

**SOUTHERN HIGHLANDS  
REGIONAL SHOOTING COMPLEX  
(HILLTOP CONSERVATION AREA)**

**CONSERVATION AREA MONITORING  
and  
BIOMETRIC CONDITION ASSESSMENT  
2015**



**Prepared by  
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# Contents

1.0	Introduction.....	3
1.1	Monitoring.....	3
1.2	Reporting Program .....	4
1.3	Zone 2 Development .....	4
2.0	Site Description.....	4
3.0	Conservation Values .....	5
3.1	Threatened Species .....	5
4.0	Additional Site Monitoring .....	6
5.0	Site Condition Assessment and .....	7
	Biometric Data Collection .....	7
	Map 1: Shooting Complex boundary and landscape .....	8
6.0	Monitoring Report Form.....	9
7.0	Photo-Points, Plot Data and Condition Assessments .....	26
7.1	Summary of Survey Findings: Plots and Photo-points .....	26
7.2	Photo-point 1 and Plot 1 data.....	28
7.3	Photo-point 2 and Plot 2 data.....	38
7.4	Photo-point 3 (GR 265263 6197520 GDA 94).....	48
7.5	Photo-point 4 and Plot 4 data .....	49
7.6	Photo-point 5 and Plot 5 data .....	62
7.6	Photo-point 6 and Plot 6 data .....	74
7.8	Photo-point 7 and Plot 7 data .....	85
8.0	References .....	97
	APPENDIX ONE.....	98
	Summary of Flora and Fauna Management Actions (Table 16) from <i>Ecological Management Plan, Southern Highlands Regional Shooting Complex.....</i>	98

Report by Ian Brown (PO Box 30, Mount Victoria, NSW 2786, 02 4787 1420) and Wyn Jones.

Cover image: Waratah (*Telopea speciosissima*) flowering in April, Zone 3, Hilltop Conservation Area (photo by Ian Brown)

## 1.0 Introduction

The Southern Highlands Regional Shooting Complex (Hilltop Conservation Area) is an area of 1036 hectares in the Southern Highlands of New South Wales, comprised of Lot 1, DP 1088254 (the site). The Hilltop Conservation Area is managed by the Office of Communities (Sport and Recreation) and was previously a part of, and is now almost surrounded by, the Bargo State Conservation Area (SCA) under the Minister administering the *National Parks and Wildlife Act 1974* and managed by the Office of Environment and Heritage (OEH).

On 12 October 2010 the Office of Communities (Sport and Recreation) entered into a *Conservation Agreement* for the entire site, under the *National Parks and Wildlife Act 1974*. The Agreement was signed between the Minister for the Environment and the Minister for Sport and Recreation. The statutory Agreement details the conservation values of the site and incorporates the owner's commitment to those values. The area is zoned into development areas of 136 hectares (zones 1 and 2) and a natural area of 900 hectares (zone 3). The development areas contain shooting facilities and the *Conservation Agreement* was prompted by the extension of the original facilities (800m range, Zone 1) with the development of new 50m and 500m ranges in Zone 2 in 2011.

Management of the zone 3 natural area is based on management of the adjoining Bargo SCA, which is guided by the *Nattai Reserves Plan of Management* (2001), a statutory document. The Office of Communities (Sport and Recreation) liaises with OEH on some aspects of management for the Conservation Area.

Annexure C of the *Conservation Agreement* includes the following provisions regarding an ongoing monitoring program:

### 1.1 Monitoring

- w) A comprehensive, measurable monitoring program including baseline information and data to be implemented consistent with requirements under any development approval and best practice guidelines to ensure that any existing or potential pollution, sedimentation or contamination impacts from Zone 2 and 3 do not impact upon Zone 1, and that if any impacts are detected over time, that remediation is implemented immediately.
- x) Annexure B contains dated aerial photographs/maps showing the location of the conservation area, the conservation values and photo-points. Photographs have been taken at these photo-points during the preparation of the Agreement. This provides baseline information and data for ongoing monitoring and adaptive management of the conservation area. Further photo-point photographs should be taken when development is completed.
- y) Photographs at the identified (and future) photo-points should be taken from time to time in consultation with Department's officers for the purposes of ongoing monitoring of the conservation values.
- z) The owner to complete a monitoring report on an annual basis, including photo-point photos, noting changes occurring in the conservation area. This will form the basis for decisions about ongoing management actions. A copy of all monitoring reports should be forwarded to the Office of Environment and Heritage (OEH).

## **1.2 Reporting Program**

A monitoring report under the *Conservation Agreement* was prepared in 2011: *Southern Highlands Regional Shooting Complex Conservation Area Monitoring and Biometric Condition Assessment* (Epacris Environmental Consultants Pty Ltd, December 2011). The report was submitted to OEH under clause (z) of the *Conservation Agreement*. That report addressed clauses (w), (x) and (y) of the *Conservation Agreement*, added some new photo-points (clause x) and included baseline data for future yearly monitoring reports. This report was prepared soon after the completion of new facilities at the shooting range.

Around the same time, a Draft Operational Environmental Management Plan was prepared for the site (GHD 2011). This plan included and extended the requirements of the *Conservation Agreement*.

This 2015 monitoring report follows the same format as the 2011 report and covers the same requirements, as well as reporting on management programs and investigations that have been carried out since 2011. It is the first monitoring report prepared since the 2011 report. In the interim, the new shooting facilities in Zone 2 have not operated due to design issues. Hence some of the impacts and issues to be addressed by the monitoring program have not eventuated or have not changed significantly.

## **1.3 Zone 2 Development**

The construction of the new 50m and 500m ranges in Zone 2 was halted in April 2012 due to design issues. The works were incomplete and the ranges have not become operational as at April 2015. Further construction works are planned to be completed by June 2016 to rectify these issues. These works will also address/rectify issues with revegetation, drainage, sediment control and encroachment of works into Zone 1.

## **2.0 Site Description**

The site is located within the Southern Highlands region and the jurisdiction of the Wingecarribee Shire Council. The area is surrounded by the Bargo State Conservation Area, which adjoins Nattai National Park. This region has extensive and significant natural areas which are part of the Sydney Basin Landscape. The area includes outstanding scenic and natural values. The adjacent Nattai National Park is part of the Greater Blue Mountains World Heritage Area. The park is managed to protect, conserve and present the World Heritage values of the area. The natural areas of the region also fulfil an important function in the protection of catchment values for Sydney's water supply.

Topographically and geologically the area is transitional between the Cumberland Plain of the Sydney Basin, and the southern uplands. The area is comprised of a deeply incised sandstone plateau landscape of ridges and gullies. The shooting complex is located on the top of the ridge which is flat to gently sloping. The ridge then drops steeply into two tributaries of Rocky Waterholes Creek. Rocky Waterholes Creek drains directly to the Nattai River within Nattai National Park approximately 6 km to the west of the existing shooting complex. The Nattai River drains north into the water supply storage of Lake Burragorang.

## 3.0 Conservation Values

The Hawkesbury Nepean Catchment Management Authority has classified 98 per cent of the Nattai River as being ‘Near Intact’ (cited from GHD, February 2008).

A recent study of the vegetation of Nattai National Park and Bargo SCA identified two broad vegetation groups within the plan area: Sheltered Sandstone Forests on the slopes and Sandstone Shrub Woodlands on the ridge-tops. Wet gully vegetation communities occur along the deeply incised creeklines.

The vegetation on the site is dominated by a mix of Eucalypt species including Scribbly Gum (*Eucalyptus sclerophylla*), Grey Gum (*E. punctata*), Blue-leaved Stringybark (*E. agglomerata*), Sydney Peppermint (*E. piperita*), White Stringybark (*E. globiodes*), Red Bloodwood (*Corymbia gummifera*) and Mountain Ash (*E. sieberi*) (GHD February 2008). No Endangered Ecological Communities have been identified.

The site contributes to a major north-south vegetation/wildlife corridor at this locality which links with east-west regional corridors located to the north and south to the Blue Mountains National Park and Woronora Escarpment and the Coast (GHD, July 2008). These natural areas are key components of the Southern Highlands Link sector of the Great Eastern Ranges initiative – a continental scale, cross-tenure corridor of natural and rehabilitated lands stretching from western Victoria to far north Queensland (<http://www.greasternranges.org.au/>).

The area provides a wide range of habitat for a variety of fauna, due to the extensive areas of intact vegetation, the presence of mature, hollow-bearing trees, a wide variety of food sources, extensive shrub and canopy habitats and deep leaf litter. Areas of rocky, sandstone platforms and small cliffs provide crevices, overhangs, cracks and rocks suitable as sheltering and foraging sites. The area provides habitat for a wide range of fauna including reptiles and mammals (GHD, July 2008).

### 3.1 Threatened Species

The Hilltop Conservation Area supports potential and known habitat for five threatened fauna species as listed below (cited from GHD 2008 and the Atlas of NSW Wildlife accessed 30 March 2015, and as listed under the *Threatened Species Conservation Act 1995*). Other threatened species may also occur in the area.

- Barking Owl (*Ninox connivens*) - Vulnerable
- Koala (*Phascolarctos cinereus*) - Vulnerable
- Scarlet Robin (*Petroica boodang*) - Vulnerable
- Varied Sitella (*Daphoenositta chrysoptera*) - Vulnerable
- Yellow Bellied Glider (*Petaurus australis*) - Vulnerable

No threatened flora species have been recorded for the Conservation Area, but several are found in the wider district in similar habitats, including *Persoonia glaucescens* (Endangered), *Persoonia hirsuta* (Endangered), *Persoonia acerosa* (Vulnerable) and *Acacia bynoeana* (Endangered).

## 4.0 Additional Site Monitoring

Several documents were prepared for the site by Sport and Recreation as per the development Conditions of Approval, these include:

- Construction Environmental Management Plan (CEMP);
- Ecological Management Plan (EMP);
- Bushfire Management Plan;
- Soil and Water Management Plan;
- Water Cycle Management Plan.

These plans can be viewed online at:

[http://majorprojects.planning.nsw.gov.au/index.pl?action=view\\_job&job\\_id=1051](http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=1051)

The EMP outlines monitoring to be carried out by Sport and Recreation after the completion of construction, additional to the requirements of the Conservation Agreement. These monitoring results were not available for the 2011 report, however the intention was for future reports to contain all data from this additional monitoring, which includes:

- *Phytophthora* monitoring
- Soil Contamination Monitoring
- Sediment Monitoring
- Surface Water Contamination Monitoring
- Inspections for evidence of shot loss and ricochet
- Inspection of engineering controls
- Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises)

This monitoring program has not become fully operational due to the non-operation of the new ranges in Zone 2, and has been undergoing review in the intervening period.

A summary of management actions required by the EMP is located in Appendix 1 of this report.

## 5.0 Site Condition Assessment and Biometric Data Collection

The Office of Environment and Heritage (OEH) provides a monitoring protocol for all Conservation Agreements. This report sets the baseline data for future monitoring of the site. This monitoring protocol and monitoring reports will form the basis for and guide future management and monitoring of the conservation area.

The data presented in this report represent the 7 photo-point locations and 6 monitoring plots established and reported on for the 2011 report (Map 2). These were to provide a basis for future annual reports.

Photo-points and plots were selected so as to provide information over time if any impacts from the development in Zones 1 and 2 are occurring within Zone 3 of the Conservation Area. To this end, the monitoring plots are generally located close to the boundary of the zones. The vegetation on site is generally uniform across the area, therefore this was not used as a criteria in selecting plot locations.

Plots are typically a 20m x 20m area, except for Plot #4 which is a 6m x 60m plot, as its aim is to monitor the efficacy of the fence blocking vehicle (including motorbike) access to the track. Plots are marked on all 4 corners with 40 cm steel star pickets with yellow plastic caps.

Photo-points (except for Photo-point 3, where no plot data was undertaken) were taken while standing at one of the plot markers and taking photos looking North, South, East and West. Photo-point photos are marked with the date when the photo was taken. Additional photos were taken if considered beneficial for future monitoring purposes.

<b>Photo-point and/or Plot No.</b>	<b>Grid Reference (GDA 94)</b>
1	265573 6199190
2	265540 6199076
3	265263 6197520
4	265119 6197472
5	264843 6200465
6	265435 6200643
7	265680 6199995



**Map 1: Shooting Complex boundary and landscape**



## 6.0 Monitoring Report Form

This form is being completed for the following reason:

- |                                     |  |                                     |                        |
|-------------------------------------|--|-------------------------------------|------------------------|
| <input checked="" type="checkbox"/> | Annual Report by landholder (self reporting)     | <input checked="" type="checkbox"/> | Conservation Agreement |
| <input type="checkbox"/>            | Routine visit by OEH with landholder             | <input type="checkbox"/>            | Wildlife Refuge        |
| <input type="checkbox"/>            | Compliance visit by OEH with landholder          | <input type="checkbox"/>            | Property Agreement     |
| <input type="checkbox"/>            | Change of ownership visit by OEH with landholder |                                     |                        |

Please make three copies of the completed form and any additional information. One to be retained by the landowner, one for the local Area office of NPWS and the third to go to Conservation Partnerships Delivery Unit, OEH, PO Box A290, Sydney South NSW 1232.

### A LANDOWNER AND PROPERTY DETAILS

Property Owner	Office of Communities (Sport and Recreation)
Property Name	Southern Highlands Regional Shooting Complex
Property Address	Wattle Ridge Road, Hilltop, NSW
CA number	0280
Area (ha)	1,036 ha
CMA Region	Hawkesbury-Nepean
Agreement signed	12 October 2010
Date of last monitoring visit	October 2011
Date of visit	24-25 March 2015
Officers undertaking visit	I. Brown / W. Jones

## B LANDHOLDER OVERVIEW SINCE LAST VISIT

### 1 LANDHOLDER EXPERIENCES RELATING TO THE IMPLEMENTATION OF THE CONSERVATION AGREEMENT /WILDLIFE REFUGE

<i>Points to note</i>	<i>Comments</i>
Since the last report in 2011, the new parts of the shooting complex have not operated due to design issues. Further works are planned by July 2016 to rectify these issues on the 500m and 50m ranges, including identified problems with rehabilitation, drainage and sediment control.	<p>Some required monitoring actions have not eventuated due to the non-operation of the range.</p> <p>However a number of environmental management actions have been carried out.</p> <p>Some of these management actions require follow-up.</p>

Please place an X in this box if new issue(s)/problem(s) require management help

## 2 WORKS UNDERTAKEN SINCE LAST VISIT

<i>Description of work undertaken</i>	<i>Source of funding and amount</i>	<i>Date completed</i>
<b>Construction.</b> Shooting Complex new facilities construction, but 50m and 500m ranges not yet operational pending corrective works. New ranges have consequently become overgrown due to lack of maintenance.		Ceased April 2012 (incomplete due to defects)
<b>Rehabilitation.</b> Disturbed areas remediated during construction. Some of these works have failed or been otherwise ineffective, and corrective works have been recommended (ErSed 2013b).		April 2012
<b>Excessive clearing.</b> Investigation into clearing that extended outside Zone 2 boundary into Zone 1 in vicinity of retention basin (as noted in 2011 report). Confirmed that extension of works into Zone 1 at 50m range and clubhouse has occurred (see map). Need to resolve Zone boundary issues with OEH and Dept of Planning.		Not yet fully resolved
<b>Dead vegetation.</b> Investigation and soil test by Wingecarribee Shire Council into dead vegetation at the end of the 800m range in Zone 3 (as noted at Photo-point 1 in 2011 report). Found to be the result of excessive wetness not toxins. Affected area as at 2015 inspection has stabilised with no extension of impacts.		February 2012
<b>Site hygiene protocols.</b> Implemented during construction phase, to prevent spread of <i>Phytophthora</i> , Myrtle Rust and weed propagules. Not practical to continue during routine operational phase and largely unnecessary (most access is on paved and otherwise highly modified areas). Access since construction to new 50m and 500m facilities has been minimal due to these not yet being operational.		2012
<b>Soil, water and sediment monitoring.</b> Monitoring Plan completed (ErSed 2013a). Initial baseline sampling completed (ErSed 2013b). Sampling showed concentrations of lead, zinc and copper were elevated above EMP recommendations at some sites and failure of a number of stabilisation, drainage, rehabilitation and water retention measures. Follow-up sampling and further erosion/rehabilitation	2 2	March 2013

<p>measures were recommended.</p> <p>Access to some remote specified water monitoring sites found to be impractical. A variation to the determination is being sought to identify sites closer to source areas within development zones.</p> <p>2015 monitoring underway at time of writing.</p>		<p>Ongoing</p> <p>Underway</p>
<p><b>Weed, feral animal and <i>Phytophthora</i> monitoring.</b> Survey undertaken and report prepared by AEC (2013, for ErSed Environmental). Survey covered the three ranges/surrounds and access tracks within the SHRSC. Localised and minor weed infestations were observed at the 800m and 50/500m range areas. Some of these infestations may be annual and non-persistent while others may require further management. Minor occurrence of rabbit and fox scat. No evidence of <i>Phytophthora</i>. Consultants recommended follow up inspection in accordance with OEMP to identify any weed communities requiring treatment, and engage bush regenerator for treatment.</p>		<p>April 2013</p>
<p><b>Feral dog control.</b> Trapping programmes undertaken in March 2013 and July 2014 in conjunction with NPWS programmes on adjoining lands. 2013 trapping results = 4 x fox and 1 x dog. 2014 results = 2 x fox and 1 x dog.</p>		<p>July 2014</p>
<p><b>Fire management.</b> Asset Protection Zone around 800m range clubhouse has been maintained by slashing. The 'Flat Top Mountain' prescribed burn in Nattai NP was completed by OEH/NPWS in August 2013 (edge burnt in May 2013), and incorporated c.400 ha of the southern part of the Hilltop Conservation Area, south from Rocky Waterholes Creek to the southern boundary near Iron Creek and the eastern boundary along the powerline easement. This area was burnt at a low to moderate intensity.</p>		<p>Ongoing</p>

### 3 FIRE HISTORY MONITORING

<b>Date of fire</b>	<b>Area burnt (% of c.a./approx ha)</b>	<b>Reason (hazard red./wild)</b>	<b>Intensity (low/medium/high)</b>
2002/2003	80%	Wildfire	Medium to high
2011	40% (c.400 ha)	Prescribed burn	Low to medium

#### 4 VISITATION

<i>Average No. of Visitors</i>	<i>Purpose of Visitation</i>	<i>Visitation effects</i>	<i>Strategies to overcome effects</i>
<b>800m range:</b> 843 p.a. over 3 years to 31-10-2014 <b>50m/500m ranges:</b> minimal (not operational)	Use of 800m range	Minimal – accumulation of spent ammunition in target area 800m range.	Implement monitoring/collection of spent ammunition.

#### 5 COMMUNITY CONSULTATION AND INPUT INTO DECISION MAKING

<i>Type of Involvement</i>	<i>Numbers involved</i>	<i>Outcomes</i>
Sport & Recreation letter to database of effected Hilltop residents to advise of noise testing.	3 residents, several communications	Ongoing for all noise tests
Sport & Recreation letter to Hilltop Resident action group to advise of noise testing.	1, several communications	Ongoing for all noise tests
Community Mail out to all residents in Hill Top re noise testing		
Camelot property notified re. dog trapping.	1, emails during trapping	Notifications only

### C CONSERVATION VALUES

	<b>Conservation Values noted in Agreement and its significance</b>	<b>Current condition **</b> (I = improving M= maintain D= declining) <i>Anecdotal evidence only available at present</i>	<b>Current and emerging threats</b>	<b>Level (severe, high, moderate or low) and extent (throughout, widespread, scattered or localised) of threats</b>	<b>New findings; any other relevant information.</b>
Landscape/ Catchment - World/national heritage listings - Landscape &	The area is regionally significant due to existing linkages with other bushland areas and Crown land creating a significant wildlife corridor. The property was	M	Current: Catchment values have declined due to failure of rehabilitation/drainage works in Zone 2.	Moderate - localised within Zone 2 into Zone 3.	Site requires corrective rehabilitation/drainage works.

scenic values	previously part of and adjoins the Bargo State Conservation Area.				
Biological - Vegetation Communities - Flora - Fauna & habitat - Water bodies	<p>The conservation area contains a high level of floristic diversity comprised largely of undisturbed sandstone shrub woodland, heath woodland and mallee vegetation communities.</p> <p>Sheltered Sandstone Forest occurs on sandstone slopes that descend into steeply dissected gullies and creeklines throughout the natural area.</p> <p>The gullies and creeklines support moist forest vegetation communities. The natural area contains regionally rare and significant plant species, such as <i>Eucalyptus apiculata</i>. The natural area contains Barking Owl (<i>Ninox connivens</i>), Koala (<i>Phascolarctos cinereus</i>) and Yellow-bellied Glider (<i>Petaurus australis</i>) which are listed as Vulnerable species on Schedule 2 of the <i>NSW Threatened Species Conservation Act, 1995</i>.</p>	M	<p>Emerging: Potential weed invasion, predominantly along tracks and water courses.</p> <p>Current: potential for erosion to impact upon water quality.</p>	<p>Low - minimal weed incursion evident into Zone 3 bushland</p> <p>Moderate – flow of turbid water into Zone 3 from inadequate rehabilitation/drainage of Zone 2 new works.</p>	<p>Cause of dead vegetation in Zone 3 at the end of the 800m range (observed 2011) was waterlogging from drainage out of disturbed/mulched area. The dead shrubs have now mostly fallen over and the impact has not increased in severity or extent. Waterlogging persists.</p>
Geological	Sandstone bisected by small creeks	M			
Cultural Heritage - Aboriginal - Historic	The area was used and continues to be use by the Gundungurra and Dharawal Aboriginal people. The conservation area contains artefact scatters and may contain other sites of cultural significance.	M			

Research/ education	No research is proposed at this stage, however there is potential for ecological and archaeological research to be carried out within the Zone 3 natural area.				
Other					

**\*\* Current Condition: determine change by comparison with previous Condition Assessments (Pages 5 to 8). Carry out new assessment if not done previously. Biometric can also be used.**

## D MANAGEMENT ISSUES

	<b>Describe the Issue</b> (short description of current extent of impacts, new sightings and any other relevant information)	<b>Description of planning and implementation of control measures being and to be undertaken, and duration</b>
Weeds  (where applicable, infestation can be given as a % of total vegetation)	There is currently a low level of weeds present within all zones of the shooting complex, and invasion of Zone 3 bushland is observed to be minimal. Main weed occurrences are of annual weeds and on disturbed areas of the new Zone 2 developments (Fleabane <i>Conyza</i> sp., <i>Verbena</i> sp.) and along roadsides. One Inkweed ( <i>Phytolacca octandra</i> ) at the 800m range shooting shelter was removed during monitoring survey (March 2015). New weed incursion may occur due to clearing and introduction of weed propagules.	<p>Weed incursions to be noted and treated as soon as identified. Weed control to be carried out by qualified bush regenerator. Any landscaping or assisted regeneration at the site will be undertaken using native plant species of local provenance. Non-viable, non-invasive turf to be used in grassed areas</p> <p>A weed management strategy is in place (EMP). Weed mapping has been carried out.</p> <p>Proper rehabilitation of exposed surfaces of the Zone 2 developments will minimise future weed occurrence.</p>
Water Quality	<p>Water quality monitoring is ongoing.</p> <p>Current sediment control measures in Zone 2 developments are not working properly and require correction.</p>	<p>Initial baseline water sampling has been completed (ErSed 2013b), which showed concentrations of lead, zinc and copper were elevated above EMP recommendations at some sites. Follow-up sampling and further erosion/rehabilitation measures were recommended. 2015 sampling is underway at time of writing. Reasons for elevated toxin levels need to be resolved.</p> <p>Access to some remote specified water monitoring sites found to be impractical. A variation to the determination is being sought to identify sites closer to source areas within development zones. Water quality testing should be undertaken when water is present in ephemeral drainage lines, in particular those drainage lines behind ranges.</p> <p>Water quality testing has been carried out at the end of the range in Zone 3, below mulched area, and no toxins identified.</p> <p>Upcoming remedial works to 50m and 500m range should include rectification of inadequate revegetation and sediment control.</p>



<b>Pest Animals</b> - Feral - Domestic - Native	Pest animal numbers are low in the area, and are unlikely to increase as a result of this development. Foxes, Wild dogs and rabbits are the predominant pests in the area.	Monitoring of the presence of feral vertebrate pests should be carried out with sand plots.  Continuation of involvement with local pest control programs (CMA) and with OEH feral control programs.
<b>Fire Management</b>	Date of last fire occurred in the 2002/2003 summer. The majority of the area appears to have been affected, however some of the wetter gullies may remain unburnt.	A Bushfire Management Plan has been prepared for the site (GHD 2010e). It addresses the life and property protection, operational capability, and biodiversity conservation goals of bushfire management within the site.  It is intended that fire management in the site will be integrated with existing programs for the surrounding OEH estate (as appropriate).
<b>Threatened species; endangered ecological communities etc</b>	Feed trees of Yellow-bellied Glider have been cleared within Zone 2.	Hollow-bearing trees and Yellow-bellied Glider sap-feeding trees were to be retained in the car park area and along access roads as far as possible. Monitoring of Yellow-bellied Glider populations to be carried out regularly to determine impacts on the populations.
<b>Cultural Heritage Management</b>	Aboriginal artefacts have been found in a few locations within the site. One site, identified as 'Hill 1', is located near the construction area in Zone 2. The location of this site has not been verified.	The CEMP (2010) stated: Where practicable, impact to the identified Aboriginal site Hill 1 be avoided, or <ul style="list-style-type: none"> <li>• If impact to the Aboriginal site Hill 1 cannot be avoided then the artefact to be collected or relocated away from the area of impact; and</li> <li>• If any Aboriginal artefacts are discovered during construction, all work is to cease in the area and the project manager be notified immediately. The project manager would be responsible for informing the OEH and the Local Aboriginal Council.</li> </ul> No issues arose during 2011-2012 construction phase. Similar provisions should apply to upcoming construction works.
<b>Visitor Impact Management</b>	Visitation by the public has not yet increased to Zone 2, as facilities have not been opened. Visitation to Zone 3 remains stable/minimal.  The existing shooting range (Zone 1) had 2,528 visitors in the 3 years to 30 October 2014. These numbers will increase significantly when	Visitor impacts are not yet being monitored.

	the new ranges are opened.	
Community Consultation and input into decision making.	Consultation with Hilltop Resident Action Group Inc re: noise management.	Awareness of community feeling to be regularly assessed, and taken into consideration for continuing management of the site.
Research/ Education programs	No research or education programs are being carried out at the present time, however there is great potential for research into the ecological values of the site.	
Other permitted uses - vehicle access - use of timber - seed collection - etc	<p>Bio-security issues and potential introduction of Phytophthora (<i>Phytophthora cinnamomi</i>) and Amphibian Chytrid Fungus.</p> <p>Inadequate biosecurity management during the construction and associated works program, including earthworks, weeding and monitoring activities, has the potential to lead to the establishment and spread of Phytophthora, resulting in a decline of vegetation and associated habitat values.</p> <p>Access to trails through Zone 1 to be restricted.</p> <p>Heavy metal and chemical contamination.</p>	<p>Implement Biosecurity Management Procedure (EMP, Appendix E).</p> <p>Access to surrounding bushland to be restricted to existing bushwalking tracks - block off vehicle access to tracks through surrounding bushland by installing bollards/ large rocks and boulders (obstacles).</p> <p>Vehicles to be restricted to designated access tracks and parking areas.</p> <p>Minimise disturbance of soil and vegetation through clear demarcation of any new construction and restricted access to the Zone 1 environmental conservation zone.</p> <p>Any imported soil or raw material must be sourced from disease free areas. Any water used for irrigation or fire fighting to be sourced from phytophthora-free areas.</p> <p>The fire trail that goes through Zone 1 on the southern side of Rocky Waterholes Creek has been fenced off at the powerline easement, restricting vehicular traffic. The fence has been breached (observed March 2015) and requires repair and regular checking.</p> <p>A long-term monitoring program has been recommended at the site to monitor possible metal accumulation and migration from the site in accordance with Section 5 of the Water Cycle Management Plan (GHD 2010b, c). The monitoring program has not yet been implemented but is to</p>

	<p>Rehabilitation of disturbed areas</p>	<p>include:</p> <ul style="list-style-type: none"> <li>• Soil Contamination Monitoring;</li> <li>• Sediment Monitoring;</li> <li>• Surface Water Contamination Monitoring;</li> <li>• Inspections for evidence of shot loss and ricochet;</li> <li>• Inspection of engineering controls (shot curtain, stop butts, shot fall zones and erosion control structures);</li> <li>• Inspections of vegetation health and density;</li> <li>• Collection and analysis of fauna carcasses for lead or heavy metal contamination (where the opportunity arises).</li> </ul> <p>(GHD, 2010).</p> <p>Rehabilitation in Zone 2 development has been inadequate, with loss of spread topsoil, failure of most plantings and incursion of annual weeds. These areas need to be re-treated, monitored and treated again as needed to ensure full stabilisation with local native species.</p>
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## E WORKPLAN TO ADDRESS MANAGEMENT ISSUES (in priority order)

### E1 Update of 2011 workplan

<i>Action to be completed or ongoing action (discuss on site and where necessary confirm details later)</i>	<i>Cost and possible funding sources</i>	<i>Completion date</i>	<i>Responsibility (landholder, OEH, other)</i>	<i>Status as at April 2015</i>
It appears that clearing has extended outside of the Zone 2 boundary into Zone 1, in the vicinity of the detection basin. This needs to be verified, documented and mapped.	In house	Ongoing	Landholder	Extension verified (in 2 places). Zone boundary needs resolution with OEH and DoP in conjunction with upcoming works.
Dead vegetation has been noted at the end of the rifle range in Zone 3 (see map). Possible cause may be nutrient flows from the extensive mulching at this site. Cause of vegetation death to be identified and remedied. Soil and water sampling to be carried out at this location. Once cause of vegetation death has been identified, remediation to be put in place immediately.	\$1,500	April 2012	Landholder	Testing showed no toxins, likely cause is waterlogging, which continues. Remediation may not be necessary as vegetation will regrow over time and further disturbance could be counterproductive.
Site hygiene protocols are essential to prevent spread of Phytophthora, Myrtle Rust and weed propagules. Hygiene protocols to be implemented by contractors and visitors to the site.	\$5,000 As per CEMP.	Start immediately  Ongoing.	Landholder	Protocols implemented during construction, not needed for routine use of range.
Water quality monitoring. Establishment of water monitoring points in Rocky Waterholes Creek and drainage lines leading from Zones 2 and 3.	\$10,000	Ongoing	Landholder	Approval is being sought for more accessible sites.
Weed control	\$6,000 annually. (monitoring and control)	Ongoing	Landholder	Weed monitoring report (AEC 2013) identified minor, localised occurrences from

				<p>stabilisation and spray-grass of disturbed areas in all 3 ranges.</p> <p>No actual weed control works undertaken.</p>
Remediation of disturbed areas.	\$30,000	Dec. 2011	Landholder	<p>Remediation undertaken as part of 2011 works (50m and 500m ranges) has been partly ineffective. Remediation of all drainage issues will be carried out as part of the upcoming works to rectify 50m and 500m range technical issues (by June 2016).</p>
Pest animal monitoring with sand traps.	\$5,000 annually.	Ongoing	Landholder	<p>AEC (2103) report found minor occurrences of rabbits and foxes. Dog and fox trapping undertaken in 2013 and 2014. No sand trap monitoring undertaken.</p>

## E2 New workplan (2015)

<i>Action to be completed or ongoing action (discuss on site and where necessary confirm details later)</i>	<i>Cost and possible funding sources</i>	<i>Planned completion date</i>	<i>Responsibility (landholder, OEH, other)</i>
<b>Erosion control.</b> Correct drainage and sediment control works at 50m and 500m ranges and revegetate exposed areas in conjunction with technical range correction works.	\$1,800	June 2016	Landholder
<b>Fence repair.</b> Repair wire strand fence beside fire trail gate (southern fire trail) on eastern boundary beside powerline.	\$200	June 2015	Landholder
<b>Stabilise fire trail.</b> Undertake drainage works to stabilise southern fire trail that enters range from powerline easement.	\$10,000	2016	Landholder
<b>Water quality monitoring.</b> Continue water sampling program once sampling points are resolved.	\$13,200 annually	Ongoing	Landholder
<b>Weed control.</b> Establish and implement weed management program using qualified bush regenerator.	\$5,000 annually	Ongoing	Landholder
<b>Feral animal control.</b> Continue monitoring and wild dog control in conjunction with OEH programs.	\$3,000 annually	Annual	Landholder
<b>Fire management.</b> Implement Bushfire Management Plan (GHD 2010e) for the site. Coordinate burn plans with OEH.	\$5,000 annually	Ongoing	Landholder
<b>Zone boundary issue.</b> Resolve boundary between Zone 1 and Zone 2 near clubhouse and north-west retention basin at 50m range to allow for de facto extent of works (in conjunction with upcoming construction).	Nil	2016	Landholder/OEH/Dept of Planning

<b>Lead control.</b> Develop remediation program (collection) for spent ammunition at all ranges.		2016	Landholder
<b>Noise Monitoring.</b> Compliance testing of noise.	\$15,000 annually	Ongoing	Landholder
<b>Soil testing.</b> Continue soil sampling program once sampling points and base line levels are resolved.	\$30,000 annually		
<b>Lead Remediation.</b> Remediate lead from 800m stop butt and have it certified by an approved auditor as being appropriately remediated.	\$10,000	Dec 2015	Landholder
<b>Signage.</b> Replace shot and damaged signs.	\$300	Oct 2015	Landholder

## F ATTACHMENTS

√ Map showing location of main issues within the Conservation Area.

List further attachments if relevant:

√ Photos from previously identified photo-points (refer 6.0)

√ Rapid Assessment Sheets for previous sites. (refer 6.0)

√ Other Monitoring results. (refer 6.0)

I/we confirm a field inspection has been undertaken and this form is a summary of the conservation values and management issues discussed.

Signature: \_\_\_\_\_  
Landowner

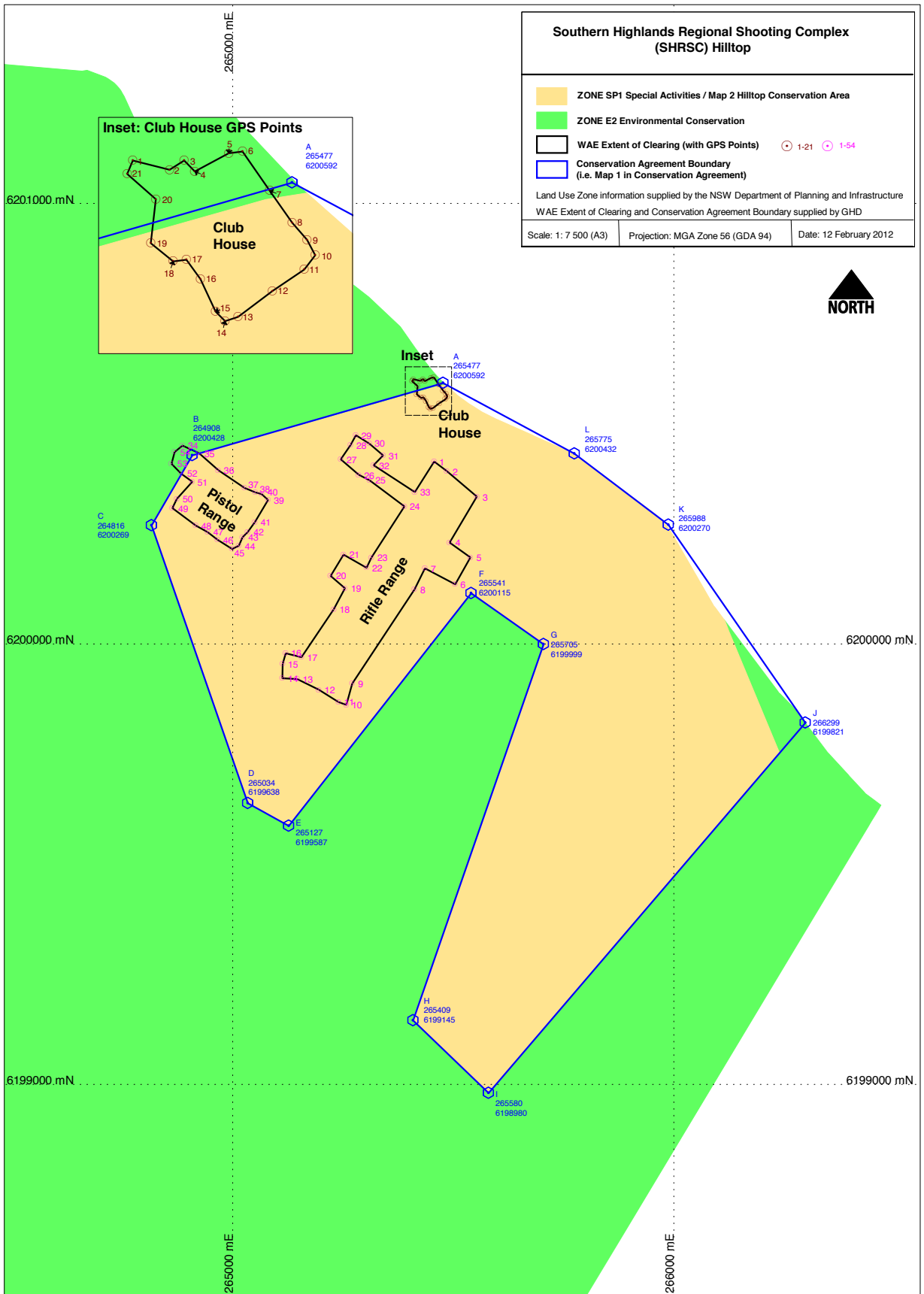
\_\_\_\_\_  
Visiting OEH/NPWS Officer, if applicable

Date report completed: \_\_\_\_\_



Map 2: Location of specific issues for attention





**Map 3: Encroachments into Zone 1**

## 7.0 Photo-Points, Plot Data and Condition Assessments

### 7.1 Summary of Survey Findings: Plots and Photo-points

Overall, the seven sites surveyed as part of the monitoring program showed little change from 2011, and no apparent impacts from the shooting complex. This is as expected because the natural vegetation will tend to develop slowly until disrupted by fire. Species compositions and community structures have remained the same or similar, the main incremental change being growth of the shrub layer.

#### Specific changes and issues

Plot 1: Dead vegetation noted around the north-west corner of the plot in 2011 is still affected, with many dead shrubs having fallen over and minimal regrowth, apparently due to ongoing waterlogging. This corner marker peg was found out of the ground, several metres from its original location – possibly removed by person/s unknown? The corner location was re-measured and the peg re-inserted.

Plot 3: Minimal change observed to powerline easement on the basis of images; erosion has neither diminished nor significantly increased.

Plot 4: Was burnt in 2011 as part of the NPWS Flat Top Mountain prescribed burn in Nattai National Park, at low intensity. Gate across trail at shooting complex boundary fence has been installed since 2011. Vehicular use of the track appears from images and observation to be minimal (despite breach of wire fence). Erosion and rilling of the track continues, possibly accelerated in the short term by increased runoff following the fire. This ongoing issue could be rectified/stabilised with basic drainage works.

Plot 5: This plot is being affected by runoff and sediment from the retention pond, as witnessed during the survey in heavy rain.

General: Finding the plots and corners by GPS was effective but slow for some plots. A number of the yellow caps placed on each peg were either missing or found some distance from the peg – it is assumed animals (wombats?) are removing them. Most were replaced (one could not be found) but are likely to be moved again. Several pegs had fallen over and one had been removed (see Plot 1 above). The plot finding process could be made more efficient by including several extra tasks on the next annual survey:

- spray-paint the pegs with a bright colour;
- fix the yellow caps firmly to the tops of the pegs, using tape or wire;
- permanently label each peg with the corner of the plot which it represents, either by engraving the yellow caps or (better) affixing an engraved metal tag to the posts.



**Map 4: Location of monitoring plots/photo-points**

## 7.2 Photo-point 1 and Plot 1 data



**Photo-point 1.** Looking North from NW plot marker (GR 265573 6199190 GDA 94).



**Photo-point 1.** Looking South from NW plot marker (GR 265573 6199190 GDA 94).



**Photo-point 1.** Looking East from NW plot marker (GR 265573 6199190 GDA 94). Note dead *Leptospermum* shrubs on left.



**Photo-point 1.** Looking West from NW plot marker (GR 265573 6199190 GDA 94) Note dead vegetation.

# Site Value – plot data sheet

Start a new sheet for each zone.

HILLTOP RIFLE RANGE MONITORING

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones / Ian Brown

LOCATION DESCRIPTION Southern Highlands Regional Shooting Complex DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002)

CMA  SITE PHYSICAL CHARACTERISTICS ASPECT 180° SLOPE 1°

AMG (GPS datum: GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265573	265567	265586	265588
Northing		6199190	6199175	6199172	6199188

### 20 x 20m plot

Number of native plant species	40				
Native over-storey cover (%) -use alternative method below if appropriate		30	40	10	20
Native mid-storey cover (%)		20	30	10	20
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		20	10	70	40
Native ground cover – other (%)		10	10	20	20
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

### Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate					
Over-storey regeneration (proportion of over-storey spp)					
Total length of fallen logs (m)					

## Plot 1

	Photo-point 1 and description
Looking North	N/W corner of plot, GR: 265573 6199190 Mostly good bush, some visible damage from 2011 shrub death.
Looking East	N/W corner of plot. GR: 265573 6199190 Mostly good bush, some visible damage ( <i>Leptospermum</i> shrubs) from 2011 shrub death.
Looking South	N/W corner of plot. GR: 265573 6199190 Mostly good bush, some visible damage in foreground from 2011 shrub death.
Looking West	N/W corner of plot. GR: 265573 6199190 Mostly good bush, some visible damage in foreground from 2011 shrub death.

### Site Value methodology prompts (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq 5$ cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet

PLOT 1

24/03/2015

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Corymbia gummifera</i> (4b)	√	<i>Corymbia gummifera</i> (5)	<i>Lambertia formosa</i> (4b)	<i>Entolasia marginata</i> (2)	<i>Caustis flexuosa</i> (4b)	
<i>Eucalyptus sieberi</i> (4b)		<i>Acacia linifolia</i> (3)	<i>Persoonia levis</i> (2)		<i>Xanthosia pilosa</i> (4b)	
		<i>Leptospermum trinervium</i> (3)	<i>Persoonia mollis</i> (3)		<i>Bossiaea obcordata</i> (4b)	
		<i>Hakea dactyloides</i> (3)	<i>Dillwynia sericea</i> (2)		<i>Patersonia glabrata</i> (2)	
			<i>Monotoca scoparia</i> (1)		<i>Lomatia silaifolia</i> (3)	
			<i>Acacia suaveolens</i> (2)		<i>Platysace linearifolia</i> (2)	
			<i>Isopogon anemonifolius</i> (1)		<i>Hybanthus vernonii</i> ssp <i>vernonii</i> (1)	
			<i>Olax stricta</i> (1)		<i>Gonocarpus teucroides</i> (3)	
			<i>Isopogon anethifolius</i> (1)		<i>Pimelea linifolia</i> (2)	
			<i>Cyathochaeta diandra</i> (4b)		<i>Tetrateca thymifolia</i> (3)	
			<i>Dillwynia retorta</i> (4b)		<i>Poranthera microphylla</i> (2)	
			<i>Lomandra confertifolia</i> ssp. <i>rubiginosa</i> (2)		<i>Phyllanthus hirtellus</i> (2)	<u>Foliage Cover (%)</u>
					<i>Eriostemon australasius</i> ssp. <i>australasius</i> (4b)	Av. crown diameter (m)= av. foliage cover (%) = # trees = sample area (ha) =
					<i>Dampiera stricta</i> (2)	
					<i>Lomandra obliqua</i> (2)	
					<i>Boronia ledifolia</i> (1)	# trees with hollows = 0 sample area (ha) =
					<i>Xylomelum pyriforme</i> (1)	Total length (m) of fallen logs (minimum 10cm diameter x 50 cm long) 10m
					<i>Telopea speciosissima</i> (1)	
					<i>Goodenia hereacea</i> (1)	
					<i>Gompholobium grandiflorum</i> (1)	
					<i>Conospermum taxifolium</i> (1)	
					<i>Pteridium esculentum</i> (1)	
<u>Foliage Cover (%) 30</u>		<u>Foliage Cover (%) 30</u>	<u>Foliage Cover (%) 40</u>	<u>Foliage Cover (%) 1</u>	<u>Foliage Cover (%) 30</u>	



### Disturbance Data – Plot 1

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

### Habitat Features – Plot 1

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	No	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	No	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
No	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

<b>Other Valuable Habitat Features</b>			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes. Trees and small hollows	Rock Outcrops/ Formations	No
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

## CONDITION ASSESSMENT NATIVE VEGETATION – PLOT 1

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: Plot 1		Monitoring date: 24/3/2015
Assessment questions		Answer Yes, No or N/A
1.	Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	N/A
2.	Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
3.	Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	Yes
4.	If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
5.	Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	Yes
6.	Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	N/A
7.	Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	Yes
8.	Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	Yes
9.	Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	Yes
10.	Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
11.	Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory.</i>	Yes

12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	Yes
13. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	No
16. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	No
17. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
18. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
22. Is the area free from the threat of salinity and / or high water tables?	Yes
<b>Total number of 'yes' answers</b>	<b>15</b>

## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management.
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (15 x "YES" answers) = HEALTHY, maintain current management

(however note area of dead shrubs near NW corner of plot, due to waterlogging from mulched area to north-east, is FAIR)

### 7.3 Photo-point 2 and Plot 2 data



**Photo-point 2.** Looking North from SW plot marker (GR 265540 6199076 GDA 94)



**Photo-point 2.** Looking South from SW plot marker (GR 265540 6199076 GDA 94)



**Photo-point 2.** Looking East from SW plot marker (GR 265540 6199076 GDA 94)



**Photo-point 2.** Looking West from SW plot marker (GR 265540 6199076 GDA 94)

# Site Value – plot data sheet

Start a new sheet for each zone.

HILLTOP RIFLE RANGE MONITORING

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones /Ian Brown

LOCATION DESCRIPTION  DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002):   
CMA  SITE ORIENTATION: ASPECT  SLOPE

AMG (GPS datum: GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265543	265540	265559	265561
Northing		6199097	6199076	6199073	6199092

### 20 x 20m plot

Number of native plant species	42				
Native over-storey cover (%) -use alternative method below if appropriate		30	20	30	30
Native mid-storey cover (%)		60	50	20	30
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		20	20	10	20
Native ground cover – other (%)		5	5	5	10
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

### Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate					
Over-storey regeneration (proportion of over-storey spp)					
Total length of fallen logs (m)					



## Plot 2

	Photo-point 2 and description
Looking North	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking East	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking South	From S/W corner of plot, GR: 265540 6199076 Good bush
Looking West	From S/W corner of plot, GR: 265540 6199076 Good bush

### **Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq 5$ cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet

PLOT 2

25/03/2015

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid-storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Eucalyptus piperita</i> (4b)	√	<i>Corymbia gummifera</i> (2)	<i>Acacia terminalis</i> (4a)		<i>Pimelea linifolia</i> ssp. <i>linifolia</i> (2)	
<i>Corymbia gummifera</i> (4b)	√	<i>Acacia terminalis</i> (3)	<i>Acacia longifolia</i> (3)		<i>Gonocarpus teucroides</i> (3)	
<i>Eucalyptus agglomerata</i> (1)		<i>Acacia linifolia</i> (2)	<i>Dillwynia retorta</i> (3)		<i>Caustis flexuosa</i> (2)	
			<i>Acacia linifolia</i> (2)		<i>Xanthosia pilosa</i> (3)	
			<i>Persoonia linearis</i> (2)		<i>Poranthera microphylla</i> (2)	
			<i>Persoonia levis</i> (2)		<i>Amperaea xiphoclada</i> (2)	
			<i>Hakea dactyloides</i> (2)		<i>Tetratheca thymifolia</i> (3)	
			<i>Banksia serrata</i> (1)		<i>Lomandra obliqua</i> (3)	
			<i>Banksia spinulosa</i> ssp. <i>spinulosa</i> (2)		<i>Cassytha glabella</i> (1)	
			<i>Grevillea sphacelata</i> (2)		<i>Lomandra micrantha</i> (2)	
			<i>Eriostemon australasius</i> ssp. <i>australasius</i> (3)		<i>Lepidosperma confertifolia</i> ssp. <i>rubiginosa</i> (2)	
			<i>Leptospermum trinervium</i> (1)		<i>Patersonia glabrata</i> (3)	<b>Foliage Cover (%)</b>
			<i>Gompholobium grandiflorum</i> (2)		<i>Lomatia silaifolia</i> (3)	Av. crown diameter (m)= av. foliage cover (%) = # trees = sample area (ha) =
			<i>Philothea hispidula</i> (4)		<i>Dianella caerulea</i> (1)	
			<i>Petrophile pedunculata</i> (3)		<i>Billardiera scandens</i> (1)	
			<i>Bossiaea obcordata</i> (2)		<i>Phyllanthus hirtella</i> (2)	
			<i>Boronia rigens</i> (3)		<i>Monotoca scoparia</i> (1)	
			<i>Dodonea triquetra</i> (2)			Total length (m) of fallen logs (minimum 10cm diameter x 50 cm long) - 40m
			<i>Acacia ulicifolia</i> (1)			
			<i>Xylomelum pyriforme</i> (1)			
			<i>Dampiera purpurea</i> (1)			
			<i>Grevillea sericea</i> (2)			
<b>Foliage Cover (%) 40</b>		<b>Foliage Cover (%) 10</b>	<b>Foliage Cover (%) 60</b>	<b>Foliage Cover (%) 0</b>	<b>Foliage Cover (%) 10</b>	

## Disturbance Data – Plot 2

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

### Habitat Features – Plot 2

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	No	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
No	Yes	Yes	Yes
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

<b>Other Valuable Habitat Features</b>			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes. Trees and hollows	Rock Outcrops/Formations	Yes – cliff line and rocky outcrops.
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

NB: Active Lyre-bird mounds

## CONDITION ASSESSMENT NATIVE VEGETATION – Plot 2

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 2		Monitoring date: 25/3/2015
Assessment questions	Answer Yes, No or N/A	
1. Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	N/A	
2. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes	
3. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	Yes	
4. If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A	
5. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	Yes	
6. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes	
7. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	Yes	
8. Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	Yes	
9. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	Yes	
10. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes	
11. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to</i>	Yes	

<i>move over the landscape for feeding, breeding, roosting and expanding territory.</i>	
12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	Yes
13. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	Yes
16. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	Yes
17. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
18. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
22. Is the area free from the threat of salinity and / or high water tables?	Yes
<b>Total number of 'yes' answers</b>	<b>18</b>

## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (18 x "YES" answers) = HEALTHY, maintain current management

### 7.4 Photo-point 3 (GR 265263 6197520 GDA 94)

Survey date: 25/03/2015.

Plot data not provided for this photo-point, as it is a maintained power-line easement.



**Photo-point 3:** View to North-east



**Photo-point 3:** View to East



**Photo-point 3:** View to South-west



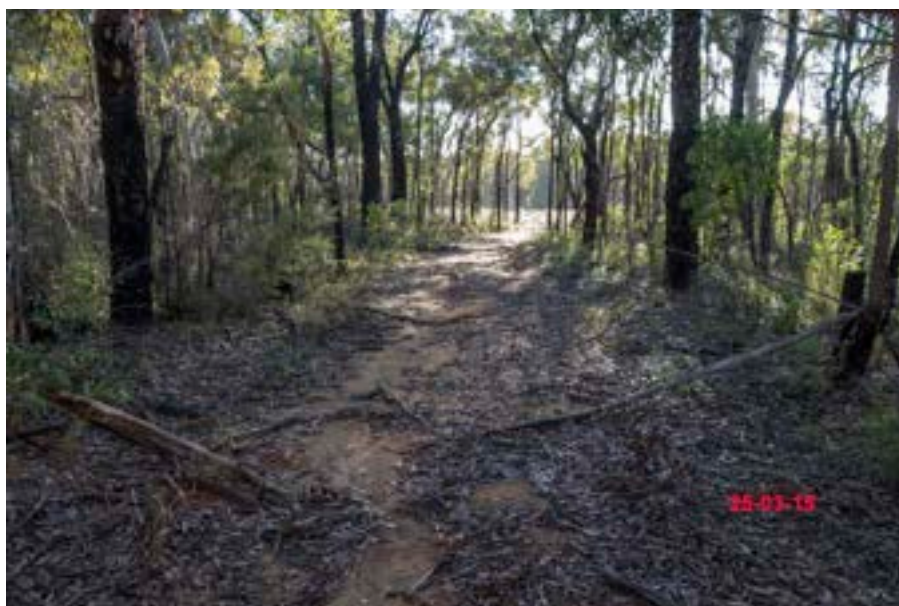
**Photo-point 3:** View to West



## 7.5 Photo-point 4 and Plot 4 data

Photo-point 4 and Plot 4 is a 6m x 60 m plot along an existing closed fire road – the photo-points and data aim to assist in continued assessment of track usage and effectiveness of the fence for track closure. Photo-points were taken at start of plot and at 10 metre lengths along the 60 metre plot line.

Evidence on the ground and reference to the Google Earth image of 2015 for the survey area shows a hazard reduction in the area and on parts of Plot 4. According to NPWS, this was a prescribed burn conducted in May (edge) and August (main burn) 2013. The burn was evidently very low intensity and patchy. In this survey the vegetation was observed to have mostly recovered to pre-fire densities, and there was a slight reduction in shrub cover between 1 and 3 metres. There was no evidence of seed germination of *Eucalyptus* or *Acacia* species nor was there any annual native grasses or weed species.



**Photo-point 4.** Looking East towards fence across track at start of Plot 4 (GR 0265119 6197472 GDA 94).



**Photo-point 4.** Looking West along Plot 4 from start of plot transect (GR 0265119 6197472 GDA 94).



**Photo-point 4.** Looking West along Plot 4 transect at 10 metre point.



**Photo-point 4.** Looking West along Plot 4 transect at 20 metre point.



**Photo-point 4.** Looking West along Plot 4 transect at 30 metre point.



**Photo-point 4.** Looking West along Plot 4 transect at 40 metre point.



**Photo-point 4.** Looking West along Plot 4 transect at 50 metre point.



**Photo-point 4.** Looking West along Plot 4 transect at 60 metre point.

**Additional photographs from Plot 4 to assist with future monitoring assessments**



**Photo-point 4.** Looking West past gate on fire trail.



**Photo-point 4.** Breached fence on south side of fire trail gate.

# Site Value – plot data sheet

Start a new sheet for each zone.

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones / Ian Brown

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002) Nattai Plateau

CMA Hawkesbury-Nepean

Site Orientation: Aspect 57° Slope: 6°

AMG (GPS datum GDA 94)	Benchmarks	1	2	3	4	5	6
Easting	0265119	10m	20m	30m	40m	50m	60m
Northing	6197472						

Located along the centreline from the eastern boundary line of the plot. 6 x 60m plot centred in the road. Estimates for the whole plot given.

Number of native plant species	32	
Native over-storey cover (%) -use alternative method below if appropriate		20
Native mid-storey cover (%)		10
Native ground cover – grasses (%)		1
Native ground cover – shrubs (%)		30
Native ground cover – other (%)		50
Exotic plant cover (%)		0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)

## Plot 4

	Photo-point 4 and description
Looking North	
Looking East	0265119 6197472 Photo-point looking east from start of track transect towards gated track entrance.
Looking South	
Looking West	Photo taken every 10 metres along track transect – for 60 metres. Track – good bush each side

**Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration (< 5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheets

Plot 4

25/03/15

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid –storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Eucalyptus sclerophylla</i> (3)	√	<i>Corymbia gummifera</i> (1)	<i>Gompholobium grandiflorum</i> (2)	<i>Entolasia stricta</i> (1)	<i>Phyllanthus hirtellus</i> (3)	
<i>Corymbia gummifera</i> (3)	√		<i>Bossiaea obcordata</i> (2)		<i>Patersonia sericea</i> (3)	
<i>Eucalyptus agglomerata</i> (3)	√		<i>Acacia myrtifolia</i> (2)		<i>Lomatia silaifolia</i> (2)	
			<i>Grevillea speciosa</i> (2)		<i>Dianella caerulea</i> (30)	
			<i>Acacia linifolia</i> (1)		<i>Pomax umbellata</i> (1)	
			<i>Xylomelum pyriforme</i> (1)		<i>Dampiera purpurea</i> (1)	
			<i>Daviesia ulicifolia</i> (1)		<i>Bossiaea heterophylla</i> (2)	
			<i>Lissanthe strigosa</i> (2)		<i>Goodenia hederacea</i> (4b)	
					<i>Lepidosperma laterale</i> (4b)	
					<i>Tetratheca thymifolia</i> (1)	Foliage Cover (%)
					<i>Hibbertia rufa</i> (10)	Av. crown diameter (m)= av. foliage cover (%) = # trees = sample area (ha) =
					<i>Gonocarpus teucroides</i> (1)	
					<i>Lomandra obliqua</i> (2)	
					<i>Billardiera scandens</i> (1)	
					<i>Lomandra glauca</i> (1)	# trees with hollows = 0
					<i>Platysace ericoides</i> (2)	sample area (ha) =
					<i>Lomandra confertifolia</i> spp. <i>rubiginosa</i> (1)	Total length (m) of fallen



					<i>Boronia ledifolia</i> (1)	logs (minimum 10cm diameter x 50 cm long)
					<i>Monotoca scoparia</i> (2)	
					<i>Scaevola ramosissima</i> (1)	
Foliage Cover (%) 40		Foliage Cover (%) 1	Foliage Cover (%) 1	Foliage Cover (%) 1	Foliage Cover (%) 1	

#### Disturbance Data – Plot 4

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and	Intensity	Nil	Very Low	Moderate	High	Very High	

Noxious Weeds	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

### Habitat Features – Plot 4

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Few	Yes	No	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	No	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	Yes
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	No

Is there a presence of

Other Valuable Habitat Features			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	No. Track edges	Rock Outcrops/Formations	No. Track edges
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

## CONDITION ASSESSMENT NATIVE VEGETATION – Plot 4

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 4		Monitoring date: 25/03/2015	
Assessment questions			Answer Yes, No or N/A
23.	Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	Yes	Partial (for security)
24.	Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes	
25.	Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	No	
26.	If grassland, is there a diverse range of grasses and broad leaf herbs present?	No	
27.	Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	No	
28.	Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	No	
29.	Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	Yes	
30.	Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	Yes	
31.	Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	Yes	
32.	Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes	

33. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory.</i>	Yes
34. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	No
35. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
36. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
37. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	Yes
38. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	Yes
39. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
40. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
41. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	N/a
42. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/a
43. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
44. Is the area free from the threat of salinity and / or high water tables?	Yes
<b>Total number of 'yes' answers</b>	<b>15</b>

## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (15 x "YES" answers) = HEALTHY, maintain current management

## 7.6 Photo-point 5 and Plot 5 data



**Photo-point 5:** Looking North from NW plot marker (GR: 264843 6200465 GDA 94).



**Photo-point 5:** Looking South from NW plot marker (GR: 264843 6200465 GDA 94).



**Photo-point 5:** Looking East from NW plot marker (GR: 264843 6200465 GDA 94).



**Photo-point 5:** Looking West from NW plot marker (GR: 264843 6200465 GDA 94).

**Additional photographs from Plot 5 to assist with future monitoring assessments**



Overview of Plot 5, towards person at SW corner, from rock shelf.



North-west marker peg for Plot 5.





Cleared area for 50m range above retention basin, looking NW. Note annual weeds and loss of rehabilitation topsoil.

# Site Value – plot data sheet

Start a new sheet for each zone.

HILLTOP RIFLE RANGE MONITORING

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones / Ian Brown

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002)

CMA

ASPECT  SLOPE

AMG (GPS datum GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		264843	264846	264866	264867
Northing		6200465	6200446	6200447	6200468

20 x 20m plot Benchmarks are located in each compass quadrant of the plot

Number of native plant species					
Native over-storey cover (%) -use alternative method below if appropriate		35	10	20	50
Native mid-storey cover (%)		10	15	10	30
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		10	10	5	10
Native ground cover – other (%)		5	1	5	1
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

Larger sampling area (20m x 50m plot, or whole of zone)

Number of trees with hollows - use alternative method below if appropriate					
Over-storey regeneration (proportion of over-storey spp)					
Total length of fallen logs (m)					

	Photo-point 5 and description
Looking North	From NW corner of plot. General habitat, Good bush. Deep litter layer. Some rock shelving.  (GR: 264843 6200465 GDA 94)
Looking East	From NW corner of plot. General habitat, deep litter layer. Good bush. Some rock shelving.  (GR: 264843 6200465 GDA 94)
Looking South	From NW corner of plot. General habitat, deep litter layer. Good bush.  (GR: 264843 6200465 GDA 94)
Looking West	From NW corner of plot. General habitat, deep litter layer. Good Bush. Large rock shelf.  (GR: 264843 6200465 GDA 94)

**Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq 5$ cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Eucalyptus piperita</i> (5)		<i>Banksia serrata</i> (4b)	<i>Acacia terminalis</i> (3)	<i>Entolasia stricta</i> (1)	<i>Lomandra confertifolia</i> ssp <i>rubiginosa</i> (4b)	
<i>Corymbia gummifera</i> (4b)	√	<i>Corymbia gummifera</i> (1)	<i>Acacia linifolia</i> (4b)		<i>Lomatia silaifolia</i> (4b)	
<i>Eucalyptus sieberi</i> (2)			<i>Banksia spinulosa</i> ssp. <i>spinulosa</i> (2)		<i>Patersonia glabrata</i> (5)	
			<i>Daviesia corymbosa</i> (2)		<i>Cassytha glabella</i> (3)	
			<i>Hakea gibbosa</i> (2)		<i>Phyllanthus hirtellus</i> (2)	
			<i>Hakea dactyloides</i> (2)		<i>Tetratheca thymifolia</i> (4b)	
			<i>Bossiaea obcordata</i> (4b)		<i>Lissanthe strigosa</i> (2)	
			<i>Acacia myrtifolia</i> (4b)		<i>Goodenia hederaceae</i> (2)	
			<i>Comesperma ericifolium</i> (2)		<i>Poranthera linifolia</i> (1)	
			<i>Pimelea linifolia</i> (2)		<i>Hovea linearis</i> (2)	
			<i>Pultenaea hispidula</i> (3)		<i>Hibbertia rufa</i> (1)	
			<i>Crowea exalta</i> (2)		<i>Hardenbergia violacea</i> (1)	Foliage Cover (%)
			<i>Persoonia levis</i> (1)		<i>Xanthosia pilosa</i> (2)	Av. crown diameter (m)= av. foliage cover (%) = # trees = ≥50 sample area (ha) =
			<i>Monotoca scoparia</i> (1)		<i>Pteridium esculentum</i> (1)	
			<i>Gompholobium grandiflorum</i> (1)		<i>Mirbelia rubiifolia</i> (1)	
			<i>Persoonia mollis</i> (1)		<i>Dampiera purpurea</i> (1)	
			<i>Pomaderris ligustrina</i> (1)		<i>Pomax umbellata</i> (1)	
			<i>Telopea speciosissima</i> (1)		<i>Lomandra obliqua</i> (2)	
			<i>Dampiera stricta</i> (1)		<i>Lepidosperma laterale</i> (2)	
			<i>Grevillea buxifolia</i> (1)		<i>Gonocarpus teucroides</i> (2)	
			<i>Baeckea linifolia</i> (1)			# trees with hollows = ≥ 15 sample area (ha) = 20m x 20m plot
			<i>Dillwynia speciosa</i> (2)			
			<i>Xylomelum pyrifforme</i> (2)			
Foliage Cover (%) 40		Foliage Cover (%) 15	Foliage Cover (%) 25	Foliage Cover (%) 5	Foliage Cover (%) 40	

### Disturbance Data - Plot 5

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

### Habitat Features – Plot 5

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Few	Yes	Yes	Yes
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	Very small areas under overhangs	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	Yes
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	Yes	No
Dam	Creek	River	Dead Trees
No	No Minor drainage line – flows temporarily from retention basin in heavy rain.	No	Yes

Is there a presence of

<b>Other Valuable Habitat Features</b>			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes, in mature trees	Rock Outcrops/Formations	Yes, Rock outcrops and exfoliating rock
Habitat Garden/Constructed water feature	N/a	Weedy vegetation used as habitat	N/a
Cultivated areas used by wildlife	N/a	Built structures/non-structural features used as habitat	N/a

## CONDITION ASSESSMENT NATIVE VEGETATION – PLOT 5

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: Plot 5		Monitoring date: 24/03/2015	
Assessment questions		Answer Yes, No or N/A	
45. Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>		Yes  (partially, for security)	
46. Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>		Yes	
47. Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>		Yes	
48. If grassland, is there a diverse range of grasses and broad leaf herbs present?		N/A	
49. Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>		Yes	
50. Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?		Yes	
51. Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>		Yes	
52. Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>		Yes	
53. Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>		Yes	
54. Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?		Yes	

55. Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory.</i>	Yes
56. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	Yes
57. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
58. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes Native shrubs
59. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	Yes
60. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	Yes
61. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
62. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
63. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	N/A
64. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
65. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
66. Is the area free from the threat of salinity and / or high water tables?	N/A
<b>Total number of 'yes' answers</b>	18



## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (18 x "YES" answers) = HEALTHY, maintain current management

## 7.6 Photo-point 6 and Plot 6 data



**Photo-point 6.** Looking North from NE plot marker (GR: 265435 6200643 GDA 94).



**Photo-point 6.** Looking South from NE plot marker (GR: 265435 6200643 GDA 94).



**Photo-point 6.** Looking East from NE plot marker (GR: 265435 6200643 GDA 94).



**Photo-point 6.** Looking East from NE plot marker (GR: 265435 6200643 GDA 94).

**Additional photographs from Plot 6 to assist with future monitoring assessments**



Looking towards Plot 6 from road (from 2011 report).



Plot 6: North-east marker adjacent to existing peg (GR: 265435 6200643 GDA 94) (from 2011 report).

# Site Value – plot data sheet

Start a new sheet for each zone.

HILLTOP RIFLE RANGE MONITORING

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones / Ian Brown

LOCATION DESCRIPTION: Southern Highlands Regional Shooting Complex DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002)

CMA

**SITE ORIENTATION: ASPECT: 290° SLOPE: 1**

AMG (GPS datum_AGD 94_)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265416	265414	265433	265435
Northing		6200646	6200626	6200624	6200643

### 20 x 20m plot

Number of native plant species	47				
Native over-storey cover (%) -use alternative method below if appropriate		50	50	40	40
Native mid-storey cover (%)		25	20	40	50
Native ground cover – grasses (%)		0	0	0	0
Native ground cover – shrubs (%)		30	40	50	40
Native ground cover – other (%)		40	50	50	40
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0

	Photo-point 6 and description
Looking North	From NE corner. Along fenceline and road verge. Good bushland (GR: 265435 6200643 GDA 94)
Looking East	From NE corner. Across to road. Good bushland. (GR: 265435 6200643 GDA 94)
Looking South	From NE corner. Good bushland (GR: 265435 6200643 GDA 94)
Looking West	From NE corner. Good bushland (GR: 265435 6200643 GDA 94)

**Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq$  5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet

PLOT 6

24/03/2015

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid –storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Eucalyptus piperita</i> (5)	√	<i>Eucalyptus piperita</i> (4b)	<i>Acacia terminalis</i> (3)	<i>Entolasia marginata</i> (2)	<i>Lomandra confertifolia</i> ssp <i>rubiginosa</i> (4b)	
<i>Corymbia gummifera</i> (4b)	√	<i>Corymbia gummifera</i> (5)	<i>Acacia linifolia</i> (4b)	<i>Entolasia stricta</i> (2)	<i>Lomatia silaifolia</i> (4b)	
<i>Eucalyptus sieberi</i> (2)	√	<i>Eucalyptus sieberi</i> (2)	<i>Banksia spinulosa</i> ssp. <i>spinulosa</i> (4b)		<i>Patersonia sericea</i> (5)	
<i>Eucalyptus oblonga</i> (2)			<i>Daviesia corybosa</i> (4b)		<i>Cassytha glabella</i> (3)	
			<i>Grevillea sphacelata</i> (4b)		<i>Phyllanthus hirtellus</i> (2)	
			<i>Hakea dactyloides</i> (2)		<i>Tetratheca thymifolia</i> (4b)	
			<i>Bossiaea obcordata</i> (4b)		<i>Lissanthe strigose</i> (2)	
			<i>Acacia myrtifolia</i> (4b)		<i>Goodenia hederacaea</i> (2)	
			<i>Comesperma ericinum</i> (2)		<i>Poranthera linifolia</i> (1)	
			<i>Pimelea linifolia</i> (2)		<i>Hovea linearis</i> (2)	
			<i>Pultenaea hispidula</i> (3)		<i>Hibbertia rufa</i> (1)	
			<i>Pultenaea scabra</i> (1)		<i>Hardenbergia violacea</i> (1)	<b>Foliage Cover (%)</b>
			<i>Persoonia levis</i> (1)		<i>Xanthosia pilosa</i> (1)	Av. crown diameter (m)= 2 av. foliage cover (%) = 80 # trees = ≥50 sample area (ha) =
			<i>Monotoca scoparia</i> (1)		<i>Pteridium esculentum</i> (1)	
			<i>Gompholobium grandiflorum</i> (1)		<i>Mirbelia rubifolia</i> (1)	
			<i>Dampiera stricta</i> (1)		<i>Dampiera purpurea</i> (1)	# trees with hollows = ≥ 10 sample area (ha) =
			<i>Grevillea buxifolia</i> (1)		<i>Pomax umbellata</i> (1)	
			<i>Baeckea linifolia</i> (1)		<i>Lomandra obliqua</i> (2)	
			<i>Dillwynia sericea</i> (1)		<i>Lepidosperma laterale</i> (2)	
			<i>Xylomelum pyriforme</i> (1)		<i>Gonocarpus teucroides</i> (2)	
			<i>Hakea gibbosa</i> (1)		<i>Cyathochaeta diandra</i> (3)	
<b>Foliage Cover (%) 40</b>		<b>Foliage Cover (%) 15</b>	<b>Foliage Cover (%) 25</b>	<b>Foliage Cover (%) 5</b>	<b>Foliage Cover (%) 40</b>	

### Disturbance Data – Plot 6

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown



### Habitat Features – Plot 6

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	Yes	Yes
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	No
Soil Cracks	Rocky areas	Caves	Mud Nests
No	No	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	No	No
Dam	Creek	River	Dead Trees
No	No	No	Yes

Is there a presence of

<b>Other Valuable Habitat Features</b>			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes, trees and hollows	Rock Outcrops/Formations	No
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

## CONDITION ASSESSMENT NATIVE VEGETATION – Plot 6

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 6		Monitoring date: 24/03/2015	
Assessment questions			Answer Yes, No or N/A
67.	Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	Yes	Partial (for security)
68.	Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes	
69.	Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	Yes	
70.	If grassland, is there a diverse range of grasses and broad leaf herbs present?	n/a	
71.	Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	Yes	
72.	Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes	
73.	Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	Yes	
74.	Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	Yes	
75.	Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	Yes	
76.	Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes	
77.	Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to</i>	Yes	

<i>move over the landscape for feeding, breeding, roosting and expanding territory.</i>	
78. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	Yes
79. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
80. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
81. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	Yes
82. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	Yes
83. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
84. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
85. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	n/a
86. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	n/a
87. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
88. Is the area free from the threat of salinity and / or high water tables?	Yes
<b>Total number of 'yes' answers</b>	<b>19</b>

## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (19 x "YES" answers) = HEALTHY, maintain current management

## 7.8 Photo-point 7 and Plot 7 data



**Photo-point 7.** Looking North from NW plot marker (GR 265680 6199995 GDA 94).



**Photo-point 7.** Looking South from NW plot marker (GR 265680 6199995 GDA 94).



**Photo-point 7.** Looking East from NW plot marker (GR 265680 6199995 GDA 94).



**Photo-point 7.** Looking West from NW plot marker (GR 265680 6199995 GDA 94).

**Additional photographs from Plot 7 to assist with future monitoring assessments**



Rocky creekline – note pothole in creek (image from 2011 report).

# Site Value – plot data sheet

Start a new sheet for each zone.

HILLTOP RIFLE RANGE MONITORING

## Biometric

SITE NO  ZONE NO  RECORDERS Wyn Jones / Ian Brown

LOCATION DESCRIPTION  DATE

LAND TENURE  LAND MANAGER

Vegetation formation (as per Keith 2004)

Vegetation class (as per Keith 2004)

Vegetation class (on ground)

Vegetation type (Biometric)

Landscape (Mitchell 2002)

CMA  SITE PHYSICAL ORIENTATION: ASPECT: 270° SLOPE: 3°

Note: Site is bisected by creekline, and is oriented parallel to creekline.

AMG (GPS datum: GDA 94)	Benchmarks	1 NW	2 SW	3 SE	4 NE
Easting		265680	265677	265696	265699
Northing		6199995	6199977	6199975	6199992

### 20 x 20m plot

Number of native plant species					
Native over-storey cover (%) -use alternative method below if appropriate		20	50	10	10
Native mid-storey cover (%)		40	10	20	15
Native ground cover – grasses (%)		0	0	1	0
Native ground cover – shrubs (%)		20	60	50	50
Native ground cover – other (%)		5	20	10	10
Exotic plant cover (%)		0	0	0	0

(use cover abundance score for all percent figures and select mid-point of % range to enter into Biometric)0



	Photo-point 7 and description
Looking North	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking upslope.
Looking East	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking across slope with rock shelving.
Looking South	From N/W corner of plot. GR: 265680 6199995 Good bush. Across minor creekline.
Looking West	From N/W corner of plot. GR: 265680 6199995 Good bush. Looking across slope.

**Site Value methodology prompts** (for full details refer to Appendix 3 of *BioMetric* Operational Manual)

- Number of native plant species: COUNT of all indigenous vascular plant species.
- Strata definitions: The over-storey is the tallest woody stratum present (including emergents) above 1m. For example, in a woodland community the over-storey stratum is the tree layer and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration). The ground stratum contains all indigenous native vegetation below 1m in height. The ground stratum (grasses) refers to indigenous native vegetation of grasses (i.e. plants belonging to the family Poaceae).
- Cover estimates (native over-storey, mid-storey, ground cover - grasses, shrubs and other, and exotic): % Foliage Cover (FC) as defined in *BioMetric* Operational Manual
- Exotic plant cover: % Foliage Cover of all exotic species (i.e. all strata).
- No. trees with hollows: hollow entrance must be AT LEAST 5cm diameter; hollows must have depth, and be >1m above the ground.
- Over-storey regeneration: proportion of species in over-storey exhibiting regeneration ( $\leq$  5cm DBH, no height limits).

Cover abundance scale 1-7		
1	<5% - rare or few individuals	3 or less individuals
2	<5% - uncommon	More than 3 – sparsely scattered or localised
3	<5% - common	Consistent throughout plot
4a	<5% - very abundant	Many individuals throughout plot
4b	5% - 25%	
5	25% - 50%	
6	50% - 75%	
7	75% - 100%	

Plot Work Sheet

PLOT 7

25/03/2015

Native Trees (over-storey) Species list	Regen (√)	Native Lower Trees and Tall shrubs (mid – storey) species	Native Ground covers – Shrubs species	Native Ground cover – Grasses species	Native Ground cover – other (ferns, climbers) species	Exotic Plants Species List
<i>Corymbia gummifera</i> (1)	√	<i>Ceratopetalum gummiferum</i> (3)	<i>Acacia terminalis</i> (3)	<i>Entolasia marginata</i> (1)	<i>Gonocarpus teucroides</i> (2)	
<i>Eucalyptus piperita</i> (2)		<i>Leptospermum trinervium</i> (2)	<i>Acacia linifolia</i> (4b)		<i>Phyllanthus hirtellus</i> (2)	
<i>Eucalyptus globoidea</i> (1)			<i>Banksia spinulosa</i> ssp. <i>spinulosa</i> (4b)		<i>Smilax glyciophylla</i> (2)	
<i>Eucalyptus punctata</i> (1)	√	<i>Acacia longifolia</i> (2)			<i>Pimelea linifolia</i> (3)	
<i>Eucalyptus cypellocarpa</i> (1)			<i>Grevillea mucronulata</i> (4b)		<i>Bossiaea heterophylla</i> (3)	
			<i>Hakea dactyloides</i> (3)		<i>Galium propinquum</i> (3)	
			<i>Bossiaea obcordata</i> (4b)		<i>Poranthera microphylla</i> (4)	
			<i>Acacia myrtifolia</i> (2)		<i>Lepidosperma filiforme</i> (4)	
			<i>Leptospermum polygalifolium</i> (2)		<i>Lindsaea microphylla</i> (1)	
			<i>Pimelea linifolia</i> (2)		<i>Dianella caerulea</i> var. <i>producta</i> (1)	
			<i>Pultenaea hispidula</i> (3)		<i>Goodenia hederacaea</i> (1)	
			<i>Pultenaea scabra</i> (1)		<i>Patersonia glabrata</i> (1)	Foliage Cover (%)
			<i>Persoonia levis</i> (1)		<i>Xanthosia pilosa</i> (1)	Av. crown diameter (m)= 4 av. foliage cover (%) = 10 # trees = ≥30 sample area (ha) =
			<i>Monotoca scoparia</i> (1)		<i>Pomax umbellata</i> (2)	
			<i>Gompholobium grandiflorum</i> (1)		<i>Dampiera purpurea</i> (1)	
			<i>Telopea speciosissima</i> (2)		<i>Lomandra obliqua</i> (1)	# trees with hollows = ≥ 5 sample area (ha) = 10m
			<i>Persoonia linearis</i> (1)		<i>Amperaea xiphoclada</i> (1)	
			<i>Pteridium esculentum</i> (1)		<i>Clematis aristata</i> (1)	
			<i>Dodonaea triquetra</i> (4b)		<i>Billardiera scandens</i> spp. <i>scandens</i> (1)	

			<i>Pultenaea daphnoides</i> (2)		<i>Acianthus</i> sp. (1)
			<i>Acacia ulicifolia</i> (2)		<i>Phyllothea hispidula</i> (2)
			<i>Alloasuarina littoralis</i> (1)		<i>Blechnum cartilagineum</i> (2)
			<i>Pomaderris lanigerum</i> (1)		<i>Lomatia silaifolia</i> (3)
			<i>Lomandra longifolia</i> (2)		<i>Lomandra filiformis</i> spp. coriacea (3)
			<i>Elaeocarpus reticulatus</i> (1)		<i>Lomandra gracilis</i> (3)
			<i>Callicoma serratifolia</i> (3)		
			<i>Pomaderris andromedifolia</i> ssp. <i>andromedifolia</i> (1)		
Foliage Cover (%) 40		Foliage Cover (%) 15	Foliage Cover (%) 25	Foliage Cover (%) 5	Foliage Cover (%) 40

### Disturbance Data - Plot 7

Grazing	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Erosion	Intensity	Nil	Minor	Moderate	Severe	Very Severe	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Fire & Burning	Intensity	Nil	Light	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Clearing	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Cropping	Intensity	Nil	Light	Moderate	Moderately Extensive	Extensive	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Logging	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Exotics and Noxious Weeds	Intensity	Nil	Very Low	Moderate	High	Very High	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown
Feral sp.	Intensity	Nil	Light	Moderate	Intermittently Heavy	Sustained Heavy	
	Time Since Disturbance	<1 yr	1-5 yrs	6-10 yrs	11-50 yrs	>50 yrs	Unknown

## Habitat Features

Is there a presence of

Hollows under 5cm	Hollows 5-10cm	Hollows 11-20cm	Hollows >20cm
Yes	Yes	Yes	No
Peeling Bark	Fissures	Cracks	Stick Nests
Yes	Yes	Yes	Yes
Soil Cracks	Rocky areas	Caves	Mud Nests
No	Yes	No	No
Fallen Hollow Logs	Fallen Timber	Leaf Litter	Bare patches
Yes	Yes	Yes	No
Mistletoe	Acacia Sp.	Termite Mounds	Casuarina Sp.
No	Yes	Yes	No
Dam	Creek	River	Dead Trees
No	Yes	No	Yes

<b>Other Valuable Habitat Features</b>			
	Yes/No & brief description condition		Yes/No & brief description condition
Breeding/ roosting sites	Yes	Rock Outcrops /Formations	Yes
Habitat Garden/Constructed water feature	No	Weedy vegetation used as habitat	No
Cultivated areas used by wildlife	No	Built structures/non-structural features used as habitat	No

## CONDITION ASSESSMENT NATIVE VEGETATION - Plot 7

For native bushland and grassland sites and paddocks containing scattered shade trees

Site number or name: 7		Monitoring date: 25/03/2015
Assessment questions		Answer Yes, No or N/A
1.	Is the area fenced to manage stock access and grazing ? <i>Healthy bush should be rested for long periods to allow regeneration. To achieve this, it should be fenced off.</i>	N/A
2.	Is there regeneration of native trees and shrubs, or if in grassland, regular germination of native herbs eg perennials such as lilies or orchids and annuals such as daisies? <i>Regeneration of trees and shrubs is necessary for the bush to maintain health, diversity and a range of habitats. An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
3.	Is there a diverse range of tree and shrub species present, eg more than 20 (coast), 15 (tablelands), 10 (western slopes and plains)? (Note: healthy river red gum forest may have only one tree and 5-10 shrub species present). <i>Diversity encourages a range of native animals and helps the bush withstand attacks of insects and other adverse conditions.</i>	Yes
4.	If grassland, is there a diverse range of grasses and broad leaf herbs present?	N/A
5.	Is there adequate ground cover, eg leaves, bark and twigs, or litter (dead grasses)? <i>Ground cover indicates whether the area is being disturbed by stock and is a measure of tree canopy density and the domination of exotic grasses and weeds.</i>	Yes
6.	Are mosses or lichens on rocks, fallen branches and the ground surface, or are these species, along with liverworts, forming a crust on bare soil?	Yes
7.	Are weeds uncommon, sparsely scattered, absent, or mainly around edges of the area? <i>The understorey may have exotic weeds present. Too many are undesirable and you may need a management plan for their control. Weeds compete with native plants for light, space, water and nutrients.</i>	Yes
8.	Is there a very low incidence of pest animals, eg foxes and rabbits? <i>Remnant bush can be a refuge for pest animals as well as natives. The feral animals should be controlled.</i>	Yes
9.	Is the patch shape a block or part of a corridor more than 30 metres wide rather than a thin strip? <i>Blocks of native vegetation have less edge area than strips, so they are less influenced by changes in levels of weeds, predators, noise and climatic effects.</i>	Yes
10.	Is the area greater than 1 ha (coast), 5 ha (tablelands), 10 ha (western slopes), 20 ha (plains), 50 ha (Western Division)?	Yes
11.	Is the remnant linked to other remnants by corridors, eg. roadside vegetation, or scattered trees no more than 50 m apart ? <i>Corridors provide shelter and pathways for native organisms (other than birds) to move over the landscape for feeding, breeding, roosting and expanding territory.</i>	Yes

12. Is there a mix of tree ages present, ie saplings through to old growth with hollows ? <i>A range of ages and conditions means the bush is regenerating itself and each stage of growth is suitable habitat for native organisms.</i>	Yes
13. If trees are present is an understorey also present? <i>An understorey of shrubs encourages small insect eating birds and other native animals.</i>	Yes
14. Is the understorey mostly comprised of native shrubs and / or grasses and broad leaf herbs?	Yes
15. Area there standing trees (alive or dead) with hollows, present in the remnant or paddock ? <i>Dead trees with hollows are essential for roosting and nesting of a large range of native birds such as parrots and of bats.</i>	Yes
16. Are the trees mainly healthy, with little or no dieback? <i>Dieback is apparent if there are bare twigs at the outer part of the tree canopy. It is usually a sign of severe insect attack.</i>	Yes
17. Are there less than 20 % of trees affected by mistletoe? <i>Mistletoe is a parasite that invades trees and causes them to lose vigour. Where many trees in an area are affected it is likely to indicate that the area of vegetation is under severe stress.</i>	Yes
18. Are there logs and fallen timber on the ground? <i>Logs and dead material are essential habitat for smaller native organisms. But they can also be a harbour for pest animals.</i>	Yes
19. If scattered paddock trees are unfenced, are stock camps absent? <i>Bare ground, bare tree roots or the movement of soil all can indicate erosion which needs to be managed and controlled.</i>	N/A
20. If scattered paddock trees are unfenced, is evidence of stock ringbarking or rubbing absent?	N/A
21. Is the area free of herbicide, insecticide or fertiliser overspray from adjoining areas? <i>Herbicides and insecticides can kill native plants and small organisms. Fertiliser encourages exotic species by raising nutrient levels.</i>	Yes
22. Is the area free from the threat of salinity and / or high water tables?	N/A
<b>Total number of 'yes' answers</b>	<b>17</b>

## Condition rating - native vegetation

Number of 'yes' answers			Vegetation condition rating	Need for management attention
Remnant bushland	Remnant grassland	Scattered paddock trees		
14 +	9 +	12 +	Healthy	Maintain current management
9 - 13	6 - 8	8 - 11	Good	Needs some management attention
5 - 8	3 - 5	5 - 7	Fair	Needs a significant level of management attention
0 - 4	0 - 2	0 - 4	Poor	Urgent management necessary if you wish to retain area as stock shelter

**This assessment** (17 x "YES" answers) = HEALTHY, maintain current management



## 8.0 References

Actinotus Environmental Consultants Pty Ltd (2013) *Baseline Monitoring Survey for Weeds & Feral Animals at the Southern Highlands Regional Shooting Complex (SHRSC), Wattle Ridge Road, Hilltop NSW*. April 2013.

DEC (2004) *The Native Vegetation of the Nattai and Bargo Reserves*. Unpublished Report. Department of Environment and Conservation, Hurstville.

Epacris Environmental Consultants Pty Ltd (2011) *Southern Highlands Regional Shooting Complex, Conservation Area Monitoring and Biometric Condition Assessment*. December 2013.

ErSed Environmental Pty Ltd (2013a) *Monitoring and Sampling Plan: Soil, Water and Sediment Monitoring, Southern Highlands Regional Shooting Complex (SHRSC)*. Draft June 2013.

ErSed Environmental Pty Ltd (2013b) *Initial Baseline Sampling: Soil, Water and Sediment Monitoring, Southern Highlands Regional Shooting Complex (SHRSC)*. Draft June 2013.

GHD (2008) *Environmental Assessment. Southern Highlands Regional Shooting Complex. Vol. 1*. Feb. 2008.

GHD (2010) *Construction Environmental Management Plan. Southern Highlands Regional Shooting Complex*. August 2010.

GHD (2010). *Ecological Management Plan. Southern Highlands Regional Shooting Complex*. Sept. 2010.

## **APPENDIX ONE**

**Summary of Flora and Fauna Management Actions (Table 16) from  
*Ecological Management Plan, Southern Highlands Regional Shooting  
Complex* (GHD, 2010)**



**Table 16 Summary of fauna and flora management actions**

Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
Pre-construction Phase				
	Section 2.4	<b>Spring Surveys</b> – supplementary targeted surveys prior to the commencement of clearing activities to meet Project Conditions of Approval	September 2010	Land Manager (Communities NSW Ecologists)
	Section 6	<b>Induction</b> – to familiarise contractors with their obligations for protecting flora and fauna and with relevant flora and fauna management protocols and methods	October 2010	Site Manager (advised by Contractors Ecologists)
	Section 5.2.1	<b>Identify Disturbance Areas</b> – identify construction footprints and suitable sites for location of ancillary infrastructure	October 2010	Contractor's Site Manager
	Section 5.2.1	<b>Install Protective Fencing and signs</b> – high visibility temporary fencing and signs erected to clearly demarcate construction and works areas from surrounding native vegetation and habitats ('no-go zones'). Installation of signs at property access points to restrict off-road activities and fauna warning signs and speed signs at appropriate locations.	October 2010	Contractor with advice from Contractor's Ecologists where appropriate
	Sections 5.2.1, 5.3.1, 5.3.4	<p><b>Pre-clearance Surveys</b> – completion of pre-clearance surveys prior to vegetation clearance, in accordance with the <i>Fauna Habitat Identification Management Procedure</i>, and including:</p> <ul style="list-style-type: none"> <li>▶ <b>Baseline weed mapping</b> in accordance with the Weed Management Strategy</li> <li>▶ <b>Identification and of hollow-bearing trees and logs</b> to be cleared in accordance with the Habitat Clearing and Hollow Tree management procedure;</li> <li>▶ <b>Identification of Wombat burrows</b> and installation of one-way wombat gates;</li> <li>▶ <b>Inspection of termite mounds</b> for evidence of nesting by Rosenberg's Goanna and egg retrieval and management in consultation with DECCW;</li> <li>▶ <b>Identification of rocky outcrops or ledges</b> within the construction footprint to be searched for native fauna immediately prior to clearing activities and removal; and</li> <li>▶ <b>Identification of Hollow Trees and Yellow-bellied Glider sap-feeding trees</b> for</li> </ul>	Late September 2010	Contractor's Ecologists  Contractor's herpetologist/ or suitably experienced Wildlife Specialist



Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
		retention in vicinity of car park and along access roads, where possible ;		
		<ul style="list-style-type: none"> <li>► <b>Identification of transportable habitat features</b> (eg large logs, rocks) to relocate during clearing activities into retained habitats under advice of Contractor's ecologist.</li> </ul>		
		<b>Closure of unwanted tracks</b> – close unwanted or unused tracks in vicinity of construction area to prevent unauthorised access	Late September/early October 2010	Contractor's Site Manager with direction from Land Manager
<b>Construction Phase</b>				
	Section 5.3.2	<b>Timing</b> – adhere to the set timing for clearing activities (June to October), clearing not to commence until completion of spring surveys and finalisation and approval of Ecological Management Plan.	September– October 2010	Contractor
	Section 5.3.2	<b>Operational hours</b> – construction works to occur during standard operational hours as far as possible to avoid impacts on fauna as a result light and noise. Night work should be avoided as far as possible and any necessary lighting located and directed to avoid light spill into retained habitats adjoining the construction area.	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	<b>Maintain Fencing and Signs</b> – temporary fencing erected to demarcate construction areas and 'no-go zones' to be inspected and repaired as necessary.	Throughout construction period	Contractor
	Section 5.3.2	<b>Restrict Access</b> – restrict vehicle movements to access roads and construction areas to prevent mechanical damage to vegetation and soil disturbance in surrounding retained habitat	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	<b>Enforce speed limits and safe driving practices</b> to minimise potential for fauna road mortality and disturbance of vegetation from dust generation	Throughout construction period	Contractor's Site Manager
	Section 5.3.2	<b>Install ancillary features</b> – locate temporary construction infrastructure (eg site office), equipment laydown and vehicle/machinery parking areas and stockpile sites within existing clearings or disturbed areas or within the construction footprint away from the drip line of trees as far as possible.	October 2010	Contractor's Site Manager
	Section 5.3.2	<b>Install sediment control features prior to clearing activities</b> – to prevent runoff from exposed soils and stockpiles to minimise the potential for adverse impacts on surrounding and downstream habitats in accordance with the Soil and Water Management Plan and Water Cycle Management Plans.	Early October 2010	Contractor



Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Section 5.3.2	<b>Dust suppression</b> – spraying of access tracks and disturbed surfaces to control dust generation and minimise impacts on adjoining vegetation	Throughout construction period, as required	Contractor
	Sections 5.3.2 & 5.3.4, Appendix E	<b>Implement Habitat Clearing and Hollow Bearing Tree Management Procedure</b> – the removal of trees with hollows and hollow logs, wombat burrows, rocky outcrops, termite mounds is to be in accordance with this procedure to minimise potential for mortality or harm to fauna. Contractor's Ecologists to be present during vegetation clearing.	September 2010 – April 2011	Contractor/Contractor's Ecologists
	Sections 5.3.2 & 5.3.4, Appendix E	<b>Exercise caution around exposed sandstone and bushrock</b> – care taken to avoid disturbance or destruction of potential Broad-headed Snake habitat adjoining construction footprints.	Throughout construction period	Contractor
	Sections 5.3.2 & 5.3.4, Appendix E Section 8.1	<b>Implement Fauna Management and Fauna Handling Management Procedures</b> – where necessary, animals encountered within construction footprints should be managed in accordance with this procedure. All wildlife handling to be undertaken by the contractor's wildlife specialists.  Document records of animal handling requirements and outcomes for inclusion in contractor monthly field inspection reports to inform Land Manager's Annual Report to DECCW.	September 2010 – April 2011	Contractor's Wildlife Specialists  Contractor's Site Manager with assistance from contractor's Wildlife Specialists
	Section 5.3.2, 5.3.4 & Appendix E	<b>Reinstatement of Fauna Habitat Features Procedure</b> – identified transportable habitat features (eg hollow logs and trunks, rocks etc) within construction footprints to be relocated to adjacent habitat in accordance with this procedure.	During vegetation clearing activities	Contractor with advice from Contractor's Ecologists
	Sections 5.3.2 & 5.3.4, Appendix E	<b>Avoidance of Habitat Features Identified for retention during pre-clearing surveys</b> – hollow-bearing trees and Yellow-bellied Glider sap-feeding trees to be retained in the car park area and along access roads to be avoided during clearing and grading works, as far as possible.	Throughout construction period	Contractor
	Appendix E	<b>Retention of topsoil and vegetation debris</b> – topsoil removed for construction should be stockpiled for use in rehabilitation areas as required. Vegetation debris from clearing activities should be mulched and used for stabilisation of disturbed soils and in proposed rehabilitation/landscaped areas.	During vegetation clearing activities	Contractor
	Section 5.4 & Appendix E	<b>Weed Control</b> – adherence to a Weed Management Strategy. Use designated access points to reduce transport of weed material between areas. Workforce personnel to inspect clothing, boots and vehicles/ plant machinery on entry and exit from site. Manage	Throughout construction period	Contractor



Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
		stockpiles to prevent weed germination. Weekly inspections of construction site and disturbed areas for new occurrences of weeds and weed removal.		
	Section 5.5 & Appendix E	<b>Implement Biosecurity Procedures</b> – boot wash down and vehicle spray down stations located at all access points to construction site. Phytoclean ( <i>Phytophthora cinnamomi</i> ), Bleach (Chytrid Fungus). Personnel boots and vehicles/ plant / machinery to be clean on entry and clean on exit. Any soil or water brought to the site is to be free of weeds or pathogens.	Throughout construction period	Contractor's Site Manager
	Appendix E	<b>Soil Stockpile Management</b> – locate stockpiles away from vegetated areas or drainage lines to prevent sediment discharge and spread of weeds. Ensure appropriate erosion and sediment controls are in place around soil stockpiles. Manage stockpiles to prevent weed germination in accordance with the Soil and Water Management Plan and Water Cycle Management Plans	Throughout construction period	Contractors
	Appendix E	<b>Rehabilitation of disturbed areas</b> – disturbed areas to be progressively stabilised and where appropriate planted with native species endemic to the local area in accordance with Rehabilitation Management Protocol and requirements of Bushfire Management Plan.	Throughout construction period	Contractors
		<b>Waste Management</b> – all chemicals and liquid wastes to be contained within bunded areas to avoid environmental contamination. Rubbish and organic waste to be disposed of regularly and appropriately in accordance with the Soil and Water Management Plan and Water Cycle Management Plans.	Throughout construction period	Contractor
	Section 8.1	<b>Site Inspections and Reporting</b> - Undertake daily site inspections and reporting in accordance with CEMP to report on environmental performance, incidents, non-conformance and remedial action to address incidents and non-conformances	Throughout construction period	Contractor's Site Manager
		<b>Removal of fencing</b> - temporary fencing is to be removed following the completion of the construction phase.	May/ June 2011	Contractor
	Appendix E	<b>Rehabilitation of disturbed areas</b> – disturbed areas to be progressively stabilised and where appropriate planted with native species endemic to the local area in accordance with Rehabilitation Management Protocol and requirements of Bushfire Management Plan.	May/ June 2011	Contractor
	Section 5.2.3	<b>Installation of permanent fencing</b> – install permanent fencing of the clubhouse and surrounds to minimise vegetation damage from vehicle and pedestrian movements on the site.	May/ June 2011	Contractor
Operational Phase				



Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Sections 5.2.1 and 7.1	<b>Photographs at Photopoints</b> – take photos at established photopoints and establish and log new photopoints in vicinity of new development, as per Conservation Agreement	September 2010	Land Manager
		<b>Restriction of access to surrounding bushland-</b> Restrict access to surrounding bushland and existing bushwalking tracks by: <ul style="list-style-type: none"> <li>• <b>Installing obstacles</b> to block vehicle access to tracks</li> <li>• <b>Installing signs</b> to clearly demarcate walking trails and asking walkers to stay on marked trails</li> <li>• <b>Maintaining internal roads</b> to ensure all-weather access for 4WD vehicles. No new roads to be created.</li> <li>• <b>Manage illegal vehicle access</b> jointly with the NSW Police and National Parks and Wildlife Group, DECCW.</li> </ul>		Land manager
	Appendix E	<b>Implement threatened flora management procedure-</b> prevent damage to disturbance loving threatened flora during maintenance activities by implementing procedures outlined in the threatened flora management procedure, including providing maintenance staff with inductions and species ID cards.	As required	Facility Site manager
	Section 5.3.3	<b>Introduce speed limits-</b> Introduce and enforce speed limits by installing signage and speed control structures (e.g. speed bumps) along roads to prevent fauna injury	May/June 2011	Contractor
	Appendix E	<b>Implement Management of Fauna on Range and Fauna Handling Management Procedures</b> – where necessary, animals encountered on the range during shooting hours should be managed in accordance with this procedure. All wildlife handling to be undertaken by the contractor's wildlife specialists.  Document records of animal handling requirements and outcomes for inclusion in Land Manager's Annual Report to DECCW.	Ongoing	Facility Site Manager/ Land manager
	Section 5.3.3	<b>Limit nocturnal shooting activities-</b> nocturnal shooting activities to be kept to a minimum to minimise the disturbance to nocturnal fauna. Light should be located and directed to avoid light spill into surrounding habitats as far as possible.	Ongoing	Facility Site manager
	Section 5.3.3	<b>Regular removal of spent munitions-</b> shooting range and surrounds to be regularly cleared of spent munitions to avoid the potential for lead poisoning of fauna	Ongoing	Facility Site manager
	Section 5.3.3	<b>Manage illegal bushrock removal-</b> management of this issue to be undertaken in the Conservation (E2) zone and uncleared areas of the SP1 zone in conjunction with initiatives undertaken by the National Parks Group on surrounding conservation lands	Ongoing	Land manager



Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Appendix E	<b>Weed Control</b> – adherence to the Weed Management Strategy. Use designated access points to reduce transport of weed material between areas. Annual weed surveys and control to be completed by a professional bush regenerator within the SP1 zone. It is intended that weed control in the Plan area will be integrated with PWG (Nattai area) weed management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation). Photos taken at established photopoints to compare pre and post construction environments	Ongoing	Land manager/PWG (Nattai area)
	Appendix E	<b>Implement Rehabilitation Management Procedure-</b> Any rehabilitation at the site to be undertaken in accordance with this procedure, using native species of local provenance and non-viable, non-invasive turf to prevent introduction of weeds	Ongoing	Land manager
	Appendix E	<b>Implement Biosecurity Procedures</b> –Any soil or water brought to the site is to be free of weeds or pathogens. All maintenance/monitoring equipment such as water quality monitoring equipment should be cleaned and disinfected between sites.	Ongoing	Land manager
	Section 5.5.5	<b>Undertake Phytophthora monitoring-</b> Surveys for Phytophthora dieback to be undertaken every 1-2 years, in conjunction with annual weed surveys. Soil and plant samples to be analysed from any areas of suspected dieback, and any infected areas should be isolated and managed in consultation with local National Parks officers.	Ongoing	Land manager
	Section 5.6	<b>Feral Animal Control</b> – It is intended that pest control in the Plan area will be integrated with PWG (Nattai area) pest management within the surrounding DECCW estate under the MOU between the PWG and Communities NSW (Sport and Recreation).  Additional control programs to be undertaken if necessary, with advice from local National Parks officers and Rural Lands Board.	Ongoing	Land manager/PWG (Nattai area)
	Section 5.6	<b>Regular waste disposal</b> to prevent attraction and accumulation of feral animals to the site	Ongoing	Land manager
	Section 5.6	<b>Rabbit control measures-</b> install measures to control European Rabbit grazing pressure within the SP1 zone, including: <ul style="list-style-type: none"> <li>▶ Install tree guards/ protective fencing around regenerating vegetation;</li> <li>▶ Undertake monthly rabbit monitoring: any observed increase in rabbit activity will trigger the preparation of a management plan in consultation with National Parks officers; and</li> <li>▶ Control programs to be undertaken if necessary with advice from local National Parks officers and Rural Lands Board.</li> </ul>	Ongoing	Land manager/PWG (Nattai area)





Project Phase	Section of EMP	Mitigation Measure	Timing	Responsibility
	Appendix C	<b>Finalisation and signing of Memorandum of Understanding</b> between Communities NSW) and Parks and Wildlife Group (agency of DECCW) (see Appendix C).		Land manager/PWG (Nattai area)
	Section 8.2	<b>Completion of Annual Report-</b> Land manager to complete the annual monitoring report for submission to DECCW, including: <ul style="list-style-type: none"> <li>▶ Photopoint photos for comparison of vegetation changes;</li> <li>▶ Records of any threatened flora or fauna species encountered during operational activities;</li> <li>▶ Summary and results of annual works program undertaken by the National Parks Group, as well as any additional control programs;</li> <li>▶ Results of environmental monitoring surveys, inspections and analyses; and</li> <li>▶ Incident reporting and actions.</li> </ul>	Annually	Land Manager