

Briefing Note

To: GHD/ARTC
From: Umwelt
Author: Ryan Parsons
Date: 03 December 2019
Subject: Revised Biodiversity Credit Requirements for Narrabri to North Star Section of the Inland Rail Project

Purpose

Subsequent to public exhibition of the EIS for the Narrabri to North Star proposal, ARTC has undertaken further investigations and design refinement.

As an outcome of these investigations, and to facilitate delivery of the Narrabri to North Star section of Inland Rail, ARTC has divided the Narrabri to North Star section into two phases:

- Phase 1 would consist of two sections of upgraded track and associated facilities, comprising:
 - about 93 kilometres between Narrabri and Alice Street, Moree
 - about 80 kilometres between Camurra North and North Star
- Phase 2 would consist of about 15 kilometres of upgraded track and associated facilities between Alice Street, Moree and Camurra North.

ARTC is currently seeking approval to undertake Phase 1, which is referred to as the 'preferred infrastructure' for the purposes of this document. Phase 2 would be subject to a separate approval process

The purpose of this briefing note is to document the revised biodiversity credit requirements of the preferred infrastructure.

Definitions

For the purposes of this briefing note the following definitions are used:

- **Development Footprint** – The Development Footprint is defined as the total construction impact zone which incorporates both permanent and temporary disturbance. In the Environmental Impact Statement (EIS) this was equivalent to the proposal site plus additional assessment areas (refer to section 2.2.2 of the EIS).
- **Revised Development Footprint** - In developing the preferred infrastructure ARTC has considered learnings from the Parkes to Narromine project, and expanded the potential construction footprint beyond the proposal site and additional assessment areas defined in the EIS, to allow for ancillary works including fence relocations, signalling upgrades, utilities relocation and the provision of a rail maintenance access road. The inclusion of these additional

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areas has increased the potential construction footprint for the preferred infrastructure compared with the proposal footprint presented in the EIS. The revised development footprint is equivalent to the construction footprint for the preferred infrastructure. The Revised Development Footprint for the preferred infrastructure was provided by ARTC on 28 August 2019.

Outcomes/Key messages

As a result of the Revised Development Footprint, the biodiversity credit requirements for the preferred infrastructure include:

- 45,502 species credits for the koala, finger panic grass, creeping tick-trefoil and Belsons panic
- 42,861 ecosystem credits for 10 vegetation zones

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1. Biodiversity Credit Reports

1.0 Background

Umwelt have updated the biodiversity credit requirements for the preferred infrastructure based on a Revised Development Footprint provided by ARTC (Refer to **Figures 1 to 7**, provided by GHD).

2.0 Methods

The Revised Development Footprint is approximately 2,436 hectares, which represents an increase of approximately 1,053 hectares which has not previously been surveyed or assessed compared to the original assessment presented in the BAR (Umwelt 2017). Umwelt have completed a desktop assessment to determine the additional impacts associated with the Revised Development Footprint on vegetation zones and species credit species. The following steps were undertaken as part of this desktop assessment:

- Desktop assessment to edge match vegetation communities to existing Umwelt mapping, including review of adjacent survey data, Aerial Photography Interpretation (API) and review of regional vegetation mapping (OEH 2015)
- Revised species polygon mapping based on the updated vegetation map.
 - Note that for the threatened grass species' finger panic grass (*Digitaria porrecta*) and Belsons panic (*Homopholis belsonii*) previously recorded in the Development Footprint as detailed in the Biodiversity Assessment Report (Umwelt 2017), species credits have been based on the delineation of a habitat area as opposed to the number of individuals recorded during surveys, due to the absence of targeted surveys across a large portion of the Revised Development Footprint. This methodology has been aligned with the current Biodiversity Assessment Method (BAM) which assesses these two species by area of habitat as opposed to the number of individuals.
 - The area of habitat assigned to each of the threatened grass species was based on a combination of the plant community types (PCTs) that each species was previously recorded in by Umwelt (2017) and a review of PCTs with which the species are associated in the Threatened Biodiversity Data Collection (TBDC) (accessed 11 September 2019).

The revised impacts were then entered into the BioBanking Credit Calculator to determine the revised biodiversity credit requirements.

- The landscape assessments in the existing assessments in the BioBanking Credit Calculator were used to determine the revised biodiversity credit requirements.

3.0 Revised Biodiversity Credits

Table 1 below details the proposed impacts to applicable species credit species and **Table 2** details the species credit requirements according to the original Biodiversity Assessment Report (BAR) (Umwelt 2017), BAR Addendum Report (Umwelt 2018), and the current Revised Development Footprint. The current Revised Development Footprint represents an increase in impacts and species credits for the koala, finger panic grass, creeping tick-trefoil and Belsons panic. The Revised Development Footprint results in an overall increase of 38,027 species credits when compared to the February 2019 – Revised Development Footprint (Umwelt 2019). Refer to **Attachment 1** for Final Credit Reports.

Table 1 - Number of Individuals or Area of Habitat for Species Credit Species according to the Biodiversity Assessment Report (Umwelt 2017), BAR Addendum Report (Umwelt 2018) and current Revised Development Footprint

| Common Name (scientific name) | BAR (Umwelt 2017) | BAR Addendum (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
|--|-------------------|----------------------------|--|
| Koala | 62.77 ha | 94.84 ha | 173.79 ha |
| finger panic grass (<i>Digitaria porrecta</i>) | 28 individuals | 28 individuals | 906 ha* (associated with zones 1, 2, 3, 4, 5, 6) |
| creeping tick-trefoil (<i>Desmodium campylocaulon</i>) | 237 ha | 280 ha | 497 ha |
| Belsons panic (<i>Homopholis belsonii</i>) | 73 individuals | 73 individuals | 913 ha* (associated with zones 1, 2, 4, 5, 6, 7,9) |

*Revised calculations based on area of habitat in the absence of targeted surveys.

Table 2 - Species Credits Generated according to the Biodiversity Assessment Report (Umwelt 2017), BAR Addendum Report (Umwelt 2018) current Revised Development Footprint

| Common Name (scientific name) | BAR (Umwelt 2017) | BAR Addendum (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
|--|-------------------|----------------------------|--|
| Koala | 1,632 | 2,466 | 4,519 |
| finger panic grass (<i>Digitaria porrecta</i>) | 364 | 364 | 11,778 |
| creeping tick-trefoil (<i>Desmodium campylocaulon</i>) | 2,607 | 3,080 | 5,467 |
| Belsons panic (<i>Homopholis belsonii</i>) | 1,898 | 1,898 | 23,738 |
| Total | 6,501 | 7,808 | 45,502 |

Table 3 below details the proposed impacts to vegetation zones and **Table 4** details the ecosystem credit requirements according to the original Biodiversity Assessment Report (BAR) (Umwelt 2017), BAR Addendum Report (Umwelt 2018) and the current Revised Development Footprint. The current Revised Development Footprint represents an increase in impacts and ecosystem credits for all vegetation zones. Refer to **Attachment 1** for Final Credit Reports.

Table 3 - Vegetation Zone Area according to Biodiversity Assessment Report (Umwelt 2017), BAR Addendum Report (Umwelt 2018), February 2019 – Revised Development Footprint (Umwelt 2019) and current Revised Development Footprint

| Vegetation Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Extent of BC Act and EPBC Act listed communities associated with each vegetation zone within the Revised Development Footprint | Area in Development Footprint (ha) | | |
|-----------------|--|------------------|--|------------------------------------|----------------------------|--|
| | | | | BAR (Umwelt 2017) | BAR Addendum (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 1 | PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion | Moderate to Good | 19.1 ha of <i>Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions</i> EEC listed under the BC Act to be impacted 10.78 ha of <i>Weeping Myall Woodlands</i> EEC listed under the EPBC Act (the remaining portion of zone 1 does not meet the EPBC listing criteria – subject to field verification) | 6.95 | 7.26 | 19.10 |
| 2 | PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gillgated clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion | Moderate to Good | 19.13 ha of <i>Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions</i> EEC listed under the BC Act to be impacted (note that a small 0.1 ha patch of vegetation zone 2 is not considered to conform to the EEC given the heavily disturbed condition) 19.13 ha of <i>Brigalow (Acacia harpophylla dominant and codominant)</i> EEC listed under the EPBC Act (the remaining portion of zone 2 does not meet the EPBC listing criteria) | 4.75 | 4.85 | 19.23 |

| Vegetation Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Extent of BC Act and EPBC Act listed communities associated with each vegetation zone within the Revised Development Footprint | Area in Development Footprint (ha) | | |
|-----------------|---|---|---|------------------------------------|----------------------------|--|
| | | | | BAR (Umwelt 2017) | BAR Addendum (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 3 | PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion | Moderate to Good | 1.74 ha of <i>Coolbah - Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain and Mulga Lands Bioregions</i> EEC listed under the BC Act to be impacted 1.74 ha of <i>Coolbah – Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregion</i> EEC under the EPBC Act to be impacted | 1.19 | 1.19 | 1.74 |
| 4 | PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion | Moderate to Good_Natural Grassland | Not listed under the BC Act 497.10 ha of <i>Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD</i> CEEC listed under the EPBC Act | 268.64 | 279.94 | 497.10 |
| 5 | PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | Moderate to Good | Not listed under the BC Act This vegetation zone (or portions of) is likely to conform to the <i>Poplar Box Grassy Woodland on Alluvial Plains</i> EEC under the EPBC Act which was recently listed on 4 July 2019. | 71.95 | 73.21 | 140.38 |
| 6 | PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | Moderate to Good_Derived Native Grassland | Not listed under the BC Act Portions of this vegetation zone (between woodland patches) are likely to conform to the <i>Poplar Box Grassy Woodland on Alluvial Plains</i> EEC under the EPBC Act which was recently listed on 4 July 2019. | 108.20 | 111.65 | 228.11 |

| Vegetation Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Extent of BC Act and EPBC Act listed communities associated with each vegetation zone within the Revised Development Footprint | Area in Development Footprint (ha) | | |
|-----------------|--|------------------|---|------------------------------------|----------------------------|--|
| | | | | BAR (Umwelt 2017) | BAR Addendum (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 7 | PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion | Moderate to Good | 0.51 ha of Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions EEC listed under the BC Act to be impacted Not listed the EPBC Act | 0.04 | 0.04 | 0.51 |
| 8 | PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion | Moderate to Good | Not listed | 14.70 | 14.91 | 11.75 |
| 9 | PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion | Moderate to Good | Not listed | 3.79 | 4.13 | 8.16 |
| 10 | PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion | Moderate to Good | Not listed | 2.59 | 2.59 | 5.66 |
| | Cleared/Non-native vegetation | - | - | 1,080.44 | 1063.48 | 1503.74 |
| Total | | | | 1,563.25 | 1,563.25 | 2,435.48 |

Table 4 - Ecosystem Credits Generated in Biodiversity Assessment Report (Umwelt 2017), BAR Addendum Report (Umwelt 2018) and current Revised Development Footprint

| Veg Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Ecosystem Credits Generated | | |
|----------|--|------------------------------------|-----------------------------|-----------------------------------|--|
| | | | BAR (Umwelt 2017) | BAR Addendum Report (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 1 | PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion | Moderate to Good | 254 | 365 | 959 |
| 2 | PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaled clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion | Moderate to Good | 250 | 343 | 1,358 |
| 3 | PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion | Moderate to Good | 63 | 63 | 93 |
| 4 | PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion | Moderate to Good_Natural Grassland | 11,046 | 13,025 | 23,128 |

| Veg Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Ecosystem Credits Generated | | |
|----------|--|----------------------|-----------------------------|-----------------------------------|--|
| | | | BAR (Umwelt 2017) | BAR Addendum Report (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 5 | PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | Moderate to Good | 3,386 | 4,501 | 8,631 |
| 6 | PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | Moderate to Good_DNG | 2,917 | 3,706 | 7,573 |
| 7 | PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion | Moderate to Good | 2 | 2 | 23 |
| 8 | PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion | Moderate to Good | 675 | 689 | 545 |
| 9 | PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion | Moderate to Good | 133 | 153 | 304 |

| Veg Zone | PCT ID (BVT IDs) and PCT Name | Condition Class | Ecosystem Credits Generated | | |
|--------------|--|------------------|-----------------------------|-----------------------------------|--|
| | | | BAR (Umwelt 2017) | BAR Addendum Report (Umwelt 2018) | Revised Development Footprint (Current Assessment) |
| 10 | PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion | Moderate to Good | 100 | 113 | 247 |
| | Cleared/Non-native vegetation | - | 0 | 0 | 0 |
| Total | | | 18,826 | 22,960 | 42,861 |

4.0 Recommended Mitigation Measures

Further to the mitigation measures detailed in Section 4.2 of the Biodiversity Assessment Report (Umwelt 2017), the following mitigation measures are recommended:

- The portions of the Revised Development Footprint previously not subject to surveys or assessment will be verified through field surveys before construction. These surveys will be undertaken in accordance with the requirements of the Framework for Biodiversity Assessment and the biodiversity credits required for the final Development Footprint recalculated based on the results of these surveys.
- Further detailed design to consider native vegetation and significant ecological entities, including threatened ecological communities and threatened species habitat, to avoid and minimise ecological impacts where possible.

5.0 Assessment Limitations and Assumptions

A number of limitations are associated with this assessment of the biodiversity credit requirements for the current Revised Development Footprint, including:

- Based on timing and seasonal constraints approximately 1,053 hectares of the Revised Development Footprint has not been surveyed and identification of impact credits is based on a desktop assessment. Surveys and assessments in accordance with the FBA are recommended prior to construction to refine and update the biodiversity credit liability.
 - The 1,053 hectares of Revised Development Footprint that has not been surveyed or assessed comprises:
 - Approximately 463 hectares of native vegetation (349 hectares of grassland and 114 hectares of woodland)
 - Approximately 590 hectares of cleared land (including cropped land, roads, infrastructure etc.)
- The desktop assessment has assumed presence of threatened species credit species that have previously been recorded as part of targeted surveys of the development footprint (Umwelt 2017), including the koala, finger panic grass (*Digitaria porrecta*), creeping tick-trefoil (*Desmodium campylocaulon*) and Belsons panic (*Homopholis belsonii*), in accordance with Section 6.5 of the FBA.
- Mapping of species polygons for threatened grasses, finger panic grass (*Digitaria porrecta*) and Belsons panic (*Homopholis belsonii*), is based on habitat area according to PCTs where these species have previously been recorded as well as those PCTs that are identified as being associated with the threatened grasses according to the Threatened Biodiversity Data Collection. The species credits have been based on the delineation of habitat area as opposed to the number of individuals recorded (standard approach under FBA). Targeted surveys for these species are expected to substantially reduce the credit liability.
- Conservative approach applied to vegetation mapping, particularly for native grassland areas. Any areas that may constitute native grassland have been mapped as such based on aerial photography interpretation (API), the latest regional vegetational mapping (OEH 2015 – Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping) and adjacent survey effort.

- Vegetation zones have been assumed to constitute relevant threatened ecological communities (TECs), where necessary the desktop assessment has assumed condition thresholds and key diagnostics are met.
- Existing plot/transect data collected in 2016 has been used to determine the site values and ecosystem credits for vegetation zones within the Revised Development Footprint. These plots/transects are assumed to be representative of the vegetation zones mapped as part of desktop assessments. These surveys were conducted in 2016 before the current drought conditions and are considered to provide an acceptable representation of vegetation condition. It is worth noting that even with the expanded Revised Development Footprint, the minimum plots/transects required by the FBA have been met (exceeded in some cases) (refer to **Table 5**) based on the extent of surveys conducted by Umwelt in 2016. It is proposed that in early 2020 areas not previously surveyed will be ground-truthed by rapid vegetation assessments and where necessary (i.e. where new PCTs or vegetation zones are identified) additional plots/transects will be completed (refer to **Section 6.0**).

Table 5 Adequacy of Vegetation Survey in the Revised Development Site (as presented in the Submissions and Preferred Infrastructure Report)

| Veg Zone | PCT ID (BVT IDs) and PCT Name <i>Condition Class</i> | Area in the Revised Development Site (ha) | Number of Biometric Plots/Transects | |
|----------|--|---|-------------------------------------|--------------------------|
| | | | Required (FBA 2014) | Undertaken During Survey |
| 1 | PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion <i>Moderate to Good</i> | 19.10 | 3 | 6 |
| 2 | PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion <i>Moderate to Good</i> | 19.23 | 3 | 3 |
| 3 | PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion <i>Moderate to Good</i> | 1.74 | 1 | 2 |
| 4 | PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion <i>Moderate to Good_Natural Grassland</i> | 497.10 | 7 | 15 |
| 5 | PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW <i>Moderate to Good</i> | 140.38 | 6 | 7 |
| 6 | PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW <i>Moderate to Good_DNG</i> | 228.11 | 6 | 7 |

| Veg Zone | PCT ID (BVT IDs) and PCT Name <i>Condition Class</i> | Area in the Revised Development Site (ha) | Number of Biometric Plots/Transects | |
|--------------|---|---|-------------------------------------|--------------------------|
| | | | Required (FBA 2014) | Undertaken During Survey |
| 7 | PCT71 (BR127, NA126) Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion <i>Moderate to Good</i> | 0.51 | 1 | 1 |
| 8 | PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion <i>Moderate to Good</i> | 11.75 | 3 | 4 |
| 9 | PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion <i>Moderate to Good</i> | 8.16 | 3 | 3 |
| 10 | PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion <i>Moderate to Good</i> | 5.66 | 3 | 3 |
| | Cleared/Non-native vegetation | 1503.74 | 0 | 3 |
| Total | | 2,435.48 | 36 | 54 |

6.0 Proposed Summer Survey Strategy

As discussed with DPIE at the meeting on 22 October 2019, ARTC proposes to complete additional field surveys of the areas previously not subject to surveys. The areas previously not surveyed occur immediately adjacent to the surveyed areas in the same or similar habitats types. As such, the desktop assessment is considered to be an accurate representation of biodiversity values. To confirm and further refine the vegetation mapping and threatened species habitat, the following survey strategy is proposed for January/February 2020 in areas not previously surveyed:

- Rapid vegetation assessments to ground-truth vegetation mapping, including confirmation of Biometric Vegetation Types (BVTs)/Plant Community Types (PCTs) and condition type. A conservative approach will be adopted given the current drought conditions, particularly for native grasslands.
- Should new PCTs or vegetation zones be identified, additional plots/transects in accordance with the FBA methodology will be completed.
- Habitat assessments for threatened fauna species will be undertaken and given the considerable amount of fauna surveys completed to date in the same or similar habitat types, species credits are proposed to only be generated for the koala in line with the Narrabri to North Star

Biodiversity Assessment Report (Umwelt, October 2017) and Addendum to the Inland Rail – Narrabri to North Star Biodiversity Assessment Report (Umwelt, October 2018).

- Targeted searches in suitable habitat will be conducted for threatened flora species identified in Table 2.3 of the Narrabri to North Star Biodiversity Assessment Report (Umwelt, October 2017) during January and February 2020. It is noted that the current drought conditions will limit these surveys for several species, and it is proposed for species previously recorded within the development footprint assumed presence is applied in suitable habitat, including finger panic grass (*Digitaria porrecta*), creeping tick-trefoil (*Desmodium campylocaulon*) and Belsons panic (*Homopholis belsonii*). An expert may be consulted for the threatened grass species to refine number of individuals or habitat area.
- Mapping of species polygons for threatened grasses, finger panic grass (*Digitaria porrecta*) and Belsons panic (*Homopholis belsonii*), is based on habitat area according to PCTs where these species have previously been recorded as well as those PCTs that are identified as being associated with the threatened grass according to the Threatened Biodiversity Data Collection. ARTC is seeking clarification from DPIE on an approach where credits for these species in areas previously surveyed are based on individuals (in accordance with the FBA) and in areas not previously surveyed based conservatively on area of habitat. The BioBanking Credit Calculator does not allow for this approach. This would substantially reduce the credit liability for these species.

7.0 References

Office of Environment and Heritage (OEH) (2015) Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping. NSW Office of Environment and Heritage, Sydney, Australia.

Umwelt (Australia) Pty Limited (Umwelt) (2017) Inland Rail – Narrabri to North Star Biodiversity Assessment Report. Report prepared on behalf of Australian Rail Track Corporation (ARTC), October 2017.

Umwelt (Australia) Pty Limited (Umwelt) (2018) Addendum to the Inland Rail – Narrabri to North Star Biodiversity Assessment Report. Report prepared on behalf of Australian Rail Track Corporation (ARTC), October 2018.

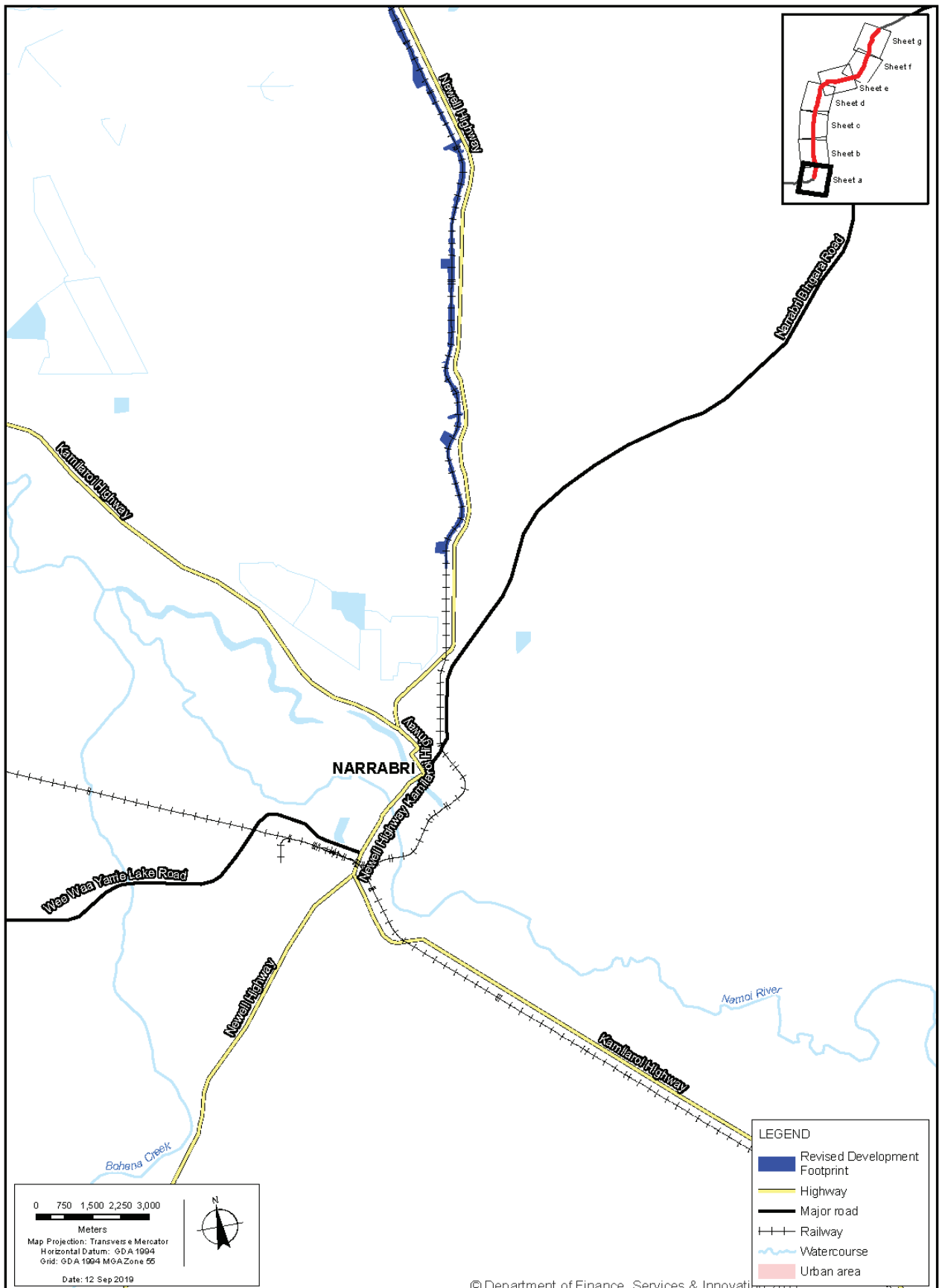


Figure 1
Revised Development Footprint

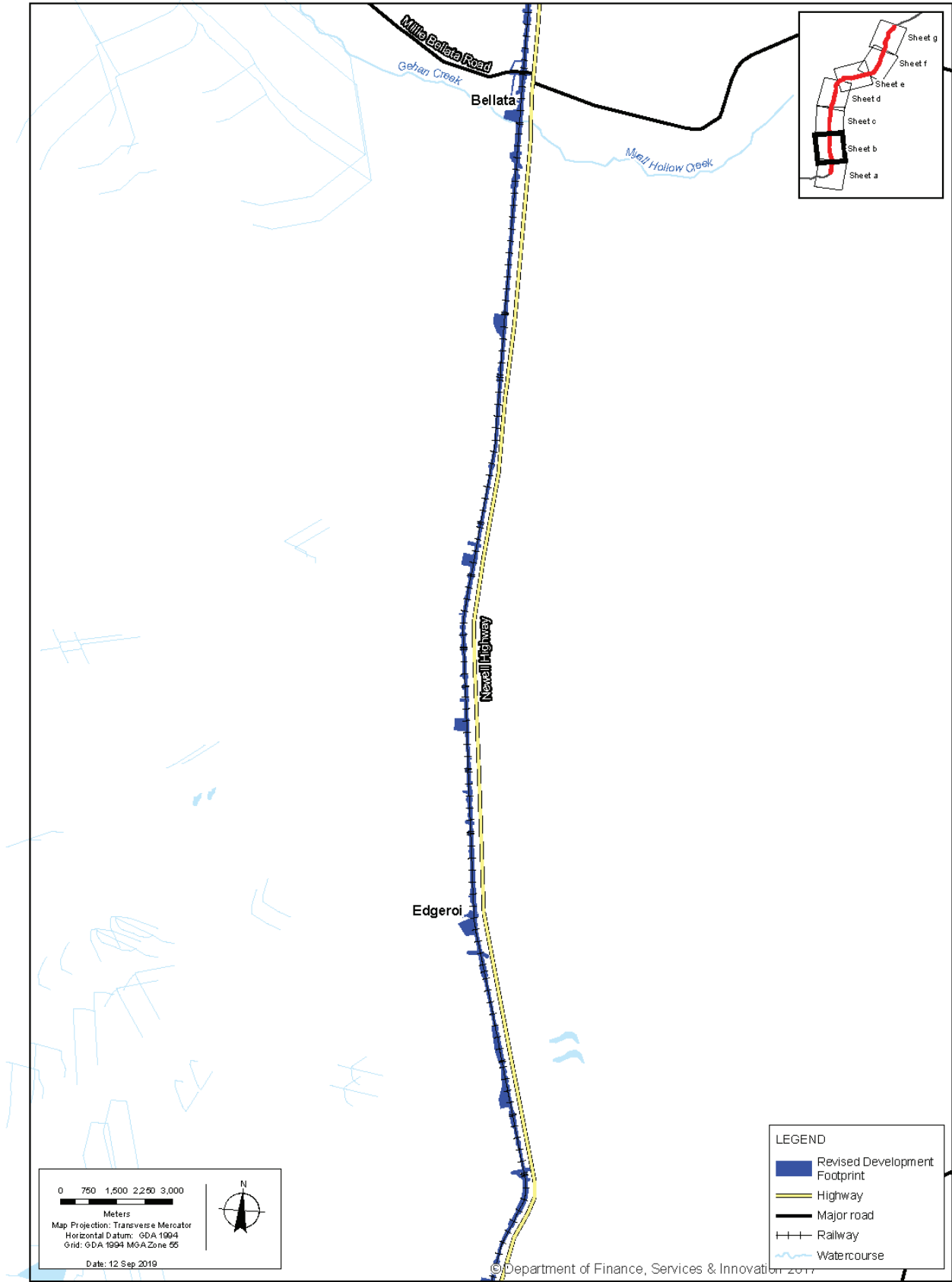


Figure 2
Revised Development Footprint

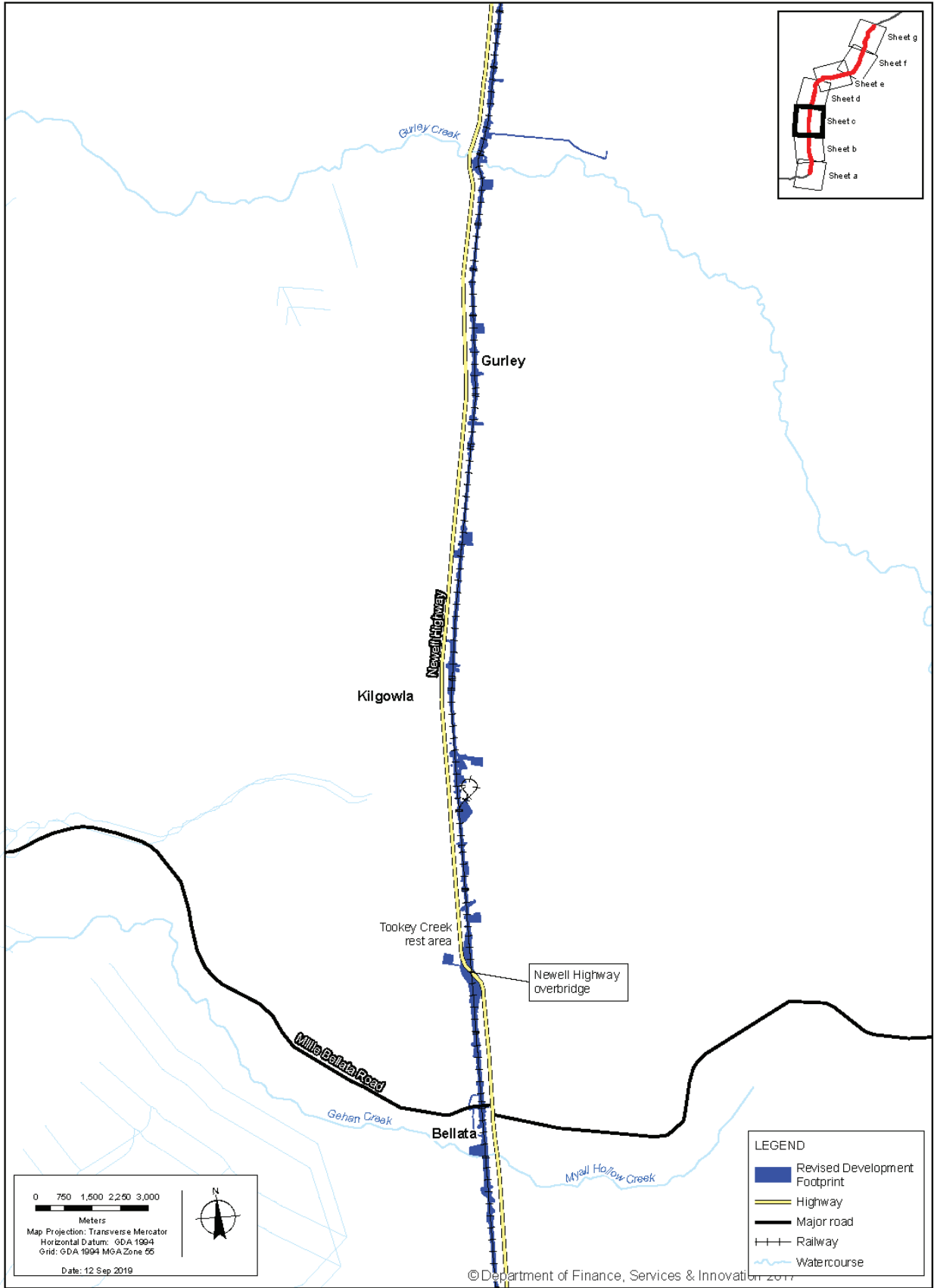


Figure 3
Revised Development Footprint

©:Z217916V6IS\Maps\Deliverables\N2N\SEIS\Submissions\PIR\Q217916_SPIR007_NN_S_Development\Footprint_0.mxd Data source: Commonwealth of Australia (Geoscience Australia), 250K Topographic Data Series 3, 2006. LPI, DCDB, 2012.

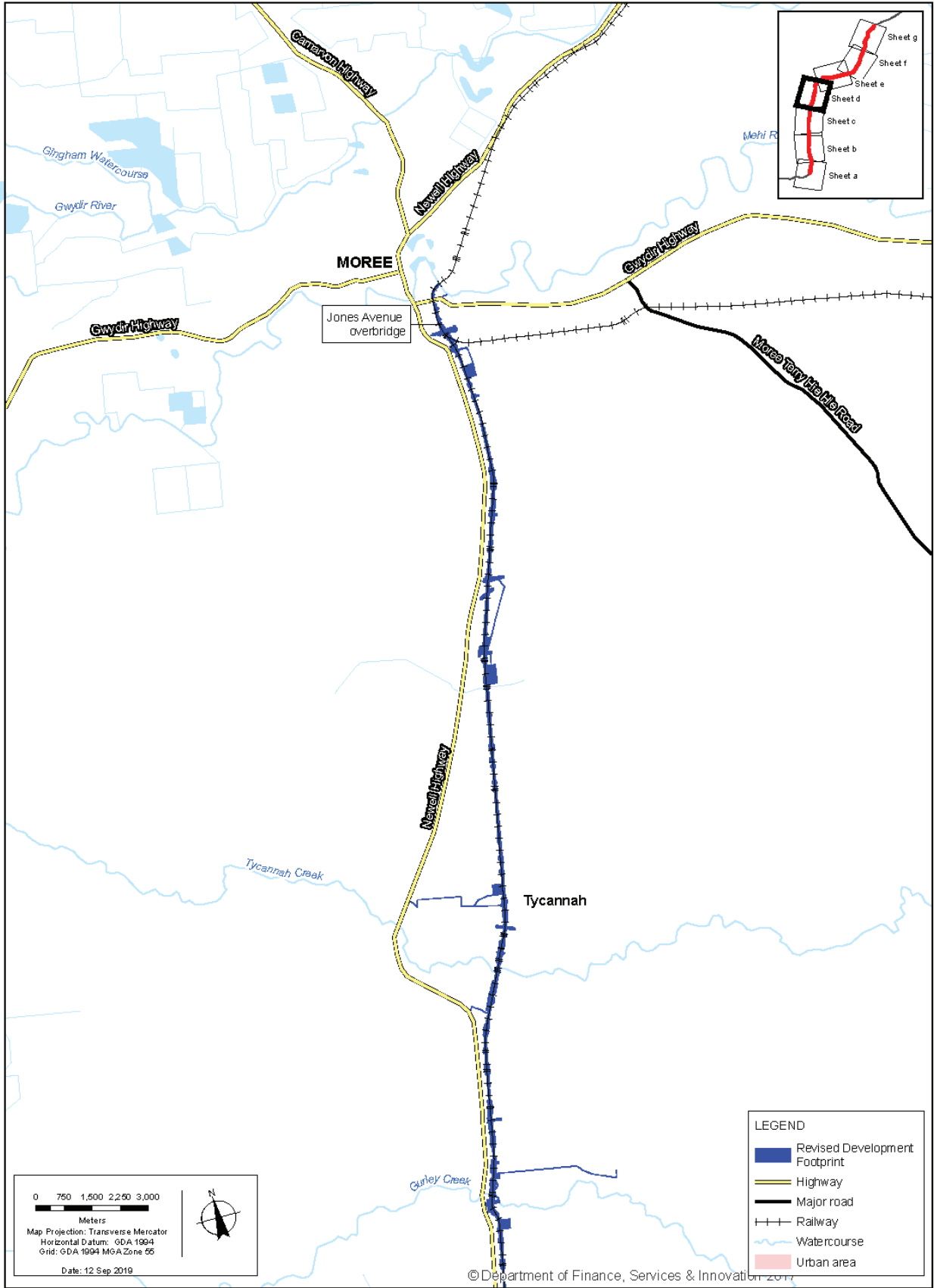


Figure 4
Revised Development Footprint

© 12/21/19 16:51 Maps\Deliverables\N2N SEIS\Submissions\PIR\2217916_SPIR007_NNS_Development\footprint_0.mxd data source: Commonwealth of Australia (Geoscience Australia), 250K Topographic Data Series 3, 2006. LPI, DCDB, 2012.

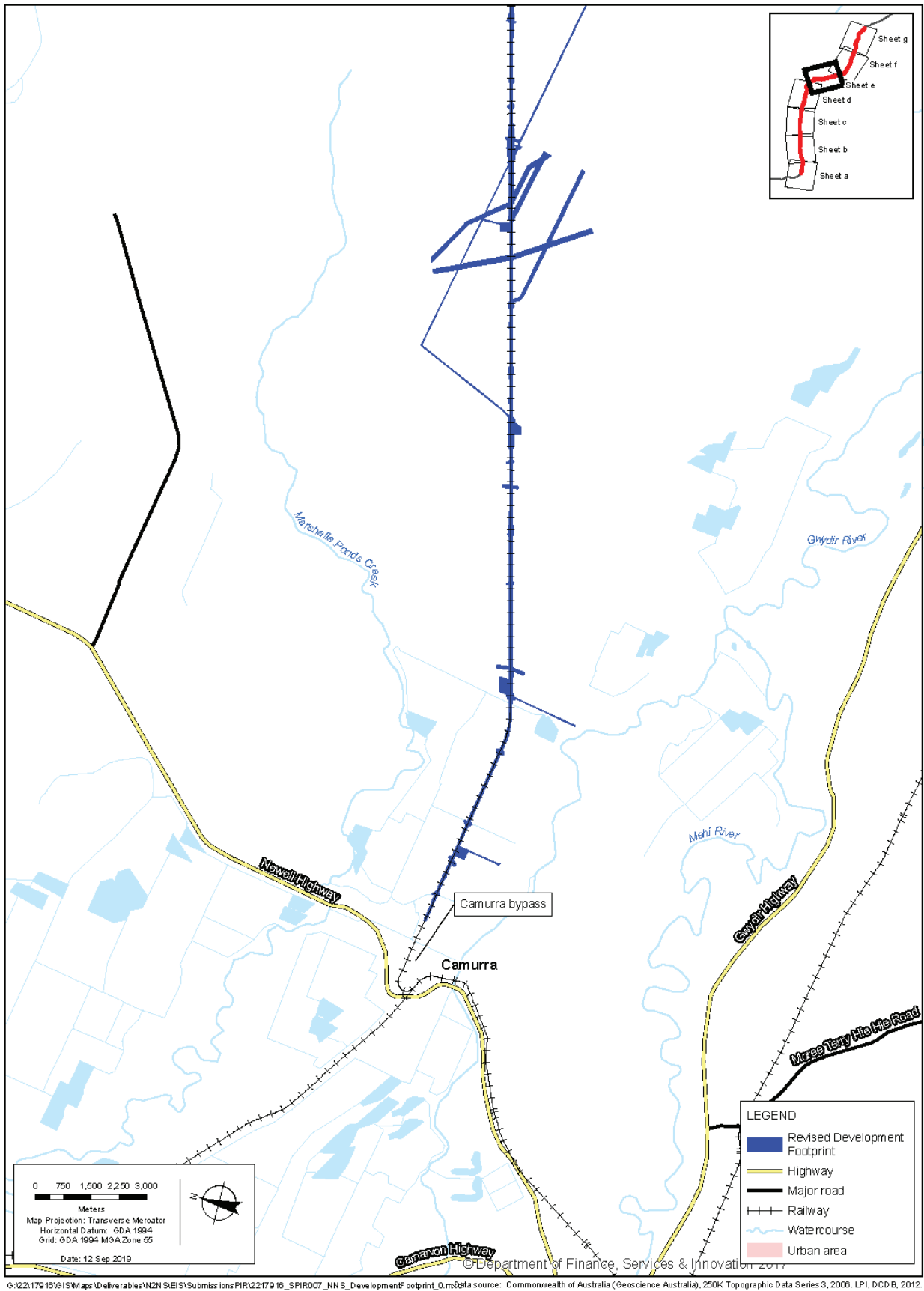


Figure 5
 Revised Development Footprint

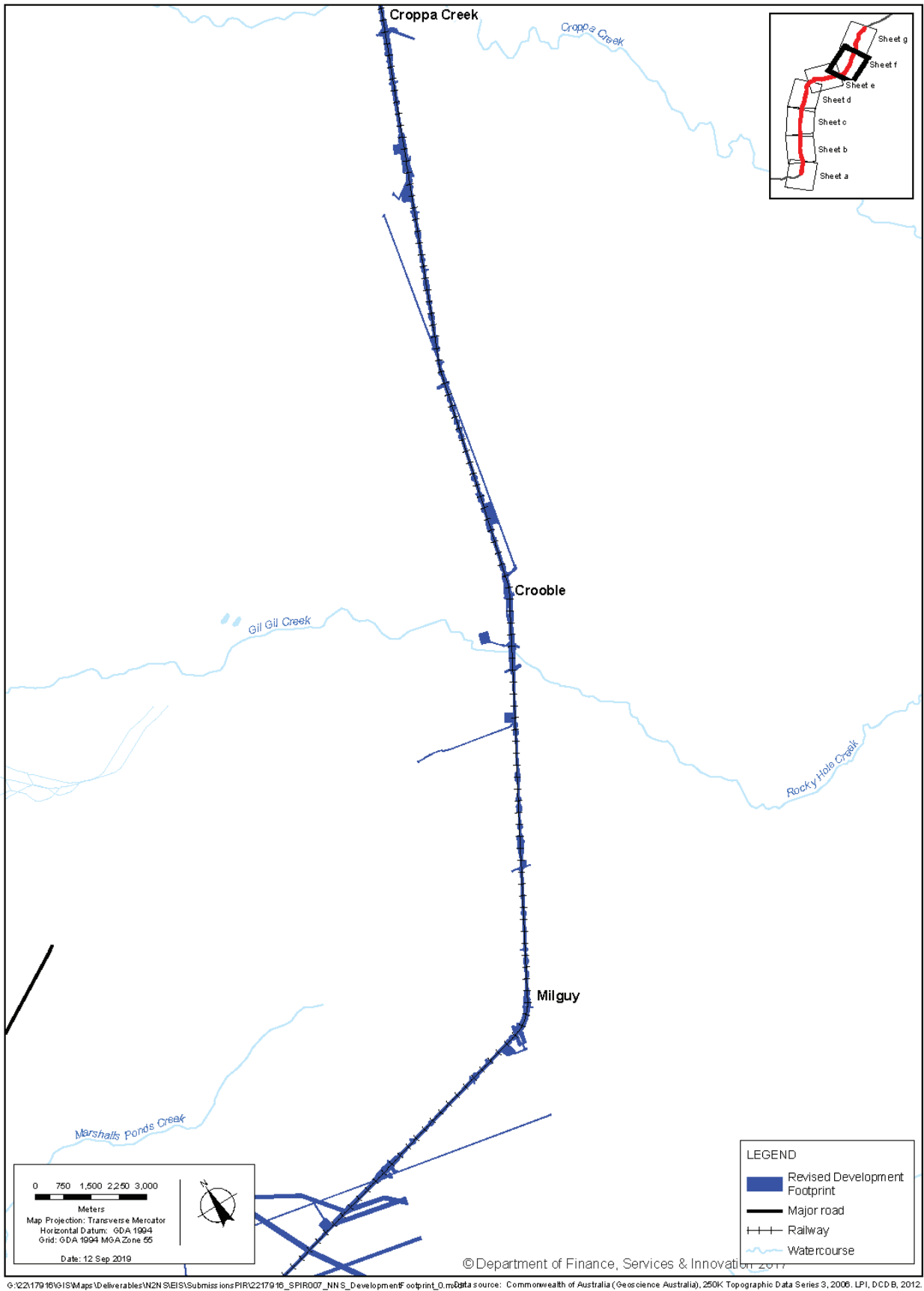


Figure 6
Revised Development Footprint

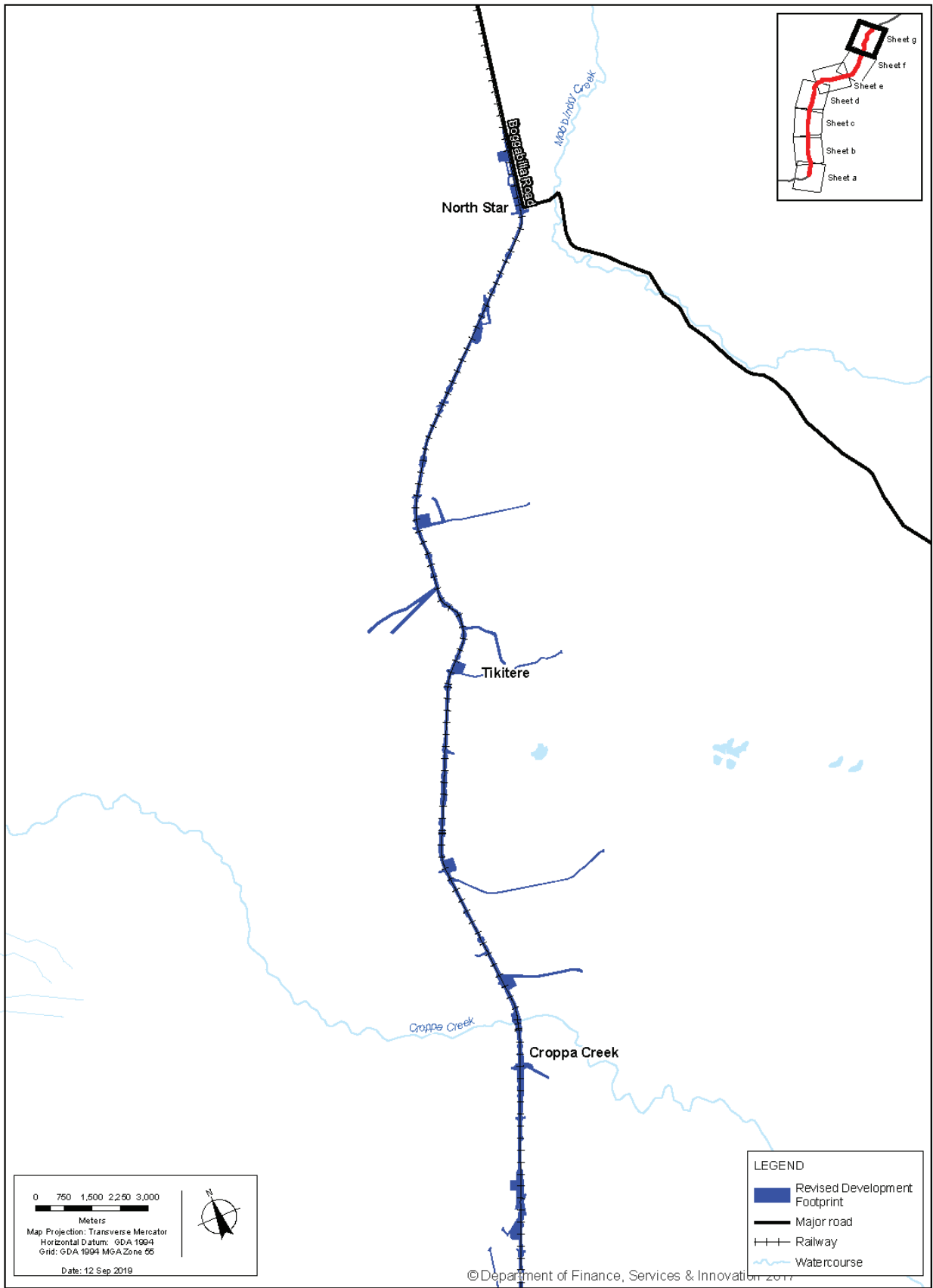


Figure 7
Revised Development Footprint

©:QZ17916V1S\Maps\Deliverables\N2N\SEIS\Submissions\PIR\QZ17916_SPIR007_NN_S_Development\Footprint_0.mxd Data source: Commonwealth of Australia (Geoscience Australia), 250K Topographic Data Series 3, 2006. LPI, DCDB, 2012.



ATTACHMENT 1
Biodiversity Credit Reports

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 11/09/2019

Time: 5:16:49PM

Calculator version: v4.0

Major Project details

Proposal ID: 0113/2016/3626MP

Proposal name: NNS Assessment Area 3 - Border Rivers Gwydir CMA/Northern Outwash IBRA SR

Proposal address: na Narrabri NSW 2309

Proponent name: Australian Rail and Track Corporation

Proponent address: Level 12, 40 Creek Street Brisbane QLD 4000

Proponent phone: na

Assessor name: Ryan Parsons

Assessor address: 75 York Street TERALBA NSW 2284

Assessor phone: 02 4950 5322

Assessor accreditation: 0113

Summary of ecosystem credits required

| Plant Community type | Area (ha) | Credits created |
|--|---------------|-----------------|
| Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion | 18.77 | 1,326.00 |
| Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion | 0.51 | 23.00 |
| Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion. | 6.09 | 230.00 |
| Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion | 1.74 | 93.00 |
| Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | 279.31 | 12,868.08 |
| Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion | 464.97 | 21,633.00 |
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion | 10.72 | 497.00 |
| Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion | 3.67 | 160.00 |
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion | 18.30 | 917.61 |
| Total | 804.08 | 37,748 |

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)

Number of ecosystem credits created

12,868

IBRA sub-region

Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| <p>Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)</p> <p>Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (BR150)</p> <p>Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (BR282)</p> | <p>Northern Outwash</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (BR346)

Number of ecosystem credits created

160

IBRA sub-region

Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|-----------------------------------|
|--|-----------------------------------|

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (BR346)

Grey Box - Rough-barked Apple shrub/grass open forest of northern parts of the Nandewar Bioregion and New England Tableland Bioregion, (BR146)

Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (BR211)

White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR236)

White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (BR239)

White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (BR246)

Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (BR257)

White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion, (BR395)

White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (BR393)

Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (BR268)

Grey Box shrubby open forest of northern parts of the Nandewar Bioregion and New England Tableland Bioregion, (BR297)

Mugga Ironbark - Black Cypress Pine shrubby open forest mainly in the Nandewar Bioregion and northern Brigalow Belt South Bioregion, (BR310)

Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (BR336)

Silver-leaved Ironbark - Black Cypress Pine +/- White Box shrubby open forest mainly in the northern Nandewar Bioregion, (BR343)

Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (BR372)

White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (BR386)

White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (BR394)

White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (BR390)

White Box shrubby open forest on hills mainly in the Nandewar Bioregion, (BR392)

Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion, (BR349)

Silver-leaved Ironbark - White Cypress Pine - tea tree shrubby woodland mainly in the northern Nandewar Bioregion, (BR347)

Tumbledown Red Gum - White Cypress Pine - Silver-leaved Ironbark shrubby woodland mainly in the northern Nandewar Bioregion, (BR374)

Northern Outwash

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion, (BR385)

Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR345)

3. Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120)

Number of ecosystem credits created 1,326
 IBRA sub-region Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120) | Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

4. Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion, (BR130)

Number of ecosystem credits created 93
 IBRA sub-region Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|--|
| Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion, (BR130) Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions., (BR102) | Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

5. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)

Number of ecosystem credits created

918

IBRA sub-region

Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233) | Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

6. Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion, (BR127)

Number of ecosystem credits created

23

IBRA sub-region

Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|---|
| <p>Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion, (BR127)</p> <p>Silver-leaved Ironbark - White Cypress Pine - Rough-barked Apple woodland on alluvial terraces in central-north NSW, (BR208)</p> | <p>Northern Outwash</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

7. Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (BR284)

Number of ecosystem credits created

230

IBRA sub-region

Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|--|
| Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (BR284) | Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

8. Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)

| | |
|-------------------------------------|------------------|
| Number of ecosystem credits created | 21,633 |
| IBRA sub-region | Northern Outwash |

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| <p>Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)</p> <p>Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones, (BR157)</p> <p>Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion, (BR167)</p> <p>Rats Tail Couch sod grassland wetland of inland floodplains, (BR192)</p> <p>Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR251)</p> | <p>Northern Outwash</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

9. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)

Number of ecosystem credits created 497
 IBRA sub-region Northern Outwash

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196) | Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

Summary of species credits required

| Common name | Scientific name | Extent of impact Ha or individuals | Number of species credits created |
|-----------------------|-------------------------|---------------------------------------|---|
| Belson's Panic | Homopholis belsonii | 913.00 | 23,738 |
| Finger Panic Grass | Digitaria porrecta | 906.00 | 11,778 |
| Creeping Tick-trefoil | Desmodium campylocaulon | 497.00 | 5,467 |
| Koala | Phascolarctos cinereus | 173.79 | 4,519 |

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 11/09/2019

Time: 5:18:34PM

Calculator version: v4.0

Major Project details

Proposal ID: 0113/2016/3684MP

Proposal name: NNS Assessment Area 1 Namoi CMA/Northern Basalts IBRA Subregion

Proposal address: na Narrabri NSW 2309

Proponent name: Australian Rail and Track Corporation

Proponent address: Level 12, 40 Creek Street Brisbane QLD 4000

Proponent phone: (07) 3364 8900

Assessor name: Ryan Parsons

Assessor address: 75 York Street TERALBA NSW 2284

Assessor phone: 02 4950 5322

Assessor accreditation: 0113

Summary of ecosystem credits required

| Plant Community type | Area (ha) | Credits created |
|--|-----------|-----------------|
| Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | 42.88 | 1,584.00 |
| Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion | 1.51 | 66.00 |
| Total | 44.39 | 1,650 |

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)

Number of ecosystem credits created

1,584

IBRA sub-region

Northern Basalts - Namoi

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| <p>Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)</p> <p>Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (NA146)</p> <p>Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (NA268)</p> | <p>Northern Basalts - Namoi</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Number of ecosystem credits created

66

IBRA sub-region

Northern Basalts - Namoi

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|-----------------------------------|
|--|-----------------------------------|

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Narrow-leaved Ironbark grassy woodland of the Brigalow Belt South bioregion, (NA164)

Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (NA206)

White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA222)

White Box - White Cypress Pine shrubby open forest of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA225)

White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (NA232)

Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (NA242)

Rough-barked Apple - Yellow Box grass/shrub footslope open forest, Brigalow Belt South Bioregion, (NA343)

Warrumbungle trachyte hillcrest Tumbledown Red Gum - Black Cypress Pine - White Bloodwood shrubby woodland, (NA382)

White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion, (NA402)

Narrow-leaved Ironbark - White Cypress pine woodland on slopes and flats in the Coonabarabran - Pilliga Scrub regions, (NA317)

White Box - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion, (NA392)

White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (NA407)

White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (NA397)

Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (NA250)

Mugga Ironbark - stringybark shrubby open forest of the far southern Nandewar Bioregion and New England Tableland Bioregion, (NA305)

Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (NA341)

Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (NA376)

White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (NA393)

White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (NA408)

White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (NA398)

White Box shrubby open forest on hills mainly in the Nandewar Bioregion,

Northern Basalts - Namoi

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

(NA401)

Silver-leaved Ironbark - White Cypress Pine shrubby open forest of
Brigalow Belt South Bioregion and Nandewar Bioregion, (NA349)

White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest /
woodland of the northern Brigalow Belt South Bioregion and Nandewar
Bioregion, (NA396)

Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub
woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion,
(NA347)

Summary of species credits required

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 11/09/2019

Time: 5:20:11PM

Calculator version: v4.0

Major Project details

Proposal ID: 0113/2016/3685MP

Proposal name: NNS Assessment Area 2 - Namoi CMA/Northern Outwash IBRA Subregion

Proposal address: na Narrabri NSW 2309

Proponent name: Australian Rail and Track Corporation

Proponent address: Level 12, 40 Creek Street Brisbane QLD 4000

Proponent phone: (07) 3364 8900

Assessor name: Ryan Parsons

Assessor address: 75 York Street TERALBA NSW 2284

Assessor phone: 02 4950 5322

Assessor accreditation: 0113

Summary of ecosystem credits required

| Plant Community type | Area (ha) | Credits created |
|--|-----------|-----------------|
| Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion. | 2.07 | 74.00 |
| Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | 25.08 | 866.00 |
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion | 0.84 | 39.00 |
| Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion | 0.48 | 21.00 |
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion | 0.23 | 11.53 |
| Total | 28.70 | 1,012 |

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)

Number of ecosystem credits created

866

IBRA sub-region

Liverpool Plains (Part B)

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| <p>Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)</p> <p>Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (NA146)</p> <p>Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (NA268)</p> | <p>Liverpool Plains (Part B)</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Number of ecosystem credits created

21

IBRA sub-region

Liverpool Plains (Part B)

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|-----------------------------------|
|--|-----------------------------------|

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Narrow-leaved Ironbark grassy woodland of the Brigalow Belt South bioregion, (NA164)

Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (NA206)

White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA222)

White Box - White Cypress Pine shrubby open forest of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA225)

White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (NA232)

Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (NA242)

Rough-barked Apple - Yellow Box grass/shrub footslope open forest, Brigalow Belt South Bioregion, (NA343)

Warrumbungle trachyte hillcrest Tumbledown Red Gum - Black Cypress Pine - White Bloodwood shrubby woodland, (NA382)

White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion, (NA402)

Narrow-leaved Ironbark - White Cypress pine woodland on slopes and flats in the Coonabarabran - Pilliga Scrub regions, (NA317)

White Box - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion, (NA392)

White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (NA407)

White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (NA397)

Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (NA250)

Mugga Ironbark - stringybark shrubby open forest of the far southern Nandewar Bioregion and New England Tableland Bioregion, (NA305)

Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (NA341)

Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (NA376)

White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (NA393)

White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (NA408)

White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (NA398)

White Box shrubby open forest on hills mainly in the Nandewar Bioregion,

Liverpool Plains (Part B)

and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

(NA401)

Silver-leaved Ironbark - White Cypress Pine shrubby open forest of
Brigalow Belt South Bioregion and Nandewar Bioregion, (NA349)

White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest /
woodland of the northern Brigalow Belt South Bioregion and Nandewar
Bioregion, (NA396)

Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub
woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion,
(NA347)

3. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219)

Number of ecosystem credits created

12

IBRA sub-region

Liverpool Plains (Part B)

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219) | Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

4. Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (NA271)

Number of ecosystem credits created

74

IBRA sub-region

Liverpool Plains (Part B)

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|--|---|
| Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (NA271) | Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

5. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA193)

Number of ecosystem credits created

39

IBRA sub-region

Liverpool Plains (Part B)

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA193) | Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

Summary of species credits required

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 11/09/2019

Time: 5:21:23PM

Calculator version: v4.0

Major Project details

Proposal ID: 0113/2016/3676MP

Proposal name: NNS Assessment Area 5 - Border Rivers Gwydir CMA/Northern Basalts IBRA SR

Proposal address: na Narrabri NSW 2309

Proponent name: Australian Rail and Track Corporation

Proponent address: Level 12, 40 Creek Street Brisbane QLD 4000

Proponent phone: (07) 3364 8900

Assessor name: Ryan Parsons

Assessor address: 75 York Street TERALBA NSW 2284

Assessor phone: 02 4950 5322

Assessor accreditation: 0113

Summary of ecosystem credits required

| Plant Community type | Area (ha) | Credits created |
|--|--------------|-----------------|
| Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion | 0.46 | 32.49 |
| Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW | 21.20 | 886.00 |
| Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion | 32.13 | 1,495.00 |
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion | 0.19 | 9.00 |
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion | 0.57 | 29.00 |
| Total | 54.55 | 2,451 |

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)

Number of ecosystem credits created

886

IBRA sub-region

Northern Basalts - Border Rivers/Gwydir

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| <p>Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)</p> <p>Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (BR150)</p> <p>Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (BR282)</p> | <p>Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

2. Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120)

Number of ecosystem credits created

32

IBRA sub-region

Northern Basalts - Border Rivers/Gwydir

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120) | Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

3. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)

Number of ecosystem credits created

29

IBRA sub-region

Northern Basalts - Border Rivers/Gwydir

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233) | Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

4. Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)

Number of ecosystem credits created 1,495
 IBRA sub-region Northern Basalts - Border Rivers/Gwydir

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|---|
| <p>Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)</p> <p>Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones, (BR157)</p> <p>Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion, (BR167)</p> <p>Rats Tail Couch sod grassland wetland of inland floodplains, (BR192)</p> <p>Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR251)</p> | <p>Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p> |

5. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)

Number of ecosystem credits created

9

IBRA sub-region

Northern Basalts - Border Rivers/Gwydir

| Offset options - Plant Community types | Offset options - IBRA sub-regions |
|---|--|
| River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196) | Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs |

Summary of species credits required