

Peak Helium
EP134
2D Seismic EMP
PKH1
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Appendix A – Ecology Assessment



Environmental Assessment

EP134 Seismic Program

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PEAK HELIUM



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1 INTRODUCTION

Peak Helium proposes to undertake helium gas exploration on Idracowra and Horseshoe Bend pastoral stations (with the majority of activities occurring within EP134, approximately 170 km south of Alice Springs, Northern Territory (Figure 1-1). EcOz Environmental Consultants (EcOz) has been engaged to undertake an ecology assessment of the proposed exploration area. Exploration will occur within the Finke bioregion.

The proposed exploration program includes the several 2D seismic lines (single lane tracks 5 m wide and 120 km in total length).

At the time of undertaking this ecology assessment, there were more seismic lines (totalling 175 km) and a proposed campsite, which field surveys assessed. This report presents the findings of the assessment for the previous proposed project footprint, as it was undertaken at the time. It needs to be noted that the project now entails no campsite, a reduction of lines to 120 km of 2D seismic lines and only existing tracks will be used as per the EMP. All the proposed project area in the EMP was assessed in this report, some areas are now just not included. Works will now only be undertaken on EP 134, no works will be undertaken on EP 82, 112 or 125.

This assessment focuses on the '*project footprint*' that incorporates the 2D seismic lines and camp site (if required) as well as a 500 m buffer surrounding the lines (i.e. 1 km corridor) and a 500 m buffer around the proposed camp (if required). This additional project footprint aims to provide flexibility in the final program design in order to minimise impacts from the project on the environment, and other aspects (such as archaeology). These areas are depicted in Figure 1-2.

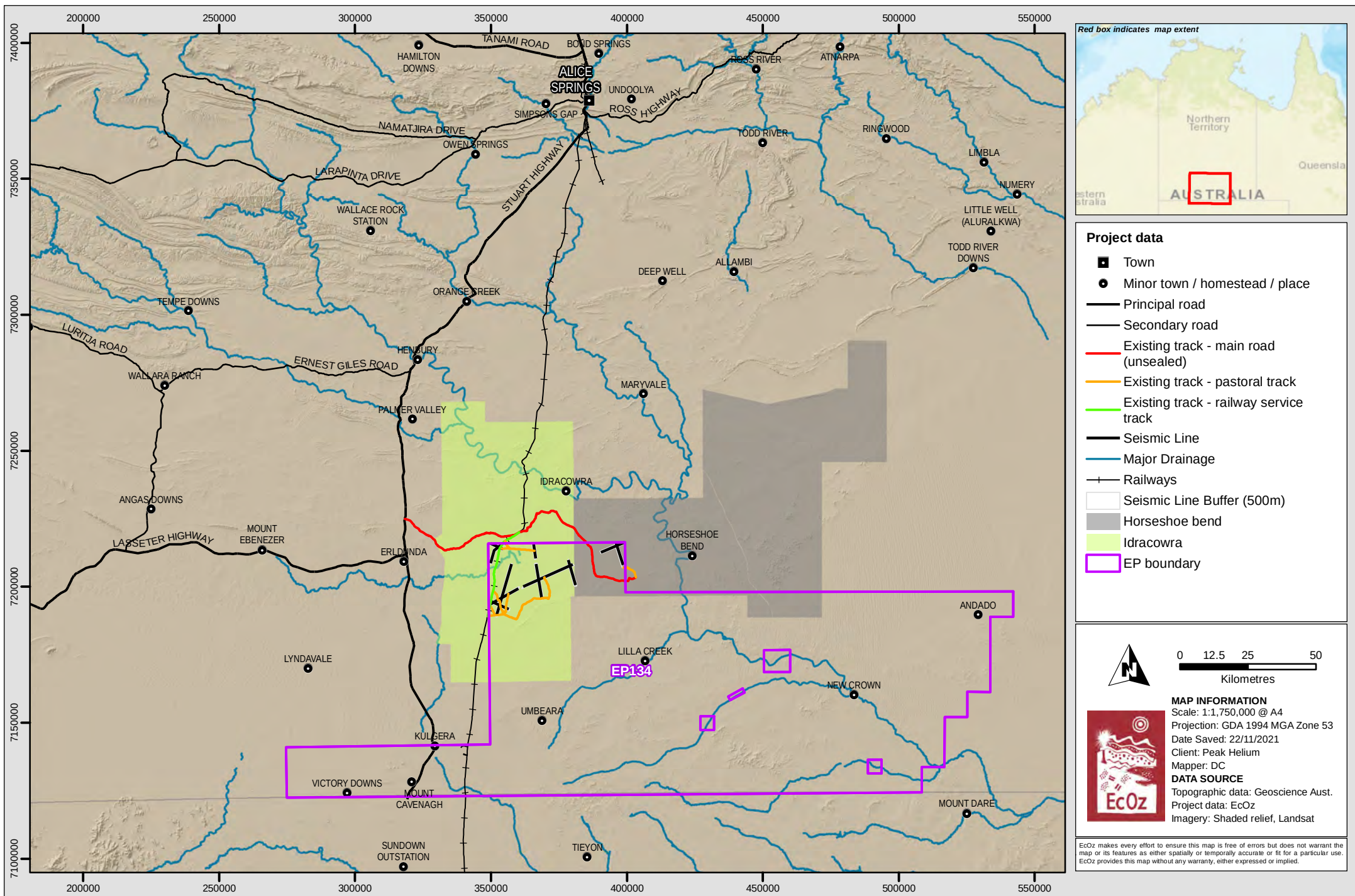
Due to the nature of this exploration, there will be no downstream impacts, or noise disturbances. As such, assessment of any down-stream or broader environments have not been included. It is also important to note that the 2D seismic lines and campsite have been situated to avoid the internationally significant Karinga Creek paleo-drainage system Site of Conservation Significance.

1.1 Scope

The exploration works will be regulated through a project-specific Environmental Management Plan (EMP). To inform the EMP, an assessment of the environmental values within the project footprint is required. This environmental assessment, consequently, has been prepared by EcOz and presents:

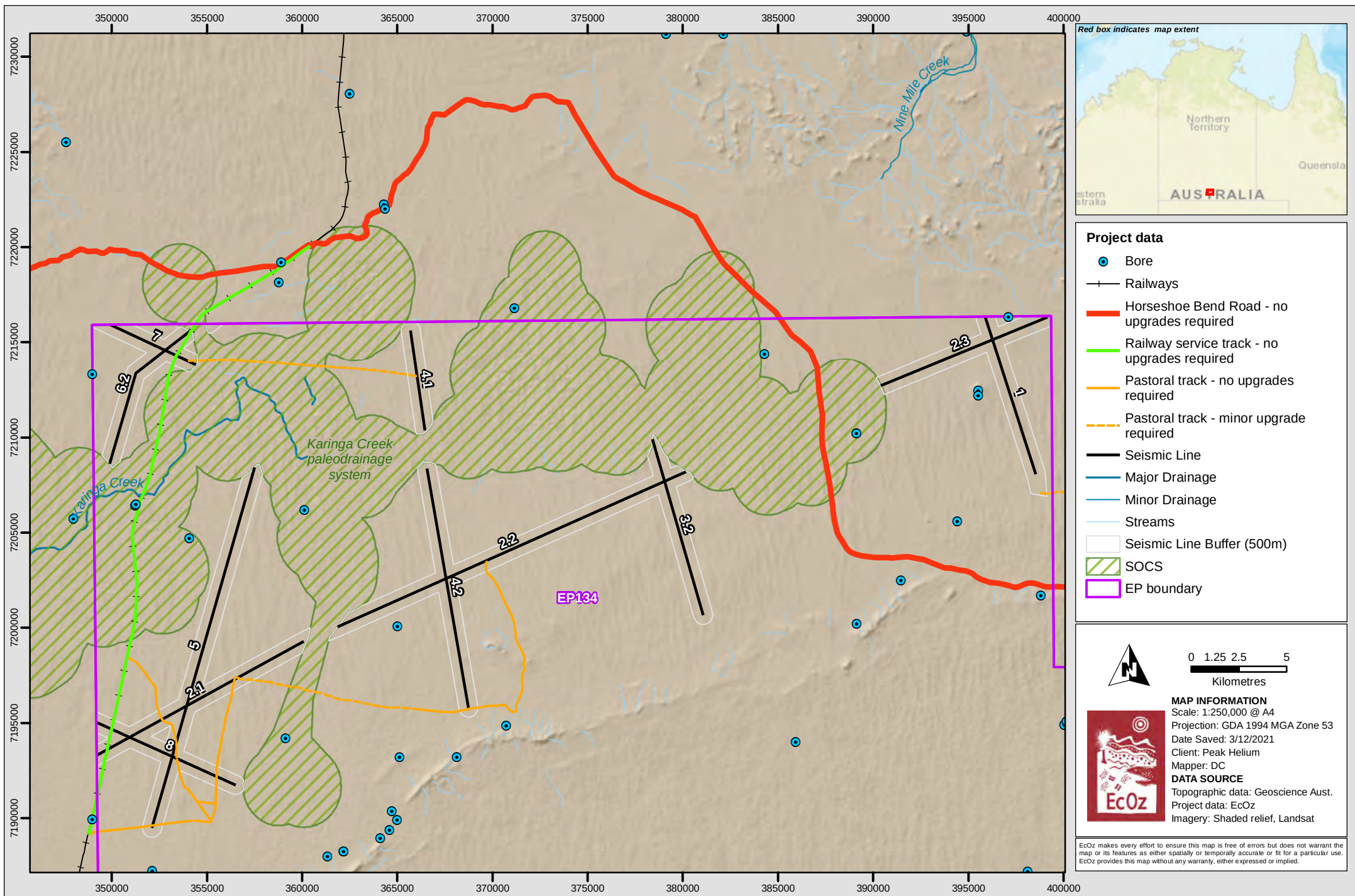
- A desktop review of the environmental context of the project footprint (land use, climate, bioregions, significant areas, surface water, and land systems).
- The methods and results of field surveys within the project footprint.
- An overview of the existing environment as surveyed in June 2021, including a land condition assessment, waterway crossings, presence of sensitive habitats and vegetation.
- A weed assessment (including desktop review and targeted field-based surveys) to inform the weed management plan for the proposed works.
- A threatened species 'likelihood of occurrence' assessment using desktop information to determine which species have a reasonable likelihood of occurring within the project footprint.
- Recommendations to reduce the potential for negative environmental impact from the program.
- Considerations regarding 2D seismic line alignment(s), to further reduce the potential for adverse environmental impacts within the project footprint.

The scope of the report is to assess the impacts and risks of exploratory activities only. This report does not assess ecological impacts and risks related to any development activities that may follow the exploratory phase of this project.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21053 - EP134 environmental review\01 Project Files\Report maps\Figure 1-1. Map of project area.mxd

Figure 1-1. Map of the regional location of the proposed 2D seismic exploration program



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Figure 1-2. Map of project footprint

2 ENVIRONMENTAL CONTEXT

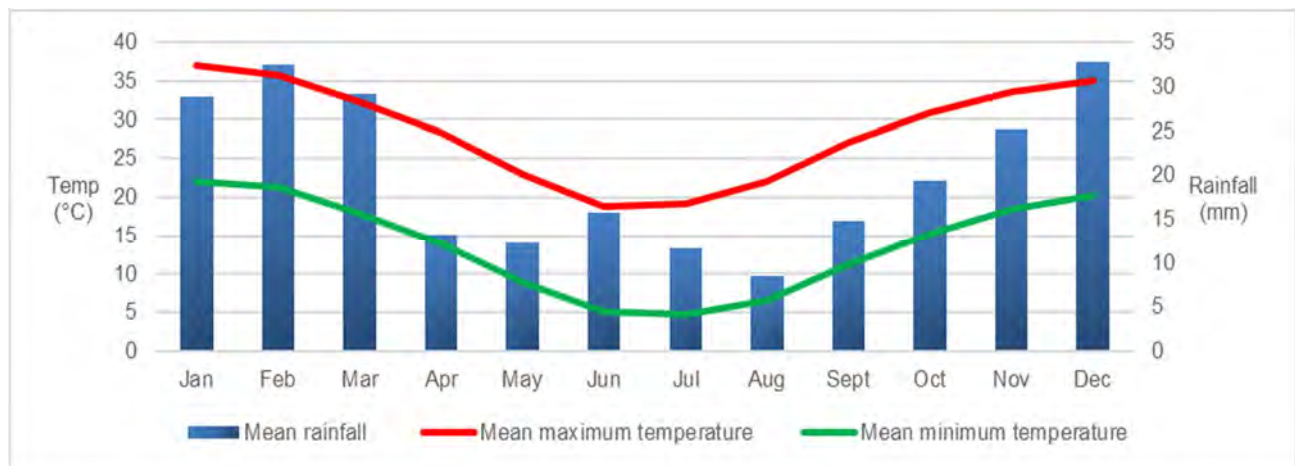
This section presents a desktop analysis of the project footprint and region.

2.1 Land use

Land use within the region is predominantly pastoralism (cattle), with the project footprint occurring within two stations – Idracowra and Horseshoe Bend (Figure 1-2). Lilla Creek Station is located immediately to the south-east of the project footprint, Maryvale Station is to the north-east, Henbury is to the north, and Palmer Valley and Erldunda Station are west of Idracowra. Mineral and mining exploration has occurred in the region historically but there is no evidence of mining activity.

2.2 Climate

The region experiences an arid to semi-arid climate, which is characterised by hot dry summers and cool dry winters, with a low average annual rainfall. Typically for this region, maximum and minimum temperatures are highest in summer. The closest long-term Bureau of Meteorology weather station is Kulgera (station number 015603) approximately 65 km south-west of the project footprint. Average annual rainfall is 249.9 mm; however, the amount of rainfall in the region is highly variable. For example, 2001 experienced 652.3 mm of rain, while 2002 experienced 153.4 mm of rain. If heavy rainfall occurs, it is generally in the summer months from November to March and can result in flash flooding in the waterways.



Data sourced from the Bureau of Meteorology. Data collected between 1980 and 2020 for temperature and 1969 and 2020 for rainfall.

Figure 2-1. Graph of mean rainfall and mean maximum and minimum temperatures

2.3 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 the large-scale geophysical patterns across Australia. These patterns in the landscape are linked to fauna and flora assemblages and processes at the ecosystem scale, thus providing a useful means for simplifying and reporting on more complex patterns of biodiversity (NSW 2003).

The project footprint occurs within the Finke bioregion – specifically within the Tieyon and Finke sub-region – which is a complex area characterised low sandstone ranges, weathered tablelands and rounded metamorphic hills (Baker et al. 2005). Vegetation is dominated by hummock grasslands, acacia shrublands and saltbush/bluebush open shrublands.

2.4 Significant areas

The project footprint occurs within close proximity to a number of significant areas (Figure 2-3). However, the project footprint has been laid out to avoid significant areas discussed within this section. It is recommended that access between these 2D seismic lines is undertaken on existing station tracks, but where this is not able to happen it should be noted to avoid the sites of significance discussed within this section.

No national parks or reserves occur within or proximate to the project footprint. The nearest is Chamber's Pillar Historical Reserve is located approximately 30 km to the north.

Sites of Conservation Significance

The NT Government has identified a number of Sites of Conservation Significance (SOCS) – the most important sites for biodiversity conservation for the NT. These are described in Harrison et al. (2009). The project footprint surrounds, but does not occur within, the Karinga Creek paleo-drainage system SOCS – and is considered to be of international significance. This system provides vital migratory stop-over grounds for migratory shorebirds, including internationally significant records of Banded Stilt, Red-capped Plover, and Sharp-tailed Sandpiper. The Karinga Creek paleo-drainage system provides important temporary salt pans and lakes, which support a diverse assemblage of flora and fauna species in an otherwise arid landscape.

Sites of Botanical Significance

The NT Government has identified a number of Sites of Botanical Significance (SOBS) – areas in the lower half of the NT that have distinguishable vegetation features from the surrounding landscape, and therefore are considered important for plant conservation, and for conserving significant plant taxa (White et al. 2000).

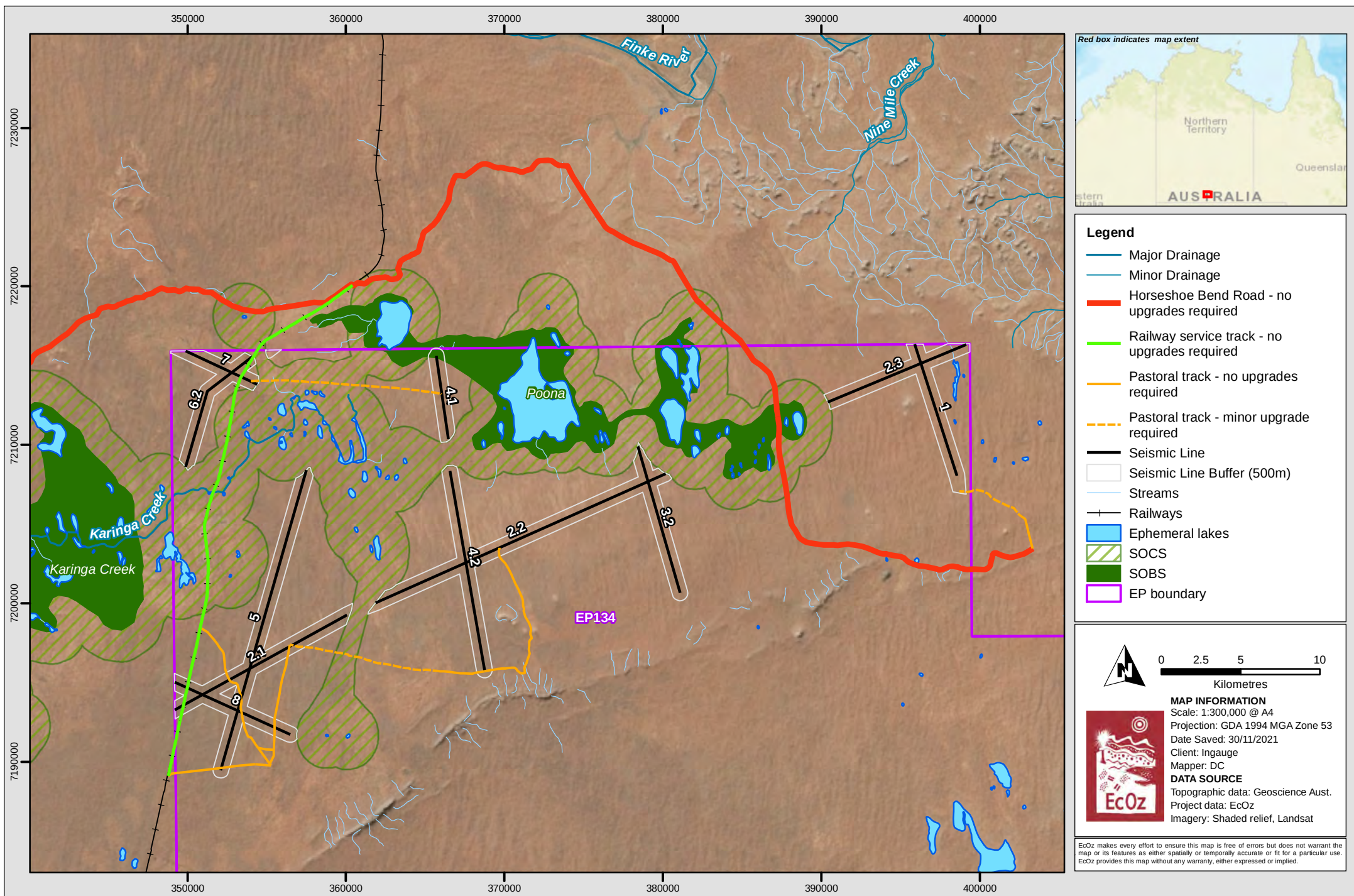
There are two SOBS adjacent to the project footprint – Poona SOBS located between the four north-eastern project footprints, and Karinga Creek SOBS immediately to the west of the project footprint. These two SOBS are areas of bioregional significance. Both of these sites occur within Karinga Creek paleo-drainage system SOCS and are part of an ancient river system. Saline lakes and basins, such as Poona and Karinga Creek, hold potential to be important habitats for 49 rare, threatened, and poorly known species. It is important to note that botanical attributes of these areas of significance are rarely well documented due to a lack of surveying history because of their remote location.



Figure 2-2. Aerial photographs of salt pans and lakes within Karinga Creek paleo-drainage system

2.5 Surface water

The project footprint lies within the Diamantina-Georgina Rivers catchment. There are numerous smaller drainages, tributaries, and drainage gullies – especially in areas of higher relief within the north-east region of project footprint, see Figure 2-3. The major watercourses in proximity to the project footprint are Karinga Creek and Nine Mile Creek. All watercourses in the region only flow after heavy rainfall events. Waterway crossings relevant to the 2D seismic line alignments are detailed in Appendix C .



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21053 - EP134 environmental review\01 Project Files\Report maps\Figure 2-2. Map of significant areas and surface water within and surrounding the project.mxd

Figure 2-3. Map of significant areas and watercourses in the region of the project footprint

2.6 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 across the NT by the government and are at a significantly smaller scale than a bioregion (i.e. bioregions constitute many different land systems). Within each land system, a set of component land units is defined. In some areas of the NT, mapping has been undertaken to the level of detail of land units. No land unit mapping is available.

Land system mapping of the region was undertaken by Perry et al. (1962) at a scale of 1:1,000,000. It shows that the project footprint passes across and through four land systems (described in Table 2-1; mapped in Figure 2-4). The project footprint is a complex combination of desert dunefields (Simpson land system), lateritic plains and rises (Endinda), limestone plains and rises (Lindavale), sandstone plains and rises (Ebenezer), and sandstone hills (Rumbalara). There is also a salt pan system (Amadeus) present within the region that is surrounded by the project footprint.

In addition to the above land system mapping, there is also 1:250,000 land system mapping (SALIC_250; based on Shaw and Bastin 1989) available for the western portion of the project footprint (Figure 2-5). This provides a more detailed and accurate landform and vegetation dataset than the broader scale land unit mapping provided above.

Table 2-1. Summary of the land systems relevant to the project footprint

Land system	Landform	Soil	Vegetation
Desert dunefields			
Simpson	Dunefields with parallel linear dunes, reticulate dunes and irregular or aligned short dunes	Red sands	Typically Desert Cane Grass (<i>Zygochloa paradoxa</i>) on dune crests, sparse shrubs, and low trees over spinifex on the flanks, and Mulga (<i>Acacia aneura</i>) and Coolibah (<i>Eucalyptus microtheca</i>) within the swales.
Salt pans			
Amadeus	Salt pans with fringing dunes	Waterlogged saline clays	Sparse, with a majority of bare ground in the pans and vegetation in the other areas including; tea-tree, samphire, saltbush, bluebush, witchetty bush, desert oak and spinifex.
Lateritic plains and rises			
Endinda	Plains and rises associated with deeply weathered profiles (laterite) including sand sheets and other depositional products	Sandy and earth soils	Sparse with very sparse shrubs and limited trees – only some Gidgee Trees (<i>Acacia georginae</i>) in valley floors – with saltbush and southern bluebush.
Limestone plains and rises			
Lindavale	Plains, rises and plateaux on weathered and unweathered Cambrian limestone, dolomite, chalcedony, shale, sandstone and siltstone with associated sand sheets	Sandy and earth soils	Mulga, sparse shrubs and low trees, witchetty bush, bluebush and short grasses and forbs.
Sandstone plains and rises			
Ebenezer	Plains, rises and plateaux on mostly on sandstone, siltstone, claystone, shale, and some limestone	Commonly shallow soils with surface stone and rock outcrop	Absent or sparse shrubs and low trees, witchetty bush, myall, bluebush, short grasses and forbs, cottonbush, and samphire with some small bare areas.
Sandstone hills			
Rumbalara	Low hills, hills and stony plateaux on sandstone, siltstone, quartzite, and conglomerate (deeply weathered in places)	Outcrop with shallow stony soils	Absent, sparse shrubs and low trees, mulga, bluebush, saltbush, samphire, witchetty bush, short grasses, and forbs.

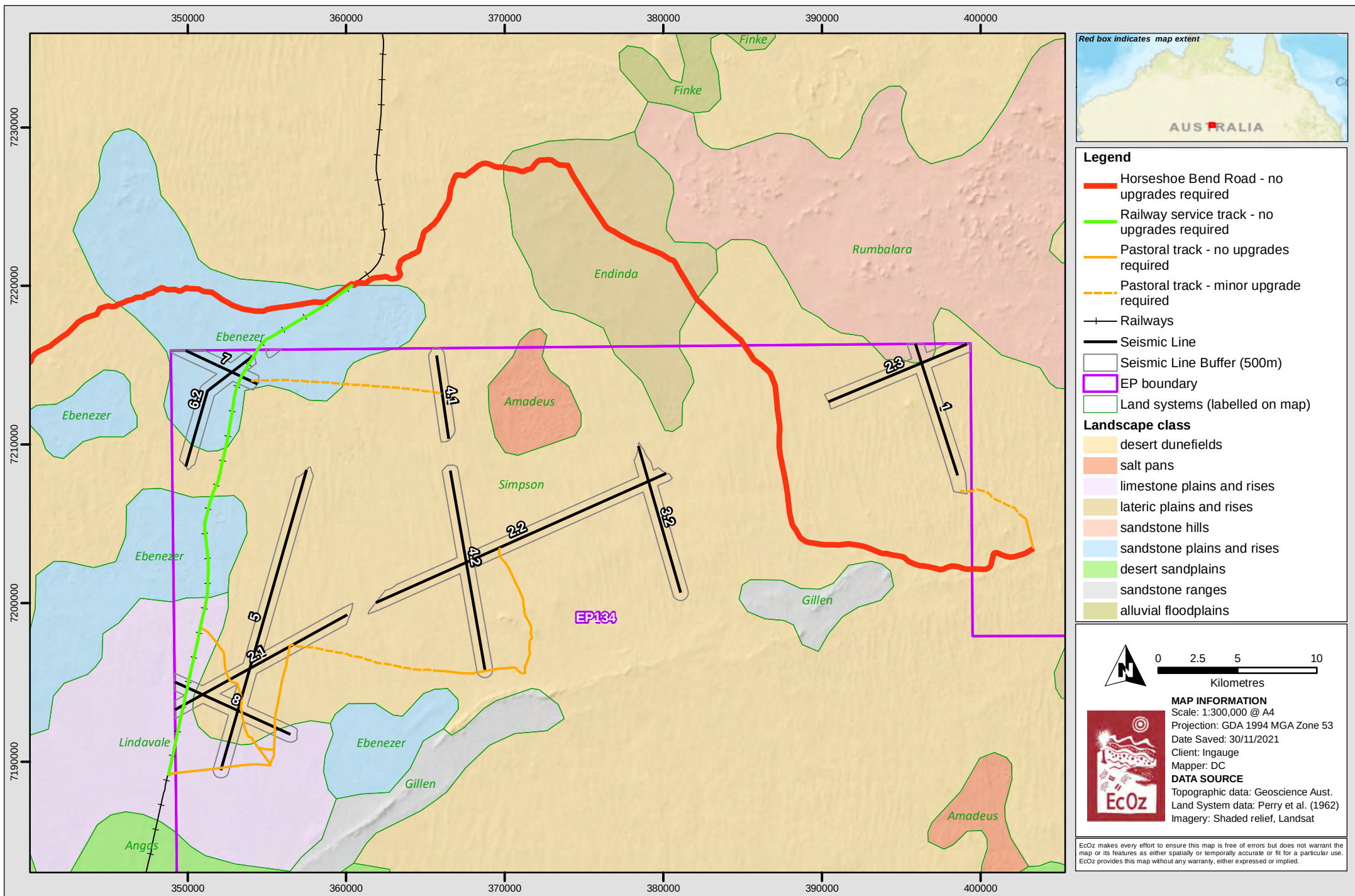
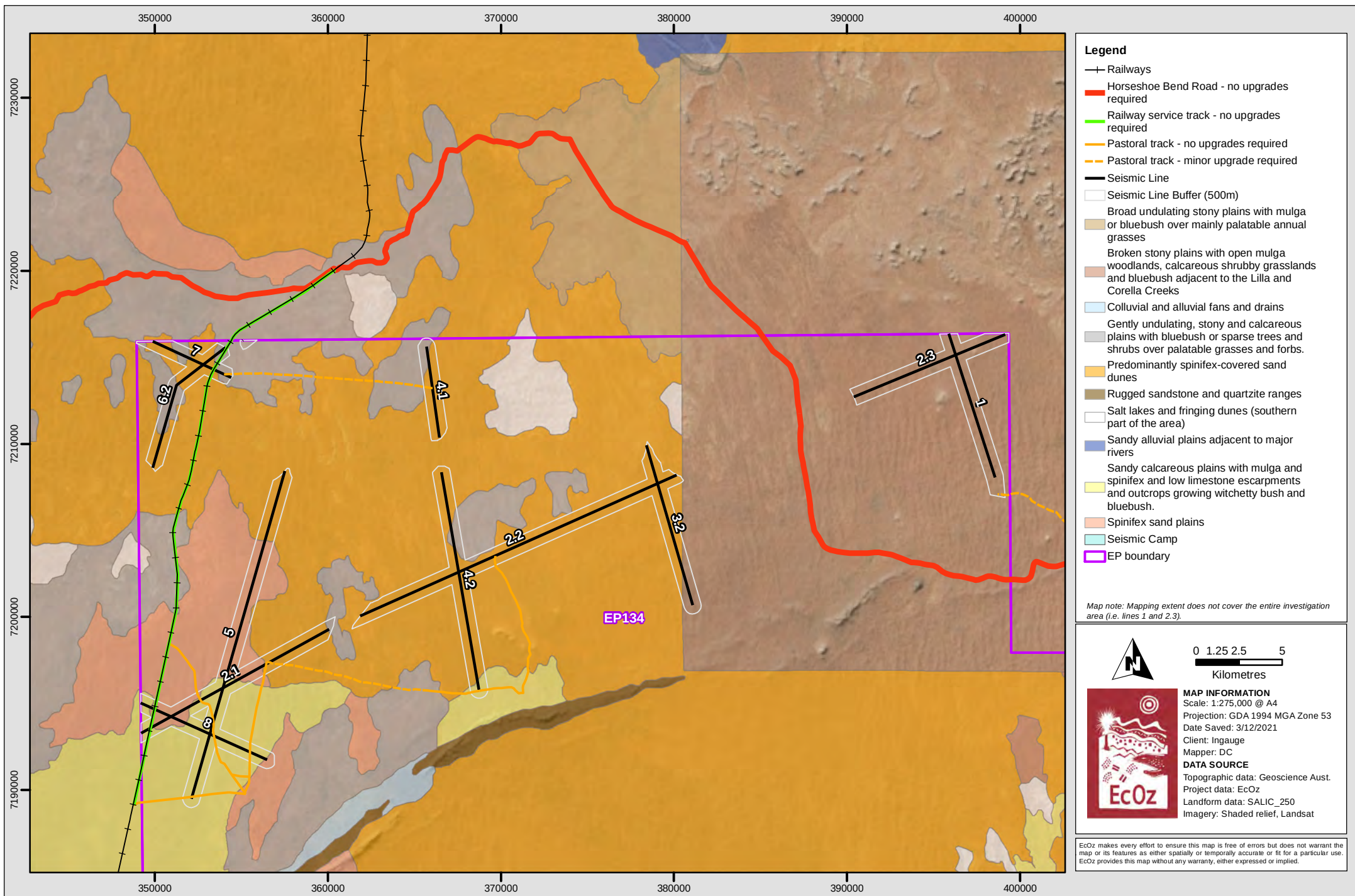


Figure 4-2. Map of land systems (scale 1:1,000,000) within the region of the project footprint



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21053 - EP134 environmental review\01 Project Files\Report maps\Figure X-X. Map of land systems.mxd

Figure 2-5. Map of land systems (scale 1:250,000) within the region of the project footprint

3 FIELD ASSESSMENT

Field studies for the environmental site assessment were conducted by Tom Reilly (Senior Ecologist, EcOz) between the 11 and 13 June 2021 to collect project-specific environmental data. The field work was carried out using ground-based and aerial survey methods and was conducted in conjunction with an archaeology survey by Dr Silvano Jung (see the Heritage Management Plan).

3.1 Methodology

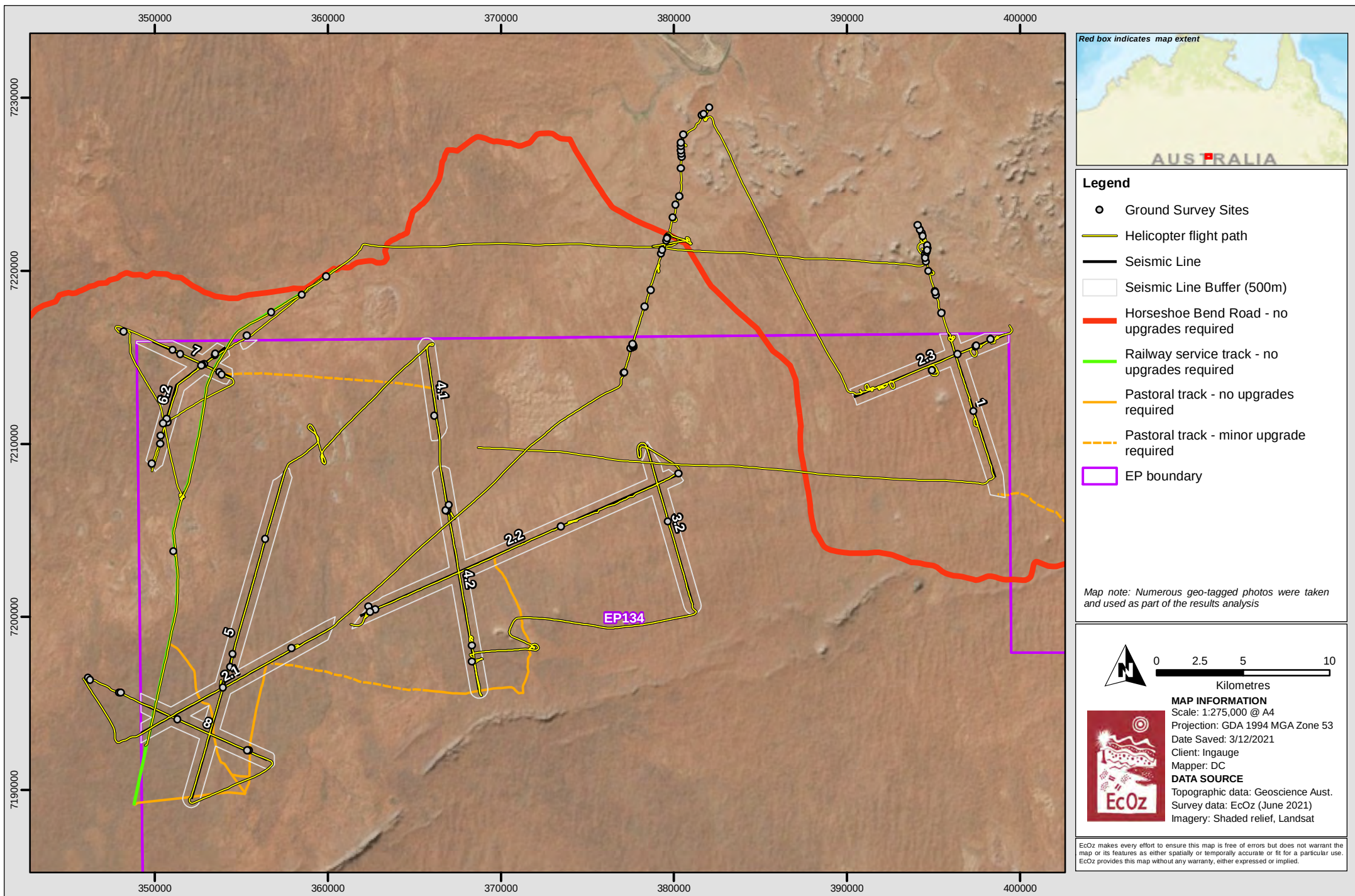
The use of a helicopter for this survey was selected as the most appropriate mode of transport due to low number of existing access tracks within the project footprint. Helicopter transport also allowed for the entire project footprint to be observed without disturbances made when off-road 4WD surveys are undertaken (i.e. creating of wheel ruts etc.). The helicopter flight path was mainly centred on the proposed 2D seismic lines and immediate surrounds; however, additional checks were also conducted if potentially sensitive habitat areas were present within the wider area (i.e. drainage line, clay pan or seasonal swamp). Figure 3-1 shows the survey locations within the project area. Note that the 'survey tracks' shown on Figure 3-1 are the helicopter GPS track log, surveying was done along the seismic lines, but not in transit between the seismic lines.

The survey collected the following data:

- **Landforms / vegetation.** Description of landforms and vegetation types within the project footprint. This included recording the variety of landform types, surface soil types, and dominant flora species at a spatially representative set of survey sites across the project footprint. Prior to field survey, aerial imagery and available land resource datasets were reviewed to help target sites of interest.
- **Drainage lines / watercourses.** Prior to field work, all drainages within the project footprint were mapped by using high resolution aerial imagery at a scale of 1:5,000. Drainages that were crossed, or travel close to the proposed 2D seismic line alignment were surveyed – with most involving a ground survey. The following data was collected specific to the drainage line sites – general size (i.e. minor, moderate, major), stream order, bank morphology (weakly defined, moderately defined, or well-defined), drainage width and depth (in metres, estimate only), and a general description of management concerns that may be relevant for crossings. Other general data was also collected – such as vegetation type, weed presence/absence and erosion presence/absence.
- **Sensitive or Important habitat.** Presence of sensitive vegetation or ecologically important habitat types, such as seasonal swamps, clay pan and habitat trees (in addition to drainages). This included mapping the extent of these landforms within the project footprint so avoidance and appropriate mitigations can be implemented where necessary. Threatened species are covered in Section 4.
- **Weeds.** Presence of weeds and priority weed infestations. Weeds listed as priority species in the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021) were targeted within the project footprint (this is described in more detail in Section 3.3.1). All weed species observed were recorded and the following information was collected – species, seeding status, photographs and infestation level based on the following categories:
 - o Low – isolated plants, scattered tussocks, or small patch (<10m²)
 - o Moderate – medium patch (>10m²)
 - o High – large or relatively large infestation.
- **Erosion.** Presence of existing erosion within the project footprint.
- **Pastoral impacts.** At each survey site, the current level of pastoral impacts was assessed based on the following categories – low (no / very little impacts; medium (some grazing and cattle trampling); high (surface soils and vegetation are highly disturbed, and erosion and weeds are present).

- **Fire / drought.** General observations were made within the project footprint to determine level of impacts from fire and drought.

Field data was collected at 92 sites which is presented in Appendix A.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21053 - EP134 environmental review\01 Project Files\Report maps\Figure 3 1. Map showing survey effort.mxd

Figure 3-1. Map of survey effort within project footprint

3.2 Landform descriptions and assessment

The project footprint has a high concentration of drainage lines and rocky rises in the north-east regions. The middle section is mostly dune systems, which transitions into plains, swales, and depressions as the predominant land formations in the south-western stretches. The following section outlines the different types of landforms within the project footprint.

3.2.1 Loamy depressions

Shallow minor depressions that have sandy loam soils that support a range of short-lived forbs and tussock grasses. Shrubs are typically absent or present as isolated individuals. These depressions are relatively common in low points within dune swales and occasionally in open sandplains. These depressions are flat (run-on areas) that are relatively small in size (<1 ha) and are not considered as clay pans.

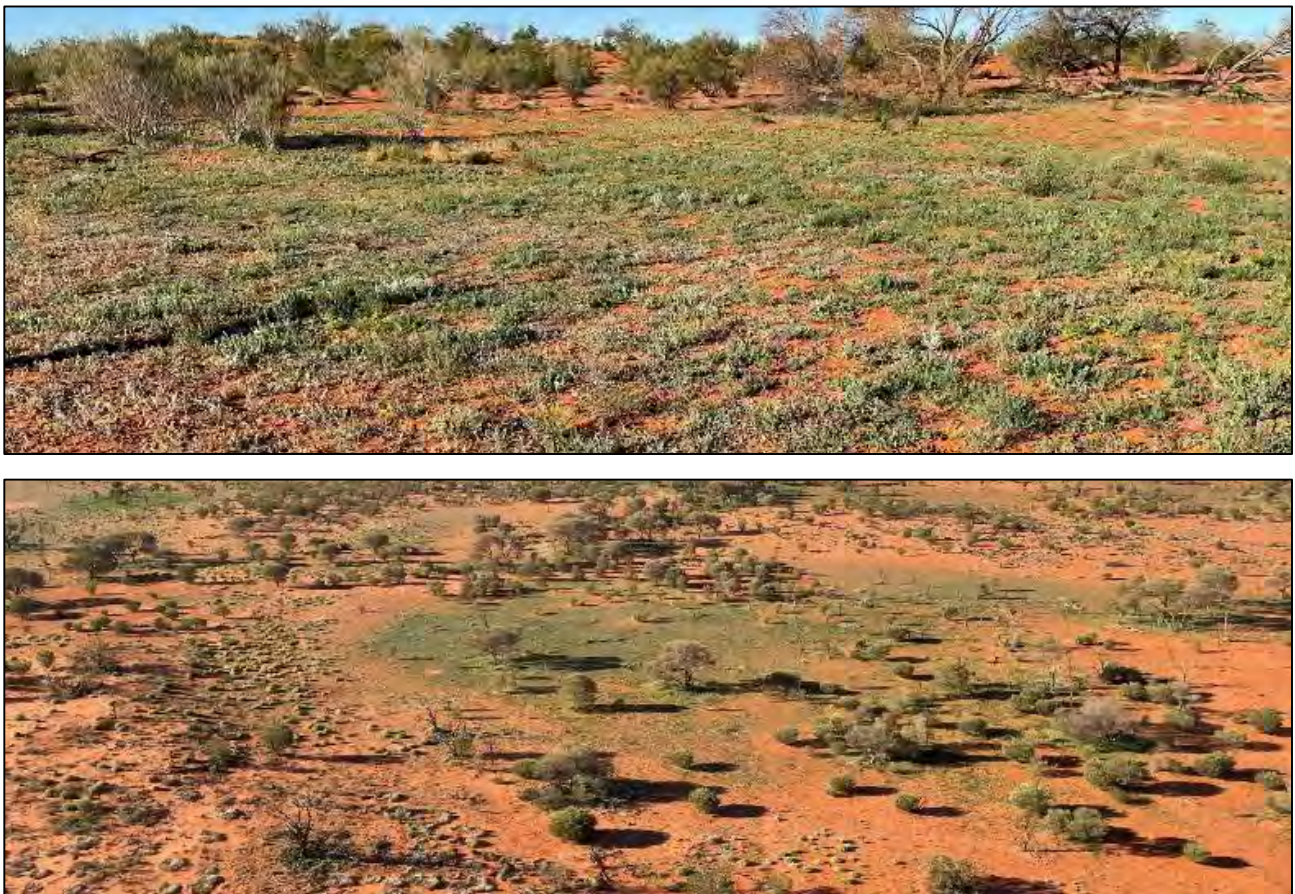


Figure 3-2. Photographs of two sites of loamy depressions along the 2D seismic acquisition corridors

3.2.2 Clay pans

Clay pans have a scattered occurrence throughout the project footprint. They are only small in size (<1 ha) and consist of scalded red-brown clay soils that hold water for short periods after seasonal rainfall events (dry at the time of survey). They support very little vegetation, and the edges are generally lined with species typical of the surrounding landform. Occasionally, large shrubs or trees are established on the edges (assumed because of better water availability/ retention). Clay pan areas are sensitive to impacts – particularly if crossed when wet, with heavy plant, vehicles, and equipment.

There are 19 small clay pans within the project footprint. These have been mapped (Figure 3-12) and provided as a spatial data layer. This information is valuable to assist with identifying areas to avoid in order to minimise impacts of erosion and preserve biodiversity within the region. Clay pans are often found to have a high probability of artefact occurrence – further information can be found in the projects Archaeological Survey Report.



Figure 3-3. Photographs of two sites of clay pans along the 2D seismic acquisition corridors

3.2.3 Seasonal swamps

Seasonal swamps in arid areas provide important regional biodiversity. They are also run-on features similar to clay pan and loamy depressions; however, they have a high cover of ephemeral forbs and support large tree species such as old Coolabah trees (*Eucalyptus coolabah* ssp. *arida*) (see Figure 3-4 for examples of these species within the project footprint). Coolabah are a long-lived tree species which can persist through significant droughts and create a refuge habitat with hollows and leaf litter favourable to a range of species. They have heavy clay soils (brown) and are occasionally gilgaied.

There are three seasonal swamps within the project footprint. These have been mapped (Figure 3-12) and provided as a spatial data layer. This information is valuable to assist with identifying areas to avoid in order to minimise impacts of erosion and preserve biodiversity within the region. Seasonal swamps are often found to have a high probability of artefact occurrence – further information can be found in the projects Archaeological Survey Report.



Figure 3-4. Photographs of two sites of seasonal swamps along the 2D seismic acquisition corridors

3.2.4 Drainage lines

Drainage lines intersected by the project footprint are lower order watercourses associated with major creek flood-outs in surrounding areas – such as Karinga Creek. The drainage lines within the sandplains and dune fields are only minor with poorly defined banks and often visible due to the presence of a higher density of trees (mainly Mulga and other Acacia species), shrubs and groundcover species. The drainage lines associated with the rocky hills and mesas are erosional channels. Drainage lines are prone to weed infestation (predominantly Buffel Grass *Cenchrus ciliaris*) and erosion. Some drainage lines are considered easily trafficable that will either require no or very minor cuts; however, others will require earthworks at crossing points and with therefore require specific controls to minimise disturbance from the movement of the exploration vehicles (i.e. deeper depressions, minor gully erosion or lined with vegetation). Erosion controls are covered separately in the project specific ESCP.

The majority of the drainage lines are concentrated in the northern parts of lines 1 and 3.1, associated with the surrounding rocky terrain and mesa landforms. A description of all drainage line crossings, their condition, and general management advice is provided in Appendix B. Additional information on vegetation, soils and other aspects at drainage crossings are also available in the general site dataset in Appendix A.

There are a total of 29 ephemeral drainage line crossings within the project footprint, seven are located on existing access tracks, while 22 will be new disturbances. These have been mapped (Figure 3-12) and provided as a spatial data layer. It is noted that drainage lines within the project footprint do not hold especial biodiversity value and are not linked to downstream sensitive riparian habitat – as such they do not need to be buffered in accordance with the NT *Land Clearing Guidelines* (DEPWS 2020). Standard weed and erosion management will be sufficient to minimise any potential impacts if crossings are required.

Additionally, the railway service road may be used for 2D seismic exploration (pending approval to use this track) and this road crosses Karinga Creek which is a non-perennial, major watercourse (Stream Order 5) that supports riparian vegetation (i.e. *Eucalyptus coolabah subsp. arida*) (refer to 6.14). This location was inspected during the survey and the crossing is in excellent condition and will not require any upgrades for 2D seismic activities – and as such risk to this watercourse is considered negligible at this location.



Figure 3-5. Photographs of two sites of drainage lines along the 2D seismic acquisition corridors

3.2.5 Open plains

Broad undulating, stony and calcareous plains with bluebush or sparse trees and shrubs (*Acacia kempeana*, *Acacia aneura*, *Eremophila spp.* and *Senna spp.*) over minor perennial grasses and forbs. They are common in the northern part of the project footprint. These areas can have a rocky (i.e. stony gibber plains) or loamy surface and typically have very little vegetation present (limited to short tussocks, forbs, chenopod shrubs – and sparse *Acacia* shrub). Soils are typically clays to clay loams with a relatively high surface gravel content, but large expanses of sandy loams with low to no rocks are also present. Widely spaced parallel sand dunes and low sand hills are often present within these areas.



Figure 3-6. Photographs of three sites of open plains along the 2D seismic acquisition corridors

3.2.6 Sandplains

Sandplains are flat to gently undulating plains with red sand to sandy red earth soils, which predominately occur in the south part of the project footprint. They include sandy calcareous plains (with open or patchy Mulga over Kerosene Grass or Oat Grasses and forbs) and spinifex sandplains (with Mulga, mallee or scattered Desert Oak over spinifex). Low dunes and minor limestone/calcrete rises are scattered throughout. Fire has produced floristic differences, and recent drought has resulted in senesced spinifex.



Figure 3-7. Photographs of three sites of sandplain along the 2D seismic acquisition corridors

3.2.7 Dunes

Dunes within the project footprint have a range of orientations from parallel (SE to NW direction), reticulate dunes or irregular dunes. They are stabilized by spinifex, low shrubs (*Acacia* spp. and *Dodonaea viscosa*) and trees. They have low relief (between 4 and 6 m); with some larger examples in the south eastern part of the project footprint that may reach up to 10 m. They have soft red aeolian sands and support an open shrubland over sparse understory of forbs, tussock grass and occasionally Spinifex.

Dune crests within the project footprint have been mapped (Figure 3-12) and has been provided as a spatial data layer. This information is valuable to assist with identifying areas to avoid in order to minimise impacts on erosion and preserve biodiversity within the region.



Figure 3-8. Photographs of three sites of dunes along the 2D seismic acquisition corridors

3.2.8 Swales

Swales are the flat plains between the dunes and have a variable vegetation structure throughout the project footprint; however, in most cases vegetation is fairly open and slopes are flat. The southern areas support swales that have scattered to patchy Desert Oak (*Allocasuarina decaisneana*) (top photograph within Figure 3-9), and the remaining swales are very similar to sandplains and open plains. The Desert Oak occur in only a few patches, shown in Figure 3-12, and do not hold threatened status (under TPWC Act or EPBC Act); however, they are known to provide valuable refuge habitat for a range of native flora and fauna. They may also provide potential roosting sites for Princess Parrot (although there is no evidence of this occurring in the region; if present very infrequent – discussed in Section 4.3.2), which is a threatened species within the region. Loamy depressions (run-on areas within the swale) are often present and have been described as a separate landform.

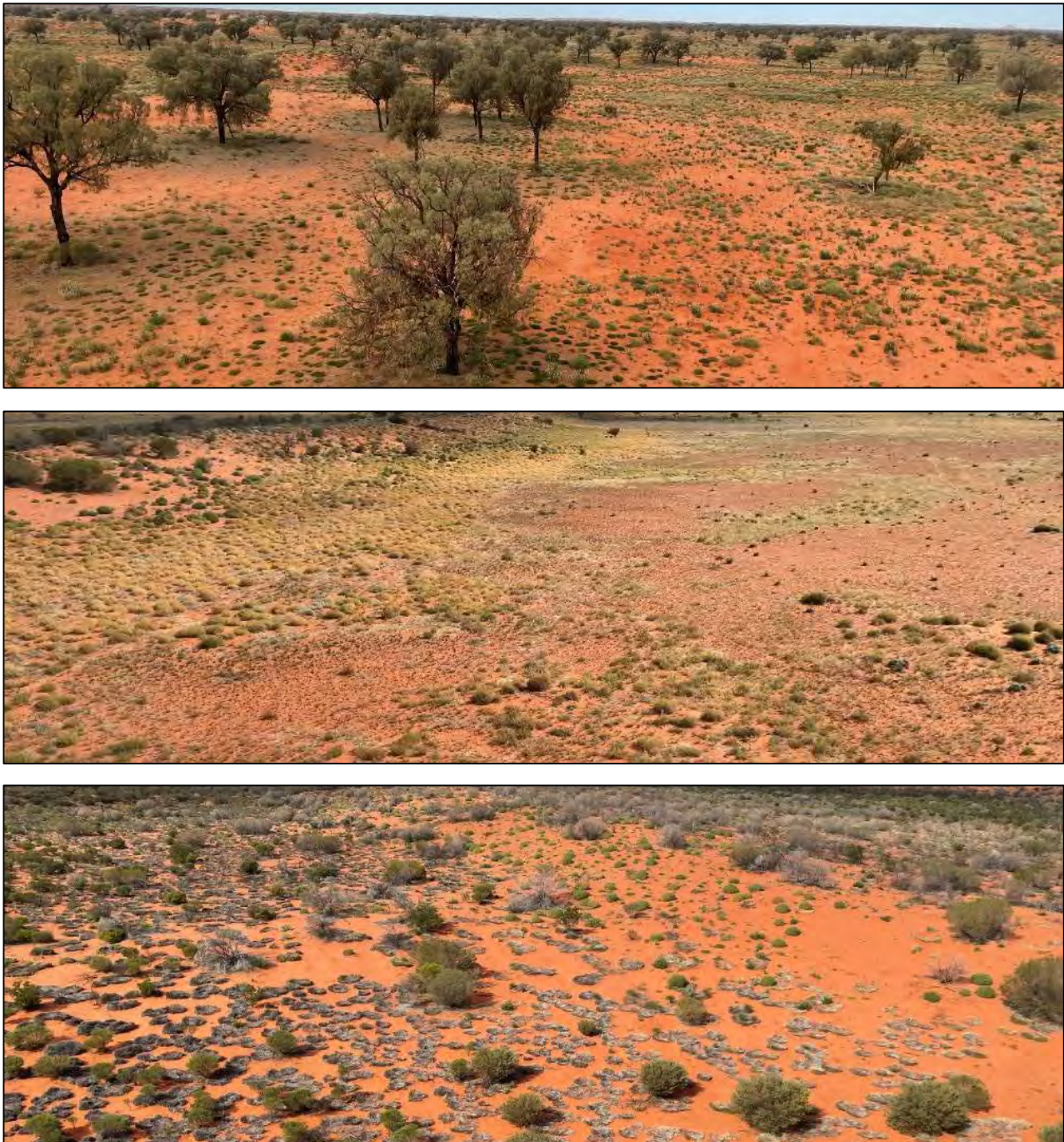


Figure 3-9. Photographs of three sites of swale along the 2D seismic acquisition corridors

3.2.9 Low rocky rises

Low rocky rises have a very low relief (i.e. <5m) and are predominately comprised of calcrete / limestone rock type, with some instances of silcrete stones and laterite gravel. These features are scattered throughout the project footprint, particularly within the sandplains and dune fields. Vegetation can vary from a low open chenopod shrubland (*Maireana astrotricha* and *Sclerolaena* spp.) to a low open shrubland of *Senna artemisioides subsp. alicia* over forbs, chenopods, and short tussocks. Surface soils are covered by a relatively high cover of rock and sandy loam soils.

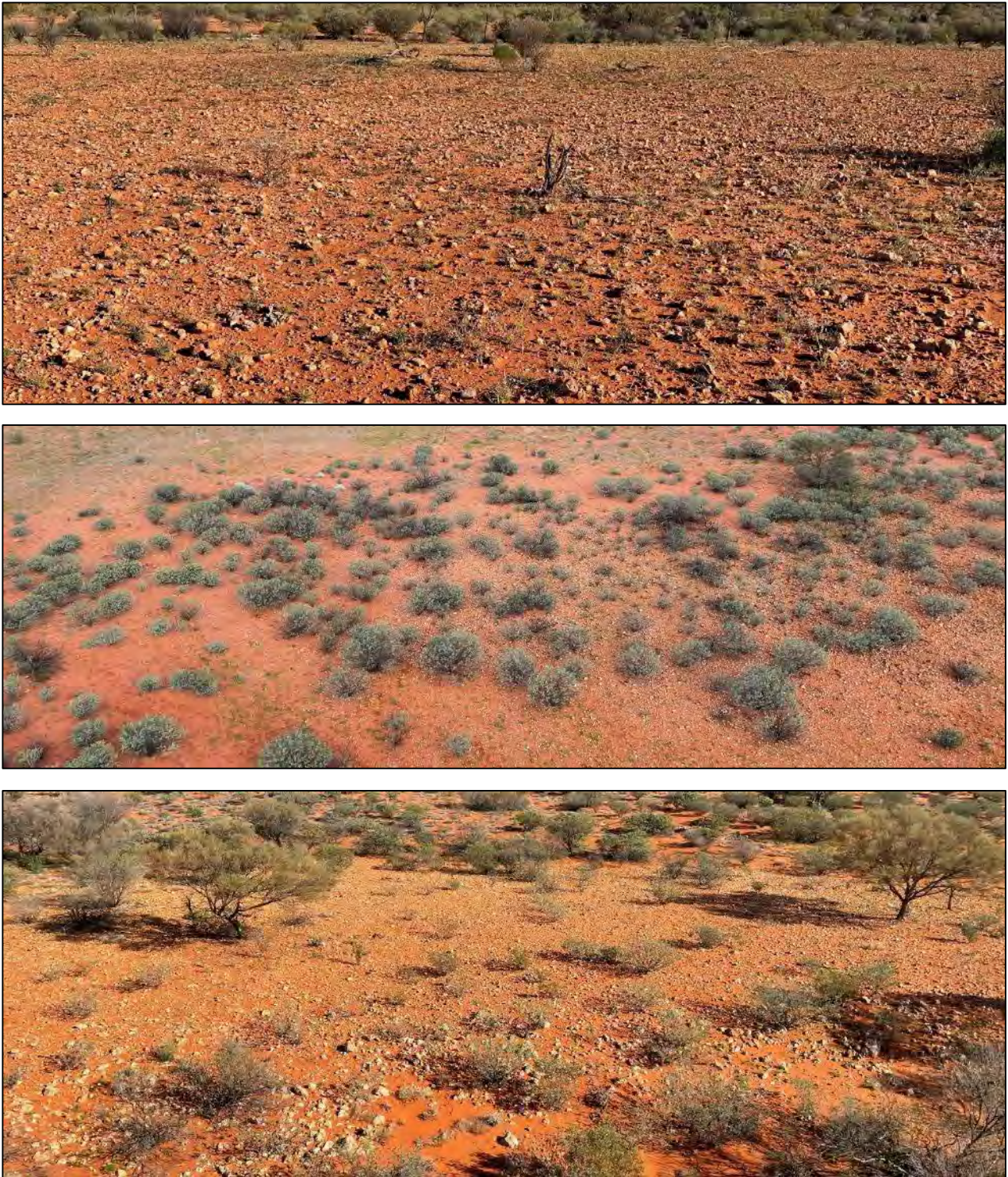


Figure 3-10. Photographs of three sites of low rock rises along the 2D seismic acquisition corridors

3.2.10 Rocky hills, breakaways, and mesas

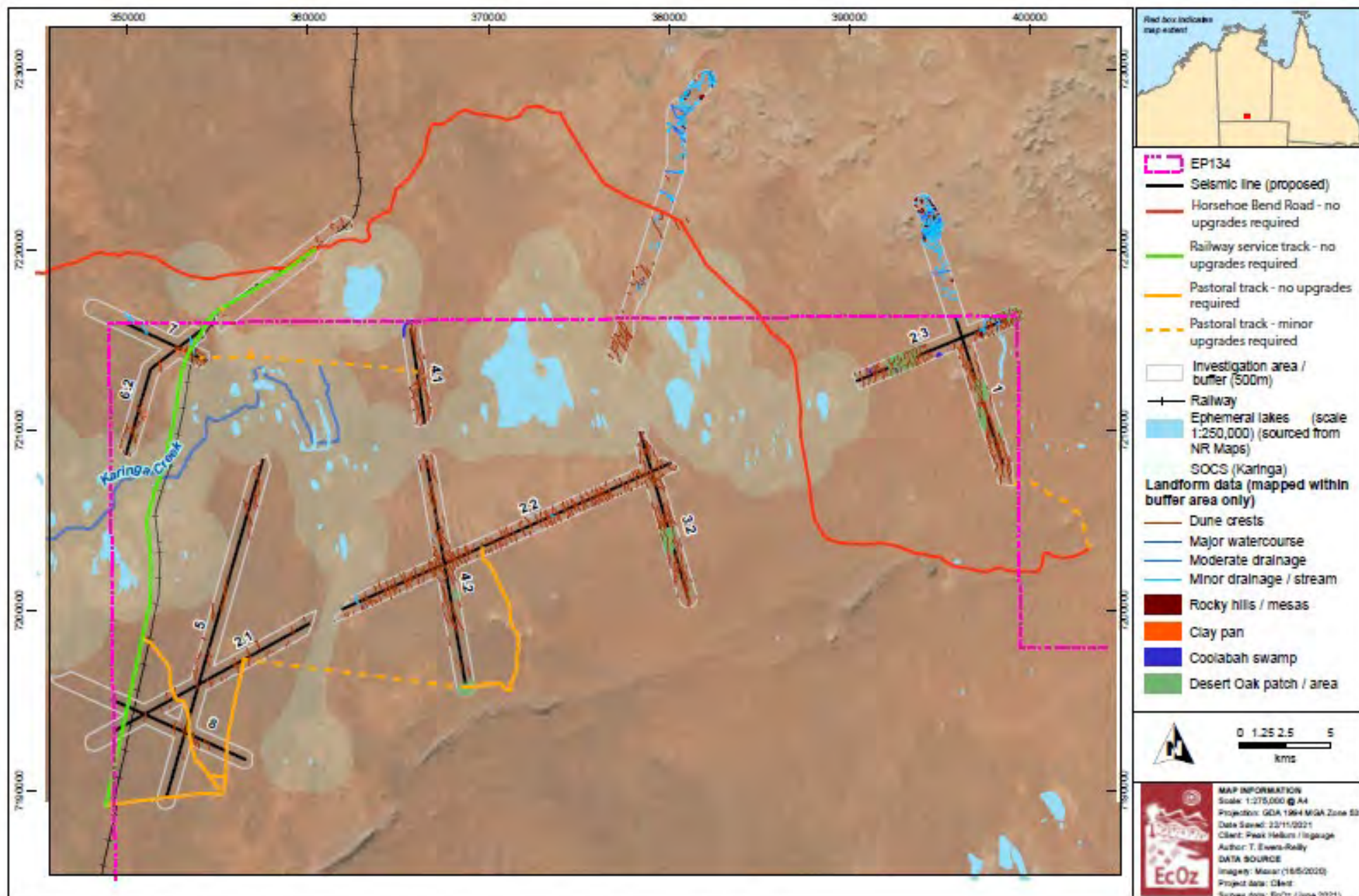
Rocky hills, breakaways, and mesas (i.e. flat-topped hills) are present in the north-eastern part of the project footprint. High plateaux with steeply dissected margins and stony footslopes. They have steep terrain (slopes from 5% to vertical in the case of mesas and drainage gullies) and are often associated with numerous dissected drainage lines and drainage gullies. They have a high surface rock cover with a range of rock types are present – including siltstone, calcrete, silcrete, sandstone and shale. Vegetation is very

open (scattered Mulga, Dead Finish, Witchetty Bush, Bluebush and Saltbush over mainly Oat Grass, Mulga Grass, Copperburrs and forbs) and often restricted to drainages and associated minor flood-out zones.

Rocky hill, breakaways, and mesas within the project footprint have been mapped (Figure 3-12) and have been provided as a spatial data layer. This information is valuable to assist with identifying areas to avoid in order to minimise impacts on erosion.



Figure 3-11. Photographs of rocky hills, breakaways, and mesas along the 2D seismic acquisition corridors



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Figure 3-12. Map of important and sensitive landforms / habitat within the investigation area

3.3 Threatening processes

There are a number of threatening processes to biodiversity as a consequence of human presence in the region. These are discussed in the sections below.

3.3.1 Weeds

Regional Context

Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act* because of the environmental and/or economic harm they can cause. Class A weeds are to be eradicated by landowners and occupiers. Class B weeds must have their growth and spread controlled by landowners and occupiers. The remaining introduced flora species are referred to as *environmental weeds*. The Commonwealth Government has also categorised some species as Weeds of National Significance (WoNS).

Weed distribution is often related to environmental disturbances caused by the construction of roads and tracks, cattle grazing and feral animals. Weeds are most prevalent on land under pastoral lease, with infestations generally concentrated around infrastructure such as water points, fence lines and tracks, and also along the banks of watercourses where cattle and feral animals tend to congregate.

A review of the NT Weed Branch weed dataset shows that part of the project footprint, to the east, occurs within the Athel Pine Management Zone. Other weeds are present within the project footprint and indicative of pastoral use, but by far the most frequently reported species is Athel Pine (*Tamarix aphylla*). This Class A/B weed was deliberately introduced as a shade and windbreaks. Its deep, woody root system means it can readily establish within arid regions, particularly around river systems and wetlands. Other common weeds are listed in Table 3-1.

The project footprint lies within the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021). This strategy focusses on weeds that are most important to the region, categorising them as either:

- *Category 1 – Priority weeds* (present in the region, widely considered feasible to eradicate from the Region, typically evaluated as very high risk and have isolated and restricted distributions).
- *Category 2 – Priority weeds or strategic control – including the eradication of outliers* (species warranting strategic control across the landscape due to the high impact they have on land managers and on broader economic and environmental values).
- *Category 3 – Weeds of concern* (assessed by the weed risk management system as a medium to high risk, or have not been assessed, but have been identified by stakeholders as posing a threat to the values of the Region).
- *Category 4 – Hygiene and biosecurity weeds* (it is important for landholders to implement weed hygiene and other biosecurity measures to prevent the spread of weeds into clean areas, and to control these species where the opportunity arises).
- *Category 5 – Alert weeds* (have the potential to have a high level of impact to the region should it become established, the likelihood of the species naturalising and spreading in the region is perceived to be high).

All such weeds are listed in Table 3-1. Buffel Grass (*Cenchrus ciliaris*) is described in the plan as a significant threat but, because of its value to pastoralists in the Northern Territory, is not a declared weed.

Weed species in the region mainly occur within watercourses, disturbed areas (i.e. roadsides, rail lines, fences, and water-points), and on drainages or depressions. Sandplains, salt pans, and rocky rises generally do not support declared weed species.

Table 3-1. Weed species relevant to the project footprint

Common name	Botanical name	Class	WoNS	Status in management plan
Rope Cactus	<i>Cylindropuntia</i> spp. including <i>C. imbricata</i> , <i>C. fulgida</i>	A	No	Category 1, very high
Prickly Pear	<i>Opuntia</i> spp. including <i>Opuntia stricta</i>	A	No	Category 1, very high
Athel Pine	<i>Tamarix aphylla</i>	A/B	Yes	Category 2, very high
Parkinsonia	<i>Parkinsonia aculeata</i>	B	Yes	Category 2, very high
Buffel Grass	<i>Cenchrus ciliaris</i>	Not declared	No	Category 2, very high
African Lovegrasses	<i>Eragrostis</i> spp. Including <i>E. cilianensis</i> , <i>E. barreleri</i> , <i>E. cylindriflora</i> , <i>E. minor</i>	Not declared	No	Category 3, *medium
Mexican Poppy	<i>Argemone ochroleuca</i>	B	No	Category 3, medium
Kapok	<i>Aerva javanica</i>	Not declared	No	Category 3, N/A
Ruby Dock	(<i>Rumex vesicarius</i> ; formerly <i>Acetosa vesicaria</i>)	Not declared	No	Category 3, low
Saffron Thistle	<i>Carthamus lanatus</i>	B	No	Category 3, medium
Mossman River Grass	<i>Cenchrus echinatus</i>	B	No	Category 4, medium
#Caltrop	# <i>Tribulus terrestris</i>	B	No	Category 4, low

*Only *Eragrostis cylindriflora* has been assessed for weed risk.

#It is uncertain whether Caltrop (*Tribulus terrestris*) is considered native or introduced to the Northern Territory. It is a weed to be controlled around tracks, parks, and other infrastructure because the spiny fruit can cause nuisance.

Weeds within the project footprint

Weed species recorded during the survey are listed and described in Table 3-2; and weed sites are shown in Figure 3-18. No declared species, or category 1 species were recorded during the survey.

The main weed of concern within the project footprint is Buffel Grass (*Cenchrus ciliaris*), which is not a declared species but is listed as a category 2 species in the *Alice Springs Regional Weeds Strategy 2021-2026* (DEPWS 2021) due to its potential impacts on biodiversity and fire risk. Buffel Grass was recorded at 22 sites, most of which were within or adjacent to drainage lines, and also a few patchy infestations on cattle impacted dunes. Some representative photographs of Buffel Grass infestations are provided in Figure 3-13 and Figure 3-14.

A few other low impact and widespread environmental weeds were also recorded – Bitter Paddymelon (*Citrullus colocynthis*), Ruby Dock (*Rumex vesicarius*), Couch Grass (*Cynodon dactylon*) and Spiked Malvastrum (*Malvastrum americanum*) – representative photographs of infestations are provided in Figure 3-15 and Figure 3-16. These species are commonly observed on pastoral stations in this region and are not of major concern. Most occurrences were within drainage lines and on the edges of station tracks or other disturbances (i.e. bores, dams or water points).

Incidentally, Athel Pine (*Tamarix aphylla*) (Class A/B species / WONS) was observed at two locations adjacent to the railway service road (photographs provided in Figure 3-17).

Table 3-2. Weed species observed during field surveys, June 2021

Species	Status	Occurrence	Comment
Buffel Grass (<i>Cenchrus ciliaris</i>)	Category 2 (very high priority)	22 sites (1b, 1d, 1e, 1f, 1i, 1k, 1l, 1m, 1o, 1p, 1r, 1s, 2.3c, 3.1j, 3.1l, 3.1m, 3.1n, 3.1o, 3.1r, 3.1s, 3.1u)	A significant threat as it is highly invasive, but because of value to pastoralists in the NT, is not a declared weed. Seeds are spread by wind, water, and animals, clothing, and vehicles.
Athel Pine (<i>Tamarix aphylla</i>)*	Class A/B; Category 2 (very high priority)	2 incidental sites adjacent to the railway service road	A Class A/B weed in the lower Finke catchment. This species is also a Weed of National Significance. Project footprint is proximate to the Athel Pine Weed Management Zone.
Ruby Dock (<i>Rumex vesicarius</i> ; formerly <i>Acetosa vesicaria</i>)	Category 3, low	1 site (2.2a)	Seeds are spread by water, and by adhering to animals, clothing, and vehicles.
Couch Grass (<i>Cynodon dactylon</i>)	-	2 sites (3.1n, 3.1s)	A drought tolerant pasture species, that easily spreads due to long stolons and rhizomes (root-like stems).
Colocynth/Paddymelon (<i>Citrullus colocynthis</i>)	-	12 sites (2.3b, 2.3c, 3.1d, 3.1j, 3.1l, 3.1m, 3.1o, 3.1r, 3.1s, 3.1u, 6.2o, 7d)	Species may be spread by exploration activities. Primarily found along tracks and close to bores.
Spiked Malvastrum (<i>Malvastrum americanum</i>)	-	11 sites (1b, 1d, 1e, 1q, 1r, 3.1j, 3.1l, 3.1o, 3.1r, 6.2o, 7d)	Seeds can be spread by animals and machinery and vehicles. It is often found river and creek margins in arid zones. It can produce root suckers.

* Found outside of project footprint however, important to avoided to prevent spread and further infestations.



Figure 3-13. Photographs of Buffel Grass infestation within a drainage line



Figure 3-14. Photographs of Buffel Grass infestation on a sand dune



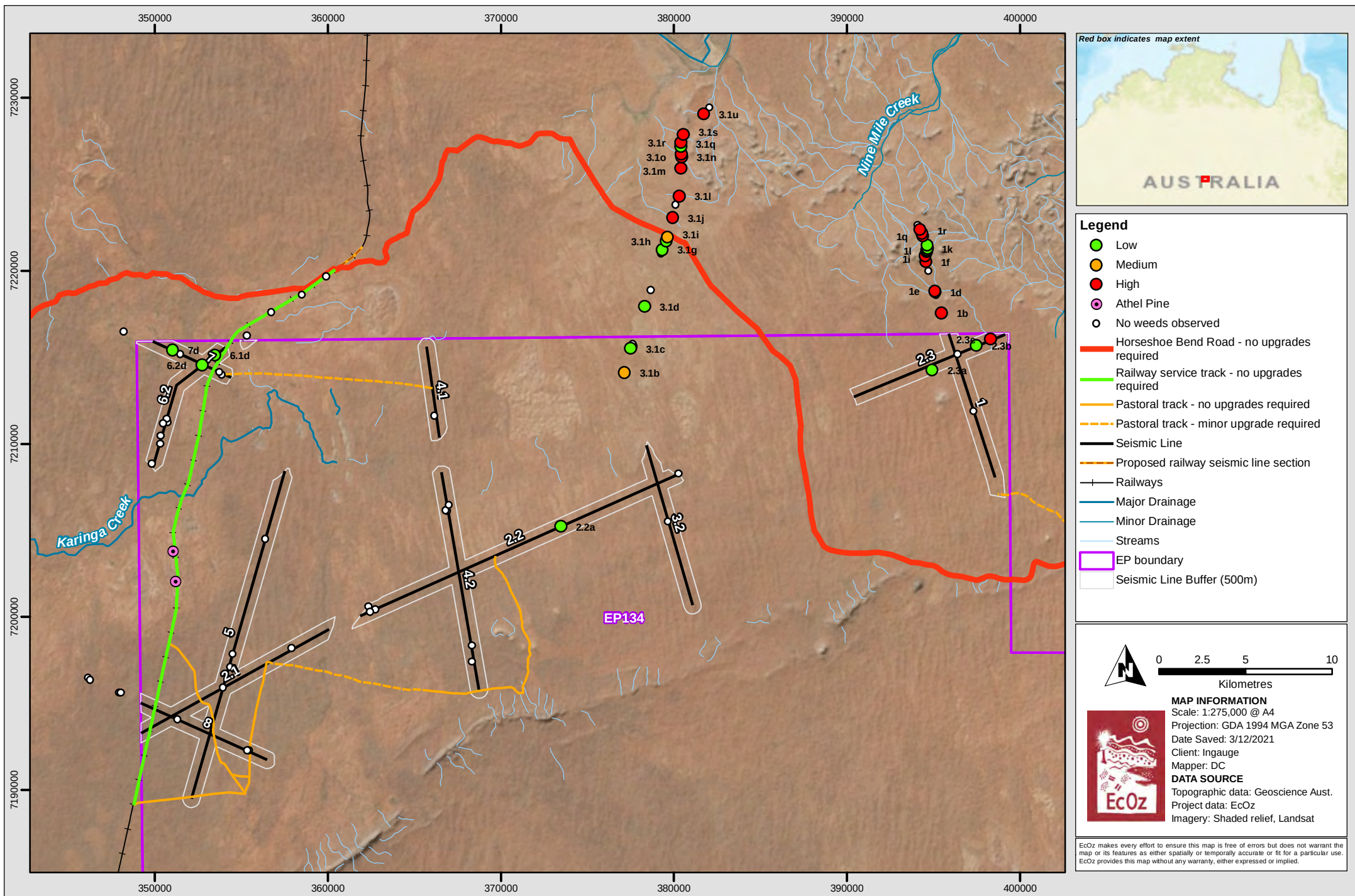
Figure 3-15. Photographs of Couch Grass infestation in a drainage



Figure 3-16. Photographs of Spiked Malvastrum (left photograph) and Rub Dock (right photograph)



Figure 3-17. Photographs of two sites of Athel Pine observed on the western side of the railway track



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ21053 - EP134 environmental review\01 Project Files\Report maps\Figure X-X. Map of weeds and athel pine ALL POINTS.mxd

Figure 3-18. Map of weed sites recorded during the survey

3.3.2 Erosion

Erosion was observed at 21 sites within the project footprint, to varying degrees – as outlined within Appendix A. Of these, 20 sites were associated with drainage lines and one site presented rill erosion associated with on an old seismic line, where the proposed 2D seismic survey lines 1 and 3.1 are to be located.

Erosion is more severe at northern end of line 1 where higher water velocities are more evident associated with steeper terrain (it was difficult to ascertain whether this erosion was from natural courses or from pastoral impacts in the surrounding region). line 2.3 has minor erosion present in drainage lines towards the eastern end of proposed 2D seismic line. line 3.1 presents minor erosion in drainage lines towards the eastern end of proposed 2D seismic line and erosion in creek crossings and along wheel ruts. Some examples of erosion within the project footprint are presented within Table 3-3.

Generally, drainages and watercourses are typically more prone / susceptible to erosion when disturbed and erosion controls will need to be installed to minimise chance of erosion development along the 2D seismic lines. However, soils in all other land types within the project footprint can also erode if track establishment / rehabilitation works are not carried out appropriately. The project specific Erosion and Sediment Control Plan (ESCP) describes how erosion will be managed.

Table 3-3. Table of examples of existing erosion along project footprint

Line 1	Line 2.3	Line 3.1 (eastern end)	Line 3.1 (drainage crossings)
			

3.3.3 Pastoralism

Pastoral stations cover the entire project footprint. Field studies undertaken in June 2021 and presented within Appendix A, indicated that pastoral impacts were generally low to very low within the project footprint. There was minimal evidence of grazing and trampling impacts from cattle. Sites with a moderate to high level of pastoral impacts, of which there were 10, were closer to water points or along cattle trails or drainages. These areas had higher level of trampling and often supported weed infestations and minor levels erosion.

3.3.4 Fire

Fires are infrequent within the region. According to fire history and fire scar data in [Northern Australia and Rangelands Fire Information](#), the majority of the project footprint was last burnt in 2012. The last burn within the project footprint happened in 2013. There has not been a large-scale burn in the area for approximately 9 years, it might be expected that fuel loads have re-established across the region – however this is not the case within the project footprint, likely as a result of recent prolonged dry conditions which has slowed vegetation recover/recruitment and also lead to senescence of spinifex (*Triodia basedowii*) in many areas. The fuels load, as observed on the field survey, has remained very low to moderate – with only nine of 92 survey sites with high fuel load localised to Buffel Grass infestations established in drainage lines on lines 1 and 3.

3.4 Land condition assessment

Each survey site has been graded against the criteria outlined within Table 3-4. If a site was considered to align with two or more of the criteria within a row, it was assigned that value.

Table 3-4. Ratings for the land condition assessment

Condition	Vegetation	Erosion	Weeds	Cattle
GOOD	Vegetation structure intact, all expected layers present	No erosion	No weeds	Negligible impact
AVERAGE	Vegetation structure altered, basic vegetation structure present	Some erosion	Few weeds (including Buffel Grass)	Some impact
POOR	Vegetation structure severely impacted, some strata are absent	Significant erosion	Many weeds (including Buffel Grass)	Significant impact

The majority of the project footprint, 58.7%, was assessed as being in a good condition, with no major land degradation issues detected. The areas that were given 'poor' land condition, 25% of the project footprint, were mostly drainage lines containing significant weed coverage and erosion.

Of the 92 sites surveyed;

- 54 were deemed in good condition.
- 16 were in average condition primarily due to a moderate weed presence, some pastoral impacts such as stock tracks.
- 22 were graded to be in poor condition due to a combination of high rates of erosion, significant weed presence, and pastoral impacts.

The complete results of these assessments are presented in Appendix A (summarised in Figure 3-19).

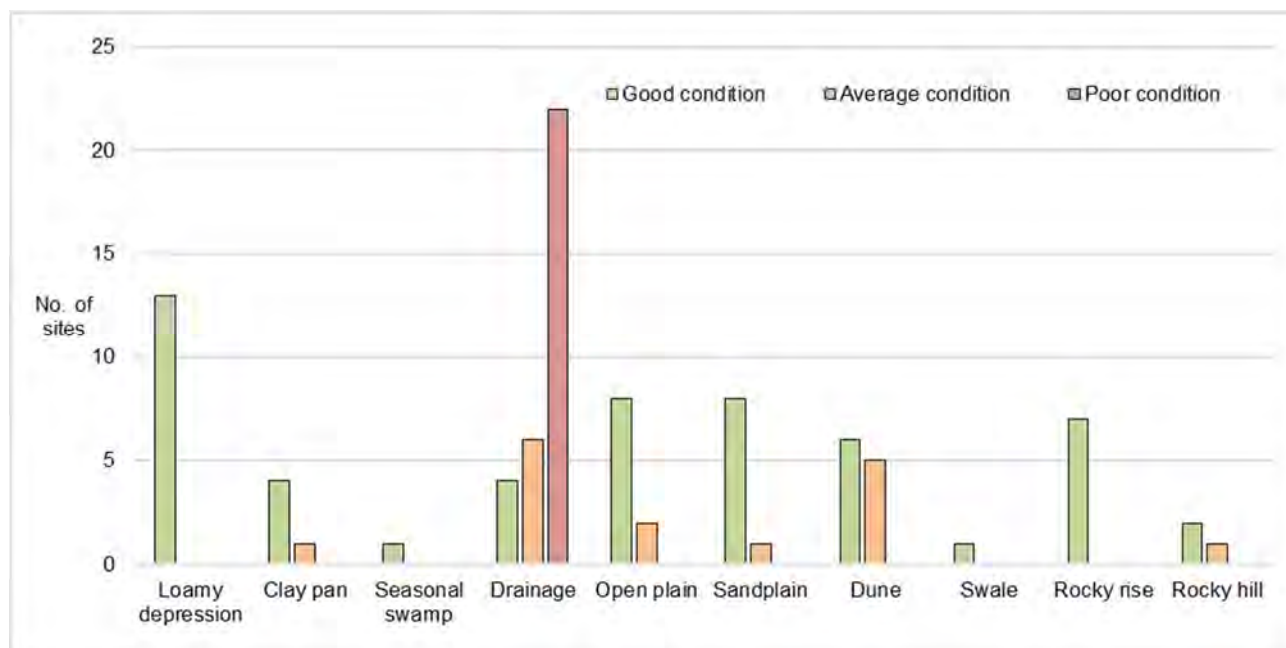


Figure 3-19. Graph of land condition site summaries for each landform type

4 THREATENED SPECIES ASSESSMENT

This section outlines the procedure and results of the threatened species 'likelihood of occurrence' assessment conducted for this report. The assessment was undertaken using available desktop information and incorporated field survey recorded by EcOz staff in June 2021. The purpose of this assessment is to identify those species that may need to be included within the project's risk assessment, and those that can be reasonably excluded from further consideration because they are unlikely to occur within the project footprint. *This is not a risk assessment as it does not take into account project activities and potential impacts.*

4.1 Categories

This assessment focuses on species that are listed as Vulnerable, Endangered or Critically Endangered under either the *Territory Parks and Wildlife Conservation Act (TPWC Act)* or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. The *EPBC Act* also protects important habitat for, and significant occurrences of, migratory species.

4.2 Procedure

The following procedure was used to determine which species have the potential to occur in the region:

- Species records from the latest version of the [NT Atlas](#) were clipped to the Finke bioregion. Bioregions give a broad area with largely similar habitat characteristics and species assemblages. Clipping data to them ensures all potential species are captured in order to undertake a project-specific 'likelihood of occurrence' assessment.
- [EPBC Protected Matters Search Tool](#) (PMST) was used to generate a report using a 100 km buffer from the project footprint. This PMST is an online enquiry tool managed by the Commonwealth Department of the Environment and Energy which interrogates a range of existing flora and fauna data, as well as predictive modelling to speculate on the presence of species within a search area. The PMST uses a grid system to determine which protected matters it encapsulates for a particular search. The PMST report was generated on 16 June 2021 (Appendix D).
- For each threatened species, the likelihood of it occurring within the project footprint was then assessed based on desktop information that relates to habitat requirements, distribution, number and dates of proximate records (obtained from NT Atlas and/or [Atlas of Living Australia](#)), the ecological information described in Section 2, and the field survey results presented in Appendix A. Likelihood ratings are defined in Table 4-1.

Table 4-1. Ratings for the desktop threatened species likelihood of occurrence assessment

Likelihood	Definition
HIGH	It is expected that this species occurs within the project footprint because there is core habitat and recent (post-2000) proximate records or knowledge that the species occurs in the local area.
MEDIUM	Species may occur within the project footprint because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records within or close to the project footprint, substantial loss of habitat within the project footprint since previous records, species is naturally-rare or occurs at a low density etc.).
LOW	Species may occur, as a vagrant, within the project footprint; only marginally-suitable habitat is expected.
NONE	There is strong evidence that this species will not occur within the project footprint (i.e. there is no suitable habitat and/or the species is considered to be regionally-extinct).

4.3 Likelihood of occurrence assessment

A total of 33 threatened species were considered in the 'likelihood of occurrence' assessment. Of those, three are considered extinct.

The EPBC Protected Matters Search Tool report also identified the possibility of migratory species protected under international agreements occurring within the region. However, all of the identified migratory species have a low likelihood of occurring within the project footprint. Many birds listed as wetland species within the report occur almost exclusively in coastal and estuarine environments, neither of which occur within the project footprint. This project footprint does not contain suitable habitat, only migratory stop-over grounds for these species – and so they are not considered further.

The results from the threatened species 'likelihood of occurrence' desktop assessment are detailed in Appendix E, presented in Table 4-2, and summarised as follows:

- One species has a high likelihood of occurring, meaning it is expected that these species occur within the project footprint (at least seasonally) because of the presence of suitable habitat, and/or there are recent proximate records.
- One species has a medium likelihood of occurring, meaning that the species may occur within the project footprint because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records with the search area, substantial loss of habitat within the project footprint since previous records, species is naturally-rare or occurs at a low density etc.).
- All migratory species have a low or no likelihood of occurring, meaning that apart from the occasional vagrant, it is not expected that these species occur within the project footprint.
- The remainder have a low or no likelihood of occurring, meaning that apart from the occasional vagrant, it is not expected that these species occur within the project footprint.

Table 4-2. Threatened species 'likelihood of occurrence' assessment summary

Likelihood	Species	Class	EPBC	TPWC
HIGH	Desert Quandong (<i>Santalum acuminatum</i>)	Plant	-	VU
MEDIUM	Princess Parrot (<i>Polytelis alexandrae</i>)	Bird	VU	VU
	Itjartjari (Southern Marsupial Mole) (<i>Notoryctes typhlops</i>)	Mammal	-	VU
LOW	Grey Falcon (<i>Falco hypoleucos</i>)	Bird	-	VU
	Night Parrot (<i>Pezoporus occidentalis</i>)		EN	CR
	Greater Bilby (<i>Macrotis lagotis</i>)	Mammal	VU	VU
	Brush-tailed Mulgara (<i>Dasycercus blythi</i>)		-	VU
	Crest-tailed Mulgara (<i>Dasycercus cristicauda</i>)		-	VU
	Plains Mouse (NT)/ Plains Rat (Cth) (<i>Pseudomys australis</i>)		VU	EN
	Great Desert Skink (<i>Liopholis kintorei</i>)	Reptile	VU	VU
	Bednall's Land Snail (<i>Sinumelon bednalli</i>)	Mollusc	EN	-
	Latz's Wattle (<i>Acacia latzii</i>)	Plant	VU	VU
	Rainbow Valley Fuchsia Bush (<i>Eremophila prostrata</i>)		VU	-
	Great Knot (<i>Calidris tenuirostris</i>)	Bird (migratory)	-	VU
	Bar-tailed Godwit (<i>Limosa lapponica</i>)		-	VU
	Eastern Curlew (<i>Numenius madagascariensis</i>)		-	VU

Likelihood	Species	Class	EPBC	TPWC
	Asian Dowitcher (<i>Limnodromus semipalmatus</i>)		-	VU
	Greater Sand Plover (<i>Charadrius leschenaultii</i>)		-	VU
	Curlew Sandpiper (<i>Calidris ferruginea</i>)		-	VU
NONE	Malleefowl (<i>Leipoa ocellata</i>)	Bird	VU	CR
	Plains-wanderer (<i>Pedionomus torquatus</i>)		CR	-
	Golden Bandicoot (<i>Isoodon auratus (auratus)</i>)	Mammal	VU	EN
	Black-footed Rock-wallaby (McDonnell Ranges race) (<i>Petrogale lateralis</i>)		VU	-
	Pale Field-rat (<i>Rattus tunneyi</i>)		-	VU
	Common Brushtail Possum (Central Australian subspecies) (<i>Trichosurus vulpecula vulpecula</i>)		-	EN
	Ghost Bat (<i>Macroderma gigas</i>)		VU	-
	Central Rock-rat (<i>Zyomys pedunculatus</i>)		EN	EN
	Slater's Skink (<i>Liopholis slateri (slateri)</i>)	Reptile	EN	EN
	Finke Goby (<i>Chlamydogobius japaipa</i>)	Fish	-	VU
	Land Snail (<i>Semotrachia esau</i>)	Mollusc	-	VU
	Dwarf Desert Spike-rush (<i>Eleocharis papillosa</i>)	Plant	VU	VU

CR = Critically Endangered; EN = Endangered; VU = Vulnerable

4.3.1 Desert Quandong (*Santalum acuminatum*)

The Desert Quandong is a shrub to small tree that occurs in dune swales, along creeks, on plains and low rises, and rarely on hills. Typically occurs where the soils are sandy or loamy, sometimes with limestone or sandstone shallowly below the soil surface (Nano et al. 2012). In the NT, the species occurs west and south-west of Alice Springs (Nano et al. 2012).

During field surveys, an individual tree located nearby to the 2D seismic line 1 was suspected as being a Desert Quandong at site 1q (latitude: -25.1142019 longitude: 133.9526449) (photograph shown in Figure 4-1; refer to Section 6.1 for a map of this records). Identification could not be fully validated as there was no fruit available (and could be Native Plum, *Santalum lanceolatum*); however based on leaf shape and the size of the tree it is highly likely to be *Santalum acuminatum* and should be avoided.

Other similar trees were observed in similar nearby drainage within the project footprint by aerial survey (isolated individuals only) at site 1s (latitude: -25.11077102; longitude: 133.950963) (aerial photograph shown in Figure 4-2; refer to Section 6.1 for a map of this records). Despite the unconfirmed identification, it should be presumed that this species is present based on available evidence.

Desert Quandong were not observed at any other sites within the project footprint.



Figure 4-1. Photograph of Desert Quandong (*Santalum acuminatum*) at site 1a on line 1

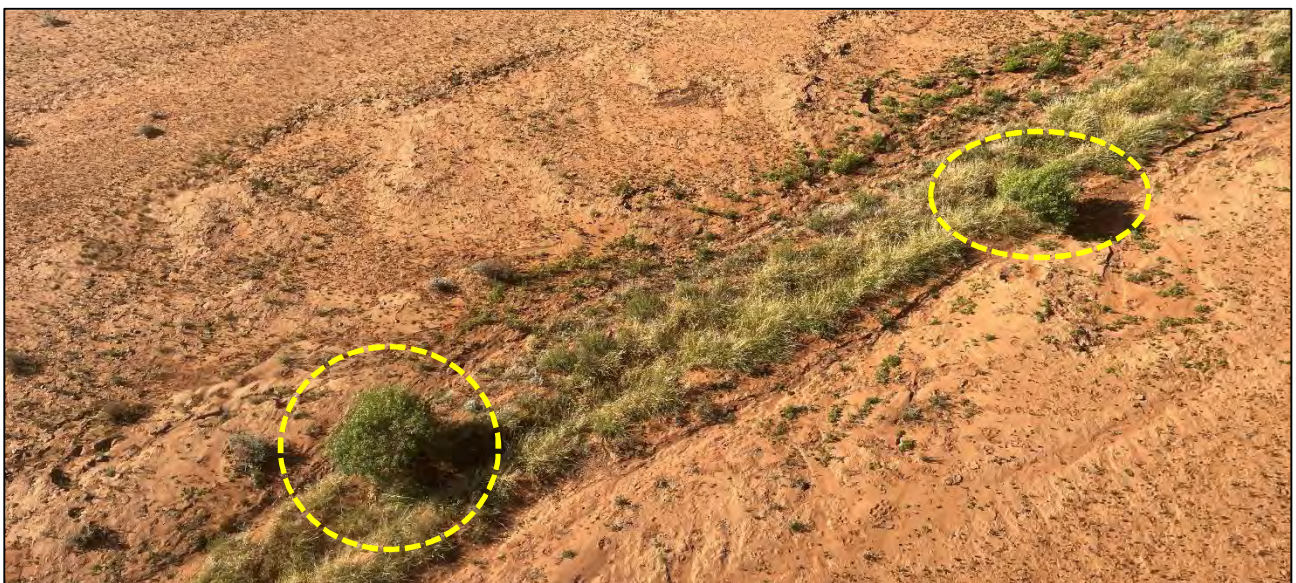


Figure 4-2. Aerial photograph of potential Desert Quandong (*Santalum acuminatum*) located at site 1s

4.3.2 Princess Parrot (*Polytelis alexandrae*)

Princess Parrot are found in the swales between sand dunes with a shrub layer and scattered trees (Pavey 2006). Distribution is confined to arid regions of WA, the NT and SA (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). They are highly nomadic and, as noted in DoE (2016), they are an irregular visitor (sometimes at intervals of more than 20 years) to most sites within its range and its movements are largely unknown. There are no recent sightings of this species in the region of the footprint. Most records in the NT are concentrated to the west of the Stuart Highway. The biggest threat to this species posed from the proposed 2D seismic program is the removal of large hollow-bearing trees that provide hollows for nesting and shelter (in particular large Eucalypts – River Red Gum and Marble Gum – and Desert Oaks (Pavey 2006).

Princess Parrot were not observed during the survey; however, there are several patches of large Desert Oak (*Allocasuarina decaisneana*) on seismic lines 4.2, 3.2, 1 and 2.3 (patches shown in Figure 4-3). These areas may contain suitable nesting hollows – although none were observed at inspection sites. These trees are scattered to sparse and can be easily avoided by the 2D seismic line establishment. As such, minimal impacts to this species are expected from the 2D seismic program.



Figure 4-3. Photograph of Desert Oak (*Allocasuarina decaisneana*) within dune swales

4.3.3 Itjaritjari / Southern Marsupial Mole (*Notoryctes typhlops*)

Southern Marsupial Mole inhabits sand dunes and adjacent swales where there is suitable deep, loose sand. They spend almost their entire life underground, only very occasionally coming to the surface, and only remaining on the surface for a short time. Its distribution follows that of the sand dune habitat it prefers (Pavey 2015). Threats are not well understood. It is speculated that predation by feral cats, foxes and dingoes occur above ground. Soil compaction by cattle or vehicles, and changes in abundance of food by altered fire regimes and grazing (Pavey 2015).

The low dunes and sand hills within the project footprint could be suitable habitat and may support Southern Marsupial Mole. There are few regional records, which indicates a relatively low likelihood of a local population. Tracking searches on dune crests and dune flanks did not find any surface evidence of the species (noting that these features are often scarce due to the subterranean habit of species therefore are not an accurate way to ascertain presence/absence in an area). Targeted surveys for this species (which require trench sampling over 5 to 7 days periods) were not considered necessary for this project as the potential impacts to this species and its habitat are low (as disturbances will be limited to dune crossing points that typically require minimal cutting to make the dune crossing trafficable; and additionally, the 2D seismic lines will be established in a way that minimise dune crossing and avoids longitudinal movements along dune flanks or crests).

5 RECOMMENDATIONS

The findings within this report conclude that the local environment will not be significantly impacted through a 2D seismic exploration program due to the impacted area being highly localised to the project footprint.

Given the results of the assessment, the following recommendations are made to minimise impacts:

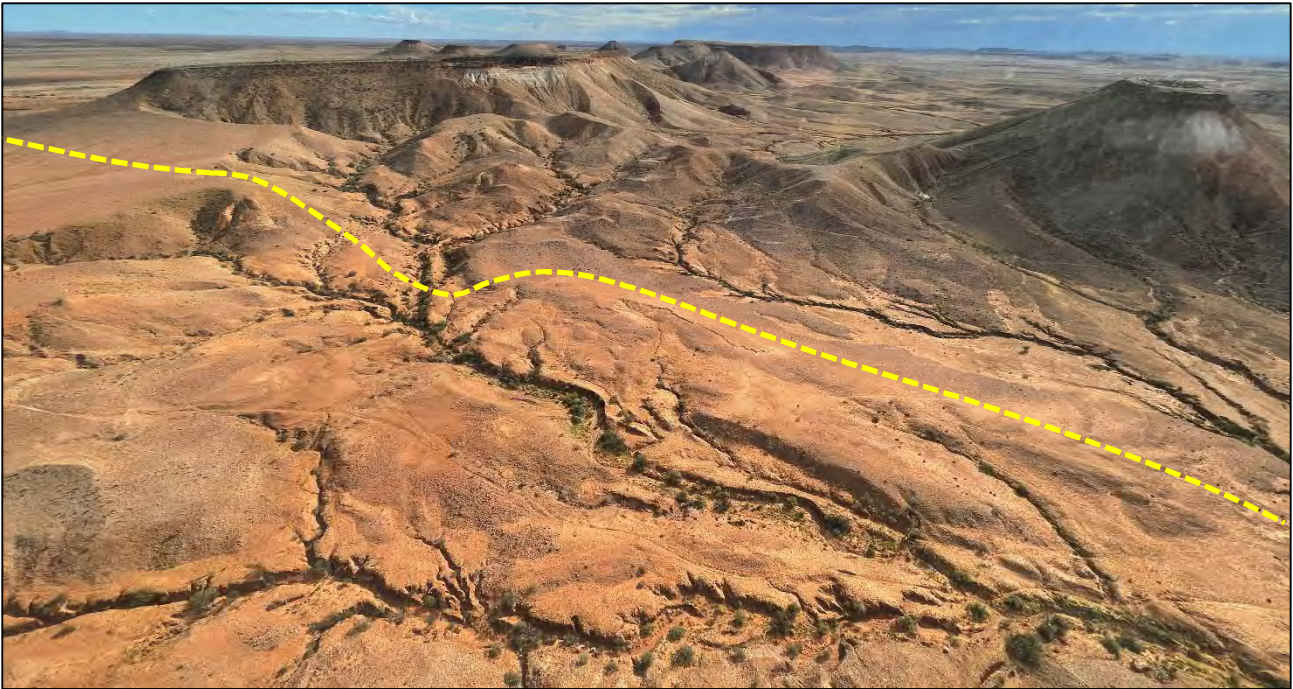
1. Travel between project footprint sites using existing tracks, roads, and trails.
2. Exploration and movement of plant and equipment within Sites of Conservation Significance and Sites of Botanical Significance should be avoided or limited to existing tracks and roads.
3. Prior to exploration works, ensure that an appropriate weed management plan is in place. All vehicles, plant, and equipment should be certified weed-free prior to entry into the project footprint.
4. Minimise spread of Buffel Grass, with weed controls focused at drainage crossing points where infestations are established.
5. Refer to the ESCP to mitigate damage when undertaking all waterway crossings, and other erosion prone landform types.
6. Where possible, minimise disturbing dune crests / sand ridges as these areas are favourable habitat for a variety of threatened and endemic species, including the Itjaritjari (Southern Marsupial Mole).
7. If dune crests need to be crossed to gain access to the adjacent swale, the dune crest should be scouted on foot or quad bike prior to vegetation clearing for passage to choose area of minimum impact (i.e. low point and/or existing cattle pass-over points to minimise impact to pristine locations).
8. Dunes should be crossed at right angles so as to minimise area of impact and erosion potential.
9. Avoid Coolabah swamps and clay pans to preserve the biodiversity within the region. Current layout travels close to, but does not interfere with areas of Coolabah or seasonal swamps, however issues may arise if a revised line laydown is considered.
10. Avoid clearing all large trees – notably the patches of Desert Oak – and minimise impacts to patches of shrubs where possible.
11. Avoid clearing the potential occurrences of Desert Quandong (threatened species) within the entire project footprint, notably in the northern end of line 1.

6 2D SEISMIC LINE SUMMARIES AND LINE REALIGNMENT CONSIDERATIONS

This section provides outlines the key findings from the ecological survey, recommendations, and several suggested realignment considerations (noting that alignment considerations are only indicative and other options would also be applicable). Close-up maps showing the key ecological data and realignments of each proposed 2D seismic are all located within Appendix F (Maps 1 to 9).

6.1 Seismic line 1

- Seismic line 1 is approximately 15.3 km in length and occurs in the eastern part of the within EP134 and EP82 (see Map 1 and 2 in Appendix F).
- Landforms intersected by this line include dunes, dune swales, broad undulating stony plains, low calcrete rises, rocky hills / breakaways, and numerous drainages of various sizes.
- The southern part of this line is situated in dune fields (i.e. dunes and swales). It is recommended that the 2D seismic line is aligned within swales to minimise impacts to dune habitat, with any required dune crossed being at right angles. A re-alignment option has been mapped in Appendix F (Map 1) to minimise dune crossings and avoid longitudinal movement along dunes.
- The southern part also supports a few patches of Desert Oak trees; these trees are sparsely spaced and will be easily avoided by the 2D seismic line. It is recommended that Desert Oak are not disturbed where possible due to potential impacts to Princess Parrot nesting habitat (albeit low risk) and general local habitat importance of tree species in the region.
- The central northern part of the line crosses gently undulating stony plains. This area has very sparse vegetation and it is recommended that 2D seismic line preparations in this area does not cut in a track (i.e. blade up) to minimise erosion issues and to reduce post-exploration remediation.
- There are 16 recorded drainage crossings within this line, which are concentrated in the northern part of the line associated with rocky hills and mesas (drainage are mapped Appendix F – Map 1 and 2) (representative photograph in Figure 6-1).
- Weeds are present at 13 sites – all within drainage lines, with the main weed of concern being Buffel Grass (*Cenchrus ciliaris*) (locations shown Appendix F – Map 1 and 2). Eight of the drainage sites have moderate to high infestations of Buffel Grass that will require weed management to minimise the chance of spread to other areas. Five other sites have either very sparse Buffel Grass or other low priority weed species such as Spiked Malvastrum – these areas have a lower risk of weed spread but should still consider weed management to minimise risk.
- Steep terrain and relatively deep drainage gullies are present within the northern part of the line. Re-alignment options have been suggested Appendix F (Map 1 and 2) to minimise the number of drainage crossings to reduce cuts and associated rehabilitation issues.
- A threatened tree species – Desert Quandong (*Santalum acuminatum*) – is present at very low densities in some of the drainages in the northern drainage area (refer to Section 4.3.1). To avoid impacts to this species, all trees within this area need to be avoided. If disturbance to a tree is required in this area, a suitability qualified ecologist should be engaged to confirm identification of the species (this could be done by several photographs rather than field visit).
- There are three seasonal swamps that support Coolabah (*Eucalyptus coolabah subsp. arida*) (locations shown Appendix F – Map 1). This habitat has local to bioregional importance. These swamps are suitably avoided by the line and no impact is expected.



Yellow dashed line shows a suggested alignment that will minimise crossings.

Figure 6-1. Aerial photograph of the northern end of line 1 that crosses steep terrain and drainages.

6.2 Seismic line 2.1

- Seismic line 2.1 is approximately 13.9 km in length and within EP125 and EP134 and it crosses the Adelaide-Darwin railway corridor (refer to Map 3 in Appendix F).
- This line mostly comprises flat to gently undulating sandplains that support some areas of tall Mulga shrubland and other areas of low open shrublands with Sticky Hopbush and Acacia shrubs.
- There are several small and low calcrete rises and loamy depressions scattered within the undulating sandplain. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- There are a few low dunes present in the eastern part of the line. The direction of this line mean that dunes are crossed at right-angles, as such no re-alignments have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.
- No notable re-alignments are required for this seismic line.

6.3 Seismic line 2.2

- Seismic line 2.2 is approximately 20 km in length and occurs within EP134 (refer to Map 3 in Appendix F).
- The major landforms intersected by this line are dunes and associated dune swales.
- The line direction means that dunes are (generally) crossed at right-angles, as such no re-alignments have been proposed. Ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.

- The line intersects two minor drainages,
 - o Site 2.2a – a weakly-defined drainage that will not require earthwork.
 - o Site 2.2c – a well-defined drainage that has banks up to 1m that will require minor earthworks for the crossing OR the drainage can be scouted for a shallower crossing point to minimise requirement for earthworks and disturbance (minimising erosion risk and restoration works.).
- Minor erosion was observed at both drainage sites, highlighting soils are prone to erosion and controls will need to be put in place.
- A small clay pan is present within the western end of the project footprint; however, it is suitable avoided by the current line alignment and will not be impacted.
- There are several scattered low calcrete rises and small loamy depressions located within some of the swales. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- No weed infestation or priority species were observed, with only minor amounts of a low impact environment weed Ruby Dock (*Rumex vesicarius*) present at one of the minor drainages.
- There are no notable threatened species concerns on this line. No patches of large Desert Oak are present; however, isolated individuals will likely be present and should be avoided.

6.4 Seismic line 2.3

- Seismic line 2.3 is approximately 9.5 km in length and occurs in the eastern part of the within EP134 and EP82, with a small part of the project footprint also intersecting EP105 (refer to Map 1 in Appendix F).
- Landforms intersected by this line include dunes, dune swales, broad undulating stony plains and some minor drainages.
- There are scattered low calcrete rises and small loamy depressions located within dune swales. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- There are two drainage crossings:
 - o Site 2.3b is a relatively minor drainage associated with isolated rocky hill / mesa top. It is recommended that the line is moved approximately 30m north at this location to minimise disturbance of the drainage (see Appendix F – Map 1). The crossing point to the north was scouted and the shallow banks in this area will likely not require a cut / earthwork to make trafficable. Refer to drainage crossing assessment (Appendix B) for more details and photographs.
 - o Site 2.3c is a well-defined drainage line that is highly impacted by cattle. Very little vegetation is present. Earthworks will be required at the currently proposed crossing point. It is possible that a shallower crossing point is present; however, this was not scouted at the time of survey.
- Seasonal swamps will Coolabah are present within the project footprint but are avoided by the proposed 2D seismic line alignment. No impacts are expected.
- There are numerous dune crossings along the entire length of this line. However, the direction of this line means that dunes are crossed at right-angles, as such no re-alignments have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.

- There are several patches of Desert Oak trees within the project footprint (see Appendix F – Map 1); these trees are sparsely spaced and will be easily avoided by the 2D seismic line. It is recommended that Desert Oak are not disturbed where possible due to potential impacts to Princess Parrot nesting habitat (albeit low risk) and general local habitat importance of tree species in the region.
- An isolated rocky hill is present within the eastern part of the project footprint; however, the line avoids this landform to the north and no impacts are expected.

6.5 Seismic line 3.1

- Seismic line 3.1 is approximately 19 km in length and occurs within EP134 (see Appendix F – Map 5 and 6).
- Landforms intersected by this line include dunes, dune swales, broad undulating stony plains, drainages lines, low calcrete rises, minor loamy depressions, and the foot slopes of rocky hills.
- There are nine drainage crossings, which are mostly concentrated to the north associated with the surrounding rocky hills and mesa country. Several of these crossings are located on existing station tracks; however, some will require crossing points and associated erosion controls. Erosion was observed at some of the drainages – including rilling along the existing station track.
- There are 3 suggested re-alignments (<100m deviation) to move the line to utilise existing station track crossing points. This is recommended to minimise potential erosion issues, but also to minimise spread of weeds (Buffel Grass) and also impacts to Aboriginal artefacts that have a scattered / patchy occurrence around drainages in this area. It is noted that the current alignment follows a fence line – however field observations confirmed there is no vehicle track present along the fence line.
- Weeds were observed at 15 sites along this line; with infestations mainly restricted to drainages – however there are some small to moderate size infestation of Buffel Grass on some dunes. As such, weed controls will need to be prioritise at drainage crossing points and at other sites where Buffel Grass infestations were observed (locations shown in Appendix F – Map 5 and 6).
- The northern part of this line follows a seismic line established in 2013. Vegetation has re-colonised reasonably well and the line itself was barely visible. Although environmental risk is fairly low along this part of the line, it is recommended that the line is moved 100m to the east to follow an existing station track, which will avoid the drainage line and minimise disturbance of vegetation / soils (see Appendix F – Map 5 and 6). This re-alignment also avoids an archaeological site that was found during the survey.
- The southern part of the line crosses several low (but broad) dunes. The line direction means that dunes are crossed at right-angles, and as such no re-alignments have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.
- Rocky hills and mesas are present within the project footprint; however, all are avoided by the current 2D seismic line alignment.

6.6 Seismic line 3.2

- Seismic line 3.2 is approximately 9.7 km in length and occurs within EP134 (Appendix F – Map 4).
- The major landforms intersected by this line are dunes and associated dune swales. It is recommended that the 2D seismic line is aligned to be positioned in swales to minimise impacts to dune habitat, with any required dune crossed occur at right angles. A re-alignment option shown in Appendix F – Map 4 to minimise dune crossings and avoid longitudinal movement along dunes. A dune crest layer has been provided for planning purposes.

- There are several scattered low calcrete rises and small loamy depressions located within some of the swales. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- The southern part also supports a few patches of Desert Oak trees; these trees are sparsely spaced and will be easily avoided by the 2D seismic line. It is recommended that Desert Oak are not disturbed where possible due to potential impacts to Princess Parrot nesting habitat (albeit low risk) and general local habitat importance of tree species in the region.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.

6.7 Seismic line 4.1

- Seismic line 4.1 is approximately 5.3 km in length and occurs within EP134 (Appendix F – Map 7).
- Landforms intersected by this line include dunes, dune swales, open plains and sparsely distributed low calcrete rises and minor loamy depressions.
- A seasonal swamp that supports Coolabah trees occurs at the northern part of the project footprint; however, it is avoided by the proposed 2D seismic line, and as such, no impacts are expected.
- Where possible, it is recommended that the 2D seismic line is aligned to be positioned in swales to minimise impacts to dune habitat, with any required dune crossed occur at right angles. A re-alignment option is shown in Appendix F (Map 7) to minimise dune crossings and avoid longitudinal movement along dunes.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.

6.8 Seismic line 4.2

- Seismic line 4.2 is approximately 12.8 km in length and occurs within EP134 (Appendix F – Map 4).
- The major landforms intersected by this line are dunes and associated dune swales. It is recommended that the 2D seismic line is aligned to be positioned in swales to minimise impacts to dune habitat, with any required dune crossed occur at right angles. A re-alignment option is provided in Appendix F (Map 4) to minimise dune crossings and avoid longitudinal movement along dunes.
- There are several scattered low calcrete rises and small loamy depressions located within some of the swales. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- The southern part also supports a few patches of Desert Oak trees; these trees are sparsely spaced and will be easily avoided by the 2D seismic line. It is recommended that Desert Oak are not disturbed where possible due to potential impacts to Princess Parrot nesting habitat (albeit low risk) and general local habitat importance of tree species in the region.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.

6.9 Seismic line 5

- Seismic line 5 is approximately 19.8 km in length and occurs within EP134 (Appendix F – Map 3).
- Landforms intersected by this line include sandplains, dunes, broad swales, and sparsely distributed low calcrete rises and minor loamy depressions.

- A small clay pan is also crossed by this line (site 5e) – this clay pan is considered to currently have poor land condition due to cattle impacts. Crossing this clay pan under dry conditions will not impact this site; however, it should be avoided after rain to avoid creation of deep wheel ruts in the clay soils.
- There are a few low dunes present along this line (see Appendix F – Map 3); however, the direction of this line mean that dunes are crossed at right-angles, as such no re-alignments have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest. One re-alignment has been suggested (shown in Appendix F – Map 3).
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.

6.10 Seismic line 6.1

- Seismic line 6.1 is approximately 8.8 km in length and occurs within EP82 (Appendix F – Map 8). It travels adjacent to, and intersects the Adelaide-Darwin railway corridor. To minimise environmental impacts, it is recommended that the adjacent railway service track used for 2D seismic activities (however it is noted that approvals to work within the railway corridor may not be possible).
- Landforms intersected by this line include broad and flat open stony or clayey plains, shallow sandplains, low dunes / sand hills, and sparsely distributed low calcrete rises and minor loamy depressions.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.
- The low cover of shrubs and trees, and the relatively hard clayey / or loamy soils along this line will make line creation relatively easy – and it is recommended that line preparation work do not cut into the soil surface (i.e. blade-up line preparation).

6.11 Seismic line 6.2

- Seismic line 6.2 is approximately 8.5 km in length and occurs within EP134 (Appendix F – Map 9).
- Landforms intersected by this line include open stony and/or clayey plains, spinifex sandplains, low dunes / sand hills, low calcrete rises, clay pan, minor loamy depressions, and one minor drainage.
- The drainage crossing point (site 6.2o) will require minimal cuts and will not require removal of the Mulga trees established at this site. This crossing also has infestation of low priority weeds (Spiked Malvastrum and Bitter Paddymelon) – as such weed management is also recommended.
- The intersection point of line 6.2 and line 7 currently crosses a dune, and it is recommended that the line is re-aligned to avoid the dune to the west (suggested re-alignment is shown in Appendix F – Map 9). This re-alignment also avoids a clay pan that has a high incidence of Aboriginal artefacts.
- There are also scattered occurrence of clay pan in the southern parts of the line. Crossing these clay pan should be avoided where possible; however environmental impacts are expected to be low under dry conditions (assuming that line preparation does not 'grade' the soil. Crossing clay pan should be avoided after rain to avoid creation of deep wheel ruts in the clay soils.
- There are a few low dunes present in the southern part of this line (see Appendix F – Map 9); however, the direction of this line mean that dunes are crossed (generally) at right-angles, as such no re-alignments related to dunes have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.

6.12 Seismic line 7

- Seismic line 7 is approximately 7 km in length and occurs within EP112 and EP134 (Appendix F – Map 9).
- Landforms intersected by this line include open stony and/or clayey plains, spinifex sandplains, low dunes / sand hills, low calcrete rises, clay pan, minor loamy depressions, and one minor drainage.
- The drainage crossing point (site 7d) will require minimal cuts and will not require removal of trees.
- There are a few low dunes present in the eastern part of this line (see Appendix F – Map 9); however, the direction of this line mean that dunes are crossed (generally) at right-angles, as such no re-alignments related to dunes have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.
- The intersection point of line 6.2 and line 7 currently crosses a dune, and it is recommended that line 7 is re-aligned to avoid the dune to the north (suggested re-alignment is shown in Appendix F – Map 9). This realignment also avoids a clay pan. If possible, the 800m section of seismic line 2 from the intersection point with line 6.2 to the railway should be removed from the program to avoid impacts to clay pan.
- Existing erosion issues or weed occurrences were not observed along this line.

6.13 Seismic line 8

- Seismic line 8 is approximately 22.5 km in length and occurs within EP125 and EP134 (Appendix F – Map 8). It crosses the Adelaide-Darwin railway corridor.
- This line mostly comprises flat to gently undulating sandplains that support some areas of tall Mulga shrubland and others with low open shrublands of Stick Hopbush and Acacia shrubs.
- There are several small and low calcrete rises and loamy depressions scattered within the undulating sandplain. These landforms typically have low vegetation cover and will be easily trafficable without the need to clear a formed track in these areas – thereby minimise restoration works and expediting rehabilitation.
- There are a few low dunes present in the eastern part of the line (see Appendix F – Map 8). The direction of this line mean that dunes are crossed at right-angles, as such no re-alignments have been proposed. However, ideally, dune crossing points should aim to occur a low point, or break, in the dune to minimise cut requirement on its crest.
- Drainage crossings, existing erosion issues or weed occurrences were not observed along this line.
- No re-alignments are required for this 2D seismic line.

6.14 Railway service track

- The railway service track is in good condition and will not require any upgrades for 2D seismic exploration (if access approvals are given for this area). Shown in Appendix F – Maps 3, 8 and 9.
- It is noted that there are numerous scattered infestation of Buffel Grass that are established in the windrows and immediate surrounds, and some small infestations of Couch Grass at drainage outlet points. However, if vehicles stay on the current track, weed risk remains low.
- It is also noted that Athel Pine (a Weed of National Significance) was observed at two location is close proximity to the railway corridor (see Appendix F – Map 3). Both occurrences were in old borrow pits / dams, which are not traversed by the existing access road. Risk of spreading this species as a result of 2D seismic works is negligible if vehicles and workers stay on the existing track.

- The service track also crosses a major watercourse – Karinga Creek (see Appendix F – Map 3). Impacts to this creek will be negligible if 2D seismic works are restricted to the existing track.



Figure 6-2. Aerial photographs of railway service track and surrounding environment

6.15 Exploration camp

- The proposed exploration camp (if required) will be 100x100m (1 ha) and occurs within EP82.
- The site is open flat rocky plain with minimal vegetation coverage (see Figure 6-3).
- No environmental issues identified.



Figure 6-3. Photograph of flat rocky plain where the temporary camp is proposed to be located if required

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APPENDIX A FIELD SURVEY RESULTS

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
1	1a	Swale	Some tall dunes nearby (10m)	red sand	None	Desert oak over Ptilotus polystachys	<i>Allocasuarina decaisneana</i> , <i>Ptilotus polystachys</i> , <i>Calandrinia balonensis</i> , <i>Salsola tragus</i> , <i>Atalaya hemiglauca</i> (isolated patch on adjacent steep dune)	None	None	Low	Low	Good	Avoid steep dunes where possible
	1b	Drainage	Minor. Weakly defined. 1m wide; 0.2m deep	Orange sand	None in drainage, rocks on edge	Tussock grass (mainly Buffel)	<i>Cenchrus ciliaris</i> , <i>Senna artemisioides</i> subsp. <i>oligophylla</i> , <i>Salsola tragus</i> , <i>Sclerolaena</i> sp., <i>Maireana astrotricha</i>	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (low)	None	Low	Moderate - localised to drainage	Poor - due to Buffel	Minimal cut required. Low erosion risk. Weed management required.
	1c	Drainage	4 - 5m wide, 0.5m deep. semi-braided channel.	Orange sand	Scattered, patchy - rocky surrounds	Low shrubland	<i>Senna shrubs</i> , <i>Eremophila freelingii</i> (scattered), <i>Salsola tragus</i> , sparse tussocks and forbs	None observed	None	Low	Low	Good	Minimal cut requires. Low risk but will require erosion controls
	1d	Drainage	5 - 7m wide, 1m deep	Orange sand	Scattered, patchy - rocky surrounds	Patchy shrubs and dense Buffel and other forbs and tussocks.	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Senna</i> sp., <i>Einadia nutans</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (scattered), <i>Dactyloctenium radulans</i> , <i>Eulalia aurea</i> , <i>Salsola tragus</i> , scattered forbs	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (high), check photo,	None	Low	High - localised to drainage	Poor	Minor cut required. Will require erosion controls
	1e	Drainage	3m wide, 0.5m deep	Orange sand	Scattered, patchy - rocky surrounds	Patchy shrubs and dense Buffel and other forbs and tussocks.	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Senna shrubs</i> , <i>Einadia nutans</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (scattered), <i>Dactyloctenium radulans</i> , <i>Eulalia aurea</i> , <i>Salsola tragus</i> , scattered forbs	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (high), check photo,	None	Low	High - localised to drainage	Poor	Aerial inspection only. Minor cut required. Will require erosion controls
	1f	Drainage	1m wide; 0.5m deep	Orange sand	Scattered rocks	Sparse shrubs over buffel Grass and forbs	<i>Not recorded</i>	<i>Cenchrus ciliaris</i> (moderate)	None	Low	Low	Poor - weeds	Aerial inspection only. Minor cut required. Will require erosion controls
	1g	Drainage	1m wide; 0.2m deep	Orange sand	Scattered rocks	Scattered Mulga and shrubs over sparse tussocks	<i>Not recorded</i>	None	None	Low	Very low	Average	Aerial inspection only. Minor cut required. Will require erosion controls
	1h	Rocky breakaway	Steep. 25-30% slope	Orange sandy loam	High rocky gravel cover	Scattered forbs and chenopods	<i>Salsola tragus</i> , <i>Maireana astrotricha</i> , <i>Sclerolaena</i> sp., <i>Rhodanthe charsleyae</i>	None	None	Low	Very low	Good	Steep terrain. No cutting required
	1i	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	High cover of rock	Scattered shrubs (mostly Dead Finish and forbs and tussocks	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Eremophila freelingii</i> , <i>Senna artemisioides</i> subsp. <i>oligophylla/alicia</i> , <i>Salsola tragus</i> , <i>Rhodanthe charsleyae</i> , <i>Roepera</i> sp., occasional <i>Pittosporum angustifolium</i>	<i>Cenchrus ciliaris</i> (moderate)	High	Low	Low	Poor - erosion and weeds	Complicated cuts. Considered alternative route to minimise further disturbance of banks. Hi risk of erosion.
	1j	Open plain	Flat area	Brown loam	Moderate to high (patchy cover) - sharp	Scattered forbs and bare rock areas	<i>Rhodanthe charsleyae</i>	None	None	Low, none	Very low	Good	Suitable for track - ideally blade up to minimise erosion development
	1k	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	High cover of rock	Scattered shrubs (mostly Dead Finish and forbs and tussocks	<i>Acacia tetragonophylla</i> , <i>Rhodanthe charsleyae</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Roepera</i> sp.	<i>Cenchrus ciliaris</i> (low, patchy)	Active erosional channel	Low / none	Low	Poor - erosion and weeds	Will require cut to cross
	1l	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Sparse shrubs, forbs and tussock grasses	<i>Acacia tetragonophylla</i> , <i>Rhodanthe charsleyae</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Roepera</i> sp., <i>Pittosporum angustifolium</i> (scattered), <i>Eremophila freelingii</i> , <i>Atalaya hemiglauca</i>	<i>Cenchrus ciliaris</i> (low, patchy)	Active erosional channel	Low / none	Low	Poor - erosion and weeds	Will require cut to cross
	1m	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Sparse shrubs, forbs and tussock grasses	<i>Acacia tetragonophylla</i> , <i>Rhodanthe charsleyae</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Roepera</i> sp., <i>Pittosporum angustifolium</i> , <i>Eremophila freelingii</i> , <i>Atalaya hemiglauca</i>	<i>Cenchrus ciliaris</i> (low, patchy)	Active erosional channel	Low / none	Low	Poor - erosion and weeds	Will require cut to cross
	1n	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Sparse shrubs, forbs and tussock grasses	<i>Eremophila freelingii</i> , <i>Salsola tragus</i> , <i>Enneapogon</i> sp., <i>Ptilotus obovatus</i> ,	None	Active erosional	Low / none	Low	Poor - erosion	Will require cut to cross

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
							<i>Rhodanthe charsleyae</i>		channel				
	1o	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Sparse shrubs, forbs and tussock grasses	<i>Eremophila freelingii</i> , <i>Salsola tragus</i> , <i>Enneapogon</i> sp., <i>Ptilotus obovatus</i> , <i>Rhodanthe charsleyae</i> , <i>Pittosporum angustifolium</i> (few)	<i>Cenchrus ciliaris</i> (low - isolated plants only)	Active erosional channel	Low / none	Low	Poor - erosion and weeds	Will require cut to cross
	1p	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Sparse shrubs, forbs and tussock grasses	<i>Eremophila freelingii</i> , <i>Salsola tragus</i> , <i>Enneapogon</i> sp., <i>Ptilotus obovatus</i> , <i>Rhodanthe charsleyae</i>	<i>Cenchrus ciliaris</i> (low - isolated plants only)	Active erosional channel	Low / none	Low	Poor - erosion and weeds	Aerial inspection only. Will require cut to cross
	1q	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Tussock grassland (Buffel) with scattered trees, forbs and short native tussocks	<i>Cenchrus ciliaris</i> , <i>Santalum</i> sp. (potentially <i>acuminatum</i> ; no fruit present), <i>Pittosporum angustifolium</i> , <i>Solanum</i> sp., <i>Salsola tragus</i> , <i>Roepera</i> sp.	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (low)	Active erosional channel	Low	High - localised to drainage	Poor - erosion and weeds	Avoid trees established in drainage; especially as one may be a threatened species (<i>S. acuminatum</i>)
	1r	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Tussock grassland (Buffel) with scattered trees, forbs and short native tussocks	<i>Cenchrus ciliaris</i> , other species not recorded	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (low)	Active erosional channel	Low	High - localised to drainage	Poor - erosion and weeds	Avoid trees established in drainage
	1s	Drainage	Active erosion. Erosion risk site	Red-brown loamy sand	Moderate cover of rock	Tussock grassland (Buffel) with scattered trees, forbs and short native tussocks	<i>Cenchrus ciliaris</i> , <i>Santalum</i> sp. (potentially <i>acuminatum</i> ; no fruit present), <i>Salsola tragus</i> , <i>Roepera</i> sp.	<i>Cenchrus ciliaris</i> (high)	Present	Low	High - localised to drainage	Poor - erosion and weeds	Avoid trees established in drainage; especially as one may be a threatened species (<i>S. acuminatum</i>)
	1t	Rocky hill	Steep slopes 15-20%	Orange loamy sand	Very high	Mostly absent. Sparse forbs	<i>Salsola tragus</i> , <i>Maireana astrotricha</i> , <i>Sclerolaena</i> sp.	None	None	None	Very low	Good?	Moderately steep terrain. No cutting if possible, to retain soil stability. Work around hill if possible.
2.1	2.1a	Loamy depression	Flat	Clay to loamy clay	Scattered calcrete fragments	Forbs and tussocks	<i>Aristida holatera</i> (dom), <i>Enneapogon polyphyllus</i> , <i>Tribulus eichlerianus</i> , <i>Portulaca oleracea</i> , <i>Enneapogon avenaceus</i> , <i>Sclerolaena</i> sp., <i>Maireana georgei</i> , <i>Salsola tragus</i> (scat), <i>Rhodanthe floribunda</i> (scat), <i>Roepera</i> sp. (patchy), <i>Acacia aneura</i> and <i>Acacia kempeana</i> in surrounding swale	None	None	Low	Very low	Good	
2.2	2.2a	Drainage	Gentle	Sandy red earth	None	Open shrubs	<i>Acacia ligulata</i> , <i>Acacia kempeana</i> , <i>Salsola tragus</i> (dom), <i>Roepera</i> sp., forbs, daisies, tussocks, <i>Triodia basedowii</i> is very sparse	<i>Rumex vesicarius</i> (low)	Minor due to cattle	Used as cattle track; impacted	Low	Average - due to cattle	Minor channel only. No cutting required. Low risk
	2.2b	Clay pan	Flat	Loamy clay	None	Daisies and forbs	<i>Rhodanthe charsleyae</i> (dominant cover), <i>Einadia nutans</i> , <i>Roepera</i> sp.	None	None		Very low	Good	Very green at time of survey
	2.2c	Drainage	Minor; Defined channel about 1m high; 4m wide;	Sandy red earth	None	Open shrubland	<i>Acacia ligulata</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Acacia aneura</i> , <i>Triodia basedowii</i> (scattered), scattered variety of forbs and small tussocks	None	Minor erosion in some parts	Low to moderate	Low	Average to poor due to minor erosion	will require erosion control. Consider crossing where bank is less defined.
	2.2d	Loamy depression	Flat	Clay loam (quite heavy)	None	Forbs and tussocks. Scattered Mulga	<i>Rhodanthe charsleyae</i> , <i>Ptilotus sessilifolius</i> , <i>Tragus australianus</i> , <i>Swainsona</i> sp., <i>Roepera</i> sp., <i>Portulaca oleracea</i>	None	None	Low	Very low	Good	
2.3	2.3a	Seasonal swamp	Flat	Heavy clay	None	Coolabah on edge; forbs and daisies in swamp	<i>Eucalyptus coolabah</i> , <i>Rhodanthe charsleyae</i> , <i>Rhodanthe floribunda</i> , <i>Muehlenbeckia florulenta</i> , <i>Einadia nutans</i> , <i>Roepera</i> sp.	<i>Cenchrus ciliaris</i> (low; patchy on edge).	None	Low	Very low	Good, average on edge due to Buffel	Swamp is avoided. Important not to clear Coolabah trees
	2.3b	Drainage	3m wide; 0.3m deep. Less defined to north	red-orange sand	None in drainage, patchy on edge	Scattered shrubs, forbs and tussock grasses. Occasional Mulga	<i>Eremophila duttonii</i> , <i>Senna artemisioides</i> subsp. <i>alicia</i> , <i>Acacia aneura</i> , tussocks and forbs	<i>Citrullus colocynthis</i> (low)	None	Low	Low	Good	Recommended crossing point to minimise impacts
	2.3c	Drainage	3m wide, 1 - 1.5m high	Pale sands	None	Sparse shrubs, forbs and tussock grasses	<i>Cenchrus ciliaris</i> , very few shrubs, <i>Datura leichhardtii</i> ; grazed tussocks	<i>Cenchrus ciliaris</i> (moderate),	Minor	High - grazed and	Low	Poor	Will require cut, or drainage scoped to find better crossing point. Already

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
							and forbs	<i>Citrullus colocynthis (low)</i>		trampled			impacted, so low priority
3.1	3.1a	Open plain	Open swale as numerous dunes in area, alluvial plain	Clay to loamy clay	Rare	Sparse to scattered forbs and tussocks	Not recorded	None	None	Low	Very low	Good	
	3.1b	Dune	Low broad dune (approx 2m high). Minor bowling present on crest	Red sand	None	Low open shrubland	<i>Cenchrus ciliaris</i> , <i>Crotalaria novae-hollandiae</i> , <i>Tribulus hystris</i> , <i>Salsola tragus</i> , <i>Tribulus eichlerianus</i> , <i>Acacia ligulata</i> , <i>Ptilotus polystachyus</i> , <i>Paractaenum refractum</i>	<i>Cenchrus ciliaris (moderate) (patch)</i> , <i>Citrullus colocynthis (low)</i> , <i>Rumex vesicarius (low)</i>	None observed	Moderate	Low	Average to poor due to Buffel and other disturbance plants	Artefacts in bowl
	3.1c	Dune	Low broad dune (approx 2m high). Minor bowling present on crest	Red sand	None	Sparse shrubs, forbs and tussock grasses	<i>Acacia ligulata</i> , <i>Acacia tetragonophylla</i> , <i>Tribulus hystris</i> , <i>Crotalaria cunninghamii</i> , <i>Salsola tragus</i> , <i>Paractaenum refractum</i>	<i>Cenchrus ciliaris (low)</i> ; <i>Citrullus colocynthis (low)</i>	None observed	Moderate	Low	Average	Artefacts in bowl
	3.1d	Drainage	Defined channel. Bank (1 - 1.5m); width (2-3m)	Pale red-orange sand	None, rare in drainage	Scattered shrubs and forbs. Sparse tussock grasses	<i>Acacia tetragonophylla</i> , <i>Tribulus eichlerianus</i> , <i>Sclerolaena sp.</i> , <i>Salsola tragus</i> , <i>Acacia kempeana</i> , <i>Rhodanthe floribunda</i> , <i>Rhodanthe charsleyae</i> , <i>Swainsona sp.</i> , <i>Dissocarpus paradoxus</i> , <i>Enneapogon polyphyllus</i> , <i>Enneapogon avenaceus</i>	<i>Citrullus colocynthis (low)</i>	Active. Small erosion arms could be associated with cattle tracks	Moderate; numerous tracks and grazing evidence.	Low	Poor - due to erosion and cattle	
	3.1e	Dune	Low broad dune (approx 2m high). Minor bowling present on crest	Red-orange soft sand	None	Scattered shrubs and forbs. Sparse tussock grasses	<i>Salsola tragus</i> , other forbs and grass not recorded	None	None	Low	Low	Average - due to high cover of <i>Salsola tragus</i> indicates disturbance	
	3.1f	Rocky rise	4-5m relief;	Sandy loam	High cover; Silcrete, some calcrete	Sparse chenopods, forbs and short tussock grasses	<i>Sclerolaena sp.</i> , <i>Salsola tragus</i>	None	None	Low	Very low	Good	
	3.1g	Dune	Low broad dune (approx 2m high). Minor bowling present on crest	Red sand	None	Scattered shrubs and forbs. Sparse tussock grasses	<i>Acacia tetragonophylla</i> , <i>Acacia ligulata</i> , <i>Salsola tragus</i> , <i>Tribulus hystris</i>	<i>Cenchrus ciliaris (low)</i>	None	Moderate	Low	Average	
	3.1h	Rocky hill	8 - 10m high	Sandy loam	High cover	Variable. Sparse on areas of high rock cover. Low open shrubland in rocky/sandy areas.	<i>Senna artemisioides subsp. alicia</i> , <i>Eremophila freelingii</i> , <i>Maireana astrotricha</i>	<i>Cenchrus ciliaris (low)</i>	None	Low	Low	Average	Line avoids land type - could move a little more to west to clearly avoid
	3.1i	Dune	Established next to rocky hill	Red sand	None	Low open shrubland	<i>Cenchrus ciliaris</i> , <i>Eremophila freelingii</i> , <i>Maireana astrotricha</i> , <i>Senna artemisioides subsp. alicia</i> , <i>Ptilotus polystachyus</i>	<i>Cenchrus ciliaris (moderate)</i>	None	Moderate	Low	Average	
	3.1j	Drainage	10m wide; 1m high	Red-orange soft sand	None	Open shrubland over Buffel Grass	<i>Cenchrus ciliaris</i> , <i>Acacia victoriae</i> , <i>Senna artemisioides subsp. artemisioides</i> , <i>Dissocarpus paradoxus</i> , <i>Sclerolaena bicornis</i> , <i>Atriplex spongiorarpa</i> , <i>Senecio sp. (maybe Senecio magnificus)</i> , <i>Salsola tragus</i> , <i>Boerhavia sp.</i> , numerous other small forbs and tussocks.	<i>Cenchrus ciliaris (high; infestation)</i> ; <i>Citrullus colocynthis (low)</i> ; <i>Malvastrum americanum (low)</i>	Banks are actively eroding	Low	High - localised to drainage	Poor	
	3.1k	Rocky rise	5m high	Sandy loam	Moderate cover; Calcrete; silcrete	Sparse chenopod, forbs and tussocks	<i>Maireana astrotricha (scattered)</i> , <i>Salsola tragus</i> , <i>Enneapogon cylindricus</i>	None observed	None	Low	Very low	Good	

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
	3.1l	Drainage	10m wide; 1m high; semi-braided	Pale red sands (soft)	None	Open shrubland over Buffel Grass	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Ptilotus obovatus</i> , <i>Aristida latifolia</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i>	<i>Cenchrus ciliaris</i> (high; infestation); <i>Citrullus colocynthis</i> (low); <i>Malvastrum americanum</i> (moderate)	Creek bank erosion present	Low	High - localised to drainage	Poor	Move line to fence line track to east to avoid requirement to cut into drainage.
	3.1m	Drainage	very minor, poorly defined	Red-orange soft sand	None, to scattered fragments	Low open shrubland over scattered tussocks and forbs	<i>Cenchrus ciliaris</i> , <i>Senna artemisioides</i> subsp. <i>oligophylla</i> , <i>Rhagodia</i> sp. (likely <i>eremaea</i>), <i>Ptilotus obovatus</i> , <i>Enneapogon avenaceus</i> (dom), <i>Enneapogon polyphyllus</i> (scattered)	<i>Cenchrus ciliaris</i> (moderate); <i>Citrullus colocynthis</i> (low)	None	Low	Low	Poor	Drainage crossing on existing track. Not cut required.
	3.1n	Drainage	8m wide; 1m high. Eroding banks	Red-orange soft sand	None	Open shrubland over Buffel Grass and Couch Grass	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Senna</i> sp., <i>Tribulus eichlerianus</i>	<i>Cenchrus ciliaris</i> (high; infestation); <i>Cynodon dactylon</i> (high; infestation); <i>Citrullus colocynthis</i> (low)	Active erosion along road - wheel ruts	Low	High - localised to drainage	Poor	Drainage crossing on existing track. Not cut required.
	3.1o	Drainage	4-5m wide, 0.5m deep. Poorly defined banks. Eroded in some parts	Pale red sands (soft)	None	Scattered shrubs over Buffel Grass	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Eremophila freelingii</i> , <i>Senna artemisioides</i> subsp. <i>alicia</i> , <i>Tribulus eichlerianus</i>	<i>Cenchrus ciliaris</i> (high), <i>Malvastrum americanum</i> (mod), <i>Citrullus colocynthis</i> (low)	Minor along banks	Low	Moderate	Poor	Drainage crossing on existing track. Not cut required.
	3.1p	Open plain	Flat	Sandy loam	None	Tussock grassland and scattered low chenopod shrubs	<i>Maireana astrotricha</i> (scattered), <i>Enneapogon avenaceus</i> (dom), <i>Salsola tragus</i>	None	None	Low	Very low	Good (adjacent to road)	On existing fence line track. No clearing required.
	3.1q	Open plain	Flat	Sandy loam	None to low	Low chenopod shrubs over tussock grass and forbs	<i>Maireana astrotricha</i> (scattered), <i>Enneapogon avenaceus</i> (dom), <i>Salsola tragus</i>	<i>Cenchrus ciliaris</i> (low)	None	Low	Very low	Good	Move line to road approx 20m to east - not fence line as that will require unnecessary vegetation clearing and risk of Buffel spread.
	3.1r	Drainage	2m wide, 0.5m deep. Weakly defined.	Red sand	None, scattered on adjacent banks	Low open shrubs over buffel grass. Shrubs localised to drainage	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Eulalia aurea</i> , <i>Tribulus eichlerianus</i> , <i>Eremophila freelingii</i> , <i>Senna artemisioides</i> subsp. <i>alicia</i>	<i>Cenchrus ciliaris</i> (mod to high), <i>Malvastrum americanum</i> (low), <i>Citrullus colocynthis</i> (low)	None	Low	Moderate - localised to drainage	Average to poor	Move line to road, 90m to east - not fence line as that will require unnecessary vegetation clearing and risk of Buffel spread.
	3.1s	Drainage	8m wide, 1m deep. Eroding banks	Pale sand	None	Patchy shrubs over Buffel Grass and Couch Grass	<i>Cenchrus ciliaris</i> , <i>Acacia tetragonophylla</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> , <i>Eremophila freelingii</i>	<i>Cenchrus ciliaris</i> (high), <i>Cynodon dactylon</i> (high), <i>Citrullus colocynthis</i> (low)	Bank erosion; minor erosion on ruts/road	Low	High - localised to drainage	Poor	On existing track. No clearing required. Upgrade potentially required.
	3.1t	Open plain	Base of slopes	Red earth	Patchy	Sparse Mulga over tussocks and forbs. Patchy low Senna shrubs	<i>Enneapogon polyphyllus</i> , <i>Aristida holathera</i> , <i>Ptilotus polystachyus</i> , <i>Acacia aneura</i> , <i>Senna</i> sp., <i>Swainsona</i> sp.	None	Erosion stable - rill	Low	Low	Average	Old Seismic line
	3.1u	Drainage	2m wide, 0.2m deep.	Pale sands	None in drainage, patchy on edge	Open Mulga over tussocks	<i>Cenchrus ciliaris</i> , <i>Acacia aneura</i> , <i>Ptilotus polystachyus</i> , <i>Salsola tragus</i>	<i>Cenchrus ciliaris</i> (moderate),	Erosion stable - rill	Low	Moderate - localised to	Average to poor due to Buffel	Old Seismic line. Fence line present (requires cut)

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
								<i>Citrullus colocynthis</i> (low)			drainage		
	3.1v	Open plain	Base of slopes	Pale brown loamy sand	Scattered rock	Tussock grassland with forbs and chenopods. Scattered emergent Mulga	<i>Acacia aneura</i> (scattered), tussocks (<i>Enneapogon polyphyllus</i> dominant), <i>Salsola tragus</i> , <i>Maireana astrotricha</i> , <i>Ptilotus polystachyus</i> (rare), <i>Aristida</i> sp. (patchy), <i>Eremophila duttonii</i> (patchy).	None	None	Low	Very low	Good	Old Seismic line - excellent rehabilitation
3.2	3.2a	Loamy depression	Slight rise; gently undulating	Sandy loam	Scattered calcrete fragments	Forbs and tussocks	<i>Enneapogon polyphyllus</i> , <i>Enneapogon avenaceus</i> , <i>Rhodanthe charsleyae</i> , <i>Leucochrysum stipitatum</i> , <i>Sclerolaena</i> sp., <i>Maireana astrotricha</i> , <i>Roepera</i> sp., <i>Lepidium</i> sp.	None	None	Low	Very low	Good	
4.1	4.1a	Rocky rise	Very low (1m relief max)	Clay loam	Calcrete high cover	Forbs and tussocks	<i>Sclerolaena</i> sp., <i>Enneapogon cylindricus</i> , <i>Salsola tragus</i> , <i>Enneapogon avenaceus</i> , <i>Roepera</i> sp., <i>Lepidium</i> sp.	None	None	Low	Very low	Good	
4.2	4.2a	Loamy depression	Flat	Clay loam	Scattered calcrete fragments	Forbs and tussocks	<i>Dissocarpus paradoxus</i> , <i>Roepera</i> sp., <i>Tragus australianus</i> , <i>Enneapogon cylindricus</i> , numerous other small forbs and daisies	None	None	Low	Very low	Good	
	4.2b	Dune	low dune - 3m high	Sandy red earth	None	Open shrubland over sparse hummock grass	<i>Acacia ramulosa</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Acacia ligulata</i> , <i>Ptilotus polystachyus</i> , <i>Salsola tragus</i> , <i>Triodia basedowii</i> , <i>Calandrinia balonensis</i>	None	None	Low	Low	Good	
	4.2c	Clay pan	Flat, run-on.	Clay, cracking, hard	None	High cover of forbs, and scattered tussocks and Mulga	<i>Acacia aneura</i> (4 - 7m, scattered), <i>Portulaca oleracea</i> , <i>Tribulus eichlerianus</i> (dom), <i>Swainsona</i> sp., <i>Cleome viscosa</i> , <i>Leucochrysum stipitatum</i>	None	None	Low	Very low	Good	
	4.2d	Sandplain	Gently undulating	Sandy red earth	None	Open Blue Mallee and Mulga over Hummock grass	<i>Eucalyptus gamophylla</i> , <i>Acacia aneura</i> , <i>Triodia basedowii</i> . Other - <i>Ptilotus polystachyus</i> , <i>Eremophila latrobei</i> , <i>Acacia kempeana</i> , <i>Halgania</i> sp, <i>Acacia ramulosa</i>	None	None	Low	Low	Good	
5	5a	Loamy depression	Flat	Sandy loam	Calcrete fragments	Forblands and tussocks	<i>Sclerolaena</i> sp. (dom) <i>Salsola tragus</i> , <i>Portulaca ol.</i> , <i>Roepera</i> sp., daisies and forbs	None	None	Low	Very low	Good	
	5b	Dune	4m dune. Low dune	Red sand	None	Open shrubland over hummock grass	<i>Acacia aneura</i> , <i>Acacia kempeana</i> (more on flanks), <i>Acacia ramulosa</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Eremophila latrobei</i> , <i>Triodia basedowii</i> , <i>Ptilotus polystachyus</i> , <i>Eragrostis eriopoda</i> , <i>Aristida</i> spp.,	None	None	Low	Low	Good	
	5c	Loamy depression	Flat	Sandy loam	Some scattered calcrete	Forbs and tussocks	<i>Sclerolaena</i> sp. (dom) <i>Salsola tragus</i> , <i>Portulaca oleracea</i> , <i>Roepera</i> sp., mixed small daisies and forbs	None	None	Low	Very low	Good	
	5d	Rocky rise	2m rise	Red-brown loam	High cover of calcrete	Low open shrubland (Senna) over sparse short tussock grasses, chenopods and forbs	<i>Senna artemisioides</i> subsp. <i>alicia</i> , other species not recorded	None	None	Low	Very low	Good	
	5e	Clay pan	Flat	Clay; brown	Calcrete fragments (low cover)	Sparse forbs	<i>Dissocarpus paradoxus</i> , <i>Roepera</i> sp.	None	None	Moderate - numerous tracks	Very low	Poor / average	
	5f	Dune	Low dune. Approx 4-5m	Sandy red earth	None	Open shrubs over sparse hummock grass	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Acacia kempeana</i> ,	None	None	Low	Low	Good	

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
							<i>Triodia basedowii</i>						
6.1	6.1a	Open plain	Flat	Clay; brown	Scattered gravel	Sparse forbland	<i>Portulaca oleracea</i> , <i>Roepera</i> sp., <i>Erodium</i> sp., <i>Rhodanthe charsleyae</i>	None	None	Low	Very low	Good	
	6.1b	Dune	Very low. Expected shallow rock due to presence of <i>Eremophila freelingii</i>	Sandy red earth	None	Low open shrubland over scattered forbs. Occasional Mulga. Chenopods on edge.	<i>Eremophila freelingii</i> , <i>Acacia kempeana</i> , <i>Acacia aneura</i> , <i>Senna artemisioides</i> subsp. <i>artemisioides</i> , <i>Salsola tragus</i> , <i>Tephrosia sphaerospora</i> , <i>Brassica tournefortii</i> , <i>Blennodia canescens</i> , <i>Dissocarpus paradoxus</i>	None	None	Low	Low	Good	
	6.1c	Rocky rise	Calcrete	Sandy loam	Calcrete	Chenopod and forbs and tussocks	<i>Sclerolaena cuneata</i> , <i>Roepera</i> sp., <i>Atriplex spongiorcarpa</i> , <i>Tragus australianus</i> , <i>Sclerolaena eriactantha</i> , <i>Maireana astrotricha</i> , <i>Lepidium oxytrichum</i> , <i>Lepidium phlebopetalum</i> , <i>Dissocarpus paradoxus</i>	None	None	Very low	Very low	Good	
6.2	6.2a	Sandplain	Rise, undulating	Sandy red earth	None	Sparse low shrubland over hummock grass	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Triodia basedowii</i> , <i>Solanum</i> sp., <i>Senna artemisioides</i> subsp. <i>filifolia</i> (patchy), <i>Trianthema pilosa</i> , <i>Salsola tragus</i> , <i>Sclerolaena johnsonii</i> , <i>Triraphis molle</i> , <i>Rhodanthe floribunda</i>	None	None	Low	Low	Good	
	6.2b	Dune	Approx 5m	Red sand	None	Open shrubs over scattered to patchy forbs and tussock grasses	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (dominant shrub), <i>Ptilotus obovatus</i> , <i>Salsola tragus</i> , <i>Paractaenum refractum</i> , <i>Ptilotus polystachyus</i> , <i>Euphorbia ferdindii</i> , <i>Crotalaria novae-hollandiae</i> , <i>Trianthema pilosa</i>	None	None	Low	Low	Good	Could be avoided
	6.2c	Open plain	Flat	Loam; clay loam	High cover	Chenopod and tussocks. Isolated patches of shrubs	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Acacia aneura</i> , <i>Acacia tetragonophylla</i> , <i>Sclerolaena cornishiana</i> , <i>Sclerolaena bicornis</i> , <i>Dactyloctenium radulans</i> , <i>Atriplex spongiorcarpa</i> , <i>Sporobolus actinocladus</i> , <i>Lepidium</i> sp.	None	None	Moderate - tracks present	Very low	Average	
	6.2d	Sandplain	Gently undulating	Red sand	None	Sparse to open low shrubland over hummock grass and forbs	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Dissocarpus paradoxus</i> , <i>Triodia basedowii</i>	<i>Cenchrus ciliaris</i> (low)	None	Low	Low	Good	
	6.2e	Clay pan	Flat	Clay; brown	Scattered stones	Absent; very low	<i>No vegetation on clay pan.</i>	None	None	Low	Very low	Good	Avoid / blade up, water feature, numerous artefacts seen
	6.2f	Loamy depression	Flat	Loam	None	Forbs and tussocks	<i>Abutilon</i> sp., <i>Aristida holathera</i> , <i>Sida</i> sp., <i>Rhodanthe charsleyae</i>	None	None	Low	Very low	Good	
	6.2g	Sandplain	Gently undulating	Sandy red earth	None	Open shrubland over open hummock grassland	<i>Acacia kempeana</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Triodia basedowii</i> , <i>Acacia estrophilata</i> (patchy), <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (low dunes)	None	None	Low	Low	Good	
	6.2h	Loamy depression	Flat	Loam	None	Forbs and tussocks	<i>Sclerolaena</i> sp. (few species), <i>Portulaca oleracea</i> , <i>Abutilon</i> sp., <i>Aristida holathera</i> , <i>Sida</i> sp., <i>Daisies</i> , <i>Eremophila sturtii</i> (rare)	None	None	Low	Very low	Good	
	6.2i	Loamy depression	Flat	Clay loam; brown	Rocks present	Absent; very low	<i>Rhodanthe charsleyae</i> , <i>Roepera</i> sp., <i>Rhodanthe floribunda</i> , other forbs. Edge species <i>Acacia aneura</i> , <i>Acacia kempeana</i> , <i>Dodonaea viscosa</i> subsp.	None	None	Low	Very low	Good	

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
							<i>angustissima</i>						
	6.2j	Clay pan	Flat	Clay; brown	Rocks present	Absent; very low	No dominant species on clay pan. <i>Acacia aneura</i> on edge, and transitional sandplain species.	None	None	Low	Very low	Good	
	6.2k	Sandplain	Undulating, scattered small low rises	Soft red sand	None	Open shrubs over hummock grass	<i>Dodonaea viscosa</i> subsp. <i>Angustissima</i> (dom), <i>Triodia basedowii</i> (dom). Other - <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Acacia murrayana</i> , <i>Eremophila sturtii</i> , numerous forbs	None	None	Low	Low	Good	
	6.2l	Rocky rise	Very low	Loam; pale brown	High cover	Sparse chenopod, forbs, short tussocks	<i>Sclerolaena eriacantha</i> , <i>Maireana astrotricha</i> , <i>Sporobolus actinocladius</i>	None	None	Low	Very low	Good	
	6.2m	Dune	Low dune; Approx 4m	Red sand	None	Open shrubs over scattered to patchy forbs and tussock grasses	<i>Acacia ramulosa</i> , <i>Ptilotus polystachyus</i> , <i>Paractaenum refractum</i> . Other - <i>Acacia dictyophleba</i> , <i>Rhagodia</i> sp., <i>Polycalymma stuartii</i>	None	None	Low	Low	Good	
	6.2n	Rocky rise	Very low	Loam; pale brown	High cover	Sparse chenopod, forbs, short tussocks	<i>Sclerolaena eriacantha</i> , <i>Maireana astrotricha</i> , <i>Sporobolus actinocladius</i>	None	None	Low	Very low	Good	
	6.2o	Drainage	4-5m wide, 0.2m deep.	Red earth	None	Open Mulga Low Woodland with Dead Finish shrubs over forbs and tussocks	<i>Acacia aneura</i> , <i>Acacia tetragonophylla</i> , <i>Malvastrum americanum</i> , <i>Cleome viscosa</i> , <i>Abutilon otocarpum</i> , <i>Swainsona burkei</i>	<i>Malvastrum americanum</i> (high), <i>Citrullus colocynthis</i> (low)	None	Low	Low	Average	There are several crossing points that would not require clearing trees.
7	7a	Drainage	Poorly defined banks; 3m wide; 0.2m deep	red sand; loam	None	Open shrubland, scattered Mulga over tussocks and forbs	Not recorded	None	None	Low	Very low	Good	Aerial inspection only. Not cut required as shallow bank
	7b	Loamy depression	Flat	Loam	None	Forbs and daisies. Scattered tussock grasses.	<i>Rhodanthe floribunda</i> , <i>Rhodanthe charsleyae</i> , <i>Roepera</i> sp., <i>Lepidium</i> sp., numerous other forbs, <i>Enneapogon polyphyllus</i>	None	None	Low	Very low	Good	
	7c	Open plain	Flat	Clay: brown	Scattered gravel	Absent; very low	<i>Sclerolaena eriacantha</i> , <i>Dactyloctenium radulans</i> , <i>Eremophila duttonii</i> (rare, stunted), <i>Tribulus eichlerianus</i> , <i>Tribulus hystrix</i> , <i>Sclerolaena</i> sp.	None	None	Low	Very low	Good	
	7d	Drainage	Gentle slope; 3m wide, 0.5m deep	Red sand	None	Shrubland over sparse forbs and tussock grasses.	<i>Acacia aneura</i> , <i>Acacia tetragonophylla</i> , <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Acacia ligulata</i> , <i>Acacia murrayana</i>	<i>Citrullus colocynthis</i> (low), <i>Malvastrum americanum</i> (low)	None	Low	Low	Good	
	7e	Open plain	Flat	Clay: brown	Rocks present; mostly calcrete	Sparse chenopods, forbs and short tussock grasses	<i>Sclerolaena bicornis</i> , <i>Sclerolaena</i> sp., <i>Roepera</i> sp., <i>Portulaca oleracea</i> , dried small tussocks	None	None	Low	Very low	Good	
8	8a	Loamy depression	Flat	Sandy loam	None	Forblands and tussocks. Scattered low shrubs	<i>Rhodanthe charsleyae</i> , <i>Ptilotus sessilifolius</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> (scattered), <i>Acacia kempeana</i> (scattered)	None	None	Low	Very low	Good	
	8b	Sandplain	Flat	Sandy red earth	None	Low open woodland (Mulga) over sparse hummock grass, tussocks grasses and forbs	<i>Acacia aneura</i> (7m), <i>Triodia basedowii</i> , <i>Erodium</i> sp. Other - <i>Calandrinia balonensis</i> , <i>Aristida holathera</i> , <i>Ptilotus polystachyus</i> , <i>Lawrencella davenportii</i> , numerous forbs	None	None	Low	Very low	Good	
	8c	Loamy depression	Flat	Sandy loam	None	Forblands and tussocks	<i>Salsola tragus</i> , <i>Sclerolaena</i> sp., numerous forbs	None	None	Low to Moderate	Very low	Good	

Line	Site	Landform	Landform notes	Soil type	Surface rock	Vegetation structure	Species data	Weeds	Erosion	Cattle	Fuel load	Land condition	Other comments
	8d	Sandplain	Gently undulating	Red sand	None	Open low shrubland over sparse forbs and tussocks. Spinifex rare (regenerating after fire)	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (2-3m), <i>Acacia estrophiolata</i> (scattered - up to 6m). <i>Triodia basedowii</i> (dominant groundcover) with scattered forbs and tussocks (<i>Eragrostis eriopoda</i> , <i>Abutilon</i> sp., <i>Sida</i> sp., <i>Portulaca oleracea</i> , <i>Sclerolaena</i> sp., <i>Solanum</i> sp.)	None	None	Moderate - numerous tracks	Low	Average	
	8e	Sandplain	Gently undulating	Sandy red earth	None	Open shrubland over hummock grass (recovering from fire)	<i>Acacia aneura</i> (<2m), <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> , <i>Acacia ramulosa</i> , <i>Ptilotus polystachyus</i> (dominant). <i>Triodia basedowii</i> normally dominant but currently rare due to fire. Other species - <i>Abutilon</i> sp., <i>Eragrostis</i> , <i>Aristida holathera</i> , <i>Newcastelia spodioptricha</i> , <i>Calandrinia balonensis</i> , <i>Sida</i> sp., <i>Euphorbia tannensis</i> , <i>Eremophila longifolia</i> , <i>Monachather paradoxus</i>	None	None	Low	Very low	Good	Recovering from fire
	8f	Loamy depression	Gentle; <2%	Clay loam	Calcrete fragments / gravel	Forblands and tussocks; scattered <i>Acacia aneura</i> (4 - 5m)	<i>Roepera</i> sp., <i>Abutilon</i> sp., <i>Sclerolaena</i> sp. (dom), <i>Eriachne aristidea</i> , <i>Enneapogon avenaceus</i> , <i>Ptilotus sessilifolius</i> , <i>Solanum</i> sp., <i>Swainsona</i> sp., small tussock grasses (maybe <i>Triraphis molle</i>)	None	None	Low	Very low	Good	
	8g	Sandplain	Gently undulating	Sandy red earth	None	Low open shrubland over sparse hummock grass, tussocks and forbs	<i>Senna artemisioides</i> subsp. <i>filifolia</i> (1 - 1.5m), <i>Dodonaea viscosa</i> subsp. <i>angustissima</i> (2-3m), <i>Acacia ligulata</i> (2m), <i>Triodia basedowii</i> , <i>Calandrinia balonensis</i>	None	None	Low	Low	Good	

APPENDIX B FLORA SPECIES LIST

Species
<i>Abutilon otocarpum</i>
<i>Abutilon sp.</i>
<i>Acacia aneura</i>
<i>Acacia dictyophleba</i>
<i>Acacia estrophiolata</i>
<i>Acacia kempeana</i>
<i>Acacia ligulata</i>
<i>Acacia murrayana</i>
<i>Acacia ramulosa</i>
<i>Acacia tetragonophylla</i>
<i>Acacia victoriae</i>
<i>Allocasuarina decaisneana</i>
<i>Aristida holathera</i>
<i>Aristida latifolia</i>
<i>Aristida spp.</i>
<i>Atalaya hemiglauca</i>
<i>Atriplex spongiocarpa</i>
<i>Blennodia canescens</i>
<i>Boerhavia sp.</i>
<i>Brassica tournefortii</i>
<i>Calandrinia balonensis</i>
<i>Cenchrus ciliaris</i> *
<i>Citrullus colocynthis</i> *
<i>Cleome viscosa</i>
<i>Crotalaria cunninghamii</i>
<i>Crotalaria novae-hollandiae</i>
<i>Cynodon dactylon</i> *
<i>Dactyloctenium radulans</i>
<i>Datura leichhardtii</i>
<i>Dissocarpus paradoxus</i>
<i>Dodonaea viscosa subsp. angustissima</i>
<i>Einadia nutans</i>
<i>Enneapogon avenaceus</i>
<i>Enneapogon cylindricus</i>
<i>Enneapogon polyphyllus</i>
<i>Enneapogon sp.</i>
<i>Eragrostis eriopoda</i> *
<i>Eremophila duttonii</i>
<i>Eremophila freelingii</i>
<i>Eremophila latrobei</i>
<i>Eremophila longifolia</i>

Species
<i>Eremophila sturtii</i>
<i>Eriachne aristidea</i>
<i>Erodium sp.</i>
<i>Eucalyptus coolabah</i>
<i>Eucalyptus gamophylla</i>
<i>Eulalia aurea</i>
<i>Euphorbia ferdindii</i>
<i>Euphorbia tannensis</i>
<i>Halgania sp</i>
<i>Lawrencella davenportii</i>
<i>Lepidium oxytrichum</i>
<i>Lepidium phlebopetalum</i>
<i>Lepidium sp.</i>
<i>Leucochrysum stipitatum</i>
<i>Maireana astrotricha</i>
<i>Maireana georgei</i>
<i>Malvastrum americanum</i>
<i>Monachather paradoxus</i>
<i>Muehlenbeckia florulenta</i>
<i>Newcastelia spodioptricha</i>
<i>Paractaenum refractum</i>
<i>Pittosporum angustifolium</i>
<i>Polycalymma stuartii</i>
<i>Portulaca oleracea</i>
<i>Ptilotus obovatus</i>
<i>Ptilotus polystachyus</i>
<i>Ptilotus sessilifolius</i>
<i>Rhagodia sp.</i>
<i>Rhodanthe charsleyae</i>
<i>Rhodanthe floribunda</i>
<i>Roepera sp.</i>
<i>Rumex vesicarius*</i>
<i>Salsola tragus</i>
<i>Santalum acuminatum[#]</i>
<i>Santalum sp.</i>
<i>Sclerolaena bicornis</i>
<i>Sclerolaena cornishiana</i>
<i>Sclerolaena cuneata</i>
<i>Sclerolaena eriacantha</i>
<i>Sclerolaena johnsonii</i>
<i>Sclerolaena sp.</i>
<i>Senecio magnificus</i>
<i>Senecio sp.</i>

Species
<i>Senna artemisioides subsp. alicia</i>
<i>Senna artemisioides subsp. artemisioides</i>
<i>Senna artemisioides subsp. filifolia</i>
<i>Senna artemisioides subsp. helmsii</i>
<i>Senna artemisioides subsp. oligophylla</i>
<i>Senna artemisioides subsp. oligophylla/alicia</i>
<i>Senna sp.</i>
<i>Sida sp.</i>
<i>Solanum sp.</i>
<i>Sporobolus actinocladus</i>
<i>Swainsona burkei</i>
<i>Swainsona sp.</i>
<i>Tephrosia sphaerospora</i>
<i>Tragus australianus</i>
<i>Trianthema pilosa</i>
<i>Tribulus eichlerianus*</i>
<i>Tribulus hystrix</i>
<i>Triodia basedowii</i>
<i>Triraphis molle</i>

* Identified within the Alice Springs Regional Weeds Strategy 2021-2026 (DEPWS 2021)

Threatened species

APPENDIX C WATERWAY CROSSING ASSESSMENT

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1b	-25.154348	133.96286	1	Minor intermittent stream. Weakly defined banks. - Width (3-4m) - Bank height (0.2m) Tussock grasses and scattered low Senna shrubs and chenopod shrubs. Weed management required (Buffel Grass infestation). Minor cut required.		
1c	-25.145214	133.95998	1	Minor intermittent stream. Low banks present, semi-braided in parts. - Width (4-5m) - Bank height (0.5m) Low Senna shrubland with sparse grasses and forbs. No weeds present. Minor cut required, but will require erosion controls to minimise chance of erosion along seismic line.		

DESCRIPTORS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1d	-25.143507	133.959409	1	Minor intermittent stream. Well defined banks, semi-braided channel. - Width (5-7m) - Bank height (1m) Scattered low trees and shrubs over a dense cover of tussock grasses and forbs. Weed management required (Buffel Grass infestation). Minor cut required. Will require erosion controls to minimise chance of erosion along seismic line.		
1e	-25.142944	133.95920	1	Minor intermittent stream. Well defined banks, - Width (3m) - Bank height (0.5m) Patchy shrubs and dense Buffel and other forbs and tussocks. Weed management required (Buffel Grass infestation). Minor cut required. Will require erosion controls to minimise chance of erosion along seismic line.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1f	-25.127651	133.95419	1	Minor intermittent stream. Moderately defined banks. - Width (1m) - Bank height (0.5m) Sparse shrubs over tussock grasses and forbs. Weed management required (Buffel Grass infestation). Potentially no cut required (very shallow banks). Will likely require restoration works to minimise chance of erosion along wheel ruts created during exploration.		
1g	-25.132449	133.95560	1	Minor intermittent stream. Weakly defined. - Width (1m) - Bank height (0.2m) Scattered Mulga and shrubs over sparse tussocks. No weeds present. Likely no cut required (due to very shallow banks). Will likely require restoration works to minimise chance of erosion along wheel ruts created during exploration.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1i	-25.124576	133.95384	1	Moderate sized intermittent drainage gully(s). Well defined banks. - Width (2-5m) - Bank height (2-2.5m) Scattered shrubs (mostly Dead Finish) over sparse forbs and tussock grass. Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.		 <i>Yellow dashed line indicates recommended seismic line alignment that minimises disturbance of drainages (to minimise erosion management issues post exploration).</i>
1k	-25.12232	133.95470	1	Moderate sized intermittent drainage gully. Well defined banks. - Width (5m) - Bank height (2m) Scattered shrubs (mostly Dead Finish) over sparse forbs and tussock grass. Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.		 <i>Yellow dashed line indicates recommended seismic line alignment that minimises disturbance of drainages (to minimise erosion management issues post exploration).</i>

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1l	-25.12153	133.95474	1	Moderate sized intermittent drainage gully. Well defined banks. - Width (1.5m) - Bank height (1.5m) Sparse shrubs, forbs and tussock grasses Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.		
1m	-25.121259	133.95501	1	Small sized intermittent drainage gully(s). Well defined banks. - Width (1-3m) - Bank height (1-1.5m) Sparse shrubs, forbs and tussock grasses Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS					
Site	Latitude	Longitude	Stream order	Description	Plates
1n	-25.120630	133.95524	1	Small sized intermittent drainage gully(s). Well defined banks; braided. - Width (1-2m) - Bank height (1m) Sparse shrubs, forbs and tussock grasses No weeds present/observed. Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.	 
1o	-25.120415	133.95530	1	Small sized intermittent drainage gully(s). Well defined banks; braided. - Width (5-6m) - Bank height (<1m) Sparse shrubs, forbs and tussock grasses Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.	

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1p	-25.119047	133.95510	1	Moderate sized intermittent drainage gully. Well defined banks. - Width (3m) - Bank height (2m) Sparse shrubs, forbs and tussock grasses Weed management required (Buffel Grass scattered, low density / patchy occurrence). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management.		
1q	-25.114202	133.95264	1	Moderate sized drainage. Well defined banks. - Width (6m) - Bank height (1-2.5m) Tussock grassland (Buffel) with scattered trees, forbs and short native tussocks Weed management required (Buffel Grass infestation). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management. Threatened tree present (Quandong, <i>Santalum acuminatum</i>); avoid all trees.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
1r	-25.112796	133.95220	1	Moderate sized intermittent drainage gully. Well defined banks. - Width (4m) - Bank height (1m) Tussock grassland (Buffel) with scattered trees, forbs and short native tussocks Weed management required (Buffel Grass infestation). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management. Avoid clearing trees.		
1s	-25.110771	133.95096	1	Moderate sized drainage. Well defined banks. - Width (5-6m) - Bank height (1-1.5m) Weed management required (Buffel Grass infestation). Earthworks / cuts required. Erosion risk area; minimise number of crossing to reduce erosion management. Threatened tree potentially present (Quandong, <i>Santalum acuminatum</i>) (not ground-checked at time of survey); avoid all trees.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
2.2a	-25.264049	133.74342	1	Minor intermittent stream. Weakly defined banks. - Width (1m) - Bank height (<0.2m) Open low shrubs (<i>Acacia ligulata</i> and <i>A. kempeana</i>). Cattle impacts along drainage resulting in minor erosion. No weed issues. Potentially no cut required (very shallow banks); however, will likely require restoration works to minimise chance of erosion along wheel ruts post exploration.		
2.2c	-25.30633	133.63649	1	Minor intermittent stream. Moderately defined banks. - Width (4m) - Bank height (1m) Open shrubland (<i>Acacia ligulata</i> and <i>Dodonaea</i>). No weed issues. Rill erosion present on banks (minor only). Will require minor cut and associated erosion controls, or scout along drainage to find appropriate crossing.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
2.3b	-25.171564	133.98282	1	Moderate intermittent stream. Moderately defined banks; less defined to north. - Width (3m) - Bank height (0.3m) Scattered shrubs, forbs and tussock grasses. Occasional Mulga No weed issues. Moving line 30m (approx.) to north will avoid the main part of this drainage and the crossing point will likely not require cuts / minimal erosion management.		
2.3c	-25.168256	133.99090	1	Moderate intermittent stream. Well defined banks: - Width (3m) - Bank height (1-1.5m) Sparse low shrubs, forbs and tussock grasses Weed management required (moderate Buffel Grass infestation). High level of cattle impact. Will require cut and associated erosion controls, or scout along drainage to find appropriate crossing.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
3.1d	-25.14976	133.79266	1	Moderate intermittent stream. Well defined banks: - Width (3m) - Bank height (1-1.5m) Scattered shrubs and forbs. Sparse tussock grasses. No weed issues. Some cattle disturbance. Rill and gully erosion present. Will require cut and associated erosion controls, or scout along drainage to find appropriate crossing.		
3.1j	-25.103532	133.80928	1	Moderate intermittent stream. Moderately defined banks: - Width (10m) - Bank height (1m) Open shrubland over Buffel Grass. Weed management required (Buffel Grass infestation). Creek bank erosion present (minor only). Will require minor cut and associated erosion controls, or scout along drainage to find appropriate crossing.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS					
Site	Latitude	Longitude	Stream order	Description	Plates
3.1l	-25.092258	133.813193	1	Minor intermittent stream. Well defined banks: - Width (8-10m) - Bank height (1m) Open shrubland over Buffel Grass. Weed management required (Buffel Grass infestation). Creek bank erosion present (minor only). Relocate line to fence line track 100m to east to avoid requirement to cut into drainage / weed spread risk.	 
3.1m	-25.077772	133.81428	1	Minor intermittent stream. Moderately defined banks: - Width (3m) - Bank height (<1m) Low open shrubland over scattered tussocks and forbs Weed management required (Buffel Grass infestation). Seismic uses existing station track so no cut required.	 

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
3.1n	-25.071804	133.81463	1	Moderate intermittent stream. Well defined banks: - Width (8m) - Bank height (1m) Open shrubland over Buffel Grass and Couch Grass Weed management required (Buffel Grass and Couch Grass infestation). Eroding banks present. Seismic uses existing station track so no cut required.		
3.1o	-25.070268	133.81452	1	Minor intermittent stream. Moderately defined banks: - Width (4-5m) - Bank height (0.5m) Open shrubland over Buffel Grass Weed management required (Buffel Grass infestation). Eroding banks present. Seismic uses existing station track so no cut required.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
3.1r	-25.064346	133.814242	1	Moderate intermittent stream. Well defined banks: - Width (2m) - Bank height (0.5m) Low open shrubs over Buffel Grass. Shrubs localised to drainage. Weed management required (Buffel Grass infestation). Move line 90m to east from fence line to existing station track as there is no clear track along fence line (therefore vegetation clearing will be required; increasing risk of Buffel spread and erosion).	 Current seismic alignment on fence line	 Existing station track to east
					 Move line to existing station track Current fence line crossing	

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
3.1s	-25.060242	133.81585	1	Minor intermittent stream. Moderately defined banks: - Width (6-8m) - Bank height (1m) Patchy shrubs over Buffel Grass and Couch Grass Weed management required (Buffel and Couch Grass). Minor erosion on track Located on station track.		
3.1u	-25.049609	133.82750	1	Minor intermittent stream. Moderately defined banks: - Width (2m) - Bank height (0.2m) Open Mulga over tussocks Weed management required (Buffel and Couch Grass). Located on old seismic line. Fence line present. Requires minor cut and erosion controls. Consider moving line to south away from drainage.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS

Site	Latitude	Longitude	Stream order	Description	Plates	
6.2o	-25.172851	133.54608	1	Minor intermittent stream. Moderately defined banks: - Width (4-5m) - Bank height (0.2m) Open Mulga Low Woodland with Dead Finish shrubs over forbs and tussocks. Minor weed issues; consider weed management at this location to minimise spread. Select a crossing point that would not require cuts (or minor cut) and avoid trees.		
7a	-25.181758	133.54861	1	Minor intermittent stream. Weakly defined banks: - Width (4-5m) - Bank height (<0.2m) Open shrubland, scattered Mulga over tussocks and forbs. No weed issues. No cut required as shallow bank; minimal erosion risk.		

DESCRIPTIONS OF DRAINAGE LINE CROSSINGS					
Site	Latitude	Longitude	Stream order	Description	Plates
7d	-25.170046	133.52193	1	Minor intermittent stream. Well defined banks: - Width (3m) - Bank height (0.5m) Open shrubland over sparse forbs and tussock grasses. No weed issues. Minor cut required. Will require erosion controls to minimise chance of erosion along seismic line.	

APPENDIX D EPBC PROTECTED MATTERS SEARCH TOOL REPORT



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

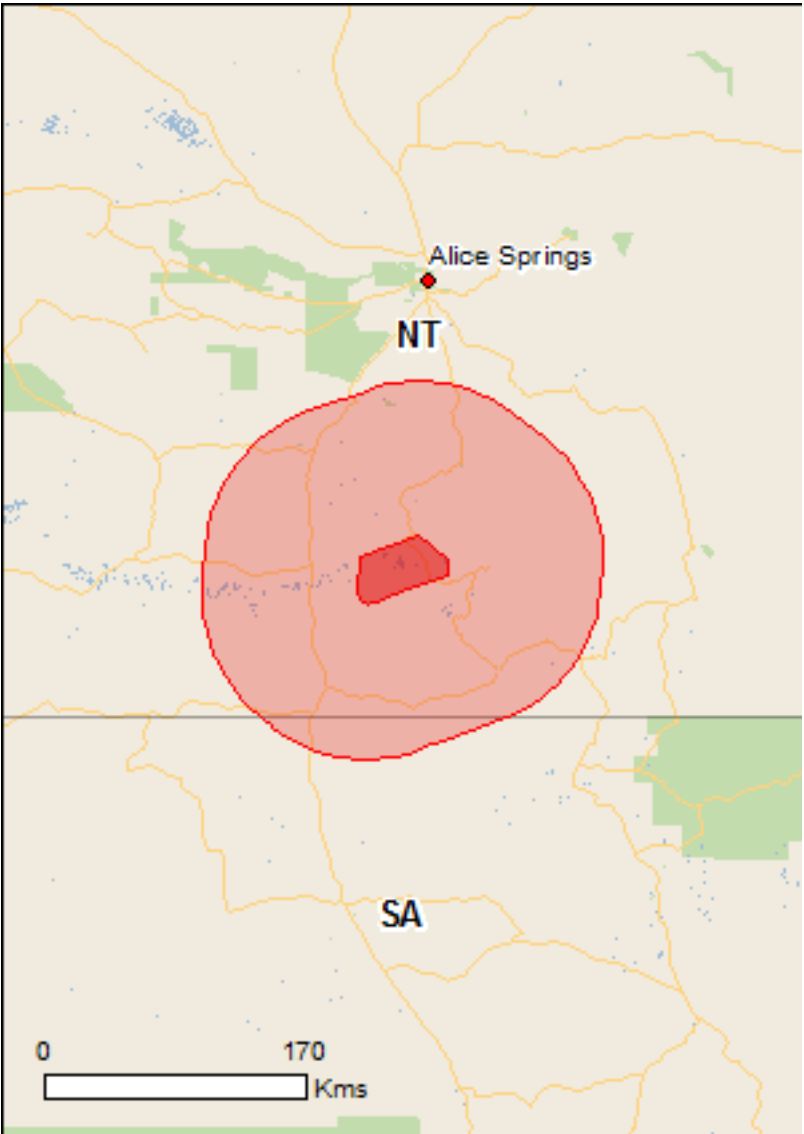
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 16/06/21 09:38:04

- [Summary](#)
- [Details](#)

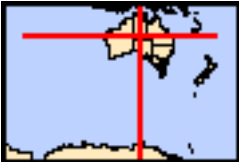
[Matters of NES](#)[Other Matters Protected by the EPBC Act](#)[Extra Information](#)
- [Caveat](#)
- [Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

[Coordinates](#)

Buffer: 100.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	18
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Amytornis modestus Thick-billed Grasswren [84121]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Petrogale lateralis centralis Warru, Central Australian Rock-wallaby [90831]	Vulnerable	Species or species habitat known to occur within area
Pseudomys australis Plains Rat, Palyoora, Plains Mouse [108]	Vulnerable	Species or species habitat known to occur within area
Zyzomys pedunculatus Central Rock-rat, Antina [68]	Critically Endangered	Species or species habitat may occur within area
Plants		
Acacia latzii Latz's Wattle [14275]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Eremophila prostrata Rainbow Valley Fuchsia Bush [56749]	Vulnerable	Species or species habitat known to occur within area
Frankenia plicata [4225]	Endangered	Species or species habitat likely to occur within area
Macrozamia macdonnellii MacDonnell Ranges Cycad [11843]	Vulnerable	Species or species habitat likely to occur within area
Minuria tridens Minnie Daisy [13753]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Liopholis slateri slateri Slater's Skink, Floodplain Skink [83163]	Endangered	Species or species habitat may occur within area
Ophidiocephalus taeniatus Bronzeback Snake-lizard [1630]	Vulnerable	Species or species habitat known to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land	[Resource Information]
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The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - WOOMERA AIR WEAPONS RANGE

Listed Marine Species	[Resource Information]
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* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
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Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
--	--	--

Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
--	--	--

Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
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Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
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Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
--	--	--

Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
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Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within
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Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		area Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Chamber's Pillar	NT
Henbury Meteorites	NT
Owen Springs Reserve	NT
Rainbow Valley	NT

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name		State
Karinga Creek Palaeodrainage System		NT

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-25.16472 134.00139,-25.04306 133.83194,-25.15444 133.48917,-25.34333 133.47028,-25.37833 133.48639,-25.40833 133.52806,-25.38778 133.575,-25.35139 133.69667,-25.30833 133.82,-25.25111 133.995,-25.16472 134.00139

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- [-Office of Environment and Heritage, New South Wales](#)
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- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
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- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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APPENDIX E THREATENED SPECIES 'LIKELIHOOD OF OCCURRENCE' ASSESSMENT

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
BIRDS				
Thick-billed Grasswren (north-west subspecies) <i>Amytornis modestus indulkana</i>	-	CR	Habitat: Chenopod shrublands dominated by <i>Atriplex</i> saltbush and <i>Maireana</i> bluebush. The Charlotte Waters' population is located along drainage lines dominated by <i>Atriplex nummularia</i> (Pavey & Ward 2002). Distribution: West of Lake Eyre and Lake Torrens near the border of SA and the NT (Black 2011). In 1994, recorded south of Charlotte Waters in the southern NT. <i>Amytornis modestus</i> was formerly present in the Finke River system but is now considered extinct (Pavey & Ward 2002).	NONE Species considered extinct within the region.
	Black, A.B. (2011). <i>Subspecies of the Thick-billed Grasswren Amytornis modestus (Aves-Maluridae)</i> . Transactions of the Royal Society of South Australia 135, 26–38. Pavey, C. and Ward, S. (2012). <i>Threatened Species of the Northern Territory - Thick-Billed Grasswren (north-western subspecies) - Amytornis modestus indulkana</i> . Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0004/206338/thick-billed-grasswren-north-western-subspecies.pdf [Accessed 1 May 2018].			
Grey Falcon <i>Falco hypoleucos</i>	-	VU	Habitat: A generally solitary desert falcon that occurs in areas of lightly-timbered lowland plains, typically on inland drainage systems, where the average annual rainfall is less than 500 mm (Ward 2012). Distribution: Sparsely distributed through much of the arid and semi-arid regions of Australia but has been recorded from all mainland states and territories. In the NT, the majority of records are from the southern half, but there are records all the way up to Darwin (Ward 2012). A study of breeding records from 2003 to 2011 documented 38 breeding events – all within the hottest climate classes of Australia – with the northern-most record occurring south of Daly Waters (Schoenjahn 2013).	LOW - Limited habitat present within project footprint. - Recent records within bioregion. - If present, more likely to be for foraging and not nesting. - Larger trees that are preferred by the species (often on the banks of major watercourses and creeks) are not within the project footprint.
	Schoenjahn, J. (2013), A hot environment and one type of prey: investigating why the Grey Falcon (<i>Falco hypoleucos</i>) is Australia's rarest falcon, <i>Emu</i> , Vol. 113, pp. 19-25. Ward, S. (2012). <i>Threatened Species of the Northern Territory - Grey Falcon - Falco hypoleucos</i> . Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0020/206354/grey-falcon.pdf [Accessed 1 May 2018].			
Malleefowl <i>Leipoa ocellata</i>	VU	CR	Habitat: Occupies woodland, shrubland and scrub and favours areas with shrubby understorey. Strongly associated with mallee in most parts of its range. In arid Australia, occupies mulga scrub, either pure stands or mixed with mallee (Pavey 2006). Distribution: In the NT, has been recorded mostly west of the Stuart Highway and south of the Tanami Desert, with no records since the early 1960's (Benshemesh 2000). Storr (1977) located nine records from the south-west corner of the NT, from the Petermann Range in the extreme south-west, north across the MacDonnell Ranges as far as Central Mount Wedge.	LOW / NONE - Limited suitable habitat present within project footprint. - Only historical records within close proximity to the project footprint. - Resumed to be existing in the region.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			Benshemesh, J. (2000). <i>National Recovery Plan for the Malleefowl</i>. National Parks and Wildlife South Australia, Adelaide. Pavey, C. (2006). <i>Threatened Species of the Northern Territory – Malleefowl - Leipoa ocellata</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0005/206339/malleefowl.pdf [Accessed 1 May 2018]. Storr, G.M. (1977). <i>Birds of the Northern Territory</i>. Western Australian Museum, Perth.	
Plains-wanderer <i>Pedionomus torquatus</i>	CR	-	Habitat: Sparse and treeless lowland native grasslands, supported by hard red-brown clay soils that do not support dense pasture growth. Records from amongst crops of cereal grasses, stubble and chenopod shrublands (DoE 2016). Distribution: Population is highly fragmented within south-eastern Australia. No confirmed records in the NT (DoE 2016).	NONE • No suitable habitat present within project footprint. • No confirmed records within region.
			Department of the Environment (2016). <i>Pedionomus torquatus</i>. Species Profile and Threats Database, Department of the Environment, Australian Government, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=906 [Accessed 1 May 2018].	
Night Parrot <i>Pezoporus occidentalis</i>	EN	CR	Habitat: Flat spinifex (<i>Triodia</i> spp.) grasslands in stony or sandy environments; and samphire and chenopod shrublands – including genera such as <i>Atriplex</i>, <i>Bassia</i> and <i>Maireana</i> – on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water (from a variety of sources cited in DoE 2017). Distribution: Extremely sparsely distributed through central arid regions. In the NT sightings were made up to 1923 in the Alice Springs region (Whitlock 1924). Presumed extinct until recently rediscovered in western Qld and north-western WA.	LOW • Limited suitable habitat present within project footprint. • There are no large patches of spinifex hummocks within the footprint, and spinifex grasslands are under stress and in poor condition due to drought. • Two records within the greater bioregion, one within close proximity to the project footprint – however, records are historic (1929).
			Department of the Environment (2017). <i>Pezoporus occidentalis</i>. Species Profile and Threats Database. Department of the Environment, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59350 [Accessed 1 May 2018]. Whitlock, F.L. (1924). Journey to central Australia in search of the night parrot. <i>Emu</i>, Vol. 23, pp. 248-281.	
Princess Parrot <i>Polytelis alexandrae</i>	VU	VU	Habitat: Swales between desert sand dunes with a shrub layer and scattered trees (Pavey 2006). Distribution: Confined to arid regions of WA, the NT and SA (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). There have been unconfirmed reports of the species from western Queensland (Britton 1992; Higgins 1999). Highly nomadic and, as noted in DoE (2016), 'is an irregular visitor (sometimes at intervals of more than 20 years) to most sites in its range and its movements are largely unknown. For these reasons, it is not possible or practical to provide an estimate of the number of locations at which the species occurs.'	MEDIUM • Some suitable habitat present within project footprint. • Recent records found within the bioregion, including nearby to the project footprint. • Project footprint is in proximity to mapped 'likely' habitat. • Desert Oak are present in some areas along the seismic lines (these trees can also provide suitable nesting habitat but are widespread across the region). These trees are scattered and can be easily avoided by seismic line establishment. No impacts to potential nesting habitat expected.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			Barrett, G. Silcocks, A. Barry, S. Cunningham, R. and Poulter, R. (2003). <i>The New Atlas of Australian Birds</i>, Birds Australia, Melbourne, Victoria. Blakers, M. Davies S.J.J.F. and Reilly P.N. (1984). <i>The Atlas of Australian Birds</i>. Melbourne, Victoria: Melbourne University Press. Britton, P.L. (1992). The Queensland Ornithological Society Bird Report, <i>Sunbird</i>, 22:51-83. Department of the Environment (2017). <i>Polytelis alexandrae</i>. Species Profile and Threats Database. Department of the Environment, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=758 [Accessed 1 May 2018]. Higgins, P.J. (ed.) (1999). <i>Handbook of Australian, New Zealand and Antarctic Birds</i>. Volume 4: Parrots to Dollarbird, Oxford University Press, Melbourne, Victoria. Pavey, C. (2006). <i>Threatened Species of the Northern Territory - Princess Parrot - Polytelis alexandrae</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0017/206360/princess-parrot.pdf [Accessed 1 May 2018].	
Great Knot Bar-tailed Godwit Eastern Curlew Asian Dowitcher Greater Sand Plover Curlew Sandpiper	-	VU	Habitat: Coastal and estuarine areas with tidal mudflats. May roost during high tide on nearby beaches. May also be found at near-coastal swamps and lakes (apart from Red and Great Knot) Distribution: Mostly widespread around the northern Australian coast, less common in the south, with few inland records. Eastern Curlew is uncommon across Australia while Asian Dowitcher is rare. Every year these species breed in the northern hemisphere in the summer, and migrate to Australia for the southern hemisphere (austral) summer. Some birds, primarily juveniles, remain in Australia during the winter. [Information above summarised from Chatto (2003), DoE (2015) and Garnett et al. (2011)].	LOW • Limited suitable habitat present within project footprint. • All species prefer a coastal habitat to an inland regions but may utilise the Karinga Creek paleo-drainage system as migratory stop-over grounds. • Limited historical records of all species. • Limited recent records on the Greater Sand Plover and Curlew Sandpiper.
			Chatto, R. (2003). <i>The distribution and status of shorebirds around the coast and coastal wetlands of the Northern Territory</i>. Technical Report 73, Parks and Wildlife Commission of the Northern Territory, Darwin. [online] Available at: https://dtc.nt.gov.au/_data/assets/pdf_file/0008/279917/2003_shorebirds_rpt76.pdf [Accessed 1 May 2018]. Department of the Environment (2015). <i>EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species</i>. Commonwealth of Australia, Canberra, ACT. http://www.environment.gov.au/epbc/publications/shorebirds-guidelines [Accessed 1 May 2018]. Garnett, S.T., Szabo, J.K. and Dutson, G. (2011). <i>The Action Plan for Australian Birds 2010</i>. CSIRO Publishing, Collingwood, Australia.	
MAMMALS (TERRESTRIAL)				
Brush-tailed Mulgara <i>Dasyercus blythi</i>	-	VU	Habitat: A range of vegetation types, but prefer mature hummock grasslands of spinifex, especially <i>Triodia basedowii</i> and <i>T. pungens</i> (Pavey et al. Woinarski 2006; Masters et. al. 2003). Digs burrows between sand dunes (Woolley 2008). Distribution: Because most previous records did not distinguish between the two species of mulgara now recognised, there is ambiguity about the distribution of both species. <i>D. blythi</i> known from at least the Western and Simpson Deserts, with confirmed records in the NT from Haast Bluff, Uluru, Papunya, Tanami Desert, Illamurta, Charlotte Waters and Crown Point (Pavey et al. 2006).	LOW • Suitable habitat present within project footprint. • Records nearby to the project footprint. • Most sightings are to the south-east of the project footprint. • Project footprint is impacted by drought. Spinifex grasslands are in poor condition. Unlikely to support species in its current condition. • Ground surveys in areas of suitable habitat (i.e. sandplains, swales and low dunes) did not find any burrows along the

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
				seismic lines.
			Masters, P. (2012). Crest-tailed Mulgara <i>Dasyercus cristicauda</i> (Krefft, 1867). In: Curtis et al. (eds.). <i>Queensland's Threatened Animals</i>. CSIRO Publishing. Pavey, C., Cole, J. and Woinarski, J.C.Z. (2006). <i>Threatened Species of the Northern Territory - Brush-tailed Mulgara - Dasyercus blythi</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/data/assets/pdf_file/0014/205511/brush-tailed-mulgara.pdf [Accessed 1 May 2018]. Woolley, P.A. (2008). Brush-tailed Mulgara <i>Dasyercus blythi</i>, in Van Dyck, S & Strahan R (eds), <i>The Mammals of Australia</i>, Third edition, pp. 191-193, Reed New Holland, Sydney.	
Crest-tailed Mulgara <i>Dasyercus cristicauda</i>	-	VU	Habitat: Prefers sand dune habitats that are vegetated with cane grass and spinifex (Masters 1997). Distribution: Due to considerable taxonomic confusion the exact distribution of this species and <i>D. blythi</i> is not well known in the NT. The majority of the records are from the southern Simpson Desert with confirmed historical records from Charlotte Waters and Crown Point in the NT (Pavey et al. 2006).	LOW • Suitable habitat present within project footprint. • Recorded sightings nearby to the project footprint. • Most sightings are to the south-east of the project footprint. • Project footprint is impacted by drought. Spinifex grasslands are in poor condition. Unlikely to support species in its current. • Ground surveys did not find any burrows along the seismic lines.
			Masters, P. (1997). <i>Interim recovery plan for Ampurta Dasyercus hillieri</i>. Report to ANCA Endangered Species Program. Pavey, C., Cole, J. and Woinarski, J.C.Z. (2006). <i>Threatened Species of the Northern Territory - Crest-tailed Mulgara - Dasyercus cristicauda</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/data/assets/pdf_file/0015/205512/crest-tailed-mulgara.pdf [Accessed 1 May 2018].	
Western Quoll <i>Dasyurus geoffroii</i>	VU	EX	Habitat: In central Australia, occurred throughout a range of habitats (Pavey 2006). Distribution: Historically occurred throughout the arid interior of Australia including southern NT (), now restricted to the south-west of WA (Pavey 2006). Considered extinct in the NT since the 1960's.	NONE • Species considered extinct within the region.
			Pavey, C. (2006). <i>Threatened Species of the Northern Territory - Western Quoll, Chuditch - Dasyurus geoffroii</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/data/assets/pdf_file/0018/205470/western-quoll.pdf [Accessed 1 May 2018].	
Ghost Bat <i>Macroderma gigas</i>	VU	-	Habitat: Ranging from the arid Pilbara of WA to tropical savanna woodlands and north Qld. rainforests (TSSC 2016). Permanent roost sites are generally deep natural caves or disused mines (TSSC 2016). Move between a number of caves seasonally or as dictated by weather conditions, and require a range of cave sites (Hutson et al. 2001). Most breeding sites are caves with multiple entrances (TSSC 2016). Distribution: Geographically-disjunct colonies occur in the Pilbara and Kimberley in WA, NT north of approximately 17° latitude (including Elcho Island and Groote Eylandt), the Gulf of Carpentaria, eastern Qld from Cape York to near Rockhampton, and western Qld (including Riversleigh and	NONE • Limited suitable habitat present within the project footprint. • Last recorded sightings in the bioregion were in 1989. • Since the 1970's, the range of this species has been predominantly north of approximately 17° latitude, with the project footprint located below this latitude.

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			Camooweal districts) (TSSC 2016). Distribution likely influenced by the availability of suitable caves and mines for roost sites (Ward & Milne 2016). Only 14 breeding sites known (Worthington Wilmer 2012). Disperse widely when not breeding (TSSC 2016). In arid Australia, including southern NT until the early 1960's (Ward & Milne 2016). Hutson, A. M., Mickleburgh, S. P. & Racey, P. A. (2001) Microchiropteran Bats - Global Status Survey and Conservation Action Plan. IUCN/SSC Chiroptera Specialist Group, Gland, Switzerland and Cambridge, U.K. Milne, D. and Ward, S. (2016). <i>Threatened Species of the Northern Territory – Ghost Bat - Macroderma gigas</i>. Northern Territory Department of Environment and Natural Resource. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0010/376138/ghost-bat.pdf [Accessed 1 May 2018]. Threatened Species Scientific Committee (2016). <i>Approved Conservation Advice for Macroderma gigas (ghost bat)</i>. Canberra: Department of the Environment. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/174-conservation-advice-05052016.pdf [Accessed 1 May 2018]. Worthington Wilmer, J. (2012). Ghost Bat <i>Macroderma gigas</i>. In: Curtis et al. (eds.). <i>Queensland's Threatened Animals</i>. CSIRO, Canberra: pp. 382-383.	
Golden Bandicoot <i>Isodon auratus</i> <i>(auratus)</i>	VU	EN	Habitat: Mainly in heathland and shrubland on sandstone sheets, avoiding vegetation with greater tree cover (Palmer et al. 2012; Southgate et al. 1996). Distribution: Formerly across most of northern, central and western Australia (across a broad range of habitats), but now only recorded population on mainland Australia is within the Kimberley. In the NT, confined to the offshore islands of Arnhem Land. The only records from mainland NT are from the north-east corner of Arnhem Land between 1950 and 1980 (Palmer et al. 2012). Now extinct on the mainland except in a few locations in the north-west Kimberley (TSSC 2015).	NONE Species considered extinct within the region.
			Palmer, C., Woinarski, J. and Hill, B. (2012). <i>Threatened Species of the Northern Territory - Golden Bandicoot - Isodon auratus</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0017/205505/golden-bandicoot.pdf [Accessed 1 May 2018]. Southgate, R., Palmer, C., Adams, C., Masters, M., Triggs, B. and Woinarski, J. (1996). Population and habitat characteristics of the Golden Bandicoot (<i>Isodon auratus</i>) on Marchinbar Island, Northern Territory. <i>Wildlife Research</i>, Vol. 23, pp. 647-664. Threatened Species Scientific Committee (TSSC) (2015). <i>Approved Conservation Advice for Isodon auratus (golden bandicoot (mainland))</i>. Canberra: Department of the Environment. [online] Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66665-conservation-advice-01102015.pdf [Accessed 1 May 2018].	
Greater Bilby <i>Macrotis lagotis</i>	VU	VU	Habitat: In the NT, occurs in hummock grasslands on sandy soils with a preference for paleo-drainage lines (Southgate 1990). Has large foraging area and will move home range in search for food (Johnson 2008). Distribution: Historically widespread in arid Australia. Currently confined to arid WA, the Tanami Desert in the NT and south-western Qld (Woinarski et al. 2014).	LOW - Suitable habitat present within project footprint. - Recent and historical records of presence of species within the bioregion, surrounding the project footprint. - Population range is located within the west of the bioregion, not in close proximity to project footprint. - Records in proximity to the project footprint are likely to be

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
				vagrants.
			Johnson, K.A. (2008). Bilby <i>Macrotis lagotis</i>. In: Van Dyck, S. and Strahan, R. (eds.). <i>Mammals of Australia</i>. Third Edition. Reed New Holland, Queensland Government, Queensland Museum: pp. 191-193. Southgate, R. (1990). Habitat and diet of the greater bilby <i>Macrotis lagotis</i> Reid (Marsupalia: Peramelidae). In: Seebeck et al. (eds.). <i>Bandicoots and Bilbies</i>. Surrey Beatty & Sons, Sydney, NSW. Woinarski, J., Burbidge, A. and Harrison, P. (2014). <i>The Action Plan for Australian Mammals 2012</i>. CSIRO Publishing: pp. 203-205.	
Itjaritjari (Southern Marsupial Mole) <i>Notoryctes typhlops</i>	-	VU	Habitat: Sandy deserts mostly associated with dunes, sandy plains, and river flats (Pavey 2015). Distribution: Central WA, northern SA, and southern NT. Seems to be confined to the southern and western sections of the NT (Benshemesh & Schultz 2008) where has been found as far north as Barrow Creek (Pavey 2015).	MEDIUM • Suitable habitat present within the project footprint. • Notable number of records within bioregion, but none in proximity to the project footprint. • No recent proximate records but due to accessibility of remote areas for survey this should not diminish the value of the data.
			Pavey, C. (2015). <i>Threatened Species of the Northern Territory - Southern Marsupial Mole - Notoryctes typhlops</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/data/assets/pdf_file/0016/205522/southern-marsupial-mole.pdf [Accessed 1 May 2018]. Benshemesh, J. and Schultz, M. (2008). <i>Survey of the underground signs of marsupial moles in the WA Great Victoria Desert</i>, Tropicana Joint Venture and the Department of Natural Resources, Environment and the Arts, NT Government	
Black-footed Rock-wallaby (McDonnell Ranges race) <i>Petrogale lateralis</i>	VU	-	Habitat: Upland rocky areas with associated steep slopes (Pavey 2006). Heavily weathered outcrops, caves, cliffs, and rock piles provide suitable habitat as daytime shelter (Woinarski et.al. 2014). Distribution: In the NT, mostly found in the MacDonnell Ranges, but also occurs throughout the arid southern end of the NT (Pavey 2006) and may be found in the Davenport and Murchison Ranges.	NONE • No suitable habitat present within project footprint.
			Pavey, C. (2006). <i>Threatened Species of the Northern Territory - Black-footed Rock-Wallaby - Petrogale lateralis</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/data/assets/pdf_file/0003/376122/black-footed-rock-wallaby.pdf [Accessed 1 May 2018]. Woinarski, J., Burbidge, A. and Harrison, P. (2014). <i>The Action Plan for Australian Mammals 2012</i>. CSIRO Publishing: pp. 403-405.	
Plains Mouse (NT) Plains Rat (Cth) <i>Pseudomys australis</i>	VU	EN	Habitat: Open plains especially stone-covered plains. Prefers areas associated with minor drainage features and cracking soil (clay) (Pavey & Cole 2012). Most commonly found in areas that are regularly inundated (DoE 2017). Distribution: Formerly throughout arid and semi- arid Australia, now restricted to northern SA and the extreme south of the NT – nearby to Charlotte Waters and to the south-east of Andado station (including the Mac Clark Conservation Reserve) (Pavey & Cole 2012).	LOW • Suitable habitat may be present within project footprint. • Recent and historical recorded sightings nearby to the project footprint. • Species is noted to be restricted outside of project footprint, nearby records likely to be vagrants. • Refugial habitat was not observed within the project footprint (cracking clay soils in open stone-covered plains), as such a

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
				core population is not expected to be present.
			Department of the Environment (2017). <i>Pseudomys australis</i>. Species Profile and Threats Database, Department of the Environment, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=108 [Accessed 1 May 2018]. Pavey, C. and Cole, J. (2012). <i>Threatened Species of the Northern Territory - Plains Mouse - Pseudomys australis</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0019/205507/plains-mouse.pdf [Accessed 1 May 2018].	
Pale Field-rat <i>Rattus tunneyi</i>	-	VU	Habitat: Historically occurred in a wide range of habitats, but now primarily in dense vegetation along creeks (Aplin et al. 2008). Fire regime seems to have little effect on population numbers; instead, the level of groundwater irrigating the riparian system and, to a lesser extent, current rainfall have a much stronger influence (Braithwaite & Griffiths 1996). Distribution: Higher rainfall areas of northern Australia, extending from Kimberley in WA to south-eastern Qld, including the Top End of the NT (Cole & Woinarski 2002, Braithwaite & Griffiths 1996). Previously widespread and patchily abundant, particularly in the north-west of the Top End, the Pale Field-rat appears to have declined in lower rainfall areas (Woinarski 2000).	NONE No suitable habitat present within project footprint due to range contraction.
			Aplin, K., Braithwaite, R. and Baverstock, P. (2008). Pale Field-rat: <i>Rattus tunneyi</i>. In: Van Dyck, S. and Strahan, R. (eds.). <i>The Mammals of Australia (3rd Edition)</i>. Reed New Holland, Sydney, NSW. Braithwaite, R. and Griffiths, A. (1996). The paradox of <i>Rattus tunneyi</i>: endangerment of a native pest. <i>Wildlife Research</i>, Vol. 23, pp. 1-21. Cole, J. and Woinarski, J. (2002). <i>Field Guide to the Rodents and Dasyurids of the Northern Territory</i>. Surrey Beatty & Sons, Chipping Norton, NSW. Woinarski, J.C.Z. (2000). The conservation status of rodents in the monsoonal tropics of the Northern Territory. <i>Wildlife Research</i>, Vol. 27, pp. 421-435.	
Common Brushtail Possum (Central Australian subspecies) <i>Trichosurus vulpecula</i>	-	EN	Habitat: In Central Australia, riverine habitat that is close to rocky outcrops and moist gullies within the ranges or rocky slopes (Kerle et al. 1992). Habitat occurs on various geological substrates but is characterised by a diverse association of fire-sensitive plant species (Pavey and Ward 2012). Distribution: Occurs in isolated populations in southern NT. Most common in the southern NT within the MacDonald Ranges (Pavey and Ward 2012). Formerly had a much more extensive distribution in the NT. Common throughout much of the continent, including SA, Victoria, NSW, southern and south-western Qld, and much of WA (Pavey & Ward 2012).	NONE No suitable habitat present within project footprint.
			Kerle, J., Foulkes, J., Kimber, R. and Papenfus, D. (1992). The decline of the brushtail possum, <i>Trichosurus vulpecula</i> (Kerr 1798), in arid Australia. <i>Rangelands Journal</i>, Vol. 14, pp. 107-127. Pavey, C. and Ward, S. (2012). <i>Threatened Species of the Northern Territory - Common Brushtail Possum - Trichosurus vulpecula</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0019/205525/common-brushtail-possum.pdf [Accessed 1 May 2018]. Woinarski, J.C.Z. (2004). In a land with few possums, even the common are rare: ecology, conservation and management of possums in the Northern Territory. In: Goldingay, R. and Jackson, S. (eds.). <i>The biology of Australian possums and gliding possums</i>. Surrey Beatty & Sons, Sydney: pp.51- 62.	

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
Central Rock-rat <i>Zyomys pedunculatus</i>	EN	EN	Habitat: Range of grasslands and woodlands in the MacDonnell Ranges (McDonald 2012). Distribution: Historically widespread in the arid regions of the NT and WA (Baynes & Johnson 1996). Rediscovered in the MacDonnell Ranges at a few sites (McDonald 2012).	NONE No suitable habitat present within project footprint.
Baynes, A. and Johnson, K. (1996). The contributions of the Horn Expedition and cave deposits to knowledge of the original mammal fauna of central Australia. In: Morton, S.R. and Mulvaney, D.J. (eds.). <i>Exploring Central Australia: Society, the Environment and the 1894 Horn Expedition</i>. Surrey Beatty and Sons, Sydney: pp. 168-186. McDonald, P. (2012). <i>Threatened Species of the Northern Territory - Central Rock Rat - Zyomys pedunculatus</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0013/205510/central-rock-rat.pdf [Accessed 1 May 2018].				
REPTILES (TERRESTRIAL)				
Great Desert Skink <i>Liopholis kintorei</i>	VU	VU	Habitat: Generally occurs in tall open shrubland, hummock grasslands and on red sandplains and sand ridges (Cogger et al. 1993). However, in some locations (e.g. the Gibson Desert) found on sandplains with fine gravel. Distribution: Originally within a broad range extending from the desert parts of south-western NT, eastern interior of WA and north-western SA (Cogger et al. 1993). Currently known from seven populations (McAlpin 2001), three of which occur in the NT –the Tanami Desert, Uluru-Kata Tjuta National Park and the Yulara lease lands.	LOW - Suitable habitat present within project footprint. - Records within bioregion are not recent. - Known populations are not nearby to the project footprint. - No ground evidence of ground burrows along seismic lines.
Cogger, H., Cameron, E., Sadler, R. and Egger, P. (1993). <i>The Action Plan for Australian Reptiles</i>. Australian Nature Conservancy Agency, Canberra. McAlpin, S. (2001). <i>The Recovery Plan for the Great Desert Skink (Egernia kintorei) 2001-2011</i>. Arid Lands Environment Centre. [online] Available at: http://www.environment.gov.au/system/files/resources/2e5e895a-e176-409e-80c3-34d63a80fac5/files/great-desert-skink.pdf [Accessed 1 May 2018].				
Slater's Skink <i>Liopholis slateri</i>	EN	EN	Habitat: Little known about ecology. Generally, on alluvial soils close to drainage lines. Although all historical sites have been in open floodplain type situations, a number of the more recently located populations, including Loves Creek, occur on minor drainages among stony hills (McDonald 2012) Distribution: Four locations in the Finke and MacDonnell Ranges bioregions centred on Alice Springs. In the 1960's, appears to have been abundant around Alice Springs (McDonald 2012).	NONE - No suitable habitat present within project footprint. - Outside of known species distribution (according to EPBC listed distribution map); all occurrence of this species within the Finke bioregion are 100km (approx.) to the north and north west of the project footprint.
McDonald, P. (2012). <i>Threatened Species of the Northern Territory - Slater's Skink - Liopholis slateri</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0006/206457/slaters-skink.pdf [Accessed 1 May 2018].				
FISH				
Finke Goby <i>Chlamydogobius</i>	-	VU	Habitat: Similar in ecology to the Desert Goby (<i>Chlamydogobius eremius</i>). Rests on the bottom amongst detritus in shallow pools with rock, sand or gravel bottoms (Stirrat & Larson 2006).	NONE No suitable habitat present within project footprint.

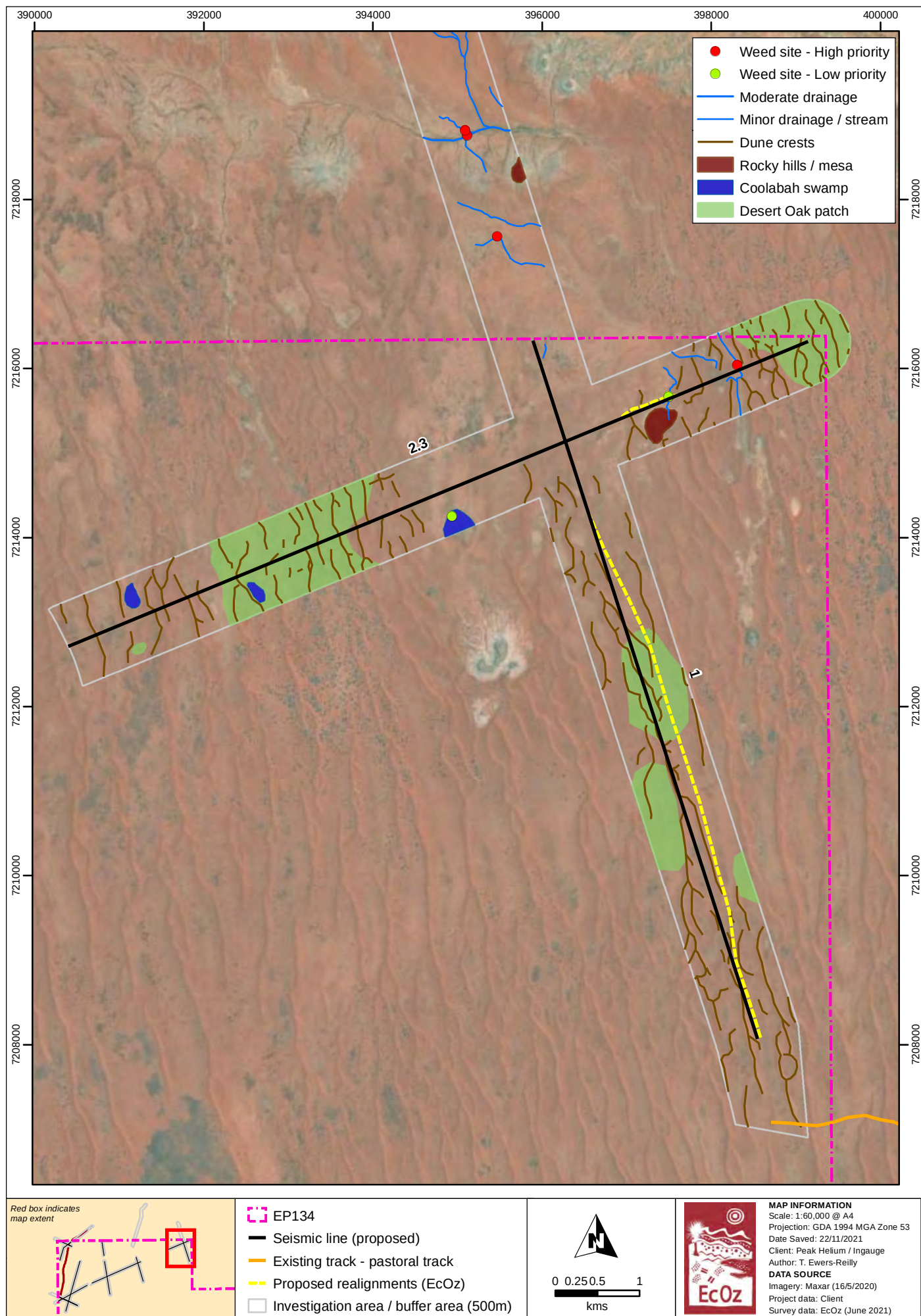
Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
<i>japalpa</i>			Distribution: Limited distribution in the upper reaches of the Finke River system (Stirrat & Larson 2006). Stirrat, S. and Larson, H. (2006). <i>Threatened Species of the Northern Territory - Finke Goby - Chlamydogobius japalpa</i> . Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0008/206387/finke-goby.pdf [Accessed 1 May 2018].	
INVERTEBRATES				
Land Snail <i>Semotrachia esau</i>	-	VU	Habitat: No published information on ecology, other than those specimens have been collected under figs (mostly) or under spinifex (Wilson et al. 2006). Distribution: Only known from a small area along the Finke River and Palm Creek in the Krichauff Ranges west of Alice Springs. Also a single isolated colony in the Palmer River drainage 78 km to the southeast. This disjunct occurrence in the Palmer River may have resulted from accidental transport of snails during flooding of the Finke River system. Some more recent museum collections extend this known range marginally (Wilson et al. 2006). No direct evidence that any factors have caused a decline in numbers or distribution.	NONE • No suitable habitat present within project footprint. • Highly restricted range that is remote from the project footprint.
Wilson, C., Woinarski, J., Kessner, V. and Braby, M. (2006). <i>Threatened Species of the Northern Territory - Land Snail - Semotrachia esau</i> . Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0016/206530/semotrachia-esau.pdf [Accessed 1 May 2018].				
Bednall's Land Snail <i>Sinumelon bednalli</i>	EN	-	Habitat: Restricted to areas around fig trees. Adults aestivate in loose litter under the trees and are only active after heavy rain (Palmer et al. 2012). Distribution: Endemic to the NT. Collected at several sites in the ranges of central Australia, from Wattarka National Park in the west to Trephina Gorge, 50 km east of Alice Springs. It is likely that other populations in the southern NT remain to be discovered (Palmer et al. 2012).	LOW • Limited suitable habitat present within project footprint – No fig trees observed in project footprint. • Highly restricted range that is remote from the project footprint. • Low likelihood due to largely unknown distribution and limited knowledge of species ecology and habitat requirements.
Palmer, C., Ward, S., Kessner, V., Braby, M. and Woinarski, J. (2012). <i>Threatened Species of the Northern Territory - Bednall's Land Snail - Sinumelon bednalli</i> . Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0020/206516/sinumelon-bednalli.pdf [Accessed 1 May 2018].				
FLORA				
Latz's Wattle <i>Acacia latzii</i>	VU	VU	Habitat: Silcrete-capped mesas and low stony hills of shale and siltstone. Often concentrated along minor creek-lines and on low hill slopes. Known to occur on highly alkaline sandy clay-loams (Nano et al. 2012). Distribution: Southern NT to far northern SA (DoE 2017). Endemic to the Finke Bioregion of the NT, where restricted to two areas 200 km apart (DoE 2017). Further survey effort will likely increase known distribution (Nano et	LOW • Suitable habitat present within project footprint. • Species is endemic to the bioregion, but not within project footprint. • Project footprint is located between two known areas where species is endemic, however the species has a restricted

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
			al. 2006).	range and do not occur within project footprint. • Noted that further efforts to survey will likely increase known distribution. • Ground surveys confirmed that no species are found along seismic lines.
			Department of the Environment (2017). <i>Acacia latzii</i> — Latz's Wattle. <i>Species Profile and Threats Database</i>. Department of the Environment, Australian Government, Canberra. [online] Available at: www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=14275 [Accessed 1 May 2018]. Nano, C., Kerrigan, R., Albrecht, D. and Pavey, C. (2012). <i>Threatened Species of the Northern Territory - Acacia latzii Maslin (Mimosaceae) - Tjilpi Wattle Peter Latz Wattle</i>. Northern Territory Department of Environment and Natural Resources. [online] Available at: https://nt.gov.au/_data/assets/pdf_file/0016/208402/acacia-latzii.pdf [Accessed 1 May 2018].	
Dwarf Desert Spike-rush <i>Eleocharis papillosa</i>	VU	VU	Habitat: Ephemeral wetlands in freshwater and semi-saline swamps. In the NT, recorded growing amongst Coolabah (<i>Eucalyptus coolabah</i>), Samphire (<i>Halosarcia</i> spp.), Northern Bluebush (<i>Chenopodium auricomum</i>) and <i>Eragrostis</i> spp. including Swamp Cane grass (<i>E. australasica</i>) (DoE 2017). Distribution: WA, SA and NT. Known from eight locations in the NT ranging from the Tanami Desert to the Southern Finke bioregion across to the edge of the Simpson Desert. These sites occur on Aboriginal free hold land (Lander River, Rabbit Flat, Lake Mackay); pastoral lease (three stations); and crown land (Ilparpa swamp) (Duguid et al. 2006). Likely to be naturally rare. An extensive survey of wetlands in 2000 and 2001, in apparently ideal conditions, only found one new population (Duguid et al. 2002).	NONE • No suitable habitat present within project footprint.
			Department of the Environment (2017). <i>Eleocharis papillosa</i>. <i>Species Profile and Threats Database</i>. Department of the Environment, Australian Government, Canberra. [online] Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=2519 [Accessed 1 May 2018]. Duguid, A., Kerrigan, R. and Albrecht, D. (2006). <i>Threatened Species of the Northern Territory - Dwarf Desert Spike-rush - Eleocharis papillosa</i>. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/_data/assets/pdf_file/0020/208433/eleocharis-papillosa.pdf [Accessed 1 May 2018].	
Rainbow Valley Fuschia Bush <i>Eremophila prostrata</i>	VU	-	Habitat: Sandplains and lower dune slopes that characteristically support hummock grasses (<i>Triodia basedowii</i>), and a variety of shrubs and trees including <i>Grevillea</i>, <i>Hakea</i>, <i>Acacia</i>, and Desert Oaks (Kerrigan et al. 2012). Distribution: Endemic to southern NT. Known from seven populations: two from the Mt Ooraminna area, four from between Deep Well and Mt Ooraminna, and another from the Rainbow Valley area (Kerrigan et al. 2012).	LOW • Limited suitable habitat present within project footprint. • Recent and historical records within bioregion to the north of the project footprint. • Restricted range that is remote from the project footprint.
			Kerrigan, R., Albrecht, D., Duguid, A. and Nano, C. (2012). <i>Threatened Species of the Northern Territory - Rainbow Valley Fuschia Bush - Eremophila prostrata</i>. Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/_data/assets/word_doc/0003/376266/eremophila-prostrata.docx [Accessed 1 May 2018].	
Desert Quandong			Habitat: Dune swales, along creeks, on plains and low rises, and rarely on hills. Typically occurs where the soils are sandy or loamy, sometimes with	HIGH

Name	Status		Summary	Likelihood of occurrence
	Cth	NT		
<i>Santalum acuminatum</i>	-	VU	limestone or sandstone shallowly below the soil surface (Nano et al. 2012). Distribution: Known from all Australian mainland areas. In the NT, occurs west and south-west of Alice Springs (Nano et al. 2012).	• Suitable habitat present within project footprint. • Recent and historical records nearby to the project footprint. • One record found during field survey within the project footprint; plus several other potential records that were observed during aerial inspections (via helicopter).
Nano, C., Kerrigan, R., Albrecht, D. and Latz, P. (2012). <i>Threatened Species of the Northern Territory - Santalum acuminatum</i> . Northern Territory Department of Environment and Natural Resources. https://nt.gov.au/data/assets/pdf_file/0004/208489/santalum-acuminatum.pdf [Accessed 1 May 2018].				

APPENDIX F MAPS OF ECOLOGICAL VALUES WITHIN EACH SEISMIC LINE AND REALIGNMENT RECOMMENDATIONS

- Map 1 – Seismic lines 1 and 2.3
- Map 2 – Seismic line 1 (close-up of northern area)
- Map 3 – Seismic lines 2.1, 5 and 8
- Map 4 – Seismic lines 2.2, 3.2 and 4.2
- Map 5 – Seismic line 3.1
- Map 6 – Seismic line 3.1 (close-up of northern area)
- Map 7 – Seismic line 4.1
- Map 8 – Seismic line 6.1
- Map 9 – Seismic lines 6.2 and 7

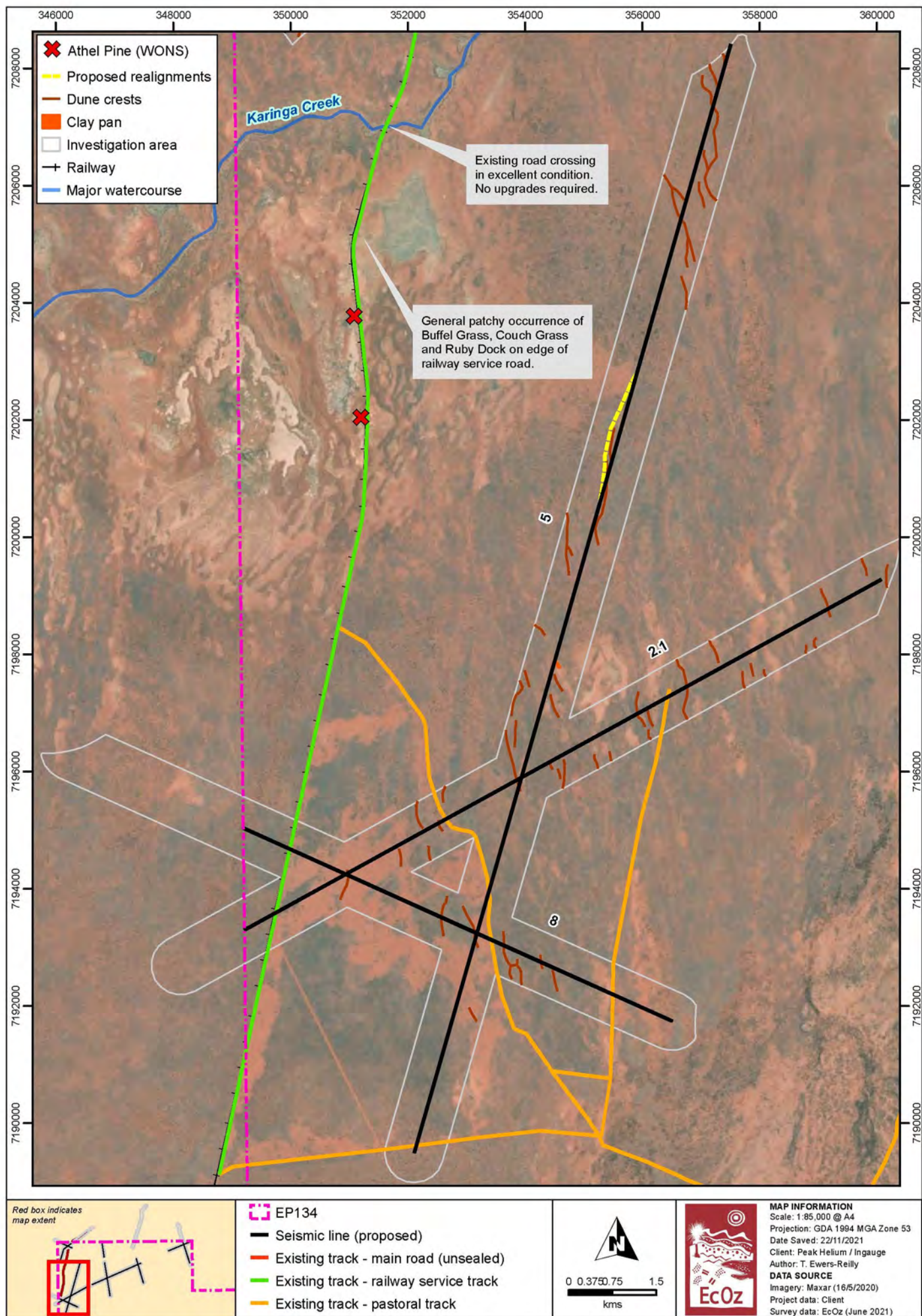


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Map 1 - Seismic lines 1 and 2.3

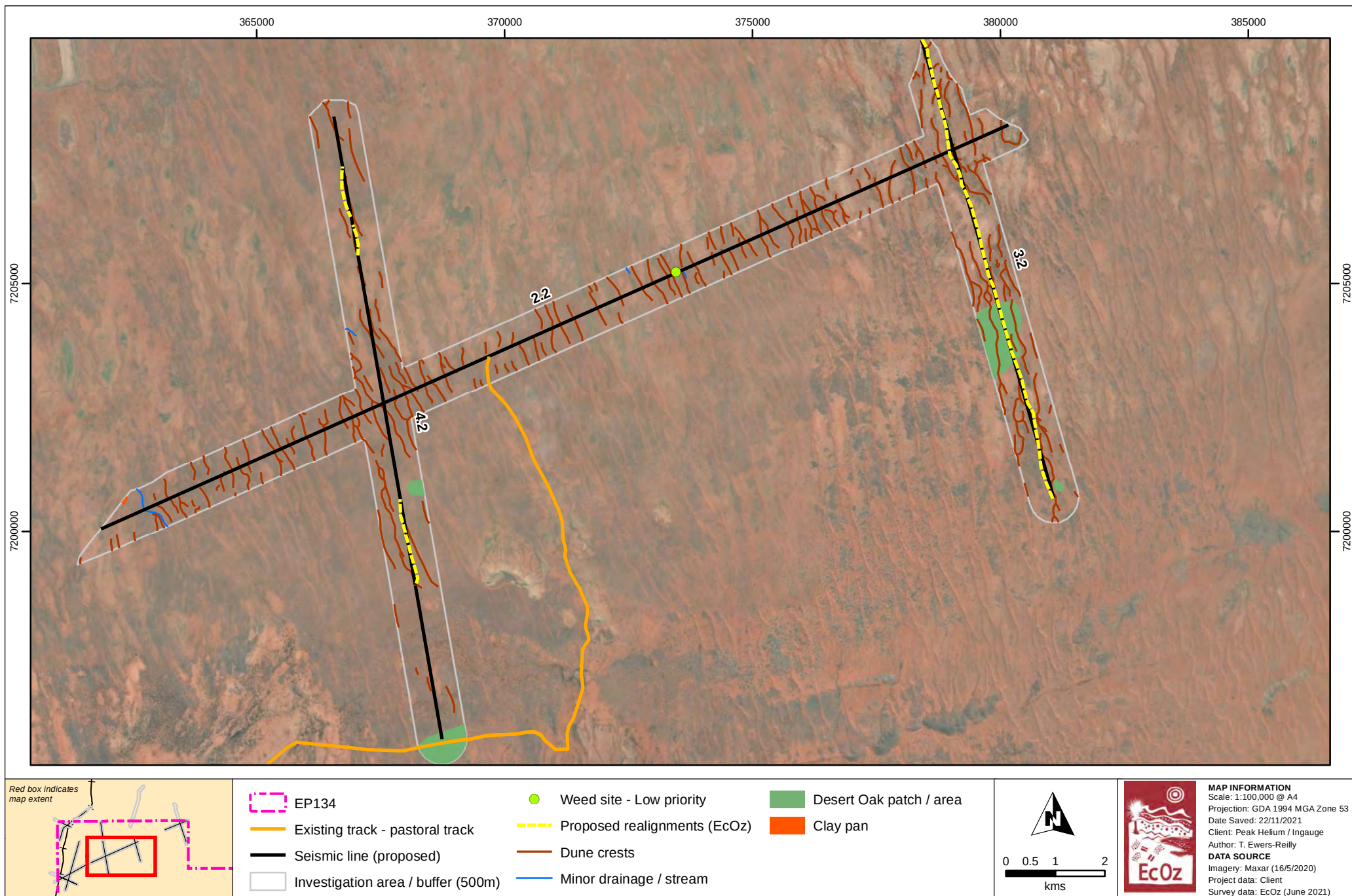


Map 2 - Seismic line 1 (close up of northern area)



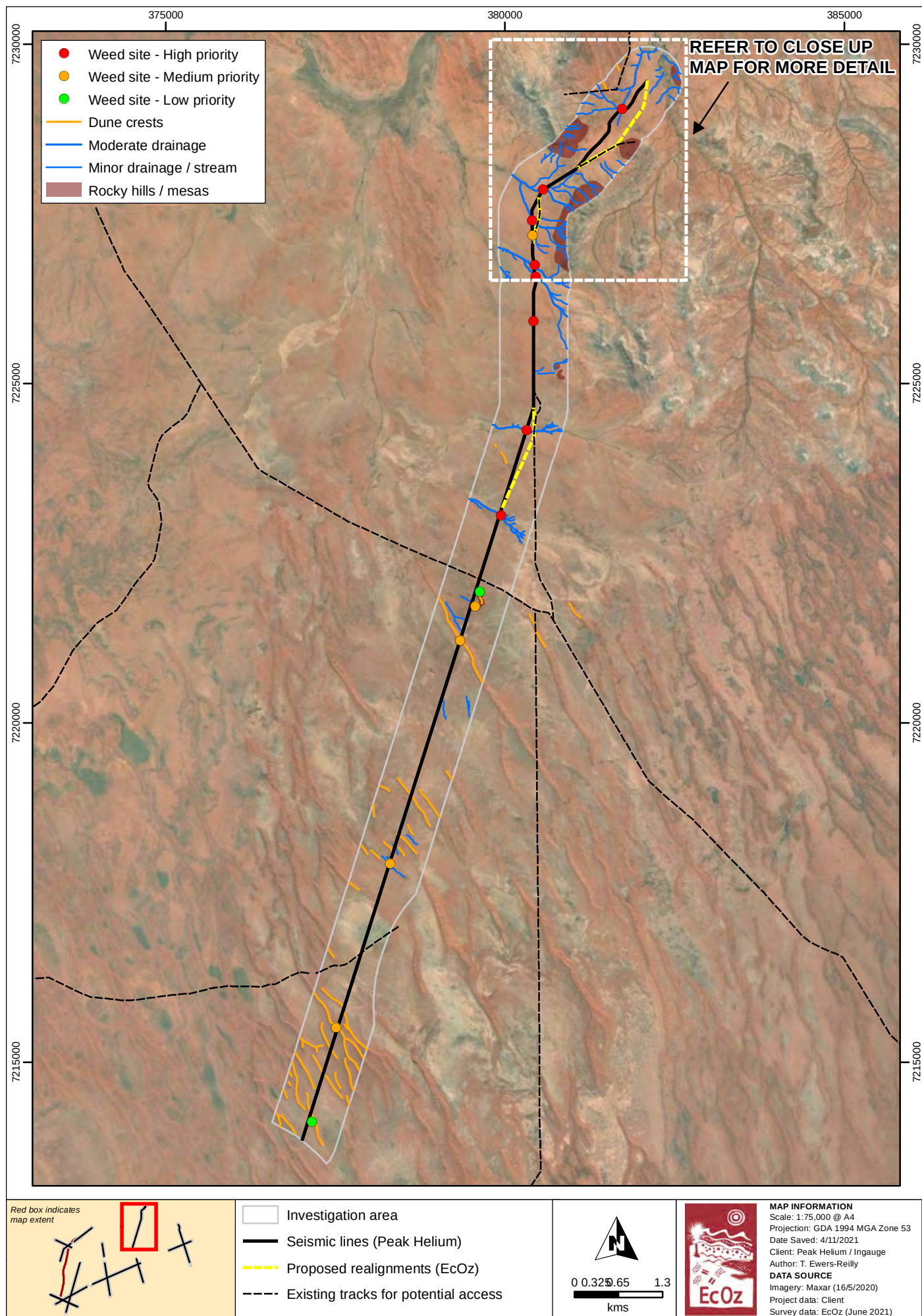
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Map 2 - Seismic lines 2.1, 5 and 8



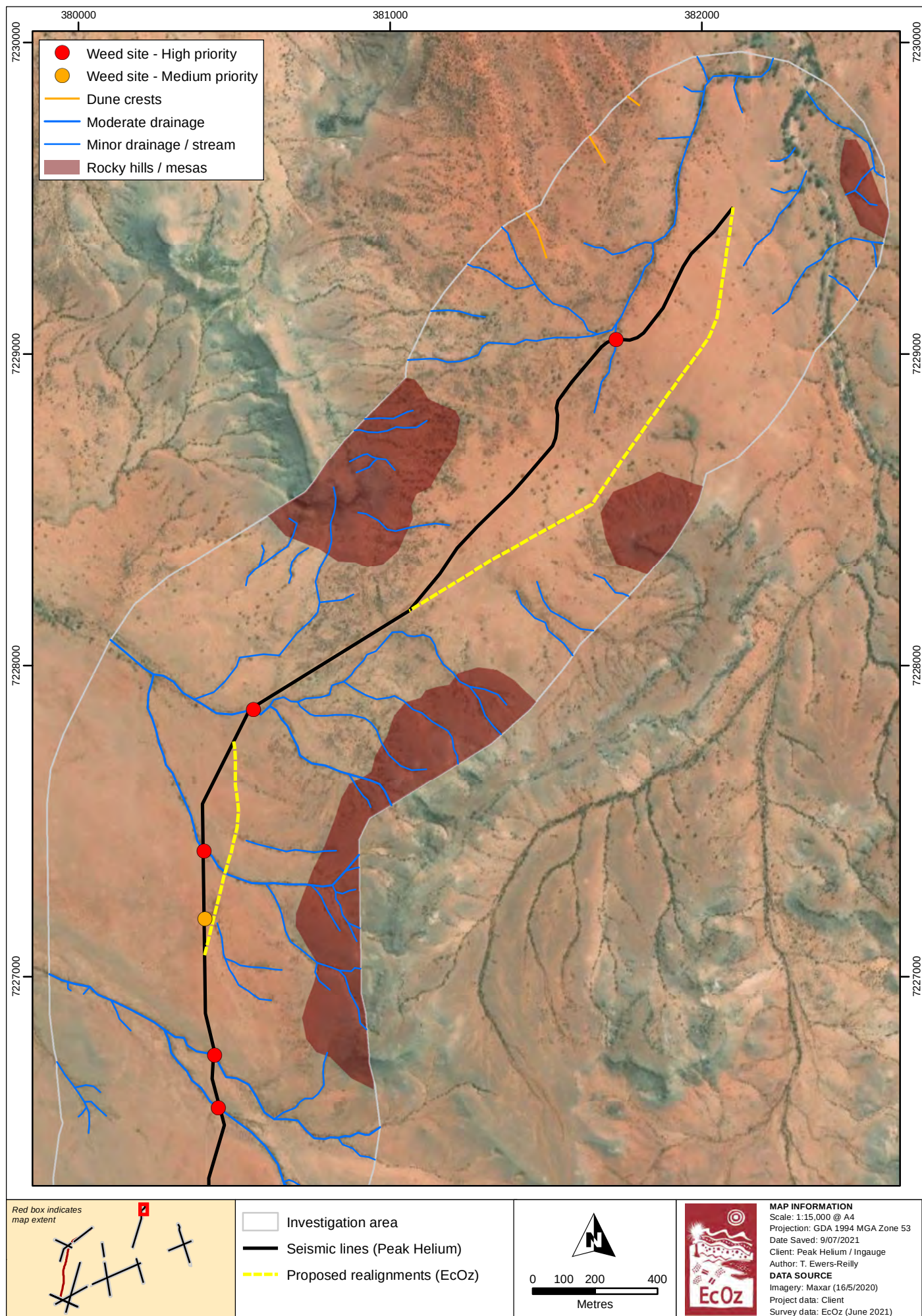
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Map 4 - Seismic lines 2.2, 3.2 and 4.2



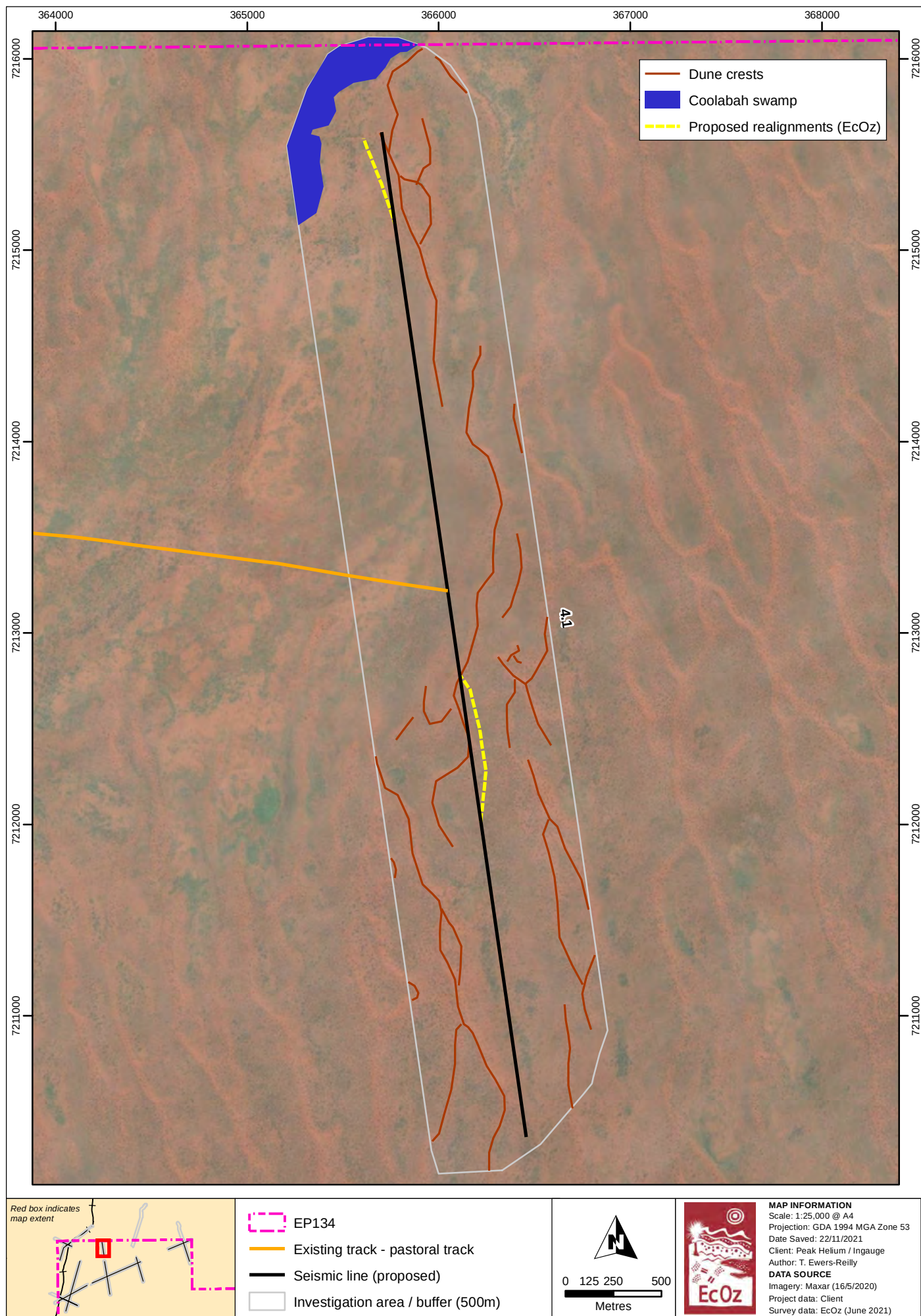
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Map 5 - Seismic line 3.1



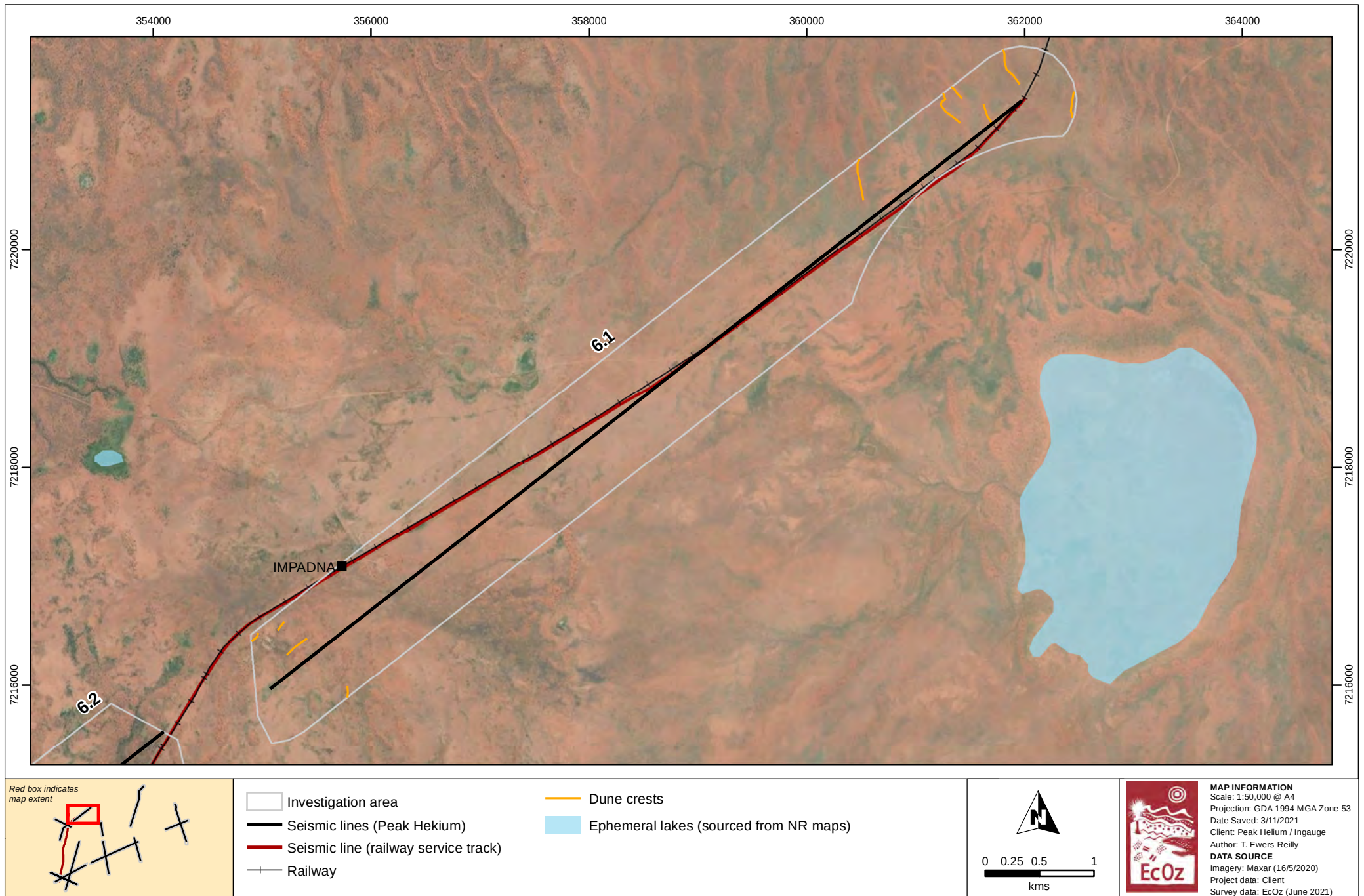
Path: C:\Users\tom.reilly.ECOZ\OneDrive - EcoZ\Documents\01. EcOz GIS Projects (TR) - new\EZ21053 (Tom) - Seismic baseline assessment (Peak)\01 Project Files\SummaryData_Line3.1_North.mxd

Map 6 - Seismic line 3.1 (close-up of northern end)



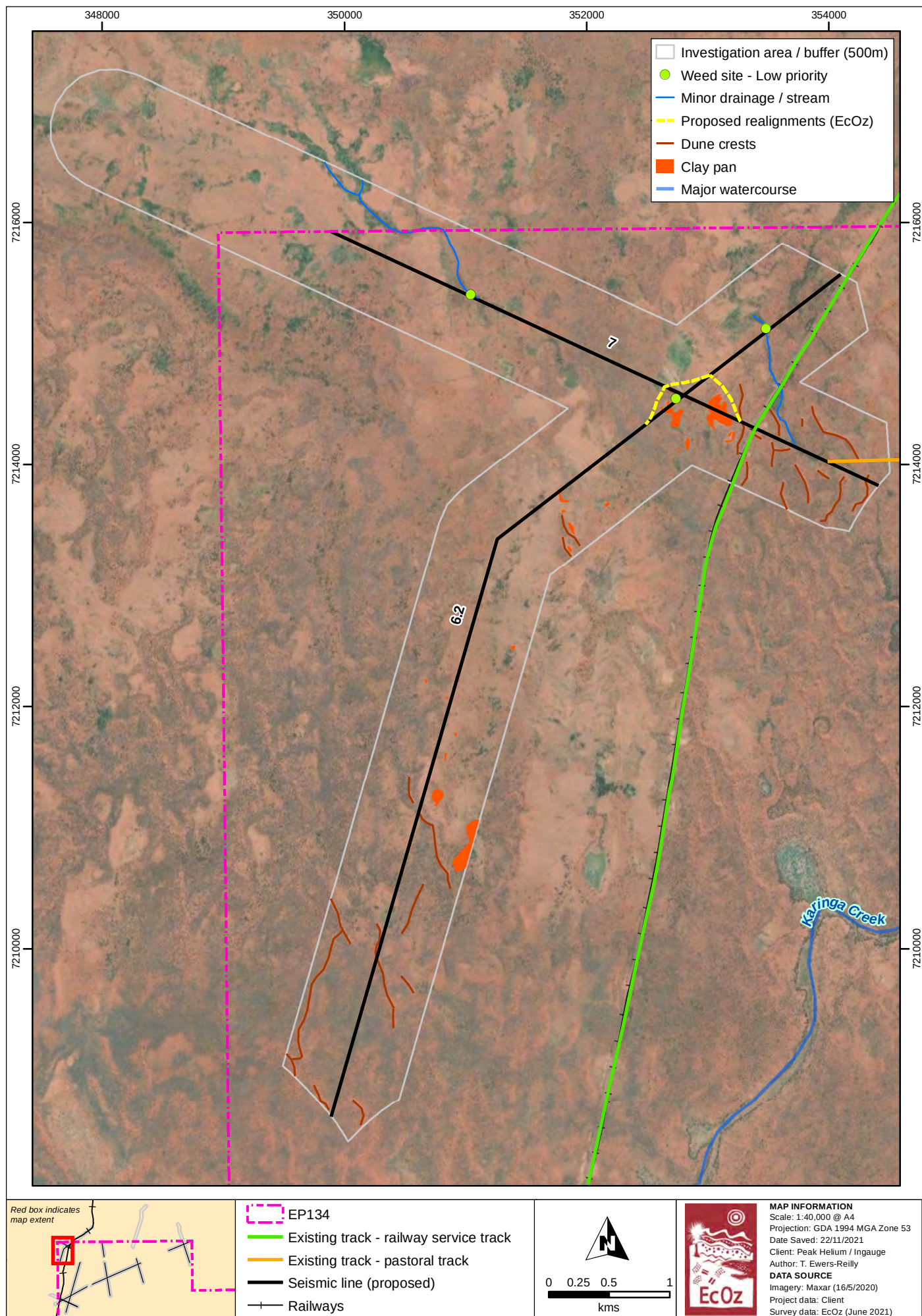
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Map 7 - Seismic line 4.1



Path: C:\Users\tom.reilly\OneDrive - EcOz\Documents\01. EcOz GIS Projects (TR) - new\EZ21053 (Tom) - Seismic baseline assessment (Peak)\01 Project Files\SummaryData_Line6.1.mxd

Map 8 - Seismic line 6.1



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Map 9 - Seismic lines 6.2 and 7



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Appendix B – Archeological Survey Report