered to be in low condition due to the presence of weeds and the previous clearing and underscrubbing activities.

Tall Open Forest – understorey variant 2

Summary: Tall Open Forest dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus siderophloia* (Grey Ironbark) in the upper stratum with a moderately dense to dense understorey dominated by introduced species and a moderately dense groundcover of native and introduced herbs and grasses. The understorey variant 2 of this community occurs throughout the E2 zoned area (environmental corridor).

Structure:

Upper Stratum (Trees) (24-30m high): Dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus siderophloia* (Grey Ironbark) with *Eucalyptus eugenioides* (Thin-leaved Stringybark) also occurring.

Mid-stratum (Small trees) (5-10m high): Moderately dense stratum including, *Allocasuarina torulosa* (Forest Oak), *Melaleuca nodosa* (Ball Honeymyrtle) and *Pittosporum undulatum* (Sweet Pittosporum). One (1)

specimen of *Livistona australis* (Cabbage Tree Palm) as well as one (1) specimen of the introduced *Erythrina x sykesii* (Coral Tree) were also observed within this stratum.

Lower-stratum (Shrubs) (1-5m high): A moderately dense to dense layer dominated by *Pittosporum undulatum* (Sweet Pittosporum) and the introduced species, *Ligustrum sinense* (Small-leaved Privet) and *Lantana camara* (Lantana). Other shrub species represented in this stratum include, *Persoonia linearis* (Narrow-leaved Geebung), *Xanthorrhoea macronema* and the introduced *Ochna serrulata* (Mickey Mouse Plant).

Groundcover (incl. small shrubs) (0-2m high): A moderately dense cover dominated by *Gahnia clarkei* (Tall Saw-sedge), *Imperata cylindrica* (Blady Grass), *Oplismenus aemulus* (Australian Basket Grass), *Panicum simile* (Two-coloured Panic), *Microlaena stipoides* (Weeping Grass), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Pellaea falcata* (Sickle Fern). Other species common throughout this stratum include, *Carex appressa* (Tall Sedge), *Juncus usitatus*, *Themeda triandra* (Kangaroo Grass) and the introduced species, *Andropogon virginicus* (Whisky Grass) and *Asparagus asparagoides* (Bridal Creeper).

Climbers: *Parsonsia straminea* (Common Silkpod) is common throughout this area with *Pandorea pandorana* (Wonga Wonga Vine) also occurring.

Condition: This area of vegetation is considered to be in low to moderate condition due to the dominance of weed species particularly throughout the understorey stratum. The presence of weeds species appears to be greater towards to the northern end and eastern side of this area.

Variations in the condition of ground cover

The quality of groundcover, leaf litter and fallen log habitats throughout the subject site have been stratified into areas of either 'poor' or 'good' quality habitats. The areas of 'good' and 'poor' quality groundcover habitats are displayed in Figure 3 in Section 7. 'Poor' quality habitats contain a dominance of introduced grasses and herbs with little or no leaf litter or fallen logs. 'Good' quality habitats are dominated by native grasses (including tussocks) and herbs with a natural cover of leaf litter and some small fallen logs.

2.2.3 Native Flora Species

A total of one hundred and three (103) flora species were recorded within the subject site, including sixty-six (66) native species and thirty-six (36) introduced species. A full list of flora species recorded on the site by Everitt Ecology is shown in **Appendix 1** of this VMP.

One (1) ROTAP species, *Macrozamia flexuosa* was recorded mostly within the E2 zoned area with a few specimens also recorded in the proposed rezoning area. *M.flexuosa* is listed as 2K by ROTAP, the '2' meaning the species has a geographic range within Australia of less than 100km and K meaning that the species is poorly known (Briggs et al., 1996).

No threatened flora species listed under either the TSC Act or the EPBC Act were recorded within the subject site.

The full flora and fauna survey methodology and assessment is included in the Ecological Assessment prepared by Everitt Ecology for the proposed rezoning (Everitt Ecology 2016).

2.2.4 Weed species

A full list of flora species, including weed species, recorded on the site by Everitt Ecology is shown in Appendix 1 of this VMP. This table includes a notation as to whether the particular weed species was recorded within the rezoning area or the corridor area, or both.

Five (5) flora species recorded within the subject site are listed as Noxious Weeds in the Wyong LGA (DPI, 2015). These include:

- *Hypericum perforatum* (St John's Wort) and *Cortaderia selloana* (Pampas Grass) which are listed as a Class 3 Noxious Weed - *'The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed'* (DPI, 2015); &

- *Asparagus aethiopicus* (Ground Asparagus), *Asparagus asparagoides* (Bridal Creeper) and *Senecio madagascariensis* (Fireweed) are listed as a Class 4 Noxious Weeds - *'The plant must not be sold, propagated or knowingly distributed'* (DPI, 2015).

Four (4) species recorded within the subject site are listed as Weeds of National Significance. These include, *Senecio madagascariensis* (Fireweed), *Lantana camara* (Lantana), *Asparagus aethiopicus* (Ground Asparagus) and *Asparagus asparagoides* (Bridal Creeper).

Two (2) introduced species recorded, *Ligustrum sinense* (Small-leaved Privet) and *Ochna serrulata* (Mickey Mouse Plant) are listed as Noxious Weeds in other parts of NSW, but not in Wyong LGA.

The areas of the site with lower densities of weed invasion and better quality native groundcover are highlighted on Figure 2 in Section 7, as are the areas of higher weed invasion and lower quality habitat.

2.3 Natural Values

2.3.1 Previous studies in local area

The subject site is situated adjacent to the Wadalba Wildlife Corridor and a variety of surveys, assessments and management plans have been previously prepared for this area. Relevant previous studies from the local area are detailed by Everitt Ecology in the Ecological Assessment of the proposed rezoning (Everitt Ecology 2016). A number of threatened flora and fauna species are known from the local area, and their occurrence on the subject site is discussed below.

2.3.2 Fauna Habitats

Flora and vegetation communities present on the subject site are discussed in Section 2.2 above.

Survey of the site revealed the following fauna habitats and fauna species present on the site:

- A total of ten (10) hollow-bearing trees, containing a mixture of mostly small (<10cm) to medium (10-20cm) sized hollows are likely to be impacted by the proposal. A total of ten (10) hollow-bearing trees are located within the proposed rezoning area (include HT7 likely to be impact by future road design), and a further six (6) hollow-bearing were recorded in areas within the E2 zoned area (drainage corridor). Locations of hollow bearing trees are shown in Figure 3 in Section 7.

- Flowering trees throughout the subject site provide suitable foraging habitat for birds and arboreal mammals. In particular, *Corymbia maculata* (Spotted Gum), when flowering provides an important winter foraging resource.

- A very sparse cover of flowering shrubs provides limited protective cover or foraging habitat for terrestrial and arboreal mammals and birds. Two fruiting specimens of *Allocasuarina torulosa* (Forest Oak) within the subject site provide potential foraging habitat for the threatened *Calyptorhynchus lathami* (Glossy Black-cockatoo).

- Areas of 'good' quality ground cover habitats are located throughout the southern side of the subject site, including a dominance of species such as *Themeda triandra* (Kangaroo Grass) in the south-east and *Lomandra longifolia* (Spiny-headed Mat-rush) in the south-west corner. Native herbs and grasses provide some foraging habitat for terrestrial mammals and birds, while leaf litter with a very sparse cover of fallen logs provides some limited protective cover and foraging habitats for reptiles and amphibians.

- The two small dams (approximately 6m x 6m each), located on the southern boundary of the subject site provide breeding habitat for common amphibian species recorded during surveys. These aquatic

habitats are likely to be a breeding area for insects, which provide a foraging resources for a variety of fauna including micro-bats recorded throughout the subject site. Common duck species recorded also utilised these habitats as a refuge and foraging resource.

- Five (5) threatened fauna species listed as Vulnerable under the TSC Act, including *Calyptorhynchus lathami* (Glossy Black-cockatoo), *Miniopterus australis* (Little Bentwing-bat), *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat), *Mormopterus norfolkensis* (Eastern Freetail-bat) and *Scoteanax rueppellii* (Greater Broad-nosed Bat) were recorded within or in close proximity to the subject site during surveys;

- *Calyptorhynchus lathami* (Glossy Black-cockatoo) was observed to the south of the subject site within the Wadalba Wildlife Corridor and foraging evidence (chewed cones of *Allocasuarina torulosa*) were recorded in two (2) locations, one being just within the southern boundary of the subject site (Refer to Figure 3 in Section 7). Two (2) additional fruiting specimens of *Allocasuarina torulosa* were observed within the subject site, neither of which contained any evidence of foraging. Two (2) potential nesting hollows (within HT4 & HT6; refer to Figure 3 in Section 7) were recorded within the subject site, both of which were inhabited by other common species and are unlikely to be utilised by Glossy Black-cockatoo;

- In regard to threatened micro-bat species recorded, no roosting locations were located. The hollow-bearing trees located within the subject site are unlikely to provide seasonal roosting sites, however they are likely to provide potential temporary roosting locations;

- No potential nesting hollows for threatened Owl species, Powerful Owl and Masked Owl, were recorded within the subject site. No Owl roosting evidence was observed during detailed searches conducted in August, 2015. The E2 zoned area is considered to provide potential roosting habitat for these Owl species, however the disturbed, open and underscrubbed areas of the proposed rezoning area are unlikely to provide potential roosting habitat. General fauna surveys also indicated a low abundance of preferred prey species within the proposed rezoning area;

- Three (3) regionally significant fauna species, *Petaurus breviceps* (Sugar Glider), *Vespadelus pumulis* (Eastern Forest Bat) and *Lewinia pectoralis* (Lewins Rail) were recorded within the proposed rezoning area, with an additional two (2) regionally significant species, *Tachyglossus aculeatus* (Short-beaked Echidna) and *Tyto alba* (Barn Owl), recorded within the E2 zoned area and to the west of the subject site respectively. No nest or roost locations of these species, apart from Sugar Glider, were recorded within the proposed rezoning area;

- Sugar Gliders were observed utilising HT10. It is considered that the small branch hollow in HT10 is an established nest site for Sugar Gliders and is likely to be used intermittently along with other hollows most likely within the E2 zoned area.

Figure 3 in Section 7 summarises the results of the fauna survey, including survey locations, sightings of threatened species and hollow bearing trees. The full flora and fauna survey methodology and assessment is included in the Ecological Assessment prepared by Everitt Ecology for the proposed rezoning (Everitt Ecology 2016).

2.3.3 Wildlife Corridors

The area of E2 zoned land on the western section of the subject site is mapped as a 'local conservation link' connecting to an area of 'Green Corridor' on the northern side of the Pacific Highway. The proposal will secure a 175m long section of environmental corridor on these E2 zoned lands, with the narrowest width being 55m. This corridor will link the Wadalba Wildlife Corridor in the south to retained trees on the western side of the sporting oval, which then provide a linkage to vegetation to the north of the Pacific Highway. There will however be earthworks and associated vegetation clearing required in the corridor, specifically rehabilitation of the quarry area, an easement for services and drainage works on the northern end of the corridor. In these areas revegetation and bush regeneration works will be required to reinstate native vegetation.

2.4 Other Site Values

There are currently no public amenities on site.

A review of previous Aboriginal cultural heritage and archaeological assessments by AHMS 2013 found no sites were located within the subject site as a result of extensive surveys.

2.5 Relationship to Other Approvals

The proposed rezoning and associated construction works require approval under the *Environmental Planning and Assessment Act 1979*.

The proposed Vegetation Management Works do not require any further approvals. The bush regeneration works do not impact any Endangered Ecological Communities or threatened flora species, so licences under the *Threatened Species Conservation Act 1995* to undertake the works are not required.

3 Management Issues

Key management issues for the site that are to be addressed by this VMP are discussed in Table 2 below. Actions to address each of these issues on the site overall and specifically for each Vegetation Management Area on the site are outlined in Section 5 of this report.

Table 2 – Key vegetation management issues

Issue	Site specific management considerations
1. Vegetation clearing and earthworks required in the E2 zoned environmental corridor	Rehabilitation of the quarry, installation of services within a service easement and reconstruction of drainage works will require vegetation clearing and earthworks within the E2 environmental corridor area. This will result in gaps in the wildlife corridor. Earthworks have potential to result in erosion and sedimentation which could impact the downstream drainage corridor. Works will be undertaken in close proximity with vegetation to be retained within the E2 environmental corridor. Revegetation of this area will be required. Revegetation will need to consider suitable species for the site, including feed trees for fauna. Suitable soil conditions will need to be created to support revegetation. Monitoring of survival rates of seedlings and possible replanting will be required to ensure survival rates meet targets. Revegetation areas will need to be protected whilst revegetation occurs, particularly while other construction works are being undertaken on the site. The E2 environmental corridor area will need to be protected while quarry rehabilitation, installation of services within the service easement and drainage construction works are undertaken.
2. Protection of	Presence of machinery and personnel on site has potential to cause inadvertent damage to areas of retained vegetation. Clearing will need to follow procedures to minimise potential harm to wildlife, particularly in relation to removal of hollow bearing trees.

Issue	Site specific management considerations
vegetation and habitats during earthworks and clearing in the development area	Earthworks have the potential to cause erosion and sedimentation that may impact downstream environments, including environmental corridors.
3. Weed infestation and spread	The site has varying levels of weed infestation. Some areas of the E2 environmental corridor have high weed infestation. Weeds need to be effectively removed and controlled to allow regeneration of native species. Clearing of the development area has potential to increase weed infestation on the E2 and Wadalba Wildlife Corridor edges. Methods of weed control will need to vary according to target species. Methods of weed control must be effective and not spread propagules. Intensity of weed control will vary according to density of weeds at specific location. Movement of vehicles and personnel has potential to spread pathogens and weeds.
4. Existing disturbances in E2 environmental corridor area	The native vegetation within the E2 environmental corridor on site has been subject to previous disturbances such as clearing, underscrubbing, weed infestation and creation of tracks. Some areas are considered to be in low condition, others in moderate condition. Levels of weed infestation vary.
5. Tracks and trails	There are existing vehicle tracks, walking tracks and evidence of trail bike use on the site. Some of the tracks are within the E2 environmental corridor area.

Issue	Site specific management considerations
6. Rubbish	There is some rubbish dumping evident on site, although there are not high volumes. Some rubbish is present within the E2 environmental corridor area and the adjacent Wadalba Wildlife Corridor. This level of dumping may increase when the site is cleared for development.
7. Loss of tree hollows	A total of ten (10) hollow-bearing trees are likely to be impacted by the proposal. A total of ten (10) hollow-bearing trees are located within the proposed rezoning area (include HT7 likely to be impact by future road design), and a further six (6) hollow-bearing were recorded in areas within the E2 environmental corridor.
8. Loss of feed resources for local threatened fauna species	Feed trees and plants will be lost from the development area and the E2 environmental corridor area due to required clearing and excavation works.
9. Sourcing plants for revegetation	It is possible that some of the flora species recommended for re-vegetation works may not be available at the time of the scheduled works.

4 OBJECTIVES AND STRATEGIES

4.1 Management Objectives

The overall purpose of this VMP is to provide for the long term protection and rehabilitation of native vegetation to be retained on the subject site.

The objectives of the works outlined in this VMP are as follows:

- Protect areas of native vegetation to be retained in environmental corridors.
- Minimise potential indirect impacts of development on environmental corridors, such as sedimentation and weed invasion.
- Regenerate native vegetation in environmental corridor areas through bush regeneration techniques, including weed control.
- Revegetate highly disturbed areas of the environmental corridor where natural processes or assisted regeneration techniques are not appropriate.
- Create suitable soil conditions for revegetation in those areas where earthworks and clearing is required for rehabilitation of the quarry, installation of services within a service easement and drainage works.
- Enhance the fauna habitat values of the environmental corridor.

Specific objectives related to each Vegetation Management Area are detailed in Table 4 of Section 5.2 below.

4.2 Management Strategies and Priorities

In relation to vegetation management on the site, the priorities for vegetation protection and rehabilitation works are those areas within environmental corridors, including the E2 zoned area and the Wadalba Wildlife Corridor to the south.

Rehabilitation strategies to be applied to the site include:

- A focus on regeneration where resilience of native vegetation occurs and where native vegetation remains but is degraded; and
- The use of revegetation in highly disturbed areas where regeneration alone is not likely to be effective.

The site has been divided into Vegetation Management Areas (VMAs) based on the development works proposed and condition of the native vegetation. These areas are shown in Figure 6 of Section 7.

Strategies and guidelines proposed to address each of the vegetation management issues on site are outlined in Section 5.1 below, and strategies to be applied in each VMA are outlined in Section 5.2.

5 Management Guidelines

5.1 Issue Guidelines

Section 3 of this plan identified key vegetation management issues for the site and the proposed development. Table 3 below provides guidance and strategies in relation to specific management issues on the site.

Table 3 – Issue Guidelines

Issue	Management Strategies and Guidelines
1. Vegetation clearing and earthworks required in the E2 environmental corridor	Prior to earthworks, topsoils and associated leaf litter will need to be collected and appropriately stored for reuse in revegetation areas in order to retain soil seedbank and encourage natural regeneration. Seed bearing branches of native trees and shrubs are to be collected during clearing works and stored for later use as 'brush matting' or layers of small branches over exposed soil in re-vegetation areas. This will assist with prevention of erosion and encourage natural regeneration in revegetation areas. An erosion and sediment control plan will be required for the quarry rehabilitation and drainage works, including diversion of runoff. Services such as electricity, town water, telephone and NBN will be placed within a single service easement to minimise clearing. Revegetation will be required in the areas to be disturbed within the corridor, including at the quarry, the service easement and drainage works area. Revegetation in the environmental corridor will include provision of feed tree and keystone species specific to those threatened species known from

Issue	Management Strategies and Guidelines
	the local area, including for Glossy Black Cockatoo and Squirrel Glider. A monitoring program will be required to ensure plant survival targets are met. Once revegetation commences, temporary protective fencing will be required. In the long term, a physical barrier to vehicle access to the E2 environmental corridor such as stones will be required.
2. Protection of vegetation and habitats during earthworks and clearing in the development area	Exclusion fencing to protect the E2 environmental corridor and the Wadalba Wildlife Corridor will need to be installed prior to the commencement of any earthworks or clearing works on the site. Clearing will need to follow procedures to minimise potential harm to wildlife, particularly in relation to removal of hollow bearing trees. These procedures are outlined in the Everitt Ecology Ecological Assessment for the rezoning and are attached to this VMP as Appendix 2. A Project Ecologist will be required to induct contractors to the site and supervise all clearing works. An erosion and sediment control plan will be required for any earthworks or construction works. Sediment basins will need to be located outside areas of native vegetation and trees to be retained. Prior to earthworks, topsoils and associated leaf litter will need to be collected and appropriately stored for reuse in revegetation areas in order to retain soil seedbank and encourage natural regeneration. Collection of topsoil and associated leaf litter from the development site or other proposed clearing areas outside of the development site should be limited to areas mapped as 'low weed invasion' as displayed in Figure 3. Seed bearing branches of native trees are to be collected including clearing works on the site and stored for re-use in brush matting of revegetation areas. This brush matting will assist with prevention of erosion and encouraging natural regeneration in revegetation areas.
3. Weed infestation	Weed control should commence in most heavily infested areas. Weed control is to include primary and secondary weeding.

Issue	Management Strategies and Guidelines
and spread	Primary and secondary weeding works are to be undertaken by qualified and experienced bush regenerators. Any herbicides used in the drainage corridor area will need to be suitable for use near waterways. Coral trees at northern end of site will need to be removed without spreading propagules. All construction and bush regeneration contractors working on site will need to implement hygiene, pathogen and weed control procedures. Buffer areas (VMA 6) to the development area will need to be monitored for any new weed invasion, particularly after clearing of the development area is undertaken. Landscaping using locally endemic species will be required along the edges of proposed rezoning area adjoining the E2 zoned area and the Wadalba Wildlife Corridor. A monitoring program will be required to ensure weed control and native rehabilitation targets are met.
4. Existing disturbances in environmental corridor area	The priority is to encourage regeneration of native species through bush regeneration techniques, including weed control, in areas where there is low to moderate condition native vegetation or there are small gaps in native vegetation. A monitoring program will be required to ensure weed control and native rehabilitation targets are met. If rehabilitation targets are not being met, revegetation with native species may be required.
5. Tracks and trails	A permanent physical barrier to vehicle access such as stones will be required at the boundaries of the E2 environmental corridor and Wadalba Wildlife Corridor.
6.	Rubbish removal will need to be undertaken by hand in E2 environmental corridor area and buffer area to the Wadalba Wildlife Corridor.

Issue	Management Strategies and Guidelines
Rubbish	A permanent physical barrier to vehicle access such as stones will be required at the boundaries of the E2 environmental corridor and Wadalba Wildlife Corridor. Dumping of garden waste may increase post development. In the proposed subdivision layout there are no lots directly adjoining the corridors, which should reduce potential for this to occur.
7. Loss of tree hollows	Fifteen (15) natural nesting boxes will be installed within the Wadalba Wildlife Corridor and the E2 zoned environmental corridor. Eight (8) natural nest boxes will be installed at least 3 months prior to the commencement of clearing works. It is planned that the remaining seven (7) nest boxes will be constructed from hollows salvaged during clearing within the development site, however this number will be subject to the number of hollows considered suitable for nest box construction. If the number of nest boxes able to be constructed from salvaged hollows is less than seven (7), the deficit will be filled by additional natural nest boxes. Nest box selection and/or construction, placement and installation will be undertaken with consideration of Appendix 4 – Guidelines for nest box type and installation. The locations of proposed nest boxes will be selected to provide suitable spacing from existing nest boxes and also with consideration for the guidelines provided in Appendix 4. The locations of existing nest boxes and the indicative locations of proposed nest boxes are displayed in Figure 7.
8. Loss of feed resources for local threatened fauna species	Revegetation in the E2 environmental corridor will include provision of feed tree and keystone species specific to those threatened species known from the site and local area, including for Glossy Black Cockatoo and Squirrel Glider. These species are noted in Appendix 3.
9. Sourcing plants for	A range of species recorded from the site would be suitable for use in revegetation, these are listed in Appendix 3. It would be preferable to use local provenance tube stock in revegetation works.

Issue	Management Strategies and Guidelines
revegetation	The proposed re-use of topsoil and leaf litter from the site as well as storage of fruiting branches from clearing works in areas of brush matting should also assist in maintaining local genetic diversity.

5.2 Area Specific Guidelines

The site has been divided into Vegetation Management Areas (VMAs) on the basis of existing environmental characteristics (including vegetation condition and weed levels) and works required in each area. The VMAs are shown in Figure 5 in Section 7. The table below outlines management guidelines, specifications and targets applicable to each Vegetation Management Area on the site.

Table 4 – Vegetation Management Area Guidelines and Objectives

Vegetation Management Area	Management Strategies and Guidelines	Objectives
VMA 1 - Quarry Revegetation Area Rehabilitation of the quarry will require vegetation clearing and earthworks within the environmental corridor area.	Temporary exclusion fencing to protect environmental corridor areas outside the proposed work area will need to be installed prior to the commencement of earthworks or clearing works in the E2 environmental corridor area. If required, a small line could be cleared to install the fence. Prior to earthworks, topsoils and associated leaf litter will need to be collected and appropriately stored for reuse in revegetation areas in order to retain soil seedbank and encourage natural regeneration. Seed bearing branches of native trees and shrubs are to be collected during clearing works and stored for later use as 'brush matting' or layers of small branches over exposed soil in re-vegetation areas. This will assist with prevention of erosion and encourage natural regeneration in revegetation areas. Earthworks have potential to result in erosion and sedimentation which could impact the downstream drainage corridor. An erosion and sediment control plan will be required, including diversion of runoff. Erosion and sediment controls will need to be monitored daily by construction contractors. Clearing will need to follow procedures to minimise potential harm to wildlife, particularly in relation to removal of hollow bearing trees. These procedures are outlined in the Everitt Ecology Ecological Assessment for the rezoning and are attached to this VMP as Appendix 2. A Project Ecologist will be required to induct contractors to the site and supervise all clearing works. Suitable soil conditions will need to be created to support revegetation. Topsoil collected from the site will be reused to encourage natural regeneration. If there is not sufficient topsoil from the site, VENM topsoil from elsewhere that is free of plant propagules could be used. Revegetation will be required in the areas to be disturbed within the corridor. Only plants selected from	No disturbance of native vegetation outside the designated work area. No release of sediment from the work area into drainage lines or environmental corridors. No native wildlife injured during clearing works. To reduce weed cover to less than 10% cover within Year 1 and less than 5% by end of Year 2. To achieve a 80% survival rate of all tube stock planted. Enhance habitat values of the corridor for fauna by encouraging native plant regeneration and planting of feed tree species.

Vegetation Management Area	Management Strategies and Guidelines	Objectives
heavily weed infested then the western side of the drainage line.	weed seed from upper slopes by overland flow. All primary weeding should take place in the first 6 months of the bush regeneration contract. Secondary weeding will follow for the length of the maintenance period at least 6 monthly intervals. Any herbicides used in the corridor area will need to be suitable for use near waterways. A monitoring program will be required to ensure weed control and native rehabilitation targets are met. If rehabilitation targets are not being met, revegetation with native species may be required. Only plants selected from the list of species at Appendix 3 are to be used on site. Rubbish removal will need to be undertaken by hand in this area. This area has some large trees and would be suitable for placement of some of the 15 required nest boxes (Refer to Table 3 - Issue 7, & Figure 7).	regeneration and provision of nestboxes.
VMA 3 - Low Level - Weeding & Regeneration Works This western side of the drainage line has a lower level of weed	Regeneration of native species will be encouraged through bush regeneration techniques, including weed control. Weed control, bush regeneration and monitoring works are to be undertaken by qualified and experienced bush regenerators. Weed species occurring in this area are detailed in Section 2.2 of this VMP. Methods of weed control will vary according to target species. Primary weed control should commence on the upper slopes where possible to minimise re-introduction of weed seed from upper slopes by overland flow. All primary weeding should take place in the first 6 months of the bush regeneration contract. Secondary	To reduce weed cover to less than 10% cover within Year 1 and less than 5% by end of Year 2. To achieve a 80% survival rate of all tube stock planted. Enhance habitat values of the corridor for fauna by encouraging native plant regeneration and provision of nestboxes.

Vegetation Management Area	Management Strategies and Guidelines	Objectives
infestation then the eastern side. It appears that some weed control may have been undertaken in this area, possibly in association with the adjoining subdivision. Weed control required here will be less intense than for VMA 2. Revegetation works are unlikely to be	weeding will follow for the length of the maintenance period at least 6 monthly intervals. Any herbicides used in the corridor area will need to be suitable for use near waterways. A monitoring program will be required to ensure weed control and native rehabilitation targets are met. If rehabilitation targets are not being met, revegetation with native species may be required. Only plants selected from the list of species at Appendix 3 are to be used on site. Rubbish removal will need to be undertaken by hand in this area. This area has some large trees and would be suitable for placement of some of the 15 required nest boxes (Refer to Table 3 - Issue 7, & Figure 7). A permanent physical barrier to vehicle access such as stones will be required at the boundaries of the E2 environmental corridor.	

Vegetation Management Area	Management Strategies and Guidelines	Objectives
required.		
VMA 4 – Service Easement & Drainage Works Revegetation Area This area is at the lower, northern end of the environmental corridor. There is existing drainage infrastructure that needs to be replaced. The works will require earthworks and	The installation of services with the service easement and drainage works in the northern end of the E2 zoned environmental corridor will require revegetation. Temporary exclusion fencing to protect environmental corridor areas outside the proposed work area will need to be installed prior to the commencement of earthworks or clearing works in the E2 environmental corridor area. If required, a small line could be cleared to install the fence. Prior to earthworks, topsoils and associated leaf litter will need to be collected and appropriately stored for reuse in revegetation areas in order to retain soil seedbank and encourage natural regeneration. Seed bearing branches of native trees and shrubs are to be collected during clearing works and stored for later use as 'brush matting' or layers of small branches over exposed soil in re-vegetation areas. This will assist with prevention of erosion and encourage natural regeneration in revegetation areas. Earthworks have potential to result in erosion and sedimentation which could impact downstream environments. An erosion and sediment control plan will be required, including diversion of runoff. Erosion and sediment controls will need to be monitored daily by construction contractors. Clearing will need to follow procedures to minimise potential harm to wildlife, particularly in relation to removal of hollow bearing trees. These procedures are outlined in the Everitt Ecology Ecological Assessment for the rezoning and are attached to this VMP as Appendix 2. A Project Ecologist will be required to induct contractors to the site and supervise all clearing works. Suitable soil conditions will need to be created to support revegetation. Topsoil collected from the site will be reused to encourage natural regeneration. If there is not sufficient topsoil from the site, VENM topsoil	No disturbance of native vegetation outside the designated work area. No release of sediment from the work area into drainage lines or environmental corridors. No native wildlife injured during clearing works. To control weed cover at less than 5% by end of Year 2. To achieve a 80% survival rate of all tube stock planted. Enhance habitat values of the corridor for fauna by encouraging native plant regeneration and planting of feed tree species.

Vegetation Management Area	Management Strategies and Guidelines	Objectives
clearing.	from elsewhere that is free of plant propagules could be used. Only plants selected from the list of species at Appendix 3 are to be used on in revegetation works site. Plantings are to include groundcover, mid-storey and tree species. Revegetation in the environmental corridor will include provision of feed tree and keystone species listed in Appendix 3. Tree species to be planted with approximately 6 m spacing, and shrubs and ground cover species at a density of $3/m^2$. A monitoring program will be required to ensure plant survival targets are met. Weed monitoring and control will be required in revegetated areas as per the schedule shown in Section 6. Once drainage construction works and installation of services is complete, and revegetation commences, temporary protective fencing will be required. A permanent physical barrier to vehicle access such as stones will be required at the boundaries of the E2 environmental corridor.	
VMA 5 - Dam Revegetation Area There are two small dams that will be removed.	Any amphibian specimens located within the two dams should be re-located to similar dam habitats located within the Wadalba Wildlife Corridor, prior to commencement of works to fill in the dams. The dam area within the wildlife corridor is to be revegetated. Suitable soil conditions will need to be created to support revegetation. Topsoil collected from the site will be reused to encourage natural regeneration. If there is not sufficient topsoil from the site, VENM topsoil from elsewhere that is free of plant propagules could be used.	No native wildlife injured during clearing works. To control weed cover at less than 5% by end of Year 2. To achieve a 80% survival rate of all tube stock planted

Vegetation Management Area	Management Strategies and Guidelines	Objectives
One of these dams is within the wildlife corridor.	Only plants selected from the list of species at Appendix 3 are to be used on site. Plantings are to include groundcover, midstorey and tree species. Revegetation in the environmental corridor will include provision of feed tree and keystone species listed in Appendix 3. Tree species to be planted with approximately 6 m spacing, and shrubs and ground cover species at a density of 3/m^2. A monitoring program will be required to ensure plant survival targets are met. Weed monitoring and control will be required in revegetated areas as per the schedule shown in Section 6.	Enhance habitat values of the corridor for fauna by encouraging native plant regeneration and planting of feed tree species.
VMA 6 - Buffer area A 5m strip along the edge of the Wadalba Wildlife Corridor to the south of the site is designated a buffer area	The level of weed infestation and rubbish dumping in this area is to be documented prior to the commencement of any earthworks, clearing or other construction works on the site. This area will be monitored for any weed invasion or rubbish dumping. Monitoring is to be undertaken as per the monitoring guidelines in Section 5.3 below every 3-6 months from the time of clearing of the development area for a period of 2 years. If any new weed growth is noted, bush regeneration contractors are to undertake weed removal activities. Any dumping of rubbish or green waste is to be removed in a low impact manner, such as by hand. Landscaping using locally endemic species selected from the list at Appendix 3 will be required along the edges of proposed rezoning area adjoining the E2 zoned area and Wadalba Wildlife Corridor. The wildlife corridor is a suitable location for placement of some of the 15 required nest boxes (Refer to	No disturbance of native vegetation outside the designated work area. No increase in weed infestation or rubbish dumping in the wildlife corridor. Enhance habitat values of the corridor for fauna by encouraging native plant regeneration.

Vegetation Management Area	Management Strategies and Guidelines	Objectives
where impacts will be monitored.	Table 3 – Issue 7, & Figure 7).	
Proposed Rezoning / Development Area The development area will be cleared of native vegetation to accommodate the proposed subdivision.	Exclusion fencing to protect the E2 zoned environmental corridor and the Wadalba Wildlife Corridor will need to be installed prior to the commencement of any earthworks or clearing works on the site. Clearing will need to follow procedures to minimise potential harm to wildlife, particularly in relation to removal of hollow bearing trees. These procedures are outlined in the Everitt Ecology Ecological Assessment for the rezoning and are attached to this VMP as Appendix 2. A Project Ecologist will be required to induct contractors to the site and supervise all clearing works. Earthworks have potential to result in erosion and sedimentation which could impact the downstream drainage corridor. An erosion and sediment control plan will be required, including diversion of runoff. Erosion and sediment controls will need to be monitored daily by construction contractors. Sediment detention basins or ponds will need to be located outside environmental corridor areas. Topsoils and associated leaf litter from the development area will need to be collected and appropriately stored for reuse in revegetation areas in order to retain soil seedbank and encourage natural regeneration. Collection of topsoil and associated leaf litter from the development site or other proposed clearing areas outside of the development site should be limited to areas mapped as 'low weed invasion' as displayed in Figure 3. Seed bearing branches of native trees and shrubs are to be collected during clearing works and stored for later use as 'brush matting' or layers of small branches over exposed soil in re-vegetation areas. This will	No native wildlife injured during clearing works. No disturbance of native vegetation outside the designated work area. No release of sediment from the work area into drainage lines or environmental corridors. No native wildlife injured during clearing works.

Vegetation Management Area	Management Strategies and Guidelines	Objectives
	assist with prevention of erosion and encourage natural regeneration in revegetation areas. Coral trees at northern end of site will need to be removed without spreading propagules. Landscaping using locally endemic species will be required along the edges of proposed rezoning area adjoining the E2 zoned area and Wadalba Wildlife Corridor. All construction and bush regeneration contractors working on site will need to implement hygiene, pathogen and weed control procedures.	

5.3 Monitoring Guidelines

The main objectives of the monitoring program are to evaluate the effectiveness of the weed management program, to determine if adequate natural regeneration is occurring and monitor the success of plantings. There will be a two (2) year monitoring and maintenance period for plantings and weed control works.

Suggested targets:

- To reduce weed cover to less than 10% cover within Year 1 and less than 5% by the end of Year 2.
- To achieve a 80% survival rate of all tube stock planted.

If monitoring determines that the weed eradication techniques are ineffective or not meeting targets, then the techniques and effort being used are to be altered to more effectively control the weeds.

If natural regeneration is failing then corrective measures will need to be implemented, including planting of tube stock, preferably from local provenance material.

Five (5) photographic monitoring points will be established on the site to assist with monitoring and documentation of progress. The recommended location of these points is shown on Figure 6 in Section 7. These points will need to be marked in the field with a stake or similar.

As outlined in Table 5 in Section 6 below, monitoring would need to include a baseline survey and associated report prior to commencement of works in each VMA, followed by monitoring and associated reports at 6 monthly intervals until a final report at 2 years after revegetation and rehabilitation works have commenced. As rehabilitation and revegetation in different VMAs may commence at different times due to staging of construction, the timing of completion of monitoring works for each VMA would vary to comply with the required 2 year maintained period for each section of works .