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ENVIRONMENT
PROTECTION ACT 2019 (NT)

Wak Wak Solar Farm



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EXECUTIVE SUMMARY

Purpose

This referral report has been prepared to inform the Northern Territory Environment Protection Authority (NT EPA) of the proposal by Darwin H2 Project Nominee Pty Ltd as trustee for Darwin H2 Hub Project Trust as a fully owned subsidiary of TE H2 Australia Pty Ltd (TE H2) to develop a renewable energy (solar) farm approximately 48 kilometres (km) south-east of Darwin, called the Wak Wak Solar Farm.

The proposal is being referred to the NT EPA to determine whether formal assessment is required pursuant to the NT *Environmental Protection Act 2019* (EP Act). The proposal will also be referred to the Commonwealth Environment Minister under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

Wak Wak Solar Farm

The objective of the proposal is to generate renewable energy to be provided to existing industry in the Darwin region, and ultimately, the Darwin H2 Hub (DHH). Separate to the Wak Wak Solar Farm, TE H2 propose to develop the DHH, a green hydrogen production facility located at the Middle Arm Precinct (MAP) on the Middle Arm Peninsula in Darwin, that will contribute to driving the progress of the NT's energy transition while enabling other industries to move toward decarbonisation. Whilst related, the DHH is considered a separate project and is not the subject of this referral.

The scope of this report consists of the proposed Wak Wak Solar Farm which includes approximately 2.7-Gigawatt peak (GWp) of solar photovoltaic (PV) and 6-Gigawatt hour (GWh) battery energy storage system (BESS) with an infrastructure footprint of up to 2,500 hectares (ha) across NT Portion 4477 (subject to Perpetual Pastoral Lease 1147), Section 1435 and Section 1436, Hundred of Guy (both freehold). Additionally, access to the proposal area will likely from the Arnhem Highway through Section 1580; however, a route will be determined in consultation with the relevant authorities and subject to a Traffic Impact Assessment.

The infrastructure footprint is encompassed by an approximately 3,400 ha proposal area, which includes 900 ha of wildlife corridors and avoidance areas between sections of the infrastructure footprint that will require ongoing management by TE H2. While majority of proposal infrastructure will be contained within the infrastructure footprint, there will be a requirement for some access tracks and electrical connections outside of that footprint but within the proposal area.

Environmental impact assessment

Pre-screening for the proposal identified the potential for significant impacts or uncertainty regarding potential impacts to 6 of the 14 NT EPA environmental factors. This referral report assessed the significance of residual impacts to each of these 6 factors, accounting for avoidance and mitigation measures. The assessment concluded the proposal is expected to have a minor residual impact on four of the six factors. For one factor – terrestrial ecosystems – there is potential for the proposal to have a moderate residual impact, largely due to the requirement to clear up to 2,500 ha of native vegetation and associated fauna habitat during construction. The proposal is unlikely to result in a significant impact on any threatened species. Further work is required to determine whether the proposal will meet the objectives of the community and economy factor. TE H2 have commenced consultation and additional studies to inform this factor, with a Social Impact Management Plan being developed to enhance potential positive impacts and avoid and mitigate potential negative impacts.

Factor	Residual impact	Conclusion
LAND		
Terrestrial environmental quality Section 5.1	Minor	The proposal has potential to have a minor residual impact on terrestrial environmental quality. While best practice mitigation measures will be implemented, it is possible there will still be isolated erosion in the short to medium term during and in the few years immediately post construction, due to the large area of clearing and climatic conditions.

Factor	Residual impact	Conclusion
		Potential impacts to soil quality are expected to be minor and can be managed through standard environmental management practices.
Terrestrial ecosystems Section 5.2	Moderate	TE H2 have undertaken an extensive avoidance process to avoid high-quality savannah woodland habitat as detailed in Section 2.4.2 including incorporating wildlife corridors into the proposal design. The proposal will result in the loss of up to 2,500 ha, which is less than 1 % of the bioregion. The clearing will occur over a moderate scale of up to 2,500 ha and while vegetation will be removed in the long-term, ecological integrity and function within the surrounding landscape and broadly across the bioregion is expected to be maintained. Significant vegetation has been avoided through proposal design, except for a minor area (28 ha) of low-quality wetland habitat (i.e. swamp). Indirect impacts will be mitigated through best-practice management of weeds, dust, erosion and sedimentation and hazardous materials. Habitat fragmentation has been avoided through design by incorporating wildlife corridors that will be managed for indirect impacts as described above. Significant impact assessments undertaken in accordance with the <i>Significant Impact Guidelines 1.1</i> demonstrate the proposal is unlikely to have a significant impact on threatened species.
WATER		
Hydrological processes Section 5.3	Minor	The proposal has the potential to have a minor residual impact on hydrological processes. Vegetation clearing and construction across 2,500 ha may alter surface water flow paths and increase surface water runoff volumes within the infrastructure footprint, requiring specific design measures to mitigate associated impacts. Standard engineered stormwater and drainage designs will be implemented to manage surface water flows and maintain groundwater recharge as much as possible, such that significant residual impacts to hydrological processes are unlikely to occur. A stormwater management strategy will be prepared to demonstrate the proposed stormwater management infrastructure can achieve an acceptable change to surface water flows outside of the infrastructure footprint.
Inland water environmental quality Section 5.4	Minor	During construction, there is potential for surface water runoff with elevated turbidity and suspended sediment concentrations due to land disturbance. Best practice mitigation measures will be implemented, including a CPESC endorsed ESCP, to minimise the potential for erosion turbid runoff. The proposal does not involve activities that would result in significant surface water or groundwater contamination.
PEOPLE		
Community and economy Section 5.5	Uncertain	A Social Impact Assessment will be undertaken to properly identify potential impacts and benefits under this factor. Preparation of this assessment will include broader community consultation than has occurred to date. Additionally, TE H2 are undertaking the following assessments to inform ongoing proposal design and impact mitigation: • Noise and vibration impact assessment. • Landscape and visual impact assessment. • Bushfire risk assessment. • Traffic impact assessment. • Economic impact assessment. A Social Impact Management Plan will be prepared to identify appropriate impact avoidance and mitigation measures and benefit enhancement measures. Until these assessments are complete, there remains uncertainty regarding the potential for significant impacts to this factor.
Culture and heritage Section 5.6	Uncertain	Impacts to sacred sites will be avoided in accordance with the requirements of an Authority Certificate obtained under the <i>Northern Territory Sacred Sites Act 1989</i>. Archaeological and ethnographic surveys and consultation are underway to identify archaeological features and cultural values (tangible and intangible). Detailed design will account for identified values and any unavoidable impacts to

Factor	Residual impact	Conclusion
		archaeology will be managed under the <i>Heritage Act 2011</i> , with high-value archaeology to be avoided. TE H2 will enter into an ILUA for the solar farm should a claimant be identified.

TABLE OF CONTENTS

1	INTRODUCTION	10
2	PROPOSAL DESCRIPTION	11
2.1	Location and regional context	11
2.2	Key components	17
2.2.1	Solar generation	17
2.2.2	Ancillary infrastructure	18
2.2.3	Construction activities and requirements	19
2.2.4	Operational activities and requirements	20
2.2.5	Decommissioning and rehabilitation	21
2.3	Related developments	21
2.3.1	Overhead transmission line	21
2.3.2	Darwin H2 Hub	22
2.3.3	Middle Arm Precinct (MAP)	22
2.4	Alternatives	24
2.4.1	Location	24
2.4.2	Site design	24
3	REGULATORY CONTEXT	29
3.1	Strategic and planning context	29
3.2	Approvals, licenses and authorisations	30
3.3	Principles of environmental protection and management	32
4	CONSULTATION	36
4.1	Engagement approach	36
4.2	Best practice standards	36
4.3	Stakeholder Mapping	37
4.4	Social impact assessment	38
4.5	Future engagement	38
5	ENVIRONMENTAL IMPACT ASSESSMENT	39
5.1	Terrestrial environmental quality	42
5.1.1	Presence of environmental values	42
5.1.2	Impact assessment	48
5.1.3	Conclusion	50
5.2	Terrestrial ecosystems	50
5.2.1	Presence of environmental values	50
5.2.2	Impact assessment	56
5.2.3	Threatened species significant impact assessment	61
5.2.4	Offsets	81
5.2.5	Conclusion	81
5.3	Hydrological processes	82
5.3.1	Presence of environmental values	82
5.3.2	Impact assessment	87
5.3.3	Conclusion	89

5.4	Inland water environmental quality	90
5.4.1	Presence of environmental values	90
5.4.2	Impact assessment	93
5.4.3	Conclusion	95
5.5	Community and economy	96
5.5.1	Presence of environmental values	96
5.5.2	Impact assessment	96
5.5.3	Conclusion	96
5.6	Culture and heritage	97
5.6.1	Presence of environmental values	97
5.6.2	Impact assessment	98
5.6.3	Conclusion	100
6	CUMULATIVE IMPACTS	101
6.1.1	Terrestrial ecosystems	102
6.2	Climate change	102
7	MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	104
8	CONCLUSION	105
9	REFERENCES	107

Appendices

APPENDIX A	ECOLOGY REPORT (ECOZ 2025A)
APPENDIX B	CONSTRAINTS REPORT (ECOZ 2025B)
APPENDIX C	IMPACT ASSESSMENT CRITERIA

Tables

Table 2-1. Summary of proposal area	11
Table 2-2. Key proposal components	17
Table 2-3. General construction activities and required vehicles and plant	20
Table 3-1. Strategic policy and plans relevant to the proposal	29
Table 3-2. Commonwealth and Territory legislation applicable to the proposal	30
Table 3-3. Responses to the EP Act section 42 and 43 requirements	32
Table 4-1. Engagement Institute Spectrum of Participation	37
Table 4-2. Identified stakeholders	37
Table 5-1. NT EPA factors assessed and reasons for further assessment	39
Table 5-2. NT EPA Factors which were excluded from further assessment	40
Table 5-3. Significant residual impact ratings and criteria	41
Table 5-4. Scale, magnitude and duration criteria	41
Table 5-5. Summary of landforms and soils relevant to the proposal	46
Table 5-6. Preliminary impact assessment – terrestrial environmental quality	49
Table 5-7. Proportion of vegetation types cleared relative to the bioregion	57
Table 5-8. Preliminary impact assessment – terrestrial ecosystems	59
Table 5-9. Significant impact assessment for the Northern Brushtail Possum	64
Table 5-10. Significant impact assessment for the Partridge Pigeon	68
Table 5-11. Significant impact assessment for the Bare-rumped Sheathtail Bat	73
Table 5-12. Significant impact assessment for the Northern Blue-tongue Skink	74
Table 5-13. Significant impact assessment for the Darwin Cycad	77

Table 5-14. Significant impact assessment for <i>Typhonium praetermissum</i>	78
Table 5-15. Aquifers relevant to the proposal area.....	83
Table 5-16. Preliminary impact assessment – hydrological processes	88
Table 5-17. Preliminary impact assessment – inland water environmental quality	94
Table 5-18. Preliminary impact assessment - culture and heritage	99
Table 6-1. Projects in the Greater Darwin Region which may contribute to cumulative impacts.....	101
Table 6-2. Climate change pressures and impacts relevant to the proposal (NESP 2020).....	103
Table 7-1. Summary of PMST results.....	104
Table 8-1. Summary of potential impacts to NT EPA environmental factors.....	105

Figures

Figure 2-1. Map of regional context	13
Figure 2-2. Map of the proposal area	14
Figure 2-3. Map of land use relevant to the proposal area	15
Figure 2-4. Map of planning zones relevant to the proposal area	16
Figure 2-5. Example of solar PV layout	18
Figure 2-6. Map of related projects	23
Figure 2-7. Map of investigation area, development envelope, proposal area and infrastructure footprint	27
Figure 2-8. Map showing infrastructure footprint relative to Northern Brushtail Possum habitat quality	28
Figure 5-1. Map of landforms within the proposal area	44
Figure 5-2. Map of topography within the proposal area	45
Figure 5-3. Map of historic disturbance and ASS risk relevant to the proposal area.....	47
Figure 5-4. Photographs showing <i>Melaleuca</i> spp. wetland habitat within the proposal area	51
Figure 5-5. Map of ecological values within the vicinity of the proposal area	54
Figure 5-6. Map of Darwin Cycad within the vicinity of the proposal area	55
Figure 5-7. Map of fire frequency, riparian vegetation and the proposal area	62
Figure 5-8. Map of fire frequency (since 2000) and Black-footed Tree-rat records (since 2015) in the Greater Darwin region.....	67
Figure 5-9. Map of tall tree densities in the vicinity of the infrastructure footprint.....	72
Figure 5-10. Map of catchment boundaries and surface water features relevant to the proposal area.....	85
Figure 5-11. Map of groundwater aquifers relevant to the proposal area.....	86
Figure 5-12. Map of surface water sample sites.....	92

ACRONYMS

AAPA	Aboriginal Areas Protection Authority
AEP	Annual Exceedance Probability
ASS	Acid sulfate soil
CHMP	Cultural Heritage Management Plan
CPESC	Certified Professional in Erosion and Sediment Control
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cth)
DLI	Department of Logistics and Infrastructure (NT)
DLPE	Department of Lands, Planning and Environment (NT)
DME	Department of Mining and Energy (NT)
EP Act	<i>Environment Protection Act 2019</i> (NT)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse gas
GWp	Gigawatt peak
ha	Hectares
HGWS	Howard Groundwater System
IECA	International Erosion Control Association
ILUA	Indigenous Land Use Agreement
km	Kilometre
kV	Kilovolt
LFP	Lithium Iron Phosphate
LGA	Local Government Area
MAP	Middle Arm Precinct
mBGL	Metres below ground level
mg/L	Milligram per litre
ML	Megalitres
MNES	Matters of National Environmental Significance
MWp	Megawatt peak
NLC	Northern Land Council
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NT Government	Northern Territory Government
OHTL	Overhead transmission line
pH	potential of Hydrogen
PMST	Protected Matters Search Tool
PV	Photovoltaic
SEA	Strategic environmental assessment
SOCS	Site of Conservation Significance
TE H2	TE H2 Australia Pty Ltd
tCO₂e	Tonnes of carbon dioxide equivalent
WMZ	Water Management Zone
µS/cm	microSiemens per centimeter

PUBLICATION STATEMENT

This referral has been prepared by EcOz Environmental Consultants (EcOz) on behalf of Darwin H2 Project Nominee Pty Ltd as trustee for Darwin H2 Hub Project Trust, a fully owned subsidiary of TE H2 Australia Pty Ltd (TE H2). A listing of the key consultants, their qualifications and experience in the environmental field are provided below.

Key consultant	Qualifications	Experience
Glen Ewers	Bachelor of Science; Bachelor of Laws; Diploma of Arts (Environmental Studies); Graduate Certificate in Ornithology	15+ years
Eliza Grant	Bachelor of Commerce, Master of Environment	5 years
Alice Nicholl	Bachelor of Science, Master of Science (BioScience)	5 years

1 INTRODUCTION

This referral report has been prepared by Darwin H2 Project Nominee Pty Ltd as trustee for Darwin H2 Hub Project Trust, a fully owned subsidiary of TE H2 Australia Pty Ltd (TE H2) (the proponent) to notify the Northern Territory (NT) Environment Protection Authority (NT EPA) of the Wak Wak Solar Farm proposal in accordance with Section 48 of the *Environment Protection Act 2019* (NT) (EP Act), to determine whether formal assessment under the EP Act is required. The proposal will also be referred to the Commonwealth Environment Minister under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) – see Section 7 for further detail.

TE H2 is a joint venture between TotalEnergies (80%) and the Eren Groupe (20%) dedicated to the development of GW-scale multi energy projects globally which provides affordable, sustainable, reliable and accessible energy. TE H2 combines extensive technical expertise and experience to deliver globally impactful renewable energy projects that create affordable, reliable, and accessible clean energy.

TE H2's parent companies, TotalEnergies and the Eren Groupe, are committed to delivering more energy with fewer emissions. TotalEnergies is diversifying its energy mix in response to the global energy transition, with hydrogen and green gases playing a crucial role in decarbonizing hard-to-abate sectors. They have over 23 GW of operational renewable energy assets worldwide. The Eren Groupe remains a leader in investing in technological innovation to save natural resources with an extensive track record in combating climate change.

The objective of the proposal is to generate renewable energy to be provided to existing industry in the Darwin region, and ultimately, the Darwin H2 Hub (DHH). Separate to the Wak Wak Solar Farm, TE H2 propose to develop the DHH, a green hydrogen production facility located at the Middle Arm Precinct (MAP) on the Middle Arm Peninsula in Darwin, that will contribute to driving the progress of the NT's energy transition while enabling other industries to move toward decarbonisation.

The scope of this report consists of the proposed Wak Wak Solar Farm which includes approximately 2.7-Gigawatt peak (GWp) of solar photovoltaic (PV) and 6-Gigawatt hour (GWh) centralised battery energy storage system (BESS) with an infrastructure footprint of up to 2,500 hectares (ha) (herein 'the proposal').

Whilst related, the DHH is considered a separate project and is not the subject of this referral. It will be assessed through the strategic environmental assessment (SEA) for MAP currently being undertaken by the NT Government under both the EP Act and EPBC Act. Assuming the NT Government receives a strategic approval for the MAP, the DHH will be assessed via an approval notice under the strategic approval. Further detail regarding related projects is provided in Section 2.3.

2 PROPOSAL DESCRIPTION

2.1 Location and regional context

The proposal is approximately 48 kilometres (km) south-east of Darwin - Figure 2-1 - within the Litchfield Local Government Area (LGA). This referral refers to three separate but related areas which are shown on Figure 2-2:

- **Initial investigation area:** approximately 13,500 ha across NT Portion 4477, Section 1435 and Section 1436, Hundred of Guy. Additionally, access to the proposal area will likely from the Arnhem Highway through Section 1580; however, a route will be determined in consultation with the relevant authorities and subject to a Traffic Impact Assessment. Note – while this referral refers to this broader area as the initial investigation area, ecology surveys referenced in Appendix A only occurred within NT Portion 4477. No surveys have yet been undertaken within Section 1435, Section 1436 or Section 1580; however, maps through this document show desktop data available for these areas. Additional surveys will be completed once an acceptable road alignment is determined.
- **Proposal area:** up to 3,400 ha within which the solar PV system, BESS and ancillary infrastructure will be located across up to 2,500 ha. This area includes 900 ha of wildlife corridors and avoidance areas between sections of the infrastructure footprint that will require ongoing management by TE H2. While majority of proposal infrastructure will be contained within the infrastructure footprint, there will be a requirement for some access tracks and electrical connections outside of that footprint but within the proposal area.
- **Infrastructure footprint:** up to 2,500 ha within the proposal area where solar PV system, BESS and ancillary infrastructure will be located.

Most of the proposal area is within NT Portion 4477 – under a Perpetual Pastoral Lease 1147 – with the remainder across two small lots of freehold land – Section 1435 and Section 1436, Hundred of Guy – shown on Figure 2-3.

TE H2 has secured an Agreement to Sublease and an Agreement to Lease over the proposal area, as required due to the proposal area containing both freehold titles and pastoral lease. The proposal area covers approximately 3,400 ha, will be installed on up to 2,500 ha. A summary of land tenure of the proposal area is provided in Table 2-1. Alternative sites considered are discussed in Section 2.4

Current land uses and zoning within and surrounding the proposal area are shown on Figure 2-3 and Figure 2-4, respectively. The proposal area is entirely zoned rural and surrounded by a mix of rural, rural living, horticulture and agriculture properties. There are granted mineral leases surrounding the proposal area on NT Portion 4477 – these mineral leases are outside the proposal area – shown on Figure 2-3. Freds Pass Road (unconstructed) intersects the proposal area; however, is considered separate to the proposal area.

Historic land use within the proposal area broadly includes some disturbance and pastoral activities. There is no evidence of recent commercial cattle grazing. However, there are areas in the northern section that have been subject to historic extractive activities. Indigenous land uses, if present within the proposal area, will be identified and assessed through community consultation with Traditional Owners and Custodians as part of the cultural values (ethnographic) assessment.

Table 2-1. Summary of proposal area

Area	The proposal area covers approximately 3,400 ha, with a proposed infrastructure footprint of up to 2,500 ha.
Street address	NT Portion 4477, 1230 Goode Road, Wak Wak, Northern Territory, 0830 Section 1435, Hundred of Guy Section 1436, Hundred of Guy Section 1580, Hundred of Guy (proposed site access track)
Zoning	Rural (R) - NT Portion 4477, Section 1435 and Section 1436

	Horticulture (H) - Section 1580
Tenure	• Pastoral land under a Perpetual Pastoral Lease granted under the <i>Pastoral Land Act 1992</i> - NT Portion 4477 • Freehold land - Sections 1435 and 1436, Hundred of Guy • Crown land - Section 1580 (south of the Arnhem Highway – proposed site access track)
Nearest residential community/town	Nearest residential property boundary (approximate distances): • Acacia Hills – 1 km south (and 3 km west) • Humpty Doo – 2.5 km north-west • Lloyd Creek – 2.5 km north-west • Lambells Lagoon – 3.5 km north-east • Noonamah – 5 km west
Ownership of land	Private/Pastoral land under a Perpetual Pastoral Lease

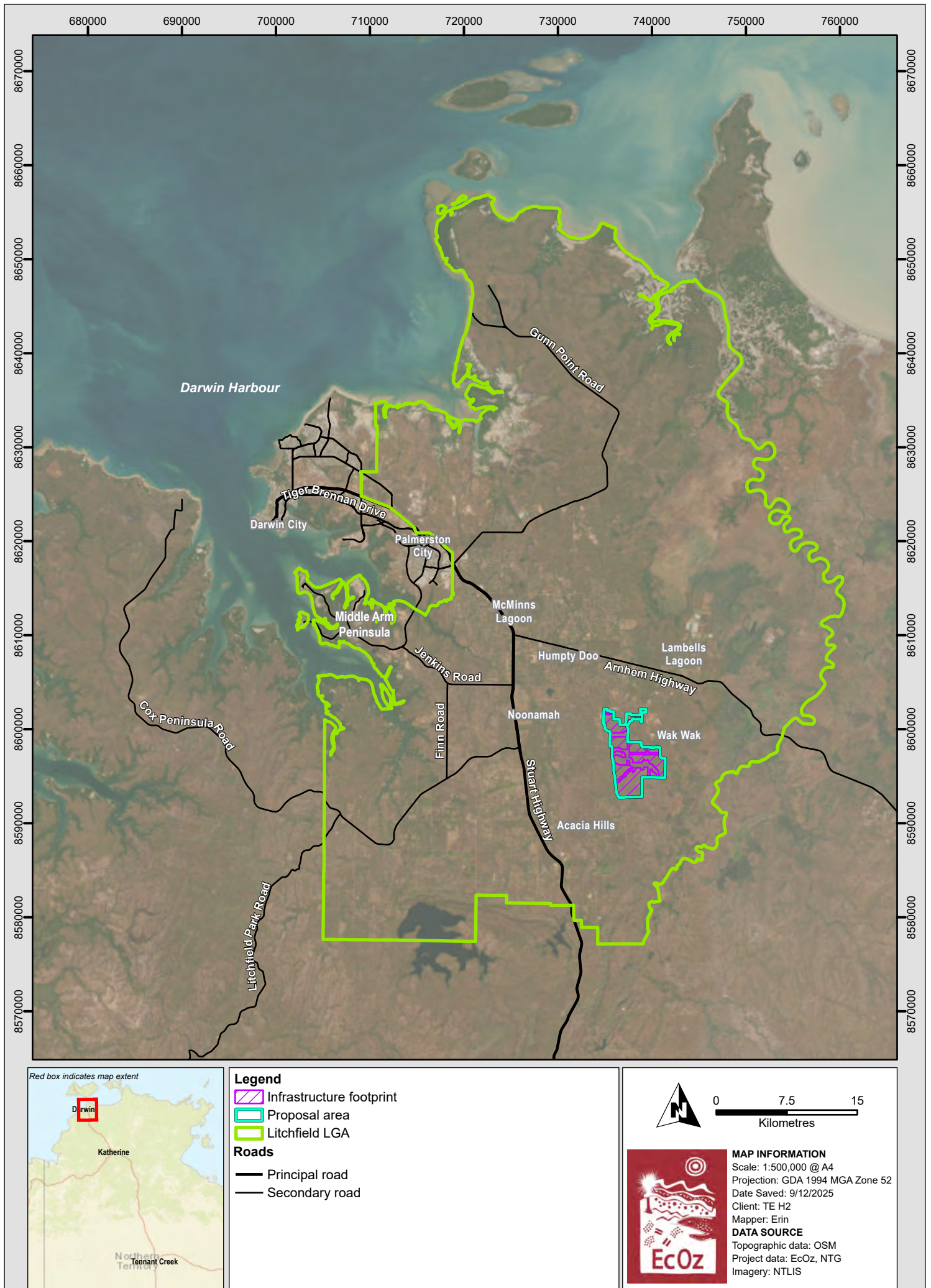
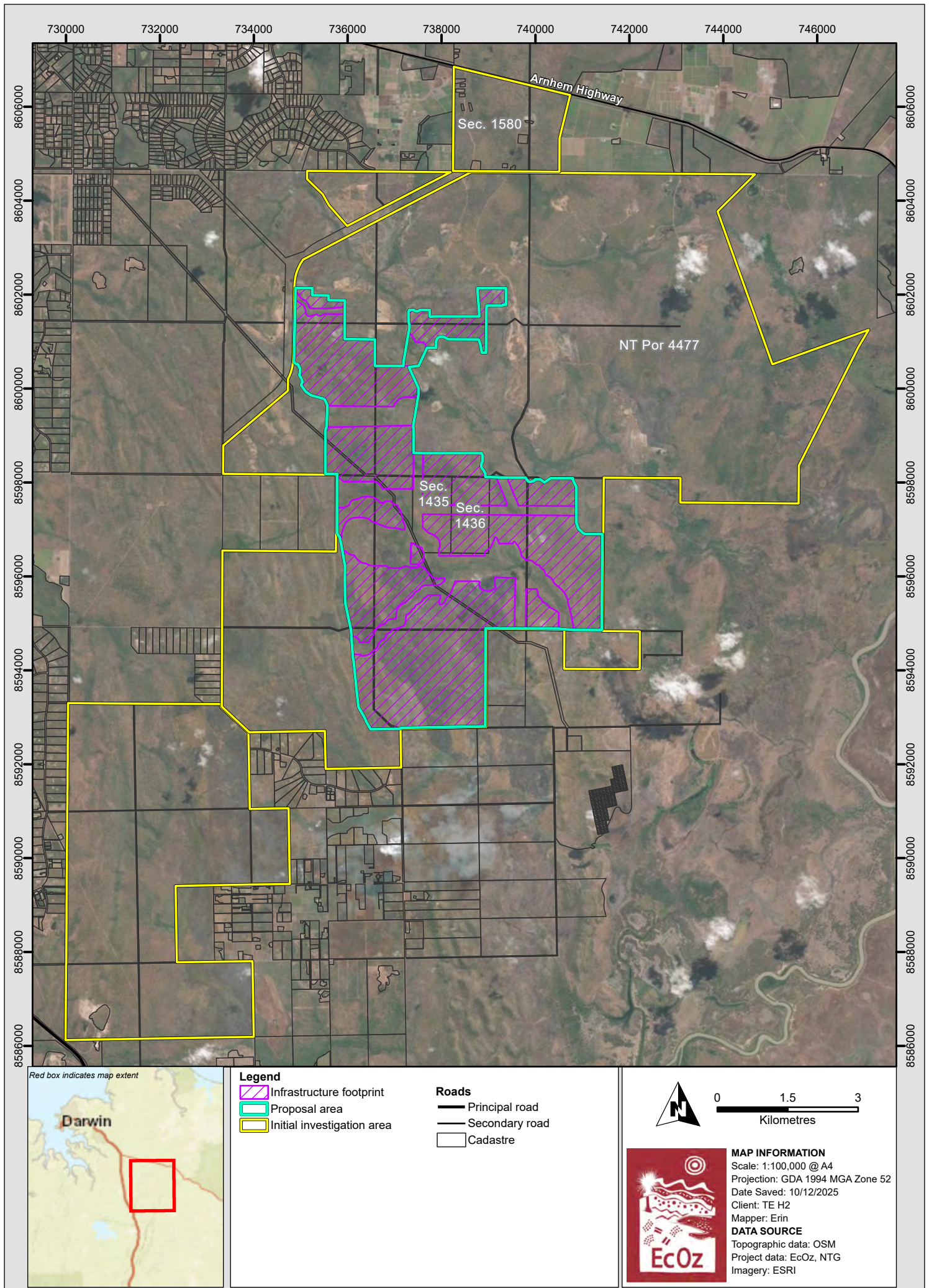
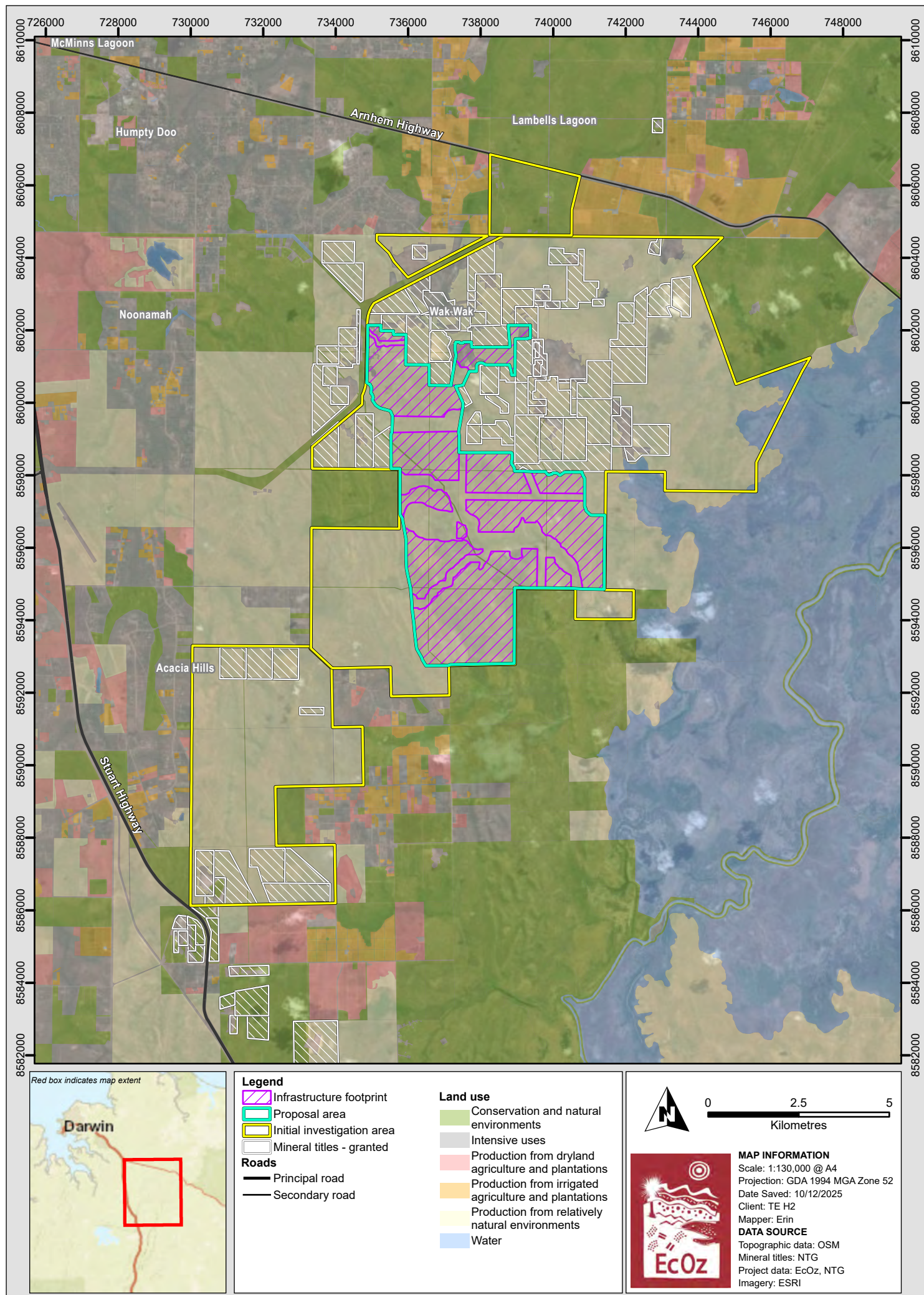


Figure 2-1. Map of regional context



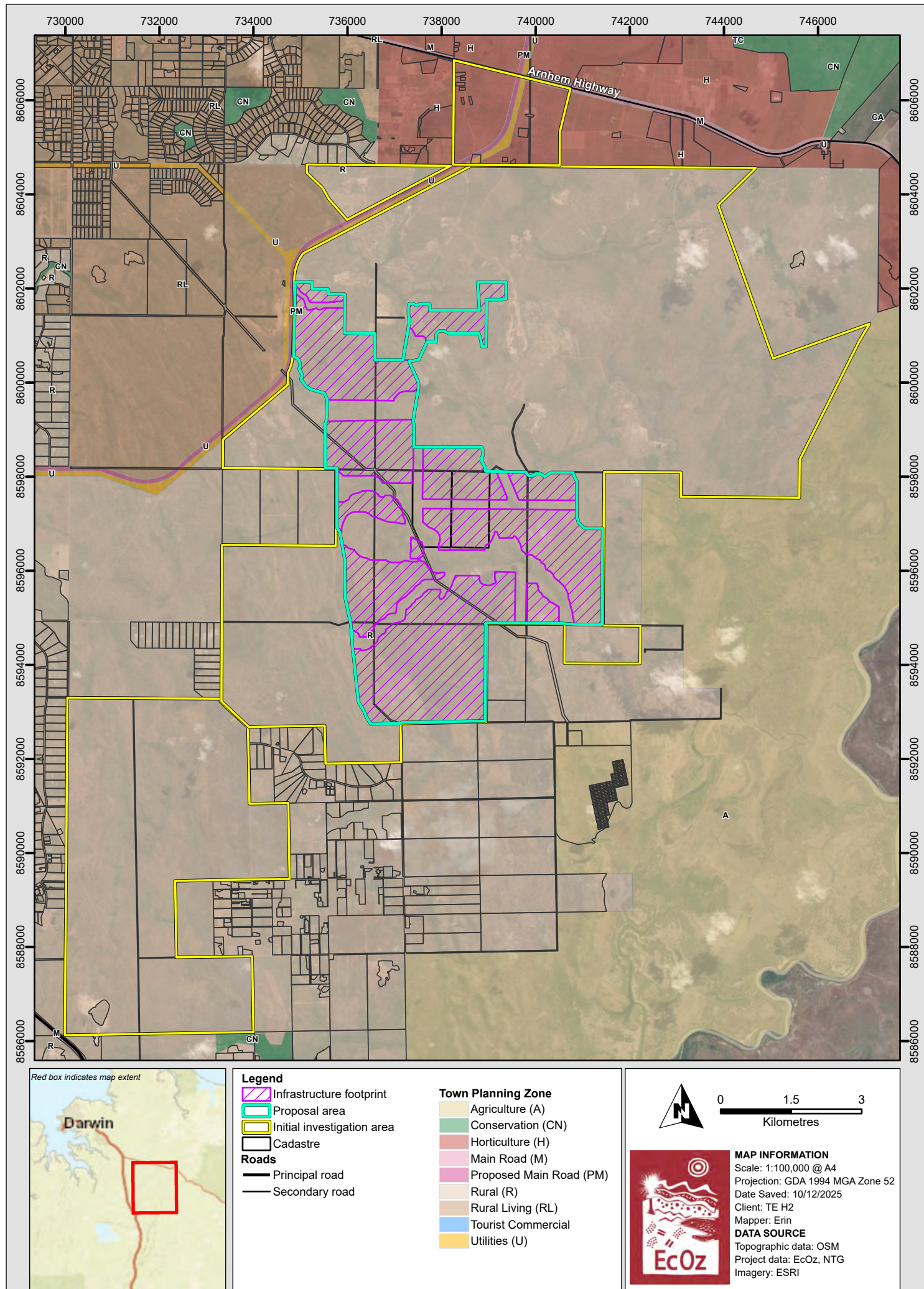
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Layout: Figure X-X. Cadastre

Figure 2-2. Map of the proposal area



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 Layout: Figure 2-2. Land use relevant to the proposal area

Figure 2-3. Map of land use relevant to the proposal area



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 Layout: Figure 2-3. Map of planning zones

Figure 2-4. Map of planning zones

2.2 Key components

Table 2-2 provides a summary of the key components of the proposal.

Table 2-2. Key proposal components

Component	Size/capacity/sub-components
Key proposal infrastructure	
Solar farm	Up to 2,500 ha Up to 2.7 GWp
Ancillary infrastructure	The following components will be within the 2,500 ha infrastructure footprint: • Centralised battery energy storage systems (BESS) (up to 6 GWh at full capacity). • Workshop, spares storage, control room. • Internal transmission and cabling infrastructure (including underground and/or overhead lines). • Solar array inverters, transformers and switchgear. • Substations / switchyards. • Access roads and internal tracks. • Laydown areas. • Temporary construction facilities (i.e. laydown areas, construction site office, ablution blocks and equipment storage). • Operational site office and ablutions. • Drainage and stormwater management infrastructure. • Fire management and emergency response infrastructure. • Fencing and security infrastructure. • Communications infrastructure (e.g. fibre optic or SCADA systems).
Key proposal features	
Timing (construction and operation)	The Wak Wak Solar Farm will be constructed in phases. It is anticipated that construction of the first stage will occur over 2 to 3 years - approximate timeline is 2027 – 2030 (subject to approvals). Approximately 2,700 MWp of solar PV and 6,000 MWh of BESS will first be developed over approximately 1,000 ha to service existing domestic industry, followed by the balance of solar PV and BESS capacity constructed for additional industrial demand. 30-year operation period, option to repower/extend to 60 years at end of first 30-year period.
Workforce	Estimated construction workforce of 900 and operation workforce of 50. No dedicated workforce accommodation is proposed on site. Local workforce will be maximised where possible for both construction and operation phases.

2.2.1 Solar generation

The solar generation will be developed to up to 2.7-GWp across approximately 2,500 ha. As described in Table 2-2, construction will occur progressively with approximately 2,700 MWp of solar PV and 6,000 MWh of BESS developed first over approximately 1,000 ha to service existing domestic industry, followed by the balance of solar PV and BESS capacity constructed.

Proposal design will make use of highly efficient PV panels, mounted on single axis tracking structures and/or fixed tilt panels and allow for an optimised, year-round energy supply to the potential electricity off-takers. It will be built using Tier 1 solar panels, mounting structures, inverters and transformers with direct current and alternating current cabling and will ensure compliance with all relevant standards of structural design,

installation, energy systems, and power systems such as the AS/NZS 1170¹, AS/NZS 5033², AS/NZS 4509 or 4777³, and IEC 62804⁴.

The concept design includes BESS of approximately 6 GWh to firm up the renewable energy supplied and to balance solar power generation with electricity consumption at downstream facilities, provide local network stability services, and serve as a backup to ensure a secure facility shutdown when needed. The exact size and technology will be determined through detailed engineering and energy balance studies.

The most common battery technology for this application is lithium iron phosphate. Batteries will likely be housed in containerised units, with a strong focus on cooling to ensure long-term performance in hot climates.

An example of solar PV layout is provided in Figure 2-5.



Figure 2-5. Example of solar PV layout

2.2.2 Ancillary infrastructure

The following components will be developed within the 2,500 ha infrastructure footprint:

- Workshop, spares storage, control room.
- Internal transmission and cabling infrastructure (including underground and/or overhead lines).
- Solar array inverters and transformers.
- Substations / switchyards.
- Access roads and internal tracks.
- Temporary construction facilities (such as, laydown areas, construction site office, ablution blocks and equipment storage).
- Operational site office and ablutions.
- Drainage and stormwater management infrastructure.
- Fire management and emergency response infrastructure.
- Fencing and security infrastructure.
- Communications infrastructure (for example, fibre optic or SCADA systems).

¹ AS/NZS 1170.2:2021 *Structural design actions, Part 2: Wind actions*

² AS/NZS 5033 *Installation and safety requirements for photovoltaic (PV) arrays*

³ AS/NZS 4509 *Stand-alone power systems or AS/NZS 4777 Grid connection of energy systems via inverters*

⁴ IEC 62804 *Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation*

The capacity and location of ancillary infrastructure will be determined through detailed design.

While majority of proposal infrastructure will be contained within the infrastructure footprint, there will be a requirement for some access tracks and electrical connections outside of that footprint but within the proposal area. The design and location of these will be developed subject to ongoing environmental assessments (such as heritage surveys) and detailed design.

2.2.3 Construction activities and requirements

General construction requirements will typically include land clearing, minor earthworks to establish laydowns and hardstand, concrete batching for footings and haul road establishment. Temporary onsite facilities will include offices, laydown areas, storage areas and hardstands, amenities, power generation infrastructure, drainage infrastructure, chemical stores and vehicle washdown and maintenance areas. Vehicles, machinery, plant and general construction activities required for the proposal are provided in Table 2-3. Environmental management activities including installation and maintenance of erosion and sediment control systems will also take place during construction.

Construction materials and workforce will be transported to the site via road. Site access is proposed to be from the Arnhem Highway through Section 1580; however, the exact route will be determined during detailed design in consultation with relevant authorities, surrounding mineral title holders and subject to a formal traffic impact assessment.

Where possible, construction materials such as concrete aggregate, soil and sand will be obtained locally from existing quarries and batch plants in Darwin and the NT region. Exact sources for these materials will be determined through detailed design as volume requirements are determined.

Power for construction will include a combination of temporary solar and battery storage on site, likely supplemented by diesel generators during the establishment and early works phase. Because the proposal will generate renewable energy, there will be negligible emissions from power generation throughout the life of the proposal. The main air emissions over the life of the proposal will be dust during land clearing and earthworks, and to a lesser extent during operations. While there will be an estimated 275,000 tonnes of carbon dioxide equivalent (tCO₂e)⁵ released associated with land clearing, the proposal is expected to achieve net zero emissions over its operational life. The solar farm and battery storage system will generate renewable electricity, offsetting emissions from grid electricity and other sources, thereby contributing to reduced greenhouse gas emissions both locally and in other jurisdictions. An assessment of greenhouse gas (GHG) emissions will be undertaken to determine the net emissions throughout the life of the proposal and identify potential abatement opportunities. There will also be contributions of GHG emissions from the operation of petrol- and diesel-powered vehicles, plant and machinery during construction and to a much lesser extent during operation.

Construction water will be required for road construction, concrete batching and dust suppression and potable water will be required for the construction workforce (for example, temporary site offices). Groundwater will not be extracted. Water is expected to be sourced from mains supply or alternative water supply (for example, truck delivery). During detailed design, estimates of water requirements will be developed and will inform a thorough assessment of where water will be sourced from to ensure water use is sustainable. Rainwater may be captured and stored in above ground tanks for operational use onsite (for example, dust suppression, equipment washdown) as part of sustainable water management. If this is identified as a requirement during detailed design, it would be subject to appropriate assessments to determine the suitability of rainwater capture and the methods used at the site, accounting for stormwater management and potential impacts on surrounding watercourses.

Non-hazardous waste will be generated during construction, which will include construction material, domestic putrescible wastes and packaging wastes. No on-site disposal of waste will occur. All waste will be stored in appropriate containers for disposal at a licenced waste management facility. Portable ablution blocks will be

⁵ Preliminary estimate based on the [NT Government Carbon Emissions Estimate Calculator](#). Further assessment of GHG emissions will be undertaken as detailed design progresses.

utilised for the construction workforce and will be serviced by a licenced waste contractor as per the *Waste Management and Pollution Control Act 1998* (NT). A waste inventory will be developed during detailed design, and the preferred treatment and disposal methods will be identified.

Small volumes of hazardous materials such as hydrocarbons (for example, oil, fuel, lubricants) will be used during construction. Self-bunded storages will be established for any hazardous material being stored on site. Storage and handling of all hazardous chemicals will be undertaken in accordance with Australian standards and guidelines, codes of practice, and manufacturer's directions.

Table 2-3. General construction activities and required vehicles and plant

Proposal component	General construction activities / required vehicles and plant
Vehicles, machinery, plant, and equipment	The construction activities are expected to include, but not be limited to: • bulldozer • excavator • grader • roller / compactor • trucks • wheel loader • water cart for dust suppression • welding equipment • light vehicles • diesel generator (temporary power supply).
Civil works	Civil works will include: • clearing and earthworks • drainage and stormwater management • access and service roads • fencing and perimeter management • concrete foundations, piling and steel mounting structures for both trackers and power poles • fire water services / emergency infrastructure.
Building works	Building works will include: • electrical switch rooms / substation buildings • administration, operation & maintenance offices • temporary construction facilities (site offices, ablutions, laydown areas) • warehouse and workshop facilities.
Electrical works	Electrical works will include delivery, installation, and commissioning of: • solar panels • direct current (DC) and alternating current (AC) cabling • inverters, transformers, and switchgear • BESS • ancillary services and equipment (e.g. monitoring, communications, control systems).

2.2.4 Operational activities and requirements

During operation, renewable energy will be generated and stored at the solar farm and transmitted via an overhead transmission line (OHTL). As outlined in Section 2.3, the OHTL is a related project and is not within the scope of this referral. Operational activities at the solar farm will comprise routine inspections and maintenance of solar arrays, inverters, transformers, and the BESS, environmental management activities and periodic cleaning of solar panels to maintain performance and efficiency.

Operational water requirements will generally be limited to maintenance and cleaning of the solar panels. Potable water will also be required for the operations and maintenance facility (drinking water, cooking, showers, and toilets). Consistent with the construction phase, no groundwater extraction is proposed. Water supply will likely be sourced from mains supply network, alternative supply (for example truck delivery) or

through on-site rainwater capture and storage, subject to assessment during detailed design. The most suitable and sustainable sources of water will be determined once operational water demand has been estimated more accurately.

The solar farm itself will generate surplus renewable energy during operations. Any electricity required to power ancillary infrastructure will be supplied by renewable energy generated on-site. Back-up generators may be required

Waste generated during standard operations is expected to be minimal, with the main source of operational waste occurring if the proposal is repowered at the end of the initial 30-year operational life. Batteries will likely have a design life of 20 years, though this may vary between suppliers and will be a source of operational waste when they are replaced. Disposal or recycling of the panels and battery materials at end of life will be the responsibility of TE H2. At the end of life, all waste will be removed from site and either recycled or disposed of at appropriate, licensed facilities as recycling technologies evolve.

On-site generation of sewage is expected to be minimal during operations due to low workforce requirements. The type of sewage treatment will be determined during detailed design but will be in accordance with the *Waste Management and Pollution Control Act 1998* (NT). No on-site waste disposal will occur for other waste streams during operations with all waste stored in suitable containers for removal and disposal offsite at licensed facilities.

2.2.5 Decommissioning and rehabilitation

The operational life of the proposal is 30 years with the option to repower/extend to 60 years at the end of the first 30-year period. Following cessation of operations, all infrastructure will be decommissioned and materials and waste removed from the site. As noted above, the disposal and/or recycling of electronic and battery waste will be managed by TE H2, with new recycling technologies anticipated to become available throughout the life of the proposal.

TE H2 will rehabilitate the site in accordance with legislation and regulatory requirements which apply at the time that decommissioning is undertaken, with a commitment for the land to be in a stable and non-polluting state for any determined future use. TE H2 will also be required to enter into an agreement with the landholder, which will stipulate requirements for end of use and rehabilitation.

Prior to decommissioning, a decommissioning and rehabilitation plan will be developed in consultation with relevant authorities and the landholder prior to commencing decommissioning activities.

2.3 Related developments

There are three key related developments that enable the transmission and distribution of the renewable energy generated by the proposed solar farm. The ultimate end use of the solar energy is as a critical input to produce firm renewables energy supply to existing industrial end users on Middle Arm initially and to power green hydrogen production at the MAP at a later stage. To facilitate this, approximately 30 km of overhead transmission infrastructure will be required to connect the solar farm to the proposed MAP. These related developments are being progressed separately and are not included within the scope of this referral.

2.3.1 Overhead transmission line

This referral excludes assessment of the OHTL on the basis that there are ongoing commercial negotiations and coordination with the NT Government for use of the nominated utilities corridor.

Renewable energy generated at the solar farm will be collected on-site in a network of underground and overhead 33 kilovolt (kV) or 66 kV reticulation. The collection points will be up to two 33/330 kV or 33/132 kV substations and switchyards in the north-western corner and the centre of the proposal area, which will connect to a planned high voltage OHTL line running to the MAP on the Middle Arm Peninsula.

The proposed OHTL is planned to run within an existing NT Government corridor zoned Utilities. The corridor is approximately 30 km long and 50 m wide - Figure 2-6. This corridor forms part of the wider Territory Energy

Link, which has been designated and is under active design and planning by the NT Government. The OHTL will consist of an access track, towers, and transmission lines. Detailed co-ordination with NT Government agencies is ongoing to ensure that TE H2's plans are compatible with the infrastructure corridors being developed as part of the MAP and multi-user approach envisaged for zoned utility corridors.

While the OHTL has been mentioned in this referral, the ownership and operation of the OHTL are subject to ongoing negotiations and consultation. The OHTL may ultimately be owned and operated by the NT Government as a shared corridor accommodating multiple proponents and various types of public infrastructure.

At this stage, TE H2 cannot be the proponent for the proposed infrastructure corridor because:

- land tenure sits with the NT Government, and specific consent for TE H2's proposed OHTL cannot be granted in isolation from other uses or infrastructure
- planning and design work for NT Government's Territory Energy Link is still underway, and while TE H2 continues to work with the NT Government and both agree the OHTL will be located within the corridor, the exact location is not currently known; and
- the NT Government supports the proposal; however, TE H2 must proceed with assessments over the solar farm to ensure the generation component of the proposal is secured prior to final investment decisions on transmission infrastructure.

The OHTL will be terminated at the boundary of the MAP and run underground to a new substation on TE H2's designated land parcel, (noting any infrastructure within an approved MAP strategic approval area is excluded from the scope of the proposal in this referral). TE H2 are committed to undertaking the necessary technical studies and impact assessment to support any future approvals within the Territory Energy Link corridor.

2.3.2 Darwin H2 Hub

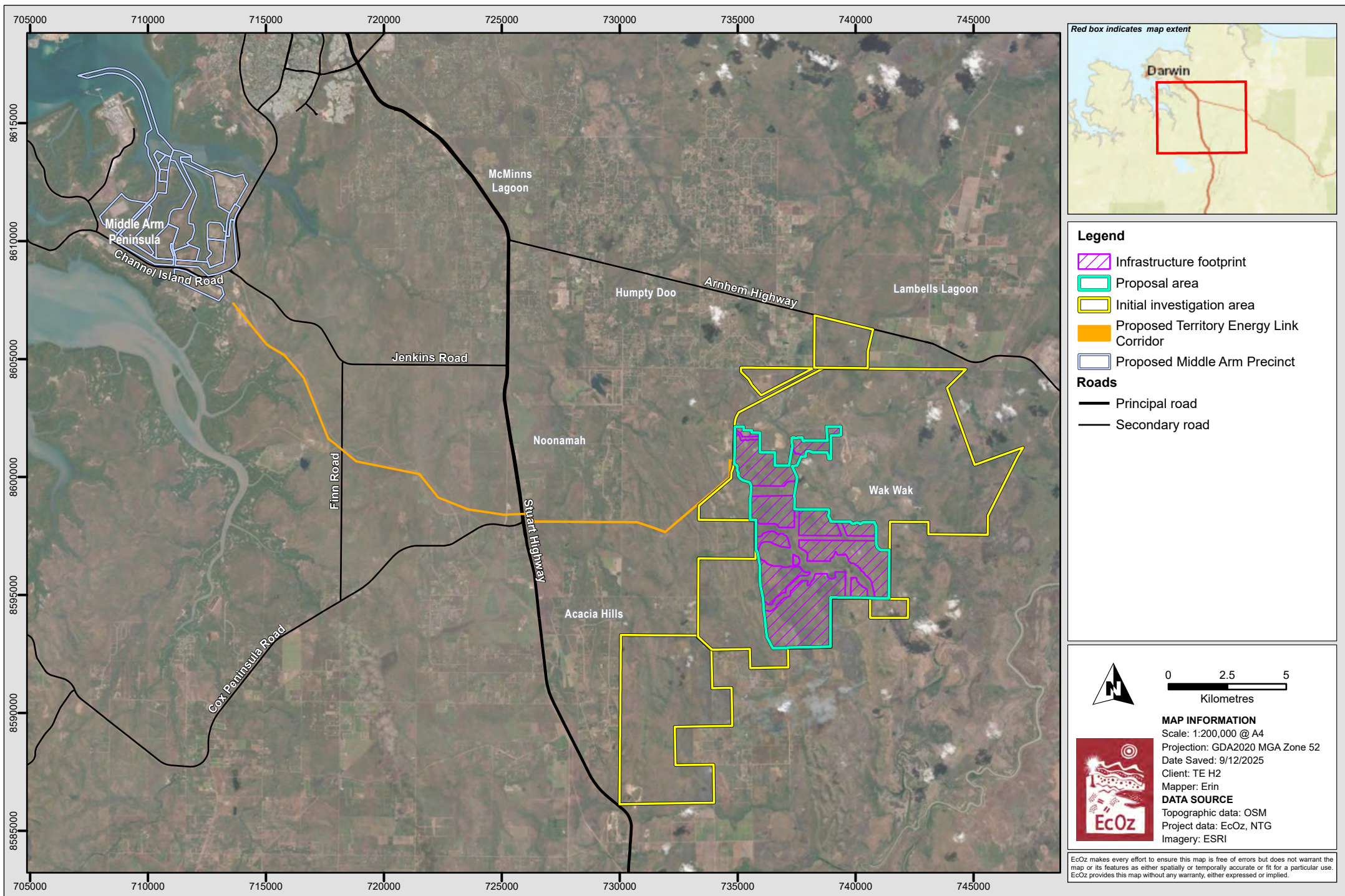
The Darwin H2 Hub – proposed to be located within the MAP on the Middle Arm Peninsula (see Figure 2-6) – is one potential end use for the solar energy generated from the Wak Wak Solar Farm.

The Darwin H2 Hub will be developed by TE H2 and includes construction and operation of a green hydrogen production facility at MAP to produce and supply green hydrogen to national and international markets. The green hydrogen production and supply facilities are within the scope of the NT Government's ongoing MAP strategic environmental assessment and approval for the green hydrogen facility will be sought under the strategic approval (once granted). TE H2 recognise this approvals pathway will require technical studies and impact assessment under a separate approval notice process. This process will commence in line with the MAP approval and undertaken in accordance with the requirements from the NT EPA under the EP Act and DCCEE under the EPBC Act for the MAP.

2.3.3 Middle Arm Precinct (MAP)

Another alternative consumer of renewable energy produced by the proposal are other new energy-intensive industries at the MAP (in addition to the Darwin H2 Hub) and existing industry on the broader Middle Arm Peninsula. TE H2 can scale and tailor energy provision as the MAP evolves and grows. Noting there are potential alternative suppliers of renewable energy to the MAP, and potential other consumers of renewable energy generated by the proposal. The proposal is not reliant on MAP as a consumer, and MAP is not reliant on the proposal as a generator.

As noted above, the MAP is subject to an ongoing strategic environmental assessment under both the NT EP Act and EPBC Act. Any project within the MAP that consumes energy from the Wak Wak Solar Farm will be assessed and approved as part of the strategic environmental assessment.



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 Layout: Figure 2-5. Related projects

Figure 2-6. Map of related projects

2.4 Alternatives

This section presents the various alternative sites, layouts and design approaches that were considered by TE H2 prior to deciding upon the proposal area presented in this referral. TE H2 has undertaken an extensive options assessment process, evaluating multiple potential site locations before identifying the current proposal area as the preferred option. The final siting and layout of the solar infrastructure within the proposal area remains subject to ongoing technical and environmental assessments. These assessments will inform the detailed design to ensure that infrastructure is located and configured to avoid or minimise impacts to environmental, cultural, and social values as much as practicable.

2.4.1 Location

TE H2 commenced investigations for a potential renewable energy and green hydrogen export project opportunity around Darwin in 2021. The objectives were to identify suitable sites close to Darwin and Middle Arm to enable cost-effective, large-scale solar generation for production and export of green hydrogen, as well as potential supply of renewable energy to existing users, and new and existing energy-intensive industries in NT (as part of their decarbonisation plans).

The Middle Arm area was identified early in the process as a suitable location for the downstream electrolyser, hydrogen processing and export facility due to the proximity to existing energy intensive industry, and the alignment with the NT strategic master plan for Middle Arm (that is, MAP).

Initial sites identified for the solar farm included Gunn Point, Cox Peninsula (Blackmore), Weddell and NT Portion 4477 (the selected site). The Weddell area was preferred by TE H2 due to its proximity to the downstream processing facility proposed on Middle Arm. Further investigations into the various sites (including consultations with Invest NT, DLI, and Department of Lands, Planning and Environment (DLPE) Crown Land Estate) resulted in NT Portion 4477 being selected as the preferred site for the proposal due to reduced overlap with other planned developments in the region.

2.4.2 Site design

TE H2 understands that, as a proponent of an action, they have an obligation under the EP Act and the EPBC Act to apply the mitigation hierarchy. This requires demonstrating that concerted, evidence-based efforts have been made through design and site selection to avoid (or reduce the extent of the 'significance' of) potential impacts. In line with this obligation, the proposal area has been refined through the following avoidance and design processes.

Investigations first occurred across approximately 13,000 ha of NT Portion 4477. As described in Section 2.1 ecology surveys referenced in Appendix A only occurred within NT Portion 4477 of the initial investigation area. No ecology surveys have been undertaken within Section 1435, Section 1436 or Section 1580; however, maps through this document show desktop data available for these areas.

Extensive ecology surveys for biodiversity values and baseline flood modelling were undertaken across NT Portion 4477 to then define a 5,000 ha development envelope within which the proposal area⁶ and infrastructure footprint⁷ would be located. These four areas are shown on Figure 2-7.

The following sections detail the steps TE H2 has taken to avoid values in accordance with the mitigation hierarchy and to define the proposal area and infrastructure footprint presented in this referral.

⁶ Proposal area - 3,400 ha encompassing the infrastructure footprint, as well as 900 ha of wildlife corridors and avoidance areas between sections of the infrastructure footprint that will require ongoing management by TE H2.

⁷ Infrastructure footprint – up to 2,500 ha where infrastructure is proposed to be located.

Excise significant vegetation types

As explained in Appendix A – Ecology Report, initial, wet season survey results highlighted that there is a high concentration of biodiversity values associated with sandsheet heath (and, to a lesser extent, rainforest) in the northernmost part of that portion of the initial investigation area, with some additional isolated patches of high-value sandsheet heath in the centre. Based on these survey results, TE H2 excised the following areas to avoid high value biodiversity features:

- The northernmost portion of the initial investigation area containing sandsheet heath and rainforest.
- The few sandsheet heath patches in the centre of the initial investigation area, buffered as per recommendation of the NT *Land Clearing Guidelines* (DEPWS, 2024b).
- Riparian vegetation, buffered as per the NT *Land Clearing Guidelines* (DEPWS, 2024b) recommendations.

This work resulted in exclusion of these areas from the infrastructure footprint. The only significant vegetation type that could not be avoided are three swamps that are partially or wholly within the infrastructure footprint (total of 28 ha) – all are considered low value (see Section 5.2.1 for further detail):

- One comprises 8 ha of *Melaleuca leucadendra*.
- One is 16 ha of *Melaleuca cajuputi* fringed with grassland.
- One is approximately 4 ha of *Melaleuca leucadendra*.

Avoid high quality savanna woodland habitat

TE H2 also engaged EcOz to undertake a habitat quality survey over the initial investigation area relating to key threatened species. This information was used in conjunction with other targeted ecological surveys to inform the infrastructure footprint (up to 2,500 ha) within the final 3,400 ha proposal area. Given the initial investigation area is dominated by savanna woodland of varying quality, the objective was to avoid the areas with the highest biodiversity values.

As discussed above, through an iterative design process, TE H2's proposed 5,000 ha development envelope had avoided habitats supporting threatened species that have a restricted range (namely those associated with sandsheet heath, rainforest and riparian vegetation communities). However, as detailed in Section 5.2, targeted surveys have also resulted in records of two threatened flora species and four threatened fauna species within the savanna woodlands (the most common habitat in the region) of the 5,000 ha development envelope. These species are:

- | | |
|-------------------------------|------------------------------------|
| • Black-footed Tree-rat | • Darwin Cycad |
| • Northern Brushtail Possum | • <i>Typhonium praetermissum</i> . |
| • Partridge Pigeon | |
| • Bare-rumped Sheath-tail Bat | |

The threats to these species are multi-factorial; there is not one direct cause for observed population declines. Given the scale of the infrastructure footprint required to achieve the necessary power output, and the limited land available within reasonable proximity to Darwin that has already been subject to clearing, avoiding having an impact to these species entirely is not feasible. Therefore, minimising potential impacts as part of the initial site selection and design for the proposal was prioritised.

To this end, the focus was turned to one of these species – the Northern Brushtail Possum – as an *umbrella species*⁸ because it was the most widely recorded in the 13,000 ha initial investigation area. Doing so presumes that the spatial extent of the predicted likelihood of occurrence and high habitat quality for that species coarsely encompasses those for the other threatened woodland species. This presumption is based upon the current knowledge of these species that suggest that the threats and habitat characteristics that these species rely upon is a subset of the threats and habitat characteristics associated with Northern Brushtail Possum. As detailed in Section 5.2.3, because of its abundance and broad distribution across the initial

⁸ An *umbrella species* is one for which protection of the species offers protection to other species that share the same habitat.

investigation area, the Northern Brushtail Possum is considered to be the threatened species with the inherently highest potential to be significantly impacted by the proposal under the provisions of the EP Act and EPBC Act. Therefore, the modelled impact for the Northern Brushtail Possum is assumed to represent a conservative proxy for the highest potential impact on any savanna woodland species.

EcOz undertook an assessment of habitat quality for the Northern Brushtail Possum across almost the entire 13,000 ha initial investigation area – excluding areas under granted mineral leases and known registered sacred sites under the *Northern Territory Aboriginal Sacred Sites Act 1989*. As detailed in Appendix B – Constraints Report, two independent approaches were used to measure and determine the quality of habitat and likelihood of occurrence for the Northern Brushtail Possum:

1. The first approach used remote-sensing products and statistical analyses to develop a species' distribution model of threatened woodland fauna for the initial investigation area. The model was formulated and statistically validated with survey records (presence and absence data of focal species) collected by EcOz as part of surveys for the proposal.
2. The second approach leveraged the habitat characteristics measured during an intensive ecological survey of the initial investigation area. A total of 170 sites were surveyed for a range of attributes that are thought to be associated with the species.

These attributes were combined and scored using a rubric that has been developed by EcOz for this species in the Top End (see Appendix B – Constraints Report). Spatial statistics were used to derive a map of interpolated habitat scoring across the initial investigation area. The results of both approaches were added together into a composite map. This mapping suggested that areas in the south-west of the initial investigation area contain the highest quality woodland habitats, with other areas of high-quality habitat in the far north. Areas in the far south, central and eastern parts of the initial investigation area have lower estimated habitat quality for threatened woodland fauna. This uneven distribution of values is likely the product of the inter-relationship between differing fire frequencies and availability of refugial habitat across the region.

TE H2 used the results of this constraints analysis to focus the location of the infrastructure footprint of the solar farm within the lowest quality habitat for Northern Brushtail Possum (and still avoiding significant vegetation types, as discussed above) – see Figure 2-8. Because habitat quality for the Northern Brushtail Possum is closely aligned with the other threatened woodland species recorded in the area, avoiding higher quality habitat is of benefit to all the threatened woodland species recorded in the region. Moreover, the proposed infrastructure footprint is intersected by wildlife corridors – see Figure 5-5 – which have been retained or incorporated into the design to reduce habitat fragmentation and minimise impacts on threatened woodland species. These focus on existing riparian areas along drainage lines, and specifically excluded corridors maintaining connection between areas of higher habitat quality or biodiversity value from the infrastructure footprint.

While TE H2 have undertaken extensive avoidance efforts to date, it is acknowledged there are other, equally important values – for example, cultural and heritage features – that have not yet been surveyed as extensively. Planning for these surveys is well progressed and will commence in late 2025/early 2026. Further studies may identify additional values which will be incorporated into detailed design.

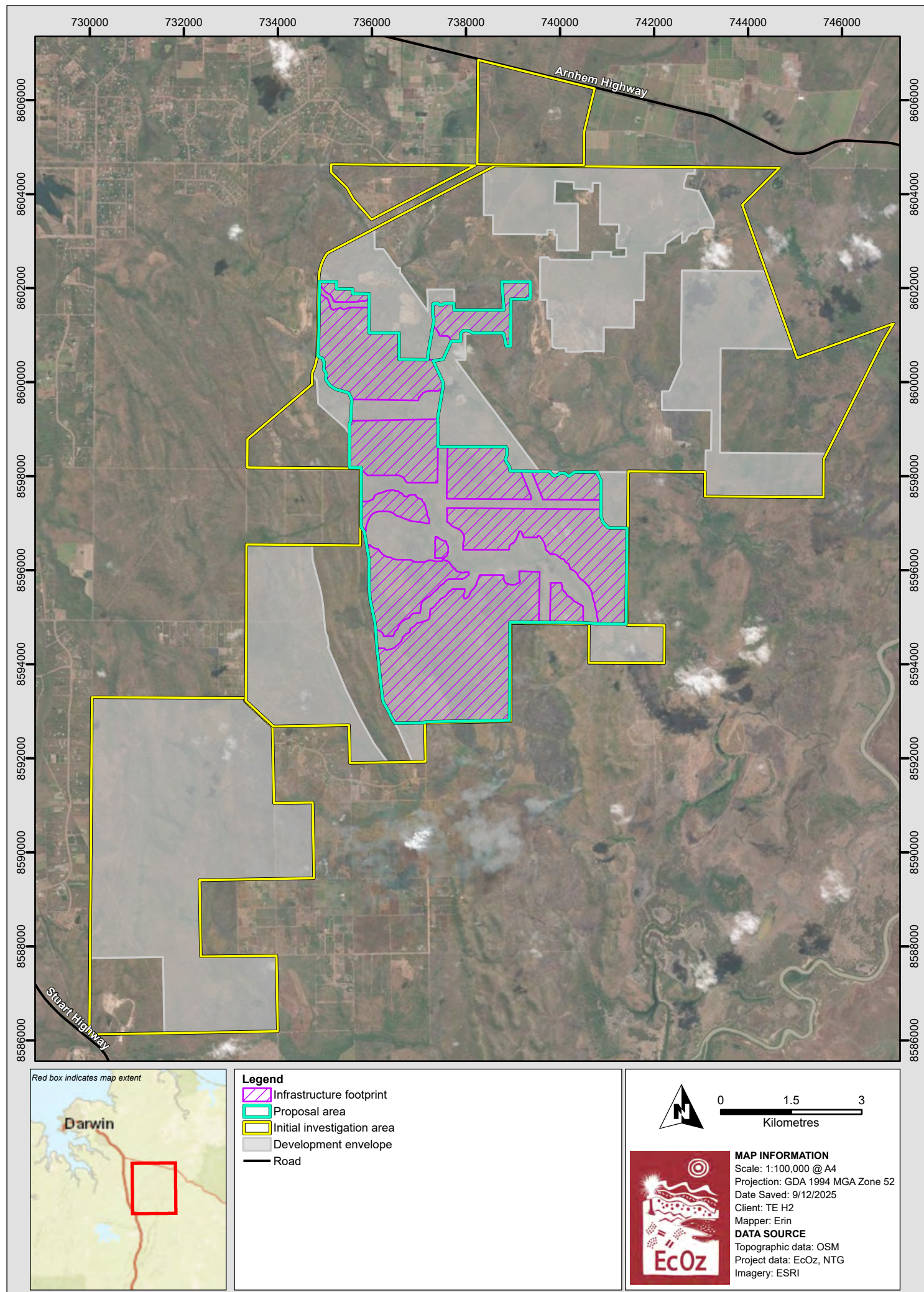
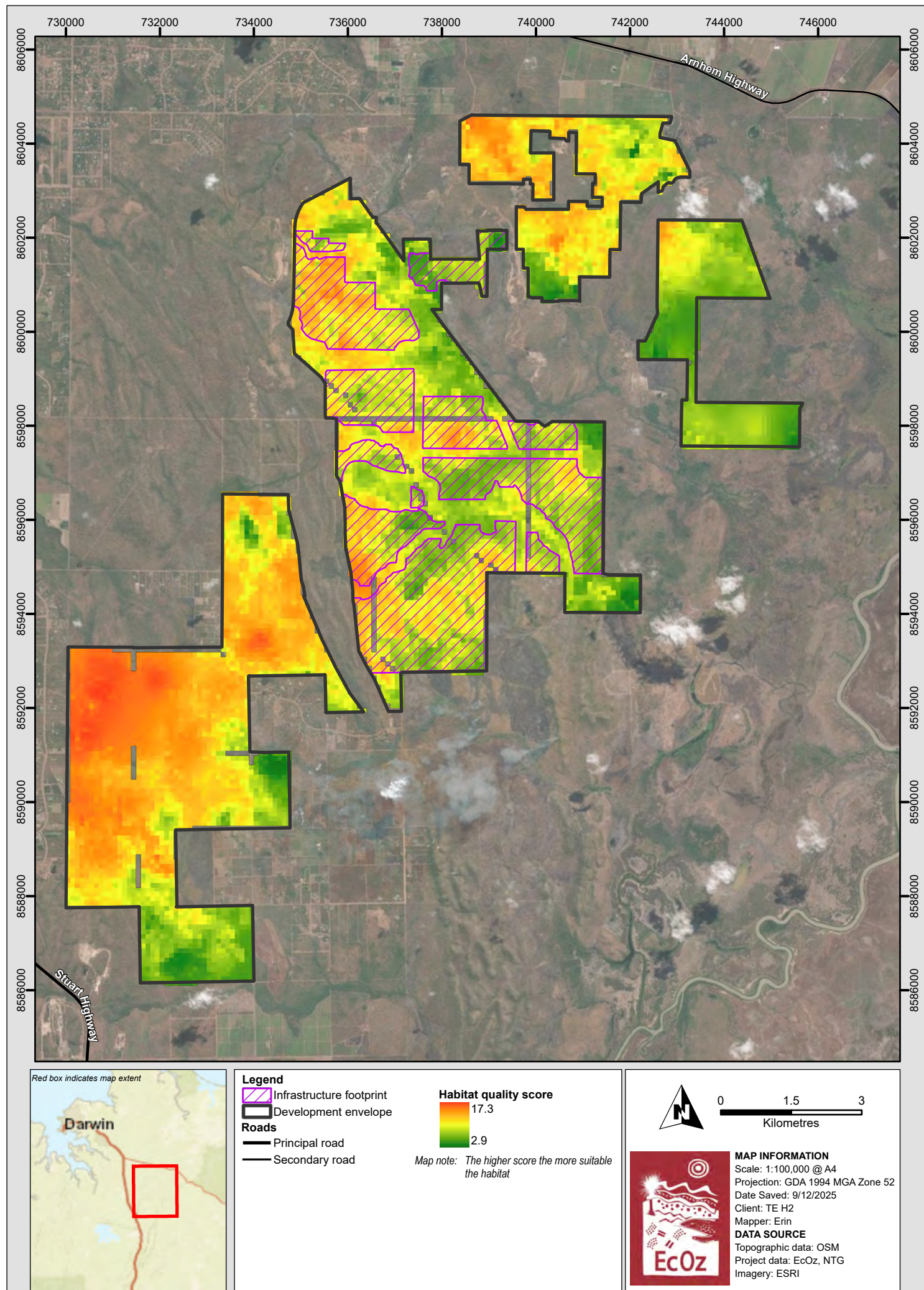


Figure 2-7. Map of investigation area, development envelope, proposal area and infrastructure footprint



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 Layout: Figure 2-7. Map showing location of proposal area relative to Northern Brushtail Possum habitat quality

Figure 2-8. Map showing infrastructure footprint relative to Northern Brushtail Possum habitat quality

3 REGULATORY CONTEXT

The following sections discuss the policy context of the proposal at both the NT and Commonwealth levels, required primary approvals, licences and authorisations, and describe how the proposal has applied the principles of environment protection and management (Part 2 of the EP Act), and general duty on proponents (section 43 of the EP Act).

3.1 Strategic and planning context

Both NT and Commonwealth Governments have been focused on the pathway to net zero emissions, including the role renewable energy generation will play in the transition away from fossil fuel energy resources for both domestic supply and international export.

Table 3-1 describes how the proposal aligns with key policies and strategies prepared by both NT and Commonwealth Governments.

Table 3-1. Strategic policy and plans relevant to the proposal

Policy/plan	Relevance to the proposal
Australian Government's Climate Change Bill – legislating emissions reductions targets	In 2022, the Australian Government passed the <i>Climate Change Bill 2022</i> which legislates Australia's greenhouse gas emissions reductions targets of a 43% reduction from 2005 levels by 2030, a 62-70% reduction by 2035 and net zero emissions by 2050. The proposal aligns with this national policy setting by contributing to emissions reductions targets within the NT, through production and distribution of renewable energy.
Australian Government's Future Made in Australia Act 2024	In 2024, the Australian Government enacted the <i>Future Made in Australia Act</i> to support the development and decision making for public investment in identified priority industries. The Act also aims to strengthen Australia's sovereign manufacturing capability, build secure and resilient clean energy supply chains, and maximise local economic participation in the transition to net zero Renewable hydrogen is identified as a priority industry for net zero transformation based on Australia's advantage of renewable energy, the contribution to decarbonising hard-to-abate sectors and the alignment with international trading partners current and future needs (Treasury, 2024). The Australian Government have set a clear ambition to develop the renewable hydrogen industry with the introduction of funding packages to stimulate development, such as the hydrogen production tax incentive. This proposal aligns with the national ambitions because the solar energy generated by the proposal may ultimately be used to power a renewable hydrogen production facility.
Australia's National Hydrogen Strategy (DCCEE, 2024)	Australia's National Hydrogen Strategy supports the Future Made in Australia Act by providing the framework to achieve the ambition of establishing Australia as a global leader for renewable hydrogen. The Strategy identifies the NT as being a strategic area for renewable hydrogen based on the abundance of renewable energy resources with vast areas of land for potential development, and the strategic proximity to international markets. This proposal aligns with the national ambitions because the solar energy generated by the proposal will ultimately be used to power a renewable hydrogen production facility.
Australia's Net Zero Plan (DCCEE, 2025)	The Australian Government has outlined a pathway to Net Zero by 2050, which includes five decarbonisation priorities. The proposal will directly or indirectly contribute to three of the five priority areas: • clean electricity across the economy • lowering emissions by electrification and efficiency • expanding clean fuel use.

Policy/plan	Relevance to the proposal
Paris Agreement	The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016. The Paris Agreement strengthens global response to the threat of climate change by: • holding the increase in global average temperature to well below 2°C above pre-industrial levels • pursuing efforts to limit temperature increase to 1.5°C. Under the Agreement, Australia must submit emissions reduction commitments. The proposal will contribute towards Australia's overall move towards reducing its GHG emissions.
Renewable Energy Target	The Renewable Energy Target (RET) is an Australian Government scheme that aims to reduce greenhouse gas emissions in the electricity sector and increase renewable electricity generation. The RET sets a target to deliver an extra 33,000 gigawatt-hours (GWh) of electricity from renewable sources every year from 2020 to 2030 (CER, 2025). The proposal is in line with the RET by providing renewable energy to both new and existing industry.
Northern Territory Government's Climate Change Response: Towards 2050 (DENR, 2020)	The NT Government recognises the challenge climate change presents for the global community and the importance of a well-managed transition to a low-carbon economy. In response, the NT Government has a goal of achieving net zero emissions by 2050 by progressively reducing net GHG emissions in the NT. The proposal would contribute to achieving the goal of net zero emissions by 2050, by supplying renewable power to the grid and other industries.
Northern Territory Renewable Hydrogen Strategy (DTBI, 2020)	The Northern Territory Renewable Hydrogen Strategy (DTBI, 2020) articulates the potential hydrogen opportunities, competitive advantages and how the NT can leverage these to be a centre of hydrogen technology research, production and use in Australia. This proposal aligns with the national ambitions because the solar energy generated by the proposal may ultimately be used to power a renewable hydrogen production facility.

3.2 Approvals, licenses and authorisations

The proposal will adhere to all relevant NT and Commonwealth legislation and will be required to obtain all associated permits and approvals. The NT EPA will assess the information presented in this referral to determine if the proposal requires assessment under the EP Act. Relevant primary legislation is described in Table 3-2.

Table 3-2. Commonwealth and Territory legislation applicable to the proposal

Legislation	Relevance
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)	The proposal has potential to impact on listed threatened species and communities (section 18 & 18A of the EPBC Act) (refer to Section 7 of this referral for further detail). A referral is being submitted under the EPBC Act for the proposal. Should assessment and approval be required under the EPBC Act, this would be undertaken in accordance with a Bilateral Agreement made under section 45 of the EPBC Act between the Minister for the Environment (Commonwealth) and the Northern Territory.
<i>Native Title Act 1993</i> (Commonwealth)	There are no current native title claims over the proposal area; however, the proposed land use triggers a future act under this Act. TE H2 are in negotiations with the Northern Land Council (NLC), Traditional Owners and relevant representative bodies to discuss land access and land use agreements.
<i>Building Act 1993</i> (NT)	All buildings constructed in the NT must comply with the standards and codes prescribed under the <i>Building Act 1993</i> (NT). Works within declared building control areas also require building permits and occupancy certificates. The proposal is within the Darwin Building Control Area and will therefore require building permits and occupancy certificates where relevant.

Legislation	Relevance
<i>Bushfires Management Act 2016</i> (NT)	The controls on fire activities provided in Part 4 of the Act will apply to the proposal, including the requirement to establish fire breaks, controls on high-risk activities during fire danger periods, and compliance with fire bans.
<i>Control of Roads Act 1953</i> (NT)	Should any work be required within a road reserve for a road under the care and control of the NTG or a Local Council, a permit may be required under the <i>Control of Roads Act 1953</i> (NT). If the work involves creating a new access, modification of an existing access, discharging stormwater or installation of new infrastructure within the NTG road network, a Road Agency Approval may be required. TE H2 are progressing stakeholder consultations and a Traffic Impact Assessment to determine if permits are required and to inform any subsequent application process.
<i>Environment Protection Act 2019</i> (NT)	This referral report has been prepared and submitted under the EP Act, on the assumption that the proposal will trigger the need for an Environmental Approval to be granted under the Act.
<i>Heritage Act 2011</i> (NT)	This Act provides for the conservation of the NT's cultural and natural heritage. The Act protects all Aboriginal archaeological heritage places and objects, and other declared heritage places and objects. TE H2 are progressing Aboriginal heritage surveys in consultation with NT Heritage Branch, Larrakia Nation Aboriginal Corporation, NLC and Wulna Traditional Owners and Custodians and will seek to avoid and protect identified places and objects. Where works on a heritage place or object are unavoidable, works approvals will be sought pursuant to Part 3.2 of the Act. Notifications must also be made to the Aboriginal Areas Protection Authority (AAPA) where Aboriginal burial sites or skeletal remains are uncovered.
<i>Northern Territory Aboriginal Sacred Sites Act 1989</i> (NT)	This Act is largely concerned with the protection of Sacred Sites. A person who proposes to use or carry out work on land may apply to the AAPA for Authority Certificate/s in accordance with Division 1A of the Act. The proposal design has accounted for and avoided known registered and recorded sacred sites, noting there may be unregistered sites that require avoidance. TE H2 are progressing ethnographic surveys along with Custodians and will seek to avoid and protect sacred sites (including tangible and intangible values). TE H2 will apply for an Authority Certificate over all proposed development areas to ensure that Sacred Sites are identified and protected.
<i>Pastoral Lands Act 1992</i> (NT)	The <i>Pastoral Lands Act 1992</i> (NT) provides for the conversion and granting of title to pastoral land and the administration, management and conservation of pastoral land, and for related purposes. The proposal will require the following approvals under the <i>Pastoral Lands Act 1992</i> (NT): • Non-pastoral Land Use Permit for non-pastoral use of pastoral land under a Perpetual Pastoral Lease. • Pastoral Land Clearing Consent for clearing of native vegetation on pastoral land under a Perpetual Pastoral Lease.
<i>Planning Act 1999</i> (NT)	The <i>Planning Act 1999</i> (NT) provides for appropriate and orderly planning and control of the use and development of land, and for related purposes. The proposal will require the following approvals under the <i>Planning Act 1999</i> (NT): • Development Permit for: - o Impact assessable development – as the use of land for a renewable energy facility is impact assessable within Rural (R) land under the <i>Northern Territory Planning Scheme 2020 (NTPS 2020)</i>. • Subdivision consent - where the proposal involves the granting of a lease exceeding 12 years
<i>Soils Conservation and Land Utilisation Act 1969</i> (NT)	Provides for the prevention of soil erosion and for the conservation and reclamation of soil. Erosion and Sediment Control Plans (ESCP) will be required to facilitate compliance with the general provisions of this Act. TE H2 will implement an ESCP in accordance with this Act.
<i>Territory Parks and Wildlife Conservation Act 1976</i> (NT)	The Act makes provision for the establishment of Territory Parks and the study, protection and conservation of wildlife in the NT. This includes the classification of threatened species and general protection of native flora and fauna. Section 5.2.3 of this referral assesses whether threatened flora and fauna species listed under TPWC Act are likely to be impacted by the proposal. A permit may be required under Section 55 of the Act, to take or interfere with protected wildlife.

Legislation	Relevance
<i>Waste Management and Pollution Control Act 1998</i> (NT)	This Act regulates the protection, restoration, and enhancement of quality of the NT environment through effective waste management and pollution control practices. The proposal is unlikely to trigger the requirement for an Environment Protection Licence, as it would not involve any of the activities listed in Schedule 2 of the Act. However, the proposal will undertake waste management in accordance with this Act.
<i>Water Act 1992</i> (NT)	The <i>Water Act 1992</i> (NT) provides for the investigation, allocation, use, control, protection, management and administration of water resources, and for related purposes. The Act regulates the use of both surface and groundwater and sets out the purposes for which water can be legally used. Waste discharge to natural waters is prohibited unless licenced under the Act. Water Allocation Plans (WAP) and Water Control Districts (WCD) are declared under the Act. The proposal is within the Darwin Rural WCD. While there is no gazetted WAP for the area, the Adelaide River WAP is currently in development and is due for completion mid-2026. The proposal does not currently involve any activity that requires approval under the Act. As detailed design progresses, compliance requirements under this Act will be reviewed and addressed as necessary.
<i>Weeds Management Act 2001</i> (NT)	This Act protects the Territory's economy, community, industry and environment from the adverse impact of weeds. To comply with the Act TE H2 is required to manage its activities to ensure that declared weeds and potential weeds are not introduced or spread.
<i>Traffic Act 1987</i> (NT)	This Act regulates traffic and the use of roads open to the public. A permit is required where construction activities are proposed within an NT road reserve. To comply with this Act, TE H2 will be required to obtain a permit to undertake any works within a road that is open to public traffic, whether publicly or privately owned. TE H2 are progressing a Traffic Impact Assessment to determine if permits are required and to inform any subsequent application process.
<i>Public and Environmental Health Act 2011</i> (NT)	The Act is relevant if a workforce camp is established on site. Any camp will require ablation and kitchen facilities, which must comply with Northern Territory Department of Health standards. As detailed design progresses, compliance requirements under this Act will be reviewed and addressed as necessary.
Generator Performance Standards (GPS)	The <i>Generator Performance Standards (GPS)</i> establish the technical criteria that all new generation facilities must meet before connection to the electricity network. The standards are relevant to the proposal, which includes solar and battery storage facilities. Compliance with the GPS will ensure the safe and reliable operation of these facilities, support their integration into the existing power network, and maintain grid stability.

3.3 Principles of environmental protection and management

The proposal has applied the principles of environment protection and management (Part 2 of the EP Act), and section 43 general duty on proponents. Details of this are provided in Table 3-3.

Table 3-3. Responses to the EP Act section 42 and 43 requirements

Principles of Ecologically Sustainable Development	
Decision-making principle	Section 18 of the EP Act states: <i>Decision-making processes should effectively integrate both long term and short term environmental and equitable considerations.</i> <i>Decision-making processes should provide for community involvement in relation to decisions and actions that affect the community.</i> <i>Decision-making processes should ensure that decisions or actions directed at minimising harm or a risk of harm or impact to the environment are proportionate to the harm or risk of harm or impact that is being addressed.</i> Both long-term and short-term environmental and equitable matters have been considered in this referral through identification of potential environmental impacts that may occur in both the short- and long-term. TE H2 will undertake ongoing consultation throughout the planning and design phases of the proposal to provide

Principles of Ecologically Sustainable Development	
	opportunity for stakeholders including Indigenous community members to share their views and concerns, and this will then inform ongoing decisions.
Precautionary principle	Section 19 of the EP Act states: <i>If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i> <i>Decision-making should be guided by:</i> • careful evaluation to avoid serious or irreversible damage to the environment wherever practicable; and • an assessment of the risk-weighted consequences of various options. The precautionary principle has been applied throughout the proposal to date and in this referral. Where there is uncertainty in potential impacts and mitigations required to manage these impacts, this has been discussed, with proposed actions to address this uncertainty either already underway or commitments made to address the uncertainty. TE H2 commits to the inclusion of adaptive management measures where relevant and to act in accordance with the precautionary principle in future. The proposal design process is ongoing and is being undertaken in consultation with relevant stakeholders. Significant initial planning work has been undertaken to ensure the proposal infrastructure will be located to avoid and mitigate environmental impacts to the greatest extent practicable – see Section 2.4.
Principle of evidence-based decision-making	Section 20 EP Act states: <i>Decisions should be based on the best available evidence in the circumstances that is relevant and reliable.</i> TE H2 are in an ongoing process of proposal design that is being informed by relevant and recent technical information. They have engaged with various qualified agencies to undertake site and proposal-specific scientific studies that have informed, and will continue to inform, decision-making relevant to the proposal. TE H2 have selected the proposal area through an options assessment that was informed by technical advice and stakeholder engagement. Various technical studies are underway to inform future decision-making, as discussed in detail in the relevant sections of this referral.
Principle of intragenerational and intergenerational equity	Section 21 of the EP Act states: <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of present and future generations.</i> TE H2 are committed to undertaking thorough assessment to minimise the impacts of the proposal so the environment is not impacted in a manner that it would constrain or disadvantage future generations. Provision of a large-scale renewable energy project in the NT will have a variety of social benefits, as well as contributing towards the Commonwealth and NT Governments' net zero GHG emissions targets, contributing to maintaining the health, diversity and productivity of the environment for the benefit of both present and future generations.
Principle of sustainable use	Section 22 of the EP Act states: <i>Natural resources should be used in a manner that is sustainable, prudent, rational, wise and appropriate.</i> TE H2 do not propose to use any natural resource in an unsustainable manner. The proposal inherently supports the sustainable use of natural resources through the generation and supply of renewable energy. Further technical studies will be undertaken to determine requirements for water and raw material use and identify appropriate sources for these materials that do not result in strain on local resources.
Principle of conservation of biological diversity and ecological integrity	Section 23 of the EP Act states: <i>Biological diversity and ecological integrity should be conserved and maintained.</i>

Principles of Ecologically Sustainable Development	
	Clearing of 2,500 ha of a greenfield site is required to facilitate the construction and operation of the proposal. This clearing is unavoidable if the proposal is to achieve the scale of renewable energy generation projected. As outlined in Section 2.4, extensive ecological surveys have been undertaken to inform proposal design and avoid high-quality habitat. TE H2 are committed to responsible environmental management and will mitigate and manage other potential impacts to biodiversity in line with best practice.
Principle of improved valuation, pricing and incentive mechanisms	Section 26 of the EP Act states: <i>Environmental factors should be included in the valuation of assets and services. Persons who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i> <i>Users of goods and services should pay prices based on the full life cycle costs of providing the goods and services, including costs relating to the use of natural resources and the ultimate disposal of wastes.</i> <i>Established environmental goals should be pursued in the most cost-effective ways by establishing incentive structure, including market mechanisms, which enable persons best placed to maximise benefits or minimise costs to develop solutions and responses to environmental problems.</i> TE H2 will ensure that material environmental risks and impacts are appropriately identified and accounted for using environment social governance frameworks that align with investor and stakeholder expectations. TE H2 will bear the costs relating to avoidance and management of any potential environmental impacts from the proposal, including any waste produced.
Environmental decision-making hierarchy	Section 26 of the EP Act states: <i>In making decisions in relation to actions that affect the environment, decision-makers, proponents and approval holders must apply the following hierarchy of approaches in order of priority.</i> <i>In making decisions in relation to actions that affect the environment, decision-makers, proponents and approval holders must ensure that the potential for actions to enhance or restore environmental quality is identified and provided for to the extent practicable.</i> TE H2 have undertaken extensive environmental studies (including biodiversity surveys and flood hydrology modelling) to inform the location of the solar farm. TE H2 have commenced consultation with Aboriginal stakeholders and engaged a team of anthropologists and archaeologists to undertake comprehensive ethnographic and archaeological surveys across the proposal area. This is to ensure ongoing decision-making regarding the proposal location and design prioritises the avoidance of environmental and cultural (both tangible and intangible) values. Where impacts cannot be avoided, industry standard and best practice mitigation measures will be implemented. TE H2 will offset any significant residual impacts if required. Where relevant and identified, TE H2 will work with relevant stakeholders to enhance or restore the environment. The data collected by TE H2 during due diligence surveys will contribute to a better understanding of environmental and cultural values and systems in the Greater Darwin Region.
Waste management hierarchy	Section 26 of the EP Act states: <i>In designing, implementing and managing an action, all reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</i> <i>For subsection (1), waste should be managed in accordance with the following hierarchy of approaches in order of priority.</i> The waste management hierarchy will inform management of waste in all phases of the proposal, including planning and design, construction, operation and decommissioning. The key waste item expected to be generated by the proposal is solar PV panels, however there are other components as listed in section 2.2. TE H2 is investigating options to recycle panels at the end of their operational life.

Principles of Ecologically Sustainable Development	
	All other waste generated by the proposal will be stored, removed and disposed of in accordance with best practice guidelines and by licensed waste handlers. TE H2 will prepare a Waste Management Plan to address end-of-life solar panels in accordance with the waste management hierarchy.
Other section 43 considerations	
Duty 1: Provide communities with information and opportunities for consultation to assist understanding of the proposed action and its potential impacts and benefit.	TE H2 have engaged a local stakeholder engagement consultant – True North Strategic Communication (True North) - who has prepared an engagement and consultation strategy, which will be implemented throughout the environmental approvals process. TE H2 are committed to undertaking best practice community consultation in accordance with the NT EPA's Stakeholder Engagement and Consultation guideline, the IAP2 Guidelines and TE H2 internal engagement standards and frameworks. Further details regarding stakeholder engagement and consultation are provided in Section 4.
Duty 2: Consult with affected communities, including Aboriginal communities, in a culturally appropriate manner.	TE H2 have commenced consultation with the Larrakia Nation Aboriginal Corporation, NLC and AAPA as well as Traditional Owners and Custodians representing the Wulna Traditional Owner groups and will continue to engage with appropriate representative bodies throughout the approvals process. TE H2 are committed to free, prior and informed consent and will enter into an Indigenous Land Use Agreement (ILUA) for the solar farm should a claimant be identified.
Duty 3: Seek and document community knowledge and understanding (including scientific and traditional knowledge and understanding) of the natural and cultural values of areas that may be impacted by the proposed action.	TE H2 have engaged with local Government departments and consulting firms to provide advice regarding the local environment and how the proposal may interact with known values. Due diligence has been undertaken to identify registered sacred sites within proximity to the proposal area and avoid them through design. Archaeological and ethnographic surveys will be undertaken with Traditional Owners, Custodians and appropriate representatives, to be determined by the NLC. Identification of cultural values, both tangible and intangible, will be undertaken through consultation with the NLC and Traditional Owners, and through the AAPA Authority Certificate process.
Duty 4: Address Aboriginal values and the rights and interests of Aboriginal communities in relation to areas that may be impacted by the proposed action.	TE H2 have commenced consultation with the NLC, Larrakia Nation and Wulna representatives and are progressing works and agreements required under the <i>Heritage Act 2011</i> , <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> , the <i>Environmental Protection Act 2019</i> and the <i>Native Title Act 1993</i> . These processes will enable Aboriginal values relevant to the proposal to be identified and negotiations to be documented regarding access and use of the proposal area.

4 CONSULTATION

The EP Act requires proponents to engage with stakeholders who may be affected by their proposal and to support these communities and the public to understand the potential impacts and benefits of a proposed action. The NT EPA's *Stakeholder Engagement and Consultation Guidance for Proponents* (NT EPA, 2021) recognises that stakeholder consultation is an important component of social, cultural and health impact assessments, over and above formal opportunities for feedback on documents placed on public exhibition.

TE H2 have engaged True North to prepare a consultation strategy, to guide TE H2's ongoing consultation.

4.1 Engagement approach

TE H2's objectives and approach to stakeholder engagement, guided by the *Stakeholder Engagement and Consultation Guidance for Proponents* (NT EPA, 2021), are:

- Communication objectives:
 - o Provide all community and other stakeholders with timely, accurate and relevant information about the proposal.
 - o Provide information in language that can be understood by stakeholders and in a culturally appropriate way.
 - o Provide clarity and information on any issues of concern raised by stakeholders.
 - o Build understanding, trust and relationships with individuals or groups likely to be impacted by the proposal.
- Engagement objectives:
 - o Seek feedback from stakeholders – listen to and understand the priorities, values and perspectives of all stakeholder groups.
 - o Identify potential issues or concerns to contribute to better proposal outcomes, avoid mistakes and mitigate negative impacts.
 - o Manage stakeholder expectations.
 - o Provide TE H2 and regulators with confidence that the communities' attitudes, beliefs, values and concerns are well understood and can be managed through all phases of the proposal.

4.2 Best practice standards

The Wak Wak Solar Farm Stakeholder Engagement Strategy provides an outline of TE H2's best practice engagement commitment. TE H2's engagement strategies are informed by industry best practice guidelines including the following:

- Engagement Institute (formerly International Association of Public Participation) spectrum of participation.
- Clean Energy Council Leading Practice Principles: First Nations and renewable energy projects.
- Clean Energy Council Best Practice Charter for Renewable Energy Projects.
- NT EPA Stakeholder Engagement and Consultation: Environment Impact assessment guidance for proponents.
- First Nations Clean Energy Network Aboriginal and Torres Strait Islander best practice principles for clean energy projects.

Table 4-1. Engagement Institute Spectrum of Participation

Level of engagement	Promise to the public
Inform	We will keep you informed.
Consult	We will keep you informed, listen to your concerns and provide feedback on how the public's input influenced the decision.
Involve	We will work with you to ensure your concerns are reflected in the alternatives developed and provide feedback on how the public's input influenced the decision.
Collaborate	We will look to you for advice, ideas and solutions and incorporate those into the decisions as much as possible.
Empower	We will implement what you decide.

4.3 Stakeholder Mapping

TE H2 commenced consultation with key stakeholders in January 2023. Consultation has been undertaken through a variety of methods, including email, phone calls and formal meetings (both virtual and in-person). To date, TE H2 has been in ongoing discussions with various NT Government agencies, including:

- Investment Territory Department of the Chief Minister and Cabinet
- DLI
- DLPE Crown Land Estate
- Land Development Corporation
- Department of Mining and Energy (DME) Mineral Titles.

A variety of other stakeholders have been identified, including from the NT Government, Indigenous organisations and Traditional Owners, environment organisations, industry and community groups, service providers, residents, and mineral title holders – see Table 4-2.

Immediate neighbour engagement commenced in October 2025. Community engagement occurred at Humpty Doo and Coolalinga in December 2025, with all future engagement to be undertaken in accordance with TE H2's Stakeholder Engagement Strategy. TE H2 records all engagement activities and stakeholder information within the Mipela X-Info software.

TE H2 undertook stakeholder mapping to identify key stakeholders, government bodies and representatives, First Nations stakeholders, community and advocacy organisations, industry and businesses, and local communities. These stakeholder groups have informed the engagement approach for the development of Wak Wak Solar Farm.

Table 4-2 provides a summary of key stakeholder identified during the stakeholder mapping process.

Table 4-2. Identified stakeholders

Stakeholder Group	Stakeholders
Federal, State, Local Government	Federal State Government Northern Territory Government Ministers, Members of Parliament, Departments Litchfield Council Councillors, Heads of Departments City of Palmerston Councillors, Heads of Departments Bushfires NT
First Nations	Aboriginal Areas Protection Authority (AAPA) Northern Land Council Larrakia Development Corporation Larrakia Nation Aboriginal Corporation Pudakul Aboriginal Corporation

Stakeholder Group	Stakeholders
Host Landowner, Neighbours	Host Landowner Immediate neighbours
Local community organisations	Environment Centre NT Landcare NT Territory Natural Resource Management Planning Action Network Amateur Fishing Association
Local industry and businesses	NT Farmer's Association Extractive Industries Association NT NT Cattleman's Association NT Road Transport Association Intrapac Projects Pty Ltd Service providers
Surrounding communities	Humpty Doo and rural community

4.4 Social impact assessment

TE H2 has engaged True North to prepare a social impact assessment (SIA) in 2026 to gain insights into the environmental, economic, people and communities, cultural identity, and cumulative impacts or opportunities of the proposal.

The SIA will adhere to the following standards:

- Guidance to proponents on stakeholder engagement and consultation (NT EPA, 2021).
- International Association for Impact Assessment (IAIA) Principles (IAIA, 2003) and Guidance (IAIA, 2015).
- Queensland Guideline for social impact assessment (DSDIP, 2018).
- New South Wales guidelines for social impact assessment ((DHPI, 2017) under revision).
- Guideline for Social Impact Assessment (Munday, 2020) which includes discussion on key indicators that might be incorporated in a strategic assessment.
- Engagement Institute's Core Values, Quality Assurance Guideline (IAP2, 2015) and Spectrum of Participation (IAP2, 2018).
- NT EPA Guidelines for development of an Economic and Social Impact Assessment (NT EPA, 2013).

4.5 Future engagement

Engagement activities will continue in 2026. TE H2 is committed to genuine and meaningful engagement with key stakeholders and the local community and will ensure they are brought along the journey of the proposal development.

All future engagement activities will align with the Wak Wak Solar Farm Stakeholder Engagement Strategy.

5 ENVIRONMENTAL IMPACT ASSESSMENT

The NT EPA has developed a framework for the assessment of environmental impact (NT EPA, 2025). The framework uses 14 environmental factors to provide a systematic approach to organising environmental information and to establish environmental objectives against which proposals will be assessed.

This section provides an assessment of the potential environmental impact of the proposal with regards to the NT EPA's environmental factors and corresponding factor objectives. This assessment focuses on impacts that have been identified as having the potential to be significant.

Pre-referral screening undertaken by EcOz Environmental Consultants determined that the proposal has potential to impact six of the 14 environmental factors – see Table 5-1. These six factors were selected for further assessment either because the environmental values associated with the factor may be significantly impacted, or because there is insufficient information available at the time of writing to make a conclusive assessment. Factors excluded from further assessment are presented in Table 5-2.

Table 5-1. NT EPA factors assessed and reasons for further assessment

Factor	Justification for assessment
LAND	
Terrestrial environmental quality Section 5.1	Land clearing and soil disturbance of up to 2,500 ha has potential to result in erosion and sedimentation impacts.
Terrestrial ecosystems Section 5.2	The proposal area supports threatened species and significant vegetation, and land clearing of up to 2,500 ha of native vegetation has the potential to result in the direct loss of threatened flora, and the loss and/or degradation of habitat for threatened fauna.
WATER	
Hydrological processes Section 5.3	Construction and operation of a large solar farm have the potential to alter surface water hydrological processes. Groundwater processes are unlikely to be significantly impacted because groundwater will not be extracted.
Inland water environmental quality Section 5.4	Large scale clearing and development has potential for impacts to water quality due to sedimentation elevating turbidity. Contamination of water is unlikely due to the nature of the proposal not requiring use or storage of large volumes of hazardous materials and no on-site landfill. The proposal area is in the Adelaide River catchment and drains toward the Adelaide River Floodplain Site of Conservation Significance.
PEOPLE	
Community and economy Section 5.5	The impacts and benefits to community and economy will be dependent on aspects such as construction workforce, local procurement, diversification of the NT's energy supply system, compatibility of the development with land use plans and amenity impacts (e.g. landscape and visual amenity). There is some uncertainty regarding these aspects of the proposal.
Culture and heritage Section 5.6	Registered and recorded sacred sites have been avoided through design to date; however, further survey and consultation is required to determine if there are further unregistered sacred sites within the proposal area. There are no known archaeological records within the proposal area; however, previous survey effort is limited, and a survey will be undertaken to identify the presence of heritage sites or objects in accordance with the <i>Heritage Act 2011</i> .

Table 5-2. NT EPA Factors which were excluded from further assessment

Factor	Justification for exclusion from assessment
LAND	
Landforms	There are no distinct natural landforms present in the proposal area which will be impacted by the proposal. The proposal will not involve substantial earthworks, recontouring, or excavation that would alter the integrity or function of existing landforms or cause significant clearing on steep or erosion-prone slopes or ground disturbance in sensitive geomorphic areas (e.g. escarpments, floodplains).
SEA	
Coastal processes	The proposal area does not contain any values associated with the Sea factors, and proposal activities will not result in discharges, disturbances, or other interactions affecting coastal processes, marine environmental quality, or marine ecosystems.
Marine environmental quality	
Marine ecosystems	
WATER	
Aquatic ecosystems	The proposal area does not include any major aquatic ecosystems. Potential impacts to significant vegetation types sandsheet heath, riparian vegetation and seasonal wetlands/swamps dominated by Melaleuca species are considered within the terrestrial ecosystems factor.
AIR	
Air quality	The key source of air emissions from the proposal is dust generated during construction, which would occur in the short-term and be managed through standard dust suppression and construction staging. Potential air quality impacts related to amenity are considered within the community and economy factor.
Atmospheric processes	The proposal involves the release of greenhouse GHG emissions, predominantly occurring during construction. Scope 1 emissions will arise from land clearing and the use of diesel-powered machinery and vehicles, while Scope 2 emissions associated with electricity consumption during construction and operation will be minimal. Once operational, GHG emissions will be limited due to the minimal requirement for diesel-powered machinery and vehicles, with vehicle use restricted to site maintenance and monitoring. The proposal will generate renewable electricity that provides a positive impact to GHG emissions in the NT. The supply of renewable electricity displaces the need for fossil-fuel based energy which therefore results in avoided emissions. This factor is excluded from assessment due to the isolated nature of GHG emissions and on the basis that the nature of the proposal is consistent with the atmospheric processes objective to minimise GHG emissions to contribute to the NT's goal of net zero emissions.
PEOPLE	
Human health	The proposal is unlikely to impact human health because the proposal does not involve any inherently dangerous or hazardous activities or materials. Potential impacts to neighbouring properties such as generation of dust, noise and vibration are assessed under the community and economy factor.

For each of the six factors selected for further assessment, the following approach was taken to identify and assess environmental impacts from the proposal. Definitions for residual impact ratings are provided in Table 5-3 while further detail/definitions are provided in Appendix C.

- 1) **Identification and characterisation of environmental values:** a combination of desktop and field assessments were undertaken to identify and characterise the existing environment that occurs within the proposal area and surrounds. Values of the environment were then selected for further assessment on the basis that they are ecologically, socially, culturally and/or economically important, and are either likely to be impacted by the proposal, or people are highly concerned that they could be impacted.
- 2) **Identification of potential impacts:** consideration was given to how the activities associated with implementing the proposal could impact each of the environmental values Potential direct and indirect impacts were identified.

- 3) **Avoidance and mitigation:** the mitigation hierarchy was applied to each potential impact, identifying opportunities for impact avoidance. Where avoidance was not possible, mitigation measures were identified.
- 4) **Assessment of impacts:** the residual impact to each environmental values was then assessed considering the context and intensity of the impact, and the scale, duration and magnitude (degree of change) of the impact. Definitions for residual impact ratings are provided in Appendix C.

The focus of the impact assessment in this referral report is on those impacts identified to be potentially significant.

Table 5-3. Significant residual impact ratings and criteria

Minor	Moderate	High
A minor residual impact is unlikely to be significant and generally has two or more of the following characteristics: Scale: limited/localised Magnitude: negligible/minor Duration: short-term/medium-term/reversible. OR There are no sensitive receptors or land uses present, and the environment does not contain any aspects that are valuable or otherwise important or unique, and there is moderate to high degree of certainty about the likelihood and intensity of the impact, and the effectiveness of proposed mitigation measures.	A moderate residual impact has potential to be significant. The significance depends on the acceptability of the impacts and the effectiveness of mitigation measures. A moderate impact generally has two or more of the following characteristics: Scale: localised Magnitude: moderate Duration: medium-term. AND/OR There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique and there is a low degree of certainty about the impact, and the effectiveness of proposed mitigation measures.	A high residual impact is likely to be significant. The level of acceptability will depend on offsets or benefits compensating for the impact. A high impact generally has two or more of the following characteristics: Scale: regional/widespread Magnitude: major Duration: long-term/permanent. AND There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique.

Table 5-4. Scale, magnitude and duration criteria

Scale	Magnitude	Duration
Limited - immediate vicinity of activities. Localised – within the boundary of the proposal area. Regional – extends outside the proposal area and affects the localities surrounding the proposal area. Widespread – affects the broader Greater Darwin Region/beyond.	Negligible - no discernible impact on existing environmental condition. Minor - impact is measurable but relevant thresholds or criteria for environmental protection are met. Moderate - relevant thresholds or criteria for environmental protection are reached or slightly exceeded, but environmental values, ecological integrity and function, including sensitive receptors are not affected. Major - relevant thresholds or criteria for environmental protection are exceeded to the point that environmental values are impaired and the ecological function and/or extent of sensitive receptors are affected.	Short-term - impact occurs sporadically and/or lasts for a few days to weeks, after which values recover. Medium term - impact occurs intermittently and/or only during the construction phase, after which values recover. Long-term - impact occurs over an extended period covering the construction and operational phases, and values eventually recover. Permanent/irreversible - impact is enduring, values are unlikely to recover.

5.1 Terrestrial environmental quality

The NT EPA's objective for the terrestrial environmental quality factor is to:

Protect the quality and integrity of land and soils so that environmental values are supported and maintained.

5.1.1 Presence of environmental values

The environmental values identified for assessment under the terrestrial environmental quality factor are:

- **Land and soil integrity** – intact land and soils are valued due to their role in supporting future land uses and preventing offsite impacts to water quality associated with erosion and turbidity and sedimentation.
- **Land and soil quality** – clean (uncontaminated) land and soils are valued as they support land uses and biodiversity, and prevent offsite contamination and water quality impacts.

This section was informed by the following information sources:

- NR Maps: Natural Resource Maps NT (DLPE, 2025).
- NT *Land Clearing Guidelines* (DEPWS 2024).
- Land Resources of the Elizabeth, Darwin and Blackmore Rivers – Greater Darwin Area, Northern Territory (DLPE, 2000).
- Aerial image review on Google Earth Pro.
- The Land Resources of the Elizabeth, Darwin and Blackmore Rivers (Fogarty, Lynch and Wood, 1984).

Land and soil integrity

Land units within the proposal area are mapped and described in *Land Resources of the Elizabeth, Darwin and Blackmore Rivers – Greater Darwin Area* (DLPE, 2000; Fogarty, Lynch and Wood, 1984). Land units, slope and drainage information for each landform within the proposal area are summarised in Table 5-5, and the extent of landforms are shown on Figure 5-1.

As shown on Figure 5-1, most of the north and a large section in the south and east of proposal area is characterised as well-drained rises and low hills, with parts of the south also being characterised as slow draining plains. A few small sections of the proposal area – mostly isolated patches around the periphery of the proposal area - are mapped as drainage systems, swamps, alluvial plains and marine areas with severe levels of seasonal soil waterlogging or inundation.

Topography across the infrastructure footprint is patchy, with some areas having slopes greater than 2% (approximately 700 ha) – see Figure 5-2. The remainder is generally flat, with slopes under 2%. Slopes of greater than 2% present a high risk of erosion.

Existing erosion across the site is unknown; however, given the limited previous disturbance across the site it is expected to be minimal.

Land and soil quality

The proposal area is generally greenfield and undisturbed with limited potential for contamination of soils; however, there are relatively small parts of the northern section of the proposal area that have been subject to previous disturbance within historic mineral leases. Additionally, there are active mineral leases adjacent to the northern parts of the proposal area. Activities associated with extractive industries that may have caused soil contamination include:

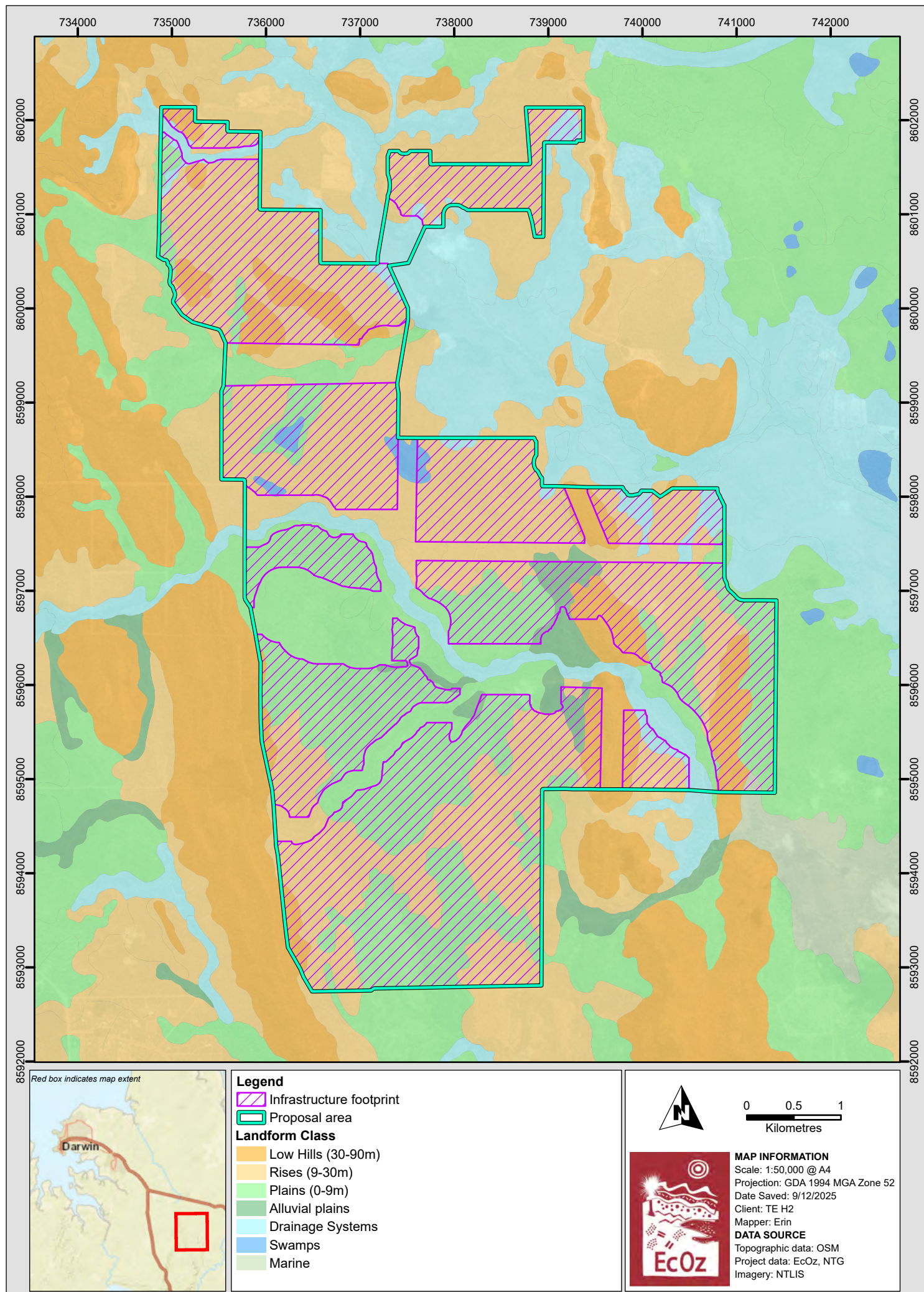
- land clearing activities
- construction and use of access tracks
- use of light and heavy vehicles and machinery
- sand mining/extraction
- storage, use of and potential spills from fuels and other hazardous materials.

Any contamination resulting from previous and current extractives activities is likely to be minor and isolated, due to the nature of activities. Broadscale or severe contamination is not known to be present within the proposal area.

Disturbance and land use in the central and southern sections is minimal, with some pastoral activities assumed to have been undertaken throughout the broader property.

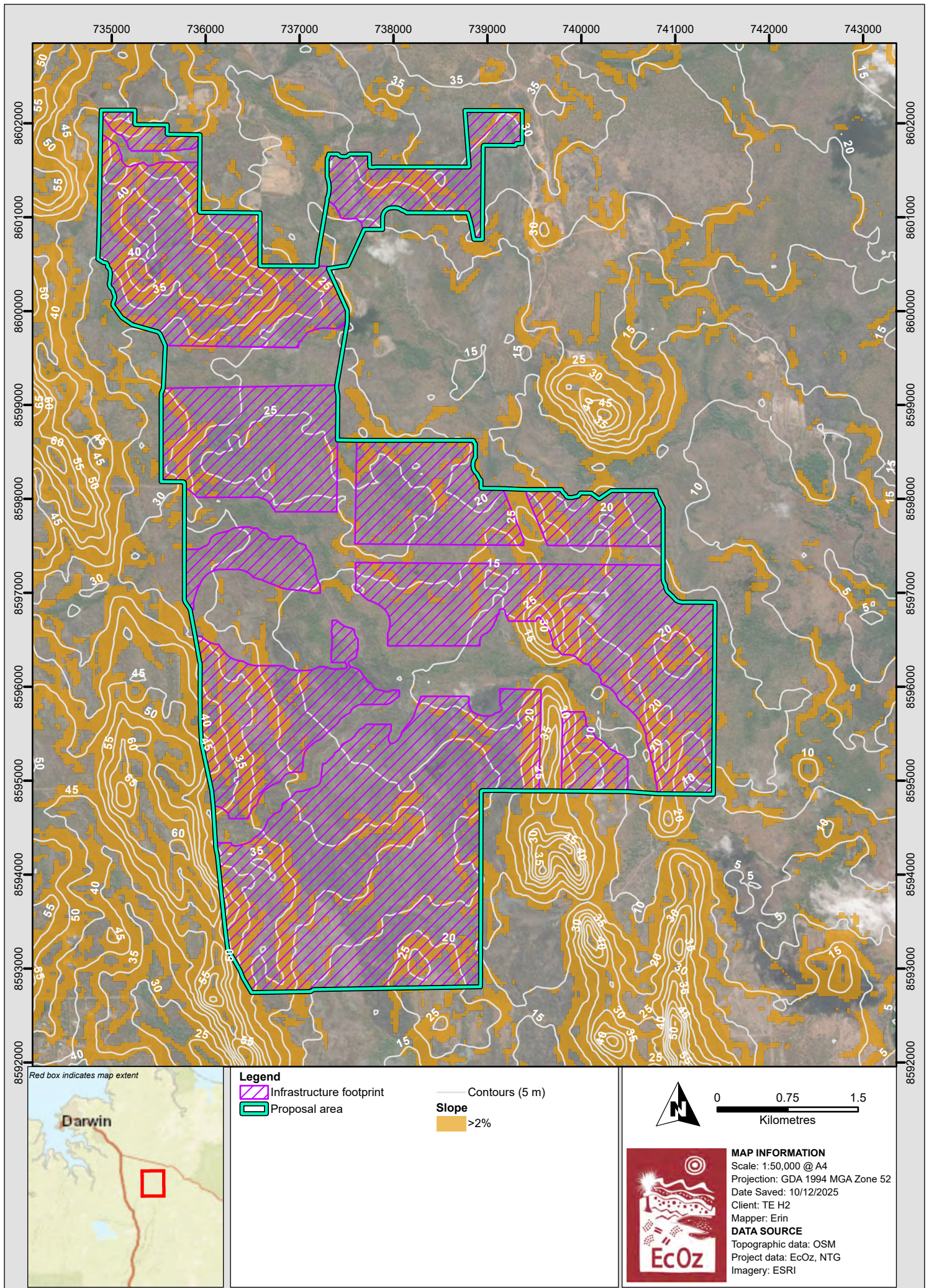
None of the proposal area or surrounding properties are registered contaminated sites under the *Waste Management and Pollution Control Act 1998*, and there have been no audits within or surrounding the proposal area.

Acid sulfate soil (ASS) mapping indicates a high risk of ASS to the east of the proposal area within the Adelaide River floodplain; however, only small (approximately 3 ha) areas in the east of the proposal area have a high risk/very low confidence of ASS – see Figure 5-3. The remainder of the proposal area has either low or extremely low probability of ASS being present.



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 Layout: Figure 5-1. Landforms relevant to the proposal area

Figure 5-1. Map of landforms within the proposal area



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Layout: Figure X-X. Elevation contours and slope

Figure 5-2. Map of topography within the proposal area

Table 5-5. Summary of landforms and soils relevant to the proposal

Landform	Description
Low hills	Low hills within the proposal area consists of land unit 1b, which is characterised by steep ridges between 10 – 40% slopes. The landform is rapidly drained and soils experience nil to low levels of seasonal waterlogging.
Rises	The rises landforms consist of land units 2a1, 2b1 and 2b2. These areas are rapidly drained, and soils are well drained with nil to low level of seasonal soil waterlogging. Slopes are generally between 2 – 5%.
Plains	The plains landform consists of land units 3b, 4a, 4b, 5b2, 6a1, 6a2 and 6b. Land units 3b, 4a and 4b are generally characterised by slow drainage with moderate to high levels of seasonal waterlogging. Generally, these land units are flat to gentle lower slopes (between 0.5 and 2.5% slope). Land units 5b2, 6a1, 6a2 and 6b are generally characterised by very poorly-drained soils with severe seasonal waterlogging. These are also relatively flat areas (>1.5% slope) of incised drainage floors with upland terrain or broad lowland plains.
Alluvial plains	Alluvial plains within the proposal area consists of land unit 5a, which is characterised by narrow upland alluvial plains with slopes of <1%. This land unit is characterised by very poorly-drained soils with severe seasonal waterlogging.
Marine	A very small area of marine landform is mapped within the proposal area in the form of land unit 8a1 which is characterised as extensive plans with slopes of <0.5% and very poorly drained soils.
Swamps	The swamps landform within the proposal area is mapped as land unit 8b – swamp depressions with very poorly drained soils.

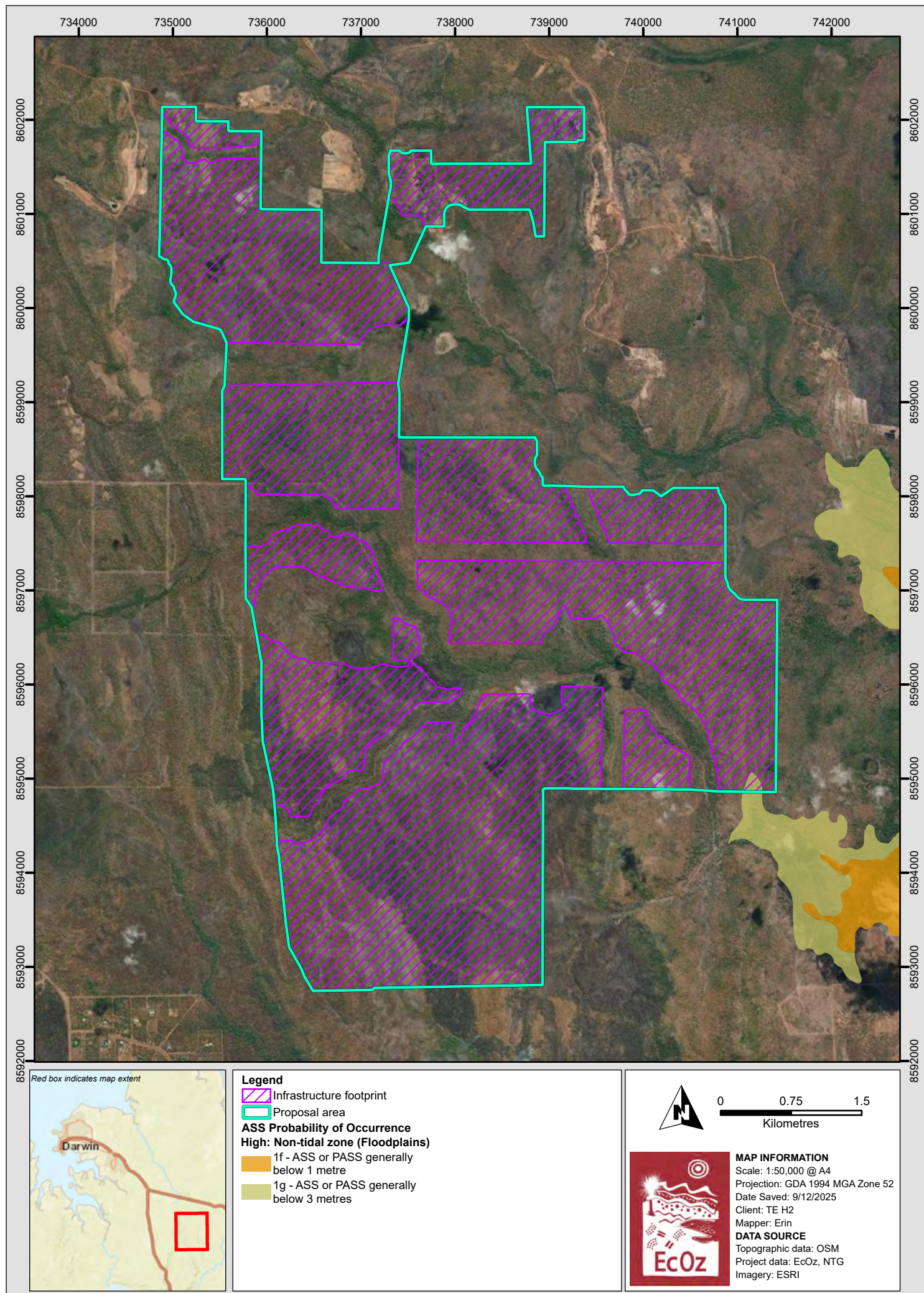


Figure 5-3. Map of historic disturbance and ASS risk relevant to the proposal area

5.1.2 Impact assessment

Potential impacts to the environmental values of the terrestrial environmental quality factor were identified and assessed in accordance with the methodology outlined in Section 5. The potential impacts, avoidance and mitigation, and residual impact significance rating are summarised in Table 5-6 and described further below.

Erosion and topsoil migration

There is potential for erosion and soil loss from vegetation clearing and earthworks, changes to surface water flows and exposure of soil within the proposal area during construction. These risks are increased for areas with a slope of greater than 2% and due to the Top End climatic conditions of intense rainfall in the wet season. While construction will likely occur over several years, the mitigation measures described in Table 5-6 would minimise the potential for erosion, resulting in only localised areas of erosion occurring, largely around stormwater drainage outfalls. Frequent monitoring, as prescribed in an endorsed ESCP, would ensure any erosion identified would be rectified in the short-term.

While there is an ongoing risk of erosion across the proposal area during the operation phase from altered surface water hydrology (see Section 5.3.2) and areas of exposed soils, this is expected to be most prevalent in the first few years post construction as the soils stabilise. Isolated occurrences of erosion may occur during each wet season and will require remediation to limit the impact. The installation of stormwater drainage infrastructure will mitigate erosion by managing and redirecting the flow of surface water runoff, reducing the velocity and concentrations of flows that cause soil damage. This provides management both for erosion within the site and offsite, as the stormwater drainage system will be designed to discharge at similar rates to existing conditions. These measures reflect current best practice for erosion and sediment control across the Top End.

Given the site's relatively low relief, progressive stabilisation of disturbed areas, and adoption of industry standard practice erosion control measures, the residual risk of erosion is assessed as minor.

Contamination of soils

There is potential for contamination of soils from spills and leaks of hazardous chemicals, improper waste storage and sewage/wastewater seepages. Based on the implementation of the avoidance and mitigation measures described in Table 5-6, any spills would be considered minor and localised due to the small volumes to be stored and used on site and appropriate bunding/storage will reduce the amount or volume of materials that could interact with soils. Additionally, any spills would be remediated in the short-term. There will be no landfill on-site, with waste stored temporarily in appropriate containers prior to removal and disposal to a licenced facility. There is a high degree of confidence that these measures will be effective in avoiding significant residual environmental impacts.

Due to the limited existing contamination on site and minor areas of ASS likely to be present, disturbance of ASS or contaminated soils there is not considered to be potential for a significant impact on soil quality. While there are no known areas of existing contamination present on site, works will be undertaken in accordance with an Unexpected Finds Procedure (stop works protocol) that would contain measures to take if unexpected contamination is encountered.

Any materials including fill brought to site will be sourced from licensed facilities and certified as clean prior to use.

Based on this, the residual impact significance has been assessed as minor.

Table 5-6. Preliminary impact assessment – terrestrial environmental quality

Impact	Proposed Avoidance	Proposed environment protection and management measures	Residual impact significance rating
Land and soil integrity			
Erosion and topsoil migration Land clearing, vegetation removal, installation of stormwater drainage infrastructure could result in erosion and soil loss across the proposal area.	- Infrastructure located above the maximum flood extent of 0.01% AEP (i.e., 1-in-1000-year flood event). - Proposal design has avoided steep slopes and rocky outcrops. - A land capability assessment (as required for a Land Clearing Permit application and approval under the <i>Pastoral Lands Act 1992</i>) will be undertaken to demonstrate soil slopes are suitable for development and appropriate controls are in place.	- Prepare and implement site-specific ESCP prepared in accordance with the most current revision of the International Erosion Control Association (IECA) Guidelines and endorsed by a Certified Practitioner of Erosion and Sediment Control (CPESC). Controls will be commensurate with the risk of erosion in each location which will be informed by preparation of an Erosion Hazard Assessment, also prepared by a suitably qualified professional. The ESCP is to include regular monitoring of disturbed areas, including temporary disturbances that have been rehabilitated, until a time the area is determined to be stable. - Stormwater management infrastructure will be implemented to manage surface water flows both within the proposal area and offsite. - Clearing will be undertaken progressively in stages to minimise areas of exposed soils. - Reinstatement of temporary disturbance footprints as soon as reasonably practicable post-construction with native vegetation species and erosion controls.	Minor
Land and soil quality			
Contamination of soils Minor spills and leaks of hazardous substances such as fuels and sewage/ wastewater could result in localised soil contamination around the site of the spill. There are no known significant sources of existing contamination within the proposal area. There is a low or very low probability of disturbance of ASS during activities associated with the proposal.	- No on-site disposal of waste will occur. All waste, including solar panels and other solar infrastructure, will be stored in appropriate containers prior to disposal at a suitable licenced waste management facility. - Only certified clean fill from licenced facilities will be used on-site. - Waste to be managed in accordance with the waste management hierarchy throughout the life of the proposal, including through decommissioning and rehabilitation.	- Fuels and hazardous chemicals will be stored and handled in accordance with Australian legislation, standards and guidelines current at the time of works being undertaken. - Portable ablution blocks will be utilised for the construction workforce and will be serviced by a licenced waste contractor as per the <i>Waste Management and Pollution Control Act 1998</i> (NT). - The type of sewage treatment during operations will be determined during detailed design and will be in accordance with the <i>Waste Management and Pollution Control Act 1998</i> (NT) and the NT Code of Practice for Wastewater Management 2020. - Unexpected Finds Procedure to prescribe measures for unexpected contamination encountered on site.	Minor

5.1.3 Conclusion

The proposal has potential to have a minor residual impact on terrestrial environmental quality. While best practice mitigation measures will be implemented, it is possible there will still be isolated erosion in the short to medium term during and in the few years immediately post construction, due to the large area of clearing and climatic conditions (for example, high intensity rainfall during the wet season). If erosion occurs, rectification measures will be implemented to avoid significant erosion which could impact on surrounding land uses (see Section 2.1) and supported values (see Sections 5.2, 5.3 and 5.4). Short term changes in suspended sediment concentration in surface water runoff or dust concentrations may occur, but these will be identified, and adaptive management will be implemented promptly. As such, while further work is required to identify site-specific erosion hazard risks, prepare required management plans and complete detailed design of stormwater infrastructure, significant residual impacts to the terrestrial environmental quality factor are not anticipated to occur.

Potential impacts to soil quality are expected to be minor and can be managed through standard environmental management practices.

5.2 Terrestrial ecosystems

The NT EPA's objective for the terrestrial ecosystems factor is to:

Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.

5.2.1 Presence of environmental values

The environmental values identified for assessment under the terrestrial ecosystems factor are:

- **Vegetation and habitats** – most of the proposal area contains areas of relatively intact vegetation that provides habitat for various threatened and non-threatened fauna and flora.
- **Significant vegetation** – there are multiple significant vegetation types within the proposal area, that are valued due to their vulnerability to impacts by adjacent land uses, limited distribution and/or inherently high biodiversity values.
- **Threatened flora** – which are vulnerable to extinction in the near future and are important due to the role they play in a healthy and functioning ecosystem, as well as having high social value. Two threatened flora species exist within the proposal area.
- **Threatened fauna** – which are vulnerable to extinction in the near future and are important due to the role they play in a healthy and functioning ecosystem, as well as having high social value. One threatened fauna species is known to occur within the proposal area, with the potential for several more to occur based on the presence of suitable habitat.

The assessment of impacts on terrestrial ecosystems was informed by a comprehensive, multi-year program of targeted threatened species' surveys coupled with vegetation and habitat quality mapping. The methods and results are detailed in the *Ecology Survey Report Darwin H2 Hub* provided in Appendix A.

Vegetation and habitats

The broader initial investigation area comprises large tracts of Eucalypt-dominated plains, rises, and low hills, as well as drainage systems communities supporting broad lowland plains associated with watercourses. Plains and rises supporting Eucalypt communities (typically *Eucalyptus miniata* and *Eucalyptus tetrodonta*) are the dominant habitat types throughout the initial investigation area. Drainage system communities occur most extensively in the north-east. These communities are generally centred around the major watercourses, supporting *Lophostemon lactifluus*, *Melaleuca*, *Grevillea* and *Eucalyptus* species typically associated with drainage systems. Low hills and steeper rises supporting Eucalypt vegetation occur in the south-west of the

initial investigation area, with extensive ridgelines occurring to the east and west of Townend and Mocatto Roads, near Noonamah. These landforms are presented in Figure 5-1.

The approximately 2,500 ha proposal area avoids the steeper rises. In the north, the proposal area is predominantly savanna woodland on low hills; in the south, the dominant habitats are plains of low shrublands and woodlands with vegetation accustomed to seasonally-saturated soils. The proposal area is incised by corridors of riparian vegetation associated with drainage systems and small areas of alluvial plains.

Significant vegetation

The ecology surveys detailed in Appendix A identified and mapped five significant vegetation types within the initial investigation area:

- Sandsheet heath
- Rainforest
- Wetlands
- Riparian vegetation
- Old-growth forest.

Apart from a few small wetlands, the proposal area has been designed to excise and buffer all of these significant vegetation types – as shown in Figure 5-5. There are three swamps partially or wholly within the proposal area. One comprises 8 ha of *Melaleuca leucadendra* (see Figure 5-4 left), one is 16 ha of *Melaleuca cajuputi* fringed with grassland (see Figure 5-4 right), and the third is approximately 4 ha of *Melaleuca leucadendra*.

The NT *Land Clearing Guidelines* (DEPWS, 2024b) state that valuing a wetland should consider:

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

The three wetlands within the proposal area are small, lack complexity, are not aggregated, do not support significant species, or have any listed or recognised special value. They are considered to be low value.



Figure 5-4. Photographs showing *Melaleuca* spp. wetland habitat within the proposal area

Threatening processes

The broader initial investigation area is subject to ongoing disturbance from various sources – including fire, weeds, pastoralism, and extractive mining activities.

Most of the proposal area has burnt upwards of 20 times since 2000, but there are areas aligning with watercourses and drainage lines that have burnt less – see Figure 5-7. Parts of the southern section of the proposal area have been subject to late season burns; however, this has only occurred between one and four years since 2000. The northern section has also been subject to late season burns of a higher frequency compared to the south, with some areas being subject to late season burns around 12 times since 2000.

Within the proposal area, weeds declared under the *Weeds Management Act 2001* were observed during field studies that also occurred across the broader initial investigation area. This includes Gamba Grass (*Andropogon gayanus*), Mission Grass (*Cenchrus polystachios*), Hyptis (*Hyptis suaveolens*) and Olive Hymenachne (*Hymenachne amplexicaulis*). Gamba Grass was the most commonly observed and widespread species occurring throughout the initial investigation area, with densities typically highest near tracks and near mining areas. Hyptis was also common and widespread throughout both the broader initial investigation area and proposal area. Mimosa, Olive Hymenachne, and Calopo (*Calopogonium mucunoides*) were all observed occurring within swamp systems or watercourses near the north-eastern section of the initial investigation area – of these species, only two records of Olive Hymenachne and three records of Calopo were recorded in the initial investigation area. Snakeweed (*Stachytarpheta* sp.) was generally observed along watercourses, with most records collected along a watercourse running through the centre of the proposal area.

As discussed in Section 5.1.1, the initial investigation area is pastoral land under a Perpetual Pastoral Lease granted under the *Pastoral Land Act 1992*, with some pastoral activities assumed to have been undertaken throughout the region in the past. Parts of the northern section of the initial investigation area have been disturbed by historic and ongoing extractive and associated activities that may consist of/have consisted of:

- Land clearing and vegetation removal
- Construction and use of access tracks
- Operation of light and heavy vehicles and machinery
- Sand and gravel extraction activities.

Threatened flora

A desktop likelihood of occurrence assessment undertaken in Appendix A identified six threatened flora species with a medium or high likelihood of occurrence within the proposal area. After comprehensive survey effort, only four threatened flora species have been detected: *Cycas armstrongii*, *Cleome insolata*, *Typhonium praetermissum* and *Utricularia dunstaniae*. Records of these species are shown on Figure 5-5 and Figure 5-6 (Darwin cycad). For full details of surveys undertaken see Appendix A.

As detailed in Section 2.4.2, based on the survey results, TE H2 have designed a proposal area that seeks to minimise, if not avoid, impacts to biodiversity values. To this end, the proposal area avoids and buffers sandsheet heath and riparian vegetation. There is therefore no habitat for *Cleome insolata* or *Utricularia dunstaniae* within the proposal area. The design of the proposal area also avoids areas with a high abundance of *Typhonium praetermissum*. Relevant to the proposal area, the highest density patches of Darwin Cycad are in, or immediately adjacent to, buffered areas that have been excised.

The presence of these species relative to the proposal area – and the potential for impacts to these species – are detailed further in Section 5.2.3.

Threatened fauna

A desktop likelihood of occurrence assessment undertaken in Appendix A identified 13 threatened fauna species with a medium or high likelihood of occurrence within the initial investigation area. After comprehensive survey effort, the following threatened fauna species were detected:

- Black-footed Tree-rat (*Mesembriomys gouldii gouldii*)
- Bare-rumped Sheath-tailed Bat (*Saccolaimus saccolaimus nudiclunatus*)
- Northern Blue-tongued Skink (*Tiliqua scincoides intermedia*)
- Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)
- Mertens' Water Monitor (*Varanus mertensi*)
- Mitchell's Water Monitor (*Varanus mitchelli*)
- Partridge Pigeon (*Geophaps smithii smithii*)
- Howard River Toadlet (*Uperoleia daviesae*).

Records of these species are shown on Figure 5-5. For full details of surveys undertaken see Appendix A. The presence of these species relative to the proposal area – and the potential for impacts to these species – are detailed in Section 5.2.3.

As detailed in Section 2.4.2, based on survey results and habitat quality mapping, TE H2 have designed a proposal area that seeks to minimise impacts to biodiversity values by avoiding areas of highest quality habitat within the initial investigation area.

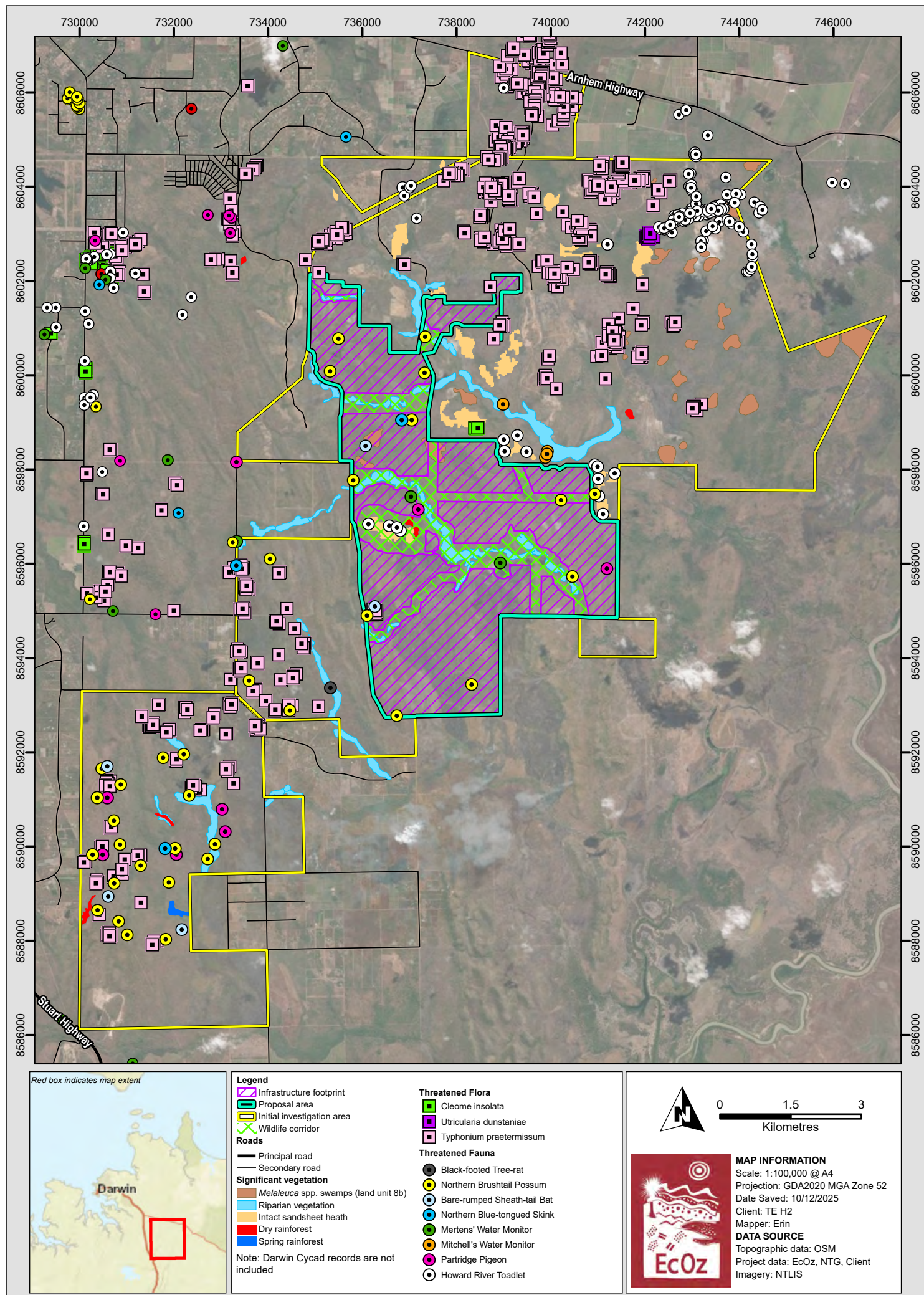
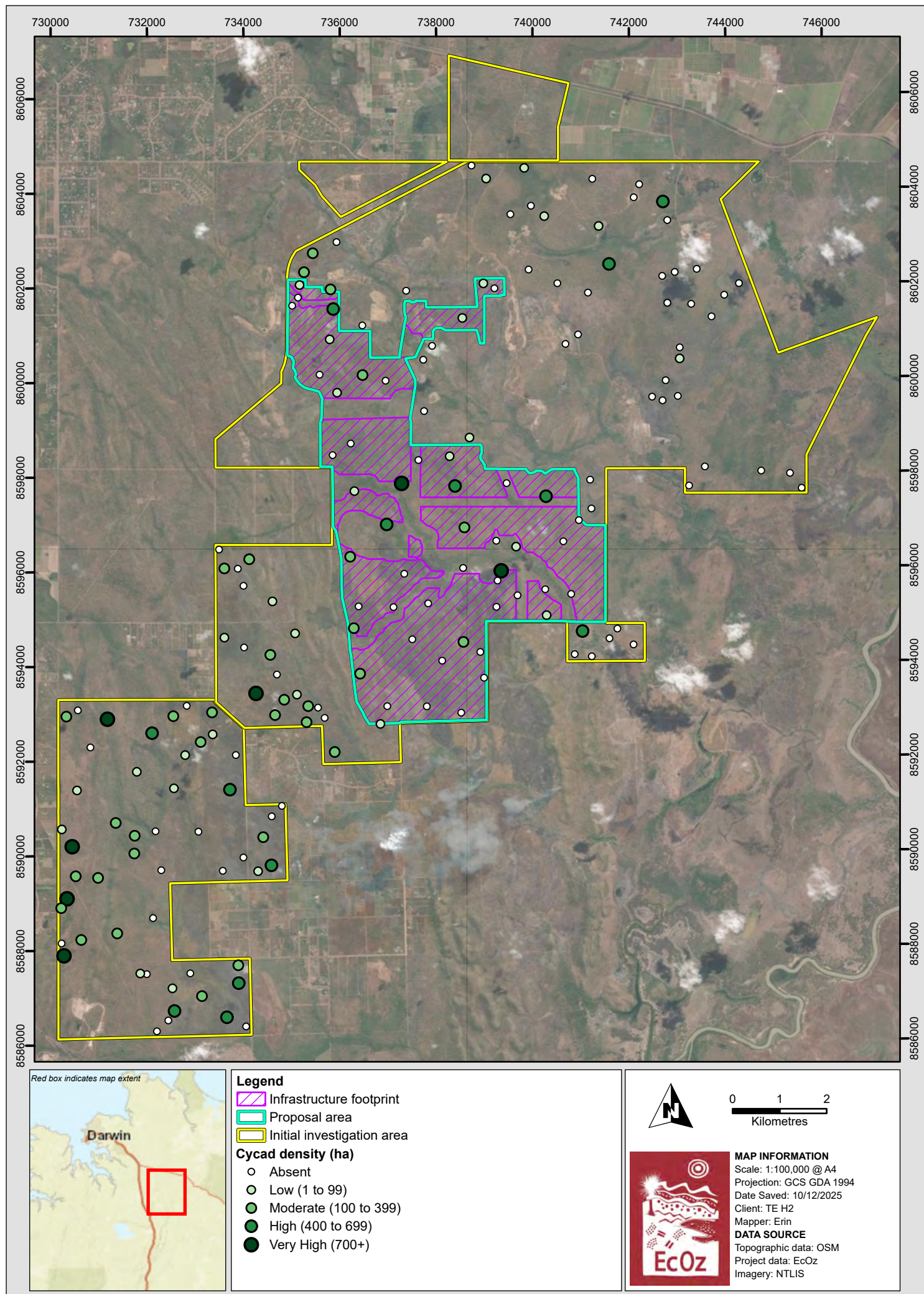


Figure 5-5. Map of ecological values within the vicinity of the proposal area



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Figure 5-6. Map of Darwin Cycad density in the vicinity of the proposal area

5.2.2 Impact assessment

Potential impacts to the environmental values of the terrestrial ecosystems factor were identified and assessed in the impact assessment register (see Appendix C). The potential impacts, corresponding avoidance and mitigation measures, and residual impact significance rating are summarised in Table 5-8 and described further below. Significant impact assessments (SIA) in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DoE, 2013) are provided in Section 5.2.3 to assess the potential for significant impacts to threatened species including description of avoidance and mitigation measures.

Loss of vegetation and habitat

The proposal involves clearing up to 2,500 ha of native vegetation and associated fauna habitat during construction. This impact considers potential impacts to general biodiversity values and non-threatened species. Whilst impacts to threatened species are considered under the threatened species' significant impact assessments in Section 5.2.3, it is acknowledged that habitat within infrastructure footprint also supports threatened species.

An assessment of the cumulative impacts of proposed land clearing for the proposal on the bioregion's vegetation community extent was undertaken on 28 September 2025 using National Vegetation Information System (NVIS) level 3 mapping as a baseline, updated as far as practicable to represent the current intact native vegetation cover. Clearing datasets were compiled from the latest NT NVIS mapping, DLPE clearing (or permitted to be cleared) areas data and Land Use Mapping (LUMP) data. This method is consistent with the approach used by the Flora and Fauna Division of DLPE to assess all large-scale land-clearing applications (for example, for non-pastoral use applications). The justification for using this method is that analysis at a regional scale is more meaningful when considering potential cumulative impacts on biodiversity, especially as this is a relatively small property.

The proposal area is approximately 2,500 ha, of which 2,439 ha (97.6%) is currently intact native vegetation. Three vegetation communities have been mapped within the proposal area.

The proposal area is almost entirely within the Pine Creek bioregion (which has only one sub-region). The Pine Creek bioregion currently has intact native vegetation across 95.65% of its extent and the proposed clearing would reduce this to 95.57%. The results of the analysis are presented in Table 5-7 which shows that all communities would have at least 95.3% of their baseline area remaining intact.

The proportion of the proposal area within the Darwin Coastal bioregion is small (4% – 98.7 ha). The proposed clearing would affect only one vegetation community, reducing its regional coverage by less than 0.1%.

The extent of proposed clearing is very small relative to the size of the bioregion (0.08%) and the Adelaide River catchment (approximately 0.3%), and the proposed clearing does not add substantially to the cumulative impacts from clearing on any of the affected vegetation communities at a regional scale.

The clearing will occur over a moderate scale of up to 2,500 ha, and while vegetation will be removed in the long-term, the broader ecological integrity and function within the surrounding landscape – and broadly across the bioregion – is expected to be maintained.

Based on this – and considering the high proportion of remaining vegetation within the bioregion – the residual impact significance of the proposal on vegetation extent and condition is assessed as moderate.

Table 5-7. Proportion of vegetation types cleared relative to the bioregion

Bioregion	Vegetation community	Baseline area (ha)	Current area (ha) intact	Current area (ha) cleared	% intact	Proposed area (ha) of additional clearing	% remained intact
Pine Creek	<u>Upper:</u> <i>Eucalyptus miniata</i> , <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> <u>Mid:</u> <i>Livistona humilis</i> , <i>Cycas armstrongii</i> , <i>Acacia oenocarpa</i> <u>Ground:</u> <i>Heteropogon triticeus</i> , <i>Sorghum plumosum</i> , <i>Chrysopogon fallax</i>	167,738	163,276	4,462	97.3%	2,334.7	95.9%
	<u>Upper:</u> <i>Melaleuca viridiflora</i> , <i>Melaleuca leucadendra</i> , <i>Melaleuca cajuputi</i> <u>Mid:</u> <i>Melaleuca leucadendra</i> , <i>Pandanus spiralis</i> , <i>Acacia auriculiformis</i> <u>Ground:</u> <i>Pseudoraphis spinescens</i> , <i>Paspalum scrobiculatum</i> , <i>Oryza rufipogon</i>	4,664	4,579	85	98.2%	0.1	98.2%
	<u>Upper:</u> <i>Aglais sapindinam</i> <i>Syzygium spp</i> , <i>Calophyllum sil</i>	1,322	1,265	56	95.7%	5.6	95.3%
Darwin Coastal	<u>Upper:</u> <i>Eucalyptus miniata</i> , <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> <u>Mid:</u> <i>Livistona humilis</i> , <i>Cycas armstrongii</i> , <i>Acacia oenocarpa</i> <u>Ground:</u> <i>Heteropogon triticeus</i> , <i>Sorghum plumosum</i> , <i>Chrysopogon fallax</i>	1,151,741	1,097,020	54,721	95.2%	98.7	95.2%

Loss of significant vegetation

The proposal will result in the clearing of 28 ha of significant vegetation. As described in Section 2.4, the proposal area has been designed to avoid significant biodiversity features including high quality patches of significant vegetation. This design process has accounted for buffer distances recommended in the NT *Land Clearing Guidelines* (DEPWS, 2024b) where feasible.

Because of this process, the residual impact to significant vegetation is of limited extent (28 ha) and low sensitivity as only three low quality wetlands will be completely or partially cleared. While this loss will persist for the life of the proposal, the magnitude of the impact is considered to be minor because other high-quality – and more extensive – patches of significant vegetation have been avoided. These will persist in the surrounding area and continue to support ecological function.

Based on this, the residual impact significance has been assessed as minor.

Degradation of vegetation and habitat and significant vegetation

There may be some minor degradation of habitats and significant vegetation directly surrounding the proposal area during construction from indirect impacts such as noise and dust emissions. These will occur in the short-term and can be managed through standard environmental management measures. This would also be restricted to areas directly surrounding the boundary of the proposal area. Fire breaks and buffer distances in line with the NT *Land Clearing Guidelines* (DEPWS, 2024b) minimise the area subject to this impact. The nature of the proposal poses an inherently low risk of habitat degradation during operations because there will be little noise, dust, odour or activity. Weeds will be managed in accordance with TE H2's obligations under the *Weeds Management Act 2001*, and strict biosecurity measures are considered to be effective at not introducing or spreading weeds to the surrounding area.

Based on this, the residual impact significance has been assessed as minor.

Habitat fragmentation

Habitat fragmentation occurs when a continuous area of habitat, suitable for a species, is divided into smaller patches that can isolate portions of that species' population. It can lead to significant biodiversity loss due to the restriction of genetic diversity, disrupted migration routes, increased competition and predation, and possibly even altered ecosystem dynamics and availability causing a decline in suitable habitat.

Fauna may experience some minor, temporary fragmentation/barrier to movement during initial stages of construction at a limited scale in the area immediately surrounding construction; however, wildlife corridors have been designed into the proposal area in accordance with the NT *Land Clearing Guidelines* (DEPWS, 2024b) to allow for long-term connectivity and refuge habitat to persist at the landscape scale.

Based on this, the residual impact significance has been assessed as minor.

Table 5-8. Preliminary impact assessment – terrestrial ecosystems

Impact	Proposal phase	Proposed avoidance	Proposed environment protection and management measures	Residual impact significance rating
Vegetation and habitats				
Loss of vegetation and habitat Up to 2,500 ha of vegetation and habitat will be cleared within the proposal area.	Construction	- Areas of high-quality vegetation and habitat based on field surveys have been avoided and buffers implemented in accordance with the NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b); the proposal area has been designed to impact areas of lower quality vegetation and habitat – see Section 2.4 for detailed avoidance summary. - Existing access tracks will be used where possible to avoid unnecessary clearing.	- Clearance only within the boundaries approved in licences obtained to clear native vegetation as per the <i>Pastoral Land Act 1992</i>. - Re-instatement of all temporary construction footprints and follow-up weed control post-construction. - Post-operations rehabilitation of cleared areas. - Establish and manage wildlife corridors in accordance with the NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b) to maintain connectivity for fauna.	Moderate
Degradation of habitats There may be some minor degradation of habitats surrounding the proposal area during construction from indirect impacts such as dust emissions and introduction and spread of weeds.	Construction Operation	Avoid introducing new weeds into proposal area by implementing weed hygiene developed in accordance with the requirements of the <i>Weeds Management Act 2001</i>.	- Management of potential weed infestations through weed hygiene measures developed in accordance with the requirements of the <i>Weeds Management Act 2001</i> and relevant statutory weed management plans, such as ongoing monitoring, training of the workforce on weed hygiene, reporting and removal of weeds if identified. - Implementation of endorsed ESCP (see Table 5-6) to mitigate impacts of dust and sedimentation. - Develop and implement a Bushfire Management Plan, including first response capability in accordance with the <i>Bushfires Management Act 2016</i>.	Minor
Significant vegetation				
Loss of significant vegetation While significant vegetation has been avoided where possible, the proposal will result in unavoidable clearing of 28 ha of low-quality wetland habitat.	Construction	High quality patches of significant vegetation have been avoided as a priority and buffers implemented in accordance with the NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b) – see	Clearance only within the boundaries approved in licences obtained to clear native vegetation as per the <i>Pastoral Land Act 1992</i>.	Minor

Impact	Proposal phase	Proposed avoidance	Proposed environment protection and management measures	Residual impact significance rating
		Section 2.4 for detailed avoidance summary. Existing access tracks will be used where possible to avoid unnecessary clearing.		
Degradation of significant vegetation There may be some minor degradation of habitats surrounding the proposal area during construction from indirect impacts such as dust emissions, introduction and spread of weeds and changes to surface water hydrology and quality.	Construction Operation	Proposal design has accounted for buffers recommended in NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b) for high quality patches and where feasible for lower quality patches.	- Stormwater management infrastructure will be implemented to manage surface water flows both within the proposal area and offsite. - Implementation of endorsed ESCP (see Table 5-6) to mitigate impacts of dust and sedimentation. - Implementation of weed hygiene measures as described above.	Minor
Habitat fragmentation Large scale clearing can result in fragmentation of habitat patches; however, the proposal area has been designed to incorporate wildlife corridors to maintain landscape level connectivity and refuge.	Construction	Proposal design has incorporated wildlife corridors in accordance with the NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b).	Mitigation measures described in the above cell will manage potential degradation of wildlife corridors adjacent to the proposal area.	Minor

5.2.3 Threatened species significant impact assessment

This section assesses the significance of potential impacts the proposal could have on threatened species that have been recorded in, or adjacent to, the proposal area.

Savanna woodland species

Section 2.4.2 details the work that TE H2 undertook to design a proposal area that avoids the highest quality habitat within the initial investigation area. The habitats within the proposal area are predominantly savanna woodlands that have been burnt almost every year for the last two decades (at least) – see Figure 5-7.⁹ Such an extreme fire frequency has resulted in a compromised landscape with a depauperate midstorey. Given this – and the location of their records within the landscape (that is, on the edges of woodland habitat) – it is likely that the woodland threatened species that persist in this area rely on the refuge provided by the lesser-burnt riparian habitats that transect it (as depicted in Figure 5-7).

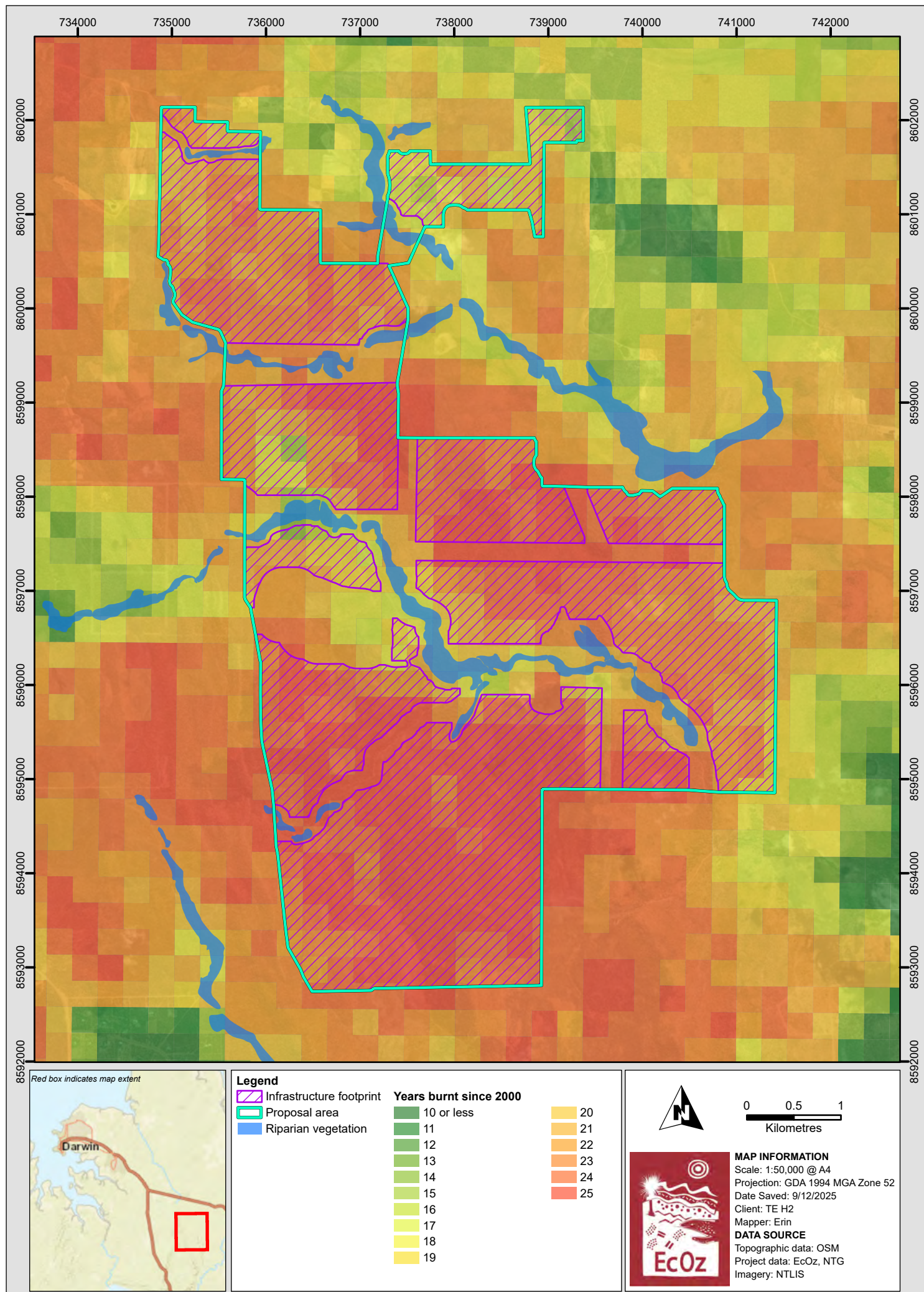
Based on the pattern of decline across these species' former ranges, it is very likely that under a business-as-usual scenario (that is, non-development, but continued annual burning), the woodland species in this region would continue to decline to the point of extirpation.

The proposal area is transected by 900 ha of wildlife corridors – see Figure 5-5. These areas will be managed for weeds and fire, and it is expected that the habitat quality within them will improve over time as the vegetation recovers from the previous fire regime.

The following avoidance and mitigation measures relevant to the protection of threatened savanna woodland species have been considered in undertaking the following significant impact assessments:

- Areas of high-quality vegetation and habitat based on field surveys have been avoided and buffers implemented in accordance with the NT *Land Clearing Guidelines* (DEPWS, 2024b); the infrastructure footprint has been designed to impact areas of lower quality vegetation and habitat.
- Wildlife corridors will be established and managed in accordance with the NT *Land Clearing Guidelines* (DEPWS, 2024b) to maintain connectivity for ground-dwelling (Partridge Pigeon) and arboreal (Northern Brushtail Possum, Black-footed Tree-rat) fauna.
- Weed hygiene measures will be implemented in accordance with obligations under the *Weeds Management Act 2001*.
- Development and implementation of a Bushfire Management Plan, including first response capability in accordance with the *Bushfires Management Act 2016*.
- Undertake pre-clearance surveys and employ a suitably qualified fauna-spotter catcher.
- Potential for translocation of Darwin Cycad in areas of unavoidable clearance – if required, translocation would be done in accordance with any required approvals under the TPWC Act.
- Water quality will be managed in accordance with measures outlined in Section 5.4.2 to mitigate potential impacts to water quality in nearby waterways where threatened fauna have been recorded.

⁹ The fire frequency mapping almost certainly understates the importance of narrow patches of riparian vegetation as a fire refuge for fauna. This arises because the fire frequency data are provided in 250 x 250 m pixels. Given the often very localised distribution of fire refugial habitat such as riparian vegetation, it is likely that pixels in lower order watercourses straddle adjacent savanna woodland. If a fire is detected in a pixel, the whole pixel is categorised as burnt. Therefore, because that savanna woodland burns every year, a fire frequency pixel sharing both savanna woodland and riparian vegetation will show the higher fire frequency from the savanna woodland that was burnt, thereby overshadowing the lower fire frequency within the riparian area that was not burnt. To help correct this, Figure 5-7 also includes ground-truthed riparian vegetation, since its persistence is evidence of less frequent burning.



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 Layout: Figure 5-5. Map of fire frequency, riparian vegetation and the proposal area

Figure 5-7. Map of fire frequency, riparian vegetation and the proposal area

Northern Brush-tailed Possum

The north-western sub-species of the Brushtail Possum (*Trichosurus vulpecula arnhemensis*) is listed as Vulnerable under the EPBC Act. This nocturnal, semi-arboreal marsupial mainly inhabits tall Eucalypt open forests and woodlands with large hollow-bearing trees, particularly where the understorey contains shrubs that bear fleshy fruits, but also occurs in mangrove communities (especially where these contain hollow-bearing trees), rainforests and semi-urban areas (notably around Darwin) (TSSC, 2020). Northern Brushtail Possum abundance is associated with high shrub density (Stobo-Wilson *et al.*, 2019).

The broadscale decline of the sub-species' populations and reduction of its distribution across the NT – an estimated 72% decrease in the sub-species' historical geographic range in north-western Australia between 1993 and 2019 – is largely attributed to frequent extensive fires, which reduce shelter sites and shrub density, thereby increasing risk of Feral Cat predation, as well as habitat modification from invasive grasses – namely Gamba Grass and Mission Grass (Stobo-Wilson *et al.*, 2019; TSSC, 2020).

The sub-species' range extends across the Top End; however, the distribution of most records in the past 30 years indicate there may be up to seven main populations in the NT, as well as numerous scattered records. These populations are found on the Tiwi Islands, Coburg Peninsula, Groote Eylandt, Kakadu/Nitmilik, Daly River and around Katherine. The records surrounding (and from) the proposal area are part of the Greater Darwin population of this sub-species, which is considered a stronghold for the Northern Brushtail Possum. The majority of recent records of this species in the NT are from the Darwin suburban and rural areas where, it is posited, the sub-species is protected from the higher rates of burning that are occurring across much of its range. The persistence of the Northern Brushtail Possum in heavily-modified environments – such as suburban Darwin – indicates that the species has a higher resilience to habitat modification than other threatened savanna woodland fauna species.

The Northern Brushtail Possum was detected at numerous locations across the initial investigation area – including in the north, centre and south of the proposal area (but generally on the periphery of the footprint). The species appears to be widespread in the region, but at occurring at the highest density in the south-west of the initial investigation area (outside of the proposal area). This pattern corresponds with the habitat quality mapping described in Section 2.4.2. Based on this, there is 2,077 ha of habitat for Northern Brushtail Possum within the infrastructure footprint. Given the dispersal barrier presented by the Adelaide River, the initial investigation area can be considered to be near the eastern edge of the Greater Darwin sub-population of Northern Brushtail Possum.

Table 5-9 assesses whether proposal activities are likely to have a significant impact upon an important population of this species (as defined in *EPBC Significant Impact Guidelines 1.1*). Whilst habitat for this species will be cleared, the infrastructure footprint has been placed (through considered design) within the lowest quality habitat available. Moreover, areas of higher quality habitat in the vicinity will be retained within a substantial network of wildlife corridors which will be managed to improve habitat quality for – and therefore abundance of – this, and other, threatened savanna woodland species.

The conclusion is therefore that the impacts to this sub-species associated with the proposal are unlikely to be significant.

Table 5-9. Significant impact assessment for the Northern Brushtail Possum

Is there is a real chance or possibility that it will... ¹⁰	Assessment
Lead to a long-term decrease in the size of an important population ¹¹ ?	NO. With reference to the definition of an important population¹² in the <i>Significant Impact Guidelines 1.1</i>, it is noted that the Greater Darwin sub-population of the Northern Brushtail Possum contains many recent records, and so could be considered a key source population, and therefore an important population. One key pathway that the proposal could lead to a decrease in the population of the Northern Brushtail Possum is through direct mortality. The Northern Brushtail Possum is a mobile species, which lowers the likelihood of direct mortality during land clearing activities for the proposal. Moreover, land clearing will be preceded by a pre-clearance survey for fauna nesting and roosting sites, and undertaken under the direction of a fauna spotter-catcher. There are other ways in which this proposal could potentially lead to a long-term decrease in the size of the Northern Brushtail Possum population – which are discussed below. None of these are likely to result in a long-term decrease in population size.
Reduce the area of occupancy ¹³ (AOO) of an important population?	NO. The AOO of the Northern Brushtail Possum is estimated to be 1,392 km² but is probably significantly greater (TSSC, 2020). It was calculated using a 2 x 2 km grid cell method. Under the grid cell method, loss of projected / inferred habitat within a cell can only lead to a reduced AOO if that habitat is entirely confined to within the infrastructure footprint. There are records of Northern Brushtail Possum in, and adjacent to, the infrastructure footprint and therefore there are AOO grid cells within the infrastructure footprint. However, due to the substantial wildlife corridor network that intersects the proposal area there will still be suitable habitat – and therefore, it is assumed, Northern Brushtail Possums – in all those grid cells after the infrastructure footprint has been disturbed. Therefore, the AOO will not be reduced.
Disrupt the breeding cycle of an important population?	NO. The Northern Brushtail Possum has no distinctive breeding season (TSSC, 2020). Consequently, whilst land clearing undertaken as part of the proposal may impact upon active Northern Brushtail Possum nests, breeding pairs will have the opportunity to try again that season. Moreover, the Northern Brushtail Possums present within the proposal area are a small subset of the entire Greater Darwin Region important population. As such, there will be only minor disruption to the breeding cycle of the <u>local</u> population Northern Brushtail Possum, not loss of an entire breeding season.
Fragment an existing important population into two or more populations?	NO. There are records of Northern Brushtail Possum from the bushland surrounding the proposal area. The inclusion of managed wildlife corridors within the proposal design will ensure that the local sub-population will not become fragmented. The persistence of the species in heavily-modified habitat within the Greater Darwin region – e.g. in the leafier suburbs – and regular records in suburban corridors such as Rapid Creek and Casuarina Coastal Reserve, support the contention that the species will use and benefit from the wildlife corridors proposed for this project, especially since vegetation within them will be managed to improve its quality.

¹⁰ It is important to note that these criteria were derived from those used by the International Union for Conservation of Nature's (IUCN) to compile the *Red List of Threatened Species*. Because the ecologies and populations of, and threats to, all the Earth's species are incredibly varied, the criteria have been designed to collectively ensure that the threatened status of all the species is adequately considered. Consequently, the relevance of each criterion varies between different species, and so for each species some consideration of the applicability and relative weighting of a particular criterion is warranted.

¹¹ This is the only criterion which refers to population size, and hence the focus is on the potential for mortality of individuals, and the consequence of that on the population of the species.

¹² The Significant Impact Guidelines 1.1 define an 'important population' of a Vulnerable species as one that is a key source population either for breeding or dispersal; necessary for maintaining genetic diversity; or populations that are near the limit of the species' range.

¹³ According to IUCN (2012), the area of occupancy (AOO) is a scaled metric that represents the area of suitable habitat currently occupied by the taxon. It is used to assess IUCN Criterion 2 for determining threatened status. AOO is particularly relevant to species with small populations and/or that occur within a few small patches, and hence are exposed to elevated extinction risks because there is a greater chance that a threat/s will affect all or most of the distribution within a given time frame. The AOO has been calculated using a tool within the Atlas of Living Australia based on post-2008 records. It is likely to be an underestimate because areas of suitable habitat that have not been surveyed are not included.

Is there is a real chance or possibility that it will... ¹⁰	Assessment
Adversely affect habitat critical to the survival of a species?	NO. Habitat critical is not defined for the Northern Brushtail Possum. For the Brush-tailed Rabbit-rat – which has similar ecological requirements – it is noted that no habitat can be clearly circumscribed as being critical to the survival of this species, because it occurs (or occurred) extensively across a habitat that is extremely wide-ranging (tropical Eucalypt open forests), because it occupies (or occupied) a range of habitats, and because in most cases, its survival is dependent upon the management of threats within a habitat, rather than retention of a defined habitat per se. A case could be made that relatively long-unburnt forest provides habitat critical to the survival of this species; however, the location of such areas will change across the landscape between years (Woinarski, Hill and Ward, 2017). The situation is the same for the Northern Brushtail Possum. Because the infrastructure footprint has burnt almost annually for the past 25 years, it therefore does not qualify as habitat critical to the survival of the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	NO. A large area of Northern Brushtail Possum habitat (up to 2,077 ha) – predominantly savanna woodland – will be cleared. In this location, that habitat is subject to an extremely high fire frequency which has significantly reduced its capacity to support threatened savanna woodland fauna species (to the point that, in a business-as-usual situation, these threatened species are unlikely to persist) – see Figure 5-7. Despite comprehensive surveying, there are few Northern Brushtail Possum records within the infrastructure footprint compared to within adjacent, higher-quality habitat. As detailed in Section 2.4.2, the infrastructure footprint has been designed to minimise disturbance to this higher-quality habitat and to retain connectivity between that habitat using a network of wildlife corridors which will be actively managed for weeds and subject to an appropriate fire regime. With such management, it is expected that the quality of this retained habitat will improve and thereby be able to support a higher density of threatened savanna woodland fauna species than is currently possible. For these reasons, the loss of the habitat within the infrastructure footprint is unlikely to lead to a decline in the Northern Brushtail Possum.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat?	NO. The proposal is unlikely to lead to increased occurrence of invasive species that could directly or indirectly impact the Northern Brushtail Possum. Feral Cats (as predators) and invasive grasses with large biomasses that increase fire frequency and intensity, such as Gamba Grass are considered current threats to Northern Brushtail Possum (TSSC, 2020). Feral Cats and Gamba Grass are already common in the region, and development of the proposal is unlikely to lead to any substantial change in their occurrence. Weed hygiene and management measures will be implemented (as previously described) to minimise introduction and proliferation of weeds within the surrounding area including the wildlife corridors for the life of the proposal.
Introduce disease that may cause the species to decline?	NO. The Conservation Advice considers disease carried by Black Rats as a potential threat to the Northern Brushtail Possum due to documented population decline from epizootic disease (TSSC, 2020). Black Rats are an existing invasive species within the Northern Brushtail Possum's range. It is unlikely that a solar farm proposal will lead to an increase in abundance of Black Rats.
Interfere substantially with the recovery of the species?	NO. There is no Recovery Plan for the Northern Brushtail Possum. Instead, the Conservation Advice for the species is considered to provide sufficient direction to implement priority actions, mitigate against key threats and enable recovery of the sub-species (TSSC, 2020). The Conservation Advice lists four primary conservation actions which relate to Feral Cats, fire, monitoring and protecting important habitat from habitat loss, degradation and fragmentation. As explained elsewhere in this table, this proposal will not interfere any of these actions.

Black-footed Tree-rat

The Kimberley and mainland Northern Territory sub-species of the Black-footed Tree-rat (*Mesembriomys gouldii gouldii*) is listed as Endangered under the EPBC Act and the TPWC Act. It is a medium-sized nocturnal rodent that dens mostly in tree hollows, but may also use clumps of *Pandanus spiralis*. Whilst the sub-species is largely arboreal, it also forages on the ground. The Black-footed Tree-rat foraging habitat generally includes fruit and seed resources – such as *Pandanus* fruits, fruiting trees and shrubs (Rankmore, 2006). The sub-species predominantly occurs in woodlands and lowland open forests dominated by large *Eucalyptus miniata* and *Eucalyptus tetradonta* trees with a moderately dense and diverse mid-storey of smaller trees and shrubs (DEPWS, 2021b). The Black-footed Tree-rat has a large home range (~67 ha) and can travel over two kilometres in a single night (Rankmore and Friend, 2008).

This sub-species is thought to be more prevalent in woodlands with infrequent and low intensity fires (Price and Baker, 2007) that have a greater fruiting species diversity to support a greater abundance of individuals (Rankmore, 2006). Tree hollows are an important resource for the species and frequently burnt landscapes may contain fewer larger trees that support these (Woinarski and Westaway, 2008). The Black-footed Tree-rat does not use highly-modified habitat and requires forested corridors connecting remnant patches of intact woodland larger than 1 ha (Rankmore and Price, 2004).

The main drivers of decline for this species are inappropriate fire regimes, habitat clearing and fragmentation, and predation by Feral Cats (Hill, 2020). Based on EcOz survey experience, Black-footed Tree-rats have remained relatively abundant in some parts of the Darwin area where they have access to suitable nesting habitat and food resources. Elsewhere – such as at Gunn Point, Litchfield, Kakadu and in the Kimberley – recent surveys have yielded far fewer records of the species than previously, indicating severe decline in these areas (TSSC, 2015b). The continuing decline of this sub-species means that all known populations and habitat supporting them are considered important and should be protected wherever possible (Stokeld *et al.*, 2020).

As detailed in Section 2.4.2, the infrastructure footprint has been placed in an area of predominantly lower quality habitat for Northern Brushtail Possum (and, by extension, Black-footed Tree-rat). Moreover, despite comprehensive camera surveying, the Black-footed Tree-rat was only recorded in one location across the approximately 5,000 ha survey area. That record was outside the infrastructure footprint (to the south-west). There are also no other recent records in the vicinity of the initial investigation area. If present within an area, the Black-footed Tree-rat is considered to have a high rate of being detected using the survey methods applied. Consequently, non-detection is assumed to equate to absence. Whilst the Black-footed Tree-rat is often recorded occurring in sympatry with the Northern Brushtail Possum, the latter is more common and widespread and therefore is assumed to be more resilient to impacts from fire. Figure 5-8 presents fire frequency (years burnt) in the past 25 years and Black-footed Tree-rat records in the past 10 years across Greater Darwin. The figure shows that Black-footed Tree-rat records are concentrated in areas that do not burn the majority of years, or else on the periphery or in refugial areas (often riparian vegetation) of those that do. There are very few records in the middle of frequently-burnt areas.

Because there are no records of Black-footed Tree-rat within the infrastructure footprint, very few recent records across the region, and the potential habitat within the infrastructure footprint is of such low quality, it is considered unlikely that proposal activities will have a significant impact upon this sub-species.

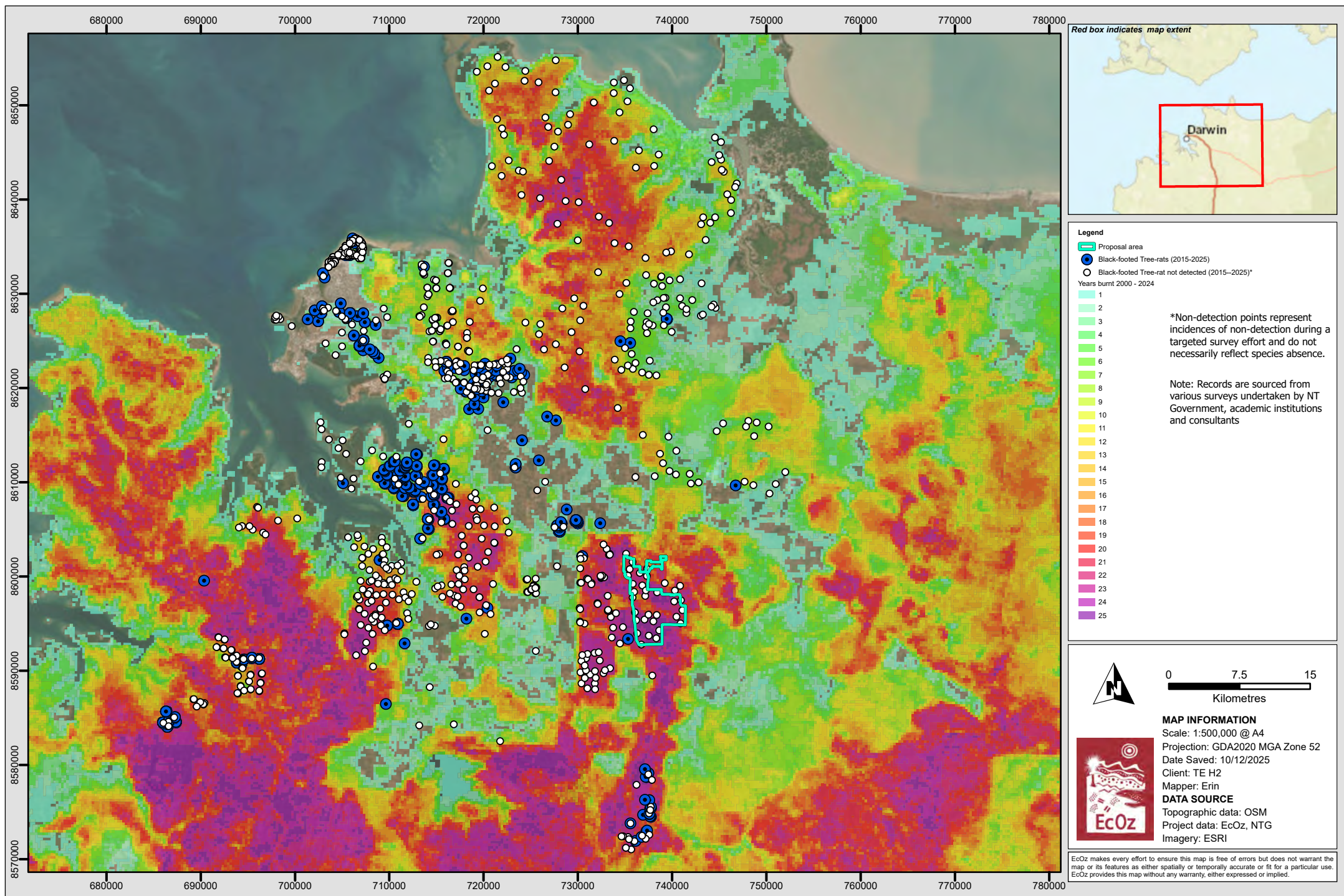


Figure 5-8. Map of fire frequency (since 2000) and Black-footed Tree-rat records (since 2015) in the Greater Darwin region

Partridge Pigeon (eastern)

The eastern sub-species of Partridge Pigeon (*Geophaps smithii smithii*) is listed as Vulnerable under both the TPWC Act and EPBC Act. It is a medium-sized, ground-dwelling bird which forages entirely on the ground and rarely flies, except when flushed. The sub-species is largely sedentary and typically occurs singly or in small family groups. Larger aggregations may occur around waterholes (DEPWS, 2021a). The Partridge Pigeon nests on the ground, preferentially in lowland Eucalypt open forests and woodlands at sites with relatively dense grass cover in the early dry season. This is in contrast to the relatively open (often burnt) areas the sub-species prefers for feeding, which suggests that fire regimes may significantly affect the sub-species (DEPWS, 2021a).

The Partridge Pigeon has suffered a severe range contraction. Apart from isolated populations on the Tiwi Islands and the Coburg Peninsula (TSSC, 2015a), occurrences in the past 30 years are almost all from the central Top End – including the outskirts of Darwin, Kakadu and Nitmiluk National Parks, Pine Creek, and Litchfield National Park. The Partridge Pigeon is also sparsely distributed in eastern and central Arnhem Land (DEPWS, 2021a). The species is therefore considered to occur in two populations – the Tiwi and Coburg Peninsula population, and the mainland population.

There are records of Partridge Pigeon at eight locations in the south-west and centre of the initial investigation area, one of which occurs on the boundary of a wildlife corridor in the centre of the proposal area. There are other recent records in the vicinity. The species is rarely recorded these days within the Greater Darwin region – there were no records from a 2019 regional survey of Gunn Point, only one record from a 2024 regional survey of Weddell, and none thus far from ongoing surveys within Greater Holtze Area. The records in the north of the initial investigation area are therefore on the northern edge of the extent of the mainland sub-population of Partridge Pigeon.

There is 1,712 ha of suitable savanna woodland habitat for Partridge Pigeon within the infrastructure footprint. The habitat in the south is not suitable because it is low shrubland or open woodland with a paucity of tall Eucalypt trees.

Table 5-10 assesses whether proposal activities are likely to have a significant impact upon an important population of this sub-species (as defined in *EPBC Significant Impact Guidelines 1.1*). Whilst habitat for this species will be cleared, the infrastructure footprint has been placed (through considered design) within the lowest quality habitat available within the initial investigation area. Moreover, areas of higher quality habitat in the vicinity will be retained within a substantial network of wildlife corridors which will be managed to improve habitat quality for – and therefore abundance of – this, and other, threatened savanna woodland species.

The conclusion is therefore that the impacts on this sub-species associated with the proposal are unlikely to be significant.

Table 5-10. Significant impact assessment for the Partridge Pigeon

Is there is a real chance or possibility that it will...	Assessment
Lead to a long-term decrease in the size of an important population ¹⁴ ?	NO. The Partridge Pigeon is a mobile species, which makes negligible the likelihood of direct mortality during land clearing activities for the proposal. There are other ways in which this development could potentially lead to a long-term decrease in the size of the Partridge Pigeon population – which are discussed below. None of these are likely to result in a long-term decrease in population size.

¹⁴ With reference to the definition of an 'important population' in the Significant Impact Guidelines, it is noted that the mainland population of this sub-species contains many recent records, and so could be considered a key source population. However, given that Partridge Pigeons are locally common within the very large area that supports the mainland population – and that any local occurrence of the sub-species within the proposal area would constitute such a small proportion of that population (and total area of suitable habitat) – it is contrary to the intention of defining 'important populations' to deem Partridge Pigeons occurring in the proposal area an 'important population'. However, because the local occurrence of Partridge Pigeons is near the limit of the sub-species range, the precautionary principle should be applied and these criteria assessed.

Is there is a real chance or possibility that it will...	Assessment
Reduce the AOO of an important population?	NO. The AOO of the Partridge Pigeon is estimated to be 9,600 km²; however, this is likely to be an underestimate (Garnett and Baker, 2021). It was calculated using a 2 x 2 km grid cell method. Under the grid cell method, loss of projected / inferred habitat within a cell can only lead to a reduced AOO if that habitat is entirely confined to within the infrastructure footprint. There are records of Partridge Pigeon in, and adjacent to, the infrastructure footprint and therefore there are AOO grid cells within the infrastructure footprint. However, due to the substantial wildlife corridor network that intersects the proposal area there will still be suitable habitat in all those grid cells after the infrastructure footprint has been disturbed. Therefore, the AOO will not be reduced.
Fragment an existing important population into two or more populations?	NO. There are records of Partridge Pigeon from the bushland surrounding the infrastructure footprint. The inclusion of managed wildlife corridors within the proposal design – coupled with the species' strong dispersal capacity through flight – will ensure that the local sub-population will not become fragmented.
Disrupt the breeding cycle of an important population?	NO. The Partridge Pigeon nests on the ground, preferentially in lowland Eucalypt open forests and woodlands at sites with relatively dense grass cover in the early dry season. Given that woodland and forests within the infrastructure footprint are burnt in the early dry season every year, it is unlikely that they support any breeding habitat. The buffered riparian areas within the wildlife corridor network likely provide the only suitable breeding habitat in the vicinity of the infrastructure footprint. For these reasons, it is unlikely that there will be a disruption to the breeding cycle of the local population of Partridge Pigeon.
Adversely affect habitat critical to the survival of a species?	NO. Critical habitat for the Partridge Pigeon has not been formally defined. In lieu of such, the most limiting of the sub-species' habitat requirements could be considered 'critical'. For the Partridge Pigeon, this would be seed food resources and diversity of habitat within their home range – namely dense, unburnt grasses for nesting and open (typically burnt) areas for feeding. Because of the very high fire frequency to which the infrastructure footprint has been subject in the past few decades, the savanna woodland within it does not constitute this preferred 'mosaic' of burnt and unburnt grasses. Therefore, there is no habitat critical to the survival of the Partridge Pigeon within the infrastructure footprint.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	NO. A large area of Partridge Pigeon habitat (up to 1,712 ha) – predominantly savanna woodland – will be cleared. However, as explained in the corresponding criterion in the significant impact assessment table for Northern Brushtail Possum (Table 5-9), the capacity of that habitat to support threatened savanna woodland fauna species is severely compromised due to the extreme fire regime it is subject to. Moreover, the infrastructure footprint has been chosen to avoid higher quality patches, and maintain connection of adjacent higher quality habitat using wildlife corridors that will be managed for threatening processes. For these reasons, the loss of the habitat within the infrastructure footprint is unlikely to lead to a decline in the Partridge Pigeon.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat?	NO. Feral Cats and invasive grass species such as African Gamba Grass (<i>Andropogon gayanus</i>), Grader Grass (<i>Themeda quadrivalvis</i>) and Mission Grass (<i>Cenchrus spp.</i>) are threats to this sub-species. Feral Cats and Gamba Grass have been recorded within the proposal area during recent surveys. The proposed action is unlikely to lead to any increase in Feral Cat numbers. Weed hygiene and management measures will be implemented (as previously described) to minimise introduction and proliferation of weeds within the surrounding area including the wildlife corridors for the life of the proposal.
Introduce disease that may cause the species to decline?	NO. Disease is not listed as a threatening process for Partridge Pigeons. The author is not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species.

Is there is a real chance or possibility that it will...	Assessment
Interfere substantially with the recovery of the species?	NO. There is no Recovery Plan for this sub-species. Instead, the Conservation Advice (TSSC, 2015a) describes conservation actions to address threats to the species – appropriate fire management, Feral Cat control and weed management strategies. Activities associated with the proposal will not interfere with any of these conservation actions or the recovery of the Partridge Pigeon.

Bare-rumped Sheath-tail Bat

Listed as Vulnerable under the EPBC Act¹⁵ (but not listed under the TPWC Act), the Bare-rumped Sheath-tail Bat (*Saccolaimus saccolaimus nudiclunatus*) is a high-flying insectivorous bat species that occurs as two geographically isolated populations in northern Australia:

- A north-eastern Queensland population within a relatively narrow range on the eastern side of Cape York in Queensland between Lockhart River to just south of Townsville.
- A western population and extending throughout the Kimberley region of Western Australia, areas of the Victoria Bonaparte bioregion, the north-western part of the Top End of the Northern Territory and reaching bare into the coastal areas of the western part of the Gulf of Carpentaria to Roper River (Armstrong *et al.*, 2021; McKenzie *et al.*, 2018).

The two geographic isolates are the same species (Milne *et al.*, 2009) but are also assumed to be separate genetic populations given the lack of contact. There have been relatively few records of Bare-rumped Sheath-tail Bats across this broad distribution. The species is difficult to capture because of its tendency to fly high (Armstrong *et al.*, 2021). Only recently have ecologists been able to develop the means to unambiguously identify it from echolocation calls, and in the Queensland part of its range it can still be difficult to distinguish from closely related species (Armstrong *et al.*, 2021; McKenzie and Bullen, 2019; Woinarski, Burbidge and Harrison, 2014). Based on the NT Atlas records of collected voucher specimens and verified calls, Bare-rumped Sheath-tail Bats have been recorded at less than ten locations across the NT.

Bare-rumped Sheath-tail Bats forage above the tree canopy (McKenzie and Bullen, 2019). In Queensland, the Bare-rumped Sheath-tail Bat is known to forage in coastal lowland rainforests, as well as more open Eucalyptus or Corymbia forests interspersed with such rainforest. Based on the types of habitats within which specimens have been recorded in the NT, suitable habitat for the western population is much broader – as suggested from the collection of specimens up to approximately 145 km from the coast in the NT (Milne *et al.*, 2009), and even further inland in the Kimberley (McKenzie *et al.*, 2018). In the NT, Bare-rumped Sheath-tail Bat specimens have been collected from Pandanus woodland fringing sedgeland and Eucalyptus tall open forests (Churchill, 2008; Friend and Braithwaite, 1986)

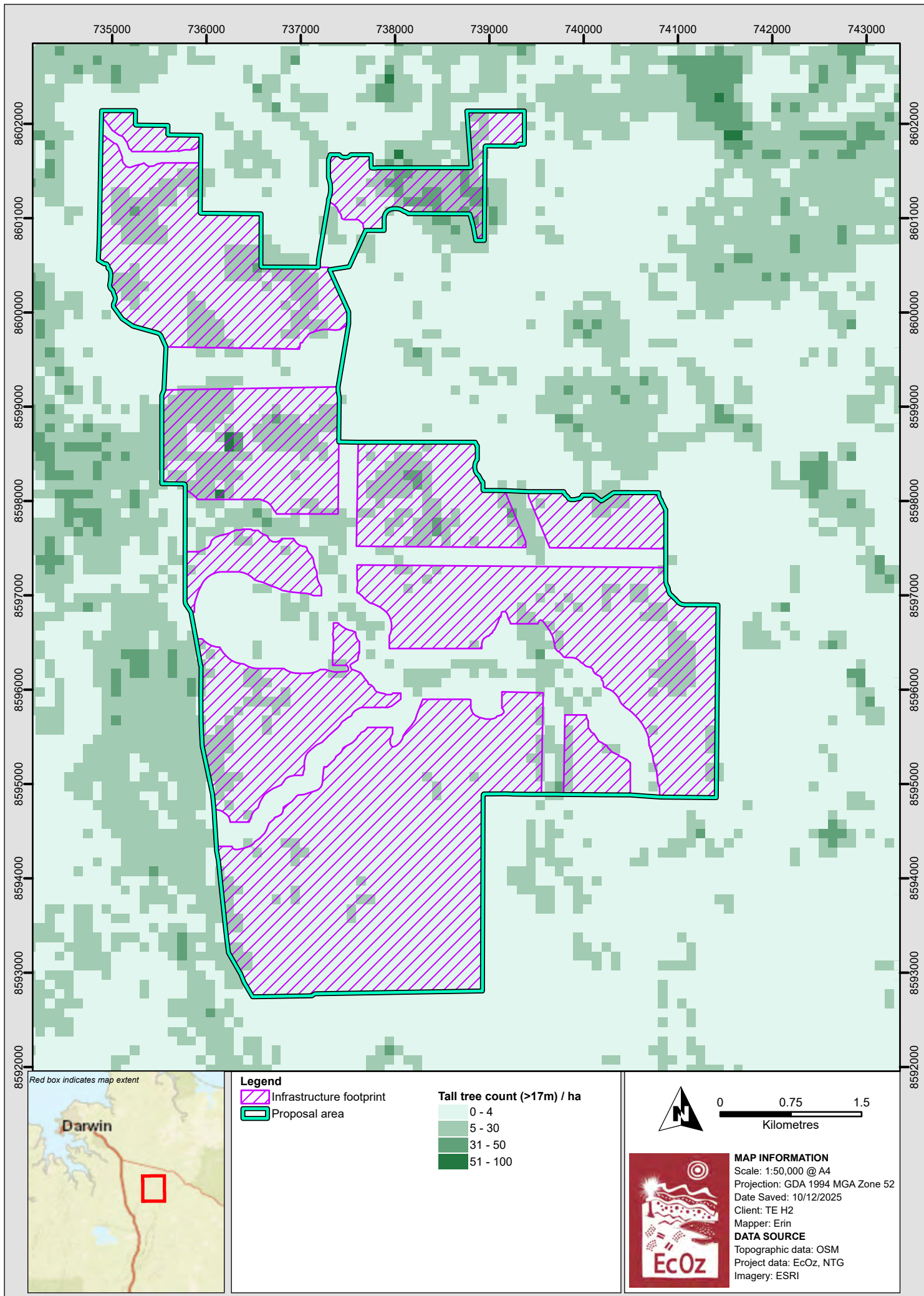
All confirmed roosting sites for the Bare-rumped Sheath-tail Bat have been in *Eucalyptus miniata*, *Eucalyptus tetrodonta* and *Eucalyptus platyphylla* (Schulz and Thomson, 2007), as well as large Melaleuca species (Armstrong *et al.*, 2021). The species roosts in groups of 10 to 100 individuals in large trees generally characterised by broken tree trunks, large branches (Murphy, 2001; Armstrong *et al.*, 2021) and deep hollow pipes more than 18 cm in diameter with hollow entrances more than 6 m from the ground (Churchill, 2008). Armstrong *et al.* (2021) notes that 'given the widespread nature of these Eucalypt woodlands and forests across parts of northern Australia, potential for roosting appears to be high...'.¹⁵

¹⁵ It is worth noting that the species was listed as Critically Endangered under the EPBC Act until December 2016, when it was re-assessed as Vulnerable. At that time, the assessment presented in the Conservation Advice for the species (TSSC, 2016b) suggested that the species may no longer be eligible to be listed under the EPBC Act, as it may not satisfy the listing criteria in any category. TSSC (2016b) cited new information showing that the Bare-rumped Sheath-tail Bat's range was larger than previously thought, and there was no evidence of a substantial, severe or very severe reduction in population size. However, the assessment also indicated a deficiency in data for this species and concluded that there was insufficient evidence to demonstrate that the Bare-rumped Sheath-tail Bat should not be included on the threatened species list under the EPBC Act – hence its re-listing as Vulnerable.

The most severe threat to Bare-rumped Sheathtail Bats is habitat loss and fragmentation – in particular the loss of roost trees (Woinarski, Burbidge and Harrison, 2014).

The Bare-rumped Sheathtail Bat was recorded in five locations during surveys for this proposal, including at one location within, and one on the boundary of, the proposal area (the rest are to the south-east) – see Figure 5-5. Consequently, all remnant vegetation – and possibly even cleared areas – in the infrastructure footprint constitute foraging habitat for the Bare-rumped Sheathtail Bat. Roosting habitat is likely limited to old-growth forest with trees supporting hollows, of which there is very little within the infrastructure footprint due to avoidance through design – see Figure 5-9. The species has only been ever recorded at five other locations in the Greater Darwin region (all to the north), noting it is a difficult to detect species for which only recently has a definitive call signature been developed.

The Bare-rumped Sheathtail Bat was assessed using the *Significant Impact Guidelines 1.1*. The results are detailed in Table 5-11. The impacts on this species associated with the proposal are unlikely to be significant because the occurrence of Bare-rumped Sheathtail Bat within the infrastructure footprint is not considered an important population, and the infrastructure footprint does not contain habitat critical to the survival of the species.



Path: C:\Users\Erin\Documents\ArcGIS\Packages\EZ22247 - Referral Reporting_5480c1p30\375F40C-B2D4-40EF-A990-D4C3B7D04F26.aprx Layout: Figure 5-X. Tall tree density

Figure 5-9. Map of tall tree densities in the vicinity of the infrastructure footprint

Table 5-11. Significant impact assessment for the Bare-rumped Sheathtail Bat

Is there is a real chance or possibility that it will...	Assessment
Lead to a long-term decrease in the size of an important population?	NO. The occurrence of this species within the proposal area is not considered an 'important' population, and so these criteria are not relevant.
Reduce the AOO of an important population?	With reference to the definition of an 'important population' in the <i>Significant Impact Guidelines 1.1</i> , it is noted that the occurrence of the Bare-rumped Sheathtail Bat in the NT is as part of the western population of the species, whose range extends from the Gulf of Carpentaria to the Kimberley. It is considered a single population across that broad range, indicating connectivity between all occurrences, and hence it is unlikely that the local Bare-rumped Sheathtail Bat population would contain unique genetic diversity. Therefore, any local occurrence would not constitute a key source population, or one that is necessary for maintaining genetic diversity. Moreover, the proposal area is located well within the known distribution of this species, not at its limits.
Fragment an existing important population into two or more populations?	
Disrupt the breeding cycle of an important population?	
Adversely affect habitat critical to the survival of a species?	NO. Habitat critical to the survival of the Bare-rumped Sheathtail Bat is only loosely defined in the <i>National Recovery Plan for the Bare-rumped Sheathtail Bat</i> (Schulz and Thomson, 2007) as being foraging and roosting habitat; however, this was at a time when less was known about the species, the information that was available was primarily relevant more to the Queensland population, and the species was still considered to be Critically Endangered. Both the foraging and breeding habitat requirements for the population of Bare-rumped Sheathtail Bats relevant to the NT are broad – Eucalypt woodlands and forests in the Top End. Such habitat occurs within the proposal area. However, it is also the dominant vegetation type across northern Australia – that is, the population's entire range. Moreover, unlike for the Northern Brushtail Possum and Black-footed Tree-rat, there is no evidence of a range retraction of Bare-rumped Sheathtail Bats into the Greater Darwin region. It is contrary to the intent of the 'critical habitat' concept to apply it to thousands of square kilometres of savanna woodland. Higher quality roosting habitat (namely old-growth forest) is also not considered a limiting – and therefore also not a critical – factor (Armstrong <i>et al.</i> , 2021). Therefore, there is no critical habitat for the Bare-rumped Sheathtail Bat in the NT. Moreover, loss of habitat within the infrastructure footprint represents a negligible proportion of suitable habitat savanna woodland for the Bare-rumped Sheathtail Bat across its enormous range – and poor-quality habitat, at that – and so will not have an adverse effect or lead to the decline of the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat?	NO. The only invasive species identified as possibly being harmful to the Bare-rumped Sheathtail Bat is the Asian Honey Bee (<i>Apis cerana</i>) in Queensland, which may outcompete the bat for hollows (TSSC, 2016b). The activities associated with the proposal are highly unlikely to result in the establishment of the Asian Honey Bee into the region. Introduced fauna species that may prey upon the Bare-rumped Sheathtail Bat – such as Feral Cats – are already well-established in the region. The proposal is unlikely to lead to any substantial change in their occurrence.
Introduce disease that may cause the species to decline?	NO. The Lyssavirus pathogen may be a threat factor for this species, with transmission coming from congeners; however, this link has not been demonstrated due to lack of collected specimens. In any case, the activities associated with the proposal are highly unlikely to lead to the introduction of diseased bats into the region.
Interfere substantially with the recovery of the species?	NO. The proposal will not interfere with the recovery of the species. <i>The National Recovery Plan for the Bare-rumped Sheathtail Bat</i> (Schulz and Thomson, 2007) was adopted in 2008. It contains five objectives – all research-centred – none of which are relevant to the proposal.

Northern Blue-tongue Skink

The Northern Blue-tongue Skink (*Tiliqua scincoides intermedia*) is listed as Critically Endangered under the EPBC Act. The species is a large, heavy-bodied, ground-dwelling lizard and distinguished by a bright blue tongue that is visible during threat displays (Shea, 1992) that can grow up to 40 cm in length. The northern sub-species is found in savanna woodlands and open forests with a high proportion of grass and leaf litter as ground cover in home ranges of 2 to 12 ha (Price-Rees, Webb and Shine, 2013) where it may spend significant time in thermal refugia during the day. The species is omnivorous (Shine, 2017). Most detections have occurred near seasonal or permanent water (Shea, 1992).

The greatest threat to the long-term persistence of the Northern Blue-tongue Skink is the invasive Cane Toad (DCCEEW, 2023a). This species is highly vulnerable to the impacts of toxic ingestions of Cane Toads, with significant population declines commencing with the arrival of Cane Toads in the Top End (Price-Rees, Brown and Shine, 2010) and a 95% reduction in population numbers predicted by 2024 as Cane Toads are to envelope the entire range of the sub-species (Shine, 2017).

There is a spread of recent records of the species across the Greater Darwin region, reflected in the detection of the Northern Blue-tongued Skink at three disparate locations across the initial investigation area (one on the boundary of the infrastructure footprint and a wildlife corridor). These records are all proximate to riparian or rainforest vegetation that provide the cool, dense vegetation that is this species' core habitat. None this habitat occurs within the infrastructure footprint.

Table 5-9 assesses whether proposal activities are likely to have a significant impact upon an important population of this species (as defined in *EPBC Significant Impact Guidelines 1.1*). Proposal activities will not increase the current regional threat to the Northern Blue-tongue Skink posed by Cane Toads. Whilst habitat for this species will be cleared, the infrastructure footprint has been placed (through considered design) within the lowest quality habitat available. Moreover, areas of higher quality habitat in the vicinity will be retained within a substantial network of wildlife corridors which will be managed to improve habitat quality for – and therefore abundance of – this, and other, threatened savanna woodland species.

The conclusion is therefore that the residual impacts to this sub-species associated with the proposal are unlikely to be significant.

Table 5-12. Significant impact assessment for the Northern Blue-tongue Skink

Is there is a real chance or possibility that it will...	Assessment
Lead to a long-term decrease in the population size?	NO. Given the Northern Blue-tongued Skink occurs in a wide variety of ecosystems, the population of the species likely used to be continuous across its range. It is unknown how fragmented that has occurred – and therefore how many populations there now are – since the advent of Cane Toads. The impact avoidance work detailed in Section 2.4.2 has resulted in the infrastructure footprint being located in the lowest quality habitat (because it has been subjected to a highly-detrimental fire regime, and therefore lacks the proximity to water and the high proportion of grass and leaf litter used for refugia) for the Northern Blue-tongued Skink. The species is therefore unlikely to be present within the infrastructure footprint. Nevertheless, land clearing will be preceded by a pre-clearance survey for fauna nesting and roosting sites, and undertaken under the direction of a fauna spotter-catcher. There are other ways in which this development could potentially lead to a long-term decrease in the size of the Northern Blue-tongued Skink population – which are discussed below. None of these are likely to result in a long-term decrease in population size.

Is there is a real chance or possibility that it will...	Assessment
Reduce the area of occupancy (AOO) of the species?	NO. The AOO of the Northern Blue-tongued Skink estimated to be 704 km², but is probably significantly greater (DCCEEW, 2023a). It was calculated using a 2 x 2 km grid cell method. Under the grid cell method, loss of projected / inferred habitat within a cell can only lead to a reduced AOO if that habitat is entirely confined to within the infrastructure footprint. There is one record of a Northern Blue-tongued Skink in the infrastructure footprint and therefore there are AOO grid cells within the infrastructure footprint. However, due to the substantial wildlife corridor network that intersects the proposal area there will still be suitable habitat in all those grid cells after the infrastructure footprint has been disturbed. Therefore, the AOO will not be reduced.
Adversely affect habitat critical to the survival of a species?	NO. Although found across a broad range of habitats, it is known that areas of dense vegetation that provide cool and moist conditions within otherwise hot, dry, and flammable landscapes are habitat critical to the survival of the Northern Blue-tongued Skink (DCCEEW, 2023a). The current fire regime across the proposal area means there is very little critical habitat within the savanna woodland, limiting the species' persistence to being in, and adjacent to, riparian and rainforest habitats. Those habitats are within the wildlife corridor network and so will not be adversely affected. Indeed, the vegetation within the corridors will be managed for fire and weeds so that habitat quality improves.
Disrupt the breeding cycle of a population?	NO. It is assumed that Northern Blue-tongued Skinks breed and raise their young (born live, not from eggs) in the abovementioned critical habitat. Given that no critical habitat will be affected by the proposal, it is unlikely that proposal activities will disrupt the breeding cycle of the local population.
Fragment an existing population into two or more populations?	NO. Because there is very little critical habitat within the savanna woodland, connectivity of the local population of Northern Blue-tongued Skink is already probably limited to use of natural riparian vegetation corridors, with an inherent risk that this leads to fragmentation of local populations. Development of the infrastructure footprint will not exacerbate that situation. Instead, the inclusion of managed wildlife corridors within the proposal design will improve connectivity to help ensure that the local population of Northern Blue-tongued Skink will not become fragmented.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	NO. Loss of habitat within the infrastructure footprint represents a negligible proportion of suitable habitat savanna woodland for the Northern Blue-tongued Skink across its enormous range – and poor-quality habitat, at that – and so will not have an adverse effect or lead to the decline of the species.
Result in invasive species that are harmful to Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat?	NO. The primary threat to the Northern Blue-tongued Skink comes from mortality due to ingestion of toxic Cane Toads (DCCEEW, 2023a). This threat is already well-established in the region and there is a low likelihood that proposal activities will exacerbate it.
Introduce disease that may cause the species to decline?	NO. Disease is not listed as a threatening process for Northern Blue-tongued Skink. The author is not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species.
Interfere substantially with the recovery of the species?	NO. The Conservation Advice for the Northern Blue-tongued Skink states that ensuring the long-term integrity and connectivity of critical habitat – where sub-populations that are resilient to Cane Toads can persist, disperse, and re-establish – is integral to the species' recovery. As mentioned above, if there is critical habitat in the vicinity of the infrastructure footprint, it would be in the riparian vegetation buffers that form the basis of the wildlife corridor network. This network therefore supports the local persistence of the Northern Blue-tongued Skink and therefore may help recovery of the species.

Darwin Cycad

The Darwin Cycad (*Cycas armstrongii*) is a small to medium-sized cycad with a slender trunk listed as Vulnerable under NT legislation. The Darwin Cycad occurs in open grassy woodlands where adequate drainage appears to be a limiting factor (Liddle, 2009). It also occurs on rocky outcrops, undulating hills and plains (DEPWS, 2021c). Prime cycad habitat has deep loamy, well-drained soil and the species is frequently associated with *Eucalyptus miniata* and *Eucalyptus tetradonta* (Liddle, 2009). Although Darwin Cycads are locally abundant in the Darwin region, their long-term conservation must be considered because they are long-lived, have a slow reproductive rate, and have a localised distribution (Liddle, 2009).

The Darwin Cycad is endemic to the Top End, with abundant populations occurring throughout the Greater Darwin region, often forming dense stands (DEPWS, 2021c). Areas with these high-density stands are important for maintaining the species' diversity and function (Hill, 2020). Within suitable habitat – and when conditions are favourable – the Darwin Cycad can occur at densities ranging from several to more than 1,000 individuals per hectare (Watkinson and Powell, 1997; Liddle, 2004). Densities of more than 700 mature cycad stems per hectare are considered very high density, with between 400 and 700 mature stems per hectare deemed high density. Such conservation-significant stands are important for maintaining the species' genetic diversity and function (Stokeld *et al.*, 2020).

As discussed in Appendix A, a count of Darwin Cycads was made at every vegetation survey site. This gives a general indication of where high densities of Darwin Cycad occur in the landscape. The species was recorded across the initial investigation area, but more often and at higher densities in the south-west – see Figure 5-6. In the centre of the initial investigation area (where the proposal area is located) the species was either absent (in frequently-burnt areas) or present at a high density. In the vicinity of the infrastructure footprint, the highest density stands of Darwin Cycad are in, or immediately adjacent to, buffered areas that have been excised. This is not a coincidence; rather, it is related to the infrastructure footprint being designed to avoid higher-quality savanna woodland. That woodland is of higher quality primarily because it is burnt less frequently, which also benefits persistence and longevity of the Darwin Cycad. Considering all known records of the Darwin Cycad, the species is locally abundant in the region although, because most records of the species are from west of the Adelaide River floodplains, the easterly records in the initial investigation area are near the edge of the species' range.

The key sources of potential impacts to the Darwin Cycad from proposal activities considered in the assessment are direct mortality during land clearing, and indirect impacts associated with the removal of suitable habitat and potential introduction of grassy weeds which could increase the intensity of fires. There will be loss of some conservation-significant stands of Darwin Cycad as consequence of land clearing for this proposal.

Table 5-13 assesses whether the proposal is likely to have a significant impact upon an important population of the Darwin Cycad (as defined in *EPBC Significant Impact Guidelines 1.1*). The conclusion is that because the occurrence of Darwin Cycad within the infrastructure footprint is not an important population, and the infrastructure footprint does not contain habitat critical to the survival of the species, the impacts to this species associated with actions proposed to be undertaken for this proposal are unlikely to constitute a significant impact. Nevertheless, it is considered best practice, where possible, to salvage individuals for translocation.

Table 5-13. Significant impact assessment for the Darwin Cycad

Is there is a real chance or possibility that it will...	Assessment
Lead to a long-term decrease in the size of an important population?	NO. The mainland Darwin Cycad population is considered a single population. The patchy presence of the species within the proposal area – and the paucity of very high density stands – indicate that the occurrence of this species within the proposal area does not constitute a key source population, or one that is necessary for maintaining genetic diversity. And whilst the proposal area is located towards the eastern edge of the known distribution of the Darwin Cycad, it is not at this species' limit, and there are both records and large areas of suitable habitat in the surrounding savanna woodland. Finally, the species will persist across much of the area within the wildlife corridors, thus maintain connectivity across the local population. For these reasons, the occurrence of this species within the proposal area is not considered an 'important' population (as defined in <i>EPBC Significant Impact Guidelines 1.1</i>) and these criteria are not met.
Fragment an existing important population into two or more populations?	
Disrupt the breeding cycle of an important population?	
Reduce the area of occupancy of an important population?	
Adversely affect habitat critical to the survival of the species?	NO. Habitat critical to the survival of Darwin Cycad has not been defined. The vast majority of the proposal area (but also the initial investigation area) supports the Darwin Cycad. Because the species is locally common within its restricted range, the focus for conservation is typically on conservation-significant (i.e. very high and high density) stands. Within the infrastructure footprint, there are some conservation-significant stands that will be cleared. As explained above, the loss of these stands is an unavoidable outcome of the avoidance-through-design of other ecological values. That avoidance includes wildlife corridors of woodland habitat that support Darwin Cycad and that will be protected from fire and weeds. This outcome contributes to counter-acting the loss of the conservation-significant stands. The loss of those stands will not equate to an adverse effect on habitat critical to the survival of the Darwin Cycad.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	NO. Although the proposal will involve both clearing an area of Darwin Cycad habitat and the loss of individuals, suitable habitat and plants will still be present elsewhere within the initial investigation area, and in abundance across Greater Darwin. Some of the impact on this species will also be reduced by leaving them in situ in undeveloped areas of the development, and salvaging and trans-locating individuals – as per the <i>Management Plan for Cycads of the NT</i> (Liddle, 2009).
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat?	NO. The <i>Management Plan for Cycads of the NT</i> (Liddle, 2009) identifies invasive grasses such as Gamba Grass (with large biomasses that increase fire intensity and outcompete native plants) are harmful to the Darwin Cycad. Weed hygiene and management measures will be implemented (as previously described) to minimise introduction and proliferation of weeds within the surrounding area including the wildlife corridors for the life of the proposal.
Introduce disease that may cause the species to decline?	NO. Disease is not listed as a threatening process for Darwin Cycad. The author is not aware of any literature on diseases that could be introduced by the proposal that would detrimentally affect this species.
Interfere with the recovery of the species?	NO. There is no recovery plan or actions for this species. The <i>Management Plan for Cycads of the NT</i> (Liddle, 2009) focusses on research and wild harvesting of cycads and does not contain any recovery actions that are relevant to this proposal.

Typhonium praetermissum

Typhonium praetermissum, listed as Vulnerable under the TPWC Act, is a small perennial herb with above-ground parts present during the annual wet season, usually between December and April. The species is currently being considered for listing as Endangered under the EPBC Act. *Typhonium praetermissum* occurs in open *Eucalyptus miniata* woodland and favours relatively unshaded areas in red brown clay and shallow gravelly soils (DENR, 2012) supporting less than 20 % vegetation ground cover and on the edge of lateritic plateaux (NTH, 2024). Habitat loss due to clearing for residential expansion and rural subdivision presents a major threat to this species.

Typhonium praetermissum plants are pollinated by beetle species with limited mobility. Consequently, a rule-of-thumb established by DEPWS in Cuff and Green (2019) is that sub-populations of *Typhonium praetermissum* are defined based on a minimum 2.5 km separation distance between records in continuous, intact potential habitat.

Typhonium praetermissum is endemic to the Greater Darwin region, extending from the Gunn Point area, south to Noonamah Ridge and west to Cox Peninsula. DLPE (as DENR) has developed a habitat model for *Typhonium praetermissum* for the Greater Darwin region (Cuff and Green, 2019). A large proportion of the initial investigation area contains modelled high-likelihood habitat for *Typhonium praetermissum*; surveys were conducted across its extent (as detailed in Appendix A). The infrastructure footprint contains very little modelled, high-likelihood habitat for *Typhonium praetermissum* apart from a few small areas in the centre-south. Some of those patches were surveyed (with seasonal accessibility issues preventing the survey of patches in the furthest east). *Typhonium praetermissum* plants were only detected in one patch of 33 plants on the very western boundary of the infrastructure footprint. The unsurveyed high-likelihood modelled habitat within the infrastructure footprint is mapped as occupying small, discrete areas that are quite isolated from the main populations of *Typhonium praetermissum* in the initial investigation area. This reduces the likelihood that there are many more *Typhonium praetermissum* patches within the infrastructure footprint.

The key sources of potential impacts to *Typhonium praetermissum* from the proposal activities considered in the assessment are direct mortality during land clearing, and indirect impacts associated with the removal of suitable habitat and potential introduction of grassy weeds.

DLPE is currently developing a conservation strategy for *Typhonium praetermissum* that allows for planned development to progress in the Darwin region without significantly impacting the geographic distribution or genetic diversity of the species. The aim is to secure adequate representation of every sub-population in line with best practice principles for species conservation. This requires maintaining the integrity of the species at a landscape level (sub-populations) by conserving spatially- and habitat-representative large patches and supporting connectivity between them. As can be seen on Figure 5-5, the south-western Koolpinyah sub-population contains multiple large patches of *Typhonium praetermissum*. Accordingly, if the infrastructure footprint is developed, any loss of *Typhonium praetermissum* plants and habitat – and reduction in AOO – will not jeopardise the persistence of the south-western Koolpinyah sub-population.

Table 5-13 assesses whether the proposal is likely to have a significant impact upon an important population of *Typhonium praetermissum* (as defined in EPBC Significant Impact Guidelines 1.1). Because the species is nominated for listing as Endangered, the criteria for that level of listing has been applied (not the criteria for Vulnerable species). The conclusion is that the impacts to this species associated with the proposal are unlikely to be significant because only a small area of suitable habitat and very few individuals (especially in proportion to the Koolpinyah sub-population) will be lost if the infrastructure footprint is developed.

Table 5-14. Significant impact assessment for *Typhonium praetermissum*

Is there is a real chance or possibility that it will...	Assessment
Lead to a long-term decrease in population size?	NO. The proposal has been designed to avoid disturbing the highest quality savanna woodland in the initial investigation area. One consequence of this is that there is very little high-likelihood habitat for, and only one patch of, <i>Typhonium praetermissum</i> within

Is there is a real chance or possibility that it will...	Assessment
	the infrastructure footprint. Loss of the 33 plants in this patch represents an insignificant proportion of the Koolpinyah sub-population of this species (at most 2% - given there are likely to be many more undetected <i>Typhonium praetermissum</i> plants in modelled high-likelihood habitat outside of the infrastructure footprint). The loss of these 33 plants will not result in a long-term decrease in the size of the <i>Typhonium praetermissum</i> population. Other ways in which this proposal could potentially lead to a long-term decrease in the size of the <i>Typhonium praetermissum</i> population are discussed and discounted below.
Reduce the area of occupancy of the species?	NO. The AOO of <i>Typhonium praetermissum</i> is estimated to be 564 km² (DEPWS, 2024a), noting that this was calculated before the survey for this proposal was completed (which found new locations of this species, extended its range, and thereby greatly increased the AOO). There are records of <i>Typhonium praetermissum</i> in the infrastructure footprint and therefore there is one AOO grid cell within the infrastructure footprint. That cell will likely be lost when the infrastructure footprint is developed. However, as noted in the main body of text, the focus for conservation of <i>Typhonium praetermissum</i> is on maintaining adequate representation of each sub-population of this species, and the development of the infrastructure footprint will not jeopardise that objective.
Fragment an existing population into two or more populations?	NO. The infrastructure footprint is almost entirely void of suitable habitat for <i>Typhonium praetermissum</i>, and so its development will not cause fragmentation into more populations, nor will it disrupt the breeding cycle since the gap between the large occurrence of <i>Typhonium praetermissum</i> in the north of the initial investigation area and the one in the south-west is far more than 2.5 km (the maximum nominal gap between plants within a sub-population).
Disrupt the breeding cycle of a population?	
Adversely affect habitat critical to the survival of the species?	NO. Critical habitat has not been identified for <i>Typhonium praetermissum</i>. This concept is arguably not relevant for rare species with restricted habitat requirements; it can be assumed that the few locations within which the species occurs constitutes critical habitat. Potential impacts to such habitat are assessed throughout this table, and it is concluded that loss of very small areas of potentially-occupied habitat will not affect the survival of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	NO. For the reasons given in this table, it is unlikely that the loss, or decrease in quality, of habitat because of proposal activities will cause a decline in the species.
Result in invasive species that are harmful to a Critically Endangered or Endangered species becoming established in the Critically Endangered or Endangered species' habitat?	NO. The Draft Conservation Advice and Listing Assessment – <i>Typhonium praetermissum</i> (DEPWS, 2024a) identify the proliferation of the weed species Gamba Grass and Mission Grass as having a high level of threat on <i>Typhonium praetermissum</i> by dramatically increasing fuel loads, resulting in more intense fires which may reduce habitat quality. Weed hygiene and management measures will be implemented (as previously described) to minimise introduction and proliferation of weeds within the area of influence for the life of the proposal.
Introduce disease that may cause the species to decline?	NO. Disease is not listed as a threatening process for this species. The author is not aware of any literature on diseases that could be introduced by the proposal and that would detrimentally affect this species.
Interfere with the recovery of the species?	NO. There is no Recovery Plan for this species. The Draft Conservation Advice and Listing Assessment – <i>Typhonium praetermissum</i> (DEPWS, 2024a) lists some recommended management and research actions, none of which would be compromised by this proposal. NTG (2012) consider the main threats to be land clearing for development and weed invasion by Gamba Grass and Mission Grass. Weed hygiene and management measures will be implemented (as previously described) to minimise introduction and proliferation of weeds within the surrounding area – including the wildlife corridors – for the life of the proposal.

Riparian species

Mertens' Water Monitor

The Mertens' Water Monitor (*Varanus mertensi*) is listed as Vulnerable under the TPWC Act and Endangered under the EPBC Act. A moderately large, semi-aquatic and arboreal monitor, this species forages extensively in freshwater. A flexible diet enables the species to adapt to seasonal and spatial differences in prey availability throughout its broad distribution, occurring in coastal and inland waters across northern Australia, from the Kimberley, in Western Australia, to the western side of Cape York Peninsula in Queensland (Christian, 2004; DEPWS, 2024c). Within the NT, records span across most of the Top End and Gulf Region (DEPWS, 2024c).

A strong swimmer seldom seen far from waterbodies, Mertens' Water Monitor occupies a range of natural and unnatural freshwater bodies (Mayes, Thompson and Withers, 2005; Wilson and Swan, 2017).

Cane Toads, the greatest threat to this species, are now present across its entire NT distribution. Mertens' Water Monitor is highly susceptible to Cane Toad toxin (DEPWS, 2024c). Given the inability to prevent localised declines once Cane Toads are established, conservation effort is best directed to maintaining Mertens' Water Monitor numbers in toad-invaded areas (DCCEEW, 2023). Based on records from the past 30 years, there is a single population of Mertens' Water Monitor stretching across the Top End of the NT, and into Western Australia and the Gulf country of Queensland. A separate population occurs on the eastern side of Cape York.

There were incidental records of Mertens' Water Monitors from the watercourse that runs through the centre-west of the infrastructure footprint. That waterway has been excised and buffered from the infrastructure footprint.

Because no habitat for this species will be directly disturbed, and potential impacts to water quality (and therefore habitat quality) have been minimised through proposal design and ESCPs – the impacts to this species associated with the proposal are unlikely to be significant. The greatest threat to this species relates to interactions with Cane Toads; this proposal will not exacerbate that threat.

Mitchell's Water Monitor

Mitchell's Water Monitor (*Varanus mitchelli*) is a diurnal, semi-aquatic and arboreal medium-sized monitor listed as Vulnerable under the TPWC Act and as Critically Endangered under the EPBC Act. In the NT, the distribution of the species includes the catchments of all rivers flowing to the Timor Sea, Arafura Sea and the Gulf of Carpentaria, with isolated occurrence in north-western Queensland (DEPWS, 2024d).

Mitchell's Water Monitor shelters in tree hollows or under bark and inhabits margins of Pandanus-lined watercourses, swamps and lagoons in Northern Australia (DCCEEW, 2023b). Found close to watercourses, this species basks on overhanging vegetation and submerges into water when approached (Swanson, 2007).

Numbers of Mitchell's Water Monitors have severely declined because of the spread of Cane Toads and the high susceptibility of monitors to their toxin; however, there does not appear to be a range contraction for this species since there are still many recent records across its historic distribution (DCCEEW, 2023b). Based on records from the past 30 years, there is likely a single population of Mitchell's Water Monitor stretching across the Top End from central Arnhem Land into the Kimberley.

There were incidental records of Mitchell's Water Monitors from the watercourse to the north-west of the infrastructure footprint – that is, in a different waterway to the abovementioned Mertens' Water Monitor records. That waterway has also been excised and buffered from the infrastructure footprint. Consequently, for the same reasons presented for the Merten's Water Monitor, impacts to Mitchell's Water Monitors associated with the proposal are unlikely.

Sandsheet heath species

The sandsheet heath patches in the vicinity of the infrastructure footprint have been buffered from disturbance according to their value, as recommended in the NT *Land Clearing Guidelines* (DEPWS, 2024b). The buffered areas are incorporated within the wildlife corridor network designed into the proposal layout. As detailed in Sections 5.3 and 5.4, the likelihood of reduced surface water quality or groundwater drawdown – which could impact the quality of nearby sandsheet heath patches – is low. Therefore, it is unlikely that proposal activities could have a significant impact on the threatened species – Howard River Toadlet and *Cleome insolata* – recorded in nearby sandsheet heath patches.

5.2.4 Offsets

The conclusion reached in Section 5.2.3 is that due to the avoidance work undertaken when designing the infrastructure footprint, there will not be a significant impact to any threatened species due to proposal activities. Offsets are therefore not proposed.

5.2.5 Conclusion

TE H2 have undertaken extensive ecology surveys across NT Portion 4477 and ultimately designed the proposal area and infrastructure footprint to avoid areas of high value – including threatened flora, significant vegetation and high-quality.

Design of the infrastructure footprint has almost entirely avoided significant vegetation except for 28 ha of low-quality wetlands. Short-term degradation of vegetation and habitat adjacent to the infrastructure footprint may occur, most likely during construction. These impacts will be managed through standard mitigations. Potential habitat fragmentation has been mitigated by design and incorporation of approximately 900 ha of wildlife corridors into the proposal area to allow for long-term connectivity and refuge habitat to persist at the landscape scale. Based on this, the proposal has potential to have a minor residual significant impact on these values.

While the proposal has potential to impact on several threatened fauna and flora, the significant impact assessments undertaken in this referral demonstrate that because of the substantial survey and avoidance work undertaken by TE H2 upfront, and implementation of best practice mitigation measures such as weed hygiene, there is not a real chance or possibility the proposal will have a significant residual impact on threatened species.

Vegetation that would be removed by the proposal represents only a small portion of the bioregions across which the proposal area is (0.08% of the Pine Creek bioregion and less than 0.01% of the Darwin Coastal bioregion). However, the clearing is still considered to occur on a moderate scale of up to 2,500 ha, and while vegetation will be removed in the long-term, the broader ecological integrity and function within the surrounding landscape – and broadly across the bioregion – is expected to be maintained.

Based on this, the proposal has potential to have a moderate residual significant impact on terrestrial ecosystems.

5.3 Hydrological processes

The NT EPA's objective for the hydrological processes factor is to:

Protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.

5.3.1 Presence of environmental values

The environmental values identified for assessment under the hydrological processes factor are:

- **Surface water flows** – surface water flows include the direction, volume, duration and seasonal pattern of flows through a watercourse. The flow regime is an important factor in maintaining local ecosystems which have adapted to the conditions, including habitat formation and species migration. Flow regimes are also key in regulating the geomorphic processes that shape the flow paths and channels.
- **Groundwater levels and discharges** – groundwater is an important resource which supports ecosystems, cultural values, public water supply and agriculture. The groundwater underlying the proposal area is recharged via diffuse rainfall recharge, which is an important process for maintaining groundwater levels.

The assessment of impacts on hydrological processes was informed by the following information sources:

- NR Maps: Natural Resource Maps NT, including bore reports of registered bores within the proposal area (DLPE, 2025).
- Groundwater Dependent Ecosystems (GDE) Atlas (BoM, 2025).
- Various technical reports (cited throughout the document), both publicly available and confidential.
- NT Governments Water Data Portal (NTG, 2025).

Surface water flow regimes

The proposal area includes numerous low order streams - see Figure 5-10 - that are largely ephemeral, becoming seasonally inundated and flowing during the wet season and/or immediately following major rains. As shown on Figure 5-10, there is one major drainage line that has been avoided through proposal design (including a buffer in accordance with the NT *Land Clearing Guidelines* (DEPWS, 2024b) that runs west-east through the proposal area. Surface water runoff from within the proposal area is assumed to flow south-easterly toward the Adelaide River floodplain, and ultimately Adelaide River.

The proposal area is within the the eastern boundary of the Adelaide River catchment, which covers an area of 764,000 ha. The proposed infrastructure footprint at 2,500 ha, covers approximately 0.3% of the total catchment area.

The initial investigation area is subject to two primary flooding mechanisms:

- **Local flooding** – local flooding will occur due to rain falling across the local catchments with resulting runoff concentrating and being conveyed in the local flowpaths. If the capacity of these flowpaths is exceeded, floodwater will escape to inundate the surrounding land.
- **Regional flooding** – Regional flooding will occur when the capacity of the Adelaide River is exceeded, causing floodwater to enter the floodplains and tributaries and inundate the initial investigation area.

A baseline flood study was undertaken to model flood behaviour (for example, flood depths, level, extents, and velocities) of the Adelaide River catchment under current and future climate conditions (year 2090 for regional flooding and year 2100 for local flooding) for both a minor (10 per cent (%) Annual Exceedance Probability (AEP)) and major (1% AEP) design storm events (WRM, 2024). The infrastructure footprint has been designed to avoid areas affected by the 1% AEP flood levels.

Ecological field surveys undertaken identified that surface water systems support *Melaleuca spp.* swamps in the infrastructure footprint – as shown on Figure 5-10. In areas avoided by proposal design but adjacent to the

footprint, surface water flows support riparian vegetation, sandsheet heath vegetation, and some dry rainforest patches (see Appendix A).

Groundwater levels and recharge

The proposal area overlies the Wildman Siltstone and Whites Formation, which is described as a local-scale, fractured and weathered rock aquifer dominated by shale, greywacke and sandstone typically local in scale and low-yield. This aquifer is part of the Mount Partridge groundwater system (see Table 5-15 and Figure 5-11) within the Noonamah Water Management Zone (WMZ) of the Adelaide River catchment (NTG, 2025). Recharge of the aquifer occurs in the wet season through diffuse recharge. In the Noonamah WMZ, groundwater levels can range from 1 to 40 m below ground level (mBGL).

Directly adjacent to the proposal area is the Koolpinyah Dolostone groundwater system, a fractured karstic dolostone aquifer that is part of the Howard Groundwater System (HGWS). This system is generally recharged by diffuse rainfall recharge during the wet season and discharges to the Howard River in the west (including Howard Springs) and the Adelaide River in the east (Short and Cobban, 2020). The proposal area is outside of the known recharge areas of the HGWS noting that the known recharge zone for the HGWS lies further east, north and northwest (Short and Cobban, 2020). However, the lateral hydraulic connectivity between the aquifers in the proposal area and those in the HGWS are not well understood. Given the structural complexity and faulting in the Mount Partridge–Koolpinyah interface, some degree of hydraulic connectivity is plausible but likely limited. Groundwater levels in the HGWS zone adjacent to the proposal area ranges from 1 to 30 mBGL (Tickell, Cobban and Baird, 2023).

Table 5-15. Aquifers relevant to the proposal area

Groundwater system	Aquifer Scale	Aquifer characteristics	Primary recharge mechanism	Typical groundwater depth (m BGL)	Groundwater estimated use	Proximity to proposal area
Koolpinyah Dolostone	Intermediate – regional influence	Part of the HGWS, a fractured and karstic dolostone aquifer	Diffuse rainfall infiltration during wet season	1 – 30	Highly allocated / locally over-used	Adjacent to proposal area
Mount Partridge	Local	Fractured and weathered rock aquifer of the Wildman Siltstone and Whites Formation	Diffuse wet-season recharge through soil and fracture infiltration	1 – 40	Low	Underlies proposal area

Groundwater is a key water source for rural residents in the Darwin Rural Area, and also supports land uses such as agriculture, horticulture and extractives. In the Noonamah WMZ, the annual water for consumptive use is 42,205 ML, which represents 20% of the average annual recharge (211,023 ML; (Tickell, Cobban and Baird, 2023)). Groundwater underlying the proposal area is likely to discharge into the Adelaide River, contributing to dry season flows. However, other sources, such as delayed interflow, bank soil storage and discharges from wetlands are also known to support dry season flows (NTG, 2025).

Groundwater-dependent ecosystems (GDE's) refer to 'natural ecosystems that require access to groundwater to meet all or some of their water requirements on a permanent or intermittent basis, so as to maintain their communities of plants and animals, ecosystem processes and ecosystem services' (Richardson et al. 2011). According to the NT *Land Clearing Guidelines* (DEPWS, 2024b) this includes native vegetation growing where groundwater is within 20 m of the land surface.

Based on definitions from Eamus et al. (Eamus *et al.*, 2006), the Atlas of Groundwater Dependent Ecosystems maps three types of GDE – subterranean, aquatic (that is, ecosystems dependant on surface expression of groundwater) and terrestrial (that is, ecosystems dependent on the sub-surface presence of groundwater, often

accessed when roots penetrate via the capillary fringe which lies above the saturated zone of the water table). The Atlas classes each mapped GDE according to the degree of certainty that it is, indeed, a GDE.

A large portion of the proposal area is mapped as having low or moderate potential to be a terrestrial GDE. In this regard, however, the proposal area is similar to a vast area to the north, south and west that is also mapped as low to moderate potential. This is not an unusual situation in the Top End and is presumably due to the high wet season watertable and low-lying altitude. Importantly, there are no high potential terrestrial GDEs within the initial investigation area.

Within the proposal area, Acacia Creek is mapped as a high potential aquatic GDE. Outside of (but downstream from) the proposal area, the Adelaide River is also mapped as a high potential aquatic GDE, as are several swamps and wetlands. Riparian areas have been buffered and excised from the proposal area, as have most wetlands. These are discussed in Section 5.2.

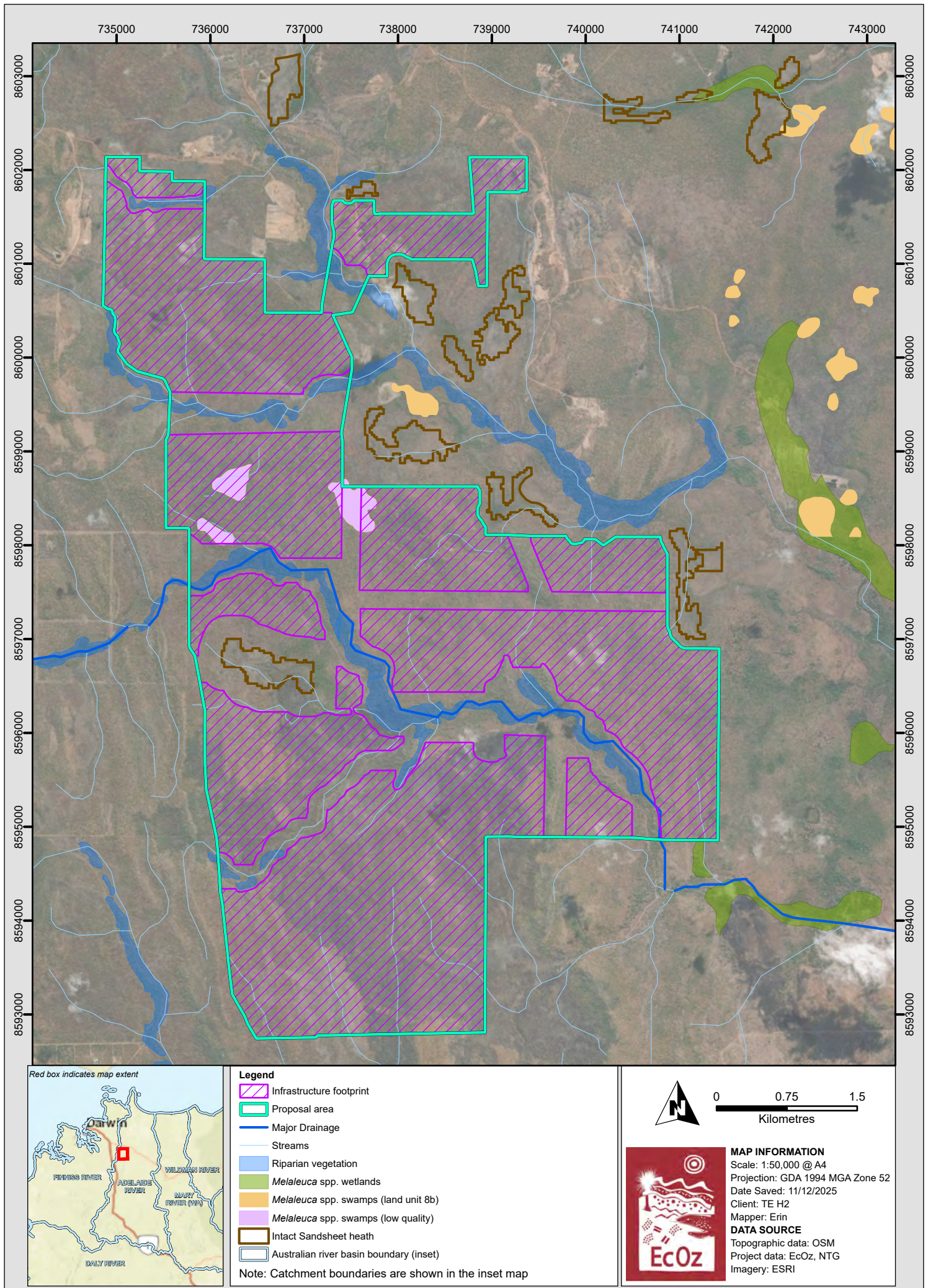
Beneficial uses

The proposal area lies within the Darwin Rural Water Control District. Beneficial uses for water resources within this district have been declared as per NT Government Gazette: G25 (2019) under the *NT Water Act 1992*:

- Agriculture
- Aquaculture
- Public water supply
- Environment
- Cultural
- Industry
- Rural stock and domestic
- Mining activity
- Petroleum activity.

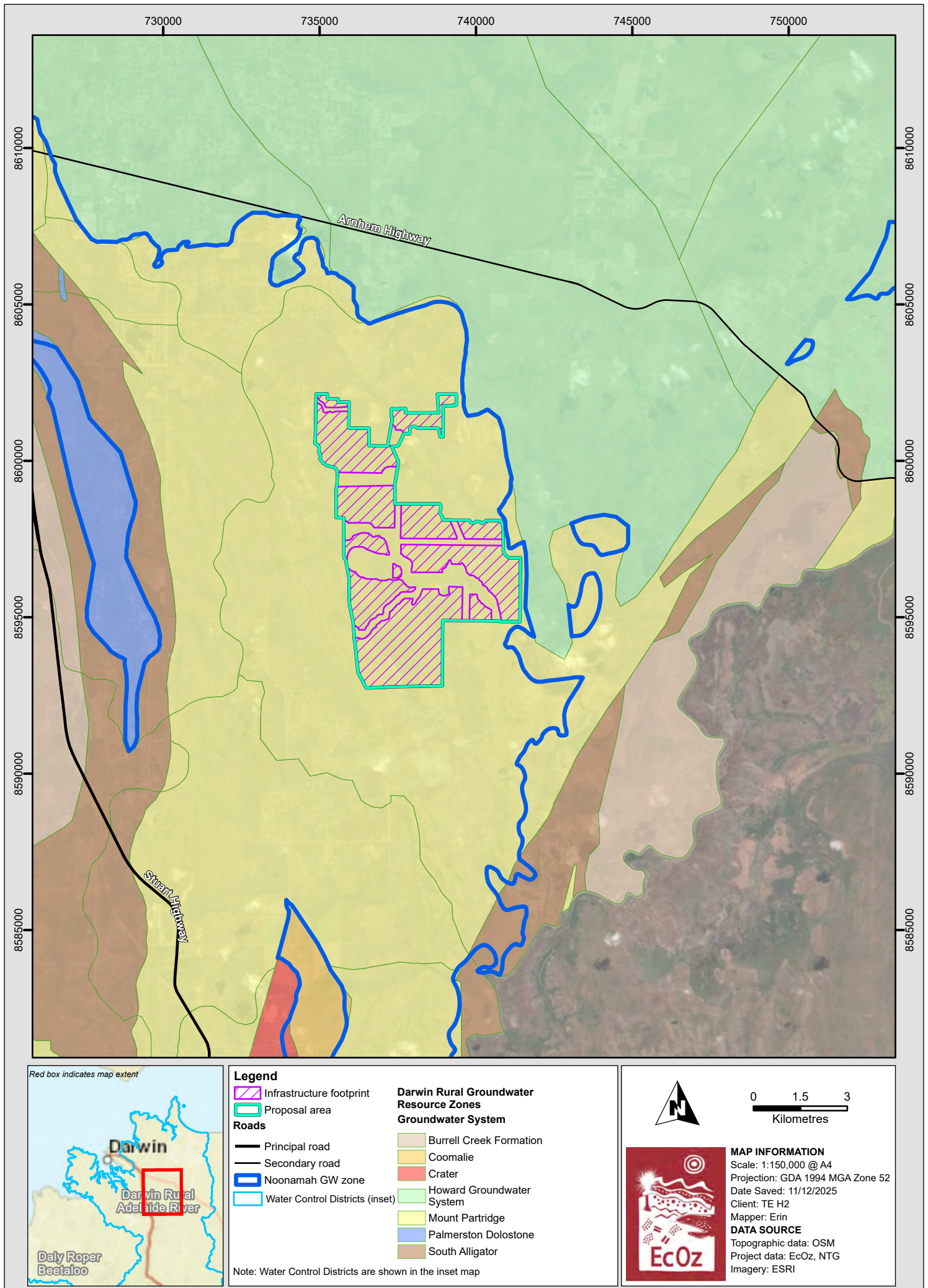
There is one surface water extraction licence downstream of the proposal area on the Adelaide River, which authorises the extraction of surface water to supply the Humpty Doo Barramundi aquaculture project. The licenced extraction point is located approximately 20 km downstream of the northern-most point of the proposal area within the Adelaide River catchment.

There are numerous groundwater extraction licences surrounding the proposal area, most of which authorising agricultural supply and extractive industry use (for example, quarry operations), and are located primarily to the south, west and north of the proposal area within the Noonamah WMZ. While not licenced, there are also numerous groundwater bores which are used to supply domestic and potable water to the rural lots north, west and south of the proposal area. These existing water uses highlight the importance of maintaining groundwater availability and surface water connectivity downstream of the proposal area, particularly in the Adelaide River catchment.



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 Layout: Figure 5-10. Catchment boundaries and surface water features relevant to the proposal area

Figure 5-10. Catchment boundaries and surface water features relevant to the proposal area



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Layout: Figure 5-10. Groundwater aquifers relevant to the proposal area

Figure 5-11. Map of groundwater aquifers relevant to the proposal area

5.3.2 Impact assessment

Potential impacts to the valued components of the hydrological processes factor were identified and assessed in accordance with the methodology outlined in Section 5. The potential impacts, avoidance and mitigation, and residual impact significance rating are summarised in Table 5-16 and described further below.

Altered surface water flows

The infrastructure footprint has been designed to avoid major drainage lines. Surface water flows will be impacted within the infrastructure footprint due to land clearing and ground levelling for infrastructure. Stormwater flows discharging from the infrastructure footprint will be managed using engineered stormwater infrastructure. A stormwater management strategy will be prepared to demonstrate the proposed stormwater management infrastructure can achieve an acceptable change to surface water flows outside of the infrastructure footprint; however, this has not been completed to date.

Stormwater drainage infrastructure is commonly used and proven effective, therefore ultimately it is expected this residual impact would be assessed as minor.

Flooding

There is a potential for increased surface water run-off and flooding because of reduced infiltration of rainfall and reduced recharge during construction and operation. Localised alteration of surface water drainage caused by the proposal may increase or decrease flood depths and flow velocities in some areas. Impacts are likely to be confined to localised areas surrounding the disturbance footprints and would be minor temporary impacts associated with flood events.

With an appropriately designed stormwater management system, the potential of this to be a significant impact is reduced. However, until an updated flood assessment which considers the altered conditions is undertaken, this is considered an information gap.

While it is acknowledged there is a current information gap regarding resultant flood levels, stormwater drainage infrastructure, engineered to relevant Australian Standards, is commonly used and proven effective, and further assessment will be undertaken to demonstrate the stormwater drainage infrastructure will be effective. Therefore, ultimately it is expected this impact would be minor.

Lowered groundwater levels

There is potential for the proposal to result in reduced groundwater levels due to reduced rainfall infiltration within the infrastructure footprint. Given there is no groundwater extraction proposed, recharge rates will be maintained as per existing conditions outside of the proposal footprint and recharge will still occur within the proposal footprint (just potentially at a reduced rate), this is expected to be a minor residual impact and there is not considered to be a feasible pathway for potential significant impacts to groundwater levels.

Table 5-16. Preliminary impact assessment – hydrological processes

Impact	Proposal phase	Proposed Avoidance	Proposed environment protection and management measures	Residual impact significance rating
Surface water				
Altered surface water flows Ground disturbance and compaction and, installation of stormwater drainage infrastructure could result in concentration of flows and alteration of stormwater drainage paths. Construction of infrastructure, including hardstand and solar panel arrays could reduce infiltration of rainfall, increasing surface water runoff volumes and velocities.	Construction	• Proposal design has avoided major drainage lines. • Buffers have been included in proposal design in accordance with the NT <i>Land Clearing Guidelines</i> (DEPWS, 2024b). • Proposal detailed design will incorporate stormwater drainage infrastructure to manage flows within the infrastructure footprint and offsite.	• The solar farm will be designed to encourage infiltration under the solar arrays, and excess volumes will be managed through basins or other engineered structures as required. • Controls will be installed as required to dissipate energy at stormwater outlets and minimise localized erosion. • A stormwater management strategy will be prepared to demonstrate the proposed stormwater management infrastructure can achieve an acceptable change to surface water flows outside of the infrastructure footprint.	Minor
Flooding Construction and operation of infrastructure may reduce rainfall infiltration, and result in increased surface water runoff which in turn could result in increased flooding within the infrastructure footprint and potentially in downstream areas.	Construction	• A baseline flood study and risk assessment has been undertaken to inform design and planning for the proposal (WRM, 2024). This is to ensure resilience to local and regional flood events under current and projected future climate conditions. • Proposal infrastructure will be designed in accordance with <i>Australian Rainfall and Runoff Guidelines 2019</i> to avoid areas of pooling water.	• Stormwater drainage system to be designed to appropriate standards to minimise the potential for off-site flooding.	Minor

5.3.3 Conclusion

The proposal has the potential to have a minor residual impact on hydrological processes. Vegetation clearing and construction across 2,500 ha may alter surface water flow paths and increase surface water runoff volumes within the infrastructure footprint, requiring specific design measures to mitigate associated impacts.

Standard engineered stormwater and drainage designs will be implemented to manage surface water flows and maintain groundwater recharge as far as practicable, such that significant residual impacts to hydrological processes are unlikely to occur. A stormwater management strategy will be prepared to demonstrate the proposed stormwater management infrastructure can achieve an acceptable change to surface water flows outside of the infrastructure footprint.

Assuming effective implementation of impact avoidance and mitigation measures and the low likelihood of broader hydrological disturbance, the NT EPA's objective for hydrological processes is expected to be met.

5.4 Inland water environmental quality

The NT EPA's objective for the inland water environmental quality factor is to:

Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.

5.4.1 Presence of environmental values

The environmental values identified for assessment under the inland water environmental quality factor are:

- **Surface water quality** – surface water quality is important in maintaining ecosystem health and supporting biodiversity within the catchment. Surface water quality supports the Adelaide River floodplain, a Site of Conservation Significance (SOCS), and downstream users.
- **Groundwater quality** – groundwater quality is important for maintaining the health of watercourses and GDEs which are supported by groundwater. Groundwater is also extracted for mining, agricultural and domestic supply surrounding the proposal area, and impacts to groundwater quality could therefore impact other users.

The assessment of impacts on inland water environmental quality was informed by the following information sources:

- NR Maps: Natural Resource Maps NT (DLPE, 2025)
- NT Governments Water Data Portal (NTG, 2025)
- Published literature, including Lloyd (1999), Lamche and Schult (2012), and Schult and Welch (2006).

Surface water quality

Within the proposal area, watercourses will flow following rainfall, and therefore the water quality is likely to be good, with low electrical conductivity and neutral to slightly acidic potential of Hydrogen (pH), indicative of freshwater conditions. Other parameters such as dissolved oxygen, turbidity and the presence of nutrients and metals, will likely fluctuate throughout the wet season, largely influenced by rainfall runoff, groundwater discharges and the characteristics of soils within the catchment.

There are several seasonal wetlands within and downstream of the proposal area. Studies have been undertaken on seasonal and perennial wetlands in the Darwin Rural Area (Lloyd, 1999; Lamache and Schult, 2012; Schult and Welch, 2006). In general, water quality in the wetlands of the Darwin region is good during the wet season and early dry season and deteriorates over the dry season due to evapo-concentration, stagnation, and factors such as agitation of sediment by water birds as water becomes shallower (Schult and Welch, 2006). In the wet season and early dry season, water quality is characterised by neutral to slightly acidic pH (consistent with rainfall in the Darwin region which is known to be slightly acidic), low electrical conductivity, low turbidity and low concentrations of nutrients (nitrogen and phosphorus) and chlorophyll-a (an indicator of algal growth). Throughout the dry season, electrical conductivity, turbidity, nutrients and chlorophyll-a generally increase (that is, water quality declines) due to the factors mentioned above. There is limited land disturbance throughout much of the proposal area which would benefit water quality. However, extractive activities, which mostly occur north of the proposal area, are likely to result in increased turbidity and potentially higher metals concentration in surface water runoff (NTG, 2025). Some minor contamination with hydrocarbons could also occur in areas of current or historic extractive activities; however, widespread contamination that could significantly impact on water quality is unlikely.

Surface water runoff from the proposal area discharges into minor and major streams that are tributaries of the Adelaide River. Although multiple studies on the water quality from the Adelaide River have been conducted, limited data is available for its smaller tributaries. Water quality at sample sites upstream (G8170020) and downstream (G8170021) from the proposal area (location shown in Figure 5-12) evidence the tidal and rainfall seasonality influence in the Adelaide River water quality. At G8170021, located near the Arnhem Highway, higher levels of turbidity were recorded in the dry season than in the wet, along with an

elevated mean electrical conductivity of 2,479.03 microSiemens per centimetre ($\mu\text{S}/\text{cm}$), both evidencing tidal influence. At G2170020, turbidity was higher in the wet season, and a lower mean electrical conductivity was reported at this site ($208.52 \mu\text{S}/\text{cm}$; (NTG, 2025)).

Groundwater quality

Groundwater in the Darwin rural region is known to generally be of good quality evidenced by the large number of rural properties the underlying aquifer services for domestic consumption. While there are no bores within the proposal area, water samples from rural bores within the same aquifer to the west and south of the proposal area indicates groundwater is neutral to slightly alkaline pH, moderate electrical conductivity and relatively low hardness. TE H2 do not propose to extract groundwater as part of the proposal.

Beneficial uses

Surface water quality from the proposal area supports environmental values, including aquatic ecosystems within and downstream of the proposal area, and the Adelaide River floodplain SOCS. As described in Section 5.4 above, there are some surface water extraction licences granted for the Adelaide River. The proposal activities do not involve activities which could significantly impact on surface water quality, and the distance between the proposal activities and licenced extraction points means that the proposal is unlikely to impact on surface water users.

Groundwater quality in groundwater underlying the proposal area supports environmental values, including GDEs, the Adelaide River, and extractive uses include agricultural, industrial, cultural, aquaculture, mining, and domestic and potable uses. The proposal does not involve activities which would result in groundwater contamination such that these supported values would be impacted.

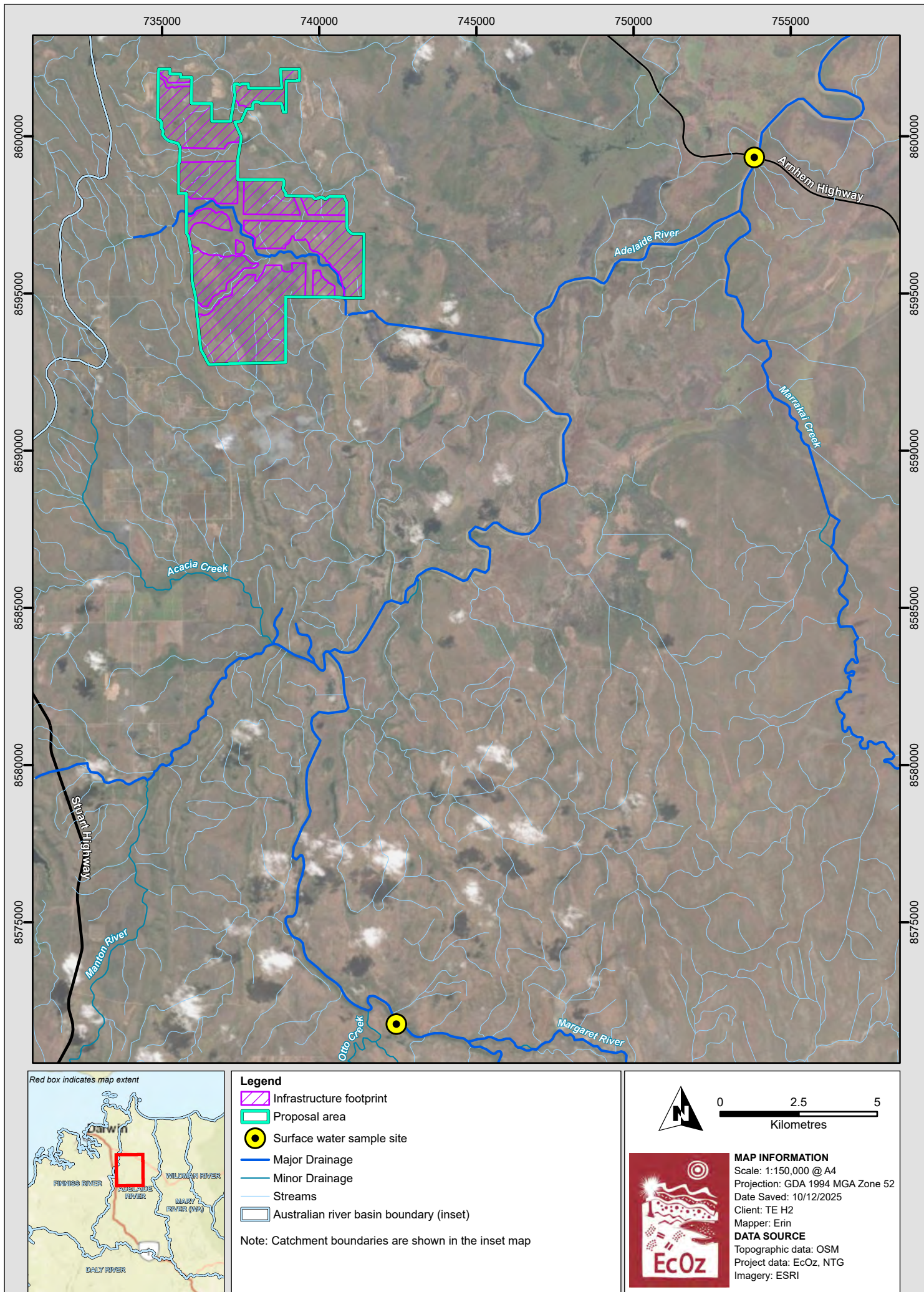


Figure 5-12. Map of surface water sample sites

5.4.2 Impact assessment

Potential impacts to the valued components of the inland water environmental quality factor were identified and assessed in accordance with the methodology outlined in Section 5. The potential impacts, avoidance and mitigation, and residual impact significance rating are summarised in Table 5-17 and described further below.

Increased turbidity of surface water

There is potential for increased turbidity and suspended sediment concentrations in surface water. The potential for erosion and sediment runoff is greatest during land clearing and construction activities such as earthworks which involves disturbance, stockpiling and handling of large volumes of soil. The solar farm will be constructed over a 2,500 ha area in an area with inherently high rainfall erosivity during the wet season months (October to April) when significant rainfall events can occur. The potential for turbidity laden runoff is lower during operations, because groundcover will be maintained under solar panels and surface water runoff will be managed to avoid significant erosion. Based on this, the residual impact has been assessed as minor.

Contamination of surface water

Given there are only proposed to be minor volumes of hazardous materials stored on site, no known areas of existing contamination and only minor areas of potential ASS within the infrastructure footprint that could be disturbed, there is not considered to be a feasible pathway for potential significant contamination of surface water to occur. A Construction Environmental Management Plan (CEMP) will be prepared and will include measures for spill prevention and response and requirements for storage of materials in accordance with AS 1940:2017 and relevant NT Dangerous Goods legislation.

Ground water quality

Similarly, given there are only proposed to be minor volumes of hazardous materials stored on site, and absence of deep excavation or process water discharges, there is not considered to be a feasible pathway for potential significant contamination of groundwater.

Table 5-17. Preliminary impact assessment – inland water environmental quality

Impact	Proposal phase	Proposed Avoidance	Proposed environment protection and management measures	Residual impact significance rating
Surface water				
Increased turbidity in surface water Land clearing and construction activities could result in erosion and sediment runoff, increasing turbidity and suspended sediment concentrations in surface water.	Construction	• Proposal layout avoids major drainage lines and areas of concentrated flow. • Construction will be staged to minimise advance clearing and exposure of soils over a large area at any one time.	• A CPESC-endorsed ESCP will be developed and implemented during construction works in accordance with Best Practice Guidelines (IECA, 2008). • Drainage from disturbed areas will be captured and treated in sediment basins designed in accordance with Best Practice Guidelines (IECA, 2008), using environmentally approved flocculants as required. • Surface water quality monitoring will be undertaken in accordance with the ESCP and adaptive management measure implemented as required. • Groundcover will be maintained as much as possible, including underneath solar panels. • Stormwater management infrastructure will be implemented to minimise erosion and sedimentation from altered surface water flows during operation.	Minor

5.4.3 Conclusion

The proposal does not involve activities which are likely to result in significant contamination of surface water or groundwater. Small volumes of fuels and other chemicals will be stored and handled during construction, however standard and industry best practice measures (for example, bunded storage, spill response procedures and secondary containment) will be implemented to avoid and mitigate the risk of contamination.

Land clearing and soil disturbance over up to 2,500 ha have the potential to increase erosion and sediment transport during construction, particularly given the proposal's location within an area of high rainfall erosivity during the wet season. Standard erosion and sediment control measures will be implemented to minimise these risks, including staged clearing, installation of sediment basins and maintenance of groundcover beneath solar panels. Stormwater runoff will be captured, treated where required, and discharged in accordance with the ESCP.

Short-term, localised increases in turbidity downstream of construction areas may occur during high-intensity rainfall events, particularly before vegetation re-establishes. These temporary exceedances of guideline turbidity levels are not expected to cause long-term degradation of water quality or ecological values, provided that monitoring and adaptive management measures are effectively implemented.

As construction progresses and the site is stabilised, the risk of erosion and sediment-laden runoff will substantially reduce. During operation, the maintained groundcover and engineered stormwater infrastructure are expected to ensure that surface water and groundwater quality are protected. Assuming effective implementation of impact avoidance and mitigation measures, significant impacts to inland water quality are not anticipated and the NT EPA's objective is likely to be met.

5.5 Community and economy

The NT EPA's objective for the community and economy factor is to:

Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.

5.5.1 Presence of environmental values

The proposal area lies within the Litchfield subregion, which is one of six subregions identified in the Darwin Regional Land Use Plan. Early development in the Litchfield subregion was shaped by rural subdivisions and agricultural activities. The Litchfield area is now important for its potential to accommodate population growth close to Palmerston and Darwin. The long-term plan for the Litchfield subregion will see the current number of dwellings almost triple (from 7,500 to 20,500) over the next 40 to 50 years (NTPC, 2016).

The proposal is located south of Darwin in the Litchfield municipality. NT Portion 4477 is a pastoral property zoned Rural, with a perpetual pastoral lease. Current land use within the proposal is agriculture and horticulture. In the surrounding area, there are some granted extractive leases and some rural living blocks. The Darwin Regional Land Use Plan (DLPE, 2015) identifies the proposal area as rural lifestyle land use. However, the rural living blocks are approximately 1 km from the proposal area at the closest point.

5.5.2 Impact assessment

TE H2 commenced consultation with key stakeholders in January 2023. Consultation has been undertaken through a variety of methods, including email, phone calls and formal meetings (both virtual and in-person). This is detailed further in Section 4.

While potential impacts on values of the community and economy factor can be predicted based on other large-scale infrastructure projects, broader community consultation has not yet been undertaken to refine these to be relevant to the current proposal. Until this broader consultation has been undertaken, there is uncertainty regarding potential impacts under the community and economy factor.

As discussed in Section 3, True North have been engaged by TE H2 and have prepared a consultation strategy for the proposal aligned with the objectives of the EP Act and in accordance with the International Association for Public Participation (IAP2). TE H2 will undertake a Social Impact Assessment which will include broad community consultation, to comprehensively assess the potential benefits and impacts of the proposal. As part of this process, a Social Impact Management Plan will be prepared and implemented that identifies appropriate and effective benefit enhancement measures and impact avoidance and mitigation measures. TE H2 are committed to thorough and culturally appropriate consultation throughout all stages of the proposal.

Additionally, TE H2 are undertaking the following assessments to inform ongoing proposal design and impact mitigation:

- Noise and vibration impact assessment.
- Landscape and visual impact assessment.
- Bushfire risk assessment.
- Traffic impact assessment.
- Economic impact assessment.

5.5.3 Conclusion

Further work is required to determine both the significance of potential social and economic impacts and benefits, and the most appropriate measures for mitigation and enhancement. TE H2 will implement the Engagement and Consultation Strategy, developed with reference to the NT EPA's Stakeholder Engagement and Consultation Guidance and IAP2 Guidelines, with the intent to participate in early and proactive consultation with stakeholders and the community. A Social Impact Assessment and Social Impact

Management Plan will also be prepared to appropriately consider potential impacts and benefits and outline measures to avoid, mitigate and enhance where feasible.

5.6 Culture and heritage

The NT EPA's objective for the culture and heritage factor is to:

Protect culture and heritage.

5.6.1 Presence of environmental values

The environmental values identified for assessment under the culture and heritage factor are:

- **Sacred sites** – Sacred sites have been identified by Custodians within the initial investigation area, and the proposal design has avoided these sites to date. Sacred sites are protected under the *Northern Territory Aboriginal Sacred Sites Act 1989* due to their cultural significance. TE H2 has lodged an application for Authority Certificates with AAPA relating to any potential sacred sites within the proposal area.
- **Archaeological features** – Archaeological features may be of Aboriginal or non-Aboriginal origin. There are likely to be unknown archaeological features across the initial investigation area due to the lack of previous survey effort. All Aboriginal and Macassan archaeological places and objects are automatically protected under the *Heritage Act 2011*. Historic archaeological places and objects which are listed on the Heritage Register are also protected under the *Heritage Act 2011*.
- **Cultural landscape features** – cultural landscape features are areas identified by Traditional Owners and Aboriginal people as holding cultural significance, but which are not sacred sites or archaeological places or objects recognised and protected under legislation. Cultural landscape features may be significant for their association with resource use, cultural practices or ongoing connection to Country.

Sacred sites

The infrastructure footprint has been designed to avoid known recorded and registered sites and restricted works areas identified with the AAPA Abstract of Records (AAPA file RI2022/957) obtained across the initial investigation area. Further ethnographic survey work will be undertaken in consultation with AAPA and Custodians to confirm there are no unrecorded or unregistered sacred sites within the infrastructure footprint.

TE H2 have commenced consultation with AAPA and Custodians and have applied for an Authority Certificate through AAPA.

Archaeological features

A review of the NT Heritage Register and NT archaeological sites database did not identify any recorded archaeological places or objects, nor any Declared Heritage Places, within the infrastructure footprint. There are no places currently under assessment or consideration for listing on the NT Heritage Register.

The absence of Aboriginal archaeological sites reflects the absence of formal archaeological surveys and recording of Aboriginal objects and sites, rather than an absence of Aboriginal occupation in the past that would have resulted in the deposition of Aboriginal occupation evidence (Aboriginal objects and places) that the *NT Heritage Act* protects.

Archaeological assessment (including survey) has commenced in consultation with Traditional Owners, the NLC and Larrakia Nation, with the results of this assessment and consultation to inform the final infrastructure footprint.

Cultural values

While not formally recognised under the *Northern Territory Aboriginal Sacred Sites Act 1989* or *Heritage Act 2011*, cultural landscape features and cultural values require assessment under the EP Act. The identification of cultural landscape features and values requires consultation with Traditional Owners and other appropriate representatives, and relevant representative bodies such as the NLC. TE H2 will enter into an ILUA for the solar farm should a claimant be identified. This process will assist in identifying cultural values within the infrastructure footprint which may be impacted by the proposal, and appropriate impact avoidance and mitigation measures to be implemented to the satisfaction of Traditional Owners. Cultural values will also be informed by consultation undertaken during archaeological surveys.

5.6.2 Impact assessment

Potential impacts to the valued components of the culture and heritage factor were identified and assessed in accordance with the methodology outlined in Section 5. The potential impacts, avoidance and mitigation, and residual impact significance rating are summarised in Table 5-18 and described further below.

Loss or damage of archaeological features and sites

Archaeological surveys are underway across the infrastructure footprint, in consultation with NT Heritage Branch, Traditional Owners, and the NLC to identify the tangible heritage values. While the presence and distribution of archaeological features across the infrastructure footprint is currently unknown, TE H2 will avoid any identified high-value sites.

Any impacts to archaeological places or objects would be managed in accordance with the *Heritage Act 2011*. Therefore, while there is uncertainty regarding the presence of features at the time of the referral, TE H2 are committed to not having a significant impact on archaeology and there is a legislative process in place to manage potential impacts on this value, so these residual impacts have been assessed as minor.

Loss or damage of sacred sites

The infrastructure footprint has been designed to avoid known registered and recorded sacred sites. Consultation with AAPA and Custodians is ongoing to identify any unregistered or unrecorded sacred sites within the infrastructure footprint. TE H2 will obtain an Authority Certificate under the *Northern Territory Sacred Sites Act 1989* from AAPA, which will provide acceptable mitigation measures. Therefore, while there is uncertainty regarding the presence of features until ethnographic surveys are complete, the combination of avoidance design, consultation, and regulatory control means residual impacts are assessed as minor.

Harm to intangible Aboriginal cultural places and values

Intangible cultural values may be present within the infrastructure footprint. These values will be identified through a Cultural Values Impact Assessment (CVIA) undertaken in close consultation with Traditional Owners. The CVIA will inform whether the proposal has the potential to significantly affect intangible cultural values. Until this work is complete, potential impacts remain uncertain.

Loss or restriction of access to cultural values / areas used for cultural purposes

Potential impacts to cultural land uses or access for cultural purposes are yet to be fully understood. Consultations with Traditional Owners have commenced, and TE H2 will enter into an ILUA for the solar farm should a claimant be identified, which would contain agreed measures to identify and manage impacts to cultural values, including access for cultural practices. A CVIA will be undertaken to document culturally significant uses and inform final design and management measures. Until this work is complete, potential impacts remain uncertain.

Table 5-18. Preliminary impact assessment - culture and heritage

Impact	Proposed avoidance measures	Proposed environment protection and management measures	Residual impact significance rating
Loss of or damage to archaeological features and sites Land clearing and ground disturbance will occur over up to 2,500 ha. There is potential for some features to require disturbance and removal (in accordance with appropriate permits) to avoid damage. Undetected features may also occur (e.g. sub-surface) which may be uncovered during construction. On-ground archaeological surveys will be undertaken to identify archaeological features and inform management measures.	• Proposal design will avoid any identified archaeological places or objects where practicable. • Ground disturbance will be limited to approved construction areas. • On-ground archaeological surveys will be undertaken prior to construction to identify features and inform detailed design.	• Unavoidable impacts to archaeological features to only occur if appropriate permits can be obtained under the <i>Heritage Act 2011</i> to carry out work on a heritage place or object (works approval). • If archaeology is identified within the infrastructure footprint, a Cultural Heritage Management Plan (CHMP) will be prepared and implemented to manage potential impacts to archaeological features, including an unexpected finds procedure. If no archaeology is identified, an unexpected finds procedure will be developed as part of the broader construction management plan. • Standard controls will be implemented during construction and operation to avoid and minimise dust and erosion and sedimentation issues. This includes development and implementation of ESCPs, and dust suppression.	Minor
Loss or damage of sacred sites There will be no direct disturbance of sacred sites. Known sites have been avoided through proposal design to date, and any sites identified through consultation with AAPA and Custodians will be avoided. Indirect impacts which may result in degradation of sacred sites (e.g. dust, erosion and sedimentation, altered surface water hydrology) will be avoided and mitigated using standard controls and in accordance with the requirements of an approved Authority Certificate under the <i>Northern Territory Aboriginal Sacred Sites Act 1989</i> .	• Known registered and recorded sites have been avoided through design. • Any additional sites identified during consultation will be avoided.	• Consultation with AAPA and Custodians to confirm the presence or absence of unrecorded sites. • TE H2 will obtain and comply with an AAPA Authority Certificate, and all works will occur in accordance with the conditions of any Authority Certificate issued. • Implement erosion, sediment, and dust controls to avoid indirect impacts on sacred sites.	Minor
Loss or restriction of access to areas used for cultural purposes Cultural land uses or access for cultural purposes is currently unknown but will be informed by consultation and site surveys that are underway.	• Proposal layout and design will consider and, where practicable, maintain access to culturally significant areas. • Avoid locating infrastructure in known or identified areas of cultural use.	• Consultation with Traditional Owners and NLC is underway and would also occur through the ILUA process if a claimant is identified, to identify and manage cultural values, including access for cultural uses. • A CVIA will be undertaken to identify culturally significant areas and inform mitigation measures. • Access protocols and management measures to be developed through the CVIA process (and ILUA if required).	Uncertain

5.6.3 Conclusion

The identification of cultural and heritage values within the infrastructure footprint requires consultation and on-ground survey work. Known registered and recorded sacred sites have been avoided by proposal design, noting further unrecorded or unregistered sites may be identified through ongoing consultation with AAPA and Traditional Owners. TE H2 have commenced consultation with AAPA and have applied for an Authority Certificate and will comply with all conditions of the certificate, including avoiding direct impacts to sacred sites and mitigating potential indirect impacts.

Consultation has also commenced with the NLC to provide input into the archaeological surveys which will assist with identifying cultural landscape features and other cultural values within the infrastructure footprint. The findings of archaeological surveys and consultation will inform a CHMP, which will detail impact avoidance and mitigation measures developed in consultation with Traditional Owners and site custodians, and to the satisfaction of NT Heritage Branch. A CVIA is being undertaken in consultation with Traditional Owners to inform whether the proposal has the potential to significantly affect intangible cultural values and inform ongoing proposal design refinement.

While there remains some uncertainty regarding the presence of culture and heritage features within the infrastructure footprint, TE H2 are committed to avoiding and minimising impacts, and consultation is underway to identify these values and incorporate them into the proposal design. Statutory processes under the *Heritage Act 2011*, *Native Title Act 1993*, and *Northern Territory Sacred Sites Act 1989* provide mechanisms to manage and mitigate potential impacts to cultural and heritage values. Assuming effective implementation of the CHMP and compliance with the AAPA Authority Certificate, no significant residual impacts to culture and heritage are anticipated.

Based on this, the NT EPA's objective is expected to be met, though an information gap remains until surveys and consultation are complete.

6 CUMULATIVE IMPACTS

The EP Regulations (regulation 79) defines matters that may be included in an environmental impact assessment, including a cumulative impact assessment that considers the combined impact of the action or proposal and other actions.

Table 6-1 identifies key proposals in the Greater Darwin Region, where the proposal is located that:

- Are approved, planned or reasonably likely to occur in the next 20 years.
- Are likely to affect the same environmental values as the current proposal within the Greater Darwin Region to an extent these impacts could be considered cumulative.

It should be noted these projects have been identified based on a review of online sources and publications, including projects being referred to or being assessed under the NT EP Act and/or EPBC Act, are identified in an existing regional land use plan, or are identified as major projects on the NT major projects list. It is not exhaustive but is considered representative of the key projects that may contribute to cumulative impacts. Climate change is also considered a potential to exacerbate residual impacts and contribute to cumulative impacts.

Table 6-1. Projects in the Greater Darwin Region which may contribute to cumulative impacts

Project	Timeframe	Description
Territory Energy Link (including the OHTL associated with this proposal)	2-5 years	Multi-user transmission corridor within a zoned Utilities corridor. TE H2's OHTL is proposed to be within the Territory Energy Link corridor.
Middle Arm Precinct (MAP)	5-10 years	Multi-user industrial precinct including various industries and export via rail and marine shipping. TE H2's Darwin H2 Hub is proposed to be within the MAP.
Extractives projects	Current	Several extractive leases and operational quarries occur within NT Portion 4477 and surrounds, which involve land clearing and ground disturbance.
Manton Dam Return to Service – Strauss Water Treatment Plant	2-3 years	New water pipeline from Manton Dam to the Strauss Water Treatment Plant on Cox Peninsula Road.
Larrakia Energy solar precinct	2-5 years	A 300 MW solar precinct on Finn Road as part of MAP
Greater Holtze residential development	2-5 years	Release of land around the Palmerston Hospital for residential development. Development of 500 residential lots proposed between Holtze and Kowandi.
Lloyd Creek residential development	5+ years	Residential development along Noonamah Ridge, directly west of the proposal area. The project received approval under the now repealed <i>Environment Assessment Act 1982</i> in 2017.
Weddell Industrial Area	5-10 years	Industrial land set aside at Weddell to cater for light, general and strategic industrial opportunities
Finniss Lithium Project, Core Lithium	5-10 years	Lithium mining and processing facilities on Cox Peninsula.
Lei Lithium Project, Lithium Plus Minerals	5-10 years	Lithium mining on Fog Bay Road.
AAPowerLink Darwin Converter Site and Overhead OHTL, Sun Cable	5-10 years	Proposed converter station at Murrumujuk (Gunn Point) and overhead OHTL corridor through Koolpinyah.
Darwin Energy Hub	5-10 years	Solar precinct and OHTL identified in NT Infrastructure Plan and Pipeline. The project was accepted for assessment on referral information on 19 August 2025.
Gunn Point renewable energy hub	5-10 years	Solar precinct and OHTL identified in Darwin-Katherine Electricity System Plan.

Project	Timeframe	Description
Other solar precincts	5-10 years	Various proponents have announced plans to develop solar projects. There are no specific details of locations and areas.
Weddell Freeway	5-10 years	A new freeway to link Tiger Brennan Drive near Palmerston to the Stuart Highway south of Darwin near Noonamah.
Adelaide River Off-stream Water Storage (AROWS) Project	7-10 years	This is a proposed new reservoir located west of the Adelaide River, south of the proposal area. The area would store water harvested from the Adelaide River during the flows in the wet season. The project is being assessed by EIS at the time of writing.
Murrumujuk residential development	15+ years	Land set aside in the Darwin Regional Land Use Plan for residential development at Gunn Point.
Weddell residential development	15+ years	Land set aside in the Darwin Regional Land Use Plan for future residential development. The vision for Weddell is to provide 10,000 housing lots in a tropical, sustainable and liveable city.
Gunn Point agribusiness precinct	15+ years	Land set aside in the Darwin Regional Land Use Plan for future agricultural development.

As discussed in Section 2.3, there are three developments related to the current proposal. These will occur within the Greater Darwin region and will be subject to thorough impact assessment and technical studies in accordance with the approvals' pathway determined under the SEA for the MAP and any approval for the Territory Energy Link. These proposals cannot be assessed as part of this referral – as discussed in Section 2.3 – because both the MAP and Territory Energy Link are undergoing development and assessment under a separate proponent – the NT Government. Both projects will be developed independently of the current proposal, and similarly, the current proposal can be developed independently of both.

Potential impacts with a moderate and high residual impact rating have the potential to contribute to cumulative impacts. This referral has identified that the proposal has potential to have moderate residual impacts on:

- Terrestrial ecosystems

A summary of the potential cumulative impacts is provided below.

6.1.1 Terrestrial ecosystems

The proposal will result in the loss of 2,500 ha of vegetation and habitats. Of all the projects identified in Table 6-1, only the AROWS project is substantively within the Pine Creek bioregion. That bioregion contains 95.65% intact remnant vegetation. The cumulative loss of additional habitat due to the development this proposal and AROWS within the Pine Creek bioregion is not significant.

6.2 Climate change

Climate change is expected to increase residual risks and cumulative impacts into the future. The concentration of GHG emissions globally is leading to increase in surface temperatures and resulting climate changes. *Climate change in the Northern Territory – State of the science and climate change impacts* (NESP, 2020) outlines the pressures and impacts relevant to the NT. The pressures and potential impacts that may impact this proposal are provided in Table 6-2.

Table 6-2. Climate change pressures and impacts relevant to the proposal (NESP 2020)

Factor	Environmental Values	Climate change pressures/impacts	Confidence in timing
Terrestrial environmental quality	• Soil stability • Soil quality	• Increased severity of heavy rainfall events may increase flooding and erosion.	• There is high confidence in the rising temperature predictions with average temperatures increasing by up to 2.4°C by mid-century (2050) and 5.1°C by late century (2090). • There is a high level of confidence that fire weather will become more frequent and harsher. • There is a medium level of confidence in tropical cyclones becoming less frequent, but more intense over the century while the intensity of associated rainfall during extreme storms may increase. • There is high confidence that heavy rainfall events will become more intense, but low confidence regarding how much more intense.
Terrestrial ecosystems	• Vegetation and habitats • Significant vegetation • Threatened species	• Increased ambient temperatures, harsher fire weather and more intense cyclones may cause degradation or loss of habitats and vegetation or alter species composition (e.g. changing species ranges or lifecycle stages). • Intense rainfall events may cause erosion.	
Hydrological processes	• Surface water flows • Groundwater levels and discharges	• Increased severity of heavy rainfall events may increase flooding and erosion.	
Inland water environmental quality	• Surface water quality • Groundwater quality		
Community and Economy	• Way of life • Surroundings • Livelihoods	• Threats to ecosystems and habitats (per above) may in turn impact the community's way of life, where there is connection with biodiversity and the environment. • More intense rainfall and cyclones may disrupt traffic routes. • Increase severity and frequency of natural disasters may impact the local economy and the operations of the proposal.	
Culture and heritage	• Archaeological features • Sacred sites • Cultural features and uses	• Increase severity and frequency of natural disasters may damage cultural artefacts, sacred sites or archaeological artefacts near the proposal area.	

7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

There are nine Matters of National Environmental Significance (MNES) protected under the EPBC Act as listed in Table 7-1. There are two MNES of relevance to the proposal – see summary in Table 7-1. As discussed in Section 1, the proposal is being referred to the Commonwealth DCCEW under the EPBC Act. DCCEW will determine whether the proposal requires assessment and approval under the EPBC Act upon receipt and review of the referral.

Table 7-1. Summary of PMST results

EPBC Act section	Controlling provision	Quantity
S12	World Heritage	None
S15B	National Heritage	None
S16	Ramsar Wetland	None
S18	Threatened Species and Ecological Communities	50
S20	Migratory Species	71
S21	Nuclear	None
S23	Commonwealth Marine Area	None
S24B	Great Barrier Reef	None
S24D	Water resource in relation to large coal mining development or coal seam gas	None

8 CONCLUSION

TE H2 propose to develop up to 2,500 ha for the Wak Wak Solar Farm at NT Portion 4477. The proposal involves land clearing and installation of solar PV, BESS and ancillary infrastructure, to generate renewable energy for distribution to existing industry and to TE H2's proposed green hydrogen production facility – the Darwin H2 Hub – at the Middle Arm Peninsula.

The proposal is being referred to the NT EPA as a standard assessment in accordance with section 48(a) of the EP Act, to determine whether formal assessment and approval is required. This referral report has assessed the potential for the proposal to have a significant impact on the environment as defined in section 11 of the EP Act.

The proposal is also being referred to the Commonwealth DCCEEW to determine whether assessment is required under the EPBC Act.

Pre-screening for the proposal identified the potential for impacts to or uncertainty regarding impacts to six of the 14 NT EPA environmental factors. This referral report assessed the significance of residual impacts to each of these six factors, accounting for avoidance and mitigation measures, and other legislative requirements and/or processes to manage potential impacts to values. A summary of the impact assessment is provided in Table 8-1.

Table 8-1. Summary of potential impacts to NT EPA environmental factors

Factor	Residual impact	Conclusion
LAND		
Terrestrial environmental quality Section 5.1	Minor	The proposal has potential to have a minor residual impact on terrestrial environmental quality. While best practice mitigation measures will be implemented, it is possible there will still be isolated erosion in the short to medium term during and in the few years immediately post construction, due to the large area of clearing and climatic conditions. Potential impacts to soil quality are expected to be minor and can be managed through standard environmental management practices.
Terrestrial ecosystems Section 5.2	Moderate	TE H2 have undertaken an extensive avoidance process to avoid high-quality savannah woodland habitat as detailed in Section 2.4.2 including incorporating wildlife corridors into the proposal design. The proposal will result in the loss of up to 2,500 ha, which is less than 1 % of the bioregion. The clearing will occur over a moderate scale of up to 2,500 ha and while vegetation will be removed in the long-term, ecological integrity and function within the surrounding landscape and broadly across the bioregion is expected to be maintained. Significant vegetation has been avoided through proposal design, except for a minor area (28 ha) of low-quality wetland habitat (i.e. swamp). Indirect impacts will be mitigated through best-practice management of weeds, dust, erosion and sedimentation and hazardous materials. Habitat fragmentation has been avoided through design by incorporating wildlife corridors that will be managed for indirect impacts as described above. Significant impact assessments undertaken in accordance with the <i>Significant Impact Guidelines 1.1</i> demonstrate the proposal is unlikely to have a significant impact on threatened species.
WATER		
Hydrological processes Section 5.3	Minor	The proposal has the potential to have a minor residual impact on hydrological processes. Vegetation clearing and construction across 2,500 ha may alter surface water flow paths and increase surface water runoff volumes within the infrastructure footprint, requiring specific design measures to mitigate associated impacts. Standard engineered stormwater and drainage designs will be implemented to manage surface water flows and maintain groundwater recharge as much as possible, such that significant residual impacts to hydrological processes are

Factor	Residual impact	Conclusion
		unlikely to occur. A stormwater management strategy will be prepared to demonstrate the proposed stormwater management infrastructure can achieve an acceptable change to surface water flows outside of the infrastructure footprint.
Inland water environmental quality Section 5.4	Minor	During construction, there is potential for surface water runoff with elevated turbidity and suspended sediment concentrations due to land disturbance. Best practice mitigation measures will be implemented, including a CPESC endorsed ESCP, to minimise the potential for erosion turbid runoff. The proposal does not involve activities that would result in significant surface water or groundwater contamination.
PEOPLE		
Community and economy Section 5.5	Uncertain	A Social Impact Assessment will be undertaken to properly identify potential impacts and benefits under this factor. Preparation of this assessment will include broader community consultation than has occurred to date. Additionally, TE H2 are undertaking the following assessments to inform ongoing proposal design and impact mitigation: • Noise and vibration impact assessment. • Landscape and visual impact assessment. • Bushfire risk assessment. • Traffic impact assessment. • Economic impact assessment. A Social Impact Management Plan will be prepared to identify appropriate impact avoidance and mitigation measures and benefit enhancement measures. Until these assessments are complete, there remains uncertainty regarding the potential for significant impacts to this factor.
Culture and heritage Section 5.6	Uncertain	Impacts to sacred sites will be avoided in accordance with the requirements of an Authority Certificate obtained under the <i>Northern Territory Sacred Sites Act 1989</i> . Archaeological and ethnographic surveys and consultation are underway to identify archaeological features and cultural values (tangible and intangible). Detailed design will account for identified values and any unavoidable impacts to archaeology will be managed under the <i>Heritage Act 2011</i> , with high-value archaeology to be avoided. TE H2 will enter into an ILUA for the solar farm should a claimant be identified.

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APPENDIX A ECOLOGY REPORT (ECOZ 2025A)

APPENDIX B CONSTRAINTS REPORT (ECOZ 2025B)

APPENDIX C IMPACT ASSESSMENT CRITERIA

	Severity		
	High	Moderate	Low
Scale	Widespread – regional Impact affects > 2,500 ha or areas >5 km from activity. Territory-wide, National or International implications and/or broad community concern.	Localised Impact affects 100-2,500ha or areas >1km but <5km from activities. Local implications and/or pockets of community concern	Limited Impact affects a small area (less than 100ha) or is confined to within 1 km of activities. Limited implications and/or only a handful of people concerned.
Duration	Permanent to long-term Impact is regular over an extended period, or impact endures permanently. Recovery unlikely without extensive remediation and/or restoration activities.	Medium-term Impact that recurs intermittently and/or persists for < 1-5 years. Conditions return to normal within 1-5 years.	Short-term One-off or occasional impact that persists for days to months. Conditions quickly return to normal.
Magnitude	High Major changes from natural conditions such that values are severely impacted or no longer supported.	Moderate Changes exceed natural variation but impacts to supported values are unlikely.	Low Changes are detectable but within normal range or natural variation.
Sensitivity	High Very sensitive receptors are present that have limited resilience to change. AND/OR Environment contains values that are important at a regional or national scale, and/or are protected by law	Medium Sensitive receptors are present but have some resilience to change. AND/OR Environment contains values that are important at a local scale and/or have beneficial use.	Low Environment is degraded, or intact but does not support sensitive receptors. AND The environment does not contain any aspects that are valuable or otherwise important or unique.

Residual impact significance assessment matrix

Severity rating	Sensitivity rating		
	High	Medium	Low
High	High	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Low