

The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park

Submissions and Preferred Infrastructure Report

Volume 2: Appendices



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Appendix C

Technical Memorandum: Biodiversity



Memorandum

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From Lukas Clews

Subject TECHNICAL MEMO – Biodiversity

1 Project description

Roads and Maritime Services (Roads and Maritime) propose to upgrade 16 km of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project).

The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two
 general traffic lanes and a kerbside bus lane in each direction). A wide central median would
 allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and just south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a central median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham to realign the section of The Northern Road that currently runs through the Western Sydney Airport site
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and just south of Glenmore Parkway, Glenmore Park
- Access to the Luddenham town centre from north of the realigned The Northern Road and the existing The Northern Road
- Twin bridges over Adams Road, Luddenham
- Four new traffic light intersections and new traffic lights at existing intersections
- Local road changes and upgrades to current access arrangements for businesses and private properties
- A new shared path for pedestrians and cyclists on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required.

A detailed description of the project, including design refinements since exhibition of the EIS is provided in Chapter 5 of the Submissions and Preferred Infrastructure Report for the project.





2 Purpose and background

The Environmental Impact Statement (EIS) for the project was publicly displayed for information and comment between 21 June and 2 August 2017. The EIS considered a range of environmental, social and planning issues and nominated a number of measures to mitigate or manage these potential impacts.

In accordance with section 115Z(6) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), Roads and Maritime is required to prepare a Submissions and Preferred Infrastructure Report to respond to any issues or questions raised by stakeholders and the community received during the EIS exhibition. The Submissions and Preferred Infrastructure Report also describes any refinements to the project's design and outlines revised environmental management measures identified in response to any changes and the submissions received. The Submissions and Preferred Infrastructure Report, including this Memorandum, will also inform the Final EIS to be prepared for the project in accordance with Part 8 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to be finalised based on the submissions received during exhibition.

The purpose of this Memorandum is to provide additional information to the Biodiversity Assessment Report (BAR) that was prepared for the project (Appendix I of the EIS), taking into consideration design refinements made during the detailed design phase (refer to Section 3) and issues raised by stakeholders and the community during the EIS exhibition (refer to Section 4).

This Memorandum should be read in conjunction with the EIS, Submissions and Preferred Infrastructure Report and any subsequent post-determination documentation. Details on design refinements are explained in the following sections.



3 Environmental assessment of design refinements

There have been a number of design refinements during detailed design of the project, as outlined in Chapter 5 of the Submissions and Preferred Infrastructure Report. These design refinements have resulted in changes to the construction and operational footprints which have affected the calculated direct impacts of the project as assessed within the Biodiversity Assessment Report (BAR) and subsequently presented within the environmental impact statement (EIS).

This section provides a revised assessment of the impacts under the Framework for Biodiversity Assessment (FBA) including recalculation of landscape values, impacts to native vegetation (including threatened ecological communities), impacts to threatened species, and impacts to Matters of National Environmental Significance (MNES), including impacts to the environment of commonwealth land.

The structure and methodology of this assessment is therefore similar to that presented within the BAR, with a focus on biodiversity values and impacts that have changed as a result of the design refinements since exhibition of the EIS.

3.1 Landscape values

As the project is a road upgrade, it is a linear shaped development and landscape value must be assessed according to Appendix 5 of the FBA (Assessing landscape value for linear shaped developments, or multiple fragmentation impacts). Alteration to the proposed construction footprint has resulted in the need for recalculation of landscape value components applicable to linear shaped developments including:

- Percent extent of native vegetation cover in the landscape
- Area to perimeter ratio.

The connectivity value and patch size calculations remain valid with the design change and no recalculation was required.

The revised percent extent of native vegetation cover in the landscape and area to perimeter ratio calculations were undertaken using ESRI ArcGIS software. To undertake the revised assessment of landscape values, a 550 metre buffer was established from the outside edge of the revised construction footprint. While this is a linear road project there are some detached construction compounds which made using a buffer from the centreline problematic. This increased the size of the landscape assessment from the BAR which assessed from the centreline.

3.1.1 Percent native vegetation cover

Once the native vegetation cover was digitised, the extent of native vegetation in the landscape before and after the development was recalculated based on the revised construction footprint (see Table 3.1). The 550 metre landscape buffer is 2,659.65 hectares in size. Current percent native vegetation cover is estimated at 12.26 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). After the development, percent native vegetation cover is estimated at 11.13 per cent (rounded to 11 per cent - score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). The score for percent native vegetation cover is 0 as no change in category is predicted. The score in the BAR prepared for the EIS was calculated at 1.25.



Table 2.4 . Darsont	. nativa vagatatian	actor in the	landacana hafar	a and after devalopment
Table 3.1 : Percent	. native vegetation	cover in the	ianuscape peror	e and after development

Assessment buffer	Before development		After development		Score for % native vegetation
	Native vegetation cover (ha)	Cover (%)	Native vegetation cover (ha)	Cover (%)	cover in the development footprint buffer
2,659.65 ha	326.51	12.26	284.83	11.13	0
(550m from the edge of		(score		(score	
the construction footprint)		2.5)		2.5)	

3.1.2 Area to perimeter ratio

For a major project that is a linear shaped development or multiple fragmentation development, the change in area to perimeter ratio of patches impacted must be assessed. This has been recalculated based on the revised construction footprint.

The total area (square metres) and perimeter (metres) of vegetation patches impacted by the development within the 550 metre buffer is outlined in Table 3.2. The area to perimeter ratio before the development is 24 (previously 22) and after development is 21. The proportional change in area to perimeter ratio as calculated by the credit calculator is 12.5 (previously 4.5) and the score for the proportional change in area to perimeter ratio is 2 according to Table 19 in Appendix 5 of the FBA (see Table 3.2).

This is a change from the EIS design assessed in the BAR in which a score of 1 was calculated, however this is still a relatively small change in area to perimeter ratio and is expected as the vegetation currently has a high area to perimeter ratio (due to many small fragments of vegetation in the landscape) which will not be increased significantly by the project.

Table 3.2: Area to perimeter ratio of vegetation patches before and after development

Before development		After development			Proportional	Score	
Vegetation area (m²)	Vegetation perimeter (m)	Area to perimeter ratio (whole number)	Vegetation area (m²)	Vegetation perimeter (m)	Area to perimeter ratio (whole number)	change	
462,329.27	19,653.96	24	342,393.32	16,340.50	21	12.5	2

3.1.3 Landscape value score

A summary of the recalculated landscape value assessment is provided here. As noted above, the connectivity value and patch size calculations remain valid with the design change therefore no recalculation was required for these.

The landscape component scores are as follows:

- Percent native vegetation cover = 0 (previously 1.25)
- Connectivity value class = 2.5 (no change from original assessment)
- Area / perimeter ratio score = 2 (previously 1)
- Average patch size score = 12.5 (no change from original assessment).



The landscape value score as determined by the BioBanking credit calculator is 17, similar to that previously assessed in the BAR in which the landscape value score was calculated as 17.25.

3.2 Removal of native vegetation

The revised potential loss of vegetation and habitat associated with the project is summarised in Table 3.3. The construction footprint would impact on up to about 40.79 hectares of native vegetation (see Table 3.3). This is a decrease of 3.50 hectares when compared to the EIS design assessed in the BAR (the original impact to all Vegetation Zones was 44.29 hectares).

These impacts have been quantified based on the development footprint after detailed design and take into consideration potential temporary disturbance during construction including compound sites and upgrading of drainage. This calculation also takes into account the clearing required within the Department of Defence land to provide vehicle access along the Defence Establishment Orchard Hills (DEOH) site inside of the new fence line proposed in some parts of the project, which was not assessed in the BAR.

Based on the detailed design, the overall impact to the critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community has reduced by 2.96 hectares. The impact to the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community has been reduced by 0.43 hectares.

Table 3.3: Impacts to native vegetation from the detailed design footprint

Vegetation zone	PCT	Condition	Status (TSC Act)	Original impact (ha)	Area to be impacted by detailed design (ha)	Change
1	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	6.67	5.38	1.29 ha reduction
2	Forest Red Gum - Rough- barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	EEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	2.53	2.43	0.1 ha reduction
3	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/ Good	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	4.92	4.92	No change





Vegetation zone	РСТ	Condition	Status (TSC Act)	Original impact (ha)	Area to be impacted by detailed design (ha)	Change
4*	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _Poor	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	4.68	4.30	0.38 ha reduction
5	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _Poor	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	3.21	3.11	0.1 ha reduction
6	Forest Red Gum - Rough- barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _Poor	EEC River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1.76	1.43	0.33 ha reduction
7	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _High	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	1.25	1.37	0.12 ha increase
8	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _Derived grassland	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	12.01	10.81	1.2 ha reduction
9	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate/Good _Other	-	6.17	6.05	0.12 ha reduction
10	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate/Good _Medium	CEEC Cumberland Plain Woodland in the Sydney Basin Bioregion	1.09	0.98	0.11 ha reduction
			Totals	44.29	40.79	3.50 ha reduction

Notes: * = The impacts to Vegetation Zone 4 have been included in Table 3.3 above to provide an overview of all impacts to native vegetation. Due to the manual override of the 'Number of Trees with Hollows' and 'Fallen Logs' for HN 528, Vegetation Zone 4 now has a site score of 29.17 and requires an offset to be calculated.

3.3 Removal of threatened fauna species habitat and habitat features

Of the known habitat for the Cumberland Plain Land Snail within the study area (i.e. vegetation in moderate to good condition including where live snails or shells were found during the field survey as part of the original assessment), the development footprint is predicted to impact on about 12.40 hectares. This is a decrease of 0.60 hectares from the original assessment in the BAR which identified 13 hectares of potential habitat.

The development footprint is predicted to impact on 24.10 hectares of potential habitat for the Regent Honeyeater. This is a decrease of 2.15 hectares form the original assessment in the BAR which identified 26.25 hectares of potential habitat.

The potential impacts to identified species credit fauna species is summarised in Table 3.4. Overall, based on detailed design, the project would have less impact on threatened fauna species habitat and habitat features than that the EIS design assessed in the BAR.

Table 3.4: Summary of threatened fauna species impacts from the detailed design footprint

Threatened	Ecosystem or	Sta	itus	Original	Habitat to be	Change
species	species credit species	TSC Act	EPBC Act	habitat impact (ha)	impacted by detailed design (ha)	
Cumberland Plain Land Snail	Species credit species	Endangered	Not listed	13	12.40	0.60 ha avoided
Regent Honeyeater	Species credit species	Critically endangered	Critically endangered	26.25	24.10	2.15 ha avoided

3.4 Removal of threatened plants

There would be an impact to the following threatened plant species and endangered population:

- Pultenaea parviflora (Endangered TSC Act)
- Marsdenia viridiflora subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas (Endangered population – TSC Act).

The predicted impact to *Pultenaea parviflora* and the *Marsdenia viridiflora* subsp. *viridiflora* endangered population are outlined below in Table 3.5.

An additional targeted survey to those undertaken for the BAR were conducted for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* (and other threatened plants) around the Vineyard Road extension on the 7th August 2017. This was to account for the footprint changes at this location. Additionally, as stated in the BAR, this area was not able to be accessed during the fieldwork undertaken for the original assessment therefore additional survey was required at this location following detailed design.

In total an additional area of habitat of approximately 4.7 hectares was surveyed by an experienced botanist following the methods described in the *NSW Guide to Surveying Threatened Plants* (Office of Environment and Heritage, 2016). Traverses of this habitat were undertaken over a three-hour period for a distance of 3.131 kilometres (3,131 metres) (see Figure 3.1). The survey located a further six *Pultenaea parviflora* plants (two of which were in the design footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* were recorded.





The original construction footprint based on the EIS design contained (and therefore would have removed) all known individuals and habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population in the study area. The detailed design has resulted in the avoidance of four *Marsdenia viridiflora* subsp. *viridiflora* plants in the area of the DEOH fence between Kings Hill Road and Longview Road (see Figure 3.2). There is no requirement to impact on the location of these plants and exclusion zones would be established around the plants during construction in accordance with standard Roads and Maritime procedure. This reduces the overall impact to 31 individuals (see Table 3.5).

The original construction footprint would have removed the four known *Pultenaea parviflora* plants within the EIS design footprint as well as the two additional plants recorded in the Vineyard Road extension during the August 2017 survey (six *Pultenaea parviflora* plants in total). The August 2017 survey of the Vineyard Road extension recorded six additional *Pultenaea parviflora* plants of which four are outside of the construction footprint so have been avoided. The impact assessed in the EIS was to four *Pultenaea parviflora* plants because the extent of habitat along Vineyard Road extension was unable to be surveyed at the time. The overall impact to *Pultenaea parviflora* is now estimated at six plants (see Table 3.5).

Table 3.5: Summary of threatened plant species impacts from the detailed design footprint

Threatened species	species Ecosystem or Status Original		Original	Individuals to	Change			
	species credit species	TSC Act	EPBC Act			BC Act habitat be impacted by impact detailed design		
Pultenaea parviflora	Species credit species	Endangered	Vulnerable	4 individuals	6 individuals	2 additional plants to be impacted 4 plants avoided		
Marsdenia viridiflora subsp. viridiflora – endangered population	Species credit species	Endangered population	Not listed	35 individuals	31 individuals	4 individuals avoided		



Figure 3-1 | Additional targeted survey for Pultenaea parviflora and Marsdenia viridiflora subsp. viridiflora undertaken in the Vineyard Road extension

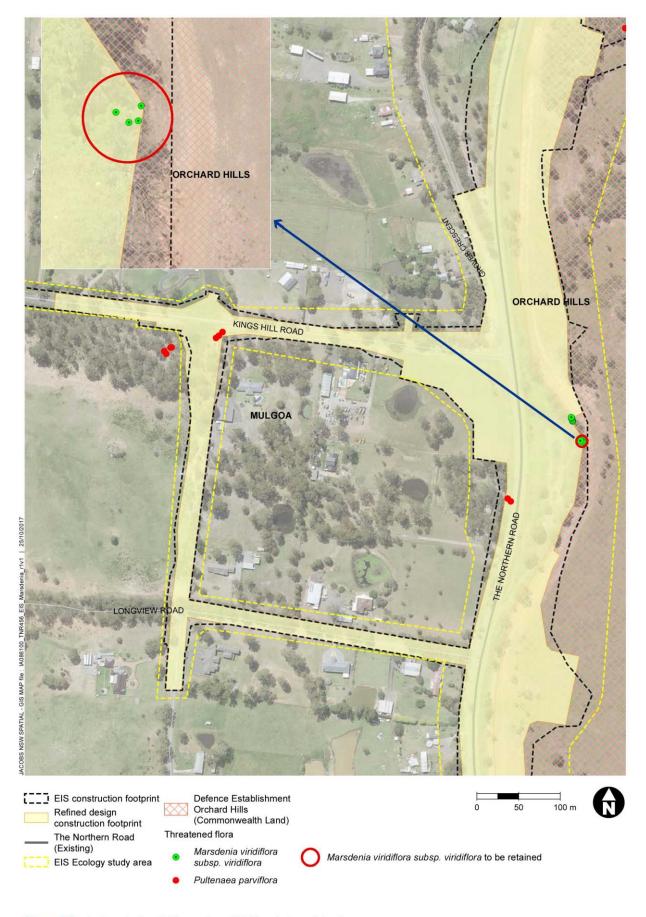


Figure 3-2 | Marsdenia viridiflora subsp. Viridiflora to be retained

3.5 Impacts to Matters of National Environmental Significance

3.5.1 Listed ecological communities

The original calculations in the BAR of the extent of direct clearing required to the critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community represented a worst case scenario based on the EIS construction footprint. This impact has been reduced at the detailed design phase.

Based on the EIS construction footprint, the project would result in the direct clearing of about 16.37 hectares of the critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community. After detailed design, this impact has been reduced by 1.29 hectares to 15.08 hectares (refer to Table 3.6).

Table 3.6 : Summary of impacts to the critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest condition category	Original impact (ha)	Detailed design impact (ha)	Change
Category A (core)	10.69	9.99	0.70 ha reduction
Category C	1.47	1.50	0.03 ha increase
Category C Derived Native Grassland	4.21	3.59	0.62 ha reduction
Total	16.37	15.08	1.29 ha reduction

3.5.2 Listed threatened flora species

The EIS construction footprint would have removed all known *Pultenaea parviflora* plants. The overall impact to *Pultenaea parviflora* is now removal of six plants since the additional plants were found along the Vineyard Road extension. The August 2017 survey of the Vineyard Road extension recorded six additional *Pultenaea parviflora* plants of which four are outside of the construction footprint so would be avoided.

3.5.3 Listed threatened terrestrial fauna species

The original construction footprint was identified as having impacts to habitat for the following threatened species that are listed as threatened under the EPBC Act:

- Grey-headed Flying-fox
- Regent Honeyeater
- Swift Parrot
- Large-eared Pied Bat.

Based on the EIS construction footprint, habitat for these four species was expected to be reduced in extent by about 26.25 hectares due to clearing requirements. Based on detailed design, the extent of this impact would be reduced by 2.15 hectares with a total of 24.10 hectares of foraging habitat expected to be impacted by the project. No breeding habitat would be affected.



3.6 The environment on Commonwealth land (including the Orchard Hills Cumberland Plain Woodland)

An update of the potential impacts to the environment of Commonwealth land as a result of construction and operation of the project is provided in this section as it relates to biodiversity. This includes the DEOH land, and land that has been acquired by the Commonwealth for the purposes of developing the Western Sydney Airport at Badgerys Creek. There would be a decrease in clearing of remnant native vegetation by approximately 0.88 ha (see Table 3.7). This includes a decrease in clearing of the Critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community by 0.8 hectares (see Table 3.7).

Table 3.7: Revised impacts to vegetation on Commonwealth land

Feature	Original impact	Revised impact after detailed design	Difference
Remnant native vegetation (excluding man-made dams)	13.34 ha	12.46 ha	0.88 ha decrease
Critically endangered Cumberland Plain Shale Woodlands and Shale- Gravel Transition Forest ecological community	10.07 ha	9.27 ha	0.80 ha decrease

3.7 Offsetting required

The results of the revised assessment undertaken within the BioBanking credit calculator are presented here. The required ecosystem credits are outlined in Table 3.8.

Table 3.9 outlines the required species credits. The revised credit calculations take into account the amendments to the landscape assessment, altered areas of impact, avoidance of some threatened species impacts, amendment of some benchmark data in the BioBanking credit calculator, and reassignment of the Derived Native Grassland to HN 529. Due to the manual override of the 'Number of Trees with Hollows' and 'Fallen Logs' benchmark values for HN 528 (see section 4.12) this has affected the number of credits generated by the credit calculator (a key change is that Vegetation Zone 4 now has a site score of 29.17 and requires an offset to be calculated). Reassignment of Derived Native Grassland to HN 529 as advised by the OEH (see Section 4.11) has resulted in an altered offset requirement for HN 529 as the Derived Native Grassland PCT is no longer used in the assessment.





Table 3.8: Ecosystem credits summary

PC type code	Plant community type (PCT)	Original area (ha)	Original credits created	Area (ha)	Credits created
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	4.29	178.00	3.86	160.54
HN528	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	11.35	307.00	9.68	346.77
HN529	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	10.47	409.66	21.19*	684.68*
HN630	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	6.17	142.00	6.05	139.00
HN627	Derived grasslands on shale hills of the Cumberland Plain (50-300m asl)	12.01	223.39	-	-
	Total	44.29	1,260	40.79	1,331

Notes: * = Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion now includes the impact and credit requirement for Derived grasslands on shale hills of the Cumberland Plain (50-300m asl).





Table 3.9 : Species credits summary

Scientific name	Common name	TS offset multiplier	Original credit requirement	Species credits required
Meridolum corneovirens	Cumberland Plain Land Snail	1.3	169	161
Marsdenia viridiflora subsp. viridiflora - endangered population	Marsdenia viridiflora subsp. viridiflora in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	4.0	1,400	1,240
Pultenaea parviflora	Pultenaea parviflora	1.5	60	90
Anthochaera phrygia	Regent Honeyeater	7.7	2,021	1,856



4 Response to issues raised by stakeholders and the community

A number of issues raised by stakeholders and the community during the EIS exhibition related to biodiversity and are addressed in this section of the Memorandum. Where similar issues have been raised in different submissions, only one response has been provided.

The issues raised and the response to these issues forms the basis of this section of the memorandum and would be used to inform the Submissions and Preferred Infrastructure Report for the project.

4.1 General objection to the project

Submission number(s)

7, 12, 25

Issue description

A number of respondents were generally opposed to the project.

The NSW Biodiversity Offsets Policy for Major Projects (BOPMP) provides a standard method for assessing impacts of major projects on biodiversity and determines offsetting requirements. In the State Significant Infrastructure (SSI) application process, the Environmental Impact Statement (EIS) must address the Secretary's Environmental Assessment Requirements (SEARs) requested by Department of Planning and Environment (DPE) and apply the Framework for Biodiversity Assessment (FBA). The FBA adopts the BOPMP and provides an assessment methodology to identify terrestrial biodiversity values, assess impacts and quantify and describe biodiversity offsets required for unavoidable impacts.

This Biodiversity Assessment Report (BAR) was completed in accordance with the requirements specified by the SEARs issued on 28 July 2015, the amended SEARs issued on 9 March 2016 and Commonwealth EIS Guidelines issued on 24 August 2016. Additional assessment in the form of this Memorandum has also been undertaken in accordance with these requirements to assess some of the changes to biodiversity values and impacts as a result of design refinements as outlined in Section 3.

Despite avoidance and mitigation, residual impacts from the clearing of native vegetation and fauna habitat features is acknowledged in the EIS. These impacts have been quantified using the BioBanking Credit Calculator, and will form the basis of offsets for the project. There would be impacts to the following matters which need to be offset via biodiversity credits:

- Forest Red Gum Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- Grey Box Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- Grey Box Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (including derived native grasslands)
- Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
- Pultenaea parviflora
- Marsdenia viridiflora subsp. viridiflora endangered population
- Cumberland Plain Land Snail
- Regent Honeyeater.

Memorandum



TECHNICAL MEMO - Biodiversity

Cumberland Plain Woodland is listed as a critically endangered ecological community (CEEC) under the NSW Threatened Species Conservation Act, 1995 (TSC Act). The project may significantly reduce the viability of this CEEC within the locality and therefore it is considered a matter for further consideration under the FBA. While not recorded during the surveys, there is also likely to be impacts to potential habitat for the critically endangered Regent Honeyeater. As such, this species is also considered a matter for further consideration.

The project is likely to result in a range of impacts to biodiversity which are not covered under the FBA including impacts to the aquatic environment, changes to hydrology, habitat fragmentation, edge effects, injury and mortality of fauna (including indirect impacts associated with vehicle strike), invasion and establishment of weeds, potential for invasion and spread of pathogens and disease, noise, vibration, dust, light and contaminant pollution, and a range of cumulative impacts to vegetation and associated species within the Cumberland Plain region.

Some of the higher quality patches of Cumberland Plain Woodland meet the description of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The plant species *Pultenaea parviflora* is also listed as vulnerable under the EPBC Act. Other Matters of National Environmental Significance that may be impacted by the project include habitat for the listed Regent Honeyeater, Swift Parrot, Grey-headed Flying-fox and Large-eared Pied Bat. As such, the project has been identified as a controlled action under the EPBC Act due to predicted significant impacts to listed threatened species and ecological communities and Commonwealth land. The controlled action is considered by the Department of the Environment and Energy (DoEE), likely to have a significant impact on the following EPBC Act listed threatened species and ecological communities:

- Critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Cumberland Plain Woodlands)
- Critically endangered *Lathamus discolor* (Swift Parrot)
- Critically endangered Anthochaera phrygia (Regent Honeyeater)
- Vulnerable Pultenaea parviflora
- Vulnerable Pteropus poliocephalus (Grey-headed Flying-fox).

A Biodiversity Offset Strategy (BOS) has been prepared for the project. The project offsets will aim to provide 'like for like' offsets for all biodiversity values, with this being the minimum requirement for those matters listed under the EPBC Act. The final offset requirement for the Project would be determined during development of the offset package.

4.2 Offsetting

Submission number(s)

27

Issue description

The respondents raised the following issues:

- Concern regarding the offsetting of Conservation Lands located on the DEOH site
- Requests that Roads and Maritime provide the respondent transparency of the offset process
- Concern regarding the ineffectiveness of BioBanking to offset the losses of critically endangered vegetation communities in Western Sydney
- There are insufficient offsets available to supply the offset needs for current development
- Requests that Roads and Maritime procure land to be managed for conservation





The BOS outlines the offsets required for unavoidable (residual) biodiversity impacts associated with the project and demonstrates that appropriate offsets are available and can be delivered for the project. Roads and Maritime are currently working in consultation with OEH to determine the quantum of offsets or supplementary measures that are required for the project. The preferred approach to securing offsets for the project is to purchase credits from the market. Where credits are unavailable for purchase on the market, Roads and Maritime would work with public and private landholders to enter a BioBanking Agreement on their land and then buy the credits issued.

Supplementary measures at a landscape scale are also being investigated in conjunction with the OEH. The final offset requirement for the Project would be determined during development of the offset package in consultation with the OEH. Following discussions with Roads and Maritime, DoEE and OEH, it was decided that an additional supplementary measures package would be developed in consultation with OEH and DoEE with a focus on landscape scale measures within the local area. The package may include measures such as weed eradication programs within Cumberland Plain Woodland.

Refer also to Section 4.22 regarding additional offsets for impact to Cumberland Plain Woodland and Section 4.23 regarding measures to secure offsets.

4.3 Dewatering and backfilling of dams and relocation of aquatic species

Submission number(s)

1, 3, 4, 5, 16, 19, 38

Issue description

The respondents raised the following issues:

- Concern regarding impacts to fauna, such as turtles, in dams near the project
- Request that the project include measures to protect and manage fauna, including capture and relocation of fauna by an appropriately qualified person prior to farm dam dewatering
- Non-native fish species should not be relocated.

The construction and operation of the project has the potential to impact aquatic ecosystems due to changes in water quality, hydrology, habitat loss and instream barriers. Many of the watercourses in the study area are artificial dams, situated in minor gullies which are either first or second order streams, and as such are not considered key fish habitat. Threatened species are unlikely to be present within these dams, however there is a possibility that native and invasive fish species have colonised these dams as well as freshwater turtles and eels. Should dams or creeks be dewatered during the construction of the project, then aquatic fauna will need to be relocated in to a similar aquatic environment to which it was found by trained aquatic ecologists under a Fisheries Permit issued by DPI.

The dewatering of farm dams would be undertaken in accordance with the relevant procedures to be outlined in the construction environmental management plan (CEMP) and relevant sub plans (e.g. the flora and fauna management plan, the soil and water management plan). This would include the management and re-location of Eastern long neck turtles and other aquatic species. All fish and aquatic fauna works will require a Fisheries Permit issued by the NSW Department of Primary Industries (DPI) under Section 37 of the FM Act. Any native fish or aquatic fauna (including turtles) present would be relocated into a similar aquatic environment to which it was found by trained aquatic ecologists.

The selection of relocation sites would be conducted in consultation with DPI Fisheries upon permit application, and will consider permanence of water, any upstream disturbances, habitat, water quality conditions. Fish and other aquatic fauna should be relocated into a waterway with similar water quality and habitat characteristics to minimise stress. Where possible the relocation site would be within the same sub-catchment to avoid the inadvertent dispersal of fauna into unsuitable habitat.





During relocation, fish would be relocated into aerated transportation tubs. Tubs would be located in the shade during capture and transportation to avoid sudden changes in temperature. Frogs, turtles, fish and eels would be treated in a similar manner, however different fauna should not be transported within the same tub to prevent injury or consumption of smaller fauna. Turtles and frogs should be damp, but not submerged in water. Fish and other aquatic fauna would be transported to the recipient site as quickly as practical. Any invasive species would be euthanised in accordance with animal care and ethics permits requirements. Accurate records of species released or euthanised (in the case of exotic species) would be recorded and provided to NSW DPI upon completion.

The EIS includes an existing mitigation measure for the development of a farm dam dewatering plan (SWC-1), this measure would be revised as follows and incorporated into the revised environmental management measures for the project (refer to Section 5):

A farm dam dewatering plan would be prepared which includes:

- A map showing locations of farm dams to be dewatered and the selected relocation sites
- Fisheries Permit and Animal Care and Ethics requirements
- Methodology for the capture, storage, relocation, release of fish and other aquatic fauna
- Euthanisation procedure (as required)
- Location of any offsite discharge points and measures to manage encounters of poor water quality.

4.4 Wildlife corridors and habitat connectivity

4.4.1 Impacts to wildlife corridors and habitat connectivity

Submission number(s)

7, 11, 17, 18, 25, 27, 29

Issue description

The respondents also raised the following issues:

- Concern regarding the impact of the project on wildlife corridors and habitat connectivity
- The EIS does not accurately assess existing wildlife permeability along The Northern Road
- Construction of the bike track to Mulgoa Nature Reserve would impact wildlife connectivity
- No bike trails should be installed through or across the Surveyors Creek Corridor
- The importance of the Glenmore Park Biodiversity Corridor is not fully assessed in the EIS
- Concern regarding impacts of the project on the Flame Robin, Rose Robin and Eastern Grey Kangaroos
- Specific assessment should be made of potential barriers to the annual migration of the Flame Robin and Scarlet Robin over The Northern Road, especially to known habitat in DEOH

Due to the linear nature of the project, it will result in fragmentation of habitats. Habitat fragmentation is considered an important impact of the project and fragmentation impacts and the impact of barriers are discussed in the EIS. The EIS acknowledges fully that there would be localised fragmentation of local wildlife corridors between the existing Northern Road and Willowdene Avenue where some intact habitat patches would be broken apart. The hard barrier introduced by the project would restrict fauna movement. The widening of the existing Northern Road in the north of the study area would further exacerbate the existing barrier effects of this roadway where it bisects Regional Corridor 17 as identified in the OEH BIOMAP.



Memorandum

TECHNICAL MEMO - Biodiversity

The EIS acknowledges the existing habitat connectivity within the landscape. Connectivity value has been assessed in accordance with Appendix 5 of the FBA. The connecting links have been identified and a connectivity value score was assigned. The EIS indicates that the project will impact on local area biodiversity links (as defined under the FBA). Several local area biodiversity links have been identified (see Figure 2.3 of the Biodiversity Assessment Report). The EIS acknowledges that the existing Northern Road is a single carriage (two lanes) road and is therefore not considered a barrier of a size that would sever a connecting link. As such, the connecting links identified in the EIS cross the existing Northern Road. The existing Northern Road does however contribute to a considerable reduction in local connectivity when compared to areas without existing roadways (the links are not severed but are highly modified). The Northern Road is a heavily used roadway and significant barrier effects are currently present. The fence along the edge of the Defence Establishment Orchard Hills does increase the barrier effect provided by the existing Northern Road in this area. In this location, dispersal of fauna is currently limited but is not entirely prevented.

The EIS acknowledges that habitat connectivity would be altered during and after construction. There may be declines in population density and/or species richness within the remaining vegetation patches as a result of the project. There may also be an alteration to community composition, altered species interactions, and altered or ecosystem functioning in the locality due to the action. Due to the importance of connectivity, dispersal opportunities and habitat quality, for species at a local scale the project is considered likely to be detrimental to the dispersal of relatively sedentary species such as mammals, frogs, and reptiles. Local division of some wildlife populations, isolation of key habitat resources, loss of genetic interchange, and loss of population viability may result from the fragmentation caused by the project.

The impacts of altered connectivity on fauna species, including Eastern Grey Kangaroos and east-west obligatory migrant species such as the Flame Robin and Scarlet Robin, have been assessed according to the assessment process outlined in the FBA. The Flame Robin and Scarlet Robin are Ecosystem Credit species and direct impacts to these species, along with common species including the Eastern Grey Kangaroo, have been assessed in conjunction with general biodiversity values as they have been assessed as being at least moderately likely to be present in the habitats that would be impacted. Suitable habitat for these species is present and this is identified in the Biodiversity Assessment Report. As with other fauna species, east-west obligatory migrant species such as the Flame Robin and Scarlet Robin would be detrimentally impacted by habitat fragmentation, as would macropods such as the Eastern Grey Kangaroo.

It is noted that the scope of the project does not include any separated bike trails that would impact on the corridor, the proposed shared path is immediately adjacent to the road corridor along the length of the upgrade. There are no plans for bike baths beyond this shared path.





4.4.2 Connectivity measures

Submission number(s)

11, 12, 17, 18, 21, 25, 27, 29, 38

Issue description

A number of respondents suggested additional fauna crossings, underpasses and other connectivity measures be included in the design.

Other issued raised include:

- Further consideration of the u-turn facility in Kings Hill Road and whether this has potential to reduce the fragmentation of a potential west-east biodiversity corridor
- The height of the proposed fauna underpass (1.5 metres) is not suitable for Eastern Grey Kangaroos
- Services should be routed to avoid interfering with Surveyors Creek Corridor and its future restoration on both eastern and western (DEOH) sides
- Insufficient consultation regarding a suitable solution for the safe movement of fauna in the vicinity of the Defence Establishment Orchard Hills.

The proposed design at Kings Hill Road includes a roundabout which would provide a u-turn facility for motorists. The proposed design in this area also includes a link road between Kings Hill Road and Longview Road. The intersection of Longview Road and The Northern Road would be left-in and left-out only and therefore the link road is required to ensure motorists travelling south on the Northern Road can access Longview Road. The connectivity value of the vegetation and the impact of the proposed design on fragmentation of this area has been assessed in BAR.

Connectivity measures are being considered during detailed design in accordance with the Wildlife Connectivity Guidelines for Road Projects (currently in preparation). In particular, maintenance of current connectivity and potential future connectivity has been considered in culvert design, lighting and fencing.

Connectivity between the Mulgoa Nature Reserve and the DEOH via Regional Corridor 17 (Surveyors Creek Corridor) would be planned for in the future with construction of a fauna crossing to allow for future connectivity to the DEOH land. The proposed fauna crossing is a 2.4-metre-tall dry passage underpass (see Figure 4.1). This would be suitable for larger species such as the Eastern Grey Kangaroo based on monitoring results from Pacific Highway projects. The culvert would lead from the Surveyors Creek corridor under the road and will exit at the new DEOH fencing within the road reserve. For DEOH security reasons and traffic safety, the underpass would be blocked onto DEOH land until the DEOH fencing is removed in the future. This is to prevent the public from gaining unauthorised access to the DEOH land through the underpass and to prevent animals from exiting the culvert onto the roadway. Fauna exclusion fencing would be provided either side of the crossing in accordance with Roads and Maritime standards.

Fauna passage would also be provided at Badgery's Creek with the construction of a fauna friendly drainage culvert of similar internal dimensions to the Surveyors Creek / DEOH culvert (see Figure 4.2).





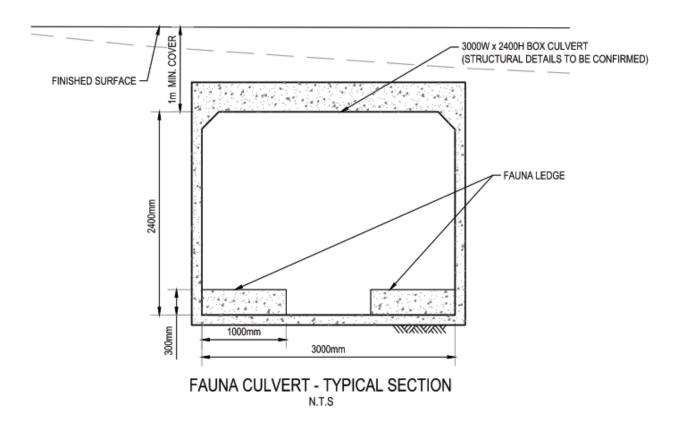


Figure 4.1 : Cross section of the proposed culvert at Surveyors Creek

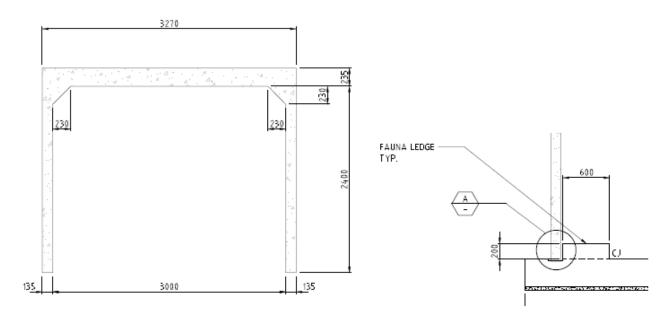


Figure 4.2: Cross section of the proposed culvert at Badgery's Creek





4.4.3 Fencing of DEOH land

Submission number(s)

11

Issue description

Physical barriers more than two metres high should not be located along the DEOH boundary.

There is a particular fencing specification required for the DEOH boundary. A Class 2 chain link perimeter fence is required to be installed to delineate the base boundary, as it is adjacent to a public road. This fence would be a galvanised, rail-less chain wire security fence and gates 2.4 metres high, topped with at least three strands of barbed (or similar) wire to a total height of 3 metres (see Figure 4.3). The mesh size of the fence would be approximately 50mm x 50mm. The fence would be kept clear of trees and other vegetation to a distance of 5 metres. This fence will continue the current level of fragmentation in the landscape until it is removed in the future.

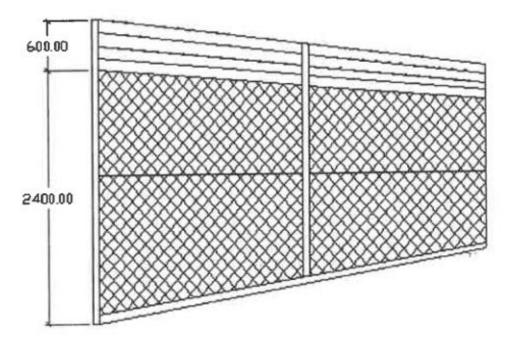


Figure 4.3 : Example of the perimeter fence along the DEOH boundary, with chainmesh and barbed wire

4.5 Large remnant trees

4.5.1 Impacts to large remnant trees

Submission number(s)

11, 12, 16, 17, 18, 21, 25, 29

Issue description

The respondents raised the following issues:

- Concern regarding impacts to large remnant trees, including hollow-bearing trees
- Concern regarding impacts to important trees, particularly Eucalyptus molucanna
- Requests that the project retain as many mature trees as possible, in particular two old-growth remnant trees or example near the Orchard Hills roundabout
- Loss of habitat has not been adequately assessed or quantified in the EIS. The EIS must identify
 the number of tree hollows that will be impacted. Noted that several habitat trees are located
 within the road shoulder or median strip and can be retained rather than removed.

The EIS recognises the loss of hollow-bearing trees as a long term impact that will affect local fauna populations. The number of hollow-bearing trees was counted at each plot/transect location within the study area and this data forms a component of the assessment of ecosystem composition and function under the FBA. The impact to hollow-bearing trees is offset as part of the ecosystem credit requirement for the project.

Some large remnant hollow-bearing trees, including the trees located near the truck inspection bay at Orchard Hills would be removed by the project. The safe retention of these trees within the median is not a viable option due to road safety, line of sight and other engineering purposes. Additionally, the wide central median has been included in the design to allow for future road capacity upgrades, therefore these trees would likely be subject to removal in the future, regardless of whether or not they could be retained in the current design.

4.5.2 Large tree removal process

Submission number(s)

16

Issue description

Concern regarding impacts to fauna during the tree removal process.

The EIS includes a mitigation measure for a two staged clearing process (B-3), which the contractor would be required to incorporate into the flora and fauna management plan (FFMP) to be developed for the project and implemented during construction. This has been updated to include additional detail and would be included as part of the revised environmental management measures for the project (refer to Section 5 of this Memorandum):

A staged habitat removal process is to be used when hollow-bearing trees are to be removed as follows:

- Make contact with vets and wildlife carers before works start to ensure they are willing to assist treating injured animals if necessary.
- An experienced and licensed wildlife carer and/or ecologist will be present on site during all
 habitat removal activities to capture and relocate fauna that may be encountered.





- Progressive habitat removal will take place around habitat identified and marked during the preclearing process. Remove non-hollow-bearing trees, undergrowth, feed-trees, regrowth and grass. Do not fell trees towards exclusion zones.
- Identified habitat (e.g. hollow-bearing trees) will be left for at least 24 hours after removing non-habitat vegetation to allow fauna to escape. A licensed wildlife carer and/or ecologist will check hollow-bearing trees are not being used by fauna before felling. If necessary, fauna may need to be trapped and relocated to pre-determined habitat identified for fauna release.
- Fell habitat trees as carefully as possible to avoid injury to any fauna still remaining in trees. Use equipment that would allow the habitat trees to be lowered to the ground with minimal impact (e.g. claw extension). Do not fell trees towards exclusion zones.
- An experienced and licensed wildlife carer and/or ecologist will inspect habitat once it is removed
 e.g. after a tree is felled. Animals that emerge should be captured, inspected for injury then
 relocated to pre-determined habitat identified for fauna release.
- All hollows have the potential to support fauna and will be placed in adjacent habitat until the
 following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna
 is present. If possible, the hollows could be permanently relocated in adjacent areas. Inspect
 woody debris for fauna immediately before chipping to avoid injury or death to fauna that may be
 present.
- The project manager and/or environment manager should ensure that the outcomes of the clearing process are recorded. Reporting is usually the responsibility of an ecologist or environment officer. Reports are to be submitted to relevant personnel e.g. environment manager or Roads and Maritime regional environmental staff.
- Consider the seasonal impact of clearing on species identified in the environmental assessment or pre-clearing process or that are known to occur in the area.

4.6 Impacts due to landscaping and lighting

4.6.1 Landscaping

Submission number(s)

11, 17, 18

Issue description

The respondents raised the following issues:

- The Orchard Hills stretch of road should be kept rural in character. Landscaping should be avoided along the Defence Establishment Orchard Hills boundary and Cumberland Plain Woodland verges should be retained
- The use of local native flora species for roadside plantings will create habitat, help retain local character, and reduce roadside maintenance
- The width of the existing Surveyors Creek Corridor on both western and eastern sides should be capped with suitable Cumberland Plain Woodland substrate via soil translocation following earthworks
- The Surveyors Creek Corridor and median strip and verges for chains adjoining the Defence Establishment Orchard Hills bushland should not be landscaped. The sites should be restored to BAM/FBA-criteria functional Cumberland Plain Woodland.

An urban design and landscape concept has been developed for the project as documented in the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan



Memorandum

TECHNICAL MEMO - Biodiversity

(UDLP) for the project which is currently ongoing. This plan would be developed in consultation with Council.

The EIS includes a mitigation measure for the re-establishment of native vegetation (B-6), which the contractor would be required to incorporate into the flora and fauna management plan (FFMP) to be developed for the project and implemented during construction. This has been updated to include additional detail and would be included as part of the revised environmental management measures for the project (refer to Section 5 of this Memorandum):

Native vegetation would be re-established in disturbed areas and along the roadway using the following procedure:

- Ecologists and landscape architects will work together on the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated.
- Allocate sufficient time for the collection of seed to be used in revegetation.
- Carry out all seed collection in accordance with RTA Seed Collection QA Specification R176 and the Florabank Guidelines and Model Code of Practice.
- Use experienced and licensed seed collectors to carry out seed collection.
- Where possible, procured plants should be grown from local provenance seed.
- Consideration should be given to a range of characteristics such as species, height and drought tolerance when procuring native plants.
- Planting operations should be in accordance with RTA Landscape Planting QA Specification R179.
- Use only plants that have been certified disease free for revegetation works.
- Collect local native topsoils and leaf litter and store for use in revegetation works.
- Soils in areas to be revegetated should match surrounding soil conditions as closely as possible unless adjacent areas are weedy or contaminated.
- Ensure areas to be revegetated have an appropriate level of natural drainage.
- Avoid compaction of soils in areas identified for revegetation. Where compaction has occurred, the soil should be loosened.
- When planting consider seasonal risks of frost, drought, flooding and sun exposure to avoid damaging plants and to encourage growth.
- Ensure plant spacing and diversity follows the landscaping plan for the project, reflects local conditions and is dense enough to ensure plants achieve a timely coverage of the ground.
- Consider appropriate shade and drainage conditions when planting. Provide mulching around plants for dry or potentially weedy sites to help retain moisture and suppress weeds.
- Inspection, monitoring and maintenance of revegetated areas should be conducted in accordance
 with the landscape management plan. Outline the roles and responsibilities in landscape
 management and revegetation plans including the schedule for monitoring and maintenance
 activities.





4.6.2 Lighting

Submission number(s)

11, 17, 18, 27

Issue description

The respondents raised the following issues:

- Concern regarding the impacts of light pollution on fauna
- Reduced street lighting would minimise impacts to native fauna
- Request for lighting to be limited to larger traffic intersections to reduce impacts to fauna, such as threatened bat and owl populations, as well as other nocturnal species
- Lighting should be excluded from the width of the Surveyors Creek Corridor on both eastern and western sides, and along the length of Cumberland Plain Woodland on the DEOH site.

The EIS acknowledges that night works would be required during construction which would involve the use of temporary lighting. Additionally, street lighting would be provided along the full length of the project to light the carriageway and shared path as required to support the safe operation of the road and paths. Street lighting would be designed to ensure relevant guidelines are adhered to including on light spill. As such, the immediate area surrounding the project activities, and the roadside during operation, would be subject to artificial lighting. This would essentially create permanent 'daylight' conditions in the area around the lights. Ecological light pollution may potentially affect nocturnal fauna by temporarily interrupting their life cycle. Due to the frequency and sustained nature of the lighting, it is unlikely that animals would habituate to the light disturbance and a long-term impact in the area of lighting is likely. Despite efforts to minimise the impacts of lighting, localised impacts from light spill would remain and this has been identified and assessed as a residual impact in the BAR/EIS for the project.

4.7 Impacts to Cumberland Plain Woodland

Submission number(s)

12, 21, 25

Issue description

The respondents raised the following issues:

- Concern regarding the impacts of the project on Cumberland Plain Woodland
- Concern regarding the impacts of the project on Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest.

The EIS identified the potential impacts to Cumberland Plain Woodland and this community is identified as a Matter for Further Consideration in the Biodiversity Assessment Report as the project is considered likely to significantly reduce the viability of Cumberland Plain Woodland.

Based on the original construction footprint, the project would result in the direct clearing of about 33.83 hectares of the TSC Act listed critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community. After detailed design, this impact has reduced by 2.96 hectares to about 30.87 hectares.

Based on the original construction footprint, the project would result in the direct clearing of about 16.37 hectares of the EPBC Act listed critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community. After detailed design, this impact has been reduced by 1.29 hectares to 15.08 hectares.





4.8 Details of proposed mitigation measures

Submission number(s)

29

Issue description

- Penrith City Council requested further detail on some of the mitigation measures outlined in the EIS
- Three additional mitigation measures regarding seeding and reuse of topsoil were identified
- Three additional mitigation measures regarding hollows, re-use of large woody debris and installation of suitable habitat boxes were identified.

Further details of the mitigation measures for the project as outlined in the EIS are provided in Table 4.1. Additional mitigation measures proposed for the project are outlined in Section 5.





Table 4.1 : Description of mitigation measures

Impact	Proposed mitigation measure	Description of actions
Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Native vegetation removal has been reduced by 3.50 hectares during detailed design.
	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	 Review the environmental assessment and associated documentation for the project to identify known locations of biodiversity features such as threatened flora and fauna (and their habitat), threatened populations and communities that need to be considered during the pre-clearing process. Identify nearby habitat that would be suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal. Consult with an ecologist to determine suitable habitat. Mark the pre-determined habitat identified for fauna release on a map. The project manager and/or environmental Management Plan (CEMP), flora and fauna management be part of the Construction Environmental alwaynement Plan (CEMP), flora and fauna management be plan or Environmental Work Method Statement (EWMS). Follow the unexpected threatened species finds procedure if additional threatened species or communities are identified that have not been considered in the environmental assessment. The project manager and/or environment manager will incorporate biodiversity management measures identified during the pre-clearing process into the project CEMP and/or designs. The project manager and/or environment manager should engage an ecologist to undertake the following procedure in the weeks before clearing begins: a. Confirm the locations of biodiversity features identified in the environmental assessment. b. Identify any fauna that have the potential to be disturbed, injured or killed as a result of clearing activities (eg nesting birds). c. Check for the presence of threatened flora and fauna species that were identified in the environmental assessment as likely to occur. This check should be: i. Conducted by licensed ecologists experienced in fauna handling and the identification of local flora and fauna species. d. If not already available, record the details for all hollow-bearing trees, trees containing threatened fauna and threatened fl





Impact	Proposed mitigation measure	Description of actions
	measure Exclusion zones will be established to mark clearing limits according to Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	An exclusion zone is a designated 'no-go' area that is clearly identified and appropriately fenced to prevent damage to native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease. Exclusion zones will be used to define approved clearing limits for the project. Exclusion zones will be implemented as follows: Review background documents such as environmental assessments and accompanying flora and fauna reports, conditions of approval, project or contract specifications and updated maps/plans that were developed as part of the pre-clearing process. Select appropriate exclusion fence type based on the risk of the excluded area being intruded upon, the area to be fenced, and the risk of fauna being trapped, injured or isolated. Mark exclusion zones on a suitable plan. Plans should: Be based on up to date plans for the project. Include construction chainages or similar distance markers used in construction. Be clearly labelled. State what is being excluded. Mark out exclusion zones with temporary markings such as pegs or paint. Ensure that any trees to be felled to establish exclusion zones are felled so as to fall away from the exclusion zone. Place exclusion zone fencing outside tree protection zones. Erect signs to inform personnel of the purpose of exclusion zone fencing. Store materials or equipment outside exclusion zones. Avoid stockpiling materials and equipment and parking vehicles and machinery within the dripline of any tree. Ensure all exclusion zones are regularly inspected and repairs to fencing are made where required. Carry out regular assessments of the adequacy and location of exclusion zones by including this as an auditable item in the project audit schedule. Maintain exclusion fencing until the risk to disturbance within the excluded zone has been eliminated through other means. Removal of fencing should be under taken in consultation with environmental staff.
		Ensure that any breaches of the exclusion zone are reported through the RTA's environmental incident reporting procedure.





Impact Proposed mitigation measure	Description of actions
Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	The pre-clearing process should be completed before any clearing begins (see <i>Guide 1: Pre-clearing process</i>). After pre-clearing has been undertaken, vegetation removal will follow this procedure: Develop a clearing and grubbing plan with reference to the Biodiversity Guidelines and communicate the requirements of the plan to site staff regularly. document the selection of suitable work methods in a clearing and grubbing plan. Ensure clearing of vegetation and/or removal of bushrock does not go beyond the approved clearing limits for the project. Follow the unexpected threatened species finds procedure if a threatened species is encountered that has not previously been identified and assessed in the environmental assessment. Carefully clear vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation. Retain stumps in riparian zones and aquatic habitats to reduce the potential for bank erosion. Separate woody vegetation to identify suitable items for secondary reuse (see Guide 5: Re-use of woody debris and bushrock) or exotic (non-native) vegetation. keep stockples of cleared vegetation under two metres high in accordance with the Roads and Maritime Stockpile Site Management Guideline. Non-woody vegetation (typically grasses and groundcover species) should be incorporated into the stripping of topsoil to retain any organic materials and nutrients within the topsoil layer. The staged habitat removal process is to be used when identified habitat (eg hollow-bearing trees, habitat tremoval process is to be used when identified habitat (eg hollow-bearing trees). A lace contact with vests and wildlife carers before works start to ensure they are willing to assist treating injured animals if necessary. b. An experienced and licensed wildlife carer and/or ecologist will be present on site during all habitat tremoval activities to capture and relocate fauna that may be encountered. c. Progressive habitat removal will take place around habitat identified and marked dur





Impact	Proposed mitigation measure	Description of actions
	Native vegetation will be re- established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	An urban design and landscape concept has been developed for the project as documented in the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan (UDLP) for the project which is currently ongoing. This plan would be developed in consultation with Council. Native vegetation will be re-established using the following procedure: Retain native vegetation by minimising the road construction footprint where possible rather than clearing and revegetating the area. Ecologists and landscape architects will work together on the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated. Allocate sufficient time for the collection of seed to be used in revegetation. Carry out all seed collection in accordance with RTA Seed Collection QA Specification R176 and the Florabank Guidelines and Model Code of Practice. Use experienced and licensed seed collectiors to carry out seed collection. Where possible, procured plants should be grown from local provenance seed. Consideration should be given to a range of characteristics such as species, height and drought tolerance when procuring native plants. Planting operations should be in accordance with RTA Landscape Planting QA Specification R179. Use only plants that have been certified disease free for revegetation works (refer to Guide 7: Pathogen management). Collect local native topsoils and leaf litter and store for use in revegetation works. Soils in areas to be revegetated have an appropriate level of natural drainage. Avoid compaction of solis in areas identified for revegetation. Where compaction has occurred, the soil should be loosened. There are several seeding te



Impact	Proposed mitigation measure	Description of actions
	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified on the project.	 The procedure is as follows: Threatened flora or fauna species unexpectedly encountered Stop work Notify the environment manager Environmental manager would arrange for an ecologist to conduct an assessment of significance of the likely impact, develop management options and notify OEH, DPI and DoEE as appropriate If a significant impact is not likely to occur, recommence work and maintain regular inspections If a significant impact is likely to occur: a. Consult with OEH, DPI and DoEE as appropriate b. Obtain approvals, licenses or permits as required c. Recommence works once advice is sought and necessary approvals, licences and permits are obtained Include species in subsequent inductions, toolbox talks and update the CEMP.
Removal of threatened species	Habitat removal will be minimised through detailed design.	Removal of habitat for threatened species has been minimised during detailed design. Impacts to habitat of the Cumberland Plain Land Snail have been reduced by 0.96 ha. Impacts to habitat of species including Grey-headed Flying-fox, Regent Honeyeater, Swift Parrot and Large-eared Pied Bat has been reduced by 2.15 ha.
	through detailed design. Habitat removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	The pre-clearing process should be completed before any clearing begins (see <i>Guide 1: Pre-clearing process</i>). After pre-clearing has been undertaken, vegetation removal will follow this procedure: Develop a clearing and grubbing plan with reference to the Biodiversity Guidelines and communicate the requirements of the plan to site staff regularly. document the selection of suitable work methods in a clearing and grubbing plan. Ensure clearing of vegetation and/or removal of bushrock does not go beyond the approved clearing limits for the project. Follow the unexpected threatened species finds procedure if a threatened species is encountered that has not previously been identified and assessed in the environmental assessment. Carefully clear vegetation so as not to mix topsoil with debris and to avoid impacts to surrounding native vegetation. Retain stumps in riparian zones and aquatic habitats to reduce the potential for bank erosion. Separate woody vegetation to identify suitable items for secondary re-use (see Guide 5: Re-use of woody debris and bushrock) or exotic (non-native) vegetation. keep stockpiles of cleared vegetation under two metres high in accordance with the Roads and Maritime Stockpile Site Management Guideline. Non-woody vegetation (typically grasses and groundcover species) should be incorporated into the stripping of topsoil to retain any organic materials and nutrients within the topsoil layer. The staged habitat removal process is to be used when identified habitat (eg hollow-bearing trees, habitat trees or bushrock) is to be removed: a. Make contact with vets and wildlife carers before works start to ensure they are willing to assist treating injured animals if necessary. b. An experienced and licensed wildlife carer and/or ecologist will be present on site during all habitat removal activities to capture and relocate fauna that may be encountered. c. Progressive habitat (eg hollow-bearing trees) will be left for at least 24 hours after removing non-habitat vegetation to allow





Impact	Proposed mitigation measure	Description of actions
		captured, inspected for injury then relocated to pre-determined habitat identified for fauna release.
		g. All hollows have the potential to support fauna and will be placed in adjacent habitat until the following day for further inspection by a licensed wildlife carer and/or ecologist to verify no fauna is present. If possible, the hollows could be permanently relocated in adjacent areas in accordance with Guide 5: Re-use of woody debris and bushrock. Inspect woody debris for fauna immediately before chipping to avoid injury or death to fauna that may be present.
		h. The project manager and/or environment manager should ensure that the outcomes of the clearing process are recorded. Reporting is usually the responsibility of an ecologist or environment officer. Reports are to be submitted to relevant personnel eg environment manager or RTA regional environmental staff.
		Consider the seasonal impact of clearing on species identified in the environmental assessment or pre-clearing process or that are known to occur in the area.
		Under take bushrock removal in a way that minimises damage to the bushrock, avoids excessive soil disturbance and avoids climatic seasons when species are utilising this resource.
		Record the outcomes of the clearing process.
		The Australian Standard AS 4373 Pruning of amenity trees should be followed for all pruning works.
	Habitat will be replaced or reinstated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest	An urban design and landscape concept has been developed for the project as documented in the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan (UDLP) for the project which is currently ongoing. This plan would be developed in consultation with Council.
	boxes of the Biodiversity	The following will be undertaken to maximise the re-use of woody debris and bushrock to minimise loss and/or damage to native flora and fauna habitats:
	Guidelines: Protecting and managing biodiversity on RTA	Contract specifications should state that woody debris and bushrock is to be re-used on site (eg for habitat improvement) where possible.
	projects (NSW Roads and Traffic	Engage an ecologist to provide advice on the re-use of woody debris and bushrock to ensure it does not have a negative impact on the receiving environment.
	Authority, 2011)	Separate weeds from native vegetation.
		Do not extend the amount of clearing and grubbing to make up for mulch shortfalls.
		Carry out removal, stockpiling, transportation and relocation of woody debris and/or bushrock in a manner that minimises disturbance to native vegetation (including the canopy, shrubs, dead trees, fallen timber and groundcover species) or bushrock.
		Avoid the spread of any weeds or pathogens that may be in the soil when relocating woody debris and bushrock from stockpiles.
		Engage an ecologist to provide advice on positioning woody debris and bushrock in designated relocation areas
		Keep topsoil disturbance to a minimum.
		When relocating woody debris, place it evenly across the site.
		Manage stockpiles in accordance with the Roads and Maritime Stockpile Site Management Guideline, Environmental Protection (Management System) QA Specification G36 and Vegetation QA Specification R178.
		Prepare a mulch tannin management plan for the project where tannins are likely to be generated.
		To minimise the impact of hollow loss, supplementary fauna habitat in the form of artificial hollows (nest boxes) will be installed as follows:
		Where nest boxes are required, an ecologist will be engaged to develop a nest box strategy.
		Consult with an ecologist to assist in the implementation of the nest box strategy including installation and monitoring of nest boxes.
		An ecologist should certify that the nest boxes are designed and built to suit the target species in accordance with the nest box strategy.
		The entrance size of nest boxes should be no bigger than that required for the target species.
		The nest box lid should overhang the front and sides of the nest box by at least 25 millimetres to prevent water damage. For monitoring and maintenance purposes, consider using a hinged lid. do not use metal lids or plates on the roof of the nest box lid.
		Paint the outside of the nest box with non-toxic, dark-coloured, outdoor, water-based acrylic paint. Avoid toxic substances.
		To assist with drainage, drill three small holes in the base of the nest box.
		Non-toxic woodchips, wood shavings or sawdust could be placed into possum, glider and bird nest boxes to provide extra insulation in cold climates.





Impact	Proposed mitigation measure	Description of actions
	measure	 An ecologist should be on site during the installation of nest boxes. The preferred method of attaching nest boxes to trees is the Habisure© system. Bolting nest boxes to trees is not recommended. The density and quantity of each nest box type should reflect the proportion of tree hollow types being removed, the proportion of tree hollow types to be retained in adjacent habitat, the availability of adjacent food resources and the assemblage of hollow-dependant fauna known or likely to occur in the project locality. The location of nest boxes should be as close as possible to the original hollow-bearing tree, consider the type of bark preferred by the target species, be in close proximity to food or other resources, not be installed on trees with existing hollows or where there is a high density of Common Mynas (<i>Acridotheres tristis</i>). Orientate nest boxes between northwest and east and so they are not facing lights from adjacent development. Install approximately 70 per cent of nest boxes up to one month before the star t of any clearing. The remainder of nest boxes would be installed before completion of the project.
		 Record the nest box identification number, nest box type, GPS location, species and diameter at breast height of the host tree, nest box height and orientation. Under take ongoing monitoring and maintenance of nest boxes in accordance with the nest box management strategy for the project. If a nest box needs to be removed from the site for repair, then an alternative nest box should be installed in the same location upon removal of the damaged nest box.
	The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011) if threatened fauna, not assessed in the biodiversity assessment, are identified on the project.	The procedure is as follows: Threatened flora or fauna species unexpectedly encountered Stop work Notify the environment manager Environmental manager would arrange for an ecologist to conduct an assessment of significance of the likely impact, develop management options and notify OEH, DPI and DoEE as appropriate If a significant impact is not likely to occur, recommence work and maintain regular inspections If a significant impact is likely to occur: a. Consult with OEH, DPI and DoEE as appropriate b. Obtain approvals, licenses or permits as required c. Recommence works once advice is sought and necessary approvals, licences and permits are obtained Include species in subsequent inductions, toolbox talks and update the CEMP.
Removal of threatened plants	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	The pre-clearing process involves: Review the environmental assessment and associated documentation for the project to identify known locations of biodiversity features such as threatened flora and fauna (and their habitat), threatened populations and communities that need to be considered during the pre-clearing process. identify nearby habitat that would be suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal. Consult with an ecologist to determine suitable habitat. Mark the pre-determined habitat identified for fauna release on a map. The project manager and/or environment manager will develop an unexpected threatened species finds procedure for projects and maintenance works. This should be part of the CEMP, flora and fauna management sub-plan or EWMS. Follow the unexpected threatened species finds procedure if additional threatened species or communities are identified that have not been considered in the environmental assessment. The project manager and/or environment manager will incorporate biodiversity management measures identified during the pre-clearing process into the project CEMP and/or designs. The project manager and/or environment manager should engage an ecologist to undertake the following procedure in the weeks before clearing begins: a. Confirm the locations of biodiversity features identified in the environmental assessment. b. Identify any fauna that have the potential to be disturbed, injured or killed as a result of clearing activities (eg nesting birds). c. Check for the presence of threatened flora and fauna species that were identified in the environmental assessment as likely to occur. This check should be: i. Conducted by licensed ecologists experienced in fauna handling and the identification of local flora and fauna species



Impact	Proposed mitigation measure	Description of actions
		ii. If possible, under taken during optimal weather conditions, season and time of day/night for identifying targeted flora and fauna species. d. If not already available, record the details for all hollow-bearing trees, trees containing threatened fauna and threatened flora, including (where applicable): i. GPS location ii. Species iii. Type of habitat feature (eg nest, bushrock) iv. Size of hollow (eg small, medium, large) v. Type of hollows (eg branch, limb, trunk). e. Mark habitat features to be protected during construction. Use suitable methods (eg flagging tape) to mark: i. All hollow-bearing trees or habitat features. ii. Any trees found to contain threatened fauna. iii. The location of any threatened flora. f. Confirm the location of pre-determined habitat identified for the release of fauna, habitat features and recommended clearing procedures to the project manager and/or environment manager (or equivalent). • The following procedure should be followed 24 hours before clearing: a. Licensed wildlife carers and/or ecologists should capture and/or remove fauna that have the potential to be disturbed, injured or killed as a result of clearing activities. b. Relocate captured fauna into pre-determined habitat identified for fauna release. c. The project manager and/or environment manager should inform clearing contractors of any changes to the sequence of clearing if required. d. Carr y out staged habitat removal as outlined in <i>Guide 4: Clearing of vegetation and removal of bushrock</i> where fauna habitat features (such as hollow-bearing trees, habitat trees and bushrock) have been identified and marked.
	The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified on the project.	The procedure is as follows: Threatened flora or fauna species unexpectedly encountered Stop work Notify the environment manager Environmental manager would arrange for an ecologist to conduct an assessment of significance of the likely impact, develop management options and notify OEH, DPI and DoEE as appropriate If a significant impact is not likely to occur; recommence work and maintain regular inspections If a significant impact is likely to occur: Consult with OEH, DPI and DoEE as appropriate Dotain approvals, licenses or permits as required Recommence works once advice is sought and necessary approvals, licences and permits are obtained Include species in subsequent inductions, toolbox talks and update the CEMP.



Impact	Proposed mitigation	Description of actions
	measure	
Aquatic impacts	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013).	This procedure is applicable to all construction and maintenance sites where works are in an aquatic habitat or within the riparian zone (50 metres from the highest bank of a waterway or the edge of a wetland). Avoid activities in aquatic habitats and riparian zones as much as practicable. The sensitivity of aquatic habitats and riparian zones and the measures in place to protect them should be regularly communicated to all staff eg during inductions and toolbox talks. Protect aquatic habitats and riparian zones where works are not required with exclusion zones. Exclusion fencing should be used outside sensitive areas. The location of aquatic habitat features within or adjacent to the footprint should be clearly identified on environmental management plans. Access the waterway so that riparian vegetation removal is minimised and restricted to the minimum amount of bank length required for the construction activity. Keep vehicles and machinery away from the banks of a waterway where possible. Refuelling of vehicles and plant, and chemical storage and decanting should not take place within 50 metres of aquatic habitats. Avoid clearing within the riparian zone during periods when flooding is likely to occur. Ensure that any clearing under taken does not allow the vegetation/trees to fall into the waterway. Retain the roots of trees on the bank of a waterway in order to maintain bank stability. Consult with department of Primary industries (DPI) (Fisheries) before clearing to identify any trees proposed to be removed that could potentially be used for resnagging of a waterway. Only the minimum number of snags should be disturbed. DPI (Fisheries) must be consulted before works commence where snags require lopping, realignment, relocation and/or removal. During rehabilitation, stabilise the banks of the waterway through revegetation and/or armouring according to available landscape plans. Protect banks from stock and/or human access using appropriate fencing during the rehabilitation and maintenance pe
Removal of woody debris Changes to hydrology	All large woody debris or snags will be relocated instream. Changes to existing surface water flows will be minimised through detailed design.	 The process involves: Consult with department of Primary industries (DPI) (Fisheries) before clearing to identify any trees proposed to be removed that could potentially be used for resnagging of a waterway. Only the minimum number of snags should be disturbed. DPI (Fisheries) must be consulted before works commence where snags require lopping, realignment, relocation and/or removal. A flood culvert PXD2 is proposed at the key connectivity point at Surveyors Creek. Scour protection measures or energy dissipation measures will be used along the bed and banks upstream and downstream of any bridge crossing or culvert where high velocities of surface water runoff cannot be minimised by design or by energy dissipaters. This may include flow velocity management measures to minimise erosion and scour in watercourses, or collection and management of runoff waters.
Fragmentation of identified biodiversity links and habitat corridors	Connectivity measures will be implemented in accordance with the Wildlife Connectivity Guidelines for Road Projects (RMS in prep).	Connectivity measures are being considered during detailed design in accordance with the Wildlife Connectivity Guidelines for Road Projects (RMS in prep). In particular, maintenance of current connectivity and potential future connectivity has been considered in culvert design, lighting and fencing. Connectivity between the Mulgoa Nature Reserve, Badgery's Creek and the DEOH via Regional Corridor 17 (Surveyors Creek Corridor) will be planned for in the future with construction of a fauna crossing to allow for future connectivity to the DEOH land. The proposed fauna crossing is a 2.4 metre tall dry passage underpass. This should be suitable for larger species such as the Eastern Grey Kangaroo based on monitoring results from Pacific Highway projects. The culvert will lead from the Surveyors Creek corridor under the road and will exit at the new DEOH fencing. For DEOH security reasons and traffic safety, the underpass will be blocked until the DEOH fencing is removed in the future. This is to prevent the public from gaining unauthorised access to the DEOH land through the underpass and to prevent animals from exiting the culvert onto the roadway.



Impact	Proposed mitigation measure	Description of actions
Edge effects on adjacent native	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide</i> 2: <i>Exclusion zones</i> of	An exclusion zone is a designated 'no-go' area that is clearly identified and appropriately fenced to prevent damage to native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease. Exclusion zones will be used to define approved clearing limits for the project. Exclusion zones will be implemented as follows:
vegetation and habitat	the Biodiversity Guidelines: Protecting and managing	Review background documents such as environmental assessments and accompanying flora and fauna reports, conditions of approval, project or CEMP, project or contract specifications and updated maps/plans that were developed as part of the pre-clearing process.
	biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	Select appropriate exclusion fence type based on the risk of the excluded area being intruded upon, the area to be fenced, and the risk of fauna being trapped, injured or isolated.
	Authority, 2011).	Mark exclusion zones on a suitable plan. Plans should:
		a. Be based on up to date plans for the project.
		b. Include construction chainages or similar distance markers used in construction.
		c. Be clearly labelled.
		d. State what is being excluded.
		e. Be displayed in prominent places in the site shed.
		f. outline any procedures that must be followed for access into exclusion zones.
		Mark out exclusion zones with temporary markings such as pegs or paint.
		Ensure that any trees to be felled to establish exclusion zones are felled so as to fall away from the exclusion zone.
		Place exclusion zone fencing outside tree protection zones.
		Erect signs to inform personnel of the purpose of exclusion zone fencing.
		Store materials or equipment outside exclusion zones.
		Avoid stockpiling materials and equipment and parking vehicles and machinery within the dripline of any tree.
		Ensure all exclusion zones are regularly inspected and repairs to fencing are made where required.
		Carr y out regular assessments of the adequacy and location of exclusion zones by including this as an auditable item in the project audit schedule.
		Maintain exclusion fencing until the risk to disturbance within the excluded zone has been eliminated through other means. Removal of fencing should be under taken in consultation with environmental staff.
		Communicate the importance of exclusion zones, and any changes to the zones, to all site staff and visitors (eg in toolbox talks and inductions).
		Ensure that any breaches of the exclusion zone are reported through the RTA's environmental incident reporting procedure.
Injury and	Fauna will be managed in	To minimise impacts on fauna as a result of being handled by humans and prevent injury to people handling fauna the following procedures will be implemented:
mortality of	accordance with Guide 9: Fauna	Allow fauna to leave an area without intervention as much as possible.
fauna	handling of the Biodiversity Guidelines: Protecting and	Use a licensed fauna ecologist or wildlife carer with specific animal handling experience to carry out any fauna handling.
	managing biodiversity on RTA projects (NSW Roads and Traffic	Contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals.
	Authority, 2011).	The contact details of the animal rescue agency/wildlife care group or vet should be provided to the site manager, displayed in the site office and included in the CEMP or other relevant management plans for the project.
		Include the procedures to follow if fauna is found or injured on site in project inductions.
		Follow the best practice methods outlined below in circumstances where the handling of fauna is completely unavoidable:
		a. Contact the nominated animal rescue agency/wildlife care group or vet if an animal is injured.
		b. Keep the injured animal in a box in a quiet, warm, dark place until transferred. If an injured animal is dangerous, carefully place a box over the top of it if possible, or section off the area and wait for an experienced and licensed fauna ecologist or wildlife carer to arrive.
		c. Never deliberately kill a snake as all snakes are protected under the National Parks and Wildlife Act 1974 (NSW). If a snake must be handled to remove the risk of harm to the snake or people then handling should only be done by a licensed fauna ecologist or wildlife carer with skills and experience in snake





Impact	Proposed mitigation measure	Description of actions
Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	handling. d. Follow the Hygiene Protocol for the control of disease in frogs for all frog handling. e. Fish should only be handled by experienced aquatic ecologists. f. Wear gloves when handling mammals (including bats) to protect against bites and scratches. If handling bats, the handler must be vaccinated against the Australian Bat Lyssavirus (ABI) which is a form of rabies. g. Release fauna into pre-determined habitat identified for fauna release. h. Release fauna into similar habitats, as near as possible to their capture location. Release nocturnal fauna at dusk. To prevent or minimise the spread of weed species on site and during roadside maintenance the following procedure will be followed: Use an ecologist or person trained in weed management and identification to undertake a site weed assessment to identify and describe or map weed infested areas within the site and adjacent areas. Identify and manage any Weeds of National Significance (WoNS), National Environmental Alert Weeds and/or noxious weeds located within the site or adjacent areas in consultation with the weeds officer at the relevant local council. Identify surrounding land uses and consult with surrounding landholders where required. Develop a weed management plan for the site. The application of herbicide should ensure the safety of users and other people, and minimise risks to the broader environment. Roads and Maritime has obligations to notify the community of proposed pesticide use (including herbicides) in accordance with the NSW Pesticides Regulation 2009. Map and mark areas that are infested with weeds as an exclusion zone with fencing and signage to limit access by personnel and vehicles. Use mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance (eg glyphosate resistance). Mowislash areas infested with weeds before they seed. This may reduce the propagation of new plants. Program works from least to most weed infested areas. Clea
Invasion and spread of pests	Pest species will be managed within the project site according to the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011).	All weed plant material and topsoil containing weed plant material should be disposed of to an appropriate waste management facility. Roads and Maritime will work with the Greater Sydney Local Land Services to determine if the site is suitable for pre-clearing pest control.





Impact	Pathogens will be managed in accordance with <i>Guide</i> 7. Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic Authority, 2011). Where pathogens are known or suspected to occur on or adjacent to projects and during maintenance works the following procedure will be implemented: songoing throughout the period in which works are being carried out. Check the department of Primary industries (DPI) website (www.industry.nsw.gov.au) for the most up-to-date hygiene protocols for each pathogen and for the most recent locations of contamination. Ensure the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors eg during inductions and toolbox talks. Advice from DPI or the Office of Environment and Heritage (OEH) regarding the most practical hygiene management measures may be required if pathogens present. Programming of works should move from uninfected areas to infected areas. Provide vehicle and boot wash down facilities. Testing from a national Association of Testing Authorities (nATA) approved laboratory may be required to confirm the presence of pathogens in the soil and/or water. Set up exclusion zones with fencing and signage to restrict access into contaminated areas. Restrict vehicles to designated tracks, trails and parking areas. Street lighting would be designed to ensure relevant guidelines are adhered to. Where installed, nest boxes will be orientated so they are not facing lights from adjacent development.	
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 7: Pathogen management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (NSW Roads and Traffic	 Pathogen management is ongoing throughout the period in which works are being carried out. Check the department of Primary industries (DPI) website (www.industry.nsw.gov.au) for the most up-to-date hygiene protocols for each pathogen and for the most recent locations of contamination. Ensure the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors eg during inductions and toolbox talks. Advice from DPI or the Office of Environment and Heritage (OEH) regarding the most practical hygiene management measures may be required if pathogens are present. Programming of works should move from uninfected areas to infected areas. Ensure vehicles and footwear are free of soil before entering or exiting the site (ie directed to wash down area before entering or exiting the site). Provide vehicle and boot wash down facilities. Testing from a national Association of Testing Authorities (nATA) approved laboratory may be required to confirm the presence of pathogens in the soil and/or water. Set up exclusion zones with fencing and signage to restrict access into contaminated areas.
Noise, light and vibration	impacts will be minimised	road and paths. Street lighting would be designed to ensure relevant guidelines are adhered to.



4.9 Impacts to threatened species in the extension of Vineyard Road

Submission number(s)

27

Issue description

The respondent raised the following issues:

- Concern regarding the impact if the Vineyard Road extension on an east-west terrestrial corridor, which has been identified to contain threatened plants including *Pultenaea parviflora* and *Marsdenia viridiflora*
- Request that further detail on the timing of 'ground truthing' in the area is provided
- Loss of identified threatened plants must be offset by the permanent conservation of a nearby population.

An additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was undertaken in an expanded study area around the Vineyard Road extension on the 7th August 2017. This area was not able to be accessed during the fieldwork undertaken for the original assessment. An area of habitat of approximately 4.7 hectares was surveyed by an experienced botanist following the methods described in the *NSW Guide to Surveying Threatened Plants* (Office of Environment and Heritage, 2016). Traverses of this habitat were undertaken over a three-hour period for a distance of 3.131 kilometres (3,131 metres) (see Figure 3.1). The survey located a further six *Pultenaea parviflora* plants (two of which were in the development footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* plants were recorded during the survey.

This data has been used in the amended assessment of impacts and calculation of offset requirement for the project (refer to Section 3).

Offsetting is also discussed in Section 4.2.

4.10 Impacts to the *Marsdenia viridiflora* subps. Viridiflora endangered population

Submission number(s)

29

Issue description

Further justification is needed regarding the impact of the project on *Marsdenia viridiflora* subsp. *viridiflora* in the context of "red flag" status.

The Marsdenia viridiflora subsp. viridiflora population has been identified in the BAR as a species credit species that cannot withstand further loss which has informed the assessment. The BAR has been undertaken in accordance with the FBA, and a BOS has been developed for the project. The BOS does not refer to the 'Red Flag' status of any species. 'Red Flag' areas are a concept from the BioBanking Assessment Methodology and do not apply to Major Projects assessed under the FBA.





4.11 Updating the Plant Community Type (PCT) selection and benchmarks for the assessment of Vegetation Zone 8 plot data

Submission number(s)

35

Issue description

OEH requests information supporting the view that PCT 850 is the likely original PCT. Following this, OEH can advise on the next steps with respect to PCT selection and benchmarks for the assessment of Vegetation Zone 8 plot data.

Vegetation Zone 8 was originally described in the BAR and entered into the Credit Calculator as Plant Community Type (PCT) 806 (HN627) 'Derived grasslands on shale hills of the Cumberland Plain (50-300m asl)'. This vegetation is derived native grassland that has resulted from the removal of the original tree canopy and shrub layer. In some parts the shrub layer is regenerating although no tree canopy remains. This native grassland vegetation is considered most likely derived from a former cover of PCT 850 (HN529) 'Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion' given the landscape position, location adjacent to PCT 850, and species composition of the ground layer.

In accordance with the FBA, an assessor must only identify PCTs on the development site that are described in the VIS Classification Database as derived or secondary vegetation communities where the assessor cannot determine the original PCT (FBA, s.5.2.1.11). As such Vegetation Zone 8 has been reassigned to PCT 850, as reflected in the revised assessment included in this Memorandum (refer to Section 3).

4.12 Updating benchmarks for 'Number of Trees with Hollows' and 'Fallen Logs' for HN528 and HN529

Submission number(s)

35

Issue description

The respondent raised the following issues:

Benchmarks for HN528 and HN529 should be 1 and 50 m for 'Number of Trees with Hollows' and 'Fallen Logs' respectively. These benchmarks should be updated manually in the Credit Calculator with a note made in the BAR. It should be noted these updates are based on OEH advice and do not constitute the use of 'More Appropriate Local Data'.

For HN528 and HN529, the benchmark data for the site attributes 'Number of Trees with Hollows' and 'Fallen Logs' do not have any values assigned to them in the credit calculator. The OEH have advised that these value should be 1 and 50 m for 'Number of Trees with Hollows' and 'Fallen Logs' respectively.

These benchmarks have been manually updated in the credit calculator and the data has been used in the revised assessment included in this Memorandum (refer to Section 3 of this Memorandum).



4.13 Correcting inconsistencies with plot/transect data entered in the Credit Calculator when compared to the values provided in Appendix A of the BAR

Submission number(s)

35

Issue description

The respondent raised the following issues:

- There are inconsistencies between the plot/transect data in the Credit Calculator and Appendix A
 of the BAR.
- OEH recommends a copy of all raw field data sheets be provided to OEH for review and to determine whether the values in Appendix A (or the Credit Calculator) are correct.

There were some inconsistencies identified with the plot/transect data entered in the Credit Calculator when compared to the values provided in Appendix A of the BAR. All data entered into the Credit Calculator has been checked and amended as necessary.

All data entered into the credit calculator has been checked for consistency with the field sheets. A copy of all raw field data sheets is provided with this memorandum (refer to Appendix A).

4.14 Removing reference to Plot 31 from the BAR as it was not used in the assessment

Submission number(s)

35

Issue description

OEH recommends that the Credit Calculator be corrected to include Plot 31 or 'Grey Box- Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion - Moderate/Good' or reference be removed from the BAR.

Plot 31 was an original Rapid Biodiversity Assessment plot undertaken on the roadside along Willowdene Avenue. This plot was not used in the revised assessment as presented in this Memorandum as it was located outside of the revised construction footprint and landscape assessment area.

4.15 Updating the legend of Figure 3.1 in the BAR to remove errors

Submission number(s)

35

Issue description

OEH recommends updating the legend of Figure 3.1 in the BAR to remove errors.

The legend of Figure 3.1 (Vegetation survey locations) in the BAR incorrectly refers to HN528 as being in 'low' condition. There also seems to be some duplication of PCT names in the legend of Figure 3.1.

The legend of Figure 3.1 has been amended to show the correct classification of HN528 as Moderate/Good_Poor and the duplication with labelling has been removed. Refer to Appendix B.



4.16 Updating Table 6.1 of the BAR to include the area of impact (4.68 ha) for vegetation zone 4 (PCT 849)

Submission number(s)

35

Issue description

OEH recommends that Table 6.1 of the BAR be updated to include the area of impact (4.68 ha) for vegetation zone 4 (PCT 849).

The impacts to Vegetation Zone 4 have been included in Table 3.3 above to provide an overview of all impacts to native vegetation. Due to the manual override of the 'Number of Trees with Hollows' and 'Fallen Logs' for HN 528, Vegetation Zone 4 now has a site score of 29.17 and requires an offset to be calculated.

4.17 Species credit species *Pultenaea pedunculata* (Matted Bush-pea) was predicted by the Credit Calculator for survey but has not been included in the BAR

Submission number(s)

35

Issue description

OEH recommends that Pultenaea pedunculata (Matted Bush-pea) be included in the BAR.

Species credit species *Pultenaea pedunculata* (Matted Bush-pea) was predicted by Credit Calculator for survey but has not been included in the BAR.

Pultenaea pedunculata has recently been found in Mulgoa Nature Reserve and there is a record of Pultenaea pedunculata from October 2015 approximately 10-11km south of the study area made from Wivenhoe Conservation area at Cobbity. Prior to this record, the nearest record of Pultenaea pedunculata was from Prestons from 1998, located about about 16km to the south east of the study area.

The habitat assessment table for the BAR was created in September 2015 before the bulk of the ecological surveys were undertaken from 2/9/2015 to 10/9/2015. The survey was based off the survey matrix generated by the Credit Calculator in September 2015. *Pultenaea pedunculata* was not identified as a species for targeted survey in the original survey matrix so this species was not targeted in the detailed field surveys for the BAR. The Credit Calculator is linked to a threatened species database that is constantly being updated. It is likely that the distribution data for *Pultenaea pedunculata* was edited causing it to appear in the Credit Calculator after the September 2015 surveys had been completed.

Despite its omission from the credit calculator at the time, the targeted surveys for other threatened plants (including *Pultenaea parviflora*) undertaken for the BAR were undertaken from September to February within the flowering period and optimal survey period for *Pultenaea pedunculata*. *Pultenaea pedunculata* was not found on site during the surveys but there is a high likelihood that *Pultenaea pedunculata* would have been encountered during the surveys if the species was present in the habitat at that time.

A summary of the assessment for *Pultenaea pedunculata* is provided in Table 4.2.





Table 4.2 : Habitat assessment for Pultenaea pedunculata

Common name (Scientific name)	TSC Act	EPBC Act	Habitat	Minimum survey requirements (Office of Environment and Heritage 2016)	Survey completed
Matted Bush-Pea (Pultenaea pedunculata)	E		In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present. Associated habitat includes PCT 849 and PCT 850 which are present on site.	The recommended approach is the parallel field traverse (i.e. parallel Transects) as used by Cropper (1993). As a sub-shrub the maximum distance between transects in open vegetation is 15 m, in dense vegetation is 10 m. In open vegetation, field traverse length is 0.63 km per hectare of potential habitat in open vegetation. With about 60 hectares of potential habitat in the study area, survey time is at least 9.38 hours in open vegetation.	Particular survey effort was expended in the in the vegetation on the Defence Establishment Orchard Hills. Surveys targeted PCT 849 and PCT 850. Derived grasslands were also surveyed. Parallel field traverses undertaken by two observers were used to survey for this species in areas which appeared to provide suitable habitat. Surveys for this species can be undertaken year round. The field surveys were undertaken over a period of 11 days from 2 September 2015 to 4 February 2016 (not inclusive). Floristic plots were undertaken in PCT 849 (14 plots), PCT 850 (16 plots) and PCT 806 (4 plots) which lasted on average 1 hour each with two observers. This equates to 68 person hours of detailed floristic survey in potential habitat. Each floristic plot was accompanied by a traverse throughout the adjacent habitat lasting a minimum of 0.5 hours' duration undertaken by two observers. This resulted in an additional 34 person hours of traverse-based survey in the habitat. In total, 102 person hours were expended on survey within the study area in 2015. The Vineyard Road extension on the 7th August 2017. While this survey was undertaken slightly before the September survey period, most species were flowering earlier than usual in August 2017. This species is known to flower from August to December. This area was not able to be accessed during the fieldwork undertaken for the original assessment. An area of habitat of approximately 4.7 hectares was surveyed. Traverses of this habitat were undertaken over a three-hour period for a distance of 3.131 kilometres (3,131 metres).



4.18 Updating the habitat assessment table for threatened fauna species in Appendix B to include the number of Atlas records

Submission number(s)

35

Issue description

OEH recommends that the habitat assessment table for threatened fauna species in Appendix B be updated to include the number of Atlas records in the 'Number or records' column.

The habitat assessment table for threatened fauna species in the BAR did not include the number of Atlas records in the 'Number or records' column.

This information is now included in Appendix C.

4.19 Updating the BAR to refer to the Grey-headed Flying-fox as an Ecosystem credits species and a Species Credit Species

Submission number(s)

35

Issue description

OEH requested that the BAR and BOS be updated to clarify that the Grey-headed Flying-fox is both an ecosystem and species credit species, no impact to camps (species credits) have been identified and no species credits are required.

The BAR and BOS refer to the Grey-headed Flying-fox as an ecosystem credit species. It is, however, both an ecosystem and species credit species. The Grey-headed Flying-fox is a dual credit species because foraging habitat is broad ranging but breeding camps are localised and, if impacted, must be offset by protecting and enhancing another breeding camp.

As no breeding camps would be impacted by the project and only foraging habitat was present, the Grey-headed Flying-fox was only identified as an ecosystem credit species. No species credits are required for the Grey-headed Flying-fox.

4.20 Revision of the Percentage Vegetation Cover calculations and associated GIS shapefile

Submission number(s)

35

Issue description

The respondents raised the following issues:

- It is unclear why areas of native vegetation identified as moderate to good condition have been excluded from GIS shapefile (CD_TNREISVegetationZonesJacobs_20170110_V03) for native vegetation.
- OEH recommends justification for the exclusion of these areas in accordance with the FBA, or the GIS shapefile be amended and appropriate recalculations be made to address the missing areas in the revised BAR.

The revised percent extent of native vegetation cover in the landscape and area to perimeter ratio calculations were undertaken using ESRI ArcGIS software. To undertake the assessment of landscape values, a 550 metre buffer was established from the outside edge of the construction





footprint as while this is a linear road project there are some detached construction compounds which made using a buffer from the centreline impossible.

Once the native vegetation cover had been digitised, the extent of native vegetation in the landscape before and after the development was recalculated (see Table 4.3). Current percent native vegetation cover is estimated at 12.26 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). After the development, percent native vegetation cover is estimated at 11.13 per cent (score 2.5 as outlined in Table 16 of Appendix 5 of the FBA). The score for percent native vegetation cover is 0.

Table 4.3: Percent native vegetation cover in the landscape before and after development

Assessment	Before de	velopment	After dev	Score for %	
buffer	Native vegetation cover (ha)	Cover (%)	Native vegetation cover (ha)	Cover (%)	native vegetation cover
550m from the edge of the construction footprint	326.51	12.26	296.25	11.13	0

4.21 Avoidance of impacts

Submission number(s)

35

Issue description

OEH recommends that the BAR be updated to include adequate detail regarding the measures taken to avoid impacts to Cumberland Plain Woodland and River-flat Eucalypt Forest as well as areas of habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population, *Pultenaea parviflora*, Regent Honeyeater and Cumberland Plain Land Snail in accordance with the FBA.

The BAR details the measures taken to avoid impacts to Cumberland Plain Woodland and River-flat Eucalypt Forest as well as areas of habitat for the *Marsdenia viridiflora* subsp. *viridiflora* endangered population, *Pultenaea parviflora*, Regent Honeyeater and Cumberland Plain Land Snail.

Section 8.3.1.3 of the FBA states that the proponent must seek to avoid the direct impacts of the Major Project on all biodiversity values at the development site including impacts on:

- a) endangered ecological communities (EECs) and critically endangered ecological communities (CEECs), and
- b) PCTs that contain threatened species habitat, and
- c) areas that contain habitat for vulnerable, endangered or critically endangered threatened species or populations, as determined in accordance with Step 5 in Section 6.5.

Section 7.1 of the BAR outlines the measures that were taken to avoid impacts to EECs, CEECs, PCTs that contain threatened species habitat, and areas that contain habitat for vulnerable, endangered or critically endangered threatened species or populations. Chapter 4 of the EIS describes the alternatives to the project that were considered as part of the project development process and explains how and why the project was selected as the preferred option. Chapter 4 of the EIS also outlines how particular elements of the project have been refined.

All of the *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* records within the study area were made from habitat directly adjacent to the existing Northern Road and Kings Hill Road within Segment 1 that would be subject to road widening. There were no options for avoiding impacts to these species, as the existing road would be widened in this area instead of realigning the road.





Avoiding impacts to these species would require realignment of the existing Northern Road which would have greater impact than the widening.

For Segment 2 of the project, a Rapid Biodiversity Assessment (RBA) was undertaken in the area of the four short listed options under consideration. The aim of the RBA was to make an initial preliminary assessment of significant ecological values potentially affected by the Segment 2 short listed options to inform decision-making for a preferred route and thus inform the concept design and Environmental Assessment. The RBA involved desktop analysis and field surveys and included plotbased vegetation condition assessment, fauna habitat assessment and targeted searches for threatened species. An analysis of the biodiversity data was undertaken with reference to the short listed route options proposed (i.e. east vs west options). The analysis was undertaken within a GIS by overlaying the short listed options onto the vegetation mapping layer that showed TECs and known or potential habitat for threatened species. Potential worst-case impacts were quantified based on a 100metre-wide corridor and considered impacts to TECs, further fragmentation of woodland, and the direct loss of vegetation / habitat. Impacts to TECs (i.e. Cumberland Plain Woodland and River-flat Eucalypt Forest) were estimated to be greater for the eastern option. The total loss of vegetation and habitat (including habitat for Regent Honeyeater, Cumberland Plain Land Snail) would be greatest with the eastern option. The Western Option was chosen for the project as there were predicted to be lesser impact to TECs and habitats.

4.21.1 Avoidance with the detailed design

The impact calculations as part of the BAR were based on a worst case scenario involving clearing of all vegetation and habitat within the construction boundary based on the EIS design. The detailed design shows the revised areas where construction will take place and where the final operational footprint would be positioned.

The detailed design has resulted in the following reduction of impact:

- Impact to native vegetation has decreased by 3.50 hectares over the original design.
- Impact to 4 *Marsdenia viridiflora* subsp. *viridiflora* plants along the DEOH fence has been avoided as this area won't be used for construction or operation.
- The impact to *Pultenaea parviflora* has increased to six plants after the additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was undertaken in an expanded study area around the Vineyard Road extension on the 7th August 2017. Six *Pultenaea parviflora* plants were found in the area of the Vineyard Road extension of which four would be avoided as they are outside of the construction footprint.
- The impact to habitat for the EPBC Act listed species' Grey-headed Flying-fox, Regent Honeyeater, Swift Parrot and Large-eared Pied Bat has been reduced by 2.15 hectares.
- The impact to the TSC Act listed critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion ecological community has reduced by 2.96 hectares.
- The impact to the TSC Act listed River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community has been reduced by 0.43 hectares
- The impact to the EPBC Act listed critically endangered Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community has been reduced by 1.29 hectares.



4.22 Additional offsets for impacts to Cumberland Plain Woodland

Submission number(s)

27, 35

Issue description

- A respondent commented on the ineffectiveness of BioBanking as the only vehicle for offsetting losses
- OEH considers the loss of approximately 29.15 ha of moderate/good condition Cumberland Plain Woodland (including 1.25 ha in high condition), and associated indirect impacts resulting from fragmentation, to be unacceptable without the implementation of additional offsets (above those already calculated), supplementary measures or other actions.

Roads and Maritime are currently working in consultation with OEH to address this matter and determine the quantum of offsets or supplementary measures that are required. Supplementary measures at a landscape scale are being investigated in conjunction with the OEH.

Following recent discussions with Roads and Maritime, DoEE and OEH, it was decided that an additional supplementary measures package would be developed in consultation with OEH and DoEE with a focus on landscape scale measures within the local area. The package may include measures such as weed eradication programs within Cumberland Plain Woodland.

4.23 Measures to secure offsets

Submission number(s)

27, 35

Issue description

- Requests that Roads and Maritime procure land to be managed for conservation
- OEH recommends further information be provided detailing the measures that will be taken to secure the required credits for the Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora*.

The BOS identifies that no credits are available to meet the offset requirements for the Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora* - endangered population, but that land may be available (for future creation of credits) via an expression of interest on the BioBanking Public Register.

If credits for Regent Honeyeater and *Marsdenia viridiflora* subsp. *viridiflora* (or any other required credit) are unavailable for purchase on the market, the first step is that Roads and Maritime would work with public and private landholders to enter a BioBanking Agreement on their land and then purchase the credits issued.

4.24 Clearing of vegetation within the DEOH fence line for an access track

Submission number(s)

35

Issue description

OEH is aware that the Department of Defence will need to clear vegetation to provide vehicle access along the inside of the new fenceline in some parts of the project. OEH considers any clearing of vegetation required a consequence of the project should be addressed in the assessment of impacts. It is unclear if this has occurred. If not, an adjustment to the calculations of offset credits will be necessary prior to the approval of the BOS.





The potential loss of vegetation and habitat associated with the project is summarised in Table 3.3. The construction footprint would impact on up to about 40.79 hectares of native vegetation (see Table 3.3). This is a decrease of 3.50 hectares over the original design (the original impact to all Vegetation Zones was 44.29 hectares). These impacts have been quantified based on the development footprint after detailed design and take into consideration potential temporary disturbance during construction including compound sites and upgrading of drainage (refer to Section 3).

This revised design and associated re-calculation also takes into account the clearing that the Department of Defence will need to clear vegetation to provide vehicle access along the inside of the new fence line in some parts of the project.

4.25 Surveys constrained by property access

Submission number(s)

35

Issue description

The respondent noted that threatened species surveys for areas which were constrained by property access would need to be completed (and new calculations performed, if necessary) prior to finalisation of the BOS.

An additional targeted survey for *Pultenaea parviflora* and *Marsdenia viridiflora* subsp. *viridiflora* was undertaken in an expanded study area around the Vineyard Road extension on the 7th August 2017. This area was not able to be accessed during the fieldwork undertaken for the original assessment. An area of habitat of approximately 4.7 hectares was surveyed by an experienced botanist following the methods described in the *NSW Guide to Surveying Threatened Plants* (Office of Environment and Heritage, 2016). Traverses of this habitat were undertaken over a three-hour period for a distance of 3.131 kilometres (3,131 metres) (see Figure 3.1).

The survey located a further six *Pultenaea parviflora* plants (two of which were in the development footprint, and four outside of the footprint). No additional *Marsdenia viridiflora* subsp. *viridiflora* were recorded. The additional impact to *Pultenaea parviflora* has been included in the reassessment of impacts.

4.26 Watercourse crossings over key fish habitat

Submission number(s)

38

Issue description

DPI raised the following issues:

- Recommends that the design of any upgraded and/or new culverts incorporates naturalised bases and a combination of elevated "dry" cells to encourage terrestrial movement, and recessed "wet" cells to facilitate fish passage
- Recommends that the EIS include a mitigation measure and condition of approval to outline that all works on waterfront land would be carried out in accordance with the DPI Water Guidelines.

Watercourse crossings over key fish habitat (as mapped by DPI Fisheries) should be designed and constructed to maintain fish passage, in accordance with the DPI Fisheries Policy and guidelines for fish habitat conservation and management.

Five waterway crossings in the study area, including the revised footprint, have been identified as Type 1 – Key Fish Habitats (DPI 2013), as they contain a combination of native aquatic plants and/or woody snags. These watercourses are impacted, intermittently flowing waterways which are also





identified as Class 2 – Moderate Key Fish Habitat (Fairfull and Witheridge, 2003) due to the presence of limited in stream aquatic vegetation.

All watercourse crossings are to be designed in accordance with Policy and Guidelines for Fish Friendly Waterway Crossings and Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge 2003).

4.27 A Vegetation Management Plan should be developed in consultation with DPI Water.

Submission number(s)

38

Issue description

- DPI requested that a Vegetation Management Plan be developed in consultation with DPI Water
- DPI require the identification and mapping of riparian corridors and associated setbacks in accordance with the DPI Water *Guidelines for controlled activities on waterfront land* (2012), and measures for rehabilitation and/or riparian offsets as required.

A new mitigation measure would be added to the revised environmental management measures for the project as follows (refer to Section 5):

A Vegetation Management Plan would be prepared in consultation with DPI Water prior to construction commencing, including details on:

- The riparian corridor widths along the watercourses in proximity to the project (so that these areas can be avoided where possible)
- Riparian areas potentially temporarily or permanently impacted by the project
- The rehabilitation of riparian areas temporarily impacted
- Riparian offsets as required in accordance with DPI guidelines for the riparian areas permanently impacted.

The Vegetation Management Plan will include a scaled map should be provided which identifies:

- The riparian corridor widths in proximity to the project so that these areas can be avoided where possible
- Riparian areas potentially temporarily or permanently impacted by the project
- Rehabilitation and/or riparian offset areas as required. Where the project encroaches on the outer riparian corridor (outer 50% of the vegetated riparian zone) the activity will be offset by connecting an equivalent area to the riparian corridor to ensure the average width of the vegetated riparian zone can be achieved over the length of the watercourse.

4.28 Macroinvertebrate survey monitoring

Submission number(s)

38

Issue description

DPI requested clarification regarding why the EIS does not propose macroinvertebrate survey monitoring along the tributaries of Blaxland Creek on the DEOH lands (Commonwealth land), Badgerys Creek, and Cosgrove Creek.

Site inspections undertaken for the aquatic assessment were visual only, no fish surveys or macroinvertebrate surveys were undertaken. Due to the low likelihood of threatened fish species





being present, limited water availability and limited aquatic habitat, fish and macroinvertebrate surveys were deemed unnecessary at the EIS stage.

4.29 Revegetation of riparian areas

Submission number(s)

11, 29, 38

Issue description

The respondents raised the following issues:

- The Surveyors Creek Corridor should be capped with suitable Cumberland Plain Woodland substrate via soil translocation at the conclusion of earthworks
- The site should be restored to BAM/FBA-criteria functional Cumberland Plain Woodland, preferably through 'Grassy Groundcover' or similar techniques
- Penrith City Council commented that mitigation measures are not identified in detail. Three additional mitigation measures regarding seeding and reuse of topsoil were identified as follows:
- 1. Use of local provenance seed in all plantings.
- 2. All areas that are to be grassed are to use direct seeding of native grasses and herbs as per Greening Australia's Grassy Groundcover Restoration.
- 3. Reuse of topsoil from high quality bushland patches in vegetated fauna crossings and other areas to be revegetated.
- DPI recommends the following:
- 1. Topsoil (and seedbank) should be removed from native vegetation areas that are to be permanently cleared and relocated and used in the revegetation of riparian areas
- 2. Native plants should be transplanted from the areas to be permanently cleared to riparian land that is to be revegetated.

An urban design and landscape concept has been developed for the project as documented in the EIS, based on the project objectives and principles, to achieve an integrated design for the project. It incorporates the urban and landscape design concept plans for the project and a landscape planting concept including recommended species. As identified in the EIS, this would be adopted and further developed during detailed design and implemented as part of the Urban Design Landscape Plan (UDLP) for the project which is currently ongoing. There may be scope to include transplanting native species from areas to be cleared into revegetation areas but this would depend on the type of species being removed and the likely success of transplanting.

Plants to be used in revegetation would be sourced from local provenance seed where available and seed collection would be undertaken before clearing. There may be the opportunity for reuse of topsoil from cleared areas depending on the quality of the vegetation to be removed as the topsoil could contain a significant load of seed from exotic species and may not be suitable for reuse. Roads and Maritime would consider reuse of topsoil as part of the Urban Design Landscape Plan (UDLP) for the project.





5 Mitigation measures

Additional mitigation measures have been developed in response to the assessment of design refinements and in response to submissions. These are included in Table 5.1 and would be incorporated into the revised environmental management measures for the project.

Table 5.1: Revised environmental management measures - Biodiversity

Impact	Environmental management measures	Responsibility	Timing
Impacts to riparian corridors	Vegetation Management Plan would be prepared in consultation with DPI Water prior to construction commencing, including details on: The riparian corridor widths along the watercourses in proximity to the project (so that these areas can be avoided where possible) Riparian areas potentially temporarily or permanently impacted by the project The rehabilitation of riparian areas temporarily impacted Riparian offsets for the riparian areas permanently impacted. The Vegetation Management Plan would include a scaled map should be provided which identifies: The riparian corridor widths in proximity to the project so that these areas can be avoided where possible Riparian areas potentially temporarily or permanently impacted by the project	Construction contractor	Prior to construction
Revegetation	Riparian offset areas. Roads and Maritime would consider reuse	Roads and Maritime	Prior to construction
Revegetation	of topsoil as part of the Urban Design Landscape Plan (UDLP) for the project.	TOdus and Mantime	Thor to construction
Revegetation	Roads and Maritime would consider transplanting native species from areas to be cleared into revegetation areas, depending on the type of species being removed and the likely success of transplanting. Plants to be used in revegetation would be sourced from local provenance seed where appropriate and available, and associated seed collection would be undertaken prior to clearing.	Roads and Maritime	Prior to construction



Memorandum

TECHNICAL MEMO – Biodiversity

Impact	Environmental management measures	Responsibility	Timing
Impacts to Marsdenia viridiflora subsp. viridiflora and Pultenaea parviflora	Exclusion zones would be established around Marsdenia viridiflora subsp. viridiflora plants proposed to be retained in the area of the DEOH fence between Kings Hill Road and Longview Road, in accordance with standard Roads and Maritime procedure. Exclusion zones would be established around the four Pultenaea parviflora plants to be retained in the area of the Vineyard Road extension in accordance with Roads and Maritime procedure. Roads and Maritime will investigate options for salvage of genetic material and/or translocation of Marsdenia viridiflora subsp. viridiflora and Pultenaea parviflora plants that are to be impacted prior to construction.	Construction contractor	Construction





6 Conclusions and recommendations

6.1 Design refinements

There have been a number of design refinements during detailed design of the project, as outlined in Chapter 5 of the Submissions and Preferred Infrastructure Report. These design refinements have resulted in changes to the construction and operational footprints which have affected the calculated impacts of the project as assessed and presented within the Biodiversity Assessment Report (BAR) and subsequently presented within the environmental impact statement (EIS).

This Memorandum has provided a revised assessment of these impacts under the Framework for Biodiversity Assessment (FBA) including recalculation of landscape values, impacts to native vegetation (including threatened ecological communities), impacts to threatened species, and impacts to Matters of National Environmental Significance (MNES).

Overall, the design refinements during detailed design would result in a reduction of impacts to biodiversity and have resulted in further avoidance of impacts to ecological values. Indeed, the direct impact to threatened ecological communities and threatened species would also be reduced from those presented in the BAR assuming the implementation of all relevant revised environmental management measures for the project.

6.2 Issues raised by Stakeholders and the community

A number of submissions were received from stakeholder and the community during the EIS exhibition, including issues related to biodiversity.

The main comments made by community respondents related to:

- Dewatering and backfilling of dams and impacts to biodiversity
- Impacts on wildlife corridors and habitat connectivity
- Impacts to large remnant trees
- Impacts due to landscaping and lighting
- Impacts to Cumberland Plain Woodland
- The details of mitigation measures such as underpasses and staging of works
- Impacts to threatened species with the extension of Vineyard Road.

Government agency submissions were also received from the Office of Environment and Heritage (OEH) and the Department of Primary Industries (DPI) regarding a range of biodiversity related issues.

These have been addressed and responded to within this Memorandum, including further impact assessment and revised environmental management measures where required. These responses would be incorporated into the relevant sections of the Submissions and Preferred Infrastructure Report.



Memorandum

TECHNICAL MEMO – Biodiversity

Appendix A – Raw field data sheets

MNSTO mod/and **JACOBS**

BioBanking Field Sheet Enteredy Allowial - Good

	Survey Sit	e Form - BioBank			Site ID: P1	2-2	Vegetation zone:	CRFF	
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Tree height (clino) level ground or top of slope = distance from tree x (top16 + bottom16) Tree height (clino) from bottom of alope = distance from tree x (top16 + bottom16) Pefinitions ord = dominant; c = ca-dominant; ii = subdominant; a = associated statimated cover = isolated (10.2-2%); v = very sparse (22-50%); ii = sparse (20-50%); ii = mid dense (50-80%); d = dense (80-100%) Valver & Hopkins height classes: 1-3m = dwarf; 3-6m = low, 6-12m = mid-high; 12-20m = tait; 20-35m = very talt; >35m = extremely talt Valver & Hopkins height classes: 1-3m = dwarf; 3-6m = low, 6-12m = mid-high; 12-20m = tait; 20-35m = very talt; >35m = extremely talt Office Transect	S2								
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NSH Crown cover: <0.2% = isolated trees or clumps; 0.2-20% = open woodland; 20-50% = woodland; 50-80% = open forest; 80-100% = classed forest 50m Transect		Tree height (clino) from d = dominant; c = co-c ir I = isofated (0.2-25%); s	m bottom of slo dominant; s = s v = very sparse	pe = distance fr ubdominant; a = (2-20%), s = sp	om tree x (top% - bo associated arse (20-50%); m =	otiom%) mid dense (60-80%); d			
Total (hits/50) Canopy % (photos) Midstorey % Exotic % - every 1m record if plant intersects (hits) point Mative grass tally - HH H								sed forest	
Mative grass tally - H	Om Transect	10 Points - Fo	ollage Projectv	e Cover	Ground cover tall	ly sheet, 50 points alor	ng 50m transect		
Total (hits/50) Total (hit	oint.	Canopy % (photos)	Midstorey %	Exotic %	- every 1m recon			707 3	
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Om 30 Sm 40 / / Om O / / Otal (stam / 10) = 2 L S / / Native shrub tally - singer 50 x 20m plot angth of woody debris > 10cm wide & >0.5m long O / Coportion of canopy sp. regeneration			+		reasive other (hert	o, rem, sedge, etc) tail	y -		Total (hits/50)
Sim 4D / Dom O					-				99610
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total (stam / 10) = 2 L · S V // Native shrub tally - angth of woody debris > 10cm wide & >0.5m long O // Exotic tally - H + H + H + H + H + H + H + H + H + H	5m	40	1/	11/	1				0/
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roportion of canopy sp. regeneration O/- Total (hits/50) C/- C/- Total (hits/50)			-		1				
100% THE HELD CONT			k >0.5m long	0					o'r.
lumber of trees with hollows >5cm 2	roportion of ca	anopy sp. regeneration		100%	Exotic telly - H	###	1-111-1		Total (hits/50)
	lumber of tree:	s with hollows >5cm		2			,		40/

ite ID: P12 - Z	Cover	Abund.	Species			Cover	Abund.	1
pecies						00701	/ ibana:	1
Bucalyptus tuckicomis		49	41			-		1
Sidn " drawlifolie	4	-	42				11	1
Microlaen stopoides	- 5	201	43	1/ west	and -	out o	x plat	Ŧ
Bidens gilosa	3	204	or Don	1/ were	2.6	00.0	1 4 00 1	1
Arayla salitura	2	201	45		115		_	1
Oxalis hains	1	1	45 Typl		tals			4
arsim vileae	-	1	" June			11.		-
Platago Jacobaba				sperm	hotage	lley		4
appert gracity	- 1	1	40 Blac	leben	7			4
A'drawdra vegus	- 3	-80k	50 Corns	29 /	1		-	4
theodiais cadrata		1	" Tria	lockin'		_	_	-
Saccio madagoscion	16 -2	105	so Findel					-
travallis andusis	-2	760	so cary	29				-
Eveloton schonie	5 -	1	in Centre	Ma	7.11	1	_	-
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			a Persica		ild Loot			-
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4			74			_	_ ~	-
5			76	-				-11
6			70 678	- Magap	hora	sulveled	ray - Im	-W
7			77	0.				-
8			78			-	_	-
0			79			-		-
0			80	- 5-50	1 1000	-	7920	\dashv
Sp. Richness Native Exotic	Ground lay	yet % 1x1 plots	Q1	Q2	Q3	Q4	Q5	\dashv
ree	Native per	enniel grass	-			-		\dashv
Shrub —	Native oth	Mark Control				-		\dashv
Grass (annual)	Native fort							\dashv
Grass (perennial)	Native shr		1			-	_	\dashv
Other (annual)	Exotic grade	and the same of th				-		\dashv
Other (perennial)	Exotic fort		-		42.		_	\dashv
×1.	Leaf & stic	sk litter	-				_	\dashv
	Rocks		-		-	-		\dashv
Cover abundance scale	Bare grou	nd	1		_	-	_	\dashv
Modified Braun-blanquet 6 scale	Cryptogan	ns	-		1		400	100
	Total		100	10		10	100	100
1 <5% - rare	Plot Distu	bance	//ii		Fire damage:			\dashv
2 <5% - common	Clearing (nc. logging):			Storm damage:			\dashv
3 5 - 25%	Cultivation	(inc. pasture):			Trampling:			-
4 25 - 50%	Soil erosio	on:			Flood damage:			\dashv
5 50 - 75%	Firewood	collection:			Feral herbivores:			\dashv
		SECTION OF THE RESERVE OF THE PERSON OF THE	Other:					

UN 526 Mod/ Wood
BioBanking Field Sheet

Aluvial - Good

Surveyor(s): Surveyor(s): Surve	aypoint ID Coordinates N speed Vegetation ope: Gante, Mo spegraphy: cres sology: basalt, g sil type: sand, lo smnant / Old gro getative Structur Strata E T1 T2 T3 S1 S2 G Tn finitions shinance d = steer & Hopkins h speed vegetation in the service of	oz 86 9 1 2 2 7 on type: od, Steep est, ridge, upper slop granite, congiomera oam, play, ordanic, o owth (uncleared): ure (formation) = (Height interval	Aspect (degree, mid slope, downer, sandstone, si ravel, skeletal, 1	wn slope, gully litstone/mudstr ? lecided?	Photo numbers Photo direction al): Soil depression, wone, shall all unitarity and control of the control of t	N Condition: Altitude: vatercourse, escarpme i, imesione, metamorp intact, topsoil remove nant Layer (EDL) - mor à Dominance	ont, terrace onics, gravel, ? d, fill st blomass =	Low	w
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prography: crest, ridge, upper slope, and slope, down slope, gull, guldensession, watercourse, escarptional, terrace seclogy: basel, guartie, conglomentae, sandstore, statisticnemustations, guidensession, make programs, sandstore, statisticnemustations, guidensession, guidens	pography: cres pology: basall, g ill type: sand, lo emnant / Old gro egetative Structu Strata E T1 T2 T3 S1 S2 G In finitions minance d = stker & Hopkins h	est, ridge, upper slop granite, conglomera oam, eay, ordanic, o owth (uncleared): ure (formation) = 0 Height interval	s, mid slope, dov e, sandstone, si ravel, skeletal, ? Yes I No Jund	wn slope, gully litstone/mudstr ? lecided?	Soli-disturbance: Ecologically Domin	ratercourse, escarpment, imessone, metamorphic intact, topsoil remove mant Layer (EDL) - more & Dominance	ont, terrace onics, gravel, 7 d, fill st blomass =	' 9	
sology basil, grante, congionerate, sandstones, statistone/mutablone, split diseash, timestone, restamosphics, gravel, 7 all types; sand, loam, planic, gravel, shaletal, 7 annual f. Old growth (complicity). Yes J J & Dinderdodd? gestative Shouchure (formaticin). Policy Care S gestative Shouchure (formaticin). Policy Care S Brass Height interval Median Est cover Enologically Dominant Layer (EDL) - most biomass = Care S S T1 S T1 S S T1 T3 S S T1 T1 S S S T1 T1 S S S S S S S S S S S S S	sology: basali, g sil type: sand, lo emnant / Old gro getative Structu Strata E T1 T2 T3 S1 S1 S2 G Tn finitions minance d = timated cover 1 =	granite, conglomera joam, play, organic, g jowth (uncleared): ure (formation) = (Height interval	e, sandstone, si ravel, skeletal, ? Yes / No Jond	itstone/mudstr ? lecided?	Soil-disturbance: Ecologically Domin	n, Imestone, metamorp i intact, topsoil remove mant Layer (EDL) - mor & Dominance	ohics, gravel, ? d, fill st biomass =	'9	
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T3 - SM S1 - SI S2 - SCA - Lypocha - Contact - Conta	T2 T3 S1 S2 G Tn Tn finitions minance d= tmated cover 1 =				eval			'9	
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S1 S2 Tree height (clino) level ground or top of stope = distance from tree x (top% + bottom%) Tree height (clino) from bottom of stope = distance from tree x (top% - bottom%) Tree height (clino) from bottom of stope = distance from tree x (top% - bottom%) finitions sinitions distance d = dominant; c = co-dominant; s = subdominant; a = associated timelad cover 1 = solated (0.2-2%); v = very sparse (2-20%); s = sparse (20-50%); m = mid dense (50-80%); d = dense (80-100%) stars & Hopkins height classes: 1-3m = owarf; 3-6m = low, 6-12m = mid-high; 12-20m = tall; 20-35m = very tall; >35m = extremely tall BH Crown cover: <0.2% = labolated rese or clumps; 0.2-20% = open woodland; 50-80% = woodland; 50-80% = copen forest; 80-100% = closed forest m Transect	S1 S2 G Tn Tn finitions minance d = timated cover 1 =	1 · 8m			حد دها	AND THE			
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Tree height (clino) fevel ground or top of stope = distance from tree x (top% - bottom%) Tree height (clino) from bottom of stope = distance from tree x (top% - bottom%) efinitions printance d = dominant; c = co-dominant; s = subdominant; a = associated situated cover 1 = isolated (0.2-2%); v = very sparse (2-20%); s = sparse (20-50%); m = mid dense (50-80%); d = dense (80-100%) allows & Hopkins height classes: 1-3m = dwarf; 3-8m = low, 6-12m = mid-high; 12-20m = tail; 20-35m = very tail; >35m = extremely tail 8H Crown cover: <0.2% = isolated trees or clumps; 0.2-20% = open woodland; 20-50% = woodland; 50-80% = open forest; 80-100% = closed forest Om Transect 10 Points - Foliage Projective Cover Ground cover tally sheet, 50 points along 50m transect om Canopy % (photos) Midstorey % Exotic % - every 1m record if plant intersects (hits) point Native grass tally - Total (hits/50) om 2 \$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	The finitions and the finitions are the finitions and the finition of the finite finite for the finite finite for the finite finite finite for the finite finite for the finite finite finite for the finite	12			Couldt	/ \	Bidus"	٧	
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######################################	finitions minance d = limeted cover 1 = after & Hopkins h	ree height (clino) leve	ground or top of	slope = distan	ce from tree x (lop%	4 bottom%)			
Similarios d = dominant; c = co-dominant; s = subdominant; a = associated	minance d = timelad cover 1 = aker & Hopkins h	ree height (clino) from	bottom of slope	= distance fro	m tree x (top% - bot)	tom%)			
Similar Simi	limated cover 1 = alos: & Hopkins h								
Total (hits/50) Native other (herb, fern, sedge, etc) tally - HH HH HH Total (hits/50)	akos & Hopkins h	= dominant; c = co-d	ominant, s = sub	dominant; a =	associated				
### Crown cover: <0.2% = Isolated tress or clumps; 0.2-20% = open woodland; 20-50% = woodland; 50-80% = open forest; 80-100% = closed forest Transect		= isolated (0.2-2%); v	= very sparse (2	-20%); s = spe	rse (20-50%); m = m	nid dense (50-80%); d =	dense (80-100%)		
### Crown cover: <0.2% = Isolated tress or clumps; 0.2-20% = open woodland; 20-50% = woodland; 50-80% = open forest; 80-100% = closed forest Transect									
Om Transect	man commen	height classes: 1-3m	- dwarf, 3-6m = k	ow; 6-12m = m	id-high; 12-20m = ta	il; 20-35m = very talt; >3	35m = extremely tall		
Canopy % (photos) Midstorey % Exotic % - every 1m record if plant intersects (hits) point	SH Crown cover:	<0.2% = isolated tre	es or clumps; 0.2	-20% = open v	voodland; 20-50% =	woodland; 50-80% = op	pen forest; 80-100% = close	d forest	
Canopy % (photos) Midstorey % Exolic % - every 1m record if plant intersects (hits) point			175	68		8	Ã0		
Canopy % (photos) Midstorey % Exotic % - every 1m record if plant intersects (hits) point	m Transect	10 Points - Fo	lage Projective	Cover	Ground cover tally	sheet, 50 points along	50m transect		
10 0 0 Native grass tally -					- G				I
m 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		7.2	-				C F-400R		Total (hits/5/)
m 20 0 0 0					rapire Arges rany -	111			rotal (misrou)
m 15 0 0 0 m 0 0 0 Native other (herb, fern, sedge, etc) tally- HH- HH- HH- III 1 Total (hits/50)						57.00			4.4
m 0 0 0 Native other (herb, fern, sedge, etc) tally - +++ +++ +++ +++									6/,
m S O Native other (herb, fern, sedge, etc) tally - HH - HH - III Total (hits/50)									70077733
Mative other (herb, fern, sedge; etc) tally - HH - HH - Total (hits/50)				0_				11.17	
			0	0	Native other (herb,	fern, sedge, etc) tally	· # ##	1/1	Total (hits/50)
		40	0				1 - [11]	1111	(56.724)
32/	n	Television		0				2000 NO	22/
	m		0						26/1
m 40 0 0	m		0	0					13
tal (sum / 10) = 23 · 5 / ,	tal (sum / 10) =	40	0	0	Native shrub tally -	5			Total (hits/50)
rger 50 x 20m plot	A from a position								SOVOVOMOCK
2 /		23.5%		1,-7					0%
ngth of woody debris >10cm wide & >0.5m long 47m		23.57. Not	>0.5m long	4/m					0 //
	poortion of canon	23.57. Not	>0.5m long	W 1100	Exotic totly - 1414	11112 1111	1111 1111	11	Total (hits/50)
cordion of canopy so, receneration LavY Exotic tally = 1/1 11 1 1 1 1 1 1 1	permanent ourself	23 - 57. debris >10cm wide &	>0.5m long	Ind's	1	1111	HH HH	11	
	mher of trees wil	23 - 57. debris >10cm wide &	>0.5m long	(00%	-146				54%

Site ID: P12	1		To .	Lyconomic	In the same			Cause	Abund.	
Species			Cover	Abund.	Species			Cover	Abuna.	
Breakyp	tre a	uplifolia .	- 3	7	41					
Evide	etus	aichog.	- 5	42	42					
Broans	itis	would	3	12	43					
Arabijo	a son	cices.	2	20t	64					
sida			3	204	66					
Contella	e de	atica	- 3	20t	40					
Platago	la.	colorda	2.	201	a.				(
Micros		stipoides	- Ex	Zech	da .					
		A 6	- 1	1	49					
aprilog	podes	rebrachs		1	40					
Strecio		hoepiering	7	Zat	50					
Biders	pilos		2	20+	51					
agen		acilir	7 7	204-	52					
	genin	leghodyller		10	63					
· House	1 Pint		2	201	\$4					
· Cirsiu	M UL	lape		2	16					
· Zmiza	culsal	stelda	7	704	60					
Humolie	ais so	diata	2	tos	57					
e Pine			1	2	58					
· JUNCUS	white	tur	+ 1	1	64					
Bruson	rella	australis	+ 1	1	60					
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9					62					
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11					71					
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14					74					
15					75			11		
16					76					
97					22					
08					79					
10					79					
40					8G					
Sp. Richness	Nasive	Exotic	Ground lave	r % 1x1 plots	Q1	Q2	Q3	Q4	Q5	
	140010	Ender.	Native perer							
Tree			-			-				
Shrub	8		Native other	-	_					
Grass (annual)	D		Native forb		_					
Grass (perennial)	1		Native shrut							
Other (annual)			Exotic grass	-	_					
Other (perennial)			Exotic forb &							
			Leaf & stick	litter						
			Rocks							
Go	over abundano	e scale	Bare ground	Ş						
Modifie	ad Braun-blan	quet 6 scale	Cryptogams	ĬÍ.						
			Total		100	100	100	100	1	
1	<5% - rare		Plot Disturb	ance			Fire damage:	0		
2	<5% - com	mon	Clearing (in	c. logging):			Storm damage:			
3	5 - 25%		-	inc. pasture):			Trampling:			
4	25 - 50%		Sail erosion				Flood damage:			
5	50 - 75%		Firewood co	V571.5527			Feral herbivores:			
6	75 - 100%		Stock grazir	· ·			1001011	Other:		

HN526 Mod/Good

JACOBS

Allumal - Good Entered

Survey Sit	e Form - BioBank			Site ID: P	12-3	Vegetation zone:	cew	
Date	18/11/-	2015		Surveyor(s):	LC			
Waypoint ID	677	7		Photo numbers	2375	_	7	2378
Coordinates	E N			Photo direction	N	E	S	w
Mapped Vegg	tation type: CP	,w		C	Condition:		Low	M6d-gbod
Stope: Gentle	Mod, Steep	Aspect (deg	rees or cardin	an: (Cal	Altitude;	68m		- Lange
opography:	crest, ridge, upper slop	e, mid slope, d	own slope, guil	y, flat, depression,	watercourse, escarpri			
Geology: bas	alt, granite, conglomera	ite, sandstone,	siltstone/muds	tone, shale, alluvius	m, limestone, metamo	rphics, gravel, ?		
oil type: san	nd, Igam, clay, organic,	gravel, skeletal	. 7	Soil disturbance	e: citaci, topsoil remov	red, fill	1	
Remnant / Old	growth (uncleared):	Yes Own Ur	decided?				-	
	ructure (formation) =	Den	Fast	Ecologically Dom	inant Laver (EDL) - m	ost biomass = COLA	224	
Strata	Height interval	Median	Est cover	Dominant Specie		OSI DIOMASS - COLON	DYPY	
Straid	riorgin nicolvar	magan	Eat cover	Dominian Spice	a o continuence			
Е		1						
-	15							
		_		Eucal	- L	duccona	70	
T1	10 7-	1		Cococ	prus u	autiona	(d)	
4:45	15-20m	ų.						
	1	+	-	A	A	19 5 1-		
T2	A.C. 34.000	1		Ango	nara	Haruda		
12	6 8m	1		7				
74	45							
Т3		1						
			-	<u> </u>				
200	1 0			Acacio	a pawa	mattersis		
S1	1-2m	1		AGOCO		247		
				Halice	a serie	ER :		
52	E 65	l .						
				Micro	aera	Elis cure	lis	
G	- 12	1		Sida	cinadia	wary sike	4	
				1	Einadden			
	Tree height (clino) leve	el ground or top	of slope = dista	nce from tree x (top)	% + bottom%)			
	Tree height (clino) from	n bollom of slop	e = distance fr	om tree x (top% - bo	ettom%)			
Definitions								
Dominance	d = dominant; c = co-d	tominant; s = su	obdominant; a =	associated				
stimated cove	r ! = isolated (0.2-2%), v	= very sparse i	(2-20%); s = sp	arse (20-50%); m =	mid dense (50-80%); d	= dense (80-100%)		
Vaker & Hopk	ins height classes: 1-3m	= dwarf; 3-6m =	fow; 6-12m = n	nid-high; 12-20m = t	ali; 20-35m = very tall;	>35m = extremely tall		
V&H Crawn co	wer: <0,2% = isolated tre	es or clumps; 0	.2-20% = open	woodland, 20-50%	= woodland; 50-80% =	open forest; 80-100% = clr	sed forest	
0m Transect	10 Points - Fo	iliaga Projectiv	e Cover	Ground cover tall	y sheet, 50 points alor	ng 50m transect		
oint.	Canopy % (photos)	Midstorey %	Ехобо %	- every 1m recon	d if plant intersects (hi	ts) point		
m	0	0	0	Native grass tally	141 141	114 114		Total (hits/50)
Om	0	0	0	100000000000000000000000000000000000000	4111 TIL	tu1 -1111		
5m	50	0	0	1	125			1.01
0m	0	0	D	1				401,
5m	0	0	0	1				
Om .	0	0	0	Native other /host	o, fern, sedge, etc) tall	v-11 1 1		Treat (full-/Env
5m	60	0	0	1-agre of let (nert	v, rotti, aquige, etc) tall	1111		Total (hits/50)
	30		1/	ł		VII		g: 30 50
Om-		0	0	ł		2.00		(0)
5m	10	0	0	ł				
0m	10	0	0					
otal (sum / 10	- 10	0	0	Native shrub tally				Total (hits/50)
arger 50 x 20				1	4	40		5
ength of wood	ty debris >10cm wide &	>0.5m long	OM	1				0%
			OM			4		13 00 000 (8).
roportion of c	anopy sp. regeneration		1004	Exotic tally -	1111	144		Total (hits/50)
			100%		I the title	411-111		501
umber of tree	s with hollows >5cm		1			. 11.1		101

ite ID: P12-3	Cover	Abund.	Species			Cover	Abund.
		3	41				
maglion flated	IT	1	10				
Acadia parynotta	N .	1	45				
	4	1	44				
- 11 1 1 +	1	1	44				
pallyma scile est	1	7.4	46			0	
trajous cuicitia	-4	705	40				
Microldua Stigoidas		70	er.				
Sida Martilota	2	201	48				
Biders gilosa	2	201	All				
Bourajella australs		ret	pa .				
Anagallis gruensis	2	zot	51				
service nadagascolus	12	rot	52				-
Grein water	- 1	1	53				
alygine technical	72	id	64				
Plataga larcedata	1	++-	55				
Oicholden regers	-3	200	56				
compea boardis's		4	67				-
Cyclospenia lestoply	Un I	701	54				-
Briza educitata	-	1	50				
Centarrem	-	1,1	60				_
phypochois radicate	1	1	61				1
Chiclattes sielsei	7 2	zot	62				
Cymbopogar voliad	- 2	5	63				
dragosti curula	7	200	04				
Richardia, stellas	-	1	MS .				
Phyllattus / e-phol	0-	1	to o		- 7		
Brie princeta -		1	67 C()C	ssorodi	7 .		
olea cirapaea	-	-	08				
oxalis - hoing	-	1	0E				
Ting Walldalaia	+ 1	-	70				
Vittadinia?	+ 1	1	71				_
Ceproday dachian	+ +	1	72				
Lomadra granis	+ 1	-	79				-
buge Walleligia	>- \	1	74				
acoderia hedroceae	-		75				
V(_	_	76				
16	_		V.X.11				
	_	+	78				
E;	_	-	79				
la l	0	er % 1x1 plots	90 Q1	Q2	Q3	Q4	Q5
p. Richness Native Exotic	_		- 01				
nee	-	ennial grass		-			
hrub (M)	Native other	-					
irass (annual)	Native forb						_
rass (perennial)	Native shru	ıb (<1m)					-
ther (annual)	Exotic gras	s					-
ther (perennial)	Exotic forb	& other					
	Leaf & stick	k litter					
	Rocks						
Cover abundance scale	Bare groun	od .					
Modified Braun-blanquet 6 scale	Cryptogam	s					
	Total		100	100	100	100	
1 <5% - rare	Plot Disturt	bance			Fire damage:		
2 <5% - common	Clearing (in	nc. logging):			Storm damage:		
3 5 - 25%		(inc. pasture):			Trampling:		
	Soil erosio				Flood damage:		
4 25 - 50%	English and the second street of the second				- Carlos and Source		
4 25 - 50% 5 50 - 75%	Firewood o	collection:			Feral herbivores:		

HN 526 Mod/Good

BioBanking Field Sheet

Ento	ord	V	_
Movial	_	Go	00

Date	e Form - BioBank			Site ID: P13	8-4	Vegetation zone:	CRFF	
		2014		Surveyor(s):	IC			
Waypoint ID	679			Photo numbers	2382		->	2385
Coordinates	E N			Photo direction	N	E	s	w
Mapped Veget	tation type:	RFF		1	Condition:		Low	Mod good
Slope: Gentle/	The second secon		rees or cardir	ial): (Col	Altitude:	71m	1500	Charles
Topography:	crest, ridge, upper slop	e, mid slope, do	own slope, gull	ly, flat, depression.	valercourse, escarpmen			
Geology: base	alt, granite, conglomera	ite, sandstone, :	siltstone/muds	tone, shale alluvius	fimestone, metamorph	rics, gravel, ?	and the second	
Soil type: san	d, Isam, clay, organic,	gravel, skeletal,	7	Soil disturbance	intect, topsail removed	, fill	14	
Remnant / Old	growth (uncleared):	Yes /No ion	decided?					
/egetative Stru	ucture (formation) =	Open to	-7	Ecologically Domi	nant Layer (EDL) - mos	biomess = Ca	nevery	
Strata	Height interval	Median	Est cover	Dominant Species	& Dominance		1	
123								
E		1						
	-	+			- A			
T1	15.11			+, +0	eticonis lora jubueluli			
300	10.180			A .	what we had be	n	E. molli	110.0
				1	cogress-10		C) POLBYCO	CCANEL
T2	194	1						
	1							
-				Acaci	er pern	aratte	12.5	
Т3		1			4			
	\ 0			13 wso	ia se	erosa		
51	1 2m				,			
2420								
S2	15	1						
	-	-	_		Α			
G				Dicho	dry v	egens		
G				alyci	373	25741		
			of alone a dista					
	Tree height (sting) line	as programed our tops a						
	Tree height (clino) leve							
Definitions	Tree height (clino) from							
		n bottom of slope	a = distance fro	om tree x (top% - bot				
Cominance	Tree height (clino) from d = dominant; c = co-d	n bottom of slope dominant; s = su	e = distance fro	om tree x (top% - bot associated	tom56)	dense (80-100%)		
Cominance	Tree height (clino) from d = dominant; c = co-d	n bottom of slope dominant; s = su	e = distance fro	om tree x (top% - bot associated		dense (80-100%)		
lominance stimated cover	Tree height (cline) from d = dominant; c = co-d r i = isolated (0.2-2%); v	n bottom of slope dominant; s = su v = very sparse ()	a = distance fro bdominant; a = 2-20%); s = sp	om tree x (top% - bot associated arse (20-50%); m = n	tom56)			
lominance stimated cover Valker & Hopkir	Tree height (clino) from d = dominant; c = co-d r I = isolated (0.2-2%); v ns height classes: [†] -3m	n boktom of slope lominant; s = su v = very sparse (: = dwarf; 3-6m =	a = distance front = di	om tree x (tup% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta	tom%) mid dense (50-80%); d =	5m = extremely tall	seed forest	
Jominance Stimated cover Valker & Hopkir V&H Crown cov	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre	n boktom of slope tominant; s = su v = very sparse (: - dwarf; 3-6m = ses of clumps; 0.	s = distance for bdominant; a = 2-20%); s = spe low; 6-12m = n 2-20% = open	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% =	fom%) nid dense (50-80%); d = : d; 20-35m = very tall; >3; woodland; 50-80% = ope	im = extremely tell in forest; 80-100% = cic	acid forest	
Commence Stimated cover Walker & Hopkir W&H Crown cov	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo	n bottom of slope tominant; s = su v = very sparse (; = dwarf; 3-6m = ses or dumps; 0.	s = distance for bdominant; a = 2-20%); s = spe low; 6-12m = n 2-20% = open	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% =	tom%) nid dense (50-80%); d = : il; 20-35m = very tall; >3!	im = extremely tell in forest; 80-100% = cic	sed forest	
Jominance istimated cover Valker & Hopkin V&H Crown cov Om Transect Point	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos)	n bottom of slope lominant, s = su v = very sparse (; = dwarf; 3-6m = ses or dumps; 0. Midstorey %	s = distance for bidominant, a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic %	associated associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	5m = extremely (all en forest; 80-100% = cic 50m transect	sed forest	
Jominance Estimated cover Walker & Hopkin W&H Crown cov Om Transect Point	Tree height (clino) from d = dominent; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos)	n bottom of slope tominant, s = su y = very sparse (; = dwarf; 3-6m = les or dumps; 0. All distorey % \ \ \ \ \ \	a = distance for bdominant; a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic %	associated associated asse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% =	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	5m = extremely (all en forest; 80-100% = cic 50m transect	and forest	Total (hits/50)
Cominance Stimated cover Walker & Hopkin W&H Crown cov Forn Transect Point Iom	Tree height (cline) from d = dominant; c = co-d r I = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 3.0 2.0	m bottom of slope forminant: s = su r = very sparse (; dwarf; 3-6m = les or clumps; 0. diage Projective Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic %	associated associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	5m = extremely (all en forest; 80-100% = cic 50m transect	seed forest	Total (hits/50)
Cominance Stimated cover Walker & Hopkin W&H Crown cov Om Transect Point im Om Sm	Tree height (clino) from d = dominant; c = co-d r I = isolated (0.2-2%); v ns height classes: 1-3m wer: <0.2% = isolated fro 10 Points - Fo Canopy % (photos) 20 20	m bottom of slope forminant: s = su e very sparse (: dwarf; 3-6m = les or clumps; 0. Midstorey % O O O O O O O O O O O O O	bdominant a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic %	associated associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	5m = extremely (all en forest; 80-100% = cic 50m transect	sed forest	
Jominance Similared cover Valker & Hopkin V&H Crown cov Om Transect Foint Om Sim Om	Tree height (cline) from d = dominant; c = co-d r I = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated fre 10 Points - Fo Canopy % (photos) SO 20 20 40	m bottom of slope tominant, s = su = ewerf; 3-6m = es or clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%); s = spi low; 6-12m = n 2-20% = open Cover Exotic %	associated associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	5m = extremely (all en forest; 80-100% = cic 50m transect	said forest	Total (hits/50)
Jominance Silmated cover Valker & Hopkir V&H Crown cov Om Transect Point om Om Om Om Om	Tree height (clino) from d = dominant; c = co-d r I = isolated (0.2-2%); v ris height classes: 1-3m wer: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 20 20 40 40	m bottom of slope forminant, s = su v = very sparse () = dwarf; 3-6m = ses of clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%); s = spi low; 6-12m = n 2-20% = open Cover Exotic %	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	fom%) find dense (50-80%); d = 14; 20-35m = very talt; >3; woodland; 50-80% = open sheet, 50 points along of plant intersects (hits)	im = extremely tall en forest; 80-100% = clo 50m transect point		18%
Jominance Silmated cover Valker & Hopkir V&H Crown cov Om Transect Point om Om Sm Om Sm Om	Tree height (clino) from d = dominant; c = co-d r I = isolated (0.2-2%); v rs height classes: 1-3m wer: <0.2% = isolated fro 10 Points - Fo Canopy % (photos) 20 20 40 40 30	m bottom of slope forminant, s = su v = very sparse (; dwarf; 3-6m = ses or olumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic %	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	fom%) find dense (50-80%); d = 14; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	im = extremely tall en forest; 80-100% = clo 50m transect point		
Jominance Silmated cover Valker & Hopkin V&H Crown cov Om Transect Point om Om Sim Om Sim Om	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v rs height classes: 1-3m wer: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 3 0 4 0 4 0 3 0	m bottom of slope forminant, s = su v = very sparse () dwarf; 3-6m = les of clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant; a = 2-20%); s = spi low, 6-12m = n 2-20% = open Cover Exotic % O O	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) init dense (50-80%); d = 4 il; 20-35m = vary tall; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	im = extremely tall en forest; 80-100% = clo 50m transect point		\8/-
Jominance Silmated cover Valker & Hopkir V&H Crown cov Om Transect Foint om Om Om Om Om Om Om	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v rs height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 3 0 4 0 4 0 3 0 10	m bottom of slope forminant; s = su y = very sparse (; dwarf; 3-6m = ses or clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant; a = 2-20%); s = spr low, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	fom%) find dense (50-80%); d = 14; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	im = extremely tall en forest; 80-100% = clo 50m transect point		\8/-
Jominance Sitimated cover Valker & Hopkin V&H Crown cov Om Transect Point om Sm S	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v rs height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fc Canopy % (photos) 3 0 4 0 4 0 5 0 7 0 5 0 7 0 5 0 7 0 7 0 8 0 8 0 8 0 8 0 8 0 8	m bottom of slope forminant; s = su y = very sparse (; dwarf; 3-6m = ses or clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant, a = 2-20%); s = spr low, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	fom%) find dense (50-80%); d = 14; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits)	im = extremely tall en forest; 80-100% = clo 50m transect point		18%
Jominance Sitimated cover Valker & Hopkir V&H Crown cov Gm Transect Point im Gm Sm Om Sm Om Sm Om	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v rs height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 3 0 2 0 4 0 3 0 3 0 5 0 10	m bottom of slope forminant; s = su y = very sparse (; dwarf; 3-6m = ses or clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	a = distance for bidominant, a = 2-20%); s = spr low, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O	om tree x (tup% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8%. Total (hits/50) -72%.
Cominance Estimated cover Walker & Hopkin W&H Crown cov Som Transect Point Som Usm Usm Usm Usm Usm Usm Usm Usm Usm Us	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) E O 20 20 40 40 30 30 30 30 30 30 30 3	m bottom of slope forminant; s = su y = very sparse (; dwarf; 3-6m = ses or clumps; 0. Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant, a = 2-20%); s = spr low, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8/-
Walker & Hopkin W&H Crown cox 50m Transect Point 10m 15m 20m 25m 30m 16m 16m 16m 16m 16m 16m 16m 16m 16m 16	Tree height (clino) from a = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) E O 20 20 40 40 30 30 30 30 30 30 30 3	m bottom of slope forminant, s = su v = very sparse () = dwarf; 3-6m = ess or dwmps; 0. filippe Projective Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%): s = spi low; 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (tup% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8%. Total (hits/50) -72%.
Cominance Estimated cover Walker & Hopkin W&H Crown cov Som Transect Com	Tree height (clino) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) E O 20 20 40 40 30 30 30 30 30 30 30 3	m bottom of slope forminant, s = su v = very sparse () = dwarf; 3-6m = ess or dwmps; 0. filippe Projective Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	a = distance for bidominant, a = 2-20%); s = spr low, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O	om tree x (tup% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8%. Total (hits/50) -72%.
Cominance Estimated cover Walker & Hopkin W&H Crown cov Som Transect Point Sim Som Som Som Som Som Som Som Som Som So	Tree height (clino) from a = dominent; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 20 20 40 40 30 20 10 5 20 10 5 20 10 5 10 10 10 10 10 10 10 10	n bottom of slope tominant, s = su y = very sparse () = dwarf; 3-6m = ess or dumps; 0. bisage Projective Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant, a = 2-20%); s = spx bw, 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (top% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally -	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8/. Total (hits/50) 72 /. Total (hits/50) O'/,
Jominance Stimated cover Valker & Hopkin Valker & Hopkin Valker & Hopkin Valker & Hopkin Om Transect Joint Om Sm Om Sm Om Sm Om Om Sm Om	Tree height (clino) from a = dominant; c = co-d r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) E O 20 20 40 40 30 30 30 30 30 30 30 3	n bottom of slope tominant, s = su y = very sparse () = dwarf; 3-6m = ess or dumps; 0. bisage Projective Midstorey % \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	bdominant a = 2-20%): s = spi low; 6-12m = n 2-20% = open Cover Exotic % O O O O O O O O O O O O O O O O O O O	om tree x (tup% - bot associated arse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally	tom%) and dense (50-80%); d = 4 al; 20-35m = very talt; >3; woodland; 50-80% = ope sheet, 50 points along if plant intersects (hits) HH	im = extremely tall en forest; 80-100% = clo 50m transect point		\8%. Total (hits/50) -72%.

pecies	Cover	Abund.	Species			Cover	Abund.
Angophora cultivelibre	-	4	41				
Podecujatus Fitica	- 45-	20	42				
Evalors orlya	- 2	3	49				
Evidentes vollecas	e- 1	2	44				<i>-</i>
bursaid solvese		204	46				8
Dichardra vepers	14	201	en				
	- 3	201	67				
Microlacia stipoias	- 7	201	60				
	1	704	100				
Thingsocopolery,		1 7					
Maca percanation		15		10		1	
TO CONTRACT OF THE PARTY OF THE		201	21				
Conderia, hadracea		504	92	-			
didather sieles		501	93				
sagio madapquestus	- 1	1	94				
Cymropogan vetracus	-		in .				
Aranjia coicitua	2	tet	49				
Decrevaria diplyla	1 1	14	58				
	1	12	big .			- 2	
stackhousia euphatin	1	2	60				
		1	01				
Cirsium vulgare	-	-	67				
	+	+	as a				
	_	+	0.0				
		_	95				
		_	60				
	-	+					
	1	+					
	_	-					
	_	+	100				
	+	+	70				
	+	+					
V	-	-	72				
N	_	+	74		9		
	-		10.	- /			
		_	100				
	+	1	70	+			
	+	-	711				
1	+		79				
K			90				
	Consinding	r % 1x1 plots	Q1	Q2	Q3	Q4	Q5
p. Richness Native Exotic	_						
ree	Native pere		1				
hrub 17	Native forb		1				
Prass (annual)	Native shrui		-				
irass (perennial)	Exotic grass						
Other (annual)	Exotic forb						
Other (perennial)	Leaf & stick	17.0					
	Rocks	1100					
Cover abundance scale	Bare ground	1					
Modified Braun-blanquet 6 scale	Cryptogems						
Modified braun-Maniques o scale	Total		100	100	100	100	0
1 <5% - rare	Plot Disturb	anon	100	-	Fire damage:		
	Clearing (in				Storm damage:		
2 <5% - common	The second second second	(inc. pasture):			Trampling:		
3 5 - 25% 4 25 - 50%	Soil erosion				Flood damage:		
	Firewood o	001075-0007			Feral herbivores:		
5 50 - 75% 6 75 - 100%	Stock grazi				Other:		

JACOBS sike 6. Alluvial Mad/ Good Bor

Survey Site	Form - BioBank				willowdere	Vegetation zone:		
Date	2/9/20	15		Surveyor(s):	A STATE OF THE PARTY OF THE PAR	eus		
Waypoint ID	- 46			Photo numbers	1243	1244	1242	
C	E			Photo direction	N	E	s	. w.
Coordinates	N			Photo direction		- 5	•	
Mapped Vegeta	stion type: CV	V			Condition:		Low	Mod-gold
Slope: Genta,	Mod, Steep	Aspect (degr	ees or cardin	al): W	Altitude: 74	M		
Topography: o	rest, ridge, upper slop	e, mid slope, do	own slope, gully	fat depression,	watercourse, escarpme			
Geology: basa	it, granite, conglomera	te, sandstone, s	sitstone/mudst	one, shale, alluviur	n, limestone, metamorp	hics, gravel, ?		
oil type: sand	, loam clay a ganic, g	pavel, skeletal,	?	Soil disturbance	: intact_tensoil removed	i, fill		
Remnant / Old o	growth (uncleared):	Yes / No Jon	decided?	Young	trees	graz.	ed.	
	cture (formation) = ($\overline{}$		inant Layer (EDL) - mos		roy	
Strata	Height interval	Median	Est. cover	Dominant Species			7	
. 363 3818-		- 10-30-30-00-0						
E		l						
5. 5 .5	5E.	_						
				Eucol	Mars serte	ucara		
T1	10.70	l .		Eved	Trus de	- Sicoria		
35.55	15.20N	1		€. €	5	cugar	roides	
		-			2000	20320	10-10-2	
T2								
1.60				7				
Т3								
1.0	127.7	1						
		_		Burso	- '	-:0		
S1	200	1				059		
31		l		Olea	eurogoin			
		-	_					
S2		1						
52	1.5	1						
		-	_		I co			
	155			Dichan	nia ve	gens	1	
G		1		apriles	41	Dirophyll	volaena	
					Solowy	the carried	have y	
	Tree height (clino) leve	73.5				300 000 107		
	Tree height (clino) from	n bottom or slop	e - distance in	am tree x (top% - bo	(ttorn %)			
Definitions	2002003-00	99.00		000000000000000000000000000000000000000				
Dominance	d = dominant; c = co-d				tee meers of			
ssimated cover	I = rsolated (0.2-2%); 1	" very sparse (2-20%); s = sp:	srae (20-50%); m =	mid dense (50-80%); d =	dense (au-100%)		
	maleurose year contratación			22200 ILIZO		25 30 30 30 30 30 40 40 40 40 40 40 40 40 40 40 40 40 40		
					all; 20-35m = very tall; >3		r and women	
V&H Crown cov	er: <0.2% = isolated tre	es or clumps; 0.	.2-20% = open	woodland; 20-50% -	= woodland; 50-80% = og	sen forest; 80-100% = cl	osed forest	
						70		
0m Transect		diage Projective			y sheet, 50 points along			
oint	Canopy % (photos)	Midstorey %	Ехова %		d if plant intersects (hits) point		
m	20	20	0	Native grass tally	1111			Total (htts/50)
Om	10	0	0	4	411			_, , ,
5m	٤	0	0	4	(197)			8%
0m	30	0	٥					0
5m	30	0	0					
0m	20	0	0	Native other (her	b, fern, sedge, etc) tally	1111-1111	-1	Total (hits/50)
5m	40	0	0	1		HT 1111	1	
0m	50	0	0	1		L. Lat	1	1221
5m	50	0	0	1				200
0m	25.5	N.	0%					
otal (sum / 10)	= 28.5	2.7	6%	Native shrub tally	-			Total (hits/50)
arger 50 x 20n	-							0.1
	y debris >10cm wide 8	>0.5m long	0	1				01
29			0					
roportion of ca	nopy sp. regeneration	0	INT.	Exotic tally - 1	L 111 - 1111	- 111		Total (hits/50)
			100%	1 11	1 +111 -1111	111		36%
Number of trees	s with hallows >5cm		0	1 1	411	II I		10/1

	600000	Aborna	Constan			Cover	Abund.
pecies	Cover	Abund.	Species			Jover	Abund.
cymbonotis .	+ 2	6	41				
Modiola codina	+ 2	204	42				
Modiola rodinag	2	204	43				
dichenced	2	701	44				
Dichardra repens -	+ 3	204	45				
Einadia mostata -	+2	204	40				
arsium vulape	Z	-201	47			- 1	
Euralyphus mothecay -	- 5	40	0				
Euroliphus tereticonis -	-2	4					
Everyptus teresicons		_	-		_		
Bursaia spinosa	-3	20	50				
Oxalis ydlon	- 3	201	61				-
caryen '	2	204	62				
Urtica incisa.	- 7	201	83				-
Anogallis arensis	2	-50-y-	54				
cyperus granicis -	+ 2-	rat	66				
Panisotum cladisting	4	not	5n				
Casuaina alaca -	+ (1	67				
Olea avadores	2	2.40-1	58				
Solam prickly agote		(89				
Matego loccolate	-4	204	60				
alycine talpecine -	707	マーキ	61				
Serecio vindanciscom	2	12 and	62				
lotus	Z	201	63				
· Sida thanhifolia	7	Zet	04				
s Richardia	7	204	00				
A	-	ren	-				
· Paa annue	2	3	Dit.				-
langua corincea.	7	-	67				-
· Souchus deraceus	1	11	es.				
Araujia seicitara	1		60				
o cieratium -	+ 1	1	70				_
Brassica		1	21				
2			72				
9			73				
4			74				
g .			76				
			nt				
9			77				
in the second se			78				
9			78			Si -	
D			80				
Sp. Richness Native Exotic	Ground lave	r % 1x1 plots	Q1	Q2	Q3	Q4	Q5
Tree	Native pere						
		7777000					1
Shrub U	Native other						
Grass (annual)	Native forb		_	-			
Grass (perennial)	Native shru		_				-
Other (annual)	Exotic grass						-
Other (perennial)	Exotic forb		-				
	Leaf & stick	litter					
	Rocks						
Cover abundance scale	Bare ground	1		-			_
Modified Braun-blanquet 6 scale	Cryptogams						
	Total		100	100	100	100	
1 <5% - rare	Plot Disturb	ence	AV		Fire damage:		
2 <5% - common	Clearing (in	c. logging):			Storm damage:		
3 5 - 25%	-	inc. pasture):			Trampling:		
4 25 - 50%	Soil erosion				Flood damage:		
	Firewood or	CONTRACTOR OF THE PARTY OF THE			Feral herbivores:		
5 50 - 75%				Feral herbivores: Other:			

JACOBS Alluvial- Poor Entered

Survey Sit	e Form - BioBank			Site ID: 34	2-1	Vegetation zone:	CAN/REG	F
)ate	2/9/201	5		Surveyor(s):				
aypoint ID	39-1			Photo numbers	1245		4	
Coordinates	E N			Photo direction	N	Е	s	w
apped Vege		FIC	ew		Condition:		Low	Mod-geod)
	Mod, Steep		ees or cardin	ai): S	Altitude: 9	m		-
opography:	crest, ridge, upper slope							
eology: bas	alt, granite, conglomeral	te, sandstone, :	iltstone/muds	tone, shale, aguivur	m, limestone, metamor	rphics, gravel, ?		
	nd, loany clay, organic, g				: inget, topsoil remov	A STATE OF THE STA		
	growth (uncleared):	Yes / No Jun		war	trees		-	
	ructure (formation) = D		1			ost biomass = Cana	March	
Strata	Height interval	Median	Est cover	Dominant Specie			4/	
E		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
T1	20-25m			Eveal	yetus to	nothicana		
5000 Spett	a Zm	_		Ango	thora fi	iluda		
T2								
тз	- 8							
S1	2-6n			Olea	ia nda	poen		
S2								
G	* _X			Pernise Malua	parrilla		There of	la couch
Valker & Hopk	Tree height (clino) from d = dominant; c = co-d er 1 = isolated (0.2-2%); v cos height classes: 1-3m over: <0.2% = isolated tree	ominant; s = si = very spatse (= dwarf; 3-6m =	bdominant; a = 2-20%); s = sp	associated arise (20-50%); m = mid-high; 12-20m = 1	mid dense (50-80%), d tad; 20-35m = very tal;	CONTRACTOR	ased forest	
m Transect	10 Points - Ec	liage Projective	Cover	Ground cover tell	ly sheet, 50 points alor	no 50m transect		
oint	Canopy % (photos)		Exotic %		nd if plant intersects (hi			
Ti .	40	O NIUSIURBY 76	8					Total (Nts/50)
)m	40	0	0		###	HH 111		101961762226555
im.	20	0	0	1	1.11	titte sei		21
lm	0	0	0	1				36/
en	0	0	0	1				370 37000
m	0	0	0	Native other (her	b, fern, sedge, etc) tail	y - 1		Total (hits/50)
im	0	0	0					
)m	Ö	0	O	1		Ni.		0'1
im	20	10	0	1				11.
lm .	20	20	40	1				0.75-0.001/201
otal (sum / 10	0)= \5	3	4	Native shrub tally	·-			Total (hits/50)
arger 50 x 20								A 1 -
	ody debris >10cm wide 8	>0.5m long	Om					01.
ropartion of a	canopy sp. regeneration	SE	100%	Exotic tally - #	+##	###	#1	Total (hits/50)
lumber of tre	es with hollows >5cm		0			888 1111	10 0	0-77

pecies	Cover	Abund.	Species		1	Cover	Abund.
	4	2	a cope of the cope				
Excaliptus maluca a -	4	2	47				
Malua panillas	3	20t	50				
Malla panetter		20+				- 10	
	3		94				
Runery cripus	-2	2014	45				_
Pennischen cladert in	5	204	40				
Microbacha stippides -	3	204	47				
Vicia sativa	2	204	48				
Tetragonia tetropopuoids	- 7	20+	40				
Circion vulgoe	2	204	50				
Medicago astimorpha	2	zet	61				
Solami wans	1	1	62				
Sergio maddioccaley>	-2	204	69				
solam orichely apple	1)	04				
Platoco Procolate	-2-	zat	56				
Aracia malanoxylan-	1	3	56				
byein ferroeises min	1	1	67				
Bidens pilosa	('	(58				
Ehrhata evecta	3	tot	50				
Taraxacum officionale	1	1	no				
foerculum vulgare	1		en				
Sdown pseudocaption	1	1	62		- 7		
chickweed	2	rat	63				
Chloris gayoun	2	204	84				
	1	1	45				
Romited Posts	2	zat	66				
German -	1	1	47				
	-2	not	ra .				
	-	201	eo				
	-	1	70				
Eragrostis curvula	- 2	20+	70				
Anistida sp. vogans -			-				
chloris verticosa -	2	204					
INEMICIE TYPE	2	204	13	+:			
uperus apricas	2	707	M				
(dryza telaies's	_	1	75				
· Brodus cathadicus	2	204	7e				
,	-	-	77				
	_	-	78				
			79				
			80	100000		200	-
p. Richness Native Exotic	Ground layer	% 1x1 plots	01	Q2	Q3	Q4	Q5
ree	Native peren	nial grass					
hrub	Native other	grass	-				
rass (annual)	Native forb &	other					
rass (perennial)	Native shrub	(<1m)					
ther (annual)	Exotic grass						
ther (perennial)	Exotic forb 8	other					
	Leaf & stick	litter					
	Rocks						
Cover abundance scale	Bare ground						
Modified BraunPolanquet 6 scale	Cryptogams						
	Total		100	100	100	100	
1 <5% - rare	Plot Disturba	ince	100		Fire damage:	V	
2 <5% - common	Clearing (inc	(logging):			Storm damage:		
3 5 - 25%		nc. pasture):			Trampling:		
4 25 - 50%	Soil erosion:		y		Flood damage:		
5 50 - 75%	Firewood co	fection.			Feral herbivores:		
	-	Total Control of the		Other:			

HN 526 Med/and- Poor

JACOBS

Allowial - Poor Entered

Survey Site	Form - BioBanki				9-2	Vegetation zone:	auly CR	W	
Date	2/9/2	1015		Surveyor(s): (ukas d	eus			
Waypoint ID	39-2			Photo numbers	1259	1260	1261		
Coordinates	E			Photo direction	N	E	s	w	
Mapped Vegeta	ation tune: CPL	N ?			Condition		Low	Mod-good	
Slope: Gentle.			rees or cardin	nat): NW		3-77	Teom	1903 and	
and the second second	crest, ridge, upper slope								
	alt, granite, conglomeral								
	d, loam, clay, organic, g				e: Intact, topsoil remov				
				Soil disturbance	в: іпкаст, торвої гелюч	red, fill			
	growth (uncleared):	Yes Mod Un							
Vegetative Stru	ucture (formation) = [per to	154	Ecologically Dom	inant Layer (EDL) - m	ost biomass = (·C4		
Strata	Height interval	Median	Est cover	Dominant Specie	s & Dominance		,		
E	*				-				
T1	10-30	,		Cosydu	hyptus	tection	2.5		
T2	ÿ.	-							
ТЗ	2-84			Olea	europa	ea		+	
S1	12			Bursa		sieben			
S2									
G				Anista	tis The	veda. D	idwadra		
Definitions Dominance Estimated cover	Tree height (clino) from d = dominant; c = co-d r-t = isolated (0.2-2%); v	n bottom of slop forminant; s = se	e = distance f ubdominant; a	rom tree x (top% - bo = associated	ottom%)	i = densa (80-100%)			
	ns height classes: 1-3m ver; <0.2% = isolated tre					>35m = extremely tall open forest; 80-100% = cio	sed forest		
i0m Transect	10 Points - Fo	ilage Projectiv	e Cover	Ground cover tal	ly sheet, 50 points alo	ng 50m transect			
oint .	Canopy % (photos)	Midstorey %	Exotic %	- every 1m recor	rd if plant intersects (h	its) point			
5m	30	30	30	Native grass tally			Y.	Total (hits/50)	
10m	0	0	100		4HT 111	+#+##			
15m	D	0	90	1		1 1 40	· · · ·	1.2	
20m	70	10	0	1				42/0	
25m	50	50	10	1		236		A 100 mm	
		5		Makes at 11 th	h form andre states	witch and	177	Total (hite/Eff)	-
iGm .	30		60	reative other (her	b, fern, sedge, etc) tal	"-HH- III L	11/	Total (hits/50)	79
15m	20	10	60	-		1111 -1117	(11	01:	16
10m	30	10	70	-1		111		26%	
15m	60	0	40	4				0 - 1	
iOm		0	0						
l'otal (sum / 10)= 24	11.5	46	Native shrub tally	1-			Total (hits/50)	
Larger 50 x 20r	m plot							20.1	
	dy debris >10cm wide &	>0.5m long	2					0%	
Proportion of ca	anopy sp. regeneration		100%.	Exotic tally - 111	H			Total (Nts/50)	
Number of trees	s with hollows >5cm		0					(0/1	

pecies	Cover	Abund.	Species			Cover	Abund.
Aspenta contega -	7	204	41			-	
Dillumin siebes -	4	204	62				
Distinguis scores	5	20+	43				
dea curopaea Buralyptus tecticonis - Bursaia coinosa -	5	20+	61				
P. Harris Toerions	3	20+	45				
Indiantera australis -	3	1					
Indigotera australis -	1	1	0 - 3	nain vei	Α.		
Acacia Habuda -	2	201	n:	EHA VE	Δ		
Dicondra vapors -	3	704	45				
Theoreta -		20+	100				
Clematis -	- 2	201	100				
Brunowilla australis.		Zot	51				
Vertica	2	-	52				
alycing talacha -		204	5.0				
Aristida pagas -	4	Zot	0.4				
Servicio madagascaisis	1	1	55				
Cirsium vuldar	-1	1	10				
alucine cladestina -	本	*ot	50				
	all-	201	60				
Convolvulus entrescus.		1,	60				
Centella asiatica.	1	1	85				
	2	1/2	er.				
Casuara glance -	1	12	42				
opisueus admilis -	1	1	6.5				
Lastera -	-	1	66				
	生	Not	44				
Cotula -	1	1	62				
Predvathus parifles.		1	68				
Pratia amourasers	艺	Rot	60				
Biles dice	1	1	m				
Ehrhata exeta	2	201	23				
	1	1	72				
Aracia foliator		11	23				
	1	1	74				
· Exemplify delites	- 1	1	75				
Create pre la aution		1	76				
7			27				
			žn.				
0			70				
0			60				
Sp. Richness Native Exotic	Ground layer	% 1x1 plots	Q1	Q2	Q3	Q4	Q5
ree	Native peren						
Shrub	Native other						
Grass (annual)	Native forb 8	The state of the s					
Grass (perennial)	Native shrub						
Other (annual)	Exotic grass						
Other (perennial)	Exotic forb 8					3	
	Leaf & stick						
	Rocks						
Cover abundance scale	Bare ground						
Modified Braun-blanquet 6 scale	Cryptogams						
	Total		100	100	100	10	0 1
1 <5% - rare	Plot Disturbance				Fire damage:		
2 <5% - common	Clearing (inc. logging):				Storm damage:		
3 5-25%	Cultivation (inc. pasture):				Tramping		
4 25 - 50%	Soil eresion:				Flood damage:		
	Firewood collection				Feral herbivores		
5 50 - 75%	IL SEMPORT OF		Stock grazing:				

HNS26 Moderate / Good - Poor BioBanking Field Sheet Poor Alluvial - Poor

Survey Site	Form - BioBank			Site ID: 54		Vegetation zone:	RFEF	
Date	2/9/20	15		Surveyor(s): ¿	ukes d	eus		
Vaypoint ID	59			Photo numbers				
Coordinates	E N			Photo direction	N	E	5	w
Mapped Veget	ation type: RF	EF			Condition:		Low	Mad-good)
Slope: Geptle	THE RESERVE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN	Aspect (degr	eas or cardin	al) SSW	Altitude: 8	214		
Topography:	crest, ridge, upper slope	e, mid slope, do	own slope, gull	y, flat, depression, w	atercourse, escarp	oment, lerrace		
Soology: basa	all, granite, conglomera	te, sandstone, s	siltstone/muds	tone, shale, alluvium	, limestone, metan	norphics, gravel, 7		
ioli type: san	d. loam, clay, organic, g	ravel, skeletal,	7	Soil disturbance:	intact, topsoil rem	oved, fill		
Remnant / Old	growth (uncleared):	Yes / No / Un	decided?				•	
	ucture (formation) =			Ecologically Domin	nant Layer (EDL) -	most biomass =		
Strata	Height interval	Median	Est. cover	Dominant Species				
Е	-							
T1	20 Z8m			Evealy Evealy Angoph	iptus r	udluccang		
T2				7				
ТЗ	*							
S1	1-2m			Bursa	00 00	pinose		
		-						
S2	- 4							
G	20			Microla Serecio Cirsium	madaga	ascanionsis	Cyrodon o	ladylon
Walker & Hopki	Tree height (clino) from d = dominant; c = co-d r 1 = isolated (0.2-2%); v ms height classee: 1-3m ver: <0.2% = solated tre	commant; s = su = very sparse (= dwarf; 3-6m =	ubdominant; a = (2-20%); s = sp - low; 6-12m = (= associated arse (20-50%); m = m mid-high; 12-20m = ta	nid dense (50-80%) ilt; 20-35m = very la		lipsed forest	
Om Transect	10 Points - Fr	ollage Projectiv	e Cover	Ground cover tally	sheet 50 noints a	long 50m transect		
oint ransect	Canopy % (photos)	Midstorey %	Екобс %	-	if plant intersects			
im	S	10	0	Native grass tally -			- MI - MII -	Total (hits/50)
0m	0	20	0	1	111 +11	###	1 ## ##	0
5m	5	10	0	111		2.1 * 1.47 * 10 * 1 * 1	111	76%
Om	5	20	0	111				10/
5m	40	15	D	1				
l0m	30	10	D	Native other (herb,	fern, sedge, etc)	tally - 1111		Total (hits/50)
5m	20	10	٥			411		N 1925 VOT 193
0m	5	20	0	1				10%
l5m	10	5	0	1				10%
iOm	10	0	0	1				
Fotal (sum / 10		12%	01.	Native shrub tally -	- 11"			Total (hits/50)
arger 50 x 20		1 25.65			41			
	dy debris >10cm wide 8	k >0.5m long	5m		1/13			4/.
Proportion of c	anopy sp. regeneration	18	(00)	Exotic tally -				Total (hits/50)
Number of tree	es with hotlows >5cm		0					41.

pecies			Cover	Abund.	Species			Cover	Abund.
Indiant	er- 0	ushralis -	2	2	62				
chicken	14	DSG-BAY 2	Z	204	42				
Microlae		ipoidos -	4	201	43				
	ullan		12	20+	44				
- · ·		pens -	2	20+	45				
alycine	dal	3015	7	204	46				
Serecio		nascaleis	2	204	47				
Hypoulo		malicata	2	204	40				
	vula		2	Tel	40				
arsim		conferma -	2_	zet	50				
111111111111111111111111111111111111111	tales		2	201	61				
Plataa			2	200	60				
Bursas	o face	.059 -	4	204	53				
	1 561	sollix com 9.	5	24	64				
Evaly	Bus L	eticomis -	3	3	55				
7.5		Comment of the Person of the P	3	20+	50				
Convolv	ye me	enivercens		Z	57				
Trifolio			2	201	58				
oxalis	yello	pers	1	20+	59				
Brunon	ell'a	australis.	- 2	Zot	80				
Sida	Mouhi	Calla	1	2	01				
Avansh			1	1	42				
Runcely	CV-6	ME COV	1	7	40				
Acete	there	parriflas	-	2	64				
	europa		3	20+	en .				
Modial	2 com	Unio-	1	1	en				
Hoppocha	- (000	Var day	1	Lot	67				
· Cotula	13 xap	wrearet	1	204	te .				
· Aristid	es .	-	3	701	20				
the total	50.		1	1	re				
Black			2	204	71				
Solam	1 50	y opple	1	1	72				7
0	- A	7 -98			12				
id.					74				
15					76				
H.					76				
17					177				
19					78				
9					yu .				
io.					eq :				
Sp. Richness	Native	Exotic	Ground laye	er % 1x1 plots	Q1	Q2	Q3	Q4	Q5
Tree	1	+	Native pere						
Shrub	1000000		Native other						
Grass (annual)	18		Native forb						
Grass (perennial)	10		Native shru	b (<1m)					
Other (annual)	1		Exotic grass	5					
Other (perennial)			Exotic forb	& other					
			Leaf & stick	litter					
			Rocks						
Ce	ver abundanc	e scale	Bare ground	d					
Modifie	d Braun-bland	quet 6 scale	Cryptogams	5	1				
			Total		100	100	100	10	0 1
1	<5% - rare		Plot Disturb	ence			Fire damage:		
2	<5% - comr	non	Clearing (in	c. logging):			Storm damage:		
3	5 - 25%			(inc. pasture):			Trampling:		
4	25 - 50%		Soil erosion	K			Flood damage:		
5	50 - 75%		Firewood o	ollection:			Feral herbivores:		
6	75 - 100%		Stock grazi	ng:			Other:		

MN 526 Mod/ Good - Poor

urvey Sit.	o Form Di-D	PL 64		Tenan Z	2	Washington and	RFEE	
ate	e Form - BipBank			Site ID: 60		Vegetation zone:	KLEL	
Vaypoint ID	66	15		Photo numbers	1276	1277		
y Unin	E			Photo direction		E		w
Coordinates	N			Photo direction	N	- 5	S	
apped Vege		-			Condition:		Low	Mod-good
1.7	, Mod, Steep		rees or cardir	1		3~		
	crest, ridge, upper slop salt, granite, conglomera					Vanish and the same of the sam		
	na foam, clay, organic, o				iptact topsoil remov			
-	d growth (uncleared):	Yes (No lun						
	nucture (formation) = θ_{μ}	ser for	51	Ecologically Domin	nant Layer (EDL) - m	ost biomass = Co	anegery	
Strata	Height interval	Median	Est, cover	Dominant Species	& Dominance		7	
-38								
E	*	l						
	+			E. I		1 1	(6) 20	
T1	20 250	l		Eucol	Atrus	esquision	105	
37/21	a con			1	1	2 can	The first of the same of the s	
T2	12	l						
70								
T3	~	l						
	+			Acocio	imple	× 4		
S1		l		heacia	Dans	enattersu	\$	
6500				Bureana	3pinos	(CA		
5255				0(00	ewood	Ĉi.		
S2		97						
	+			1111-1-1-1				
G				Microlo		cides		
0				Scaus	0.	0_		
	Tree height (clino) leve			om tree a /loo// bot	tom%)			
efinitions ominance stimated cove	Tree height (clino) leve Tree height (clino) from $d = dominant; c = co-d$ or i = isolated (0.2-2%); v	ominant; s = su	ibdominant; a	* associated	nid dense (50-80%); d	= dense (80-100%)		
minance timated cove alker & Hopk	Tree height (clino) from d = dominant; c = co-d er l = isolated (0.2-2%); v ins height classes: 1-3m	ominant; s = su = very sparse (= dwarf; 3-6m =	(bdominant; a = 2-20%); s = sp (low; 6-12m =	= associated narse (20-50%); m = n mid-righ; 12-20m = ta	l; 20-35m = very tal;	>35m = extremely tall		
minance timated cove siker & Hopk	Tree height (clino) from d = dominant; c = co-d er i = isolated (0.2-2%); v	ominant; s = su = very sparse (= dwarf; 3-6m =	(bdominant; a = 2-20%); s = sp (low; 6-12m =	= associated narse (20-50%); m = n mid-righ; 12-20m = ta	l; 20-35m = very tal;	>35m = extremely tall	losed forest	a a
minance timated cove alker & Hopk	Tree height (cino) from d = dominant; c = co-d er l = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre	ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0	ibdominant; a = 2-20%); s = sp low; 6-12m = 2-20% = open	= associated rarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% =	I; 20-35m = very tal; woodland; 50-80% =	>35m = extremety (all open forest; 80-100% = c	losed forest	G.
iminance timated cove alker & Hopk &H Crown co	Tree height (cino) from d = dominant; c = co-d er l = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre	ominant; s = su = very sparse (= dwarf; 3-6m =	ibdominant; a = 2-20%); s = sp low; 6-12m = 2-20% = open	= associated sarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally	l; 20-35m = very tal;	>35m = extremely tall open forest; 80-100% = o ng 50m transect	losed forest	a
minance timated cove alker & Hopk SH Crown co m Transect	Tree height (cino) from d = dominant; c = co-d er l = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tra 10 Points - Fo	ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0 lage Projective	odominant; a = sp 2-20%); s = sp low; 6-12m = 2-20% = open s Cover	= associated sarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally	I; 20-35m = very tal; woodland; 50-80% = sheet, 50 points afor	>35m = extremely tall open forest; 80-100% = o ng 50m transect	losed forest	Total (hits/50)
minance timated dove alker & Hopki SH Crown co m Transect tint	Tree height (clino) from d = dominant; c = co-d er I = isolated (0.2-2%); v sins height classes: 1-3m over; <0.2% = isolated tra 10 Points - Fo Canopy % (photos)	ominant; s = su = very sparse (= dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey %	2-20%); s = sp iow; 6-12m = 2-20% = open cover Exosc %	= associated sarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	I; 20-35m = very tal; woodland; 50-80% = sheet, 50 points afor	>35m = extremely tall open forest; 80-100% = o ng 50m transect	losed forest	1111
minance simated cove siker & Hopki SH Crown co m Transect int	Tree height (clino) from d = dominant; c = co-d er I = isolated (0.2-2%); v ens height classes: 1-3m over; <0.2% = isolated tra 10 Points - Fo Canopy % (photos)	ominant; s = su = very sparse (= dwart; 3-6m = es or clumps; 0 fage Projectivi Midstorey % 40 60 90	2-20%); s = sp low; 6-12m = 2-20% = apen c Cover Exotic %	= associated sarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	I; 20-35m = very tal; woodland; 50-80% = sheet, 50 points afor	>35m = extremely tall open forest; 80-100% = o ng 50m transect	lased forest	1111
minance simated cove siker & Hopke siH Crown co m Transect int	Tree height (clino) from d = dominant; c = co-d or i = isolated (0.2-2%); v ons height classes: 1-3m over: <0.2% = isolated tra 10 Points - Fo Canopy % (photos) 3.0 4.0	ominant; s = su = very sparse (= dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 40 90 25	2-20%); s = sp low; 6-12m = 2-20% = apen c Cover Exotic %	= associated sarse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record	I; 20-35m = very tal; woodland; 50-80% = sheet, 50 points afor	>35m = extremely tall open forest; 80-100% = o ng 50m transect	losed forest	Total (hiss/50)
minance imated gove ilker & Hopk il-Crown co in Transect int in in	Tree height (aino) from d = dominant; c = co-d or I = isolated (0.2-2%); v ons height classes: 1-3m over: <0.2% = isolated tre 10 Points = Fo Canopy % (photos) 30 40 40 60	ominant; s = su = very sparse (- dwart; 3-6m = es or clumps; 0 tage Projective Midstorey % 40 40 25 7.5	2-20%): s = sp low; 6-12m = 2-20% = apen 2-20% = ben 2-20% = cover Exolic %	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	It; 20-35m = very tell; woodland; 50-80% = sheet, 50 points afor if plant intersects (hi	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HT H	# 76
minance timated cove siker & Hopk SH Grown co m Transect int i m m m	Tree height (clino) from d = dominant; c = co-d or i = isolated (0.2-2%); v ons height classes: 1-3m over: <0.2% = isolated tra 10 Points - Fo Canopy % (photos) 3.0 4.0	ominant; s = su = very sparse (= dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 40 90 25	2-20%): s = sp low; 6-12m = 2-20% = apen cover Exotic %	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	I; 20-35m = very tal; woodland; 50-80% = sheet, 50 points afor	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HT HH	1111
minance timated cove siker & Hopk SH Grown co m Transect int i m m m	Tree height (clino) from d = dominant; c = co-d er = isolated (0.2-2%); v ins height classes: 1-9m over: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 3.0 4.0 6.0 3.0	ominant; s = su = very sparse (- dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 40 2 s 7.5	2-20%): s = sp low; 6-12m = 2-20% = apen 2-20% = ben 2-20% = cover Exolic %	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	It; 20-35m = very tell; woodland; 50-80% = sheet, 50 points afor if plant intersects (hi	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	kosed forest	76 Total (hits/50)
minance imated cove imated cov	Tree height (aino) from d = dominant; c = co-d er = isolated (0.2-2%); v ins height classes: 1-3m over: <0.2% = isolated tra 10 Points - Fo Canopy % (photos) S 4-0 6-0 70	ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 75 0 0 20	iodominant; a = sp 2-20%); s = sp iow; 6-12m = 2-20% = apen cover Exosic % D D	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	It; 20-35m = very tell; woodland; 50-80% = sheet, 50 points afor if plant intersects (hi	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	losed forest	# 76
minance imated cove imated cov	Tree height (alno) from d = dominant; c = co-d or I = isolated (0.2-2%); v ons height classes: 1-3m over; <0.2% = isolated tra 10 Points - Fo Canopy % (photos) S Q Q Q S O	ominant; s = su = very sparse (- very sparse (- dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 70 0 50	lodominant; a = sp 2-20%): s = sp low; 6-12m = 2-20% = apen 0 Cover Exotic % 0 0 0	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	It; 20-35m = very tell; woodland; 50-80% = sheet, 50 points afor if plant intersects (hi	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HH HH	76 Total (hits/50)
minance timated cove siker & Hopki SH Crown co m Transect int i m m m m m m m m m m m m m m m m m m	Tree height (clino) from d = dominant; c = co-d sr = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 30 40 60 30 00 5 00 17	ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 75 0 0 20	lodominant; a = sp 2-20%): s = sp low; 6-12m = 2-20% = apen cover Exotic %	= associated harse (20-50%); m = n mid-high; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally;	It; 20-35m = very tell; woodland; 50-90% = sheet, 50 points alor if plant intersects (hit	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HH HH.	76 Total (hits/50)
minance imated cove ilker & Hopk ilker & Hopk ilker & Hopk in Transect int in	Tree height (clino) from d = dominant; c = co-d sr = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 30 40 60 30 00 17 on plot	ominant; s = su = very sparse (- dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 75 70 0 333	iodominant; a = sp 2-20%): s = sp iow; 6-12m = 2-20% = apen a Cover Exotic % O O O	associated arse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally; Native other (herb	It; 20-35m = very tell; woodland; 50-90% = sheet, 50 points alor if plant intersects (hit	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	kosed forest	Total (hits/50)
minance mated cove liker & Hopk H Crown on Transect nt n n n n n n n n n n n n n n n n n	Tree height (clino) from d = dominant; c = co-d sr = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 30 40 60 30 00 5 00 17	ominant; s = su = very sparse (- dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 75 70 0 333	iodominant; a = sp 2-20%); s = sp iow; 6-12m = 2-20% = apen cover Exosic % D D D D D	associated arse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally; Native other (herb	It; 20-35m = very tell; woodland; 50-90% = sheet, 50 points alor if plant intersects (hit	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HH HH	Total (hits/50)
inance nated cove ser & Hopk If Crown co Transect t I (sum / 10 er 50 x 20 ith of wood	Tree height (clino) from d = dominant; c = co-d sr = isolated (0.2-2%); v ins height classes: 1-3m over; <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 30 40 60 30 00 17 on plot	ominant; s = su = very sparse (- dwart; 3-6m = es or clumps; 0 fiage Projective Midstorey % 40 90 25 75 70 0 333	iodominant; a = sp 2-20%): s = sp iow; 6-12m = 2-20% = apen a Cover Exotic % O O O	associated arse (20-50%); m = n mid-righ; 12-20m = ta woodland; 20-50% = Ground cover tally - every 1m record Native grass tally; Native other (herb	It; 20-35m = very tell; woodland; 50-90% = sheet, 50 points alor if plant intersects (hit	>35m = extremely tall open forest; 80-100% = or og 50m transect (s) point	HH HH	Total (hits/50)

pecies			Cover	Abund.	Species				Cover	Abund.
	1.5 A-	dianis -		3	41				-	
Acacia	W 1-0	eve -	3	8	42					
Recicia	1 amp	anattersis		4	43					
Busan		1050	3	704	44					
	-		4	204	45					
Carl	20000	Scaerda	1	5	10 Scaw	da	albila	t .		
sida M	110	1 - Tenecoun	2	201	47					
		در د د د د د د د د د د د د د د د د د د		294	48					
IA L	man 2	Angolde -	6	203	40					
Platago	-	1 da	2	201	to					
circle	lace	e less in	1	1	55					
		iae	1	1	62					
RULUS			Z	201	03					
Dictione	aro ve	ens.	2	201	24					
Geilan	-lack	-		1	55					
clema		_	2	204	56					
Colis	10.5	خدساست		705	67					
oblis	- 1 -	-	2	zot	56					
		Thesce-s		Zah	59					
of banks	in's	dica la		1	60					
Nathar	12/2	Letens	1	1	61					
2 Bidens	alos	a	1		62					
Jarben	a prices		1	1	63					
Galiu			2	704	64					
o Chicle	wend		1	1	85					
· Trifol	LAG IP	neas	1	1	86					
Geranic	100	-	7	705	67					
· Calyair	dad	loction -	1	1	66					
o Vicia	contro	CI	1	1	09					
o alyan				1	iro					
" Huspen			1	1	21					
n Land Smith	19			1	72					
39					73					
14			77.		74				1	
35					76					
16					76					_
17					277					
98					78					
10					79					_
80					80					
Sp. Richness	Native	Exotic	Ground lay	er % 1x1 plots	01		Q2	Q3	Q4	Q5
Tree			Native pere	nnial grass						
Shrub	10		Native office	r grass						_
Grass (annual)	W		Native forb	& other						_
Grass (perennial)	200		Native shru	6 (<1m)						
Other (annual)	1 . 1		Exotic gras	5						+
Other (perennial)	1 1		Exotic forb	& other						_
			Leaf & stick	litter					_	-
			Rocks		-	-				-
	over abundanc		Bare groun			_				_
Modifi	ed Braun-blan	quet 6 scale	Cryptogam	9	9,00	_	Case			00
			Total	A-1 - 2 P	100		100	10	1	00
1	<5% - rare		Plot Disturt	And the second				Fire damage:		
2	<5% - com	non	-	c. logging):				Storm damage:		
3	5 - 25%			(inc. pasture):		_		Trampling:		
4	25 - 50%		Soil erosio	-				Flood damage:		
5	50 - 75%		Firewood o					Feral herbivores:		
6	75 - 100%		Stock grazi	ing:				Other:		

HN 528 Mod/Good

Shale Plains Mad/Good

JACOBS

1655

Northern Rd Survey Site Form - BioBanking 3/9/2015 Lukas Date Surveyor(s): 1267 Waypoint ID Photo numbers Coordinates RFEF Mod-good Mapped Vegetation type: Condition Low Slope: Gentle, Mod, Steep Aspect (degrees or cardinal): Flat Altitude: Topography: crest, ridge, upper slope, mid slope, down slope, gully, flat, defiression, watercourse, escarpment, terrace Geology: basall, granite, conglomerate, sandstone, sitatons/mudstone, shafe, alluvium, limestone, metamorphics, gravel, ? Soil type: sand, lgam, glay, organic, gravel, skeletal, ? Soil disturbance: intact, topsoil removed, fill Yes / Undecided? Remnant / Old growth (uncleared): Vegetative Structure (formation) = Lan Ecologically Dominant Layer (EDL) - most biomass = Uga Dominant Species & Dominance Median Est cover Height interval Strata E Eucalyptus tachicornis (d) Eucalyptus molluncona (cd) 15 -20 N T2 T3 europaea olea **S1** 6m 52 G Tree height (clino) level ground or top of slope = distance from tree x (top% + bottom%) Tree height (clino) from bottom of slope = distance from tree x (top% - bottom%) Definitions d = dominant; c = co-dominant; s = subdominant; a = associated Dominance Estimated cover I = isolated (0.2-2%); v = very sparse (2-20%); s = sparse (20-50%); m = mid dense (50-80%); d = dense (80-100%) Walker & Hopkins height classes: 1-3m = dwarf; 3-6m = low; 6-12m = mid-high; 12-20m = talt; 20-35m = very talt; >35m = extremely tall W&H Crown cover <0.2% = isolated trees or clumps; 0.2-20% = open woodlend; 20-50% = woodlend; 50-80% = open forest; 80-100% = closed forest 10 Points - Foliage Projective Cover 50m Transect Ground cover taily sheet, 50 points along 50m transect Canopy % (photos) Midstorey % Exotic % Point - every 1m record if plant intersects (hits) point 40 30 10 Total (hits/50) 5m Native grass tally -10m 40 0 Ö 15m 20 0 0 20m 60 0 0 60 25m 0 0 30m 40 0 0 Native other (herb, fem, sedge, etc) tally -35m 40 0 0 0 40m 50 20 45m 50m 40 Total (hits/50) Total (sum / 10) = Native shrub tally -Larger 50 x 20m plot Length of woody debris >10cm wide & >0.5m long Total (hts/50) Proportion of canopy sp. regeneration

Number of trees with hollows >5cm

JACOBS Namow

Unear Plat to get Roadside ved.

10x40m Survey type:Quadrat-20m x 20m 10 Site ID: Cover Abund. Cover Abund. Species Species 日 20 Exalgetus terchicornis 2 Everyphis Andluceaux Olea curaciea Haydenbergia violacea Bidens pilosa Ehrhanta crecha Platago mudita Oidhandra repens 5 20+ 20+ 2 2 20+ 70+ 764 204 Rommelina 20+ 2 Modelala 704 飲み Soprum 201 circula Evagration Ardyja scicitera zot 2 tops 204 Walleddengia Vulgar arsium Einodia notone openisetus cladistina oblinadia hostata 704 m Sida mhontifolia 2 4 Romex compos a Chloris gayona Z 201 cypens gracilis zot m setania 25 Chickensed 204 Vertica bonociensis m Aristida vagars 204 丞 * Serecio modoobscalasis 2 Souches oldacens so Atempathera Z " Funavia muralis Solare sor pidely apple Q5 03 04 Sp. Richness 01 02 Exotic Ground layer % 1x1 plots Native Tree Native perennial grass Shrub Native other grass Native forb & other Grass (annual) Grass (perennial) Native shrub (<1m) Exotic grass Other (annual) Exotic forb & other Other (perennial) Leaf & stick liner Rocks Cover abundance scale Bare ground Modified Braun-blanquet 6 scale Cryptogams 100 100 100 100 Total Fire damage: Plot Disturbance 1 <5% - rare Storm damage: <5% - common Clearing (inc. logging): 2 Cultivation (inc. pasture): Trampling: 5 - 25% 3 Flood damage: 4 25-50% Soil erosion: Feral herbivores: 50 - 75% Firewood collection: 5 Other: 75 - 100% Stock grazing:

th 528 Mod/ Good

JACOBS

Shale Plains - Mod (good

Survey Sit	e Form - BioBani			Site ID: Def	ence 2	Vegetation zone:	SHW	Cew
Date	1/10/20			Surveyor(s):	Lukas	deus	140.00	
Naypoint ID	658			Photo numbers	2240	_	\rightarrow	2244
Coordinates	F 2856	26		Photo direction	N	E	2	723
OUG UI IBIBS	N 625	4457		THORU GRECION	389		s	w
Mapped Vegg	station type: C	N.			Condition:		Low	Modegood
	f, Mod, Steep		rees or cardi	14-	Altitude: <	12m		
	crest, ridge, upper slop					E. A. D. G. C. A. D. U.		
seology: bas	alt, granite, conglomera	ste, sandstone,	siltstone/muds	stone, shafe, alluviur	m, limestone, metamor	phics, gravel, ?	- 4	
oil type: sar	nd, loam clay, organic,	gravet, skeletal	, ?	Soil disturbance	e: intact, Jopsoil remov	ed, fill		
Remnant / Ok	d growth (uncleared):	Yes TROTU	ndecided?					
egetative St	ructure (formation) =	Don to	-15	Ecologically Dom	inant Layer (EDL) - mo	ost biomass = Cou	ony	
Strata	Height interval	Median	Est, cover	Dominant Species	s & Dominance		1) .	
	1							
E	(₹							
1000	4 400-0 - 1000000			Eural	yptus v	holly cons	2	
T1	15.25m		1	Euca	Cuptus	fibrosa		
	Mark Mark							
	1	1						
T2		1						
	+	-	_					
TO								
Т3	*	1						
	+	+		1	a Calca	1		
S1	10	1		Acacie				
0.		1		Dave		chei		
	 	-	<u> </u>	-VOAT	KEH			
S2		1						
		1	l					
		_		clular	5 questo	_a		
G		1		They		mondo		
				Eroge		plumu		
	Tree height (clino) leve	ni ground or top	of slope = dista					
	Tree height (clino) from	n bottom of slop	e = distance fr	om Iree x (top% - bo	(flam%)			
ofinitions								
ominance	d = dominant; c = co-c	forminant; s = si	abdominant; a •	associated				
stimated cove	r 1 = isolated (0;2-2%); v	v = very sperse	(2-20%); s = sp	erse (20-50%); m = r	mid dense (50-80%); d	= dense (80-100%)		
alker & Hopki	ins height classes: 1-3m	= dwarf; 3-6m =	fow; 6-12m = 1	nid-high; 12-20m = tr	alt; 20-35m = very tall; >	35m = extremely tall		
&H Crown co	wer; <0.2% = isolated tre	es or clumps; 0	.2-20% = open	woodland; 20-50% =	woodland; 50-80% = o	pen forest, 80-100% = clos	sed forest	
lm Transect		oliage Projectiv	T	4 8	y sheet, 50 points along			
virit	Canopy % (photos)	Midstorey %	Exotic %		d if plant intersects (hits			
n .	10	0	0	Native grass tally	###	-1111-111	+ 1111	Total (hits/50)
m	0	20	0	1111-	111	1111 -111	1 +11	925
im	0	20	0	1111	1	A. 11.800A		72%
en .	5	30	0	1.1	1111			1016
im	2	30	0	er a	7)	11		Lance Services
m	0	20	0	Native other (herb	o, fern, sedge, etc) tally	. //		Total (hits/50)
im	0	10	0	-		7.12.9		1 .
m	0	# 0	8	1				41
m		140		1				1.00
m tot (s / 40	70	10	0					
tal (sum / 10	-10010000	17	0	Native shrub tally				Total (hits/50)
rger 50 x 20				1				Δ',
ingth of wood	ty debris >10cm wide &	>0.5m long	OM	I				01.
needing of			V 1	Franks III 944	II Usa	V-1		
opertion of c	anopy sp. regeneration		100%	Exotic tally -	# #11	11		Total (hits/50)
			1	1 ,	4	H		24%
imper of tree	s with hollows >5cm	- 1/	0			1		411

(001.

Paging	Cover	Abund.	Species		Te Te	Cover	Abund.
species Bucalyptus mollicaa	- 3	2	41			50101	7.00110.
1 . / C 1 -	1 4	201-	42				
maria tarres	- 3	10	43				
Dillumnia sieles	3	201	44				
Englostis anuly		-	46				
nedda triadra	7 4	708					
allon's gayaa	3	205	66				
Execio modagasco insi		4	43				
Matego Miccolale	1 2	201	48				
Dichaldra regers	- 2	704	40				
· Chidottes siebel	7 !	Z	60.				
· goodenia hederaced	+ 2	70+	51				
· Myseium granieu		38 4	52				
· Hadebegia Triplacon	. 7	2004	63				
· Cylycie - talacira	7		64				
s Velze-c	-	0.0	66				
· Britis swaisholy	3	26	66				
Centella asiation	+ 7	701	67				
· Bidere piloce	1	1	58				
9			58				
0	_	-	60				
*	_	-	01				
2	2 1-1	1 14	82				
670 - E, Albrosa X7	0073	ac pos					
4	_	+ `	64				
9	_	+	65				
96			BS				
U.	-	_	86				
26	_	_					
20	_	+	70				
10	_	+	70				
žt .	_	_					
30	_	+	72				
33	-	+	73				
34			76				
30	-	+	70				
90	1	_	27				
ar .	_	+	78				
35		+	70				
39	-	+	80				/
Sp. Richness Native Exotic	Geoupel Ince	ar % 1x1 plots	Q1	Q2	Q3	Q4	Q5
Tres	Native pere			-		0	
Shrub	Native other						
Grass (annual)	Native forb						
Gress (perennial)	Native shru	TAXABLE PARTY.					
Other (annual)	Exotic grass						
Other (perennial)	Exotic forts						
	Leaf & stick						
/5	Rocks						
Cover abundance scale	Bare groun	d,					
Modified Braun-blanquet 6 scale	Cryptogama						
	Total		100	100	100	100	0 1
1 <5% - rare	Plot Disturb	ance			Fire damage:		
2 <5% - common	Cleaning (in				Storm damage:		
3 5-25%		(inc. pasture):			Trampling:		
4 25 - 50%	Soil erosion				Flood damage.		
5 50 - 75%	Firewood o	1977			Feral herbivores		
6 75 - 100%	Stock grazi				Other:		

4N 528 Mal/Good **JACOBS**

Shale Plains - Mad (Good

Survey Sit	e Form - BioBanl			Site ID: Mar.	sderia 1	Vegetation zone:	CPW		7
Date	1/10/201	٤		Surveyor(s):	Lukos	deus			
Waypoint ID	656	the bit conserved		Photo numbers	2503		\rightarrow	2229	2232
Coordinates	E 2857	892		Photo direction	N	E	s	w	2234
Mapped Vege	tation type:	PW		7	Condition:		Low	Mod-good	7
Slope: Seale	, Mod, Steep	Aspect (deg	rees or cardin	ial): Plast	Altitude:	93m			7
	crest, ridge, upper slo				watercourse, escarpro	ent, terrace			7
Geology: bas	salt, granite, conglomer	ate, sandstone,	siltstone/muds	fone shale alluviur	m, limestone, metamor	rphics, gravel, ?			1
Soil type: san	nd, loam, elsy, organic,	gravel, skeletal	.7	Soil disturbance	: intact, topsoil remov	ed, fill			7
Remnant / Old	growth (uncleared):	Yes Mo Jur	ndecided?						1
Vegetative Str	ructure (formation) =			Ecologically Dom	inant Layer (EDL) - mo	ost biomass =			7
Strata	Height interval	Median	Est. cover	Dominant Species	s & Dominance				i
E									=
T1	15			Eiscol	yptus .	ndlixeara			=
T2	12	-							1
Т3]
S1	3			Acacio	Para	cata]
S2									
G				There Chilor	da tric	ruyla adra	Aristid	4]
	Tree height (clino) lev Tree height (clino) from d = dominant; c = co-c r I = isolated (0.2-2%); ns height classes: 1-3m	m bottom of slop dominant; s = su v = very sparse (e = distance fro abdominant; a = 2-20%); s = spa	associated associated (20-50%); m = r	(torn%) Wassder mid dense (50-80%); d	= dense (60-100%)	lora hab	sitat.	
	ver: <0.2% = isolated tre	ses or clumps; 0.	2-20% = open	woodland; 20-50% =	woodland; 50-80% = o	pen forest; 80-100% = clas	sed forest		_
Point	Canopy % (photos)	Midstorey %			r sheet, 50 points along				1
5m		Midstorey %	Exotic %		If plant intersects (hits		,	Total City West	-
10m	10	5	0	wanve grass rany	111-111	·##	1	Total (hits/50)	1
15m	S	0	0	1	5050V (05053)		5		1
20m	10	0	0	Í				22%	1
25m	5	0	Ö	i				85 47	1
30m	ó	0	0	Noting other than	form andre stelled	1111-		Total (bits 450)	1
35m	40		0	nauve other (nerb	, fern, sedge, etc) tally	+++		Total (hits/50)	921.
t0m		0		1		- 11		#05323P#0115	1771
45m	10	2	0	1				10%	190
200	10	0	0					55.535.00	
SOm February (100	I III-	0.5	75					2007000000	-
Total (sum / 10)		0.5	07.	Native shrub tally				Total (hits/50)	1
arger 50 x 20n ength of wood	n plot ly debris >10cm wide 8	>0.5m long	Dua					0%	
Proportion of ca	anopy sp. regeneration		0m	Exotic tally -	####	H 111L		Total (hits/50)	-
Number of trees	s with hotlows >5cm		100%	~ 1);	11 111 4	11 +11		20%	

pecies	1	-	Cover	Abund.	Species				Cover	Abund.
		olliccong -	5	9	41					
	TUS M	diffara .	1	5?	e als	657	-	E. teet	rorrus	
Λ	in the	ACCULTON AS				0 - 1			3.0	
Arren		eifera	U	2						_
Thered	A STATE OF THE PARTY OF THE PAR	ada -	1	201	84					+
alais	gaya	-1	4	20+	85					+
Bracico	stie (www.da	4	201	40					
Bidlens	piloso		1	1	47					
Serecio	mada	pscamers 3	2	10	48					
Brynon		australis.	- 3	20+	40					
Dichon	-	eo.ers	3	204	60					
Patago			2	Pat	št:		-			
Husooh		ndirata	7.	ZOT	tz					
11 1	s old	D-F	1	Z	63					
		aifal'a	1	T	54					
Elnadik	a 10-	ans	1	1	55					
The second second		ecina	2-	201	56					
The state of the s			D ₁ -	1	67					
Vittadi	The second second	3P.	1	1						
Arthrop		willeffer .	1	-	50.					
Acacia	porte			2	50.					
succela		soden	1	1	80					
Acres		ator	1	1	ei					+
Arist	da	vaging	1	1,	62					-
Marderb		riolacere	1	1	63					_
Ercupol	ita d	د نازل	- 1		84					_
5					65.					
6					05					
,					87					
6					0.0					
0					eo					
n					76					
4					21					
0					72			100		
W					23					
3.			_		74					
14				_						
10:			-	_	70 .					
6			-		100					
17.			-	-	"				-	+
it.			-	-	78					-
10			_	-	70				-	-
to					en	_				-
Sp. Richness	Native	Exotic	Ground laye	r % 1x1 plots	Q1	_	Q2	C3	Q4	Q5
Tree			Native perer	vnial grass		_				
Shrub	0	1	Native other	grass						
Grass (annual)	15		Native forb	& other		_				
Grass (perennial)	12		Native shrut	(<1m)						
Other (annual)			Exotic grass							
Other (perennial)			Exotic forb 8	other						
	_		Leaf & stick	litter						
			Rocks							
0	over abundanc	e scale	Bare ground							
	ed Braun-blan		Cryptogams							
moun	or an entire trail i		Total			100	100	10	0	100
24	est one		Plot Disturb	ance		_		Fire damage:		-
1	<5% - rare			Office Contractors				Storm damage:		
2	<5% - com	mon	Clearing (in		-		_	Trampling:		
3	5 - 25%			inc. pasture):						
4	25 - 50%		Soil erosion					Flood damage:		
5	50 - 75%		Firewood or	-		_		Feral herbivores:		
6	75 - 100%		Stock grazin	10:				Other		

HN528 Mod/wood

JACOBS

Shale Plains - Mod/Good

Survey Site	Form - BioBank	ing		Site ID: Defer	ce PZ	Vegetation zone:	CPW	
Date	1/10/20	15			uras	Cleus		
Naypoint ID	636			Photo numbers	2200	2201	2202	
Coorfoote	E 28	3752		Ohale Cont	77			
Coordinates	N 62	55149		Photo direction	N	E	S	·W
Aapped Veget					Condition:		Low	Mod good
Slope: Gentle.	Mod, Steep	Aspect (deg	rees or cardi	nal): +(ad	Altitude: Q	ZM		
opography:	crest, ridge, upper slop	e, mid slope, d	own stope, gut	ly, Mit, depression, v				
eology: basa	alt, granite, conglomera	te, sandstone,	siltstone/muds	tone, stale, alleviun	n, limestone, meterni	orphics, gravel, ?		
	d, loam_elay/organic.		All the second second second second		: intact_topsoil remo			
	growth (uncleared):	(es)Np/Ur		Same.	lorger	trees	60-65en	dollo a
	ucture (formation) =	Carry	Silviono.	T	inant Layer (EDL) - n	The state of the s	60 6-61	W offer
Strata	Height interval	Median	Est. cover	Dominant Species		nuse uncertains -		
Swara	ridigis siteival	wiculan	Cat. LOVE	Dominant apecies	s a Dominance			
-	10,	l						
Е	7.5	I						
		-	-					
2.0		1		Eucoli	yotus v	Johnson		
T1	15 200	1		_				
	97,100	_						
-								
T2		L	1					
								4.2
		16						
T3	98	1						
				Daday	nea vi	>=0.54		
S1		1	l	Dave				
				Olra	europo	200		
					-			
S2		I	l .					
		1	1					
				Eragro	1242	phyru		
G		l 1	1	duais	agree			
177	10			Aishid	- 27			
	Tree height (clina) leve	comunities that	of sinon = dista	mon from tree v /tools	i + hottom%)			
	Tree height (clino) from				1939 (J. 1934) 4. 1947 (1941)			
efinitions	The median females area	Demont to skip	e wateried it	man in the se Viole se - Dise	144			
ominance	d = dominant, c = co-d	ominant v = -	hdominant: a -	associated				
	I = isolated (0.2-2%); v				nid dones (E0-800)	d = denen /gp apper		
sticianda cover	1 - Isoleten (n. 6-6-76), v	- Ani A otvo on I	e-enself o = ob	arse (20-co vs), m = n	nio dense (au-au-xi), (2 = Gense (60-100%)		
aliver & Linearia	on helpht classes 4.3-	a dual 2 de -	term R. 475-	and black are now a	4.70.70-	A DE mandar and the San		
	is height classes: 1-3m					지어생이의 이렇게 되었다면 하지 않는데 되었다.	50000000	
art Crown cov	rer. <u.z% =="" isolated="" td="" tra<=""><td>es or clumps; O</td><td>z-20% = open</td><td>woodrand; 20-50% #</td><td>woodand; 50-80% =</td><td>open forest; 80-100% = cl</td><td>osed forest</td><td></td></u.z%>	es or clumps; O	z-20% = open	woodrand; 20-50% #	woodand; 50-80% =	open forest; 80-100% = cl	osed forest	
	1404000000	W	(1200 Here)	I zana az eskaronas		ercogeneration		
m Transect		ilage Projectivi			sheet, 50 points alo	374700000000000000000000000000000000000		
int	Canopy % (photos)	Midstorey %	Exotic %	- every 1m record	If plant intersects (h	its) point		_
1	40	0	0	Native grass tally	111-111	1 [[1]		Total (hits/50)
m	40	0	0	1 "	1111	1 1111		
m	10	0	0	1	1.0	0.79(%)		000
m	20	5	. 0	1				28%
m	30	10	0					
m	5	0	0	Native other (herb	, fern, sedge, etc) tal	By - 1111		Total (hits/50)
m	30	0	0			[1]		
m	10	10	0	1		1		07
n	50	25	ō	1				87,
m	30	0		1				(2)
			0	16.00 - 20 - 1.00				
tal (sum / 10)		3	0	Native shrub tally -				Total (hits/50)
rger 50 x 20m				1				000
ngth of woody	y debris >10cm wide &	>0,5m long	OM	I				0/
			O 143					
oportion of ca	nopy sp. regeneration		(00%	Exotic tally -	# 111			Total (hits/50)
- 1	100		(00/1	1	111/			281.
umber of trees	with hollows >5cm		2	1	11/1	'		2000

ite ID: Oeferce	Cover	Abund.	Species			Cover	Abund.
Placed other auditycone	- 45	4	as a				
Breakptis molluccas Bragiostis curula Daughia Militia	3	204	42				
CVA GICSTIS CHARLES	1 7	1	42				
aversa munus	I ,'	2					
Obdonaca Viscosa	T /	22-	44				
Olea europuea	1	1	45				-
Sercio modagiscarinsis	7	8	46				
Perniseter Eladistinen	72	204	47				
Chloris gayong	4	201	46				
Plastago lorceolada		2	40				
Andrea vagous	+ (4	50				
Di chardra repers	- 2	20+	51				
Lachrogrostis filliforis	+ \	1	82				
Araisia scicitera		11	53				
Taraxaum officiale	1	Z	54				
Linux - Yellow	1	1	55				
	1	L	SA.				
Colin perene	100	1	47				
Briza solaristata	1	1					
	1	5	60				
Tilly - 85	1	2	50				
Galochaeta	1	1	60				
Cymodon dadyla	- 3	200	61				
Bursania spinosa	- 1	1	62				
1			63				
			64				
			05				
1			do				
t contract of the contract of			R7				
			46				
			40				
0			20				
			H				
			22				
	1	177	73				
		1	74				
			75			1-	
			re				
		_	77				
	-	-	78				
1	+	+	79				
9	-	+	-				
Land to Land to Land	0	4/ 4-4 -1-1-	80	03	Q3	Q4	Q5
Sp. Richness Native Exotic	_	r % 1x1 plats	Q1	Q2	143	C/4	- CO
ree	Native perer						_
Shrub Ø	Native other			-			
Grass (annual)	Native forb	ACCORDING TO THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUMN TWO					
Grass (perennial)	Native shrut	(<1m)				-	-
Other (annual)	Exotic grass						
Other (perennial)	Exotic forb 8	kother					
	Leaf & stick	litter					
	Rocks						
Cover abundance scale	Bare ground						
Modified Braun-blanquet 6 scale	Cryptogams						
	Total		100	100	100	10	0 1
1 <5% - rare	Plot Disturb	ance			Fire damage:		
2 <5% - common	Clearing (inc	: logging);			Storm damage:		
3 5 - 25%	-	inc. pasture):			Trampling:		
4 25 - 50%	Soil erosion				Flood damage:		
5 50 - 75%	Firewood co				Feral herbivores:		
					Other:		

HNSZ8 Mod/acod.

JACOBS

Shale Plains - Mod (Good

Survey Site	Form - BioBank			Site ID: 219	83 NR	Vegetation zone:	CPW		
Date	1/10/2	015		Surveyor(s):	V3	310			Year
Waypoint ID	635			Photo numbers	2182		>	2180 2	19
Coordinates	E 2864	6320	1	Photo direction	N	E	5	w	
Mapped Veget		N			Condition:		Low	M6d-good	
Slope: Gentle:	Mod, Steep	Aspect (deg	rees or cardi	nal): Plat		71m		4	
Topography:	crest, ridge, upper slop				watercourse, escarpme	ent, terrace			
	alt, granite, conglomera								
0.11.000	d, loam, elay, ofganic, g		V-12-14-14-14-14-14-14-14-14-14-14-14-14-14-	The second secon	e; intact/topsoil remove		1		
	growth (uncleared):	Yes,/No / Jor	-						
					emat		<u>al</u>		
-	cture (formation) = 0	1	exest.	_	ninant Layer (EDL) - mo	est biomass = (a_e	201		
Strata	Height interval	Median	Est. cover	Dominant Specie	is a Dominance		,		
E	9								
T1	15.20m			Ecal	yptis +	meducce	s (d)		
Т2									
ТЗ	æ								
S1	is.			Bursa	arrapo	089			
S2	9				orgin w	dacear			
G	*			Dichon		currula			
Definitions Dominance Estimated cover	Tree height (clino) from d = dominant; c = co-d 1 = isolated (0.2-254), v	bottom of slop ominant; s = su	e = distance fi ubdominant; a	rom tree x (top% - bo = associated	ottom#6)	= dense (90-100%)			
	ns height classes: 1-3m ver. <0.2% = isolated tre					35m = extremely Iall pen forest; 80-100% = clo	sed forest		
50m Transect	10 Points - Fo	liage Projectiv	e Cover	Ground cover tall	ly sheet, 50 points along	g 50m transect			
Point	Canopy % (photos)	Midstorey %	_		d if plant intersects (hits				
5m	30	0	0	Native grass tally		-1111 111		Total (hits/50)	
10m	0	0	0		-HH -HH	HH 111			
15m	0	1	1	1	111	(4) 11)		2711	
20m	0			1		or over hills		36 %	
25m	0			1				(120000)	
30m	0			Native other feet	h fam godina olo) tot	. 111- 111		Total (hite 650)	
	ő			- Nauve outer (nert	b, fern, sedge, etc) tally	111		Total (hits/50)	
35m	00	-		-1		111		11-1	
40m				-1				16%	5
45m	/0	1/	V	+				9	11
50m	60	W							16
Total (sum / 10)	- 10	0/1	01	Native shrub tally				Total (hits/50)	L
Larger 50 x 20n Langth of wood	n plot y debris >10cm wide &	>0.5m long	Om					0%	
Proportion of ca	nopy sp. regeneration		100%	Exotic tally	1-111-1			Total (hits/50) 2 Z '/_	
Number of trees	s with hollows >5cm		2		11			4-1.	

pecies	Cover	Abund.	Species			Cover	Abund.
Evenlytes molluccona	- 5	36	41				
Excalyous tordicomis		2	42				
Bursaia sonosa	+ (1	43				
sida Mandifola	1	S	44				
Sercio madagascoi -si	2	204	45				
Educostis Euryula	t _t -	204	48				F
Thoracdo australis	- 4	201	47		4		
Dichardra vegers.	- z	204	48				
Brunaviella australia	4 2	204	40				
Aristida vadono	+ 1	2	60				
Sorelus deraceus	1	1	51				
alucine tolorina	+ -z	-ect	52				
Plantago loncedato	2	7.65	53				
Lilly	+ 2	704	54				
chiloris aguara	2	204	36			L	
Lomado - fillitais	. + \	2	se				
Hardenherain vialle		1	67				
Einabice Unitaria	. + \	1,	58				
· Opuntia stricta	1	2	59				
Lactuca seriola	1	1	60				
Dianella braifelia	+ 1	4	03				
dra emosora	1	2	62				
Taraxacunh officials		b	85				
Hypochica's radicale	1	2	64				
circium vulcae	(2	65				
canochagto procur	1	1	00				
Arthropadin willelt	mi - 1	1	67	100			
· Aravilla scicifea	1		66				
Walla burgia - large	. + 1	3	60				
andospermen ledo	phylle 1	8	/n				
· Wédica as polymore		Zat	21				
Anagollis aversis	2	204	72				-
Vetters baraberes	1	-	73				
4	_	-	74				
6			75				
5	_	+	76				
7		+	77				
		-	78				
	_	+	79 80				1
Sp. Richness Native Exotic	General Inc.	or % 1x1 plots	Q1	Q2	Q3	Q4	Q5
ree Ranness Native Excess	_	onial grass	- 41	ME	560	-	
thrub .	Native othe		+				
Grass (anytual)	Native forb						
Grass (perencial)	Native shru	The second secon					
Other (annual)	Exotic gras						
Other (perennial)	Exotic forb		1				
	Leaf & stick	THE REAL PROPERTY.					
	Rocks			_			
Cover abundance scale	Bare groun	ď					
Modified Braun-blanquet 6 scale	Cryptogam						1
were an experience for the desired a fine model and another section of	Total		100	100	100	100	1
1 <5% - rare	Plot Disturb	ance			Fire damage:		
2 <5% - common	Clearing (in	ic. logging):			Storm damage:		
3 5 - 25%		(inc. pasture):			Trampling:		
4 25 - 50%	Soil erosion				Flood damage:		
5 50 - 75%	Firewood c	offection:			Feral herbivores:		
6 75 - 100%	Stock grazi	and the same of th			Other:		

HUSZ8 Mod/aood **JACOBS**

BIOBANKING FIELD Sheet Entered Shale Plains - Mod (Good

Survey Site	e Form - BioBank	ing		Site ID: 2	Bradley	Vegetation zone:	CPW	
Date	30/9/5	2015		Surveyor(s):	Lukas	deus		
Waypoint ID	, ,	633		Photo numbers	2165	2166		
Coordinates		706		Photo direction	N	E	s	w
500 tall lates	N 67	25702	-5	I TIGO OF ECHOT			3	W
Mapped Vegel	tation type: CPV	V		N. 171	Condition:	14 10 40 40	Low	Mo)-good
Slope: Gentle	/Mod, Steep	Aspect (deg	rees or cardin	an Ese	Altitude:	68m		
	crest, ridge, upper slop			The state of the s				
Beology: basa	at, granite, conglomera	de, sandstone,	siltstone/mudsl	tone shale afuviu	m, limestone, metamor	phics, gravel, ?		
Soil type: san	d, loage, clay, organic,	gravel, skeletal	.7	Soil disturbance	Fitact lopsoil remov	ed, fill		
Remnant / Old	growth (uncleared):	Yes Ng / U	ndecided?				-	
/egetative Stn	ucture (formation) = 0	THE RESERVE THE PERSON NAMED IN	-1	Ecologically Dom	inant Layer (EDL) - mo	ost biomass = / e.	Mary	
Strata	Height Interval	Median	Est. cover	Dominant Specie			47	
-			1					
Ε	8	1						
1415	1	1						
		_		Furn	Lyptus	tecticor	70.C	
T1		1		Final	lystus	cretra	nus	
(3.35)	1			LUCEC	70105	Creary		
	1	_			227			
T2	02			-				
	8							
		_						
Т3	12	1						
13	1 "	1			_			
		_		W				
S1	l	1		Bursel		1035		
51	8	1		Lycile	a tem	ocissinnon	9	
		-	-	Acacio	a born	anathers	<u> </u>	
S2		1						
			-		,			
820	1	1	1	Evagi	resto	cermile	7 ,	
G	*	l		S-c-le		agostonia	215	
				Dichard	LAS MODE	es c	Microlas	ana
	Tree height (clino) levi				2.000			
12/12/09/09	Tree height (clino) from	n bettom of slop	e = distance fro	im tree x (tap% - bo	ittom%)			
lefinitions								
lominance	d = dominant; c = co-d							
stimated cover	r I = isolated (0.2-2%);	v = very sperse	(2-20%); s = spa	arse (20-50%); m =	mid dense (50-80%); d	= dense (80-100%)		
	ns height classes: 1-3m				417 37 31 31 31 31			
&H Crown co	ver: <0.2% = isolated tre	es or clumps; 0	(2-20% = open)	woodland; 20-50% :	= woodland: 50-80% = 6	pen forest; 80-100% = ck	sed forest	
m Transect	10 Points - Fo	oliage Projectiv	e Cover	Ground cover tall	y sheet, 50 points alon	g 50m transect		
pint	Canopy % (photos)	Midstorey %	Exotic %	- every 1m recon	d if plant intersects (hit	s) point		50
n	40	10	0	Native grass tally	1111 11			Total (hits/50)
im	40	20	0		+11 11			
im	5	Ó	0	Į.	1.)			14%
lm	. 40	10	D	l			2	(()
im	40	25	0					
lm	20	60	D	Native other (hert	o, fem, sedge, etc) tally	-114-1111	-1111	Total (hits/50)
im	30	60	0			-HI 1111	1111	2000 Amagaan
im	60	10	0	1		1.1	1111	20%
m	0	0	0	1			0)	201,
m	0	0	0	1				
tal (sum / 10)	= 27.5	19.5	0	Native shrub tally	- 111			Total (hits/50)
rger 50 x 20n		1117		armor tary	111			/ 3
	y debris >10cm wide 8	>0 firm leans	L	1	.11			61
agin or wood	y Jeura - roum wide t	- Polan long	Im	I				077
montion of	MONE MARKET		001	Eastin to be 111				T-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1
oportion or ca	anopy sp. regeneration		00%	Exotic tally - 111	- 1111-1	111		Total (hits/50)
	- Marian		-	11	1	11.)		28%
mber of trees	s with hollows >5cm			미	1 1111	111		28/

ite ID: 87ad	7		Cover	Abund.	Species		T	Cover	Abund.
	T L	veticonis -	4	34	ореско				
Every			_	3	41				
Curally	offs	augret's	4		43				
prenow	ella			204	44				
Bursavia	spino		3	704					
Portmos		moera -	_	70+	45				
lycius		sijaum	7	3	46				
Aravija			7	204	47				
Diction	dra v	epers .		701	46				
Plantas			2	205	49		-		
Succial		gascanso	2	201	50		11		
Anistic	la A	Jacomby -	2	201-	51				
Oplish	en il	Jaconhy	- 2	rest	52				
Hadel	odnia	violacen	- (£3			- 22	
Sida	Mark	ifolin	7	20A	64				
alyane	telas	ecina :	2	- tos	rii.				
Lollium	pere	ne	1		66				
Cyper	gra	alir .	2	20+	67				
Oxalis	hall	(<u></u>	2	20+	5.6				
Briza	SOLO	isterta	PE.	20+	69				
Acacia	porte	mattersis	+ 4	3	ap				
Soneli		leracers	1	1	01				
Cirsium	w	4a-c	1	12	62				
Brome		Maxicus	1	1	63				
· Euchon	Lia		1	1	84				
· chiel	thos	sicken	1 1	3	40				
Nalle	Lurai	a .	+ 1	1	en				
7	1				67				
e e					64				
g.					60				i.
0		-			70				
t					71				
2					72				
9					73				U
4					74				
5					75				
6					76				
×					27				
е					78				
0					79				
D					90				
ip. Richness	Native	Exotic	Ground laye	er% 1x1 plots	Q1	Q2	Q3	Q4	Q5
ree			Native pere	nnial grass					
Shrub	111		Native other	grass					
Frass (annual)	117		Native forb	& other					1
Grass (perennial)	20. 20		Native shru	b (<1m)					
Other (annual)			Exotic grass						
Other (perennial)			Exotic forb	& other					
			Leaf & stick	litter					
			Rocks						
Co	wer abundance	scale	Bare ground	t .					
Modifie	ed Braun-bland	uet 6 scale	Cryptogams	ŧ.					
			Total		100	100	100	100	1
1	<5% - rare		Plot Disturb	ance			Fire damage:		
2	<5% - comm	ton	Clearing (in	c. logging):			Storm damage:		
3	5 - 25%		Cultivation ((inc. pasture):			Trampling:		
4	25 - 50%		Soil erosion	Ė			Flood damage:		
5	50 - 75%		Firewood or	ollection:			Feral herbivores:		
6	75 - 100%		Stock grazin	ng:			Other:		

urvoy Sito			-	450000			Entere Good	
	Form - BioBankir	-7-		Site ID: (22	-2 N	egetation zone: ∠	cew	
ate aypoint ID	18/11/2	28/	_	Surveyor(s): Photo numbers	2398		->	2400
Coordinates	E	101		Photo direction	N	2	s	7,53
oordinates	N			Photo direction		E	8	W
pped Vegeti	A STATE OF THE PARTY OF THE PAR	-		n. 114	Condition:		Low	Mod-glod
			rees or cardin	1 616	Altitude: 8 watercourse, escarpment,	errace		
					m, limestone, metamorphic			
	i, loam, clay-organic, gr			-	c intact topsoil removed, f			
mnant / Old	growth (uncleared):	Yes Morun	decided?	-				
etative Stru	cture (formation) = 🚫	an for	ext	Ecologically Dom	inant Layer (EDL) - most b	omass = Cerre	200	
Strata	Height interval	Median	Est. cover	Dominant Specie	s & Dominance		-/	
E								
-								
				Euro	lyptus	molluce	ana	
T1	10.300				/			
T2								
1.4								
T3	1.50							
				N.C				
S1				Monice	m olive			
01	1,40							
				-				
S2	848							
				201.0				
	33			Side	laena	Sid	nonielle	
G	10.05				4 1 1 1 1 1 1 1 1		the section of the	4
G					1400 11	uldare	William Statement Statemen	(
G	Tree height (cino) level	ground or top	of slope = distar	Circl	(1 (1)	ulgare		
170C	Tree height (clino) level Tree height (clino) from	51 (1)	199	ce from tree x (top)	(A + bottom%)	ulgare		(
vilions	Tree height (clino) from	bottom of slop	e = distance fro	ce from tree x (top) on tree x (top)% - bo	(A + bottom%)	ulgare		
vilions inance	Tree height (clino) from d = dominant; c = co-do	bottom of slop minant: s = se	e = distance fro	ce from tree x (top) m tree x (top% - bo associated	(A \) % + bottom%) ttom%))		
illions Inance	Tree height (clino) from d = dominant; c = co-do	bottom of slop minant: s = se	e = distance fro	ce from tree x (top) m tree x (top% - bo associated	(A + bottom%))		
villons Anance nated cover	Tree height (clino) from d = dominant; c = co-do l = isolated (0.2-2%); v =	bottom of slop minant; a = su - very sparse (e = distance fro ibdominant, a = 2-20%); s = spa	nce from tree x (top) m tree x (top)% - bo associated arse (20-50%); m =	(A \) % + bottom%) ttom%)	nee (80-100%)		
nitions mance mated cover ker & Hopkin	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%); v : is height classes: 1-3m =	bottom of slop minant; a = se = very sparse of dwarf; 3-6m =	e = distance fro ibdominant, a = 2-20%); s = spi low, 6-12m = n	co from tree x (top) im tree x (top)% - bo associated use (20-50%); m = iid-high; 12-20m = t	(nse (80-100%) = extremely tall		
initions nihance mated cover ker & Hopkin H Crown cov	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated tree	bottom of slop minant; a = se = very sparse of dwarf; 3-6m = s or clumps; 0	e = distance for ibdominant, a = 2.20%), s = spr low, 6-12m = n 2-20% = open	coe from tree x (top) in tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = b woodland; 20-50% =	% + bottom%) ttam%) mid dense (50-80%); d = de st, 20-35m = very talt; >35m = woodland; 50-80% = open	nse (80-100%) = extremely tell forest; 80-100% = close		
initions ninance imated cover liker & Hapkin	Tree height (clino) from d = dominant; c = co-do l = isolated (0.2-2%); v : s height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli	bottom of slop minant; a = se - vary sparse of dwarf; 3-6m = s or clumps; 0 sage Projective	e = distance for ibdominant; a = 2-20%); s = spi low; 6-12m = n 2-20% = open s e Cover	co from tree x (top) m tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50%; Ground cover tall	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50	nee (80-100%) = extremely tall forest, 80-100% = close m transect		
initions minance mated cover ker & Hopkin H Crown cov n Transect	Tree height (clino) from d = dominant; c = co-do l = isolated (0.2-2%); v : s height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli	bottom of slop minant; a = se = very sparse of dwarf; 3-6m = s or clumps; 0	e = distance for ibdominant; a = 2-20%); s = spi low; 6-12m = n 2-20% = open s e Cover	co from tree x (top) m tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50%; Ground cover tall	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pi	nee (80-100%) = extremely tall forest, 80-100% = close m transect		Total (hits/50)
initions mated cover ker & Hopkir H Crown cov	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%), v : is height classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos)	bottom of slop minant; a = se - vary sparse e dwarf; 3-6m = s or clumps; 0 age Projective Midstorey %	e = distance for ibdominent, a = 2-20%); s = spi low, 6-12m = n 2-20% = open t e Cover Exotic %	co from tree x (top) m tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50% = Ground cover tall - every 1m recon	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pi	nee (80-100%) = extremely tall forest, 80-100% = close m transect		
rillions imanos mated cover ker & Hopkir H Crown cov i Transect it	Tree height (clino) from d = dominant; c = co-do l = isolated (0.2-2%); v = sheight classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos) 3 0 4 0	bottom of slop minant; s = se - very sparse e dwart; 3-6m = s or clumps; 0 age Projective Midstorey %	e = distance for ibdominant, a = 2-20%); s = spi low, 6-12m = n 2-20% = open se Cover Exotic %	co from tree x (top) m tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50% = Ground cover tall - every 1m recon	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pi	nee (80-100%) = extremely tall forest, 80-100% = close m transect		
nitions inance mated cover ser & Hopkir H Crown cov Transect	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : s height classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos) 30 40 50 40	bottorn of slop minant; a = se - vary sparse e dwarf; 3-6m = s or clumps; 0 sage Projective Midstorey %	e = distance for ibdominant, a = 2-20%); s = spi low; 6-12m = n 2-20% = open de Cover Exotic %	co from tree x (top) m tree x (top)% - bo associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50% = Ground cover tall - every 1m recon	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pi	nee (80-100%) = extremely tall forest, 80-100% = close m transect		
nillons ilinance mated cover ker & Hopkir H Crown cov I Transect II	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos) 3.0 4.0 4.0 4.0	bottorn of slop minant; s = si - very sparse i dwarf; 3-6m = s or clumps; 0 sage Projective Midstorey %	e = distance for control of the cont	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	ttom%) ttom%) ttom%) mid dense (50-80%); d = de at, 20-35m = very talt; >35m woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) po	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (nits/50)
nillons ilinance mated cover ker & Hopkir H Crown cov I Transect II	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos) 3.0 4.0 4.0 4.0	bottom of slop minant: a = se very sparse i dwarf; 3-6m = s or clumps; 0 age Projectivi Midstorey %	e = distance fro 2-20%); s = spi low; 6-12m = n 2-20% = open s Cover Exotic % Cover Do Do Do Do Do Do Do Do Do D	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	% + bottom%) ttom%) mid dense (50-80%), d = de st, 20-35m = very talt, >35m voodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pi	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		
rillons ilhance mated cover ker & Hopkir H Crown cov Transect	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli Canopy % (photos) 3.0 4.0 4.0 4.0	bottorn of slop minant; a = se - vary sparse e dwarf; 3-6m = s or clumps; 0 sage Projective Midstorey %	e = distance for control of the cont	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	ttom%) ttom%) ttom%) mid dense (50-80%); d = de at, 20-35m = very talt; >35m woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) po	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50)
nitions inance mated cover ser & Hopkir H Crown cov	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated free 10 Points - Foli Canopy % (photos) 3.0 4.0 4.0 4.0	bottom of slop minant: a = se very sparse of dwarf; 3-6m = s or clumps; 0 age Projective Midstorey %	e = distance fro ibdominant, a = 2-20%); s = spi low; 6-12m = n 2-20% = open n cover Exotic % Cover Exotic % Cover Do Do Do Do Do Do Do Do Do D	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	ttom%) ttom%) ttom%) mid dense (50-80%); d = de at, 20-35m = very talt; >35m woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) po	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (nits/50)
illons nance sated cover er & Hopkir Crown cov	Tree height (clino) from d = dominant; c = co-do i = isolated (0.2-2%), v : is height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli Canopy % (photos) 3.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0	bottom of slop minant: a = se - very sparse e dwarf; 3-6m = s or clumps; 0 sige Projective Midstorey %	e = distance fro ibdominant, a = 2-20%); s = spi low; 6-12m = n 2-20% = open n cover Exotic % Cover Exotic % Cover Do Do Do Do Do Do Do Do Do D	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	ttom%) ttom%) ttom%) mid dense (50-80%); d = de at, 20-35m = very talt; >35m woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) po	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50)
illions ilnance nated cover er & Hopkir l Crown cov Transect t	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli Canopy % (photos) 30 40 40 40 40 40 40 40 40 40	bottom of slop minant: a = se very sparse of dwarf; 3-6m = s or clumps; 0 age Projective Midstorey %	e = distance fro ibdominant, a = 2-20%), s = spi low, 6-12m = n 2-20% = open s e Cover Exotic % 6 7 0 10 10 10 10 10 10 10 10	ce from tree x (top% - bo associated tree (20-50%); m = id-high; 12-20m = b woodland; 20-50% = Ground cover tall - every 1m record	% + bottom%) ttom%) mid dense (50-80%); d = de st, 20-35m = very talt; >35m e woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pr - \[\] o, fern, sedge, etc) tally - \[\]	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50)
illions inance nated cover er & Hopkir i Crown cov Transect t	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%); v : s height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foi Canopy % (photos) 30 40 40 40 40 40 40 40 40 40	bottom of slop minant: a = se very sparse e dwarf; 3-6m = s or clumps; 0 sige Projective Midstorey %	e = distance for ibdominant, a = 2.20%), s = spir low, 6-12m = n 2.20% = open 10	ce from tree x (top) m tree x (top) associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50%; Ground cover tall - every 1m recon Native grass tally	% + bottom%) ttom%) mid dense (50-80%); d = de st, 20-35m = very talt; >35m e woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pr - \[\] o, fern, sedge, etc) tally - \[\]	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50) 6 /- Total (hits/50) 38/,
illons ilhance nated cover ser & Hopkir I Crown cov Transect I (sum / 10)	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%); v : is height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foli Canopy % (photos) 30 40 40 40 40 40 40 40 40 40	bottom of slop minant: a = se very sparse e dwarf; 3-6m = s or clumps; 0 sige Projective Midstorey %	e = distance fro ibdominant, a = 2-20%), s = spi low, 6-12m = n 2-20% = open s e Cover Exotic % 6 7 0 10 10 10 10 10 10 10 10	ce from tree x (top) m tree x (top) associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50%; Ground cover tall - every 1m recon Native grass tally	% + bottom%) ttom%) mid dense (50-80%); d = de st, 20-35m = very talt; >35m e woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) pr - \[\] o, fern, sedge, etc) tally - \[\]	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50) 6 /- Total (hits/50) 38/,
illons nance sted cover of & Hopkir Crown cov Transect (sum / 10) er 50 x 20n th of wood	Tree height (clino) from d = dominant; c = co-do I = isolated (0.2-2%); v : s height classes: 1-3m = er: <0.2% = isolated tree 10 Points - Foi Canopy % (photos) 30 40 40 40 40 40 40 40 40 40	bottom of slop minant: a = se very sparse e dwarf; 3-6m = s or clumps; 0 sige Projective Midstorey %	e = distance for ibdominant, a = 2.20%), s = spir low, 6-12m = n 2.20% = open 10	ce from tree x (top) m tree x (top) associated use (20-50%); m = id-high; 12-20m = t woodland; 20-50%; Ground cover tall - every 1m recon Native grass tally	% + bottom%) ttom%) mid dense (50-80%); d = de sit, 20-35m = very talt; >35m woodland; 50-80% = open y sheet, 50 points along 50 d if plant intersects (hits) po	nee (80-100%) = extremely tall forest, 60-100% = close m transsect		Total (hits/50) 6 /- Total (hits/50) 38/,

Species			Cover	Abund.	Species		- 1	Cover	Abund.
Pivcale	otrs.	maler can	- 6	40	41			1	
deal		voea	3	201	42				
	Maulo		3	204	43				
Evenous	-[]	australis		20+	44	7 to			
Billers	pilo		14	20+	45				
Celipalne	61.0	hadre	+ -	201	48				
lingen		3.1-	1 .	1	47			-	-
0/1	S S	A. Company	1		40			r	-
Dr. / Julia	000	vegus	I	25	60				0
June	-		I 2	29-3	-				
Edun	openon	coespilons		ZA	50				
Misson	1	Somelie	+ 2		01				
Odism	Bhu!	Characterist	+2	304	52				
ayen	is ava	avosts Us	1	1	53				-
1 Flore	ocho	-	- 2	200	54				-
	10 /2	_	1 1	1	65				
Microde	stende	Shpoider	1 4	304	66				
Centel	so as	iaha.	I	1	57				
FINAL	dia	nutary	12	201	58				
Diche	chack		I		59				
Bursa	ia,	plance	T 1		60				
Gain	-fres	rocissim-	1	\rightarrow	61				
La	stang			11	62				
Circina	w		1	28,	63				
Cycloso	Carra	- leghoply	10	1,	64				
frage	mila	content	7 3	1 20+	65				
Briza	سان	airenta	1	1 1	en				
· did	othes	Sicher	1	1	67	0 1			
1 Loopen			+ 1	rest	es Mootha	saduroid	N.S		
o Evelis	ray 9	phaenies.	+ ^		es .				
0		7			70				
100					71				
2					72				
2					73				
4					74			-	
8					75				
6					76				
7					77				
В					78				
0					79				
O.					80				100
ip. Richness	Native	Exotic	Ground la	ayer % 1x1 plots	Q1	Q2	Q3	Q4	Q5
ree	1		Native pe	erennial grass				1	
thrub	V A		Native of	her grass			7. 4		
Grass (annual)	18		Native fo	rb & other					
Grass (perennial)	No.	1	Native st	nub (<1m)					
Other (annual)			Exotic gr	nss					
Other (perennial)			Exotic for	rb & other					
			Leaf & st	iak litter					
			Rocks	Value to the latest and the latest a					
Co	over abundance	e scale	Bare gro	und					
	ed Braun-bland		Cryptoga						
THE SAME	and the state of	3	Total		100	100	100	10	D
1	<5% - rare		Plot Distr	zbance		. 100	Fire damage:		-
2	<5% - comn	nom.		(inc. logging):			Storm damage:		
3	5 - 25%	mest.		on (inc. pasture):			Trampling:		
4	25 - 50%		Suil eros	Marie			Flood damage:		
5	50 - 75%			collection:			Feral herbivores:		
			***************************************						-
	6 75 - 100%		Stock grazing:				Other:		

Shale Plains - Good

urvey Site	Form - BioBanki	ng		Site ID: PZ	3 v	egetation zone: (-PW	
ale	18/11/3	2015		Surveyor(s):	l			
Vaypoint ID	683			Photo numbers	2405	10000	>	2408
Coordinates	E N			Photo direction	N	E	s	w
apped Vegetat	tion type:	~			Condition:		Low	Mod-good
lope: Gontle, N	Mod, Steep	Aspect (degr	rees or cardin	ial): + (all	Altitude: <	Du	I CONTRACTOR OF THE PARTY OF TH	
				The second second	atercourse, escarpment,	егтасе		
				-	Imestone, metamorphic			
ill type: sand,	loam, clay, organic, gr			Soil disturbance	listant, topsoil removed, f	II.		
		Yes //No / Un		r				
	ture (formation) =	der to			ant Layer (EDL) - most b	iomass = Com	Cocy	
Strata	Height interval	Median	Est. cover	Dominant Species	& Dominance		1/	
E								
	- *			Pineal	yetus m	dlivensa		
T1	15-25m			13/3/80	1000	CAN LONG		
2011	1 con							
1027	120		- 9					
T2	T- 4							
	-6"							
144								
Т3	* 1							
_		-		tion	yetrs n		_	
S1	1 - /			Cucae	y pros n	rollucra	A	
٠, ا	1 6m							
S2	141							
					27			
				Nico	laera .	the do	c	
G				sida		of poids	ita	tragosks c
				Mot	a wind	2	Secas	Histo.
	Tree height (clino) level	(T) (A)		111				
	Tree height (clino) from	bottom of slope	e = distance fr	om tree x (top% - bott	om%)			
finitions minance	d = dominant; c = co-do	minary, a - au	delominant: a =	personal				
					id dense (50-80%); d = de	(38001-085)		
1171110000000	1	tery sparses	5.77 (00 (5.55)	and the country in - in	12 Julius (35 Julius 74), 4 – 50	100 (00 100 10)		
iker & Hopkins	height classes: 1-3m =	dwarf, 3-6m =	low; 6-12m = r	nkd-high; 12-20m = tal	1; 20-35m = very talt >35m	= extremely tall		
			2-20% = open	moodidily, 20.0070 -	woodland, 50-80% = open	forest; 80-100% = close	d forest	
		200	2-20% = open	WOODEN 0, 20 00 W	woodland, 50-80% = open	forest; 80-100% = close	d forest	
m Transect	10 Points - Fol	iage Projective			woodland, 50-80% = open sheet, 50 points along 50	22,310.00	d forest	
				Ground cover tally	60 00	m iransect	d forest	
int (Canopy % (photos)		9 Cover	Ground cover tally	sheet, 50 points along 50 If plant intersects (hits) po	m iransect	d forest	Total (hits/50)
m Transect int n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record	sheet, 50 points along 50 If plant intersects (hits) po	m iransect	d forest	Total (hits/50)
m m	Canapy % (photos)	Midslorey %	Exotic %	Ground cover tally - every 1m record	sheet, 50 points along 50 If plant intersects (hits) po	m iransect	d forest	Total (hits/50)
n n n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record	sheet, 50 points along 50 If plant intersects (hits) po	m iransect	d forest	Total (hite/50) 421,
n n n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 if plant intersects (hits) po	m iransect	d forest	Total (hits/50) 421,
n n n n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 If plant intersects (hits) po	m iransect	d forest	Total (hits/50) 42/, Total (hits/50)
inst	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 if plant intersects (hits) po	m iransect	d forest	421,
int m m m m m m m m m m m	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 if plant intersects (hits) po	m iransect	d forest	421,
int m m m m m m m m m m m m m m m m m m m	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 if plant intersects (hits) po	m iransect	d forest	421,
n n n n n n n n n n n n n n n n n n n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally - Native other (herb,	sheet, 50 points along 50 if plant intersects (hits) pr H H fem, sedge, etc) tally	m iransect	d forest	421, Total (hits/50)
n n m m m n n	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally -	sheet, 50 points along 50 if plant intersects (hits) pr H H fem, sedge, etc) tally	m iransect	d forest	421,
m m m m m m m m	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally - Native other (herb,	sheet, 50 points along 50 if plant intersects (hits) pr H H fem, sedge, etc) tally	m iransect	d forest	421, Total (hits/50)
m m m m m m m m	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally - Native other (herb,	sheet, 50 points along 50 if plant intersects (hits) pr H H fem, sedge, etc) tally	m iransect	d forest	421, Total (hits/50)
ol (sum / 10) of serso / 20m gith of woody	Canepy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally - Native other (herb, Native shrub tally -	sheek, 50 points along 50 If plant intersects (hits) pr HH HH fern, sedge, etc) tally -	m transect wint HH-HH-	1	(21, Total (hits/50) Total (hits/50) O 1,
(sum / 10) er 50 x 20m gith of woody	Canopy % (photos)	Midstorey %	Exotic %	Ground cover tally - every 1m record Native grass tally - Native other (herb,	sheek, 50 points along 50 If plant intersects (hits) pr HH HH fern, sedge, etc) tally -	m iransect	1	421, Total (hits/50)

ite ID: P2 – 3	Cover	Abund.	Species			Cover	Abund.
			Species			Cover	Abunu.
Eucalyptus moll	scrant 6	70	41				
Myperten gran		704	42				-
A STATE OF THE PARTY OF THE PAR	rula 4	ral	43				-
Microlana stypos		500	44				
throwliais vail	icela.	1	4E				
Sida etalifol	ie ly	201	46				
Bidene pilozen	72	707	47				
aperis dias	Cis - 1	1	48				
Avistida una	5 - 3	-165	49				
Themeda	+ 2	201	50		17		
so-ecio madago		1	51				
1 1 1 1		2de	52				
And her with the state of the s	TA 2	_	92				
Araijia scigit	-u 5	204	54				
Circum sala	10	See	34				-
They Walder		1	55				-
Bursain spinos	9-1	6	SE .				
Oxalat primare		204	57				
Elphalia	1	1	58				
alyane tobac		704	te				
Solarun oscud		2	60				
Anagallis and	45	1	7.6				
Parsonsia Stran	went 1	1	62				
	ima.	1	62				
	0 -3	20	61				1
61/1	de l	2	na .				
Briza subaista		1	les .				8
-1 1 1		1	00				
Stadehousia	- T	2004	67				
	ED. 1	1	68				-
Verbera long		-	es.				
· Yellow Linua		4.4	10				-
cutalla agiat	156 - 1		71				
1			72				
)			79				
			74				
			75				
Ü			76				
6			77				
g .			78				
			79				
			60				
p. Richness Native Exotic	Ground lay	er % 1x1 plots	Q1	Q2	Q3	Q4	Q5
nest , .			1	, Ann	- 40		-
	The state of the s	onnial grass					
hrub	Native other	-	-				
rass (annual) / O	Native forb					-	-
rass (perennial)	Native shre		-				
ther (annual)	Exotic gras		-				_
ther (perennial)	Exotic forb						
	Leaf & stic	k litter					
	Rocks						
Cover abundance scale	Bare groun	d					
Modified Braun-blanquet 6 scale	Cryptogan	18					
	Total		100	100	100	10	0
1 <5% - rare	Plot Distur	bance	-01		Fire damage:	0.00	-17.
2 <5% - common		na. lagging):			Storm damage:		
3 5 - 25%		(inc. pasture):			Trampling:		
	Soil erosio				The state of the s		
4 25 - 50%	-	M-1			Flood damage:		
5 50 - 75% 8 75 - 100%	Firewood o	ALCOHOL SECTION AND ADDRESS OF THE PARTY OF			Feral herbivores:		
6 75 - 100%	Stock graz	SOUT.			Other:		

HN 528 Mod/acod

JACOBS

Shale Plains - mod acod

Date					20	7			
	20/1/20	016		Surveyor(s):	Lukas C	Lews 5			
Waypoint (D	767			Photo numbers	7312	2313	2319	23(\$	
Coordinates	N 624	5921		Photo direction	N	E	s	w	
Mapped Vegeta		PW			Condition:		Low	Mod-good	
Slope: Gentle,		_	rees or cardin	ial):	Altitude:			Cl.	
Topography: o	rest, ridge, upper stope	e, mid slope, d	lown slope, gul	y, flat_depression,	waterodurse, escarpm	ent, terrace			
Geology: basal	It, granite, conglomera	te, sandatone,	sittstoneimuds	tone, shale, pluviu	im, limestone, metamor	phics, gravel, ?			
-	loam, Elay, organic, g			The state of the s	ge/intact_lopsoil remove		T		
	growth (uncleared):	Yes (NoTy)		1 (
	cture (formation)	force		Ecologically Dom	ninant Layer (EDL) - mo	et blomore =	20000000000000		
Strata	Height interval	Median	Est. cover	Dominant Specie		isi Didrilass - C	anopy		
Contra	riedin adervai	(VIEWISI)	CSL COVE	Lightenia apecie	es a Dominance				
E		1							
- 75		1							
		-	_	Paris -	I ab t	Latie			
T1	0 11	1	1	Escal	lyptis	mollisce	2000		
100	20 25mg	1		Crear	4000	MOCKOL E.S	~~~		
-		_	+						
T2			1						
A5-0					+				
				_					
Т3	9								
1.3	- 5								
_			+	-		-			
S1	1 -		1	0100	the state	9			
51	1.8m		1	Oleo arrapaca.					
	F. 100		_	_					
00									
S2			1						
			-	chilais		10.2			
				F A 4 5 4 1 1	the state of the s	P 20			
							117-1-27		
G	6 oten			Micro	placed	stipoid	2.5		
G				Micro	da cas		2 5		
G	Tree height (clino) leve	10,000		Mich c Anisti nce from Irea x (top	da ras	stipoid	٤.5		
		10,000		Mich c Anisti nce from Irea x (top	da ras	stipoid	2.5		
Definitions	Tree height (clino) leve Tree height (clino) from	bollom of slop	e = distance fr	An sti	da ras	stipoid	2.5		
Definitions Commance	Tree height (clino) leve Tree height (clino) from d = dominant; c = co-d-	n bollom of slop ominant, s = si	ie = distance fr ubdominant; a =	nce from Irea x (top% - bo	of the bottom%)	stipoid Mosa	2.5		
Definitions Cominance	Tree height (clino) leve Tree height (clino) from d = dominant; c = co-d-	n bollom of slop ominant, s = si	ie = distance fr ubdominant; a =	nce from Irea x (top% - bo	da ras	stipoid Mosa	2.5		
Definitions Commance Estimated cover	Tree height (clino) leve Tree height (clino) from d = dominant; c = co-d 1 = isolated (0.2-2%); v	n bollom of slop ominant, s = si = very sparse	e = distance fr ubdominant; a = (2-20%); s = sp	nce from Irea x (top om tree x (top% - bo associated arse (20-50%); m =	% + boflom%) attom%) mid dense (50-80%); d	2003 de conso (80-100%)	2.5		
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		ceolates	2	729	62				
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1 16	Sacru	vulgere	1	3	61				-
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717		unsphylleni	/	4	79				-
		major			90			12.7	
p. Richness	Native	Exotic		layer % 1x1 plots	Q1	Q2 -	Q3	Q4	Q5
ree			-	perennial grass					-
hrub	26	1	-	other grass			-		-
rass (annual)	120		_	orb & other					+
rass (perennial)		20		shrub (<1m)					
ther (ennual)			Exotic g						-
ther (perennial)			-	orb & other	-				-
			-	stick litter					-
4500		201080	Rocks	NAST TO STATE OF THE STATE OF T					-
	ver abundance		Bare gr	Market Control			-		-
Modifie	d Braun-bland	uet 6 scale	Cryptog	jams	-				10
()			Total		100	100	1	10	TV .
2 .00	<5% - rare	4		turbance			Fire damage:		
2	<5% - comm	non	a commonweal	g (inc. logging):			Storm damage:		
3	5 - 2,5%		12000	ion (inc. pasture):			Trampling:		
4	25 - 50%		Soll ero				Flood damage:		
5	50 - 75%			od collection:			Feral herbivores:		
6	75 - 100%		Stock g	razing:			Other:		

HN 528 Hol/acod

JACOBS

Plains - mod/good Shale

Date	e Form - BioBank			Site ID: Prog	. 27	Vegetation zone:	COW	
Waypoint ID	20/1/2	016	27	Photo numbers	2308	2309	2310	2311
	E 02861	a l	-/	Prioto Humbers	2308	2 50 1	2510	2311
Coordinates	N 6246			Photo direction	N	E	s	w
Mapped Vege					Condition:		Low	Mod-good
Slope: Gentle		Aspect (deg	rees or cardi	nal):	Altitude:		Lun .	mos-gond
Topography:	crest, ridge, upper slop	e, mid slope, d	own slope, gu	lly, flat, depression,	watercourse, escarpme	nt, terrace		
					m, limestone, metamorp			
	nd, loam, clay, organic, i		STATE OF THE PARTY OF		: intact, topsoil remove	AT COLUMN SECURIORISM		
	growth (uncleared);	Yes / No / Ur						
	ucture (formation) =	100 / 190 / 01	Mediada :	Ecologically Dom	inant Layer (EDL) - mor	et biomane.		
Strata	Height interval	Median	Est, cover			at bioli isaa -		
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			-	+				
T2								
			1					
				1				
Т3	20		1					
	1	1	1					
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S1			ASI,	Bursa	NO SPI	1 - 221		
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	 		-	-				
S2	20.		1				-	
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G	n 20		Bar	Micro	laria	repens		
G	0 ran		90%	Cicn	OVENT RE	repens		
	Tree height (clino) leve	ground or top	of slope = dist	ance from tree x (top*	% + battorn%)			
	Tree height (clino) from	n bollom of slop	e = distance f	rom tree x (top% - bo	(lom%)			
Definitions								
Dominance .	d = dominant; c = co-d	ominant; s = su	ubdominant; a	= associated				
stimated cover	r 1 = isolated (0.2-2%); v	= very врагве	(2-20%); s = s	parse (20-50%); m =	mid dense (50-80%); d =	dense (80-100%)		
Valker & Hopki	ns height classes: 1-3m	= dwarf; 3-6m =	low; 6-12m =	mid-high; 12-20m = t	all; 20-35m = very tal; >3	35m = extremely tall		
V&H Crown co	ver: <0,2% = isolated tre	es or clumps; 0	.2-20% = oper	woodland; 20-50%	woodland; 50-80% = op	en forest; 80-100% = cla	sed forest	
0m Transect	10 Paints - Fo	liage Projectiv	e Cover	Ground cover tail	y sheet, 50 points along	50m transect		
oint	Canopy % (photos)	Midstorey %	Exotic %	- every 1m record	d if plant intersects (hits			11.5
m	10	0	0	Native grass tally	44- 1111	IIII IIIL	111/ 1111	Total (hits/50)
0m	0	0	0		1111 -	##	HT HH-11	Testerast.
5m	10	0	0]	76 50	12 May 1	an and H	カカン
Om	30	0	0					1941
5m	30	0	0					
0m	5	0	0	Native other (hert	s, fern, sedge, etc) tally	1114 114 1		Total (hits/50)
5m	0	0	0	- Committee of the comm	25-14 (25-14-20)	111-1111		V-88 (V-7) (680)[20]
0m	0	0	0	1		1.1		00'
5m	0	0	0	1				221.
0m	0	0	0	1				
otal (sum / 10		0	0	Native shrub tally	- 1			Total (hits/50)
arger 50 x 20r			-77	1	1			1:::5:03::5:0
	by debris >10cm wide &	>0.5m long	-	1				27.
		KIEGO MOOR	2m					
angur or wood								
	anopy sp. regeneration		1.00	Exotic tally - 111				Total (hits/50)
	anopy sp. regeneration	(100	Exotic tally -				Total (hits/50)

ipecies	Cover	Abund.	Species			Cover	Abund.
Evialyotus tecticornis	- 3	4	41				
/	2	30	43				
solain order gorle	3	40	40				
Saun amongolisting.	- 2	70	04				
avaired and	- 7	704	at				
	- 3	7100	46				
Microbacia stipoids	- 5	7200	47	-			
	- 2	204	48				
4.7	2	1	40				
Orgen to Day	1	Z	50				
Phyllattus	E :	1					
Desmoding miars	- 7	rox	10				
Ermonella autoli		TOT	102				
The state of the s	- 7	70%					
	1	100	51				
Evision whose	1	1	55				
	- 2	1	67				
Carey inversa	1 4	204	CD CD				
sporolodus creles	I	170	50				
Wildelangia	I	10	60				
· Arictida - appreceded		1	60				
1	1	2	82			-	
		2.	en .				
olea erapore	1	1	Cd.				
Asperula lasforted	1 3	7.04	65				
Asperula conferred		5					
Madrata	1	1/2	60		-		
portworklos meura	- 2	2	07				
prograstis brand	- 1	1	06				
achtorie vernicoca	T +	1	60				
School madespreaded	2	24	91				
side manifold	-	10	72				
Osligmen & sendy	1	1	73				
The state of the s	1	1	74				
· Platago laccolate	1	1	26				
	- 1	4	70				
Micaryne clasiar	1	1	77				
· Changlecopes physicals	2	204	78		7		
		E CP-1	79				
9	_	_	80				
o Sp. Richness Native Exotic	Ground laws	r % 1x1 plots	Qt	Q2	Q3	Q4	Q5
rea Page Expec	Native perer		—				
shrub /	Native other						
Grass (annual)	Native forb 8						
Grass (perennial)	Native shrut	-					
W C	Exotic grass						
Other (perennial)	Exotic forb &						
and Garantel	Leaf & stick						
	Rocks	19001					
Cover abundance scale	Bare ground						
Modified Braun-blanquet 6 scale	Cryptogams						
- The second contract server is the service of the	Total		100	100	100	100	1
1 <5% - rare	Plot Disturb	ance			Fire damage:		
2 <5% - common	Clearing (inc				Storm damage:		
3 5 - 25%		inc. pasture):			Tramping:		
4 25 - 50%	Soil erosion				Flood damage:		
	Firewood oc				Feral herbivores:		
5 50 - 75%		g:			Other;		

HN 528 Mod/acod

Shale Plains - Mod/Good

JACOBS

Front Paddock

Survey Site	Form - BigBank	ing					Vegetation zone:	CBM3	
Date	3/9/201			Surveyor(s)	Lukeas	cle	ews		
Waypoint ID	107	1 (10-2	Photo numbers	1299		1300	130	
Coordinates	E N			Photo direction	N		E	s	w
Vapped Vegeta	ation type: CP	W7		•	Condition:			Low	N/9d-good
Slope: Gentle,		Aspect (deg	rees or cardin	nail: N4	Altitude:	100	Dvn		
Topography: o	rest, ridge, upper slop	e, mid slope, d	own slope, guil	y, flat depression,	watercourse, es		- Andrews		
Geology: basa	It. granite, conglomera	de, sandstone,	sitstone/mulds	fone, phale, alluvius	m, limestone, m	etamorph	nics, gravel, ?		
	Joam, clay, organic,			Soil disturbance					
	growth (uncleared):	Yes (No / Ur							
	cture (formation) = (- Contract of the last of the last		Ecologically Dom	inant Laver (FD	N.Y. most	thinmass = /	and a	
Strata	Height interval	Median	Est cover	Dominant Specie				mary	
E									
Т1	20:30m			Eveal	plus	te	olican	13	
T2	20:30m			Conego	y ve	350	with the	mis	
Т3									
S1	\ 3m			Lasta	nd fen	por	ishmem ser		
S2									
G				Microl	ata	st	Poides		
Walker & Hopkin	Tree height (clino) from d = dominant; c = co- i = isolated (0,2-2%); is height classes: 1-3m ver: <0,2% = isolated tr	forminant; s = si v = very sperse = dwarf; 3-6m =	ubdominant; a = sp (2-20%); s = sp - low; 6-12m = r	= associated arse (20-50%); m = mid-high; 12-20m =	mid dense (50-8 tall; 20-35m = ve	ry tall; >3	5m = axtremely tall	losed forest	
50m Transect	10 Dviete - E	oliage Projectiv	n Cover	Ground cover tall	ly sheet 50 entire	nts alone	50m transect		
Polivi	Canopy % (photos)	Midstorey %	Exotic %	- every 1m recor	9				
im	5	Ø	D	Native grass tally	- 1	111	Mys III	OF MARKET COLOR	Total (hits/50)
10m	50	0	0	1	-1111-	+++	## 14	1111-1111-	//
15m	20	0	0	Win .	111111111111111111111111111111111111111	it [11 11 11	1111 1111	00
!Om	30	0	0	144	1111	11		1111	06%
:5m	5	. 10	0	1 ,	all I	11			(Catholistic 6)
10m	0	0	D	Native other (her	b, fern, sedge, e	ric) tally -	ê		Total (hits/50)
15m	50	0	0			1100018			W W
tOm :	40	0	40	1					A'1
15m	5	0	0	1					01.
50m	10	0	6						
Total (sum / 10)	= 21.5	1	4	Native shrub tally	100				Total (hits/50)
arger 50 x 20n					EC-C				
	y debris >10cm wide &	\$ >0.5m long	1.2m	1					01
Proportion of ca	nopy sp. regeneration		(00/,	Exotic tally -	#				Total (hits/50)
Number of Ireas	with hollows >5cm		1	1 "	1				(0/2

frat Poddock

pecies	-1 170-7		Cover	Abund.	Species		-	Cover	Abund.
	hat a	Mixcaa.		22	41				-
Evalle	The part	tactionis	- 6		40				
Evalue	ソリンシ	rencomo		3			- 4	-	
lataid	1		3	6	63				
Lycium	fore	cissim	3	4	44				
Solam	seat	attion	12	7.04	45				
Tank		-	君	20+	60				
	weed		卷3	201	47				
Medial			2	201	49				
	11100	4	_		-				
Chrim	vilga	K 1:-	2	704	44				
Sida Y	houti	1000	7.	701	66				
dulais.	acro-	5	2 2	200+	63				_
cotrola	J .			204	52				
Schones	and	dy april	2	20+	69				
Lypens	arris	17.2	- 7	7=+	04				
1.//		and the second	13	zet	86				
Parale		- Janes	1	P	56				
Romex	- CM- 50	3 50	+ 2	TO	57				
Bursa	Ø C	eirosq-	9	1	-				
· Medic	200 6	dynanda	1	1	70				
oxali	SV Y	ellans !-	- 2	500	50				
Eluha		enda	3	201	60				
Ortice	their	Cer	+		61				
Phytol.	occo	odada	1	1	62				
Pennisa	tien ,	ladestin	D	test	63				
(1000	64		7		
5					65				
					65				
-									
r			-		61				
			-	-	1			-	
G .			_	-	eu				-
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î .					71				-
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3					73				
4					. 2A				
6					75				
n					76				
9					77				
				-					
6		_	_	_	78				
í¥.			-		70				-
0					80			200	
Sp. Richness	Native	Exotic	Ground layer	% 1x1 plots	Q1	Q2	Q3	Q4	Q5
Tree			Native peren	nial grass					
Shrub	1		Native other	grass		(5-)			
Grass (annual)	4		Native forb 8	other					
Grass (perennial)	1		Native shrub	(<1m)					
Other (annual)		1	Exotic grass						
Other (perennial)		1	Exotic forb 8						
your (perential)			Leaf & stick		+ +				-
				HUGH .	+				
:500		509050	Rocks		_				
	over abundand		Bare ground						-
Modifi	ed Braun-bland	quet 6 scale	Cryptogams						
			Total		100	100	100	10	U
58	<5% - rare		Piot Disturba	ince			Fire damage:		
2	<5% - com	non	Clearing (inc	(logging):			Storm damage:		
3	5 - 25%		Cultivation (i				Trampling:		
4	25 - 50%		Soil erosion:				Flood damage:		
5	50 - 75%		Firewood co				Feral herbivores:		
6			-						
	75 - 100%		Stock grazing: Other:						25

AN 528-Med/wood_ Koor

Entered

JACOBS

Shale Plains - Root

Survey Site	Form - BioBanki				209	Vegetation zone:	CPW-	2 (ATHE	em.
)ate	2/9/20	15		Surveyor(s): (ullas cl	eus			
Vaypoint ID	209			Photo numbers					
Coordinales	E N			Photo direction	N	E	s	, w	
Aapped Veget		~			Condition:		Low	Mbd-good	
Stope: Gentle.			rees or cardin	>	Altitude:	98M			
11.1	crest, ridge, upper slepe			-	watercourse, esca	rpment, terrace			
	alt, granite, conglomeral			1000			330		
ioil type: sand	d, loam, day, organic, g	ravel, skeletal,	7	Access to the second se	e: idjad, topsoli rer	moved, fill	1	1	
Remnant / Old	growth (uncleared):	Yes / No / Un	Acres de la constante de la co	old to	ea.s				
egetative Str.	ucture (formation) = /	lon wo	odlad	Ecologically Don	ninant Layer (EDL)	- most biomass = Cox	004		
Strata	Height interval	Median	Est. cover	Dominant Specie	ss & Dominance		-17		
E	X	X	X		\rightarrow	<			
Т1	15.20m			Eved	yptus v	rediconis	(d)		
T2	X	X	Χ		\rightarrow				
ТЗ	X	X	X		X				
S1	V	V	V	ŧ		/			
\$2	()	1			_/				
02									
G				Penice	tur de	le seinen logo «cai ensis	Paspal	w	
G refinitions orminance	Tree height (clino) lave Tree height (clino) from d = dominant; q = co-d r = isolated (0.2-2%); v	bottom of slop ominant; s = su	e = distance fr ubdominant; a =	nce from tree x (top% - b) associated	156 + bottom56) attom56)	<u> </u>	Paspal	w	
G definitions deminance stimated cover	Tree height (clino) from d = dominant; c = co-di r l = isolated (0.2-2%); v ns height classes: 1-3m =	s bottom of slop ominant; s = su = very sparse (= dwarf; 3-6m =	e = distance fronts a = (2-20%); s = spi low; 6-12m = r	nce from tree x (top% - b) associated arse (20-50%); m =	1% + bottom%) ottom%) mid dense (50-80% talt; 20-35m = very (<u> </u>		im	
G efinitions ominance stimated cover raiker & Hopkin raiker & Hopkin	Tree height (clino) from d = dominant; q = co-dr r = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tree	m bettom of slop ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0	e = distance fn ubdominant; a = (2-20%); s = sp low; 6-12m = r (2-20% = open	nce from tree x (top% - b) associated asse (20-50%); m = nid-high; 12-20m = woodland; 20-50%	1% + bottom%) ottom%) mid dense (50-80% talt; 20-35m = very t = woodland; 50-80%	alt; >35m = extremely tall 6 = open forest; 80-100% = c			
G Mefinitions Mominance Stimated cover Valker & Hopkin V&H Crown cov Om Transect	Tree height (clino) from d = dominant; q = co-di r l = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated tree	bottom of slop ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0	e = distance fn ubdominant; a = (2-20%); s = sp low; 6-12m = r (2-20% = open e Cover	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50%	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80%	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect			
G Mefinitions Mominance Stimated cover Valker & Hopkir V&H Crown cov Om Transect	Tree height (clino) from d = dominant; c = co-di t = isolated (0.2-2%); v ns height classes: 1-3m = ver; <0.2% = isolated be 10 Points - Fo Canopy % (photos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tai - every 1 m recover	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect			
G efinitions ominance stimated cover falker & Hopkir /&H Crown cov Om Transect oint m	Tree height (clino) from d = dominant; c = co-di t = isolated (0.2-2%); v ns height classes: 1-3m = vor; <0.2% = isolated tre 10 Points - Fo Cenopy % (photos)	bottom of slop ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0	e = distance fn ubdominant; a = (2-20%); s = sp low; 6-12m = r (2-20% = open e Cover	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50%	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect		Total (hts/50)
G Mefinitions Mominance stimated cover Valker & Hopkin Om Transect Moint m Om	Tree height (clino) from d = dominant; c = co-di r l = isolated (0.2-2%); v ns height classes: 1-3m = ver; <0.2% = isolated tree 10 Points - Fo Cenopy % (photos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tai - every 1 m recover	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect			
G sefinitions ominance stimated cover valker & Hopkin /&H Crown cov om Transect oint m om	Tree height (clino) from d = dominant; c = co-di t = isolated (0.2-2%); v ns height classes: 1-3m = vor; <0.2% = isolated tre 10 Points - Fo Cenopy % (photos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tai - every 1 m recover	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect			
G sefinitions ominance stimated cover valker & Hopkin /&H Crown cov om Transect oint m om om	Tree height (clino) from d = dominant; c = co-di r 1 = isolated (0.2-2%); v ns height classes: 1-3m = ver; <0.2% = isolated tree 10 Points - Fo Cenopy % (photos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tai - every 1 m recover	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall 6 = open forest; 80-100% = o along 50m transect			, (30
G sefinitions commance stimated cover stimated cove	Tree height (clino) from d = dominant; c = co-di r 1 = isolated (0.2-2%); v ns height classes: 1-3m = vor; <0.2% = isolated tree 10 Points - Fo Cenopy % (photos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	1% + bottom%) ottom%) mid dense (50-80% tall; 20-35m = very t = woodland; 50-80% ily sheet, 50 points rd if plant intersects	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point			00
G sefinitions commance stimated cover /alker & Hopkin /alker &	Tree height (clino) from d = dominant; c = co-di r I = isolated (0.2-2%); v res height classes: 1-3m- ver; <0.2% = isolated tree 10 Points - Fo Canopy % (ghotos)	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	mid dense (50-80%) mid dense (50-80%) talt; 20-35m = very (= woodland; 50-80%) ly sheet, 50 points rd if plant intersects	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hts/50	00
G sefinitions commance stimated cover /alker & Hopkin /alker &	Tree height (cino) from d = dominant; c = co-d r I = isolated (0.2-2%); v rs height classes: 1-3m = ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 10 5 7 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	mid dense (50-80%) mid dense (50-80%) talt; 20-35m = very (= woodland; 50-80%) ly sheet, 50 points rd if plant intersects	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hts/50	00
G sefinitions cominance stimated cover stimated cover stimated cover of Transect coint m om o	Tree height (cino) from d = dominant; c = co-d r I = isolated (0.2-2%); v rs height classes: 1-3m - ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 10 5 7 7 7 8 7 8 7 8 7 8 7 8 7 8 8 8 8 8 8	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance fn ubdominant: a = (2-20%); s = spi low; 6-12m = r (2-20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	mid dense (50-80%) mid dense (50-80%) talt; 20-35m = very (= woodland; 50-80%) ly sheet, 50 points rd if plant intersects	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hts/50	00
G Methillions Mominance Stimated cover Walker & Hopkin Walker & Hopkin Om Transect Foint m Om Sm Om Sm Om Sm Om Sm Om Sm	Tree height (cino) from d = dominant; q = co-d r I = isolated (0.2-2%); v rs height classes: 1-3m ver: <0.2% = isolated tre 10 Points - Fo Canopy % (photos) 10 5 7 7 8 9 10 10 10 10 10 10 10 10 10 10 10 10 10	minant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0. Midetorey %	e = distance for ubdominant; a = (2:20%); s = sp low; 6-12m = r ,2:20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	mid dense (50-80%) mid dense (50-80%) talt; 20-35m = very (= woodland; 50-80%) ly sheet, 50 points rd if plant intersects	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hts/50	00
G Definitions Dominance istimated cover	Tree height (clino) from d = dominant; q = co-d r = isolated (0.2-2%); v ns height classes: 1-3m - vor: <0.2% = isolated tre 10 Points - Fo Cenopy % (photos) 10 5 7 9 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 10 5 7 8 8 8 8 8 8 8 8 8 8 8 8	ominant: s = su = very sparse (= dwarf; 3-6m = es or clumps; 0 Midstorey %	e = distance fn ubdominant: a = (2-20%); s = spi low; 6-12m = r (2-20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = mid-high; 12-20m = woodland; 20-50% Ground covertal - every 1m reco	1% + bottom%) ottom%) mid dense (50-80% talt; 20-35m = very t = woodland; 50-80% liy sheet, 50 points rd if plant intersects (*** b, fern, sedge, etc)	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hts/50	, 0(
G Definitions Nominance Stimated cover Valker & Hopkin Valker & Hopkin Om Transect Point m Om Sm Om Sm Om Om Sm Om Om	Tree height (clino) from d = dominant; c = co-dr r = isolated (0.2-2%); v ns height classes: 1-3m - ver: <0.2% = isolated tree 10 Points - Fo Canopy % (photos) \[\begin{align*} \text{O} \text{S}	bottom of slop ominant; s = su = very sparse (= dwarf; 3-6m = es or clumps; 0 Midstorey %	e = distance fn abdominant; a = (2-20%); s = sp fow; 6-12m = r (2-20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tal - every 1m reco Native grass (all) Native other (her	1% + bottom%) ottom%) mid dense (50-80% talt; 20-35m = very t = woodland; 50-80% liy sheet, 50 points rd if plant intersects (*** b, fern, sedge, etc)	alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point		Total (hits/50	, 00
G Definitions Sominance Stimated cover Valker & Hopkin V&H Crown cov Om Transect Point m Om Om Sm Om	Tree height (clino) from d = dominant; c = co-dr r = isolated (0.2-2%); v ns height classes: 1-3m - ver: <0.2% = isolated tree 10 Points - Fo Canopy % (photos) \[\begin{align*} \text{O} \text{S}	bottom of slop ominant; s = su = very sparse (= dwarf; 3-6m = es or plumps; 0 Midstorey % O	e = distance fn abdominant; a = (2-20%); s = sp fow; 6-12m = r (2-20% = open e Cover Exotic %	nce from tree x (top% - b) associated arse (20-50%); m = nid-high; 12-20m = woodland; 20-50% Ground cover tal - every 1m reco Native grass (all) Native other (her	ottom%) ottom%) mid dense (50-80% talt; 20-35m = very t = woodland; 50-80% liy sheet, 50 points rd if plant intersects (alt; >35m = extremely tall is = open forest; 80-100% = o along 50m transect i (hits) point	losed forest	Total (hits/50	, 0(

pecies	Cover	Abund.	Species			Cover	Abund.
Eucoliptus induccang.	100	2	41				
Consisten dadestinen	6	2ot	42				
Carried March 1 has	3	201	43				
Caperos gracilis	2	204	44				
coula -	2	20+	45		-		
The state of the s	3	201	an an				
Paspalem	3		40				
Trifglian vogers		20+		-	-		
dicleweed	Z	20t	40				
Ortica incisa.	++-	4	40				
Sondus daraceus	1	2	60				
Poa anuva	2	20+	51				
Malua gariflare	2		52	1.1	ed as t	ela	-
longe charles	2	2	m just	die	sed as	e to C	
Platago lanceolata	1	-	54				
· Taraxeren officinale	1	1	65				
Wire weed	1		50				
7	-	-	67				
	-		58				
0	-	-	10				
0	-	+	60			-	
5		-	E1				
2		-	62				
9		-	6)				
4	-	-	61				
4	-	-	(H)				
e .			00				
T .		-	87				
9			66				
9			60				
0			70				
н	_		91				
12			72				
19		_	73				
94		-	74				
35	_		75				
96	-	_	/6				
it .			77				
96			76				-
80	-		70				
н	-		60				26
Sp. Richness Native Exotic	_	er % 1x1 plots	Q1	Q2	Q3	Q4.	Q5
Tree	-	ennial grass	-				
Shruti (L	Native other	*******					
Grass (annual)	Native fort	-					-
Grass (perennial)	Native shr.	ib (<1m)					
Other (annual)	Exotic gras	s					
Other (perennial)	Exotic forb	& other					
	Leaf & stic	klitter					-
	Rocks						
Cover abundance scale	Bare groun	d					
Modified Braun-blanquet 6 scale	Cryptogam	5					
	Total		100	100	100	10	0 10
1 <5% - rare	Plot Distur	barice			Fire damage:		
2 <5% - common	Clearing (i	nc. logging):			Storm damage:		
3 5-25%		(inc. pasture):			Trampling:		
4 25 - 50%	Soil erosio		,		Flood damage:		
5 50 - 75%	Firewood	7.77			Feral herbivores:		
6 75 - 100%	Stock graz				Other:		

WN 528 Mod/wood-POOT

BioBanking Field Sheet
Poor

Shale Halts - Poor

Survey Sit	e Form - BioBank	ing		Site ID: 510	willowday	egetation zone:	CPN - Poo	~	
Date	20/1/2	016		Surveyor(s):	i i	W			
Waypoint ID				Photo numbers	2306				
Coordinates	E - 33 - 40	688	28	Photo direction	N	E	s	w	
Mapped Vege	itation type:	w	000V	-	Condition:		Low	Modelsood	9001
	Mod, Steep	the same	rees or cardin	nat): Hof	Altitude:		1000	proggood	Tool .
		e, mid slope, d	lawn slade, gul	y, flat, depression,	watercourse, escarpment, to	errace			
			and the same of th		m, limestone, metamorphics				
	nd, loam , clay , organic, s			-	: intact, topsoil removed, fil				
	-6-			Son disturbance	r. inact, jupoui removeu, ni				
	growth (uncleared):	Yes (No U							
egetative Str	ructure (formation) = (m t	- the	Ecologically Dom	inant Layer (EDL) - most bi	omass = Co	rapay		
Strata	Height interval	Median	Est. cover	Dominant Specie	s & Dominance				
E	1								
Т1	20.5		201	Eveal	y phus -	tertico	enis		
T0	CO 2/A						W		
T2			_						
тз			2.5				4		
S1	1 2m		51,	Lyci	n tenoci	schum			
S2	20								
G	0 1m		90%	Solow Solow	y bonidely	Vic agree			
	CARACH SON	n bottom of slop ominant, s = s = very sparse	e = distance fr ubdominant; a « (2-20%), a = sp	om tree x (top% - bo associated aree (20-50%); m =	#8am%) mid dense (50-80%); d = den	22.02.000.0010.00			
					all; 20-35m = very tail; >35m • woodland; 50-80% = open f		ed forest		
Om Transect	10 Points - Fo	slage Projectiv	e Cover	Ground cover tall	y sheet, 50 points along 50r	m transect			
pint	Canopy % (photos)	Midstorey %	Exotic %		d if plant intersects (hits) poi				
η	30	0	0	Native grass tally		0.00		Total (hits/50)	
)m	0	0	0		11			Name of the last o	11
im .	D	0	0	1	TI.			11	, I
)m	0	0	8	1				4/	, [
im	10	100		1				1	
	20	0	0	Mother street	fin age was a	4.14		T-110	
lm	1000	0	0	reative other (nert	o, fern, sedge, etc) tally - 1	111-1		Total (hits/50)	(3)
m	10	٥	0	-	7	[1]			a, I
)m	2	0	0	1		To Call		17	1. 1
im	20	0	0	-				(0	100
0m	10	0	0						
otal (sum / 10	1015	0	0	Native shrub tally				Total (hits/50)	
arger 50 x 20		100 TEMP	Western -	1				Δ.	
	dy debris >10cm wide &	>0.5m long	8m					0/	
	anopy sp. regeneration		0	Exotic tally - H	丰丰丰丰	十十十十十十十十十十十十十十十十十十十十十十十	#1	Total (hits/50)	5.5 a
lumber of tree	s with hollows >5cm		0	tun			***	PL	

Site ID: W:\\o	US CARS-C		Cover	Abund.	Species			Cover	Abund.
	I	tochiconis	-4	5	41				
Side 1	An and	LIG	3	23	42				
Rikuy		-1707-1	6	100+	40				
Sporolo		2-1-5	+ 1	1	44				
2010101	3,53,5	creses	4	47	es:				
Solam	pricer	y apple	1	13	in .				
Atriples	× 1	-1 **	1 1	10	-				
apper	5 91	acius	2	26+	las .				
crows	toot		-	1	49				
	s much	appscains's	1		AD.			,	
Lycing	firex	missi	++-	2	80.				
Walva	me he	pens	1	11	11				
Malla	Paris	-lova	+ +	1	98				
Pospalid	in		1	2	53				
Lepillin	- ali	-	Z	12	54				
Notiena	othic		1	1	66				
Oxalis		engas.	-2	rat	28				
Compa	ena	closioidy		1	67				
Enod	6 pol	ngonoides	- 3	200	68				_
Wine .	wedd	7		1	50				
Harrie			1	2	00				
Fined		Sagaras	-	10	61				
Evagios	tic	brownii	- 1	2	62				
Coningzo	100	nciens	1	1	65				
setelia	500		1)	64				
aynoda	n da	elylan	+ 4	Look	85				
o dulais	acre	· · · ·		5	en.				
Dicha	don	repus	+ 1	7	67				
· cirsin	~ 111	dagare.	1	1	64				
9		9			ins				
0					vo ov				2 2
1					78				
2					72.				
9					73				
14					76				
D.					75				
u.					76				
it					77				
id.					78				
0					<i>1</i> 11				
10					80				
Sp. Richness	Native	Exotic	Ground lay	er % 1x1 plots	Q1	Q2	Q3	04	Q5
Free			_	ennial grass					
Shrub	100 00		Native other						
Grass (annual)	11		Native fort	-0.9.000					
Grass (perennial)	111		Native shru	ALCOHOL: NAME OF TAXABLE PARTY.	1				
Other (annual)	- 8		Exotic gras		1				
Other (perennial)			Exotic forb						
said (pororeila)			Leaf & stic						
			Rocks	, otter	1				
Co	ver abundan:	se scale	Bare groun	nd					
	d Braun-blan		Cryptogan	**	1				
Modifie	u uraur-pali	quer o avaire	Total		100	10	100	10	0 1
- 4	ego:		Plot Distur	hanno	100	10	Fire damage:		
- 1	<5% - rare						-		
2	<5% - com	nom	-	nc. logging):			Storm damage:		
3	5 - 25%			(inc. pasture):			Trampling:		
4	25 - 50%		Soil erosio	STATE OF THE PARTY			Flood damage:		
5	50 - 75%		Firewood o				Feral herbivores:		
6	75 - 100%		Stock graz	ing			Other:		

JACOBS Shale Plains - Poor

	Form - BioBank	irig		Site ID: 2	219	Vegetation zone:	CPW H	itts Plairs
ate		200		Surveyor(s):	Lukas	Cleus		
Vaypoint ID	219	V		Photo numbers				
Constitution	Ε			Dhata dissetter	0	-	(48)	700
Coordinates	N			Photo direction	И	E	S	W
Mapped Veget	ation type: CE	W			Condition:		Low	Word good
Slope: Gentle.			rees or cardin	al): SSF	Altitude: \ (06 m		
	crest, ridge, upper slop					AND DESCRIPTION OF THE PERSON		
	ilt, granite, conglomera		- 17 17 17					
	d, loam day organic, s			· · · · · · · · · · · · · · · · · · ·	e: intact, topsoil reme		T	
Remnant / Old	growth (uncleared):	Yes/No/U	depided?	Canopy	, tree	s bury		
/egetative Stru	ucture (formation) =			Ecologically Dom	ninant Layer (EDL) -	most biomass =		
Strata	Height interval	Median	Est cover	Dominant Specie	s & Dominance			
	1/	1.0	V		V			
E	X	V	1	- 5	\wedge			
	(>		177					
				Ercol	1,075	(creticonis	5	
T1	V 20	1	20%	F-11-1		nollecconor		
550	15 25M		YOU,		74.00	MONEY (- ac-1		
		_	_		7.5			
TO	V	1900000	10	-	X			
T2	7.	X	X		1			
	0/00							
		10000	χ		X			
T3	·	X	1					
		12700				0.2		
	10			Lycin	un, fe	rociss Mu	u	
S1	100	ı		,				
	30323	1						
		_	1					
S2	1.00	1						
O.		1						
		-		0.5	1-	8 H 71		
72.07			ant	Penise	tun .	ladest ne	ч	
G			90%	Penise	tun oda	ladest ne	ч	
G	*		90%	Penise Cirsiu Senec	tun oda	ladest nu logarais	sis Dic	lada repo
G	Tree height (clino) leve	el ground or top				ladest nu logaraier	sis Dic	liadia repo
G	Tree height (dino) leve		of slope = dista	nce from tree x (top)	% + bottom%)	ladest nu lagaszaier	sis Dic	liadia repo
			of slope = dista	nce from tree x (top)	% + bottom%)	ladest nu lagaszaier	sis Dic	liadia repo
Definitions	Tree height (clino) from	n bottom of slop	of slope = dista e = distance fn	nce from tree x (top/ om tree x (top% - bo	% + bottom%)	ladest nu lagaszaier	sis Dic	Madra repo
Definitions Dominance	Tree height (clino) from d = dominant; c = co-d	n bottom of slop tominant; s = si	of slope = dista e = distance fo	nce from tree x (top) orn tree x (top% - bo associated	% + bottom%) ottom%)	J	sis Dic	Uadra repo
Definitions Dominance	Tree height (clino) from	n bottom of slop tominant; s = si	of slope = dista e = distance fo	nce from tree x (top) orn tree x (top% - bo associated	% + bottom%) ottom%)	J	sis Dic	Uadra repo
Definitions Dominance Estimated cover	Tree height (dine) from d = dominant; c = co-d i = isolated (0.2-2%); v	n bottom of slop forminant; s = si v = very sperse	of slope = dista e = distance for ubdominant; a = (2-20%); s = sp	nce from free x (top/ cm free x (top% - bo associated arse (20-50%); m =	% + bottom%) ottom%) mid dense (50-80%)	d = dense (80-100%)	sis Dic	ladia repo
Definitions Dominance Estimated cover	Tree height (clino) from d = dominant; c = co-d	n bottom of slop forminant; s = si v = very sperse	of slope = dista e = distance for ubdominant; a = (2-20%); s = sp	nce from free x (top/ cm free x (top% - bo associated arse (20-50%); m =	% + bottom%) ottom%) mid dense (50-80%)	d = dense (80-100%)	sis Dic	ladia repo
definitions dominance is limated cover Valker & Hopkin	Tree height (clino) from d = dominant; c = co-d i = isolated (0.2-2%); v hs height classes; 1-3m	n bottom of slop forminant; s = si v = very sparse = dwarf; 3-6m =	of slope = dista e = distance for ubdominant; a = (2-20%); s = sp = low; 6-12m = r	nce from free x (top% - bo associated arse (20-50%); m = tid-high; 12-20m = t	% + bottom%) ottom%) mid dense (50-80%); tall; 20-35m = very tal	d = dense (80-100%)		Madra repo
definitions dominance is limated cover Valker & Hopkin	Tree height (clino) from d = dominant; c = co-d i = isolated (0.2-2%); v hs height classes; 1-3m	n bottom of slop forminant; s = si v = very sparse = dwarf; 3-6m =	of slope = dista e = distance for ubdominant; a = (2-20%); s = sp = low; 6-12m = r	nce from free x (top% - bo associated arse (20-50%); m = tid-high; 12-20m = t	% + bottom%) ottom%) mid dense (50-80%); tall; 20-35m = very tal	d = dense (80-100%) 1;>35m = extremely (all		Uadra repo
definitions lominance islimated cover Valker & Hopkir V&H Crown cov	Tree height (dine) from d = dominant; c = co-d r i = isolated (0.2-2%); r hs height classes; 1-3m ver: <0.2% = isolated from	n bottom of slop forminant; s = si v = very sparse = dwarf; 3-6m =	of slope = dista se = distance for ubdominant; a = (2-20%); s = sp slow; 6-12m = r 1,2-20% = open	nce from free x (top% - bo associated aree (20-50%); m = nid-high; 12-20m = t woodland; 20-50%;	% + bottom%) ottom%) mid dense (50-80%); tall; 20-35m = very tal	d = dense (80-100%) ; >35m = extremely tall = open forest; 80-100% = ck		Uadra repo
Definitions Identification Stimated cover Valker & Hopkir V&H Crown cov	Tree height (dine) from d = dominant; c = co-d r i = isolated (0.2-2%); r hs height classes; 1-3m ver: <0.2% = isolated from	n bottom of stop terrinant; s = si v = very sparse = dwarf, 3-6m = pes or dlumps; 0	of slope = dista se = distance for ubdominant; a = (2-20%); s = sp slow; 6-12m = r 1,2-20% = open	nce from free x (top% - bo associated area (20-50%); m = nid-high; 12-20m = t woodland; 20-50%;	% + bottom%) ottom%) mid dense (50-80%), tal; 20-35m = very tal = woodland; 50-80%	d = dense (80-100%) t >35m = extremely tall = open forest; 80-100% = clo		ladia repo
definitions forminance stimeted cover Valker & Hopkin V&H Crown cov Om Transect	Tree height (cline) from d = dominant; c = co-d i = isolated (0.2-2%); i his height classes: 1-3m ver: <0.2% = isolated from 10 Points - Fo Canopy % (photos)	n bottom of stop formant; s = s v = very sparse = dwarf; 3-6m = ses or dumps; 0 bilage Projectiv Midstorey %	of slope = distance for addominant; a = (2-20%); s = sp = low; 5-12m = r ,2-20% = open e Cover Exotic %	ace from free x (top% - bo accorded area (20-50%); m = nid-high; 12-20m = t woodland; 20-50% - Ground cover tall - every 1m recon	% + bottom%) pitom%) mid dense (50-80%); tal; 20-35m = very tal = woodland; 50-80% by sheet; 50 points at d if plant intersects (d = dense (80-100%) t >35m = extremely tall = open forest; 80-100% = clo		
definitions frominance stimated cover valver & Hopkir V&H Crown cov Om Transect Point	Tree height (cline) from d = dominant; c = co-d i = isolated (0.2-2%); v ns height classes: 1-3m ver: <0.2% = isolated fro 10 Points - Fo Canopy % (photos) 2 O	n bottom of stop terrimant; s = si v = very sparse = dwarf; 3-6m = ses or dumps; 0 bliage Projectiv Midstorey %	of slope = dista le = distance for Jodominant; a * (2-20%); s = sp low; 6-12m = r J.2-20% = open e Cover Exotic %	nce from free x (top% - bo associated area (20-50%); m = nid-high; 12-20m = t woodland; 20-50%;	% + bottom%) pitom%) mid dense (50-80%); tal; 20-35m = very tal = woodland; 50-80% by sheet; 50 points at d if plant intersects (d = dense (80-100%) t >35m = extremely tall = open forest; 80-100% = clo		Condina repo
definitions Iteminance Estimated cover Valker & Hopkir V&H Crown cov Om Transect Point m Om	Tree height (cline) from d = dominant; c = co-d i = isolated (0.2-2%); v hs height classes: 1-3m ver: <0.2% = isolated from 10 Points - Fo Canopy % (photos) 20 20	n bottom of stop forminant; s = si v = very sparse = dwarf; 3-6m = ses or dumps; 0 bilage Projective Midstorey %	of slope = dista e = distance for Jodominant; a * (2-20%); s = sp low; 6-12m = r J.2-20% = open e Cover Exotic %	ace from free x (top% - bo accorded area (20-50%); m = nid-high; 12-20m = t woodland; 20-50% - Ground cover tall - every 1m recon	% + bottom%) pitom%) mid dense (50-80%); tal; 20-35m = very tal = woodland; 50-80% by sheet; 50 points at d if plant intersects (d = dense (80-100%) t >35m = extremely tall = open forest; 80-100% = clo		
definitions flominance sitimated cover Valker & Hopkir V&H Crown cov Om Transect Point m Om 5m	Tree height (cline) from d = dominant; c = co-d r = isolated (0.2-2%); v ns height classes; 1-3m ver. <0.2% = isolated fro 10 Points - Fo Canopy % (photos) 20 30 50	n bottom of stop forminant; s = si v = very sparse = dwarf; 3-6m = ess or dumps; 0 bliage Projectiv Midstorey %	of slope = distance for a distance f	ace from free x (top% - bo accorded area (20-50%); m = nid-high; 12-20m = t woodland; 20-50% - Ground cover tall - every 1m recon	% + bottom%) pitom%) mid dense (50-80%); tal; 20-35m = very tal = woodland; 50-80% by sheet; 50 points at d if plant intersects (d = dense (80-100%) t >35m = extremely tall = open forest; 80-100% = clo		
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