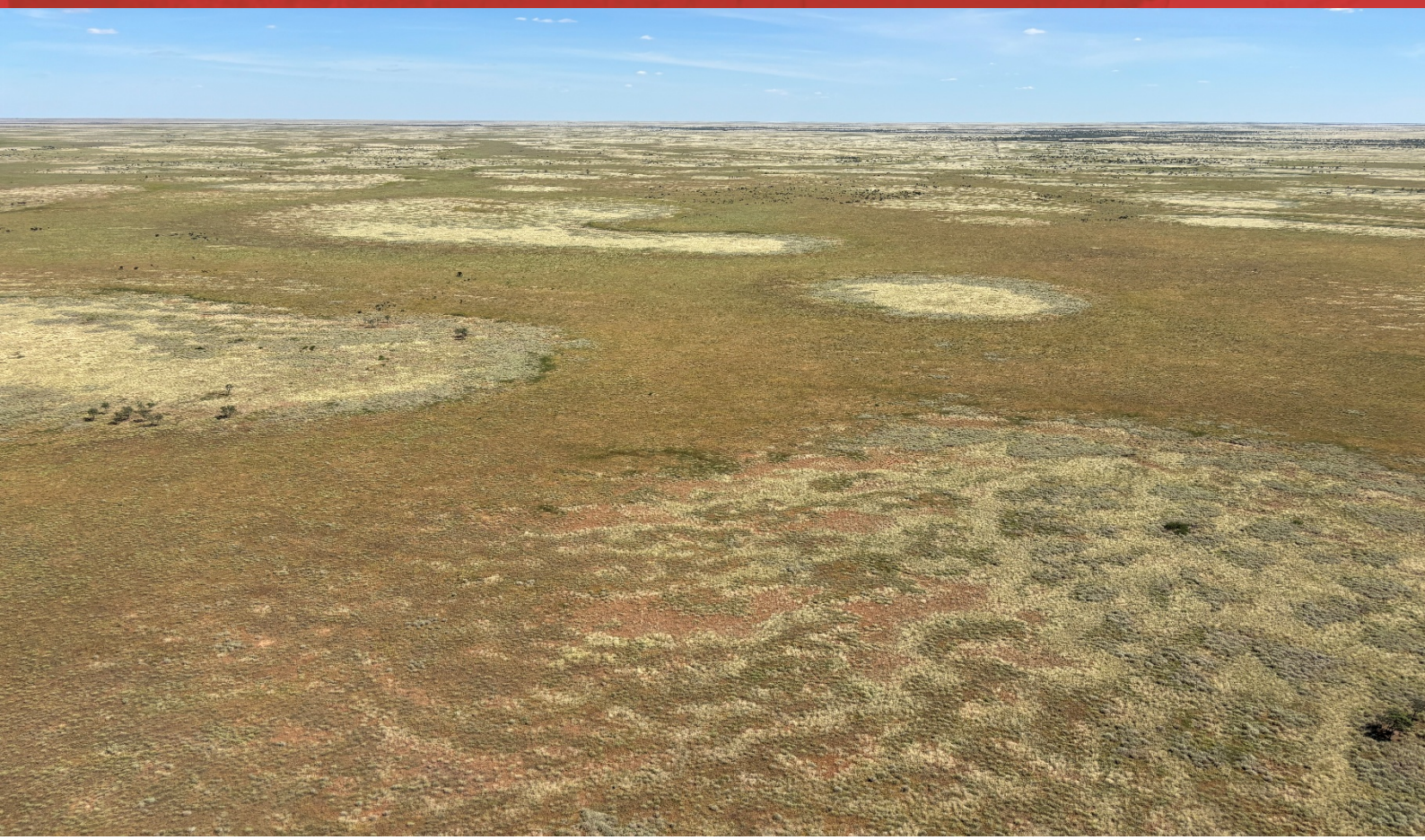
Ecological Assessment Report
North to East Australia Pipeline (NEAP): Stage 1 (Northern Territory)

ATP Management Services Pty Ltd (APA)



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EXECUTIVE SUMMARY

ATP Management Services Pty Ltd (APA) is proposing the underground North to East Australia Pipeline (NEAP), which will connect gas from the Beetaloo sub-basin producers to the gas market on the east coast of Australia. Stage 1 of the pipeline will run directly from the basin in the Beetaloo sub-basin of the Northern Territory (NT) to the border between NT and Queensland (QLD) border.

EcOz Environmental Consultants was engaged to identify terrestrial ecological values and potential constraints relevant to the project design and the environmental approvals of Stage 1. This report is based on desktop assessment and a helicopter-based field survey undertaken in April 2026 of a study area encompassing the proposed pipeline and access tracks. The study area is approximately 662 km long and 1 km wide. This represents a wider corridor than the final disturbance footprint to allow routing flexibility and to assess potential supporting infrastructure. The assessment does not quantify project impacts or prescribe mitigation measures.

Overview

The study area crosses three bioregions: the Sturt Plateau in the north, the Gulf Fall and Uplands in the central section, and the Mitchell Grass Downs across much of the southern section. Broadly, the northern part of the study area supports more structurally-diverse Lancewood, Bullwaddy and Melaleuca woodland communities, while the central and southern sections are dominated by extensive Mitchell Grass Downs clay plains with scattered woodland, floodplain and riparian features. The study area does not intersect any national parks, conservation reserves or Sites of Conservation Significance, but it does intersect or pass close to several Sites of Botanical Significance (SOBS) associated with waterholes, rivers and locally-important landforms. There are no threatened or highly-significant flora species of interest in the SOBS intersected by the study area, and the field survey did not observe any of the other significant (non-threatened) species conserved within these SOBS, particularly those with associations with permanent/semi-permanent waterholes or swamps.

Pastoral stations cover the entire study area. Consequently, environmental impacts typically associated with pastoralism – such as increased weed infestation, erosion, degradation of wetlands and riparian habitats (if present), changes to soil surface structure and infiltration, water source degradation and altered fire regimes – are expected to occur within the study area to varying degrees depending on management of each station. Fires are a regular occurrence in the bioregions; however, the north-western end of the study area is subject to higher fire frequency than the southern areas (which have a very low fire frequency).

Regionally, the most recorded priority weed species are Mesquite, Prickly Acacia, Hyptis, Parkinsonia and Rubber Bush, with a higher concentration of records in the central part of the study area. During fieldwork, weeds were recorded at 51 sites during the survey, comprising 9 different weed species which is considered relatively few given the size of the study area. The most recorded species were Buffel Grass, Parkinsonia and Spiked Malvastrum. Weed infestations were most concentrated in the southern portion of the study area, in the Mitchell Grass Downs bioregion, particularly within drainage systems and alluvial plains. Fewer infestations were recorded in the central section of the alignment, whilst the northern section supported scattered infestations associated with riparian areas and localised disturbance. Infestations were generally small to moderate in extent and variable in density, ranging from isolated plants to locally-dense infestations beneath mature trees and around drainage features.

Landforms

There are nine landforms mapped within the study area:

- **Alluvial plains** (floodplains) occur throughout. These areas are subject to seasonal inundation and tend to have heavy clay soils. Some are broad flow-paths (or drainage depressions) that are not associated with a drainage channel, while others are flood-out areas of major drainages. The main vegetation types open tussock grasslands or low open woodlands of Coolibah, Gidgee or Bullwaddy over tussock grass.

- **Drainage systems** within the study area consist of major and minor waterways. All drainages and their banks support heavy clay soils. Major waterways have well-defined channels and typically support Coolibah low open woodland. Minor waterways typically have shallow drainage paths (occasionally small channel) of varying widths and generally support tussock grassland and sedges with scattered shrubs.
- **Downs (clay) plains** dominate the southern parts of the study area. These clay plains comprise of extensive tussock grasslands with scattered occurrences of shrubs. The plains are flat to gently undulating, with occasional very low lateritic rises. There is a high diversity of grass species present.
- **Lateritic plains** are common in the north of the study area, have a patchy occurrence in the centre of the study area and are uncommon or absent in the south. These plains are flat to gently undulating and have red earth, lateritic-based soils. A broad variety of Lancewood, Bullwaddy, Silver Box, Bloodwood, Mulga, Snappy Gum and Ghost Gum woodland types are associated with lateritic plains.
- **Lateritic low rises** are scattered throughout the study area. These rises have very low relief and often support gravel substrate mixed with lateritic red earth soils. Vegetation types recorded include Variable-barked Bloodwood open woodland, Turpentine closed shrubland and mixed species open woodland over tussock grasses.
- **Sandstone low rises** are uncommon and were only encountered adjacent to one of the proposed (existing) access tracks. This rise has very low relief. This location supported Snappy Gum and Silver Box low open woodland with sparse to patchy shrubs (*Acacia* species) over tussock and hummock grasses.

Another landform, **inland wetlands,** is discussed below. There are two other landforms mapped as occurring within the study area: **sandstone hills** and **limestone plains**. The survey did not record the presence of these landforms, although several small areas of exposed calcrete (limestone) were noted in the southern part of the study area.

Sensitive and significant vegetation

There are several sensitive and significant vegetation types relevant to the study area:

- **Riparian vegetation** which occurs along major and minor waterways, waterholes and drainage lines and provides disproportionately-important habitat in an otherwise dry landscape. These areas can support larger trees, more complex vegetation structure, refuge habitat, movement corridors and water-dependent ecological values.
- **Wetlands** – the study area includes, or occurs near, ephemeral swamps, drainage depressions, closed depressions, gilgai and floodplain vegetation. Some of these wetland sites were assessed as having moderate ecological significance. Nationally-significant wetlands occur in the broader region.
- A few **sinkholes** occur in the north of the study area. These features are typically small in area but can have high local ecological importance.
- **Large hollow-bearing trees**, which are a significant fauna habitat feature. These trees are considered most likely to occur in the woodland in the north of the study area and along riparian areas.

Threatened species

The threatened species assessment combined desktop records, habitat modelling, land type mapping and field observations to determine likelihood of occurrence of threatened species, and to identify habitat features that should be considered during project design and approvals. Based on a desktop 'likelihood of occurrence' assessment, the following species were assessed in detail:

- **Plains Death Adder** is linked to extensive cracking clay plains and downs country, which are widespread through the Mitchell Grass Downs bioregion which intersects most of the southern section of the study area. This species has a high likelihood of occurring within the study area.
- Suitable habitat for the **Yellow-spotted Monitor** is widespread throughout the study area– particularly within alluvial plains, drainage systems, inland wetland margins and downs (clay) plains associated with ephemeral watercourses and floodplain environments. This species has a high likelihood of occurring within the study area.
- The **Gouldian Finch** is only relevant in the northern part of the study area where there could be Snappy Gum and other woodland patches that provide potential nesting habitat, particularly where suitable hollow-bearing trees occur near seasonal grass seed resources and water. However, NT Government modelling considers the likelihood of such habitat intersecting the study area to be low. Moreover, the field survey found that Snappy Gum woodlands within the study area occurred only as scattered patches and the trees lacked hollow characteristics consistent with the species' known nesting requirements. No Gouldian Finches were recorded during the survey, and no evidence of recent presence was observed. This species has a low likelihood of occurring within the study area.
- Potential nesting habitat for the **Grey Falcon** occurs primarily along major watercourses within the south of the study area, particularly where drainage lines intersect alluvial floodplains supporting mature Coolibah and, in limited areas, other large riparian Eucalypts. The entire study area is considered to support general foraging habitat for the species, which is widespread across the surrounding region. This naturally-rare species has a medium likelihood of occurring within the study area.
- Given the strong reliance of **Painted Honeyeater** on mistletoe, and the very low abundance of mistletoe recorded, the study area is considered to provide limited suitable foraging or transient habitat. As a result, the species has a low likelihood of occurring within the study area.
- The northern section of the study area falls within the known distribution of **Northern Blue-tongued Skink**. This corresponds with patches of suitable habitat being observed within lateritic plains and rises. The assessment focuses on habitat critical to the survival of the species, namely areas of dense vegetation that provide cool and moist conditions. Key areas included Bullwaddy-dominated vegetation communities, mixed-structure woodlands, and drainage-associated landforms – including minor drainages, swamps and seasonally-moist depressions. Across the region, potential refuge habitat is common and widespread. Within the study area, potential refuge habitat is present but is fragmented. Consequently, this species has a medium likelihood of occurring within the study area.

The proportion of regional habitat available for other threatened, migratory or significant species within the study area is negligible, and hence these species are unlikely to occur within the study area.

Key implications

The main ecological constraint for NEAP Stage 1 is not a single mapped protected area, but the cumulative presence of sensitive habitat features along a long linear corridor. The most important areas are riparian corridors, waterholes, wetlands and floodplain depressions, sinkholes, hollow-bearing trees, Bullwaddy and Bullwaddy-Lancewood refuge habitat, Snappy Gum woodland patches and extensive cracking clay plains that may support Plains Death Adder habitat.

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1 INTRODUCTION

APA Group (APA) is proposing the underground North to East Australia Pipeline (NEAP), which will connect gas from the Beetaloo sub-basin producers to the gas market on the east coast of Australia. Stage 1 of the pipeline will run directly from the basin in the Beetaloo sub-basin of the Northern Territory (NT) to the border between NT and Queensland (QLD) border – see Figure 1-1 – and is the subject of this report.

EcOz Environmental Consultants (EcOz) was engaged by APA to prepare this ecology report – based on both desktop and field surveys – to identify terrestrial ecological values and potential constraints relevant to NEAP Stage 1. The results will inform project design and the referral of the project under the NT *Environment Protection Act 2019* (EP Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Study area

This report is based on Rev 1.0 of the NEA pipeline and access tracks. The Stage 1 pipeline easement is approximately 662 km in length, comprising a Collection Header (79.69 km – CHKP[1] 0 to 79.69) and the Main Alignment (582.22 km – MAKP 0 to 582.22). EcOz understands the route is not final and may be influenced by the outcomes of various technical environmental and engineering studies and assessments; therefore, a broader study area was used in this report to provide some routing flexibility and to cover proposed locations for temporary construction camps, gravel quarrying (borrow pits) and anode beds to support cathodic protection. The study area (subject of this report) includes a 1 km wide corridor for the pipeline (i.e. 500 m on either side of the proposed alignment) and 500 m wide corridor for proposed access tracks (i.e. 250 m on either side of each proposed track), noting that most of the proposed access roads are existing tracks and will require minor upgrades only. The resulting study area is 95,065 ha.

1.2 Scope

This report provides information to inform project design and management decisions, and the assessment of potential project-related ecological impacts in subsequent referral and assessment documents. It consolidates all matters of conservation significance identified in a comprehensive review.

This report does not assess the potential impact of the project on ecological values, nor does it provide principles or recommendations for avoidance and mitigation measures.

Desktop data and field surveys were undertaken to inform ecological aspects relevant to this stage of project design and approvals (including guidance for infrastructure site selection, preliminary impact assessment, and preparation of referral documentation). The NT Department of Lands, Planning and Environment (DLPE) Flora and Fauna Division agreed with this approach for this phase of the assessment process.

Broadly, this report presents:

- The environmental context of the study area.
- Descriptions and extents of significant and sensitive vegetation that occur within the study area.
- Desktop likelihood of occurrence assessments (within the study area) for significant species[2] listed under the NT *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act) and the Commonwealth EPBC Act.

[1] Kilometre point

[2] For the purposes of this report, significant species are those listed as threatened under the TPWC Act or EPBC Act (Vulnerable, Endangered or Critically Endangered), migratory species listed under the EPBC Act, and species listed as Near Threatened / Data Deficient under the TPWC Act that have restricted ranges.

- The methods and results of a field survey used to verify landforms and land types, and to map significant vegetation, threatened species' habitat and weeds.
- Revised desktop likelihood of occurrence assessments based on the results of field surveys.

The field survey was conducted by helicopter by EcOz ecologists Tom Ewers-Reilly and Erin Barritt from 23 to 29 April 2026. Data were collected using the ArcGIS Fieldmaps app. Survey conditions for the helicopter survey were ideal – sunny weather with few clouds and low wind. Prior to the survey, rain was last recorded in the region on 18 April 2026 (5 days before the survey commenced) – i.e. at the two nearest weather stations of Elliot (8.6 mm) and Camooweal (10.8 mm). There was no notable rainfall recorded regionally at any other time in April.

The survey was conducted under the following ecological permits:

- Project No. A24004: Fauna Studies in the Northern Territory (Animal Ethic Committee, Charles Darwin University)
- Permit No. 74225: Permit to Interfere with Wildlife for Commercial Purposes (Parks and Wildlife Commission of the Northern Territory)
- Registration No. 038: Registration to use, or allow an animal to be used, for scientific purposes (Department of Industry, Tourism and Trade).

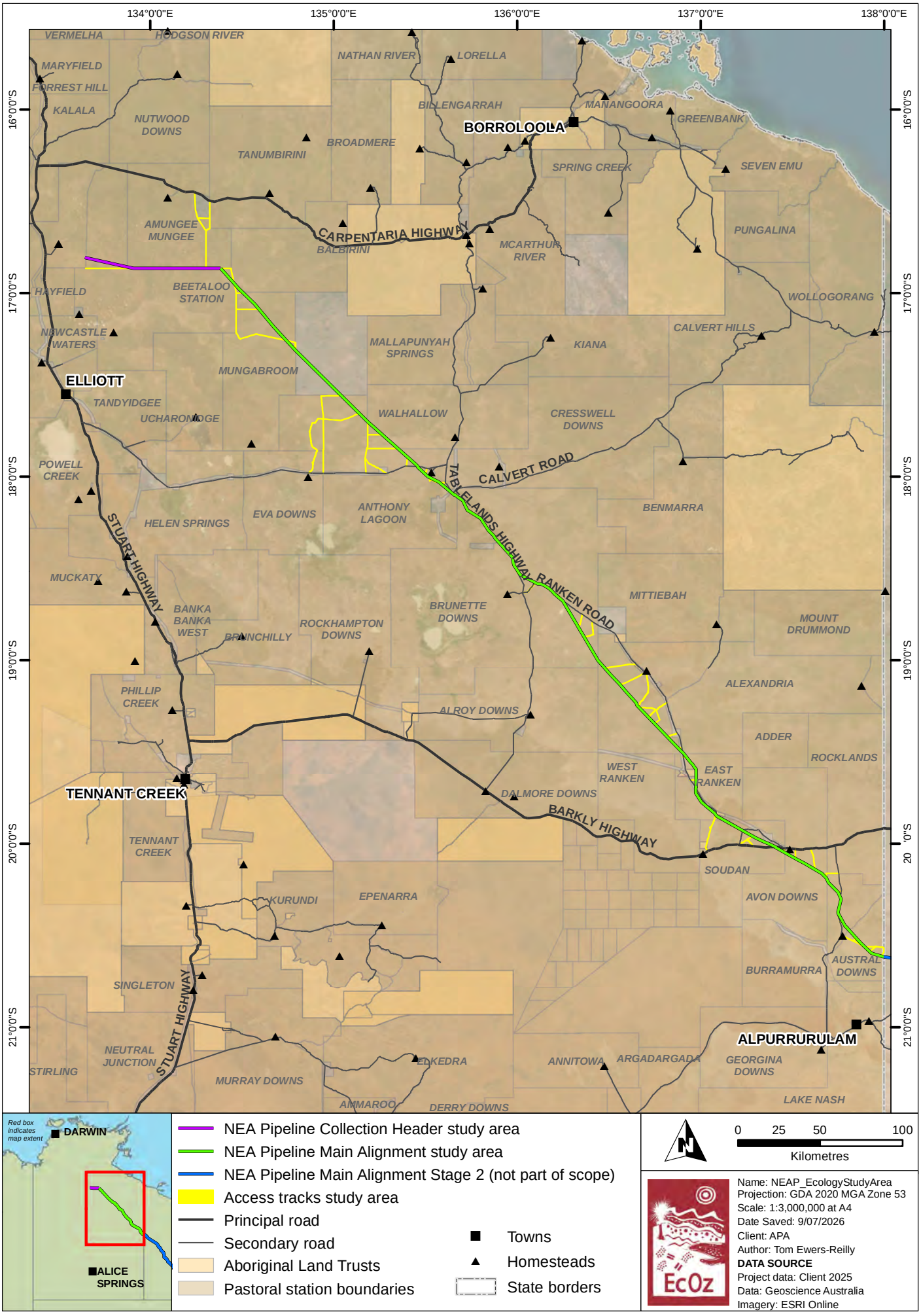


Figure 1-1. Map of ecological study area

2 ENVIRONMENTAL CONTEXT

This section of the report provides an environmental context for the study area based on information from desktop databases and reports, and analysis of aerial imagery.

2.1 Climate

The region experiences a semi-arid climate, which is characterised by hot, dry summers and warm, dry winters, with low average annual rainfall. Temperatures follow the seasonal patterns typical of northern and central Australia, with the highest daily maximums occurring in January. Rainfall is typically higher in the summer months, associated with the northern monsoon. However, annual rainfall in the region can be highly variable. In general, higher rainfall is expected in the northern part of the study area.

2.2 Bioregion

Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture large-scale geophysical patterns across Australia. These landscape patterns are linked to fauna and flora assemblages and processes at the ecosystem scale (NSW NPWS 2003). NT bioregions are described in Baker et al. (2005). Three bioregions are intersected by the study area, described below – see Figure 2-1.

The **Sturt Plateau bioregion** comprises mostly gently undulating plains on lateritised sandstone dominated by Eucalypt woodlands (Bloodwoods, Bullwaddy and Lancewood) over spinifex/grass understoreys, with lateritic soils and deep sands. This bioregion occurs in the northern part of the study area between CHKP 0 and MAKP 67.

The **Gulf Fall and Uplands bioregion** is characterised by undulating sandstone plateaus, gorges, and woodlands over spinifex grasslands, featuring Eucalyptus (stringybark, bloodwood and box) and Acacia. This bioregion coincides with a relatively small section of the central part of the study area between MAKP 67 and MAKP 139. The area intersected by the study area consists solely of undulating lowland plains, with steeper terrain (including gorges or escarpments) located 60 km to the east.

The **Mitchell Grass Downs bioregion** comprises extensive Mitchell tussock grasslands on cracking clay soil. It also includes several nationally-important wetlands. This bioregion occurs in the southern part of the study area between MAKP 139 and MAKP 582.

2.3 Conservation areas

The study area does not intersect any national parks or conservation reserves. The closest reserve is Connells Lagoon Conservation Reserve located approximately 8 km north-west of MAKP 310 – see Figure 2-2.

The NT Government has identified Sites of Conservation Significance (SOCS) – the most important sites for biodiversity conservation for the NT (described in Harrison et al. 2009). The study area does not intersect with or occur near any SOCS – see Figure 2-2. The NT Government has also identified Sites of Botanical Significance (SOBS) – areas considered important for plant conservation generally, and specifically for conserving significant plant taxa (White et al. 2000). The study area intersects SOBC in the following locations:

- SOBS site 18-5-1 – Brunette Creek Waterholes (national significance) (MAKP 267 – 269)
- SOBS site 19-6-2 – Lorne Creek Waterholes (bio-regional significance) (MAKP 444 – 445)
- SOBS site 20-6-2 – James River Waterholes (bio-regional significance) (MAKP 492 – 493)
- SOBS site 20-6-1 – Georgina River (bio-regional significance) (MAKP 552-555, access track)
- SOBS site 18-6-1 – Connells Lagoon (national significance) (access track east of MAKP 310)
- SOBS site 19-6-1 – Buchanan Rises (bio-regional significance) (access track east of MAKP 362)

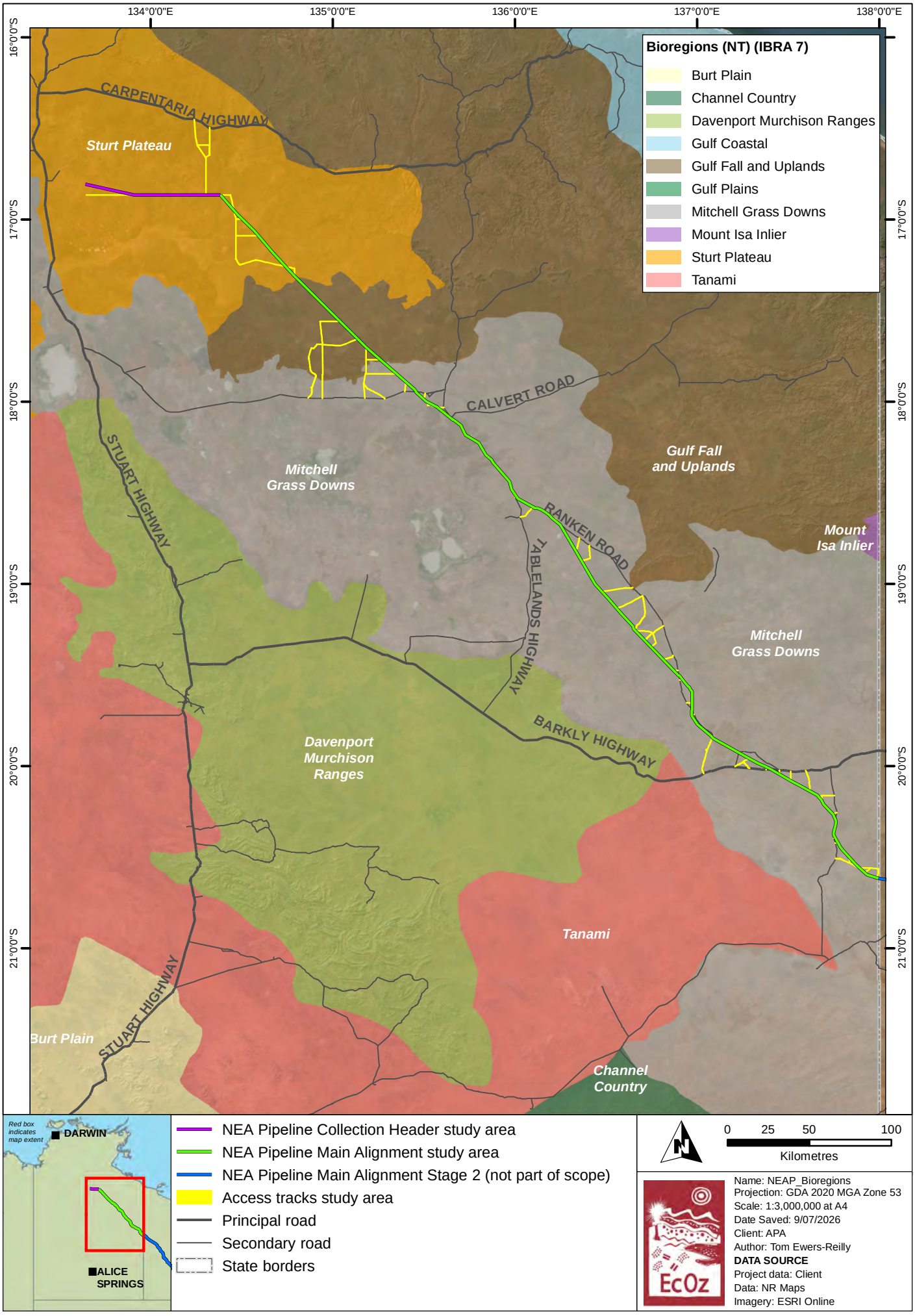


Figure 2-1. Map of bioregions within the region of the study area

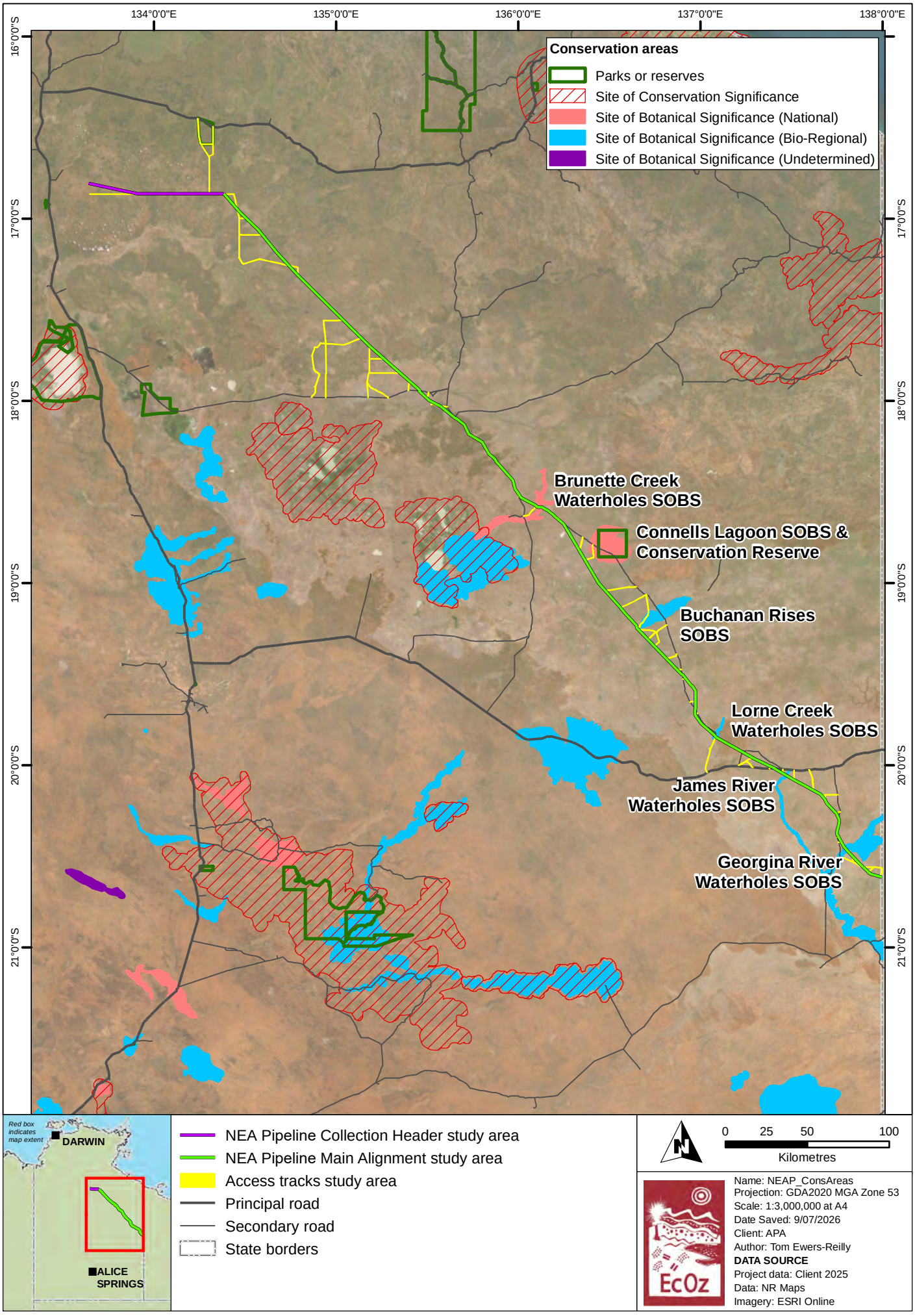


Figure 2-2. Map of conservation areas in the vicinity of the study area

2.4 Topography, soils and vegetation

The NT does not have standardised, fine-scale vegetation and habitat mapping across the jurisdiction. The level of detail available differs throughout the NT depending on the survey effort that has been undertaken by the NT Government. The following vegetation and habitat datasets are relevant to the study area:

- Land system mapping across the entire study area at a scale of 1:1,000,000
- Land unit mapping across a small proportion of the study area at a scale of 1:250,000
- Land type mapping across the entire study area at a scale of 1:250,000
- Vegetation mapping across the entire study area, at a scale of 1:100,000 for the northern 150 km of the study area, and a varying scale for the remainder of the study area.

The land type mapping has the most valuable and consistent data for this assessment because it is the finest scale mapping available across the entire study area. Consequently, it was the subject of field verification in the 2026 field survey and is discussed in Section 3.

2.4.1 Land systems

Christian and Stewart (1968) define a land system as 'an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation'. These have been mapped by the government across the NT at scales ranging from 1:250,000 (in the north) to 1:1,000,000 (in the south). Land system mapping of the region is described in *Survey of the Barkly Region, Northern Territory and Queensland, 1947-48* (Christian et al. 1951), which was mapped at a scale of 1:1,000,000.

Land system datasets show that the study area intersects 10 land systems across three major landscape classes (land systems are described in Table 2-1; landscape classes are mapped in Figure 2-3). Most of the study area comprises clay plains or lateritic plains and rises. This dataset indicates that steep terrain such as hills, ridges and escarpments is not present within, or adjacent to, the study area.

Table 2-1. Summary of the land systems relevant to the study area

Landscape class		Land system	Description
Lateritic plains and rises	Plains and rises on weathered sedimentary rocks; red clayey sands, red earths and texture contrast soils	Beetaloo	Gently undulating country with various lateritic soils, mostly with Lancewood forest (*Acacia shirleyi*), occasional woodlands with *Corymbia dichromophloia* or *Eucalyptus leucophloia*.
		Pollyarra	A discontinuous strip of gently-undulating, sparsely-timbered country with lateritic soils. Vegetation mostly *Corymbia dichromophloia* or *E. leucophloia* woodland. Scattered patches of *Acacia shirleyi* forest
		Wonorah	Gently undulating country with deep lateritic soil and low, scrubby vegetation. Vegetation is mostly woodlands or shrublands (*E. pruinosa, E. argillacea, E. terminalis, E. leucophloia, Corymbia dichromophloia, Accacia spp., Ventilago viminalis*)
Clay plains	Broad level plains (black soil) plains; cracking clay soils	Creswell	Discontinuous areas of very gently undulating to nearly flat black-soil grasslands. Vegetation is mostly *Eulalia / Dichanthium* grassland; with *Eucalyptus leucophloia* fringing community on streamlines.
		Barkly 1, 2 and 3	Very gently undulating to nearly flat Mitchell Grass plains; heavy grey pedocals. Vegetation is mostly *Astrebla pectinata* grassland. Some grasslands dominated by *Sporobolus* sp. and *Enneapogon* sp.; Scattered occurrences of *E. leucophloia* and *Ventilago viminalis* trees / woodlands.
		Wonardo	Irregular areas of gently undulating to nearly flat Mitchell grass plains. Vegetation is mostly *Astrebla pectinata* grasslands. Some woodlands with *Acacia georginae* or *E. brevifolia.*

Landscape class		Land system	Description
		Austral	Small areas of gently undulating Mitchell grass plains. Some isolated patches of woodland (including *E. leucophloia*, *Acacia cambagei*).
		Joanundah	Several small areas of very gently undulating black-soil plains that support Coolibah woodlands. Other common vegetation includes grasslands with *Eulalia* sp., *Dichanthium* sp., *Astrebla* sp.
		Kallala	Numerous irregular areas of nearly flat Mitchell grass plains. Vegetation is mostly *Astrebla pectinata* or *Astrebla elymoides* grassland or *Acacia georginae* / *Astrebla pectinata* woodland.
Alluvial floodplains	River plains, swamps and alluvial fans formed on Quaternary alluvium	Georgina	Narrow bands of Mitchell grass plains cut by the braided streamlines of the Georgina River and major tributaries. Mostly *Astrebla* grasslands; occasional shrubland (*Chenopodium auricomum*) or woodland (Coolibah).

E. = Eucalyptus; C = Corymbia

2.4.2 Land units

In some parts of the NT, land systems have been broken down into land units which are reasonably-homogeneous parts of a land surface, distinct from the surrounding terrain and characterised by consistent landform, soil and vegetation properties (Jessop & King 1997). These are typically mapped at a scale of 1:100,000 or smaller (i.e. at a finer scale than land system surveys). Land unit data are only available for the study area between MAKP 195 and MAKP 326 at a scale of 1:100,000 as part of the Land Resource Assessment of Brunette Downs Station (Edgoose & Kennedy 1996). That dataset was used to help identify sensitive habitats, but because it comprises such a small proportion of the study area, it is not detailed in this report.

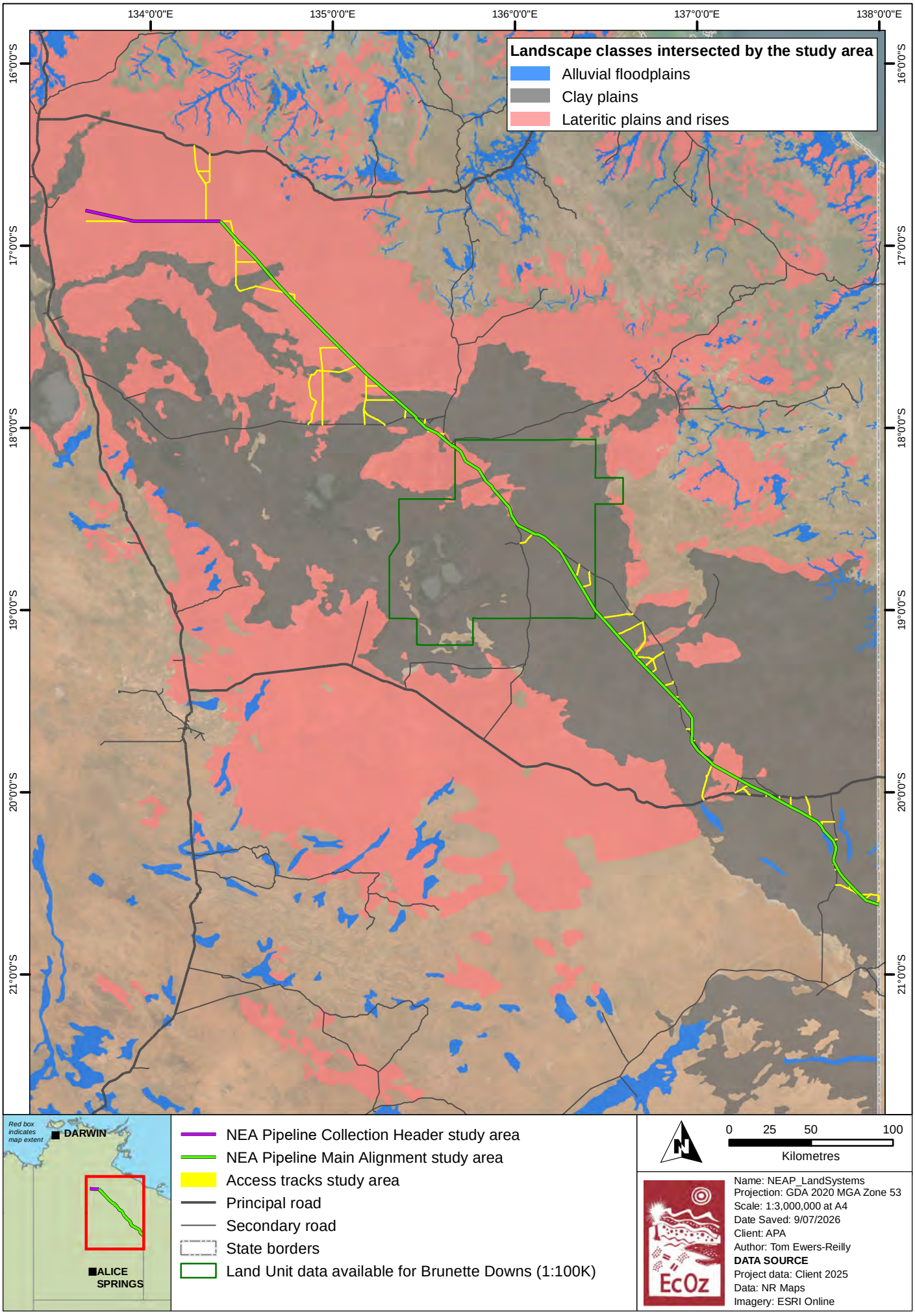


Figure 2-3. Map of land systems in the vicinity of the study area

2.4.3 Vegetation

There are two vegetation datasets available within the study area: the National Vegetation Information System (NVIS) and the Strategic Regional Environmental and Baseline Assessment (SREBA) for the Beetaloo Sub-basin. These are described in the sections below.

National Vegetation Information System

The National Vegetation Information System (NVIS) (NVIS Technical Working Group 2017) is a nationally consistent dataset that provides information on the extent and distribution of vegetation types in Australia. It provides a framework for classifying, mapping and describing vegetation types across Australia. NVIS organises vegetation data into hierarchical levels, ranging from broad national categories to highly specific descriptions of plant communities, landforms and soils. These levels capture dominant species, community structure and soil types. The dataset combines vegetation surveys undertaken at scales ranging from 1:100,000 to 1:1,000,000. The latest NVIS dataset is NVIS Version 7.0 which was released in December 2024 by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The NVIS is available across the entire study area and shows that the study area intersects 10 Major Vegetation Subgroups (MVG) and 23 vegetation types (i.e. NVIS ID) (described in Table 2-2; mapped in Figure 2-4). Note that Figure 2-4 includes all vegetation types within a 50 km radius of the study area and therefore includes additional vegetation types which are not present in the study area.

The central and southern parts of the study area are dominated by MVG Mitchel grass (Astrebla) tussock grasslands, which typically occurs on deep grey cracking clays over tertiary alluvium in the Mitchell Grass Downs bioregion. Within the extensive clay plains there are areas of low woodlands and shrubland present on plains and low rises. The northern part of the study area has a more complex vegetation mosaic that includes a variety of Eucalyptus/Corymbia, Lancewood, Bullwaddy and Melaleuca woodland communities.

Table 2-2. Summary of NVIS (version 7) vegetation types within the study area

Major Vegetation Subgroup	NVIS ID	NVIS Level 3	Dominant species (based on NVIS Level 6 data)	Environs
Acacia (+/- low) open woodlands and sparse shrublands +/- tussock grass	30799	Acacia low open woodland	**Upper**: *Acacia georginae* **Mid**: *Acacia georginae, +/- Acacia stowardii, +/- Acacia tetragonophylla, +/- Senna artemisioides subsp. oligophylla* **Ground**: *Astrebla pectinata, Dactyloctenium radulans, Tripogon loliiformis, +/- Sclerolaena bicornis, +/- Eragrostis spp.*	Clay loam to clay, calcareous soils, occasional limestone outcrops
	31195	Acacia / Macropteranthes mid open woodland	**Upper**: *Acacia shirleyi, +/-Macropteranthes kekwickii, +/-Corymbia dichromophloia* **Mid**: *Acacia shirleyi, Flueggea virosa, Acacia lysiphloia* **Ground**: *Chrysopogon fallax, Enneapogon oblongus, Aristida pruinosa*	N/A
Eucalyptus low open woodlands with hummock grass	30770	Eucalyptus low open woodland	**Upper**: *Eucalyptus leucophloia, +/-Eucalyptus terminalis, +/- Eucalyptus pruinosa, +/- Corymbia dichromophloia, +/- Erythrophleum chlorostachys* **Mid**: *Carissa lanceolata, Petalostigma quadriloculare, Eucalyptus leucophloia, +/- Acacia plectocarpa, +/- Acacia subternata* **Ground**: *Triodia pungens, Triodia bitextura, Chrysopogon fallax*	Gentle undulating plains, low ridges, shallow sands with lateritic gravels

Major Vegetation Subgroup	NVIS ID	NVIS Level 3	Dominant species (based on NVIS Level 6 data)	Environs
	30773	Eucalyptus / Lysiphyllum low open woodland	**Upper**: *Eucalyptus pruinosa, Lysiphyllum cunninghamii, Corymbia opaca, +/- Macropteranthes kekwickii, +/- Gyrocarpus americanus* **Mid**: *Carissa lanceolata, Acacia lysiphloia, Atalaya hemiglauca, +/-Ehretia saligna, +/- Lysiphyllum cunninghamii* **Ground**: *Triodia pungens, Chrysopogon fallax, Enneapogon polyphyllus*	Gentle undulating plains, deep sandy yellow earths, lateritic red earths, or deep sands
	30776	Corymbia / Eucalyptus low open woodland	**Upper**: *Corymbia opaca, Eucalyptus pruinosa, Corymbia bella, +/- Acacia sericophylla, +/- Grevillea striata* **Mid**: *Carissa lanceolata, Atalaya hemiglauca, Acacia lysiphloia, +/-Hakea chordophylla* **Ground**: *Triodia pungens, Eulalia aurea, +/- Enneapogon polyphyllus*	Gently undulating peneplain, lateritic red earths
Eucalyptus low open woodlands with tussock grass	30759	Eucalyptus / Lophostemon low open woodland	**Upper**: *Eucalyptus microtheca, +/- Lophostemon grandiflorus, +/-Ventilago viminalis, +/- Atalaya hemiglauca* **Mid**: *Acacia holosericea, Atalaya hemiglauca, +/- Ventilago viminalis, +/- Acacia cowleana* **Ground**: *Eulalia aurea, Chrysopogon fallax, Astrebla pectinata*	Low-lying flat plains, fringing watercourses and swamps. Light to heavy grey and brown clays, some loamy soil
	31120	Corymbia / Eucalyptus low open woodland	**Upper**: *Corymbia dichromophloia, Eucalyptus leucophloia, +/- Eucalyptus ferruginea* **Mid**: *Terminalia canescens, Petalostigma pubescens, Erythrophleum chlorostachys* **Ground**: *Chrysopogon fallax, Triodia bitextura, Grewia retusifolia*	N/A
	31126	Eucalyptus low open woodland	**Upper**: *Eucalyptus terminalis, Eucalyptus chlorophylla, Eucalyptus pruinosa* **Mid**: *Carissa lanceolata, Hakea arborescens, Terminalia canescens* **Ground**: *Chrysopogon fallax, Sehima nervosum, Heteropogon contortus*	N/A
	31132	Eucalyptus / Excoecaria low open woodland	**Upper**: *Eucalyptus microtheca, Excoecaria parvifolia, +/- Lysiphyllum cunninghamii* **Mid**: *Eucalyptus microtheca, Atalaya hemiglauca, Excoecaria parvifolia* **Ground**: *Iseilema vaginiflorum, Chrysopogon fallax, Dichanthium spp.*	N/A
Eucalyptus open forests with a grassy understorey	31121	Corymbia / Eucalyptus low open forest	**Upper**: *Corymbia dichromophloia, Eucalyptus leucophloia, +/- Eucalyptus ferruginea* **Mid**: *Terminalia canescens, Petalostigma pubescens, Erythrophleum chlorostachys* **Ground**: *Chrysopogon fallax, Triodia bitextura, Grewia retusifolia*	N/A
Eucalyptus woodlands with a hummock grass understorey	31156	Eucalyptus low woodland	**Upper**: *Eucalyptus leucophloia, +/-Eucalyptus terminalis, +/-Eucalyptus pruinosa* **Mid**: *Carissa lanceolata, Petalostigma quadriloculare, Eucalyptus leucophloia* **Ground**: *Triodia pungens, Triodia bitextura, Chrysopogon fallax*	N/A

Major Vegetation Subgroup	NVIS ID	NVIS Level 3	Dominant species (based on NVIS Level 6 data)	Environs
	31165	Lysiphyllum / Corymbia low woodland	**Upper**: *Eucalyptus pruinosa, Lysiphyllum cunninghamii, Corymbia opaca* **Mid**: *Acacia lysiphloia, Carissa lanceolata, Atalaya hemiglauca* **Ground**: *Triodia pungens, Chrysopogon fallax, Enneapogon polyphyllus*	N/A
Eucalyptus woodlands with a tussock grass understorey	30755	Eucalyptus low woodland	**Upper**: *Eucalyptus terminalis, Eucalyptus chlorophylla, Eucalyptus pruinosa, +/- Lysiphyllum cunninghamii, +/- Brachychiton diversifolius subsp. diversifolius* **Mid**: *Carissa lanceolata, Hakea arborescens, Terminalia canescens, +/- Flueggea virosa subsp. melanthesoides* **Ground**: *Chrysopogon fallax, Sehima nervosum, Heteropogon contortus*	Gently undulating or flat plains with clays or yellow earth and some gravelly loam soils
	30757	Eucalyptus / Excoecaria low woodland	**Upper**: *Eucalyptus microtheca, Excoecaria parvifolia, +/- Lysiphyllum cunninghamii, +/- Eucalyptus pruinosa* **Mid**: *Eucalyptus microtheca, Atalaya hemiglauca, Excoecaria parvifolia, +/- Sesbania cannabina, +/- Erythroxylum ellipticum* **Ground**: *Iseilema vaginiflorum, Chrysopogon fallax, Dichanthium spp.*	Flat to gently sloping, low lying floodplains often with braided drainage lines. Heavy grey or brown clays
	31030	Corymbia / Eucalyptus low woodland	**Upper**: *Corymbia dichromophloia, Eucalyptus leucophloia, +/- Eucalyptus ferruginea, +/- Erythrophleum chlorostachys* **Mid**: *Terminalia canescens, Petalostigma pubescens, Erythrophleum chlorostachys, +/- Corymbia dichromophloia, +/- Acacia shirleyi* **Ground**: *Chrysopogon fallax, Triodia bitextura, Grewia retusifolia*	Gently undulating plains, shallow red to yellow, gravelly, sandy earths or stoney sands
Melaleuca open forests and woodlands	30696	Melaleuca low woodland	**Upper**: *Melaleuca citrolens, Melaleuca minutifolia, +/- Eucalyptus pruinosa, +/- Melaleuca stenostachya* **Mid**: *Carissa lanceolata, Melaleuca citrolens, Melaleuca stenostachya, Atalaya hemiglauca, Dodonaea physocarpa* **Ground**: *Eulalia aurea, Chrysopogon fallax, Triodia microstachya*	Low woodland / open woodland, plains/relict drainage fringe
Mitchell grass (Astrebla) tussock grasslands	30842	Astrebla / Iseilema low tussock grassland	**Upper**: Absent **Mid**: *Acacia victoriae, Vachellia farnesiana* **Ground**: *Astrebla pectinata, Iseilema vaginiflorum, +/-Iseilema membranaceum, +/- Astrebla squarrosa, +/- Brachyachne convergens*	Plains, deep grey cracking clays over tertiary alluvium
Other Acacia forests and woodlands	30792	Acacia / Macropteranthes mid open forest	**Upper**: *Acacia shirleyi, +/-Macropteranthes kekwickii, +/-Corymbia dichromophloia, +/- Ventilago viminalis* **Mid**: *Acacia shirleyi, Flueggea virosa, Acacia lysiphloia, +/- Gyrocarpus americanus* **Ground**: *Chrysopogon fallax, Enneapogon oblongus, Aristida pruinosa*	Rises with rocky skeletal soils extending onto shallow gravelly sands in drier areas

Major Vegetation Subgroup	NVIS ID	NVIS Level 3	Dominant species (based on NVIS Level 6 data)	Environs
	31040	Acacia low open forest	**Upper**: *Acacia shirleyi* **Mid**: absent **Ground**: *Eriachne ciliata, Schizachyrium fragile, Chrysopogon fallax, Scleria sphacelata, Paspalidium rarum*	Lateritic sandstone outcrops, plateaux, breakaways to north / rises and plains to south; gravelly lithosols, some shallow red, yellow and black earths; well drained
	31045	Acacia / Macropteranthes low woodland	**Upper**: *Acacia shirleyi, Macropteranthes kekwickii* **Mid**: Absent **Ground**: *Eragrostis cumingii, Mnesithea formosa, Paspalidium rarum, +/- Corchorus aestuans, +/-Panicum mindanaense*	Lateritic sandstone outcrops, plateaux, breakaways to north/rises and plains to south; gravelly lithosols, some shallow red, yellow and black earths; well drained
	31196	Acacia / Macropteranthes mid woodland	**Upper**: *Acacia shirleyi, +/-Macropteranthes kekwickii, +/-Corymbia dichromophloia* **Mid**: *Acacia shirleyi, Flueggea virosa, Acacia lysiphloia* **Ground**: *Chrysopogon fallax, Enneapogon oblongus, Aristida pruinosa*	N/A
Tropical mixed species forests and woodlands	31043	Macropteranthes / Acacia low woodland	**Upper**: *Macropteranthes kekwickii, Acacia shirleyi* **Mid**: Absent **Ground**: *Panicum mindanaense, Evolvulus alsinoides*	Lateritic sandstone outcrops, plateaux, breakaways to north/rises and plains to south; gravelly lithosols, some shallow red, yellow and black earths; well drained
	31044	Macropteranthes / Acacia low woodland	**Upper**: *Macropteranthes kekwickii, Acacia shirleyi* **Mid**: Absent **Ground**: *Chrysopogon fallax, Paspalidium rarum, Mnesithea formosa, +/- Sorghum spp., +/-Sorghum timorense*	Lateritic sandstone outcrops, plateaux, breakaways to north/rises and plains to south; gravelly lithosols, some shallow red, yellow and black earths; well drained

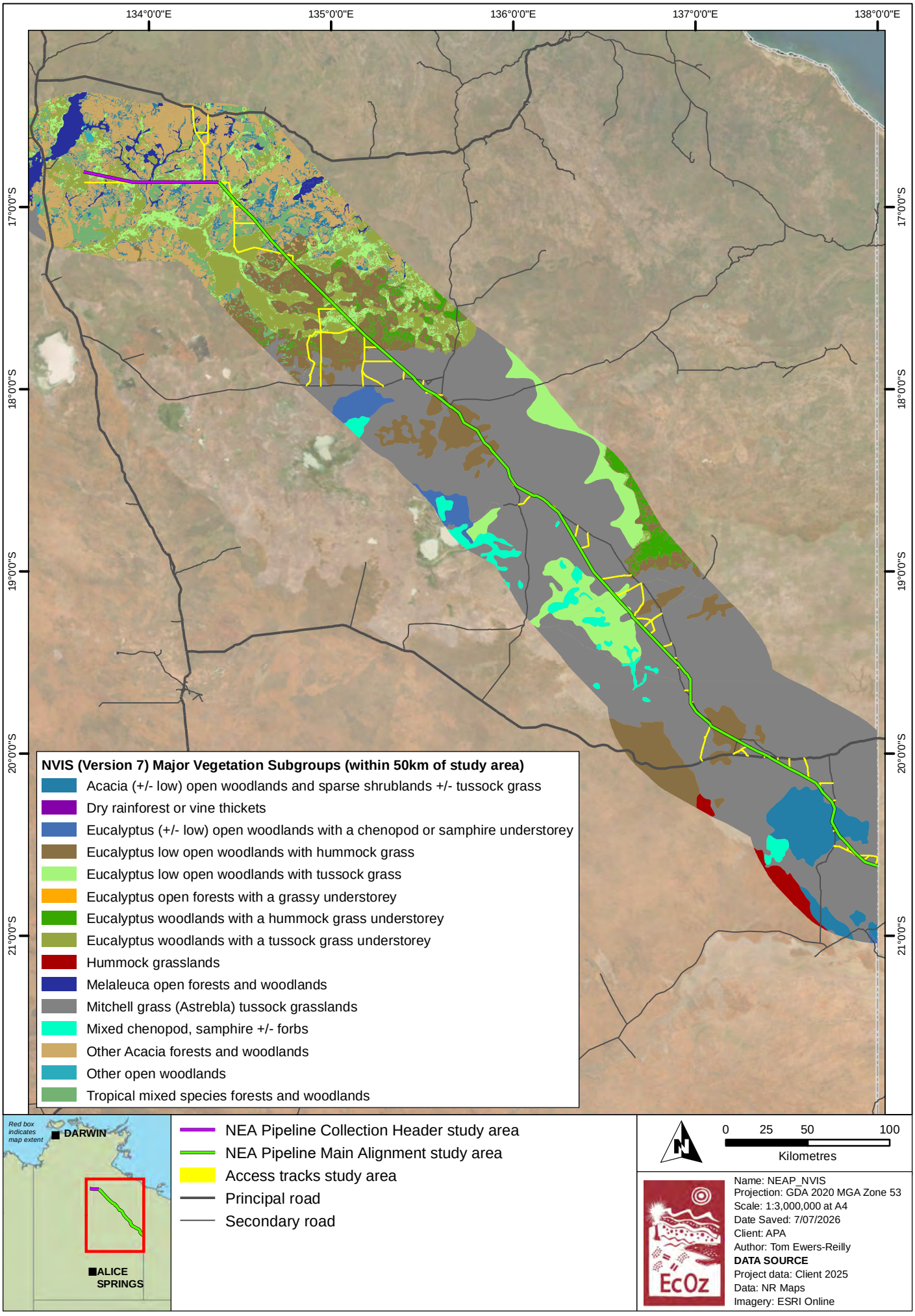


Figure 2-4. Map showing NVIS Major Vegetation Subgroups within 50km of the study area

Strategic Regional Environmental and Baseline Assessment (SREBA) for the Beetaloo Sub-basin

The SREBA (Young et al. 2022) provides a high-resolution dataset held by the NT Government. It is available for the northern 150 km of the study area north of MAKP 72 at a scale of 1:100,000 (extent shown in Figure 2-5). The vegetation survey followed a methodology that complies with Brocklehurst et al. (2007) and the *NVIS standards for collection of floristic and structural attributes to support vegetation classification and mapping* (NVIS Technical Working Group 2017). The SREBA vegetation dataset describes and maps Broad Vegetation Groups (BVG) at a scale of 1:100,000 and provides descriptions of dominant vegetation communities within each BVG (Young et al. 2022).

Sixteen BVGs occur within the northern 150 km of the study area (described in Table 2-3 and shown on Figure 2-5). The dataset also indicates there is potential for sensitive and significant vegetation to occur within the northern 150 km of the study area. These are identified in Table 2-3 and discussed further in Section 4 (where relevant).

Table 2-3. SREBA Broad Vegetation Groups within the northern 150 km of the study area

Broad Vegetation Group (BVG)		Significant vegetation	Ecological value	Area (ha) within 50km	Study area (ha)
1	Corymbia / Eucalyptus open woodland on sandy loam	Large trees with hollows	-	586,811	5,568
2	Corymbia / Eucalyptus woodland (run-on areas, heavier soils)	Run-on areas Large trees with hollows	Moderate	184,010	1,837
3	*Corymbia bella* woodland on alluvial plains	Large trees with hollows	Moderate	5,671	2
4*	*Eucalyptus miniata* open woodland on loamy sand	Large trees with hollows	-	2,920	100
5*	Riparian woodland (ephemeral streams)	Riparian Large trees with hollows	High	10,776	64
8	Snappy gum low open woodland	Large trees with hollows	-	57,520	209
9	Lancewood forest	-	-	493,441	3,843
10	Bullwaddy shrubland and woodland	-	Moderate	185,212	1,705
11	Bauhinia and Corymbia open woodland on sandy clay	-	-	32,539	167
12	*Eucalyptus chlorophylla* low open woodland	-	-	106,224	965
13	Silver box low open woodland	-	-	140,123	1,279
14	Coolibah low open woodland on clay	Floodplain Large trees with hollows	Moderate	188,623	2,193
15	Coolibah, Lophostemon and Gutta Percha swamps	Wetland / floodplain	Moderate	111,596	921
16	Melaleuca low open woodland on floodplains & drainage depressions	Floodplain / drainage depression	Moderate	122,581	3,467
17	Tussock grassland	-	-	207,337	606
20	Corymbia / Eucalyptus woodland on sandstone	-	-	41,660	76
21	Acacia shrubland and hummock grassland on sandplains	-	-	34,039	183

** Considered unlikely to occur within the study area (based on distribution notes provided in SREBA report, Young et al. 2022).*

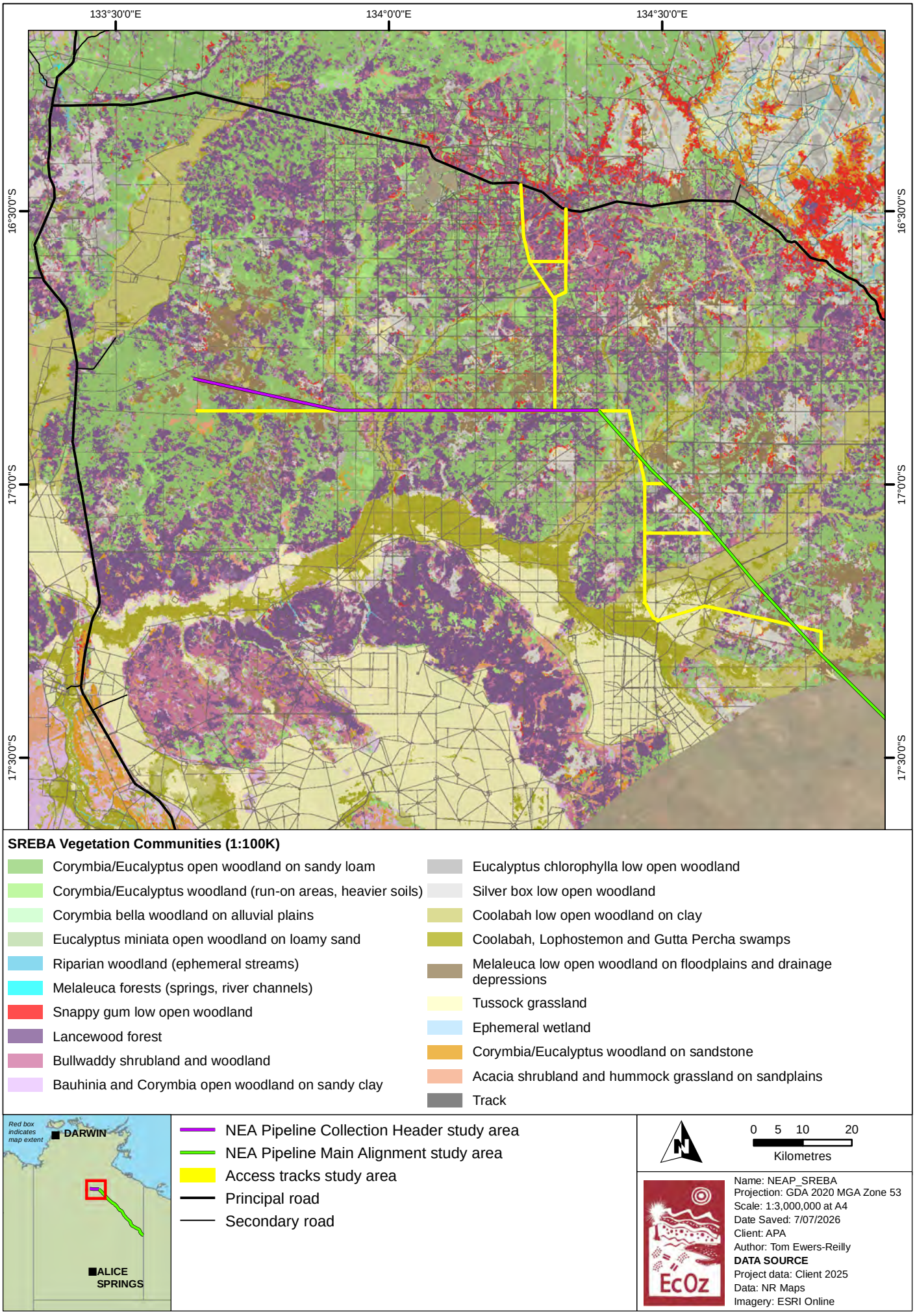


Figure 2-5. Map showing SREBA vegetation communities within the region of the study area

2.5 Threatening processes

There are several general threatening processes to biodiversity in the region of the study area due to human presence, which may influence ecological factors, including the presence of threatened species. These are discussed in the subsections below. Weeds are addressed separately in Section 8.

2.5.1 Pastoralism

The study area occurs entirely within pastoral stations. Consequently, environmental impacts typically associated with pastoralism are expected to occur within the study area – such as increased weed infestation, erosion, degradation of wetlands and riparian habitats (if present), changes to soil surface structure and infiltration, water source degradation and altered fire regimes (NRMMC 2009). Cumulatively, these impacts can negatively affect biodiversity. Pastoralism is implicated in the decline of some vertebrate species and in changes to plant species composition in the Australian rangelands (Fisher et al. 2002). Pastoral impacts have particularly affected mammals – especially larger dasyurids and rodents, bandicoots and smaller macropods (Woinarski & Ash 2002; DEWHA 2009).

The level of impacts from pastoral activities on biodiversity values will depend on station management (i.e. stocking rates, provision of artificial water points and prescribed burns) and on the sensitivity of vegetation communities to grazing.

2.5.2 Fire

The northern savanna constitutes the most fire-prone landscapes in Australia (Russell-Smith & Whitehead 2015), and regular fires have always been a natural part of the environment in the Top End. However, frequent fires can result in fewer flora species and reduced structural complexity (McKay 2017), which can significantly diminish the habitat quality for fauna and facilitate weed invasion.

Fires are a regular occurrence in the NT. Regional fire history and fire scar mapping were obtained from the Northern Australia and Rangelands Fire Information website. Fire frequency is presented on Figure 2-6. This indicates that the north-western end of the study area is subject to higher fire frequency than the southern areas (which have a very low fire frequency). A higher fire frequency is present within the lateritic plains and rises land systems (these areas typically support woodlands to open woodlands with shrubby and/or grassy understorey), whereas a low (to none) fire frequency is present within black soil (clay) plains and alluvial areas.

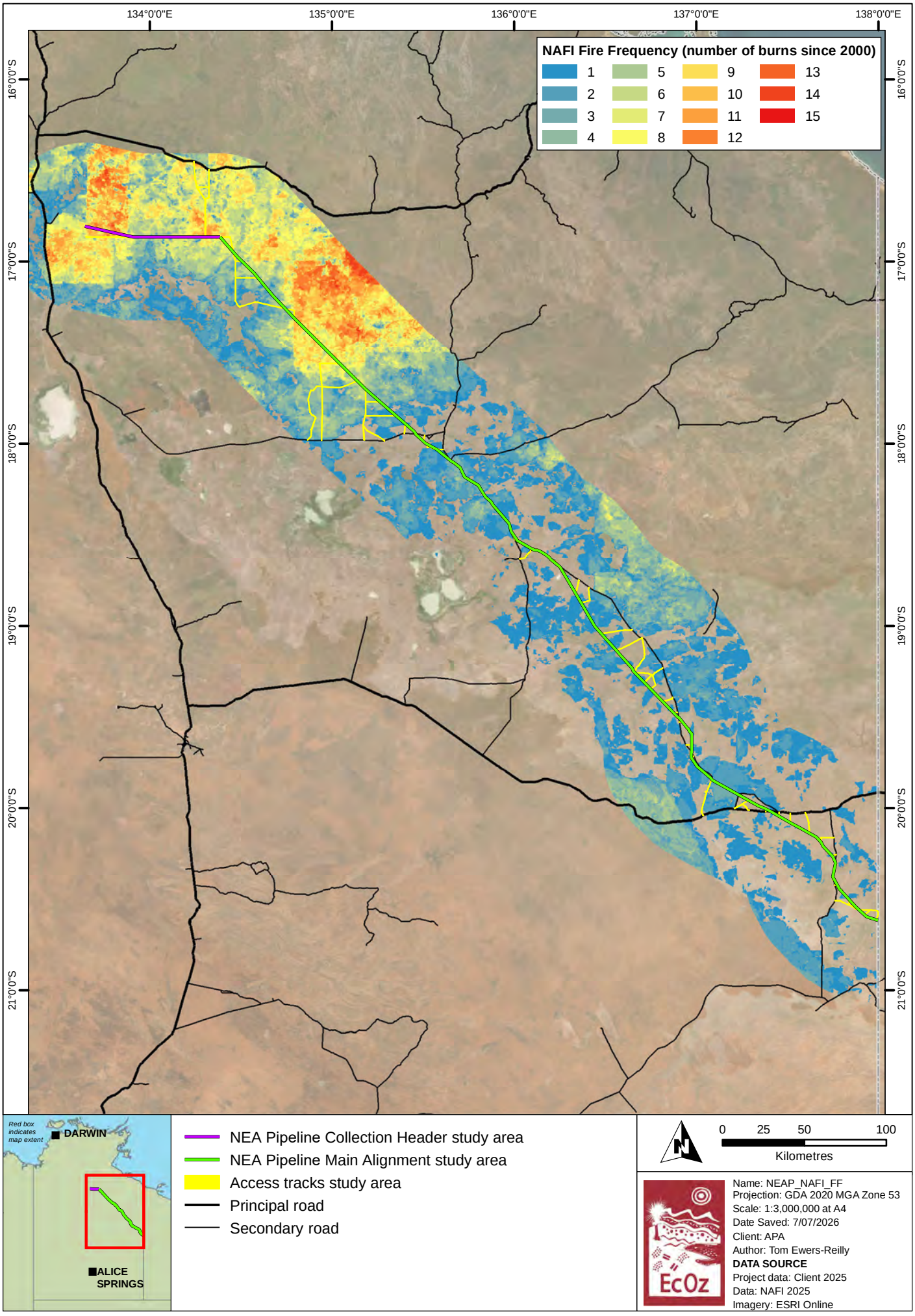


Figure 2-6. Map of fire frequency within 50km of the study area

2.5.3 Pest animals

Pest animal species can be defined as any species (native or exotic) occurring outside their natural range and having a negative impact on the environment, the economy and/or human health. Some pest animal species are also declared as 'feral animals' under section 47 of the TPWC Act.

According to the NT Fauna Atlas, the introduced fauna species listed in Table 2-4 are widespread and abundant within the region and hence may occur within the study area. Cane Toads, Feral Cats, Feral Pigs and Feral European Rabbits are each listed as a Key Threatening Process under the EPBC Act.

Table 2-4. Pest animals that may occur within the study area (NT Atlas)

Common name	Scientific name	Impacts
Feral Cattle	*Bos taurus*	Erosion of soil and watercourses, weed spread, trampling and consumption of native flora, and sedimentation and increased nutrient levels in watercourses.
Donkey	*Equus asinus*	
Horse	*Equus caballus*	
Feral Cat	*Felis catus*	Prey on many species of native animals.
Feral Pig	*Sus scrofa*	Physical damage to wetlands.
Golden Perch	*Macquaria ambigua*	Introduced to NT from native populations in temperate south-eastern Australia. Only historic records in the NT Atlas. Compete with and predate on native species.
House Mouse	*Mus domesticus*	Compete with native species. May impact upon native vegetation via seed predation.
Black Rat	*Rattus rattus*	
House Sparrow	*Passer domesticus*	
Feral European Rabbit	*Oryctolagus cuniculus*	Compete with native species, damage vegetation and degrade land.
One-humped Camel	*Camelus dromedarius*	Trampling, suppression of plant recruitment, damage to wetland and riparian areas, and competition with native animals for food and shelter.
Cane Toad	*Rhinella marina*	Known to cause population reductions in a range of predatory species (due to poisoning by ingestion).

3 LAND TYPES

A land type is a unit of land that comprises 'a reasonably homogeneous part of a land surface, distinct from surrounding terrain with consistent properties in landform, soils or vegetation' (Hooper 1970). Land type mapping is available for the entire study area at a scale of 1:250,000 (Brocklehurst et al., in preparation; spatial dataset reference code: SHTLT_250, Version 3, March 2017). Based on previous applications of this dataset by the authors for other projects, the mapping is considered broadly accurate, with only minor refinements for dominant species composition and land type boundaries.

3.1 Methods

Desktop assessment of the mapping shows nine landform types occurring within the study area (data is summarised in Table 3-1; mapped on Figure 3-1):

- Alluvial plains
- Drainage systems
- Inland wetlands
- Downs (clay) plains
- Lateritic plains
- Low laterite rises
- Sandstone plains
- Sandstone hills
- Limestone plains.

This landform categorisation closely aligns with other land resource datasets (land systems and land units described in Section 2.4).

A field survey was conducted across the study area by helicopter by EcOz ecologists Tom Ewers-Reilly and Erin Barritt from 23 to 29 April 2026. It included a terrestrial vegetation survey to validate the vegetation component of the land type mapping. The verification survey was predominantly based on representative fixed-point checks of landforms and vegetation communities along the study area, with a particular focus on land types that support sensitive and significant vegetation and/or important habitat for threatened species. All major watercourses crossed by the alignment or access tracks were also assessed.

Field data was collected in accordance with the *Land and Vegetation physiognomic floristic approach to vegetation description and classification* (Brocklehurst *2*007) and NVIS. Two types of data collection sites were undertaken – ground-based and aerial-based.

Ground-based sites included collection of landform type, soil type, and dominant flora species. Aerial-based sites focussed on landform type and vegetation structure (and dominant species if possible). Ground site checks also collected data on threatened species and sensitive and significant vegetation types, described in the following chapters.

Significant vegetation and landforms were mapped at a nominal scale of 1:10,000, as detailed in Section 4.

Table 3-1. Summary of STHNT_250 land types within the study area

Landscape class	Landscape description	Land type	Land-form	Soil type	Vegetation structure	Vegetation description	Dominant species	Study area (ha)	
								Land type	Landform
Alluvial floodplains	Alluvial floodplains, swamps, drainage depressions and alluvial fans; sandy, silty and clay soils on Quaternary alluvium	cr2s	Alluvial plains	Vertosols	Tussock grassland	Mixed species tussock grassland	*Aristida latifolia* *Eulalia aurea* *Dichanthium fecundum*	402	9,196
		g1				Astrebla tussock grassland	*Astrebla pectinata* *Astrebla elymoides* *Chenopodium auricomum*	25	
		dr1			Low open woodland	Eucalypt low open woodland over tussock grasses	*Eucalyptus microtheca* *Eucalyptus coolabah* *Excoecaria parvifolia*	1,072	
		j1				Mixed species low open woodland over tussock grasses	*Eucalyptus microtheca* *Eucalyptus microtheca* *Lysiphyllum cunninghamii*	238	
		j1s				Mixed species low open woodland over tussock grasses	*Eucalyptus microtheca* *Lysiphyllum cunninghamii*	4,029	
		j2				Eucalypt low open woodland over tussock grasses	*Eucalyptus microtheca* *Excoecaria parvifolia*	2619	
		j4				Mixed species low open woodland over tussock grasses	*Eucalyptus microtheca* *Excoecaria parvifolia* *Acacia stenophylla*	808	
		g3	Drainage systems			Mixed species low woodland over tussock grasses	*Eucalyptus microtheca* *Acacia stenophylla*	345	345
Clay plains	Level to gently undulating clay plains (black soil plains); cracking clay soils	bara	Downs plains	Vertosols	Tussock grassland	Astrebla tussock grassland	*Astrebla pectinata* *Aristida latifolia* *Eulalia aurea*	27,134	41,271
		barb					*Astrebla pectinata* *Aristida latifolia* *Eulalia aurea*	5,861	
		barc				Mixed species tussock grassland	*Aristida latifolia* *Astrebla pectinata*	2,905	

Landscape class	Landscape description	Land type	Land-form	Soil type	Vegetation structure	Vegetation description	Dominant species	Study area (ha)	
								Land type	Landform
							Brachyachne convergens		
		cr2	Downs plains	Vertosols	Tussock grassland	Mixed species tussock grassland	*Aristida latifolia* *Eulalia aurea* *Dichanthium fecundum*	5,077	
		gg				Astrebla tussock grassland	*Astrebla pectinata*	293	
		wn	Alluvial plains	Vertosols	Low woodland	Acacia low woodland over tussock grasses	*Acacia cambagei* *Acacia georginae*	6,192	6,192
		sy3	Inland wetlands	Vertosols	Open Chenopod Shrubland	Open Chenopod Shrubland	*Chenopodium auricomum* *Muehlenbeckia florulenta*	58.5	58.5
Lateritic plains and rises	Plains and rises associated with deeply weathered profiles (laterite) including sand sheets and other depositional products; sandy and earth soils	bt2	Lateritic plains	Kandosols	Mid open forest	Acacia and/or Macropteranthes mid open forest over short grasses and forbs	*Acacia shirleyi* *Macropteranthes kekwickii*	6,023	23,474
		bt2a			Mid woodland	Acacia and/or Macropteranthes mid woodland over short grasses and forbs	*Acacia shirleyi* *Macropteranthes kekwickii*	1,995	
		p1a		Kandosols	Low woodland	Eucalypt low woodland over tussock grasses	*Eucalyptus pruinosa* *Bauhinia cunninghamii*	721	
		p2		Kandosols	Mid open woodland	Corymbia mid open woodland to woodland over tussock and hummock grasses	*Corymbia dichromophloia* *Erythrophleum chlorostachys* *Corymbia ferruginea*	12,865	
		tan1		Kandosols	Mid open woodland	*Eucalyptus chlorophylla* mid high open woodland over tussock grasses	*Eucalyptus chlorophylla* *Erythrophleum chlorostachys* *Eucalyptus pruinosa*	739	
		trp		Kandosols	Tall open shrubland	*Acacia lysiphloia* tall open shrubland	*Acacia lysiphloia*	388	
		bul5		Hydrosolic Kandosols	Low open woodland	*Corymbia terminalis* low open woodland over tussock grasses	*Corymbia terminalis* *Eucalyptus chlorophylla* *Eucalyptus tectifica*	740	

Landscape class	Landscape description	Land type	Land-form	Soil type	Vegetation structure	Vegetation description	Dominant species	Study area (ha)	
								Land type	Landform
		p4	Low laterite rises	Rudosols	Low open woodland	Corymbia low open woodland over hummock and tussock grasses	*Corymbia dichromophloia* *Eucalyptus leucophloia* *Corymbia ferruginea*	2,722	12,190
		wh2		Kandosols	Open woodland	Eucalypt open woodland over tussock grasses	*Corymbia dichromophloia* *Corymbia terminalis* *Eucalyptus leucophloia*	4,561	
		wh3			Closed shrubland	Acacia closed shrubland over tussock grasses +/- emergent eucalypts	*Acacia lysiphloia*	2,257	
		wh4		Dermosols	Low open woodland	Mixed species low open woodland over tussock grasses	*Lysiphyllum cunninghamii* *Ventilago viminalis* *Atalaya hemiglauca*	2,648	
Sandstone plains and rises	Plains, rises and plateaux on mostly on sandstone, siltstone, claystone, shale and some limestone; commonly shallow soils with surface stone and rock outcrop	shd	Sandstone plains	Tenosols	Low open woodland	Corymbia/Eucalypt low open woodland over hummock grasses	*Corymbia setosa* *Eucalyptus pruinosa* *Corymbia bella*	1,469	1,469
		y3		Kandosols	Low open woodland	*Eucalyptus pruinosa* low open woodland over tussock and hummock grasses	*Eucalyptus pruinosa* *Lysiphyllum cunninghamii* *Ventilago viminalis*	116	485
		y1	Sandstone hills	Kandosols	Low open woodland	Eucalypt low open woodland over hummock grasses	*Eucalyptus leucophloia* *Corymbia dichromophloia* *Corymbia terminalis*	369	
Limestone plains and rises	Plains, rises and plateaux on weathered and unweathered limestone, dolomite, chalcedony, shale, sandstone and siltstone with sand sheets; sandy and earth soils	ton	Limestone plains	Calcarosols	Open Tussock Grassland	Mixed species open tussock grassland	*Dactyloctenium radulans* *Enneapogon polyphyllus* *Enneapogon avenaceus*	55	55

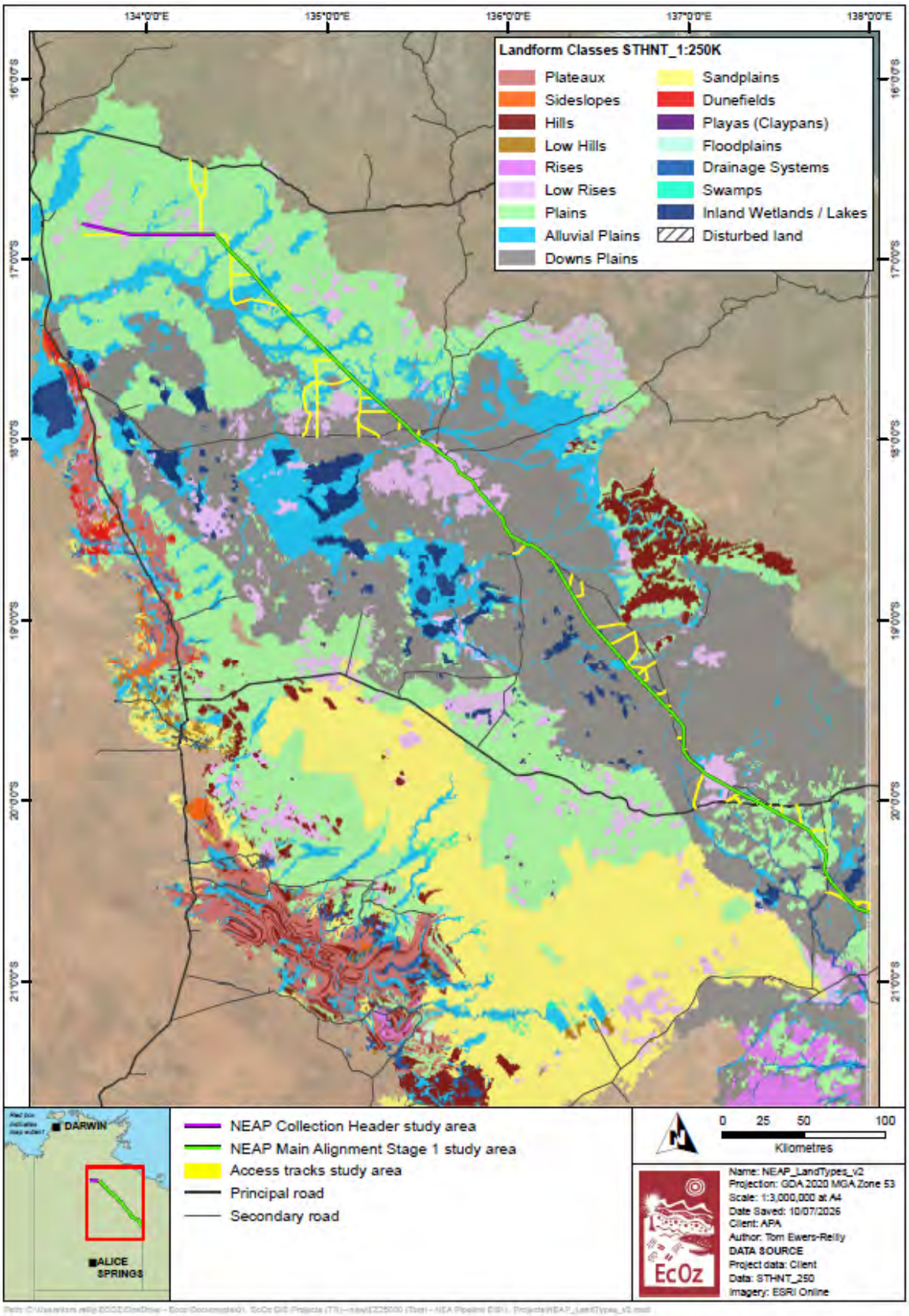


Figure 3-1. Map of land types within the region of the study area

Figure 3-1. Map of land types within the region of the study area

3.2 Results

The survey was conducted post-wet season (23 – 29 April 2026) so that short-lived and ephemeral species were detectable. Field data was collected at 715 survey sites (101 ground-based and 614 aerial-based) (dataset provided in Appendix B).

The survey confirmed that the existing land type dataset as summarised in Table 3-1 is broadly accurate and suitable for the purposes of ecological assessment of landform and vegetation types. As expected, there are numerous minor variations in vegetation structure and floristics between desktop mapping and actual field observations, and several land type boundaries are occasionally inaccurate due to magnitude of scale differences between land type dataset and field survey. However, for the purpose of ecological assessment, survey effort and data collection were focused on describing and mapping significant and sensitive vegetation (Section 4) and threatened species' habitat (Section 5) within the study area, rather than ground-truthing the existing land type dataset at a finer scale.

A high-level description of each main landform and common vegetation types is provided below.

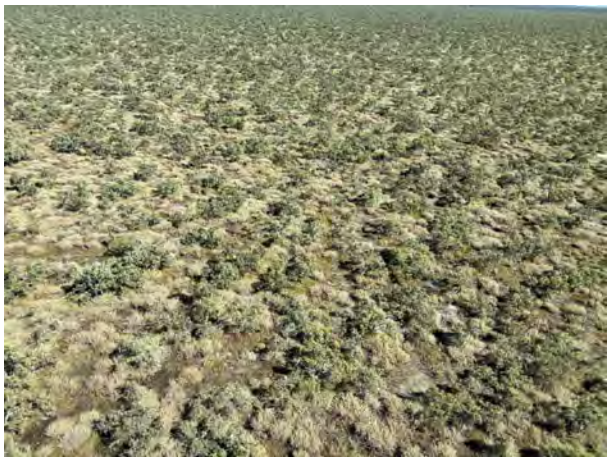
- **Alluvial plains** (floodplains) are present throughout the study area. These areas are subject to seasonal inundation and tend to have heavy clay soils. Some are broad flow-paths (or drainage depressions) that are not associated with a drainage channel; others are flood-out areas of major drainages. The main vegetation types include Coolibah (+/- Gutta Percha) low open woodland, open tussock grasslands (i.e. sparse trees and shrubs), Gidgee low woodland over tussock grass, and Bullwaddy low open woodlands. Refer to Figure 3-2 for representative photographs.
- **Drainage systems** within the study area consist of major and minor waterways. All drainages and their banks support heavy clay soils. Major waterways have well-defined channels and typically support Coolibah low open woodland tussock grasses, sedges and forbs – see Figure 3-3 for representative photographs. Minor waterways typically have shallow drainage paths (occasionally small channel) of varying widths and generally support tussock grassland and sedges with scattered shrubs (such as Mimosa Bush) – see Figure 3-4 for representative photographs. These are described in detail as part of the riparian vegetation assessment in Section 4.1 and the Waterway Crossing Assessment at Appendix C.
- **Inland wetlands** are present in, or near, the study area in the form of ephemeral swamps, drainage depressions, closed depressions, gilgai and floodplain vegetation. These are discussed in detail in Section 4.2.
- **Downs (clay) plains** dominate the southern parts of the study area. These clay plains comprise of extensive tussock grasslands with scattered occurrences of shrubs such as Mimosa Bush (*Vachellia farnesiana*). The plains are flat to gently undulating, with occasional very low lateritic rises – see Figure 3-5 for representative photographs. The main grass species observed include *Astrebla pectinata, Aristida latifolia, Eulalia aurea* and *Iseilema vaginiflorum*; however, there is a high diversity of grass species present.
- **Lateritic plains** are common to the northern part of the study area, have a patchy occurrence in the central part of the study area and are uncommon to absent in the south. These are flat to gently undulating and have red earth, lateritic-based soils. A broad variety of vegetation types were associated with lateritic plains – see Figure 3-6 for representative photographs – including:
    - Lancewood woodland over tussock grasses
    - Bullwaddy woodland (often present as groved/dense thickets) over tussock grasses
    - Silver Box and Bauhinia low woodland over scattered shrubs and hummock / tussock grasses
    - Variable-barked Bloodwood open woodland over tussock and hummock grasses
    - Turpentine tall open shrubland over tussock grass
    - Mulga tall shrubland with patches of Turpentine over tussock grass
    - Northern Bloodwood low open woodland over tussock grasses

- Snappy Gum low open woodland with sparse shrubs over tussock and hummock grasses
- Ghost Gum open woodland over hummock and tussock grasses.

- **Lateritic low rises** are scattered throughout the study area – see Figure 3-7 for representative photographs. These are rises have very low relief and often support gravel substrate mixed with lateritic red earth soils. Vegetation types recorded include:
  - Variable-barked Bloodwood open woodland over mixed grasses
  - Turpentine closed shrubland over tussock grasses
  - Mixed species open woodland over tussock grasses.
- **Sandstone low rises** are uncommon and were only encountered adjacent to one of the proposed (existing) access tracks – see Figure 3-8 for representative photographs. This rise has very low relief. This location supported Snappy Gum and Silver Box low open woodland with sparse to patchy shrubs (*Acacia* species) over tussock and hummock grasses.

Two other landforms mapped as occurring within the study area are **sandstone hills** and **limestone plains**. The survey did not record the presence of these landforms, although several small areas of exposed calcrete (limestone) were noted in the southern part of the study area.

Gutta Percha low open woodland



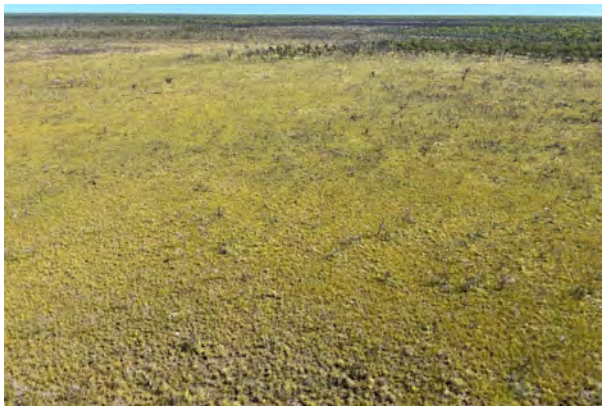
Coolibah low open woodland

Bullwaddy floodplain / seasonally-inundated area

Gidyea low open woodland

Gidyea low open woodland

Coolibah and Gutta Percha low open woodland



Tussock grassland with sedges

Melaleuca viridiflora open shrubland

Figure 3-2. Representative photographs of alluvial plains (floodplains)

Figure 3-3. Representative photographs of major waterways

Figure 3-4. Representative photographs of minor waterways

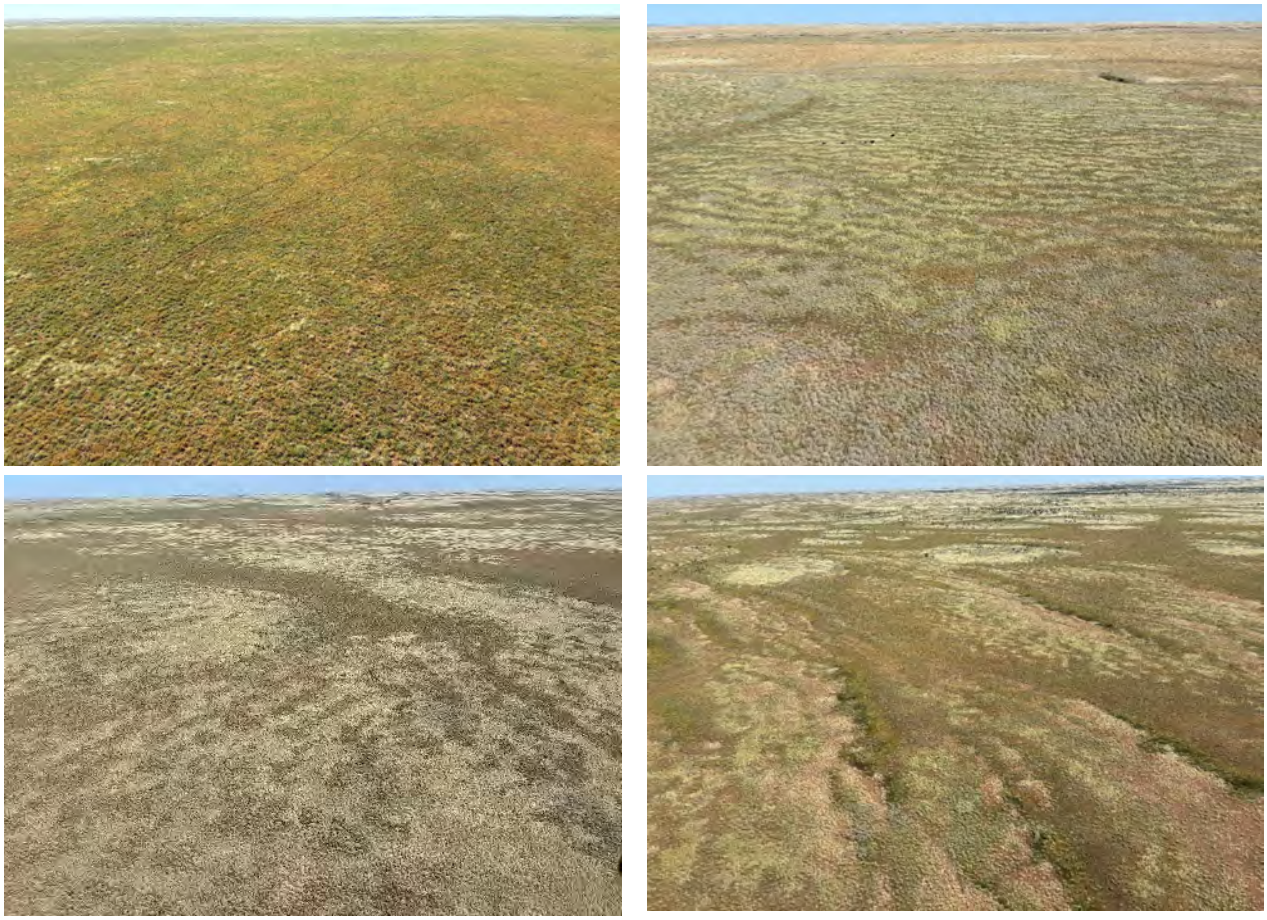


Figure 3-5. Representative photographs of downs (clay) plains

Turpentine shrublands

Mulga open shrubland

Snappy Gum

Corymbia spp. open woodland

Bullwaddy

Lancewood

Silver Box over Turpentine

Ghost Gum open woodland

Figure 3-6. Representative photographs of lateritic plains

Snappy Gum

Turpentine shrubland

Turpentine and Silver Box

Snappy Gum and Turpentine

Figure 3-7. Representative photographs of low lateritic rises

Figure 3-8. Representative photographs of low sandstone rises

4 SENSITIVE AND SIGNIFICANT VEGETATION

Sensitive and significant vegetation (SSV) is a term used in the NT to describe spatially-restricted vegetation communities that are important to specialist wildlife (including threatened species) and provide valuable ecosystem services (such as riparian vegetation preventing erosion of watercourses and mangroves acting as fish nurseries). The value of these vegetation types is described in the NT *Land Clearing Guidelines* (DLPE 2026).

The field survey identified that the following SSVs occur within the study area:

- Riparian vegetation
- Wetlands
- Large trees with hollows suitable for fauna
- Sinkholes
- Other groundwater-dependent ecosystems.

Using data from the field survey, the occurrence of these SSVs within the study area is mapped at an approximate scale of 1:10,000.

4.1 Riparian vegetation

According to the *Land Clearing Guidelines* (DLPE 2026), riparian vegetation is any native vegetation within and immediately surrounding a waterway, and is not restricted to a distinct vegetation community immediately adjacent to waterways. This broad definition recognises that all riparian vegetation plays a critical role in maintaining ecological processes, including improving water quality by filtering terrestrial run-off and stabilising banks, thereby reducing erosion. Riparian vegetation that is distinct from the surrounding vegetation often has additional values – including supporting unique biodiversity and providing refuge habitat and habitat corridors.

To determine presence of riparian vegetation within the study area, a desktop review was initially undertaken to identify major[3] and minor[4] watercourses intersected by the study area, followed by field survey to describe the waterway and determine presence of sensitive riparian vegetation. Major watercourse crossings were prioritised for field assessment because it is assumed that sensitive riparian vegetation has potential to be associated with major waterways and is less likely to be associated minor waterways. Minor waterways were qualitatively assessed in the field to verify that the minor classification is relevant and for presence of sensitive riparian vegetation.

Data collection included a physical assessment in accordance with the *Australian River Assessment System: AusRivAS Physical Assessment Protocol 2001,* and ecological assessment to determine baseline conditions and identify presence of sensitive vegetation. More detail on survey methodology is provided in the Waterway Crossing Assessment (Appendix C).

Approximate boundaries of major and minor waterways have been mapped within the study area at an approximate scale of 1:10,000 using aerial imagery and field data. These generally identify the extent of riparian vegetation at a site (i.e. channel and extent of associated vegetation on the adjacent banks and floodplain). Spatial data for major waterways are presented in Appendix C.

The field survey confirmed that the study area intersects 19 major waterways that support sensitive riparian vegetation to some extent, including 15 within the pipeline alignment component of the study area and 4 on proposed (but existing) access tracks (summarised in Table 4-1; site locations mapped on Figure 4-1). Detailed

[3] Major waterways have a stream order of 3 (or above) and/or if are classed as a ‘major’ watercourse, as per the NT Stream Order dataset (DLPE 2018)
[4] Minor waterways have a stream order of 2, and are not classed as a ‘major’ watercourse, as per the NT Stream Order dataset (DLPE 2018)

assessments of individual major waterway crossings – including ecological values and management considerations – are provided in the Waterway Crossing Assessment at Appendix C.

In most locations, riparian vegetation was structurally and floristically distinct from adjacent upland vegetation and was commonly dominated by mature Coolibah trees (*Eucalyptus microtheca* or *Eucalyptus coolabah*) (example photographs provided at Figure 4-2). Large habitat trees supporting hollows and occasional raptor nests were frequently observed within riparian corridors, indicating these areas likely provide important refuge habitat and corridors for fauna.

Many of the watercourses also support distinct ephemeral pools / waterholes which are often surrounded by larger and denser trees and vegetation, and sometimes support aquatic plants such as Water Lillies, Marshworts, Spiny Mudgrass, Lignum and sedges (example photographs provided at Figure 4-3). As such, these in-stream waterhole features are considered to support riparian vegetation.

The survey confirmed numerous minor waterways within the study area. These waterways typically have no or very low banks and lack the waterholes and aquatic vegetation required to support significant ecological values (example photographs provided at Figure 4-4). The scant riparian vegetation that is present has no notable biodiversity compared with adjacent vegetation; its value is purely functional, helping to stabilise the waterway and thereby reduce erosion.

Table 4-1. Summary of riparian vegetation sites within the study area

Waterway Site ID	Survey site number	Name	Location	Sensitive riparian vegetation	Waterhole / pool present
PIPELINE CORRIDOR STUDY AREA					
MDC-PC-01	367	Creswell Creek	KP 173.5	Small Coolibah trees	Close by
MDC-PC-02	316	Corella Creek	KP 232.2	Small Coolibah trees	Yes
MDC-PC-03	287	Brunette Creek*	KP 268.2	Large Coolibah trees	No
MDC-PC-05	248	Playford Creek	KP 345.8	Large Coolibah trees	Yes
MDC-PC-06	236	Buchanan Creek	KP 360.9	Small Coolibah trees	No
MDC-PC-08	233	Buchanan Creek	KP 361.3	Large Coolibah trees	No
MDC-PC-10	208	Ranken River	KP 409.1	Large Coolibah trees, aquatic vegetation	Close by
MDC-PC-11	177	Lorne Creek*	KP 445.8	Large Coolibah trees, aquatic vegetation	Close by
MDC-PC-12	153	Six Mile Creek	KP 472.4	Lignum swamp trees, aquatic vegetation	Yes
MDC-PC-13	120	James River*	KP 493.4	Large Coolibah trees, aquatic vegetation	Yes
MDC-PC-14	93	Shakespeare Creek	KP 516.3	Aquatic vegetation	Close by
MDC-PC-15	49	Happy Creek	KP 551.1	Large Coolibah trees	Yes
MDC-PC-16	42	Georgina River*	KP 553.5	Large Coolibah trees	Yes
MDC-PC-17	39	Georgina River*	KP 554.1	Large Coolibah trees	Close by
MDC-PC-19	4	Blue Bush Creek	KP 576.3	Large Coolibah trees	No
ACCESS TRACKS STUDY AREA					
MDC-AC-05	231	Buchanan Creek	N/A	Large Coolibah trees	Close by
MDC-AC-06	50	Shakespeare Creek	N/A	Small Coolibah trees	Close by
MDC-AC-07	23	Georgina River	N/A	Large Coolibah trees	Close by
MDC-AC-08	11	Blue Bush Creek	N/A	Large Coolibah trees	Close by

** Associated with a SOBS (see Section 2.3)*

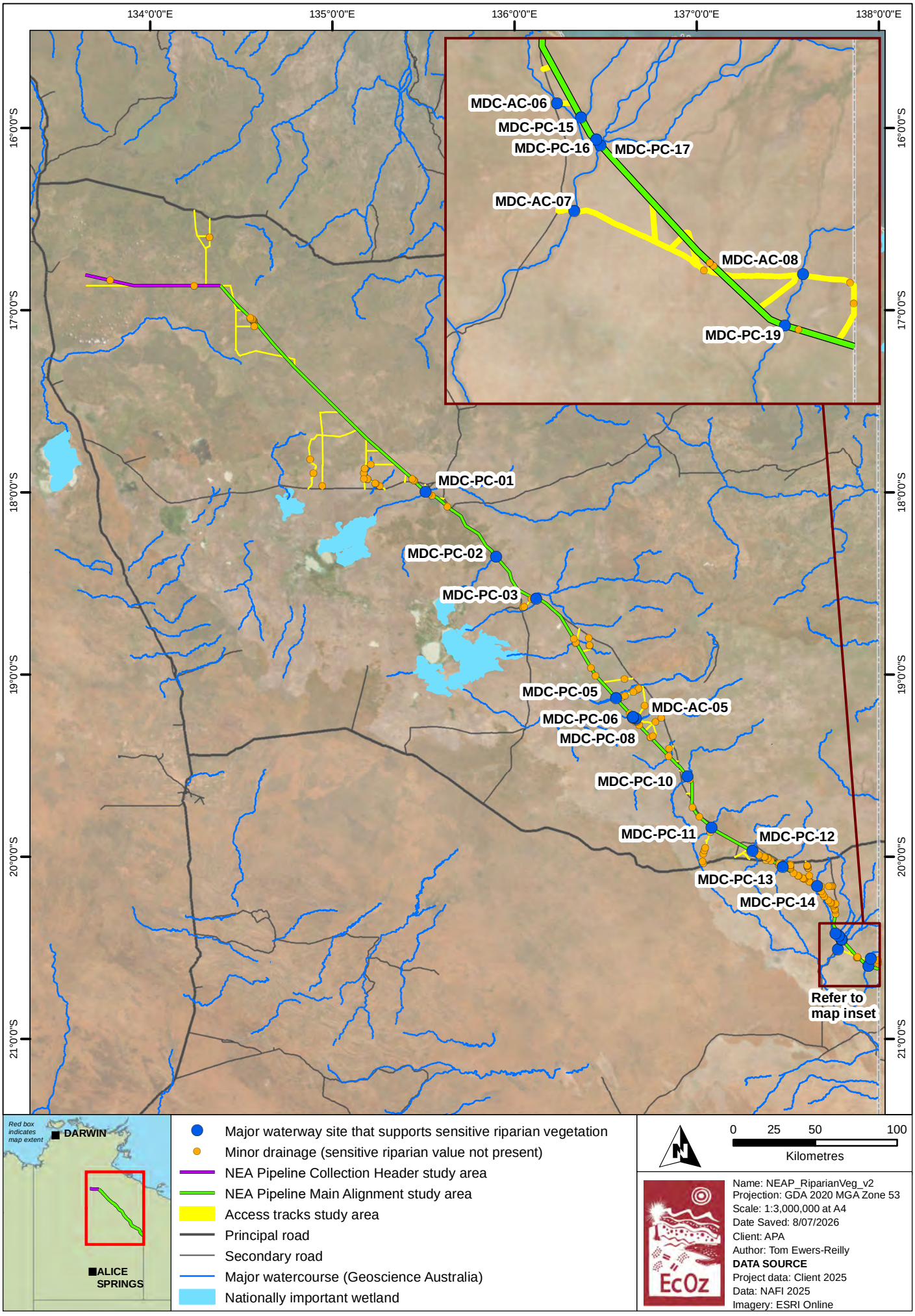


Figure 4-1. Map of sensitive riparian vegetation sites within the study area

MDC-PC-05 (Playford Creek) (Coolibah trees)

MDC-PC-08 (Buchanan Creek) (Coolibah trees)

MDC-PC-10 (Ranken River) (Coolibah trees)

MDC-PC-13 (James River) (Coolibah trees, Marshwort)

MDC-PC-12 (Six Mile Creek) (Lignum and Marshwort swamp surrounded by Gidyea)

Figure 4-2. Example photographs of riparian vegetation identified within the study area

Drainage waterhole present at MDC-PC-11 (Lorne Creek))

Drainage waterhole present downstream of MDC-PC-11 (Lorne Creek)

Drainage waterhole present downstream of MDC-PC-14 (Shakespeare Creek)

Figure 4-3. Example photographs of waterhole riparian vegetation identified within the study area

MDC-PC-04 (tussock grassland)

MDC-PC-09 (tussock grassland)

MDC-PC-18 (scattered *Vachellia farnesiana* shrubs over tussock grassland)

MDC-AC-02 (tussock grassland)

MDC-AC-10 (tussock grassland)

Figure 4-4. Example photographs of minor waterways identified within the study area

4.2 Wetlands

According to the NT *Land Clearing Guidelines* (DLPE 2026) wetlands 'encompass a wide range of habitats that permanently or intermittently support plants or animals dependent upon wet conditions to complete their lifecycles'. This includes, but is not restricted to, swamps, marshes, billabongs, lakes, salt marshes, mudflats, mangroves and closed (drainage) depressions. The NT *Land Clearing Guidelines* state that valuing a wetland should consider:

- Wetland type and complexity.
- Size – larger wetland systems are generally considered to support a more diverse range of habitats.
- Aggregation – the occurrence of a wetland within a discrete aggregation may increase its value.
- The known or likely presence of significant species, or key resources or habitat for such species.
- Permanence and context in landscape – especially in arid climate zones.
- Listed importance or recognised special value.

Based on this guidance, this assessment focuses on the types of wetlands that occur within the study area and are most likely to be considered significant – namely, swamps and lakes.

The study area does not intersect any nationally-important wetlands (as per sites recognised under the Directory of Important Wetlands https://www.dcceew.gov.au/water/wetlands/publications/directory-important-wetlands). The following nationally-important wetlands occur within 50 km of the study area; all are located downstream of the study area, with the closest significant wetlands being approximately 30 km downstream (locations shown on Figure 4-5):

- Eva Downs Swamp (approx. 50 km downstream from study area, near MAKP 122)
- Tarrabool Lake (approx. 30 km downstream from study area via Creswell Creek, near MAKP 173)
- Corella Lake (approx. 30 km downstream from study area via Corella Creek, near MAKP 232)
- Lake Sylvester (approx. 30 km downstream from study area via Brunette Creek and Boree Creek, near MAKP 268 and MAKP 304, respectively) (Lake de Burgh also linked to this wetland).

These significant wetland features were aerially inspected during the survey and all contained extensive bodies of water and numerous instances of waterbird congregations (example photographs provided in Figure 4-6).

Existing land and vegetation datasets (Sections 2 and 3) and aerial imagery (viewed at a scale of 1:4,000) were used to identify potential wetland features within the study area. These were targeted for assessment during the field survey, as were any additional wetland features that were encountered. Wetland features were selected for field assessment if they had a well-defined boundary and supported a distinct vegetation community characteristic of seasonal and/or permanent aquatic flora species. The ecological significance of each wetland feature was also qualitatively assessed based on a range of criteria – including size, complexity, regional context, habitat features and permanence.

The field survey confirmed the following wetland features (mapped within the study area at a scale of 1:10,000) are present within the study area:

- **Ephemeral swamps** – 31 survey sites (all occurrences). Uncommon within the study area. Small to moderate-sized closed depressions that temporarily fill with water after heavy rains or seasonal run-off, and then completely dry out. Support a distinct flora community dependent on seasonal inundation.
- **Gilgai** – 2 survey sites (representative selection only; although uncommon, there are more gilgai features present within the study area). A natural micro-relief formation on expanding clay soils consisting of alternating mounds and depressions
- **Closed depressions** – 9 survey sites (representative selection only, relatively uncommon, there is likely more closed depressions present). A low-lying basin or landform with no natural surface drainage outlet. Typically supports tussock grassland rather than aquatic flora species.

- **Inundated plains / floodplains** – 68 survey sites recorded. Flat low-lying areas that have clay or clay loam soils and become seasonally inundated. These areas do not have formed channels or flow paths typical of waterways.

Wetland assessments were undertaken at 25 sites (15 within or adjacent to the pipeline component of the study area; 10 within the access tracks component of the study area) because these locations are considered to have a local to regional ecological significance and therefore management measures will be required to minimise impacts (summarised in Table 4-2; locations mapped on Figure 4-5; example photographs provided at Figure 4-9; detailed assessment provided in Appendix D). These wetlands generally comprised distinct, seasonally-inundated areas supporting scattered trees and often supported some aquatic vegetation. These features are unlikely to represent wetlands of high ecological significance due to their limited size, ephemeral nature and lack of structural complexity. They may support short-term habitat for migratory wetland bird species when inundated during summer months (i.e. migratory season); however, are unlikely to be considered as important or critical habitat.

The other recorded wetland features – including gilgai, closed depressions, floodplains and seasonally inundated areas – typically supported small, grassy and seasonally-inundated areas (example photographs provided in Figure 4-8). These features are considered unlikely to support high ecological value.

Some drainage channels also support wetland type features – referred to as drainage waterholes / pools. These are covered as part of the discussion on riparian vegetation (Section 4.1) and detailed in Appendix C.

Table 4-2. Summary of wetland sites considered to have moderate ecological significance

Wetland ID	Site	Wetland type	Size	Location relative to Rev 1.0 of the NEA pipeline	Closest KP
PIPELINE STUDY AREA					
WL-PC-01	654	Ephemeral swamp	1 ha	Avoided by Rev 1.0 of the NEA pipeline (10m)	CHKP 2
WL-PC-02	544	Ephemeral swamp	2 ha	Avoided by Rev 1.0 of the NEA pipeline (330m)	MAKP 13
WL-PC-03	541	Ephemeral swamp	2 ha	Avoided by Rev 1.0 of the NEA pipeline (330m)	MAKP 15
WL-PC-04	497	Ephemeral swamp	0.5 ha	Avoided by Rev 1.0 of the NEA pipeline (185m)	MAKP 36
WL-PC-05	498	Ephemeral swamp	2 ha	Avoided by Rev 1.0 of the NEA pipeline (285m)	MAKP 36
WL-PC-06	500	Ephemeral swamp	1 ha	Edge intersected by Rev 1.0 of the NEA pipeline	MAKP 36
WL-PC-07	501	Ephemeral swamp	2 ha	Avoided by Rev 1.0 of the NEA pipeline (330m)	MAKP 36
WL-PC-08	695	Ephemeral swamp	225 ha	Avoided by Rev 1.0 of the NEA pipeline (800m)	MAKP 298
WL-PC-09	256	Ephemeral swamp	250 ha	Avoided by Rev 1.0 of the NEA pipeline (1,000m)	MAKP 336
WL-PC-10	249	Ephemeral swamp	2 ha	Avoided by Rev 1.0 of the NEA pipeline (65m)	MAKP 344
WL-PC-11	178	Ephemeral swamp	1 ha	Intersected by Rev 1.0 of the NEA pipeline	MAKP 444
WL-PC-12	20	Ephemeral swamp	18 ha	Avoided by Rev 1.0 of the NEA pipeline (65m)	MAKP 563
WL-PC-13	19	Ephemeral swamp	65 ha	Avoided by Rev 1.0 of the NEA pipeline (300m)	MAKP 565
WL-PC-14	605	Inundated area	22 ha	Intersected by Rev 1.0 of the NEA pipeline	CHKP 55
WL-PC-15	781	Ephemeral swamp	14 ha	Avoided by Rev 1.0 of the NEA pipeline (380m)	MAKP 46
Rev 1.0 NEA ACCESS TRACK STUDY AREA					
WL-AC-01	564	Inundated area	43 ha	Intersected by existing access track	NA
WL-AC-02	762	Ephemeral swamp	16 ha	Edge intersected by existing access track	NA
WL-AC-03	658	Ephemeral swamp	4 ha	Intersected by existing access track	NA
WL-AC-04	763	Inundated area	50 ha	Intersected by existing access track	NA
WL-AC-05	728	Ephemeral swamp	1 ha	Intersected by proposed new access track	NA
WL-AC-06	475	Ephemeral swamp	4 ha	Intersected by existing access track	NA
WL-AC-07	388	Ephemeral swamp	4 ha	Avoided by existing access track	NA
WL-AC-08	170	Ephemeral swamp	140 ha	Avoided by existing access track	NA
WL-AC-09	145	Ephemeral swamp	3 ha	Avoided by existing access track	NA
WL-AC-10	17	Ephemeral swamp	65 ha	Intersected by existing access track	NA

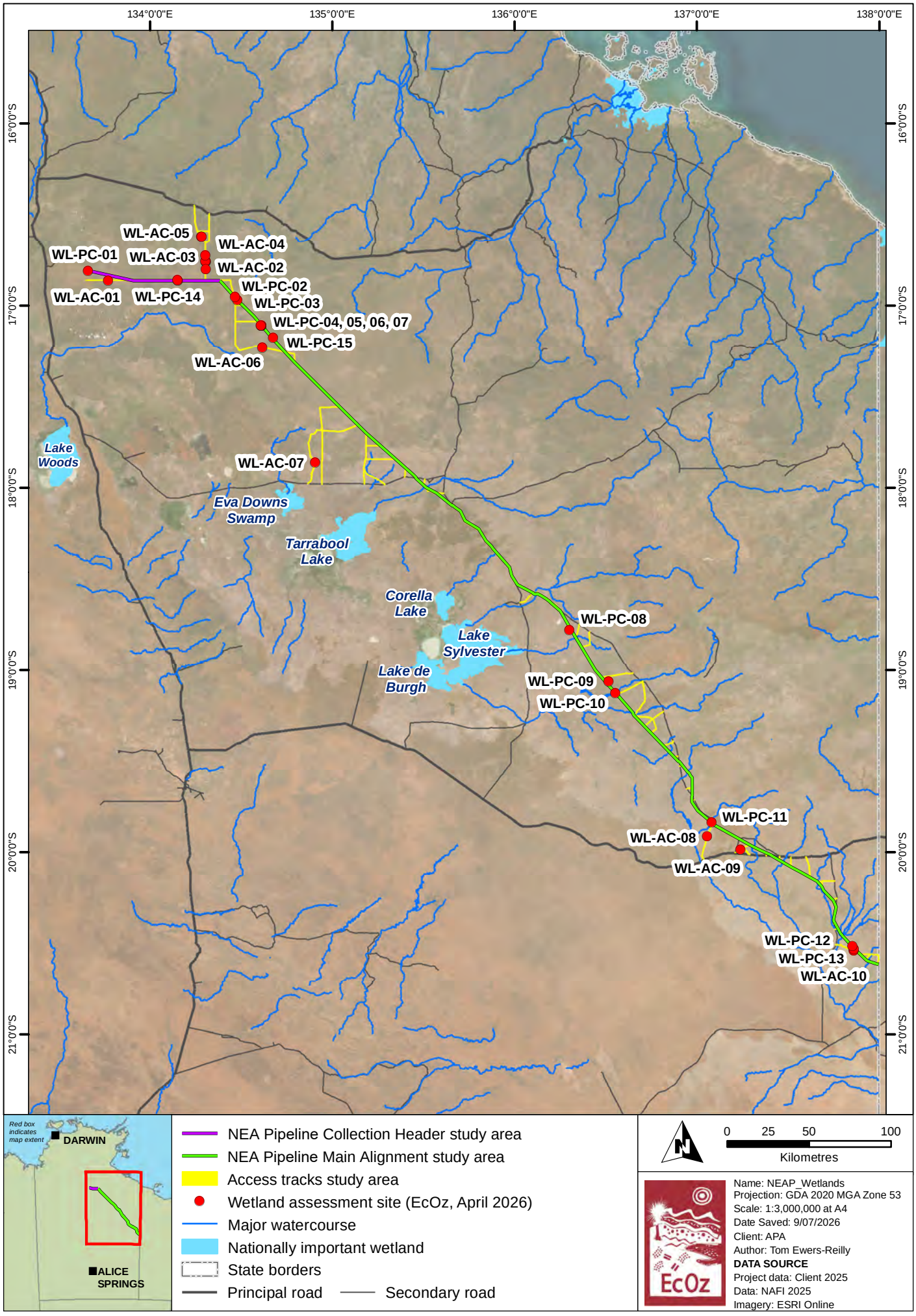
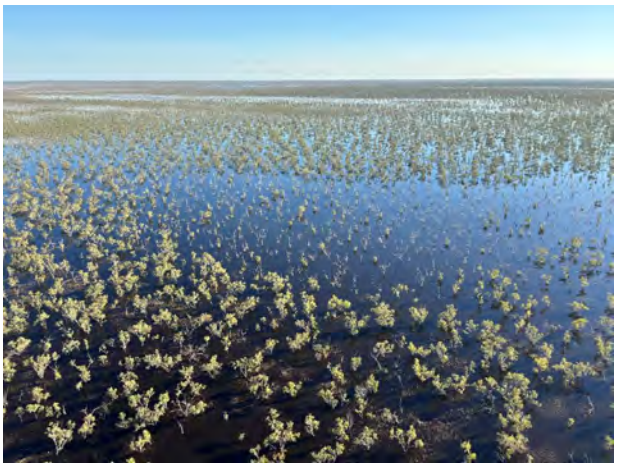
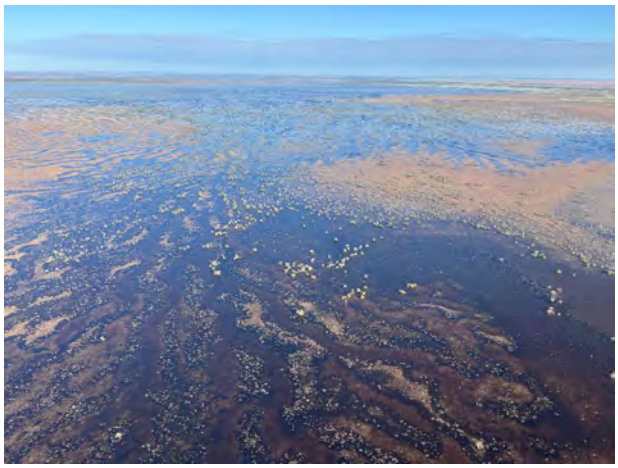


Figure 4-5. Map showing locations of wetland assessment sites recorded within the study area and location of nationally significant wetlands present in the surrounding area

Eva Downs Swamp (50km downstream)



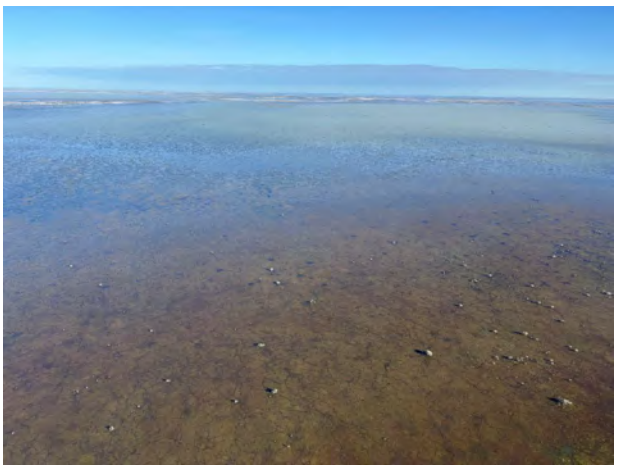
Eva Downs Swamp (50km downstream)



Corella Lake (30km downstream)

Lake Sylvester (30km downstream)

Lake Sylvester (30km downstream)



Lake Sylvester (30km downstream)

Figure 4-6. Example photographs of nationally-significant wetlands in surrounding region

Lignum swamp

Coolibah swamp

Bluebush swamp

Melaleuca/Acacia swamp

Figure 4-7. Representative photographs of ephemeral swamps

Gilgai (Nardoo)

Closed depressions

Swampy closed depressions with Coolibah

Figure 4-8. Representative photographs of closed depressions and gilgai

Coolibah swamp (survey site 541)

Reticulated Bluebush swamp (survey sites 695)

Coolibah swamp (survey site 781)

Swampy inundated area with Coolibah (survey sites 564)

Swampy inundated area with Bullwaddy (survey site 605)

Coolibah swamp (survey sites 728 and 729)

Figure 4-9. Example photographs of ephemeral swamp features

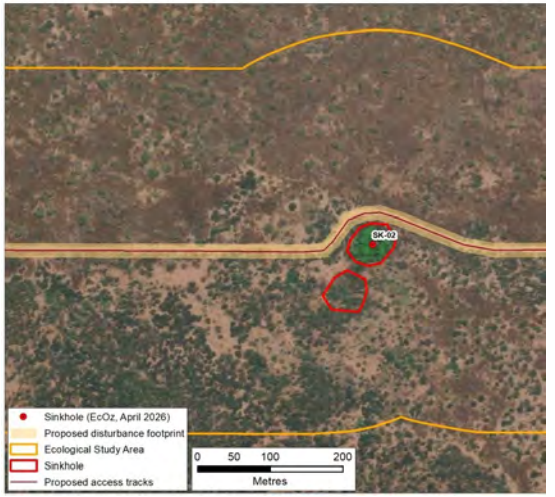
4.3 Sinkholes

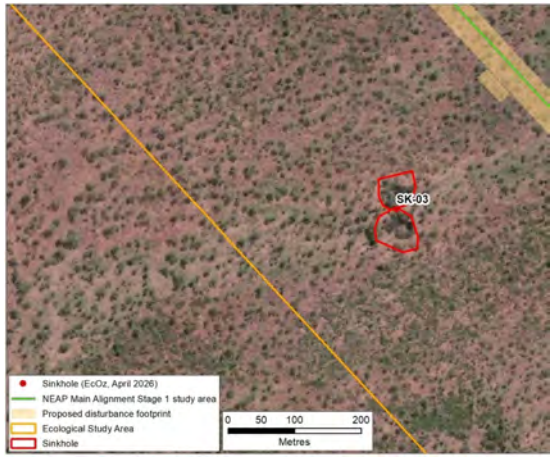
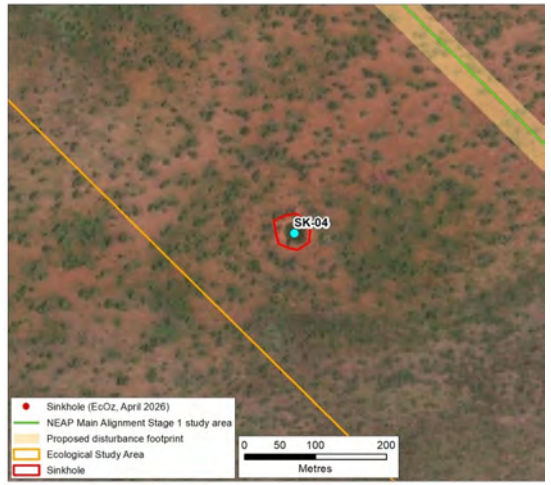
Sinkholes are considered significant under the NT *Land Clearing Guidelines* (DLPE 2026) because they contribute to groundwater recharge and provide unique habitats for biodiversity, effectively operating as habitat 'islands' within terrestrial ecosystems, and therefore may support species with highly-restricted distributions. They are indicators of karst landscapes (dissolving rock) vital for water management and planning.

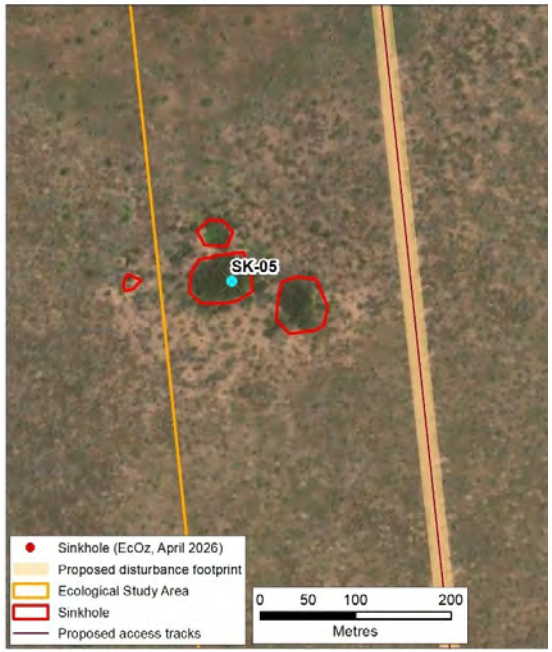
The existing sinkhole dataset from the NT Government does not indicate the presence of any sinkholes within the study area but does indicate occurrence in the general region surrounding the study area (particularly to the north) (see Figure 4-10). However, the field survey identified five locations where sinkhole features are present within the study area, all in the north of the study area, north of MAKP-111 (site photographs provided in Table 4-3; locations on Figure 4-10). Some of these locations comprised multiple sinkholes in proximity (refer to as a sinkhole cluster) – including SK-02 (2 sinkholes), SK-03 (2 sinkholes) and SK-05 (4 sinkholes).

None of the sinkholes are intersected by the Rev 1.0 of the NEA pipeline (design basis for the study area in this report); however, two sinkholes are intersected or close to the Rev 1.0 proposed access track footprint (sinkhole sites SK-01 and SK-02) (refer to maps provided in Table 4-3). The presence of sinkholes indicates potentially unstable subsurface conditions and the possible occurrence of underlying karst geology in the vicinity.

Table 4-3. Sinkholes recorded within the study area

Sinkhole site	Description	Representative photograph(s)	Map snip
SK-01 (survey site 568)	Sinkhole is located on an existing station fenceline. The existing station track currently goes around the edge of the sinkhole feature. The Rev 1.0 access track footprint intersects the sinkhole feature. The sinkhole feature involves a relatively small depression (approximately 10x10m, and 4m deep); and there is an open crack or crevice at the base of the feature that is estimated to be approxmately 10m deep with an hole size of 1x1m. Vegetation community at the site comprises of a mixed woodland and dense shrubs over tussock grass (*Corymbia dichromophloia, Erythrophleum chlorostachys, Alphitonia excelsa, Terminalia canescens, Calytrix extipulata, Grewia retusifolia*)	 	
SK-02 (survey site 721)	Sinkhole is located adjacent to an existing station track that goes around the edge of the sinkhole feature. The Rev 1.0 access track footprint avoids the sinkhole feature. There are two sinkholes at this location, both approximately 50x50m in diameter and 3m deep. Vegetation community at the site comprises dense woodland of Lancewood, Bullwaddy and *Acacia holosericea*		

Sinkhole site	Description	Representative photograph(s)	Map snip
SK-03 (survey site 463)	Sinkhole is located within the study area; however, the edge of the Rev 1.0 of the NEA pipeline is approximately 200m to the east. There are two small; sinkholes at this location, each approxmately 15x15m in diamterer and 4m deep Vegetation community at the site comprises dense shrubs surrounded by *Corymbia dichromophloia* over tussock grass.		
SK-04 (survey site 437)	Sinkhole is located within the study area; however, the edge of the Rev 1.0 of the NEA pipeline is approximately 270m to the east. This is a single sinkhole feature, approximately 30x30m in diameter and 6 to 8m deep. Edges are concave and erosional (erosion gullys present in lateritic substrate). Closer inspection indicates potential limestone / calcretre rock at depth. There are only overhang features within the sinkhole, no caves or other deep cracks observed. Vegetation community at the site comprises dense shrubs within the sinkhole (*Acacia holosericea, Grewia retusifolia, Carissa lanceolata, Hakea arboresens*) surrounded by *Corymbia dichromophloia* over tussock grass and spinifex.		

Sinkhole site	Description	Representative photograph(s)	Map snip
SK-05 (site 425)	Sinkhole cluster is located near an existing station track that is proposed to be used for project access. Closest sinkhole is 80m from edge of Rev 1.0 access track footprint. There are four sinkholes associated with this sinkhole cluster (described below): • The northern sinkole is rocky with steep banks and an approximate diameter of 30x30m and depth of 10m. No vegetation present within hole. • The central and eastern sinkholes are depressions both approximately 40x40m in diameter and 3 to 4m deep (shallow edges, walkable). These sinkholes support dense tall shrubland, *Acacia holoserica, Grewia retusfolia, Terminalia volucris*. • The western sinkhole occurs outside of the study area. It has a small diameter (5x5m); however, is relatively deep (10m depth) and has dangerous overhang edges. Edges are currently erosional and overhang is estimated to be approximately 2m. Vegetation community at the site comprises dense Acacia and Grewia shrubs surrounded by *Corymbia dichromophloia* and Silver Box over tussock grass.		

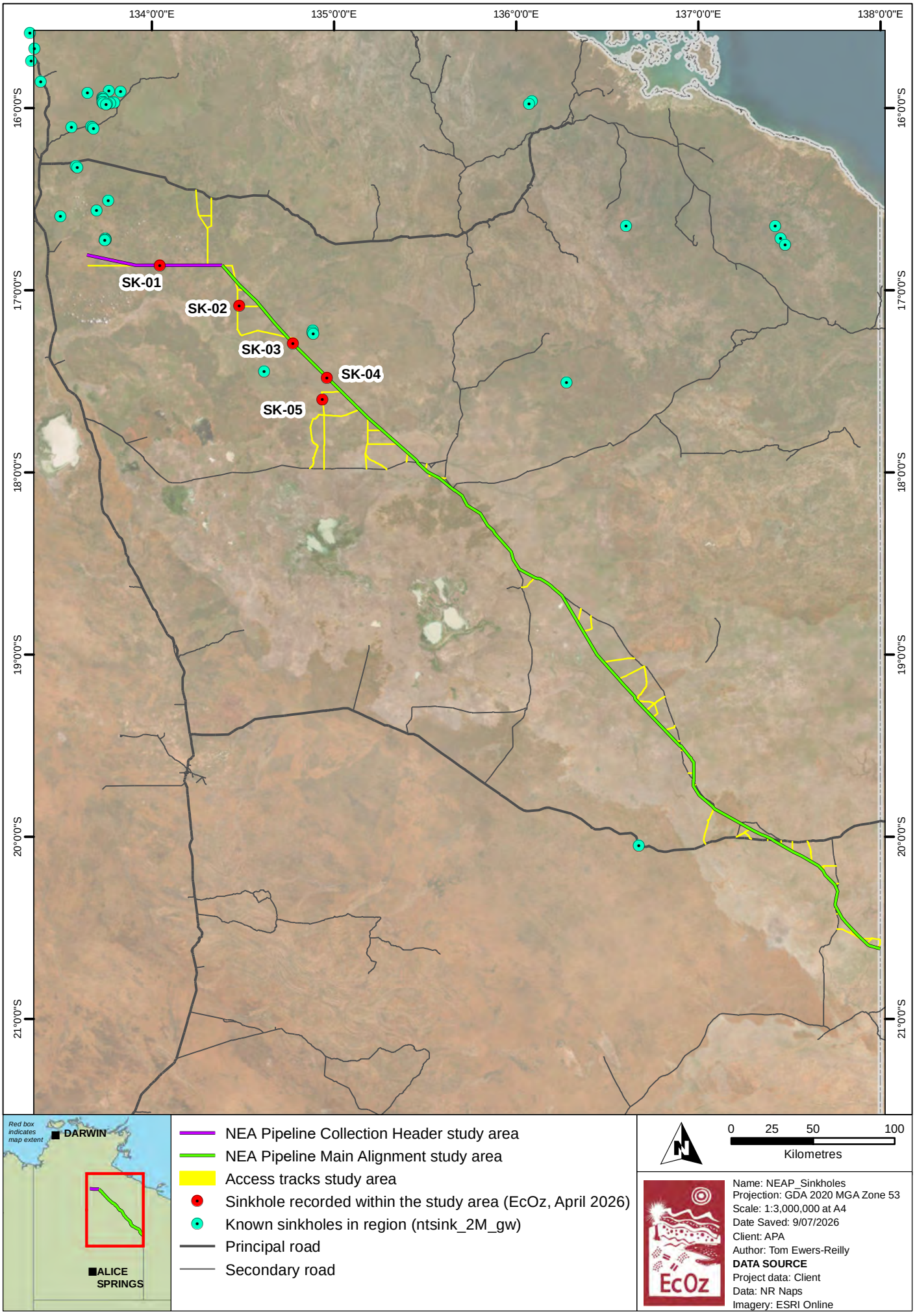


Figure 4-10. Map showing sinkholes locations from field survey and regional sinkhole dataset

4.4 Large trees with hollows suitable for fauna

The NT *Land Clearing Guidelines* (DLPE 2026) consider large trees with hollows as a significant vegetation type because that can provide critical habitat for hollow-dependant fauna species.

A review of existing datasets indicated the following hollow-bearing trees species may be present within approximately half of the study area and may be considered as significant vegetation – *Corymbia bella*, *Corymbia dichromophloia*, *Corymbia flavescens, Corymbia foelscheana, Corymbia latifolia, Corymbia setosa, Corymbia terminalis, Corymbia opaca, Eucalyptus coolabah, Eucalyptus leucophloia, Eucalyptus microtheca*, *Eucalyptus miniata, Eucalyptus tetrodonta*, *Eucalyptus bigalerita, Lophostemon grandiflorus* and *Macropteranthes kekwickii.* Numerous other tree species[5] are also referenced to occur within the area (based on existing datasets); however, these species do not typically support significant hollow features.

The field survey checked tree species for hollow presence. Results are described below and presented on Figure 4-11.

The field survey determined that large, mature Coolibah (*Eucalyptus microtheca* and *Eucalypts coolabah*) with well-developed hollows are common along riparian corridors and ephemeral swamp features throughout the study area and surrounds (example photographs provided at Figure 4-12), but less common throughout other parts of the study area. These trees are likely to provide important habitat resources for hollow-dependent fauna and contribute to local habitat connectivity across the broader landscape.

A discrete patch of Ghost Gum (*Corymbia bella*) was also recorded at survey site 417 near MAKP 119, with several individuals supporting moderate to large hollows suitable for fauna use (example photograph of Ghost Gum patch is provided in Figure 4-12). These hollows may have local significance for native fauna.

Variable-barked Bloodwood (*Corymbia dichromophloia*) was relatively common in the northern part of the study area; however, trees are relatively small and stunted (or fire impacted) and as such the trees rarely support significant hollows (although large trees should be considered to potentially support moderate to large hollows suitable for native fauna). No significant hollows were observed in *Corymbia dichromophloia* within the study area.

Patches of Snappy Gum (*Eucalyptus leucophloia*) with small to moderate-sized hollows were also observed; however, the hollows lacked the structural features required to support significant species such as Gouldian Finch (*Erythrura gouldiae*) (refer to Section 5.2.3) (example photographs provided at Figure 4-12). These hollows are expected to provide refugia for a range of native fauna species; but are unlikely to be considered as significant.

It was also noted that some of the large, mature Bullwaddy (*Macropteranthes kekwickii*) supported large hollows and are expected to provide refugia for a range of native fauna species (example photographs provided at Figure 4-12). Bullwaddy is relatively common within the northern part of the study area and can occur as discrete patches (shown on Figure 4-11).

Desktop research indicated that *Eucalyptus miniata, Eucalyptus tetrodonta* and *Eucalyptus bigalerita* may be present within the study area (these species are known to support significant hollows); however, these species were not recorded during field studies.

[5] *Acacia spp., Alphitonia excelsa, Brachychiton diversifolius, Brachychiton paradoxus, Corymbia aspera, Corymbia ferruginea, Croton arnhemicus, Erythrophleum chlorostachys, Eucalyptus chlorophylla, Eucalyptus patellaris, Eucalyptus pruinosa, Eucalyptus tectifica, Grevillea striata, Lophostemon lactifluus, Lysiphyllum cunninghamii, Terminalis spp., Ventilago viminalis*

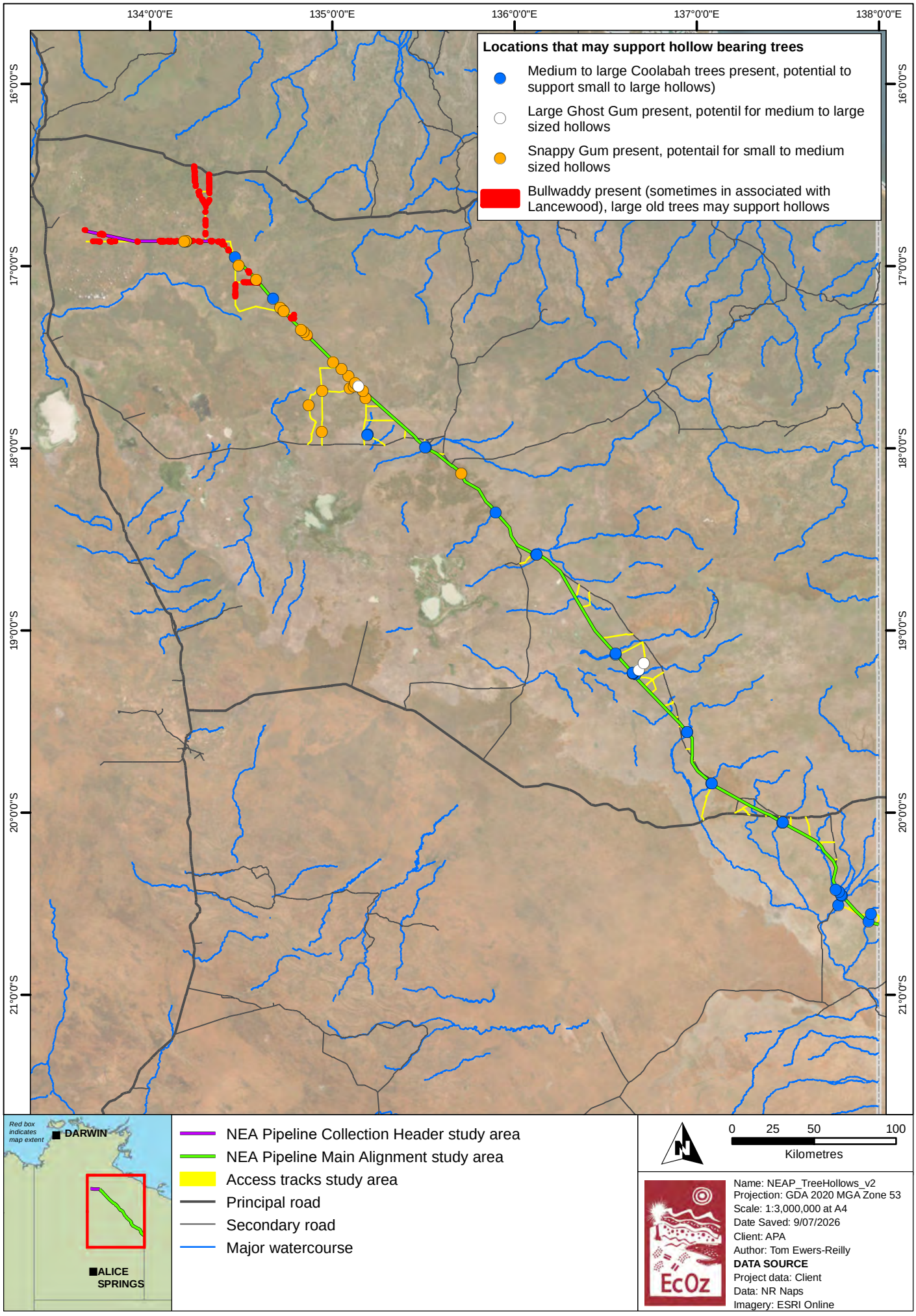


Figure 4-11. Map showing locations where large, hollow-bearing trees were recorded or expected to occur within the study area

Coolibah hollows

Coolibah hollows

Coolibah hollows

Coolibah hollows

Snappy Gum hollows

Snappy Gum hollows

Ghost Gum patch (hollows expected)

Bullwaddy hollows

Figure 4-12. Example photographs of tree hollows recorded during the survey

4.5 Groundwater-dependant ecosystems

Groundwater-dependent ecosystems (GDEs) refer to 'natural ecosystems that require access to groundwater to meet all or some of their water requirements on a permanent or intermittent basis, so as to maintain their communities of plants and animals, ecosystem processes and ecosystem services' (Richardson et al. 2011). Groundwater is especially important to ecosystems in arid and semi-arid parts of the country and when there are extended dry periods, during which evaporation markedly exceeds precipitation and so surface water is scarce (Eamus et al. 2006). These areas provide essential habitat for a diverse range of flora and fauna and can be easily impacted by poor land management and planning.

Based on definitions from Eamus et al. (2006), the Atlas of Groundwater Dependent Ecosystems (GDE Atlas) maps three types of GDE – *subterranean*, *aquatic* (i.e. ecosystems dependant on surface expression of groundwater) and *terrestrial* (i.e. ecosystems dependent on the sub-surface presence of groundwater, often accessed when roots penetrate via the capillary fringe which lies above the saturated zone of the water table). The Atlas classes each mapped GDE according to the degree of certainty that it is, indeed, a GDE.

According to the GDE Atlas:

- Major drainage lines within the study area are considered to have a low potential to be an aquatic GDE. No other aquatic GDEs are expected to occur. Refer to Figure 4-13 for GDE Atlas data.
- There are several small areas of low potential terrestrial GDEs within the north of the study area. The southern areas have not been assessed as part of regional or national studies. Refer to Figure 4-13 for GDE Atlas data.
- There is no assessment available for subterranean GDEs within the study area.

The location of aquatic and terrestrial GDEs is highly influenced by groundwater depth. In the study area, limited information on terrestrial GDEs is available. The northern end lies within the Beetaloo SREBA study area, which has been well assessed. Results from the SREBA assessment indicates that potential GDEs are mostly north of, and outside, the Georgina Wiso water management zone (within which the northern and central sections of the study area occur). Some seasonal, low-to-moderate confidence GDEs were mapped within the water management zone, but the regional watertable there is deep, suggesting that the vegetation is most likely accessing shallower perched groundwater systems, or areas with higher soil moisture resulting from surface water inflows from adjacent areas (NTG 2023).

As detailed in Section 4.3, the field survey identified several sinkholes within the study area. These sinkholes may be associated with a karst groundwater-dependent ecosystems which is a type of subterranean GDE.

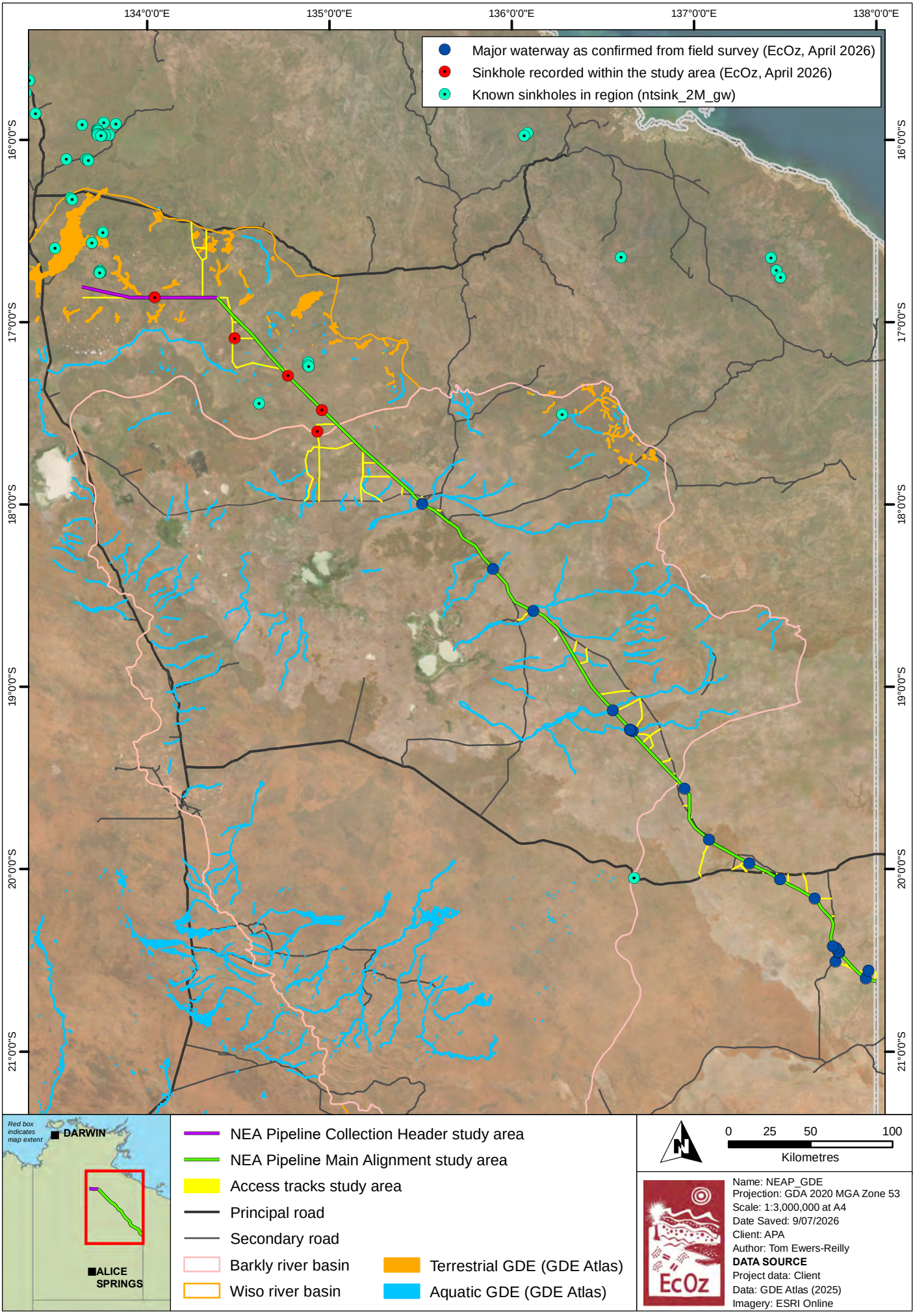


Figure 4-13. Map of potential GDEs within the region of the study area