CONSERVATION AREA MONITORING AND BIOMETRIC CONDITION ASSESSMENT

Southern Highlands Regional Shooting Complex (Hill Top Conservation Area)

SEPTEMBER 2019

Lesnok ENVIRONMENTAL

Cover photographs:

Top left: Looking towards Mt Jellore over the conservation area. Photograph taken looking south-west from the Southern end of the 800 m rifle range.

Top right: *Leucopogon setiger* in flower. Present at vegetation plot 4.

Bottom left: Character of the vegetation within vegetation plot 4. Photograph taken from the north-west corner of the plot looking into the quadrat.

Report produced at the request of:

NSW Office of Sport

by

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This report is prepared in accordance with both the 6th Edition of the Commonwealth of Australia (2002) Style Manual.

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Glossary

Abbreviation	Definition
ºC	Degrees Celsius
CEMP	Construction Environmental Management Plan
DEE	Commonwealth Department of the Environment and Energy
DPI	NSW Department of Primary Industries
cm/m/km	Centimetres, metres, kilometres
ha	Hectares
Lesryk	Lesryk Environmental Pty Ltd
LGA	Local Government Area
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SHRSC	Southern Highlands Regional Shooting Complex
TEC	Threatened Ecological Community
WoNS	Weeds of National Significance

1. Introduction

This report presents the findings of the second monitoring study undertaken by Lesryk at the request of the NSW Office of Sport (formerly Office of Sport and Recreation) in regards to the development of the SHRSC, this being located off Wattle Ridge Road, Hill Top, NSW.

The monitoring involves the surveying of six flora plots and six photo-point locations within the SHRSC (Figure 1). For reference, the coordinates of these locations are provided in Tables 1 and 2. It is noted that during this monitoring study the coordinates previously recorded for vegetation plot 2 were found to be erroneous. As such, these have been amended and updated in this report .

Table 1. Vegetation plot coordinates

Plot No.	Grid Reference (GDA 94)		General location and description
	Easting	Northing	
1	265573	6199190	Southern end of the 800 m rifle range (Zone 3).
2	265546[1]	6199096	230 m south-west of the 800 m rifle range (Zone 1).
3	265119	6197472	Firetrail on the western side of a powerline easement, 1.8 km south of the 800 m rifle range (Zone 1).
4	264843	6200465	West of the (under construction) 50 m gun range (boundary Zone 2).
5	265435	6200643	On the southern side of Wattle Ridge Road, 20 m north-west of the entry to Zone 2) (boundary of Zone 2).
6	265680	6199995	The gully between Zones 2 and 3 (Zone 1).

Table 2. Photo-point coordinates

Photo-points	Grid Reference (GDA 94)		General location and description
	Easting	Northing	
1	265635	6199258	South end of 800 m rifle range (Zone 3).
2	265503	6199183	Intact woodland (Zone 1).
3	265263	6197520	Powerline easement crossing, 1.8 km south of the 800 m rifle range (Zone 1).
4	265635	6199258	South end of 800 m rifle range (Zone 3).
5	264932	6200416	Northern boundary of the 50 m range (Zone 2).
6	265000	6200218	South-east of the 50 m range (Zone 2).

The first monitoring report prepared by Lesryk (2018) provides further details on:

- the purpose and inititiation of the study
- location and description of the SHRSC
- the conservation values of the SHRSC
- the methodology employed.

The monitoring of the SHRSC site was carried out by Paul Burcher (B.App.Sc.) [Senior Botanist] and Stephen Bloomfield (B.App.Sc.) [Botanist], the investigations being conducted on 8 and 9 August 2019.

For reference, the weather conditions experienced during the current monitoring session were:

- 8 August - cool temperatures (15 ºC), partly cloudy skies (<80% cloud cover), strong winds and intermittent drizzle
- 9 August - cold temperatures (8 ºC), overcast skies (95%) and strong winds.

[1] Updated GPS coordinate

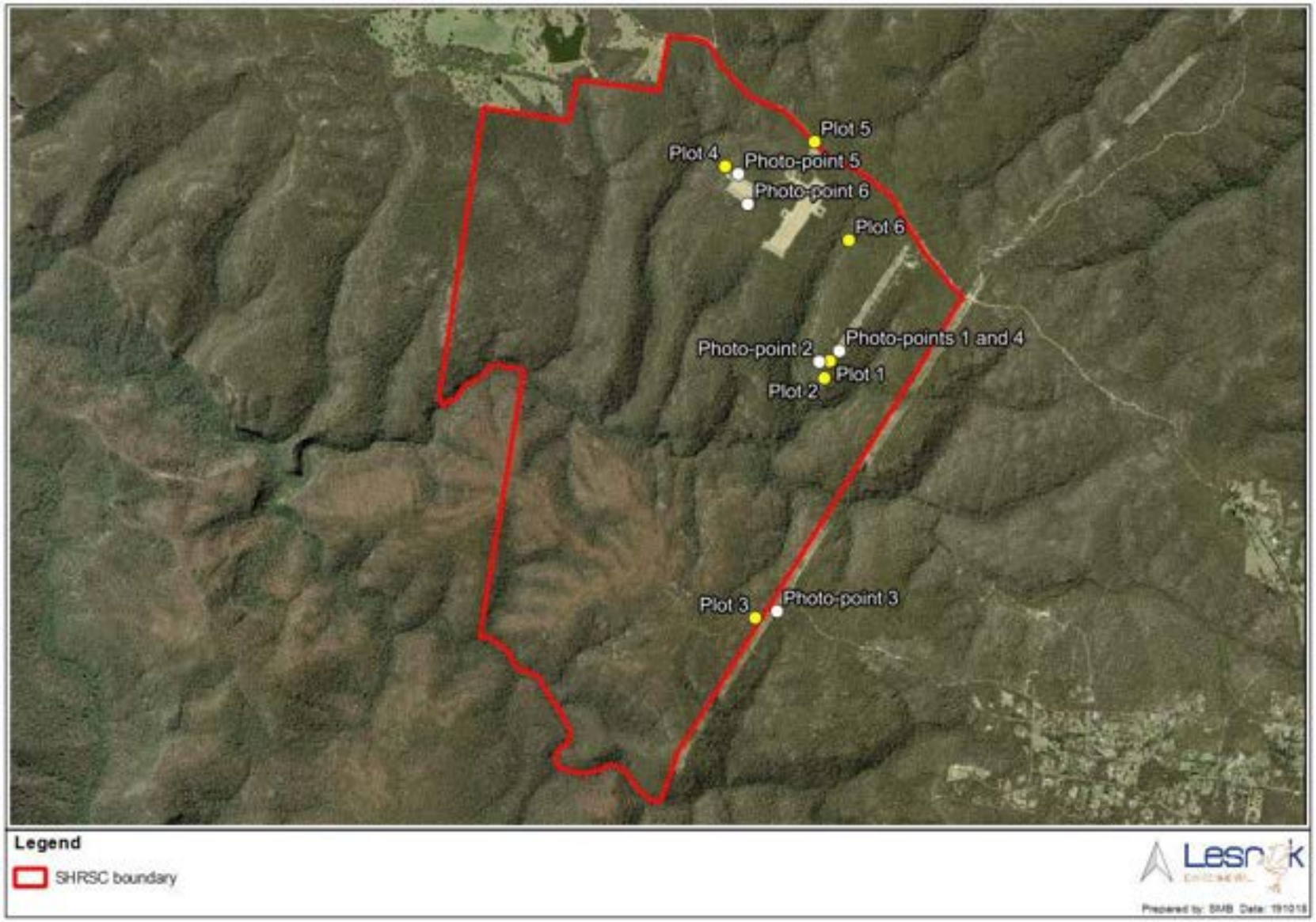

Figure 1. Location of vegetation plots and photo-points

2. Results

2.1. Vegetation plots

The photos that were taken looking into each plot from the north-western plot marker, or the 0 m mark in the case of Plot 3, have been included within the relevant sections below. The photos that were taken looking north, east, south and west from the north-western plot marker (and the remaining photos of Plot 3) have been provided in Appendix 1.

A list of all the flora species identified and their location has been tabulated in Appendix 2.

2.1.1. Plot 1

Plot 1 Floristic Site Survey Form Hill Top

Date: 08/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: Southern end of the 800 m rifle range (Zone 3)
Hill Top Conservation Area, NSW

Plot Size: 20 x 20 m

Easting: 265573 **Northing:** 6199190 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 616 m **Slope:** 1°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	15	15	*Eucalyptus sieberi*, *E. piperita*
Mid-upper	6	40	*Corymbia gummifera*, *Hakea dactyloides*, *Acacia terminalis*, *Leptospermum trinervium*
Mid-lower	1.5	20	*Lambertia formosa*, *A. terminalis*, *Dillwynia elegans*, *H. dactyloides*, *Grevillea spp.*, *L. trinervium*
Ground	0.3	10	*Cyathochaeta diandra*, *Caustis flexuosa*, *Amperea xiphoclada*, *Lomandra spp.*

Total No. of native species recorded: 49

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus sieberi – Corymbia gummifera*

PCT: 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin.

Feature	Y/N	Comment
Hollow-bearing trees	Y	Overhanging.
Rock outcrop	Y	Very minor amount.
Mistletoe	N	
Water body	N	
Threatened species	N	
Weeds	N	
Pest fauna	N	
Tree dieback	Y	A number of trees within the plot and surrounding area are affected.
Fire history	Y	Between 6-10 years ago.
Erosion	N	
Other	Y	The north-west portion of the plot and adjacent to the west has been affected by sediment runoff from upslope in association with the 800 m gun range. Mulching and drainage works (i.e. placement of sandstone rocks) have been undertaken to address the issue (refer to section 5.1.8).

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia linifolia*	1
2	*Acacia suaveolens*	1
3	*Acacia terminalis*	2
4	*Amperea xiphoclada*	3
5	*Austrostipa pubescens*	1
6	*Banksia serrata*	1
7	*Banksia spinulosa*	3
8	*Billardiera scandens*	1
9	*Boronia ledifolia*	2
10	*Bossiaea obcordata*	3
11	*Caustis flexuosa*	3
12	*Corymbia gummifera*	4b
13	*Cyathochaeta diandra*	4b
14	*Dampier stricta*	2
15	*Daviesia ulicifolia*	1
16	*Dillwynia elegans*	3
17	*Dillwynia phylicoides*	1
18	*Dodonea triquetra*	1
19	*Entolasia stricta*	2
20	*Eragrostis brownii*	2
21	*Eriostemon australasius* ssp. *australasius*	2
22	*Eucalyptus piperita*	4b
23	*Eucalyptus sieberi*	4b
24	*Exocarpos strictus*	1
25	*Gompholobium grandiflorum*	2
26	*Gonocarpus teucrioides*	3
27	*Goodenia bellidifolia*	1
28	*Grevillea sphacelata*	3
29	*Hakea dactyloides*	4b
30	*Hakea gibbosa*	1
31	*Hibbertia rufa*	1
32	*Isopogon anemonifolius*	2
33	*Isopogon anethifolius*	1
34	*Lambertia formosa*	3
35	*Lepidosperma laterale*	1
36	*Leptospermum trinervium*	4b
37	*Leucopogon setiger*	1
38	*Lomandra micrantha* subsp. *tuberculata*	3
39	*Lomandra obliqua*	2
40	*Lomatia silaiifolia*	1
41	*Monotoca scoparia*	1
42	*Patersonia glabrata*	1
43	*Persoonia levis*	1
44	*Petrophile pedunculata*	1
45	*Poranthera ericifolia*	1
46	*Poranthera microphylla*	1
47	*Pteridium esculentum*	1
48	*Stylidium productum*	2
49	*Telopea speciosissima*	1
50	*Tetratheca thymifolia*	3
51	*Xanthosia pilosa*	2

Plate 1. The character of the vegetation within Plot 1.

2.1.2. Plot 2

Plot 2	Floristic Site Survey Form	Hill Top

Date: 08/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: 230 m south-west of the 800 m rifle range (Zone 1)
Hill Top Conservation Area, NSW

Plot Size: 20 x 20 m

Easting: 265540 **Northing:** 6199076 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 602 m **Slope:** 2°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	15-20	20	*Eucalyptus piperita*, Corymbia *gummifera*, *Eucalyptus sieberi*
Mid-upper	8	5	*Corymbia gummifera*
Mid-lower	2.5-3	50	*Acacia obtusifolia*, *Dillwynia retorta*, *Hakea dactyloides*
Ground	0.5	5	*Lomandra micrantha* ssp. *tuberculata*, *Caustis flexuosa*, *Eriostemon australasius* ssp. *australasius*

Total No. of native species recorded: 44

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus piperita – Corymbia gummifera*

PCT: 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Feature	Y/N	Comment
Hollow-bearing trees	Y	Hollows with diameters 11-20 cm and >20 cm are present.
Rock outcrop	N	Some loose boulders.
Mistletoe	N	
Water body	N	
Threatened species	N	
Weeds	N	
Pest fauna	N	
Tree dieback	Y	Due to drought.
Fire history	Y	Between 6-10 years ago.
Erosion	N	
Other	N	

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia linifolia*	2
2	*Acacia obtusifolia*	3
3	*Acacia terminalis*	2
4	*Acacia ulicifolia*	1
5	*Austrostipa pubescens*	1
6	*Banksia oblongifolia*	1
7	*Banksia serrata*	1
8	*Banksia spinulosa*	3
9	*Billiardiera scandens*	1
10	*Boronia ledifolia*	3
11	*Bossiaea obcordata*	2
12	*Caustis flexuosa*	3
13	*Corymbia gummifera*	4b
14	*Dampiera purpurea*	1
15	*Daviesia ulicifolia*	1
16	*Dillwynia retorta*	4b
17	*Dodonea triquetra*	1
18	*Eriostemon australasius* ssp. *australasius*	3
19	*Eucalyptus piperita*	4b
20	*Eucalyptus sieberi*	4b
21	*Exocarpos strictus*	1
22	*Gompholobium grandiflorum*	1
23	*Grevillea mucronulata*	2
24	*Grevillea sphacelata*	1
25	*Hakea dactyloides*	3
26	*Hibbertia rufa*	1
27	*Hovea linearis*	1
28	*Isopogon anethifolius*	1
29	*Leptospermum trinervium*	3
30	*Leucopogon setiger*	1
31	*Lomandra micrantha* ssp. *tuberculata*	3
32	*Lomandra obliqua*	2
33	*Lomatia silaifolia*	1
34	*Monotoca scoparia*	1
35	*Patersonia glabrata*	1
36	*Persoonia levis*	1
37	*Persoonia linearis*	2
38	*Petrophile pedunculata*	2
39	*Phyllanthus hirtellus*	2
40	*Poranthera ericifolia*	1
41	*Pteridium esculentum*	1
42	*Tetratheca thymifolia*	3
43	*Xanthosia pilosa*	1
44	*Xylomelum pyriforme*	2

Plate 2. The character of the vegetation within Plot 2.

2.1.3. Plot 3

Plot 3 Floristic Site Survey Form Hill Top

Date: 09/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: Firetrail on the western side of a powerline easement, 1.8 km south of the 800 m rifle range (Zone 1)
Hill Top Conservation Area, NSW

Plot Size: 6 x 60 m

Easting: 265119 **Northing:** 6197472 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 639 m **Slope:** 2°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	15-20	25	*Eucalyptus sclerophylla*, *Corymbia gummifera*
Mid-upper	4	<5	*Corymbia gummifera*
Mid-lower	1-1.5	<5	*Corymbia gummifera*, *Grevillea arenaria*
Ground	0.5	15	*Lomandra spp.*, *Patersonia glabrata*, *Bossiaea obcordata*

Total No. of native species recorded: 39

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus sclerophylla* - *Corymbia gummifera*

PCT: 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin

Feature	Y/N	Comment
Hollow-bearing trees	N	Not within the plot.
Rock outcrop	Y	Very minor amount.
Mistletoe	N	
Water body	N	
Threatened species	N	
Weeds	N	
Pest fauna	N	
Tree dieback	N	
Fire history	Y	Within the last 10 years.
Erosion	Y	The track has a history of use and appears to still be used. The surface of the track is hard-set.
Other	N	Gate/fence is broken, permitting vehicle entry.

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia linifolia*	2
2	*Acacia myrtifolia*	2
3	*Acacia ulicifolia*	1
4	*Actinotus minor*	1
5	*Billiardiera scandens*	1
6	*Bossiaea neoanglica*	2
7	*Bossiaea obcordata*	3
8	*Corybas sp*	1
9	*Corymbia gummifera*	3
10	*Dampiera purpurea*	1
11	*Daviesia ulicifolia*	2
12	*Dianella caerulea* var. *caerulea*	2
13	*Entolasia stricta*	1
14	*Eucalyptus eugenioides*	1
15	*Eucalyptus sclerophylla*	4b
16	*Eucalyptus sieberi*	1
17	*Gompholobium grandiflorum*	2
18	*Gonocarpus teucrioides*	1
19	*Goodenia bellidifolia*	2
20	*Grevillea arenaria*	3
21	*Grevillea sphacelata*	1
22	*Hovea linearis*	1
23	*Lindsaea microphylla*	1
24	*Lomandra micrantha* subsp. *tuberculata*	2
25	*Lomandra filiformis*	1
26	*Lomandra multiflora*	2
27	*Lomandra obliqua*	1
28	*Lomatia silaifolia*	2
29	*Monotoca scoparia*	1
30	*Patersonia glabrata*	3
31	*Patersonia sericea*	1
32	*Persoonia oblongata*	1
33	*Petrophile pedunculata*	1
34	*Phyllanthus hirtellus*	2
35	*Pimelea linifolia* ssp. *linifolia*	1
36	*Pomax umbellata*	1
37	*Poranthera corymbosa*	2
38	*Poranthera ericifolia*	2
39	*Xanthorrhoea media*	1
40	*Xylomelum pyriforme*	1

Plate 3. The character of the vegetation within Plot 3.

2.1.4. Plot 4

Plot 4 Floristic Site Survey Form Hill Top

Date: 08/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: West of the 50 m gun range (boundary Zone 2)
Hill Top Conservation Area, NSW

Plot Size: 20 x 20 m

Easting: 264843 **Northing:** 6200465 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 591 m **Slope:** 15°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	15-20	30	*Corymbia gummifera*, *Eucalyptus piperita*
Mid-upper	6	5	*Corymbia gummifera*, *Banksia serrata*, *Hakea dactyloides*
Mid-lower	2-3	15	*Acacia terminalis*, *Banksia spinulosa*, *Pomaderris andromedifolia*
Ground	1	5	*Pteridium esculentum*, *Lomandra spp.*, *Lepidosperma laterale*

Total No. of native species recorded: 35

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus piperita – Corymbia gummifera*

PCT: 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin.

Feature	Y/N	Comment
Hollow-bearing trees	Y	Hollows with diameters around 10 cm are present.
Rock outcrop	Y	Large areas of outcropping with numerous crevices, ledges, and exfoliated rock.
Mistletoe	N	
Water body	N	
Threatened species	N	
Weeds	Y	Minor. The introduced Fleabane (*Conyza sp*) and Catsear (*Hypochaeris radicata*), with cover abundance scores of 1 and 1, respectively, are present.
Pest fauna	N	
Tree dieback	N	
Fire history	Y	Between 6-10 years ago.
Erosion	N	
Other	Y	Areas of sediment have been deposited on top the rock shelf in the eastern portion of the plot from runoff upslope in association with the sedimentation basin development. Termite mound present.

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia myrtifolia*	1
2	*Acacia suaveolens*	1
3	*Acacia terminalis*	3
4	*Banksia serrata*	4b
5	*Banksia spinulosa*	2
6	*Billiardiera scandens*	1
7	*Bossiaea obcordata*	3
8	*Cheilanthes distans*	1
9	*Clematis glycinoides*	1
10	*Conyza sp**	1
11	*Corymbia gummifera*	4b
12	*Dampiera purpurea*	1
13	*Dillwynia ramosissima*	1
14	*Entolasia stricta*	2
15	*Eriostemon australasius* ssp. *australasius*	3
16	*Eucalyptus piperita*	4b
17	*Eucalyptus sieberi*	1
18	*Gompholobium grandiflorum*	1
19	*Gonocarpus teucrioides*	1
20	*Goodenia bellidifolia*	1
21	*Grevillea sphacelata*	3
22	*Hakea dactyloides*	3
23	*Hakea gibbosa*	2
24	*Hibbertia rufa*	1
25	*Hovea linearis*	1
26	*Hypochaeris radicata**	1
27	*Lagenophora gracilis*	1
28	*Lepidosperma laterale*	2
29	*Leptospermum trinervium*	2
30	*Leucopogon setiger*	2
31	*Lomandra confertifolia* ssp. *rubiginosa*	1
32	*Lomandra filiformis*	2
33	*Lomandra gracilis*	1
34	*Lomandra micrantha* ssp. *tuberculata*	2
35	*Lomandra obliqua*	3
36	*Lomatia ilicifolia*	1
37	*Lomatia silaifolia*	1
38	*Persoonia levis*	1
39	*Persoonia mollis*	1
40	*Phyllanthus hirtellus*	1
41	*Grass sp*	1
42	*Pomaderris andromedifolia*	3
42	*Poranthera ericifolia*	1
44	*Pteridium esculentum*	2
45	*Smilax glyciphylla*	1
46	*Telopea speciosissima*	1
47	*Tetratheca thymifolia*	2
48	*Xanthorrhoea ?media*	1
49	*Xylomelum pyriforme*	1

Plate 4. The character of the vegetation within Plot 4.

2.1.5. Plot 5

Plot 5	Floristic Site Survey Form	Hill Top

Date: 09/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: On the southern side of Wattle Ridge Road, 20 m north-west of the entry to Zone 2 (boundary of Zone 2)
Hill Top Conservation Area, NSW

Plot Size: 20 x 20 m

Easting: 265435 **Northing:** 6200643 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 606 m **Slope:** 1°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	15	40	*Eucalyptus sieberi*, *Corymbia gummifera*, *Eucalyptus sparsifolia*
Mid-upper	6	10	*Corymbia gummifera*, *Hakea dactyloides*
Mid-lower	2	25	*Grevillea arenaria*, *Hakea dactyloides*, *Acacia spp.*, *Bossiaea obcordata*
Ground	0.5	30	*Cyathochaeta diandra*, *Lomandra spp.*, *Patersonia glabrata*, *Entolasia stricta*

Total No. of native species recorded: 44

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus piperita – Corymbia gummifera – E. sieberi*

PCT: 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin.

Feature	Y/N	Comment
Hollow-bearing trees	Y	Potential <10 cm diameter spout.
Rock outcrop	N	
Mistletoe	N	
Water body	N	
Threatened species	N	
Weeds	N	
Pest fauna	N	
Tree dieback	Y	Minor, due to drought.
Fire history	Y	Between 6-10 years ago.
Erosion	N	
Other	Y	The majority of the plot and adjacent area appears to have been cleared in the past due to young nature of the woodland (approximately 20-30 years old).

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia linifolia*	1
2	*Acacia myrtifolia*	1
3	*Acacia obtusifolia*	1
4	*Acacia terminalis*	2
5	*Austrostipa pubescens*	2
6	*Banksia spinulosa*	1
7	*Bossiaea obcordata*	3
8	*Cassytha glabella*	1
9	*Corybas sp*	3
10	*Corymbia gummifera*	4b
11	*Cyathochaeta diandra*	4b
12	*Dampiera stricta*	2
13	*Daviesia ulicifolia*	1
14	*Dianella caerulea* var. *caerulea*	1
15	*Dianella longifolia*	1
16	*Entolasia stricta*	3
17	*Eucalyptus oblonga/sparsifolia*	4b
18	*Eucalyptus sieberi*	4b
19	*Goodenia bellidifolia*	3
20	*Grevillea arenaria*	4a
21	*Hakea dactyloides*	3
22	*Hibbertia sp*	1
23	*Hovea linearis*	3
24	*Leptomeria acida*	1
25	*Leptospermum trinervium*	1
26	*Lindsaea microphylla*	1
27	*Lomandra filiformis*	2
28	*Lomandra micrantha* ssp. *tuberculata*	3
29	*Lomandra multiflora*	4a
30	*Lomandra obliqua*	3
31	*Lomatia silaifolia*	3
32	*Microlaeana stipoides*	1
33	*Monotoca scoparia*	1
34	*Patersonia glabrata*	4a
35	*Persoonia levis*	1
36	*Phyllanthus hirtellus*	3
37	*Poranthera ericifolia*	1
38	*Pultenaea hispidula*	2
39	*Pultenaea scabra*	2
40	*Scaevola ramosissima*	1
41	*Tetratheca thymifolia*	2

Plate 5. The character of the vegetation within Plot 5.

2.1.6. Plot 6

Plot 6 Floristic Site Survey Form Hill Top

Date: 08/08/19 **Recorder:** P. Burcher and S. Bloomfield

Location: The gully between Zones 2 and 3 (Zone 1)
Hill Top Conservation Area, NSW

Plot Size: 20 x 20 m

Easting: 265680 **Northing:** 6199995 **Position in quadrat:** north-west corner
Zone No.: 56

Altitude: 592 m **Slope:** 3°

Mitchell Landscape: Nattai Plateau **CMA:** Hawkesbury-Nepean

Geology: Nattai Tablelands erosional

Vegetation Structure: (Walker & Hopkins 1983)

Stratum	Height (m)	% cover	Dominant species
Upper	30	50	*Eucalyptus punctata*, *E. cypellocarpa*, *E. agglomerata*, *E. piperita*
Mid-upper	10	40	*Ceratopetalum gummiferum*, *Acacia obstusifolia*
Mid-lower	3	40	*Dodonea triquetra*, *Grevillea arenaria*, *Hakea dactyloides*, *Acacia spp.*
Ground	0.3	<5	*Lomandra spp.*, *Schoenus melanostachys*, *Blechnum cartilagineum*

Total No. of native species recorded: 41

Vegetation formation and class (Keith 2004): Sydney Hinterland Dry Sclerophyll Forests
Dry Sclerophyll Forests

Vegetation on-ground description: Open Forest - *Eucalyptus punctate - E. cypellocarpa – E. agglomerata - E piperita*

PCT: 1181. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion.

Feature	Y/N	Comment
Hollow-bearing trees	N	
Rock outcrop	Y	Large areas of outcropping with some crevices, ledges, and exfoliated rock.
Mistletoe	N	
Water body	Y	An ephemeral drainage line traverses the plot. This drainage line was dry at the time of survey.
Threatened species	N	
Weeds	N	
Pest fauna	N	
Tree dieback	Y	Due to drought.
Fire history	Y	10+ years ago.
Erosion	N	
Other	Y	The plot traverses two aspects, and includes a slope and an ephemeral drainage line.

Floristic Composition		
No.	**Species**	**Cover Abundance**
1	*Acacia linifolia*	1
2	*Acacia obstusifolia*	4b
3	*Acacia terminalis*	3
4	*Actinotus minor*	1
5	*Banksia spinulosa*	1
6	*Billiardiera scandens*	1
7	*Blechnum cartilagineum*	3
8	*Bossiaea neoanglica*	2
9	*Bossiaea obcordata*	1
10	*Callicoma serratifolia*	1
11	*Calochlaena dubia*	1
12	*Ceratopetalum gummiferum*	3
13	*Corymbia gummifera*	2
14	*Dianella caerulea* var. *caerulea*	1
15	*Dodonea triquetra*	4b
16	*Elaeocarpus reticultis*	2
17	*Entolasia stricta*	1
18	*Eucalyptus agglomerata*	4b
19	*Eucalyptus cypellocarpa*	4b
20	*Eucalyptus piperita*	4b
21	*Eucalyptus punctata*	4b
22	*Gompholobium grandiflorum*	1
23	*Gonocarpus teucrioides*	1
24	*Grevillea arenaria*	4b
25	*Hakea dactyloides*	3
26	*Hardenbergia violacea*	1
27	*Lepidosperma laterale*	1
28	*Leptospermum polygalifolium*	2
29	*Leptospermum trinervium*	2
30	*Leucopogon lanceolatus*	1
31	*Lindsaea microphylla*	1
32	*Lomandra filiformis*	1
33	*Lomandra longifolia*	3
34	*Lomandra micrantha* ssp. *tuberculata*	2
35	*Lomandra multiflora*	1
36	*Lomandra obliqua*	1
37	*Lomatia silaifolia*	2
38	*Opercularia diphylla*	2
39	*Patersonia glabrata*	1
40	*Persoonia levis*	1
41	*Persoonia linearis*	2
42	*Persoonia mollis*	3
43	*Philotheca hispidula*	2
44	*Pimelea linifolia* ssp. *linifolia*	1
45	*Pomaderris elliptica*	1
46	*Pteridium esculentum*	2
47	*Pultenaea sp*	1
48	*Schoenus melanostachys*	3
49	*Smilax glyciphylla*	1
50	*Telopea speciosissima*	1

Plate 6. The character of the vegetation within Plot 6.

2.2. Photo-points

2.2.1. Photo-point 1

Plate 7. Looking south-west over the conservation area towards Mt Jellore (date taken: 08/08/2019).

2.2.2. Photo-point 2

Plate 8. Intact woodland within Zone 1 (date taken: 08/09/2019).

2.2.3. Photo-point 3

A small amount of erosion is evident in this area as a result of the access tracks that are being used (Plates 9a-9d). The vegetation within the powerline easement is regularly maintained and slashed (Plates 9a, 9c-d). Some rock outcropping and loose rock is present (Plates 9a and 9d).

No weeds are present.

Plate 9a. Looking north-east with the conservation area evident to the west of the powerline easement (left of photo) (date taken: 09/8/2019).

Plate 9b. Looking east (date taken: 09/8/2019).

Plate 9c. Looking south-west with the conservation area evident to the west of the powerline easement (right of photograph) (date taken: 09/8/2019).

Plate 9d. Looking west towards the conservation area and Plot 3 location (date taken: 09/8/2019).

2.2.4. Photo-point 4

Some mulching works have occurred alongside the rifle range.

Plate 10a. Looking north-east along existing 800 m rifle range (date taken: 08/09/2019).

Immediately south of this photo-point, the area has recently been contoured to divert and control water and sediment runoff. This has been achieved by placing sandstone boulders and rocks of differing sizes in a drainage formation, and layering mulch around this (Plate 10b). The works have been undertaken as scouring and erosion has occurred, and sediment has been deposited near Plot 1. Deposition of this sediment has resulted in the death of some small trees and shrubs.

No weeds were observed at this location.

Plate 10b. The disturbed area at the southern end of the 800 m rifle range. Note the attempted rehabilitation measures of mulching and rock placement (date taken: 08/08/19).

2.1.5. Photo-point 5

Minor erosion and sediment deposition along the boundary of the 50 m gun range area, adjacent to the woodland, has occurred. Sedimentation fencing has been erected in some areas but requires maintenance (Plate 11).

Consideration should be given to rehabilitating the bare earth batter slope (evident in Plate 11) with native grasses and shrubs.

No weeds were observed at this location.

Plate 11. Looking east along the northern boundary of the 50 m gun range, construction now completed (date taken: 08/08/19).

2.1.6. Photo-point 6

Sediment deposition is common at the toe of the batter slope and woodland boundary at the south-east corner of the 50 m gun range area (Plate 12) and along the entire eastern batter.

Sedimentation and erosion control must be implemented.

Regeneration of the southern batter slope was evident, however, rehabilitation of the eastern batter requires attention.

No weeds were observed at this location.

Plate 12. The character of the drainage pit and vegetation at the south-east corner of the 50 m gun range (date taken: 29/08/18).

2.3. Weeds and pest animals

Under the NSW *Biosecurity Act 2015*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.'

Two introduced plant species, Fleabane (*Conyza sp*) and Catsear (*Hypochaeris radicata*), were recorded, neither of which are listed:

- under Schedule 3 of the NSW Biosecurity Regulation 2017
- as 'priority weeds' in the South East region (this incorporating the Wingecarribee LGA) (DPI 2019)
- as a WoNS (DEE 2019)[2].

No invasive fauna species were observed or indicated as occurring (i.e. indicative characteristic tracks or scats). However, given its indicative presence during last year's monitoring study (i.e. the accumulation of feathers at Plot 6), the Fox (*Vulpes vulpes*) is the most likely invasive species to be present, and is known to occur in the locality.

[2] The list of WoNS is part of a combined State and Commonwealth initiative to combat invasive species.

3. Summary of findings

The results of the vegetation plots and photo-points has been summarised in Table 3, along with any of the management issues that were identified.

For a comparison the species richness results of the 2018 and 2019 monitoring sessions have been provided alongside each other.

The total species recorded during the current study was 119 compared with a total of 103 during the previous (2018) monitoring study.

Table 3. Summary of management issues

Plot/Photo-point	PCT	Species Richness 2018/2019	TEC or threatened species	Management Issues
Plot				
1	1086	49/51	No	The north-west portion of the plot and adjacent to the west has been affected by sediment runoff from upslope in association with the 800 m gun range.
2	1086	44/44	No	None.
3	1086	39/40	No	The track has a history of use and appears to currently be in use. The wire strand fence beside firetrail gate appears to have been folded back to permit access to the firetrail.
4	1086	35/49	No	Two introduced species Fleabane and Catsear are present. Areas of sediment have been deposited on top the rock shelf in the eastern portion of the plot from runoff upslope in association with the sedimentation basin development.
5	1086	44/41	No	None.
6	1181	41/50	No	None.
Photo-point				
1	N/A		No	None.
2	N/A		No	None.
3	N/A		No	Minor erosion.
4	N/A		No	None.
5	N/A		No	Inadequate erosion and sedimentation controls.
6	N/A		No	Sediment deposition.
General	Exposed areas with little to no vegetation cover present within the development areas (Zones 2 and 3).			

When compared to the previous monitoring report (Lesryk 2018), the results of the current session illustrate that, broadly, the vegetation structure and composition have remained the same. Some additional groundcover species were recorded during the current session while others were not. This is typical of this stratum as it is influenced by short-term climatic conditions (i.e. rain) more so than the shrub and tree layers.

Tree dieback was noted at various locations, presumably as a result of the drought currently being experienced within NSW.

No significant weeds or an increase in weed cover has been identified.

No fire has affected any of the monitoring plots or photo-points since the 2018 survey.

4. Management actions

Management actions have been prescribed for those issues identified in Section 3 (Table 4).

Table 4 Management actions required

Plot/Photo-point	Action
Plot	
1	Mulching and drainage works (i.e. placement of sandstone rocks) have been undertaken to address the sediment runoff issue. No further action required.
2	No action required.
3	The wire strand fence beside fire trail gate requires repair.
4	The occurrences of Fleabane and Catsear are to be controlled as per the weed management strategy prepared for the site and/or in accordance with Item 1 of Annexure C of the Conservation Agreement. The batter slope on the western boundary of the sedimentation basin should be rehabilitated.
5	No action required.
6	No action required.
Photo-point	
1	No action required.
2	No action required.
3	No action required.
4	No action required.
5	Sedimentation and erosion control measures implemented as part of the CEMP require maintenance. Rehabilitation should be undertaken at this location on the batter slope and should include native plant species of local provenance and/or those specified in Appendix G of the Ecological Management Plan (GHD 2010).
6	Sedimentation and erosion control must be implemented in line with the CEMP. Rehabilitation proposed to be undertaken at this location and on the batter slopes should include native plant species of local provenance and/or those specified in Appendix G of the Ecological Management Plan (GHD 2010).
General	Rehabilitation of the exposed surfaces of the development areas (Zones 2 and 3) is proposed to be undertaken and should include native plant species of local provenance and/or those specified in Appendix G of the Ecological Management Plan (GHD 2010). Any weeds present are to be controlled as per the weed management strategy prepared for the site and/or in accordance with Item 1 of Annexure C of the Conservation Agreement.

5. Recommendations

As works have now been completed for the 50 m range, it is recommended that a monitoring plot and photo-point be established near this area to monitor any changes.

6. References

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Appendix 1. Photographic record of the SHRSC

Plot 1

Plate 1. Looking north

Plate 2. Looking east

Plate 3. Looking south

Plate 4. Looking west

Plot 2

Plate 1. Looking north

Plate 2. Looking east

Plate 3. Looking south

Plate 4. Looking west

Plot 3

Plate 1. Looking east from the east end of the transect

Plate 2. Looking west from the east end of the transect

Plate 3. Looking east from the west end of the transect

Plate 4. Looking west from the west end of the transect

Plate 5. Looking east from the 30 m mark of the transect

Plate 6. Looking west from the 30 m mark of the transect

Plot 4

Plate 1. Looking north

Plate 2. Looking east

Plate 3. Looking south

Plate 4. Looking west

Plot 5

Plate 1. Looking north

Plate 2. Looking east

Plate 3. Looking south

Plate 4. Looking west

Plot 6

Plate 1. Looking north

Plate 2. Looking east

Plate 3. Looking south

Plate 4. Looking west

Appendix 2. Flora species recorded at each plot

Key
* denotes introduced species

Scientific name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Acacia linifolia	X	X	X		X	X
Acacia myrtifolia			X	X	X	
Acacia obtusifolia		X			X	X
Acacia suaveolens	X			X		
Acacia terminalis	X	X		X	X	X
Acacia ulicifolia		X	X			
Actinotus minor			X			X
Amperea xiphoclada	X					
Austrostipa pubescens	X	X			X	
Banksia oblongifolia		X				
Banksia serrata	X	X		X		
Banksia spinulosa	X	X		X	X	X
Billardiera scandens	X	X	X	X		X
Blechnum cartilagineum						X
Boronia ledifolia	X	X				
Bossiaea neoanglica			X			X
Bossiaea obcordata	X	X	X	X	X	X
Callicoma serratifolia						X
Calochlaena dubia						X
Cassytha glabella					X	
Caustis flexuosa	X	X				
Ceratopetalum gummiferum						X
Cheilanthes distans				X		
Clematis glycinoides				X		
*Conyza sp**				X		
Corybas sp			X		X	
Corymbia gummifera	X	X	X	X	X	X
Cyathochaeta diandra	X				X	
Dampier stricta	X					
Dampiera purpurea		X	X	X		
Dampiera stricta					X	
Daviesia ulicifolia	X	X	X		X	
Dianella caerulea var. *caerulea*			X		X	X
Dianella longifolia					X	
Dillwynia elegans	X					
Dillwynia phylicoides	X					
Dillwynia ramosissima				X		
Dillwynia retorta		X				
Dodonea triquetra	X	X				X
Elaeocarpus reticulatus						X
Entolasia stricta	X		X	X	X	X
Eragrostis brownii	X					

Scientific name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Eriostemon australasius ssp. australasius	X	X		X		
Eucalyptus agglomerata						X
Eucalyptus cypellocarpa						X
Eucalyptus eugenioides			X			
Eucalyptus oblonga/sparsifolia					X	
Eucalyptus piperita	X	X		X		X
Eucalyptus punctata						X
Eucalyptus sclerophylla			X			
Eucalyptus sieberi	X	X	X	X	X	
Exocarpos strictus	X	X				
Gompholobium grandiflorum	X	X	X	X		X
Gonocarpus teucrioides	X		X	X		X
Goodenia bellidifolia	X		X	X	X	
Grevillea arenaria			X		X	X
Grevillea mucronulata		X				
Grevillea sphacelata	X	X	X	X		
Hakea dactyloides	X	X		X	X	X
Hakea gibbosa	X			X		
Hardenbergia violacea						X
Hibbertia rufa	X	X		X		
Hibbertia sp					X	
Hovea linearis		X	X	X	X	
*Hypochaeris radicata**				X		
Isopogon anemonifolius	X					
Isopogon anethifolius	X	X				
Lagenophora gracilis				X		
Lambertia formosa	X					
Lepidosperma laterale	X			X		X
Leptomeria acida					X	
Leptospermum polygalifolium						X
Leptospermum trinervium	X	X		X	X	X
Leucopogon lanceolatus						X
Leucopogon setiger	X	X		X		
Lindsaea microphylla			X		X	X
Lomandra confertifolia ssp. *rubiginosa*				X		
Lomandra filiformis			X	X	X	X
Lomandra gracilis				X		
Lomandra longifolia						X
Lomandra micrantha ssp. *tuberculata*	X	X	X	X	X	X
Lomandra multiflora			X		X	X
Lomandra obliqua	X	X	X	X	X	X
Lomatia ilicifolia				X		
Lomatia silaifolia	X	X	X	X	X	X
Microlaeana stipoides					X	

Scientific name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Monotoca scoparia	X	X	X		X	
Opercularia diphylla						X
Patersonia glabrata	X	X	X		X	X
Patersonia sericea			X			
Persoonia levis	X	X		X	X	X
Persoonia linearis		X				X
Persoonia mollis				X		X
Persoonia oblongata			X			
Petrophile pedunculata	X	X	X			
Philotheca hispidula						X
Phyllanthus hirtellus		X	X	X	X	
Pimelea linifolia ssp. *linifolia*			X			X
Poaceae sp				X		
Pomaderris andromedifolia				X		
Pomaderris elliptica						X
Pomax umbellata			X			
Poranthera corymbosa			X			
Poranthera ericifolia	X	X	X	X	X	
Poranthera microphylla	X					
Pteridium esculentum	X	X		X		X
Pultenaea hispidula					X	
Pultenaea scabra					X	
Pultenaea sp						X
Scaevola ramosissima					X	
Schoenus melanostachys						X
Smilax glyciphylla				X		X
Stylidium productum	X					
Telopea speciosissima	X			X		X
Tetratheca thymifolia	X	X		X	X	
Xanthorrhoea ?media				X		
Xanthorrhoea media			X			
Xanthosia pilosa	X	X				
Xylomelum pyriforme		X	X	X		