Rix's Creek Continuation Project

Revised Response to Submissions - Biodiversity

Prepared for Bloomfield Collieries Pty Ltd | 2 March 2018

Rix's Creek Continuation Project

Revised Response to Submissions - Biodiversity

Prepared for Bloomfield Collieries Pty Ltd | 2 March 2018

Level 5, 21 Bolton Street
Newcastle NSW 2300

T +61(0)2 4907 4800
F +61 (0)2 4926 131207 4899
E info@emmconsulting.com.au

www.emmconsulting.com.au

Rix's Creek Continuation Project

Final

Report J16201RP3 | Prepared for Bloomfield Collieries Pty Ltd | 2 March 2018

Prepared by	**Eugene Dodd**	Approved by	**Nathan Garvey**
Position	Senior Ecologist	Position	Associate Ecologist
Signature		Signature	
Date	2 March2018	Date	2 March 2018

Document Control

Version	Date	Prepared by	Reviewed by
1	26 October 2017	Eugene Dodd	Nathan Garvey
2	30 October 2017	Eugene Dodd	Nathan Garvey
3	2 March 2018	Eugene Dodd	Katie Diver

T +61 (0)2 4927 0506 | F +61 (0)2 4926 1312

Level 51 | 21 Bolton Street | Newcastle | New South Wales | 2300 | Australia

www.emmconsulting.com.au

Table of contents

Table of contents *(Cont'd)*

Appendices

Tables

Photographs

1 Introduction

This report has been prepared on behalf of Bloomfield Collieries Pty Ltd (Bloomfield) to provide supplementary ecological information for the Rix's Creek Continuation Project. The most recent submission to the NSW Department of Planning and Environment (DPE) was a Response to Submissions (RtS) Addendum (AECOM 2016). The Office of Environment and Heritage (OEH) provided comments on the biodiversity aspects of the submission (OEH letter to the Department of Planning and Environment, dated 6 February 2017). OEH raised seven key points requiring further attention. EMM and Bloomfield met with OEH on 26 February 2017 to discuss the outstanding information and how to most effectively to address the key requirements. This report provides the specific biodiversity information requested by OEH in the RTS (Section 2) and any additional information requested during subsequent correspondence with DPE and OEH.

Several revisions to the project footprint have been proposed during the environmental assessment process; this report consolidates these changes and provides an assessment based on an updated project area of 213 ha. During the submissions process, OEH also requested amendments to the assessment circle sizes used. This has implications for the final credit calculations. All figures and vegetation credit calculations have been amended to reflect the revised footprint and alterations to the assessment circle sizes (refer to Section 2.4).

This report will be provided as an appendix to the Revised Response to Submissions (RRTS) for project.

1.1 Referenced reports and data sources

The following reports and data sources have been used to inform this submission, and are referenced throughout:

- AECOM 2015, *Rix's Creek Mine – Rehabilitation Strategy,* prepared by AECOM Australia Pty Ltd for Rix's Creek Pty Ltd;
- AECOM 2016, *Rix's Creek Continuation of Mining Project. Response to Submissions Addendum,* prepared by AECOM Australia Pty Ltd for Bloomfield Collieries Pty Ltd;
- Bell 2016, *Changes to the Extent of Threatened Communities and Credits. Rix's Creek Continuation Project,* letter to John Hindmarsh at Rix's Creek Pty Ltd, dated 6 April 2016;
- Bell, Murray & Driscoll 2014, *Upper Hunter Strategic Assessments: Rix's Creek Mine, Singleton LGA, unpublished DRAFT v6*, prepared by Eastcoast Flora Survey for Rix's Creek Pty Ltd, October 2014;
- Bloomfield Company Ltd. 2011, *Mining Operations (Rix's Creek Mine) – Water Management Plan, Site Water Management Plan Ver 2- 091111*, Bloomfield Company Ltd;
- DECCW 2011, *Biodiversity Certification Assessment Methodology (BCAM),* Department of Environment, Climate Change and Water, Sydney;
- Eastcoast Flora Survey 2015, *Ecology Report for the Continuation of Rix's Creek Mine, Singleton LGA, Revision 4.4*. Prepared by Eastcoast Flora Survey for Rix's Creek Pty Ltd, October 2015 (the project ecology assessment);
- Environmental Protection and Biodiversity Conservation Act Referral No. 2014/7348;

- JP Environmental 2010, *Erosion and Sediment Control Plan*, prepared for Bloomfield Company Ltd by JP Environmental for*;*

- OEH 2015, *Biodiversity Certification Operational Manual,* NSW Office of Environment and Heritage, Sydney;

- OEH 2016a, *Information Requirements for the Revised Footprint of the Rix's Creek Coal Mine Extension Project,* including Attachment A through C, letter to John Hindmarsh at Rix's Creek Pty Ltd dated 18 November 2016;

- OEH 2016b, *Upper Hunter Strategic Assessment: Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity,* NSW Office of Environment and Heritage, Sydney; and

- OEH 2017, *Rix's Creek Extension Project (SSD 6300) Attachment A: OEH Review of Rix's Creek Continuation of Mining Project: Response to Submissions Addendum*, letter to Thomas Watt at Department of Planning and Environment, dated 6 February 2017.

2 Responses to OEH

Each point raised by OEH is outlined below, with further information and discussion provided where necessary.

2.1 Central Hunter Valley eucalypt forest and woodland (CHVEFW)

> That the proponent must identify native vegetation in the project area that meets the definition of the (Commonwealth) Environmental Protection and Biodiversity Conservation act 1999 (EPBC Act) listed 'Central Hunter Valley eucalypt forest and woodland critically endangered ecological community (CHVEF). This must be present as an area calculation and map.

Four communities within the project area are considered part of the CHVEF listing;

- Bull Oak Grassy Woodland;
- Derived Native Grassland;
- Grey Box Grassy Open Forest; and
- Narrow–Leaved Ironbark–Native Ironbark.

Figure 5 in Appendix B of this report provides an updated map, showing the extent of CHVEFW within the project area. The total area of CHVEFW within the Project Area is 47.12 ha, 17.62 ha of which is the woodland / forest form and 29.5 ha is derived grasslands linking larger woodland / forest patches. Other areas of derived grassland do not meet the definition of the CHVEFW community as listed under the EPBC Act. The methodology for mapping CHVEFW has been through several iterations and was been developed between Dr Stephen Bell (Eastcoast Flora Survey) and Paul Hillier of OEH. The full detail of this process is outlined in a letter which is attached in Appendix A (Bell 2016). It is noted that the extent of the state listed TECs and EPBC listed communities differ (refer to Appendix B, Figure 4 and 5), this is due to the way patch sizes and buffer distances are applied around woodland areas and differences in the scientific determinations.

The project was referred to the Department of Environment and Energy (DoEE) in September 2014 (EPBC Act Referral No. 2014/7348). A decision on the referral was made by DoEE on 21 November 2014 under Section 75 of the EPBC Act, determining that the project was not a controlled action. This decision was made prior to the listing of CHVEFW (May 2015) and therefore no further assessment or approval of the project was required under the EPBC Act.

2.2 Mitigation and mine site rehabilitation

> Clarification is required on the requirements of planned mitigation and mine site rehabilitation for the life of the mine Project under the UHSA. This includes consideration of the Guidelines for the mitigation of coal mining impacts on biodiversity have been applied (industry best practice, proportion of cost of the total Project that is dedicated to biodiversity protection, and the risk of failure of mitigation measures). Table 4 in the addendum report provides a list of mitigation measures. However, it is unclear if the proposed mitigation measures have been developed by applying the Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity, Upper Hunter Strategic Assessment. The report must include details of how the proponent has applied the mitigation guidelines. Table 4 should not include the purchase of ecosystems offsets or any other type of offset as a mitigation measure.

OEH (2016b) presents recommendations for reasonable and feasible actions that will reduce local impacts on biodiversity from vegetation clearing and other mine operations carried out under the Biodiversity Management Plan.

The RTS addendum report (AECOM 2016) provides a summary of the relevant mitigation measures (Table 4) that were presented in the project's Environmental Impact Statement. Further, the *Ecology Report* (Eastcoast Flora Survey 2015) (Appendix I of EIS), and *Rix's Creek Mine Land Rehabilitation Strategy* (Rehabilitation Strategy) (AECOM 2015, Appendix Q of EIS) provide a range of mitigation measures that are aligned with those recommended in *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b), and are separate to the purchase of ecosystem credits, but does not specifically outline how these meet the requirements of OEH (2016b).

Further discussion is provided below on the extensive list of mitigation and mine site rehabilitation measures from the Rehabilitation Strategy (AECOM 2015, Appendix Q of EIS) and how these recommendations meet the requirements of OEH (2016b).

2.2.1 Landform establishment/surface and groundwater management

The Rehabilitation Strategy (Section 5.2) provides details on surface shaping, deep ripping and rock removal and drainage establishment to ensure that the final landform is stable and safely sheds surface water runoff without giving rise to erosion. The final landform drainage will be designed to integrate with the surrounding catchments and it will be revegetated to achieve long-term stability, erosion control and to harmonise with more general rehabilitation and revegetation strategies. Further, the Rehabilitation Strategy states that erosion and sedimentation at the mine is to be prevented through the implementation of the *Water Management Plan* (WMP) (Bloomfield Company Ltd 2011) which includes an *Erosion and Sediment Control Plan* (ESCP) (JP Environmental 2010).

These proposed measures meet a range of applicable recommendations outlined in section 5.1, Table 2 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.2 Growing media

The Rehabilitation Strategy (Section 5.3) provides details on the development of growing media/soil which is capable of supporting a sustainable plant community. This will include overburden characterisation, topsoil and subsoil characterisation, soil stripping, stockpile management, soil amelioration, topdressing, soil integration, and land management practices and erosion and sediment controls.

These proposed measures meet a range of the recommended direct and indirect mitigation actions for growing media in section 5.2, Table 3 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.3 Weed management

The Rehabilitation Strategy (Section 5.4.5) provides details on weed management. It states that all noxious weeds will be managed and controlled in accordance with the requirements of the *Biosecurity Act 2015*. Weeds will be controlled in consultation with the Local Land Services, Singleton Council and Upper Hunter Weeds Authority staff using a combination of mechanical, biological and chemical controls. Particular attention will be paid to the control of African Olive (*Olea europaea* L subsp *cuspidata*) across the site as the invasion of this species is listed as a potential key threatening process to the Central Hunter Grey Box-Ironbark Woodland and the Hunter Lowlands Redgum Forest both of which are listed under the *Biodiversity Conservation Act 2016*.

These proposed measures meet applicable recommendations for weed mitigation outlined in section 5.3, Table 4 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.4 Pest animal and feral fauna management

The Rehabilitation Strategy (Section 5.4.5) provides details on the Mine's annual feral animal management and control program that will be carried out for the life of the Mine. All work will be implemented in close liaison with the staff of the Local Land Services and in close communication with adjoining land users to ensure a coordinated approach to pest management.

These proposed measures meet the applicable recommendations in section 5.4 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.5 Domestic stock

The aim of the rehabilitation program at the Mine is to reinstate the pre-mining land capability of grazing land, with the post-mined lands being revegetated with pasture species and areas of trees over grass to provide enhanced habitat for both native animals and domesticated stock. The Rehabilitation Strategy (AECOM 2015) (Section 5.4.8) provides guidance on carrying capacity/stocking rates of cattle.

These proposed measures meet the applicable recommendations in section 5.5, Table 6 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.6 Fauna movement structures

Fauna movement structures (overpasses and underpasses) can be effective where mining activities sever habitat connectivity over a wide or linear area. This is not relevant to this project, which is located within an already fragmented landscape and is not a linear project.

While not fauna movement structures, nesting boxes that will provide habitat for a range of arboreal and avian species will be established in older areas of rehabilitated lands once tree heights are adequate to support them and provide primary habitat for these species, as they recolonise these areas (Rehabilitation Strategy Section 5.4.7, AECOM 2015).

2.2.7 Bushfire management

A bushfire hazard reduction plan has been prepared in consultation with the Rural Fire Service. The Rural Fire Service conduct hazard reduction activities on The Bloomfield Group managed lands surrounding the mining operation (Rehabilitation Strategy Section 5.5.2). These hazard reduction activities include ameliorative actions and management safeguards.

These measures meet the applicable recommendations in section 5.8, Table 10 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.8 Pre-clearing surveys and tree-felling supervision

The Ecology Report (Eastcoast Flora Survey 2015, Section 5.2) describes the staging of mining for gradual fauna dispersal and the ongoing development of rehabilitated areas on land that is already mined. It also discusses pre-clearance survey technique and timing, as well as stockpiling of habitat for later use in rehabilitation.

The Rehabilitation Plan (AECOM 2015, Section 5.4.1) describes limiting vegetation clearance to that required to effectively operate the mine; and programming the works so that only the areas which are scheduled for mining activities are cleared. The proposed use of felled vegetation in future rehabilitation will follow best practice and may include the collection of timber for fencing; incorporating ground cover, understorey species and saplings into stripped topsoil; and respreading large woody debris onto re-contoured land.

Stag trees will be installed into the post-mining landscape as part of the rehabilitation program to optimise future potential habitat for arboreal and avian fauna, including Squirrel Gliders (*Petaurus norfolcensis*). Wherever possible, dead trees will be retained in the areas of open paddock that are not mined to provide sheltering habitat for arboreal avian fauna.

These measures meet the applicable recommendations in section 5.10, Table 12 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.9 Access control, signage and barriers – fencing

The Rehabilitation Plan (Section 5.4.2) provides details on proposed access control including fencing and signage. The layout will be designed during Phase 4 'Ecosystem and Landuse Establishment' and will include consideration of fencing (materials and construction), delineation of paddocks, access to watering points, stock handling facilities and stock refuge areas.

These measures meet the applicable recommendations in section 5.14, Table 16 of the *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b).

2.2.10 Traffic management

The Rehabilitation Strategy (AECOM 2015, Section 5.3.8) provides land management practices including restricting vehicular traffic on the soils to be stripped. Traffic will be excluded from soils that are sensitive to structural degradation.

The *Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity* (OEH 2016b) provide recommendations on traffic management as it relates to wildlife-vehicle collisions. Measures to minimise wildlife-vehicle collisions are not covered within any project management plans as yet. It is recommended that speed limits are implemented in areas which have elevated risk of collisions with wildlife.

2.3 Offsetting

> Demonstration of 'reasonable steps' having been undertaken to seek land-based offsets before the proponent may consider paying on the Offsets Fund. Section 2.2.1 (Offsetting) of the addendum report states that 'reasonable steps' to source offsets were taken "in accordance with the Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity, Upper Hunter Strategic Assessment (OEH, 2016r). The 'reasonable steps' are a requirement of the UHSA, but are not found in the Mitigation Guidelines. Therefore, OEH recommends that the proponent changes the wording to "in accordance with the Upper Hunter Strategic Assessment".

The RRTS addendum (AECOM 2016) (Section 2.2.1 'Offsetting') states that:

> As part of the Project as described in the EIS and RTS, Bloomfield undertook reasonable steps to demonstrate that attempts have been made to obtain credits in accordance with the Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity, Upper Hunter Strategic Assessment (OEH, 2016).

The review by OEH noted that, whilst the 'reasonable steps' are a requirement of the UHSA, they are not stated in the mitigation guidelines. Therefore the following paragraph is more appropriate:

> As part of the Project as described in the EIS and RTS, Bloomfield undertook reasonable steps to demonstrate that attempts have been made to obtain credits in accordance with the Upper Hunter Strategic Assessment Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity, Upper Hunter Strategic Assessment (OEH 2016b).

Further detail regarding offsets are provided in the offset management strategy, Section 5.

2.4 Avoidance

> The report must consider and describe all reasonable measures to avoid impacts on biodiversity and will provide reasons why impacts cannot be further avoided. The addendum report has not described any avoidance considerations in relation to the revised footprint and has not provided reasons why impacts on biodiversity cannot be further avoided. Section 2.2.1 (Management Measures) of the addendum report lists the purchase of ecosystems credits as part of the approach to avoid, reduce and mitigate potential impacts to biodiversity. OEH does not regard the purchase of ecosystem credits as corresponding to any of these measures.

The approach undertaken for the Rix's Creek Continuation of Mining Project is to avoid, reduce and mitigate potential impacts to biodiversity, before offsetting and residual impacts. Two key steps to avoid and minimise impacts have been undertaken.

The Bloomfield Group have consulted with OEH and the Department of Planning and Environment in order to refine the project footprint and reduce impact to biodiversity. This has resulted in a total footprint of 213 ha, significantly smaller than the previously proposed 280 ha iteration. As a result, there will be no disturbance of the northern section of the coal resource, north of Deadman's Gully, which is one of the most densely forested areas within the locality and is a key step to avoiding and minimising impacts. Further steps to mitigate and rehabilitate impacts are outlined in Section 2.2.

The project has limited scope to further apply the avoidance hierarchy further as the resource occurs within a discrete area and is directly adjacent to the currently exploited resource. The majority of remaining native vegetation occurs as small, discrete patches and avoidance of these areas would not be economically viable or practical given the scale of the open cut operations. Furthermore this is not advantageous ecologically as any remaining habitat would be discontinuous with poor connectivity.

Avoidance principles are more effectively applied for associated infrastructure, especially where it is linear (eg access roads or transmission lines). This is not an important part of this project as most of the infrastructure is already present as part of the existing mine operations. The coal resource is within a disturbed landscape where biodiversity values are already reduced due to previous land use (grazing and mining).

The Ecology Report (Eastcoast Flora Survey 2015, Section 4.2) provides discussion on potential impacts and mitigation measures; however the RTS Addendum Report does not describe any additional avoidance considerations in relation to the additional footprint area. The same mitigation measures outlined in the ecology report will be applied to the entire project area.

2.5 Accredited Assessor

> The report components that relate to the BCAM must be prepared by an accredited assessor. Section 2.2.1 of the addendum report states that the report has been prepared by an accredited assessor. Thus this requirement has been met.

A BCAM calculation of the vegetation in the development footprint has been run to include the revised project area, as discussed in Section 2.7. An accredited assessor, Eugene Dodd (Accreditation number 191), completed both the BCAM and FBA calculations (refer to Section 2.7 and Section 3).

2.6 Compliance with the information requirements listed the Bio Certification Operation manual (2015)

> Ensure that all information requirements listed in Appendix A of the Biodiversity Certification Operational Manual (2015), available from the OEH website, are met.
>
> The addendum report has not adequately demonstrated that all information requirements listed in Appendix A of the Biodiversity Certification Operation Manual (2015) have been met. The addendum report should make reference to each requirement, listing where in the EIS or in the addendum report it has been addressed.

The original BCAM report for the UHSA Rix's Creek Mine (Bell, Murray & Driscoll 2014) was developed prior to the publication of the *Biodiversity Certification Operation Manual* (OEH 2015), while the Ecology Report for the Continuation of Rix's Creek Mine (Bell 2015) was heavily based on the original BCAM Report, despite being published shortly after the finalisation of the Manual.

Appendix A of the Manual provides a structured guide to the information requirements and contents of the Biodiversity Assessment Report. An assessment of the Biodiversity Assessment Report against all of the information requirements in Appendix A of the Operation Manual (OEH 2015) is provided in Appendix C of this report. In the majority of cases, the required data is contained in the Ecology Report, BCAM Report or the RTS Addendum report. However, the data may not have been presented as required by the Manual owing to this being published after the majority of the reports were completed. This is particularly evident in the figures such as the Site Map and Location Map. Additional information is provided in Appendix A of this report to clarify previously provided information or to fill data gaps. Six figures have been reproduced in accordance with the Operation Manual (OEH 2015) and these are provided in Appendix B of this report.

2.7 Biodiversity Certification Assessment Methodology Calculations

> Reviewing and re-running the Biodiversity Certification Assessment Methodology (BCAM) calculation of the vegetation in the development footprint to include the Addendum Area and address apparent errors in the calculation presented in the EIS. The addendum report presented OEH's updated BCAM calculations of the whole project site, and the Addendum Area that was provided in a letter to the proponent in a letter dated 18 November 2016. It was intended that the proponent would re-run the BCAM assessment using this letter as a guide so as to become familiar with the process and to check the details of the calculation. The proponent is asked to clarify if they did indeed re-run the tool, and if so, to provide a copy of their calculation and the output files.

BCAM credit calculations were undertaken for the entire project area by EMM which produced the same results as those which had been previously verified by OEH. As part of this RRTS addendum, EMM have reproduced several figures to ensure that they meet the requirements outlined in the BCAM Operation Manual (OEH 2015); refer to Appendix B of this report. This included displaying the vegetation mapping at smaller scale to improve clarity. During this process, it was noted that vegetation mapping was absent in several small areas. Mapping for these gaps were provided by Dr Stephen Bell (Eastcoast Flora Surveys), and has been incorporated into this report's assessments and findings.

Revised calculations undertaken for the new disturbance area project footprint were based on the original survey work undertaken for the *Upper Hunter Strategic Assessment* (Bell 2014). Vegetation types and areas were calculated from shapefiles and plot data provided by Dr Stephen Bell (Eastcoast Flora Survey). A review of the plots and transects completed for the Rix's Creek Continuation Project found that there were a sufficient number to meet the assessment requirements, despite the increase in the area of several vegetation communities. One minor amendment was made, with regeneration figures originally entered as percentages rather than decimals; this has been updated. These calculations build on work for the wider Rix's Creek development conducted by Colin Driscoll of Hunter ECO, which have previously been audited by Paul Hillier of OEH.

During the response to submissions process, the assessment circle for BCMA was revised to 1,000 ha. The development did not cause sufficient vegetation loss to cross any thresholds, remaining within the 11-20% category. As a result, there were no changes to the amount of credits generated by the revised BCAM assessment.

A comparison of each vegetation zones, their areas within the project area and the credits generated for each vegetation zone under the original and the new disturbance area is provided in Table 2.1. The full output of the landscape scores and credits generated for each vegetation zone, based on the revised credit calculations, is provided in Table 2.2. In addition, the electronic files have been sent to OEH to accompany this report.

Table 2.1 BioCertification credits

Vegetation zone details	Original vegetation zone (ha)	Revised vegetation zone (ha)	Discrepancy (ha)	Original credits required	Revised credits required	Credit Change
HU812_Moderate/Good_Zone 1 Forest Red Gum grassy open forest on floodplains of the lower Hunter	0.81	0.22	-0.59	29	8	-21
HU906_Moderate/Good_Zone 2 Bull Oak grassy woodland of the central Hunter Valley	0.10	0.10	0.00	2	2	0
HU945_Moderate/Good_Zone 3 Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	0.36	0.00	-0.36	11	0	-11
HU819_Moderate/Good_Zone 4 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	21.25	17.62	-3.63	606	503	-103
HU962_Moderate/Good_Zone 5 Grey Box grassy open forest of the Central and Lower Hunter Valley	1.01	0.76	-0.25	25	19	-6
HU819_Low_Zone 7 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter Derived Grassland	195.49	194.09	-1.41	3,385	3,361	-24
Total	**219.02**	**212.79**	**-6.24**	**4,058**	**3,893**	**-165**

**Note that in addition to the area changes, the credit discrepancy is partially driven by a correction of the regeneration values in the calculator. These were previously inputted as a percentage rather than a decimal.*

Table 2.2 BioCertification credits and landscape scores

Vegetation zone details	Vegetation zone area	Percent cleared value	EEC	Red Flag	Loss of SV score	LV score (certification area)	Landscape Tg value	Area of veg zone certified	Number of credits required	Gain SV score offset	10 percent good mgmt (offset)	LV score offset
Entire area												
HU812_Moderate/Good_Zone 1 Forest Red Gum grassy open forest on floodplains of the lower Hunter	0.22	0	Yes	Yes	72.40	16	0.56	0.22	8	15.60	7.24	21
HU906_Moderate/Good_Zone 2 Bull Oak grassy woodland of the central Hunter Valley	0.10	53	No	Yes	47.92	16	0.57	0.10	2	16.08	4.79	21
HU819_Moderate/Good_Zone 4 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	17.62	32	Yes	Yes	56.60	16	0.58	17.62	503	14.40	5.66	21
HU962_Moderate/Good_Zone 5 Grey Box grassy open forest of the Central and Lower Hunter Valley	0.76	0	No	Yes	45.83	16	0.56	0.76	19	19.17	4.58	21
HU819_Low_Zone 7 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter Derived Grassland	194.09	32	Yes	No	30.73	16	0.58	194.09	3,361	19.27	3.07	21
Total	**212.79**								**3,893**			

3 Framework for Biodiversity Assessment calculations and credit comparison with BCAM

The number of credits generated for the project has been calculated using BCAM, refer to Section 2.7. However, the UHSA and its trust fund have not been finalised. If BCAM is used as the offset mechanism, the project would be subject to a voluntary planning agreement negotiated with the NSW Office of Environment and Heritage, which may result in delays to project approval. Furthermore the NSW Department of Planning and Environment (DPE) have indicated that due to the uncertainty of UHSA implementation an alternative method of offset will need to be put forward.

An assessment under the *Framework for Biodiversity Assessment: NSW Offsets Policy for Major Projects* (FBA) (OEH 2014) is the preferred alternative, which will also need to be inclusive of a plan to acquire offsets (an offset strategy; refer to Section 5). The FBA uses the BioBanking Credit Calculator for major projects, which comprises slightly different inputs and outputs to the BCAM. This section provide the methodology used to undertake the FBA credit calculation and presents the resulting credit differences between the BCAM and FBA mechanisms.

Existing data and maps from the previous BCAM calculation were used to complete calculations in the BioBanking credit calculator for major projects. Vegetation types and areas were calculated from shapefiles and plot data provided by Dr Stephen Bell (Eastcoast Flora Survey).

3.1 Methods

Several key differences exist between the BCAM and BioBanking calculators. This section outlines the methods used for the BioBanking Calculator, where the inputs differ to that of BCAM.

Percentage native vegetation cover, connectivity widths and patch sizes were calculated using the Greater Hunter Native Vegetation Mapping V4 (OEH 2012) as a baseline. This maintains consistency with the previous work conducted to date. Key differences are presented in Table 3.1.

Table 3.1 Approach to BioBanking calculations compared to the previous BCAM methods

BioBanking Input	Approach	Reason required
Landscape Score		
Percentage native vegetation cover	100 ha inner and 1,000 outer assessment circles were used.	BCAM uses a single 1000 ha assessment circle
Connectivity value class	No connectivity value classes were identified within the project area. Therefore the width of vegetation corridors were calculated prior to development and after development.	Different connectivity value options required within BCAM.
Woody vegetation types	Connectivity corridors were assessed based on benchmark data	Not required in BCAM
Patch size	Calculation of patch size for entire project.	Verified that the adjacent remnant area used in BCAM (501 ha) is consistent with patch size under the FBA.
Vegetation Zones		
Patch size	Patch size was calculated for each vegetation community.	This step is not required under BCAM.
Site Values		

Table 3.1 Approach to BioBanking calculations compared to the previous BCAM methods

BioBanking Input	Approach	Reason required
Plot data	EMM utilised plot data collected for the BCAM assessment. Six addition plot and transects were also conducted by EMM during October 2017 due to splitting of Vegetation Zone 7 into EPBC Act listed and non EPBC Act listed CHVEFW (see below). The plot and transect data collected are provided in Appendix E, Table E.1 and Table E.2. The additional survey locations are displayed on Figure E.1.	The number of vegetation plots under BCAM is less than required under the FBA. In addition Zone 7 was split into two, to enable those areas listed as EPBC listed EECs to be distinguished.
Threatened species survey results	Additional targeted surveys have been conducted for the Pine Donkey Orchid (*Diuris tricolor*); refer to Section 4. Otherwise, species credit species have been assumed to have been adequately assessed as part of the original ecological report (East Coast Flora Survey 2015).	A new population of the Pine Donkey Orchid has been reported at Belford to the east of the project area, extending the known range of the species.

In addition, Zone 7 was split into two zones to enable those areas listed as EPBC Act listed CHVEFW to be distinguished from areas not meeting the EPBC Act listing for CHVEFW. Areas listed as EPBC Act listed CHVEFW are discussed in Section 2.1.

3.2 Results

The landscape values entered into the BioBanking calculator and the corresponding scores generated are provided in Table 3.2.

Table 3.2 Landscape values and resulting scores using BioBanking methodology

Landscape Value	Calculator input	Landscape score
Major Catchment Area	Hunter/Central Rivers	
LGA	Singleton Shire Council	
IBRA Sub-region	Hunter	
Mitchell Landscape	Central Hunter footslopes	
% vegetation cover outer assessment circle (1000 ha)	prior to development: 17.38% after development: 14.59%	4.25
% vegetation cover inner assessment circle (100 ha)	prior to development: 18.01% after development: 0.00%	4.25
Connectivity width	prior to development: >100-500m after development: 0-5 m	12
Overstorey condition	prior to development: PFC at Benchmark after development: no native over-storey	
Understorey condition	prior to development: PFC mid-storey/ground cover at Benchmark after development: No mid-storey/ground cover	
Patch size	501 ha (meets very large criteria for the Hunter CMA)	12
Assessment circle score		28.8

A total of 5,808 ecosystem were generated using the BioBanking credit calculator (refer to Table 3.2). This compares to 3,893 ecosystem credits generated by the BCAM calculator representing an increase of 49 **%**.

When the credits required for each community are considered individually, the credits increased between 36 and 100% (refer to Table 3.3). A full credit report is provided in Appendix E.1 which details the range of potential offset options for each PCT impacted.

Table 3.3 BCAM and BioBanking Calculator credits outcomes

Vegetation zone details	Vegetation zone area(ha)	Credits required by BCAM calculator	Credits required under FBA	Credit difference
HU812_Moderate/Good_Zone 1 Forest Red Gum grassy open forest on floodplains of the lower Hunter	0.22	8	13	5 (62.5)
HU906_Moderate/Good_Zone 2 Bull Oak grassy woodland of the central Hunter Valley	0.10	2	4	2 (100 %)
HU819_Moderate/Good_Zone 4 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	17.62	503	872	369 (73.4 %)
HU962_Moderate/Good_Zone 5 Grey Box grassy open forest of the Central and Lower Hunter Valley	0.76	19	28	12 (63.2 %)
HU819_Moderate/Good_derived grassland_Zone 7 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	164.58	N/A	4,057	N/A
HU819_Moderate/Good_other_Zone 8 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter. (Part of the EPBC listed CHVEFW community)	29.5	N/A	834	N/A
Combined total of Zone 7 and Zone 8 – enabling comparison with BCAM calculations	*194.08*	*3,361*	*4,891*	*1530 (45.5 %)*
Total	**212.79**	**3893**	**5,808**	**1,562 (49.3 %)**

4 Targeted survey for the Pine Donkey Orchid (*Diuris tricolor*)

The Pine Donkey Orchid was originally targeted by Eastcoast Flora Survey during 2013, with no individuals identified. Until recently, the species had been recorded north-west of the project area, with the closest record approximately 25 km, near Bureen. Furthermore, the species is not highlighted as a species credit species requiring survey under either BCAM or FBA. However, a small sub-population of the species has recently been recorded near Belford, located south-east of the project area. This effectively increases the known range of the species and increases the likelihood of the species occurring within the project area. For this reason targeted surveys for the species were conducted during October 2017.

4.1 Method

Parallel field transverses were conducted across the entire project area by two ecologists (refer to Appendix F, Figure F.1). In order to ensure consistent coverage, parallel line were marked on tablets, so that the ecologists' positions could be viewed in real time and aligned accordingly. Much of the field surveys were conducted in heavily grazed native pasture, with very good visibility. The transect width of 20 m was discussed and confirmed as appropriate by Robert Gibson of OEH (pers. comm. 26 September 2017). Where visibility was less optimal, transect spacing was reduced to 10m, this included forested areas.

The field surveys were conducted over four days between 26 and 29 September 2017. This is within the flowering period for this species, when they are most detectable. The Pine Donkey Orchid had been recorded flowering concurrently at references sites within the Hunter (Dr Stephen Bell, Eastcoast Flora Survey pers. comm.).

4.2 Results

A total of 78.24 km were traversed, with no Pine Donkey Orchids observed within the project area. Much of the project area is native pasture which is heavily grazed by cattle (refer to Photograph 4.1). The prevalence of native forbs was low with most palatable species, grazed close to ground level. It is considered unlikely that the Pine Donkey Orchid occurs within the project area given the level of survey effort and the long history of grazing.

Photograph 4.1 **Typical native pasture within the project area**

5 Biodiversity offset strategy

5.1 Strategy

A biodiversity offset strategy has been prepared to identify how offsets to compensate for the project's impacts as calculated under the FBA will be provided. Preparation of this strategy has considered the following steps:

1. identifying if suitable credits are available on the market to meet offset requirements;

2. finding potential on-site or off-site offset sites with the biodiversity values required to compensate for the project's impacts;

3. in the absence of suitable offset credits or properties, applying the variation criteria rules of the FBA and finding suitable offsets to meet the requirements; and

4. payment into the Biodiversity Conservation Trust.

5.1.1 Purchasing credits

Bloomfield has engaged an agent to act for Bloomfield to locate, purchase and assist with biobanking agreements suitable for Rixs Creek Mine future development. The agent is currently investigating a number of potentially suitable sites in the local area, as well as desktop audits of potential offset sites, with ground truthing, where required. The aim is to identify if any sites suitable as offset sites for the Rix's Creek Continuation Project are available, and if so, develop Biodiversity Stewardship Agreements over the land and acquire the offsets. No suitable sites have been identified at this stage.

In addition to the above, the Bloomfield Group has previously listed its credit requirements on the Credits Wanted Register on 14 March 2016 (noting that the quantum of credits have since changed). The credits types required for the project have not been traded to date, and no landowners have been forthcoming indicating they have suitable credits available.

5.1.2 Identification of potential offset sites

i Methods

Identification of potential offset sites is currently ongoing. Bloomfield and EMM have identified several potential sites close to RCCP, on land both currently owned by Bloomfield and elsewhere. A total of eighteen sites were initially considered, with a desktop review reducing this to nine. The initial exclusion of offset sites was based on their unsuitability from a biodiversity perspective, such as small patch size, isolation, and absence of suitable PCTs; and from a logistical and practical perspective, including current land ownership and potential competing land uses.

Vegetation mapping was available for several of the sites identified, completed by Dr Stephen Bell (Eastcoast Flora Surveys). The remainder of the site were mapped by an EMM ecologist over a period of three days from 9 - 11 October 2017. Rapid vegetation assessments were used across the potential offset sites, recording at least three dominant species from the canopy, mid-story and ground strata. Vegetation boundaries were mapped using a hand held GPS in conjunction with aerial imagery. Vegetation was assigned to PCTs using the online VIS classification 2.1 (OEH 2017) and mapped using GIS.

In order to calculate the likely number of credits generated by each offset site, it was assumed 9.5 credits would be generated per hectare. This is the same multiplier which OEH uses for calculating credits for the UHSA. Whilst this will not provide the exact number of credits, it is useful for refining the selection of offsets sites for further investigation. No plot and transects have been conducted at this stage.

ii Results

A total of twelve PCTs were identified within the nine potential offset sites. Vegetation mapping for the nine potential offset sites are provided in Appendix G. The area of each PCT and the corresponding credit estimates are provided in Appendix H, Table H.1. A summary of the credit requirements for the project are provided in Table 5.1. This table includes the PCTs recorded within the offset areas, which are viable offset options for RCCP. The total number of suitable credits generated within the offset site, are then compared against those required.

Table 5.1 Comparison of suitable credits generated and those required for RCCP

PCT requiring offsets	Credit requirement	BVT/PCT offset options with potential offset areas	Credit estimate	Sum of credits	Residual credits required
HU 906/PCT 1692 Bull Oak grassy woodland of the central Hunter Valley	4	HU 817/PCT 1603 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter - Moderate/good	349.0	549.5	Yes (545.5 surplus credits)
		HU 817/PCT 1603 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter - Moderate/good_derived grassland	196.6		
		HU 906/PCT 1692 Bull Oak grassy woodland of the central Hunter Valley - Moderate/good	4.3		
HU 819/PCT1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter	5,763	HU 819/PCT 1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter - Moderate/good	451.6	540	No (an additional 5,223 credits required)
		HU 819/PCT 1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter - Moderate/good_derived grassland	57.7		
		HU 821/PCT 1696 Blakelys Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter - Moderate/good	30.0		

Table 5.1 Comparison of suitable credits generated and those required for RCCP

PCT requiring offsets	Credit requirement	BVT/PCT offset options with potential offset areas	Credit estimate	Sum of credits	Residual credits required
HU 962/PCT 1748 Grey Box grassy open forest of the Central and Lower Hunter Valley	28	HU 806/PCT 1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter - Moderate/good	350.7	1544	Yes (1,516 surplus credits)
		HU 806/PCT 1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter - Moderate/good_Derived grassland	369.4		
		HU 815/PCT 1601 Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good	543.0		
		HU 815/PCT 1601 Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good_derived grassland	142.3		
		HU 816/PCT 1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter - Moderate/good			
		HU 962/PCT 1748 Grey Box grassy open forest of the Central and Lower Hunter Valley - Moderate/good	138.4		
HU 812/PCT 1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter	12	HU 812/PCT 1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good	111	348	Yes (335 surplus credits)
		HU 812/PCT 1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good_derived grassland	237		

Three of the PCTs have relatively low credit requirements (HU 906/PCT 1692; HU 962/ PCT 1748 and HU 812/PCT 1598), and the credits generated by the combined offset sites greatly exceed the requirements.

In contrast, HU819/PCT 1605 has a high credit requirement (5,763) with only 540 credits generated, leaving a residual of 5,223 credits. A large area of derived grassland (214 ha) within the potential offset areas remains unassigned within the offset sites, which may contribute to further offsets for 1605 (Appendix H, Table H.1). However even if a best case scenario is assumed and the entire area was assigned to PCT 1605, approximately 3,190 extra credits would still be required.

It is unlikely that the proposed offset sites will generate sufficient credits for the entire project. However they may provide part of a wider solution. Further investigation of the offset sites described may occur, however this will depend on the clarification regarding the BCT. Any property identified for offsetting will be secured under a BioBanking agreement, in accordance with the FBA (OEH 2014).

5.1.3 Application of the variation criteria

Under the FBA, the offset rules can be varied to match ecosystem credits, using credits generated by a PCT from the same vegetation formation as the PCT to which the required ecosystem credit relates. If the BCT becomes prohibitively expensive and like for like credits cannot be found then the variation rules will be applied to the project and suitable PCTs in the same vegetation class will be identified prior to matching by formation. The application of the variation criteria, if needed, will be completed in consultation with OEH and DPE. EMM have identified areas, currently owned by Bloomfield, that may be suitable to form the basis of an application to vary the criteria.

5.1.4 Payment into the Biodiversity Conservation Trust (BCT)

The PCTs and corresponding number of credits generated under the FBA were entered into the online Biodiversity Offset Payment Calculator on 19 October 2017. The total payment required for the project was $8,487,920.14 (including GST) or $1,414.25 per credit. The payment calculator was revisited on 28 February 2018 to calculate the required total payment given the increased credit requirements. The updated credit payment required is amount is $9,817,606.06 or $1,690.36 per credit. For a more detailed breakdown per PCT, refer to Appendix I.

Payment into the BCT is the preferred option to secure offsets for this project, based on current payment requirements. At the time of writing clarification was being sought with OEH, regarding the likelihood of credit price fluctuation during the approval process, and if there is a mechanism to secure current credits prices, to enable certainty for the offset process.

Due to the current uncertainty regarding the BCT, Bloomfield will continue to pursue other means of securing offsets during the approval process.

5.1.5 Staging of credit retirement

The Rix's Creek Continuation Project will be undertaken in stages, with the initial stage of works to be undertaken immediately west of the existing pit, while latter works will proceed to the north of the existing pit.

In line with this, Bloomfield seeks a staged credit retirement plan, in the line with the staging of impacts, with credits to be retired in line with the staging outlined in the Mining Operations Plan (MOP). A summary of the credits required in each stage, based on FBA credit calculations, are provided in Table 5.2.

Table 5.2 BCAM and BioBanking Calculator credit outcomes

Vegetation zone details	Credits required in Stage 1	Credits required in Stage 2
HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter	13	0
HU906 Bull Oak grassy woodland of the central Hunter Valley	0	4
HU819 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	3,929	1,834

Table 5.2 BCAM and BioBanking Calculator credit outcomes

Vegetation zone details	Credits required in Stage 1	Credits required in Stage 2
HU962 Grey Box grassy open forest of the Central and Lower Hunter Valley	3	25
Total	**3,945**	**1,863**

This will also allow Bloomfield to undertake further investigations into how offset obligations can be met, but with the confidence that a payment into the Biodiversity Trust provides certainty that this obligation will be met in any event.

5.1.6 Summary

Bloomfield have investigated a number of options for meeting their offset requirements for the Rix's Creek Continuation Project, including purchasing credits from the market, on-site and off-site offset sites, application of the variation rules and payment into the BCT. At this stage, payment into the BCT is the most certain for all stakeholders and is therefore the preferred option. Using this Bloomfield can meet their offset obligations. Bloomfield seeks a staged credit retirement option, in line with the MOP.

Investigations into biodiversity offsets will continue whilst the approval process is occurring. Much of the decision making process will be dependent on the affordability of, and any risks associated with, paying into the BCT. The biodiversity offset strategy will be finalised in consultation with OEH and DPE within 12 months of obtaining project approval.

Appendix A

CHVEFW methodology letter (Bell 2016)

EASTCOAST FLORA SURVEY
VEGETATION ASSESSMENT & MAPPING

PO Box 216 KOTARA FAIR NSW 2289
Ph. 02 4953 6523
ABN 38 325 015 471

6 April 2016

John Hindmarsh
Environmental Officer
Rix's Creek Pty Limited
via email jhindmarsh@rixs.com.au

Dear John

Re: Changes to the extent of threatened communities and credits, Rix's Creek Continuation Project

As requested, I have outlined below the process which led to the revision of the extent of threatened vegetation (particularly Commonwealth-listed TECs) potentially impacted upon by the proposed expansion to Rix's Creek mine, from 6 ha to 95 ha, and then back down again to 56 ha. In consultation with Colin Driscoll (accredited Biobanking assessor), I have also outlined the reasons for the change in ecosystem credits calculated as part of the Upper Hunter Strategic Assessments (UHSA) process that came about over the course of the project.

Change in threatened communities' extent

The required revision to the extent of threatened vegetation affected by the proposal was primarily due to the differing assessment requirements necessary for State and Commonwealth governments. Over the life of this project, updates to proposed disturbance areas and threatened ecological communities under relevant legislation have meant several revisions to the original project report, and during this process it became evident that each level of government assessed the same vegetation in different ways.

In the original mapping and assessment of significance in 2013, much of the area of interest was former grazing land that, with the removal of cattle, had responded with mass germination and growth of primarily Ironbark (*Eucalyptus crebra*) saplings. Mapping of these lands consequently pulled out the larger trees and groups of trees or remnants as specific vegetation types, with the balance remaining as 'derived native grasslands'. Assessment under NSW legislation, which does not include such areas of derived grassland in determinations of threatened communities, was required only on the larger trees and remnants. This resulted in a potential impact on approximately 1.5 ha of State-listed threatened ecological communities. At that time, there was no Commonwealth listed affecting the land.

During assessments undertaken in 2014 for the UHSA being run and co-ordinated by OEH, derived native grasslands were not specifically included in State-listed threatened communities and consequently did not trigger a significant impact. However, the UHSA did include Matters of National Significance as listed on the EPBC Act 1999, and for which there is now a Commonwealth listing (Central Hunter Valley Eucalypt Forest and Woodland, CHVEFW) occurring on land owned by Rix's Creek. An update of the mapping and assessment to address the Commonwealth listing was completed in October 2015 using the existing mapping, revealing the presence of approximately 6 ha of CHVEFW. As the Commonwealth had already signed off on the proposed expansion, this assessment was considered an academic exercise only.

Problems were detected, however, in the assessment of Commonwealth-listed vegetation, specifically in how the two levels of government view remnant vegetation. Under Commonwealth legislation, the definition of a 'patch' of vegetation is that with a separation distance of 30m between neighbouring 'tree'

species (not the 100m separation used by NSW), which includes saplings > 1m in height (not included in NSW TECs). This meant that much of that regrowth ironbark that was formerly mapped as derived native grasslands required amalgamation into larger 'patches' under the meaning of the EPBC Act. This situation was exacerbated by the period of time that had elapsed between the original mapping of vegetation in 2013, and the subsequent assessment by determining authorities in 2015. During this period, continual growth of sapling eucalypts evidently became more pronounced in aerial imagery, meaning that considerably more vegetation met the requirements of CHVEFW.

Remapping of the CHVEFW, strictly adhering to EPBC guidelines as detailed above, in 2015 revealed approximately 95ha of this community, an increase from the 6ha originally calculated for CHVEFW. The bulk of this was due to the regrowth ironbark that is now obvious in the aerial imagery (+ the required 30m buffers into grasslands), and which effectively fills in the gaps between the more obvious remnant areas. This 95ha of threatened vegetation includes:

- all patches of *Eucalyptus crebra* and/or *Corymbia maculata* and/or *Eucalyptus moluccana* woody vegetation and saplings >1m high, with separation distances of 30m or less between adjacent trees, and where native ground cover is dominant;
- a 30m buffer into surrounding grassland from the outer edge of these patches, as per the EPBC guidelines.

As a consequence of this process, the amount of significant vegetation protected under the Commonwealth increased to 95 ha, and because of the requirements to include Matters of National Significance, also meant assessment of this vegetation in the UHSA and an update of ecosystem credits.

During the project review process in 2016, OEH disputed the method in which the Commonwealth CHVEFW was interpreted for the Continuation project (in particular, how woodland buffers and derived native grasslands were mapped), and a series of discussions and negotiations were begun. These discussions included the relevant officer from the Commonwealth Department of Environment. Because OEH were co-ordinating the UHSA process, it was important that all projects interpreted CHVEFW in a similar way. As a consequence, GIS staff at OEH developed a method which automated the generation of woodland buffers into derived grassland areas, adhering to the guidelines included in the listing advice for CHVEFW. This process involved the following steps (email advice from Paul Hillier, OEH, 14 March 2016):

1. All equivalent PCT polygons from the BCAM assessment are buffered to a distance of 15m using a Euclidean distance function in Spatial Analyst. Polygons are the source and each cell value corresponds to the Euclidean distance from that source polygon (up to 15m only);
2. Create a new raster layer from only those cells that are 15m from the polygons i.e the furtherest cells. This will be essentially the same as a 15m vector buffer function;
3. Reverse the Euclidean distance function now using the furtherest cells (Step2) as the source and restrict the Euclidean buffering direction back towards the original source polygons. This raster result will not cover all the original buffered area (from step 1) as there will be gaps and those gaps are the buffered areas as per the determination requirement. The final layer is created by converting only those gap areas to a layer.
4. The resulting layer was then queried to select patch sizes at or greater than 0.5 ha.

An additional step to this process was also implemented to improve accuracy and provide a more 'natural' flow, whereby 15m buffering around the centre point of areas between woodland patches that are within 30m of each other was incorporated (email from Paul Hillier, OEH, 1 April 2016). Applying this total process to the Rix's Creek Continuation project area revealed **55.93 ha** of CHVEFW (incorporating 16.82 ha of woodland and 39.11 ha of DNG). This is a reduction from the 95 ha last calculated for this EEC. A revised

map showing the distribution of CHVEFW is appended to this letter, and updates Figure 10 in the Rix's Creek EIS ecology report (Appendix I), and also the image showing the revised mapping of CHVEFW which I emailed to you on that date ("CHVEFW revised map v1_18Dec2015.jpg").

Change in Biobanking credits

A change in the number of credits calculated under the UHSA was required following the OEH adequacy review. Specifically, values entered into the Landscape Value Assessment component required revision to reflect updated values resulting from finalisation of the proposed development area. In addition, areas of derived native grassland were included as 'native vegetation cover', when it was later advised by OEH that such areas should not be included. Other discrepancies identified in the OEH adequacy review included minor changes to Connectivity Value and Adjacent Remnant Area components. Final credit calculations were undertaken in consultation with OEH and these numbers have been used to determine credit requirements for the project.

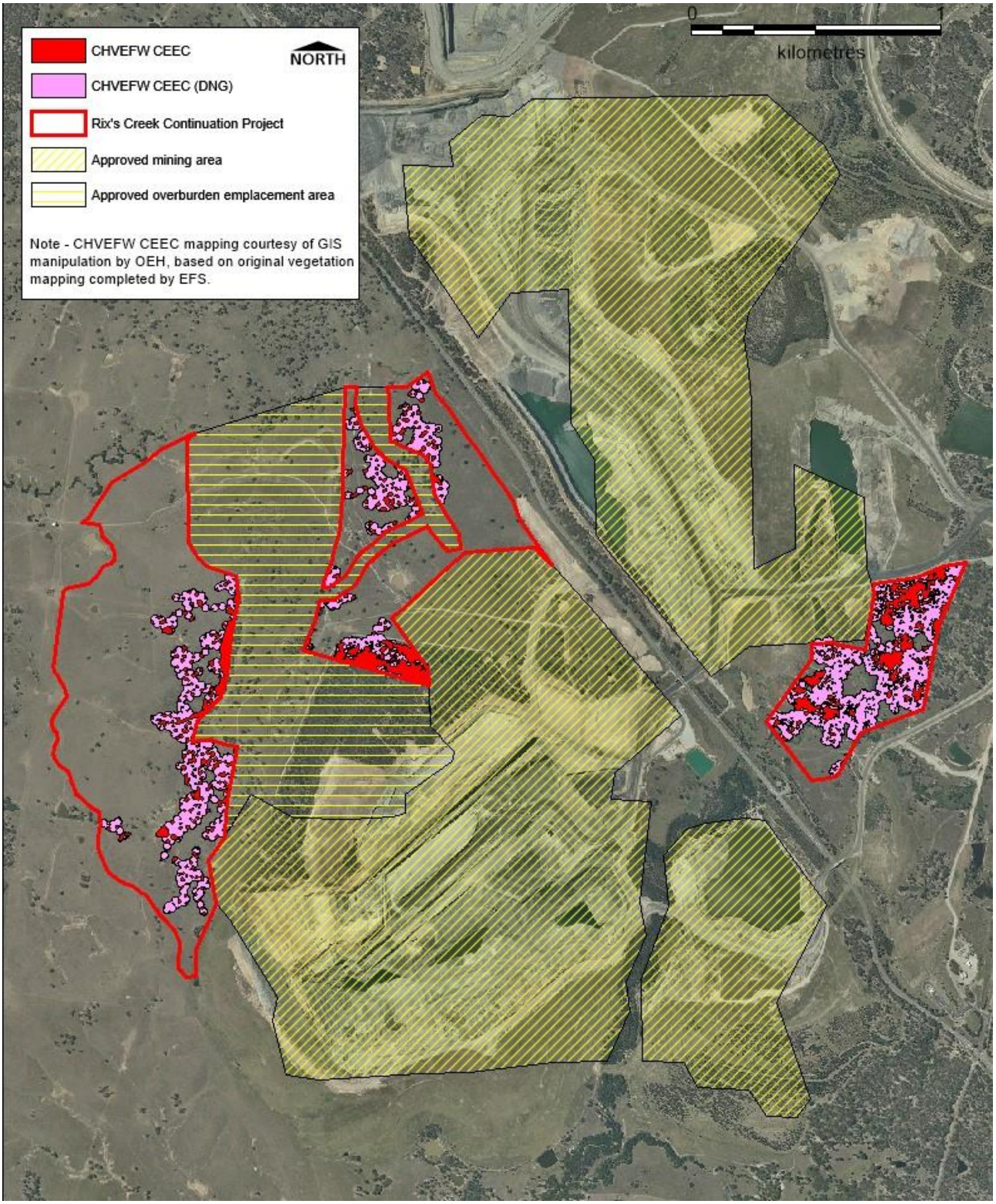
A typographical error in the number of hectares of DNG was also detected late in the assessment process in March 2016. This involved the documentation of 52.2 ha of DNG in Table 8 of the ecology report, instead of 152.2 ha (subsequently amended to 158.4 ha in the most recent mapping). As a consequence, a revision to the credit calculations was required, which was undertaken by OEH in early April 2016. This resulted in 2,742 credits for DNG (up from 917 credits), and with a total credit load of 3,308 credits.

I trust this information adequately explains the changes in assessment.

Regards

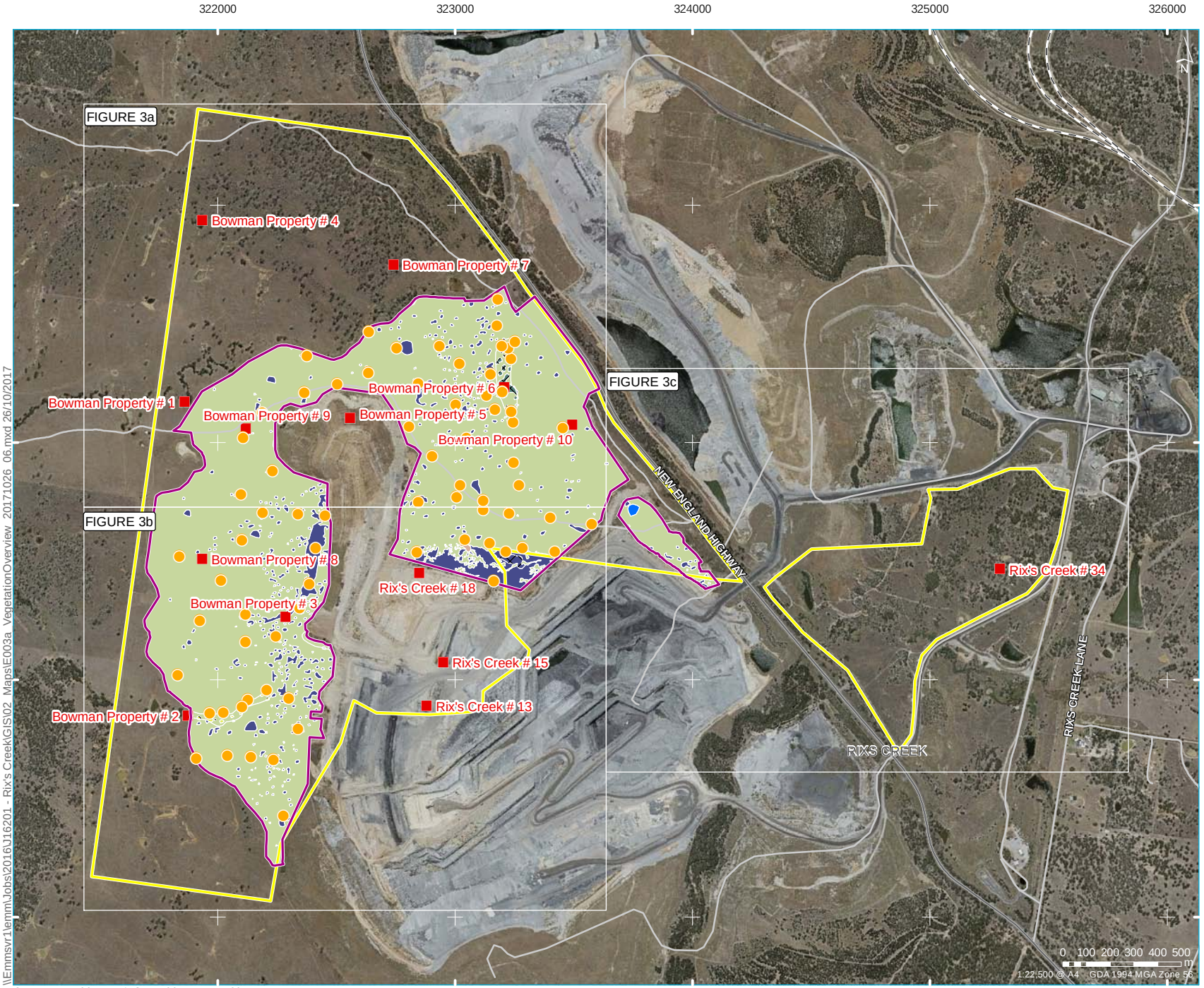
Stephen Bell

Attachment **Revised mapping of CHVEFW and associated Derived Native Grasslands (DNG).**



Appendix B

Biodiversity figures reproduced in accordance with Biodiversity Certification Operational Manual



KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Rapid data points
- Plot or transect location
- EEC listed under the TSC Act
- Rail line

Roads

- Main road
- Local road

Plant community type

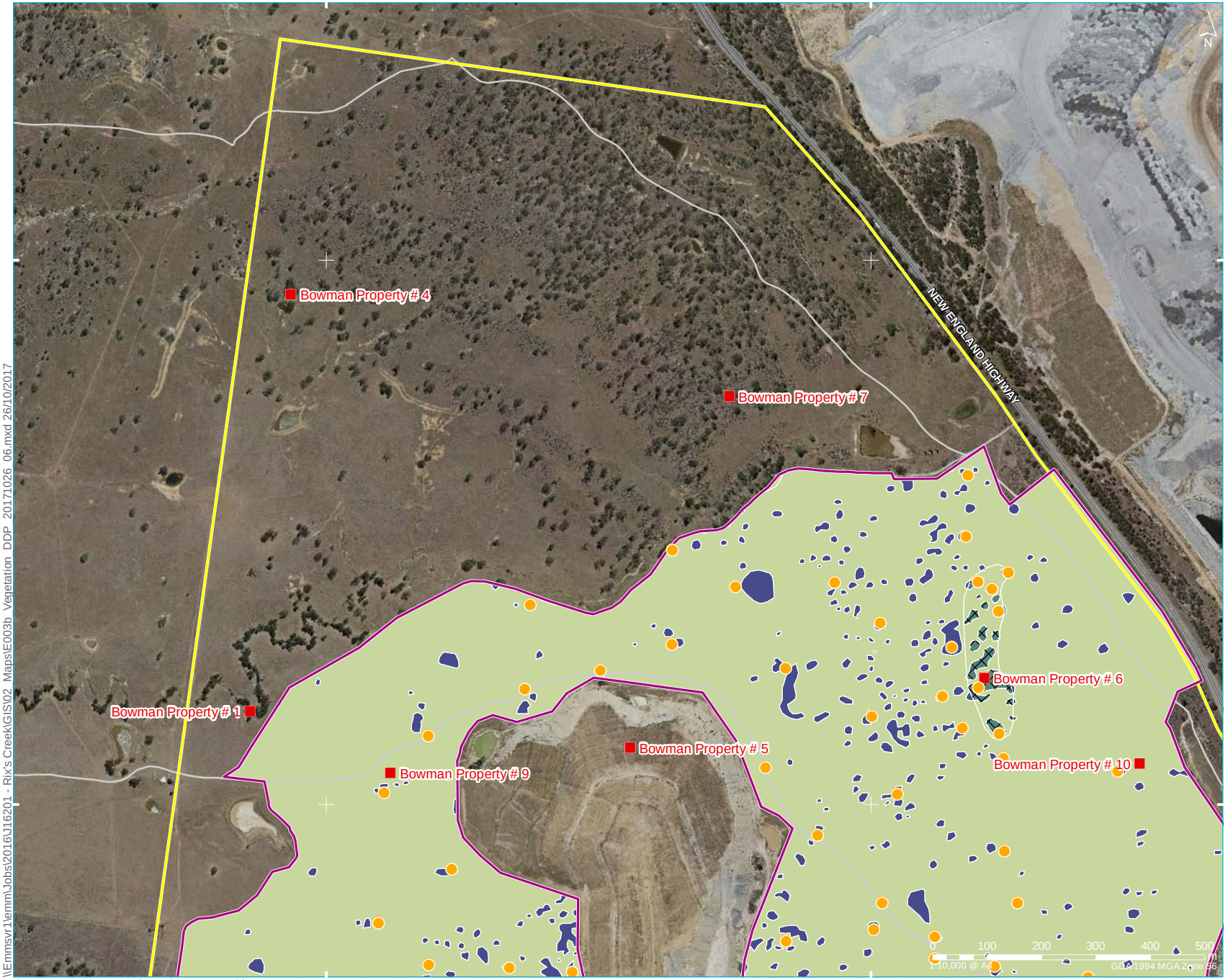
- Zone 1: PCT 1598 (Forest Red Gum grassy open forest)
- Zone 2: PCT 1692 (Bull Oak grassy woodland)
- Zone 4: PCT 1605 (Narrow-leaved Ironbark-Native Olive shrubby open forest)
- Zone 5: PCT 1748 (Grey Box grassy open forest)
- Zone 7: Derived Native Grassland
- Dam

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Vegetation zones and survey locations

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.3

EMM



KEY

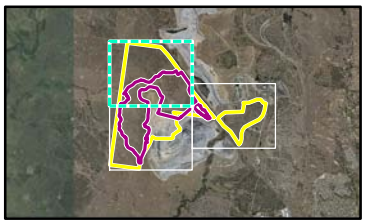
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Rapid data points
- Plot or transect location
- EEC listed under the TSC Act

Roads

- Main road
- Local road

Plant community type

- Zone 1: PCT 1598 (Forest Red Gum grassy open forest)
- Zone 4: PCT 1605 (Narrow-leaved Ironbark-Native Olive shrubby open forest)
- Zone 5: PCT 1748 (Grey Box grassy open forest)
- Zone 7: Derived Native Grassland

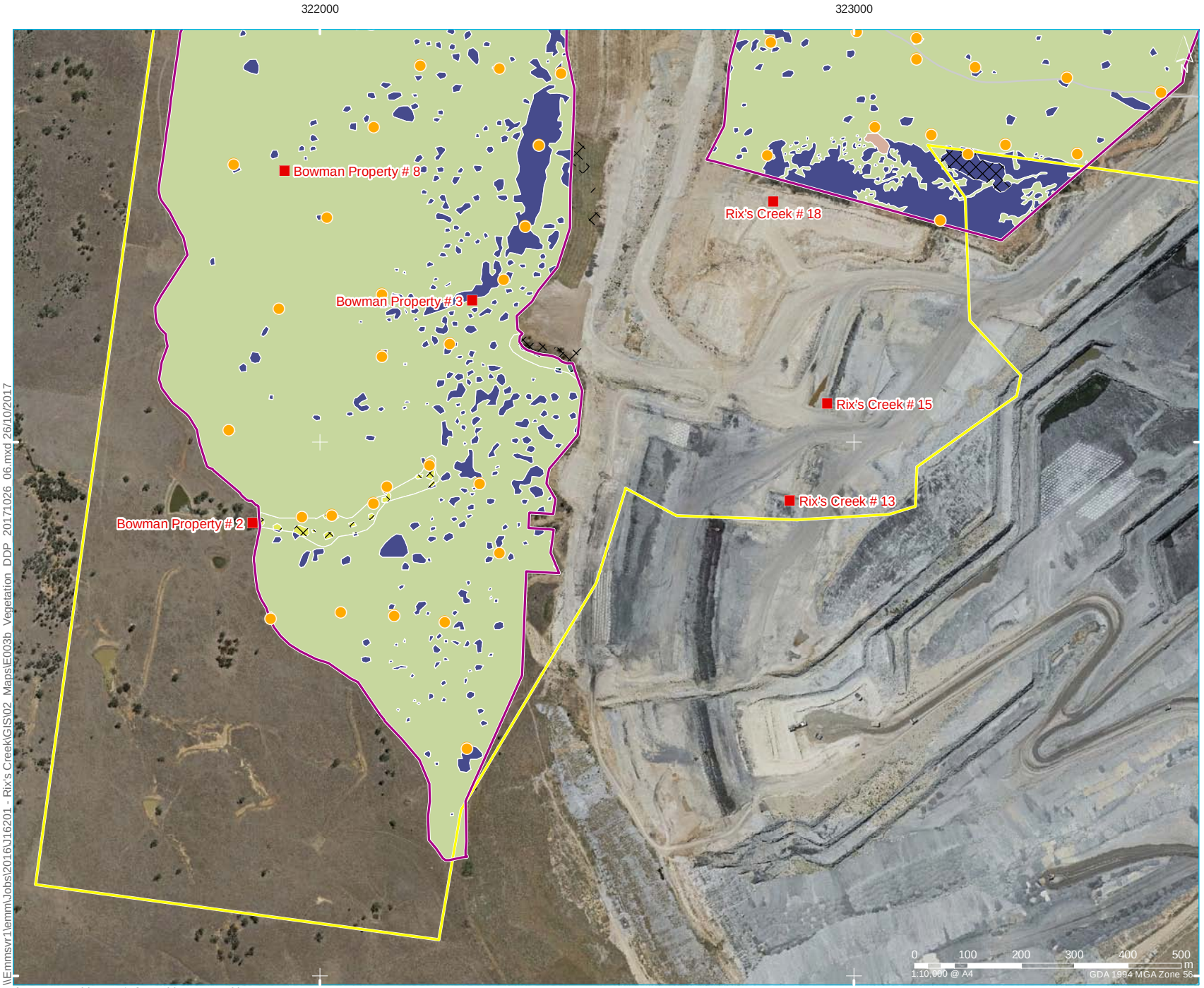


Vegetation zones and survey locations

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.3a

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)



Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Vegetation zones and survey locations

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.3b

KEY

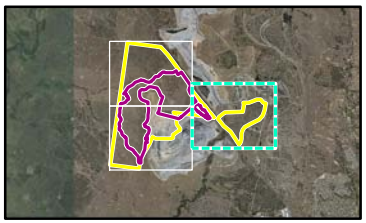
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Plot or transect location
- EEC listed under the TSC Act

Roads

- Main road
- Local road

Plant community type

- Zone 4: PCT 1605 (Narrow-leaved Ironbark-Native Olive shrubby open forest)
- Zone 7: Derived Native Grassland
- Dam



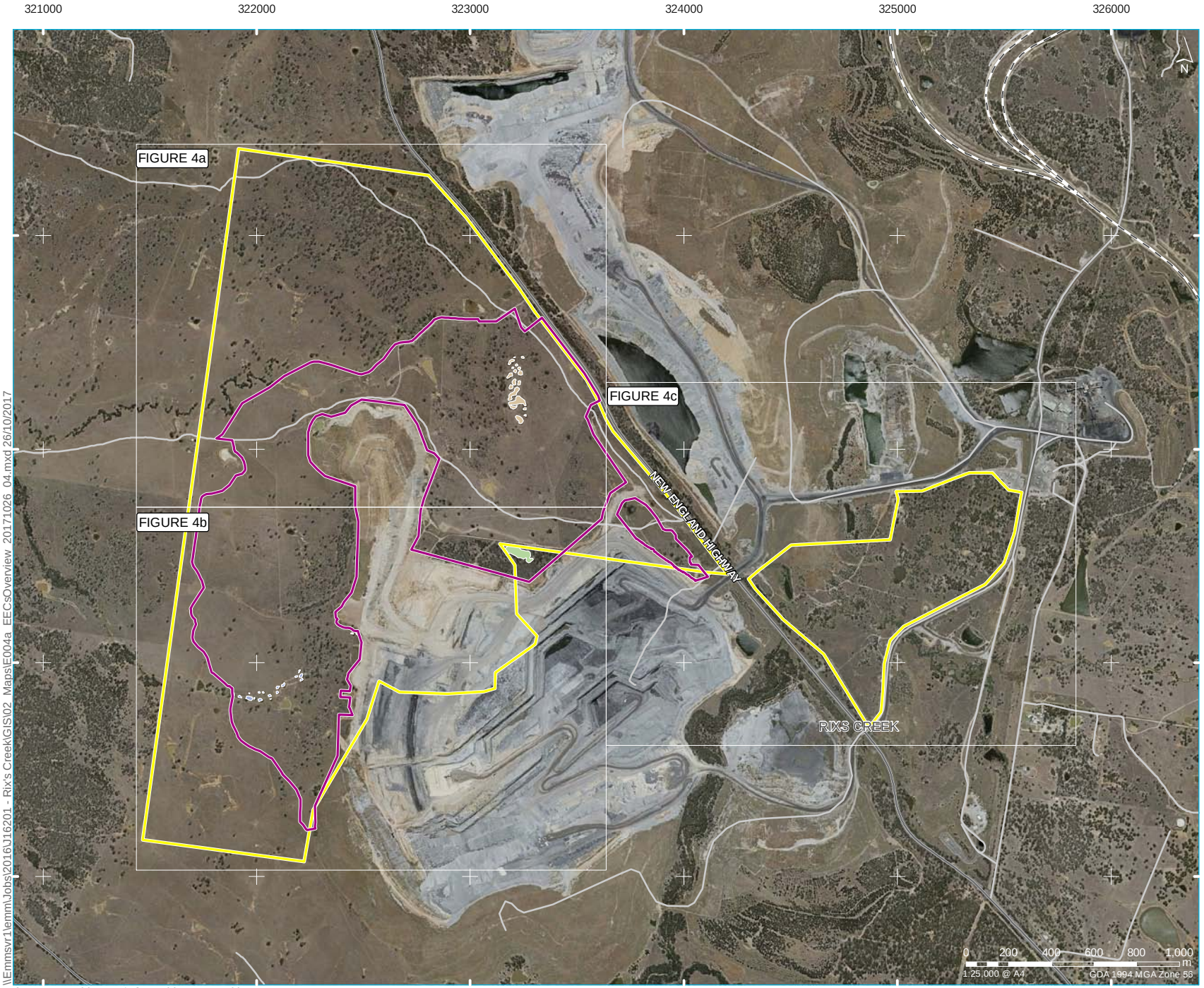
Vegetation zones and survey locations

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.3c

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E003b Vegetation DDP 20171026 06.mxd 26/10/2017



KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Rail line

Roads

- Main road
- Local road

EEC listed under the TSC Act

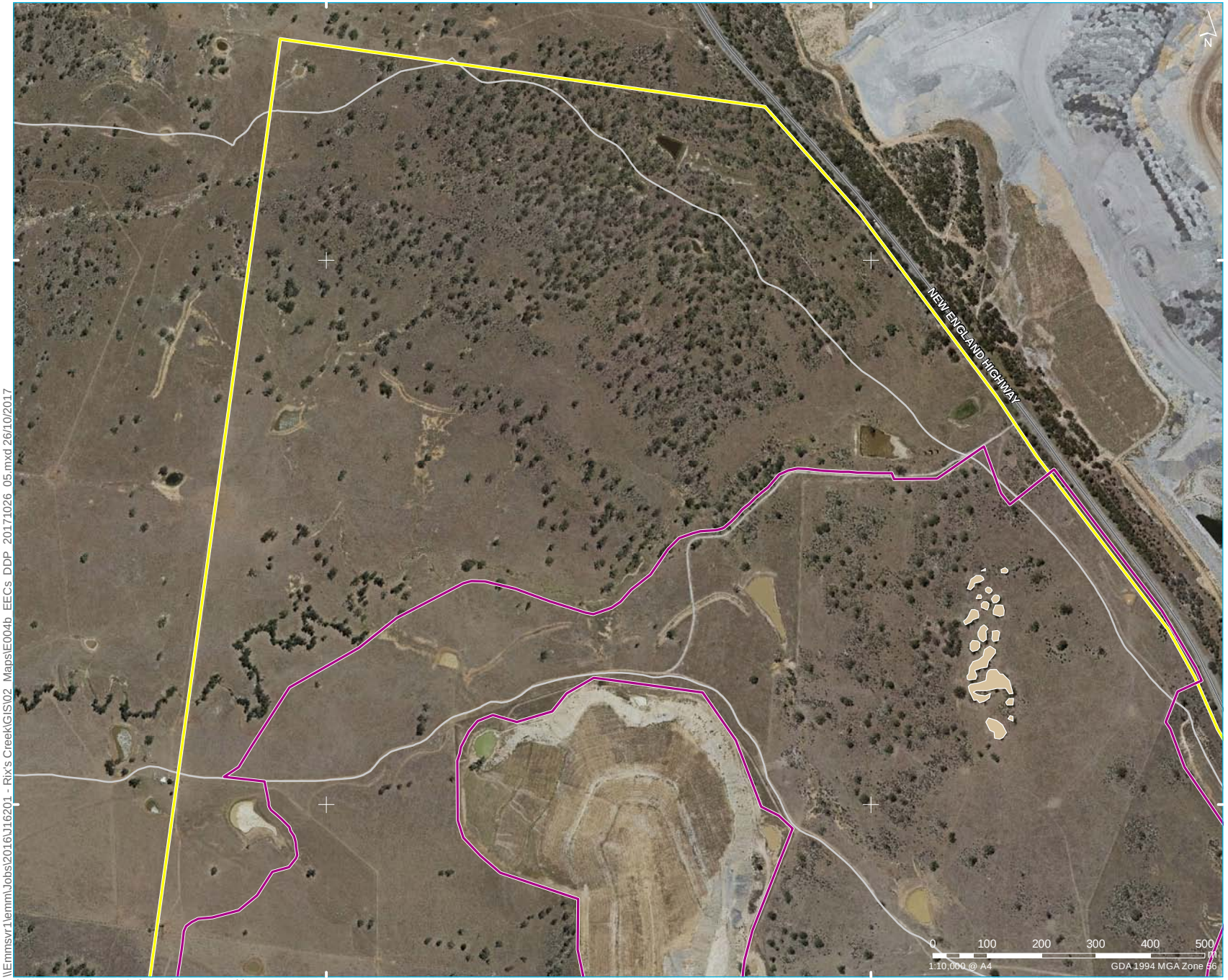
- Central Hunter Grey Box-Ironbark Woodland EEC
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC
- Hunter Lowlands Redgum Forest EEC

Endangered Ecological Communities listed under the TSC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.4

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)



KEY

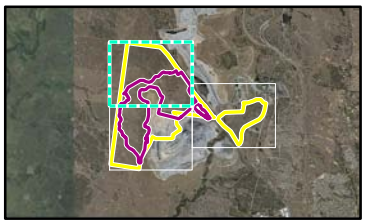
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Main road
- Local road

EEC listed under the TSC Act

- Central Hunter Grey Box-Ironbark Woodland EEC
- Hunter Lowlands Redgum Forest EEC



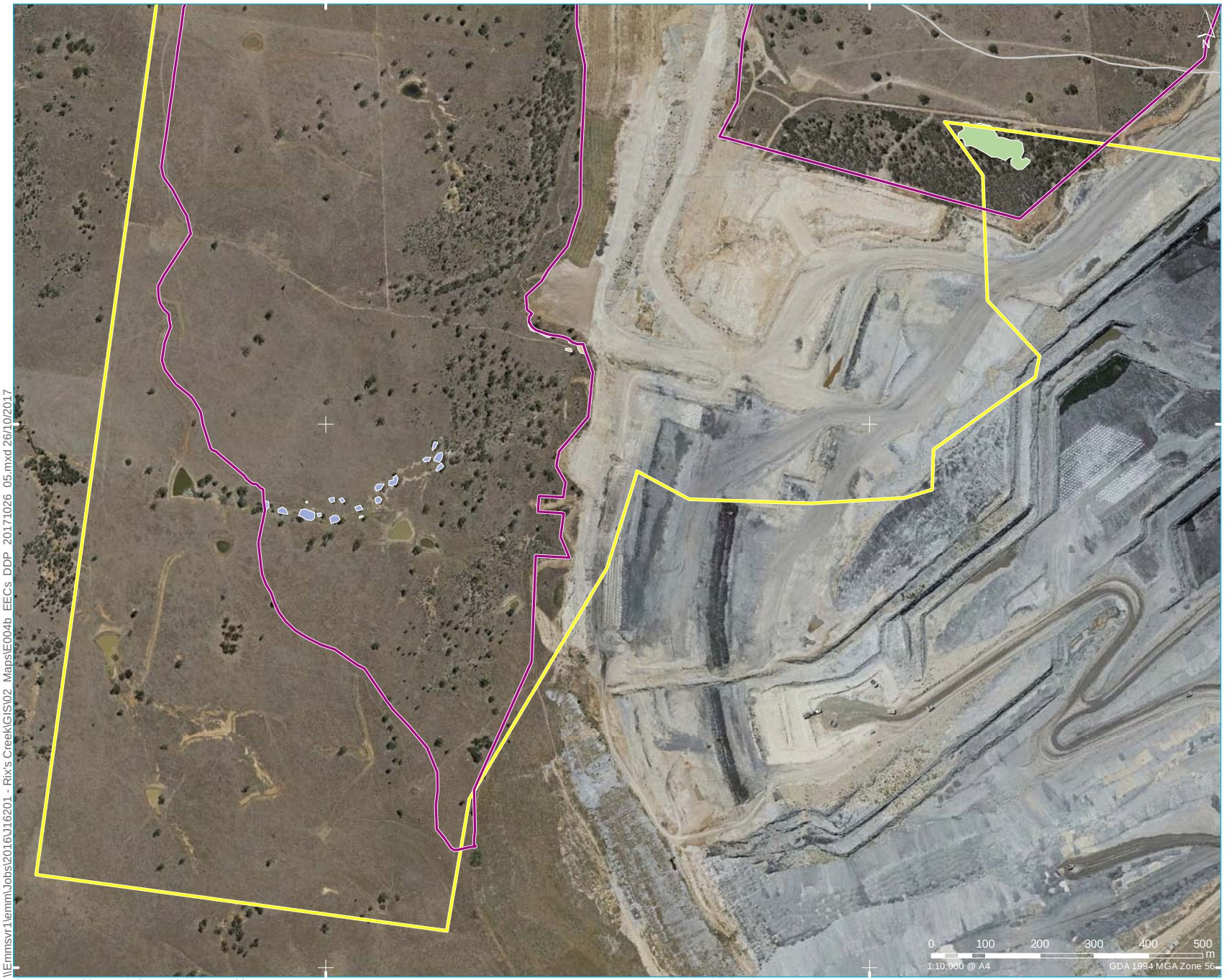
Endangered Ecological Communities listed under the TSC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.4a

EMM

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E004b EECs DDP 20171026 05.mxd 26/10/2017

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)



KEY

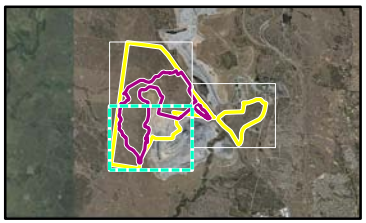
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Local road

EEC listed under the TSC Act

- Central Hunter Grey Box-Ironbark Woodland EEC
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC
- Hunter Lowlands Redgum Forest EEC



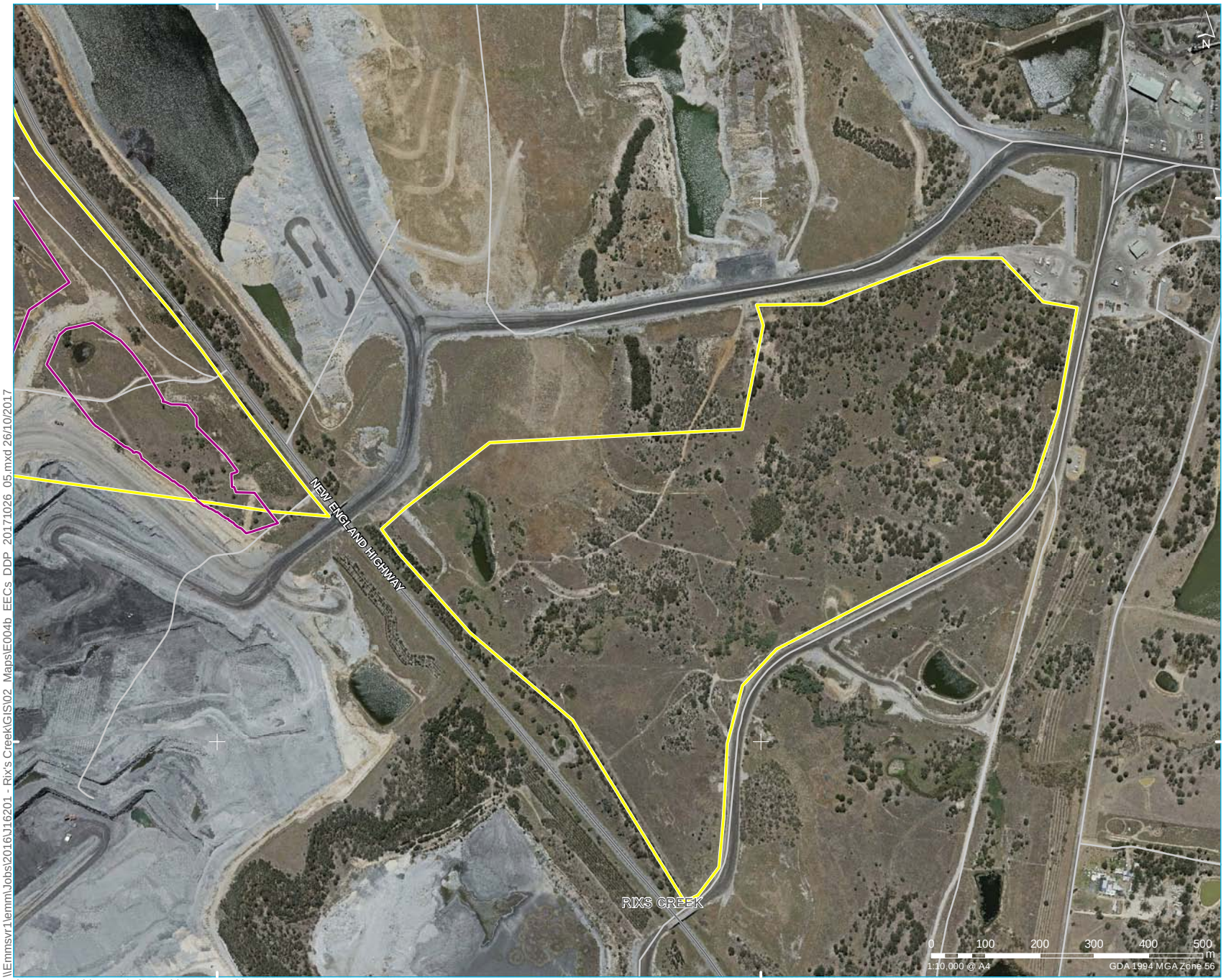
Endangered Ecological Communities listed under the TSC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.4b

EMM

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E004b EECs DDP 20171026 05.mxd 26/10/2017

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

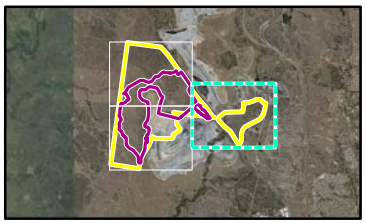


KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Main road
- Local road



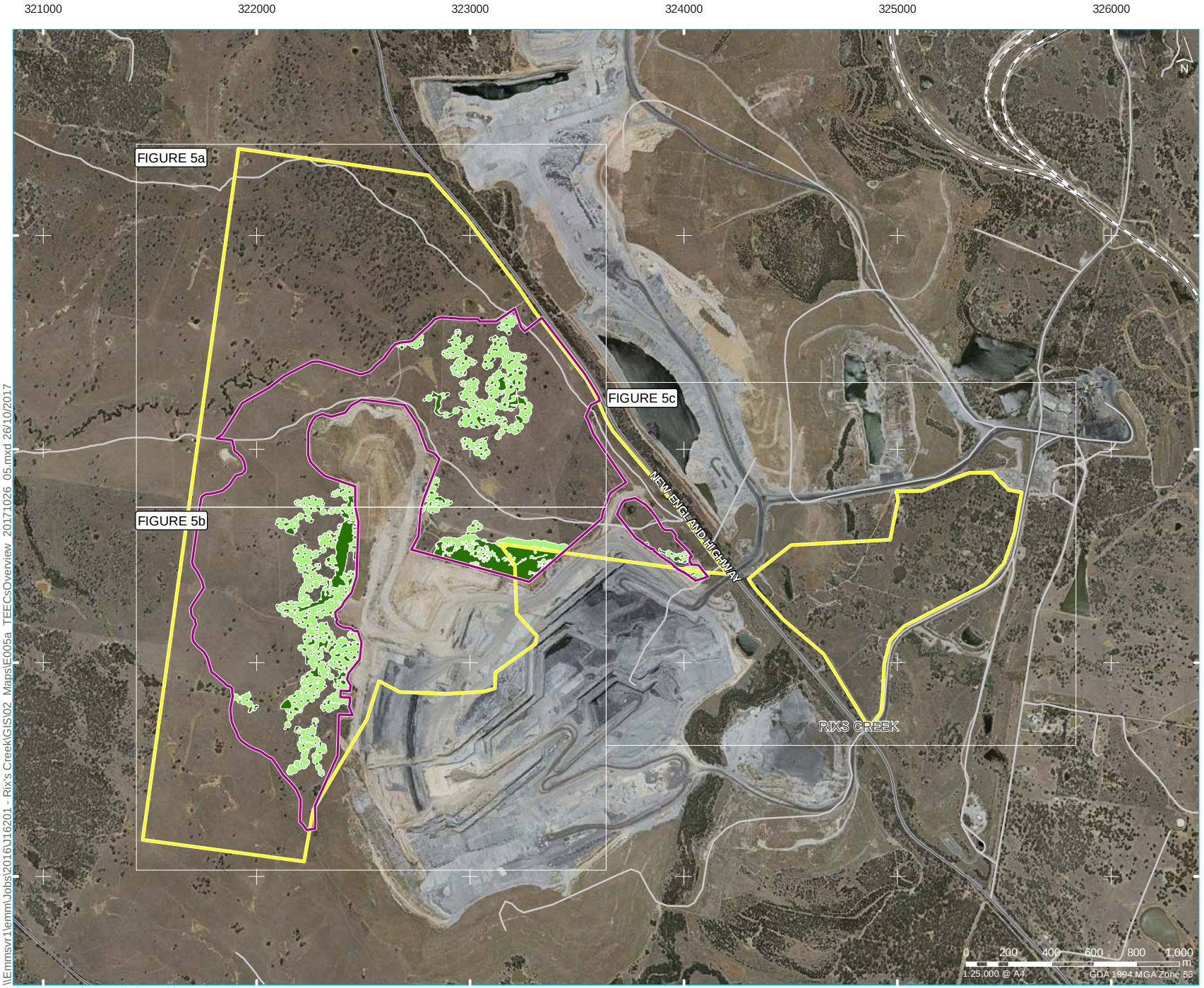
Endangered Ecological Communities listed under the TSC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.4c

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E004b EECs DDP 20171026 05.mxd 26/10/2017



KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Rail line

Roads

- Main road
- Local road

Threatened Ecological Communities listed under the EPBC Act

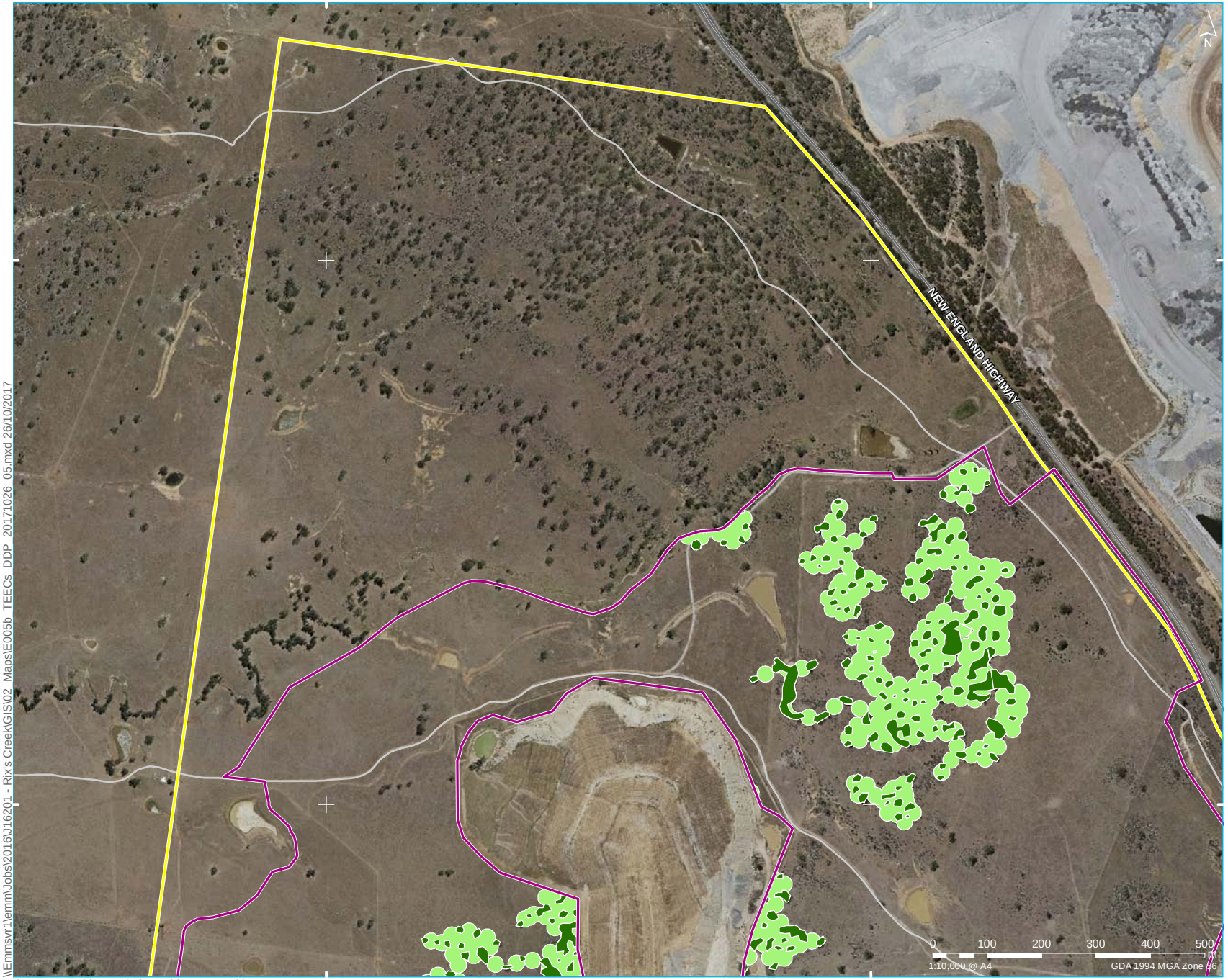
- Central Hunter Valley Eucalypt Forest and Woodland
- Central Hunter Valley Eucalypt Forest and Woodland (Derived Native Grassland)

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Threatened Ecological Communities listed under the EPBC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.5

EMM



KEY

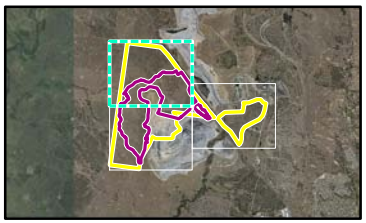
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Main road
- Local road

Threatened Ecological Communities listed under the EPBC Act

- Central Hunter Valley Eucalypt Forest and Woodland
- Central Hunter Valley Eucalypt Forest and Woodland (Derived Native Grassland)



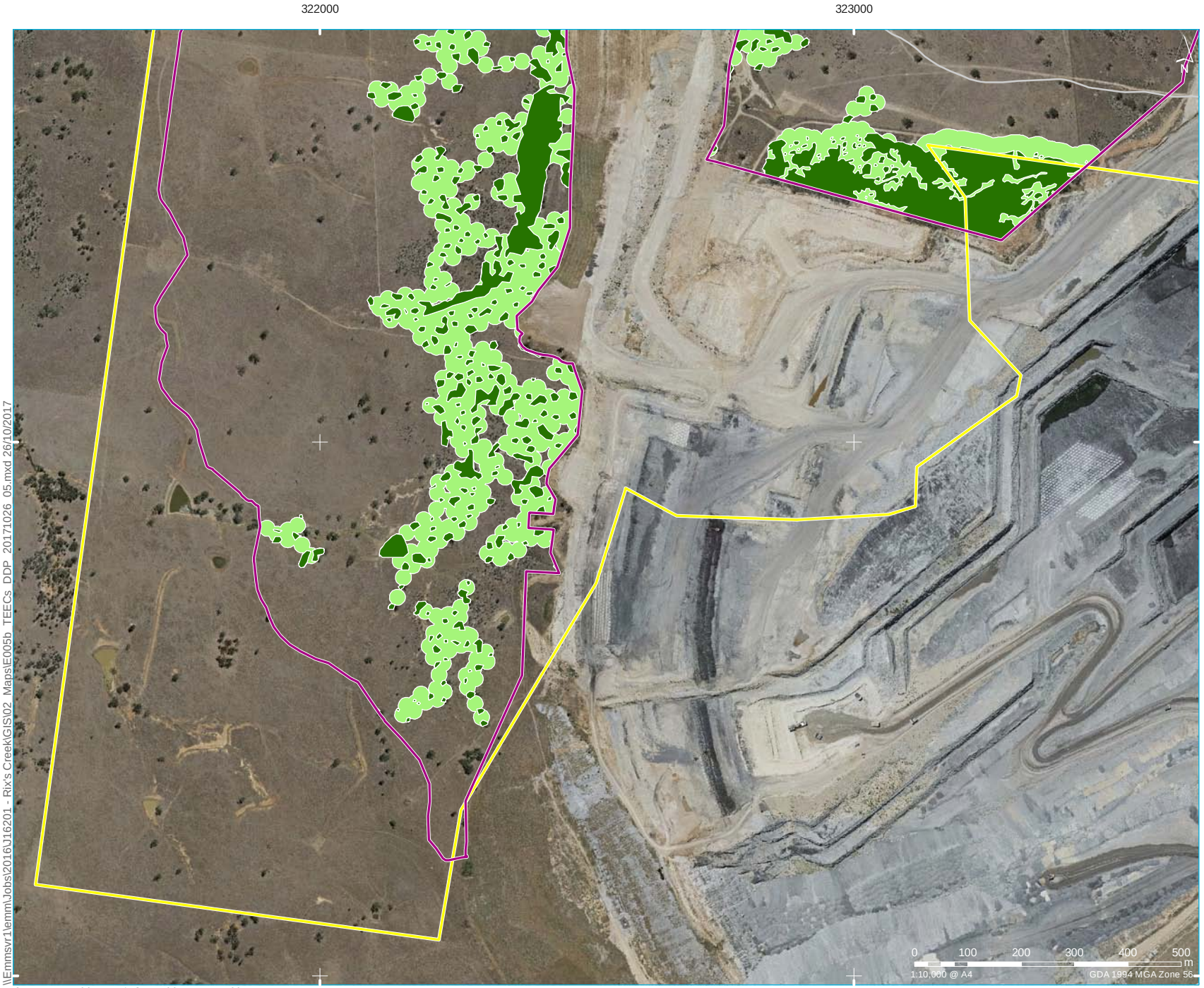
Threatened Ecological Communities listed under the EPBC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.5a

EMM

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E005b TEECs DDP 20171026 05.mxd 26/10/2017

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)



KEY

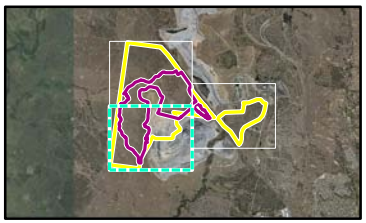
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Local road

Threatened Ecological Communities listed under the EPBC Act

- Central Hunter Valley Eucalypt Forest and Woodland
- Central Hunter Valley Eucalypt Forest and Woodland (Derived Native Grassland)



Threatened Ecological Communities listed under the EPBC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.5b

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

\\Emmsvr1emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E005b TEECs DDP 20171026 05.mxd 26/10/2017

KEY

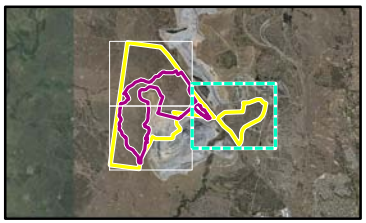
- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area

Roads

- Main road
- Local road

Threatened Ecological Communities listed under the EPBC Act

- Central Hunter Valley Eucalypt Forest and Woodland
- Central Hunter Valley Eucalypt Forest and Woodland (Derived Native Grassland)



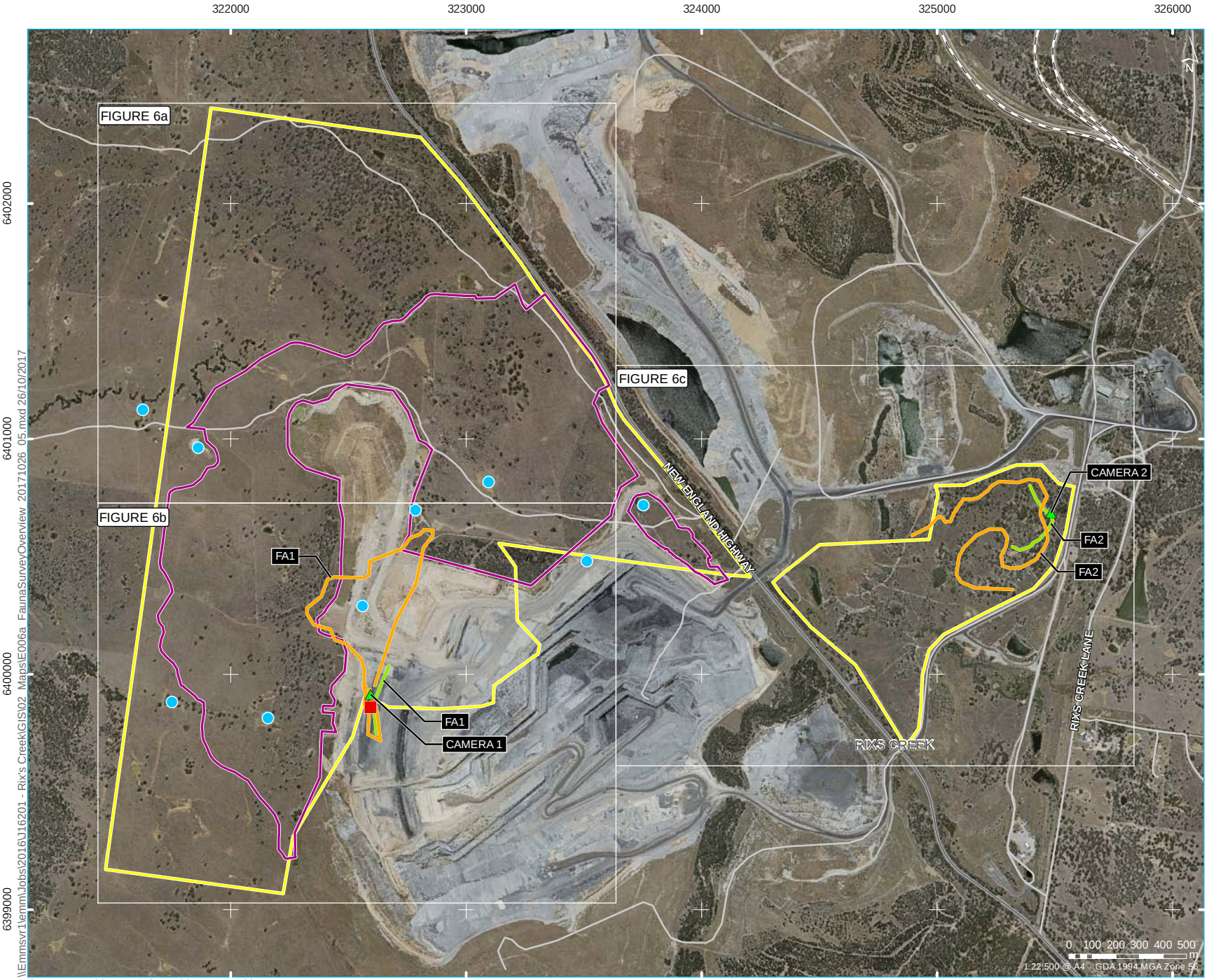
Threatened Ecological Communities listed under the EPBC Act

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.5c

EMM

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E005b TEECs DDP 20171026 05.mxd 26/10/2017

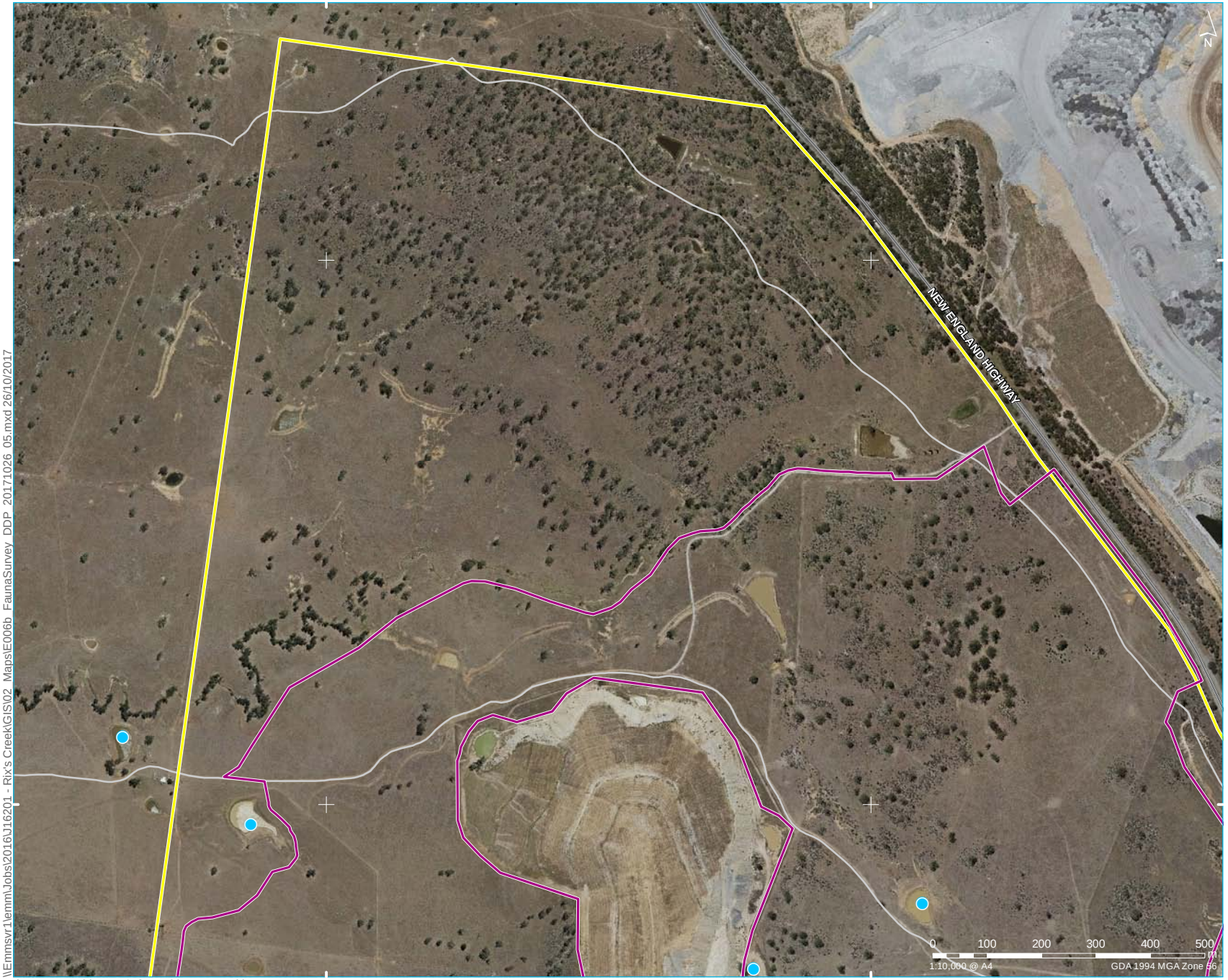
Source: EMM (2017); Rix's Creek (2017); LPMA (2011)



Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Targeted fauna survey locations and threatened fauna recorded

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.6

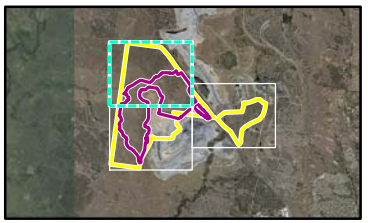


KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Dams

Roads

- Main road
- Local road



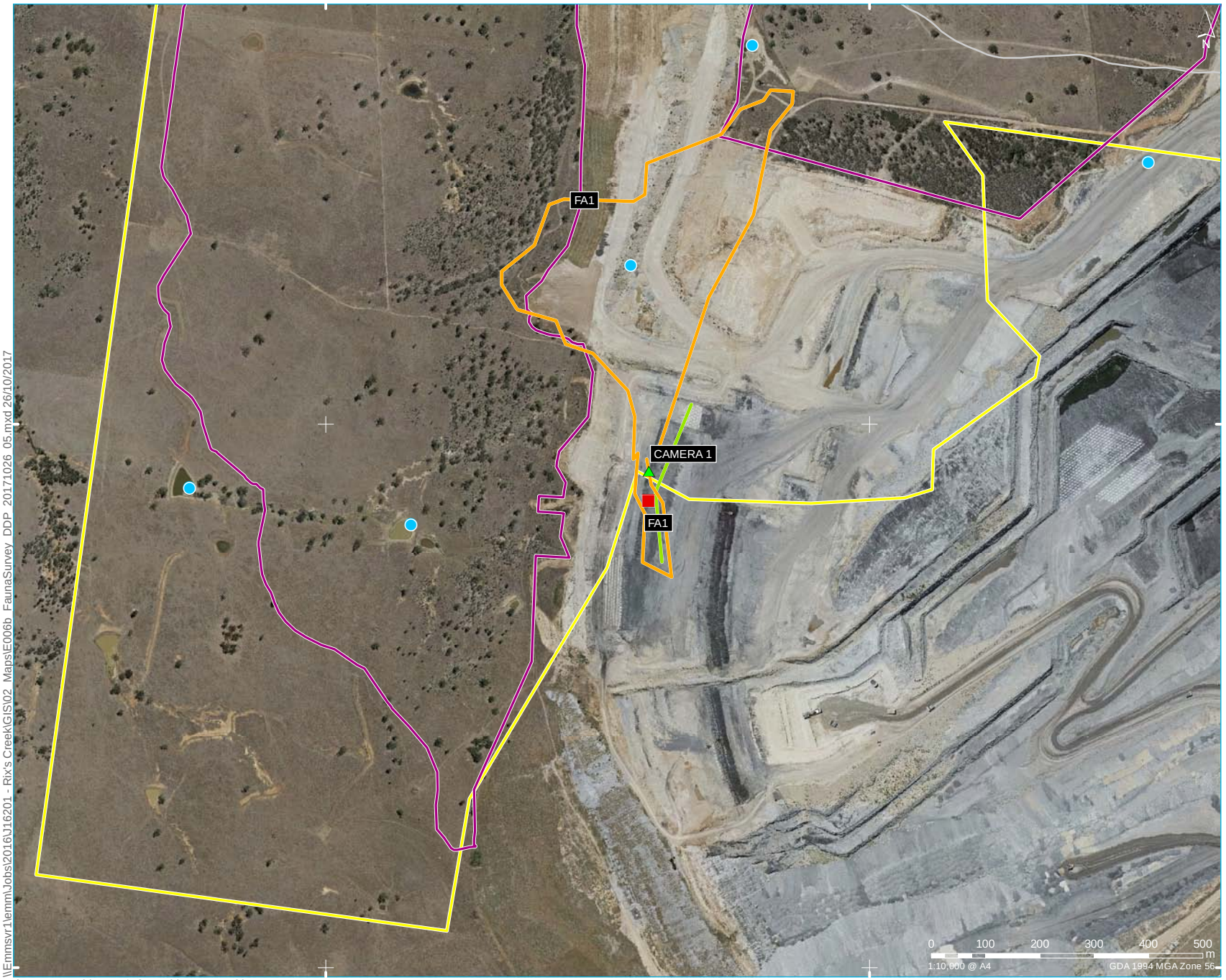
Targeted fauna survey locations and threatened fauna recorded

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.6a

EMM

\\Emmsvr1emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E006b FaunaSurvey DDP 20171026 05.mxd 26/10/2017

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

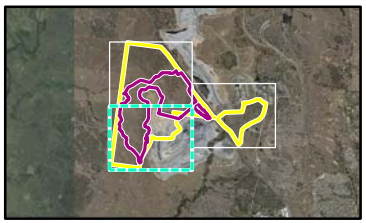


KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Dams
- Squirrel glider
- Camera
- Spotlight transect
- Trapline

Roads

- Local road



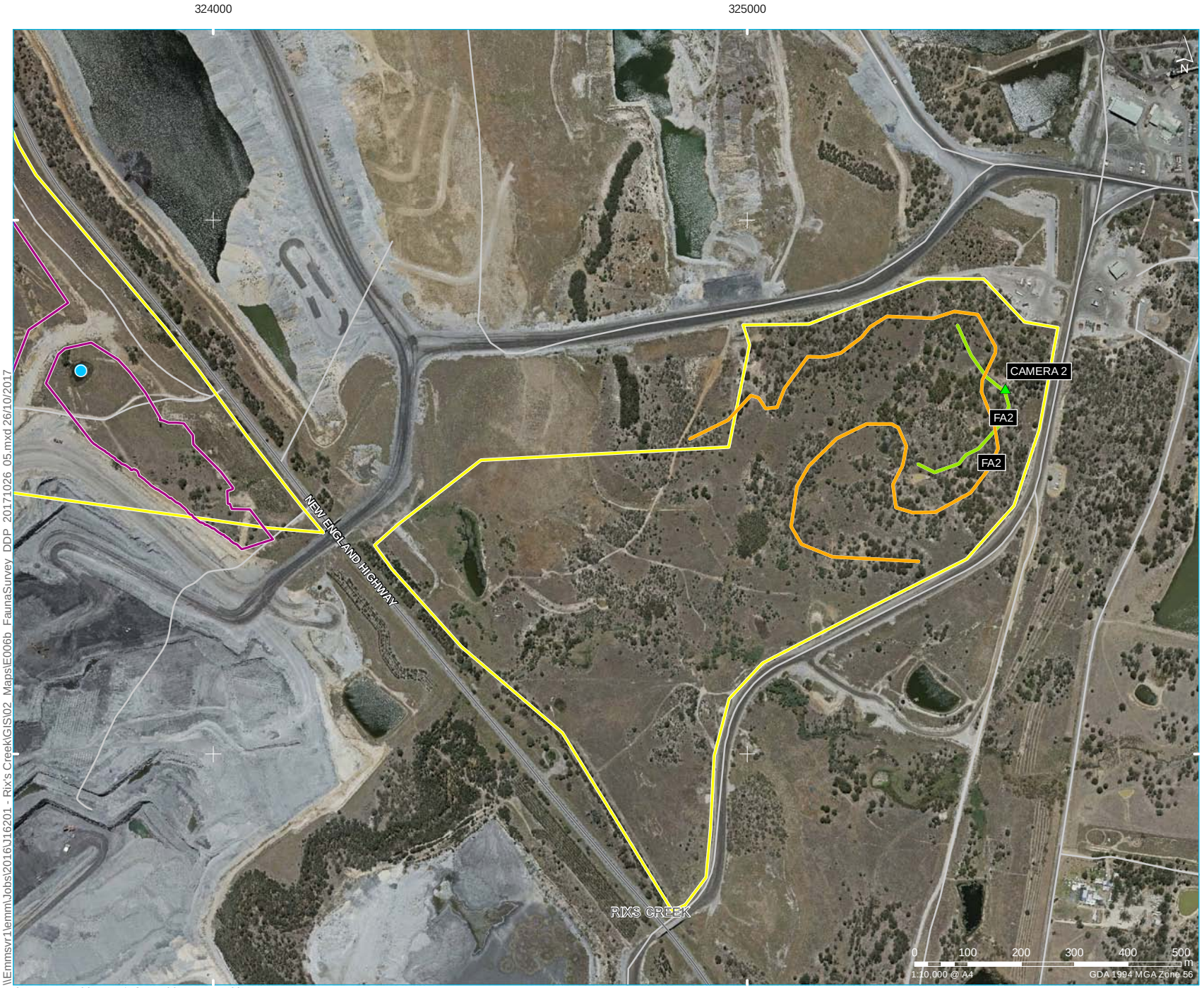
Targeted fauna survey locations and threatened fauna recorded

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.6b

EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E006b FaunaSurvey DDP 20171026 05.mxd 26/10/2017

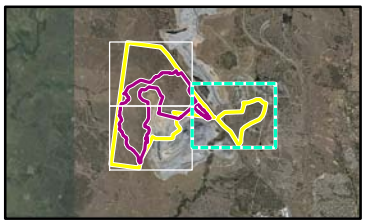


KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Dams
- Camera
- Spotlight transect
- Trapline

Roads

- Main road
- Local road



Targeted fauna survey locations and threatened fauna recorded

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure B.6c

EMM

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E006b FaunaSurvey DDP 20171026 05.mxd 26/10/2017

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Appendix C

Required contents of the Biodiversity Assessment Report

Report Section	Maps and Data	Ecology Report	RTS	Gap identified	Additional information provided
Figures and Data					
Introduction	Location Map	Included in part as Figure 1, pg 6.	Included in part as Figure 1, pg 3.	No gap in data, however map needs to be set out as per Operation Manual, Introduction to Stage 1.	Displayed in Figure B.1, Appendix B of this report.
	Assessment Area Map	Included in part as Figure 2, pg 10.	Included in part as Figure 1, pg 3.	No gap in data, however map needs to be set out as per Operation Manual, Introduction to Stage 1.	Displayed in Figure B.2, Appendix B of this report.
Landscape Features: Part 1, Appendix B and Appendix C	IBRA region and subregion and adjacent IBRA subregions	Mentioned in text (pg 19 and 24). Not shown in figures.	Not shown in figures.	Mentioned in BCAM text but needs to be shown in Location Map and Map of Landscape features (Assessment Area Map).	Displayed in Figure B.1 and B.2, Appendix B of this report.
	Native vegetation extent within the biodiversity certification assessment area, including cleared areas	Figure 1 maps remnant veg (Peake 2006). Figure 5 maps vegetation extent (broken down into PCTs) and cleared area too. Figure 11 (connectivity assessment) maps grassland and woodland.	Figure 1 maps PCTs within Investigation Area.	No gap in data, just need to show relevant mapping for assessment area.	Displayed in Figure B.3, Appendix B of this letter.
	Rivers, streams and wetlands showing appropriate riparian buffers	Not shown in figures. Mention of no riparian habitat in study area (in relation to Large-footed Myotis). No buffers mentioned.	Watercourses mapped in Figure 1 aligns with BCAM report mapping. No buffers mentioned.	No gap in data, however buffers not shown in Figures.	Displayed in Figure 1 and 2, Appendix B of this report
	Biodiversity corridors	Figure 11. Also text "For the Project Area, the Local biodiversity link is the 3rd order stream (minor creeks); there is no State or Regional biodiversity link applicable" (pg 35).	Not shown in figures.	Local biodiversity link not shown on figures.	The local biodiversity link is the 3rd order stream (minor creeks), as displayed in Figure B.1 and B.2, Appendix B of this report.
	Regional vegetation used to calculate adjacent remnant area	Shown in Figure 11.		No gap	None
	Assessment circle	Shown in *Figure 11 Connectivity Assessment (2000 ha)*	Not shown in figures.	No gap in data, but not shown on assessment area map.	Displayed in Figure B.1 and B.2, Appendix B of this report.
	Size (ha) of biodiversity certification assessment area, including vegetated and cleared components (**table**)	Table 13	Table 1 Main report	Vegetation mapping was not complete for the whole assessment area.	Completed vegetation mapping for areas where gaps were present and provided in Figure B.3. Credit calculations were rerun and provided in Table 1 and 2, Section 2.7 of this report.
	Current landscape scores for each landscape attribute and total current landscape score (**table**)	Table 14	Table 1 Main report, Table 1 of Appendix A (Biocert Calc.)	Vegetation mapping was not complete for the whole assessment area.	Credit calculation were rerun with landscape scores provided in Section 2.7 of this report.

Report Section	Maps and Data	Ecology Report	RTS	Gap identified	Additional information provided
Native Vegetation: Part 2	Map of PCTs within the project assessment area	Mapped in Figure 5	Figure 1 maps PCTs within Investigation Area.	Vegetation mapping was not complete for the whole assessment area.	Native vegetation mapping was updated. Displayed in Figure B.3, Appendix B of this report.
	Condition class and subcategory (where relevant)	as above	as above	Vegetation mapping was not complete for the whole assessment area.	Native vegetation mapping was updated. Displayed in Figure B.3, Appendix B of this report.
	Hollow-bearing trees	Tabulated number of hollows in each PCT in Table 10 (Section 3.1.2, pg 27). Not mapped.	Not mapped or tabulated - tabulated in previous reports	Hollow-bearing trees have not been mapped.	Hollow bearing trees (HBT) were recorded within each plot/transect undertaken in accordance with the BCAM methodology as outlined in both the Biodiversity Certification Assessment Methodology (2011) and the Biodiversity Certification Operational Manual (2015). The number of HBT per plot/transect are detailed within the ecology report. The BCAM methodology does not specify mapping all HBT within the project area and therefore the data has not been collected, nor mapped. This approach was confirmed during the meeting with OEH on 22/02/2017.
	Plot and transect locations relative to PCTs and condition class	Figure 4 shows location of Rapid Data Points, but not relative to PCTs (RDPs were used to establish PCTs). However Figure 5 shows veg zones (PCTs) and sampling transects.	Not mapped or tabulated - mapped in previous reports.	No gaps present.	None.
	Map of EECs	Figure 10	Not mapped, in previous reports.	EEC mapping was not complete for the whole assessment area.	EECs were mapped in the portions of the project area missing data. Displayed in Figure B.5, Appendix B of this report.
	Site value attribute scores (**table**)	Not present	Table 1, Appendix A	Calculated but not provided in the body of the report	Calculations were updated and are provided in Section 2.7, Table 2.1 and 2.1.
	Current site value scores for each vegetation zone (**table**)	Not present	Table 1, Appendix A	Calculated but not provided in the body of the report	Calculations were updated and are provided in Section 2.7, Table 2.1 and 2.1.
	Default and local benchmark values, where relevant (**table**)	Default values were used		No gap.	No action required.
Threatened Species: Part 3	Targeted survey locations	Figure 8	Not mapped, in previous reports.	No gap.	No action required.
	Species credit species polygons	Not provided	Not provided	Not specifically discussed or mapped in terms of species polygons	No species credits species were recorded within the project area, nor are any anticipated to occur. Species credit species were ruled out by either expert report or field survey effort. For this reason no species polygons are required.
	Species polygons for species that cannot withstand a loss.	Not provided	Not provided	Not specifically discussed or mapped in terms of species polygons	As above.
	Table of vegetation zones and landscape Tg values, particularly indicating where these have changed due to species exclusion	Not provided	Not provided	Calculated but not provided in the body of the report, in addition the credit calculation have been recalculated.	Refer to table 2 of this report
	List of species credit species and presence status on site as determined by targeted survey, indicating also where presence was assumed and/or where presence was determined by expert report.	2.4.1.2 and 2.4.1.3		None.	None.

Report Section	Maps and Data	Ecology Report	RTS	Gap identified	Additional information provided
Matters of National Environmental Significance (optional), Part 4	Matters of National Environmental Significance known and predicted to occur in the biodiversity certification assessment area, overlain with vegetation zone boundaries.	5.8 ha of CHVEFW CEEC within the Project Area - Mapped in *Figure 10* but not overlain with vegetation zones. Plus 6 mig. birds known from the mid-upper Hunter Valley have potential to occur within habitat (not mapped but in text (Section 4.3.3, Table 16).	No mapping in Ecology Report.	Gap present.	CHVEFC mapping and information has been requested by OEH as point on of the RTS addendum. This is discussed in 2.1 with a map provided as Figure B.5, Appendix B of this report.
Report					
Introduction	Introduction to the biodiversity certification including:				
	• Identification of the proposed biodiversity certification assessment CMA, CMA subregion, Mitchell landscape (ha)	3.1		No gaps but the information could be stated more explicitly and upfront.	The assessment area is within the *Hunter-Central Rivers CMA* , the *Hunter* sub-region, and Central Hunter Foothills Mitchell landscape.
	• Identification of the proposed biodiversity certification assessment area (ha)	2.2	Section 2.2.1 in RTS.	No gaps, but there have been a series of changes.	The proposed biodiversity assessment area is 213 ha. A more detailed summary of changes are provided in Section 2.7.
	• Planning context and history relevant to proposed biodiversity certification assessment area.	Section 1 & 2.3.3	1.1	None.	No action required.
	• Sources of information used in the assessment, including reports and spatial data	2.3	2.2.1	None.	No action required.
	• General description of proposed biodiversity certification assessment area	3.1	Section 2.2.1 in RTS.	None.	The assessment area has been amended, due to gaps noticed in the vegetation mapping, refer to Section 2.7.
Landscape Features: Part 1, Appendix B and Appendix C	Identification of landscape features within and surrounding the proposed biodiversity certification assessment area, including:			Minor gaps in this section	Any gaps in this section are able to be filled in the response.
	• IBRA region, IBRA subregion, Mitchell landscape and area (ha)	4.1.2		Specific reference to IBRA regions is not made even though the information is provided.	The assessment area is within the *assessment area is within the IBRA Sydney Basin, the IBRA Hunter sub-region and the Central Hunter Foothills Mitchell landscape.*
	• Native vegetation extent	4.1.8		Woodland and grassland areas listed however need to clearly categorise according to 'cleared' and 'native vegetation' definitions	The native vegetation extent within the 2000 ha assessment circle is 277 ha.
	• Cleared areas	4.1.8, description in 4.1.1		As above.	Cleared area extent within the 2000 ha assessment circle is 1,723 ha.
	• Evidence to support differences between mapped vegetation extent and aerial imagery	2.4.1.1		None	The vegetation mapping largely mirrors that of the aerial imagery.
	• Rivers and streams within the assessment site classified according to stream order	4.1.8		Described in text however - not mapped or the buffer distance noted.	Displayed in Figure 1 and 2, Appendix B of this letter.
	• Wetlands within, adjacent to and downstream of the assessment site	-		Not specifically discussed.	No wetlands are found within either the project area, adjacent to or within the assessment circle.
	• Biodiversity corridors	4.1.8		No gaps in text.	The Local biodiversity link is the 3rd order stream (minor creeks), as Displayed in Figure 1 and 2, Appendix B of this letter.
	• Landscape value score components, including:	4.1.8		No gaps in text.	Landscape scores were recalculated and provided in Section 2.7 of this report.
	- Percent native vegetation cover estimate (includes identification of any adjustments and justification)	4.1.8		Information is present however correct nomenclature need to be used.	The native vegetation extent within the 2,000 ha assessment circle is 277 ha. Cleared area extent is 1,723 ha.
	- Connectivity value	4.1.8		As above.	Landscape scores were recalculated and provided in Section 2.4 of this report.
	- Adjacent remnant area	4.1.8		As above.	Landscape scores were recalculated and provided in Section 2.4 of this report.

Report Section	Maps and Data	Ecology Report	RTS	Gap identified	Additional information provided
Native Vegetation: Part 2	Detail plant community types within the proposed biodiversity certification assessment area, including:				
	• vegetation class			Not provided.	Zone 1, PCT 1598 - Coastal Floodplain Wetland, Zone 2, PCT 1692 - Coastal Valley Grassy Woodlands Zone 3, PCT 1731 - Coastal Swamp Forests Zone 4, PCT 1605 - North West Slopes Dry Sclerophyll Woodlands Zone 5, PCT 1748 - Hunter-Macleay Dry Sclerophyll Forests Zone 7, PCT 1605 - North West Slopes Dry Sclerophyll Woodlands (derived grassland)
	• vegetation type	4.1.1		No gaps in text.	no action required
	• area (ha) for each vegetation type	4.1.2 (Table 8); 4.3.2.1		Gaps noted in mapping extent within the project area.	Gaps filled and areas recalculated, refer to Section 2.7 of this report.
	• species relied upon for identification of vegetation type and relative abundance	4.1.2 (Table 9)		No gaps in text.	no action required
	• EEC status.	4.1.7.1		Gaps noted in mapping extent within the project area.	Gaps filed and areas recalculated, refer to Section 2.7 of this report. The total area of EEC present within the project area is: Hunter Lowlands Redgum Forest - 0.81 ha. The total area of Central Hunter Grey Box - Ironbark EEC is 1.01 ha.
	Describe vegetation zones, including:	4.4.1; 4.1.2		No gaps in text.	no action required
	• condition class and subcategory (where relevant)	4.1.1		No gaps in text.	No action required.
	• area (ha) for each vegetation zone	4.1.2, Table 8		Gaps noted in mapping extent within the project area.	Gaps filled and areas recalculated, refer to Section 2.7 of this report.
	• survey effort (number of plots/transects).	4.1.2, Table 8		No gaps in text	No action required.
	Where use of local data is proposed:	N/A		N/A	
	• identify relevant vegetation type	N/A		N/A	
	• identify source of information for local benchmark data	N/A		N/A	
	• justify use of local data in preference to database values.	N/A		N/A	
Threatened Species: Part 3	Identify ecosystem credit species associated with plant community types within the proposed biodiversity certification assessment area, including:				
	• List of species	3.2.1 (flora) and 3.3.3 (fauna)		No gaps in text.	No action required.
	• Justification for exclusion of any ecosystem credit species predicted above	N/A, no such exclusions		No gaps in text.	No action required.
	Identify species credit species within the proposed biodiversity certification assessment area, including:			No gaps in text.	
	• List of candidate species	3.2.1 (flora) and 3.3.3 (fauna)		No gaps in text.	No action required.
	• Justification for inclusions and exclusions based on habitat features	2.4.1.3, (pg 16 onwards), 3.2.1 (flora) and 3.3.3 (fauna)		No gaps in text.	No action required.
	• Indication of presence based on targeted survey	6.3		No gaps in text.	No action required.
	• Details of targeted survey technique, effort and timing	2.4.1.2, 2.4.1.3		No gaps in text.	No action required.
	• Species polygons	4.3.1, 6.3.2 (discussion of occurrence)		Not specifically discussed or mapped in terms of species polygons	No species credits species were recorded within the project area, nor are any anticipated to occur. Species credit species were ruled out by either expert report or field survey effort. For this reason no species polygons are required.

Report Section	Maps and Data	Ecology Report	RTS	Gap identified	Additional information provided
	• Species that cannot withstand a further loss. Where use of local data is proposed:			Not specifically mentioned	Species credit species were ruled out from occurring within the project area. Therefore species which cannot withstand a loss are absent from the project area and do not require any further consideration.
	• Identify relevant species or population	N/A		No gaps in text.	No action required.
	• Identify aspect of species/population data	N/A		No gaps in text.	No action required.
	• Identify source of information for local data	N/A		No gaps in text.	No action required.
	• Justify use of local data in preference to database values. Where an expert report is used in place of targeted survey:	N/A		No gaps in text.	No action required.
	• Identify the relevant species or population	2.4.1.3 (pg 16 - onwards)		No gaps in text.	No action required.
	• Justify the use of an expert report	2.4.1.3 (pg 16 - onwards)		No gaps in text.	No action required.
	• Indicate and justify the likelihood of presence of the species or population	2.4.1.3 (pg 16 - onwards)		No gaps in text.	No action required.
	• Estimate the number of individuals or area of habitat (whichever unit of measurement applies to the species/individual) for the proposed biodiversity certification assessment area, including a description of how the estimate was made;	4.3.2.2		not applicable as no species considered in the expert reports were anticipated to occur.	No action required.
	• Identify the expert and provide evidence of their expert credentials.	2.4.1.3 (pg 16)		Require further evidence of expert credentials.	Appendix D of this letter provides an Expert CV.
Matters of National Environmental Significance (optional), Part 4	A description of Matters of National Environmental Significance that occur within the proposed biodiversity certification assessment area, including:	4.3; 4.3.3; 6.4	Page 7	OEH have requested more information regarding CHVEF.	CHVEF mapping and information regarding EPBC listed communities has been requested by OEH as part of the RTS addendum. This will form a detailed part of the response and include discussion of the Referral which was deemed 'not a controlled action' even when the newly listed CHVEF was considered.
	• identification of matters of NES that overlap with listings on the TSC Act	4.1.7.1 and 4.1.7.2, including 12		No gaps.	No action required.
	• area (ha) of matters of NES	4.1.7.2		OEH have requested more information regarding CHVEF	Refer to Section 2.1 of this report.
	• vegetation zone relevant to biological matters of NES.	4.1.7.1 and 4.1.7.2, including 12		OEH have requested more information regarding CHVEF	Refer to Section 2.1 of this report.

Appendix D

Expert CV - Michael Murray

CURRICULUM VITAE: MICHAEL MURRAY

ACADEMIC QUALIFICATIONS:	Bachelor of Science (Hons), University of Newcastle, 1990.
	Pathology Technicians Certificate Tighes Hill Technical College, 1985.
LICENCE	OEH Scientific Licence SL100096 Animal Research Authority 15/969 DG's Animal Care & Ethics Committee 15/969
May 1995 - present	Established FOREST FAUNA SURVEYS (Incorporated 1998).

PROFESSIONAL EXPERIENCE

Extensive experience in undertaking detailed fauna surveys. Has undertaken many studies in the range of environments within the Newcastle/Lake Macquarie area, Hunter Valley, Sydney Basin, Western Slops and Plains, NE NSW, and riverine and mallee areas of Western Division of NSW.

MONITORING PROJECTS

I have been involved in long term wildlife monitoring projects for a number of open cut coal mine in the Hunter Valley and western slopes and plains of NSW. This work includes the establishment and monitoring of procedures, and formulation of amelioration measures for the maintenance and enhancement of habitat for protected and threatened fauna species. In particular, the threatened Squirrel Glider, woodland birds and microchiropteran bat species.

FAUNA SURVEYS

I have undertaken numerous fauna investigations for fauna and species impact statements, environmental impact statements, environmental assessments and strategic planning studies. These surveys have ranged from small individual allotment environmental assessments through to landscape level surveys. Clients have included property developers, local councils, NSW National Parks and Wildlife Service, Forests NSW, Department of Defence. Examples of landscape level surveys include:

- Somersby Industrial Park
- Awaba Landfill Ecological Constraints
- Bulahdelah Land Use Rezoning
- Wyrrabalong National Park
- Tuggerah Nature Reserve
- Wyong Employment Zone (WEZ).
- Munmorah State Conservation Area, Lake Macquarie SCA.
- Large Forest Owl Habitat Tree Mapping, Koompahtoo Land Rezoning, Morisset.
- Department of Defence: Singleton Training Area, Hunter Valley (13,752 hectares), Beecroft Weapons Range, Jervis Bay (4,200 hectares), HMAS Albatross, HMAS Cresswell and JBRF, Jervis Bay (610 hectares).
- Specialist Team Member (Large Forest Owls Survey)
- Specialist Team Member (Mammals and Nocturnal Birds) NSW National Parks and Wildlife Service Sydney Zone CRA (Comprehensive Regional Assessments)
- Consultant Biologist- TUNRA (The University of Newcastle Research Associates Ltd)
- Environmental Scientist - ERM Mitchell McCotter
- Project Officer SWC CONSULTANCY
- Research Officer, Shortland Wetlands Centre

CURRICULUM VITAE: MICHAEL MURRAY

COMPETENCY

Michael is very competent in all aspects of fauna surveys including species identification of birds, mammals (including microchiropteran bats), reptiles and amphibians. Michael also has extensive GIS experience. Michael has prepared reports for:

- impact assessments,
- species impact statements,
- ecological management plans,
- threatened species management plans,
- ecological monitoring,
- biodiversity certifications
- local environmental studies,
- flora and fauna survey guidelines and
- fauna inventory studies.

EXAMPLES OF PUBLICATIONS:

Research Projects

Murray, M. (1990) The re-introduction of the Magpie Goose *Anseranas semipalmata* to the Shortland Wetlands. BSc (Hons) thesis, Department of Biological Sciences, University of Newcastle.

Murray, M. and Winning, G. (1992). *Flight behaviour and collision mortality of waterbird species into 330kV electricity transmission lines adjacent to the Shortland Wetlands*. Report to Pacific Power by the Shortland Wetlands Centre.

Winning, G. and Murray, M. (1992). *NSW Important Wetlands - the First Chapter*. Recommended important wetlands in NSW, in support of the Directory of Important Wetlands in Australia. Report to NSW Department of Water Resources.

Murray, M. (1993). *Review of Literature on High Country Wetlands of New South Wales and Victoria.* Report to Australian Nature Conservation Agency by Shortland Wetlands Centre.

Murray, M. (1996) *Eleebana Local Squirrel Glider Study.* Report to Lake Macquarie City Council by SWC Consultancy.

Murray, M. (1999) *Characterisation of Habitats and Distribution of Large Forest Owls in the City of Lake Macquarie*. Report to Lake Macquarie City Council.

Published Papers

Kavanagh, R.P. and Murray, M. (1996). Home range, habitat and behaviour of the Masked Owl (*Tyto novaehollandiae*) near Newcastle, New South Wales. *Emu.* **96,** 157-170

Smith, A.P. and Murray, M. (2003). Habitat requirements of the squirrel glider (*Petaurus norfolcensis*) and associated possums and gliders on the New South Wales central coast. *Wildlife Research* **30**, 291-301.

Major Fauna Surveys

Murray, M., Mahony, M. and Hoye, G. (1995). *Pinney Beach Fauna Study.* Report to Lake Macquarie City Council.

Hoye, G., Murray, M. and Mahony, M. (1996) *Mount Owen Coal Mine Wildlife Management Pilot Study.* Report to HLA-Envirosciences by Fly By Night Bat Surveys Pty Ltd and TUNRA Ltd.

Hoye, G., Murray, M., Mahony, M. and Clulow, J. (1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007) *Mount Owen Coal Mine Wildlife Management - Annual Report(s).* Report by Fly By Night Bat Surveys Pty Ltd, Forest Fauna Surveys P/L and TUNRA Ltd.

Smith, A.P. (2000). *Wyong Sub-regional Squirrel Glider Study*. Report to Wyong Shire Council.

Murray, M. (2001) *Salt Ash Air Weapons Range - Fauna and Habitat Assessment*. Report to URS Pty Ltd and Department of Defence.

Bell, S.A.J. and Murray, M. (2001). *The ecological significance of Bow Wow Creek Gorge, Mulbring, lower Hunter Valley, New South Wales: a nationally significant site.* Report to Cessnock City Council by Eastcoast Flora Survey and Forest Fauna Surveys Pty Ltd.

Thomson, C. and Murray, M. (2005). *The Vertebrate Fauna of Singleton Training Area, Hunter Valley, New South Wales*. Report to Department of Defence by Sinclair Knight Merz and Forest Fauna Surveys Pty Ltd.

Thomson, C. and Murray, M. (2005). *The Vertebrate Fauna of Beecroft Weapons Range, Jervis Bay, New South Wales*. Report to Department of Defence by Sinclair Knight Merz and Forest Fauna Surveys Pty Ltd.

Thomson, C. and Murray, M. (2005). *The Vertebrate Fauna of HMAS Albatross, HMAS Cresswell and JBRF, Jervis Bay, New South Wales*. Report to Department of Defence by Sinclair Knight Merz and Forest Fauna Surveys Pty Ltd.

Species Impact Statement

Murray, M., Maryott-Brown, K. and Hoye, G. (1996) *Species Impact Statement, SRA Land, Glendale*. Report to Lake Macquarie City Council by Forest Fauna Surveys, in association with EcoPro P/L and Fly By Night Bat Surveys P/L.

Murray, M., Hoye, G., Mahony, M. and Clulow, J. (2003). *Mt Owen Operations Species Impact Statement*. Prepared for Umwelt (Australia) Pty Ltd on behalf of Mt Owen Mine by Forest Fauna Surveys Pty Ltd, Fly By Night Bat Surveys P/L and TUNRA Ltd.

Bell, S.A.J. and Murray, M. (2004). *Warnervale Business Park Species Impact Statement. Stage 1.* Prepared for Wyong Shire Council by Eastcoast Flora Survey and Forest Fauna Surveys Pty Ltd.

Murray, M. (2005). *Fern Bay Estate Squirrel Glider Study*. Prepared for ERM Australia Pty Limited.

Planning Documents

Murray, M., Maryott-Brown, K. and Hoye, G. (1997) *Flora and Fauna Survey Guidelines*. Report to Lake Macquarie City Council by Forest Fauna Surveys, Fly By Night Bat Surveys P/L and EcoPro P/L.

Murray, M., Bell, S.A.J., Hoye, G. (2001) *Flora and Fauna Survey Guidelines v.2.* Report to Lake Macquarie City Council by Forest Fauna Surveys P/L, Eastcoast Flora Survey and Fly By Night Bat Surveys P/L.

Murray, M., Bell, S.A.J., Hoye, G. (2002) *Flora and Fauna Survey Guidelines. Lower Hunter and Central Coast*. Report to Lower Hunter and Central Coast Regional Environment Management Strategy (LHCCREMS) by Forest Fauna Surveys P/L, Eastcoast Flora Survey and Fly By Night Bat Surveys P/L.

Smith, A.P., Watson, G. and Murray, M. (2002) *Fauna Habitat Modelling and Wildlife Linkages in Wyong Shire*. Austeco, Armidale, 2350.

Murray, M. and Bell, S.A.J. (2005). *Wyong Employment Zone Ecological Study*. Report to Wyong Shire Council.

Murray, M. and Bell, S.A.J. (2007). *Ecological Investigations and Biocertification Application, Wyong Employment Zone, Warnervale Business Park, Warnervale Airport Lands, Precincts 11 & 13 and Precinct 14.* Report to Wyong Shire Council.

Murray, M. (2008). *Wyong Corridor Strategy, Wyong Shire*. Report to Wyong Shire.

Appendix E

Framework for Biodiversity Assessment

BioBanking Credit Calculator

Ecosystem credits

Proposal ID :	191/2016/4068D
Proposal name :	Rix's Creek Continuation Project
Assessor name :	Eugene Dodd
Assessor accreditation number :	191
Tool version :	v4.0
Report created :	28/02/2018 15:37

Assessment circle name	Landscape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
1	28.20	HU812_Moderate/Good	Forest Red Gum grassy open forest on floodplains of the lower Hunter	Moderate/Good	Yes	1	0.22	68.67	0.00	68.67	13	11	Spotted-tailed Quoll	38.89	2.60	13
1	28.20	HU906_Moderate/Good	Bull Oak grassy woodland of the central Hunter Valley	Moderate/Good	Yes	1	0.10	44.79	0.00	44.79	4	4	Bush Stone-curlew	53.33	2.60	4
1	28.20	HU819_Moderate/Good	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Moderate/Good	Yes	1	17.62	56.60	0.00	56.60	872	772	Bush Stone-curlew	60.00	2.60	872
1	28.20	HU962_Moderate/Good	Grey Box grassy open forest of the Central and Lower Hunter Valley	Moderate/Good	Yes	1	0.76	45.83	0.00	45.83	0	28	Spotted-tailed Quoll	61.11	2.60	28
1	28.20	HU819_Moderate/Good_Derived grassland	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Moderate/Good_Derived grassland	Yes	1	164.58	27.08	0.00	27.08	0	4,057	Bush Stone-curlew	20.00	0.00	4,057
1	28.20	HU819_Moderate/Good_Other	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Moderate/Good_Other	No	1	29.50	28.30	0.00	28.30	834	751	Bush Stone-curlew	13.33	2.60	834

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

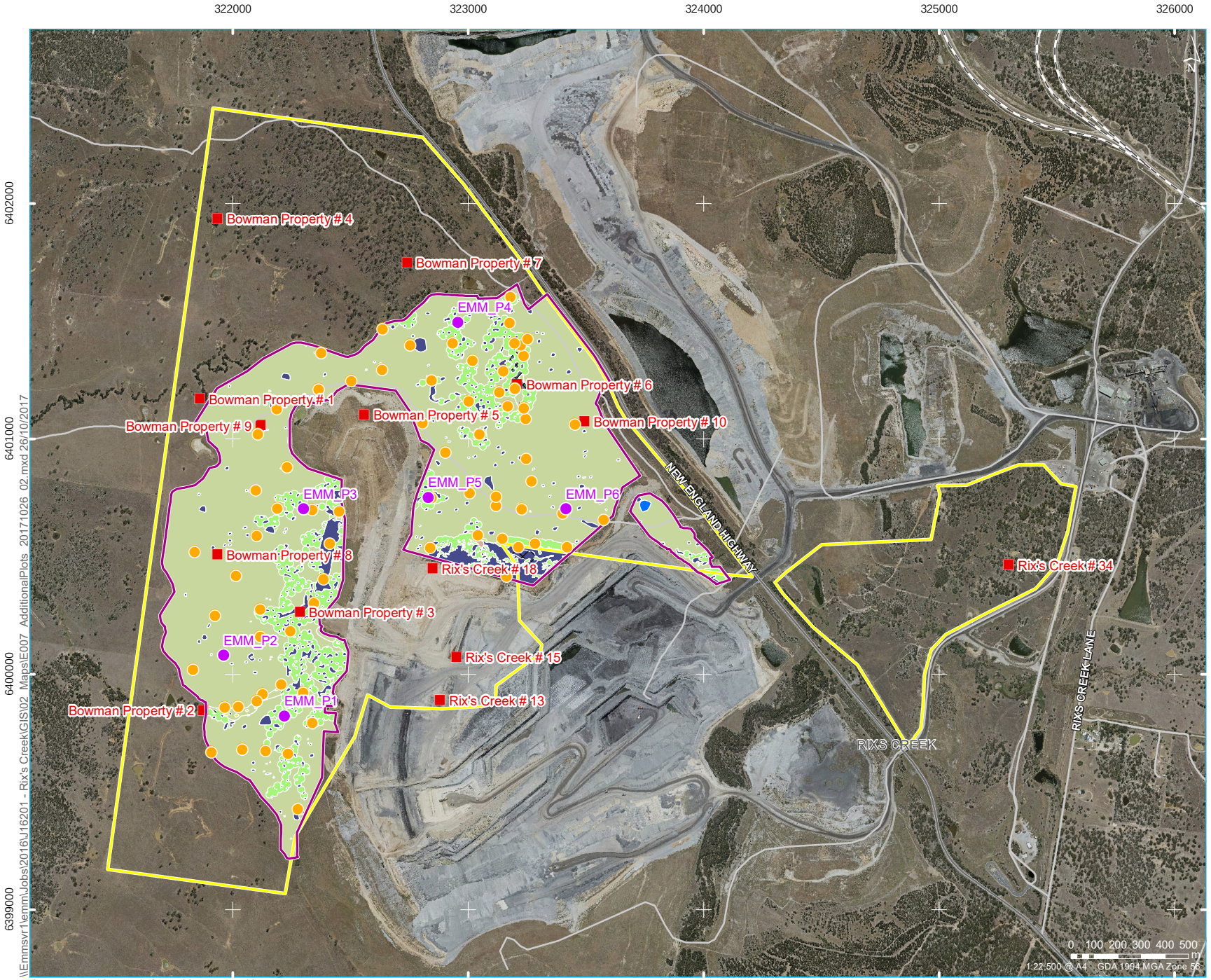
Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 28/02/2018 15:37

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / number of loss	Negligible loss	Red flag status	Number of credits
			No					



KEY

- Rix's Creek Continuation Project (including additional area)
- UHSA assessment area
- Rapid data points
- Additional plot and transect location
- Plot or transect location
- EEC listed under the TSC Act
- Rail line

Roads

- Main road
- Local road

Plant community type

- Zone 1: PCT 1598 (Forest Red Gum grassy open forest)
- Zone 2: PCT 1692 (Bull Oak grassy woodland)
- Zone 4: PCT 1605 (Narrow-leaved Ironbark-Native Olive shrubby open forest)
- Zone 5: PCT 1748 (Grey Box grassy open forest)
- Zone 7: PCT 1605 (Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter_derived grassland)
- Zone 8: PCT 1605 (Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter_other)
- Dam

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

Additional plot and transect locations required for FBA

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure E.1

EMM

Family	Scientific Name	Common Name	Percentage cover					
			Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
			1605_other	1605_DG	1605_other	1605_other	1605_other	1605_DG
Aizoaceae	**Galenia pubescens*	Galenia	0.1					
Apocynaceae	**Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	0.4	0.1	0.1	0.1		0.1
Asteraceae	**Carthamus lanatus*	Saffron Thistle	0.1	1	1			
Asteraceae	**Cirsium vulgare*	Spear Thistle	0.1	0.1	0.1			
Asteraceae	**Facelis retusa*	Annual Trampweed			0.1			
Asteraceae	**Gamochaeta americana*	Cudweed			0.1			
Asteraceae	**Hypochaeris radicata*	Catsear	0.2	0.1				0.1
Asteraceae	**Senecio madagascariensis*	Fireweed	0.4	0.2	0.1	0.1	0.1	0.1
Asteraceae	**Sonchus oleraceus*	Common Sowthistle	0.2	1	1			
Caryophyllaceae	**Paronychia brasiliana*	Chilean Whitlow Wort			0.1			
Caryophyllaceae	**Stellaria pallida*	Lesser Chickweed					0.1	
Fabaceae - Faboideae	**Medicago minima*	Wooly Burr Medic		0.2				
Fabaceae - Faboideae	**Trifolium campestre*	Hop Clover			0.4			
Fabaceae - Faboideae	**Trifolium campestre*	Hop Clover	0.1					
Gentianaceae	**Centaurium erythraea*	Common Centaury	0.1					0.1
Iridaceae	**Sisyrinchium micranthum*	Blue Pigroot			0.1			
Linaceae	**Linum trigynum*	French Flax	0.1			0.1	0.1	
Linaceae	**Lolium loliaceum*	Stiff Ryegrass		2	2			
Malvaceae	**Sida rhombifolia*	Paddy's Lucerne		0.1	0.1		0.1	0.1
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongues	1	3	10	0.2		1
Plantaginaceae	**Plantago myosuros*	Mouse Plantain		1				
Poaceae	**Briza minor*	Shivery Grass			1			2
Poaceae	**Bromus hordeaceus*	Soft Brome		0.1				1
Poaceae	**Melinis repens*	Red Natal Grass						0.1
Poaceae	**Paspalum dilatatum*	Paspalum						20
Primulaceae	**Lysimachia arvensis*	Scarlet Pimpernel	0.6	0.2	0.1		0.1	0.1
Verbenaceae	**Verbena rigida*	Veined Verbena				0.1		
Acanthaceae	*Brunoniella australis*	Blue Trumpet	0.2			0.1		
Asteraceae	*Calocephalus citreus*	Lemon Beauty-heads	0.2			0.1	0.1	
Asteraceae	*Calotis cuneifolia*	Purple Burr-daisy	0.1			0.1	0.1	0.1
Asteraceae	*Chrysocephalum semipapposum*	Clustered Everlasting	0.8					
Asteraceae	*Cotula australis*	Carrot Weed		0.1		1		
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed		0.1	0.1			
Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush			0.1			
Convolvulaceae	*Dichondra repens*	Kidney Weed	0.1	0.1				
Cyperaceae	*Carax inversa*	Knob Sedge		0.1				
Fabaceae - Faboideae	*Daviesia genistifolia*	Broom Bitter Pea						
Fabaceae - Faboideae	*Desmodium brachypodum*	Large Tick-trefoil	0.2				0.1	

Fabaceae - Faboideae	*Desmodium varians*	Slender Tick-trefoil				0.1		0.1
Fabaceae - Faboideae	*Glycine tabacina*	Variable Glycine				0.1		
Fabaceae - Faboideae	*Indigofera australis*	Australian Indigo					0.1	
Fabaceae - Faboideae	*Templetonia stenophylla*	Leafy Templetonia					0.1	
Fabaceae - Mimosoideae	*Acacia paradoxa*	Kangaroo Thorn			0.1			
Genaniaceae	*Genranium solanderi*	Native Geranium						0.1
Goodeniaceae	*Goodenia hederacea*	Ivy Goodenia				0.1		
Lobeliaceae	*Pratia purpurascens*	Whiteroot				0.1		
Lomandraceae	*Lomandra confertifolia*	Mat-rush	0.5		0.1			
Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush				0.1		
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush					0.1	
Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	0.6			3	0.3	
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	3		0.1	10	15	0.1
Nyctaginaceae	*Boerhavia dominii*	Tarvine					0.1	
Oxalidaceae	*Oxalis perenans*	Native Oxalis		0.1				0.1
Plantaginaceae	*Veronica plebeia*	Trailing Speedwell				0.1		
Poaceae	*Aristida ramosa*	Purple wiregrass	2	5	10	30	4	
Poaceae	*Austrostipa scabra*	Speargrass	40	5	5	5	5	10
Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass						5
Poaceae	*Bothriochloa decipiens*	Red Grass	5	50				20
Poaceae	*Chloris truncata*	Windmill Grass					1	0.1
Poaceae	*Chloris ventricosa*	Plump Windmill Grass	5					
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	40	5	45	45	70	20
Poaceae	*Cynodon dactylon*	Couch	0.1		4		3	2
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	5	5	20	20	15	30
Poaceae	*Eragrostis sp 1.*		3			2	5	5
Poaceae	*Panicum effusum*	Hairy Panic						5
Poaceae	*Poa labillardierei var. labillardierei*	Tussock		10			4	5
Poaceae	*Rytidosperma sp.*					5		
Poaceae	*Sporobolus creber*	Western Rat-tail Grass	10	40	40			
Poaceae	*Themeda australis*	Kangaroo Grass		2		10	15	
Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Poison Rock Fern	0.1		0.1	0.1	0.1	0.1
Rhamnaceae	*Cryptandra amara*	Bitter Cryptandra					0.1	0.1
Rubiaceae	*Asperula conferta*	Common Woodruff	0.6	0.1				
Rubiaceae	*Pomax umbellata*	Pomax						0.1
Solanaceae	*Solanum cinereum*	Narrawa Burr		0.1				
Total Exotic Species			12	13	15	5	5	11
Total Native Species			20	15	12	20	20	18
Total Species			32	28	27	25	25	29

Footnote: * Indicates exotic species, where species were recorded within the plot percentage cover abundance

Table E.2 – Vegetation transect data

PlotName	Zone	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
EMM_P1	1605_other	20	0	0	98	0	28	16	0	1	5	322218	6399822	56
EMM_P2	1605_derived grassland	15	0	0	98	0	12	38	0	1	0	321962	6400081	56
EMM_P3	1605_other	12	0	0	96	0	10	48	0	1	0	322301	6400703	56
EMM_P4	1605_other	20	0	3.5	90	0	34	8	0	1	6	322956	6401497	56
EMM_P5	1605_other	20	0	4.5	92	0	18	8	0	1	0	322830	6400752	56
EMM_P6	1605_derived grassland	18	0	0	96	0	28	32	0	1	0	323415	6400703	56

Appendix F

Targeted survey effort for the Pine Donkey Orchid (Diuris tricolor)

KEY

- Rix's Creek Continuation Project (including additional area)
- Pine Donkey Orchid (*Diuris tricolor*) transect
- Main road
- Local road

Targeted survey effort for the Pine Donkey Orchid (*Diuris tricolor*)

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure F.1

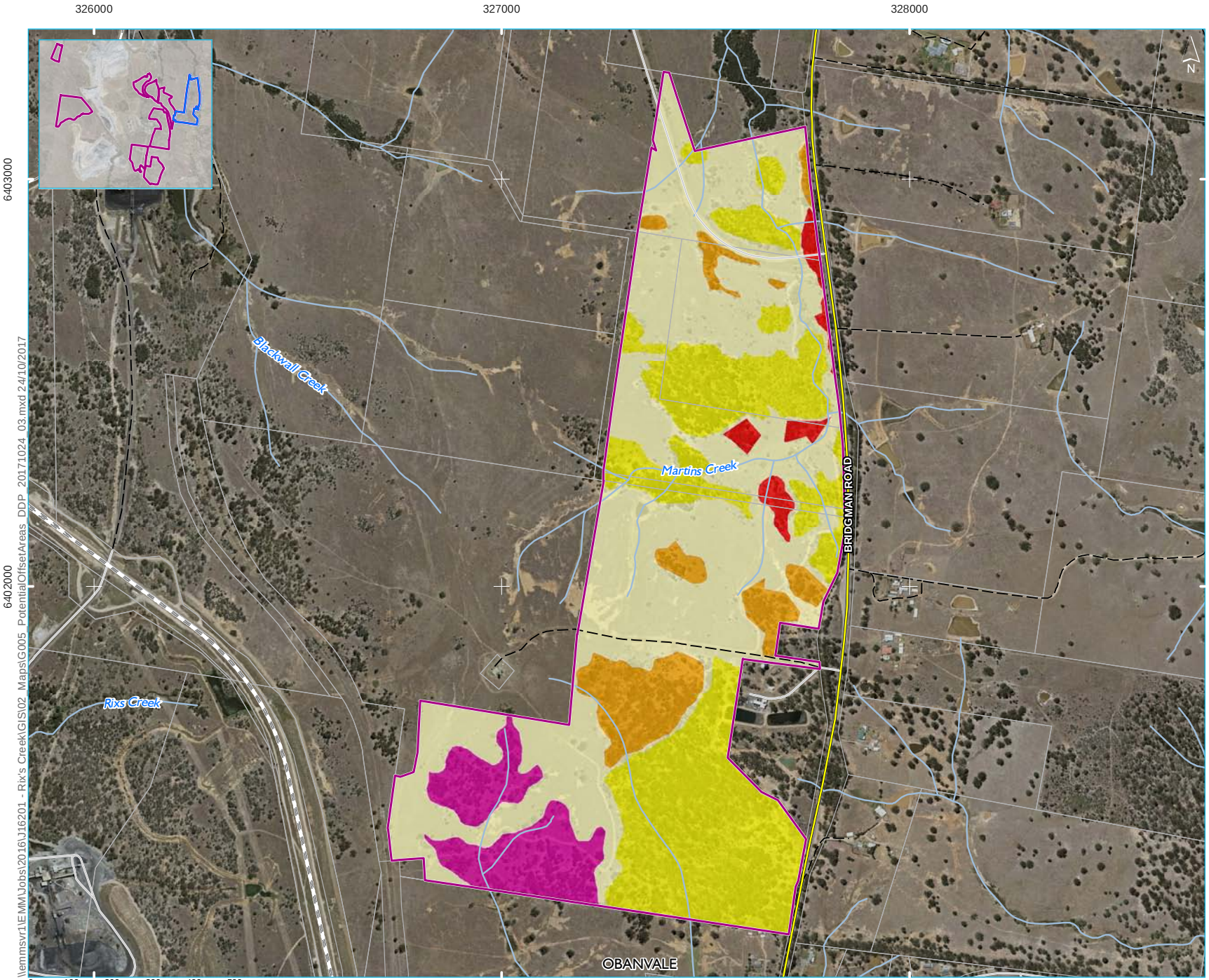
EMM

Source: EMM (2017); Rix's Creek (2017); LPMA (2011)

\\Emmsvr1\emm\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\E008 SurveyEffort 20171025 02.mxd 26/10/2017

Appendix G

Plant Community Types (PCTs) within the potential offset area



KEY

- Offset boundary
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse / drainage line
- Cadastral boundary

Plant community type (EMM, 2017)

- 1598 - Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good
- 1600 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter - Moderate/good
- 1601 - Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good_derived grassland
- 1601 - Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good
- 1748 - Grey Box grassy open forest of the Central and Lower Hunter Valley - Moderate/good

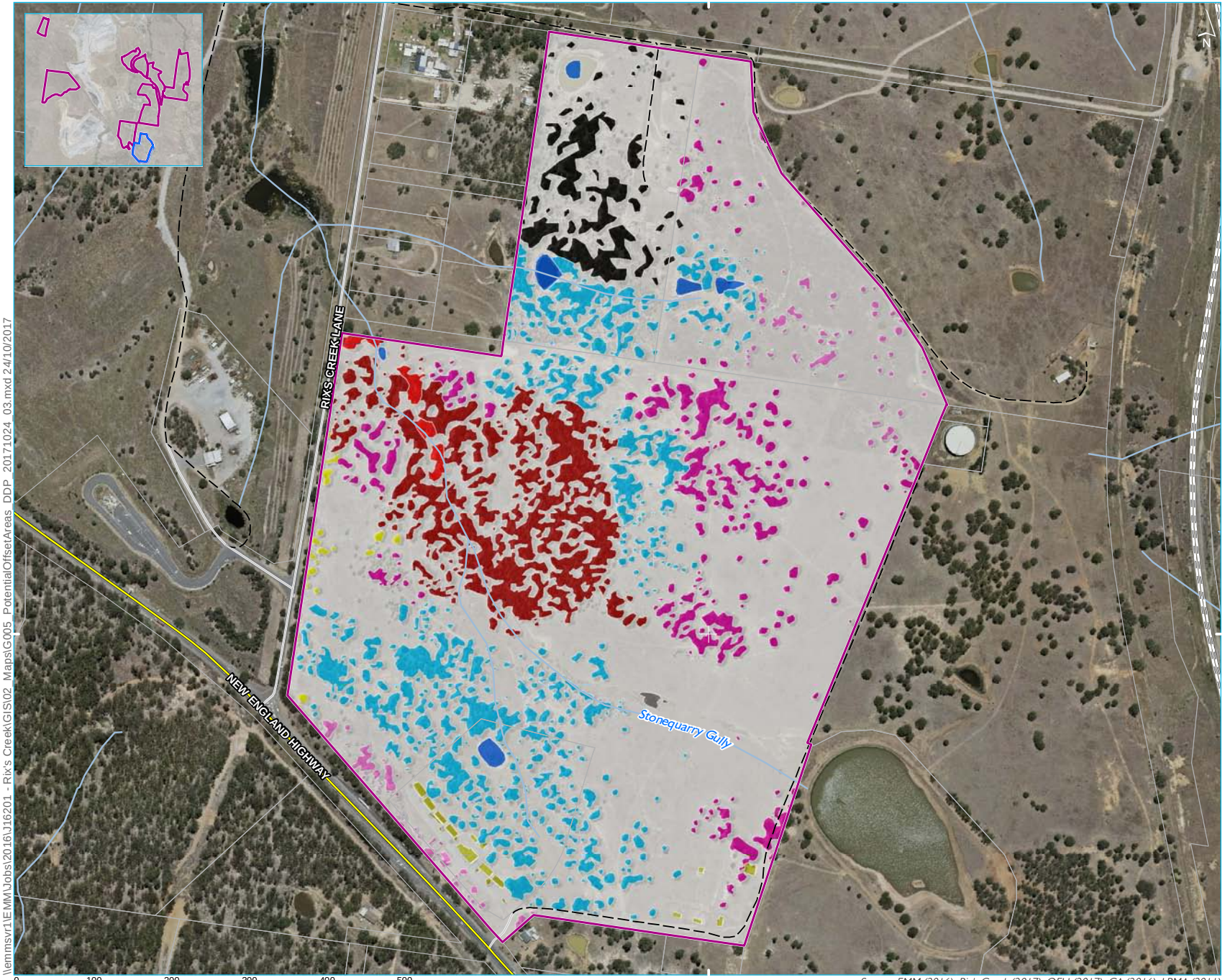
Source: EMM (2016); Rix's Creek (2017); OEH (2017); GA (2016); LPMA (2011)

Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1a

EMM

326000



6399000

\\emmsvr1\EMM\Jobs\2016\J16201 - Rix's Creek\GIS\02 Maps\G005 PotentialOffsetAreas DDP 20171024 03.mxd 24/10/2017

KEY

- Offset boundary
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse / drainage line
- Cadastral boundary

Plant community type (Stephen Bell (East Coast Flora Survey))

- 1598 - Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good
- 1601 - Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good
- 1602 - Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter - Moderate/good
- 1605 - Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter - Moderate/good
- 1607 - Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter - Moderate/good
- 1748 - Grey Box grassy open forest of the Central and Lower Hunter Valley - Moderate/good
- Derived grassland
- Spiny Rush
- Yet to be assessed
- Cleared/rehabilitation
- Dam

0 100 200 300 400 500 m

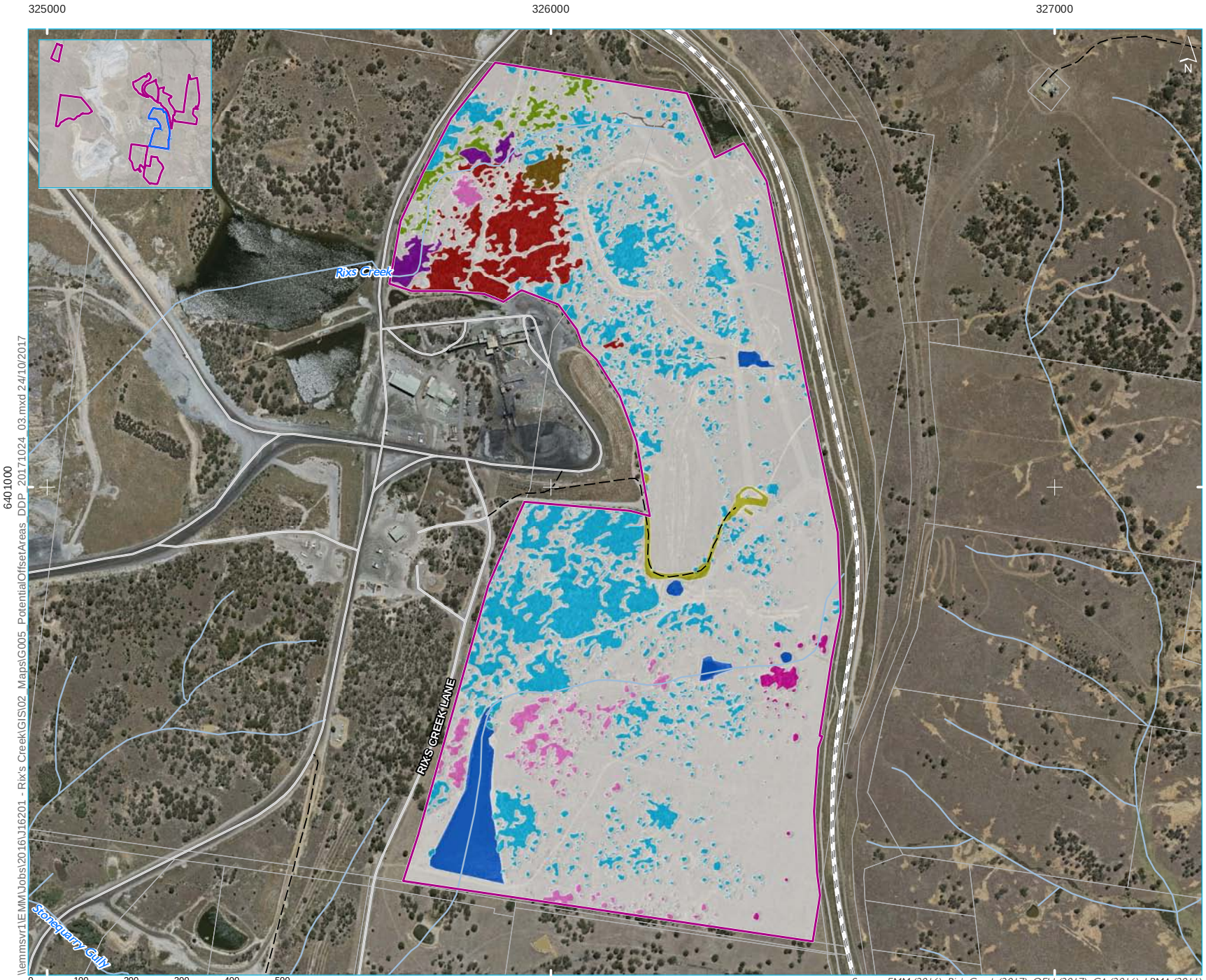
GDA 1994 MGA Zone 56 1:7,000

Source: EMM (2016); Rix's Creek (2017); OEH (2017); GA (2016); LPMA (2011)

Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1b

EMM

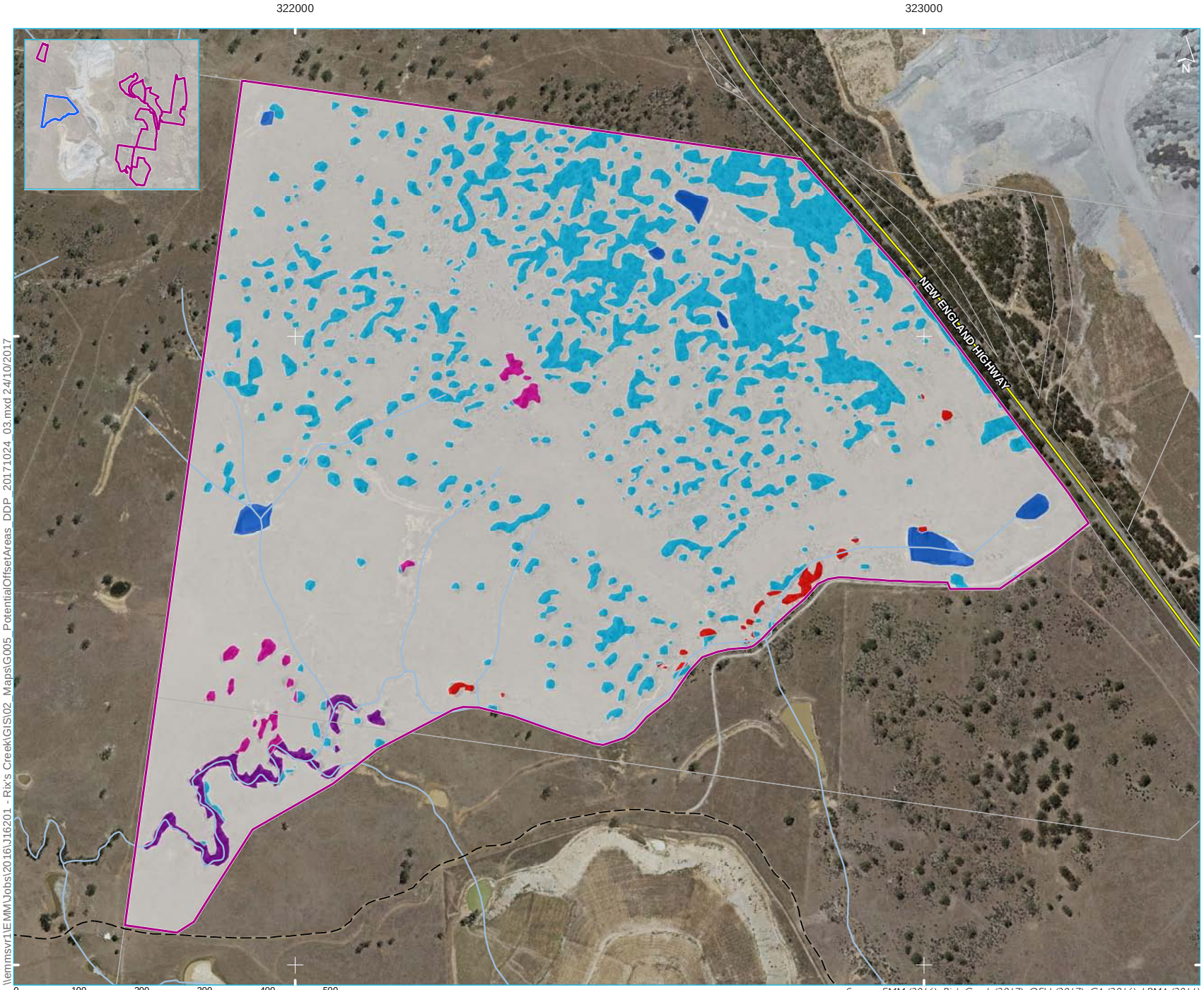


Source: EMM (2016); Rix's Creek (2017); OEH (2017); GA (2016); LPMA (2011)

Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1c

EMM



Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1d

EMM

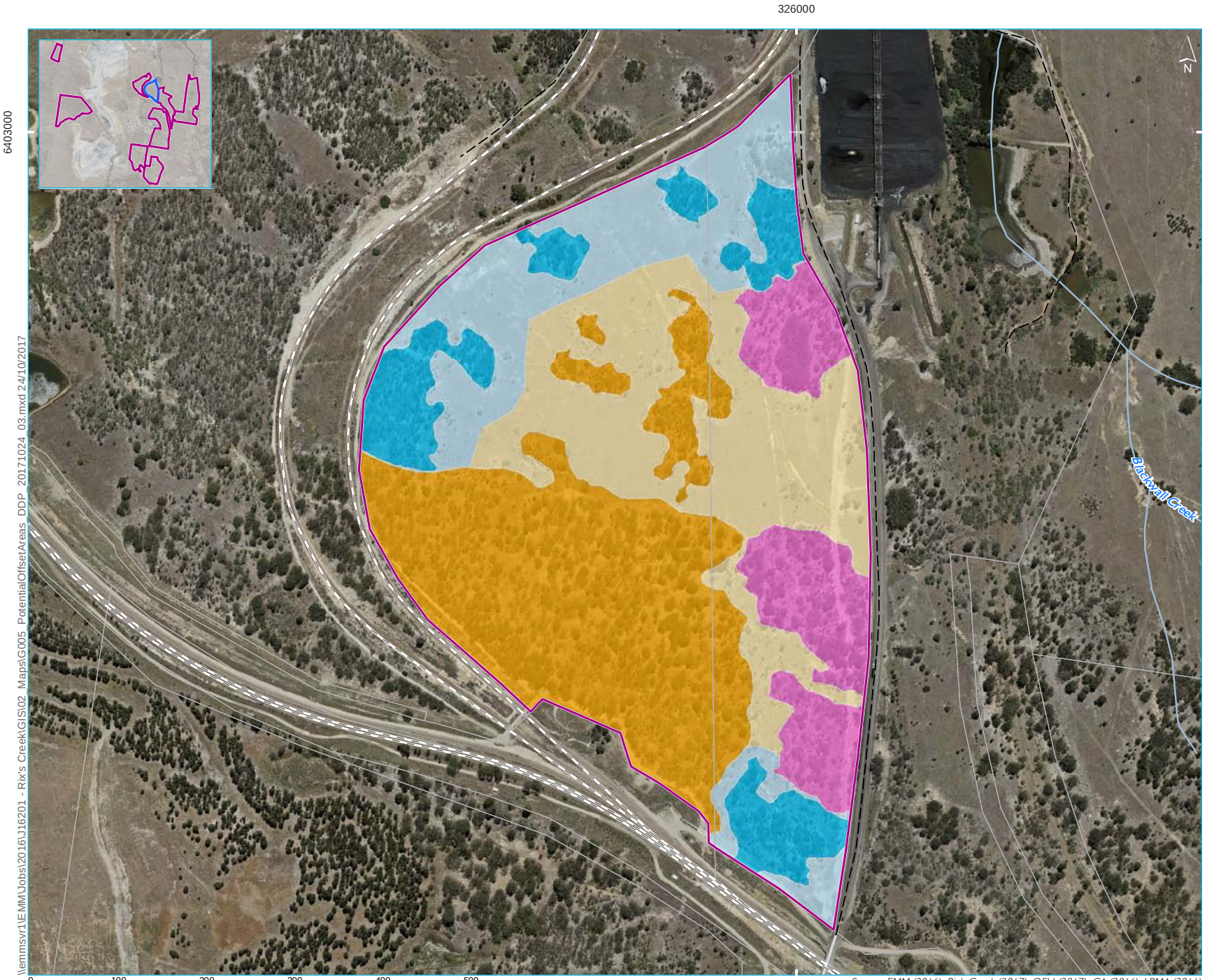
Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1e

EMM

Plant community types (PCT) within potential offset areas for RCCP

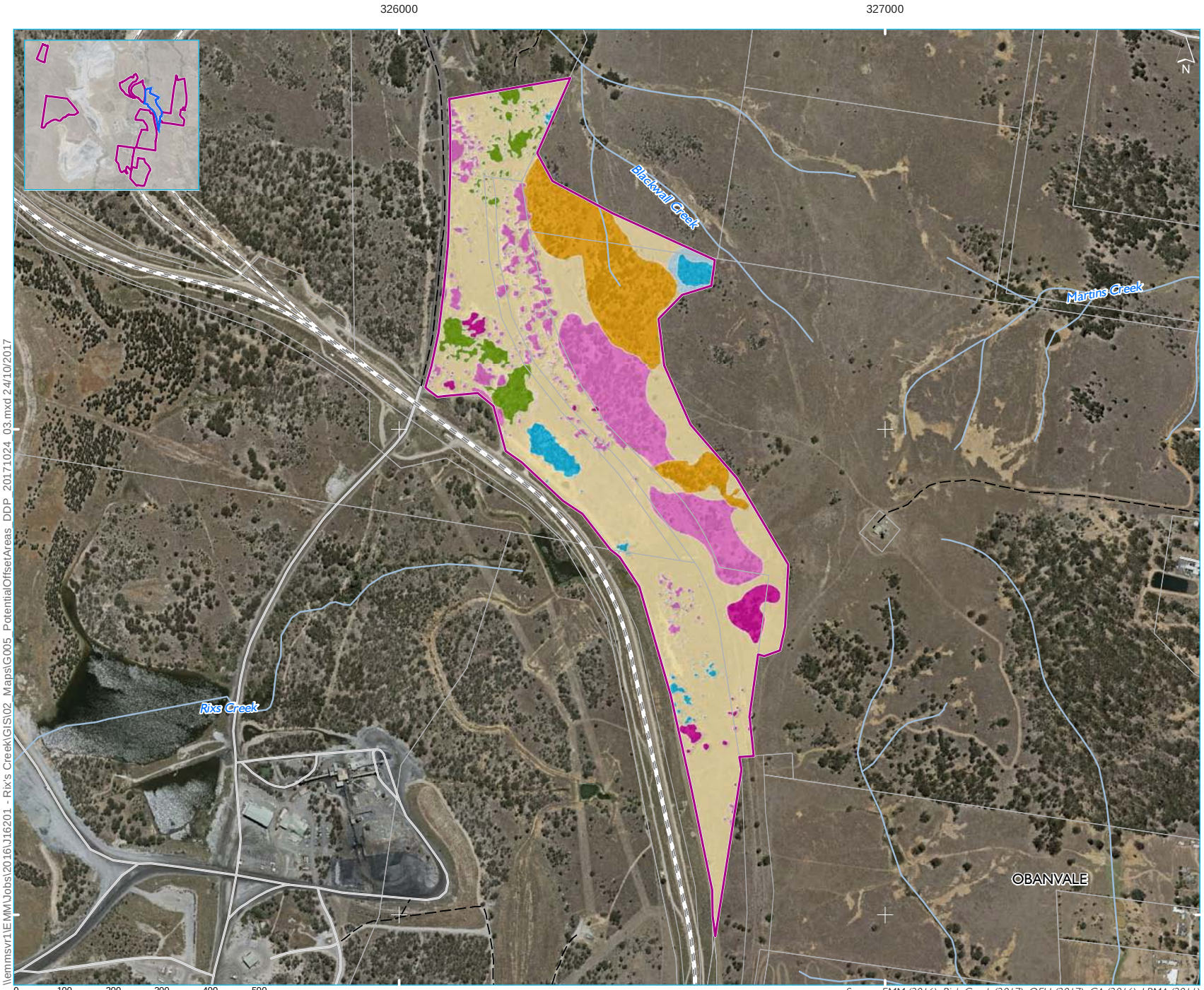
Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1f



Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1g

EMM



Source: EMM (2016); Rix's Creek (2017); OEH (2017); GA (2016); LPMA (2011)

Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1h

EMM

Source: EMM (2016); Rix's Creek (2017); OEH (2017); GA (2016); LPMA (2011)

Plant community types (PCT) within potential offset areas for RCCP

Rix's Creek Continuation Project
Response to Submissions - Biodiversity
Figure G.1i

EMM

Appendix H

PCT areas and credit estimates within potential offset areas

Offset area identification	3		5		7		9		10		15		16		17		18		Total	Total
Area of PCT/ (ha) and corresponding credits generated (x 9.5)	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**
1106 - River Oak riparian woodland of the NSW North Coast Bioregion and northern Sydney Basin Bioregion - Moderate/good	-	-	-	-	-	-	-	-	0.40	3.79	-	-	-	-	-	-	-	-	**0.40**	**3.79**
1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good	2.49	23.68	0.26	2.47	-	-	0.43	4.12	-	-	-	-	-	-	-	-	8.49	80.62	**11.67**	**110.89**
1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter - Moderate/good_derived grassland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.91	236.68	**24.91**	**236.68**
1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter - Moderate/good	9.72	92.38	-	-	-	-	-	-	-	-	-	-	12.00	114.02	6.55	62.23	-	-	**28.28**	**268.64**
1600 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter - Moderate/good_Derived grassland	-	-	-	-	-	-	-	-	-	-	-	-	8.31	78.94	28.60	271.71	-	-	**36.91**	**350.66**
1601 Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good	36.46	346.42	0.14	1.33	-	-	-	-	-	-	2.28	21.61	-	-	-	-	-	-	**38.88**	**369.36**
1601 Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub – grass open forest of the central and lower Hunter - Moderate/good_derived grassland	57.15	542.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**57.15**	**542.96**
1602 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter - Moderate/good	-	-	0.56	5.32	1.99	18.93	-	-	-	-	-	-	4.21	40.01	8.22	78.07	-	-	**14.98**	**142.33**
1603 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter - Moderate/good	-	-	-	-	-	-	-	-	9.92	94.23	16.01	152.09	-	-	-	-	10.81	102.65	**36.73**	**348.97**
1603 Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter - Moderate/good_derived grassland	-	-	-	-	-	-	-	-	10.18	96.72	10.48	99.55	-	-	-	-	-	-	**20.66**	**196.27**

Offset area identification	3		5		7		9		10		15		16		17		18		Total	Total
Area of PCT/ (ha) and corresponding credits generated (x 9.5)	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**	**Area**	**Credits**
1607 Blakelys Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter - Moderate/good	-	-	4.59	43.61	3.90	37.09	-	-	-	-	-	-	-	-	-	-	-	-	**8.49**	**80.70**
1692 Bull Oak grassy woodland of the central Hunter Valley - Moderate/good	-	-	-	-	0.45	4.25	-	-	-	-	-	-	-	-	-	-	-	-	**0.45**	**4.25**
1696 Blakelys Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter - Moderate/good	-	-	-	-	1.15	10.93	-	-	-	-	-	-	-	-	2.01	19.12	-	-	**3.16**	**30.05**
1731 Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley - Moderate/good	-	-	-	-	0.80	7.64	1.11	10.57	-	-	-	-	-	-	-	-	-	-	**1.92**	**18.21**
1748 Grey Box grassy open forest of the Central and Lower Hunter Valley - Moderate/good	9.78	92.93	2.61	24.80	0.45	4.31	0.60	5.74	-	-	-	-	-	-	1.11	10.58	-	-	**14.56**	**138.35**
Derived grassland	-	-	47.76	453.73	73.16	695.00	93.06	884.08	-	-	-	-	-	-	-	-	-	-	**213.98**	**2032.82**
Total area (ha)/Total credits per offset site	**118.62**	**1098.37**	**60.92**	**536.25**	**88.91**	**785.16**	**104.21**	**913.51**	**30.50**	**204.74**	**43.76**	**288.25**	**40.52**	**248.98**	**63.50**	**458.72**	**62.20**	**437.95**	**594.47**	**5647.44**

Appendix I

Biodiversity Offset Payment Calculator

Search undertaken on 19 October 2017

Biodiversity Offset Payment Calculator

Version: 1.1.0.00
Last updated: 21/09/2017 16:00

Credit Offset Payment Calculator | Payments

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price per credit	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Hunter	**1692 -** Bull Oak grassy woodland of the central Hunter Valley ***Warning: This PCT has NO trades recorded***	$1,155.78	0.3658967	4.436469	25.00%	$20.00	1.0000	$1,414.25	4	$5,656.99
Hunter	**1748 -** Grey Box grassy open forest of the Central and Lower Hunter Valley ***Warning: This PCT has NO trades recorded***	$1,155.78	0.3658967	4.436469	25.00%	$20.00	1.0000	$1,414.25	27	$38,184.69
Hunter	**1598 -** Forest Red Gum grassy open forest on floodplains of the lower Hunter ***Warning: This PCT has NO trades recorded***	$1,155.78	0.3658967	4.436469	25.00%	$20.00	1.0000	$1,414.25	12.47	$17,635.67
Hunter	**1605 -** Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter ***Warning: This PCT has NO trades recorded***	$1,155.78	0.3658967	4.436469	25.00%	$20.00	1.0000	$1,414.25	5411.64	$7,653,399.44
Hunter	**1603 -** Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter ***Warning: This PCT has NO trades recorded***	$1,155.78	0.3658967	4.436469	25.00%	$20.00	1.0000	$1,414.25	1	$1,414.25
									Subtotal (excl. GST)	**$7,716,291.04**
									GST	**$771,629.10**
									Total ecosystem credits (incl. GST)	**$8,487,920.14**

Search undertaken on 28 February 2018

Biodiversity Offset Payment Calculator

Version: 1.3.0.00
Last updated: 22/02/2018 16:00

Credit Offset Payment Calculator | Payments

Message!

If you would like to meet your offset obligation by making a payment to the Biodiversity Conservation Fund, please contact the BCT team at **bct@environment.nsw.gov.au**

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price per credit	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Hunter	**1598 -** Forest Red Gum grassy open forest on floodplains of the lower Hunter ***Warning: This PCT has NO trades recorded***	$1,363.56	0.1849704	5.88276373	22.50%	$20.00	1.0000	$1,690.36	13	$21,974.67
Hunter	**1692 -** Bull Oak grassy woodland of the central Hunter Valley ***Warning: This PCT has NO trades recorded***	$1,363.56	0.1849704	5.88276373	22.50%	$20.00	1.0000	$1,690.36	4	$6,761.44
Hunter	**1605 -** Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter ***Warning: This PCT has NO trades recorded***	$1,363.56	0.1849704	5.88276373	22.50%	$20.00	1.0000	$1,690.36	5763	$9,741,539.89
Hunter	**1748 -** Grey Box grassy open forest of the Central and Lower Hunter Valley ***Warning: This PCT has NO trades recorded***	$1,363.56	0.1849704	5.88276373	22.50%	$20.00	1.0000	$1,690.36	28	$47,330.06
									Subtotal (excl. GST)	**$9,817,606.06**
									GST	**$981,760.61**

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866