

PF FORMATION

NOVEMBER 2017

2017 MONITORING OF REVEGETATION AT HITCHCOCK ROAD, MAROOTA

wsp



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2017 Monitoring of Revegetation at Hitchcock Road, Maroota

PF Formation

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1 INTRODUCTION

This report presents the findings of the fifth monitoring session of a rehabilitation area within PF Formation's sandmining operations at Hitchcock Road, Maroota.

1.1 PROJECT BACKGROUND

Expansion of an existing PF Formation sand mine at Hitchcock Road required clearing of 3.7 hectares of Sydney Hinterland Transition Woodland. It was proposed to offset this clearing with revegetation and re-creation of this community within a 7.9 hectare area on the western boundary of the site where quarrying has been completed. A key condition of the clearing being permitted is that PF Formation establishes at least 3.7 hectares of revegetation, recreating the Sydney Hinterland Transition Woodland community. Revegetation was commenced by PF Formation in 2004. To date an area of 4.2 hectares has been replanted (approximately 1 hectare in 2004, 2 hectares in 2006 and 1.2 hectares in 2011) with the aim to recreate the vegetation to be cleared from Lot 1 DP 1013943.

Monitoring of the rehabilitation of previously mined areas is a requirement of project approval and environmental reporting is required to provide some certainty that this revegetation will ultimately result in the creation of a naturally regenerating patch of Sydney Hinterland Transition Woodland. This monitoring needs to be undertaken regularly by independent consultants (not those undertaking the revegetation works) and to include assessment against the success criteria developed for rehabilitation within the site, as included in the consent conditions for the project.

WSP (previously known as Parsons Brinckerhoff) has undertaken monitoring of the revegetation area since 2010 with four monitoring sessions to date (2010, 2012, 2013, 2015). Based on the monitoring results of 2012 (Parsons Brinckerhoff 2012) and the progress towards the ecological completion criteria, the Department of Planning and Infrastructure approved the clearing of Sydney Hinterland Transition Woodland within the site in March 2013. Continuation of the monitoring of the rehabilitation and offset obligations are required in accordance with the project approval and to provide detailed reporting for inclusion in the next Independent Environmental Audit report for the quarry.

1.1.1 OBJECTIVES OF REVEGETATION

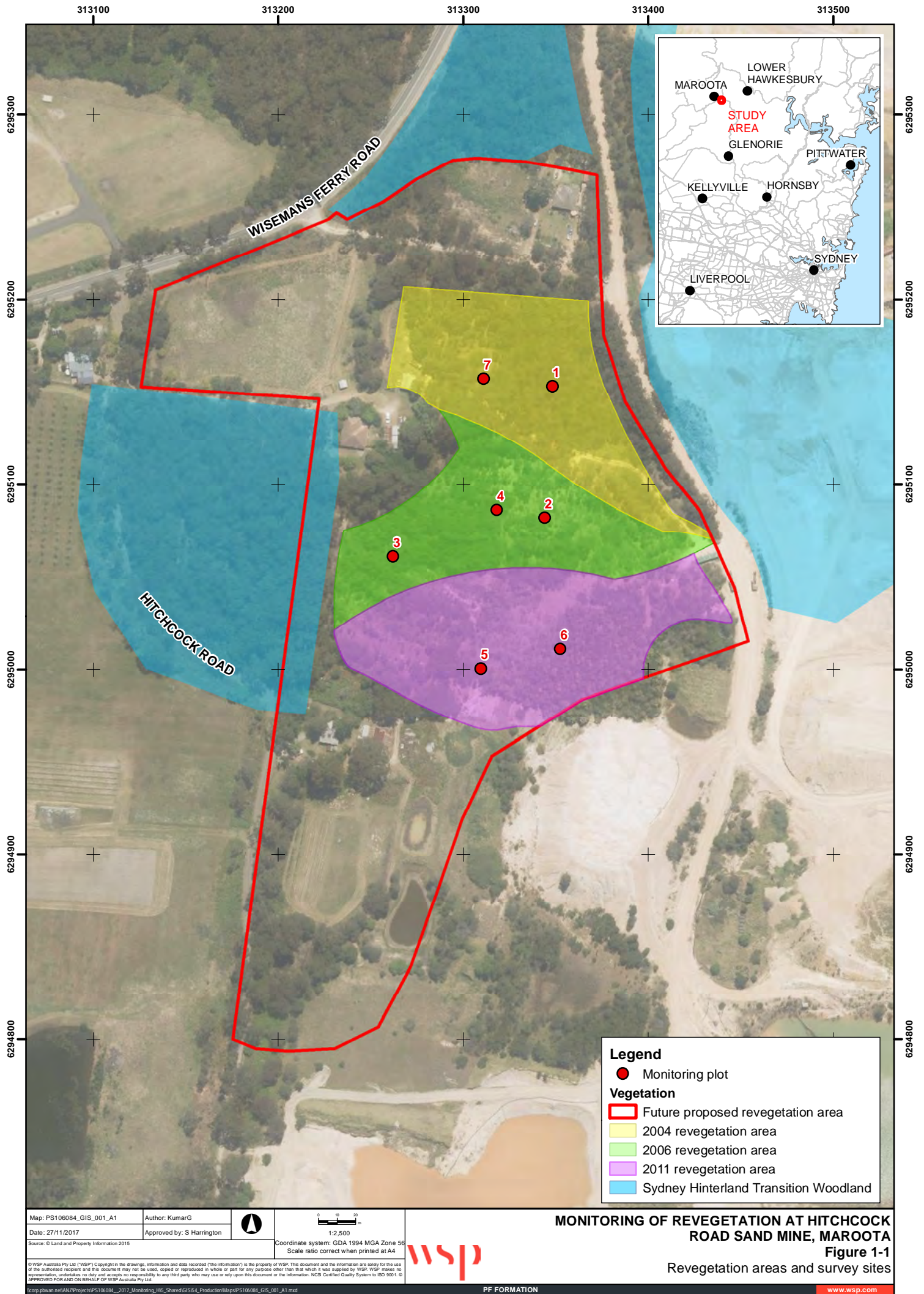
The objectives of revegetation within the Hitchcock Road site are to:

- rehabilitate and revegetate quarried areas
- revegetate with native vegetation characteristic of the community to be removed from Lot 1 DP 1013943, namely Sydney Hinterland Transition Woodland
- re-create the existing characteristics of this community, to provide an area suitable for offsetting the clearing of this community at that time.

1.1.2 AIMS OF THE REPORT

The aims of this report are to:

- present the results of the monitoring survey
- analyse the results against the criteria for monitoring the success of rehabilitation and progress towards five, ten and fifteen year targets (see Section 2.3)
- provide recommendations on management actions required to assist in successful re-creation of Sydney Hinterland Transition Woodland within the site and to meet the long-term goals
- provide independent monitoring report for inclusion as part of the Independent Environmental Audit for the quarry.



2 METHODOLOGY

2.1 NOMENCLATURE

Names of plants used in this document follow Harden (1992, 1993, 2000, 2002) with updates from PlantNet (Royal Botanic Gardens 2017). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in Appendices A and C. Introduced species are identified within the text with an asterisk following the name, for example *Lantana camara**.

2.2 FIELD SURVEY

Monitoring of the revegetation was undertaken on 17 November 2017. Previous monitoring sessions were undertaken on:

- 5 July 2010
- 25 October 2012
- 2 December 2013
- 15 October 2015.

Fixed quadrats (20 x 20 m) were set up with edges running in a north-south, east west direction. Quadrats were marked with stakes at the north western and south western corners of the quadrat. Within each quadrat, every species of plant present was recorded and its cover abundance estimated using a modified braun blanquet scale:

- 1 <5% - rare or few individuals
- 2 <5% common
- 3 5–25%
- 4 25–50%
- 5 50–75%
- 6 75–100%.

Additional information recorded at each quadrat site included:

- evidence of disturbance, condition
- evidence of canopy recruitment, natural regeneration
- fauna habitat values
- photographs from the south western corner of the quadrat (to the north, north east, east, south and west).

The location of quadrats is summarised in Table 2.1. An additional quadrat surveys (site 7) was undertaken in 2017 as recommended in the 2015 report.

Table 2.1 Quadrat survey locations

STRATIFICATION	QUADRAT IDENTIFIER	SOUTH WEST CORNER ¹		SLOPE	ASPECT
		Easting	Northing		
2004 Revegetation Area	1	313335	6295148	3	S
	7	313311	6295157	4	S
2006 Revegetation Area	2	313333	6295087	6	S
	3	313253	6295059	8	SE
	4	313306	6295077	6	SE

STRATIFICATION	QUADRAT IDENTIFIER	SOUTH WEST CORNER ¹		SLOPE	ASPECT
		Easting	Northing		
2011 Revegetation Area	5	313309	6295000	5	SW
	6	313352	6295011	4	S

(1) Location of monitoring photo point and stake marking the south western corner of quadrat

2.3 CRITERIA TO ASSESS REHABILITATION SUCCESS

Field surveys were undertaken in 2008 of the vegetation to be cleared to provide data on the typical characteristics of the community and provide baseline information against which the revegetation program can be assessed (Parsons Brinckerhoff 2008).

The criteria for assessment and the target values for these goals are provided in Table 2.2 on the following page.

Table 2.2 Criteria to monitor success of revegetation

CATEGORY	CRITERIA	TARGET			CONDITION OF VEGETATION TO BE REMOVED
		5 years	10 years	15 years	
Native species	Native species diversity (average number per 400 m ² quadrat)	20	35	40	46
	Average number of characteristic species for the site occurring within 400 m ²	15	20	27	34.5 (+/- 1.5)
	Native species cover (% cover in 400 m ² quadrat)	>50	>85	>95	99
Weeds	Weed abundance (% of vegetation cover in 400 m ² quadrat)	<50	<15	<5	<1
	Invasive or Noxious weed species (e.g. Lantana, Blackberry, exotic vines)	Controlled	Controlled	Controlled	Restricted
Vegetation structure	Vegetation structure	Canopy, shrublayer and groundcover species present. However, structure limited, generally consisting of low canopy and ground cover.	Canopy, shrublayer and groundcover species present. Structure beginning to develop.	Well-structured and includes canopy, mid-storey and ground cover units	Well-structured and includes canopy, mid-storey and ground cover units
Canopy ^a	Average canopy height (m)	4	8	12	12-16
	Native canopy cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	5 [3]	5 [3]	5 [3]
Shrub layer ^a	Native shrub cover (minimum % cover) [modified braun blanquet scale] ^b	10 [3]	15 [3]	25 [4]	32.5 (+/-7.5) [4]
	Average shrub layer height (m)	0.5	1	1	1.25

CATEGORY	CRITERIA	TARGET			CONDITION OF VEGETATION TO BE REMOVED
		5 years	10 years	15 years	
Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	10 [3]	10 [3]	15 (+/-5) [3]
Ecosystem function	Habitat values	Vegetation structure beginning to develop.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Provides minimal habitat for fauna, however, many woodland birds present. Well-structured habitat, includes moderate levels of leaf litter and fallen timber.
	Natural regeneration indicating dispersal of seed into site and/or presence of soil seed bank	Yes	Yes	Yes	Yes

3 RESULTS

Photos of the vegetation to be cleared within Lot 1 DP 1013943 and the rehabilitation area quadrat sites are provided in Appendix B. Species recorded, vegetation structure and other environmental characteristics of the quadrat sites are summarised in Appendix C.

3.1 SPECIES OF PLANT

A total of 98 species of plant was recorded within the site during this monitoring session, of which 68 (69%) are native. A full list of species recorded within each quadrat and the vegetation structure is provided in Appendix C.

Two species listed as Weed of National Significance and as priority weeds for the Greater Sydney region were recorded (Table 3.1). No species listed on the national environmental alert list was recorded.

Table 3.1 Significant weeds

WEED	WEED OF NATIONAL SIGNIFICANCE	PRIORITY WEED FOR GREATER SYDNEY REGION (BIOSECURITY DUTY UNDER THE BIOSECURITY ACT 2015)
<i>Senecio madagascariensis*</i> (Fireweed)	Yes Recorded as scattered plants throughout	Yes (Prohibition on dealings. Must not be imported into the State or sold)
<i>Lantana camara*</i> (Lantana)	Yes A single stem of <i>Lantana camara*</i> was recorded within the 2004 revegetation area.	

Notes: information is taken from the Biosecurity Act 2015 and its subordinate legislation, and the Regional Strategic Weed Management Plans (published by each Local Land Services region in NSW). It describes the state and regional priorities for weeds in New South Wales, Australia.

3.2 ASSESSMENT AGAINST CRITERIA

The results of the field survey were assessed against the criteria for successful revegetation, using the five, 10 and 15 year targets (Table 3.2).

Table 3.2 Assessment against criteria to monitor success of revegetation

CATEGORY	CRITERIA	TARGET			RESULTS		
		5 years	10 years	15 years	2011 revegetation area (6 years)	2006 revegetation area (11 years)	2004 revegetation area (13 years)
Native species	Native species diversity (average number per 400 m ² quadrat)	20	35	40	19	29	32
	Average number of characteristic species for the site occurring within 400 m ²	15	20	27	12	18	25
	Native species cover (% of species in 400 m ² quadrat)	>50	>85	>95	56	81	86
Weeds	Weed abundance (% of vegetation cover in 400 m ² quadrat)	<50	<15	<5	38	14	2
	Invasive or Noxious weed species (e.g. Lantana, Blackberry, exotic vines)	Controlled	Controlled	Controlled	Ground cover in some areas dominated by invasive species, but no noxious or highly invasive species present	Controlled	Controlled One single stem of Lantana recorded.

CATEGORY	CRITERIA	TARGET			RESULTS		
		5 years	10 years	15 years	2011 revegetation area (6 years)	2006 revegetation area (11 years)	2004 revegetation area (13 years)
Vegetation structure	Vegetation structure	Canopy, shrublayer and groundcover species present. However, structure limited, generally consisting of low canopy and ground cover.	Canopy, shrublayer and groundcover species present. Structure beginning to develop.	Well-structured and includes canopy, mid-storey and ground cover units	Canopy, shrublayer and groundcover species present. Structure beginning to develop.	Well-structured and includes canopy, mid-storey and ground cover units.	Well-structured and includes canopy, mid-storey and ground cover units
Canopy ^a	Average canopy height (m)	4	8	12	9	11.3	15
	Native canopy cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	5 [3]	5 [3]	5 [3]	20 [3]	25 [4]
Shrub layer ^a	Native shrub cover (minimum % cover) [modified braun blanquet scale] ^b	10 [3]	15 [3]	25 [4]	10 [3]	31 [4]	15 [3]
	Average shrub layer height (m)	0.5	1	1	3.8	2.1	3.25
Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	10 [3]	10 [3]	25 [4]	62.7 [5]	61.5 [5]

CATEGORY	CRITERIA	TARGET			RESULTS		
		5 years	10 years	15 years	2011 revegetation area (6 years)	2006 revegetation area (11 years)	2004 revegetation area (13 years)
Ecosystem function	Habitat values	Vegetation structure beginning to develop.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Vegetation structure beginning to develop X ê é	Woodland birds recorded. Habitat structure beginning to develop, including a dense native shrub layer. Groundcover such as leaf litter and fallen timber also developing.	Woodland birds recorded. Habitat structure continuing to develop, including groundcover such as leaf litter and fallen timber.
	Natural regeneration indicating dispersal of seed into site and/or presence of soil seed bank	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Purple font indicates that the 5 year target has been met; black font that the 10 year target has been met, green font that the 15 year criteria has been met. Red font indicates that no target has been met. Arrows indicate change since 2015 monitoring session. X indicates no change.

4 DISCUSSION AND RECOMMENDATIONS

There has been a stabilisation or general improvement in the habitat quality and native species diversity cover and vegetation structure since the previous monitoring survey. Senescence of some colonising *Acacia* species was evident in the 2011 and 2006 revegetation areas. Native species diversity and cover has increased while weed cover and diversity has decreased. Erosion noted in previous years appears to be stable with increasing cover of groundcover vegetation. Weed cover across all regions has decreased, however two weeds of national significance were recorded. Key findings include:

- After 13 years the 2004 revegetation area:
 - has met the 10 year targets and even the 15 year targets in many cases.
- After 11 years, the 2006 revegetation area:
 - has met the 5 year targets for all criteria
 - has met the 10 and 15 year targets for the majority of criteria. The exceptions are:
 - native species diversity (29 versus target of 35 in year 10)
 - number of characteristic species in 400m² (18 versus target of 20 in year 10)
 - At this stage no active management is considered necessary for these criteria as these criteria are likely to be low partially due to dry conditions and are likely to improve naturally given time.
- After 6 years, the 2011 revegetation area:
 - was dominated by early colonising *Acacia* species and some areas lacked canopy species
 - has met the 5 year targets for the majority of criteria and even the 10 and 15 year targets for some. The exceptions are:
 - although native species diversity and the number of characteristic species had increased, the 5 year target had not been met
 - in some areas ground cover was still dominated by invasive species.
 - requires regular visual assessments to check for spread of weeds that may inhibit germination and growth of native species
 - may benefit from additional planting including canopy and low shrub species.

The rehabilitation is progressing well and is generally meeting or exceeding the targets set. This suggests that given time, the 2004 and 2006 revegetation areas are likely to continue to meet and exceed the target criteria. To further improve success, recommendations for monitoring, weed control and supplementary plantings are provided in Table 4.1.

Table 4.1 Recommendations to improve revegetation success

OBSERVATION	RECOMMENDATION
Monitoring	
Monitoring has not been undertaken annually as part of the annual environmental reporting. However, based on the work undertaken and natural regeneration of the area, this has been appropriate.	Given that the rehabilitation has generally met or exceeded the relevant targets, monitoring next year is not considered necessary for these areas.

OBSERVATION	RECOMMENDATION
In some locations monitoring plot markers are hard to locate and have degraded.	Reinstate plot markers and replace with metal star pickets with yellow caps.
Weeds	
Weed abundance with 2004 and 2006 revegetation has generally stabilised and does not appear to be inhibiting natural regeneration. Exotic grasses were dominant in patches throughout the 2011 revegetation area.	<p>The revegetation area would benefit from regular visual inspections (twice yearly), particularly for weed abundance and cover. Where noxious, highly invasive species or dense weeds smothering native species are noted, these should be controlled. Detailed independent monitoring of this area in two year's would be sufficient.</p> <p>Undertake weed control, particularly focussed on priority weeds and Weeds of National Significance:</p> <ul style="list-style-type: none"> — <i>Lantana camara</i> * <ul style="list-style-type: none"> — using cut and paint technique. — <i>Senecio madagascariensis</i> <ul style="list-style-type: none"> — Plants can be chipped out as long as they are bagged and burnt or disposed of at Council approved land fill tips. Chipped out plants need to be removed as they may still set seed. — Spraying with herbicides are most effective if sprayed before plants reach maturity. Application in the autumn period during April provides good control. Application during flowering effective if higher recommended rates of herbicide are applied. <p>Consider broad spraying exotic grasses where they occur densely, particularly in the 2011 revegetation area. Broad spraying should be followed by:</p> <ul style="list-style-type: none"> — slashing and raking or mowing to remove excess debris and stimulate seed germination — inspection for regeneration of native plants — repeated broad spraying of germinating weeds if native regeneration is minimal — spot-spraying and/or hand weeding if substantial germination of native species is recorded.
Supplementary Plantings	
Native species diversity and average number of characteristic species and native species cover were below 5 years targets within the 2011 revegetation area. This area also had limited canopy and low shrub species.	<p>Consider undertaking supplementary plantings within the 2011 revegetation area. Supplementary plantings are recommended to be undertaken in the following manner;</p> <ul style="list-style-type: none"> — in conjunction with appropriate weed control — species selection should include a mixture of canopy, shrub and groundcover species consistent with those previously planted as outlined in Appendix A — planting should be undertaken in autumn preferable following rain — follow up weed control and planting maintenance is recommended.

5 LIMITATIONS

5.1 STUDY FOR BENEFIT OF CLIENT

This document has been prepared for the exclusive benefit of the client and no other party. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with in this study, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in this study (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in this study). Other parties should not rely upon the study or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

5.2 CHANGING CIRCUMSTANCES

To the best of WSP's knowledge, the project presented and the facts and matters described in this study reasonably represent the client's intentions at the time of preparation of the study. The surface impacts and study area are based on design at the time of preparation of the report (design date 5/7/16). However, the passage of time, the manifestation of latent conditions or the impact of future events (including a change in applicable law) may have resulted in a variation of the project and of its possible environmental impact.

WSP will not be liable to update or revise this assessment to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the document.

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APPENDIX A

REVEGETATION WORKS TO DATE



A1 REVEGETATION WORKS TO DATE

To date an area of 4.2 hectares has been replanted with the aim to recreate the vegetation to be removed from Lot 1 DP 1013943. The revegetation area is on the western boundary of the site (Figure 1.1) and further revegetation scheduled to the south as quarrying is completed. The revegetation area occurs adjacent to remnant vegetation, both within and adjacent to the site. This adjacent vegetation provides a potential seed source for natural seed dispersal into the revegetation area.

Greening Australia were commissioned to propagate tubestock from cuttings and seed from collected vegetation within Lot 1 DP 1013943 to enable the revegetation of quarried areas. The first collection period occurred from late 2000 to February 2002.

Rehabilitation and revegetation has commenced with further revegetation scheduled to the south as quarrying is completed. In 2004 over one hectare of the quarry that had been previously extracted and used as a silt pond was reshaped and prepared for rehabilitation by PF Formation staff. The top soil had been stored from an adjacent area with Sydney Hinterland Transition Woodland and was spread over the site. Further seed collected over the previous 4 years was broadcast over the site in June 2004 to augment the natural soil borne native seed bank.

In 2006 an additional area of approximately two hectares that had been previously mined was prepared for revegetation. The stored top soil was distributed over the site. Greening Australia then provided over 10,000 seedlings and supervised the planting in September to November 2006. An irrigation system was installed to water the plantings over that summer.

In 2011 an additional area of approximately 1.2 hectares was prepared for revegetation and stored top soil was spread over the site.

In 2011, additional work was undertaken as recommended in the 2010 report. This included weed control, erosion control and additional planting (of both seed and tube stock). Seed used for the revegetation was collected locally including from the former trig site. Species used for additional planting are listed in Table A.1.

No additional work has been undertaken on the site since the 2012 monitoring survey.

Table A.1 Additional plantings undertaken in 2011

SCIENTIFIC NAME	COMMON NAME	PREVIOUSLY RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	ADDITIONAL PLANTINGS	
				Seed	Tubestock
<i>Acacia decurrens</i>	Black Wattle			Y	Y
<i>Acacia falcata</i>			Y	Y	Y
<i>Acacia fimbriata</i>	Fringed Wattle			Y	
<i>Acacia linifolia</i>	Flax-leaved Wattle	Y	Y		Y
<i>Acacia longifolia</i>			Y	Y	Y
<i>Acacia myrtifolia</i>	Red-stemmed Wattle	Y	Y		Y
<i>Acacia parramattensis</i>	Parramatta Wattle	Y	Y	Y	Y
<i>Acacia suaveolens</i>	Sweet Wattle	Y	Y	Y	Y
<i>Acacia terminalis</i>	Sunshine Wattle	Y	Y	Y	
<i>Acacia ulicifolia</i>	Heath Wattle	Y	Y	Y	Y

SCIENTIFIC NAME	COMMON NAME	PREVIOUSLY RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	ADDITIONAL PLANTINGS	
				Seed	Tubestock
<i>Allocasuarina littoralis</i>	Black Sheoak	Y	Y	Y	Y
<i>Angophora costata</i>	Sydney Red Gum	Y	Y	Y	Y
<i>Angophora floribunda</i>				Y	
<i>Angophora hispida</i>				Y	
<i>Austrodanthonia tenuior</i>			Y		Y
<i>Banksia ericifolia</i>	Heath Banksia				Y
<i>Banksia integrifolia</i>					Y
<i>Bursaria spinosa</i>	Native Blackthorn				Y
<i>Callistemon pinifolius</i>				Y	
<i>Chloris truncata</i>					Y
<i>Clematis aristata</i>		Y		Y	
<i>Daviesia acicularis</i>			Y		Y
<i>Daviesia ulicifolia</i>					Y
<i>Daviesia virgata</i>					Y
<i>Dianella caerulea</i>		Y	Y		Y
<i>Dichelachne crinita</i>					Y
<i>Dodonaea triquetra</i>			Y	Y	Y
<i>Elaeocarpus reticulatus</i>				Y	
<i>Eragrostis benthamii</i>			Y	Y	
<i>Eragrostis brownii</i>	Brown's Lovegrass		Y	Y	
<i>Eucalyptus crebra</i>			Y	Y	
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark	Y	Y	Y	
<i>Eucalyptus eximia</i>				Y	
<i>Eucalyptus globoidea</i>				Y	
<i>Eucalyptus haemastoma</i>				Y	
<i>Eucalyptus moluccana</i>				Y	
<i>Eucalyptus pilularis</i>			Y	Y	
<i>Eucalyptus piperita</i>				Y	
<i>Eucalyptus punctata</i>	Grey Gum	Y	Y		Y
<i>Eucalyptus robusta</i>				Y	

SCIENTIFIC NAME	COMMON NAME	PREVIOUSLY RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	ADDITIONAL PLANTINGS	
				Seed	Tubestock
<i>Eucalyptus saligna</i>					Y
<i>Eucalyptus sp.</i>				Y	
<i>Eucalyptus sparsifolia</i>	Narrow-leaved Stringybark	Y	Y	Y	
<i>Gahnia sieberiana</i>				Y	
<i>Glycine clandestina</i>		Y	Y		Y
<i>Hakea sericea</i>		Y	Y		Y
<i>Imperata cylindrica</i> var. <i>major</i>	Bladey Grass	Y	Y	Y	
<i>Isopogon anemonifolius</i>			Y	Y	
<i>Kunzea ambigua</i>	Tick Bush		Y	Y	Y
<i>Leptospermum polygalifolium</i>				Y	
<i>Leptospermum trinervium</i>			Y	Y	Y
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Y		Y	Y
<i>Macrozamia spiralis</i>		Y	Y	Y	
<i>Petrophile pulchella</i>			Y	Y	
<i>Pittosporum undulatum</i>	Sweet Pittosporum	Y		Y	
<i>Poa labillardierei</i> var. <i>labillardierei</i>		Y		Y	Y
<i>Pultenaea villosa</i>			Y	Y	Y
<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>	Turpentine	Y	Y	Y	
<i>Themeda australis</i>	Kangaroo Grass	Y	Y		Y

APPENDIX B

PHOTOGRAPHS



B1 VEGETATION WITHIN LOT 1 DP 1013943 (2008)



B2 PHOTO MONITORING

Table B.1 Quadrat 1 – 2004 rehabilitation area

Q1	2010	2012	2013	2015	2017
To north					
To east					
To south					

Q1	2010	2012	2013	2015	2017
To west					
North east into centre					

Table B.2 Quadrat 2 – 2006 rehabilitation area

Q2	2010	2012	2013	2015	2017
To north					






















Q2	2010	2012	2013	2015	2017
To east					
To south					
To west					
North east into centre					

Table B.3 Quadrat 3 – 2006 rehabilitation area

Q3	2010	2012	2013	2015	2017
To north					
To east					
To south					
To west					

Q3	2010	2012	2013	2015	2017
North east into centre					

Table B.4 Quadrat 4 – 2006 rehabilitation area

Q4	2010	2012	2013	2015	2017
To north					
To east					




























Q4	2010	2012	2013	2015	2017
To south					
To west					
North east into centre					

Table B.5 Quadrat 5 – 2011 rehabilitation area

Q5	2012	2013	2015	2017
To north				
To east				
To south				













Q5	2012	2013	2015	2017
To west				
North east into centre				

Table B.6 Quadrat 6 – 2011 rehabilitation area

Q6	2012	2013	2015	2017
To north				

Q6	2012	2013	2015	2017
To east				
To south				
To west				
North east into centre				

APPENDIX C

QUADRAT RESULTS



C1 VEGETATION STRUCTURE

Table C.1 Vegetation structure

VEGETATION LAYER	HEIGHT: RANGE (MEDIAN) m	% FOLIAGE COVER	DOMINANT SPECIES
Quadrat 1			
T1	12-18 (15)	35	<i>Acacia parramattensis</i> , <i>Allocasuarina littoralis</i> , <i>Eucalyptus pilularis</i> , <i>Eucalyptus oblonga</i> , <i>Angophora costata</i>
T2	3-6 (4)	5	<i>Allocasuarina littoralis</i> , <i>Exocarpos cuppressiformis</i> , <i>Syncarpia glomulifera</i>
S1	0.5-3 (1.5)	10	<i>Daviesia genistifolia</i> , <i>Bossiaea lenticularis</i> , <i>Ozothamnus diosmifolius</i> , <i>Oxylobium ilicifolium</i> , <i>Acacia parramattensis</i>
G1	0.1-0.5 (0.4)	10	<i>Entolasia stricta</i> , <i>Bossiaea lenticularis</i> , <i>Lomandra longifolia</i> , <i>Panicum simile</i>
Notes:	Good regeneration continuing. Canopy developing. Good layer of leaf litter and some dead grass; Very low cover of weeds, No weedy shrubs, weeds present only in groundcover layer; good soil health- soil lichens and moss; fauna habitat moderate- no hollows or timber, limited groundcover, leaf litter developing; lots of birds present.		
Quadrat 2			
T1	5-15 (13)	15	<i>Angophora costata</i> , <i>Syncarpia glomulifera</i> , <i>Acacia parramattensis</i> ,
S1	0.5-1.5 (1)	15	<i>Bursaria spinosa</i> , <i>Hakea salicifolia</i> , <i>Acacia longifolia</i> , <i>Pittosporum undulatum</i>
G1	0.1-1.2 (0.5)	60	<i>Themeda australis</i> , <i>Hypochaeris radicata</i> *, <i>Andropogon virginicus</i> *, <i>Briza maxima</i> *
Notes:	Significant planting was undertaken in the area. Lots of native seedlings, especially of <i>Hakea sericea</i> and <i>Eucalyptus</i> species. Shrub layer is developing. Soil health developing with cryptograms present, <i>Themeda australis</i> dominant in patches; poor fauna habitat - no hollows, grass is dense, leaf litter developing, some senescent and fallen shrubs. Main weeds are <i>Andropogon virginicus</i> * and <i>Briza maxima</i> *.		
Quadrat 3			
T1	10-16 (12)	30	<i>Eucalyptus eugenioides</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i> , <i>Allocasuarina littoralis</i>
S1	2-7 (3)	50	<i>Kunzea ambigua</i> , <i>Acacia linifolia</i> , <i>Leptospermum polygalifolium</i> , <i>Hakea sericea</i> , <i>Persoonia levis</i> , <i>Acacia terminalis</i>
G1	0.1-1 (0.3)	64	<i>Entolasia stricta</i> , <i>Themeda australis</i> , <i>Andropogon virginicus</i> *
Notes:	Canopy developing and tall shrub layer evident. Few weeds, only occasional introduced grass; good regeneration of natives including seedlings from seedbank and mature plantings; some erosion; good soil health- soil lichens and moss common; fauna habitat poor- no hollows or timber, sparse understory, limited leaf litter, lots of small lizards present.		

VEGETATION LAYER	HEIGHT: RANGE (MEDIAN) m	% FOLIAGE COVER	DOMINANT SPECIES
Quadrat 4			
T1	8-10 (9)	15	<i>Angophora costata</i> , <i>Acacia longifolia</i> , <i>Banksia ericifolia</i>
S1	2-6 (4)	50	<i>Banksia ericifolia</i> , <i>Acacia myrtifolia</i> , <i>Acacia ulicifolia</i> , <i>Leptospermum polygalifolium</i> , <i>Kunzea ambigua</i> , <i>Hakea dactyloides</i>
S2	0.3-1 (0.6)	30	<i>Kunzea ambigua</i> , <i>Acacia linifolia</i> , <i>Hakea sericea</i> , <i>Leptospermum trinervium</i>
G1	0-0.5 (0.4)	80	<i>Themeda australis</i> , <i>Entolasia stricta</i> , <i>Andropogon virginicus</i> *, <i>Briza maxima</i> *
Notes:	More complex structure developing. Erosion evident from previous surveys has stabilized, no eucalypts present; good recruitment; good native groundcover dominated by <i>Themeda australis</i> ; soil health developing with good cover of cryptograms, fauna habitat poor- no hollows or timber, limited groundcover or leaf litter		
Quadrat 5			
T1	8-12 (8)	2	<i>Eucalyptus eugenioides</i>
S1	2-6 (3)	10	<i>Acacia parramattensis</i> , <i>Acacia longifolia</i> , <i>Kunzea ambigua</i>
G1	0-0.5 (0.3)	9	<i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> *, <i>Conyza bonariensis</i> *, <i>Paspalum dilatatum</i> *, <i>Imperata cylindrica</i>
Notes:	Structure developing with clear tree and shrub layers. Predominantly weedy groundcover, a diversity of <i>Acacia</i> spp. growing and some other native species germinating; leaf litter developing, shrub layer developing. Fauna habitat poor, evidence of kangaroos and rabbits.		
Quadrat 6			
T1	8-12 (10)	8	<i>Acacia parramattensis</i> , <i>Acacia longifolia</i>
S1	1-4 (3)	10	<i>Allocasuarina littoralis</i> , <i>Acacia parramattensis</i> , <i>Acacia longifolia</i> , <i>Acacia myrtifolia</i> , <i>Eucalyptus</i> spp.
G1	0.1-0.6 (0.3)	40	<i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> *, <i>Acacia parramattensis</i> , <i>Sida rhombifolia</i> *, <i>Conyza bonariensis</i> *, <i>Plantago lanceolata</i> *, <i>Hypochaeris radicata</i> *
Notes:	Structure developing with clear tree and shrub layers. Shrub layer developing with colonizing <i>Acacia</i> spp., regeneration of canopy species evident in tree and shrub layer including <i>Allocasuarina littoralis</i> and <i>Eucalyptus</i> spp., predominantly weedy groundcover of <i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> * although some regeneration of native ground cover species evident. Fauna habitat relatively poor, evidence of foxes.		

VEGETATION LAYER	HEIGHT: RANGE (MEDIAN) m	% FOLIAGE COVER	DOMINANT SPECIES
Quadrat 7			
T1	10-16 (15)	15	<i>Eucalyptus eugenoides</i> , <i>Angophora costata</i> , <i>Acacia parramattensis</i>
S1	4-6 (5)	15	<i>Kunzea ambigua</i> , <i>Acacia parramattensis</i> , <i>Acacia brownii</i> , <i>Ozothamnus diosmifolius</i> ,
G1	0.1-0.5 (0.4)	90	<i>Imperata cylindrica</i> , <i>Entolasia stricta</i> , <i>Lomandra longifolia</i> , <i>Panicum simile</i> , <i>Acacia sp.</i>
Notes:	Good regeneration and structure. Very low weed cover. No weedy shrubs, weeds present only in groundcover layer; good soil health- soil lichens and moss; fauna habitat moderate- no hollows or timber. Dense cover of grass, leaf litter developing; lots of birds present.		

Notes: T1, T2 = Tree layer; S1, S2 = Shrub layer; G1=Groundcover

Table C.2 Quadrat results: groundcover, vegetation cover, slope and aspect

CHARACTERISTIC	2010				2012						2013						2015						2017						
	1	2	3	4	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7
Ground cover (% cover)																													
Bare soil	5	6	13	33	5	8	15	20	50	80	0	5	10	10	10	80	1	5	8	10	5	15	1	5	6	8	5	8	5
Litter	57	2	5	0	41	25	5	0	0	0	40	15	15	2	5	0	35	15	16	3	6	3	60	18	18	5	3	50	5
Timber	1	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	3	2	4	1	1	0	3	2	4	1	1	0	0
Rock	5	2	1	5	2	0	0	2	3	2	1	0	0	2	3	2	1	0	0	2	3	2	1	0	0	2	1	2	0
Cryptogram	2	0	1	2	2	0	10	2	0	0	2	10	10	5	0	0	5	8	8	4	0	0	6	5	8	4	0	0	2
Vegetation	30	90	80	60	50	65	70	76	47	18	55	68	65	81	82	18	55	70	64	80	85	80	29	70	64	80	90	40	90
Ground cover vegetation (% cover)																													
Native ground cover- grasses	20	15	70	25	28	10	53	45	1	0	44	25	43	60	15	5	40	22	40	58	12	3	30	50	44	58	12	13	85
Native ground cover- shrubs	2	2	5	2	3	3	5	5	5	5	3	2	10	10	5	5	5	2	10	10	10	7	2	5	10	6	10	10	2
Native ground cover- other	1	1	0	2	2	2	2	12	1	1	7	3	2	2	2	2	7	5	6	4	3	2	5	5	6	4	3	2	3
Exotic	7	72	5	30	10	50	10	20	40	12	1	38	10	9	60	6	3	41	8	8	60	68	2	15	20	8	60	15	1
Vegetation cover (% cover)																													
Total native groundcover	23	18	75	24	33	15	60	51	7	6	55	30	55	72	22	12	52	29	64	72	25	12	34	60	60	68	25	25	89
Native overstorey	30	10	10	0	25	15	10	0	0	0	25	15	15	0	0	0	37	15	15	5	0	0	25	15	30	15	2	8	15
Native midstorey	10	10	20	8	10	8	25	10	0	0	5	10	30	15	30	35	10	25	50	55	45	60	15	15	50	80	10	10	15
Exotic cover (all layers)	10	72	5	30	10	50	10	20	40	12	1	38	10	9	60	6	3	41	8	8	60	68	2	15	20	8	60	15	2

Table C.3 Species recorded

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Acacia brownii</i>	Heath Wattle			Y	Y	Y	Y	Y	Y		2	2	2			
<i>Acacia decurrens</i>	Black Wattle				Y		Y	Y	Y		3					
<i>Acacia falcata</i>				Y	Y	Y	Y	Y	Y	1			1		1	
<i>Acacia fimbriata</i>	Fringed Wattle				Y	Y	Y	Y	Y					1	2	
<i>Acacia hispidula</i>				Y												
<i>Acacia linifolia</i>	Flax-leaved Wattle		Y	Y	Y	Y	Y	Y	Y	1	2	3	3			
<i>Acacia longifolia</i>				Y		Y	Y	Y	Y		3	2	3	3	2	
<i>Acacia myrtifolia</i>	Red-stemmed Wattle		Y	Y	Y	Y	Y	Y	Y				1		1	
<i>Acacia parramattensis</i>	Parramatta Wattle		Y	Y	Y	Y	Y	Y	Y	3	3		3	3	4	2
<i>Acacia parvippinula</i>				Y			Y	Y	Y					3	3	
<i>Acacia saligna</i>	Golden Wreath Wattle	*			Y											
<i>Acacia suaveolens</i>	Sweet Wattle		Y	Y	Y	Y	Y		Y		1					
<i>Acacia terminalis</i>	Sunshine Wattle		Y	Y	Y	Y	Y	Y	Y	1			3			1
<i>Acacia trinervata</i>				Y			Y									
<i>Acacia ulicifolia</i>	Heath Wattle		Y	Y	Y	Y	Y	Y	Y		1			1	1	
<i>Acetosella vulgaris</i>		*					Y	Y	Y					1	1	1
<i>Acianthus fornicatus</i>	Pixie Caps		Y	Y			Y									
<i>Actinotus helianthi</i>				Y												
<i>Ageratina adenophora</i>	Crofton Weed	*	Y		Y			Y	Y					1		
<i>Agrostis avenacea</i>						Y	Y	Y	Y					1		
<i>Aira caryophyllea</i>	Silvery Hairgrass	*						Y	Y				1			
<i>Allocasuarina littoralis</i>	Black Sheoak		Y	Y	Y	Y	Y	Y	Y	4	1	2	2	1	2	1
<i>Anagallis arvensis</i>	Scarlet Pimpernel	*				Y	Y	Y	Y		1			2	1	
<i>Andropogon virginicus</i>	Whisky Grass	*			Y	Y	Y	Y	Y	1	3		3	3	3	1
<i>Angophora bakeri</i>	Narrow-leaved Apple		Y	Y	Y	Y	Y									
<i>Angophora costata</i>	Sydney Red Gum		Y	Y	Y	Y	Y	Y	Y	3	4	3	1			3
<i>Anisopogon avenaceus</i>				Y												
<i>Araujia sericifera</i>	Moth Vine	*	Y													
<i>Aristida benthamii</i>				Y												
<i>Aristida vagans</i>	Threeawn Speargrass		Y	Y												
<i>Aristida warburgii</i>				Y												

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Astroloma humifusum</i>				Y												
<i>Astroloma pinifolium</i>				Y												
<i>Austrodanthonia fulva</i>				Y												
<i>Austrodanthonia tenuior</i> (now <i>Rytidosperma tenuius</i>)				Y			Y	Y	Y					2		
<i>Austrostipa pubescens</i>			Y	Y												
<i>Banksia ericifolia</i>	Heath Banksia				Y	Y	Y	Y	Y		1		3			
<i>Banksia integrifolia</i>					Y	Y	Y	Y	Y		2		1			
<i>Banksia oblongifolia</i>					Y	Y										
<i>Banksia spinulosa</i> var. <i>spinulosa</i>				Y												
<i>Bidens pilosa</i>		*				Y	Y	Y	Y	1	2			2	1	1
<i>Billardiera scandens</i>	Appleberry		Y	Y		Y	Y		Y	1			1			1
<i>Blechnum cartilagineum</i>	Gristle fern															
<i>Boronia polygalifolia</i>			Y													
<i>Bossiaea lenticularis</i>			Y	Y	Y	Y	Y	Y	Y	2		1				1
<i>Bossiaea obcordata</i>			Y	Y	Y				Y							
<i>Bossiaea rhombifolia</i> subsp. <i>rhombifolia</i>				Y												
<i>Breynia oblongifolia</i>	Coffee Bush		Y													
<i>Briza maxima</i>	Quaking Grass	*				Y	Y	Y	Y	1	3		1	2		1
<i>Briza minor</i>	Shivery Grass	*						Y			1					
<i>Brunoniella pumilio</i>	Dwarf Blue Trumpet		Y	Y	Y	Y	Y	Y	Y	1						
<i>Bursaria spinosa</i>	Native Blackthorn				Y	Y	Y	Y	Y		1					
<i>Caesia parviflora</i>				Y												
<i>Callistemon linearis</i>				Y												
<i>Callistemon rigidus</i>				Y												
<i>Cassythia glabella</i>				Y												
<i>Cassythia pubescens</i>				Y												
<i>Caustis flexuosa</i>				Y												
<i>Centaureium erythraea</i>		*				Y	Y	Y	Y		2		1	1		
<i>Ceratopetalum apetalum</i>	Coachwood		Y													
<i>Cheilanthes sieberi</i>				Y			Y	Y	Y	1		2				1
<i>Clematis aristata</i>			Y					Y	Y	1						

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Comesperma ericinum</i>	Pyramid flower		Y													
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*	Y		Y	Y	Y	Y	Y					2	2	
<i>Corymbia eximia</i>				Y				Y		1						
<i>Corymbia gummifera</i>	Red Bloodwood		Y	Y												
<i>Cyathochaeta diandra</i>				Y												
<i>Cynodon dactylon</i>	Couch						Y	Y	Y		1		1	2	2	
<i>Cyperus ?polystachyos</i>						Y	Y									
<i>Daviesia acicularis</i>				Y												
<i>Daviesia corymbosa</i>				Y												
<i>Daviesia genistifolia</i>	Broom Bitter Pea			Y	Y	Y	Y	Y	Y	1	1					1
<i>Daviesia squarrosa</i>				Y												
<i>Dianella caerulea</i>			Y	Y		Y	Y	Y	Y		1	1				
<i>Dianella prunina</i>			Y	Y	Y	Y	Y		Y							
<i>Dianella revoluta</i> var. <i>revoluta</i>				Y												
<i>Dichelachne crinite</i>	Long-haired Plume Grass						Y		Y							
<i>Dillwynia acicularis</i>				Y												
<i>Dillwynia parvifolia</i>				Y												
<i>Dillwynia retorta</i>				Y	Y	Y	Y									
<i>Dodonaea pinnata</i>				Y												
<i>Dodonaea triquetra</i>				Y				Y	Y				1		1	
<i>Drosera auriculata</i>				Y												
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>				Y												
<i>Einadia hastata</i>	Berry Saltbush		Y													
<i>Entolasia stricta</i>	Wiry Panic		Y	Y	Y	Y	Y	Y	Y	3		3	2			3
<i>Entolasia whiteana</i>				Y												
<i>Epacris pulchella</i>	NSW Coral Heath			Y	Y											
<i>Epacris purpurascens</i> var. <i>purpurascens</i>				Y												
<i>Eragrostis benthamii</i>				Y												
<i>Eragrostis brownii</i>	Brown's Lovegrass			Y	Y	Y	Y	Y	Y	2		2		2	1	2
<i>Eragrostis leptostachya</i>	Paddock Lovegrass							Y	Y			2				

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Eriostemon australasius</i>				Y												
<i>Eucalyptus ?saligna</i>					Y	Y										
<i>Eucalyptus beyeriana</i>				Y												
<i>Eucalyptus crebra</i>				Y												
<i>Eucalyptus eugeniioides</i>	Thin-leaved Stringybark		Y	Y	Y	Y	Y	Y	Y		1	3				3
<i>Eucalyptus notabilis</i>				Y	Y											
<i>Eucalyptus oblonga</i>	Stringybark			Y	Y	Y	Y	Y	Y	3						2
<i>Eucalyptus pilularis</i>				Y				Y	Y	3						
<i>Eucalyptus punctata</i>	Grey Gum		Y	Y	Y	Y	Y	Y	Y	2						
<i>Eucalyptus resinifera</i> subsp. <i>resinifera</i>				Y												
<i>Eucalyptus scias</i> subsp. <i>scias</i>				Y												
<i>Eucalyptus sclerophylla</i>			Y	Y												
<i>Eucalyptus</i> sp.						Y	Y	Y	Y						2	
<i>Eucalyptus sparsifolia</i>	Narrow-leaved Stringybark		Y	Y												
<i>Eucalyptus squamosa</i>				Y												
<i>Exocarpos cupressiformis</i>	Native Cherry				Y	Y	Y	Y	Y	1						
<i>Exocarpos strictus</i>	Dwarf Cherry		Y	Y		Y										
<i>Glycine clandestina</i>			Y	Y	Y	Y	Y	Y	Y	2	2				1	1
<i>Glycine tabacina</i>			Y	Y		Y	Y	Y	Y	1						
<i>Gnaphalium</i> sp.					Y	Y	Y	Y	Y		2		1	2		
<i>Gompholobium glabratum</i>	Dainty Wedge Pea		Y	Y												
<i>Gompholobium grandiflorum</i>				Y												
<i>Gompholobium inconspicuum</i>				Y												
<i>Gompholobium minus</i>				Y												
<i>Gompholobium pinnatum</i>				Y												
<i>Gompholobium uncinatum</i>				Y												
<i>Gonocarpus tetragynus</i>				Y												
<i>Gonocarpus teucrioides</i>					Y	Y	Y	Y	Y			1				
<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>			Y	Y			Y	Y		1						

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Goodenia hederacea</i> subsp. <i>hederacea</i>				Y												
<i>Goodenia heterophylla</i>			Y	Y												
<i>Grevillea buxifolia</i> subsp. <i>buxifolia</i>	Grey Spider Flower		Y	Y												
<i>Grevillea diffusa</i>				Y												
<i>Grevillea longifolia</i>				Y												
<i>Grevillea mucronulata</i>				Y												
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>				Y												
<i>Grevillea phyllicoides</i>				Y												
<i>Grevillea sericea</i>				Y												
<i>Grevillea sphacelata</i>				Y												
<i>Haemodorum planifolium</i>				Y												
<i>Hakea dactyloides</i>	Broad-leaved Hakea			Y	Y	Y	Y		Y							
<i>Hakea salicifolia</i>	Willow-leaved Hakea							Y	Y		3	3	3			
<i>Hakea sericea</i>			Y	Y	Y	Y	Y	Y	Y		3		2			1
<i>Hardenbergia violacea</i>	False Sarsaparilla		Y	Y	Y	Y	Y	Y	Y	1	1					1
<i>Hibbertia aspera</i> subsp. <i>aspera</i>				Y												
<i>Hibbertia bracteata</i>				Y												
<i>Hibbertia diffusa</i>				Y												
<i>Hibbertia serpyllifolia</i>				Y												
<i>Hibbertia</i> sp.					Y	Y										
<i>Hovea linearis</i>			Y	Y												
<i>Hybanthus monopetalus</i>				Y												
<i>Hypochaeris radicata</i>	Catsear	*			Y	Y	Y	Y	Y	1	2		2			1
<i>Imperata cylindrica</i> var. <i>major</i>	Bladey Grass		Y	Y	Y	Y	Y	Y	Y	1		2			2	4
<i>Isopogon anemonifolius</i>				Y												
<i>Jacksonia scoparia</i>				Y												
<i>Juncus</i> sp.			Y		Y	Y		Y			1	1		1	1	
<i>Kunzea ambigua</i>	Tick Bush			Y	Y	Y	Y	Y	Y	2	2	4	3			2
<i>Lagenifera gracilis</i>				Y												
<i>Lambertia formosa</i>	Mountain Devil			Y												
<i>Lantana camara</i>	Lantana	*							Y							1

SCIENTIFIC NAME	COMMON NAME	EXOTIC	RECORDED WITHIN LOT 1 DP 1013943	SPECIES OF SYDNEY HINTERLAND TRANSITION WOODLAND	RECORDED IN REHABILITATION AREA					QUADRAT RESULTS (2017)						
					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Lasiopetalum ferrugineum</i>				Y												
<i>Lasiopetalum rufum</i>				Y												
<i>Laxmannia gracilis</i>				Y												
<i>Lepidosperma latens</i>				Y												
<i>Lepidosperma laterale</i>			Y	Y	Y	Y	Y	Y	Y	2						1
<i>Leptomeria acida</i>				Y												
<i>Leptospermum parvifolium</i>				Y												
<i>Leptospermum polygalifolium</i>								Y	Y		2	1	3	1		
<i>Leptospermum trinervium</i>				Y	Y	Y	Y	Y	Y	2						2
<i>Leucopogon juniperinus</i>			Y		Y	Y	Y									
<i>Leucopogon lanceolatus</i>	Lance Beard Heath		Y													
<i>Leucopogon muticus</i>				Y												
<i>Leucopogon virgatus</i>				Y												
<i>Lindsaea microphylla</i>				Y												
<i>Lissanthe sapida</i>				Y												
<i>Lissanthe strigosa</i>				Y												
<i>Lobelia gracilis</i>				Y												
<i>Logania pusilla</i>				Y												
<i>Lomandra confertifolia</i> subsp. <i>rubiginosa</i>				Y												
<i>Lomandra cylindrica</i>				Y												
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>				Y												
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>				Y												
<i>Lomandra glauca</i>				Y												
<i>Lomandra gracilis</i>			Y	Y												
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		Y		Y	Y	Y	Y	Y	2	1	1	2	1		2
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>			Y	Y												
<i>Lomandra obliqua</i>			Y	Y												
<i>Lomatia silaifolia</i>	Crinkle Bush		Y	Y												
<i>Macrozamia spiralis</i>			Y	Y												
<i>Medicago</i> sp.		*				Y										

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					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Melaleuca nodosa</i>				Y												
<i>Micrantheum ericoides</i>				Y												
<i>Microtis sp.</i>						Y		Y	Y		1		1			
<i>Mirbelia rubiifolia</i>				Y												
<i>Monotoca scoparia</i>				Y												
<i>Myrsiphyllum asparagoides</i>	Florist's Smilax	*	Y													
<i>Olearia microphylla</i>				Y												
<i>Opercularia diphylla</i>				Y												
<i>Opercularia varia</i>				Y												
<i>Oxalis perennans</i>					Y	Y	Y	Y								
<i>Oxylobium ilicifolium</i>	Prickly Shaggy Pea		Y		Y	Y	Y	Y	Y	2						
<i>Ozothamnus diosmifolius</i>	White Dogwood		Y	Y	Y	Y	Y	Y	Y	2					1	2
<i>Pandorea pandorana</i>	Wonga Vine		Y													
<i>Panicum simile</i>	Two-colour Panic		Y	Y	Y	Y	Y	Y	Y	3		2				2
<i>Paspalum dilatatum</i>	Paspalum	*			Y	Y	Y	Y	Y		1			2	2	
<i>Passiflora sp.</i>	Passionfruit		Y													1
<i>Patersonia glabrata</i>				Y												
<i>Patersonia longifolia</i>				Y												
<i>Patersonia sericea</i>				Y												
<i>Pennisetum clandestinum</i>		*				Y	Y	Y	Y					3	3	
<i>Persicaria decipiens</i>	Pepperweed					Y										
<i>Persoonia hirsuta</i>				Y												
<i>Persoonia lanceolata</i>				Y				Y	Y			1				
<i>Persoonia laurina</i>				Y												
<i>Persoonia levis</i>	Broad-leaved Geebung			Y	Y	Y	Y	Y	Y		1	1				
<i>Persoonia linearis</i>	Narrow-leaved Geebung		Y	Y												
<i>Persoonia oblongata</i>				Y												
<i>Persoonia pinifolia</i>				Y												
<i>Petrophile pulchella</i>				Y												
<i>Petrophile sessilis</i>				Y												
<i>Philothea hispidula</i>				Y												

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<i>Phyllanthus hirtellus</i>				Y												
<i>Pimelea curviflora</i> var. <i>curviflora</i>				Y												
<i>Pimelea linifolia</i> subsp. <i>linifolia</i>				Y			Y									
<i>Pittosporum undulatum</i>	Sweet Pittosporum		Y					Y	Y	1	1	1	1	1	1	1
<i>Plantago lanceolata</i>	Lamb's Tongues	*			Y	Y	Y	Y	Y		2				2	
<i>Platysace ericoides</i>				Y												
<i>Platysace lanceolata</i>			Y													
<i>Platysace linearifolia</i>				Y												
<i>Poa labillardierei</i> var. <i>labillardierei</i>			Y				Y								1	
<i>Podolobium scandens</i>				Y												
<i>Polyscias sambucifolia</i>	Elderberry Panax		Y													
<i>Pomax umbellata</i>			Y	Y												
<i>Poranthera microphylla</i>			Y													
<i>Pratia purpurascens</i>	Whiteroot		Y	Y												
<i>Prostanthera howelliae</i>				Y												
<i>Pteridium esculentum</i>	Bracken				Y	Y	Y	Y				1				
<i>Pterostylis acuminata</i>				Y												
<i>Pterostylis longifolia</i>				Y												
<i>Pultenaea ferruginea</i>				Y												
<i>Pultenaea microphylla</i>			Y													
<i>Pultenaea polifolia</i>				Y												
<i>Pultenaea scabra</i>			Y	Y												
<i>Pultenaea tuberculata</i>				Y												
<i>Pultenaea villosa</i>				Y		Y	Y	Y	Y		1			2	2	
<i>Rumex crispus</i>		*						Y						1		
<i>Scaevola ramosissima</i>			Y	Y												
<i>Schizaea bifida</i>				Y												
<i>Schoenus imberbis</i>				Y												
<i>Senecio madagascariensis</i>	Fireweed	*			Y	Y	Y	Y	Y	1	2		2	2	3	1
<i>Setaria gracilis</i>	Slender Pigeon Grass	*			Y	Y		Y	Y	1		1				
<i>Sida rhombifolia</i>	Paddy's Lucerne	*	Y		Y	Y	Y	Y	Y		1			2	2	
<i>Solanum mauritianum</i>	Wild Tobacco Bush	*	Y													

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					2010	2012	2013	2015	2017	1	2	3	4	5	6	7
<i>Solanum nigrum</i>	Black-berry Nightshade	*	Y					Y								
<i>Sonchus oleraceus</i>	Common Sowthistle	*	Y													1
<i>Stylidium sp.</i>					Y	Y	Y	Y	Y		1	1	1			
<i>Styphelia laeta subsp. laeta</i>				Y												
<i>Syncarpia glomulifera subsp. glomulifera</i>	Turpentine		Y	Y	Y	Y	Y	Y	Y		3	3	1	1	1	2
<i>Thelymitra pauciflora</i>				Y												
<i>Themeda australis</i>	Kangaroo Grass		Y	Y	Y	Y	Y	Y	Y		4	2	4			
<i>Thysanotus tuberosus subsp. tuberosus</i>				Y												
<i>Trachymene incisa subsp. incisa</i>				Y												
<i>Tricoryne simplex</i>				Y												
<i>Trifolium arvense</i>	Haresfoot clover	*				Y	Y	Y	Y		2		2	2		
<i>Trifolium repens</i>	White Clover	*			Y	Y	Y	Y	Y		2			2	1	
<i>Verbena bonariensis</i>	Purpletop	*			Y	Y	Y	Y	Y		2			2	2	
<i>Veronica plebeia</i>	Trailing Speedwell		Y													
<i>Vicia sativa</i>		*			Y	Y		Y	Y		2		1	2	1	
<i>Wahlenbergia stricta</i>	Tall Bluebell				Y	Y	Y	Y	Y		1				1	
<i>Xanthorrhoea concava</i>				Y												
<i>Xanthorrhoea media</i>				Y												
<i>Xanthorrhoea minor subsp. minor</i>				Y												
<i>Xanthorrhoea resinifera</i>				Y												
<i>Xanthorrhoea sp.</i>	Grass tree		Y													
<i>Xanthosia pilosa</i>				Y												
<i>Xanthosia tridentata</i>				Y			Y		Y							
<i>Xylomelum pyriforme</i>	Woody Pear		Y	Y												

Notes:

Cover abundance scores:

- (1) 5%- rare or few individuals
- (2) <5% common
- (3) 5-25%
- (4) 25-50%
- (5) 50-75%
- (6) 75-100%

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

