



FINAL SUBMISSION

Haughton Pipeline Stage 2

**Response to DCCEEW information
request**

Townsville City Council

21 October 2022

→ The Power of Commitment



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Executive summary

Townsville City Council (TCC) is proposing to undertake the Haughton Pipeline Stage 2 (HPS2) Project (the Project) which comprises a new pump station at the Burdekin River Clare Weir Storage, high voltage substation, overhead power supply from the substation to the pump station, and a 1.8 m diameter pipeline approximately 28.5 km long (underground) connecting to the already constructed Stage 1 pipeline. The purpose of the overall Project is to provide transfer of 364 ML/day of raw water from the Burdekin River to the Ross River Dam to provide water supply security for Townsville City.

This report presents the Preliminary Documentation (PD) in response to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) Request for Further Information (dated 10 March 2022, EPBC ref: 2021/9133) for an assessment under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the HPS2 Project, Mulgrave, Qld (the Project).

The purpose of the report is to provide sufficient information to allow DCCEEW to assess the potential impacts of the proposed HPS2 on the following listed threatened species confirmed present or likely to occur:

- Confirmed present
 - Black ironbox (*Eucalyptus raveretiana*) – Vulnerable
 - Black-throated finch (southern) (*Poephila cincta cincta*) – Endangered
 - Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*) – Vulnerable
 - Squatter pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable.
- Likely to occur
 - Koala (*Phascolarctos cinereus*) – Endangered
 - White-throated needletail (*Hirundapus caudacutus*) – Vulnerable.

The report has been structured to align with the relevant sections of the Request for Further Information. A detailed cross reference table is provided in Section 1.3.

The Project will result in a total disturbance footprint of 153.9 ha, comprising:

- Permanent disturbance impact of 15.64 ha for the access roads, the pump station and power supply works
- Temporary disturbance impact of 138.26 ha with progressive rehabilitation to be undertaken as the construction work front progresses.

The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation over many decades for agricultural and cattle grazing purposes. Through these processes, the natural environment has undergone substantial alteration and fragmentation of habitat values, including through the sowing of pasture grasses resulting in the spread of invasive weeds. Despite this, parts of the Project area contain remnants of very sparse to open woodland and remnant vegetation predominantly along riparian corridors which provide foraging habitat, breeding places, drinking sites, shelter habitat and dispersal corridors for several EPBC Act listed species.

The assessment of impacts to Matters of National Environmental Significance (MNES) determined a number of impacting processes that pose the most risk to MNES (Section 4), and thus will be the focus of mitigation and management:

- Loss of habitat
- Injury or mortality
- Fragmentation of habitat and loss of connectivity
- Disturbance to habitat from noise, light, and vibration
- Habitat degradation and increased erosion
- Spread of invasive species.

Substantial avoidance has been achieved by the Project area by siting infrastructure in existing disturbed areas. Other mitigation measures to reduce the impacts of habitat fragmentation and help to maintain habitat connectivity include:

- The only permanent infrastructure remaining will be an access track, intake structure and pump station, substation and power supply works
- Land clearing will be restricted to the minimal amount necessary for the construction of the Project and will not extend outside of the Project area
- Removal of all temporary fencing after completion of construction works.

In addition to the abovementioned mitigation and management measures that will be implemented to minimise the impacts of the Project’s construction, rehabilitation following construction is proposed, and will include:

- Revegetation with tubestock and hydromulch with endemic grass species in areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the Department of Resources (DoR) Vegetation Management Watercourse and Drainage Feature Map. This excludes a 10 m wide zone of influence above the pipeline which shall only be hydromulched to enable future maintenance of the pipeline, and also excludes the 4 m wide permanent access track that will not be vegetated.
- Hydromulching for remaining areas.

A detailed suite of management and mitigation measures to address (e.g. avoid, minimise, mitigate) these impacts has been identified in this report.

A detailed assessment of likely impacts to MNES associated with the construction, operation and maintenance of the Project are detailed in the MNES report (GHD, 2022) and Section 4 of this PD Report. Despite the substantial measures that will be undertaken to avoid and mitigate impacts, a significant residual impact is still anticipated on three species as summarised in Table ES 1.1.

Table ES 1.1 Project residual impacts on MNES

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significant residual impact
<i>Eucalyptus raveretiana</i>	Maximum removal of four individuals.	No impact	Not significant
Koala	Loss of habitat that constitutes habitat critical to the survival of the species (134.19 ha) Total habitat disturbance comprised of 85.94 ha of forest or woodland and 48.25 ha of non-remnant (e.g. road-side, paddock trees) vegetation.	Loss of 134.19 ha of habitat critical to the survival of the species.	Significant
Bare-rumped sheathtail bat	Loss of 10 large and 27 moderate-sized <i>Eucalyptus platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 325 small <i>E. platyphylla</i> hollows that represent future potential roosting habitat Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Total habitat disturbance of 85.54 ha of foraging habitat and 43.12 ha of roosting habitat	Significant
Black-throated finch (southern)	Indiscriminate loss of trees within 1 km of water Loss of 96.34 ha of suitable habitat (in aggregate), comprising: – Nesting and foraging 82.14 ha – Foraging only 14.19 ha	Indiscriminate loss of trees within 1 km of water associated with pump station and laydown areas Total habitat disturbance of 96.34 ha (in aggregate), comprising 82.14 ha of nesting and foraging and 14.19 ha of foraging only	Significant

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significant residual impact
Squatter pigeon (southern)	Loss of 96.32 ha (in aggregate), comprising: <ul style="list-style-type: none"> – 82.33 ha of foraging and breeding habitat – 13.31 ha of foraging only habitat – 0.68 ha of drinking and dispersal habitat – 	No impact	Not significant
White-throated needletail	No impact – almost exclusively aerial forager and does not have typical associations with habitat. Non-breeding visitor.	No impact	Not significant

Cumulative impacts inclusive of the Haughton Pipeline Duplication Project (HPDP) (Stage 1 and Stage 1.1) have been reviewed. While the construction and operation of the HPDP resulted in impacts to several MNES also identified in the proposed HPS2, including, black-throated-finch (southern), bare-rumped sheath-tail bat, *Eucalyptus raveretiana* and squatter pigeon (southern), significant impact assessments concluded the HPDP was unlikely to result in significant residual impacts. When considered in aggregate, and noting the implementation of avoidance, minimisation and mitigation measures (undertaken/committed to – Stage 1, Stage 1.1; proposed – Stage 2), species' declines resulting from the entirety of the action are considered unlikely. From a landscape-level population/metapopulation dynamics perspective, in aggregate, these developments are not likely to affect local to landscape-level dispersal, exacerbate threats like weeds or invasive animals, nor cause the loss of areas of particular ecological importance such as key (known) breeding or aggregation sites.

TCC remains committed to mitigating long term impacts to EPBC Act listed species arising from the clearing of vegetation through rehabilitation of much of the disturbance footprint, recognising that there will be a time lag between rehabilitation works and the reestablishment of vegetation (especially woody vegetation). The disturbance footprint rehabilitation treatments are detailed in Section 6 (in addition to land based offsets described in Section 7).

The Project will result in significant economic and social benefits including:

- Water security: The Project will result in high water security and reliability for Townsville for the next 60 years
- Employment: The Project is estimated to generate around 345 new jobs during the construction period, and a further 30 new full-time equivalent (FTE) positions
- Regional growth: The Project will have long-term positive impacts on Townsville's community, business and industry, helping to attract new industries and supporting growth and development of existing business and supporting new employment opportunities
- Social wellbeing: High positive impacts on local amenity, quality of life and health and wellbeing of local communities would be supported, by reliably providing water required to maintain gardens, public spaces and landscape
- Indigenous participation: TCC has set a specific Project Goal for indigenous participation, with a target of 7% of construction total labour hours to be completed by Indigenous Australian businesses and/or Indigenous Australian employees
- Economic output: The Project is estimated to increase output in the construction sector and supporting industries during the construction period by \$274 million.

A land-based offset is proposed to compensate for significant residual impacts on the following MNES:

- Bare-rumped sheath-tail bat – due to the clearance of 92.23 ha of habitat critical to the survival of the species
- Black-throated finch (southern) – due to the clearance of 96.34 ha of habitat critical to the survival of the sub-species associated with localised indiscriminate loss of trees within 1 km of water
- Koala – due to clearance of 134.19 ha of habitat critical to the survival of the species

A proposed offset area has been identified on a series of adjoining land parcels located immediately south of Lake Ross (Ross River Dam) in southern Townsville. Preliminary ecological surveys were undertaken in March 2022 by

Biodiversity Australia (2022b) to assess the suitability of the offset area. These have confirmed the area provides suitable habitat and opportunity for improvement.

All three species are considered likely to occur within the offset area. The bare-rumped sheath-tail bat was confirmed present by surveys undertaken by Biodiversity Australia and the black-throated finch (southern) and koala are likely to occur due to the presence of suitable habitat and proximity to nearby historical records.

The results of the ecological surveys that have been undertaken at the impact area (Ecological Interpretations 2022) and preliminary survey results for the offset area (Biodiversity Australia 2022) indicate that the offset area and impact area are ecologically similar. The offset therefore represents a 'like for like' compensation, as is required by the EPBC Act Environmental Offsets Policy 2012. Both impact and offset areas support a mix of coastal floodplain open woodland vegetation that has been subject to substantial historical impacts from habitat fragmentation, cattle grazing, replacement of the ground layer with pasture grass species and extensive weed infestation, notably woody weeds such as chinee apple (*Ziziphus mauritiana*), rubber vine (*Cryptostegia grandiflora*) and prickly acacia (*Vachellia nilotica*; syn. *Acacia nilotica*) and invasive grassy weeds including Guinea grass (*Megathurmus maximus*) and grader grass (*Themeda quadrivalvis*).

An Offset Area Management Strategy (OAMS) has been prepared to provide a preliminary approach and methodology proposed to develop and deliver the offset, and will be superseded by an Offset Area Management Plan (OAMP) following completion of all data analysis from ecological field surveys.

The proposed offset area has opportunities for ecological improvement through the following measures:

- Replanting of non-remnant areas with canopy, sub-canopy and shrub-layer species to reinstate the pre-clear Regional Ecosystem communities
- Natural rehabilitation of regrowth areas to encourage regeneration of canopy trees
- Hydro-mulching of areas of degraded ground layer with native food grass species
- Extensive weed control including removal of chinee apple, rubber vine, lantana and other woody weeds and removal of invasive grassy weeds
- Provision of additional water sources to maximise drinking opportunities and increase the extent of adjacent nesting and foraging habitat for the southern black-throated finch
- Fire management to prevent the likelihood of uncontrolled bushfire
- Removal of cattle to reduce degradation of understorey vegetation.

These improvements have the potential to make a real contribution to MNES by increasing the availability of resources for foraging, shelter and breeding and increasing mobility through increased habitat connectivity.

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1. Introduction

1.1 Background

Townsville City Council (TCC) is undertaking Stage 2 of the Haughton Pipeline (HPS2) Project which includes a new pump station, pipeline and associated ancillary works (herein referred to as the 'Project'), connecting to the constructed Stage 1 and Stage 1.1 Haughton Pipeline Duplication Project (HPDP). The HPDP will transfer 364 ML/day of raw water over a 22-hour period from the Burdekin River (at the Clare Weir Storage) to Ross River Dam.

The HPDP includes the following stages:

- Stage 1 of the Project was completed in 2020 and comprises approximately 33 km of DN1800 pipeline constructed from the Haughton River to Toonpan Creek at the head of Ross River Dam
- Stage 1.1 of the Project was completed in 2021 and is an extension of the Stage 1 pipeline works by 4 km from the Haughton River, directed towards the Stage 2 pipeline alignment. The Stage 1.1 works end with an isolation valve pit and is the connection point for Stage 2
- Stage 2 (this Project) comprises construction of new pump station and construction of a new 28.5 km water pipeline from the pump station to Stage 1.1 to provide an integrated water transfer system and associated ancillary works. Construction for the pipeline is due to begin in April 2023, with completion of the construction phase by the end of July 2025.

The Project is a joint funding arrangement between the Queensland Government (the State) and TCC (the Proponent). The Project location is shown on Figure 1.1.

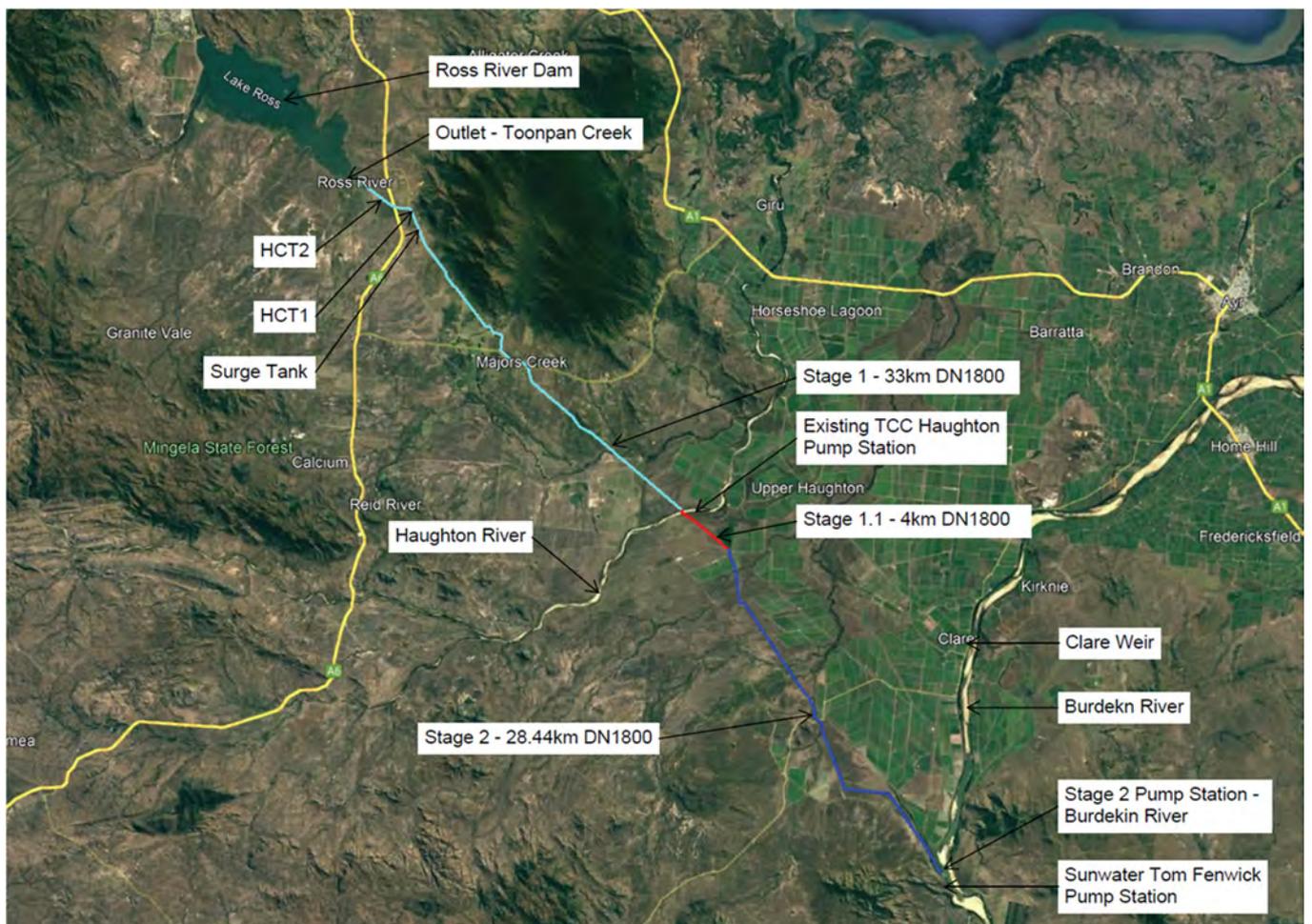


Figure 1.1 Haughton Pipeline Overview (Stage 1, Stage 1.1 and Stage 2)

A number of approvals are required for the HPS2 Project including an approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Part 3 of the EPBC Act determines that an action cannot be taken that is likely to have significant impacts on Matters of National Environmental Significance (MNES) without approval from the Minister who administers the EPBC Act.

TCC requested GHD Pty Ltd (GHD) to submit an EPBC Act Referral to the Department of Agriculture, Water and the Environment (DAWE) (now Department of Climate Change, Energy, the Environment and Water, (DCCEEW) for the HPS2 Project on the basis that Stage 1 of the HPDP was previously referred in 2015.

The results of baseline ecological field surveys and targeted MNES field surveys, including the significance of impacts assessment informed the EPBC Act Referral. A pre-referral meeting was held with DCCEEW on 13 December 2021 to discuss the potential impacts HPS2 may have on MNES prior to the submission of the online referral form. The action was referred to DCCEEW on 21 January 2022, and DCCEEW deemed the impacts of HPS2 to be a 'controlled action' by notice of Referral Decision on 18 February 2022, with HPS2 to be assessed by Preliminary Documentation (PD).

On 10 March 2022, DCCEEW issued an Information Request (IR) indicating that further information was required for PD.

1.2 Purpose of this report

This report represents PD to allow DCCEEW to assess the potential impacts of HPS2 (EPBC 2021-9133) on six threatened species that are confirmed present and considered likely to occur.

- Five species that are MNES were confirmed present within the Project area:
 - Black-throated finch (southern) (*Poephila cincta cincta*) - Endangered
 - Squatter pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable
 - Black ironbox (*Eucalyptus raveretiana*) – Vulnerable
 - Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*) – Vulnerable
- Four species that are MNES were considered likely to occur due to the presence of suitable habitat:
 - Koala (*Phascolarctos cinereus*) - Endangered
 - White-throated needletail (*Hirundapus caudacutus*) – Vulnerable.

Significant impact assessments were undertaken for all six threatened species. Of six, the Project was anticipated to result in a significant residual impact for three threatened species, namely:

- Black-throated finch (southern) (*Poephila cincta cincta*)
- Koala (*Phascolarctos cinereus*)
- Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*).

This report has been prepared in response to the IR from DCCEEW requesting:

- Strategies proposed to avoid, mitigate and offset impacts to listed threatened species and communities
- Any other relevant information as outlined in the IR on matters protected under the EPBC Act.

1.3 Further information required – cross reference table

A copy of DCCEEW's Further Information Required for Preliminary Documentation (dated 10 March 2022, EPBC ref: 2021/9133) for the HPS2 Project, Mulgrave, Qld can be found in Appendix W.

A detailed Cross Reference Table is provided Table 1.1 to demonstrate how this Preliminary Documentation Report responds and meets the information requested by DCCEEW.

Table 1.1 RFI – PD Cross Reference Table

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
2 Description of action		
2.1	The location, boundaries and size (in hectares) of the disturbance footprint and of any areas which may be indirectly impacted by the proposal, including from upstream or downstream impacts (e.g., altered water flows). Include mapping and coordinates.	Section 2.1 Appendix A
2.2	A description of all components of the action, including the anticipated timing and duration (including start and completion dates) of each component of the project. In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.	Section 2.2
2.3	A description of the operational requirements of the action including any anticipated maintenance works.	Section 2.3
2.4	A description of the surrounding land uses.	Section 2.4
2.5	An indicative layout plan for the proposed action area, including the location and type of land use or infrastructure and features, i.e., dwellings, other buildings, stockpiles, access tracks, firebreaks, pump station, cabling, power supply works areas, open space, and conservation/exclusion areas. Include mapping and coordinates for each aspect.	Section 2.5
2.6	Detail about the intended water use and water allocations enabled by the proposed pipeline. Any facilitated impacts from the use of the water from the pipeline (such as irrigated agriculture) need to be included in the PD (see section 4 below).	Section 2.6
2.7	A more detailed erosion management plan to ensure any downstream impacts to listed threatened species and communities (e.g., sedimentation) are addressed (see section 5 below).	Section 2.7 Appendix Q
2.8	Outline any state-based water plans and requirements that will be adhered to, including any relevant water allocation approvals.	Section 2.8
3 Habitat assessment		
3.1	Provide an appropriate habitat assessment for relevant listed threatened species and communities. Please note an assessment must be undertaken regardless of whether the species was recorded in the project area or not. As such, the potential for occurrence of listed threatened species and communities must also be considered and assessed.	Section 3.1 Appendix B Appendix E
3.2	Identify and describe known historical records of the listed threatened species and ecological communities in the broader region. All known records must be supported by an appropriate source (i.e., Commonwealth and State databases, published research, publicly available survey reports, etc.), the year of the record and a description of the habitat in which the record was identified.	Section 3.2
3.3	Provide detailed mapping of suitable habitat (within, adjacent to and, where relevant, downstream of the project) for all listed threatened species and communities, which: <ul style="list-style-type: none"> – is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e., does not only illustrate relevant Queensland Regional Ecosystems); – includes an overlay of the project disturbance footprint; – includes known records of individuals derived from desktop analysis and field surveys; and – is provided separately as attachments in JPEG format. 	Section 3.3 Appendix B
3.4	Attach all relevant ecological surveys referenced in the referral and PD as supporting documents.	Section 3.4 Appendix B Appendix I Appendix J Appendix K Appendix L Appendix M Appendix N

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
3.5	Provide information relating to the two ecological communities – Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; Poplar Box Grassy Woodland on Alluvial Plains – that are returned in the EPBC Act Protected Matters Report as likely to be present in the project area. Specifically, provide justification relating to their occurrence in the project area and any survey effort undertaken. Include the communities in what was Appendix C of the MNES report referral documentation.	Section 3.5 Appendix B Appendix E
3.6	Habitat assessments must note where the species is known to occur as well as where it has the potential to occur (i.e., suitable habitat). This is applicable for flora species too. Therefore, survey data should include not only presence/absence data, but also an assessment of the suitability of the area for a protected species to occur.	Section 3.6 Appendix B Appendix E
3.7	The department notes that the endangered Northern Quoll (<i>Dasyurus hallucatus</i>) or its habitat is known to occur according to the PMST report in the project area despite no suitable habitat found by the proponent in the referral documentation. The department would like to see more detailed information about the survey methodology and effort. The department understands rocky areas are used by the species for denning, but that the species also used trees, termite mounds or hollow logs for denning purposes in woodland areas. The PD should refer to survey effort across the breadth of potential habitat for the species.	Section 3.7 Appendix B
3.8	The department notes that no reptile surveys were undertaken. The department would like to see further survey effort made for the vulnerable Yakka Skink (<i>Egernia rugosa</i>), or adequate justification as to why further survey effort is not required to be undertaken.	Section 3.8 Appendix B
3.9	The department notes that no targeted field survey effort was conducted for the vulnerable Red Goshawk (<i>Erythrotriorchis radiatus</i>), which was considered likely to occur in the project area according to the PMST report. Although the closest record of the Red Goshawk is 83 km away, their home range is known to be up to 200 km. Given suitable habitat was found in the project area, the department expects further survey effort (particularly for nests) and/or a justification of why no survey effort was undertaken. Likewise, discussion should be included for the vulnerable Grey Falcon (<i>Falco hypoleucos</i>).	Section 3.9 Appendix B
3.10	The Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (<i>Phascolarctos cinereus</i>) was up-listed from Vulnerable to Endangered prior to the controlled action decision. Therefore, an updated assessment is required in the PD taking into consideration the up-listing and the new Conservation Advice <u>(Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (environment.gov.au))</u> .	Section 3.10 Appendix B
3.11	The referral documentation says that incidental sightings of fauna were recorded. Please provide these sightings in the PD.	Section 3.11 Appendix D
3.12	The <u>Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta) (awe.gov.au)</u> state that the loss of a stable population in the Townsville area would contribute significantly to the risk of extinction (page 6). Please provide an assessment of the impact of the action on the Black-throated Finch using population viability analysis. This modelling technique may be useful to assess any population-level impacts resulting from the proposed action on other protected species too.	Section 3.12 Appendix D
3.13	The department notes that the <u>Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3 (www.qld.gov.au)</u> outline best practice surveys for the Brigalow Belt region for vertebrate fauna species as one survey set in September to mid-November and another in Autumn (march-mid may before the onset of cold winter nights). The department anticipates the proponent may provide results from further survey efforts in the PD.	Section 3.13 Appendix B
4 Impact assessment		
4.1	An assessment of the likely impacts associated with the construction, operational, maintenance and (if relevant) decommissioning components of the project. The department notes information regarding any impacts during the operation and maintenance were not clear in the referral documentation.	Section 4.1 Appendix B
4.2	Include the direct, indirect, and facilitated loss and/or disturbance of MNES individuals and habitat as a result of the proposed action. This must include the quality of the habitat	Section 4.2

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
	impacted and quantification of the individuals and habitat area (in hectares) to be impacted.	Appendix B Appendix D Appendix N
4.3	An assessment of the impacts of habitat fragmentation in the proposed action area and surrounding areas, including consideration of species' movement patterns.	Section 4.3 Appendix B
4.4	An assessment of the likely duration of impacts to MNES as a result of the proposed action.	Section 4.4 Appendix B
4.5	A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.	Section 4.5 Appendix B
4.6	A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.	Section 4.6 Appendix B
4.7	<p>Justification, with supporting evidence, how the proposed action will not be inconsistent with:</p> <ul style="list-style-type: none"> – Australia's obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and – Statutory documents, including relevant recovery plans, conservation advice/s, and/or threat abatement plans. 	Section 4.7 Appendix B
4.8	An assessment of the cumulative impacts of the proposed action (inclusive of Stage 1 and Stage 1,1 of the pipeline).	Section 4.8 Appendix L Appendix M Appendix N
4.9	<p>Outline any impacts (direct, indirect, facilitated and cumulative e.g., downstream) of water diversion (or altered flow regimes) resulting from the proposed action (e.g., particularly during the operational phase).</p> <p>Outline any hydrological connectivity between the project area and other water bodies that may provide habitat for listed threatened species and communities (e.g., the Bowling Green Bay Ramsar wetland, which is within the catchment of the proposed site footprint).</p> <p>Outline any impacts to protected matters as a result of reduced/altered water flows in the Burdekin River (and any further downstream water systems/bodies), as well as any impacts to protected matters resulting from increased water levels in the Ross River Dam.</p>	Section 4.9
4.10	Update references to 'temporary' and 'permanent' disturbance from referral documentation throughout the PD. The department considers both of these disturbances to be combined as the 'disturbance footprint' regardless of any proposed rehabilitation measures.	Section 4.10
5	Avoidance, mitigation, and management measures	
5.1	A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant MNES.	Section 5.1 Appendix R
5.2	The proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence.	Section 5.2
5.3	<p>All proposed measures for MNES must be drafted to meet the 'S.M.A.R.T' principle:</p> <ul style="list-style-type: none"> – S – Specific (what and how) – M – Measurable (baseline information, number/value, auditable) – A – Achievable (timeframe, money, personnel) – R – Relevant (conservation advice/s, recovery plans, threat abatement plans, best available published scientific evidence) – T – Time-bound (specific timeframe to complete) 	Section 5.3 Appendix R
5.4	Include any relevant management plans that will be developed or implemented prior to commencement. E.g., Pest and weed management plan, vegetation management plan, fauna management plan.	Section 5.4 Appendix O Appendix P

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
	The department notes two draft plans were provided in the referral documentation - Construction Environmental Management Plan and Conceptual Erosion and Sediment Control Plan (ESCP).	Appendix Q Appendix R Appendix S Appendix T
5.5	Details of specific and measurable environmental outcomes to be achieved for relevant MNES. All commitments must be drafted using unambiguous and committal language when describing the proposed measures i.e., use 'will' and 'must' when committing to actions instead of 'where possible', 'where practicable', 'as required', 'to the greatest extent possible', and 'should' or 'may'.	Section 5.5
5.6	Details of the proposed measures to be undertaken to avoid, mitigate and manage the relevant impacts of the proposed action, including those required through other Commonwealth, State and local government approvals.	Section 5.6 Appendix R Appendix T Appendix U Appendix X
5.7	Information on the timing, frequency and duration of the proposed avoidance, mitigation, management and monitoring measures, and corrective actions to be implemented.	Section 5.7 Appendix B Appendix P
5.8	An assessment of the expected or predicted effectiveness of the proposed measures.	Section 5.8 Appendix B
5.9	Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are not inconsistent with relevant plans.	Section 5.9
5.10	Details of ongoing management, including monitoring programs to support an adaptive management approach, that validate the effectiveness of the proposed measures and overall demonstrate that environmental outcomes will be achieved.	Section 5.10
5.11	Details of tangible, on-ground corrective actions that will be implemented in the event the monitoring programs indicate that the environmental outcomes have not or will not be achieved.	Section 5.11
5.12	Details of any measures proposed to be undertaken by Queensland and local governments, including the name of the agency responsible for approving each measure.	Section 5.12 Appendix R Appendix T Appendix U
5.13	Outline any proposed avoidance or mitigation measures to reduce possible impacts on protected matters during the operational phase of the pipeline e.g., reducing water transfer amounts to allow environmental flows during waterbird breeding events; any flow monitoring activities.	Section 5.13
5.14	Information regarding methodology/ies for pre-clearance surveys. The PD needs to expand upon the pre-clearance surveys to mark the locations of potential breeding nests outlined in the referral documentation to detail how the impact to these areas will be reduced.	Section 5.14 Appendix T
5.15	Information regarding the likely success rated of relocating fauna within the disturbance footprint. Consideration should be given as to the timing of the action to avoid the need for relocating species, particularly during breeding periods when species may be occupying roost hollows.	Section 5.15 Appendix T
5.16	The department anticipates a revised description of mitigation measures will be required to determine the potential residual impacts of the proposed action. In particular, rehabilitation activities are not considered by the department to be a mitigation measure. The department considers the referral information is therefore likely to have underrepresented significant impacts to listed threatened species and communities and the PD must contain a revised discussion of the residual significant impacts.	Section 5.16 Appendix B
5.17	The department considers the retention of a biodiversity corridor the length of the entire pipeline (of an appropriate width) may be an effective mitigation measure to reduce the	Section 0 Appendix B

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
	impacts of habitat fragmentation and help maintain habitat connectivity between habitat patches around the project area. The proponent may wish to investigate/propose this as an approach and provide a discussion as part of the PD.	
6	Rehabilitation requirements	
6.1	A description of the rehabilitation measures proposed to be undertaken. Please also include a map of any areas that will be rehabilitated (with a land-based area measurement, e.g., in hectares, indicating areas that will or will not be rehabilitated).	Section 6.1 Appendix R Appendix S
6.2	Rehabilitation acceptance criteria, including for the restoration of habitat for relevant listed threatened species and communities.	Section 6.2 Appendix R
6.3	A summary of the procedures, including contingency measures, that will be undertaken to achieve the rehabilitation acceptance criteria.	Section 6.3 Appendix P Appendix R
6.4	A summary of a monitoring program (including time-based milestones) to determine the success of rehabilitation activities implemented by the proponent.	Section 6.4 Appendix R
6.5	The details of any rehabilitation activities proposed to be undertaken as required by Commonwealth, State or Territory, and local government legislation. Attach relevant Commonwealth, State or Territory, and local government approvals and permits as supporting documents to the PD.	Section 6.5 Appendix R Appendix U
6.6	The department notes the referral documentation contains information about salvaging and reinstating all large and moderate sized <i>E. platyphylla</i> hollows. The department requires information about the methodology and likely success rates of salvaged hollows being utilised by roosting species. Information should be provided about the salvage and reinstatement of any other individual hollows that will be cleared as part of the action.	Section 6.6 Appendix O
6.7	<p>The department does not agree with the notion outlined in the referral documentation that tubestocking for cleared <i>E. platyphylla</i> achieves a 'like for like replacement of potential roosting habitat'. This is because:</p> <ul style="list-style-type: none"> – The same number of trees cleared (325 small sized) have not been committed to be replaced. – The newly planted trees would be well-below the maturity/age of any trees that were removed, effectively delaying the period of time they can be utilised by threatened species. 	Section 6.7 Appendix O
6.8	Rehabilitation measures should use committal language e.g., 'will' and not 'may' for the department to adequately consider them as part of the assessment.	Section 6.8
6.9	Information pertaining to the effectiveness of natural regeneration as an appropriate rehabilitation method for the area should be provided.	Section 6.9
7	Offsets	
7.1	General information required	
7.1.1	An assessment of the likelihood of residual significant impacts occurring on relevant MNES, after avoidance, mitigation and management measures have been applied.	Section 7.1.1 Appendix O
7.1.2	A summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter.	Section 7.1.2 Appendix O
7.1.3	If an offset area has not been nominated, include a draft OMS as an appendix to the PD. The draft OMS must meet the information requirements set out in 7.2.	Section 0 Appendix O
7.1.4	Where offset area/s have been nominated, include a draft OAMP as an appendix to the PD. The draft OAMP must meet the information requirements set out in 7.3, and must be prepared by a suitably qualified ecologist and in accordance with the department's <i>Environmental Management Plan Guidelines</i> (2014), available at: http://www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines	Section 7.1.4

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
7.2	Minimum Requirements for a draft Offset Management Strategy	
7.2.1	Specific details of the nature of the conservation gain to be achieved for relevant MNES, including the creation, restoration and revegetation of habitat in the proposed offset area/s.	Section 7.2.1 Appendix O
7.2.2	Details of the environmental offset/s (in hectares) to compensate for the residual significant impacts of the proposed action on relevant MNES.	Section 7.2.2
7.2.3	Details of the potential offset area/s (including a map) to compensate for the residual significant impacts of the proposed action on relevant MNES.	Section 7.2.3 Appendix O
7.2.4	<p>The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the project site for each relevant MNES, including:</p> <ul style="list-style-type: none"> – total area of habitat (in hectares); and – habitat quality (e.g. using the Queensland Government <u>Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy</u> [2020]). <p>Please note that a methodology that is suitable for each species (i.e., approved by the department or supported by literature) must be used to assess habitat quality, noting the same scoring mechanism must be used at both impact and offset sites.</p>	Section 7.2.4 Appendix O
7.2.5	Details, with supporting evidence, of how the environmental offset/s meets the requirements of the department's EPBC Act Environmental Offsets Policy (2012) (Offsets Policy), available at: <u>www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy</u> .	Section 7.2.5 Appendix O
7.2.6	<p>The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to each potential offset area/s for each relevant MNES, including:</p> <ul style="list-style-type: none"> – time over which loss is averted (max. 20 years); – time until ecological benefit; – risk of loss (%) without offset; – risk of loss (%) with offset; and – confidence in result (%). <p>When calculating offsets, please refer to the department's published guidance: How to use the Offsets Assessment Guide, available at: <u>https://www.awe.gov.au/sites/default/files/documents/offsets-how-use.pdf</u></p>	Section 7.2.6 Appendix O
7.2.7	Evidence that the relevant MNES, and/or their habitat, can be present in the potential offset area/s.	Section 7.2.7 Appendix O
7.2.8	Information about how the potential offset area/s provides connectivity with other relevant habitats and biodiversity corridors.	Section 7.2.8 Appendix O
7.2.9	Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation.	Section Item 7.2.9
7.3	Minimum Requirements for a draft Offset Area Management Plan	
7.3	<i>An Offset Area Management Strategy (OAMS) has been included in the Preliminary Documentation which proposes land-based offsets for MNES species that will be subject to significant residual impacts due to the Project. Following completion of data analysis from recent condition surveys of the proposed offset site, an Offset Area Management Plan (OAMP) will be developed for the Project and submitted to DCCEEW for approval prior to commencement of the proposed action. The OAMP will be developed in accordance with the requirements set out in Section 7.3 of the RFI and will be prepared by a suitably qualified ecologist in accordance with the Departments Environmental Management Plan Guidelines (DoE 2014).</i>	Section 7.3
8	Ecologically Sustainable Development (ESD)	
8.1	A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. More information on ESD is available at <u>https://www.environment.gov.au/about-us/esd</u> .	Section 8.1

Item	DCCEEW Request for Further Information	Preliminary Documentation - Section of Report
9	Economic and social matters	
9.1	An analysis of the economic and social impacts of the action, both positive and negative.	Section 9.1
9.2	Details of any public consultation activities undertaken and their outcomes.	Section 9.2
9.3	<p>Details of any consultation with Indigenous stakeholders.</p> <p>General Indigenous engagement</p> <p>Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts.</p> <p>Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes.</p> <p>The department considers that best practice consultation, in accordance with the <u>Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act</u> (2016) includes:</p> <ul style="list-style-type: none"> – identifying and acknowledging all relevant affected Indigenous peoples and communities; – committing to early engagement; – building trust through early and ongoing communication for the duration of the project, including approvals, implementation and future management; – setting appropriate timeframes for consultation; and – demonstrating cultural awareness. <p>Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.</p> <p>Specific Indigenous engagement</p> <p>The department notes that the proponent has sought to address possible impacts through a Cultural Heritage Management Agreement between the Bindal People and TCC. Noting the proposed area is within a Native Title claim area for the Bindal People, please outline information relating to any processes that may be required through the Queensland Government before the project can commence. Provide relevant advice/correspondence from the Queensland Government about whether any future processes under the Native Title Act 1993 are required before the project commences.</p> <p>The department understands that there is a high chance of unrecorded cultural heritage present in the project area. The PD should include any information where the proponent has worked (or will work) with Traditional Owners to address any potential impacts.</p>	Section 9.3
9.4	Projected economic costs and benefits of the project, including the basis for their estimate through cost/benefit analysis or similar studies.	Section 9.4
9.5	Employment opportunities expected to be generated by the project (including construction and operational phases).	Section 9.5
10	Environmental records of the person proposing to take the action	
10.1	the person proposing to take the action;	Section 10.1
10.2	for an action for which a person has applied for a permit, the person making the application;	Section 10.2
10.3	if the person is a body corporate—the history of its executive officers in relation to environmental matters; and	Section 10.3
10.4	if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.	Section 10.4

1.4 Scope and limitations

This report: has been prepared by GHD for Townsville City Council and may only be used and relied on by Townsville City Council for the purpose agreed between GHD and Townsville City Council as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Townsville City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Description of action

2.1 Item 2.1

The location, boundaries and size (in hectares) of the disturbance footprint and of any areas which may be indirectly impacted by the proposal, including from upstream or downstream impacts (e.g., altered water flows). Include mapping and coordinates.

2.1.1 Response

The HPS2 Project is located approximately 60 km south-east of Townsville and 40 km south-west of Ayr (at the northern end of the alignment). The alignment extends 28.5 km to the south-east where it meets the Burdekin River, approximately 16 km north of the town of Millaroo and 16 km south of the town of Clare. The proposed pump station will be located adjacent to the Burdekin River next to the existing Sunwater Tom Fenwick Pump Station on the Clare Weir Storage.

The HPS2 Project intercepts 15 land parcels including a number of easements. Table 2.1 provides details of the land parcel tenure, ownership and any easements and encumbrances. The HPS2 Project is located entirely within the Burdekin Shire Council (BSC) local government area (LGA). The locality of the HPS2 Project is provided in Figure 2.1. The project disturbance foot print is provided in Figure 2.2. The coordinates for the HPS2 Project are included in Appendix A.

Shapes files detailing the location and extent of the total disturbed area associated with the HPS2 Project are attached to this PD.

Table 2.1 Property descriptions

Lot on plan	Tenure	Entity	Easements and encumbrances
Land parcels			
2 AP23197	Estate in Unallocated State land	State of Qld (DoR)	Nil
15 CP891307	Reserve – Camping Lease (No Term) – Grazing – Reserve, Road or Stock Route (Camping and Water Reserve)	BSC Registered Permittee – Rapisarda Investments Pty Ltd	State Permit No. 702039990
308 GS1041	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	Nil
22 GS1042	Estate in Fee Simple (Freehold)	Scott and Judith Sheahan	– Easement A GS885 abd A GS510 (Qld Electricity Transmission Corp Ltd) – Easement B GS1009 (Nth Qld Electricity Board)
170 GS804007	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	Nil
261 GS804009	Estate in Unallocated State Land Lase (No Term) – Grazing – USL	State of Qld (DoR) Registered Permittee – Rapisarda Investments Pty Ltd	Permit to Occupy No 713437069
301 SP107466	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	– Easement C SP256356 (Ergon Energy Corp Ltd)
302 SP107469	Perpetual Lease – The use flow and control of water, and ancillary	Sunwater Limited	Nil

Lot on plan	Tenure	Entity	Easements and encumbrances
	purposes, community and commercial purposes		
4 SP107479	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	<ul style="list-style-type: none"> – Easement C GS431 (Northern Electric Authority of Qld) – Easement A SP256357 (Ergon Energy Corp Ltd)
5 SP107479	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	<ul style="list-style-type: none"> – Easement C GS431 (Northern Electric Authority of Qld) – Easement R SP306218 (Qld Electricity Transmission Corp Ltd)
10 SP111327	Perpetual Lease – The use flow and control of water, and ancillary purposes, community and commercial purposes	Sunwater Limited	Nil
33 SP117630	Reserve – Camping and Water	BSC	<ul style="list-style-type: none"> – Lease A SP275837 (Scoot and Judith Sheahan)
71 SP289517	Rolling Term Lease (30 years) – No purpose defined	Rapisarda Investments Pty Ltd	<ul style="list-style-type: none"> – Easement No 602806358 (Qld Electricity Transmission Corp Ltd) – Easement No 602806359 (Townsville Regional Electricity Board) – Easement EA, FA and GA SP175281 (Enetrade (NQ) Pipeline Pty Ltd) – Easement D, E & F SP144889 (Qld Electricity Transmission Corp Ltd) – Easement AA SP289517 (Qld Electricity Transmission Corp Ltd) – Easement BB SP289517 (Nth Qld Pipeline Pty Ltd)
2 SP302825	Estate in Fee Simple (Freehold)	David Cox	<ul style="list-style-type: none"> – Easement A on GS683 (Qld Electricity Transmission Corp Ltd) – Easement A on GS672 (Qld Electricity Transmission Corp Ltd) – Easement B SP256358 (Ergon Energy Corp Ltd) – Easement W SP302825
3 SP302825	Estate in Fee Simple (Freehold)	David Cox	<ul style="list-style-type: none"> – Easement A on GS683 (Northern Electric Authority of Australia) – Easement X SP302825 – Easement Y SP302825 – Easement W SP302825

The Project's location in relation to upstream and downstream MNES that may be impacted by the Project are detailed in Table 2.2

Table 2.2 Location of Project components in relation to downstream MNES

Matters of National Environmental Significance		Location in context of Project
World Heritage Properties	Great Barrier Reef Marine Park	Approximately 125 km downstream of the proposed Clare Weir Storage pump station.
National Heritage Properties		Approximately 70 km downstream of the existing outlet headwall of Toonpan Creek (catchment of Ross River Dam) Approximately 40 km downstream of the existing Houghton River transfer system.
Wetland of international Importance	Bowling Green Bay	Approximately 40 km downstream of the existing Houghton River transfer system

The extent of disturbance and indicative impact is detailed in Table 2.3.

Table 2.3 Project construction components and disturbance extent

Vegetation Status	Disturbance	Area
Remnant vegetation	Temporary <ul style="list-style-type: none"> – Clearing of remnant vegetation within a 20 m corridor of a defined distance from a mapped vegetation management watercourse, and 40 m corridor in all other areas – Clearing of temporary construction access roads and stockpile yards 	86.18 ha
	Permanent <ul style="list-style-type: none"> – 4 m gravel access track to the defining bank – Pump station, intake structure and power supply works (substation, overhead HV power lines etc.). 	9.74 ha
Remnant vegetation disturbance sub-total		95.92 ha
High-value regrowth vegetation	Temporary <ul style="list-style-type: none"> – Clearing of remnant vegetation within a 20 m corridor of a defined distance from a mapped vegetation management watercourse, and 40 m corridor in all other areas – Clearing of temporary construction access roads and stockpile yards 	0.42 ha
	Permanent <ul style="list-style-type: none"> – 4 m gravel access track to the defining bank – Pump station, intake structure and power supply works (substation, overhead HV power lines etc.). 	0 ha
High-value regrowth vegetation disturbance sub-total		0.42 ha
Non-remnant vegetation	Temporary <ul style="list-style-type: none"> – Clearing of remnant vegetation within a 20 m corridor of a defined distance from a mapped vegetation management watercourse, and 40 m corridor in all other areas – Clearing of temporary construction access roads and stockpile yards 	51.67 ha
	Permanent <ul style="list-style-type: none"> – 4 m gravel access track to the defining bank – Pump station, intake structure and power supply works (substation, overhead HV power lines etc.). 	5.9 ha
Non-remnant vegetation disturbance sub-total		57.57 ha
Total disturbance		153.9 ha

The HPS2 Project will result in approximately 153.9 ha of disturbance footprint. Project construction works will typically involve the following:

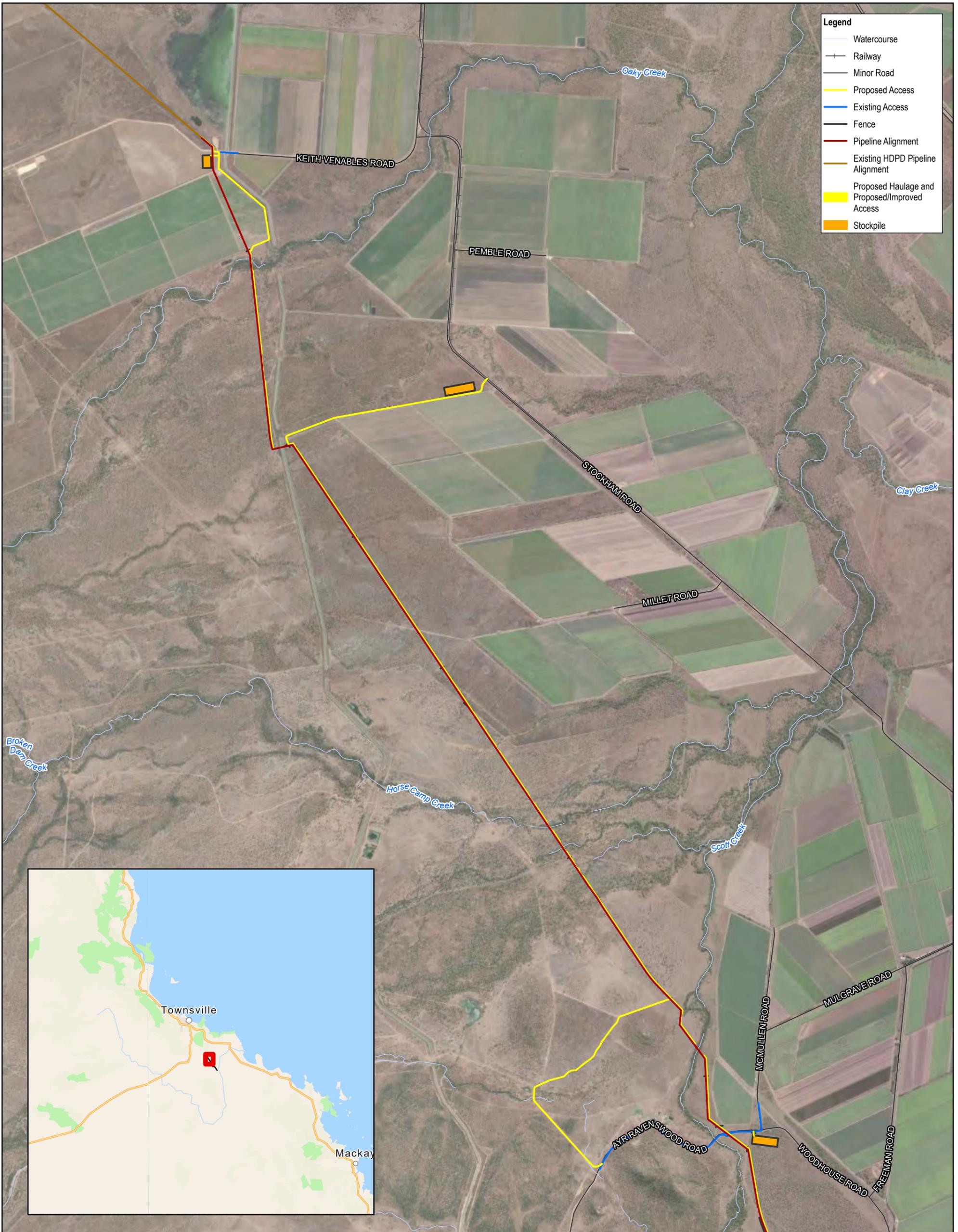
- Clearing vegetation for the pipeline alignment construction corridor, river intake and pump station site
- Stockpiling topsoils to be used in the rehabilitation process
- In-river construction works for construction of an edge of bank intake in the Burdekin River, access road, discharge pipeline, bank erosion and scour protection works
- Civil and building works at top of bank for construction of a new pump station and supporting infrastructure
- Construction of a substation and overhead high voltage power line to supply the pump station
- Construction of temporary access and haulage roads to the pipeline construction corridor and construction of five temporary pipe delivery stockpile yards
- Delivery of pipe to designated stockpile holding yards and stringing out of pipeline along the pipeline construction corridor
- Use of excavators, trenching machines and conventional methods to create an open trench for the pipeline to be installed
- Assembly of pipe in the trench, bedding around the pipe with imported embedment materials, and backfilling the trench with stockpiled excavated materials and topsoil

- Trenchless construction methods (pipe jacking) for key crossings to minimise impacts on perennial creeks, existing public and private utility plant and agreed state controlled road crossings.
- Construction of a permanent 4 m wide gravel access road along the length of the pipeline corridor for operation and maintenance access
- Rehabilitation of construction areas (disturbance footprint areas).

The disturbance footprint areas include the 40 m wide pipeline construction corridor (reduced to 20 m wide at the vegetation management water courses), temporary access and haulage roads for access to the construction corridor via private properties as well as local and State-controlled roads and five temporary stockpile areas for pipe delivery and storing construction material and equipment.

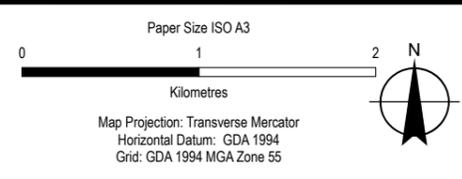
The disturbance footprint includes the 28.5 km long buried DN1800 pipeline, 4 m wide gravel access road, pump station, intake structure and power supply works (substation, overhead HV power lines etc.).

Operation of the proposed action will involve the ongoing maintenance of a 21.5 m wide public utility easement, 10 m wide zone of influence above the pipeline (where only a ground layer stratum is proposed) and operation of the pump station and substation. No permanent fencing is proposed other than surrounding the pump station and substation sites.



- Legend**
- Watercourse
 - Railway
 - Minor Road
 - Proposed Access
 - Existing Access
 - Fence
 - Pipeline Alignment
 - Existing HDPD Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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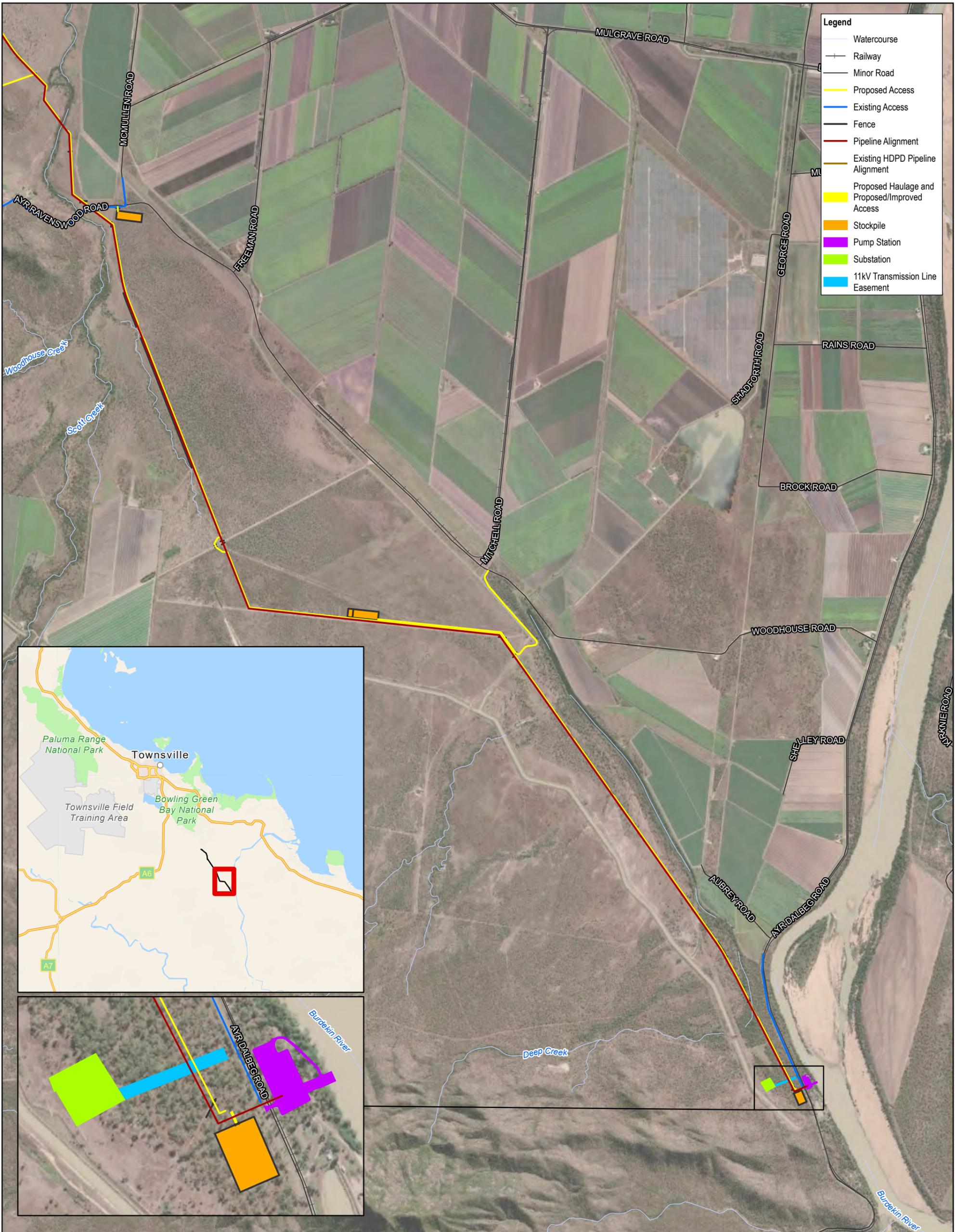


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Houghton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 2
Date 7/29/2022

Houghton Pipeline Stage 2 project area

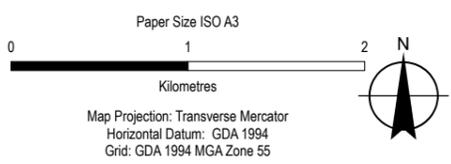
FIGURE 2-1



- Legend**
- Watercourse
 - Railway
 - Minor Road
 - Proposed Access
 - Existing Access
 - Fence
 - Pipeline Alignment
 - Existing HDPD Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile
 - Pump Station
 - Substation
 - 11kV Transmission Line Easement



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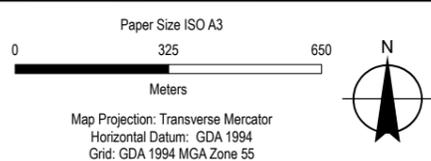
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Houghton Pipeline Stage 2 project area

FIGURE 2-1



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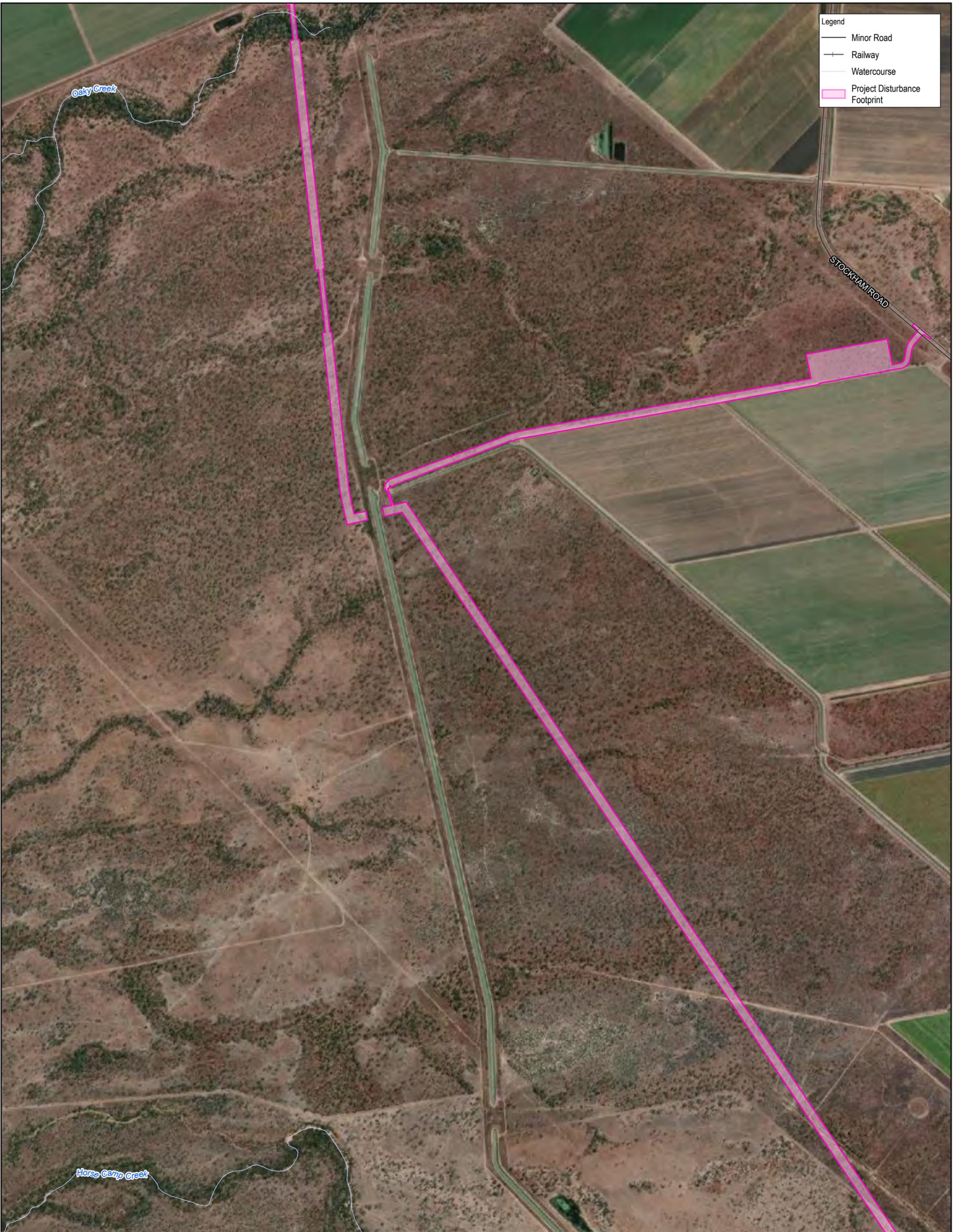


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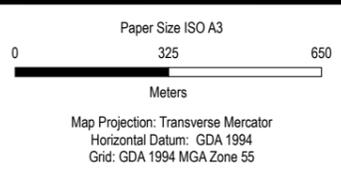
Project No. 12537606
Revision No. 1
Date 8/10/2022

HPS2 project disturbance footprint

FIGURE 2-2



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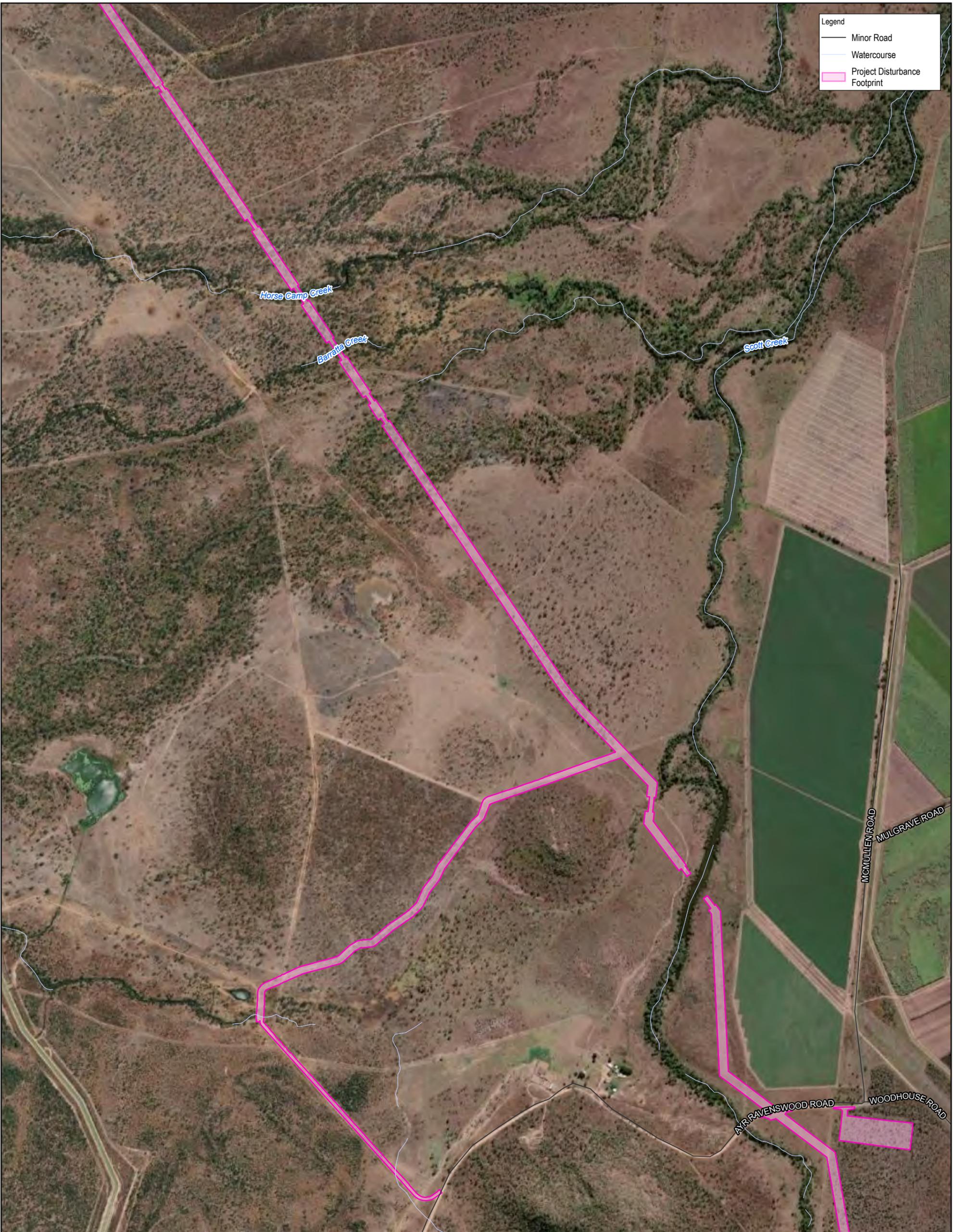


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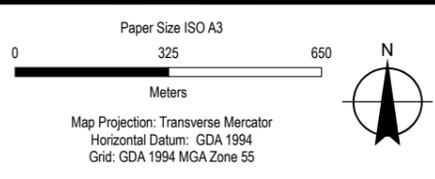
Project No. 12537606
Revision No. 1
Date 8/10/2022

HPS2 project disturbance footprint

FIGURE 2-2



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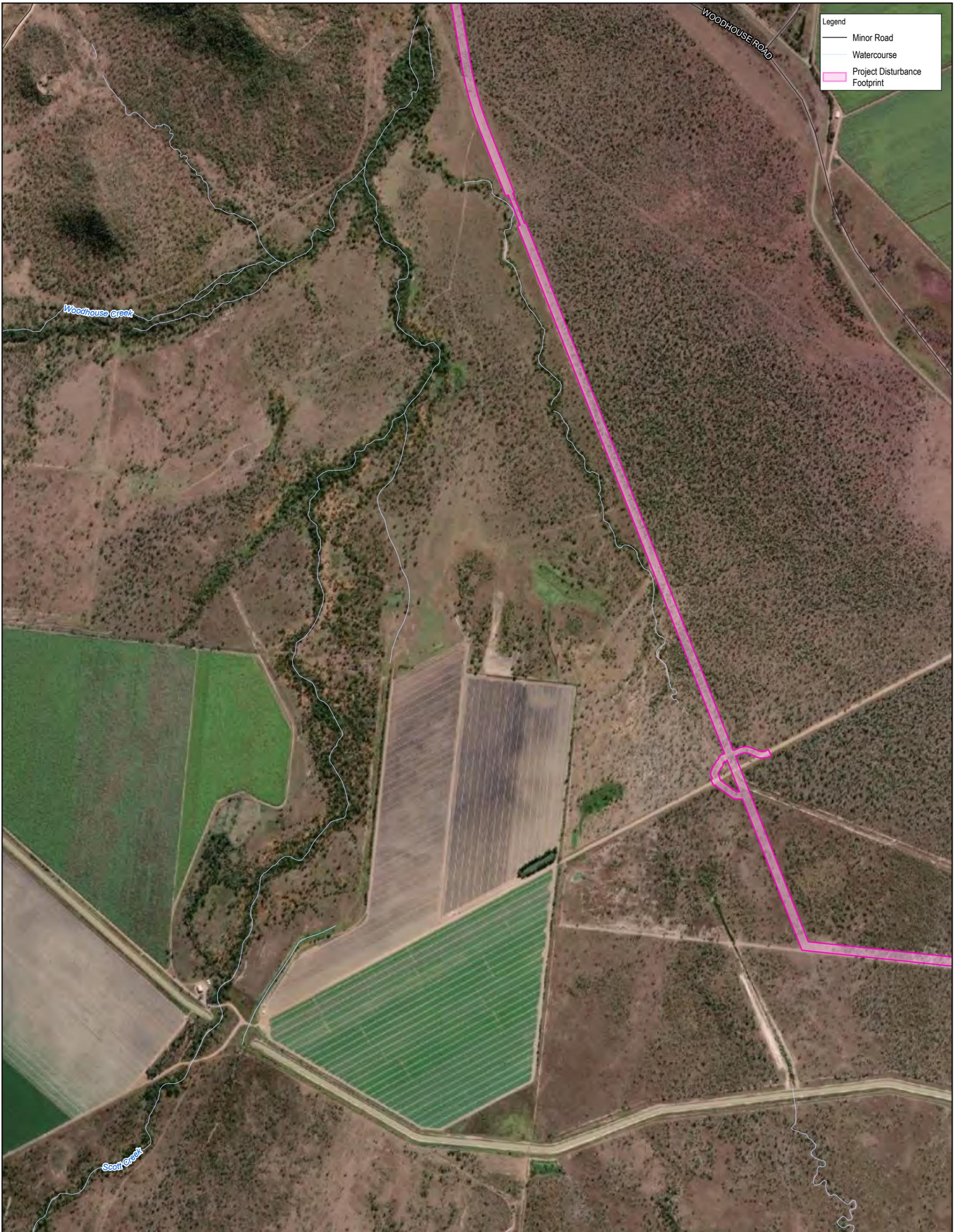


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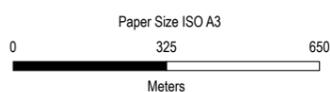
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HPS2 project disturbance footprint

FIGURE 2-2



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
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HPS2 project disturbance footprint

FIGURE 2-2



Legend

- Minor Road
- +— Railway
- Watercourse
- Project Disturbance Footprint

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

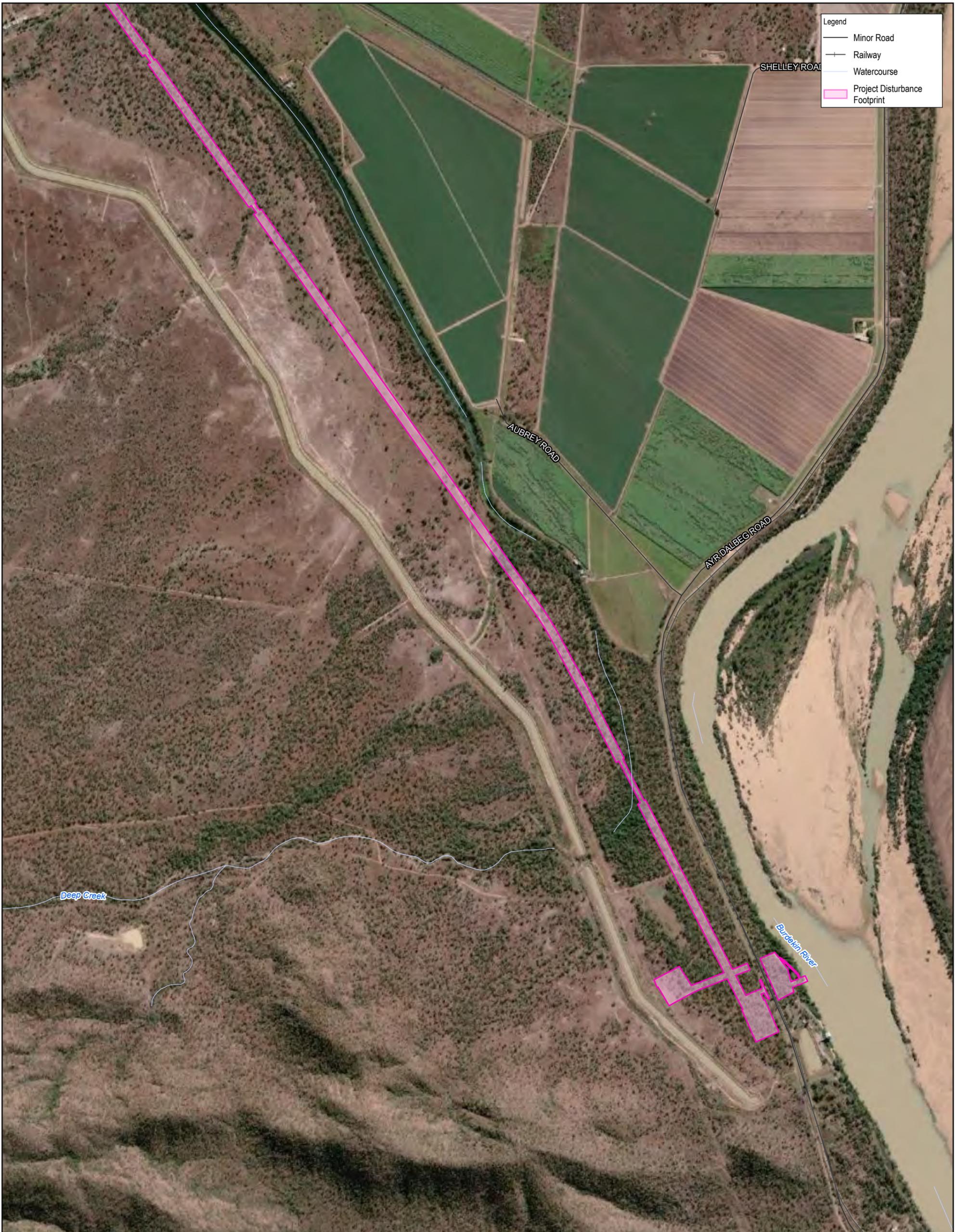


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HPS2 project disturbance footprint

FIGURE 2-2



Legend

- Minor Road
- Railway
- Watercourse
- Project Disturbance Footprint

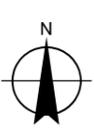
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Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

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HPS2 project disturbance footprint

FIGURE 2-2

2.2 Item 2.2

A description of all components of the action, including the anticipated timing and duration (including start and completion dates) of each component of the Project. In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.

2.2.1 Response

Overview

The HPS2 Project comprises construction of a pump station on the Burdekin River, a high voltage (HV) power supply connection and substation, and DN1800 pipeline approximately 28.5 km in length from the pump station to the previously completed Stage 1.1 works to provide an integrated water transfer system. To facilitate construction, additional temporary works are required, including construction access and haulage roads to access the pipeline, a construction corridor from public accessible roads, and pipe laydown stockpile yards for temporary storage of manufactured pipe.

Most of the pipeline will be constructed using open trench construction methodology. Ground levels will be progressively reinstated, stabilised and rehabilitated as the construction works advance. Suitable erosion and sediment control measures will be implemented during construction.

A number of key crossings will be constructed using trenchless construction methodology (pipe jacking) to minimise impacts on perennial creeks, existing infrastructure and public road assets. Trenchless construction crossings include under Ayr-Dalberg Road and Wilmar cane rail, Sunwater irrigation siphons, Scotts Creek and Sunwater Haughton Main Channel (HMC) irrigation channel crossings.

The pipeline construction corridor includes crossing of various public utilities plant (PUP) and roads including the following:

- Wilmar cane rail
- TMR State controlled Ayr-Dalbeg and Ayr Ravenswood roads
- Various Powerlink and Ergon high and low voltage overhead power lines
- Sunwater inground siphons
- Sunwater irrigation channel
- Four creek crossings (Scott Creek, Baratta Creek, Horsecamp Creek, Oaky Creek)
- Burdekin Shire Council's Keith Venables road

An overview of the HPS2 Project is provided in Figure 2.3.

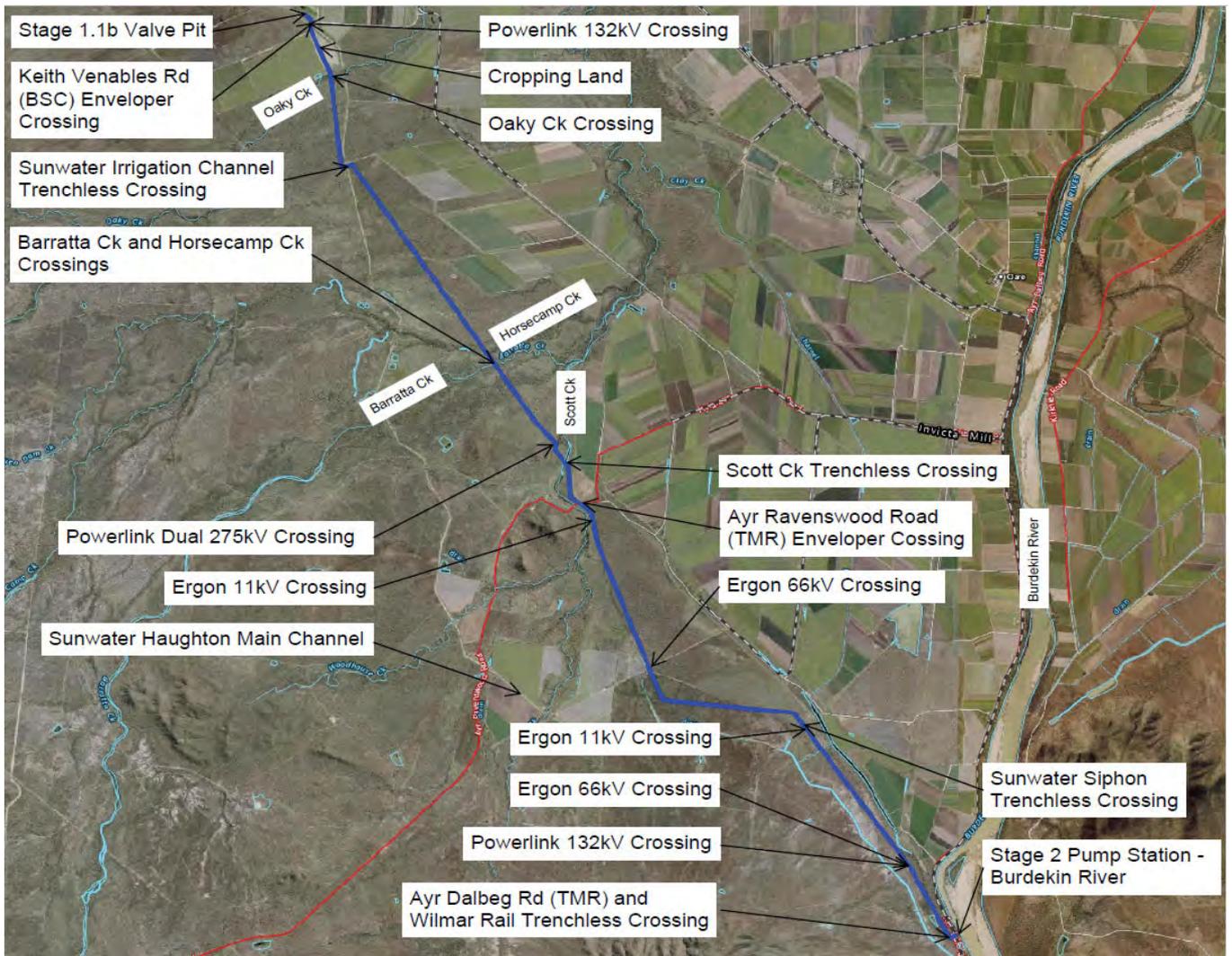


Figure 2.3 HPS2 Project overview

Pipeline components:

A description of the pipeline components is detailed below

- Single DN1800 pipeline (28.5 km in length) from the Burdekin River Pump Station and connecting to the completed Stage 1.1 pipeline
- DN1800 Glass Reinforced Polymer (GRP), rubber ring jointed pipe for general pipeline construction with concrete thrust blocks where thrust restraint is required at bends
- Trenchless construction (pipe jacking) with Reinforced Concrete Pipe (RCP) enveloper pipe and fully welded OD1829 Mild Steel Cement Lined (MSCL) carrier pipe beneath the Wilmar Rail and state-controlled Ayr-Dalbeg Rd, Sunwater Siphons, Scott Creek and Sunwater Haughton Main Channel crossings
- Open trench construction with RCP enveloper pipe and fully welded OD1829 Mild Steel Cement Lined (MSCL) carrier pipe beneath state-controlled Ayr Ravenswood Road and BSC controlled Keith Venables Rd
- Concrete encased fully welded OD1829 Mild Steel Cement Lined (MSCL) pipe through creek crossings Barratta Creek, Horse Camp Creek and Oaky Creek.
- Inline PA thrust blocks where transitioning from restrained MSCL to GRP RRJ pipe.
- Air valves, scour valves and isolation valves for operation and maintenance of the pipeline.

The construction corridor for the pipeline will be 40 m wide which will reduce to 20 m wide at vegetation management watercourses. Following construction, operation of the pipeline will involve ongoing maintenance requiring a 21.5 m wide public utility easement along the length of the pipeline corridor including a 4 m wide gravel access road.

Typical sections of the pipeline construction corridor showing the temporary construction easement and permanent operational easement is provided in Figure 2.4.

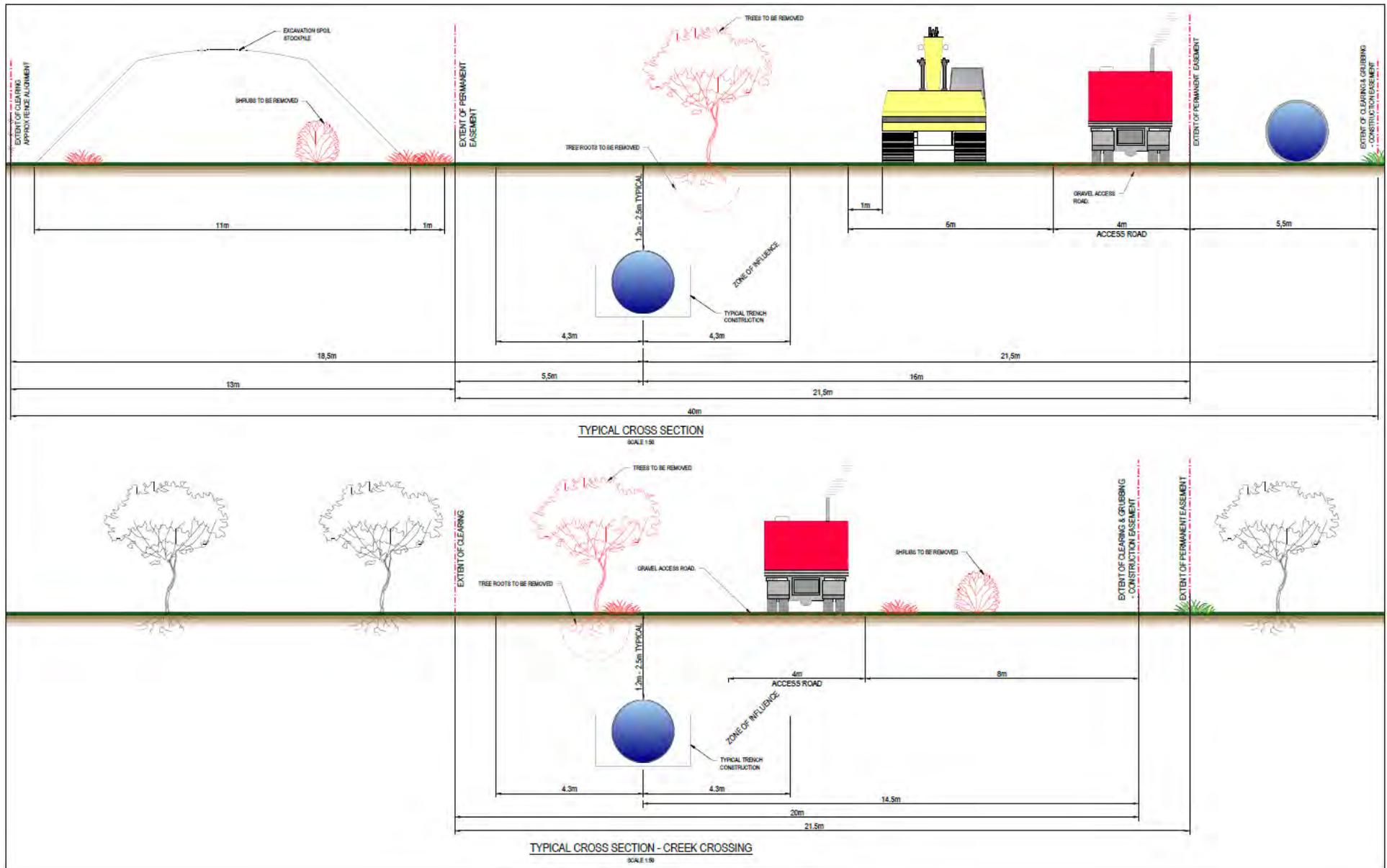


Figure 2.4 Pipeline corridor typical cross section (construction corridor and permanent easement)

Pump station and high voltage power supply components

A description of the pump station, high voltage power supply and supporting infrastructure components is detailed below.

- New pump station and intake structure located adjacent to the Burdekin River for abstraction from the Clare Weir Storage (downstream of the existing Sunwater Tom Fenwick pumpstation).
- Supporting infrastructure including balancing tank, voltage step down transformers, high voltage and low voltage electrical buildings and sealed hardstand and access roads. The proposed site for the pump station is 1.63 ha.
- Power supply to the new pump station via 11 kV overhead cabling from a new substation located approximately 530 m west of the pump station site. The substation site is approximately 130 m x 130 m. The power supply easement for the overhead 11 kV cabling and access to the substation is 30 m wide. Final power supply agreements are being negotiated between the two available Distribution Network Service Providers Ergon and Powerlink.

An overview of the pump station configuration and supporting infrastructure is provided Figure 2.5 and Figure 2.6.

The location of the proposed pump station site, power supply easement and new substation site is provided in Figure 2.7.



Figure 2.5 HPS2 Pump Station perspective and location relative to the existing upstream Sunwater Tom Fenwick Pump Station



Figure 2.6 HPS2 Pump Station configuration plan

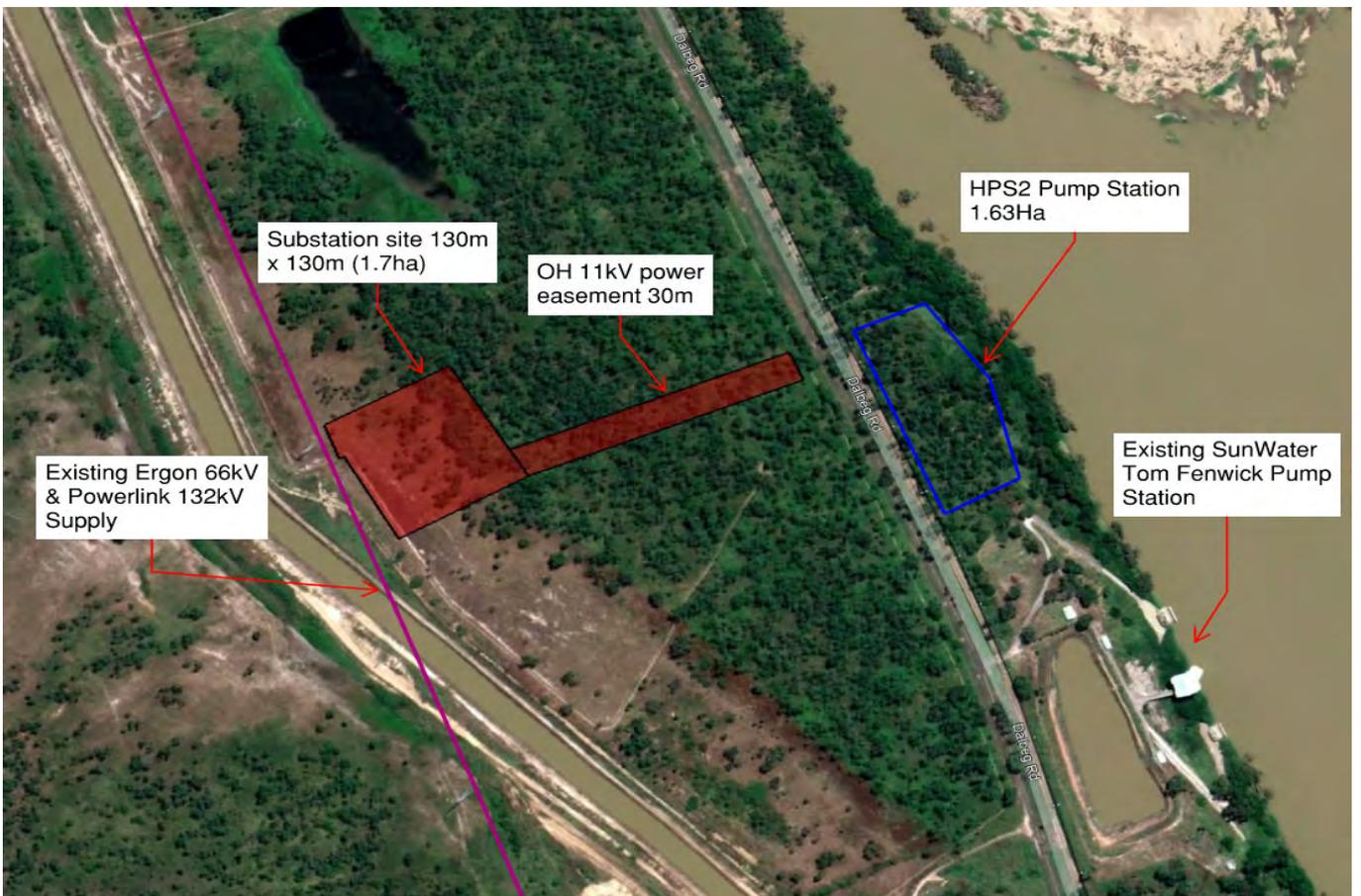


Figure 2.7 Location of proposed pump station, power supply easement and substation sites

Temporary access and haulage roads and stockpile yards

To facilitate construction, temporary works are required including construction of access roads, haulage roads and pipe stockpile yards:

- Approximately 8.7 km of 6 m wide two lane temporary access and haulage roads to access the pipeline construction corridor from public roads and limit impacts on private landowners.
- Five pipe laydown stockpile yards for storage of manufactured pipe (approximately 2100 lengths of pipe progressively delivered)

The location of the proposed access and haulage roads and five stockpile sites are provided in Figure 2.8 and Figure 2.9.

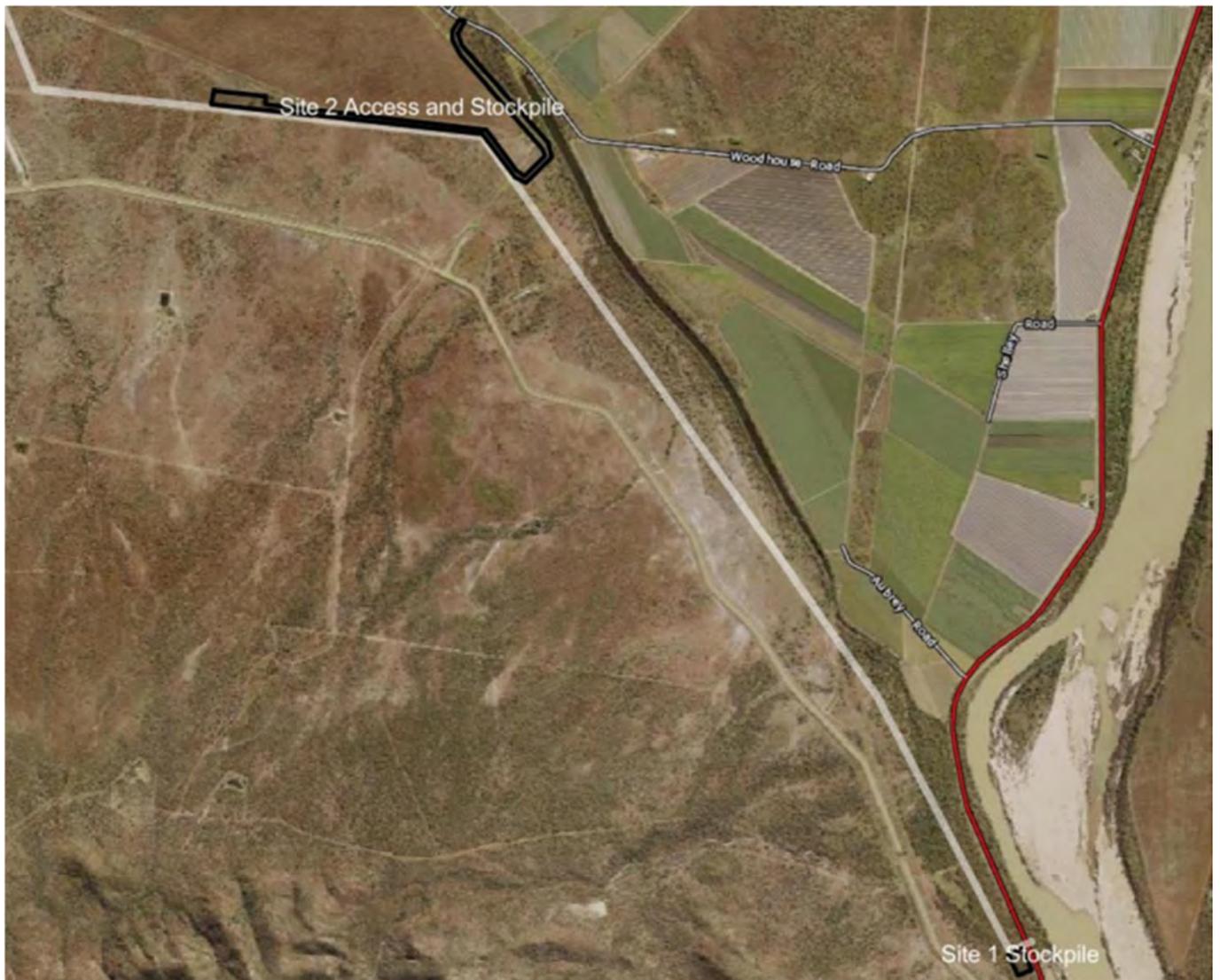


Figure 2.8 Site 1 and 2 access and haulage roads and stockpile areas



Figure 2.9 Site 3, 4 and 5 access and haulage roads and stockpile areas

Timing and duration

Construction of the HPS2 is scheduled to take place over a period of approximately three years, with the works to commence in April 2023 through to final project completion in July 2026. The project will comprise of two phases:

- Construction (build) phase to be completed by the end of July 2025 (twenty seven months construction period)
- Post construction defects liability phase, being a twelve month period for monitoring, maintaining and undertaking any corrective actions for the rehabilitation works and any construction defects.

A high level construction program is provided in Table 2.4 and a more detailed construction program is provided in Appendix Y.

Mobilisation and site establishment will commence in April 2023 through to May 2023, followed by clearing of the project area and construction of temporary access tracks and stockpile yards through to October 2023.

Clearing for the access tracks, stockpile yards and pipeline construction corridor will be undertaken in a single pass, with the exception of any areas identified in the pre-clearance surveys that may require establishment of exclusion areas and avoidance of active breeding sites for NC Act listed species until exclusion areas can be lifted per the High Risk Species Management Plan (GHD, 2022).

Construction of the pipeline (dig, lay, backfill) will commence in August 2023 with completion of the pipeline build in February 2025. To minimise the disturbance timeline, construction of the pipeline will be undertaken in four

sections with separate construction work fronts. Ground levels will be progressively reinstated, stabilised and rehabilitated as the construction works advance. On completion of pipeline construction and pressure testing, the temporary stockpile yards and temporary access roads will be removed and rehabilitated.

Rehabilitation activities will commence in September 2023 (around four months after commencement of clearing) and will lag the pipeline construction work front by one month with rehabilitation works to be progressively completed as the pipeline is built.

Construction of the pump station will be undertaken in parallel with the pipeline construction with mobilisation and site establishment commencing in April 2023 through to May 2023. Construction of in-river civil works, bank stabilisation and rehabilitation will be undertaken from May 2023 to November 2023 to limit construction during the wet season. Rehabilitation will occur in two phases being the in-river bank works initially and high level bank works towards end of construction as the relevant construction areas are completed. Completion of the pump station build is scheduled for July 2025.

Disturbance in the project area will be for a period of 27 months, with the disturbance area reducing progressively as the work areas are completed, stabilised and rehabilitated. Suitable erosion and sediment control measures will be implemented and maintained during construction in accordance with the Erosion and Sediment Control Plan (ESCP) (GHD, 2022).

Activities during the post construction twelve months defects liability period will include quarterly monitoring of rehabilitation works against the acceptance criteria, periodic watering of established revegetation, undertaking of any required corrective actions (refer Rehabilitation Management Plan) and rectification of any identified construction defective works, including:

- Monitoring of elements detailed in the Rehabilitation Management Plan (soil stability, groundcover, tubestock survival) every four months
- Periodic watering of tube-stock (unless climatic conditions provide sufficient rainfall)
- Check the planted tube-stock every four months for mortality. If greater than 5% mortality occurs, replace any plant losses
- Check for ground cover dieback every four months and re-apply hydromulch in any areas where ground cover is less than the acceptance criteria. Ripping may be required prior to re-seeding if the surface has become compacted
- Site inspection for restricted invasive weed species will be undertaken every four months by personnel experienced in weed identification and control using appropriate control techniques (e.g. in accordance with the DAF factsheets for the relevant species)
- Inspection of watercourses following any notable weather events to ascertain if degradation of the rehabilitation works has occurred, and undertake restoration works where required
- Removal of any shrub or canopy species from the pipeline 10 m wide zone of influence
- Rectification of any identified construction defects over the twelve month warranty period

Construction will generally be undertaken during daylight hours except for some of the road crossings which may require night works for traffic management reasons.

Table 2.4 HPS2 proponent’s construction program

Pipeline	
Construction activity	Date
Site establishment	April 2023 to May 2023
Clearing	May 2023 to August 2023
Commence pipeline	August 2023
Pipeline corridor revegetation	September 2023 to August 2024 (progressive rehabilitation as construction works advance)
Access roads and stockpile yards revegetation	April 2024 to January 2025
Complete pipeline	February 2025

Defects liability period (construction and rehabilitation monitoring warranty period)	February 2025 to February 2026
Pump station	
Construction activity	Date
Site establishment	April 2023 to May 2023
Commence pump station	May 2023
River bank stabilisation and revegetation	August 2023 to November 2023
High level bank revegetation	February 2025 to April 2025
Complete pump station	July 2025
Defects liability period (construction and rehabilitation monitoring warranty period)	July 2025 to July 2026

2.3 Item 2.3

A description of the operational requirements of the action including any anticipated maintenance works.

2.3.1 Response

Operational Requirements

The operational requirements for the Project is for the reliable and economic transfer of 364 ML/day of raw water from the Clare Weir Storage to the head of the Ross River Dam (RRD). The Project is part of a long-term solution for urban water supply security for Townsville, by providing bulk water supply for drought proofing, population growth and industry development.

Operational Overview

Raw water is released from the Burdekin Dam, operated by Sunwater (bulk water infrastructure developer) and flows down the Burdekin River into the Clare Weir Storage. Raw water for the Haughton Pipeline transfer system is then extracted by TCC from the Clare Weir Storage via a pump station located on the bank of the Burdekin River.

The pump station delivers water via a single DN1800 pipeline, approximately 65 km in length, to an outlet headwall at Toonpan Creek, being a catchment creek at the top of Ross River Dam. Appurtenances including air release valves, scour valves and isolation valves are provided along the pipeline for operation and maintenance.

The pump station is automatically controlled, operated and monitored by the plant PLC, local HMI touch screens at the pump station site (local SCADA) and TCC's Wide Area SCADA network (remote SCADA).

Operation of the pipeline will involve the ongoing maintenance of a 21.5 m wide public utility easement along the length of the pipeline corridor. Within this easement is a 10 m wide zone directly above the pipeline where only ground layer stratum revegetation is proposed and a 4 m wide gravel access road to enable vehicle movements to transverse and inspect the pipeline.

Operational requirements will typically include low volumes of vehicle movements (1 -2 vehicles) along the gravel access road approximately once per week, with 40 km/hr speed restrictions to suit the rural type gravel access road. No permanent fencing is proposed, other than reinstatement of private land owner rural fencing were traversing the pipeline corridor.

Maintenance Requirements

The design life of the assets is 100 years. During that time, it is anticipated that a range of maintenance activities would be required at varying intervals.

Maintenance activities will include the following:

- Pump station maintenance will be typical of mechanical and electrical equipment and include:
 - Replacement of wearing parts,

- Preventative maintenance and routine statutory maintenance of electrical switchboards and cabling systems
- Hardstands and access roads and tracks are provided at the pump station for maintenance activities including removal of pump sets, motors, and heavy items of plant using mobile cranes
- Periodic cleaning of the river intake screens may be required to remove accumulated debris such as after seasonal flooding events
- Maintenance activities for the pipeline may include the following:
 - Replacement of valves
 - Maintenance of the 4 m wide gravel access road
 - Operation of valves
 - General condition inspections.
- Maintenance activities for the pipeline may include the replacement of valves, maintenance of the 4 m wide gravel access road, operation of valves and general condition inspections.

All operational and maintenance-based activities will be subject to a maintenance plan developed by TCC, typical of local authority water supply assets.

2.4 Item 2.4

A description of the surrounding land uses.

2.4.1 Response

The HPS2 Project is wholly located within the Burdekin Shire Council (BSC) LGA and is mapped within the Rural zone under the Burdekin Shire *IPA Planning Scheme*, March 2011. The HPS2 Project area is located within the Brigalow Belt North Bioregion and broadly contains sparse open eucalypt woodlands, substantial areas of grass and shrub layers dominated by weed species along with high levels of fragmentation. The land is generally flat to slightly undulating agricultural land used for cattle grazing and cropping.

The Project is situated in the Burdekin Irrigation Area where the predominant land use is cattle grazing and predominate agricultural crop is sugar cane. Other agricultural uses in the area include melons, pumpkins, zucchinis and sweet corn.

The Australian Land Use and Management (ALUM) system is used to describe existing land use (Table 2.5). Existing land uses within the Project area include grazing and irrigated cropping (sugar cane). Irrigated sugar cane cropping areas are situated east of Ayr Ravenswood Road and toward the northern end of the Haughton main channel, in the vicinity of Keith Venables Road. These cropping areas are identified as part of important agricultural areas under the *State Planning Policy 2017*, which recognises their value as an agricultural resource of regional significance. Existing land uses are generally consistent with the intent of the rural zone.

Additional land identified as cropping land is situated in proximity of the Haughton balancing storage aggregation.

Table 2.5 Existing land use

Real property description	ALUM classification	Current land use
2AP23197	Grazing native vegetation	Grazing
15CP891307	Grazing native vegetation	Grazing
308GS1041	Grazing native vegetation	Grazing native vegetation, easement for water purposes
170GS804007	Part grazing native vegetation Part irrigated cropping	Grazing
261GS804009	Grazing native vegetation Part water	Easement for water purposes
301SP107466	Other minimal use	Grazing
302SP107469	Other minimal use	Grazing

Real property description	ALUM classification	Current land use
4SP107479	Part other minimal use Part irrigated cropping Part water	Easement for water purposes
33 SP117630	Grazing native vegetation	Grazing
A/GS510	Grazing native vegetation	Easement for water purposes
22/GS1042	Grazing native vegetation	Grazing
1/AP3570	Grazing native vegetation	Grazing
71/SP289517	Part grazing native vegetation Part irrigated cropping	Part sugar cane cropping
1/SP302825	Part grazing native vegetation Part residential and farm infrastructure	Grazing House and farm buildings
2/SP302825	Part grazing native vegetation Part irrigated cropping	Grazing Cropping
3/SP302825	Grazing native vegetation	Grazing
5SP107479	Part water Part grazing native vegetation	Channel
7/GS947	Water	Water storage
8SP123168	Part water Part grazing native vegetation Part conservation and natural environment	Water storage Channel

The main land tenures within and surrounding the HPS2 Project area include State Land, Lands Lease and Freehold Land.

Surrounding land uses typically consist of:

- **North** – Rural fields for irrigated crop production and cultivation and other supporting uses including State land and rural residential dwellings
- **East** – Rural fields for irrigated crop production and cultivation and other supporting uses including rural residential dwellings
- **South** – Undeveloped land and cattle grazing on native vegetation
- **West** – Predominantly undeveloped land and cattle grazing on native vegetation.

Figure 2.10 details the Queensland land use mapping of surrounding areas.

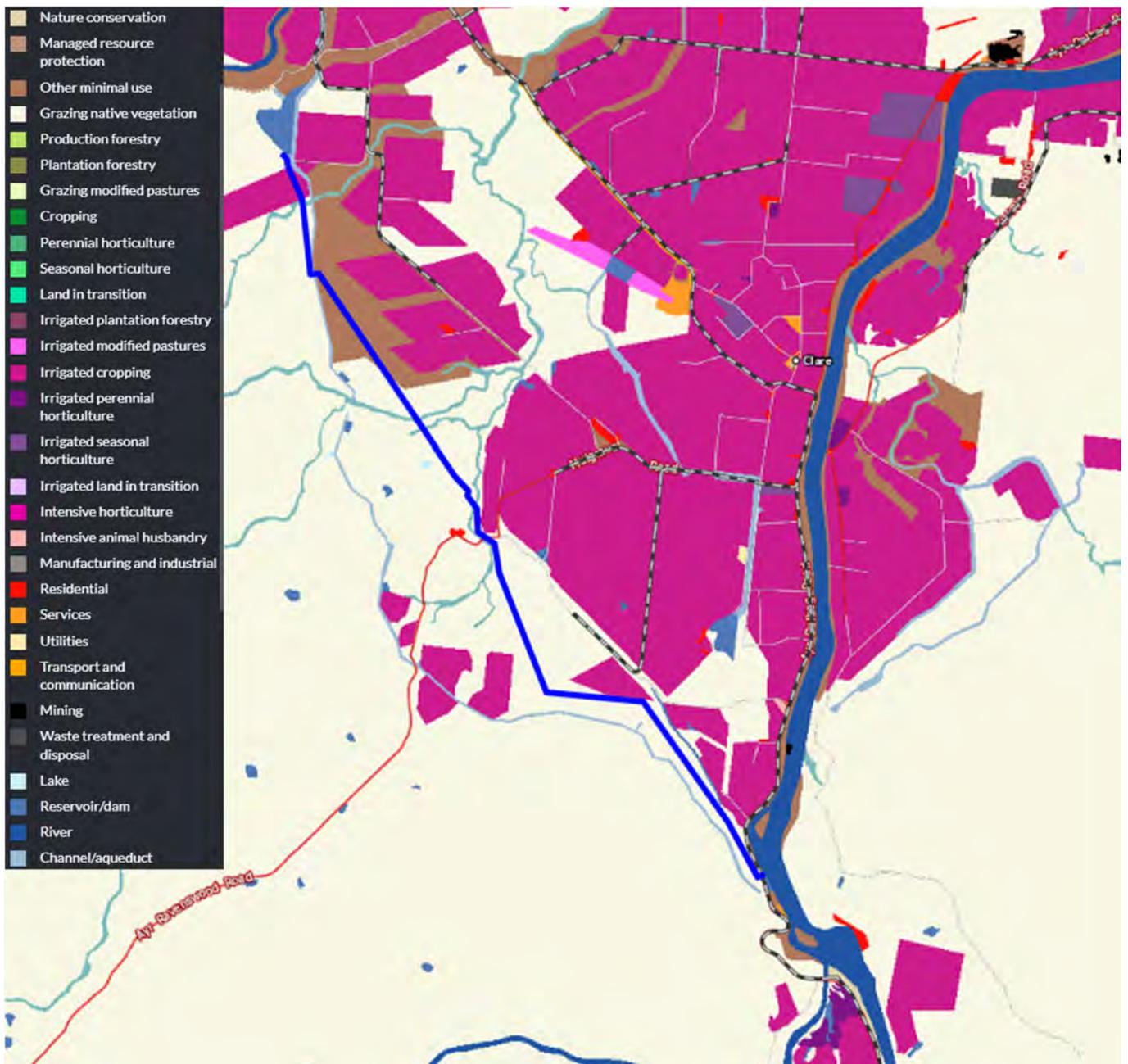


Figure 2.10 Qld land use mapping

2.5 Item 2.5

An indicative layout plan for the proposed action area, including the location and type of land use or infrastructure and features, i.e., dwellings, other buildings, stockpiles, access tracks, firebreaks, pump station, cabling, power supply works areas, open space, and conservation/exclusion areas. Include mapping and coordinates for each aspect.

2.5.1 Response

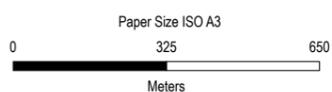
Figure 2.11 identifies key features of the Project, including the pipeline alignment, pump station site, substation site, power supply easement and adjoining and nearby land uses. The coordinates of each aspect are provided in Table 2.6.

Table 2.6 Coordinates for each aspect

Coordinates	
Latitude	Longitude
-19.925223167781	147.21876147044
-19.929419132911	147.22167971385
-19.929903275565	147.22185137523
-19.932485344666	147.21601488841
-19.928612225192	147.213096645
-19.88180453252	147.18116762889
-19.879867364252	147.15147021068
-19.839342835742	147.13893893016
-19.83982725377	147.12211611522
-19.82464812015,	147.11009981883
-19.81592753658	147.12657931102
-19.751638863526	147.0857239033
-19.727725909695	147.07593920482
-19.72433256537	147.08005907786
-19.730796016272	147.08761217845
-19.75567786019	147.09035876048
-19.750346363	147.10752489818
-19.755193185989	147.11318972362
-19.759070538366	147.09379198802
-19.824486632211	147.13670733226
-19.831430465474	147.13739397777
-19.829492682065	147.14374544871
-19.871634134919	147.15885164989
-19.871472694775	147.18254091991
-19.907631178747	147.20605852855
-19.92651424584	147.21652987254
-19.925223167781	147.2187614704



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

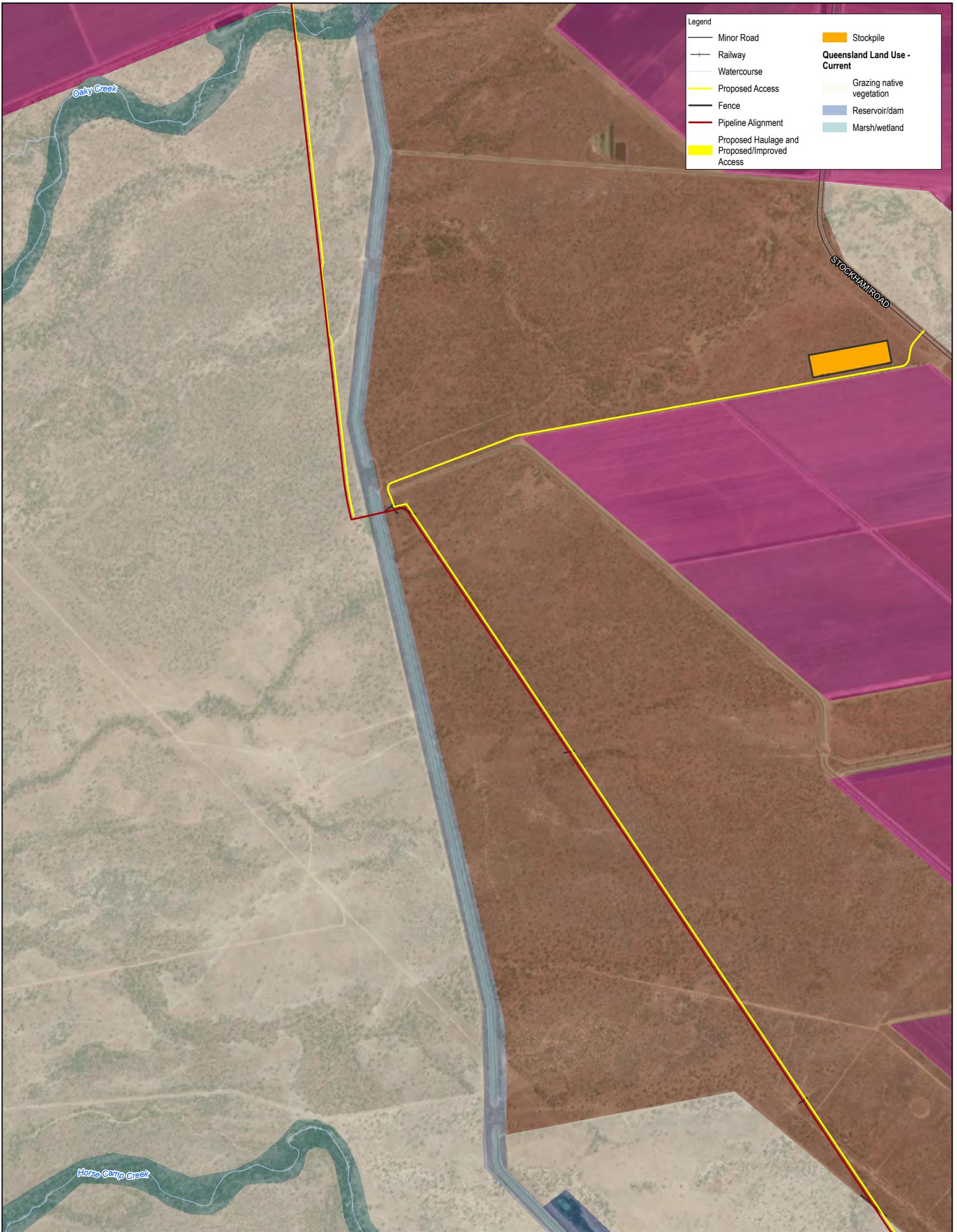


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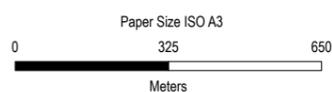
HPS2 pipeline alignment and adjoining and nearby land use

Project No. 12537606
Revision No. 2
Date 7/29/2022

FIGURE 2-11



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

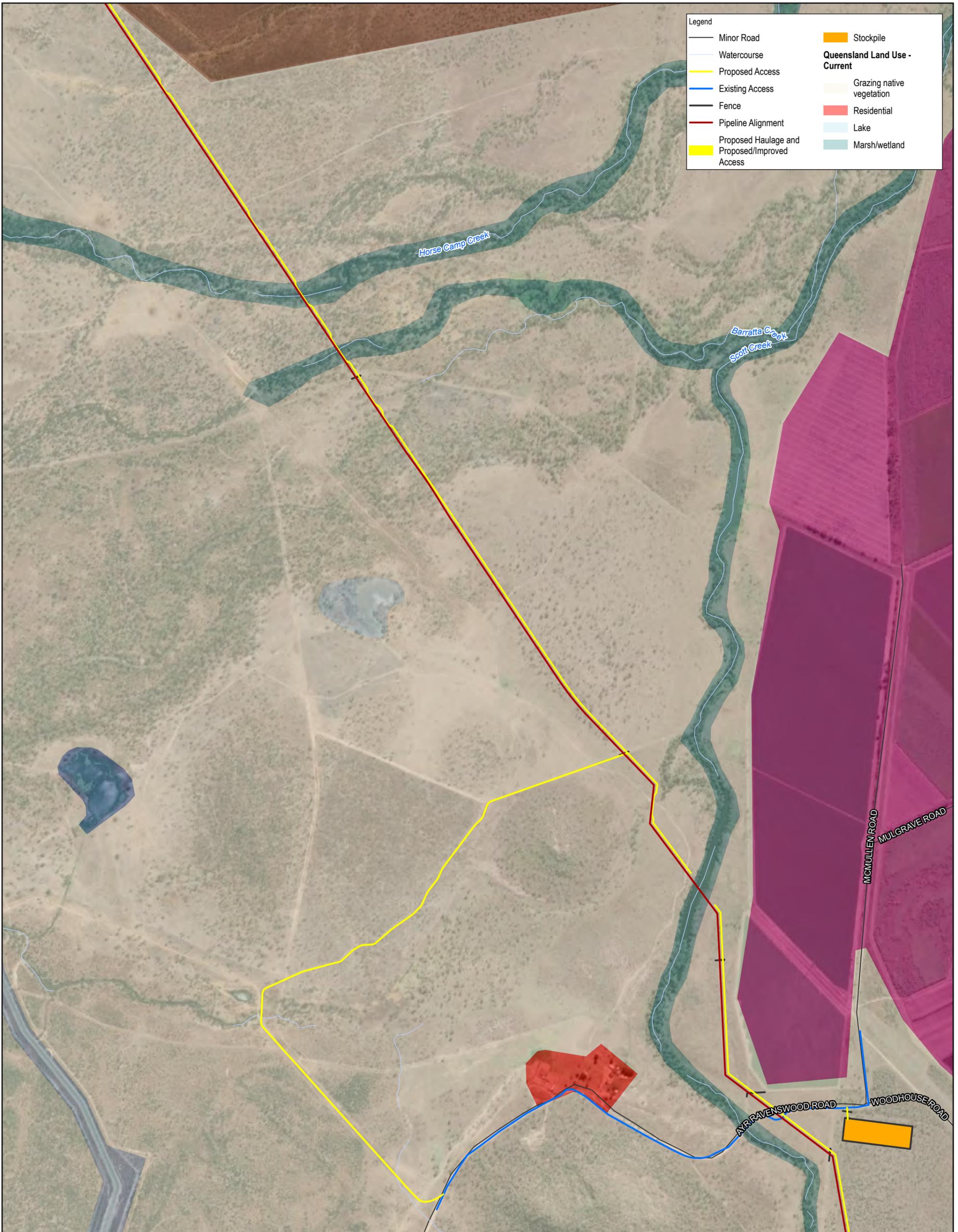


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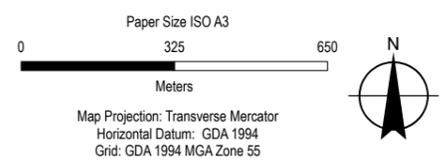
Project No. 12537606
Revision No. 2
Date 7/29/2022

HPS2 pipeline alignment and adjoining and nearby land use

FIGURE 2-11



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Houghton Pipeline Stage 2 - MNES Assessment

HPS2 pipeline alignment and adjoining and nearby land use

Project No. 12537606
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FIGURE 2-11



Legend	
	Minor Road
	Watercourse
	Proposed Access
	Fence
	Pipeline Alignment
Queensland Land Use - Current	
	Grazing native vegetation
	Irrigated cropping
	Marsh/wetland

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

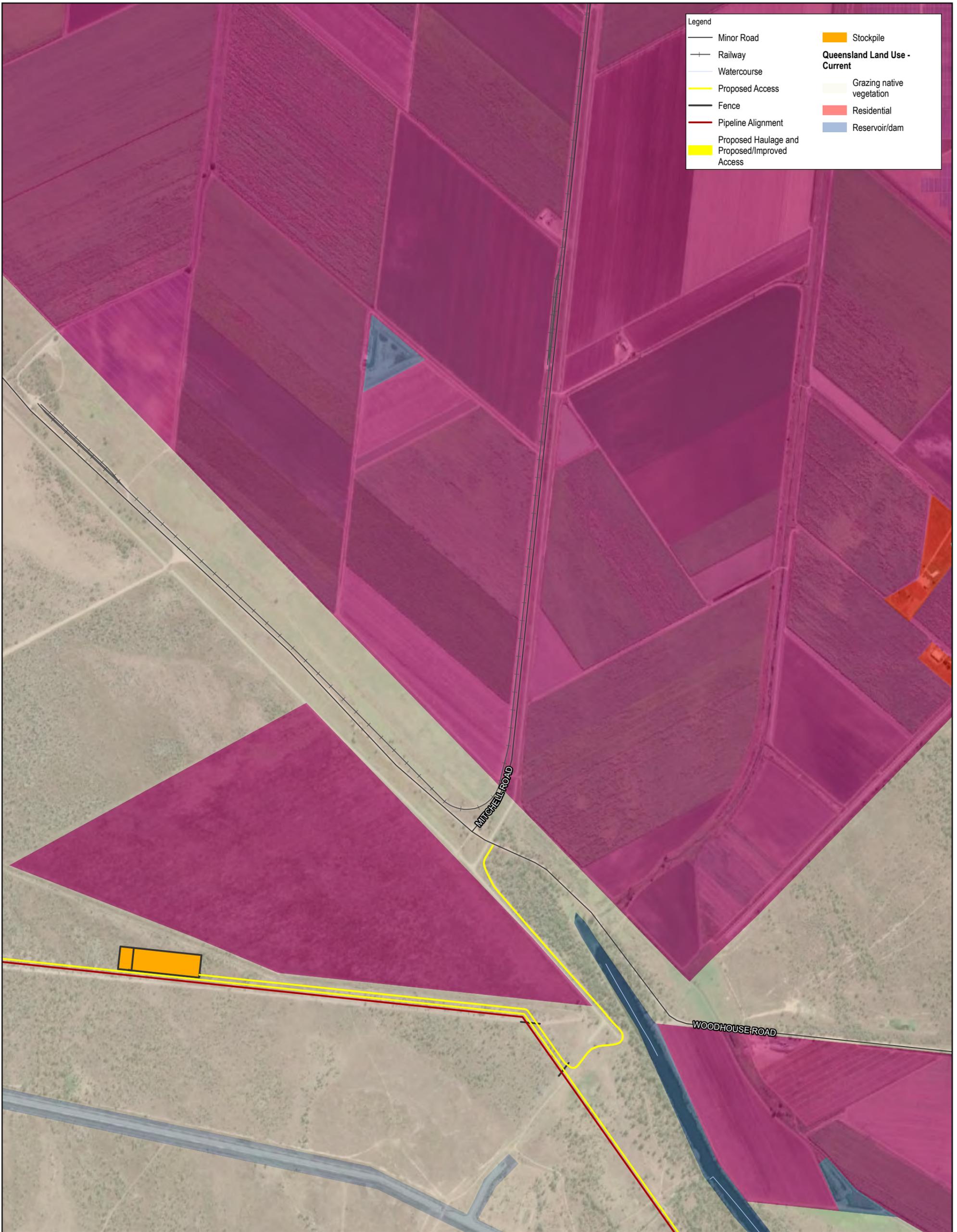


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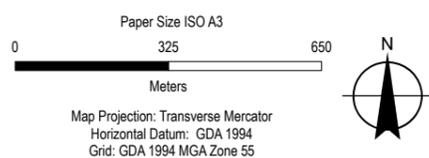
HPS2 pipeline alignment and adjoining and nearby land use

FIGURE 2-11



Legend	
	Minor Road
	Railway
	Watercourse
	Proposed Access
	Fence
	Pipeline Alignment
	Proposed Haulage and Proposed/Improved Access
	Stockpile
Queensland Land Use - Current	
	Grazing native vegetation
	Residential
	Reservoir/dam

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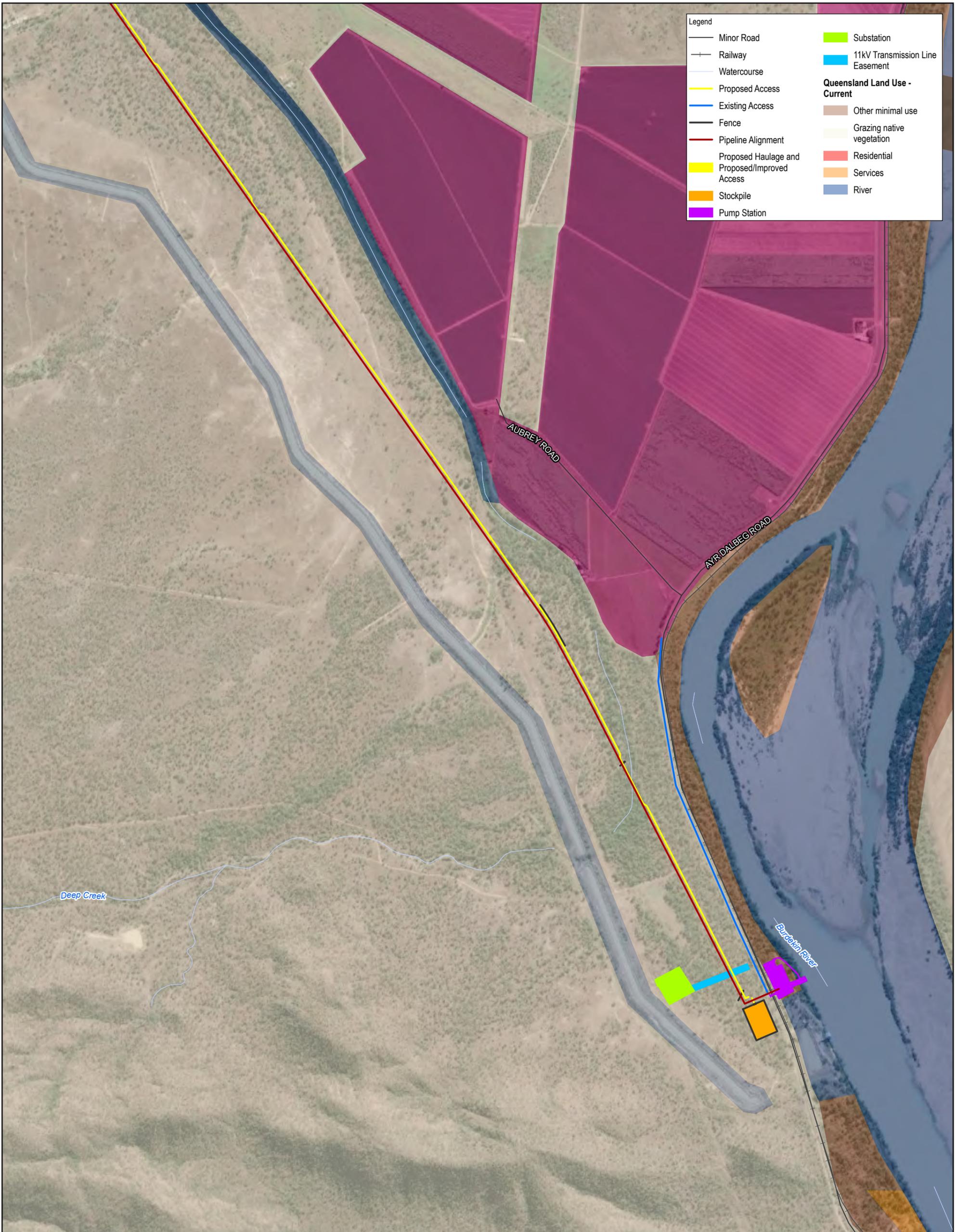


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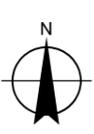
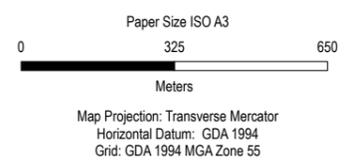
HPS2 pipeline alignment and adjoining and nearby land use

FIGURE 2-11



Legend	
— Minor Road	Substation
— Railway	11kV Transmission Line Easement
— Watercourse	Queensland Land Use - Current
— Proposed Access	Other minimal use
— Existing Access	Grazing native vegetation
— Fence	Residential
— Pipeline Alignment	Services
— Proposed Haulage and Proposed/Improved Access	River
— Stockpile	
— Pump Station	

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

HPS2 pipeline alignment and adjoining and nearby land use

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FIGURE 2-11

2.6 Item 2.6

Detail about the intended water use and water allocations enabled by the proposed pipeline. Any facilitated impacts from the use of the water from the pipeline (such as irrigated agriculture) need to be included in the PD (see section 4 below- Impact assessment).

2.6.1 Response

2.6.1.1 Intended water use

The intended water use for HPDP is to provide a long-term raw water supply security solution for Townsville for urban water. The Haughton Pipeline system will transfer raw water (364 ML/day) from the Clare Weir Storage to Ross River Dam to provide bulk raw water supply for drought proofing and city demand growth. The raw water will be treated by TCC's municipal Douglas Water Treatment Plant and distributed as potable water to residential and commercial customers via TCC treated water distribution network.

2.6.1.2 Water allocation

TCC has an existing allocation comprising of 10,000 ML/annum high priority water and 10,000 ML/annum of medium priority water allocation sourced from the Burdekin irrigation scheme main channel. TCC is currently negotiating with Sunwater for the purchase of an additional 110,000 ML of water allocation directly from the Burdekin River.

The design capacity for the Haughton Pipeline system is 364 ML/day and is based on transfer of a total annual water allocation from the Burdekin Haughton WSS of 120,00 ML/annum after allowance for downtime of the transfer system for maintenance and operational avoidance period such as Burdekin River high flood events.

There are no interconnections or offtakes for raw water supply along the pipeline. There are no irrigation or agriculture water users from the pipeline.

2.7 Item 2.7

A more detailed erosion management plan to ensure any downstream impacts to listed threatened species and communities (e.g., sedimentation) are addressed (see section 5 below-Avoidance, mitigation and management measures).

2.7.1 Response

An Erosion and Sediment Control Plan (ESCP) (GHD, 2022) has been prepared for the HPS2 Project by a Certified Professional in Erosion and Sediment Control (CPESC), and in accordance with Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association (IECA)) (Appendix Q). The ESCP provides detailed information for the Construction Contractor to be able to develop site-specific erosion and sediment control plans (SSESCP) in accordance with contract documentation for construction.

The developed ESCP provides a set of overarching erosion and sediment control principals, sediment control plans and soil loss calculations as a guiding requirement for the construction Contractors. The control principles and management techniques outlined are to be used by each Contractor during the Project to minimise/ eliminate the potential for sediment laden runoff to be discharged into the receiving environment for each site. A summary of control measures proposed includes the following:

- Drainage control
 - Provide diversion works (clean water, disturbed, mid-slope diversion drains)
 - Sediment weirs or rock checks within exposed diversion and drainage channels
 - Level spreader on unsealed access track
- Erosion control
 - Limit vehicle to access and haulage tracks
 - Minimise disturbance
 - Vegetation clearing areas to be clearly marked

- Establishment of low growing cover vegetation on exposed soils, stockpiles and temporary earth banks
- Stabilise construction entry/exists
- Sediment control
 - Dust suppression
- Sediment control devices
 - Diversion bunds/drains (clean water, disturbed)
 - Rock check dams within all stabilised diversion channels and sediment weirs within the main drainage channel
- Stockpile management
- Pipe trench management
 - Spoil, topsoil/vegetation stockpiles adjacent to trench for ease of reinstatement
 - Diversion of clean water away
 - Use of mulch berms to prevent dirty water leaving the site
 - Use of sandbags (> 10 mm rainfall imminent) to provide trench stops
 - In case dewatering of the trench is required, it will be achieved by a dewatering pump with discharge sediment control measures
 - Following construction, flow controls berms to be installed
- Pump station management
 - Soil stabilisation on banks of Burdekin River, use of erosion control blankets, mats and/or mesh
 - Downslope sediment control including fences and isolation barrier to be installed on banks
 - Provide diversion works (clean water, disturbed, mid-slope diversion drains)
 - Sediment boom to be used when undertaking instream works (pump station intake).

Performance requirements shall give an indication if the applied controls are meeting standards set out in the contract and/or relevant legislation. The main indicator is the monitoring of directly impacted waterways and water at the point of discharge off site. This will ensure any downstream impacts to listed threatened species and communities is mitigated.

The Erosion and Sediment Control Plan (ESCP) (GHD, 2022) has been developed to comply with the Queensland Water Quality Guidelines (QWQG) 2009. In meeting this guideline, the project is following industry standard practice to mitigate impacts to waterways and the species within. The Queensland Water Quality Guidelines were developed by the state government to achieve ongoing water quality assessment and objectives under Australian and New Zealand Guidelines for Fresh and Marine Water Quality (the ANZECC 2000 Guidelines). *“The ANZECC 2000 Guidelines provide guideline values (numbers) or descriptive statements for different indicators to protect aquatic ecosystems and human uses of waters”* (QWQG, 2009). The QWQG are also integrated with the ‘Water Quality Guidelines for the Great Barrier Reef Marine Park’ and in turn the ‘Reef 2050 Water Quality Improvement Plan’. *“The Water Quality Guidelines for the Great Barrier Reef Marine Park describe the concentrations and trigger values for sediment, nutrients and pesticides that have been established as necessary for the protection and maintenance of marine species and ecosystem health of the Great Barrier Reef”*¹. *“The Reef 2050 WQIP is included as an action within the water quality theme of the Reef 2050 Plan. Its specific purpose is to identify management and monitoring requirements for all land-based pollution to improve the quality of water flowing from catchments adjacent to the Reef.”*². By way of project compliance with the QWQG guidelines the project will meet the guideline objectives of the ‘Reef 2050 Water Quality Improvement Plan’ by reducing the impact to downstream habitat for threatened species.

During the construction phase of the Project, off-site surface water releases must comply with the design objectives outlined in Table 8.2.1 of the QWQG, which details currently used stormwater quality design objectives for development in Queensland. These design objectives have been included in the ESCP. As part of the Contractor’s site-specific erosion and sediment control plan, a Water Quality Monitoring Program shall be developed to include the location, frequency and parameters of monitoring for all waterways that are directly

¹ Great Barrier Reef Marine Park Authority (2009). Water quality guidelines for the Great Barrier Reef Marine Park. Great Barrier Reef Marine Park Authority, Townsville

² State of Queensland (2018) Reef 2050 Water Quality Improvement Plan 2017–2022

impacted by the construction. The locations of waterways intersected by the project, and parameters for water quality monitoring listed in QWQG 2009 are listed in Table 2.7 and Table 2.8.

Table 2.7 Watercourse chainages, stream order and corresponding REs

Pipeline Chainage (m)	Latitude	Longitude	Stream order	Qld WWBW classifications	Corresponding RE
1578.992886	-19.740135	147.084186	4	Purple - Major	11.3.25b
2803.019057	-19.751129	147.08547	1	Orange - Moderate	11.3.7
8379.5925	-19.792166	147.111868	1	Orange - Moderate	11.3.35
9096.037065	-19.797542	147.11568	1	Not classified	11.3.35
9476.656766	-19.800398	147.117706	4	Purple - Major	11.3.25b
9766.980128	-19.802576	147.119251	5	Purple - Major	11.3.25b
10025.57953	-19.804517	147.120627	1	Not classified	11.3.4a
10140.96884	-19.805382	147.121241	1	Orange - Moderate	11.3.7
12217.86974	-19.820566	147.132489	1	Orange - Moderate	Non-rem
12672.56564	-19.824019	147.134456	5	Purple - High	11.3.25b
23328.34677	-19.888934	147.191586	1	Orange - Major	11.3.35
23328.34677	-19.888934	147.191586	1	Red - High	11.3.35
24138.55718	-19.894915	147.196049	1	Orange - Major	Non-rem
27185.56834	-19.917895	147.212004	3	Red - High	11.3.25b

Table 2.8 Summary of discharge design objectives

Description	QWQG 2009 design objectives ^{1,9}
Intent	To protect water EVs by minimizing hydrologic disturbance and the loads of contaminants in runoff.
Pollutant/Issue	Stormwater design objectives ²
Coarse Sediment	Retain coarse sediment on site.
Fine Sediment (Total Suspended Solids – TSS)	Take all reasonable and practicable measures to collect all runoff from disturbed areas and drain to a sediment basin – up to the design storm event. ³ Site discharge during sediment basin dewatering complies with a TSS concentration less than 50 mg/L up to the design event – flocculation as required. In storms greater than the design event take all other reasonable and practicable measures to minimise erosion and sediment export.
Turbidity	Released waters from the approved discharge point(s) have turbidity ⁴ (NTU) less than 10% above receiving waters turbidity – measured immediately upstream of the site.
Nutrients (N and P)	Manage through sediment control.
pH	Acceptable site discharge pH range 6.5 to 8.5 ⁵
Litter or other Waste	Prevent litter/waste entering the site or the stormwater system or internal watercourses that discharge from the site – minimise on-site production, contain on-site and regularly clear bins ⁶ .
Hydrocarbons and other contaminants ⁷	Prevent from entering the stormwater system or internal watercourses that discharge from the site – control storage, limit application and contain contaminants at source. Waste containing contaminants must be disposed of at authorised facilities. Store oil and fuel in accordance with Australia Standard AS1940 – no visible oil or grease sheen on released waters.
Wash down water	Prevent from entering the stormwater system or internal watercourses that discharge from the site.
Cations and anions	As required under an approved Acid Sulfate Soil Management Plan, including aluminium, iron and sulfate.

Description	QWQG 2009 design objectives ^{1,9}
Stormwater drainage/flow management	Take all reasonable and practicable measures ⁸ to minimise changes to the natural waterway hydraulics and hydrology from: <ul style="list-style-type: none"> - Peak flow for the 1-year and 100-year ARI event (respectively for aquatic habitat and flood protection) - Runoff frequency and volumes entering receiving waters Uncontrolled release of contaminated stormwater.
Dissolved Oxygen	N/A

Table notes:

1. For small scale construction sites (defined as disturbance area less than 2500 m²) and independent of a larger common development, the implementation of best practice environmental management should be in accordance with the Queensland Development Code, local government planning scheme requirements (including any deemed to comply provisions) and Draft urban stormwater – Queensland BPEM guidelines Appendix 1 'Model Provisions for Best Practice Erosion and Sediment Control'.
2. Compliance release limits for rainfall events less than the design storm event – (based on the design rainfall event of 80%ile five day rainfall depth for developments involving land disturbed less than six months, and 85%ile for longer disturbance).
3. For sites with disturbance greater than one hectare, drain such area to a sediment basin where practicable. See Table 6.3 of Urban Stormwater – Queensland BPEM guidelines and IECA 2008 for details.
4. A site-specific relationship should be developed between turbidity and suspended solids, prior to the commencement of construction on large and medium scale construction sites. Background refers to receiving waters immediately upstream of site waters release points.
5. Note the range may be further limited to prevent mobilisation of specific elements.
6. Avoid wind blown litter; remove gross pollutants.
7. See the prescribed contaminant list in the *Environmental Protection Regulation 1999*.
8. Including making best use of constructed sediment basins to attenuate the discharge of stormwater from the site.
9. Source: Draft urban stormwater – Queensland best practice environmental management guidelines, 2009.

The Construction Contractor will be required to further develop a certified (written evidence from a CPESC) site specific SSESOP for their relevant construction parcel of works prior to the commencement of construction and within 20 business days after completion of works. The SSESOP shall be in accordance Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association (IECA) (IECA, 2008).

2.8 Item 2.8

Outline any state-based water plans and requirements that will be adhered to, including any relevant water allocation approvals.

2.8.1 Response

All water transferred to the Ross River Dam will be used in accordance with TCC's Interim Resource Operations Licence (ROL) issued by the Department of Regional Development, Manufacturing and Water (DRDMW).

The take of water from the Burdekin River for the HPS2 project is understood to be under a supply agreement and existing water allocation held by Sunwater. Therefore a development permit is not required for the take of 364 ML/day of raw water from the Burdekin River.

Operational activities associated with the construction of the HPS2 project (including the pump station) require access to water in accordance with the provisions of the *Water Act 2000* (Water Act) and the *Water Regulation 2016* (Water Regulation).

The Water Regulation provides for water authorisation for industry and government. Specifically, DRDMW's 'OSW/2020/5467 Exemption requirements for construction authorities for the take of water without a water entitlement' identifies that the key conditions to be met by TCC or its Construction Contractors include:

- Notify the chief executive 10 business days prior to taking any water
- Keep records for each take of water
 - The date the water was taken
 - The time the take commenced and ceased
 - The purpose for which the water was taken
 - The source of water (e.g. the name of the watercourse, lake, spring, underground water or overland flow)
 - The location from where the water was taken
 - The volume of water taken

- Any identified impacts on the environment and measures to remedy such impacts (to be addressed by the Construction Contractor if applicable)
 - Any concerns or issues raised by other water users and arrangements in place to address these.
- If there is a flow in the watercourse, the take of water must stop if the take causes the flow, immediately downstream of the point of take, to cease.

Further, constructing authorities (as defined in Schedule 2 of the *Acquisition of Land Act 1967*) can take water without a permit or license to construct or maintain infrastructure as long as the take of water is done in accordance with the OSW/2020/5467. This includes both surface water and underground water.

The taking of water for construction by the Construction Contractors will be done in accordance with DRDMW's OSW/2020/5467.

3. Habitat assessment

3.1 Item 3.1

Provide an appropriate habitat assessment for relevant listed threatened species and communities.

Please note an assessment must be undertaken regardless of whether the species was recorded in the Project area or not. As such, the potential for occurrence of listed threatened species and communities must also be considered and assessed.

3.1.1 Response

An assessment was conducted in the MNES report (Section 3.5 and Appendix B) (GHD, 2022) to attribute a 'likelihood of occurrence' to threatened species and ecological communities (i.e. threatened species and communities listed under the EPBC Act) that have been previously recorded or are predicted to occur within the desktop search extent. The likelihood of occurrence assessment was based on a review of species' distributions and habitat requirements, literature reviews, historical records for the region, and the results of habitat assessments and field surveys conducted within the Project area.

The likelihood of occurrence assessment undertaken in GHD 2022 returned the following results:

- Four EPBC Act listed threatened species were confirmed present in the Project area. These species are *Eucalyptus raveretiana*, bare-rumped sheath-tail bat, black-throated finch (southern) and squatter pigeon (southern)
- Two EPBC Act listed threatened species were considered likely to occur in the Project area. These species are koala and white throated needletail
- Five EPBC Act listed threatened species were rated as may occur in the Project area. These species include ghost bat, large-eared horseshoe bat, yakka skink, Mount Cooper striped lerista and *Tephrosia levillei*
- The remaining 19 listed threatened species and ecological communities identified in desktop searches were considered unlikely to occur based on the absence of suitable habitat, current knowledge of range/distribution and/or a lack of nearby recent historical records. These species are listed in Appendix E.

The habitat assessment and likelihood of occurrence assessment for all threatened species and communities is provided in Appendix E, and in the MNES report (GHD, 2022) (Appendix B).

An assessment of the habitat values across the Project area was undertaken based on field observations and is provided below. The following five fauna habitat types were observed within the Project area, as described in Table 3.1:

- *Eucalyptus platyphylla* open woodland on alluvial plains
- Very sparse open woodland/grassland on alluvial plains
- *Melaleuca* and *Grevillea* woodland on alluvial plains
- Ephemeral or permanent watercourses with fringing riparian woodland
- Very sparse native canopy with mixture of invasive and native grasses and shrubs (non-remnant).

These terrestrial habitats are described in Table 3.1 and mapped in Figure 3.1.

Table 3.1 Fauna habitat types within the Project area

Habitat type	Characteristics	Ecological values
<i>Eucalyptus platyphylla</i> open woodland on alluvial plains		
	<p>Mature canopy vegetation</p> <p>Moderate abundance of hollow-bearing trees</p> <p>Abundant patches of invasive shrubs and grasses</p> <p>Logs, woody debris and other complex ground-level microhabitats present in low densities</p> <p>Moderately dense grassy ground layer with some bare ground</p>	<p>Nesting and foraging habitat for canopy-dwelling woodland birds</p> <p>Foraging habitat for granivorous birds</p> <p>Denning habitat for possums and other arboreal mammals</p> <p>Foraging and nesting habitat for raptors</p> <p>Roosting habitat for microchiropteran bats</p> <p>Foraging sites and foraging habitat for snakes, dragons, geckos, monitors, macropods and other ground dwelling vertebrates</p> <p>Potential conservation significant fauna species – koala, bare-rumped sheathail bat, black-throated finch (southern), squatter pigeon (southern).</p>
Very sparse open woodland/grassland on alluvial plains		
	<p>Mature canopy woodland with diverse range of species</p> <p>Low abundance of hollow-bearing trees</p> <p>Shrub layer periodically dominated by invasive rubber vine and chinee apple</p> <p>Dense grassy ground layer dominated by mix of native and exotic grasses</p> <p>Some areas subject to seasonal inundation</p>	<p>Nesting and foraging habitat for woodland birds</p> <p>Foraging habitat for granivorous birds</p> <p>Roosting sites and foraging habitat for microchiropteran bats</p> <p>Foraging habitat for reptiles, macropods and other ground dwelling vertebrates</p> <p>Potential conservation significant fauna species – koala, bare-rumped sheathail bat, black-throated finch and squatter pigeon (southern).</p>

Melaleuca and Grevillea woodland on alluvial plains



Dense low *Melaleuca* regrowth patches
 Woodland with sparse *Grevillea striata*
 Low abundance of mature eucalypt or *Corymbia* canopy species
 Few hollow bearing trees
 Ground layer mixture of invasive and native grasses
 Shrub layer occasionally dominated by invasive chinee apple and rubber vine

Nesting and foraging habitat for woodland birds
 Foraging habitat for granivorous birds
 Foraging habitat for macropods and other ground dwelling vertebrates
 Foraging habitat for snakes and other reptiles
 Potential conservation significant species – koala, foraging for bare-rumped sheathtail bat, black-throated finch and squatter pigeon (southern).

Ephemeral or permanent watercourses with fringing riparian vegetation



Mature canopy with diverse range of species
 Low abundance of hollow-bearing trees
 Patches of dense shrubs including mixture of invasive and native plants
 Ephemeral and permanent water sources
 Sandy substrate suitable for burrowing

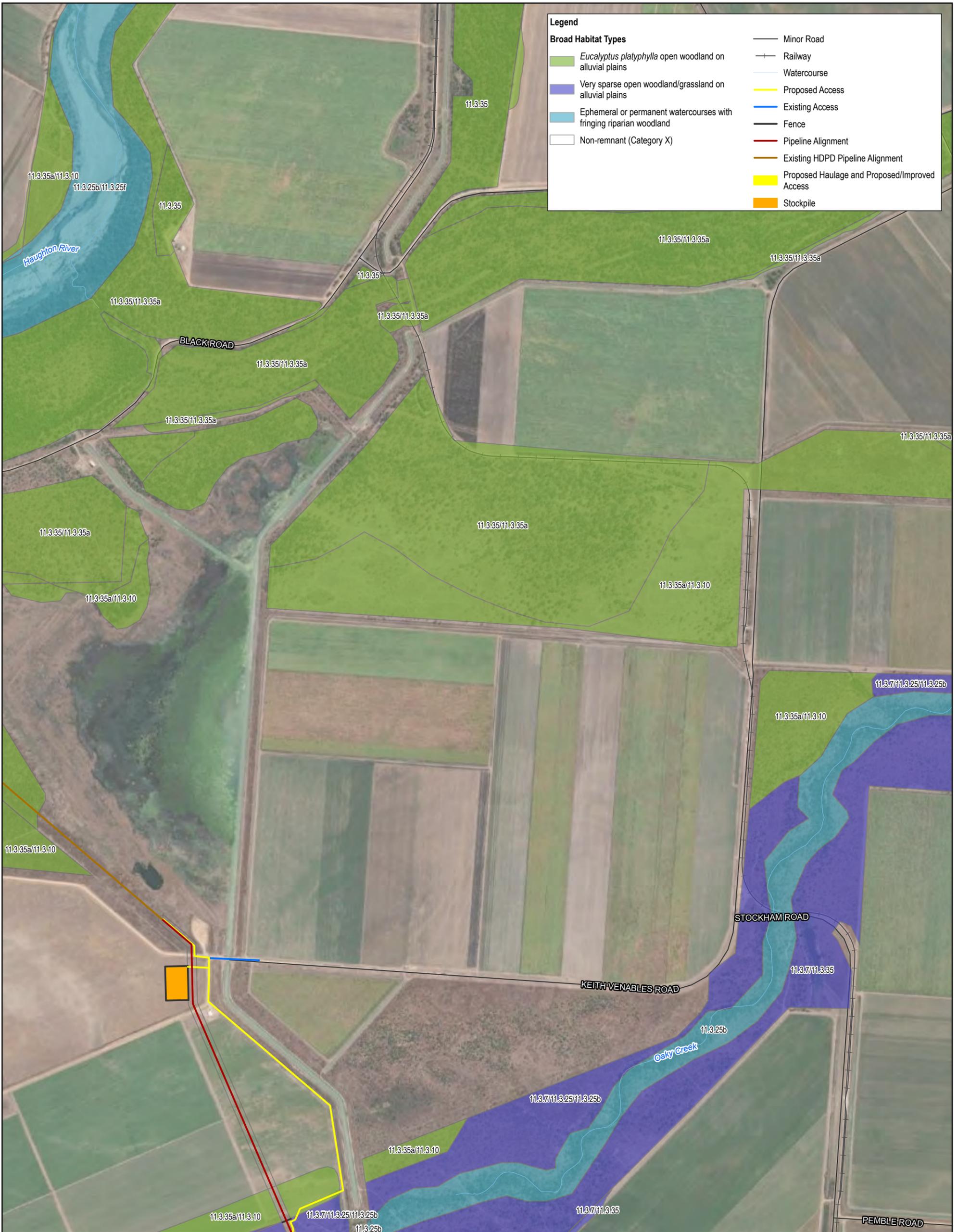
Drinking sites for birds and mammals
 Nesting and foraging habitat for canopy, shrub and ground-dwelling birds
 Refuges and breeding sites for amphibians
 Foraging habitat for snakes
 Foraging and roosting habitat for microbats
 Movement corridors for birds, reptiles and mammals
 Potential conservation significant species – koala, bare-rumped sheathtail bat and black-throated finch (southern)

Very sparse native canopy with mixture of invasive and native grasses and shrubs (non-remnant)

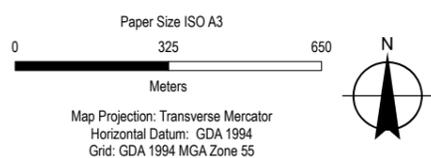


Mature to regrowth native eucalypt and *Corymbia* species
 Very low presence of hollow-bearing trees
 Patches of dense invasive grasses and shrubs
 Highly disturbed by cattle, weeds and historical vegetation clearing

Foraging habitat for raptors
 Foraging habitat for macropods and other ground dwelling mammals
 Movement and dispersal habitat to areas of higher quality and vegetation cover
 Potential conservation significant species – koala.



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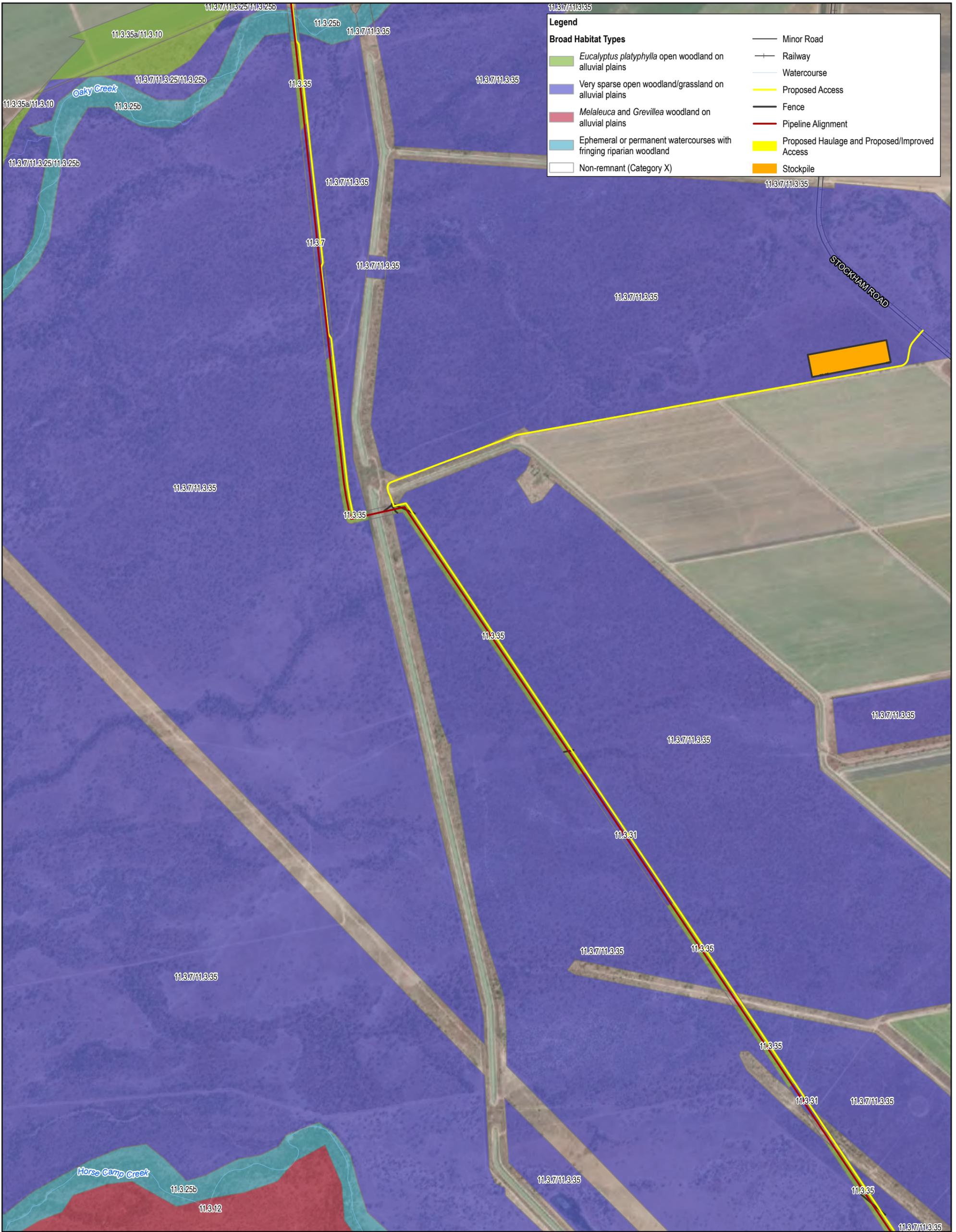


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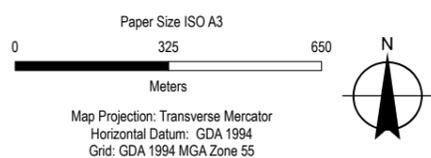
Project No. 12537606
Revision No. 1
Date 7/15/2022

Distribution of fauna habitat types
within survey area

FIGURE 3-1



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

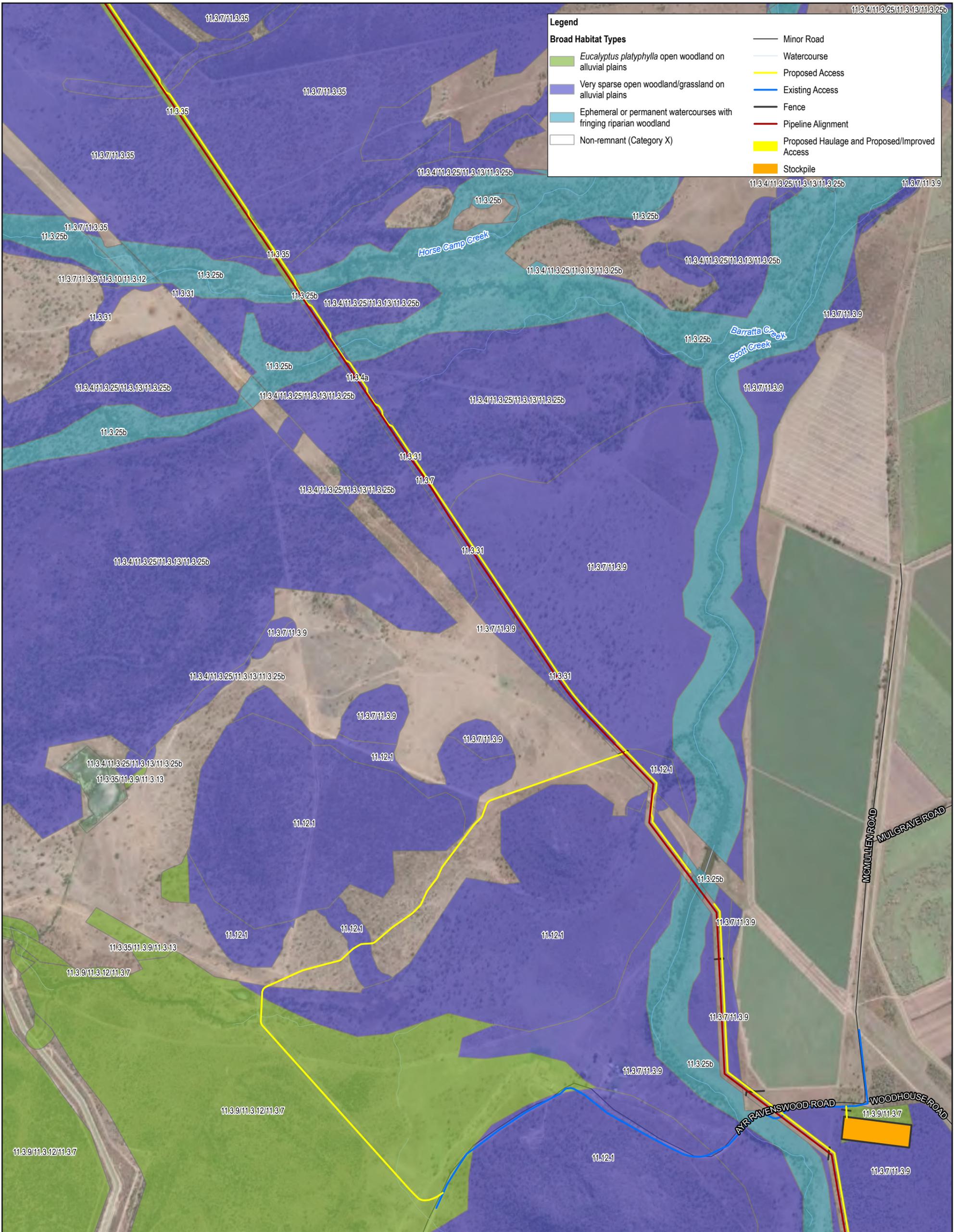


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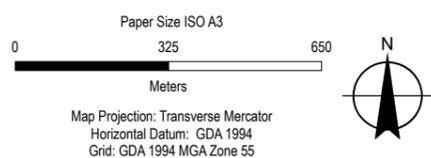
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FIGURE 3-1



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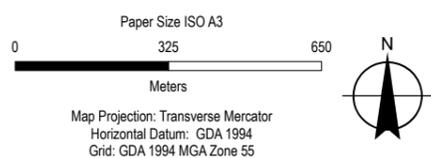
Distribution of fauna habitat types
within survey area

Project No. 12537606
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FIGURE 3-1



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Distribution of fauna habitat types
within survey area

FIGURE 3-1



Legend

Broad Habitat Types	— Minor Road
 <i>Eucalyptus platyphylla</i> open woodland on alluvial plains	—+— Railway
 Very sparse open woodland/grassland on alluvial plains	— Watercourse
 Non-remnant (Category X)	— Proposed Access
	— Fence
	— Pipeline Alignment
	 Proposed Haulage and Proposed/Improved Access
	 Stockpile

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

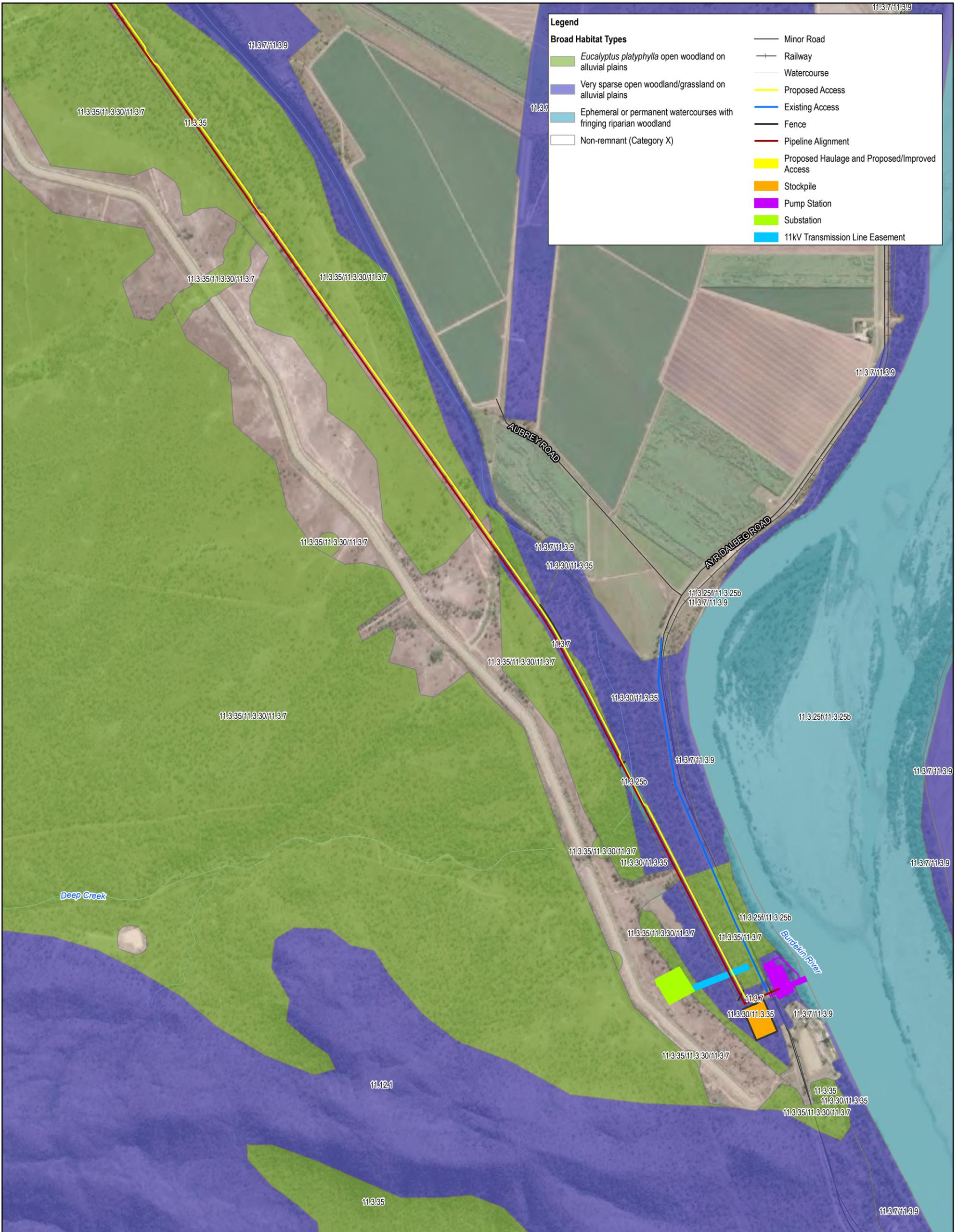


Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
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Distribution of fauna habitat types
within survey area

FIGURE 3-1



Legend

Broad Habitat Types

- Eucalyptus platyphylla* open woodland on alluvial plains
- Very sparse open woodland/grassland on alluvial plains
- Ephemeral or permanent watercourses with fringing riparian woodland
- Non-remnant (Category X)

- Minor Road
- Railway
- Watercourse
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile
- Pump Station
- Substation
- 11kV Transmission Line Easement

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Distribution of fauna habitat types within survey area

Project No. 12537606
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FIGURE 3-1

Five EPBC Act listed species were considered as 'may occur' within the Project area, including one flora species. For these five threatened species, further detail on the desktop and field studies undertaken to arrive at these conclusions are described further here. Noting their explicit mention in the RFI for this assessment, the northern quoll, red goshawk and grey falcon, all of which were determined to be unlikely to occur are discussed below.

***Tephrosia leveillei* (concluded to be may occur)** – survey effort for threatened flora species comprised of targeted searches including random meander searches at 11 sites and quaternary vegetation assessments at 40 sites. Desktop and field data was used to determine the likelihood of occurrence of *Tephrosia leveillei* within the Project area and surrounds. The species was not recorded during field surveys. Noting: (1) the species has not been historically recorded within the desktop search extent, (2) there are no publicly accessible DES historical records within the broad landscape of the Project area. According to ALA the nearest record is approximately 315 km northwest near Undara Volcanic National Park. Of six known locations that the species has been recorded, the closest is near Ravenswood.

While suitable habitat for the species occurs in the form of eucalypt and *Corymbia* woodland and open forest, on the basis that the species has not been historically recorded in the desktop search extent, the species is considered to have potential to occur.

Northern quoll (*Dasyurus hallucatus*) (concluded to be unlikely to occur)– survey effort for the northern quoll comprised of baited remote camera traps at seven sites (seven trap nights) and habitat assessments at 35 sites. Desktop and field data was used to determine the likelihood of occurrence of the northern quoll within the Project area and surrounds. Noting: (1) field data and observations from habitat assessments and BioCondition surveys (especially regarding the lack of structural complexity of remnant habitats, and their open and weed-affected ground layer); (2) the fragmented landscape in which the Project occur; (3) the prevalence of cane toads; (4) the absence of suitable rocky areas and topographically diverse areas in or near the Project footprint; (5) the lack of records (or evidence of occurrence) from surveys conducted for the Project; and (6) the lack of historical records within the immediate surrounding landscape, it is considered unlikely that the species will utilise habitats within the Project area on anything more than a highly infrequent and enigmatic basis (if it is indeed it persists in upland areas in the lower Burdekin region). Desktop and field data indicates that habitat within the Project area does not contain the requisite characteristics that comprise shelter habitat for the species (i.e. provides breeding and refuge habitat generally defined as rocky areas or structurally diverse woodland or forest with surrounding vegetated habitats) (DoE, 2016). Habitat within the Project area may comprise suitable foraging and/or dispersal habitat for the species, however this habitat is unlikely to support more than transient individuals within the landscape. Additionally, where shelter habitat may occur within the surrounding landscape, the Project area does not provide sufficient connectivity for the species (i.e. within 1 km of shelter habitat) (DoE, 2016). Accordingly, the species was considered unlikely to occur.

Grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*) (both concluded to be unlikely to occur) – survey effort for the grey falcon and red goshawk comprised of 10 days x 10 hour vigilant bird surveys, habitat assessments at 35 sites and searches for nests. Desktop and field data informed the likelihood of occurrence for both species. While habitat of very marginal suitability (e.g. sparse woodland) was present for the grey falcon, the species' Commonwealth approved conservation advice indicates that this bird is generally absent from areas east of the Great Dividing Range and where rainfall is greater than 500 mm, except when wet years are followed by drought (TSSC 2020). Bureau of Meteorology (BOM 2022a) long-term climate statistics for the 'Burdekin Shire Council' weather station (Station ID 033001) report the average annual rainfall for the region is 1056 mm. Additionally, the nearest historical record is located approximately 75 km southeast of the Project area from 1999, where the record is protected by a 10 km inaccuracy buffer. Accordingly, the grey falcon is considered unlikely to occur. Potentially suitable habitat is also present for the red goshawk within the Project area. While a historical record from 1998 is located 55 km north of the Project area, recent research by Garnett and Baker 2020 has determined the red goshawk has experienced a recent, rapid northward contraction, and is now rarely encountered south of southern Cape York in Queensland. On this basis, the red goshawk is unlikely to occur within the Project area.

Ghost bat (*Macroderma gigas*) and large-eared horseshoe bat (*Rhinolophus robertsi*) (both concluded to be may occur) – survey effort for the ghost bat and large-eared horseshoe bat comprised of 35 habitat assessments, six dusk roost watch surveys and two Anabat detectors at 5 sites. No ghost bats were recorded via Anabat detectors during the field surveys. Desktop and field data informed the likelihood of occurrence for both species. Potentially suitable foraging habitat was present in the Project area for the ghost bat. No roosting habitat was present for the species. Desktop review of Commonwealth documentation for historically known roosts

revealed the nearest known roost is Cape Hillsborough (220 km southeast). According to the Commonwealth approved conservation advice for the ghost bat, the species is known to forage within 1.9 km, and typically less than 5 km from diurnal roosts (TSSC 2016a). Although the closest historical record (75 km northwest) and roost (220 km southeast) are significantly further than known foraging distances for the species, given the presence of suitable habitat for the ghost bat, the species was considered to have *potential* to occur within the Project area (i.e. 'may occur'). Any such occurrence is likely to be enigmatic and infrequent, given the lack of proximal records.

Potentially suitable habitat for the large-eared horseshoe bat is present in the form of foraging habitat in open woodland and roosting habitat in hollow-bearing trees. No large-eared horseshoe bats were recorded via Anabat detectors during the field surveys. The species is poorly-known and generally uncommon, and within the species' core habitat it occurs in low densities (TSSC 2016b). The nearest historical record is 300 km north from 2019. Given suitable habitat is present within the Project area, the species is considered to have *potential* to occur (i.e. 'may occur'). Any such occurrence is likely to be enigmatic and infrequent, given the lack of proximal records.

Yakka skink (*Egernia rugosa*) and Mount Cooper striped lerista (*Lerista vittate*) (both concluded to be may occur) – Survey effort was aligned with the Commonwealth Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DSEWPaC 2011). Survey effort for the yakka skink and Mount Cooper striped skink comprised of habitat assessments and 24 active reptile search sites around areas of accumulated groundcover and fallen timber. Active searches were undertaken in >27°C temperatures (BOM 2022b) and were concentrated during the early morning and late afternoon where reptiles were likely to be sunning themselves and more easily detectable. Field survey effort met minimum survey effort required for diurnal searches. Desktop and field data informed the likelihood of occurrence for the two reptiles. The Project area is within the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles 'may occur' modelled distribution for the yakka skink and Mount Cooper striped lerista (DSEWPaC 2011). The nearest historical record for the yakka skink is located 75 km southwest (from 1980), the historical record is protected by a 10 km inaccuracy buffer. The nearest historical record for the Mount Cooper striped lerista is 73 km southwest (from 1980) at Mount Cooper station which is the only confirmed location of a population, with a second population *tentatively* identified on the Chudleigh Plateau 200 km northwest of Hughenden (further research required to confirm whether the Chudleigh Plateau population comprises a conspecific population, or represents a separate taxa). Microhabitats pertaining to the yakka skink comprise dense ground vegetation, large hollow legs, cavities in soil-bound root systems of fallen trees and beneath rocks, while the species may persist in cleared habitat where shelter sites such as tunnel erosion, rabbit warrens and log piles exist (DoE 2014b). Microhabitats pertaining to the Mount Cooper striped lerista include low closed forest and woodlands with vine thickets, on soft sandy soils where burrows are made into leaf litter and loose soil under logs, the species can be found in open patches of low vegetation that extends into adjacent woodland on heavier soils (DEWHA 2008b). The Mount Cooper striped lerista is currently only known (with confidence) to occur at one location – it is highly unlikely that it occurs at the Project area, given the survey effort undertaken and the composition, structure and condition of broad habitats and especially ground-layer microhabitats. Habitat of limited suitability was observed in the Project area for both the yakka skink and Mount Cooper striped lerista due to weed affected ground habitats, fragmentation and disturbance, and lack of structural complexity across much of the Project area. Active searches did not confirm the presence of traces of either species (e.g. communal defecation sites). Although no historical records are located within the desktop search extent, the yakka skink is an extremely secretive reptile, and further research is required to inform population size, distribution and ecological requirements for the Mount Cooper striped lerista, accordingly both reptiles have a *remote* chance of occurring within the Project area ('may occur').

3.2 Item 3.2

Identify and describe known historical records of the listed threatened species and ecological communities in the broader region. All known records must be supported by an appropriate source (i.e., Commonwealth and State databases, published research, publicly available survey reports, etc.), the year of the record and a description of the habitat in which the record was identified.

3.2.1 Response

The nearest historical records of listed threatened species and ecological communities that desktop searches indicated may be of relevance to the Project are provided in Table 3.2. Not all threatened species had historical records within the broader landscape of the Project area. The assessment of ecological communities was based on Queensland Regional Ecosystem (RE) mapping within a 2 km buffer of the Project area – their presence or otherwise was not informed by historical records in ecological databases. TEC constituent REs were used as defined by the Threatened Ecological Community relevant Commonwealth approved conservation advice or National recovery plan.

Table 3.2 Historical records of listed threatened species and ecological communities

Species name	EPBC Act status	NC Act status	Source	Records	Habitat (as per current vegetation mapping)	Likelihood of occurrence	References
Threatened Ecological Communities							
Poplar Box Grassy Woodland on Alluvial Plains	E	-	PMST	<p>No REs corresponding to the TEC were identified using field verified REs within the Project area. The TEC was not recorded during field surveys within the Project area.</p> <p>To assist in understanding the potential for the occurrence of Poplar Box TEC within the landscape of the Project area, a desktop search for RE constituent for the TECs was undertaken within a 2 km buffer of the Project area, using DoR RE mapping version 12.</p> <p>REs corresponding with the Poplar Box TEC were used as per Commonwealth conservation advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains (DEE 2019) documentation.</p> <p>Within a 2 km buffer of the Project area, no REs potentially corresponding to the Poplar Box TEC were identified within the desktop assessment.</p>	N/A	Unlikely to occur	DoR version 12 RE mapping based on refinements by RE confirmation by NRA and GHD, and BioCondition refinements by Ecological Interpretations.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar	E	-	PMST	<p>No REs corresponding to the TEC were identified using field verified REs within the Project area. The TEC was not recorded during field surveys within the Project area.</p>	N/A	Unlikely to occur	DoR version 12 RE mapping based on refinements by RE confirmation by NRA and GHD, and BioCondition

Bioregions – endangered.				<p>To assist in understanding the potential for the occurrence of Semi-evergreen vine thicket TEC within the landscape of the Project area, a desktop search for REs constituent for the TECs was undertaken within a 2 km buffer of the Project area, using DoR RE mapping version 12.</p> <p>REs corresponding with the TEC were used as per Commonwealth National recovery plan for the "Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions" ecological community documentation.</p> <p>Within a 2 km buffer of the Project area, no REs potentially corresponding to the Semi-evergreen vine thicket TEC was identified within the desktop assessment</p>			refinements by Ecological Interpretations.
Birds							
<i>Calidris ferruginea</i> Curlew sandpiper	CE, Mig	CE	PMST	<p>Occurrence ID: 524967 Date: 1971 Location: 27 km northeast from the northern extent of the alignment.</p>	<i>Grevillea striata</i> open woodland on coastal alluvial plains	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
<i>Erythrotriorchis radiatus</i> Red goshawk	V	E	PMST	<p>Occurrence ID: 550816 Date: 1998 Location: 55 km northwest from the northern extent of the alignment.</p>	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
				<p>Occurrence ID: 460953 Date: 2000 Location: 67 km northwest from the northern extent of the alignment.</p>	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest		
<i>Falco hypoleucos</i> Grey falcon	V	V	PMST	<p>Occurrence ID: OBS1227724911 Date: 1999 Location: 73 km southeast from the southern extent of the alignment.</p>	Non-remnant vegetation. Pre-clear RE description: <i>Eucalyptus crebra</i> woodland on igneous rocks	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022) https://www.ala.org.au/
<i>Geophaps scripta scripta</i>	V	V	WO	Nineteen squatter pigeon (southern – although uncertainty about taxonomy in intergrade zone) individuals were confirmed present in 2021 and 2022	<i>Eucalyptus</i> and <i>Corymbia</i> open woodland to very sparse open woodland or	Confirmed present	GHD 2021 and 2022 field surveys

Squatter pigeon (southern)					highly disturbed pastures for cattle grazing		DES Species profile search (Accessed 07/07/2022)
				Occurrence ID: 1260889 Date: 2011 Location: 32 km northwest from the northern extent of the alignment.	Between non-remnant grassland/very sparse open woodland and <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains		
White-throated needletail <i>Hirundapus caudacutus</i>	V	V	PMST, WO	Occurrence ID: 364323 Date: 1969 Location: 983 m west from the northern extent of the alignment.	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains	Likely to occur	Atlas of Living Australia (Accessed 16/05/2022) https://www.ala.org.au/
				Occurrence ID: 105700 Date: 1969 Location: 3.8 km northeast from the southern extent of the alignment.	<i>Eucalyptus coolabah</i> fringing woodland on alluvial plains		
<i>Neochmia ruficauda ruficauda</i> Star finch (eastern, southern)	E	E	PMST	Occurrence ID: 929579 Date: 1986 Location: 60 km northwest from the northern extent of the alignment.	<i>Eucalyptus drepanophylla</i> , <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
<i>Numenius madagascariensis</i> Eastern curlew	CE, Mig	E	PMST	Occurrence ID: OBS228719124 Date: 2008 Location: 20 km northwest from the northern extent of the alignment	Horseshoe Lagoon Conservation Park in Freshwater wetlands with aquatics and emergents	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022 and 13/09/2022) https://www.ala.org.au/
				Occurrence ID: OBS229408545 Date: 2011 Location: 16 km north from the northern extent of the alignment	Cleared agricultural land adjacent to Ironbark Creek in non-remnant (preclear <i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains)		
				Occurrence ID: OBS1068945486 Date: 2021 Location: 21 km northwest from the northern extent of the alignment	Cleared agricultural land adjacent to Haughton River in non-remnant (preclear <i>Corymbia</i> spp. open woodland on alluvial plains)		
				Occurrence ID: 3743709 Date: 1972	Cleared agricultural land, adjacent to the Burdekin River riparian zone (<i>Eucalyptus tereticornis</i> or		

				Location: 23 km north from the southern extent of the alignment.	<i>E. camaldulensis</i> woodland fringing drainage lines)		
				Occurrence ID: 280624 Date: 1981 Location: 24 km west from the central extent of the alignment.	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains		
Black-throated finch (southern) <i>Poephila cincta cincta</i>	E	E	PMST, WO	Two individuals were observed within the Project area in October 2021	Very sparse open woodland	Confirmed present	GHD 2021 field surveys Atlas of Living Australia (Accessed 16/05/2022) https://www.ala.org.au/
				Occurrence ID: 455709 Date: Not supplied Location: 6.5 km west from the southern extent of the alignment.	<i>Melaleuca viridiflora</i> , <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains		
				Occurrence ID: OBS1250965445 Date: 2021 Location: 800 m west from the southern extent of alignment, adjacent to Ayr Ravenswood Road.	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains		
				Occurrence ID: 78444 Date: Not supplied Location: 1.4 km west from the centre north of the alignment.	<i>Eucalyptus platyphylline</i> , <i>Corymbia</i> spp. woodland on alluvial plains		
				Occurrence ID: 28021082 Date: Not supplied Location: 3.8 km northeast from the far northern point of the alignment.	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains		
<i>Rostratula australis</i> Australian painted snipe	E	E	PMST	Occurrence ID: 549176 Date: 1972 Location: 19 km northeast from the central point of the alignment.	Cleared agricultural land, adjacent to the Burdekin River riparian zone (<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines)	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
				Occurrence ID: 551434 Date: 1965 Location: 28 km north from the northernmost point of the alignment.	Samphire forbland on marine clay plains		
<i>Turnix olivii</i> Buff-breasted button-quail	E	E	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The	N/A	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022) https://www.ala.org.au/

				nearest record is approximately 300 km north.			
<i>Tyto novaehollandiae kimberli</i> Masked owl (northern)	V	V	PMST	Occurrence ID: 483355 Date: 1991 Location: 54 km northwest from the northernmost point of the alignment.	<i>Eucalyptus crebra</i> , <i>Corymbia clarksoniana</i> , <i>C. citriodora</i> subsp. <i>citriodora</i> +/- <i>E. portuensis</i> open forest on shallow soils on metamorphic hills and ranges	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
				Occurrence ID: 550815 Date: 1998 Location: 54 km northwest from the northernmost point of the alignment.	<i>Eucalyptus drepanophylla</i> , <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges		
Mammals							
<i>Dasyurus hallucatus</i> Northern quoll	E	LC	PMST, WO	Occurrence ID: 549177 Date: 1972 Location: 19 km east from the central extent of the alignment.	Cleared agricultural land, adjacent to the Burdekin River riparian zone (<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines)	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
				Occurrence ID: 483487 Date: 1973 Location: 23 km north from the northern extent of the alignment.	<i>Eucalyptus platyphylla</i> woodland on igneous rocks		
				Occurrence ID: 1015240 Date: 2007 Location: 29 km north from the northern extent of the alignment.	Montane shrubland on igneous rocks		
				Occurrence ID: 483343 Date: 1993 Location: 30 km east from the southern extent of the alignment.	Grazing/agricultural land (preclear <i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains)		
<i>Hipposideros semoni</i> Semon's leaf-nosed bat	V	E	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 500 km north.	N/A	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
<i>Macroderma gigas</i> Ghost bat	V	E	PMST	Occurrence ID: 43182405 Date: 2019	<i>Melaleuca leucadendra</i> and <i>Livistona decora</i> open forest, with occasional	May occur	

				Location: 24 km north from the northern extent of the alignment.	<i>Corymbia tessellaris</i> and <i>Nauclea orientalis</i>		DES Species profile search (Accessed 07/07/2022 and 13/09/2022)
				Occurrence ID: 1404037 Date: 2005 Location: 72 km north from the northern extent of the alignment.	Semi-evergreen vine thicket with <i>Araucaria cunninghamii</i> on steep hills on igneous rocks		
				Occurrence ID: 1404032 Date: 2001 Location: 76 km north from the northern extent of the alignment.	<i>Eucalyptus drepanophylla</i> , <i>Corymbia clarksoniana</i> or <i>C. intermedia</i> and <i>C. dallachiana</i> woodland on steep rugged igneous ranges		
				Occurrence ID: 1404034 Date: 2016 Location: 76 km north from the northern extent of the alignment.	Non-remnant (preclear <i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite)		
				Occurrence ID: 1404033 Date: 2001 Location: 76 km north from the northern extent of the alignment.	<i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite		
				Occurrence ID: 1404033 Date: 2016 Location: 76 km north from the northern extent of the alignment.	<i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite		
				Occurrence ID: 1404033 Date: 2016 Location: 76 km north from the northern extent of the alignment.	<i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite		
Large-eared horseshoe bat <i>Rhinolophus robertsi</i>	V	E	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 302 km north.	N/A	May occur	Atlas of Living Australia (Accessed 16/05/2022) https://www.ala.org.au/

Koala <i>Phascolarctos cinereus</i>	E	E	PMST, WO	Occurrence ID: 2652017 Date: 1987 Location: 2.5 km southwest from the southern extent of alignment.	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains	Likely to occur	Atlas of Living Australia (Accessed 16/05/2022) https://www.ala.org.au/
				Occurrence ID: 87045991 Date: 2021 Location: 19.5 km north north-west from the northern extent of alignment.	<i>Eucalyptus crebra</i> , <i>Corymbia</i> spp., <i>E. acmenoides</i> woodland on igneous rocks. Coastal hills		
				Occurrence ID: 3743492 Date: 1972 Location: 20.1 km east from the northern extent of alignment.	Non-remnant (preclear <i>Corymbia</i> spp. open woodland on alluvial plains)		
				Occurrence ID: 3749915 Date: 2000 Location: 8.5 km south south-east from the southern extent of alignment.	Non-remnant (preclear <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains)		
Bare-rumped sheath-tail bat <i>Saccolaimus saccolaimus nudicluniatus</i>	V	E	PMST	The bare-rumped sheath-tail bat was confirmed during the field survey undertaken by Balance! Environmental. An Anabat Swift detector was deployed from 28 th to 31 st March. 168 files were reliably attributed to the <i>S. saccolaimus</i> and a further 37 were attributed to either <i>S. saccolaimus</i> (possibly roost emergence call) or <i>Taphozous troughtoni</i> (not listed under the EPBC Act).	<i>Eucalyptus</i> and <i>Corymbia</i> woodland	Confirmed present	GHD field surveys 2022
				Site Visit ID: 938683 Date: 1978 Location: 27.5 km northeast the far northern point of the alignment.	Freshwater wetlands		DES Species profile search (Accessed 17/05/2022 and 07/07/2022)
				Site Visit ID: 938684 Date: 1981 Location: 27.5 km northeast from the northern extent of alignment.	Freshwater wetlands		
				Occurrence ID: 550128 Date: 2003	<i>Eucalyptus platyphylla</i> woodland on igneous rocks		

				Location: 37 km north from the northern extent of alignment.			
<i>Xeromys myoides</i> Water mouse	V	V	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 155 km southeast.	N/A	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
Reptiles							
<i>Denisonia maculata</i> Ornamental snake	V	V	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 135 km southwest.	N/A	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
Yakka skink <i>Egernia rugosa</i>	V	V	PMST	Occurrence ID: J44956 Date: 1980 Location: 77.1 km south-west from the southern extent of the alignment.	<i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks	May occur	Atlas of Living Australia (Accessed 17/05/2022) https://www.ala.org.au/
Mount Cooper striped skink <i>Lerista vittata</i>	V	V	PMST	Site Visit ID: 538949 Date: 1993 Location: 72 km south-west from the far southern extent of alignment.	Non-remnant vegetation (preclear semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces)	May occur	DES Species profile search (Accessed 17/05/2022)
				Occurrence ID: 562472 Date: 1980 Location: 74.42 km south-west from the northern extent of the alignment.	<i>Corymbia clarksoniana</i> woodland and other <i>Corymbia</i> spp. and <i>Eucalyptus</i> spp. on Cainozoic sand plains and/or remnant surfaces		
				Occurrence ID: 562471 Date: 1980 Location: 74.42 km south-west from the northern extent of the alignment.	Non-remnant vegetation (preclear semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces)		
				Occurrence ID: 482554 Date: 1992 Location: 79 km south-west from the northern extent of the alignment.	Non-remnant vegetation (preclear woodland to low open woodland of <i>Eucalyptus crebra</i>)		
				Occurrence ID: 482555 Date: 1988	Non-remnant vegetation (preclear woodland to low open woodland of <i>Eucalyptus crebra</i>)		

				Location: 79 km south-west from the northern extent of the alignment.			
Plants							
<i>Bulbophyllum globuliforme</i> Miniature moss-orchid	V	NT	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 625 km southeast.	N/A	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022) https://www.ala.org.au/
<i>Dichanthium setosum</i> Bluegrass	V	LC	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 200 km southeast.	N/A	Unlikely to occur	DES Species profile search (Accessed 17/05/2022)
<i>Eucalyptus raveretiana</i> Black ironbox	V	LC	PMST, WO	Thirteen individuals were confirmed present along the Burdekin River riparian zone.	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Confirmed present	GHD field surveys 2021
				Site Visit ID: 1559548 Date: 1949 Location: 12 km northeast from central extent of alignment.	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines		DES Species profile search (Accessed 17/05/2022 and 07/07/2022)
				Occurrence ID: 1529814 Date: 1950 Location: 30 km south from the southern extent of the alignment	<i>Eucalyptus platyphylla</i> woodland on igneous rocks		
<i>Leichhardtia brevifolia</i> Previously listed as <i>Marsdenia brevifolia</i>	V	V	PMST	Occurrence ID: 1717795 Date: 1996 Location: 50 km northwest from the northern extent of the alignment	<i>Eucalyptus crebra</i> and/or <i>E. xanthoclada</i> and/or <i>E. drepanophylla</i> low open woodland on igneous rocks	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022 and 13/09/2022) https://www.ala.org.au/ DES Species profile search (Accessed 13/09/2022)
<i>Omphalea celata</i>	V	V	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 195 km southeast.	N/A	Unlikely to occur	DES Species profile search (Accessed 07/07/2022)
<i>Tephrosia leveillei</i>	V	LC	PMST	There are no publicly accessible historical records within the broad landscape of the Project area. The nearest record is approximately 315 km northwest.	N/A	Unlikely to occur	Atlas of Living Australia (Accessed 07/07/2022) https://www.ala.org.au/

Fish							
<i>Pristis pristis</i> Freshwater sawfish	V, Mig	LC	PMST	Occurrence ID: I5396 Date: 1936 Location: 43 km northeast of the southern extent of the pipeline alignment	Burdekin River mouth	Unlikely to occur	DES Species profile search (Accessed 07/07/2022) Atlas of Living Australia (Accessed 07/07/2022 and 13/09/2022) https://www.ala.org.au/
<p>Key: E – Endangered, V – Vulnerable, Mig – Migratory, SL – Special Least Concern, LC – Least Concern PMST – Protected Matters Search Tool, WO – Wildlife Online, RE – Regional Ecosystem, DES – Department of Environment and Science, DEE – Department of Environment and Energy, NRA – Natural Resources Assessment</p>							

3.3 Item 3.3

Provide detailed mapping of suitable habitat (within, adjacent to and, where relevant, downstream of the Project) for all listed threatened species and communities, which:

- Is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e., does not only illustrate relevant Queensland Regional Ecosystems);
- Includes an overlay of the Project disturbance footprint;
- Includes known records of individuals derived from desktop analysis and field surveys; and
- Is provided separately as attachments in JPEG format.

3.3.1 Response

The MNES report (GHD 2022) (see Appendix B) includes habitat mapping and known records for four EPBC Act listed species confirmed present (black-throated finch (southern), squatter pigeon (southern), black ironbox and bare-rumped sheath-tail bat) and two EPBC Act listed species considered likely to occur (koala and white-throated needletail) within the Project area. The likelihood of occurrence assessment was based on a review of species' distributions and habitat requirements, literature review of recent papers, historical records for the region, and the results of habitat assessments and field surveys conducted within the Project area.

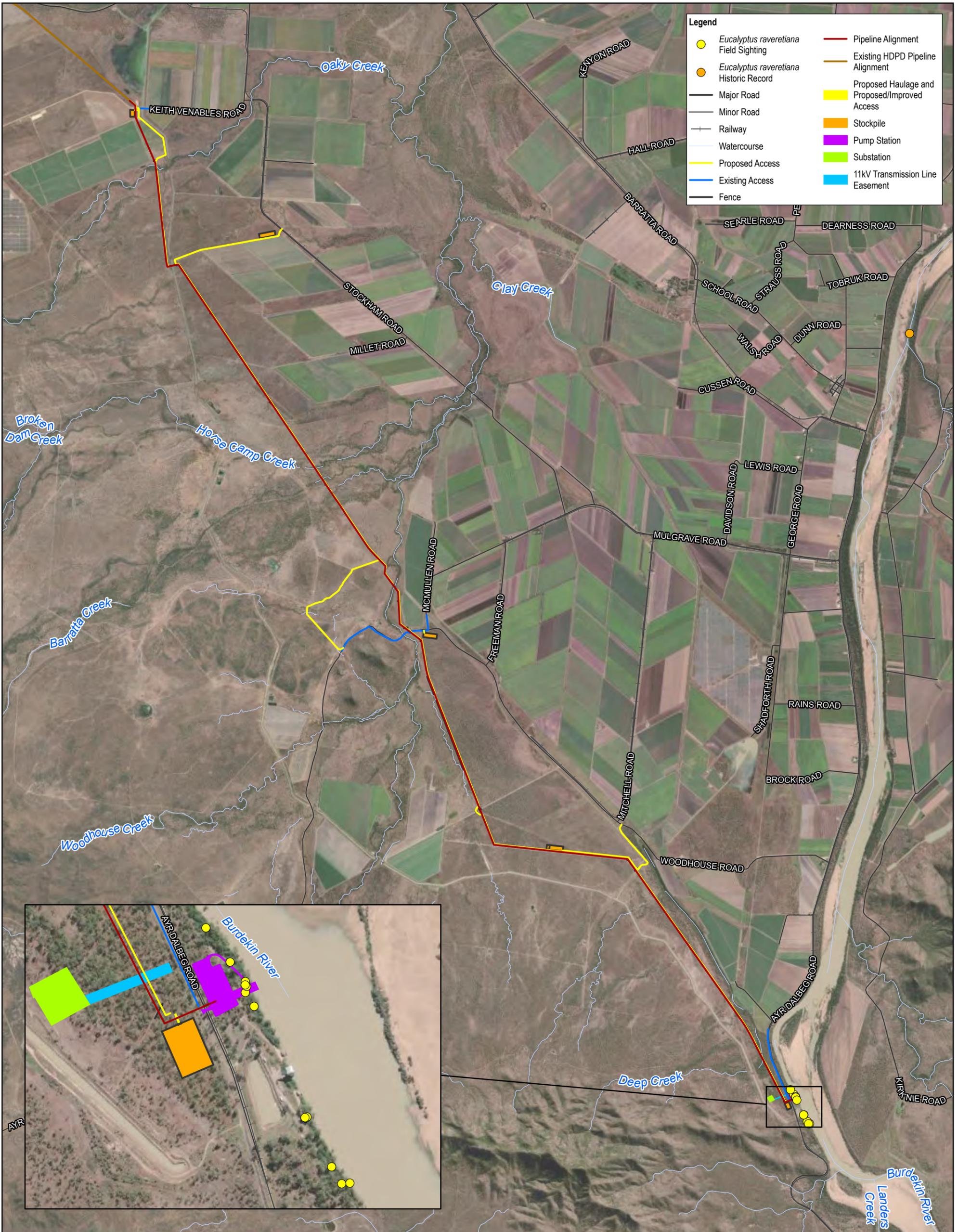
The distribution of predicted habitat was mapped based on criteria detailed in Sections 5 and 6 of the MNES report (GHD 2022), differentiating areas of habitat into habitat critical to the survival of the species and potential breeding, foraging and drinking/dispersal habitat, where relevant.

The criteria used for each species are informed by the habitat requirements and definitions specified in the Commonwealth listing advice/conservation advice, Species Profile and Threats (SPRAT) database, recovery plans or referral guidelines, where available, as well as DES Wildlife Online (WO) historical records. For most species, predicted habitat mapping was underpinned by REs considered ecologically equivalent to the Commonwealth habitat descriptions relevant to conservation significant species, noting that REs represent a high-resolution spatial representation of ecosystem composition, structure and landscape position (e.g. landform, topography), that is conducive to aligning to species-specific habitat requirements. Where relevant, (field-verified) REs as the base unit for mapping were adapted to reflect variations in on-site conditions identified via field surveys (for example, inclusion of non-REs (e.g non-remnant) vegetation as a habitat criterion for koala). The relationship between Commonwealth habitat criteria and the criteria used to map habitat for each species has been detailed in the relevant species sections in Sections 5 and 6 of the MNES report (GHD 2022). Reasons for any minor deviations from the Commonwealth habitat descriptions are explained in the species descriptions below. For each species, habitat critical to the survival of the species was defined for the Project, and its alignment with the Commonwealth definition is detailed in Sections 5 and 6 (GHD 2022).

Of the remaining 19 threatened species identified in the desktop assessment, it was concluded that five EPBC Act threatened species 'may occur' in the Project area. Those species determined to 'may occur' includes species where the distribution incorporates the Project area but no suitable habitat, or habitat lacking essential species' resources is present, or the species has not been recorded in the desktop search extent. This includes transient or vagrant species that have a reduced likelihood of occurrence but cannot be entirely discounted. Due to their reduced potential to occur, the impact to these species arising from the Project is considered minimal or negligible – as such, habitat has not been mapped for these species. Additionally, detailed assessments of impacts against the Commonwealth Significant impact guidelines is not considered necessary for these species, given impacts arising are unlikely to have any population/metapopulation-level implications, nor reduce access to resources. These 'may occur' species include ghost bat, large-eared horseshoe bat, yakka skink, Mount Cooper striped lerista and *Tephrosia leveille*, as well as three 'unlikely to occur' species explicitly referenced in the RFI, are discussed in Section 3.1.1 above.

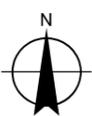
The two threatened ecological communities identified in the PMST as being of relevance to the Project are both considered 'unlikely to occur'. Mapping of occurrence/potential occurrence has not been undertaken for these communities. These communities are discussed in more detail in response 3.5.1, below.

Detailed habitat mapping for five MNES confirmed present or considered likely to occur has been provided below in Figure 3.2 to Figure 3.6. These species include: black ironbox, koala, black-throated finch (southern), bare-rumped sheath-tail bat and squatter pigeon (southern). Detailed habitat maps were not generated for the white-throated needletail (considered 'likely to occur'), as this threatened bird is almost exclusively an aerial forager and does not have typical associations with terrestrial habitat (DAWE 2021).



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Paper Size ISO A3
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 Kilometres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



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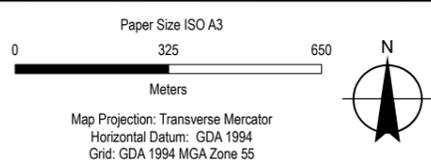
Project No. 12537606
 Revision No. 2
 Date 7/13/2022

Extent of *Eucalyptus raveretiana*
 within and surrounding the Project area

FIGURE 3-2



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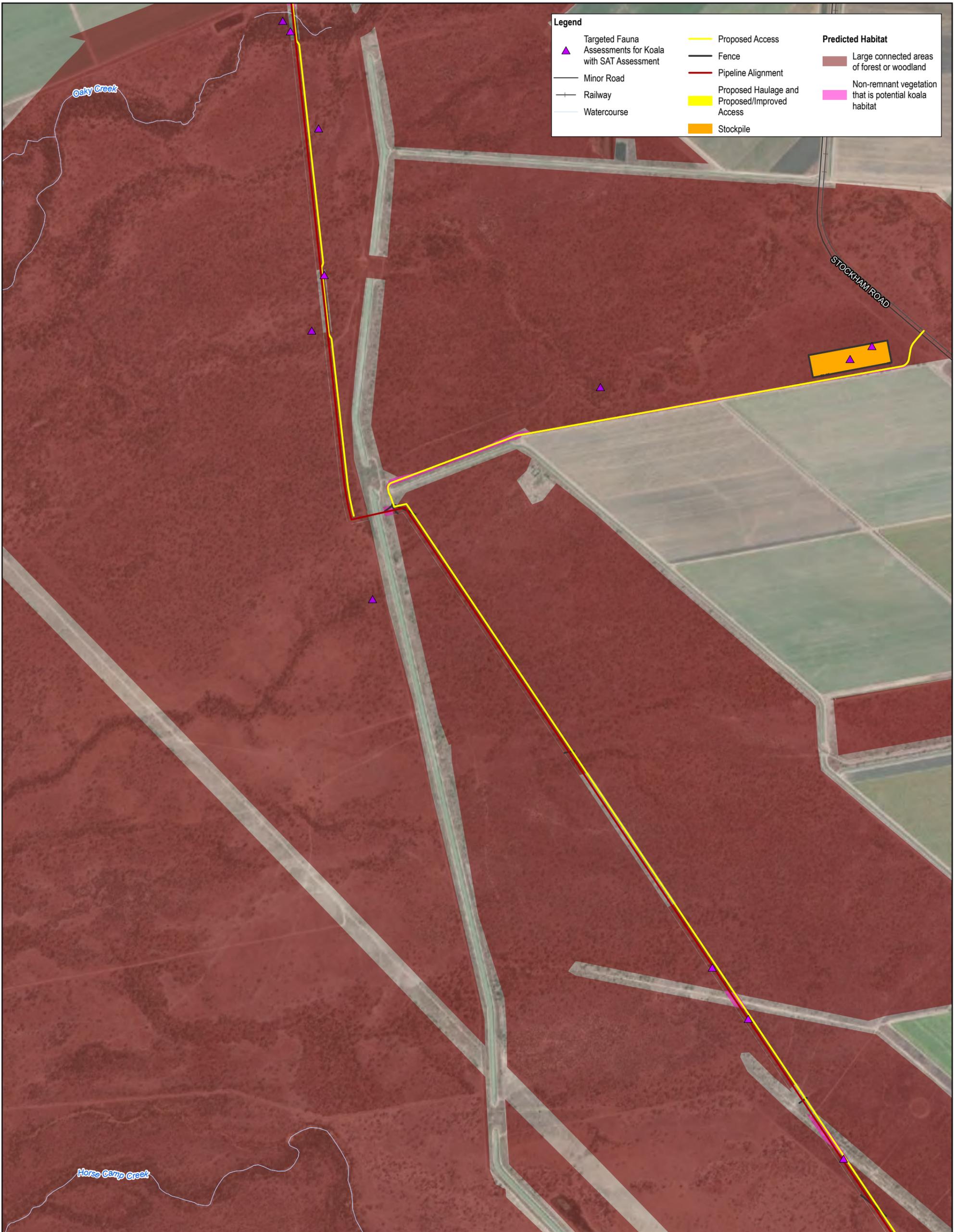


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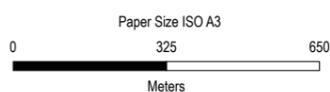
Distribution of predicted koala habitat
within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/29/2022

FIGURE 3-3



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

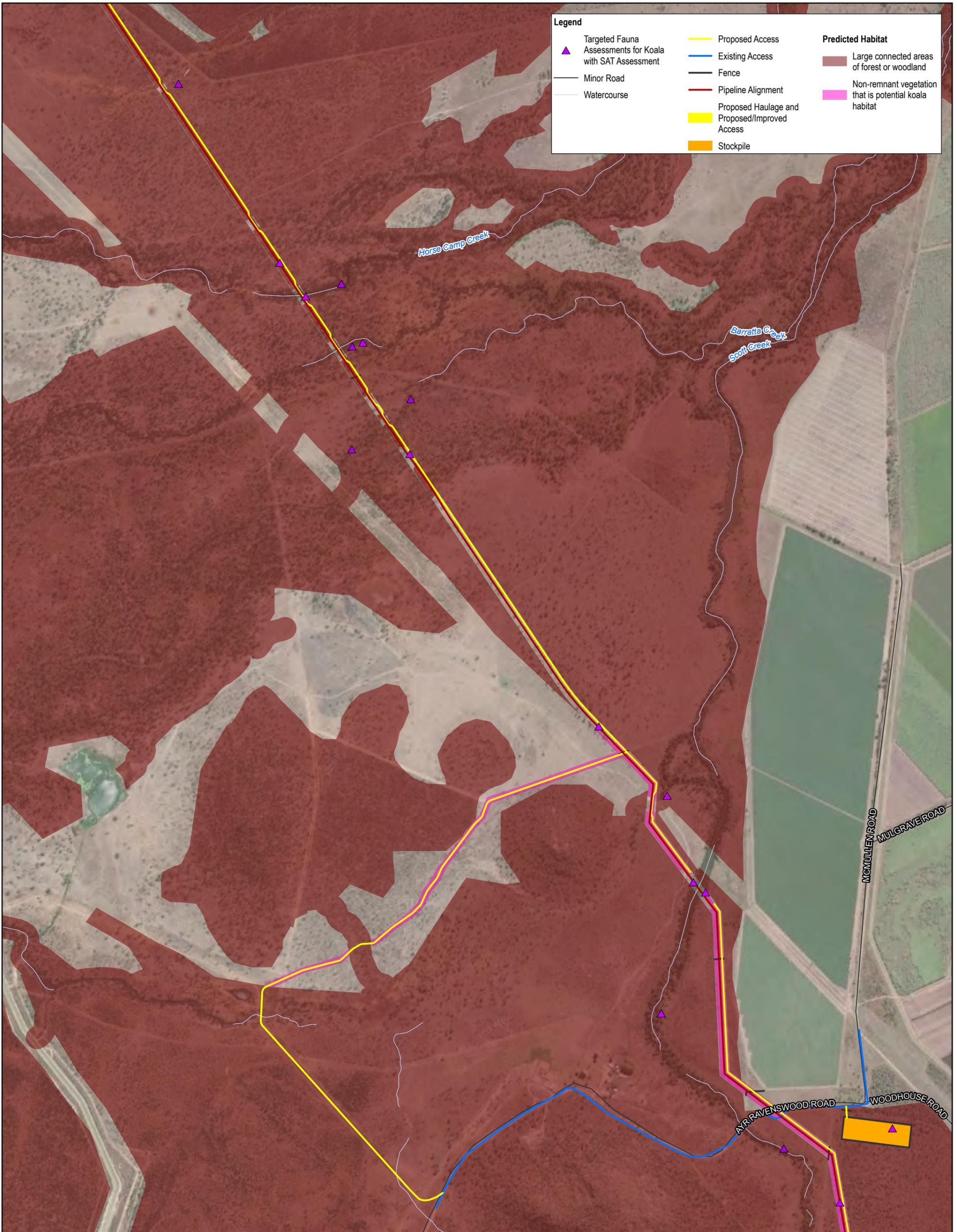


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Distribution of predicted koala habitat
within and surrounding the Project area

Project No. 12537606
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Date 9/29/2022

FIGURE 3-3



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	Predicted Habitat
— Minor Road	— Existing Access	■ Large connected areas of forest or woodland
— Watercourse	— Fence	■ Non-remnant vegetation that is potential koala habitat
	— Pipeline Alignment	
	■ Proposed Haulage and Proposed/Improved Access	
	■ Stockpile	

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Paper Size ISO A3

0 325 650
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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Date 9/29/2022

Distribution of predicted koala habitat within and surrounding the Project area

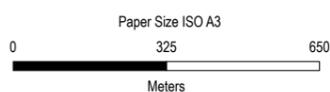
FIGURE 3-3

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Print date: 29 Sep 2022 - 15:07c

Data source: DoR: Roads, Railway, Watercourses, Essential Habitat v10 (2021); GHD: Site Layout, Field Survey, Potential Habitat (2022); DES: Wildnet Records (2021); World Imagery: Maxar. Created by: shar2



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Map Projection: Transverse Mercator
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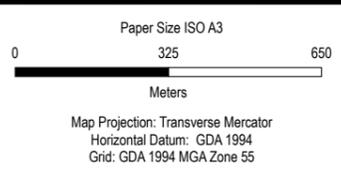
Project No. 12537606
Revision No. 3
Date 9/29/2022

Distribution of predicted koala habitat
within and surrounding the Project area

FIGURE 3-3



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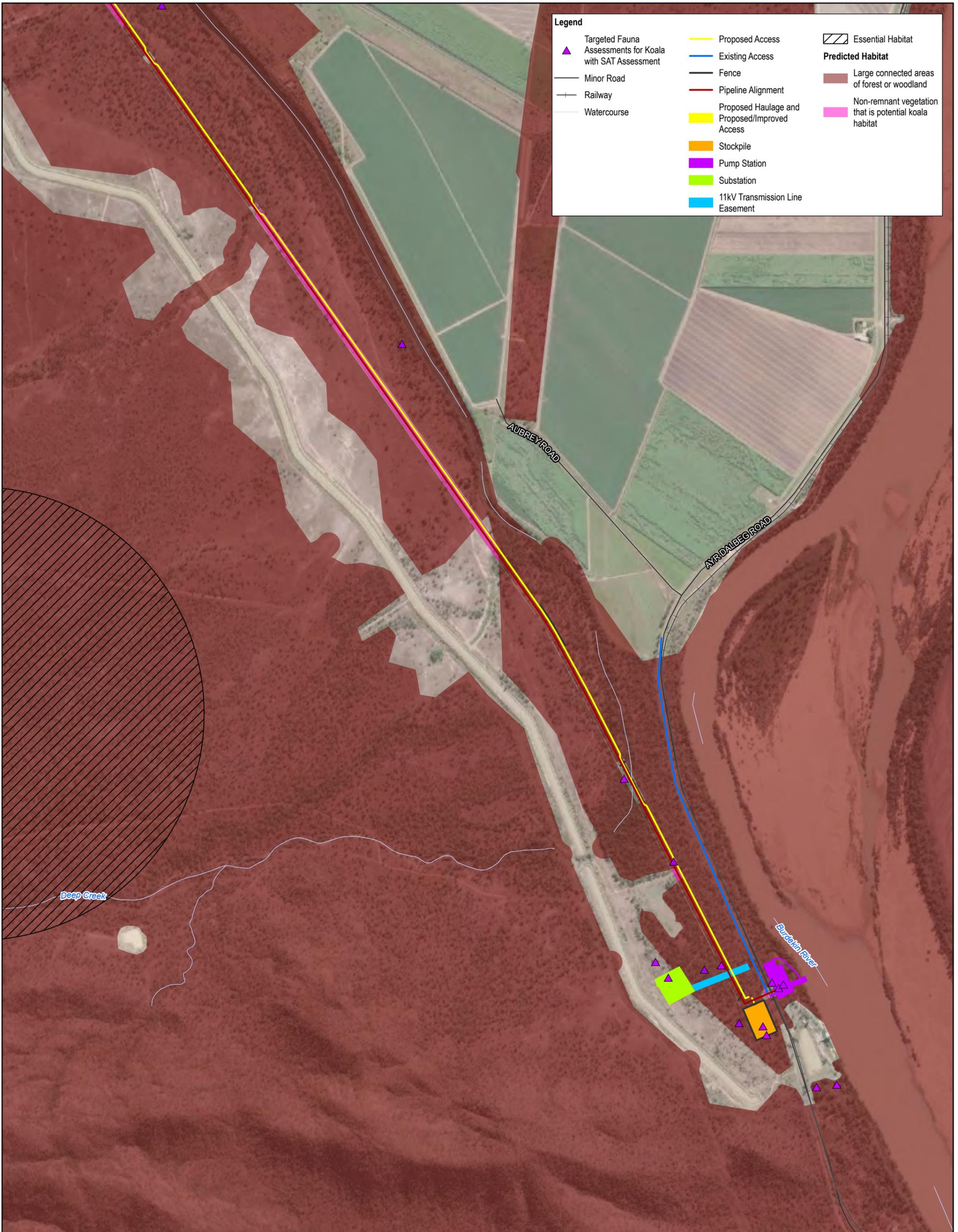


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Houghton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 3
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Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 3-3



Legend

▲ Targeted Fauna Assessments for Koala with SAT Assessment	— Proposed Access	▨ Essential Habitat
— Minor Road	— Existing Access	Predicted Habitat
— Railway	— Fence	■ Large connected areas of forest or woodland
— Watercourse	— Pipeline Alignment	■ Non-remnant vegetation that is potential koala habitat
	■ Proposed Haulage and Proposed/Improved Access	
	■ Stockpile	
	■ Pump Station	
	■ Substation	
	■ 11kV Transmission Line Easement	

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0 325 650

Meters

Map Projection: Transverse Mercator
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Project No. 12537606
Revision No. 3
Date 9/29/2022

Distribution of predicted koala habitat within and surrounding the Project area

FIGURE 3-3

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Print date: 29 Sep 2022 - 15:07c
Data source: DoR: Roads, Railway, Watercourses, Essential Habitat v10 (2021); GHD: Site Layout, Field Survey, Potential Habitat (2022); DES: Wildnet Records (2021); World Imagery: Maxar. Created by: shaz2



Legend

— Minor Road	— Proposed Access	▨ Essential Habitat
— Railway	— Existing Access	Roost Tree
— Watercourse	— Fence	■ Large hollow >30cm diameter
	— Pipeline Alignment	■ Moderate hollow 20cm-30cm diameter
	— Existing HDPD Pipeline Alignment	■ Small hollow <10cm-20cm diameter
	— Proposed Haulage and Proposed/Improved Access	Predicted Habitat
	■ Stockpile	■ Foraging Habitat
		■ Roosting Habitat

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

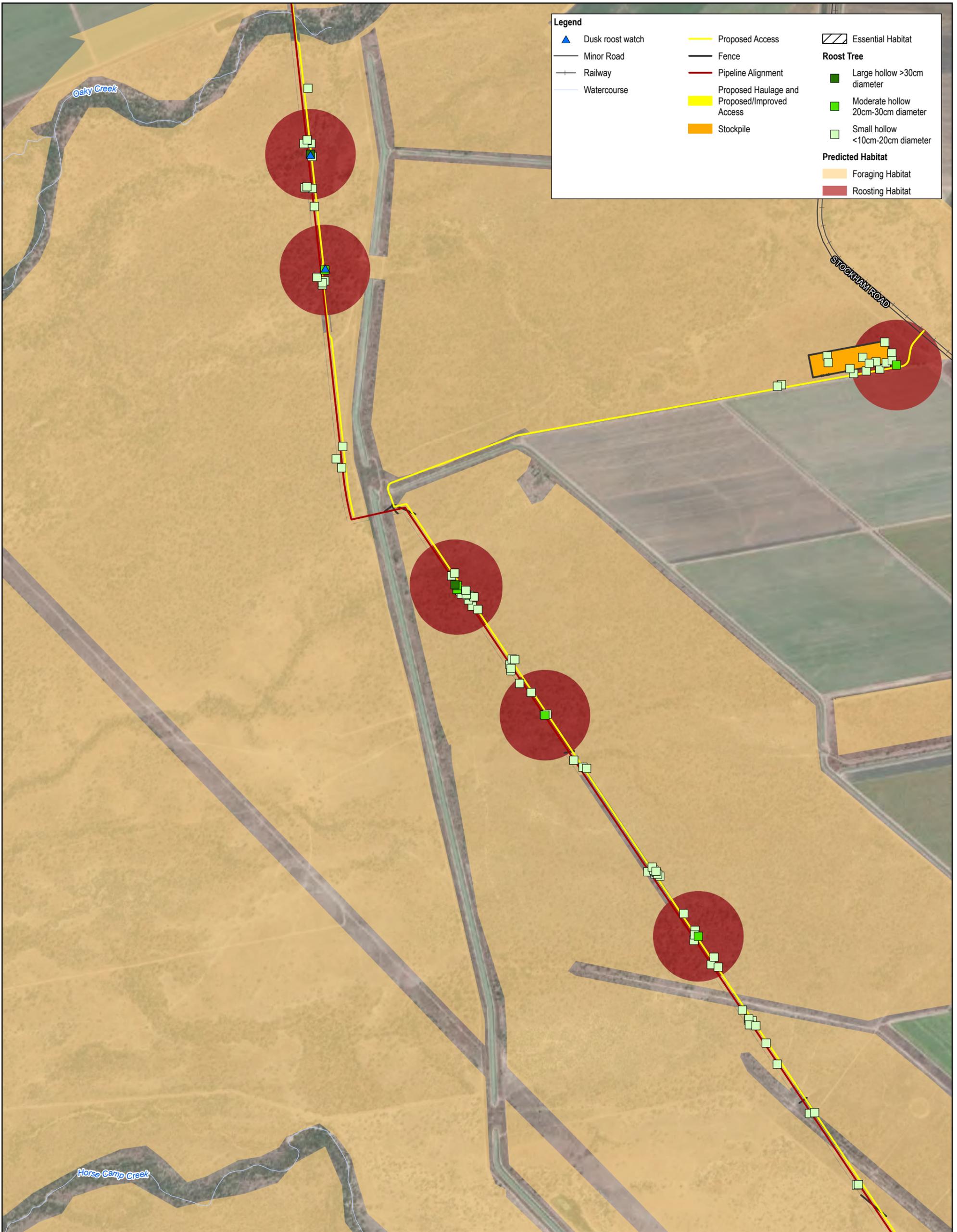


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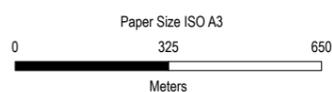
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-4



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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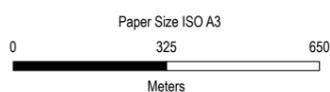
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-4



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 55

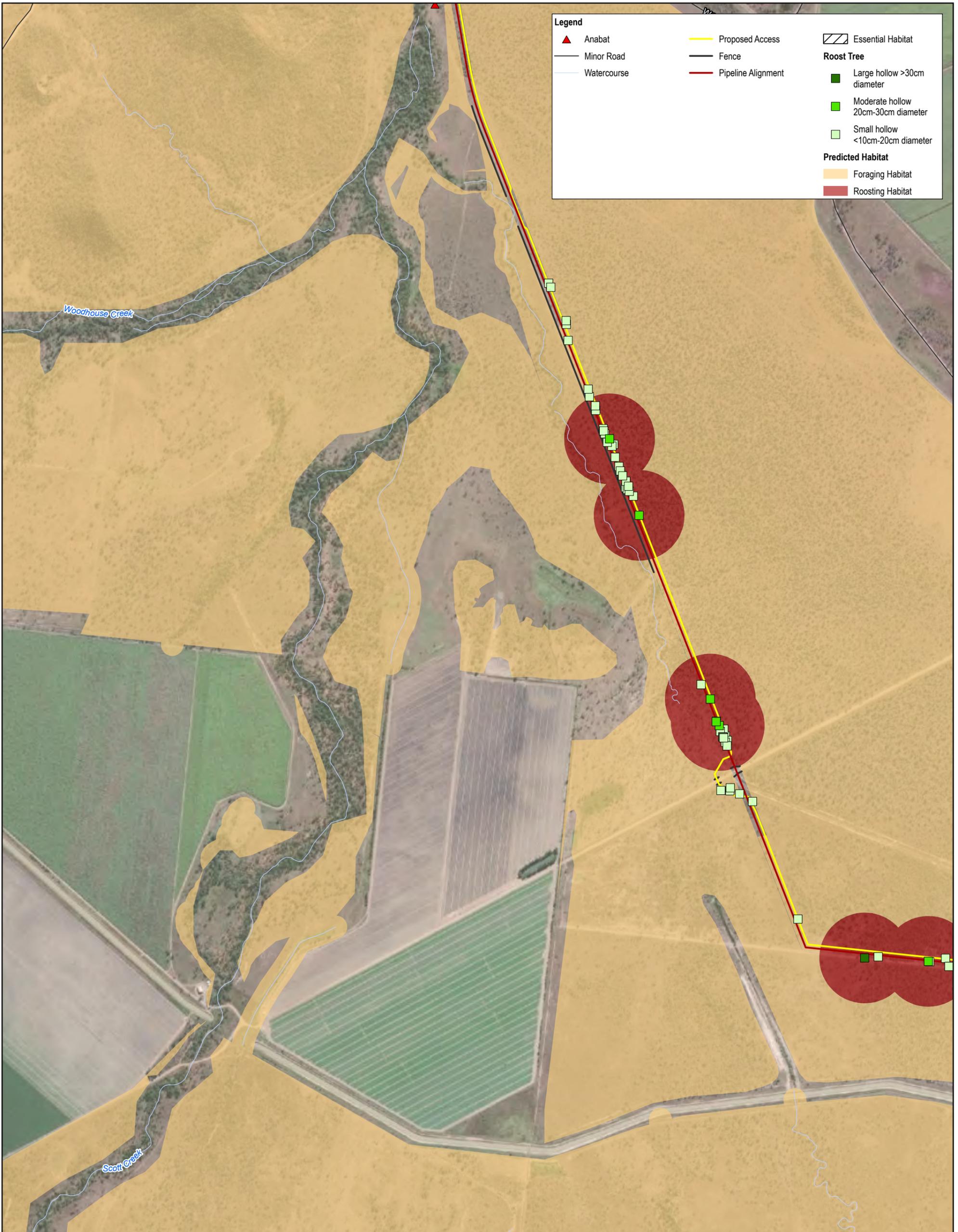


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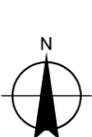
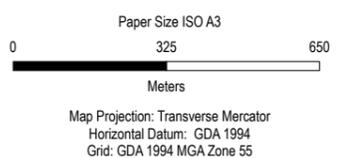
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-4



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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Haughton Pipeline Stage 2 - MNES Assessment

Distribution of predicted bare-rumped sheathtail bat habitat within and surrounding the Project area

Project No. 12537606
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Date 9/25/2022

FIGURE 3-4



Legend

Anabat	Proposed Access	Essential Habitat
Dusk roost watch	Fence	Roost Tree
Minor Road	Pipeline Alignment	Large hollow >30cm diameter
Railway	Proposed Haulage and Proposed/Improved Access	Moderate hollow 20cm-30cm diameter
Watercourse	Stockpile	Small hollow <10cm-20cm diameter
		Predicted Habitat
		Foraging Habitat
		Roosting Habitat

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Paper Size ISO A3

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Meters

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

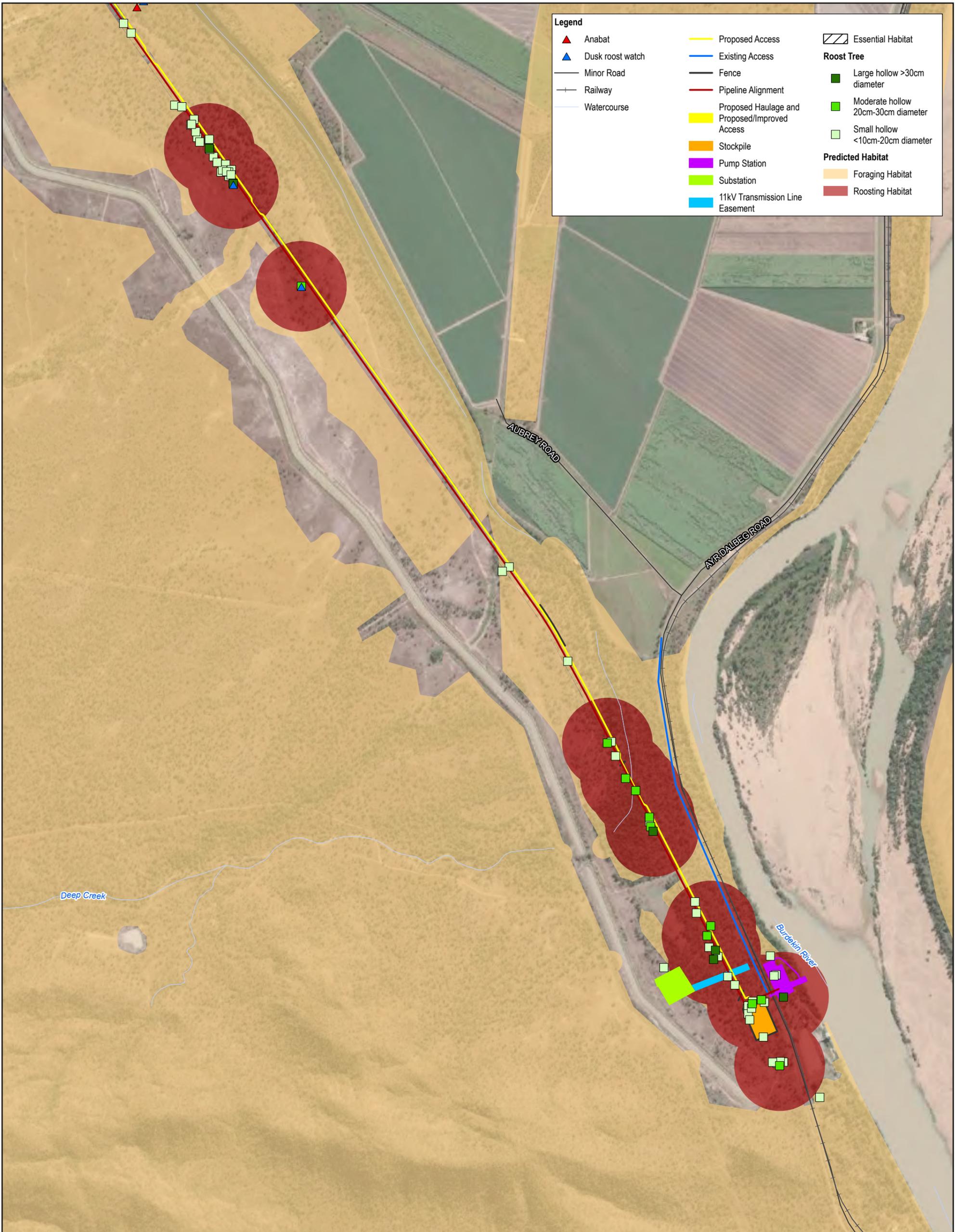


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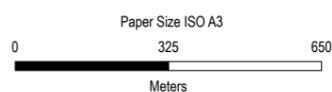
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-4



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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Grid: GDA 1994 MGA Zone 55

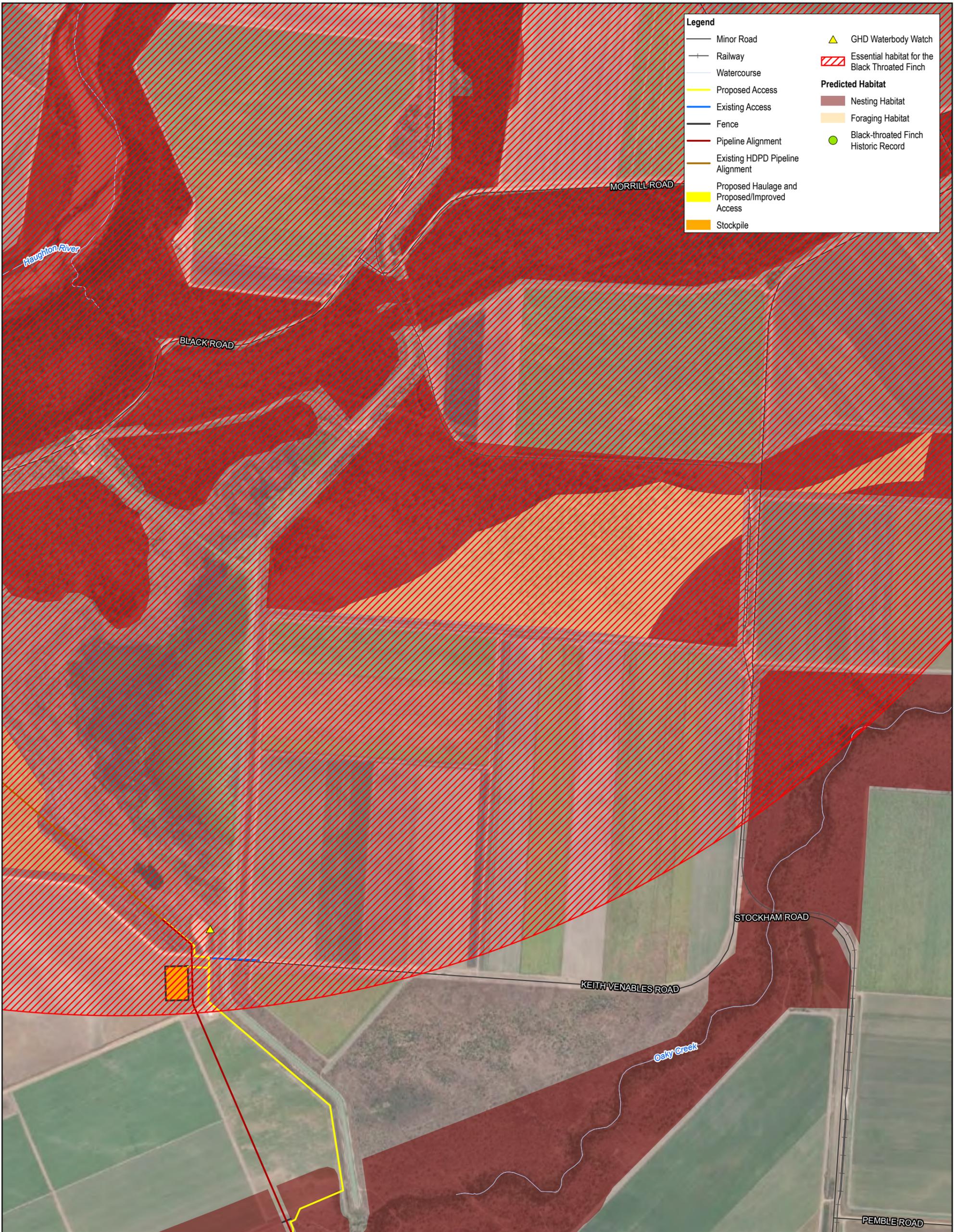


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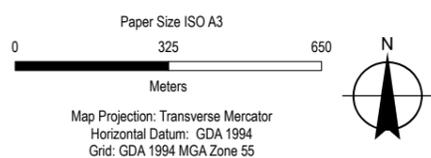
Distribution of predicted bare-rumped sheath-tail bat habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-4



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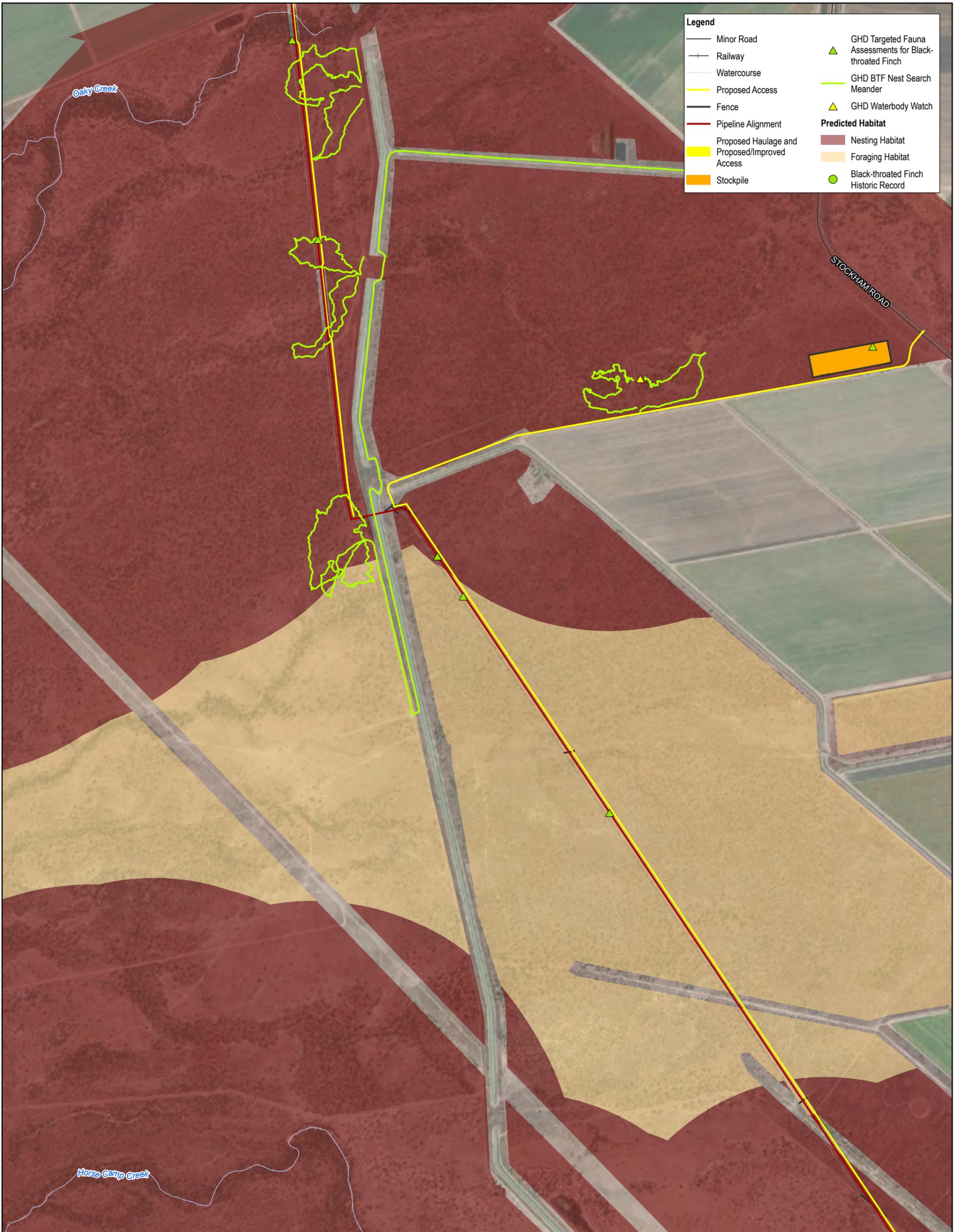


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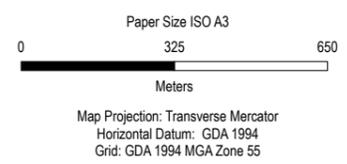
Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-5



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

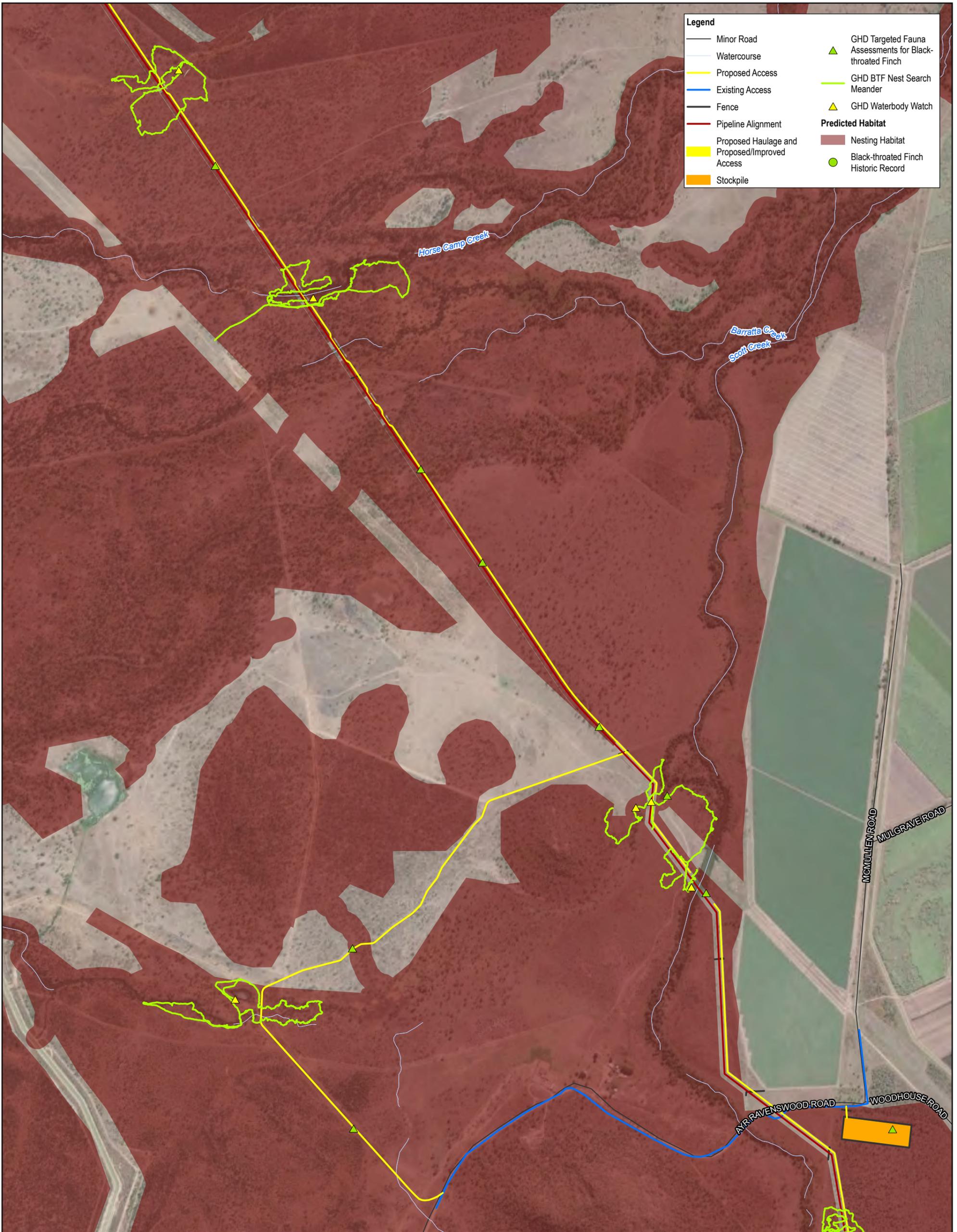


Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-5



Legend

— Minor Road	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Watercourse	— GHD BTF Nest Search Meander
— Proposed Access	▲ GHD Waterbody Watch
— Existing Access	Predicted Habitat
— Fence	■ Nesting Habitat
— Pipeline Alignment	● Black-throated Finch Historic Record
■ Proposed Haulage and Proposed/Improved Access	
■ Stockpile	

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
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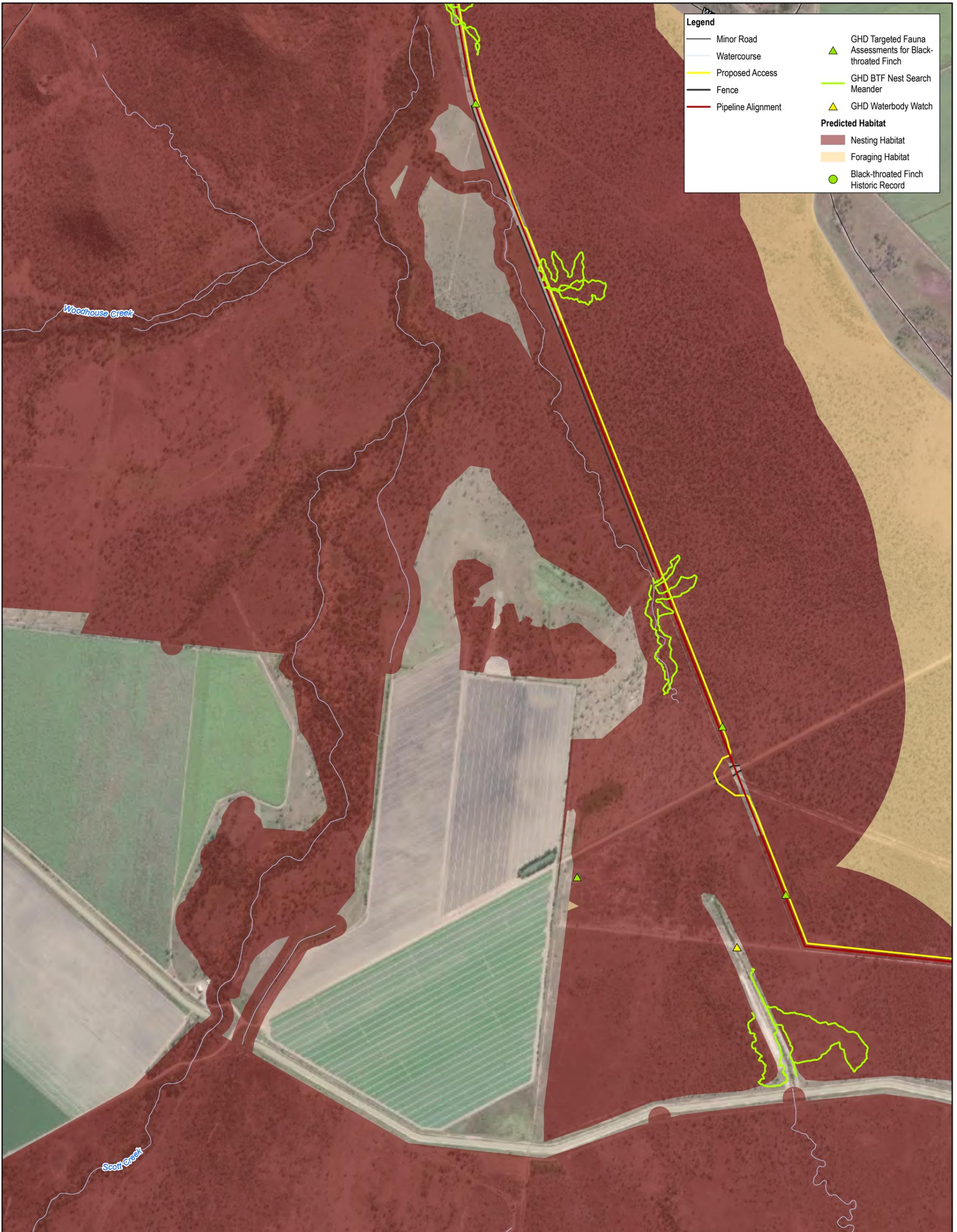


Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-5



Legend

- Minor Road
- Watercourse
- Proposed Access
- Fence
- Pipeline Alignment
- ▲ GHD Targeted Fauna Assessments for Black-throated Finch
- GHD BTF Nest Search Meander
- ▲ GHD Waterbody Watch

Predicted Habitat

- Nesting Habitat
- Foraging Habitat
- Black-throated Finch Historic Record

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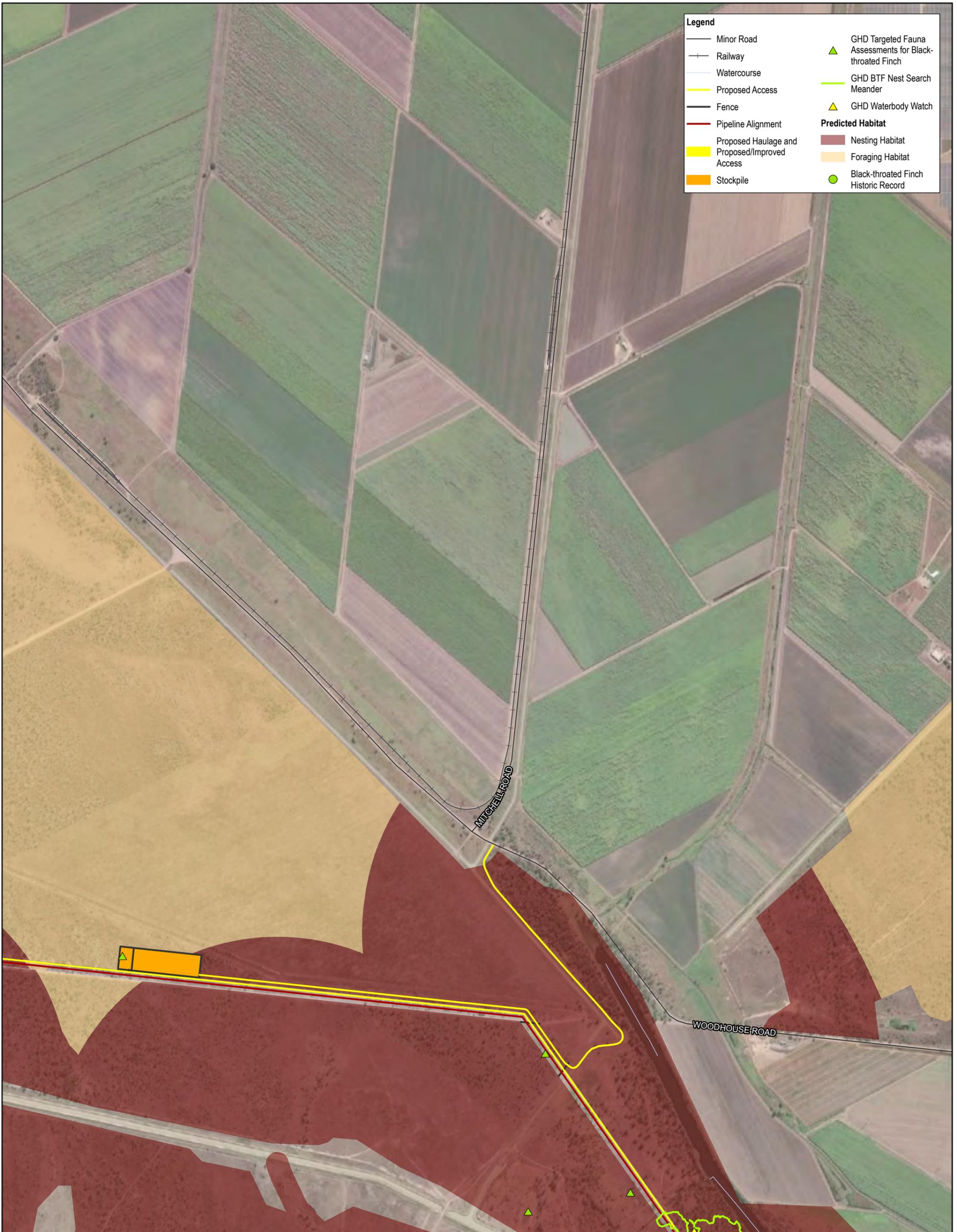


Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 3
Date 9/25/2022

FIGURE 3-5



Legend

— Minor Road	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Railway	— GHD BTF Nest Search Meander
— Watercourse	▲ GHD Waterbody Watch
— Proposed Access	Predicted Habitat
— Fence	■ Nesting Habitat
— Pipeline Alignment	■ Foraging Habitat
■ Proposed Haulage and Proposed/Improved Access	● Black-throated Finch Historic Record
■ Stockpile	

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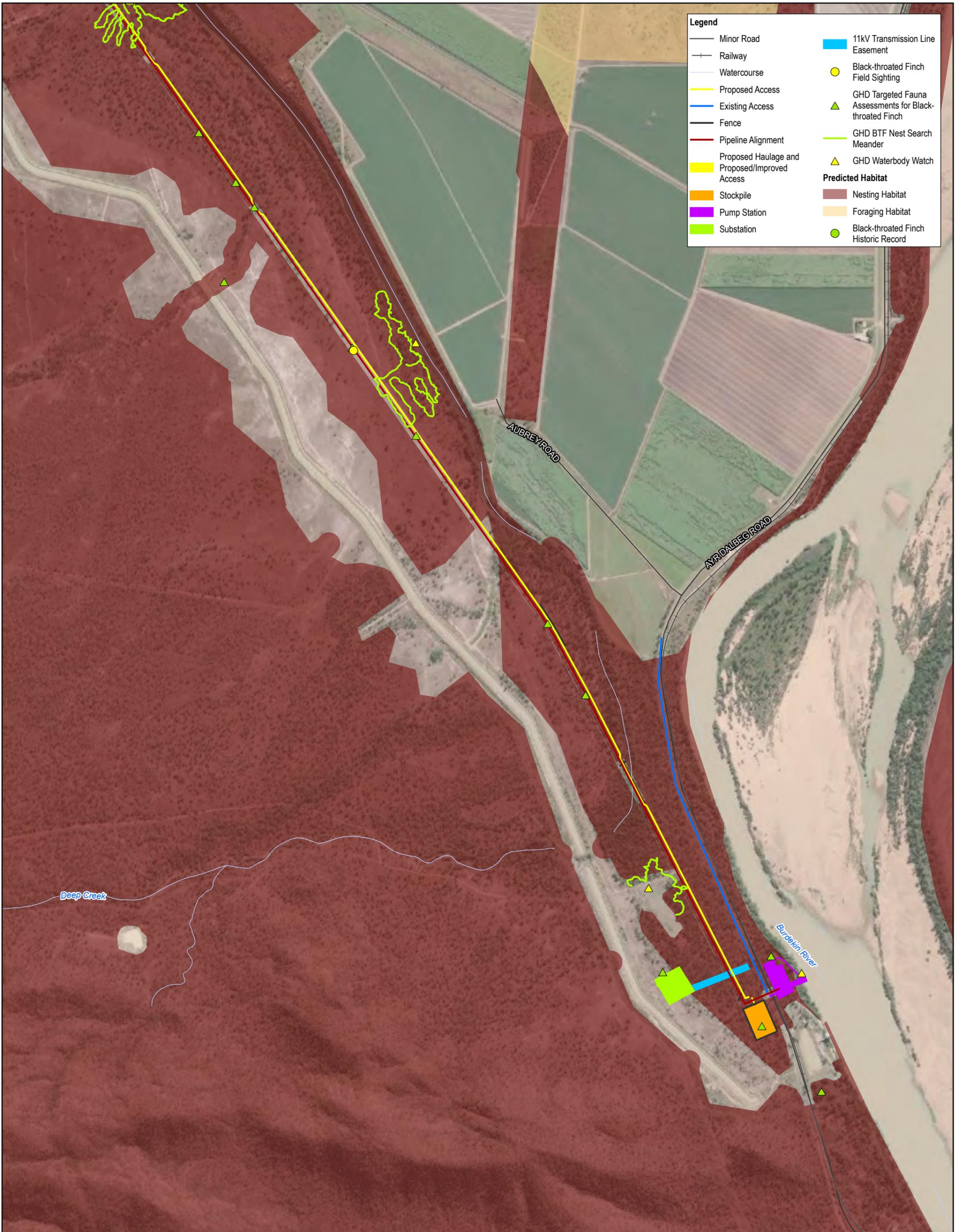


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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

Project No. 12537606
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Date 9/25/2022

FIGURE 3-5



Legend

— Minor Road	11kV Transmission Line Easement
— Railway	● Black-throated Finch Field Sighting
— Watercourse	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Proposed Access	— GHD BTF Nest Search Meander
— Existing Access	▲ GHD Waterbody Watch
— Fence	Predicted Habitat
— Pipeline Alignment	■ Nesting Habitat
■ Proposed Haulage and Proposed/Improved Access	■ Foraging Habitat
■ Stockpile	● Black-throated Finch Historic Record
■ Pump Station	
■ Substation	

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Map Projection: Transverse Mercator
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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 3-5



Legend

— Minor Road	— Proposed Access
— Railway	— Existing Access
— Watercourse	— Fence
Potential Habitat	— Pipeline Alignment
■ Breeding Habitat	— Existing HDPD Pipeline Alignment
■ Foraging Habitat	— Proposed Haulage and Proposed/Improved Access
	■ Stockpile
	● Point_edit_layer

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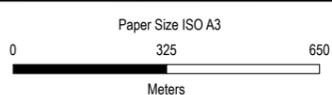
Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 3-6



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



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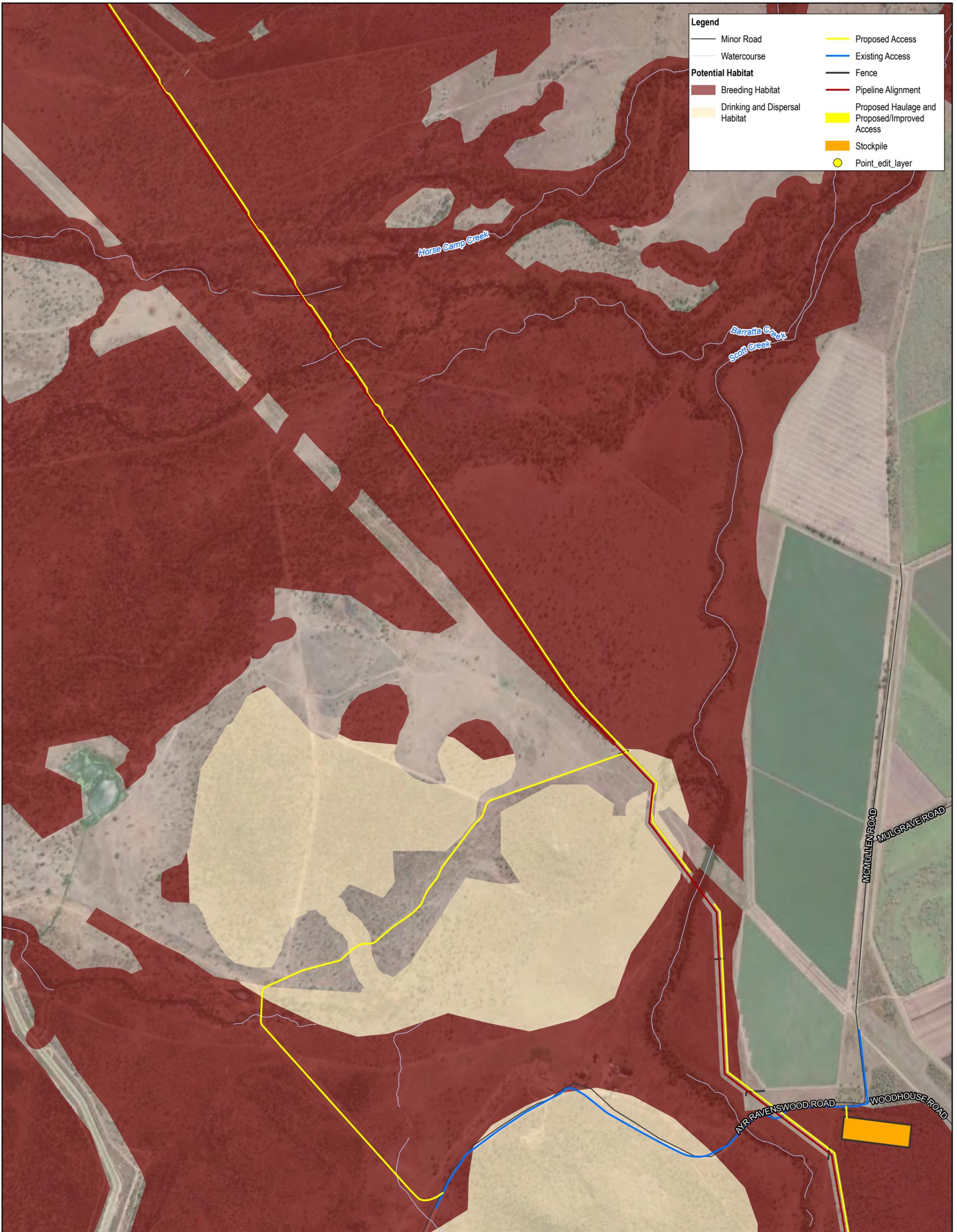


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Distribution of potential habitat for
squatter pigeon (southern) habitat within
and surrounding the Project area

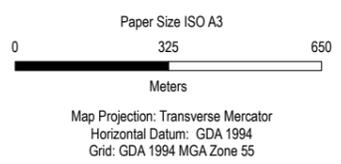
Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 3-6



Legend	
— Minor Road	— Proposed Access
— Watercourse	— Existing Access
Potential Habitat	
■ Breeding Habitat	— Fence
■ Drinking and Dispersal Habitat	— Pipeline Alignment
	■ Proposed Haulage and Proposed/Improved Access
	■ Stockpile
	● Point_edit_layer

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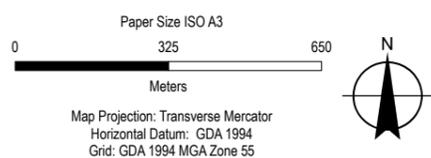
Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 3-6



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Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

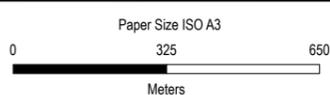
Distribution of potential habitat for
squatter pigeon (southern) habitat within
and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

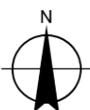
FIGURE 3-6



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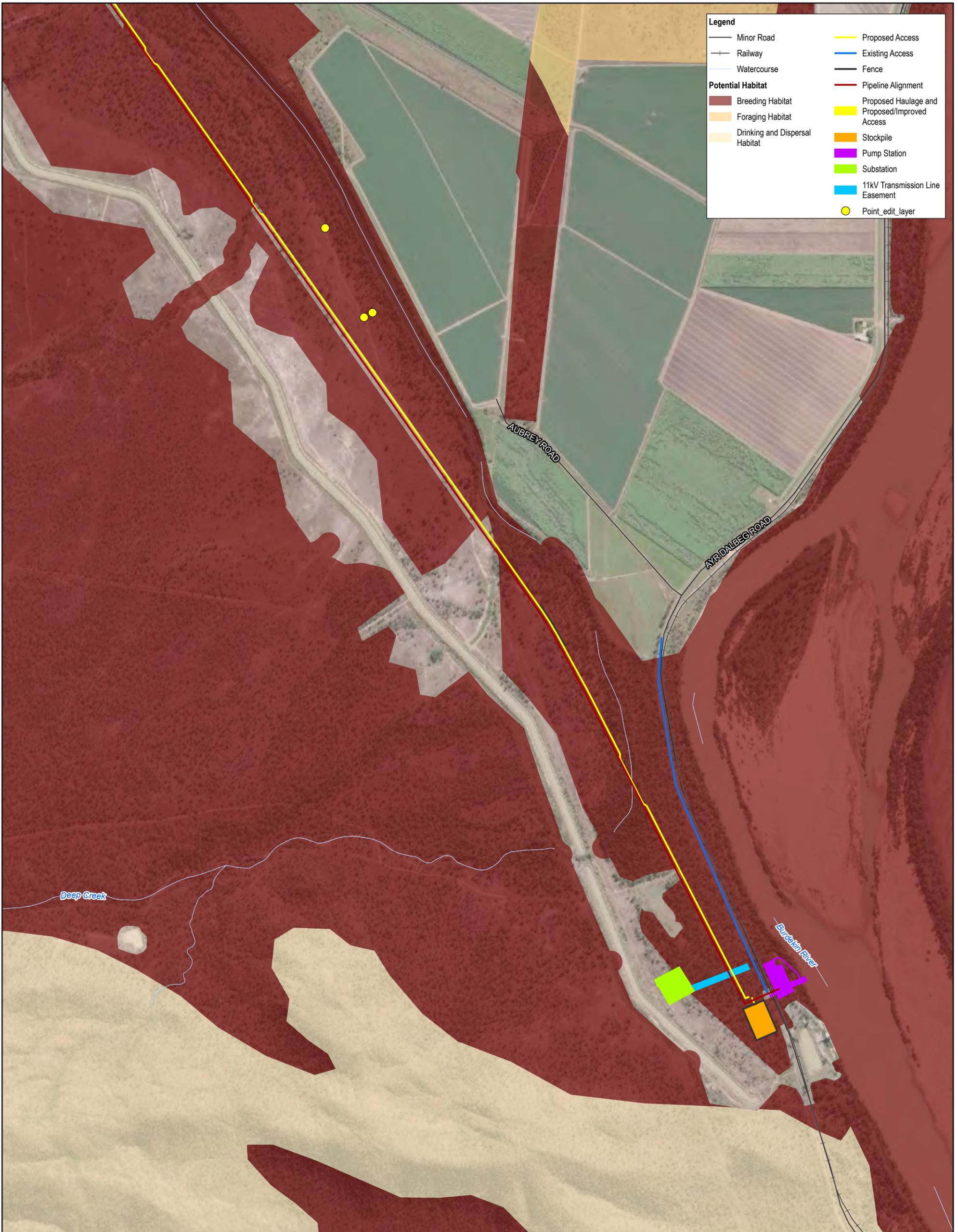


Townsville City Council
Haughton Pipeline Stage 2 - MNES Assessment

Distribution of potential habitat for
squatter pigeon (southern) habitat within
and surrounding the Project area

Project No. 12537606
Revision No. 4
Date 9/25/2022

FIGURE 3-6



Legend	
— Minor Road	— Proposed Access
— Railway	— Existing Access
— Watercourse	— Fence
Potential Habitat	— Pipeline Alignment
■ Breeding Habitat	■ Proposed Haulage and Proposed/Improved Access
■ Foraging Habitat	■ Stockpile
■ Drinking and Dispersal Habitat	■ Pump Station
	■ Substation
	■ 11kV Transmission Line Easement
	● Point_edit_layer

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Paper Size ISO A3
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Map Projection: Transverse Mercator
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 Haughton Pipeline Stage 2 - MNES Assessment

Distribution of potential habitat for squatter pigeon (southern) habitat within and surrounding the Project area

Project No. 12537606
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FIGURE 3-6

3.4 Item 3.4

Attach all relevant ecological surveys referenced in the referral and PD as supporting documents.

3.4.1 Response

All relevant ecological survey reports listed below have been attached hereabouts:

- GHD (2022) Haughton Pipeline Stage 2 Project Matters of National Environmental Significance Report, Prepared by GHD Pty Ltd for Townsville City Council, 21 October 2022 (Appendix B)
- NRA (2018) Haughton Pipeline Duplication Project – Gap Analysis and Planning Assessment, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 11 May 2018 (Appendix I)
- NRA (2018) Haughton Pipeline Duplication Project – Supplementary Ecological Surveys, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 28 August 2018 (Appendix J)
- NRA (2018) Haughton Pipeline Duplication Project – EPBC Self-assessment, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 27 August 2018 (Appendix K)
- NRA (2021) Haughton Pipeline Stage 2 Project Environmental Analysis Report, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 27 August 2021 (Appendix L)
- Biodiversity Australia (2022) Rapid Habitat Assessment Black Throated Finch, Prepared by Biodiversity Australia for GHD Pty Ltd, 22 April 2022 (Appendix M)
- Ecological Interpretation (2022), GHD Haughton Pipeline 2 Biocondition Survey, Prepared by Ecological Interpretation for GHD Pty Ltd (Appendix N).

3.5 Item 3.5

Provide information relating to the two ecological communities – Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; Poplar Box Grassy Woodland on Alluvial Plains – that are returned in the EPBC Act Protected Matters Report as likely to be present in the Project area. Specifically, provide justification relating to their occurrence in the Project area and any survey effort undertaken. Include the communities in what was Appendix C of the MNES report (GHD 2022) referral documentation.

3.5.1 Response

The Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box) TEC and the Semi-evergreen vine thickets of Brigalow Belt (North and South) and Nandewar Bioregions (SEVT) TEC were both reported as 'may occur' within the DCCEE PMST desktop search.

Remnant patches of the SEVT TEC are mostly associated with coastal dunes and river deltas in the vicinity of Townsville and Ayr through the northern and central parts of the Brigalow Belt Bioregion (McDonald 2010). No such environs are within or immediately adjacent to the Project area.

The Poplar Box TEC occurs south of Charters Towers and east of Longreach, with the nearest mapped patch to the Project area occurring at least 150 km to the south (i.e. north west of Collinsville) (DEE 2019).

An assessment was conducted in the MNES report (GHD 2022) (Section 3.3 of Appendix B) to attribute a 'likelihood of occurrence' for Poplar Box and SEVT TECs. The likelihood of occurrence assessment was based on a review of community distributions and habitat requirements, mapping of constituent vegetation communities across the region, and the results of habitat assessments and field surveys conducted within the Project area.

NRA and GHD undertook surveys for the purpose of RE and TEC verification during April and October 2021 across the length of the Project area. During October 2021, a senior botanist traversed the Project area and undertook vegetation surveys over five days. During this time, no TECs were observed.

Additionally, field survey results indicated that no vegetation or REs indicative of either Poplar Box or SEVT TECs were present within or adjacent to the Project area. While Poplar Box TEC occurs in fragmented patches, and potential SEVT TEC may occur 3 km south of the Project area in suitable mapped REs, the Project area does not contain REs or vegetation that is diagnostic of either TECs. The habitat assessment and likelihood of occurrence assessment for the TECs (SEVT and Poplar Box Grassy Woodland on Alluvial Plain) is provided in Appendix E, and in the MNES report (GHD 2022) (Appendix B). The assessment concluded that both TECs are unlikely to

occur as the area intersected by the Project does not contain any of the associated Regional Ecosystems and no communities meeting the description of the communities were observed during the field investigations.

3.6 Item 3.6

Habitat assessments must note where the species is known to occur as well as where it has the potential to occur (i.e., suitable habitat). This is applicable for flora species too. Therefore, survey data should include not only presence/absence data, but also an assessment of the suitability of the area for a protected species to occur.

3.6.1 Response

An assessment was conducted in the MNES report (GHD 2022) (Section 3.5 of Appendix B) to attribute a 'likelihood of occurrence' to threatened fauna and flora species (i.e. species listed under the EPBC Act) that have been previously recorded or predicted to occur within the desktop search extent. The likelihood of occurrence assessment was based on a review of species distributions and habitat requirements, historical records for the region, recent research, and the results of habitat assessments and field surveys conducted within the Project area.

The likelihood of occurrence assessment undertaken in GHD 2022 returned the following results:

- Four EPBC Act listed threatened species were confirmed present in the Project area
- Two EPBC Act listed threatened species were considered likely to occur in the Project area
- Five EPBC Act listed threatened species may occur in the Project area
- The remaining 21 listed threatened species (n=19) and ecological communities (n=2) identified in desktop searches were considered unlikely to occur based on the absence of suitable habitat and nearby recent historical records, or where a species' distribution has contracted and no longer encompasses the Project area landscape due to habitat loss and other threats (i.e. the red goshawk).

For all EPBC Act listed species confirmed present or considered likely to occur (with the exception of one near-exclusively aerial bird species), the distribution of predicted habitat was mapped based on criteria detailed in Sections 5 and 6 of the MNES report (GHD 2022), differentiating areas of habitat into habitat critical to the survival of the species and potential breeding, foraging and drinking/dispersal habitat, where relevant. The criteria used for each species were generally consistent with the habitat requirements specified in the Commonwealth listing and/or conservation advice, recovery plans (where available), species-specific referral/significant impact guidelines (where available), and Species Profile and Threats (SPRAT) database provided by DCCEEW. Given these descriptions are often necessarily broad to apply at a national scale and use definitions that are generally not spatially defined, further definition of the habitat criteria was required to explain how they have been mapped at a local scale. For most species, predicted habitat mapping was based on field-verified REs ecologically equivalent to Commonwealth habitat descriptions, supplemented by essential habitat factors listed for each species in the Queensland essential habitat mapping database, relying on factors including RE vegetation communities, elevation and soil type. Additionally, high definition aerial imagery was used to further detail suitable habitat (e.g. for the koala). Where relevant, these were adapted to reflect variations in on-site conditions identified via field surveys. The relationship between Commonwealth habitat criteria and the criteria used to map habitat for each species has been detailed in the relevant species sections in Sections 5 and 6 of the MNES report (GHD 2022). Reasons for any minor deviations from the Commonwealth habitat descriptions are explained in the species descriptions below.

The habitat assessment and likelihood of occurrence assessment for all conservation significant species is provided in Appendix E, and in the MNES report (GHD 2022) (Appendix B). Further justification for key species considered 'may occur' and 'unlikely to occur' are provided in Section 3.5.1 of the MNES report (GHD 2022).

3.7 Item 3.7

*The department notes that the endangered Northern Quoll (*Dasyurus hallucatus*) or its habitat is known to occur according to the PMST report in the Project area despite no suitable habitat found by the proponent in the referral documentation. The department would like to see more detailed information about the survey methodology and effort. The department understands rocky areas are used by the species for denning, but that the species also*

used trees, termite mounds or hollow logs for denning purposes in woodland areas. The PD should refer to survey effort across the breadth of potential habitat for the species.

3.7.1 Response

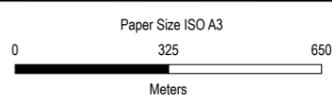
As detailed in Section 2.3, Section 3.5 and Appendix A of the MNES report (GHD 2022) (Appendix B).

Northern quoll (*Dasyurus hallucatus*) (concluded to be ‘unlikely to occur’)– survey effort for the northern quoll comprised of baited remote camera traps at seven sites (seven trap nights) and habitat assessments at 35 sites. Desktop and field data was used to determine the likelihood of occurrence of the northern quoll within the Project area and surrounds. Noting: (1) field data and observations from habitat assessments and BioCondition surveys (especially regarding the lack of structural complexity of remnant habitats, and their open and weed-affected ground layer); (2) the fragmented landscape in which the Project occur; (3) the prevalence of cane toads; (4) the absence of suitable rocky areas and topographically diverse areas in or near the Project footprint; (5) the lack of records (or evidence of occurrence) from surveys conducted for the Project; and (6) the lack of historical records within the immediate surrounding landscape, it is considered unlikely that the species will utilise habitats within the Project area on anything more than a highly infrequent and enigmatic basis (if it is indeed it persists in upland areas in the lower Burdekin region). Desktop and field data indicates that habitat within the Project area does not contain the requisite characteristics that comprise shelter habitat for the species (i.e. provides breeding and refuge habitat generally defined as rocky areas or structurally diverse woodland or forest with surrounding vegetated habitats) (DoE 2016). Habitat within the Project area may comprise suitable foraging and/or dispersal habitat for the species, however this habitat is unlikely to support more than transient individuals within the landscape. Additionally, where shelter habitat may occur within the surrounding landscape, the Project area does not provide sufficient connectivity for the species (i.e. within 1 km of shelter habitat) (DoE 2016). Accordingly, the species was considered unlikely to occur.

Survey effort undertaken for the Project is shown in Figure 3.7, inclusive of remote camera trap locations.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

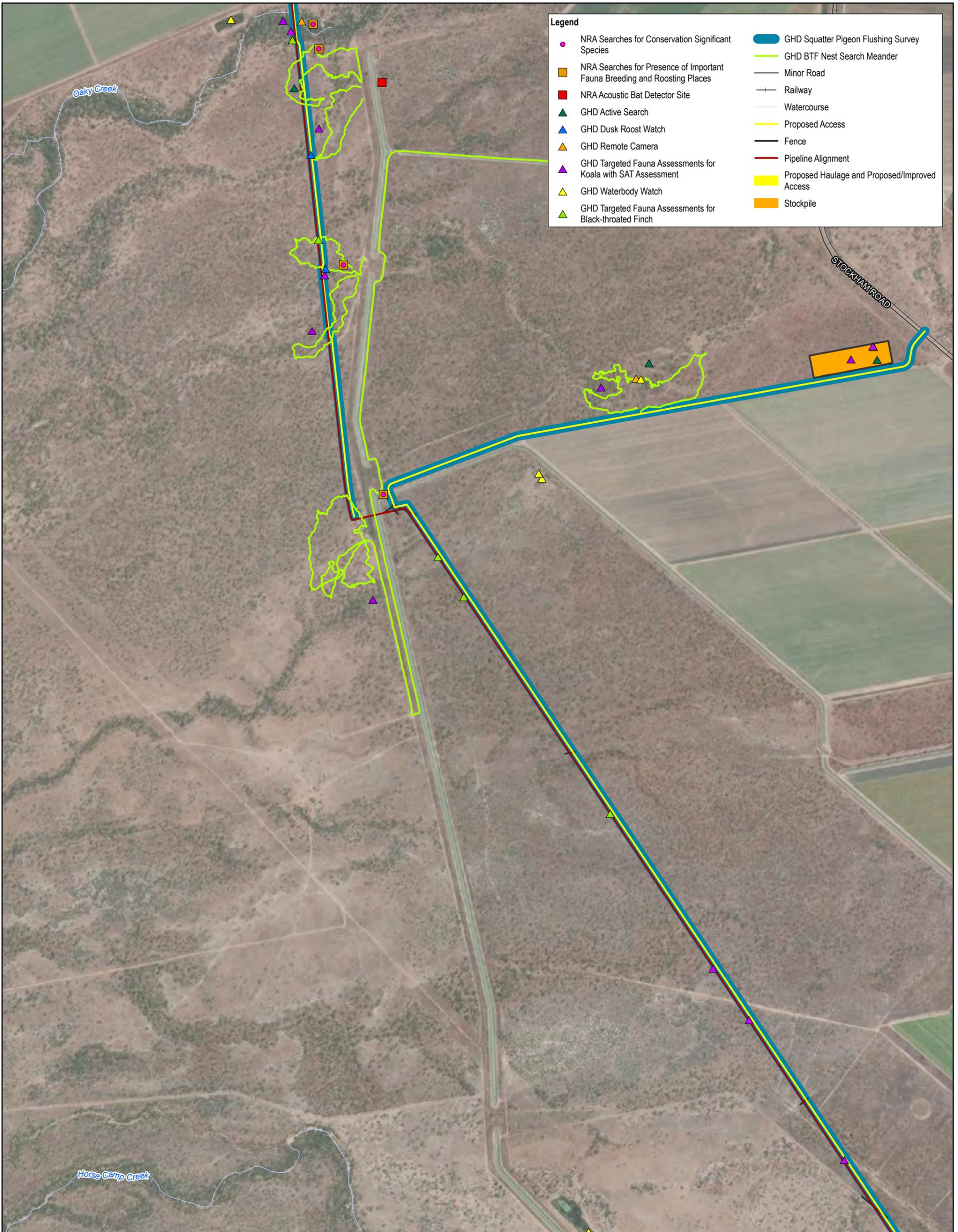


Townsville City Council
Houghton Pipeline Stage 2 - MNES Assessment

Project No. 12537606
Revision No. 2
Date 7/15/2022

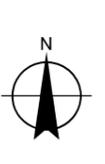
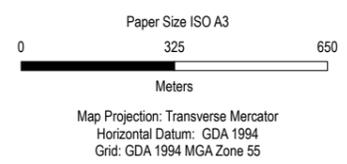
Distribution of fauna survey effort

FIGURE 3-7



- Legend**
- NRA Searches for Conservation Significant Species
 - NRA Searches for Presence of Important Fauna Breeding and Roosting Places
 - NRA Acoustic Bat Detector Site
 - ▲ GHD Active Search
 - ▲ GHD Dusk Roost Watch
 - ▲ GHD Remote Camera
 - ▲ GHD Targeted Fauna Assessments for Koala with SAT Assessment
 - ▲ GHD Waterbody Watch
 - ▲ GHD Targeted Fauna Assessments for Black-throated Finch
 - GHD Squatter Pigeon Flushing Survey
 - GHD BTF Nest Search Meander
 - Minor Road
 - Railway
 - Watercourse
 - Proposed Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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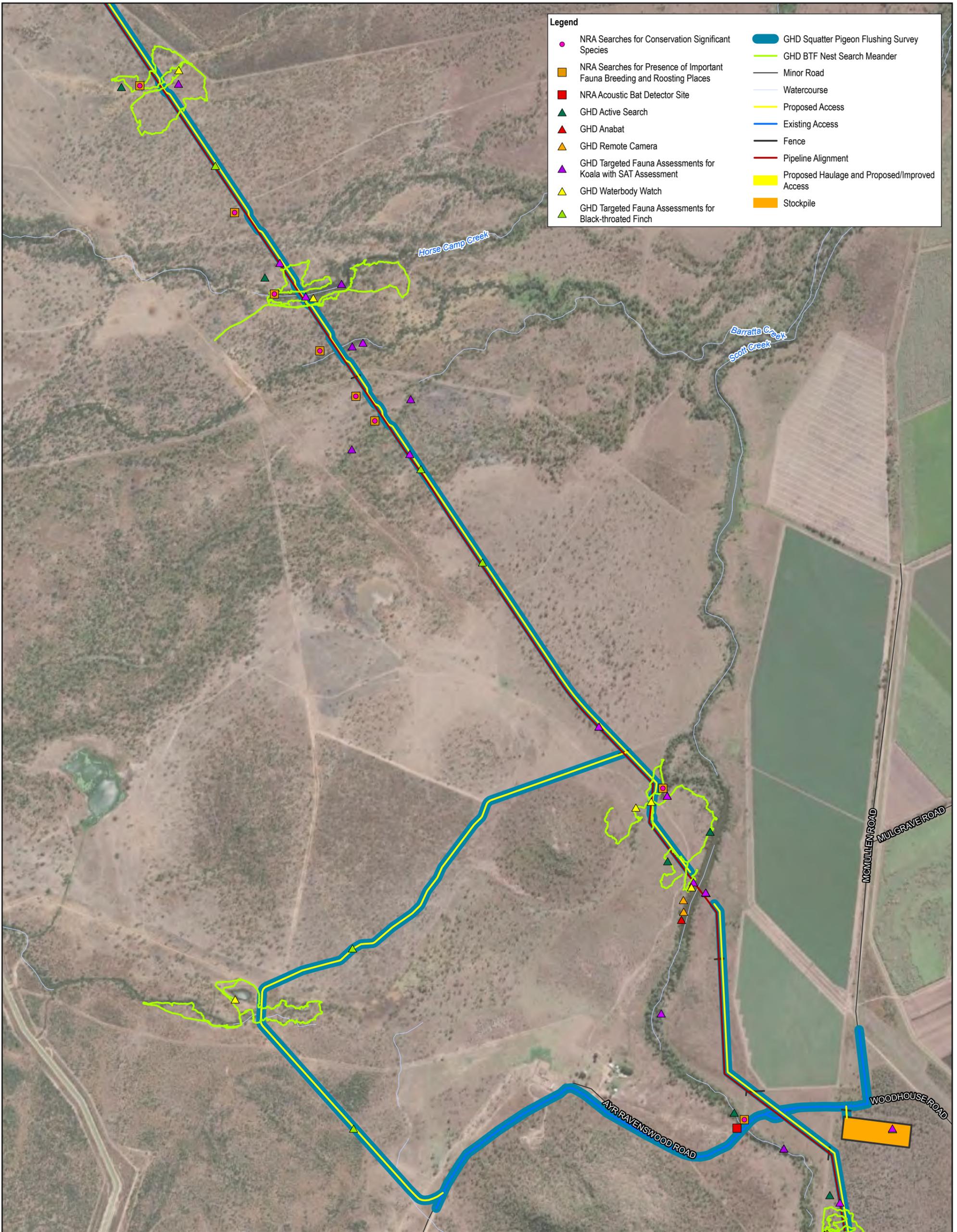


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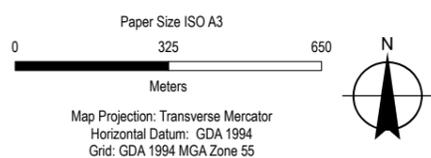
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Distribution of fauna survey effort

FIGURE 3-7



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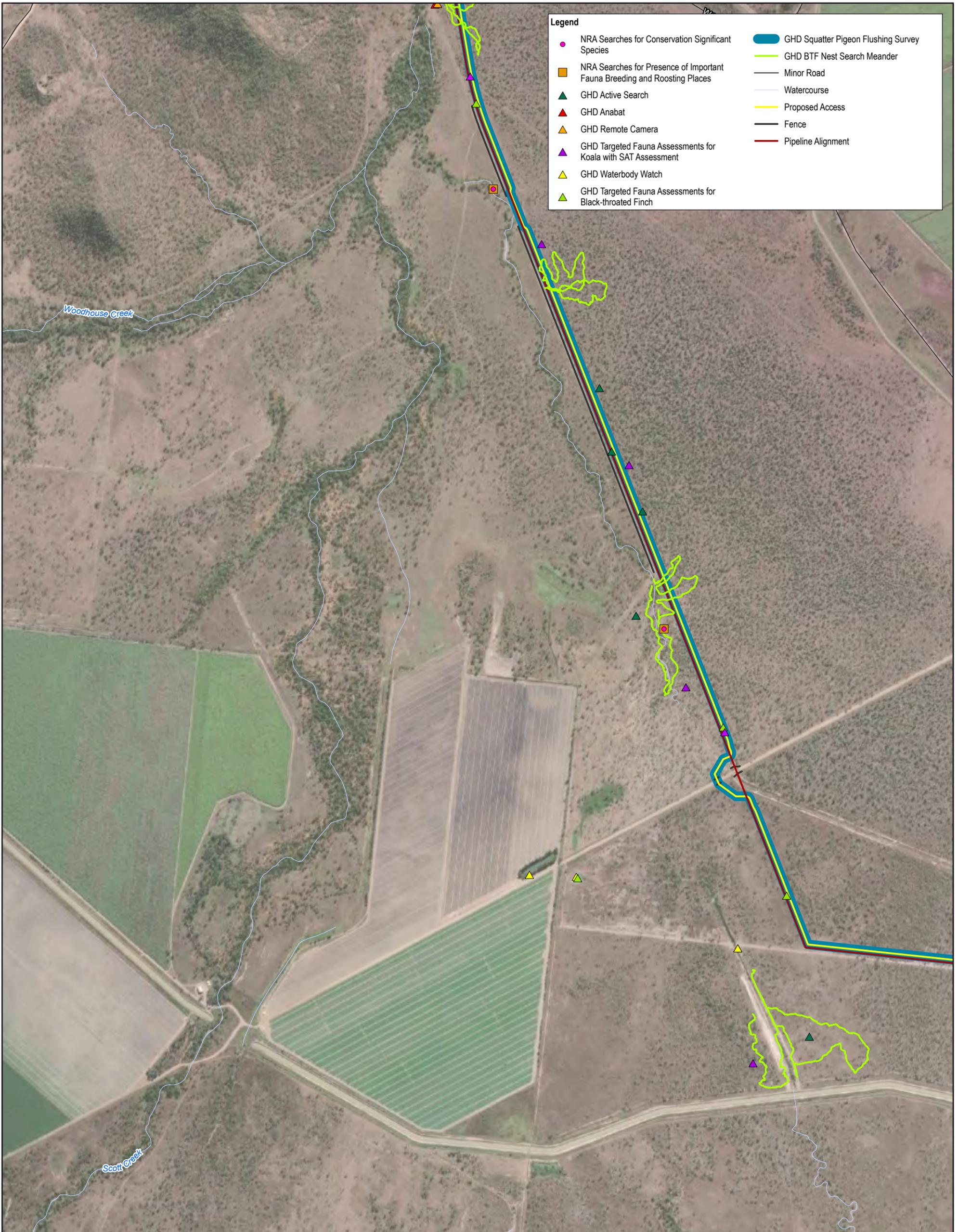


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Distribution of fauna survey effort

FIGURE 3-7



Legend

- NRA Searches for Conservation Significant Species
- NRA Searches for Presence of Important Fauna Breeding and Roosting Places
- ▲ GHD Active Search
- ▲ GHD Anabat
- ▲ GHD Remote Camera
- ▲ GHD Targeted Fauna Assessments for Koala with SAT Assessment
- ▲ GHD Waterbody Watch
- ▲ GHD Targeted Fauna Assessments for Black-throated Finch
- GHD Squatter Pigeon Flushing Survey
- GHD BTF Nest Search Meander
- Minor Road
- Watercourse
- Proposed Access
- Fence
- Pipeline Alignment

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Paper Size ISO A3

0 325 650

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Distribution of fauna survey effort

FIGURE 3-7



Legend

GHD Active Search	GHD Squatter Pigeon Flushing Survey
GHD Anabat	GHD BTF Nest Search Meander
GHD Bird Census	Minor Road
GHD Dusk Roost Watch	Railway
GHD Targeted Fauna Assessments for Koala with SAT Assessment	Watercourse
GHD Waterbody Watch	Proposed Access
GHD Targeted Fauna Assessments for Black-throated Finch	Fence
	Pipeline Alignment
	Proposed Haulage and Proposed/Improved Access
	Stockpile

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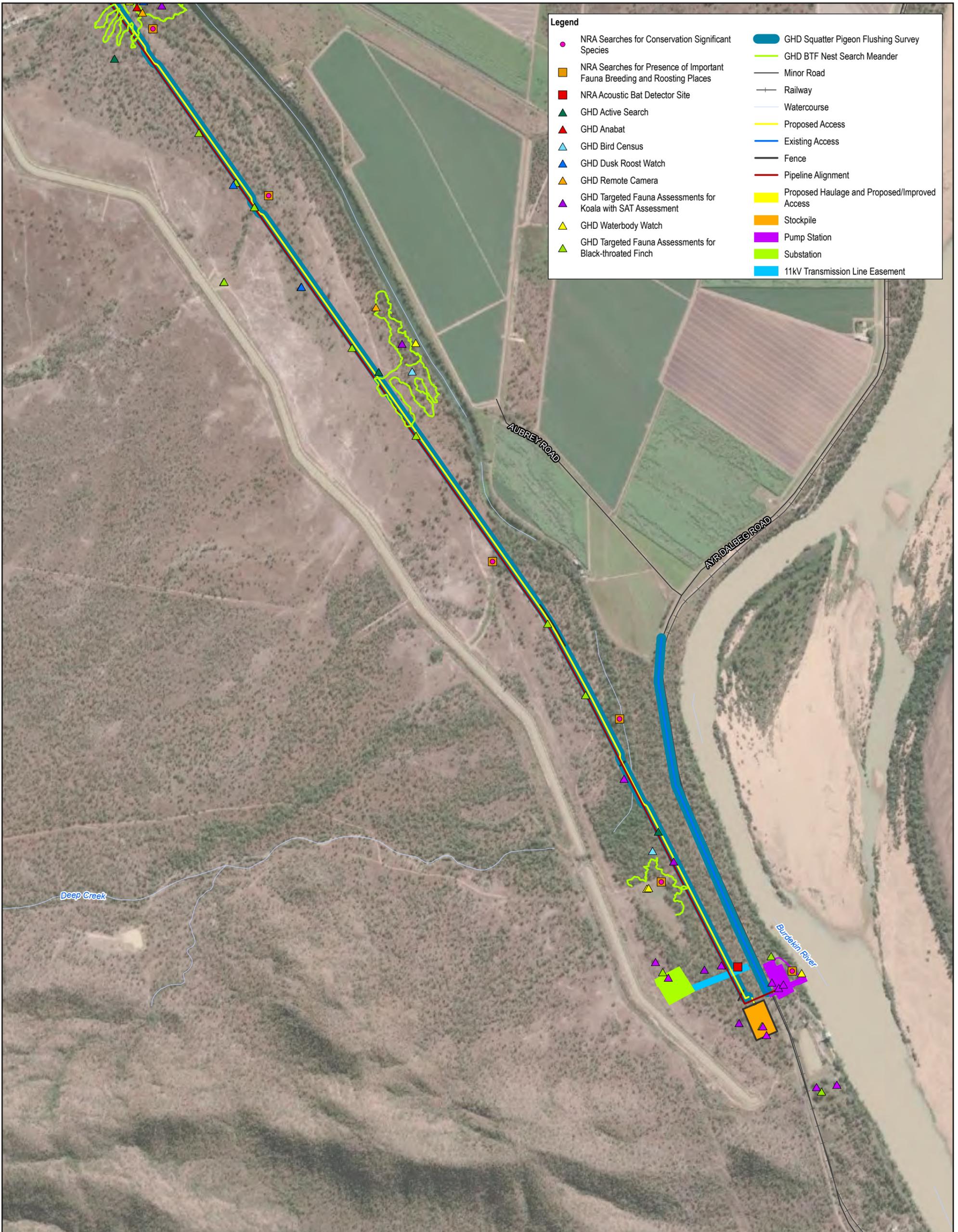


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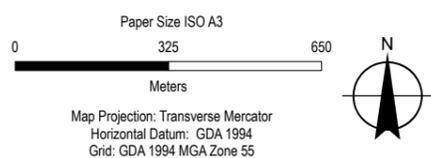
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FIGURE 3-7



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Distribution of fauna survey effort

FIGURE 3-7

3.8 Item 3.8

The department notes that no reptile surveys were undertaken. The department would like to see further survey effort made for the vulnerable Yakka Skink (*Egernia rugosa*), or adequate justification as to why further survey effort is not required to be undertaken.

3.8.1 Response

As detailed in section 2.3 MNES report (GHD 2022) (Appendix B), two terrestrial fauna surveys were undertaken by GHD in October 2021 (Spring) and March 2022 (Autumn) at locations representative of different habitat types throughout the Project area. Active searches for threatened reptile species were conducted in March 2022 survey and included a 20 minute search at 24 locations to detect reptile and amphibian species by searching beneath rocks, logs, bark, leaf litter and other suitable microhabitats. Survey effort is shown in Figure 3.8. Species targeted included the yakka skink (*Egernia rugosa*), ornamental snake (*Denisonia maculata*) and Mount Cooper striped skink (*Lerista vittata*). The field survey did not detect these reptiles.

Ornamental snake (*Denisonia maculata*) – the species has not been historically recorded in the desktop search extent. The nearest historical record is over 130 km southwest along the Campaspe River. The ornamental snake is found in locations close to preferred habitat of its food source (frogs). While two species of frog was observed within the Project area during field surveys, microhabitats that represent important habitat for the ornamental snake were not observed within the Project area, namely gilgai depressions and mounds. Additionally, the Project area is within the Commonwealth Draft Referral guidelines for the nationally listed Brigalow Belt reptiles ‘may occur’ modelled distribution for the ornamental snake. As no suitable habitat was observed, and noting the distance of the nearest historic record, the species is considered unlikely to occur.

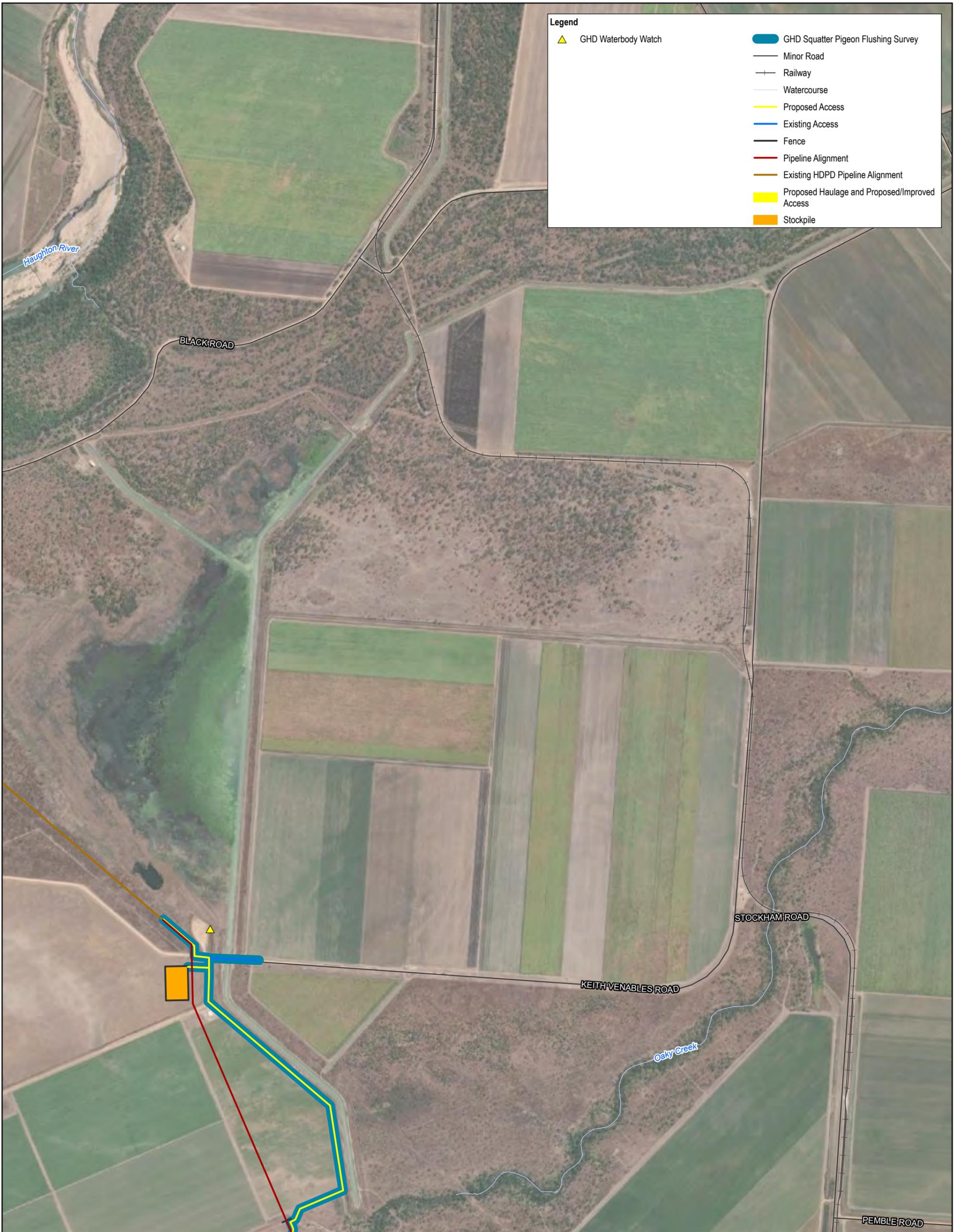
Yakka skink (*Egernia rugosa*) – survey effort for the yakka skink comprised of habitat assessments and 24 active reptile search sites around areas of accumulated groundcover and fallen timber. Active searches were undertaken in >27°C temperatures (BOM 2022b) and were concentrated during the early morning and late afternoon where reptiles were likely to be sunning themselves and more easily detectable. Field survey effort met minimum survey effort required for diurnal searches as per the Commonwealth *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPaC 2011). Desktop and field data informed the likelihood of occurrence for the species. The Project area is within the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles ‘may occur’ modelled distribution for the yakka skink (DSEWPaC 2011). The nearest historical record for the yakka skink is located 75 km southwest (from 1980), the historical record is protected by a 10 km inaccuracy buffer.

Microhabitats pertaining to the yakka skink comprise dense ground vegetation, large hollow logs, cavities in soil-bound root systems of fallen trees and beneath rocks. The species may persist in cleared habitat where shelter sites such as tunnel erosion, rabbit warrens and log piles exist (DoE 2014b). Important habitat for the yakka skink is defined in the *Draft Referral guidelines for the national listed Brigalow Belt reptiles* as (1) habitat where the species has been identified during a survey; (2) near the limit of the species’ known range; (3) large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or (4) a habitat type where the species is identified during a survey, but which was previously thought not to support the species (DSEWPaC 2011). Habitat of limited suitability was observed in the Project area for the yakka skink due to weed affected ground habitats, fragmentation and disturbance, and a lack of structural complexity across much of the Project area. Accordingly, important habitat, and especially microhabitats that are essential for shelter habitat for the yakka skink are largely absent within the Project area. Active searches did not confirm the presence of traces of the species (e.g. communal defecation sites). Although no historical records are located within the desktop search extent, the yakka skink is an extremely secretive reptile and seldom venture far from shelter sites, where they retreat to at the first sign of disturbance. Accordingly, the yakka skink has a *remote* chance of occurring within the Project area (‘may occur’).

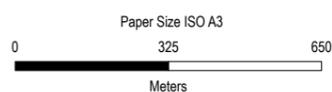
Mount Cooper striped lerista (*Lerista vittate*) – survey effort for the Mount Cooper striped skink comprised of active reptiles searches and habitat assessments. Field survey effort met minimum survey effort required for diurnal searches as per the Commonwealth *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPaC 2011). Desktop and field data informed the likelihood of occurrence for the reptile. The Project area is within the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles ‘may occur’ modelled distribution for the Mount Cooper striped lerista (DSEWPaC 2011). The nearest historical record for the Mount Cooper striped

lerista is 73 km southwest (from 1980) at Mount Cooper station which is the only confirmed location of a population, with a second population tentatively identified on the Chudleigh Plateau 200 km northwest of Hughenden (further research required to confirm whether the Chudleigh Plateau population comprises a conspecific population, or represents a separate taxa).

Microhabitats pertaining to the Mount Cooper striped lerista include low closed forest and woodlands with vine thickets, on soft sandy soils where burrows are made into leaf litter and loose soil under logs, the species can be found in open patches of low vegetation that extends into adjacent woodland on heavier soils (DEWHA 2008b). Important habitat for the Mount Cooper striped lerista is defined in the *Draft Referral guidelines for the national listed Brigalow Belt reptiles* as (1) habitat where the species has been identified during a survey; (2) near the limit of the species' known range; (3) large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or (4) a habitat type where the species is identified during a survey, but which was previously thought not to support the species (DSEWPaC 2011). Habitat of limited suitability was observed in the Project area for the Mount Cooper striped lerista due to weed affected ground habitats, fragmentation and disturbance, and lack of structural complexity across much of the Project area. Accordingly, important habitat, and especially microhabitats that are essential for shelter habitat for the Mount Cooper striped lerista are largely absent within the Project area. Active searches did not confirm the presence of traces of the species. Although no historical records are located within the desktop search extent, further research is required to inform population size, distribution and ecological requirements for the Mount Cooper striped lerista, accordingly the species has a *remote* chance of occurring within the Project area ('may occur').



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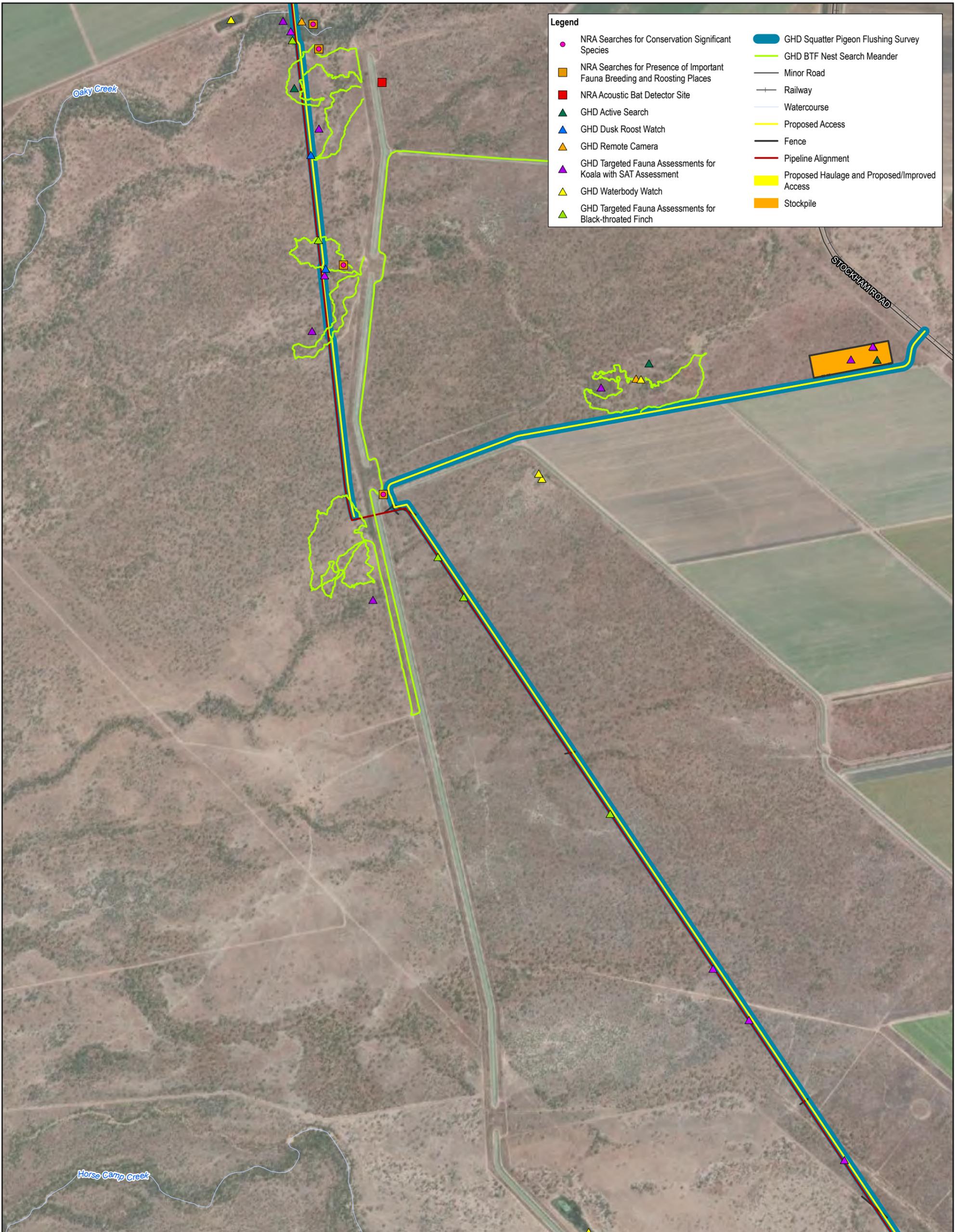


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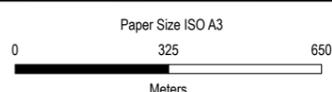
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Distribution of fauna survey effort

FIGURE 3-8



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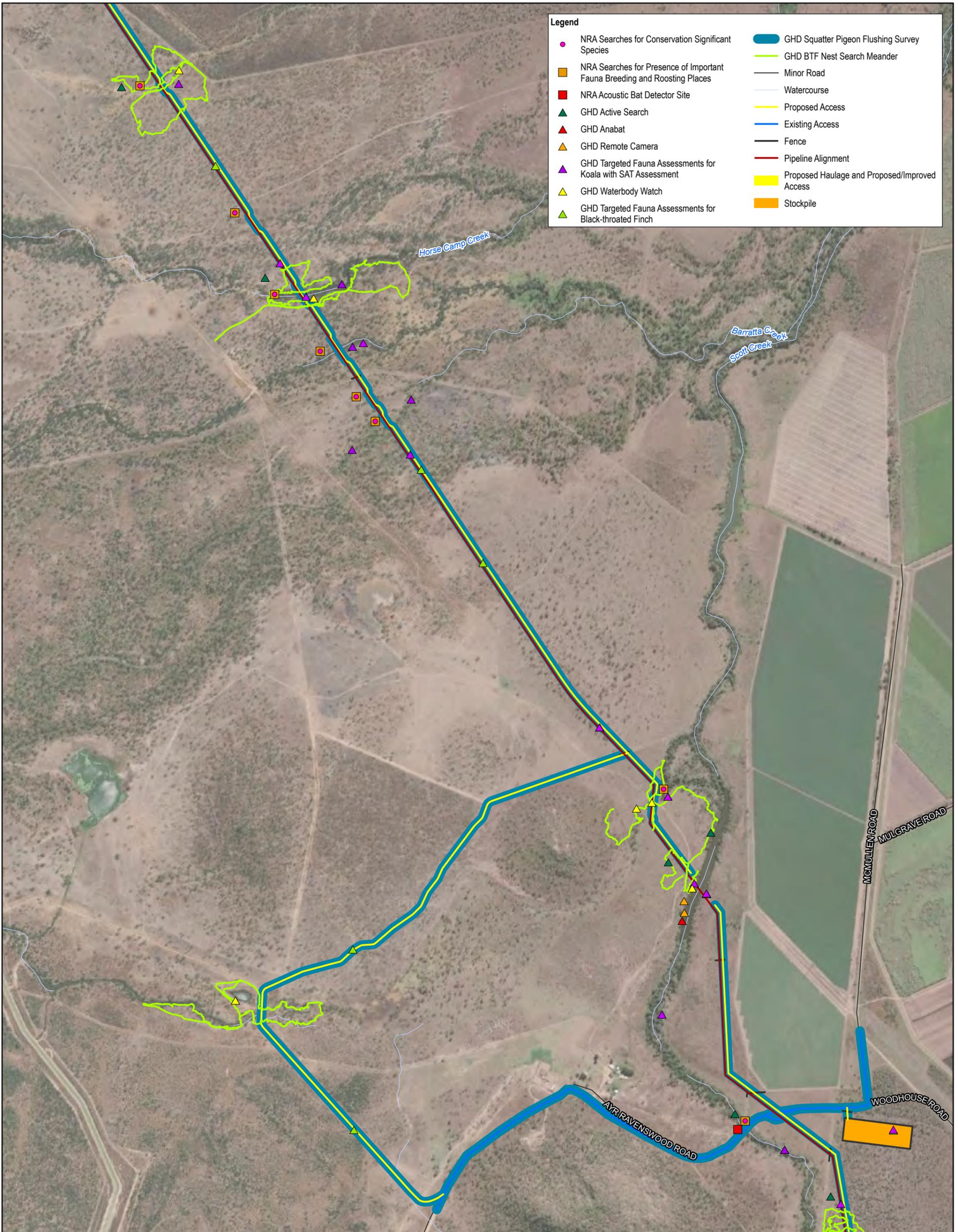


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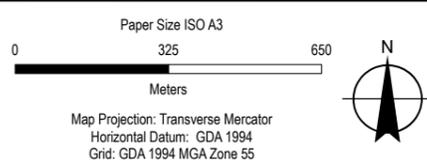
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FIGURE 3-8



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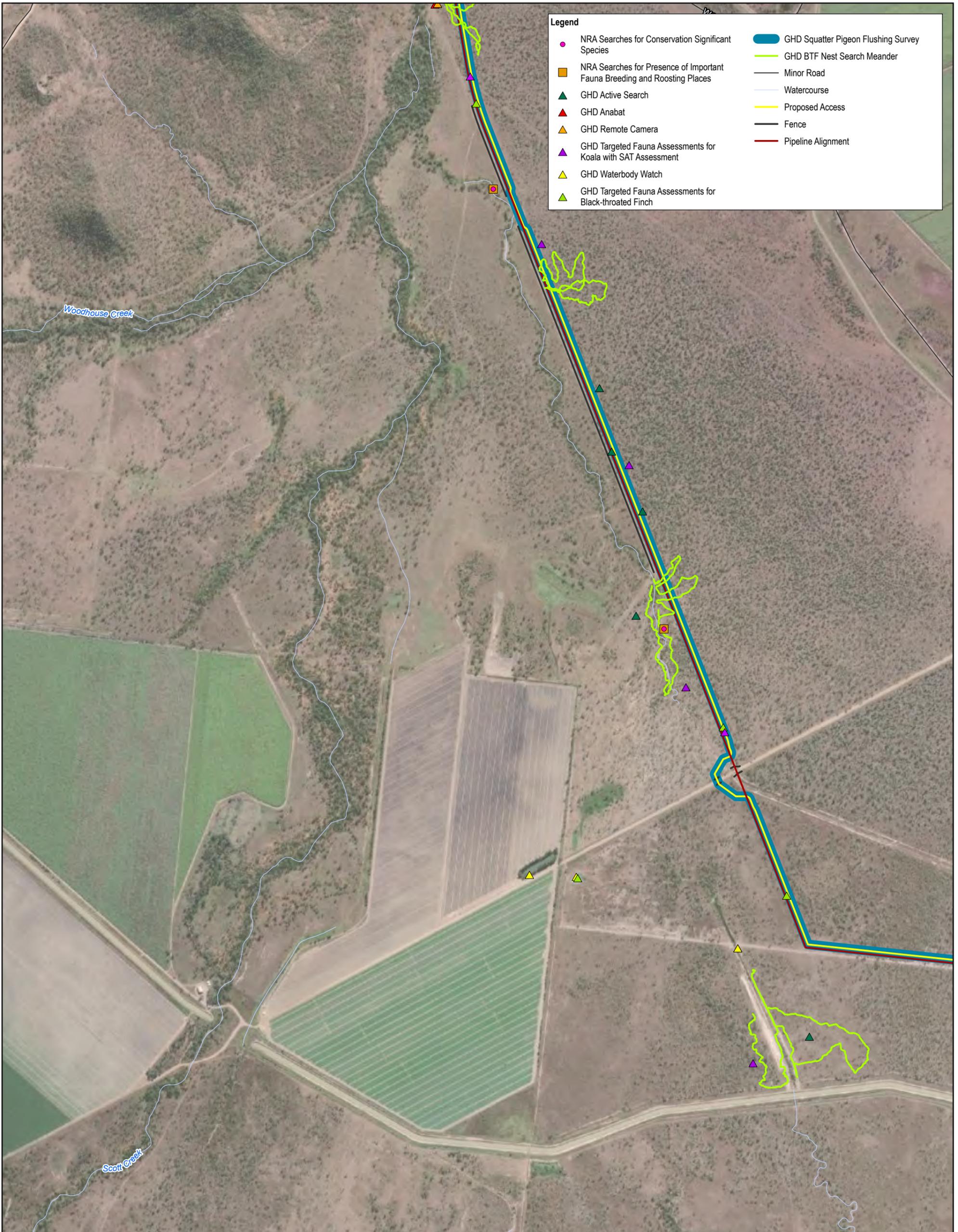


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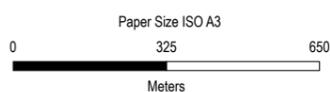
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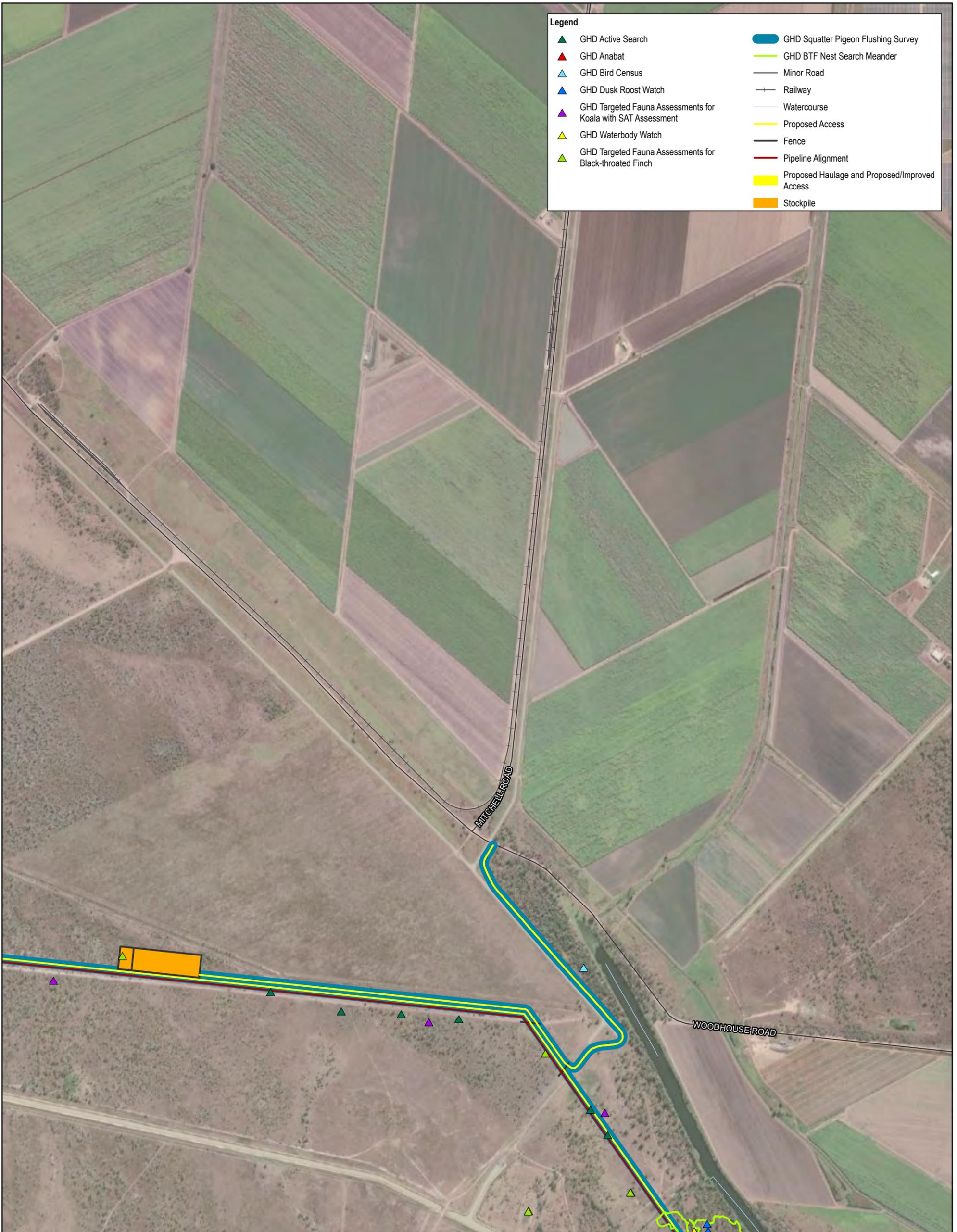


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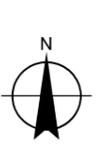
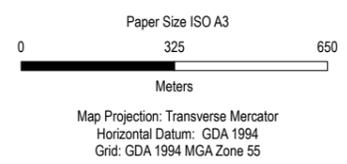
Distribution of fauna survey effort

FIGURE 3-8



- Legend**
- ▲ GHD Active Search
 - ▲ GHD Anabat
 - ▲ GHD Bird Census
 - ▲ GHD Dusk Roost Watch
 - ▲ GHD Targeted Fauna Assessments for Koala with SAT Assessment
 - ▲ GHD Waterbody Watch
 - ▲ GHD Targeted Fauna Assessments for Black-throated Finch
 - ▬ GHD Squatter Pigeon Flushing Survey
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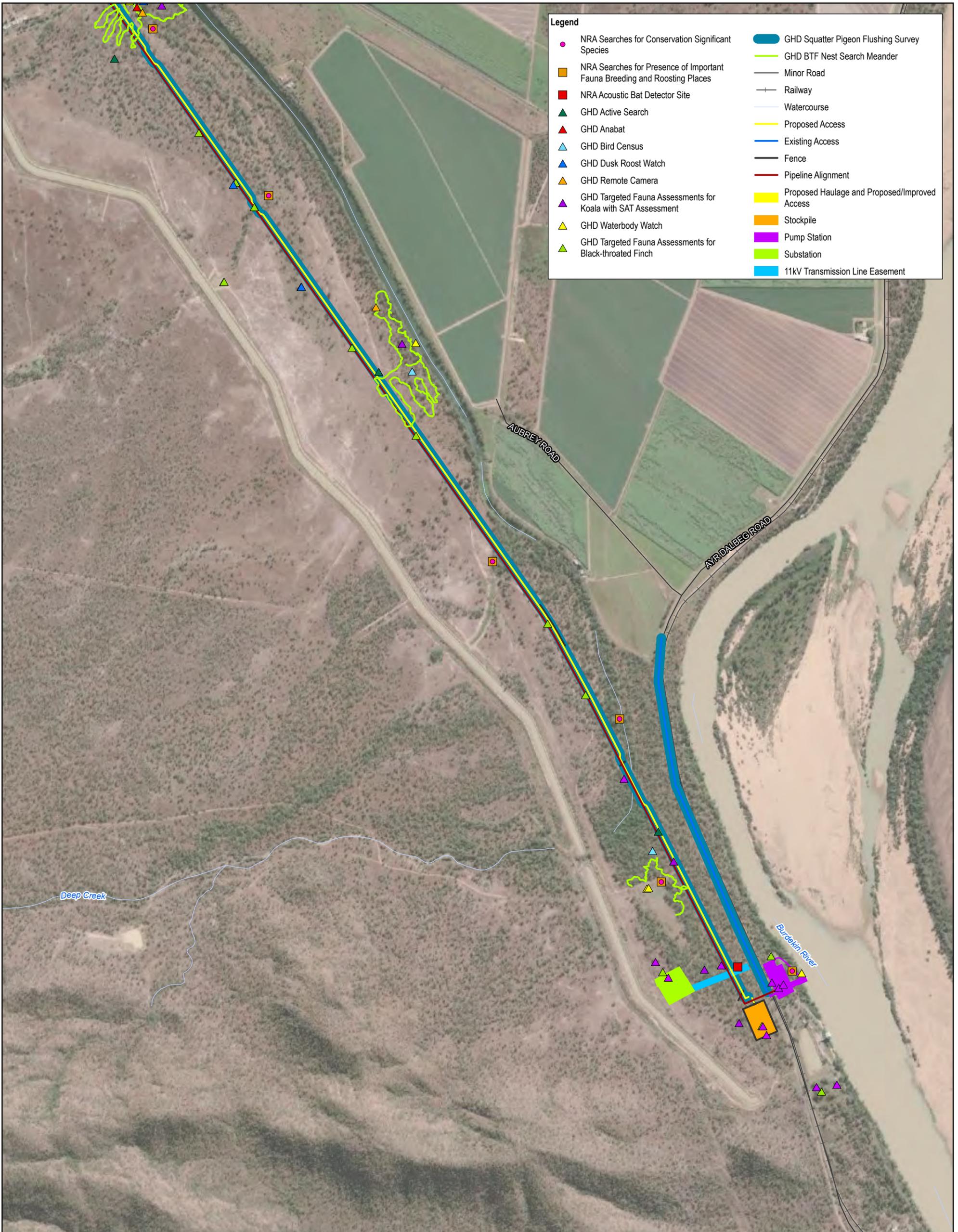


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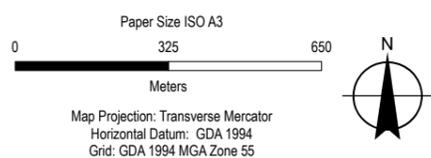
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Distribution of fauna survey effort

FIGURE 3-8

3.9 Item 3.9

The department notes that no targeted field survey effort was conducted for the vulnerable Red Goshawk (*Erythrotriorchis radiatus*), which was considered likely to occur in the Project area according to the PMST report. Although the closest record of the Red Goshawk is 83 km away, their home range is known to be up to 200 km. Given suitable habitat was found in the Project area, the department expects further survey effort (particularly for nests) and/or a justification of why no survey effort was undertaken. Likewise, discussion should be included for the vulnerable Grey Falcon (*Falco hypoleucos*).

3.9.1 Response

As detailed in section 2.3 of the MNES report (GHD 2022) (Appendix B), two terrestrial fauna surveys were undertaken by GHD at representative locations throughout the Project area. Vigilant bird observations over 6 x 10 hr days (October 2021) and 4 x 10 hr days (March 2022) were conducted during the GHD surveys. Survey effort involved:

- October 2021 (Spring) over six days by two ecologists and one botanist
- March 2022 (Autumn) over 5 days by two ecologists.

Grey falcon (*Falco hypoleucos*) and red goshawk (*Erythrotriorchis radiatus*) (both concluded to be ‘unlikely to occur’) – survey effort for the grey falcon and red goshawk comprised of 10 days x 10 hour vigilant bird surveys, habitat assessments at 35 sites and searches for nests. Desktop and field data informed the likelihood of occurrence for both species. While habitat of very marginal suitability (e.g. sparse woodland) was present for the grey falcon, the species’ Commonwealth approved conservation advice indicates that this bird is generally absent from areas east of the Great Dividing Range and where rainfall is greater than 500 mm, except when wet years are followed by drought (TSSC 2020). Bureau of Meteorology long-term climate statistics for the ‘Burdekin Shire Council’ weather station (Station ID 033001) report the average annual rainfall for the region is 1056 mm. Additionally, the nearest historical record is located approximately 75 km southeast of the Project area from 1999, where the record is protected by a 10 km inaccuracy buffer. Accordingly, the grey falcon is considered unlikely to occur. Potentially suitable habitat is also present for the red goshawk within the Project area. While a historical record from 1998 is located 55 km north of the Project area, recent research by Garnett and Baker 2020 has determined the red goshawk has experienced a recent, rapid northward contraction, and is now rarely encountered south of southern Cape York in Queensland. On this basis, the red goshawk is unlikely to occur within the Project area.

3.10 Item 3.10

The Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (*Phascolarctos cinereus*) was up-listed from Vulnerable to Endangered prior to the controlled action decision. Therefore, an updated assessment is required in the PD taking into consideration the up-listing and the new Conservation Advice (Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (environment.gov.au)).

3.10.1 Response

As a result of Koala (*Phascolarctos cinereus*) being up-listed from Vulnerable to Endangered an updated assessment has been provided and in section 6.1 of the MNES report (GHD 2022) (Appendix B). This is summarised below.

The significance of the Project’s impacts on koala has been assessed with consideration to the DCCEEW National recovery plan (DAWE 2022b) and the species’ conservation advice (DAWE 2022a), specifically:

- An assessment of the potential to impact ‘habitat critical to the survival’ of the koala
- An assessment of the potential to interfere with the recovery of the species
- An assessment against the significant impact criteria for an endangered species in the Significant Impact Guidelines 1.1.

Justification for the significance of impact assessment is provided in Table 3.3.

Table 3.3 Significance of impact on koalas

Impact criteria	Potential to occur
Lead to a long-term decrease in the size of a population	<p>Unlikely</p> <p>The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation within the last 200 years for agricultural and cattle grazing purposes.</p> <p>No koalas (or evidence thereof) were recorded during field studies for this Project. The Project will result in loss of 134.19 ha of potential koala habitat. The habitat losses will be localised (a narrow linear strip) and across a dispersed area. The local habitat loss is small in the context of the availability of similar habitat in the surrounding landscape. The loss of habitat alone is therefore unlikely to lead to a long-term decrease in the size of a population, especially noting that highly localised loss of availability of some foraging resources (the species was not confirmed present in field surveys, and is thus considered likely to occur at a low density), can likely be ‘absorbed’ by surrounding areas of habitat which are not likely to be at carrying capacity (noting infrequency of koala records, and the ubiquity of threats like dogs across the region).</p> <p>Vegetation clearing for the Project carries the risks of koala injury and mortality. However, these risks will be mitigated through the use of sequential clearing under the supervision of suitably trained and qualified fauna spotter/catchers. Risks of mortality and injury due to collision with construction vehicles will be mitigated through the implementation of a Traffic Management Plan. The Project is otherwise unlikely to have any substantial impact in terms of its expected impact on koalas, with no anticipated increase in dog attacks or vehicle collision risks. Based on the low risks and the mitigation measures proposed, the Project is unlikely to lead to a long-term decrease in the size of the local koala population.</p>
Reduce the area of occupancy of the species.	<p>Unlikely</p> <p>Habitat losses within the Project area are not expected to result in the displacement or disappearance of koalas from any individual area at a spatial scale that relates directly to the scale at which area of occupancy is measured (i.e. 2 km x 2 km) (IUCN 2013). While the Project will result in a loss of 134.19 ha of potential koala habitat, this will occur in small (and narrow) areas (i.e. 40 m wide alignment across a relatively broad geographic extent (along over 28.5 km) and will not result in the complete loss of habitat (e.g. patches) within any given area. Given that the ongoing risks to koalas post-construction are minor, and will not lead to ongoing habitat loss, the Project is not expected to reduce the area of occupancy of the species.</p>
Fragment an existing population into two or more populations.	<p>Unlikely</p> <p>The majority of proposed infrastructure is located within woodland and open woodland, in a landscape where fragmentation impacts already exist from irrigated agriculture and livestock grazing. The pipeline alignment will result in 134.19 ha of habitat loss, a proportion of which will be reinstated and rehabilitated in-situ post-construction with native flora species. Habitat loss will be small in the context of the local and regional landscape and will not create large gaps that present barriers to koala movement in this open landscape. The Project is connected via a State terrestrial corridor to large areas of habitat further west and south of the Project area. The State terrestrial corridor provides for koala dispersal and movement to areas outside of the Project area. As such, the Project will not fragment an existing population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species.	<p>Likely</p> <p>Dispersing koalas may occasionally utilise trees in the Project area for foraging and shelter, with any permanent utilisation in the surrounding landscape likely to be restricted to a very small number of individuals. No evidence of koala was present in the Project area and only one record is reported within 2 km of the Project (record from 1987). Foraging resources (trees) occur at low densities within the Project area, within a modified matrix characterised by multiple threats (i.e. roads, domestic/wild dogs, existing fragmentation). However, as per the species’ conservation advice, the Project area provides essential life cycle requirements for the koala – namely foraging and shelter trees. Accordingly, the Project area is considered likely to support habitat critical to the survival of the species.</p>
Disrupt the breeding cycle of a population.	<p>Unlikely</p> <p>The koala mating season is generally between September and March, with females giving birth to a single young between October and May. Based on the low density at which koalas occur in the Lower Burdekin region, the Project is at worst, likely to impact the breeding movements of a very small number of individual koalas. Measures will be implemented to further reduce the potential impacts to breeding individuals by managing the risks of vehicle strike, limiting the duration of works at watercourses, maintaining opportunities for longitudinal movement of koalas, and other fauna along watercourses, minimising works during the breeding season, implementing on-site speed limits, signage in higher-value koala habitat areas, and standard best practice sequential clearing using koala spotters.</p> <p>Clearing within koala habitat areas will be limited to daylight hours only during the peak breeding season (September – November).</p>

Impact criteria	Potential to occur
	Once operational, the Project will cause negligible disruption to koala movement. Based on the low densities at which koalas are thought to occur, and the mitigation measures proposed, the Project is unlikely to disrupt the breeding cycle of the local koala population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	<p>Unlikely</p> <p>The Project will result in a loss of 134.19 ha of potential koala habitat. This accounts for only a small proportion of suitable habitat in the broader landscape. Although clearing will cause minor temporary fragmentation of habitat (i.e. during construction) and reduce the area of available habitat, a proportion of the impacted (cleared) area will be reinstated and rehabilitated with native flora species, reconnecting temporarily fragmented areas for dispersal by the koala. The extent of temporary habitat disturbance is not likely to decrease the availability or quality of habitat available to the local population to the extent that the species will decline.</p>
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat.	<p>Unlikely</p> <p>Wild dogs represent a key threat to koalas. Creation of new tracks can facilitate dog movements into new areas. However, as the existing environment already has an extensive network of farm tracks, the Project is unlikely to exacerbate the threat of wild dog attacks on koalas.</p> <p>Unmitigated, the Project has the potential to introduce or spread weeds, some of which (e.g. Chinese apple and rubber vine) could inhibit local koala movement. This potential will be mitigated by the implementation of a Weed Management Plan governing construction and operation of the Project. The Project therefore poses low risks to the local koala population via introduction and spread of invasive species.</p>
Introduce disease that may cause the species to decline.	<p>Unlikely</p> <p>The Project is not anticipated to introduce new diseases that may cause the species to decline. Stress may lead to an increase in the expression of chlamydia in koalas, however the implementation of mitigation measures such as sequential clearing will reduce disturbance-related stress and risk of disease.</p>
Interfere with the recovery of the species.	<p>Unlikely</p> <p>The National Recovery Plan for the Koala (DAWE 2022b) identifies six recovery actions required for effective management and conservation (DAWE 2022b). Two of these actions are field-based actions and of relevance to the Project. These being:</p> <ul style="list-style-type: none"> – Strategy 5: Strategic habitat restoration – Strategy 6: Active metapopulation management <p>The Project is unlikely to interfere with either of these recovery actions. The Project area exists in a landscape that has pre-existing disturbance and fragmentation. Vegetation clearance will not result in permanent areas of fragmentation. Of the 134.19 ha of potential habitat to be cleared, a proportion of the Project area will be reinstated and rehabilitated with native flora species post-construction, reconnecting temporarily fragmented areas for dispersal by the koala. The surrounding landscape is highly fragmented by irrigated agriculture (sugar cane) and cattle grazing land use. Noting this, and the lack of historic records and field survey observations, koala, if present, are likely to occur at very low densities. The Project will result in a loss of 134.19 ha of suitable koala habitat critical to the survival of the species, in a landscape in which the species occurs at low densities. Therefore, the Project is unlikely to impact the Ayr/Townville metapopulation. The extent of temporary habitat disturbance is not likely to interfere substantially with the recovery of the species.</p>

The Project is **likely** to have a significant impact on the koala, as the Project results in the clearance of 134.19 ha of habitat critical to the survival of the species.

3.11 Item 3.11

The referral documentation says that incidental sightings of fauna were recorded. Please provide these sightings in the PD.

3.11.1 Response

Incidental fauna sightings recorded during the field surveys have been included in the MNES report (GHD 2022) (Appendix D) and Appendix D.

3.12 Item 3.12

The below RFI was originally provided, but was subsequently withdrawn by DCCEEW:

The Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta) (awe.gov.au) state that the loss of a stable population in the Townsville area would contribute significantly to the risk of extinction (page 6).

Please provide an assessment of the impact of the action on the Black-throated Finch using population viability analysis. This modelling technique may be useful to assess any population-level impacts resulting from the proposed action on other protected species too.

In July 2022 DCCEEW confirmed that the following RFI relating to the black-throated finch (southern) needs to be addressed:

The Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta) (awe.gov.au) state that the loss of a stable population in the Townsville area would contribute significantly to the risk of extinction (page 6).

Please provide a habitat assessment of the proposed area of the action on the Black-throated Finch which must include, at a minimum:

- *A discussion of the vegetation composition and structure (i.e. specific tree and grass species);*
- *identification and description (including capacity to retain water) of permanent or seasonal water bodies or watercourses;*
- *description of suitable food sources (i.e. grass seeds);*
- *discussion of habitat use requirements (e.g. breeding, nesting, foraging, etc.);*
- *total area (in hectares) of each identified habitat type being impacted (e.g. breeding, nesting, foraging, etc.); and*
- *connectivity of the site to other areas of Black-throated Finch (southern) habitat.*

This must inform an impact assessment on the species to consider all indirect, direct and facilitated impacts.

3.12.1 Response

Project impact to black-throated finch (southern)

The Project is anticipated to result in the loss of 96.34 ha of potential habitat (in aggregate) for the black-throated finch (southern). Loss of habitat includes 82.14 ha of habitat suitable for nesting and foraging habitat (considered to be habitat critical to the survival of the species), and 14.19 ha of suitable foraging habitat. Much of this loss will be temporary, with active rehabilitation of habitat to be undertaken over 61.33 ha (63% of lost habitat) post-construction. Nonetheless, noting the time-lag between the loss and the (rehabilitation) gain, the loss of 96.34 ha is concluded to represent a significant residual impact to the subspecies, and will be addressed through the provision of an offset that is consistent with, and achieves the requisite outcomes of the EPBC Act Environmental Offsets Policy 2012.

Noting the application of the mitigation hierarchy that has been applied (namely, minimising impacts through Project siting/design, rehabilitating temporary impacts post-construction, and providing an offsite conservation gain that is commensurate with the loss via an offset), the net outcome of the Project for the subspecies is not anticipated to be one of loss (e.g. of habitat, of black-throated finch (southern) individuals across the Project and offset sites). Indeed, in the context of the losses/gains from the Project, it is unlikely that this Project will have a detrimental bearing on the regional population of the subspecies.

Vegetation composition and structure

The subspecies occurs in habitat broadly defined as grassy, open woodlands and forests typically dominated by *Eucalyptus*, *Acacia* and *Melaleuca*. The subspecies prefers habitat adjacent to water sources or riparian strips. Within this habitat, the subspecies requires access to water sources, grass seeds and trees providing suitable nesting habitat. Any disruption between connectivity of these three resources has a serious impact on an area's ability to sustain the subspecies' populations (DEWHA 2009a). The subspecies is likely to traverse over uninhabitable sites if the distance is less than 1 km (DEWHA 2009a).

The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation over many decades for agricultural and cattle grazing purposes (Plate 3.1). Through these processes, the natural environment has undergone substantial alteration and fragmentation of habitat values, including through the sowing of pasture grasses resulting in the spread of invasive weeds. Field studies revealed that across substantial parts of the Project area, the ground and shrub layers were dominated by invasive weeds in localised and widespread areas, including *Themeda quadrivalvis*, *Urochloa mutica* grasses, rubber vine (*Cryptostegia grandiflora*) and chinee apple (*Ziziphus mauritiana*) (Plate 3.1). Extensive areas were also disturbed through trampling of the ground layer by cattle. Thirty-six invasive weed species were identified during the GHD field survey (Appendix D), as well as five invasive fauna species, including wild dog (*Canis familiaris*), feral cat (*Felis catus*), pig (*Sus scrofa*), rabbit (*Oryctolagus cuniculus*) (Appendix D) and cane toad (*Rhinella marina*). Chinee apple was particularly abundant and widespread across parts of the Project area. This species, which dominates the shrub layer and suppresses the germination and spread of native shrub and ground layer species is negatively associated with the abundance of black-throated finch (southern) (Rechetello 2015).



Plate 3.1 Heavily grazed areas (left) and areas with Chinee apple (right) observed during GHD field surveys (2021)

Despite this, some parts of the Project area contain remnants of very sparse to open woodland, dominated by native *Eucalyptus*, *Corymbia*, *Melaleuca* and *Casuarina* species. Dominant canopy species included *Corymbia dallachiana*, *Eucalyptus tereticornis*, *Eucalyptus platyphylla*, *Corymbia erythrophloia*, *Corymbia clarksoniana*, *Corymbia tessellaris*, *Eucalyptus crebra*, *Grevillia striata*, *Melaleuca leucadendra* and *Melaleuca viridiflora*.

Nesting and water sources for the black-throated finch (southern)

Black-throated finch (southern) nesting site selection is likely more closely related to proximity to water sources, than tree structure itself. The subspecies nests in a range of tree structures including hollow tree limbs, pendulous branches, the base of active raptor nests, bushy shrubs etc. During the nesting season, the proximity of the nests are typically within 400 m of a permanent water source (and rarely greater than 1 km) (DEWHA 2009a).

Waterbodies used by the subspecies include both natural and artificial water sources. The Project area intersects a number of watercourses. The Burdekin River and Scott Creek were the only watercourses observed to contain permanent wetted channels. With a few exceptions, the majority of watercourses within the Project area are classified as minor, non-perennial watercourses. During field surveys, most of these ephemeral watercourses were observed to be dry and are likely to retain water for short periods of time after rainfall events. A number of ephemeral waterbodies were observed to contain water during field surveys, and additionally, stock dams were present in areas adjacent to the Project area. Permanent and ephemeral watercourses retained riparian vegetation, while stock dams and troughs typically contained disturbed ground layers with sparse canopy trees and shrubs. Substantial areas were heavily degraded by cattle grazing and other areas were dominated by *Stylosanthes scabra*, a species known to be avoided by the black-throated finch (southern) (Rechetello 2015).

Foraging resources for the black-throated finch (southern)

The black-throated finch (southern) forages on grass seeds from native and invasive grasses. Foraging preferences shift with changing seed availability. When grass seed is abundant, the subspecies preferentially forage near nesting sites, while dry conditions require the subspecies to forage progressively further (up to 3 km)

(DEWHA 2009a). Perennial grasses are thought to dominate the subspecies' diet, including *Urochloa*, *Enteropogon*, *Panicum*, *Dichanthium*, *Eragrostis* and *Themeda* (DEWHA 2009a). Grass species present across the Project footprint suitable for foraging by the black-throated finch (southern) are provided below in Table 3.4. The number of suitable grass species present is likely to be under-represented due to the dry conditions and lack of reproductive material present at the time of the surveys. .

Table 3.4 *Black-throated finch (southern) foraging grasses recorded within the Project area*

Scientific name	Common name
<i>Aristida holathera</i>	Erect kerosine grass
<i>Bothriochloa bladhii</i> subsp. <i>Bladhii</i>	Forest bluegrass
<i>Bothriochloa decipiens</i>	Pitted grass
* <i>Bothriochloa pertusa</i>	Indian bluegrass
* <i>Chloris gayana</i>	Rhodes grass
* <i>Chloris inflata</i>	Purpletop chloris
* <i>Dichanthium annulatum</i>	Sheda grass
* <i>Dichanthium aristatum</i>	Angleton grass
<i>Dichanthium sericeum</i> subsp. <i>sericeum</i>	Queensland bluegrass
<i>Enteropogon ramosus</i>	Twirly windmill grass
<i>Eragrostis sororia</i>	-
<i>Eragrostis</i> sp (<i>indet</i>)	-
<i>Eriochloa pseudoacrotricha</i>	Early spring cupgrass
<i>Eulalia aurea</i>	Silky browntop
<i>Heteropogon contortus</i>	Black speargrass
* <i>Melinis repens</i>	Red natal grass
<i>Oryza australiensis</i>	Australian wild rice
<i>Panicum decompositum</i>	Australian millet
<i>Sporobolus jacquemontii</i>	Rat's tail grass
<i>Themeda triandra</i>	Kangaroo grass
* <i>Urochloa mutica</i>	Para grass
Note: '*' – introduced species	

Habitat use requirements and connectivity for the black-throated finch (southern)

Five broad habitat types were observed across the Project. Characteristics and ecological value of each of the broad habitat types were identified, including where they provide potential habitat for the black-throated finch (southern). These are described in Table 3.5.

Table 3.5 Fauna habitat types within the Project area

Habitat type	Characteristics	Ecological values
<i>Eucalyptus platyphylla</i> open woodland on alluvial plains		
	<p>Mature canopy vegetation</p> <p>Moderate abundance of hollow-bearing trees</p> <p>Abundant patches of invasive shrubs and grasses</p> <p>Logs, woody debris and other complex ground-level microhabitats present in low densities</p> <p>Moderately dense grassy ground layer with some bare ground</p>	<p>Nesting and foraging habitat for canopy-dwelling woodland birds</p> <p>Foraging habitat for granivorous birds</p> <p>Denning habitat for possums and other arboreal mammals</p> <p>Foraging and nesting habitat for raptors</p> <p>Roosting habitat for microchiropteran bats</p> <p>Foraging sites and foraging habitat for snakes, dragons, geckos, monitors, macropods and other ground dwelling vertebrates</p> <p>Potential conservation significant fauna species – koala, bare-rumped sheathail bat, black-throated finch (southern), squatter pigeon (southern).</p>
Very sparse open woodland/grassland on alluvial plains		
	<p>Mature canopy woodland with diverse range of species</p> <p>Low abundance of hollow-bearing trees</p> <p>Shrub layer periodically dominated by invasive rubber vine and chinee apple</p> <p>Dense grassy ground layer dominated by mix of native and exotic grasses</p> <p>Some areas subject to seasonal inundation</p>	<p>Nesting and foraging habitat for woodland birds</p> <p>Foraging habitat for granivorous birds</p> <p>Roosting sites and foraging habitat for microchiropteran bats</p> <p>Foraging habitat for reptiles, macropods and other ground dwelling vertebrates</p> <p>Potential conservation significant fauna species – koala, bare-rumped sheathail bat, black-throated finch (southern) and squatter pigeon (southern).</p>

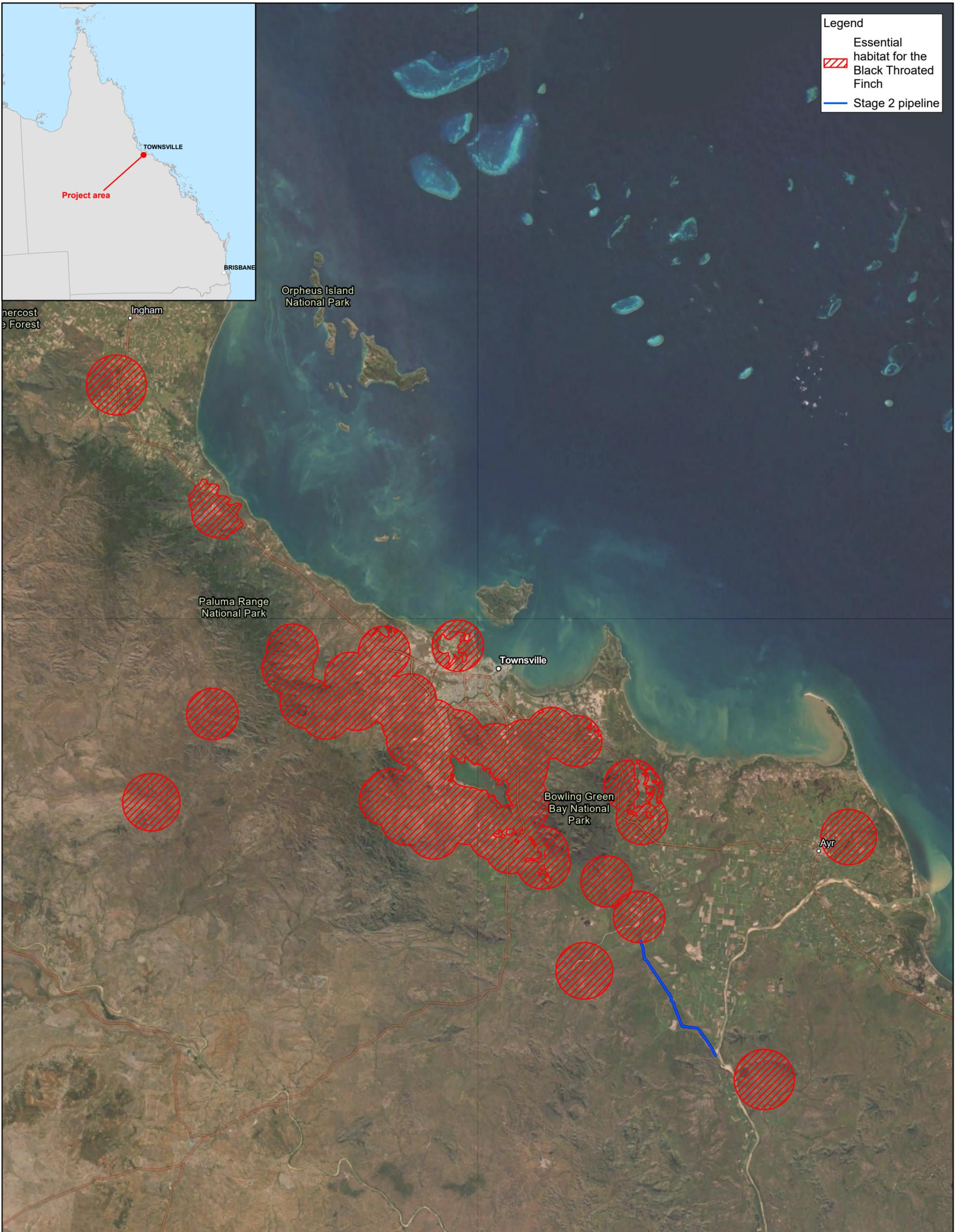
Habitat type	Characteristics	Ecological values
Melaleuca and Grevillea woodland on alluvial plains		
	<p>Dense low <i>Melaleuca</i> regrowth patches</p> <p>Woodland with sparse <i>Grevillea striata</i></p> <p>Low abundance of mature eucalypt or <i>Corymbia</i> canopy species</p> <p>Few hollow bearing trees</p> <p>Ground layer mixture of invasive and native grasses</p> <p>Shrub layer occasionally dominated by invasive chinee apple and rubber vine</p>	<p>Nesting and foraging habitat for woodland birds</p> <p>Foraging habitat for granivorous birds</p> <p>Foraging habitat for macropods and other ground dwelling vertebrates</p> <p>Foraging habitat for snakes and other reptiles</p> <p>Potential conservation significant species – koala, foraging for bare-rumped sheathail bat, black-throated finch (southern) and squatter pigeon (southern).</p>
Ephemeral or permanent watercourses with fringing riparian vegetation		
	<p>Mature canopy with diverse range of species</p> <p>Low abundance of hollow-bearing trees</p> <p>Patches of dense shrubs including mixture of invasive and native plants</p> <p>Ephemeral and permanent water sources</p> <p>Sandy substrate suitable for burrowing</p>	<p>Drinking sites for birds and mammals</p> <p>Nesting and foraging habitat for canopy, shrub and ground-dwelling birds</p> <p>Refuges and breeding sites for amphibians</p> <p>Foraging habitat for snakes</p> <p>Foraging and roosting habitat for microbats</p> <p>Movement corridors for birds, reptiles and mammals</p> <p>Potential conservation significant species – koala, bare-rumped sheathail bat and black-throated finch (southern)</p>
Very sparse native canopy with mixture of invasive and native grasses and shrubs (non-remnant)		
	<p>Mature to regrowth native <i>Eucalyptus</i> and <i>Corymbia</i> species</p> <p>Very low presence of hollow-bearing trees</p> <p>Patches of dense invasive grasses and shrubs</p> <p>Highly disturbed by cattle, weeds and historical vegetation clearing</p>	<p>Foraging habitat for raptors</p> <p>Foraging habitat for macropods and other ground dwelling mammals</p> <p>Movement and dispersal habitat to areas of higher quality and vegetation cover</p> <p>Potential conservation significant species – koala.</p>

Vegetation clearing for the Project will not result in vegetation loss greater than 1 km (in an east-west direction). While small and narrow areas (i.e. 40 m alignment width) will be cleared for the Project, the subspecies is known to traverse across inhabitable areas where distances are less than a kilometre (DEWHA 2009a). The Project is

located in a landscape with existing fragmentation, particularly to the east of the Project area where large areas of vegetation have been historically cleared for sugar cane farming.

To determine the Project's impact on the region's black-throated finch (southern), a coarse demonstration of the Project's connectivity to other areas of black-throated finch (southern) habitat in the context of the greater Townsville population was undertaken. The area of remnant woodland and forest vegetation (based on Queensland Government version 12.1 Regional Ecosystem mapping) occurring within 'Important areas' in the greater Townsville region mapped in Figure 2 of the *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)* (DEWHA 2009b) was quantified. This map of important areas in the greater Townsville area, and their proximity to and connectivity with mapped potential habitat for the subspecies within the Project area is shown in Figure 3.9. This exercise revealed that approximately 230,285 ha of remnant vegetation corresponding with Commonwealth-defined 'important areas' for the subspecies occurs in the greater Townsville region. Importantly this 230,285 ha is not a definitive representation of habitat for the subspecies – it is coarsely indicative of where the black-throated finch (southern) may occur given the presence of remnant woodland and forest in locations that are considered important for the subspecies, without accounting for on-ground condition, threats and habitat composition and structure.

The loss of 96.34 ha in a landscape in which the subspecies is known to occur, risks contributing to the decline of the subspecies in the greater Townsville area. However, when considered in context (the loss represents 0.04% of *potential* habitat in the greater Townsville area (an even smaller area if also considering the lower Burdekin/Ayr/Home Hill region)), and noting strict application of the mitigation hierarchy to address the impacts of the Project, it is concluded that the Project is not likely to exacerbate declines to/contribute to the regional extinction of the black-throated finch in the greater Townsville region.



Legend

- Essential habitat for the Black Throated Finch
- Stage 2 pipeline

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

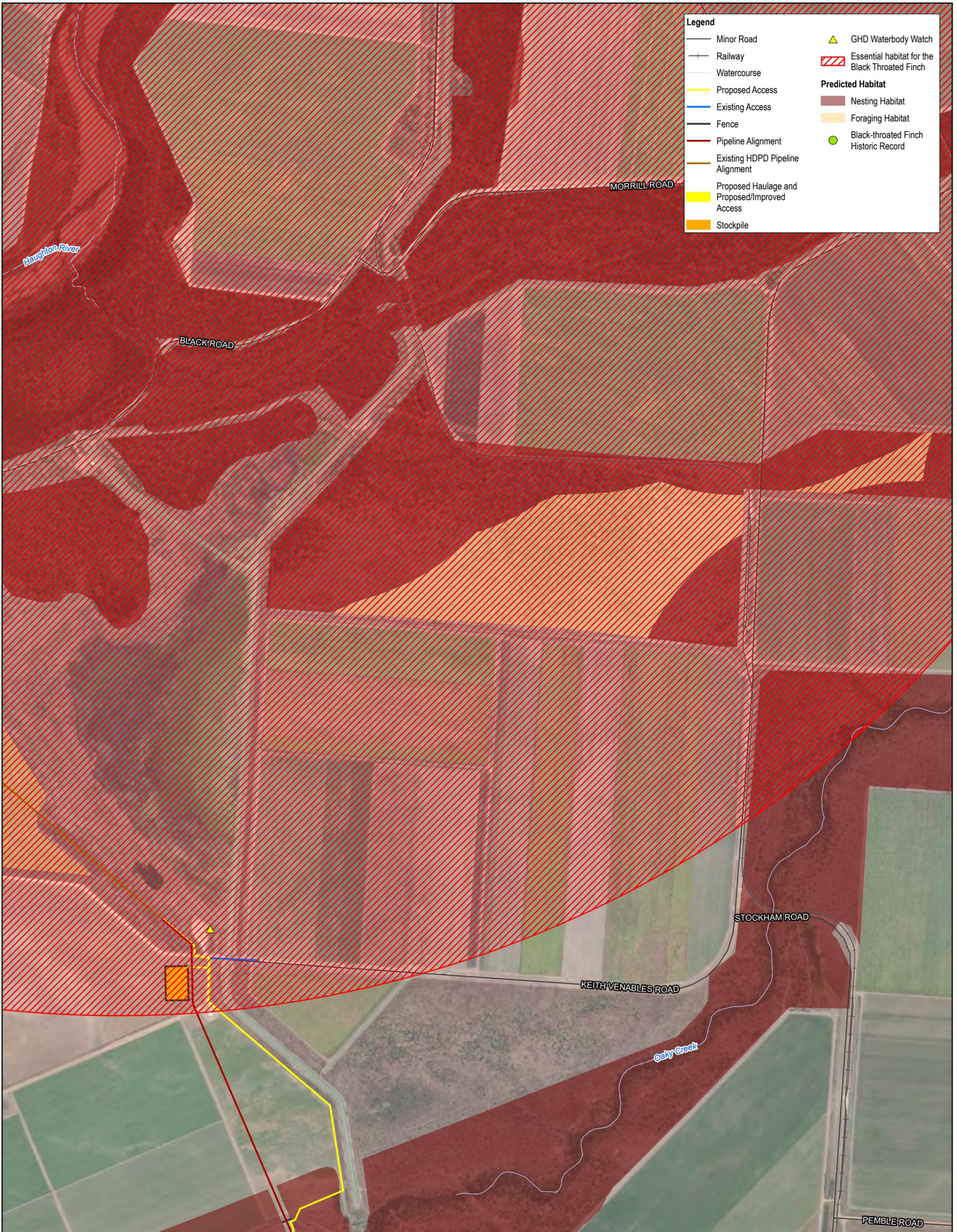


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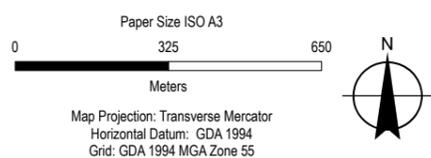
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Essential habitat for the Black Throated Finch

FIGURE 3-9



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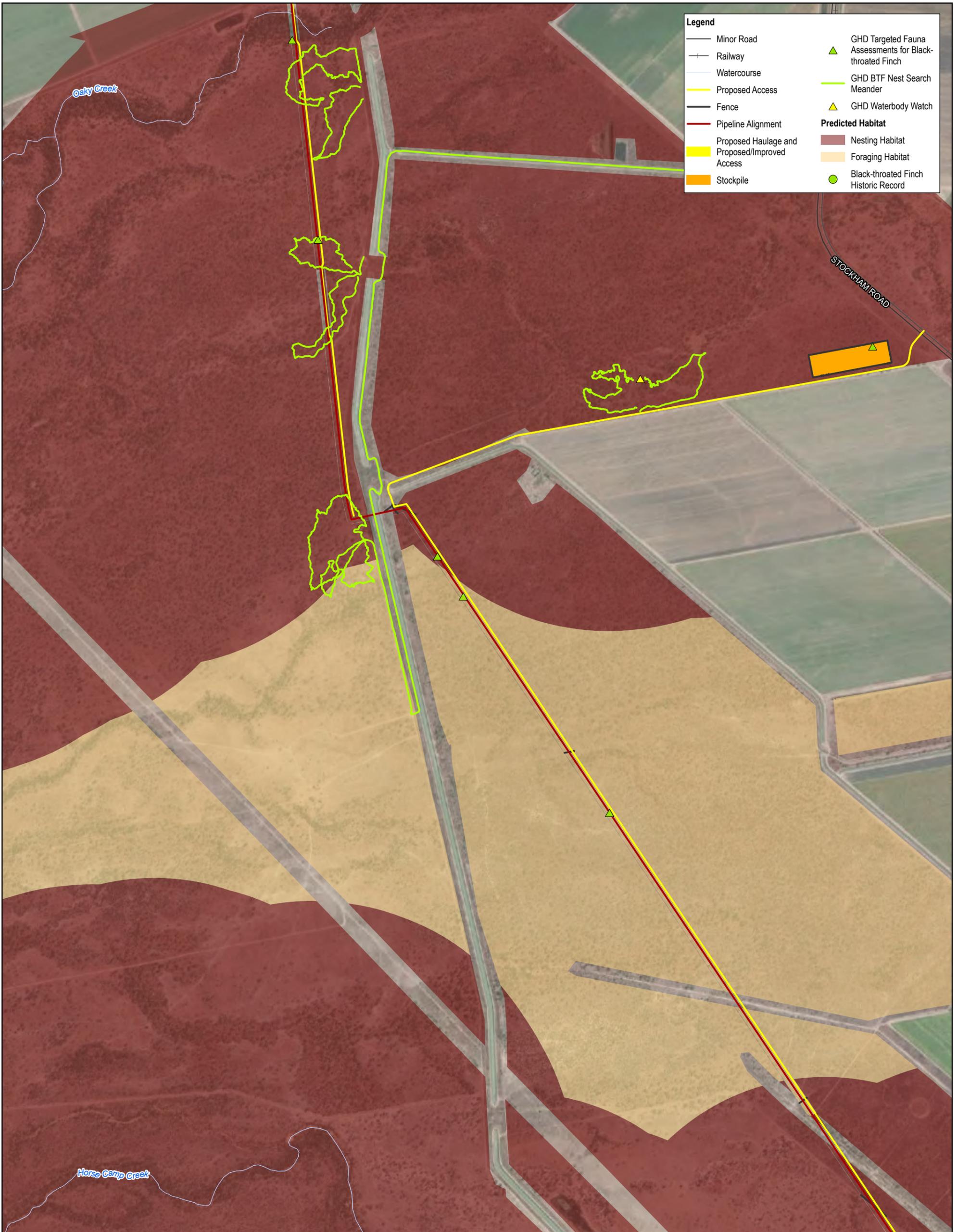


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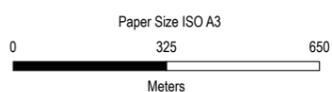
Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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Date 9/25/2022

FIGURE 3-5



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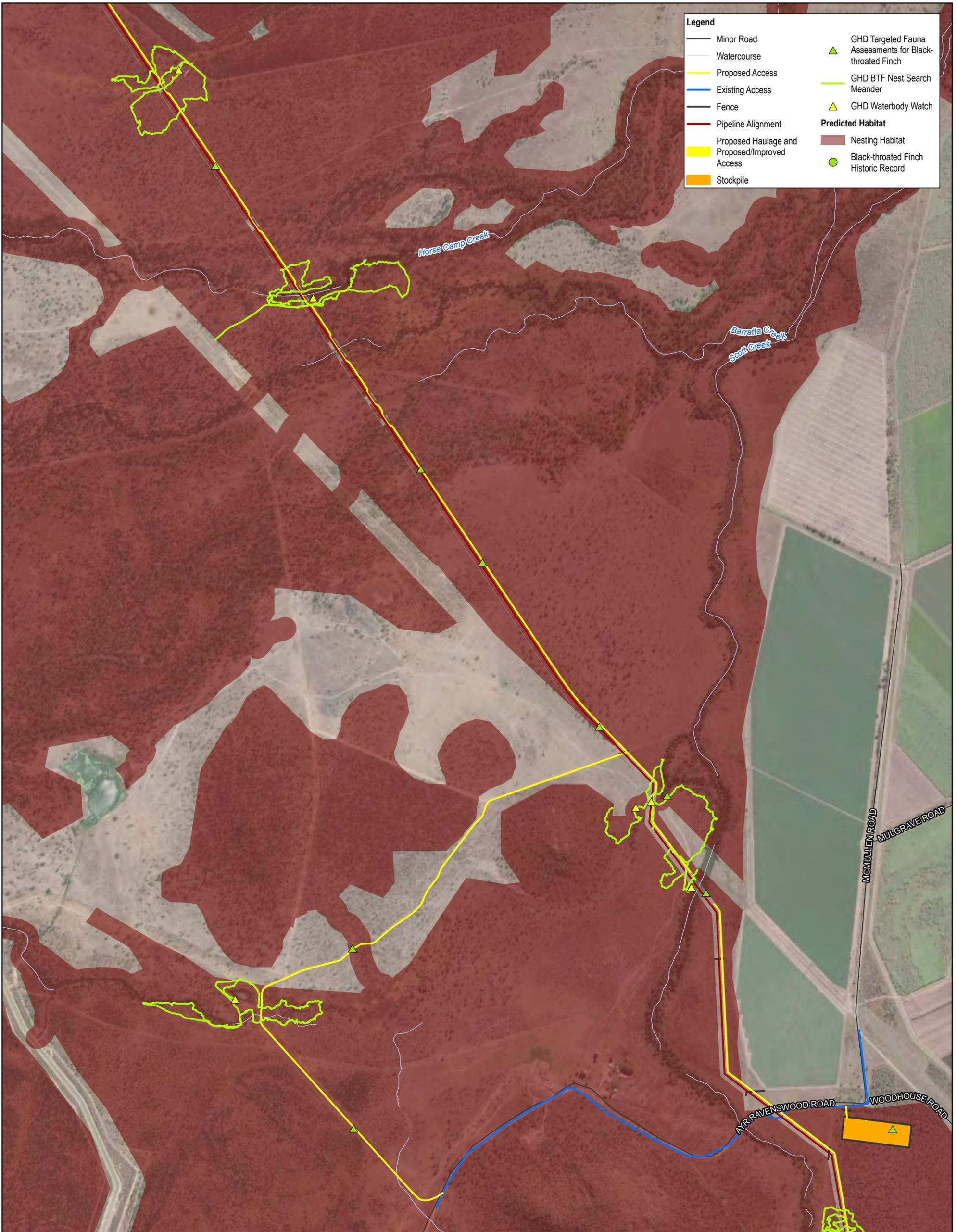
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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 3-5



Legend

— Minor Road	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Watercourse	— GHD BTF Nest Search Meander
— Proposed Access	▲ GHD Waterbody Watch
— Existing Access	Predicted Habitat
— Fence	■ Nesting Habitat
— Pipeline Alignment	● Black-throated Finch Historic Record
■ Proposed Haulage and Proposed/Improved Access	
■ Stockpile	

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Paper Size ISO A3

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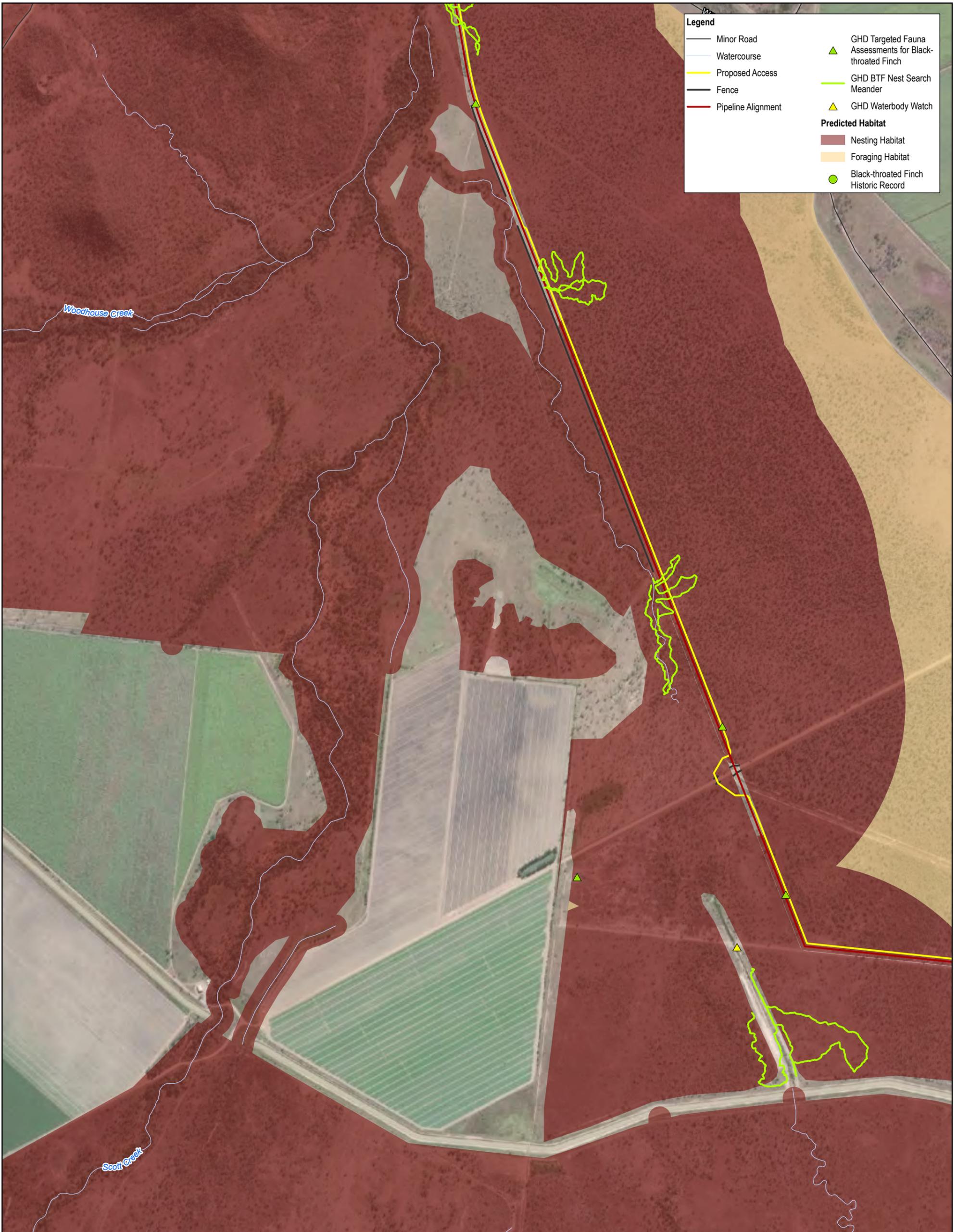


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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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Date 9/25/2022

FIGURE 3-5



Legend

- Minor Road
- Watercourse
- Proposed Access
- Fence
- Pipeline Alignment
- GHD Targeted Fauna Assessments for Black-throated Finch
- GHD BTF Nest Search Meander
- GHD Waterbody Watch

Predicted Habitat

- Nesting Habitat
- Foraging Habitat
- Black-throated Finch Historic Record

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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 3-5



Legend

— Minor Road	▲ GHD Targeted Fauna Assessments for Black-throated Finch
— Railway	— GHD BTF Nest Search Meander
— Watercourse	▲ GHD Waterbody Watch
— Proposed Access	Predicted Habitat
— Fence	■ Nesting Habitat
— Pipeline Alignment	■ Foraging Habitat
■ Proposed Haulage and Proposed/Improved Access	● Black-throated Finch Historic Record
■ Stockpile	

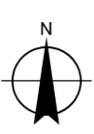
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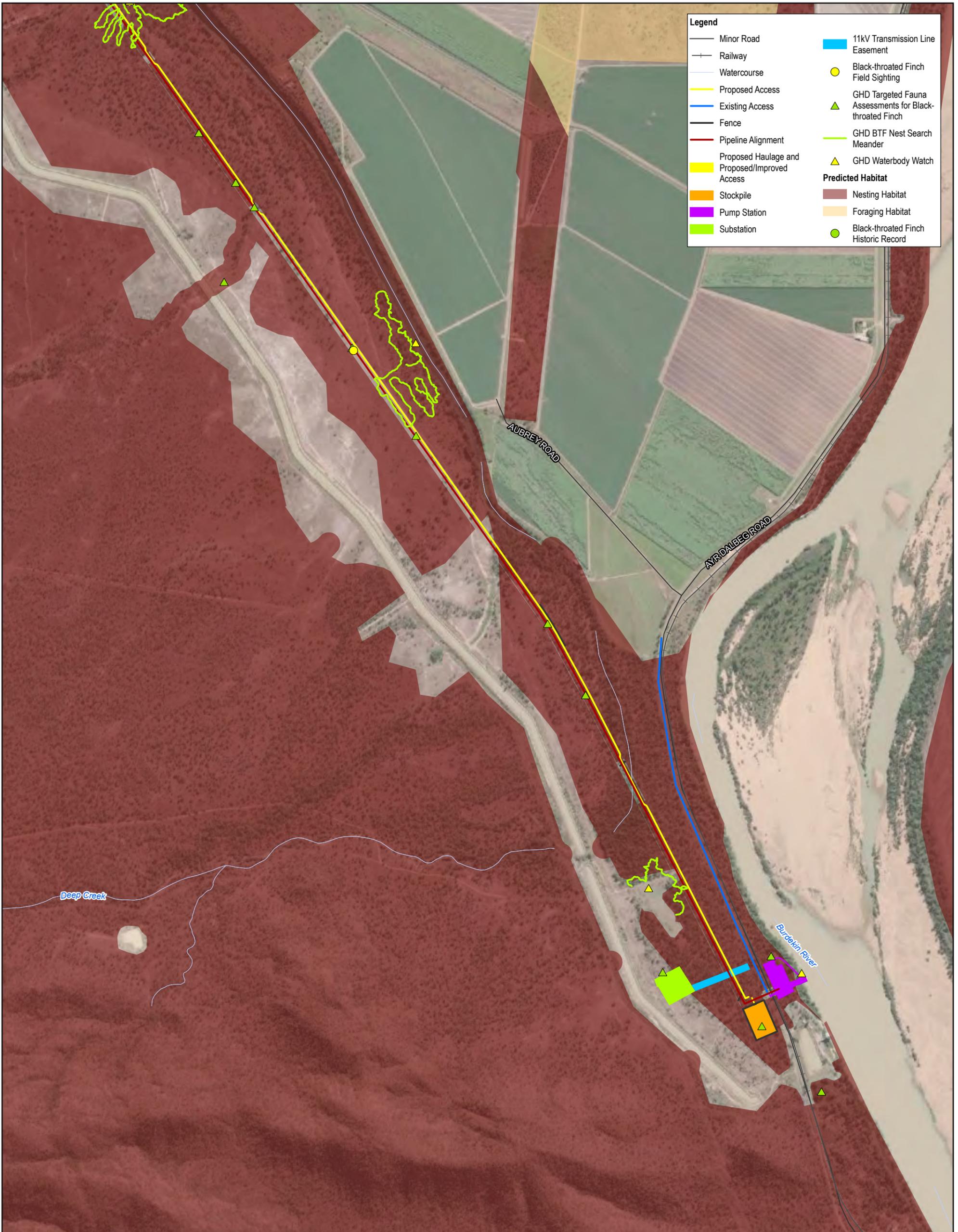


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Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

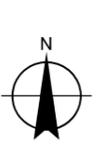
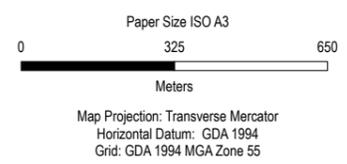
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FIGURE 3-5



Legend	
— Minor Road	11kV Transmission Line Easement
— Railway	Black-throated Finch Field Sighting
— Watercourse	GHD Targeted Fauna Assessments for Black-throated Finch
— Proposed Access	GHD BTF Nest Search Meander
— Existing Access	GHD Waterbody Watch
— Fence	Predicted Habitat
— Pipeline Alignment	Nesting Habitat
Proposed Haulage and Proposed/Improved Access	Foraging Habitat
Stockpile	Black-throated Finch Historic Record
Pump Station	
Substation	

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Haughton Pipeline Stage 2 - MNES Assessment

Distribution of potential black-throated finch (southern) habitat within and surrounding the Project area

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FIGURE 3-5

3.13 Item 3.13

The department notes that the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3* (www.qld.gov.au) outline best practice surveys for the Brigalow Belt region for vertebrate fauna species as one survey set in September to mid-November and another in Autumn (march-mid may before the onset of cold winter nights). The department anticipates the proponent may provide results from further survey efforts in the PD.

3.13.1 Response

A summary of all field assessments is presented in Section 2.3 of the MNES report (GHD 2022) (Appendix B), and in Table 3.6 below. Field surveys that have been undertaken for this Project have included targeted fauna assessments and searches within the seasonal windows recommended for Brigalow Belt fauna in the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3*.

Table 3.6 Summary of ecological survey effort undertaken for the Project

Survey dates	Ecologists	Days	Methodology and survey effort
Baseline surveys – NRA 2021			
21 April 2021 25 – 26 May 2021	2	3	<ul style="list-style-type: none"> – Quaternary RE vegetation assessments – 32 sites – Acoustic bat detectors – 3 deployed – Habitat assessments – Targeted flora and fauna searches
Targeted surveys for EPBC listed species – GHD 2021			
25 – 30 October 2021	3	6	<ul style="list-style-type: none"> – Quaternary RE verification – 8 sites – Targeted flora searches for <i>Eucalyptus raveretiana</i> – 11 sites – Fauna and habitat assessments for black-throated finch (southern) – 35 sites – Koala habitat assessments and targeted koala scat searches using the Spot Assessment Technique (SAT) method – 30 sites – Daytime waterbody watch surveys – 14 sites – Recording location of all hollow-bearing trees including large hollows that represent potential roost sites for bare-rumped sheathtail bat – Driving/flushing surveys for the squatter pigeon (southern) – 464 km (based on two vehicles driving around the Project area over 6 days) – Vigilant bird surveys over 6 x 10 hr days including targeted survey for squatter pigeon (southern) and black-throated finch (southern)
Targeted surveys for EPBC listed species – GHD 2022			
28 March – 1 April 2022	2	5	<ul style="list-style-type: none"> – Area searches around waterbodies in suitable nesting habitat for the black-throated finch (southern), searching for the species and their nests – 14 sites – Targeted koala scat searches using the SAT method – 25 sites – Daytime waterbody watch surveys – 14 sites – Dusk roost watch surveys – 6 sites – Active reptile searches – 24 sites – Vigilant bird surveys over 4 x 10 hr days including targeted survey for black-throated finch, red goshawk and grey falcon – Deployment of four remote cameras for northern quoll – 7 sites – Deployment of two anabat detectors for bare-rumped sheathtail bat – 5 sites
BioCondition surveys – Ecological Interpretation 2022			
15 – 28 March 2022	1	14	<ul style="list-style-type: none"> – Field observations: both quaternary level observations and BioCondition surveys – Land unit mapping derived from air photo interpretation, internal report to Burdekin Dry Tropics – CSIRO land unit mapping from 1952, precursor and foundation to RE mapping in Queensland – Soils mapping Projects (Reid and Baker (1984), Thompson et al. (1990).

4. Impact assessment

4.1 Item 4.1

An assessment of the likely impacts associated with the construction, operational, maintenance and (if relevant) decommissioning components of the Project. The department notes information regarding any impacts during the operation and maintenance were not clear in the referral documentation.

4.1.1 Response

The assessment of likely impacts to MNES associated with the construction, operation and maintenance are detailed in the MNES report (GHD 2022) (Appendix B) and summarised below. Decommissioning is not considered relevant to this Project as the pipeline is intended to exist in perpetuity, providing water security to the greater Townsville region.

As a result of construction, the Project will result in 153.92 ha of total disturbance and 15.64 ha of permanent footprint impacts. Permanent impacts will be associated with parts of the Project footprint that will be cleared for permanent infrastructure. The temporary and permanent impact areas are defined below.

Temporary clearance impacts for MNES

The total temporary disturbance footprint is 138.26 ha

- Construction corridor for the 28.5 km long pipeline alignment – typically consisting of a 40 m wide corridor (for clearing activities, trenching works, pipe installation, fencing and stockpiling of excavated material and topsoil are to be accommodated within the pipeline clearance extents) reducing to a 20 m wide corridor at riparian zones and mapped watercourse/waterway crossings
- Temporary construction access and haulage roads and five stockpile areas for storing materials and equipment

Permanent clearance impacts for MNES

The total permanent disturbance footprint is 15.64 ha

- 4 m wide gravel access road along the length of the pipeline
- Pump station – as per the extent of the pump station site (1.63 ha)
- Intake structure – 11.52 ha for intake structure and access road
- Substation site – 1.7 ha to establish substation
- Power supply works – 0.8 ha for overhead power utility easement and access road

Substantial avoidance has been achieved by locating the Project footprint within areas of existing disturbance (e.g. modified grazing land) wherever possible. Key impacts during the construction phase include localised losses of vegetation and habitat due to clearing for the pipeline, pump station, stockpiles, access and haulage tracks and other ancillary infrastructure. The siting of this infrastructure will result in direct loss of habitat, has the potential for mortality and injury of wildlife, and potential indirect ecological impacts such as the disturbance of wildlife through construction light, noise, vibration, increased vehicle movements, restricted fauna movement and barrier effects, as well as the degradation of adjacent habitats through erosion and sedimentation and weed and pest invasion.

Rehabilitation of temporary works areas will reduce the magnitude of impact on MNES. Despite the comprehensive mitigation and rehabilitation measures proposed in the MNES report (GHD 2022), a significant residual impact is still anticipated on three species, the black-throated finch (southern), bare-rumped sheathtail bat and koala.

The Project's significant residual impacts on MNES after mitigation measures have been considered and are summarised in Table 4.1.

Table 4.1 Summary of impacts on MNES

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significance of impact
Flora species			
<i>Eucalyptus raveretiana</i>	Maximum removal of four individuals	No impact	Not significant
Fauna species			
Koala	Loss of habitat that constitutes habitat critical to the survival of the species (134.19 ha) Total habitat disturbance comprised of 85.94 ha of forest or woodland and 48.25 ha of non-remnant (e.g. road-side, paddock trees) vegetation.	Loss of 134.19 ha of habitat critical to the survival of the species.	Significant
Bare-rumped sheathtail bat	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 325 small <i>E. platyphylla</i> hollows that represent future potential roosting habitat Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Total habitat disturbance of 85.54 ha of foraging habitat and 43.12 ha of roosting habitat	Significant
Black-throated finch (southern)	Indiscriminate loss of trees within 1 km of water Loss of 96.34 ha of suitable habitat (in aggregate), comprising: – Nesting and foraging 82.14 ha – Foraging only 14.19 ha	Indiscriminate loss of trees within 1 km of water associated with pump station and laydown areas Total habitat disturbance of 96.34 ha (in aggregate), comprising 82.14 ha of nesting and foraging and 14.19 ha of foraging only	Significant
Squatter pigeon (southern)	Loss of 96.32 ha (in aggregate), comprising: – 82.33 ha of foraging and breeding habitat – 13.31 ha of foraging only habitat – 0.68 ha of drinking and dispersal habitat	No impact	Not significant
White-throated needletail	No impact – almost exclusively aerial forager and does not have typical associations with habitat, no suitable roosting habitat, non-breeding visitor	No impact	Not significant

Operation and maintenance of the Project will involve the ongoing maintenance of a 21.5 m wide public utility easement, 10 m wide zone influence above the pipeline (where only ground layer stratum is proposed), 4 m wide permanent gravel access road for the length of the pipeline and operation of the pump station and substation. This will include low levels of vehicle movements along the access corridor approximately one a week. No permanent fencing is proposed, other than surrounding the pump station and substation. Due to the nature of the proposed operation and maintenance works, negligible impact is expected on MNES during this phase.

4.2 Item 4.2

Include the direct, indirect, and facilitated loss and/or disturbance of MNES individuals and habitat as a result of the proposed action. This must include the quality of the habitat impacted and quantification of the individuals and habitat area (in hectares) to be impacted.

4.2.1 Response

Direct, indirect and facilitated loss and/or disturbance of MNES individuals and habitat as a result of the proposed action is detailed in the MNES report (GHD 2022) (Appendix B) and habitat quality is described in the BioCondition report (Ecological Interpretation 2022) (Appendix N).

The Project area exists in a region which has undergone substantial disturbance and clearing of vegetation over many decades for agricultural and cattle grazing purposes. Through these processes, the natural environment has undergone substantial alteration and fragmentation of habitat values, including through the sowing of pasture grasses resulting in the spread of invasive weeds. Across substantial areas, the ground and shrub layers were dominated by invasive weeds in localised and widespread areas, including *Themeda quadrivalvis*, *Urochloa mutica* grasses, rubber vine (*Cryptostegia grandiflora*) and chinee apple (*Ziziphus mauritiana*), extensive areas were also disturbed through trampling of the ground layer by cattle. Thirty-six invasive weed species were identified during the GHD field survey (Appendix D), as well as five invasive fauna species, these included wild dog (*Canis familiaris*), feral cat (*Felis catus*), pig (*Sus scrofa*), rabbit (*Oryctolagus cuniculus*) and cane toad (*Rhinella marina*).

Despite this, parts of the Project area contain remnants of very sparse to open woodland, dominated by native *Eucalyptus*, *Corymbia*, *Melaleuca* and *Casuarina* species, with dominant canopy species included *Corymbia dallachiana*, *Eucalyptus platyphylla* and *Corymbia clarksoniana*. Within these remnants, open woodlands were commonly found to have a poor quality understorey (often dominated by non-native species), or dense chinee apple coverage. In the central section of the Project area, it was observed that chinee apple management had been recently undertaken. While these remnants exist within a landscape with high levels of fragmentation occurring particularly to the east of the Project area, areas of remnant vegetation predominantly along riparian corridors provide localised habitat values for birds, mammals, reptiles and amphibians, including breeding habitat. Open woodlands and waterbodies throughout the Project area provide foraging habitat, breeding places, drinking sites, shelter habitat and dispersal corridors for several EPBC Act listed species. Cleared non-remnant vegetation, predominantly in the southernmost and northernmost sections of the Project area, provides foraging habitat for raptors, macropods and other species adapted to open environments. The Project area is connected to larger tracts of remnant habitat further north and west through a State terrestrial corridor, which provides connectivity for species within the wider landscape.

Ecological Interpretation prepared a BioCondition report (Appendix N) which consisted of desktop assessment and field surveys within the proposed pipeline alignment and pump station site. The field surveys were undertaken between 15-28 March 2022 and Regional Ecosystems were verified within the 40 m proposed pipeline alignment and pump station site.

Remnant Regional Ecosystems identified during the BioCondition assessment are detailed in Table 4.2. Field verified Regional Ecosystems are shown in Table 4.3 and shown in Figure 4.1.

Table 4.2 BioCondition Regional Ecosystems within the Project area

RE	VM Act status	Vegetation
Remnant 11.3.7	Least concern	<i>Corymbia</i> spp. Open woodland on alluvial plains
Remnant 11.3.35	Least concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
Remnant 11.3.25b	Least concern	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest
Remnant 11.3.4a	Of concern	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict
Remnant 11.3.31	Of concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. Grassland on alluvial plains
Non-remnant 11.3.35	Category X	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
Non-remnant 11.3.7	Category X	<i>Corymbia</i> spp. Open woodland on alluvial plains
Non-remnant 11.3.31	Category X	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. Grassland on alluvial plains
Non-remnant 11.12.1	Category X	<i>Eucalyptus crebra</i> woodland on igneous rocks

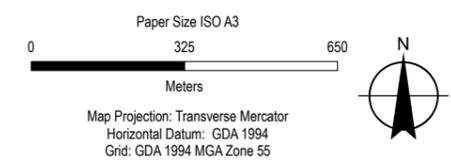
Table 4.3 Field Verified Regional Ecosystem mapping

RE	VM Act Status	Description
11.3.4	Of Concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains
11.3.4a	Of Concern	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict.
11.3.7	Least Concern	<i>Corymbia</i> spp. open woodland on alluvial plains
11.3.9	Least Concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. woodland on alluvial plains
11.3.10	Least Concern	<i>Eucalyptus brownii</i> woodland on alluvial plains
11.3.12	Least Concern	<i>Melaleuca viridiflora</i> , <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains
11.3.13	Of Concern	<i>Grevillea striata</i> open woodland on coastal alluvial plains
11.3.25	Least Concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines
11.3.25b	Least Concern	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest
11.3.25f	Least Concern	Main river channels. Open water or exposed stream beds and bars. Usually devoid of emergent vegetation although scattered trees and shrubs such as <i>Melaleuca viminalis</i> or <i>Melaleuca</i> spp. May be present and aquatic species may be abundant particularly in water holes and lagoons. Occurs in river channels. Riverine
11.3.30	Least Concern	<i>Eucalyptus crebra</i> , <i>Corymbia dallachiana</i> woodland on alluvial plains
11.3.31	Of Concern	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains
11.3.35	Least Concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains
11.3.35a	Least Concern	<i>Corymbia tessellaris</i> , <i>C. clarksoniana</i> and <i>Eucalyptus platyphylla</i> woodland
11.12.1	Least Concern	<i>Eucalyptus crebra</i> woodland on igneous rocks



Legend			
	Minor Road		Proposed Access
	Railway		Existing Access
	Watercourse		Fence
Regional Ecosystems			Pipeline Alignment
	Category A or B area that is least concern		Existing HDPD Pipeline Alignment
	Category C or R area that is least concern		Proposed Haulage and Proposed/Improved Access
	Non-remnant		Stockpile

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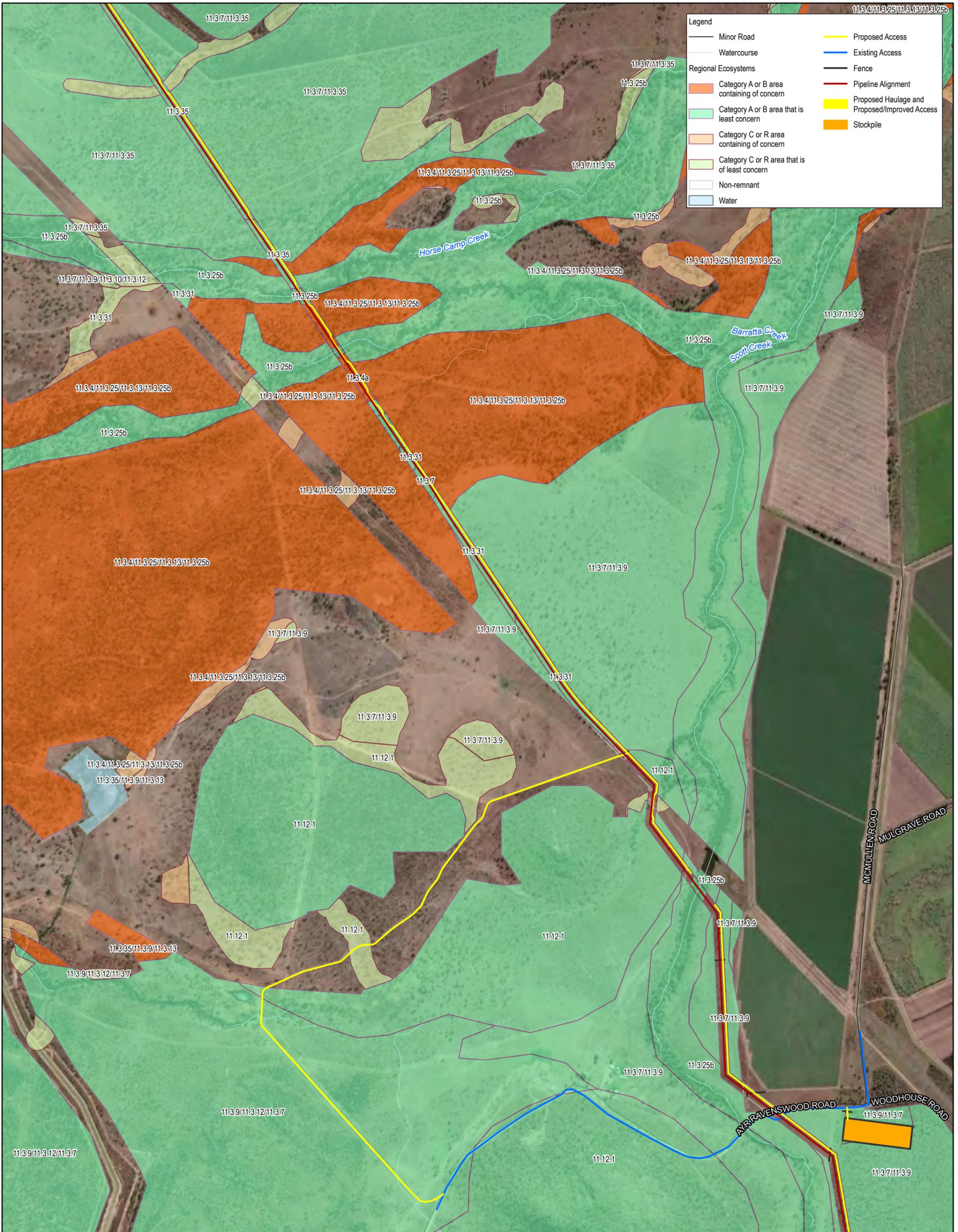


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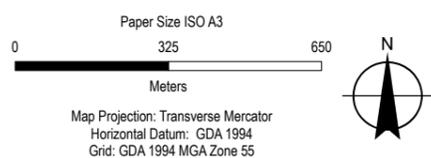
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**Vegetation communities
(regional ecosystems)**

FIGURE 4-1



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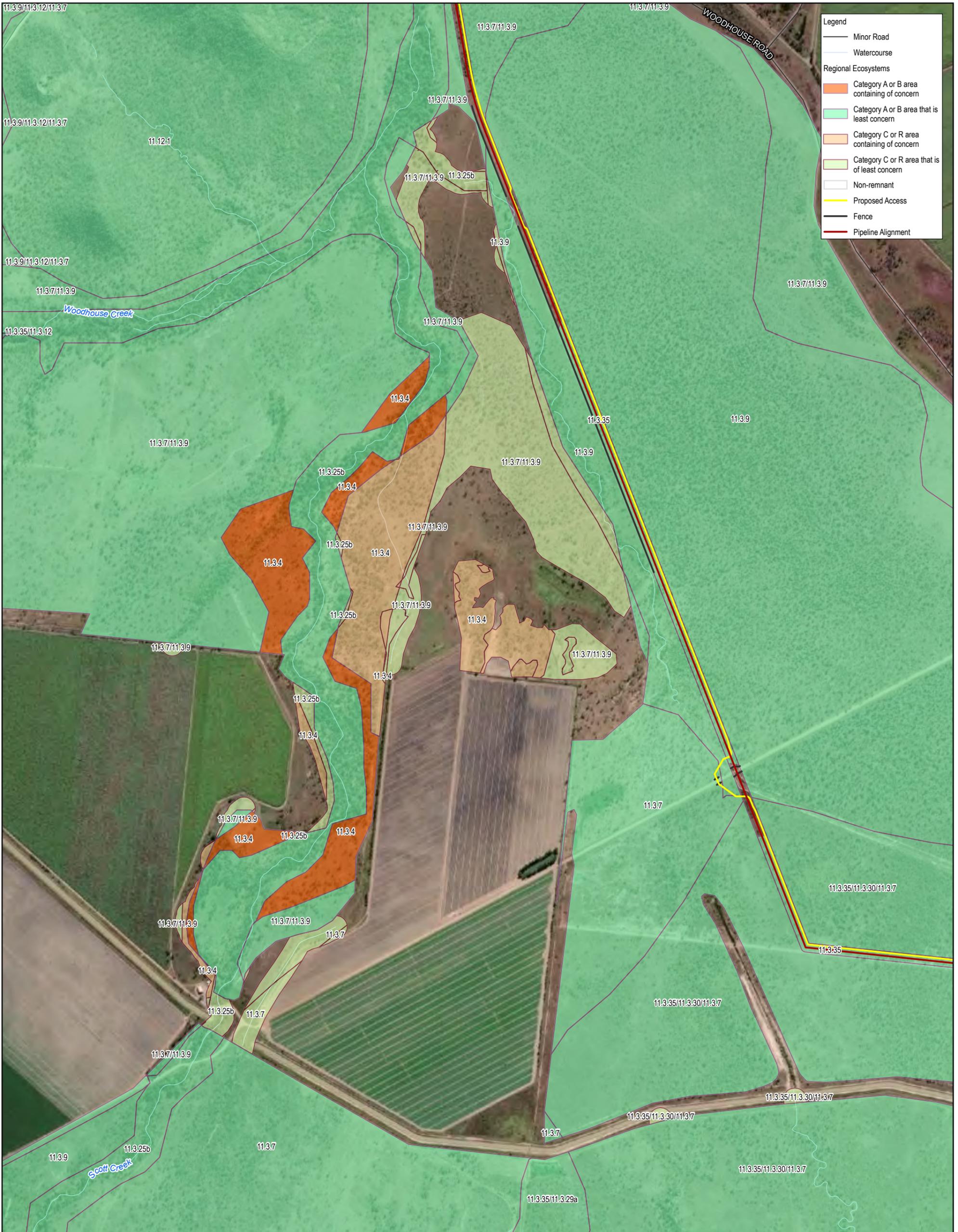


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**Vegetation communities
(regional ecosystems)**

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FIGURE 4-1



Legend

- Minor Road
- Watercourse
- Regional Ecosystems**
 - Category A or B area containing of concern
 - Category A or B area that is least concern
 - Category C or R area containing of concern
 - Category C or R area that is of least concern
 - Non-remnant
 - Proposed Access
 - Fence
 - Pipeline Alignment

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Paper Size ISO A3

0 325 650
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

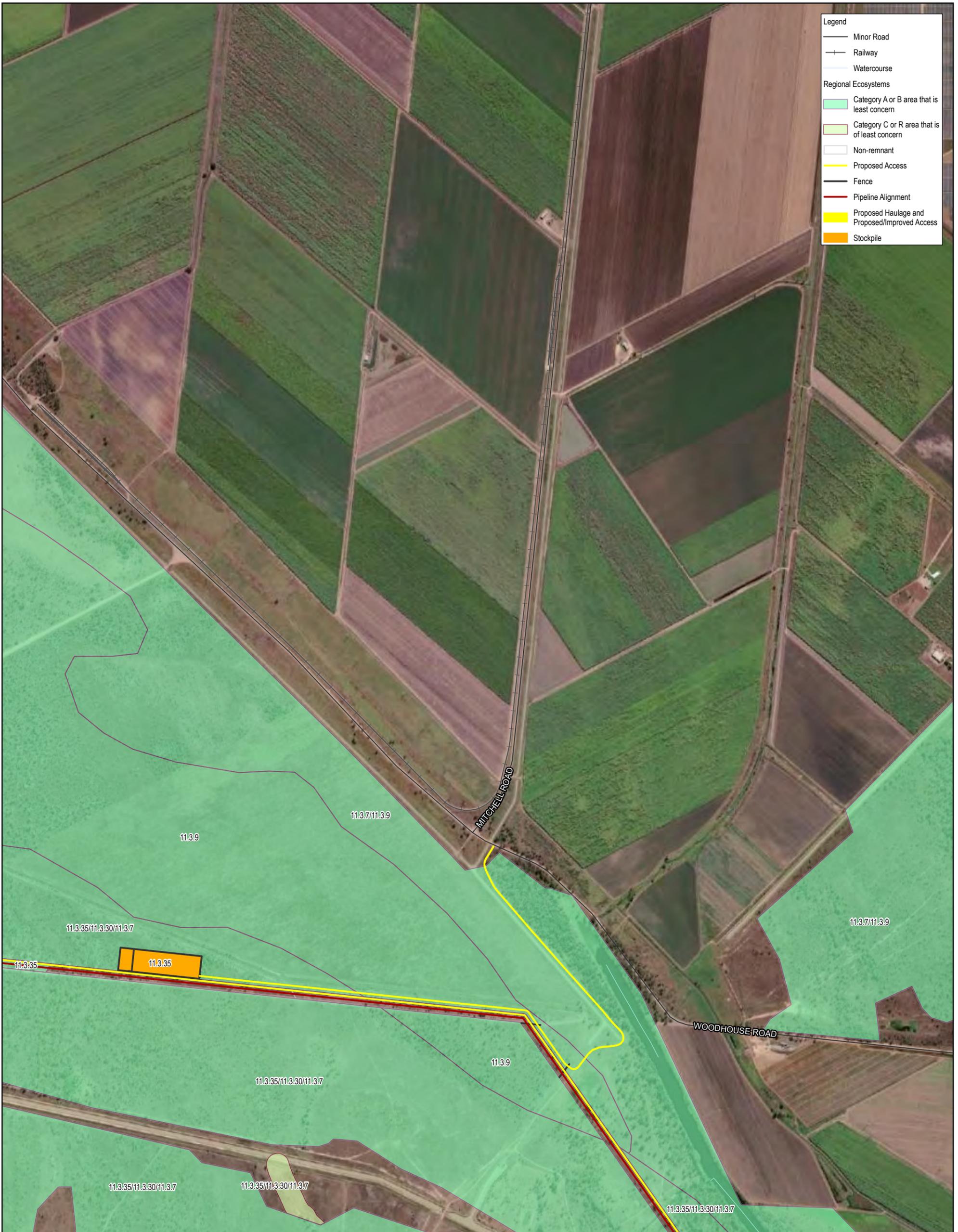


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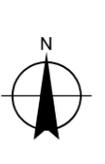
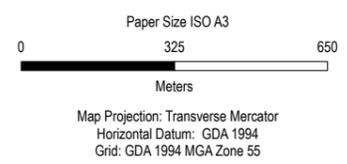
**Vegetation communities
(regional ecosystems)**

FIGURE 4-1



- Legend**
- Minor Road
 - +— Railway
 - Watercourse
 - Regional Ecosystems**
 - Category A or B area that is least concern
 - Category C or R area that is of least concern
 - Non-remnant
 - Proposed Access
 - Fence
 - Pipeline Alignment
 - Proposed Haulage and Proposed/Improved Access
 - Stockpile

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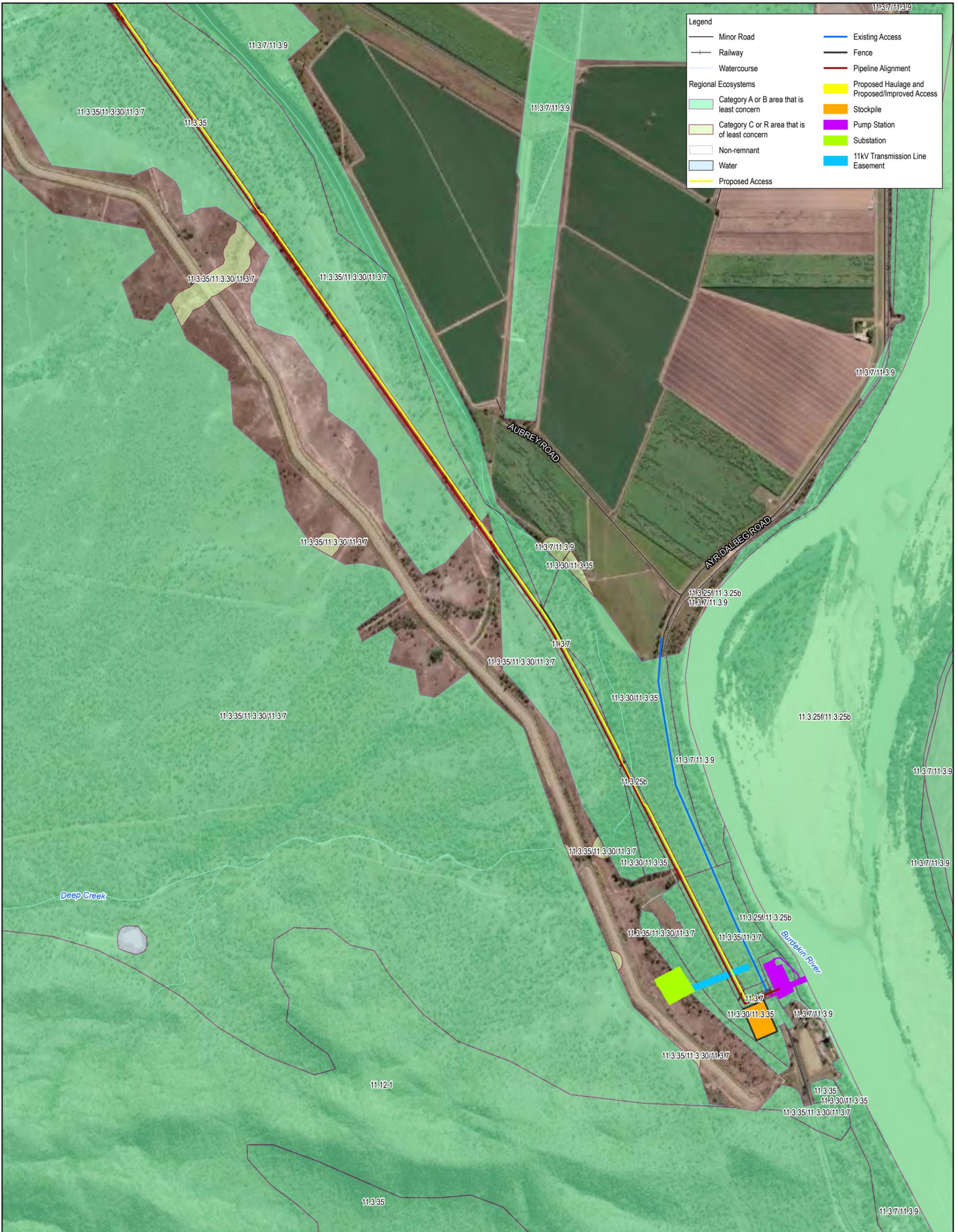


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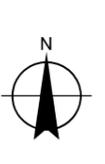
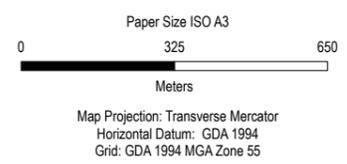
**Vegetation communities
(regional ecosystems)**

FIGURE 4-1



Legend	
— Minor Road	— Existing Access
— Railway	— Fence
— Watercourse	— Pipeline Alignment
Regional Ecosystems	
Category A or B area that is least concern	Proposed Haulage and Proposed/Improved Access
Category C or R area that is least concern	Stockpile
Non-remnant	Pump Station
Water	Substation
Proposed Access	11kV Transmission Line Easement

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**Vegetation communities
(regional ecosystems)**

FIGURE 4-1

The BioCondition results of the alignment are detailed in Table 4.4. Location of BioCondition sites are shown in Figure 4.2. The BioCondition class for all assessment units ranged from 2 to 4 (1 = functional biodiversity condition, 4 = dysfunctional biodiversity condition) indicating that none of the sites were considered functional.

Table 4.4 BioCondition survey results

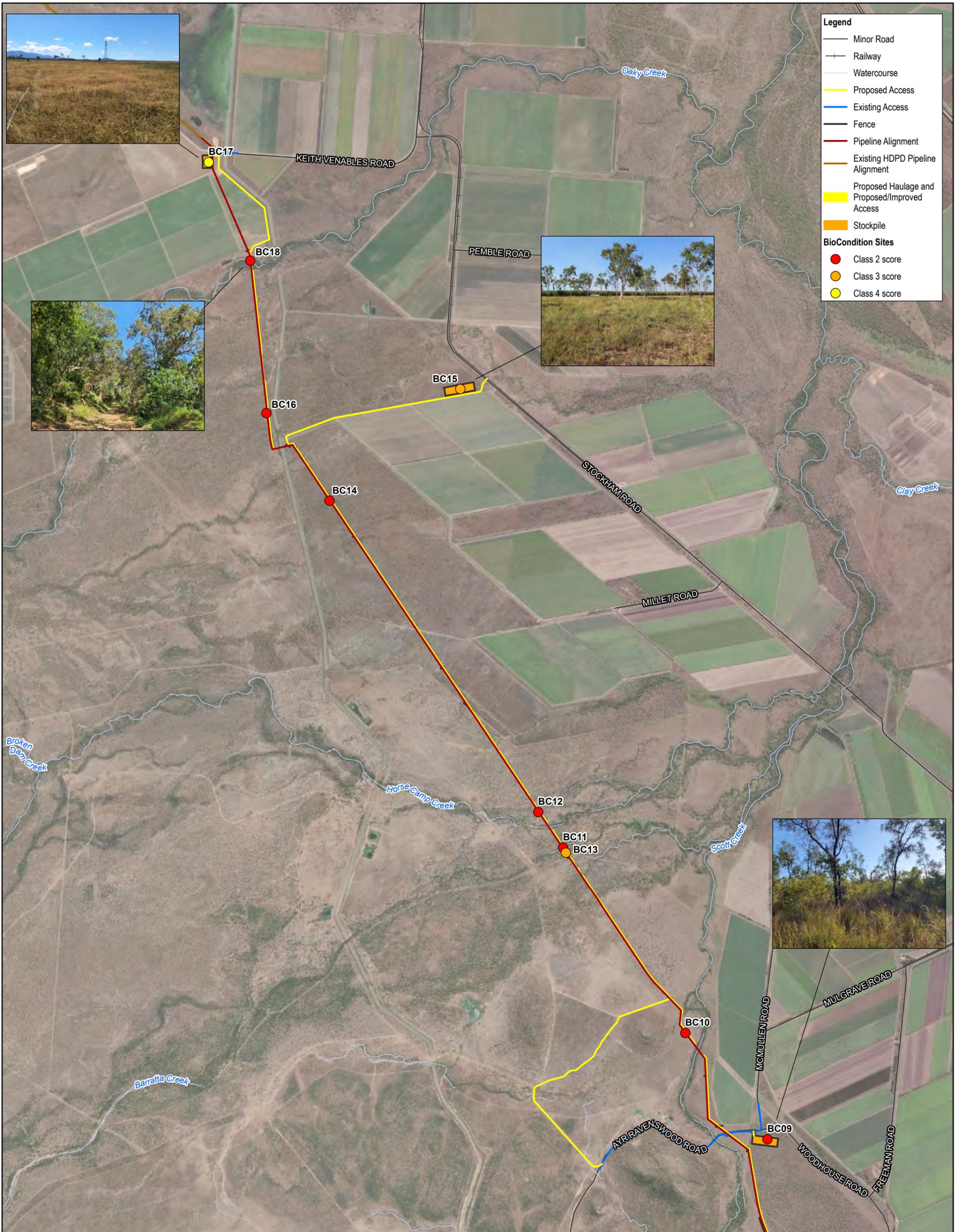
BioCondition Site Number	RE assigned	Assessment Unit	BioCondition Site Score	BioCondition Landscape Score	BioCondition Total Score	BioCondition Class
BC01	11.3.7	AU1	41.5	20	61.5	2
BC02	Non-rem (Originally 11.3.7)	AU7	38	5	43	3
BC03	Non-rem (Originally 11.3.31)	AU15	0	4	4	4
BC04	11.3.35	AU2	47.5	19	4	2
BC05	Non-rem (Originally 11.3.31)	AU16	8	20	66.5	3
BC06	Non-rem (Originally 11.3.31)	AU16	13	20	28	3
BC07	11.3.35	AU2	33	20	23	3
BC08	11.3.35	AU2	48.5	19	53	2
BC09	11.3.35	AU2	45.5	19	67.5	2
BC10	Non-rem (Originally 11.3.30)	AU17	39.5	19	64.5	2
BC11	11.3.25b	AU6	53.5	20	58.5	2
BC12	11.3.35	AU2	43	20	73.5	2
BC13	11.3.4a	AU8	35	20	63	3
BC14	11.3.35	AU2	48	20	55	2
BC15	11.3.35	AU2	43.5	14	68	3
BC16	11.3.35	AU2	51	20	57.5	2
BC17	Non-rem (Originally 11.3.35)	AU5	5.5	0	71	4
BC18	11.3.25b	AU6	47.5	19	5.5	2

Field data collected subsequent to the Referral decision has resulted in a refinement in vegetation mapping. As such, this has had a bearing on the habitat area calculations for MNES (species that were ‘confirmed present’ or are ‘likely to occur’).

Despite the general mitigation and rehabilitation measures proposed in Section 4.2.1 of the MNES report (GHD 2022) (Appendix B), a significant residual is still anticipated on three species, the black-throated finch (southern), bare-rumped sheath-tail bat and koala. The Project’s significant residual impacts on MNES after mitigation measures have been considered are summarised in Table 4.5.

The squatter pigeon (southern) significant impact assessment concluded the Project is unlikely to result in a significant residual impact. This is on the basis of: the Project area is located outside of an ‘important population’ of the subspecies, the small quantum of impact to habitat noting the availability of resources for the subspecies within the local and regional landscape, and the fact that of the impact sub-categories of impacted habitat (i.e. breeding, foraging, drinking), none is limiting (in terms of extent) in the Project area, the local landscape or the broader (e.g. Burdekin) region. On this last point, loss of particularly categories of habitat associated with this project are not

likely to be significant in the context of impacts to habitat critical to the survival of the species, as these habitat categories (i.e. breeding, foraging etc.) frequently co-occur, and none are especially restricted in extent (relative to the other categories of habitat). While the disturbance will have negligible implications for movement, the Project is not likely to lead to a decline in the local, let alone whole-of-range, population of the squatter pigeon (southern). Although suitable breeding and foraging habitat is mapped within the impact area, an 'important population' of the subspecies is not located within the Project area. As such, the Project will not impact habitat critical to the survival of an important population, and thus, the Project is considered **unlikely** to result in a significant impact on the squatter pigeon (southern).



Legend

- Minor Road
- Railway
- Watercourse
- Proposed Access
- Existing Access
- Fence
- Pipeline Alignment
- Existing HDPD Pipeline Alignment
- Proposed Haulage and Proposed/Improved Access
- Stockpile

BioCondition Sites

- Class 2 score
- Class 3 score
- Class 4 score

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Paper Size ISO A3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

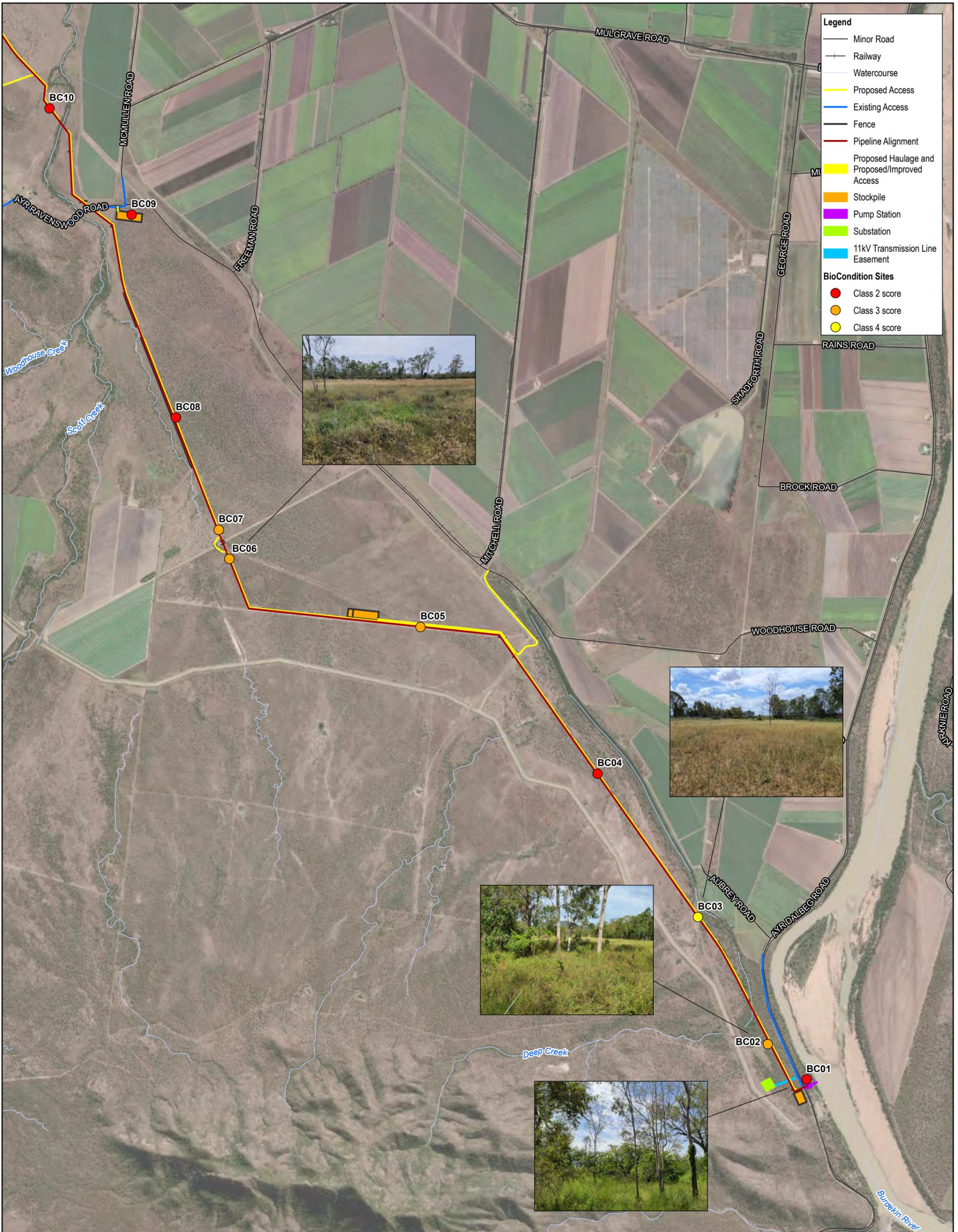


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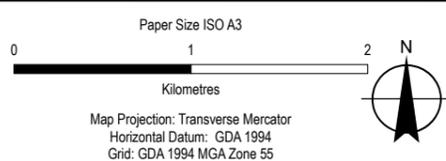
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BioCondition sites and class score

FIGURE 4-2



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BioCondition sites
and class score

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FIGURE 4-2

Table 4.5 Summary of impacts on MNES

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significance of impact
Flora species			
<i>Eucalyptus raveretiana</i>	Maximum removal of four individuals	No impact	Not significant
Fauna species			
Koala	Loss of habitat that constitutes habitat critical to the survival of the species (134.19 ha) Total habitat disturbance comprised of 85.94 ha of forest or woodland and 48.25 ha of non-remnant (e.g. road-side, paddock trees) vegetation.	Loss of 134.19 ha of habitat critical to the survival of the species.	Significant
Bare-rumped sheathtail bat	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 325 small <i>E. platyphylla</i> hollows that represent future potential roosting habitat Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Total habitat disturbance of 85.54 ha of foraging habitat and 43.12 ha of roosting habitat	Significant
Black-throated finch (southern)	Indiscriminate loss of trees within 1 km of water Loss of 96.34 ha of suitable habitat (in aggregate), comprising: – Nesting and foraging 82.14 ha – Foraging only 14.19 ha	Indiscriminate loss of trees within 1 km of water associated with pump station and laydown areas Total habitat disturbance of 96.34 ha (in aggregate), comprising 82.14 ha of nesting and foraging and 14.19 ha of foraging only	Significant
Squatter pigeon (southern)	Loss of 96.32 ha (in aggregate), comprising: – 82.33 ha of foraging and breeding habitat – 13.31 ha of foraging only habitat – 0.68 ha of drinking and dispersal habitat –	No impact	Not significant
White-throated needletail	No impact – almost exclusively aerial forager and does not have typical associations with habitat, no suitable roosting habitat, non-breeding visitor	No impact	Not significant

For EPBC Act listed species considered ‘may occur’ (*Tephrusia leveillei*, ghost bat, large-eared horseshoe bat, yakka skink and Mt Cooper striped lerista) or ‘unlikely to occur’ (northern quoll, red goshawk and grey falcon) within the likelihood of occurrence, the Project is considered to result in minimal to negligible impacts to the aforementioned species. As such, no habitat mapped was undertaken for these species. Additionally, detailed assessments of impacts against the Commonwealth Significant impact guidelines is not considered necessary.

The Project is considered **unlikely** to result in indirect impacts that will significantly affect EPBC Act listed species confirmed present (black ironbox, bare-rumped sheathtail bat, black-throated finch (southern), squatter pigeon (southern)) and considered ‘likely to occur’ (koala and white-throated needletail) within the likelihood of occurrence. The implementation of mitigation measures summarised below will manage potential indirect impacts to threatened species such that residual risk is subsequently managed to a ‘moderate’, ‘low’ or ‘negligible’ risk (outlined further in Section 5.8.1). With the implementation of erosion and sedimentation measures, the Project is

expected to result in minimal to negligible indirect impacts to downstream EPBC Act species and ecological communities.

Key mitigation measures to be implemented during construction, operation and maintenance centred around indirect impacts include the following (not a comprehensive list, further outlined in Section 5.8.1):

- Injury and mortality (i.e. pre-clearance surveys, pest control measures, restricting vehicle movements)
- Fragmentation (utilising existing disturbed areas, limiting permanent fencing)
- Disturbance from noise, light and vibration (lighting to be kept to a minimum, activities to typically occur in daylight hours, implementation of a Traffic Management Plan)
- Habitat degradation (reduce duration of works in watercourses and drainage lines, ESCPs to include appropriate erosion and sediment controls)
- Spread of invasive weeds and pests (waste management plan, as part of the CEMP, weed management plan and weed hygiene protocols, as part of the CEMP)
- Disturbance to surface waterways (reduce duration of works in watercourses and drainage lines, ESCPs to include appropriate erosion and sediment controls).

The Project will accommodate increased water demand in the Townsville region by transporting water from the Burdekin River to Ross River Dam. The transported water will be used for various domestic and industrial uses, were this water use enables new development or exacerbates impacts of existing water users, any such impacts to MNES shall be considered with regard to potential referral to the Commonwealth under the EPBC Act.

To address the significant residual impact on MNES, a dedicated land-based offsets will achieve measurable gains for the black-throated finch (southern), bare-rumped sheathtail bat and koala. Further details on the proposed offset is provided in Section 7.

4.3 Item 4.3

An assessment of the impacts of habitat fragmentation in the proposed action area and surrounding areas, including consideration of species' movement patterns.

4.3.1 Response

As detailed in the MNES report (GHD 2022) (Appendix B), the Project area occurs within a landscape which has undergone extensive disturbance and clearing of vegetation because of agricultural production (namely sugar cane and cattle grazing). The condition of ecosystems (and habitats) across large tracts of the Project area has been degraded by vegetation clearance, cattle grazing, sowing of exotic pasture grasses and the presence of weeds. Non-remnant cleared areas are scattered across the Project area, predominantly in the southern and northernmost sections.

As much of the Project area has been located in open woodland areas already subject to grazing, the impacts of habitat fragmentation are expected to be relatively minor and localised. The construction of the Project will result in localised fragmentation where it intersects tracts of open woodland, as in these areas, clearing of vegetation for the buried pipeline (required to a width of 40 m), pump station and stockpiles are required. However, the localised scale at which this will occur is unlikely to significantly restrict fauna movement. The movement of conservation significant species that are known to occur within the Project area is unlikely to be limited by the open spaces created (refer Table 4.6 below). Consequently, the fragmentation of habitat is expected to have only temporary impacts on the movement of EPBC Act listed species known or likely to occur at/near the Project area..

The Queensland DES has developed a 'landscape fragmentation and connectivity assessment tool' (the LFC tool) which is used to assess connectivity impacts at the local (5 km) and regional scale (20 km). The LFC tool determines the significance of a proposed impact on connectivity areas by assessing:

1. Whether the change in the core ecosystem extent at the local scale (post impacts) is greater than a threshold determined by the level of fragmentation at the regional scale; or
2. If any core area (greater than or equal to one hectare) is lost or reduced to patch fragments (core to non-core).

The LFC tool was run for the landscape in which the proposed pipeline is sited, and the analysis determined there would **not** be a significant impact on connectivity areas as there are no core remnant areas within and adjacent to the Project area.

Table 4.6 provides further assessment on the impacts of habitat fragmentation on MNES conservation significant species confirmed present or considered 'likely to occur'.

Table 4.6 *Habitat fragmentation impacts on MNES conservation significant species*

Scientific name	Common name	EPBC Act status	Impacts of habitat fragmentation
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	Squatter pigeon (southern) utilises habitats that have been subject to high levels of fragmentation, occurring in sparse, modified grassland, and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. Accordingly, the Project will result in negligible fragmentation of habitat for the squatter pigeon (southern).
<i>Phascolarctos cinereus</i>	Koala	E	The majority of proposed infrastructure is located within woodland and open woodland, in land where fragmentation impacts already exist from agricultural production. The pipeline alignment will result in temporary habitat loss which will largely be reinstated and rehabilitated with native flora species (albeit, recognising a time lag for vegetation reestablishment). The Project will result in a loss of 134.19 ha of koala habitat. Habitat loss will be small in the context of the local and regional landscape and will not create large gaps that present barriers to koala movement. Large areas of habitat west and south of the Project connect the Project area via a State terrestrial corridor for koala dispersal and movement these areas will not be impacted. The Commonwealth approved conservation advice for the koala describes koala habitat as including safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches, where these areas sufficiently provide quality food and shelter trees. Accordingly, the species is unlikely to be impacted by the narrow, linear disturbance associated with the Project.
<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheathtail bat	V	Within the Project area, bare-rumped sheathtail bat habitat has already been subjected to a high level of fragmentation, occurring in sparse, modified grassland and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. The Project will have direct impact on habitat for the bare-rumped sheathtail bat, resulting in impact to 92.23 ha of suitable habitat (in aggregate, 36.44 ha of overlapped habitat), comprising 85.54 ha of suitable foraging and 43.12 ha of suitable roosting habitat from a relatively dispersed area. The Project footprint generally supports hollows smaller than those typically required by the species, with habitat supporting these trees localised along the Project footprint and similar habitat persisting immediately adjacent. Along the length of the Project alignment only 10 large and 27 medium sized hollows representing potentially suitable roosting habitat for the species will be subject to clearing. An additional 325 small hollows representing future roosting habitat will also be cleared. The bare-rumped sheathtail bat can fly large distances and can cross open ground (TSSC 2016). As such, the species' habitat is unlikely to be fragmented by the narrow disturbance corridor required for the Project.
<i>Poephila cincta cincta</i>	Black throated finch (southern)	E	Vegetation clearing for the Project will not result in vegetation loss greater than 1 km (in an east-west direction). with no broad-scale fragmentation of habitat resulting or barriers to movement imposed. While small and narrow areas (i.e. 40 m alignment width) will be cleared for the Project, the subspecies is known to traverse across inhabitable areas where distances are less than a kilometre (DEWHA 2009a). The Project is located in a landscape with existing fragmentation, particularly to the east of the Project area where large areas of vegetation have been historically cleared for sugar cane farming. The Project is unlikely to have any bearing on landscape-level connectivity and metapopulation dynamics, noting that the Project does not sever connectivity to mapped 'important habitat areas' for the subspecies.

Scientific name	Common name	EPBC Act status	Impacts of habitat fragmentation
			Localised clearance of habitat will not restrict ongoing access to riparian habitats or the capacity for the subspecies to move between habitats within the local landscape.
<i>Hirundapus caudacutus</i>	White-throated needletail	V, Mig	The white-throated needletail is not directly dependent on terrestrial habitats at ground level and has the capacity to fly over cleared and fragmented areas. Accordingly, the Project will result in no direct loss or fragmentation of habitat for the white-throated needletail.
Key: EPBC Act – E – Endangered, V – Vulnerable, Mig - Migratory			

4.4 Item 4.4

An assessment of the likely duration of impacts to MNES as a result of the proposed action.

4.4.1 Response

As detailed in the MNES report (GHD 2022) (Appendix B), completion of the Project is scheduled to take place over a period of approximately three years, with mobilisation works to commence in April 2023 for site establishment and construction of temporary access tracks and laydown areas. Pipeline and pump station construction is scheduled to take approximately 2.3 years, commencing April 2023 and be completed by the end of July 2025.

Construction will generally be undertaken during daylight hours.

The general construction program is detailed in Table 4.7.

Table 4.7 HPS2 construction program – current at time of publishing – wet season may impact

Pipeline	
Construction activity	Date
Site establishment	April 2023 to May 2023
Clearing	May 2023 to August 2023
Commence pipeline	August 2023
Pipeline corridor revegetation	September 2023 to August 2024 (progressive rehabilitation as construction works advance)
Access roads and stockpile yards revegetation	April 2024 to January 2025
Complete pipeline	February 2025
Defects liability period (construction and rehabilitation monitoring warranty period)	February 2025 to February 2026
Pump station	
Construction activity	Date
Site establishment	April 2023 to May 2023
Commence pump station	May 2023
River bank stabilisation and revegetation	August 2023 to November 2023
High level bank revegetation	February 2025 to April 2025
Complete pump station	July 2025
Defects liability period (construction and rehabilitation monitoring warranty period)	July 2025 to July 2026

Impacts to EPBC Act listed species that are known or likely to occur are primarily associated with the clearing of potential habitat and potential injury and mortality. Anticipated indirect impacts are expected to include barrier effects and restriction of movement, habitat degradation by increased dust runoff and sedimentation, disturbance

from increased light, noise and vibration, introduction and spread of invasive pests and weeds and disturbance of surface waterways and waterbodies. However, the risk as detailed in the MNES report (GHD 2022) (Appendix B) is expected to be low to moderate following the implementation of control mitigation measures outlined in the MNES report (GHD 2022) and in Table 4.10 and Table 4.11 below.

Table 4.8 Summary of impacts and mitigation measures (construction)

Impacting process	Mitigation and management measures
Loss of habitat	Clearing restricted to minimum area required for Project footprint Clearing areas to be clearly identified during construction Existing disturbed areas to be utilised Rehabilitation of nominated disturbance footprint areas Implementation of a CEMP and ESCP Environmental awareness training for construction personnel
Injury or mortality	Pre-clearance surveys and clearing activities to be supervised by a qualified fauna spotter catcher Adverse incident response procedures implemented CEMP to include protocols on fauna injury and mortality
Fragmentation of habitat and loss of connectivity	Activities to be undertaken in existing disturbed areas Reinstatement and rehabilitation of temporarily disturbed areas at nominated locations as soon as practicable
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Construction activities to typically occur in daylight hours (unless night works are required for road crossings) Implementation of a Traffic Management Plan Maintenance schedule for construction vehicles
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the CEMP Weed management plan and weed hygiene protocols, as part of the CEMP Vehicle movements to remain on dedicated tracks
Disturbance of surface waterways and waterbodies	Reduce duration of works in watercourses and drainage lines Monitor weather events when working within watercourses Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation ESCPs to include appropriate erosion and sediment controls

It is noted that rehabilitation of much of the disturbance footprint will be undertaken to help mitigate impacts to EPBC Act listed species arising from the clearing of vegetation. However, it is recognised that there will be a time lag between rehabilitation works and the reestablishment of vegetation (especially woody vegetation). The temporal program for rehabilitation is described in more detail in section 6 below.

Operational impacts will persist for the life of the pipeline, but the exposure of MNES to operation-related impacts will be infrequent, and the risk of impact very low. These impacts are summarised in Table 4.84 below.

Table 4.9 Summary of impacts and mitigation measures (operation)

Impacting process	Mitigation and management measures
Injury or mortality	Low level vehicle movement approximately once per week along corridor
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Operational works will typically be performed in daylight hours
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the CEMP Weed management plan and weed hygiene protocols, as part of the CEMP Vehicle movements to remain on dedicated tracks

4.5 Item 4.5

A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.

4.5.1 Response

As detailed in the MNES report (GHD 2022) (Appendix B), operation and maintenance of the Project will involve the ongoing maintenance of a 21.5 m wide public utility easement, 10 m wide zone of influence above the pipeline (where only ground layer stratum is proposed), 4 m wide permanent gravel access road for the length of the pipeline and operation of the pump station and substation. This will include low levels of vehicle movements along the access corridor approximately one a week. No permanent fencing is proposed, other than surrounding the pump station and substation.

The pipeline will be subject to a hydrostatic pressure test of 2,000kPa (on completion of construction), this being higher than the pipeline normal operating pressure, and an operational commissioning period to prove the performance of the installation. If the pipeline fails at a location along the alignment at subsequent stages of the asset life, minimum clearing and excavation in proximity to the failed section will be required to repair the pipeline. Accordingly, due to the nature of the proposed operation and maintenance works, negligible impacts are expected on MNES conservation significant species during this phase.

4.6 Item 4.6

A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.

4.6.1 Response

The assessment of likely impacts to MNES associated with the construction, operation and maintenance phases of the Project are detailed in the MNES report (GHD 2022) (Appendix B) and are summarised below.

As a result of construction, the Project will result in 153.9 ha of total disturbance and 15.64 ha of permanent disturbance footprint impacts. Permanent impacts will be associated with parts of the Project footprint that will be cleared for permanent infrastructure. The temporary and permanent impact areas are defined below.

Temporary clearance impacts for MNES

- Construction corridor for the 28.5 km long pipeline alignment – typically consisting of a 40 m wide corridor (for clearing activities, trenching works, pipe installation, fencing and stockpiling of excavated material and topsoil are to be accommodated within the pipeline clearance extents) reducing to a 20 m wide corridor at riparian zones and mapped watercourse/waterway crossings.
- Temporary construction access and haulage roads and five stockpile areas for storing materials and equipment

Permanent clearance impacts for MNES

- 4 m wide gravel access road along the length of the pipeline
- Pump station – as per the extent of the pump station site (1.63 ha)
- Intake structure – 11.52 ha for intake structure and access road
- Substation site – 1.7 ha to establish substation
- Power supply works – 0.8 ha for overhead power line from the substation to the pump station

Operation and maintenance of the Project will involve the ongoing maintenance of a 21.5 m wide public utility easement, 10 m wide zone influence above the pipeline (where only ground layer stratum is proposed), 4 m wide permanent gravel access road for the length of the pipeline and operation of the pump station and substation. This will include low levels of vehicle movements along the access corridor approximately one a week. No permanent fencing is proposed, other than surrounding the pump station and substation. Due to the nature of the proposed operation and maintenance works, negligible impact is expected on MNES during this phase.

Where species were confirmed present or considered 'likely to occur', species-specific mitigation measures have been detailed within this document and the MNES Report (Appendix B). Accordingly, potential for unknown, unpredictable or irreversible impacts have been assessed and discussed.

For MNES considered 'unlikely to occur', potential for impacts are considered negligible. This is applicable for species whose distribution is outside of the Project area, where suitable habitat is absent and where no historical records persist within the desktop search extent.

For MNES considered 'may occur', potential impacts including unknown, unpredictable and irreversible impacts measures that have been outlined for confirmed and 'likely to occur' MNES. Specifically, 'may occur' species include (fauna only): ghost bat, large-eared horseshoe bat, yakka skink and Mount Cooper striped lerista. For these 'may occur' fauna species, the general mitigation measures relating to avoiding/minimising fauna mortality, minimising disturbance and preventing degradation to adjacent habitat (as listed in Table 4.10, Table 4.11 and Table 4.12) which are to be implemented during construction, operation and/or maintenance of the Project area are applicable to reduce the potential for unknown, unpredictable or irreversible impacts for these species with lower likelihood of occurrence.

Table 4.10 Summary of impacts and mitigation measures (construction)

Impacting process	Mitigation and management measures
Loss of habitat	Clearing restricted to minimum area required for Project footprint Clearing areas to be clearly identified during construction Existing disturbed areas to be utilised Rehabilitation of nominated disturbance footprint areas per Rehabilitation Plan Implementation of a CEMP and ESCP Environmental awareness training for construction personnel
Injury or mortality	Pre-clearance surveys and clearing activities to be supervised by a qualified fauna spotter/catcher Adverse incident response procedures implemented CEMP to include protocols on fauna injury and mortality
Fragmentation of habitat and loss of connectivity	Activities to be undertaken in existing disturbed areas Reinstatement and rehabilitation of temporarily disturbed areas at nominated locations as soon as practicable
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Construction activities to typically occur in daylight hours (unless night works are required for road crossings) Implementation of a Traffic Management Plan Maintenance schedule for construction vehicles
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the CEMP Weed management plan and weed hygiene protocols, as part of the CEMP

Impacting process	Mitigation and management measures
	Vehicle movements to remain on dedicated tracks
Disturbance of surface waterways and waterbodies	Reduce duration of works in watercourses and drainage lines Monitor weather events when working within watercourses Reduce speed limits (40 km/hr) during dry conditions to reduce dust generation and potential sedimentation ESCPs to include appropriate erosion and sediment controls

Table 4.11 Summary of impacts and mitigation measures (operation)

Impacting process	Mitigation and management measures
Injury or mortality	Low level vehicle movement approximately once per week along corridor
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Operational works will typically be performed in daylight hours
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the CEMP Weed management plan and weed hygiene protocols, as part of the CEMP Vehicle movements to remain on dedicated tracks

Table 4.12 Summary of impacts and mitigation measures (maintenance)

Impacting process	Mitigation and management measures
Injury or mortality	Adverse incident response procedures implemented CEMP to include protocols on fauna injury and mortality
Disturbance to habitat from noise, light, and vibration	Lighting to be kept to a minimum (unless required for safety reasons) Maintenance activities to typically occur in daylight hours (unless night works are required for road crossings)
Habitat degradation and increased erosion	ESCPs to include appropriate erosion and sediment controls Vehicle movements to remain on dedicated tracks
Spread of invasive species	Waste management plan, as part of the CEMP Weed management plan and weed hygiene protocols, as part of the CEMP Vehicle movements to remain on dedicated tracks

Accordingly, the impacts are well defined and understood. The loss of habitat as a result of clearing is considered the main impacting process to MNES conservation significant species. Irreversible impacts associated with the Project will be limited to:

- 4 m wide gravel access road along the length of the pipeline
- Pump station – as per the extent of the pump station site (1.63 ha)
- Intake structure – 11.52 ha for intake structure and access road
- Substation site – 1.7 ha to establish substation
- Power supply works – 0.8 ha for overhead power line from the substation to the pump station.

4.7 Item 4.7

Justification, with supporting evidence, how the proposed action will not be inconsistent with:

- Australia’s obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and
- Statutory documents, including relevant recovery plans, conservation advice/s, and/or threat abatement plans.

4.7.1 Response

Despite the general mitigations measures proposed hereabouts, and in Section 4.3 of the MNES report (GHD 2022) (Appendix B), a significant residual is still anticipated on three species, the black-throated finch (southern), bare-rumped sheathtail bat and koala. The Project’s significant residual impacts on MNES after mitigation measures have been considered and summarised in Table 4.13. These will be addressed through a dedicated land-based offsets that will achieve measurable gains for the black-throated finch (southern), bare-rumped sheathtail bat and koala.

In summary, the Project’s strict adherence to the mitigation hierarchy, underpinned by careful consideration of statutory documents including relevant recovery plans, conservation advice/s, and/or threat abatement plans, will embed a framework of management of MNES that achieves outcomes consistent with the Convention on Biological Diversity (including the proposed Post-2020 Global Biodiversity Framework) – in broad terms, maintaining species populations, and enhancing the extent and quality of ecosystems. These endeavours, which will be designed to be consistent with Commonwealth statutory documents for MNES species conservation and recovery, will also satisfy applicable objectives of the APIA Convention, while trade in endangered species is not applicable to this Project (e.g. CITES), as the taking of species from this landscape for illegal trade is not a known threat.

Table 4.13 Summary of impacts on MNES

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significance of impact
Flora species			
<i>Eucalyptus raveretiana</i>	Maximum removal of four individuals	No impact	Not significant
Fauna species			
Koala	Loss of habitat that constitutes habitat critical to the survival of the species (134.19 ha) Total habitat disturbance comprised of 85.94 ha of forest or woodland and 48.25 ha of non-remnant (e.g. road-side, paddock trees) vegetation.	Loss of 134.19 ha of habitat critical to the survival of the species.	Significant
Bare-rumped sheathtail bat	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Loss of 325 small <i>E. platyphylla</i> hollows that represent future potential roosting habitat Loss of 92.23 ha of suitable habitat (in aggregate) (36.44 ha of foraging and roosting habitat overlap), comprising: – Foraging habitat 85.54 ha – Roosting habitat 43.12 ha	Loss of 10 large and 27 moderate-sized <i>E. platyphylla</i> hollows that represent potential roosting habitat (i.e. habitat critical to the survival of the species) Total habitat disturbance of 85.54 ha of foraging habitat and 43.12 ha of roosting habitat	Significant
Black-throated finch (southern)	Indiscriminate loss of trees within 1 km of water Loss of 96.34 ha of suitable habitat (in aggregate), comprising: – Nesting and foraging 82.14 ha – Foraging only 14.19 ha	Indiscriminate loss of trees within 1 km of water associated with pump station and laydown areas Total habitat disturbance of 96.34 ha (in aggregate), comprising 82.14 ha of nesting and foraging and 14.19 ha of foraging only	Significant

Matter	Impact	Impact on important habitat/habitat critical to the survival of the species	Significance of impact
Squatter pigeon (southern)	Loss of 96.32 ha (in aggregate), comprising: <ul style="list-style-type: none"> – 82.33 ha of foraging and breeding habitat – 13.31 ha of foraging only habitat – 0.68 ha of drinking and dispersal habitat 	No impact	Not significant
White-throated needletail	No impact – almost exclusively aerial forager and does not have typical associations with habitat, no suitable roosting habitat, non-breeding visitor	No impact	Not significant

4.8 Item 4.8

An assessment of the cumulative impacts of the proposed action (inclusive of Stage 1 and Stage 1.1 of the pipeline).

4.8.1 Response

HPDP EPBC Referral and Ecological Assessment (NRA 2016)

The HPS2 Project includes a pipeline and pump station and associated ancillary infrastructure, connecting to the constructed Stage 1 and Stage 1.1 Haughton Pipeline Duplication Project (HPDP), to provide a complete raw transfer system from the Burdekin River to the Ross River Dam.

Stage 1 of the HPDP was completed in 2020 and comprised approximately 33 km of DN1800 pipeline constructed from the Haughton River to Toonpan Creek at the head of Ross River Dam. Stage 1.1 of the HPDP was completed in 2021 and is an extension of the Stage 1 pipeline works from the Haughton River by 3.8 km, directed towards the Stage 2 pipeline alignment. The Stage 1.1 works ended with an isolation valve pit and is the connection point for Stage 2.

The Stage 1 Project area is approximately 40 km (from its mid-point) south-east of Townsville, at the base of Mount Elliot range. The alignment follows the existing Haughton Pipeline (which runs within a 10 m easement), and for the majority of its length the proposed alignment also follows a high voltage transmission line easement (approximately 70 m in width). Much of the Stage 1 pipeline was constructed near to the alignment of the existing Haughton Pipeline (began operations in 1988), which runs within a 20 m easement, in a north-westerly direction from the Upper Haughton Irrigation Channel for approximately 36 km to the head of the Ross Dam. The total area of disturbance for the HPDP was approximately 153.9 ha. For most of the length, the existing pipeline easement follows a large (approximately 70 m in width) Powerlink easement containing a high voltage transmission line.

The construction and operation of the HPDP (Stage 1) impacted four threatened species considered likely to occur, namely (NRA 2016):

- Black-throated finch (southern) – the HPDP resulted in the loss of 5.2 ha of potential nesting habitat (0.1% of total nesting habitat within the Townsville LGA). The long-term loss of potential foraging habitat was likely to be negligible where disturbance footprints were minimised and disturbed areas were properly rehabilitated with suitable grass species following construction. With implementation of avoidance, minimisation and mitigation measures, the HPDP was concluded unlikely to result in a significant impact to the subspecies.
- Squatter pigeon (southern) – the HPDP resulted in the loss of potential foraging and nesting habitat for the subspecies. Potential impacts on the subspecies were anticipated to be short-term and negligible on the basis that disturbance footprints were minimised and rehabilitation of disturbance areas were undertaken with suitable grass species. The subspecies is known to prefer open habitat and therefore may have benefitted from the disturbance resulting from the construction of the HPDP. With implementation of avoidance, minimisation and mitigation measures, the HPDP was concluded unlikely to result in a significant impact to the subspecies.
- Greater large-eared horseshoe bat – the HPDP resulted in the loss of 3.6 ha of core habitat (riparian forests) (0.2% of available area of this habitat in the receiving catchment (covering three sub-basins)). The HPDP disturbance footprint was located along an existing edge of disturbance. With the implementation of additional

avoidance, minimisation and mitigation measures, the HPDP was concluded unlikely to result in a significant impact to the species

- Bare-rumped sheathtail bat – the HPDP resulted in the loss of 37.5 ha of potential roosting habitat (0.04% of the available area of this habitat in the receiving catchment (covering three sub-basins)). To reduce impact to roosting bats during vegetation clearance, selective clearing was undertaken in the presence of a spotter/catcher. With the implementation of additional avoidance, minimisation and mitigation measures, the HPDP was concluded unlikely to result in a significant impact to the species.

The construction and operation of the HPDP had the potential to impact two migratory species, namely the black-faced monarch and rufous fantail. In total, the HPDP impacted 3.6 ha of core habitat (riparian forests) (0.2% of available area of this habitat within the receiving catchment (covering three sub-basins)). Suitable habitat was located along an existing edge of disturbance. No significant impacts were anticipated.

An EPBC Act Referral (reference number: EPBC 2015/7606) was submitted in 2015. On 5 January 2016 the Project was deemed to be 'not a controlled action' by the Commonwealth Department of the Environment and Energy (now DCCEEW). While the HPDP impacted potential habitat for four threatened species and two migratory species, the majority of the HPDP Project area had been previously cleared, with highly disturbed cropping and grazing land characterising much of the landscape. Additionally, the HPDP Project area comprised of 68% of non-remnant habitat, and 32% of remnant vegetation. Majority of these habitat were in poor condition. The loss of habitat was considered small in the context of the landscape, of which similar habitat was abundant locally and regionally. With the implementation of avoidance, minimisation and mitigation measures, the HPDP action was considered 'not a controlled action' and unlikely to significantly impact MNES.

HPDP gap analysis and planning assessment (NRA 2018a)

In 2018, prior to the construction of the HPDP, NRA undertook a gap analysis and planning assessment as a result of changes to the HPDP alignment. The purpose of the report was to identify potentially relevant environmental approvals.

Desktop assessments were undertaken to identify updates to regulatory mapping and database records. Of relevance:

- Essential habitat for the black-throated finch (southern) occurs across approximately 650 m section of the proposed alignment. This essential habitat relates to a record for the subspecies. The essential habitat area was identified by NRA (2016) as potential core habitat
- While five new threatened species were identified during the desktop assessment (not in the NRA 2016 desktop results), these species were considered to have a low likelihood of occurrence. These species included:
 - Freshwater crayfish (*Euastacus bindal*), ghost bat (*Macrodermas gigas*), greater glider (*Petauroides 152olans*), yellow wagtail (*Motacilla flava*) and common death adder (*Acanthophis antarcticus*).

While changes in some approval pathways were identified, no changes to significant impact assessments for MNES were required.

HPDP EPBC self-assessment (NRA 2018b)

In 2015, NRA on behalf of TCC submitted an EPBC referral for the HPDP, the Project was deemed 'not a controlled action'. With minor changes to the alignment occurring since the referral, NRA undertook a gap analysis to finalise environmental approvals. As a result of these changes, NRA was engaged by GHD, on behalf of TCC, to prepare an EPBC Act self-assessment report to re-evaluate the potential for significant impacts on MNES.

The following pertinent information was detailed in the report:

- One individual of black ironbox has been *potentially* recorded.
- The change in alignment resulted in changes to habitat loss for MNES. For the majority of species impact was reduced (black-throated finch (southern), squatter pigeon (southern) and black ironbox), for two MNES habitat loss increased, namely for the large-eared horseshoe bat (total impact 5.3 ha), and for the bare-rumped sheathtail bat (total impact 42.9 ha). The significant impact determination remained unchanged, provided avoidance, minimisation and mitigation measures are implemented.

Based on the report, and in alignment with the Significant impact guidelines 1.1 (DoE 2013), no changes to significant impact assessments were made. In summary, the HPDP Stage 1 and Stage 1.1 were considered unlikely to result in significant residual impacts on MNES.

HPDP supplementary ecological surveys (NRA 2018c)

NRA was commissioned by GHD, on behalf of TCC, to undertake targeted surveys in the HPDP Project area to assess and map weeds, threatened flora species protected under the EPBC Act and NC Act and fauna breeding places to inform preparation of a high-risk SMP. The following summary is provided:

- Eleven weeds species were recorded within the HPDP
- Breeding places were recorded including nests and hollow-bearing trees. No active breeding place were recorded.

HPS2 ecological assessment report (NRA 2021)

NRA was commissioned by GHD, on behalf of TCC, to undertake an Ecological Assessment Report for the proposed HPS2 (i.e. the action which is the focus of this EPBC Act assessment) which is a 28.5 km pipeline connecting to the HPDP Stage 1.1 pipeline to the Burdekin River. The EAR is provided in Appendix L. The construction phase involves early works to establish access to and along the pipeline alignment, 40 m wide pipeline corridor (20 m at waterways) and rehabilitation along parts of the disturbed area. The HPS2 will include a pump station and other ancillary infrastructure, consistent with the Project description provided in Section 1.

The HPS2 Project area is mapped as grazing native vegetation, and channel/aqueducts', irrigated cropping, river, reservoir/dam and marsh/wetland. Surrounding land use is primarily irrigated cropping and grazing native pasture.

Sixty weed species were recorded during field surveys, including six WONS. Many weed species were abundant in the Project area. The condition of fauna habitat in the Project area varied. The influence of cattle grazing and fire was evident, these processes have had a negative impact on some habitats. Some degree of weed ingress was present throughout the Project area. Weeds were dominant in the ground and shrub layers at most sites assessed. Tree layers were dominated by native species. Two pest fauna were recorded during field surveys including feral pig and European rabbit. Evidence of pig activity was widely observed in wetland/riparian areas, signs of rabbits were observed in the centre of the Project area in open woodland habitat.

The Ecological Assessment Report identified the following threatened species which may be impacted as a result of the Project's construction and operation. Potential habitat impacts to these species were not calculated (NRA 2021), however this list served as a foundation upon which detailed impact assessment for the HSP2 Project was based:

- | | |
|--|---|
| <ul style="list-style-type: none">– Probable occurrence<ul style="list-style-type: none">• Bare-rumped sheathtail bat• Black-throated finch (southern)• Squatter pigeon (southern)• White-throated needletail• Fork-tailed swift | <ul style="list-style-type: none">– Possible occurrence<ul style="list-style-type: none">• Black ironbox• Estuarine crocodile• Eastern osprey• Black-faced monarch• Spectacled monarch• Rufous fantail• Oriental cuckoo |
|--|---|

BioCondition surveys (Ecological interpretation 2022)

BioCondition surveys were conducted along the length of the alignment. The report is provided in Appendix N. The area of each mapped Regional Ecosystem and non-remnant area within the Project area was calculated and used to create a list of Assessment Units (AUs) as per BioCondition guidelines (Eyre et al. (2015). Two sites were proposed in each AU with an area of 2 ha or more and one site for the remaining AUs larger than 0.5 ha (the size of a standard BioCondition plot).

Eighteen BioCondition sites were surveyed across the Project area. Of 18, six sites were reassigned as non-remnant (Category X) vegetation. The BioCondition class for all assessment units ranged from 2 to 4 (1 = functional biodiversity condition, 4 = dysfunctional biodiversity condition) indicating that none of the sites were considered functional.

Rapid Habitat Assessment: Black-throated finch (Biodiversity Australia 2022a)

Biodiversity Australia was engaged by GHD to undertake preliminary habitat suitability investigations over three potential offset sites within the Greater Townsville Region. The report is provided in Appendix M. These investigations will determine areas suitable for use as offsets for the subspecies in conjunction with the HPS2. Three sites were selected due to their potential to contain essential habitat for the subspecies, site 1 was located northwest of Ross River Dam and sites 2 and 3 were located immediately south of Ross River Dam.

Suitable nesting trees were abundant across all three sites. Chinese apple was observed across all sites, with high density of the weed in sites 2 and 3. Moderate to high shrub density was recorded across all sites. Dominance by Guinea grass in site 1 has reduced foraging habitat, while suitable grass species were recorded in the remaining sites. Majority of the assessment points recorded low level of disturbance. Access to water sources was not observed to be a limiting factor at any of the sites. No nests by the subspecies were observed.

Cumulative impacts summary

Cumulative impacts inclusive of the HPDP (Stage 1 and Stage 1.1) have been reviewed. While the construction and operation of the HPDP resulted in impacts to several MNES also identified in the HPS2, including, black-throated-finch (southern), bare-rumped sheath-tail bat, black ironbox and squatter pigeon (southern), significant impact assessments concluded the HPDP was unlikely to result in significant residual impacts. When considered in aggregate, and noting the implementation of avoidance, minimisation and mitigation measures (undertaken/committed to – Stage 1, Stage 1.1; proposed – Stage 2), species' declines resulting from the entirety of the action are considered unlikely. Expanding upon this, the carefully managed losses from Stage 1 and Stage 1.1 are unlikely to be amplified by Stage 2 of the Project, recognising the narrow, linear nature of the development, the minimal Implications for species' movement, the strict application of controls to minimise indirect impacts, and adherence to construction and operation protocols that avoid/minimise direct mortality of any MNES.

From a landscape-level population/metapopulation dynamics perspective, in aggregate, these developments are not likely to affect local to landscape-level dispersal, exacerbate threats like weeds or invasive animals, nor cause the loss of areas of particular ecological importance such as key (known) breeding or aggregation sites. The outcome will thus be that of a narrow strip of vegetation removal which will have a small, and likely inconsequential effect on the ability of species like the black-throated finch (southern), squatter pigeon (southern), bare-rumped sheath-tail bat, and notably for the Stage 2 action, koala, to access key life history requirements – namely, food, shelter and breeding places.

Nonetheless, the HPS2 is concluded to result in significant residual impacts to three MNES due to the extent of vegetation removal. As such, environmental offsets are proposed for the black-throated finch (southern), bare-rumped sheath-tail bat and koala, such that the key principles of the EPBC Act Environmental Offsets Policy 2012 are satisfied.

4.9 Item 4.9

Outline any impacts (direct, indirect, facilitated and cumulative e.g., downstream) of water diversion (or altered flow regimes) resulting from the proposed action (e.g., particularly during the operational phase).

Outline any hydrological connectivity between the Project area and other water bodies that may provide habitat for listed threatened species and communities (e.g., the Bowling Green Bay Ramsar wetland, which is within the catchment of the proposed site footprint).

Outline any impacts to protected matters as a result of reduced/altered water flows in the Burdekin River (and any further downstream water systems/bodies), as well as any impacts to protected matters resulting from increased water levels in the Ross River Dam.

4.9.1 Response

The HPS2 Project will transfer raw water from the Burdekin River (at the Clare Weir Storage) to the Ross River Dam. The Burdekin River is heavily regulated and the Burdekin Falls Dam (located approximately 100 km upstream from the HPS2 proposed intake) is the largest water storage on the Burdekin River with a capacity of 1,860,000 ML. There are three weirs downstream of Burdekin Falls Dam in the Lower Burdekin catchment (Gorge Weir, Blue Valley Weir, Clare Weir and The Rocks Weir), together with extensive irrigation schemes that include other storages associated with levees and bunds, seasonal sand dams and the Haughton Balancing Storage. The total storage capacity of these weirs is approximately 29,000 ML.

Collectively, the water infrastructure supplies the Burdekin Haughton Scheme which supplies water for irrigation customers in the lower Burdekin region and supplements urban and industrial requirements for Townsville. Sunwater manage the scheme and they must comply with the conditions set out in the *Burdekin Haughton Water Supply Scheme Resource Operations Licence* (ROL), issued to Sunwater in December 2009 by the DRDMW. The ROL outlines the infrastructure details, environmental release rules and all Sunwater's monitoring and operating obligations.

Any take of water from the Clare Weir Storage by the HPS2 Project would be supplemented by further releases from the Burdekin Dam in accordance with Sunwater's operating system to ensure adequate environmental releases. Accordingly, any take of water is expected to have negligible impact to the downstream environment of the Burdekin River.

HPS2 Project includes a new pump station and pipeline, connecting to the constructed Stage 1 and Stage 1.1 HPDP, to provide transfer of 364 ML/day of raw water from the Burdekin River to the Ross River Dam. The HPDP is a water security initiative for Townsville, that will support the city's Ross River Dam water catchment. Pumping will only occur when required to maintain levels within the Ross River Dam (e.g. lack of rainfall within the catchment) and will not affect Ross River Dam's current release regime.

The HPS2 pipeline construction corridor intersects a number of watercourses/drainage lines and four waterways being Scotts Creek, Barratta Creek, Horsecamp Creek and Oaky Creek that are at the upper reaches of the catchment for the Bowling Green Bay Ramsar Wetland. No Ramsar Areas are located within the project footprint. With the exception of Scotts Creek all watercourses and waterways are ephemeral and only experience flow following rain events. Scotts Creek, whilst non-perennial, has permeant perch water at the location of the pipeline crossing. The Scotts Creek pipeline crossing will be constructed using trenchless construction methods (pipe jacking) to avoid impacts associated with construction through the permeant perched waterway. All other waterway crossings will be constructed using open trench construction, with works to be completed outside the wet season. On completion of construction, all watercourses and water ways shall be reinstated to pre-existing conditions, using natural substrate of similar composition on the waterway bed with no changes in elevation, and banks shall be reprofiled to pre-existing conditions and stabilised with scour protection and vegetation. All works within the vicinity of watercourses and waterways will be subject to erosion and sediment control measures as detailed in the Erosion Sediment Control Plan (Appendix Q) and designed and undertaken in accordance with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) guidelines. The Project is expected to have negligible impacts to the downstream receiving environment of the Bowling Green Bay Ramsar Wetland.

Ross River is the main river which runs through the Townsville region. The Ross River flows in an easterly direction from its headwaters in the Ross River Dam and discharges into Cleveland Bay, south of Townsville. The river is currently interrupted by three weirs and a dam, and incorporates two distinctly different wetland ecosystems. Upstream of Aplins Weir, the river incorporates a series of palustrine wetlands, whilst below it is an estuarine environment. The construction of the weirs and dam infrastructure has considerably reduced the natural seasonal flow regime within the river. After the construction of the Ross River Dam in 1973 the average annual water flow in the river to the sea was reduced by approximately 56% (QWISC 1974). Downstream consequences of the river regulation have included loss of seasonal habitat and dependant species, inadequate flows for riparian vegetation, restriction to fish movement between fresh and estuarine habitats, invasion of wees due to the lack of flushing and stagnation of water bodies (Lukacs 1996).

As the Project will not affect the Ross River Dams releases regime, the Project is expected to have negligible impacts to the downstream receiving environment of the Ross River, including the Bowling Green Bay Ramsar site, located to the south of the Ross River mouth.

4.10 Item 4.10

Update references to 'temporary' and 'permanent' disturbance from referral documentation throughout the PD. The department considers both of these disturbances to be combined as the 'disturbance footprint' regardless of any proposed rehabilitation measures.

4.10.1 Response

All references have been updated, referring temporary and permanent disturbance as the 'disturbance footprint'. With respect to assessments of significant impacts on MNES, the aggregate (i.e. disturbance footprint) extent has been considered.

5. Avoidance, mitigation, and management measures

5.1 Item 5.1

A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant MNES.

5.1.1 Response

The Project has the potential to result in a number of impacts during construction and operation phases. The MNES report (GHD 2022) details potential impacting processes and relevant mitigation and management measures that are summarised in Table 5.1, Table 5.2 and Table 5.3. These mitigation and management measures will be implemented through the CEMP.

It is also relevant to note here that a land-based offset is proposed to compensate for the significant residual impact on MNES. An Offset Area Management Strategy (OAMS) has been submitted as part of the PD, providing preliminary details regarding the proposed approach and methodology to the offset (refer Section 7).

Table 5.1 Summary of impacts and measures to avoid, mitigate and manage (construction)

Impacting process	Mitigation and management measures
Loss of habitat	<ul style="list-style-type: none"> – Utilise existing tracks – Establishing no-go areas – Clearing restricted to minimum area required for Project footprint – Clearing areas to be clearly identified during construction – Existing disturbed areas to be utilised. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation – Rehabilitation of the disturbance footprint areas – Implementation of a CEMP and ESCP – Environmental awareness training for construction personnel – Rehabilitation of the disturbance footprint areas undertaken as soon as practicable with native species – Reinstatement and rehabilitation of pipeline with native species
Injury or mortality	<ul style="list-style-type: none"> – Pre-clearance surveys and clearing activities to be supervised by a qualified fauna spotter catcher (at-risk koalas relocated before clearing) – Sequential clearing – Restricting clearing to daylight hours only during the koala breeding season (September-November) – Establishing no-go areas – Restricting vehicle movements to designated areas – Establishing and enforcing 40km/hr speed limits – Identify areas of potential habitat with signage and flagging tape – Designated construct access and haulage roads off public roads to the construction corridor – Pest control measures as part of the CEMP – Waste management plan – Adverse incident response procedures implemented – CEMP to include protocols on fauna injury and mortality
Fragmentation of habitat and loss of connectivity	<ul style="list-style-type: none"> – Existing disturbed areas to be utilised. Infrastructure is sited within 57.57 ha of non-remnant vegetation (part of substation and access roads), the Project area is sited within 96.34 ha of remnant and regrowth vegetation – Limiting permanent fencing to small areas of operation and maintenance infrastructure (pump station site and substation) – Reinstatement and rehabilitation of temporarily disturbed areas as soon as practicable

Impacting process	Mitigation and management measures
Disturbance to habitat from noise, light, and vibration	<ul style="list-style-type: none"> – Lighting to be kept to a minimum (unless required for safety reasons) – Direct lighting away from sensitive areas – Construction activities to typically occur in daylight hours (unless night works are required for public road crossings) – Implementation of a Traffic Management Plan – Maintenance schedule for construction vehicles
Habitat degradation and increased erosion	<ul style="list-style-type: none"> – Reduce duration of works in watercourses and drainage lines. – Monitor weather events when working within watercourses. – Reduce speed limits during dry conditions or employ and water truck to reduce dust rates – ESCPs to include appropriate erosion and sediment controls – Vehicle movements to remain on dedicated tracks
Spread of invasive species	<ul style="list-style-type: none"> – Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works – Educate staff on the impacts of weeds and their general environmental obligation – Identify areas of dense outcrops of introduced flora to restrict construction vehicles from entering the area – Waste management plan, as part of the CEMP – Weed management plan and weed hygiene protocols, as part of the CEMP – Vehicle movements to remain on dedicated tracks
Disturbance of surface waterways and waterbodies	<ul style="list-style-type: none"> – Reduce duration of works in watercourses and drainage lines – Monitor weather events when working within watercourses – Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation – ESCPs to include appropriate erosion and sediment controls

Table 5.2 Summary of impacts and measures to avoid, mitigate and manage (operation)

Impacting process	Mitigation and management measures
Injury or mortality	<ul style="list-style-type: none"> – Establishing no-go areas and temporary exclusion fencing (where required) – Establishing and enforcing speed limits – Pest control measures as part of the project operation and maintenance EMP – Waste management plan – Low level vehicle movement approximately once per week along corridor
Disturbance to habitat from noise, light, and vibration	<ul style="list-style-type: none"> – Lighting to be kept to a minimum during operation (i.e. at pump station and substation) (unless required for safety reasons) – Operational works will typically be performed in daylight hours
Spread of invasive species	<ul style="list-style-type: none"> – Waste management plan, as part of the project operation and maintenance EMP – Weed management plan and weed hygiene protocols, as part of the project operation and maintenance EMP – Vehicle movements to remain on dedicated tracks

Table 5.3 Summary of impacts and measures to avoid, mitigate and manage (maintenance)

Impacting process	Mitigation and management measures
Injury or mortality	<ul style="list-style-type: none"> – Adverse incident response procedures implemented – Project operation and maintenance EMP to include protocols on fauna injury and mortality
Disturbance to habitat from noise, light, and vibration	<ul style="list-style-type: none"> – Lighting to be kept to a minimum (unless required for safety reasons) – Maintenance activities to typically occur in daylight hours (unless night works are required for road crossings)
Habitat degradation and increased erosion	<ul style="list-style-type: none"> – ESCPs to include appropriate erosion and sediment controls – Vehicle movements to remain on dedicated tracks
Spread of invasive species	<ul style="list-style-type: none"> – Waste management plan, as part of the project operation and maintenance EMP

Impacting process	Mitigation and management measures
	<ul style="list-style-type: none"> – Weed management plan and weed hygiene protocols, as part of the project operation and maintenance EMP – Vehicle movements to remain on dedicated tracks

Post-construction rehabilitation measures

All disturbed areas within the construction corridor, with the exception of a 4 m wide permanent access track for access and maintenance of the pipeline, will have rehabilitation treatment applied in accordance with the Rehabilitation Management Plan (GHD 2022) (Appendix R). Land within the construction corridor has been categorised into two distinct rehabilitation extents, each of which will receive a different rehabilitation treatment, as follows:

- To provide future habitat values for black-throated finch, bare-rumped sheath-tail bat and koala, areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the Department of Resources (DoR) Vegetation Management Watercourse and Drainage Feature Map will be revegetated with tubestock consistent with the relevant riparian or woodland Regional Ecosystems (i.e. RE 11.3.25 or 11.3.35) and hydromulch comprising endemic grass species. These areas exclude a 10 m wide zone of influence above the pipeline which shall only be hydromulched to enable future maintenance of the pipeline.
- To achieve sufficient protection against erosion, all other areas of the pipeline construction corridor will be hydromulched with endemic grass species. These areas include minor watercourses and drainage lines that are not mapped on the DoR Vegetation Management Watercourse and Drainage Feature Map, the pipeline 10 m wide zone of influence centred about the pipeline (i.e. 5 m either side of the pipeline centerline), temporary construction access roads and stockpile yards.

Further details of the rehabilitation management measures are provided in Section 6 of this PD.

Contingency planning

In the event of an unexpected impact to a conservation significant fauna during clearing and construction, the contingency measures outlined in Table 5.4 will be enacted.

Table 5.4 Contingency measures to be enacted in the event of impact to conservation significant fauna

Scenario	Action	Responsibility
Conservation significant fauna identified within the Project footprint during construction	The DES Register of Animal Breeding Places Template is required to be completed for location referencing and reporting. Any conservation significant fauna observed during monitoring events are to be submitted to DES within six months of interactions. An application for a Species Management Program (SMP) under the <i>Nature Conservation Act 1992</i> (NC Act) for tampering with an animal breeding place where there is a high risk was submitted to DES on 8 February 2022. An SMP is required where an animal breeding place has been identified and activities proposed that would tamper with the breeding place. The HPS2 high risk SMP applies to all protected wildlife (NC Act) including special least concern animals, colonial breeders and other least concern animals associated with the Project. A subset of the species this program covers are MNES. The SMP was approved by DES on 16 May 2022 and has been registered with DES as an approved SMP. The approval remains in effect until 12 May 2025.	Construction contractor / fauna spotter/catcher
	All conservation significant fauna will be given the opportunity to move out of the Project footprint on their own accord. Where the conservation significant fauna is unable to move out of the Project footprint on its own accord, the terrestrial fauna specialist (spotter/catcher) will be required to remove the individual using the appropriate handling technique for the species. Only the terrestrial fauna specialist will handle protected terrestrial fauna. The terrestrial fauna specialist shall inspect the individual for injury and signs of stress and, where uninjured, undertake relocation of the individual to suitable habitat (in accordance with the methodology below).	Construction contractor / fauna spotter/catcher

<p>Relocation of conservation significant fauna within the Project footprint</p>	<p>Where conservation significant fauna are collected within the Project footprint and the individual has been assessed by the fauna spotter/catcher and is in good health or has a minor injury and the animal is otherwise alert and active, the animal is to be released outside of the construction footprint in habitat suitable for the species. For terrestrial fauna species, the individual will be released into suitable habitat a safe distance away from the Project footprint to reduce the stress on the animal.</p> <p>The fauna spotter/catcher will assess whether the habitat is suitable for the individual species.</p> <p>When assessing a release area's suitability, consideration will be given to the extent of the vegetation patch, presence of critical habitat requirements and habitat connectivity when selecting a relocation site for terrestrial species.</p> <p>All nocturnal wildlife removed from trees during clearing will be housed in appropriate temporary holding facilities by experienced spotter/catchers and released at dusk into an area of nearby habitat located outside the Project footprint.</p>	<p>Construction contractor / fauna spotter/catcher</p>
<p>Eggs found within the Project footprint</p>	<p>Where a nest with bird eggs or chicks is found within the Project footprint, the nest shall be removed by the fauna spotter/catcher and safely transported to one of the below mentioned veterinary clinics or licensed wildlife rescue organisations.</p> <p>The following local veterinarian resources will be used to care for any wildlife injury during the construction process:</p> <p><u>Tropical Vets</u> 184 Queen St, Ayr QLD 4807 Phone: 07 4783 2055</p> <p><u>FNQ Wildlife Rescue</u> 24/7 Phone: 07 4053 4467</p>	<p>Construction contractor / fauna spotter/catcher</p>
<p>Displaced young found within the Project footprint</p>	<p>Any displaced young of conservation significant fauna species found during the Project will be transported to a qualified wildlife carer.</p> <p>TCC and DES are to be notified.</p> <p>The following local veterinarian resources will be used to care for any wildlife injury during the construction process:</p> <p><u>Tropical Vets</u> 184 Queen St, Ayr QLD 4807 Phone: 07 4783 2055</p> <p><u>FNQ Wildlife Rescue</u> 24/7 Phone: 07 4053 4467</p>	<p>Construction contractor / fauna spotter/catcher</p>
<p>Fauna sickness, injury or mortality</p>	<p>In the event that a conservation significant species is suffering injuries of a serious nature, the individual/s are to be transported to the nearest veterinary clinic or licensed wildlife rescue organisation as detailed below.</p> <p>The fauna spotter/catcher will be required to maintain records of all protected fauna and injuries using DES's animal breeding place register.</p> <p>The following local veterinarian resources will be used to care for any wildlife injury during the construction process:</p> <p><u>Tropical Vets</u> 184 Queen St, Ayr QLD 4807 Phone: 07 4783 2055</p> <p><u>FNQ Wildlife Rescue</u> 24/7 Phone: 07 4053 4467</p>	<p>Construction contractor / fauna spotter/catcher</p>
<p>Accidental clearing of fauna habitat for conservation significant species outside of the Project footprint</p>	<p>Report incident immediately to TCC. DES shall be advised and an incident report prepared detailing:</p> <ul style="list-style-type: none"> Extent of clearing Habitat types Potential impacts to conservation significant fauna and their habitat 	<p>Construction contractor / fauna spotter/catcher</p>

5.2 Item 5.2

The proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence.

5.2.1 Response

The proposed mitigation and management measures stated in Section 5.1.1 are considered to be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence as demonstrated in Table 5.5.

Table 5.5 Demonstration of proposed mitigation and management measures

Standards	Evidence
Best available practices	<p>The mitigation and management measures proposed for the construction of the HPS2 are best practice. GHD and TCC have successfully completed similar Projects (e.g. HPDP Stage 1 and Stage 1.1) and make certain that best industry practices are employed.</p> <p>The Project's ESCP has been prepared by a Certified Professional in Erosion and Sediment Control (CPESC) in accordance with Best Practice Erosion and Sediment Control (BPESC) guidelines for Australia (International Erosion Control Association). The ESCP methodology is an evidence-based approach.</p>
Appropriate standards	International Erosion Control Association's Best Practice Erosion and Sediment Control Guidelines (hereafter referred to as the IECA Guidelines).
Evidence of success	<p>The Haughton Pipeline Stage 1 and Stage 1.1 Projects that have been successfully constructed and employed similar mitigation and managements as proposed for Stage 2. Throughout the construction of Stage 1 and Stage 1.1 there were no reportable environmental incidents nor harm to native wildlife. The Haughton Pipeline Rehabilitation Report (GHD 2022) assessed the rehabilitation works in Stage 1 and 1.1 were successful in accordance with the Project approval. The following was concluded:</p> <ul style="list-style-type: none"> – Successes <ul style="list-style-type: none"> • Landform generally stable, stable within essential habitat rehabilitation areas • Land generally fit for purpose, fit for purpose in black-throated finch (southern) essential habitat • Safe for humans and wildlife • Drainage well established • 50% of sites achieved groundcover outcome – Corrective actions <ul style="list-style-type: none"> • Remediation of sinkholes • Remediation of rill erosion, measures to control bank stabilisation • Remediation, weed management and maintenance of sites with <70% native vegetation cover
Published scientific evidence	<p>The below sources were referenced in conducting the assessment of impacts to MNES, and to inform the proposed avoidance, mitigation and management (including rehabilitation) measures proposed hereabouts to reduce avoidable impacts to these matters. The key points of reference for assessing and managing impacts to species that are MNES that were confirmed present or considered likely to occur were Commonwealth documents and guidelines (namely, conservation advice, listing advices, SPRAT profiles, recovery plans, species-specific EPBC Act policy guidelines). Specifically, the specific life-history attributes of these species, and key threats acting on each species, as outlined in these documents, have been considered when tailoring mitigation and management measures.</p> <p>An example of this is the rehabilitation plan, where the most intensive rehabilitation efforts have been prioritised to areas where there will be an unavoidable loss of mature vegetation in proximity to water – key habitat for the endangered black-throated finch (southern), as well as likely important foraging and movement habitat should a low-density population of koala persist in the broader landscape.</p> <ul style="list-style-type: none"> – Baldwin, M. (1975). Birds of the Inverell District, N.S.W. <i>Emu</i>. 75:113-120. – Barrett, G., A. Silcocks, S. Barry, R. Cunningham & R. Poulter (2003). <i>The New Atlas of Australian Birds</i>. Melbourne, Victoria: Birds Australia. – Beruldsen, G.R. (1972). Return to Marrapina. <i>Australian Bird Watcher</i>. 4:144-147. – Birdlife (2021a). Spectacled Monarch <i>Symposiarchus trivirgatus</i> Monarchidae. Available from: https://birdlife.org.au/bird-profile/spectacled-monarch – Birdlife (2021b). Birdlife (2021a). Glossy Ibis <i>Plegadis falcinellus</i> Threskiornithidae. Available from: https://www.birdlife.org.au/bird-profile/glossy-ibis – Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service. (2007). National recovery plan for the black-throated finch

Standards	Evidence
	<p>southern subspecies <i>Poephila cincta cincta</i>. Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane.</p> <ul style="list-style-type: none"> – Churchill, S.K. (1998). Australian Bats. Sydney: Reed New Holland. – Cooper, R.M., I.A.W. McAllan and B.R. Curtis (2014). The Atlas of the Birds of NSW and the ACT. Mini-Publishing, Gordon, New South Wales. – Compton, A. & P.M. Johnson (1983). Observations of the Sheath-tailed Bat: <i>Taphozous saccolaimus</i> Temminck (Chiroptera: Emballonuridae), in the Townsville region of Queensland. Australian Mammalogy. 6:83-87. – Dennis, A.J. (2012). Bare-rumped Sheath-tail Bat. In: Curtis, L.K., A.J. Dennis, K.R. McDonald, P.M. Kyne & S.J.S. Debus, eds. Queensland's Threatened Animals. CSIRO Publishing. – Department of Agriculture, Water and the Environment (DAWE) (2021a). Species Profile and Threats Database, Accessed November 2021. Department of Agriculture, Water and the Environment Available from: http://www.environment.gov.au/cgibin/sprat/public/sprat.pl. – Department of Environment and Science (DES) (2021). Species profile search. Available from: https://apps.des.qld.gov.au/species-search/ – Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009a). Significant impact guidelines for the endangered black-throated finch (southern) (<i>Poephila cincta cincta</i>): Background paper – Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009b). Significant impact guidelines for the endangered black-throated finch (southern) (<i>Poephila cincta cincta</i>). – Department of the Environment (2015a). Conservation Advice <i>Numenius madagascariensis</i> eastern curlew. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/847-conservation-advice.pdf. In effect under the EPBC Act from 26-May-2015. – Department of the Environment (2015b). Referral guideline for 14 birds listed as migratory species under the EPBC Act. Department of the Environment. Available from: http://www.environment.gov.au/system/files/resources/c05f5b87-0a99-4998-897e-7072c236cf83/files/migratory-birds-draft-referral-guideline.pdf – Frith, H.J. (1982b). Pigeons and Doves of Australia. Melbourne: Rigby. – Garnett S.T., Szabo J.K. and Dutson G. (2011). The Action Plan for Australian Birds 2010. Birds Australia, CSIRO Publishing, Melbourne. – Garnett, S.T. & G.M. Crowley (2000). The Action Plan for Australian Birds 2000. Canberra, ACT: Environment Australia and Birds Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html. – Haddad, M.N., Brudvig, L.A., Clobert, J., Davies, K.F., Gonzalez, A., Holt, R.D., Lovejoy, T.E., Sexton, J.O., Austin, M.P., Collins, C.D., Cook W.M., Damschen, E.I., Ewers, R.M., Foster, B.L., Jenkins, C.N., King, A.J., Laureance, W.F., Levey, D.J., Margules, C.R., Melbourne, B.A. Nicholls, A.O., Orrock, J.L., Song, D.X., Townshend, J.R. (2015). Habitat fragmentation and its lasting impacts on Earth's ecosystem. Science Advances, Vol 1 (2). – Hero, Jean-Marc & Hodgkison, Simon & Hazell, Donna (2004). Winners and Losers: The impacts of modifying natural landscapes on amphibian & reptile assemblages in eastern Australia. Higgins, P.J. (1999). Handbook of Australian, New Zealand and Antarctic Birds. Volume 4 Parrots to Dollarbird. Oxford University Press, Melbourne. – Higgins, P.J. and Davies, S.J.J.F. (eds) (1996). Handbook of Australian, New Zealand and Antarctic Birds. Volume 3: Snipe to Pigeons. Oxford University Press, Melbourne. – Higgins, P.J. (ed.) (1999). Handbook of Australian, New Zealand and Antarctic Birds. Volume Four-- Parrots to Dollarbird. Melbourne: Oxford University Press. – IUCN Standards and Petitions Subcommittee. 2013. Guidelines for Using the IUCN Red List Categories and Criteria. Version 10. Prepared by the Standards and Petitions Subcommittee. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf – Johnstone & Storr (1998). Handbook of Western Australian Birds. – Longcore, T. and Rich, C. (2004). Ecological light pollution. Frontiers in Ecology and the Environment, Vol 2 (4), pp. 191-198. – McKean, J.L., G. Friend & A.L. Hertog (1981). Occurrence of the Sheath-tailed Bat <i>Taphozous saccolaimus</i> in the Northern Territory. Northern Territory Naturalist. 4:20. – Mitchell, D.F. (1996). Foraging Ecology of the Black-throated Finch <i>Poephila cincta cincta</i>. M.Sc. Thesis. Townsville: James Cook University of North Queensland. – Murphy, S. (2002). Observations of the "Critically Endangere" Bare-rumped Sheath-tail Bat <i>Saccolaimus saccolaimus</i> Temminck (Chiroptera: Emballonuridae) on Cape York Peninsula, Queensland. Australian Mammalogy. 23:185-187.

Standards	Evidence
	<ul style="list-style-type: none"> – Natural Resource Assessment Environmental Consultants (NRA) (2005). Enertrade North Queensland Gas Pipeline Black-throated Finch Studies (Post-Construction). Unpublished report prepared for Enertrade, Brisbane. – Natural Resource Assessment Environmental Consultants (NRA) (2007). Survey and Assessment of the Black-throated Finch (<i>Poephila cincta cincta</i>) at the Chisholm Trail Rural Residential Development, Townsville. Unpublished report prepared for the Department of Environment and Water Resources. – Natural Resource Assessment Environmental Consultants (NRA) (2021). Haughton Pipeline Stage 2 Project: Environmental Analysis Report. – North, A.J. (1913-1914). Nests and Eggs of Birds Found Breeding in Australia and Tasmania. In: Special Catalogue 1. 4. Sydney: Australian Museum. – Office of Environment and Heritage (OEH) (2019). Large Bent-winged Bat – profile. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534 – Office of Environment and Heritage (OEH) (2020). Little Bent-winged Bat – profile. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10533 – Office of Environment & Heritage (OEH 2020). Eastern Osprey – profile. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10585 – Popper, A. and Hawkins, A. (2016). The effects of noise on aquatic life (Vol. 730). Springer Science and Business Media: New York, USA. – Reardon, T.B., S.K.A. Robson, J.G. Parsons & T. Inkster (2010). Review of the threatened status of microchiropteran bat species on Cape York Peninsula. – Rismiller, P. D. (1993). Overcoming a prickly problem. Australian Natural History Magazine, vol. 24, no. 6, pp. 22–29. – Schulz, M. & B. Thomson (2007). National recovery plan for the bare-rumped sheathtail bat <i>Saccolaimus saccolaimus nudicluniatus</i>. Report to Department of the Environment and Heritage, Canberra. Brisbane: Queensland Parks and Wildlife Service. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-bare-rumped-sheathtail-bat-saccolaimus-saccolaimus-nudicluniatus. In effect under the EPBC Act from 08-Jan-2008. – Squatter Pigeon Workshop (2011). Proceedings from the workshop for the Squatter Pigeon (southern). 14-15 December 2011. Toowoomba Office of the Queensland Parks and Wildlife Service. – Threatened Species Scientific Committee (TSSC) (2015). Conservation Advice <i>Geophaps scripta scripta</i> squatter pigeon (southern), Department of Agriculture, Water and Energy, viewed 7 October 2021, <http://www.environment.gov.au/biodiversity/threatened/species/pubs/64440-conservation-advice-31102015.pdf>. – Threatened Species Scientific Committee (TSSC) (2016). Conservation Advice for <i>Rhinolophus robertsi</i> greater large-eared horseshoe bat. Available: http://www.environment.gov.au/biodiversity/threatened/species/pubs/87639-conservation-advice-07122016.pdf – Threatened Species Scientific Committee (TSSC) (2016). Conservation Advice <i>Saccolaimus saccolaimus nudicluniatus</i> bare-rumped sheathtail bat. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66889-conservation-advice-07122016.pdf. – Threatened Species Scientific Committee (TSSC) (2019). Conservation Advice <i>Hirundapus caudacutus</i> White-throated needletail, Department of Agriculture, Water and Energy, viewed 7 October 2021, <http://www.environment.gov.au/biodiversity/threatened/species/pubs/682-conservation-advice-04072019.pdf>. – Threatened Species Scientific Committee (TSSC) (2021). Conservation Advice for <i>Xeromys myoides</i> (Water Mouse), Department of Agriculture, Water and Energy, viewed 22 November 2021, http://www.environment.gov.au/biodiversity/threatened/species/pubs/66-conservation-advice-29092021.pdf – Wheeler, A.P., Angermeier, P.L. and Rosenberger, A.E. (2005) Impacts of new highways and subsequent landscape urbanization on stream habitat and biota, <i>Reviews in Fisheries Science</i>, 13: 141-164. – Wood, P. J., and Armitage, P. D. (1997). Biological effects of fine sediment in the lotic environment. <i>Environmental Management</i>, 21, 203-217.

5.3 Item 5.3

All proposed measures for MNES must be drafted to meet the ‘S.M.A.R.T’ principle:

- S – Specific (what and how)

- *M – Measurable (baseline information, number/value, auditable)*
- *A – Achievable (timeframe, money, personnel)*
- *R – Relevant (conservation advice/s, recovery plans, threat abatement plans, best available published scientific evidence)*
- *T – Time-bound (specific timeframe to complete).*

5.3.1 Response

The proposed mitigation and management measures follow the SMART principles as demonstrated in Table 5.6.

Table 5.6 *Demonstration of SMART principles*

Standards	Evidence
Specific	Mitigation and management measures proposed are specific to those MNES conservation significant species (i.e. breeding times) with reference to published scientific evidence and relevant Commonwealth documentation (e.g. conservation advices). See section 5.1.1 for rehabilitation measures, and how they have been tailored to the specific habitat requirements of key MNES affected by the Project.
Measurable	Measurable with quantifiable criteria and/or outcomes pertaining to, for example, (1) injury/mortality of fauna during Project construction; and (2) the maximum disturbance area, and (3) performance indicators following the completion of rehabilitation to indicate success of measures or decline of values as early as possible, outlined in the Rehabilitation Management Plan Appendix R.
Achievable	Achievable through having realistic performance indicators for disturbance limits based on construction experience from Stage 1 (HPDP) for a constrained 40m wide pipeline construction corridor.
Relevant	Relevant by addressing the potential direct loss of habitat for MNES conservation significant species, indirect disturbance during construction and operation, rehabilitation of disturbed areas and provision of an offset that is consistent with, and achieves the requisite outcomes of the EPBC Act Environmental Offsets Policy 2012.
Time	Time-bound with performance indicators over a period to ensure rehabilitation completion criteria are achieved within a reasonable time period.

5.4 Item 5.4

Include any relevant management plans that will be developed or implemented prior to commencement. E.g., Pest and weed management plan, vegetation management plan, fauna management plan.

The department notes two draft plans were provided in the referral documentation— Construction Environmental Management Plan and Conceptual Erosion and Sediment Control Plan.

5.4.1 Response

Relevant management plans that have been developed and will be implemented prior to commencement include the following:

- Offset Area Management Strategy (Appendix O)
- Construction Environmental Management Plan (CEMP) (includes pest and weed management, vegetation management, fauna management, waste management) (Appendix P)
- Erosion Sediment Control Plan (ESCP) (Appendix Q)
- Rehabilitation Management Plan (Appendix R)
- Technical Specification for Rehabilitation Works (Appendix S)
- High-Risk Species Management Program (Appendix T).
- Offset Area Management Plan (in development)

5.5 Item 5.5

Details of specific and measurable environmental outcomes to be achieved for relevant MNES. All commitments must be drafted using unambiguous and committal language when describing the proposed measures i.e., use

'will' and 'must' when committing to actions instead of 'where possible', 'where practicable', 'as required', 'to the greatest extent possible', and 'should' or 'may'.

5.5.1 Response

Key environmental outcomes will be achieved through the Project by identifying, avoiding and minimising impact on MNES. The Project's strict adherence to the mitigation hierarchy, underpinned by careful consideration of statutory documents including relevant recovery plans, conservation advice/s, and/or threat abatement plans, will embed a framework of management of MNES that achieves outcomes consistent with the Convention on Biological Diversity (including the proposed Post-2020 Global Biodiversity Framework) – in broad terms, maintaining species populations, and enhancing the extent and quality of ecosystems.

Table 5.7 provides specific and measurable environmental outcomes that will be achieved for relevant MNES in the project and rehabilitation area through the construction and operation of the Project. These outcomes will be achieved through the following commitments:

- Minimising loss of habitat for MNES by identifying and avoiding habitat through the route selection process
- Preventing accidental clearing by marking no – go areas on plans and on-ground
- Preventing injury and mortality of MNES fauna by implementing pre-clearance surveys by suitably qualified and experienced fauna spotter/catchers. This will include preparation of a High Risk Species Management Plan under the NC Act identifying and inspecting and managing risk to MNES within potential breeding places
- Preventing accidental injury to MNES by restricting vehicle movements and speeds near MNES habitat
- Minimising impact on MNES habitat through the rehabilitation of the footprint with native vegetation species
- Minimising erosion and degradation of adjacent MNES habitat through implementation of an ESCP
- Enhance the value of reinstated habitats for MNES through implementation of a Weed Management Plan

Table 5.7 Statement of outcomes and clearing limits for MNES

MNES	Environmental outcomes	Clearing limits
Koala	<ul style="list-style-type: none"> – No mortality of MNES fauna species during construction of Project – No mortality of MNES fauna due to vehicle movements or infrastructure maintenance during operation phase – No presence of restricted invasive weeds in the disturbance area – Land is vegetated with endemic groundcover exceeding 70% within 400 m of a DoR Vegetation Management Watercourse – Land is vegetated with groundcover exceeding 50% in all other rehabilitation areas 	Clearing of koala habitat will be limited to 134.19 ha
Black-throated finch (southern)	<ul style="list-style-type: none"> – No mortality of MNES fauna species during construction of Project – No mortality of MNES fauna due to vehicle movements or infrastructure maintenance during operation phase – No presence of restricted invasive weeds in the disturbance area – Land is vegetated with endemic groundcover exceeding 70% within 400 m of a DoR Vegetation Management Watercourse – Land is vegetated with groundcover exceeding 50% in all other rehabilitation areas 	Clearing of black-throated finch habitat will be limited to 96.34 ha.
Bare-rumped sheathtail bat	<ul style="list-style-type: none"> – No mortality of MNES fauna species during construction of Project – No mortality of MNES fauna due to vehicle movements or infrastructure maintenance during operation phase – No presence of restricted invasive weeds in the disturbance area – Land is vegetated with endemic groundcover exceeding 70% within 400 m of a DoR Vegetation Management Watercourse – Land is vegetated with groundcover exceeding 50% in all other rehabilitation areas 	Clearing of bare-rumped sheathtail bat habitat will be limited to 92.23 ha
Squatter pigeon (southern)	<ul style="list-style-type: none"> – No mortality of MNES fauna species during construction of Project – No mortality of MNES fauna due to vehicle movements or infrastructure maintenance during operation phase – No presence of restricted invasive weeds in the disturbance area 	Clearing of squatter pigeon (southern) habitat will be limited to 96.32 ha

MNES	Environmental outcomes	Clearing limits
	<ul style="list-style-type: none"> – Land is vegetated with endemic groundcover exceeding 70% within 400 m of a DoR Vegetation Management Watercourse – Land is vegetated with groundcover exceeding 50% in all other rehabilitation areas 	

Despite the substantial measures that will be undertaken to avoid and mitigate impact, a significant residual impact on MNES is still anticipated for the following MNES species:

- Bare-rumped sheath-tail bat (*Saccolaimus saccolaimus nudicluniatus*, vulnerable) – due to the impact on habitat critical to the survival of the species, notably loss of potential roosting trees including loss of 10 large- and 27 moderate-sized *E. platyphylla* hollows
- Black-throated finch (southern) (*Poephila cincta cincta*, endangered) – due to the impact on habitat critical to the survival of the species associated with localised indiscriminate loss of trees within 1 km of water
- Koala (*Phascolarctos cinereus*, endangered) – due to the impact on habitat critical to the survival of the species.

To compensate for the significant residual impact on MNES, a land-based offset is proposed. While a suitable offset area has been identified within the region – located immediately south of Lake Ross on the Townsville coastal floodplain, the extent of the offset area is still being determined. Ecological field surveys are currently being undertaken to quantify the extent and starting condition of habitats proposed within the offset area. Initial estimation is that the Project requires a land-based offset of approximately 500 ha.

An OAMS has been prepared to provide a preliminary outline of the ecological outcomes proposed for each MNES through the offset process. The ecological outcomes for each relevant MNES are summarised in Table 5.8 to Table 5.10.

Table 5.8 Ecological outcomes for bare-rumped sheath-tail bat

Number	Outcome	Statement of outcome
1.	Secure local roosts for the bare-rumped sheath-tail bat population such that there is no reduction in the number of potential roosts or utilisation of roosts within site within 10 years.	This outcome is desirable as it helps to achieve the overall recovery objective of the Recovery Plan (Schulz and Thomson 2007), being to increase protection of known roosts for the BRSB both on and outside reserved lands.
3.	Reduction in key shrubby weed densities by 90% of baseline level within 10 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan of understanding threatening processes on the bare-rumped sheath-tail bat.
2.	Increase species richness of canopy and shrub level vegetation compared to baseline levels as a surrogate to increase invertebrate food availability within 10 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan (Schulz and Thomson 2007) of investigating key aspects of the biology and ecology of the bare-rumped sheath-tail bat better determine and document foraging habitat requirements of the species.
4.	Provide habitat enhancements for the bare-rumped sheath-tail bat including providing a minimum of 10 artificial roosts and 10 salvaged roosts. This commitment includes regular monitoring of all artificial roosts within the offset area by a suitably qualified ecologist. All monitoring data will be made publicly available annually on the proponent's website.	This outcome is desirable as it helps to achieve the specific recovery objectives within the Recovery Plan of understanding the roosting habitat requirements to aid recovery.
5.	Increase the bare-rumped sheath-tail bat offset area habitat quality by at least one point (when compared to baseline data measured by the site condition, site context and species stocking rate) within 20 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan of reducing the rate of habitat loss and fragmentation.

Table 5.9 *Ecological outcomes for southern black-throated finch*

Number	Outcome	Statement of outcome
1.	Secure a breeding area containing a viable population of southern black-throated finch.	This outcome is desirable as it helps to achieve the specific recovery objective of the Recovery Plan of protecting and enhancing habitat by securing a site for conservation.
2.	Increase the area and quality of potential habitat for the southern black-throated finch by 493.67 ha within 20 years via re-establishing native food grasses in key areas (i.e. within 400 m of waterbodies) and planting non-remnant areas with native tubestock.	This outcome is desirable as it helps achieve the overall recovery objective of the Recovery Plan, to protect and enhance habitat for the southern black-throated finch.
3.	Reduce the density and extent of shrubby weeds and grassy weeds within the offset area by 70% of baseline level within 10 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan of managing threats to breeding areas for the southern black-throated finch.
4.	Provide artificial permanent water sources to ensure that southern black-throated finch utilisation of the area is not constrained by a lack of water.	This outcome is desirable as it helps to achieve the overall recovery objective within the Recovery Plan of protecting and enhancing habitat through the introduction and the securing of permanent water sources to ensure offset area provides a permanent breeding and foraging habitat.
5.	Implement a fire management strategy to enhance the southern black-throated finch offset area resulting in no uncontrolled bushfires that burn more than 50% of the offset area for 10 years.	This outcome is desirable as it helps to achieve the overall recovery objective within the Recovery Plan of protecting and enhancing habitat through the implementation of strategic burning to assist in the restoration of suitable foraging grass species.
6.	Increase the southern black-throated finch offset area habitat quality by at least one point (when compared to baseline data measured by the site condition, site context and species stocking rate) within 20 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan of protecting and enhancing habitat.
7.	Provide habitat enhancements for the SBTF including providing a minimum of 10 artificial nest boxes. This commitment includes regular monitoring of all artificial nest boxes within the offset area by a suitably qualified ecologist. All monitoring data will be made publicly available annually on the proponent's website.	This outcome is desirable as it helps to achieve the specific recovery objectives within the Recovery Plan of understanding the nesting habitat requirements to aid recovery.
8.	Reduction in densities of feral animals (i.e. wild pigs) to prevent the degradation of habitat.	This outcome is desirable as it helps to achieve the recovery objective with the Recovery Plan of protecting and enhancing habitat through the implementation of feral animal control.

Table 5.10 *Ecological outcomes for koala*

Number	Outcome	Statement of outcome
1.	Increase the area and quality of habitat for the koala by 378.77 ha within 20 years via planting non-remnant areas with locally important koala food trees and allowing regrowth areas to naturally regenerate.	This outcome is desirable as it helps to achieve the overall recovery objective of increasing the area and quality of refugial habitat for populations whose primary threat is climate change.
2.	Reduction in key shrubby weed densities by 70% of baseline level within 10 years.	This outcome is desirable as it helps to achieve the overall recovery objective of increasing the area and quality of refugial habitat for populations whose primary threat is climate change.
3.	Reduce densities of wild dogs to reduce the predation pressures on the local koala population.	This outcome is desirable as it helps reduce the negative pressures adversely impacting the size and viability of the local koala population.

Number	Outcome	Statement of outcome
4.	Increase the koala offset area habitat quality by at least two points (when compared to baseline data measured by the site condition, site context and species stocking rate) within 20 years.	This outcome is desirable as it helps to achieve the specific recovery objective within the Recovery Plan of reducing the rate of habitat loss and fragmentation.

The ecological outcomes follow the SMART principles by being:

- Specific to the conservation of the koala, southern black-throated finch and bare-rumped sheath-tail bat population and the protection of the offset area.
- Measurable with quantifiable criteria and/or outcomes that can be compared over time to baseline levels, with performance indicators across a number of years to indicate failure of measures or decline of values as early as possible.
- Achievable through having realistic gains or maintaining of existing conditions to demonstrate no reduction in values.
- Relevant by addressing the potential direct loss of habitat and a minimal number of denning resources for koala, southern black-throated finch and bare-rumped sheath-tail bat and their prey species and minor indirect disturbance during construction and operation activities.
- Time-bound with performance indicators over the life of the offset, with 5-yearly performance indicators prior to completion in order to capture management issues within a reasonable time period.

5.6 Item 5.6

Details of the proposed measures to be undertaken to avoid, mitigate and manage the relevant impacts of the proposed action, including those required through other Commonwealth, State and local government approvals.

5.6.1 Response

The proposed measures to be undertaken to avoid, mitigate and manage the relevant impacts of the proposed action are described in Item 5.1.

Commonwealth, State and Local Government approvals required to avoid, mitigate and manage the relevant impacts of the proposed action are listed in detail in project Regulatory Approvals Plan (GHD, 2022) (Appendix X).

An application for a SMP under the *Nature Conservation Act 1992* (NC Act) for tampering with an animal breeding place where there is a high risk was submitted to DES on 8 February 2022. An SMP is required where an animal breeding place has been identified and activities proposed that would tamper with the breeding place. The HPS2 high risk SMP applies to all protected wildlife (NC Act) including special least concern animals, colonial breeders and other least concern animals associated with the Project. A subset of the species this program covers are MNES. The SMP was approved by DES on 16 May 2022 and has been registered with DES as an approved SMP. The approval remains in effect until 12 May 2025. A copy of the SMP is provided in Appendix T.

Queensland State approvals under the *Planning Act 2016* (Planning Act) and *Planning Regulation 2017* (Planning Regulation) are required for the construction of the HPS2. This includes a Development Application for Operational Works, assessed, and decided by the Department of State Development Infrastructure, Local Government and Planning (DSDILGP) acting through SARA (State Assessment and Referral Agency) as the Assessment Manager. An approved Decision Notice, SARA reference 2201-26844 SDA, for the pipeline construction works was received on 14 June 2022 with no conditions relating to rehabilitation activities. A copy of the SARA Decision Notice can be found in Appendix U. A copy of the Project Rehabilitation Management Plan (GHD 2022) (Appendix R) was included in the Development Application to SARA.

At the time of preparation of this PD, a Development Application for a Material Change of Use for the Pump Station under the Planning Act and Planning Regulation and Burdekin Shire *IPA Planning Scheme*, March 2011 has not been submitted to Burdekin Shire Council as the Assessment Manager.

Other State and Local Government Approvals required to facilitate the construction of HPS2 that are currently being obtained include:

- Development Permits for Environmentally Relevant Activities (ERA) under the *Environmental Protection Act 1994* (EPA)

- Land tenure (easements) under the *Land Title Act 1994*
- Public Utility Installation in a State Controlled Road under *Transport Infrastructure Act 1994*
- Access Works and Works in State Controlled Road under the *Transport Infrastructure Act 1994*
- Local Law Road Works Permit under Burdekin Shire Council Local Law No.1
- Owners Consent under the Planning Act and *Land Act 1994* for the Development Application for the Pump Station
- Waterway Barrier Works under the *Fisheries Act 1994* for the Development Application for the Pump Station
- Removal of Quarry Material from a Watercourse under the *Water Act 2000* for the Development Application for the Pump Station

5.7 Item 5.7

Information on the timing, frequency and duration of the proposed avoidance, mitigation, management and monitoring measures, and corrective actions to be implemented.

5.7.1 Response

Information on the timing, frequency and duration of the proposed mitigation and management measures are included in the CEMP (GHD 2021) (Appendix P) and MNES report (GHD 2022) (Appendix B), and summarised in Table 5.11, Table 5.12, Table 5.13, Table 5.14, Table 5.15, Table 5.16 and Table 5.17.

Table 5.11 Water quality, erosion and sediment control and dewatering management

Environmental Objective		
Minimise impacts of sediment transport through implementing erosion control measures.		
Performance Criteria		
<ul style="list-style-type: none"> – All works are managed in accordance with the Best Practice Erosion and Sediment Control Guidelines and any other relevant approval and statutory requirements. – No complaints are received in relation to erosion and sediment control issues. 		
Mitigation Measures	Responsibility	Timing
Minimise land clearance / disturbance to Project area and slope angles.	Site Supervisor	At all times
Vehicles to drive on designated routes only	All personnel	At all times
Vehicles to comply with designated speed limits.	All personnel	At all times
Vehicles are not to traverse eroded areas.	All personnel	At all times
Diversion of overland upstream flows around disturbed construction areas to limit erosion.	Site Supervisor	At all times
Conduct all major watercourse earthworks during the dry season and ensure that all bed and banks are stabilised prior to the onset of wet season.	Project Manager and Site Supervisor	At all times
Disturbance to ground cover and soil must be effectively returned to a stable, non-eroding condition where land surface contours within riparian areas are consistent with the adjacent areas.	Site Supervisor	At all times
Where trench dewatering is required, ensure the dewatering effluent is dispersed on stabilised ground via a suitable dispersion method. Sediment traps are to be used where required.	Site Supervisors and all personnel	At all times
Bunded areas are to be constructed for the mixing/filling and the storage of fuel or chemical and hazardous materials. Bunded areas are to be constructed at least 200 m away from drains and waterways and will follow Australian Standards (i.e., AS/AZS 3833:2007, AS1940:2017, A3780:2008).	Site Supervisor	At all times
During refuelling activities ensure that drip mats are used and that it is conducted at least 50 m off a watercourse or 5 m from a drain.	Site Supervisor	At all times
Use water efficiently and minimise use of portable water for construction.	Project Manager, Contractor's HSE	At all times

	manager and all personnel	
After construction remove all temporary erosion and sediment control structures and make good.	Site Supervisor	Upon completion of construction works
Monitoring	Responsibility	Timing
During any works around waterways/water courses water quality will be monitored. Downstream turbidity will need to be maintained at comparable levels to upstream turbidity. Water samples are to be tested onsite by a calibrated water quality meter. Results are to be provided to the principle's Representative as requested.	Contractor's HSE Manager	At all times
Conduct daily, weekly, and monthly environmental inspection.	Site Supervisor	Daily, weekly, and monthly
Reporting	Responsibility	Timing
All personnel to report incidents including where erosion is occurring.	All personnel	At all times
Record and manage all complaints in a register and corrective actions taken.	Site Supervisor	At all times
Water quality and visual assessment results are to be given to the Principle's Representative to show sediment control measures are effective.	Contractor's HSE Manager	Upon completion of each monitoring event
Corrective Action	Responsibility	Timing
Appropriate control measures shall be implemented in a timely manner where sedimentation or erosion issues are identified or have the potential to occur in the future.	Site Supervisor	Following identification
If excessive sediments are collected in diversion drains/sediment traps, sediments will need to be removed.	Contractor's HSE manager, site supervisor and all personnel	Following identification
All incidents and complaints in relation to erosion and sediment control shall be investigated, legitimate problems shall be rectified.	Project Manager	Upon request or complaint

Table 5.12 Vegetation and fauna

Environmental Objective		
To minimise disturbance to native flora and fauna beyond areas of unavoidable habitat loss, in order to maintain the composition and condition of habitats adjacent to and downstream of the Project area.		
Performance Criteria		
<ul style="list-style-type: none"> – No complaints are received in relation to flora and fauna management – Undertake clearing works in accordance with Operation Work Development Permit for clearing native vegetation – No mortality to any EPBC Act listed fauna species – Active nests are managed in accordance with Project SMP 		
Mitigation Measures	Responsibility	Timing
Tree clearing activities to avoid the core breeding season of threatened fauna.	Contractor's Project Manager and Contractor's HSE Manager	Prior to commencement of construction
Avoid the removal of mature (large and moderate <i>E. platyphylla</i>) trees and root systems on the periphery of the construction corridor which possible	Site Supervisor	At all times
Site inductions to include awareness of significant vegetation known to occur in the Project area, that is likely to provide habitat for MNES.	Site Supervisor	At all times
Do not attach signs to trees.	All personnel	At all times
Do not stockpile dead fall. Timber shall be mulched or cut into manageable pieces and removed from site.	Site Supervisor	At all times
Do not store or place stockpile material and/or equipment/machinery at or near the base of trees.	All personnel	At all times

Do not allow traffic into topsoil stockpiles.	Site Supervisor	At all times
Ensure vehicle speeds are regulated to avoid collisions.	All personnel	At all times
'Fauna Warning' signs are to be used in areas of high fauna activity.	Contractor's HSE Manager	At all times
All fauna encountered are to be protected from construction works and left to move off on their own accord.	All personnel	At all times
Employ a fauna spotter/catcher during clearing activities.	Contractor's HSE Manager	Prior to commencement of construction
The fauna spotter/catcher to conduct a pre-clearing survey to identify the presence of active nests and tree hollows.	Site Supervisor and Contractor's HSE Manager	Directly prior to clearing works
Minimise the time that trenches remain open. Where open for more than 24-hours trench ramps are to be placed every 50 m (ramps to provide an escape option for fauna).	Site Supervisor	Throughout duration of works
Project SMP to be followed.	All personnel	Throughout duration of works
All injured wildlife to be taken to the nearest vet for treatment.	All personnel	At all times
Vegetation is not to be burnt on site.	All personnel	At all times
Implement clearing management measures to include the following: <ul style="list-style-type: none"> – Mark clearing areas prior to clearing including setout by licenced surveyor – Fauna spotter/catcher ahead of clearing works – Mulching of cleared variation – Separation of topsoil from subsoil for later placement – Minimise felling of mature hollow bearing trees 	Site Supervisor	Prior to commencement of construction and duration of works
Implement the Rehabilitation Plan. Plan to include the following: <ul style="list-style-type: none"> – Conserve and stockpile topsoil for reuse in rehabilitation of site – Rehabilitate disturbed land as soon as practical with suitable native species. 	Site Supervisor and Contractor's HSE Manager	At all times
Monitoring	Responsibility	Timing
Conduct daily, weekly, and monthly environmental inspections of the Project site.	Site Supervisor	Daily, weekly, and monthly
Open trenches to be checked daily by a fauna spotter and any trapped fauna to be removed.	Site Supervisor and Contractor's HSE Manager	Throughout duration of works
Report any incident involving damage to flora or fauna where this is inconsistent with the performance criteria outlined above to the Principle's Representative.	Project Manager	At all times
Record wildlife incidents (i.e. injury or mortality) in a register.	All personnel	At all times
In the event of a significant environmental management issue (e.g. a breach of the performance criteria outlined above) report immediately to the Principles Representative.	Project Manager	At all times
Corrective Action	Responsibility	Timing
All complaints shall be investigated promptly, and appropriate actions taken.	Project Manager	Upon request of complaint
Where investigations identify environmental nuisance or potential to harm fauna, revision to management plans will be undertaken and further controls implemented, as necessary.	Site Supervisor	Following identification

Table 5.13 Weed and pest management

Environmental Objective		
Avoid and effectively manage potential impacts associated with weeds and pests.		
Performance Criteria		
<ul style="list-style-type: none"> – No introduction or spread of new (invasive) weeds, pests and pathogens. – No complaints are received about weeds and pest introduction or distribution. 		
Mitigation Measures	Responsibility	Timing
Implement a weed and pest management plan	Site Supervisor	Throughout the duration of work
Establish and construct wash-down areas at Project location to minimise the spread of weeds. All wash-down areas are to be constructed at least 200 m of any watercourse/waterway.	Site Supervisor	Prior to the commencement of works
Only clean vehicles, machinery and equipment that are free from soil and plant material are to be accepted onto site.	All personnel	At all times
Wash-down and inspect all plant, vehicles and equipment between of landowner properties.	Site Supervisor and all personnel	At all times
All vehicles, machinery and equipment obtained from Fire Ant, Yellow Crazy Ant or Eclectic Ant regions are to be washed down and inspected prior to entering the Project area. Wash-down certificates must be presented to Principle's Representative via the Site Supervisor	All personnel	At all times
In high weed infested areas, soil is to be identified and not moved/transported to other areas within the Project site.	Contractor's HSE Manger	At all times
Imported material shall be sourced from weed and pest free areas.	Project Manager and Contractor's HSE Manger	At all times
Control key weed species under the weed and pest management plan.	Project Manager and Contractor's HSE Manger	At all times
Monitor disturbed areas for new weed establishment	Project Manager and Contractor's HSE Manger	At all times
Do not feed, keep or release pest species	All personnel	At all times
Food scraps to be disposed of into lidded bins	All personnel	At all times
Monitoring	Responsibility	Timing
All vehicles and equipment to be inspected for weeds	Site Supervisor	At all times
Maintain a wash-down and inspection register for all vehicles, machinery and plant.	Contractor's HSE Manger	At all times
Conduct daily, weekly, and monthly environmental inspection of the Project site.	Site Supervisor	Daily, weekly, and monthly
Reporting	Responsibility	Timing
All personnel to report environmental incidents to the Site supervisor.	All personnel	At all times
Record and manage all complaints in a register.	Project manager	At all times
Corrective Action	Responsibility	Timing
Where investigations show restricted/declared weeds, and pests present, revision to management plans shall be undertaken and further controls implemented, as necessary. Controls shall include use of contracted licensed weed eradicator or pest exterminator.	Project Manager	Following Identification

Table 5.14 Noise and vibration

Environmental Objective		
To prevent and minimise noise and vibration generation.		
Performance Criteria		
– No complaints are received in relation to noise or vibration.		
Mitigation Measures	Responsibility	Timing
Implement a noise and vibration management plan.	Site Supervisor	Prior to the commencement of works
Conduct operations within approved working hours. This is between the hours of 6:30 am and 6:30 pm Monday to Saturday. No works are to be conducted on Sundays or public holidays	Site Supervisor	At all times
Noise reducing devices are to be fitted and maintained on all equipment and plant as per the manufacture's recommendations	Site Supervisor	At all times
Notify neighbours of the proposed work schedule and of any noise or vibration producing activities	Site Supervisor	Prior to the commencement of works
Prior to undertaking any works in the vicinity of livestock, notify the livestock owner and allow enough time for transportation of cattle to another area if they require.	Site Supervisor	At all times
Monitoring	Responsibility	Timing
Conduct regular inspections of equipment noise direction during site works.	Site Supervisor	At all times
Conduct daily, weekly, and monthly environmental inspection.	Site Supervisor	Daily, weekly, and monthly
Reporting	Responsibility	Timing
All non-conformance to noise and vibration are to be reported to the Principle's Representative.	All personnel	At all times
Corrective Action	Responsibility	Timing
All complaints related to noise or vibration shall be investigated promptly and appropriate actions are to be taken to mitigate.	Site Supervisor	At all times

Table 5.15 Air quality

Environmental Objective		
To prevent and minimise the increase in dust emissions.		
Performance Criteria		
– Minimal dust generation		
Mitigation Measures	Responsibility	Timing
Implement an Air Management Plan.	Site Supervisor	At all times
Adopt dust reduction techniques such as, dust suppression dampening disturbed areas with water.	Site Supervisor	At all times
Cover loads during transportation.	Site Supervisor	Transporting material
Provide dust suppression to stockpiles during windy conditions.	Site Supervisor	At all times
Plan construction work fronts to minimise number of vehicle movements to prevent the movement of dust emissions.	All personnel	At all times
Do not burn any materials or light fires on the construction site. Provide protective measures in the event of a fire.	All personnel	At all times
Monitoring	Responsibility	Timing

Conduct daily, weekly, and monthly environmental inspection.	Site Supervisor	Daily, weekly, and monthly
Reporting	Responsibility	Timing
All non-conformance to the air management plan are to be reported to the Principle's Representative.	All personnel	At all times
Corrective Action	Responsibility	Timing
All complaints related to dust generation shall be investigated promptly and appropriate actions are to be taken to mitigate.	Site Supervisor	At all times

Table 5.16 Contaminated land and hazardous substances

Environmental Objective		
To prevent the contamination of land and water with the HPS2 Project area.		
Performance Criteria		
<ul style="list-style-type: none"> – Fuel and hazardous substances stored on site is undertaken in accordance with A1940 the storage and handling of flammable and combustible liquids. – No petroleum, oil and lubricants (POL) to enter drains or watercourse. – No unauthorised disturbance to and/or disposal of potentially contaminated material. – No complaints received from regulatory authorities or the community in relation to the storage and utilisation of fuel and hazardous material. 		
Mitigation Measures	Responsibility	Timing
Bunded areas are to be constructed for the mixing/ filling and the storage of fuel or chemical and hazardous materials. Bunded areas are to be constructed at least 200 m away from drains and waterways and will follow Australian Standards (i.e., AS1940:2017, AS3780:2009, AS/NZS 3833:2007).	Site Supervisor	At all times
Storage sites must be bunded	Site Supervisor	At all times
Storage sites must be in accordance with Australian Standards and away from waterways/water courses.	Site Supervisor	At all times
Fuel storage on site to be minimised.	Site Supervisor	At all times
Store materials and equipment on-site in a manner that prevents damage to the site and minimises hazards to persons.	Site Supervisor	At all times
Spill kits must be available and maintained at all POL storage and refuelling areas.	Site Supervisor	At all times
Prepare and implement a spill response and containment procedure in the event of a spillage or hazardous waste substance, including the immediate containment, clean-up and disposal to a licenced trade waste site.	Site Supervisor	At all times
Site workers are required to wear long-sleeved shirts, cotton drill pants and ankle lace up boots which will limit contact with potentially hazardous substances.	All personnel	At all times
Monitoring	Responsibility	Timing
Conduct daily, weekly, and monthly environmental inspection.	Site Supervisor	Daily, weekly, and monthly
Visual inspections of plant, machinery and works site to ensure no oil leaks, hydraulic leaks, fuel leak/spills or any other hazardous material.	Site Supervisor	At all times
An incident register shall be maintained which includes corrective actions undertaken and persons notified.	Site Supervisor	At all times
Visual inspection for any Unexploded Ordinance (UXO) items. If suspected UXO are identified on site the following actions shall be followed: <ul style="list-style-type: none"> – Immediately stop work – Note item. This includes noting any colour or markings that are visible. Do not touch the item. – Mark the location of the item – Report the finding to the Project Manager and await further instruction. 	All personnel	At all times

– Provide actions on discovery of UXO and ensure any UXO finds are handled appropriately by an Explosive Ordnance Detection (EOD) technician or persons appropriately qualified.		
Reporting	Responsibility	Timing
Notify the Principle's Representative immediately if any of the following hazardous materials are found that have not been known to the site. These include, but are not limited to: <ul style="list-style-type: none"> – UXO's – Flammable or explosive liquids or gases – Toxic, infectious or contaminated materials – Noxious or explosive chemicals – Tanks or containers that may have previously been used to store explosives or toxic substances. 	Project Manager	Immediately following identification of any hazardous material
Environmental incidents involving spills shall be recorded including time of incident, persons involved, details of incident mitigation measures and actions taken to minimise the probability or reoccurrence.	Project Manager	At all times
Corrective Action	Responsibility	Timing
All complaints relating to fuels, chemicals or hazardous material use shall be investigated promptly and appropriate actions taken.	Project Manager	Upon receipt of complaint
Disposal of contaminated soil (small or large quantities) shall be undertaken of in accordance with relevant regulations.	Site Supervisor	When required
In the event of a spill of dangerous goods, work procedures and control measures must be reviewed and revised is necessary.	Site Supervisor	When required

Table 5.17 Waste management

Environmental Objective		
To prevent or minimise the generation of wastes and to appropriately contain, control and dispose of all waste generated.		
Performance Criteria		
<ul style="list-style-type: none"> – No complaints received by the public in relation to waste issues – All works are managed in accordance with the Queensland <i>Waste Reduction and Recycling Act 2011</i> – All waste is appropriately stored and disposed of upon the completion of works 		
Mitigation Measures	Responsibility	Timing
Dispose of all onsite generated waste offsite in accordance with the <i>Waste Reduction and Recycling Act 2011</i> .	Site Supervisor and all personnel	At all times
Adopt the waste management hierarchy when dealing with waste (avoid, reduce, reuse, recycle, recover, treat, dispose).	Site Supervisor and all personnel	At all times
Store waste (including general refuse and hazardous chemicals) in designated areas away from watercourses as per the relevant Australian Standards.	Site Supervisor and all personnel	At all times
No waste is to be dumped in any other location other than the designated storage area. Waste must not enter drainage lines or any other area.	All personnel	At all times
Collect waste hydrocarbons in an appropriate storage container and store in a clear location on site. All hydrocarbon waste will be taken to a licence disposal or recycling facility as soon as possible.	Site Supervisor and all personnel	At all times
Do not burn waste.	All personnel	At all times
General housekeeping shall be implemented to kept site in a tidy condition (i.e., clean and remove all waste including all unwanted construction material from the construction site).	All personnel	At all times
File substantial written evidence (dockets, invoices and receipts) for all waste disposals. Provide copies of records to the TCC Representative when requested.	Project Manger	At all times
Construct a Concrete Washout area at designated locations. Ensure the washout area is self-contained, lined with black plastic and located at least 200 m for any waterway/water course.	Contractor's HSE manager, all personnel	At all times

Monitoring	Responsibility	Timing
Conduct daily, weekly, and monthly environmental inspection.	Site Supervisor	Daily, weekly, and monthly
Regular inspections of on-site facilities shall be undertaken to ensure waste is being generated, stored, handled, disposed and transported in accordance with regulations.	Site Supervisor	At all times
Monitor waste disposal evidence (dockets, invoices and receipts).	Site Supervisor	At all times
Reporting	Responsibility	Timing
Provide waste disposal evidence upon request.	Site Supervisor	Upon request
All personnel to report incidents where waste material has been a contributing factor.	All personnel	At all times
Record and manage all complaints in a register and corrective actions taken.	Project Manager	At all times
Corrective Action	Responsibility	Timing
All complaints relating to waste issues shall be investigated promptly and appropriate actions taken to clean up the affected area and manage the waste generated.	Project Manager	Upon receipt of complaint
Where inspections have shown unacceptable waste management, revisions of management plans are to be made and further controls implemented.	Project Manager	Following identification

5.8 Item 5.8

An assessment of the expected or predicted effectiveness of the proposed measures.

5.8.1 Response

An assessment of the predicted effectiveness of the proposed measures have been assessed in the residual impact assessment in MNES report (GHD 2022) (Appendix B) and is summarised in Table 5.18 to Table 5.25.

The initial impact is re-assessed following mitigation as a residual impact indicating the mitigation measures effectiveness.

- High Effectiveness – no impact to species and/or habitats due to prevention and/or avoidance. Negligible residual impact.
- Moderate Effectiveness – direct and indirect impacts are minimised, residual impact is reduced by two bands e.g. severe reduced to moderate. Unless reduced to low then this is moderately effective.
- Low Effectiveness – minimal reduction in impact through control, survey and observation measures. Reduced by one band e.g. high to moderate.

Risk framework is provided in Table 5.18 to Table 5.20.

Proposed avoidance and mitigation measures will be effective in preventing a significant residual impact for all MNES, with the exception of three species (i.e. koala, southern black-throated finch and bare-rumped sheathtail bat). Significant residual impacts are anticipated on these three MNES species. The residual impact will be compensated through a proposed land-based offset. More information on the offset is outlined in Section 7.

Table 5.18 Risk matrix used to assess impacts and residual impacts

Likelihood	Consequence				
	Negligible	Low	Moderate	High	Severe
Certain	Negligible	Low	High	Severe	Severe
Almost certain	Negligible	Low	Moderate	High	Severe
Likely	Negligible	Low	Moderate	High	High
Possible	Negligible	Negligible	Low	Moderate	High
Unlikely	Negligible	Negligible	Negligible	Low	Low

Table 5.19 Criteria used to define likelihood

Likelihood	Criteria used to define likelihood
Certain	It is very probable that the risk event could occur in any year (>95%)
Almost certain	It is more probable than not that the risk event could occur in any year (>50%)
Likely	It is equally probable that the risk event could or could not occur in any year (50%)
Possible	It is less probable than not that the risk event could occur in any year (<50%)
Unlikely	It is improbable that the risk event could occur in any year. (<5%) The risk event is only theoretically possible or would require exceptional circumstances to occur.

Table 5.20 Criteria used to define the severity of the impact

Magnitude	Criteria used to define severity of impact
Severe	Permanent impacts AND/OR extreme intensity AND/OR regional extent (i.e. impact at a population level)
High	Long duration AND/OR high intensity AND/OR large extent (i.e. major impact to individuals with minor impacts at a population level)
Moderate	Moderate duration AND/OR moderate intensity AND/OR localised extent (i.e. moderate level impacts to individuals with no impact at a population level)

Magnitude	Criteria used to define severity of impact
Low	Short duration AND/OR low intensity AND/OR very localized extent (i.e. low level impacts to individuals that have no impact at a population level)
Negligible	Very short duration AND/OR negligible intensity AND/OR (i.e. negligible impact to individuals)

Table 5.21 Residual impact assessment for the *Eucalyptus raveretiana*

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Loss four individuals	High	Preliminary design has sought to minimise disturbance and removal of observed <i>E. raveretiana</i> individuals at the intake site.	Moderate	Low effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness

Table 5.22 Residual impact assessment for the koala

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
Loss of 134.19 ha of potential habitat comprising: Forest and woodland 85.94 ha Non-remnant suitable habitat 48.25 ha	High	Utilise existing tracks. Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint. Establishing no-go areas. Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas. Preparation of a CEMP and ESCPs.	Moderate	Moderate effectiveness
Injury/mortality during construction: – Construction vehicle movements – Vegetation clearing – Entrapment/entanglement – Increase in dog attacks	High	Clearing supervised by spotter/catchers – at-risk koalas relocated before clearing. Sequential clearing. Restricting clearing to daylight hours only during the koala breeding season (September – November). Establishing no-go areas. Restricting vehicle movements to designated areas. Establishing and enforcing speed limits. Signage in koala habitat areas. Construct access/haulage roads in existing tracks wherever possible. Pest control measures as part of the CEMP. Waste management plan.	Low	Moderate effectiveness
Injury/mortality during operation:	Moderate	Establishing no-go areas and temporary exclusion fencing (where required).	Low	Moderate effectiveness

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
<ul style="list-style-type: none"> – Vehicle movements (on average 1-2 per week) – Entrapment in infrastructure – Increase in dog attacks 		<p>Establishing and enforcing speed limits.</p> <p>Pest control measures as part of the CEMP.</p> <p>Waste management plan.</p>		
Habitat degradation by increased dust run-off and sedimentation	Low	<p>Reduce duration of works in watercourses and drainage lines.</p> <p>Monitor weather events when working within watercourses.</p> <p>Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.</p>	Negligible	High effectiveness
Barrier effects – localised restriction of koala movement	Low	<p>Fencing installed during construction to remain temporarily during the construction phase.</p> <p>Limiting permanent fencing to small areas of operation and maintenance infrastructure.</p>	Negligible	High effectiveness
<p>Introduction and spread of disease:</p> <p>The Project is unlikely to cause an increase in the incidence or transmission of Phytophthora that can degrade koala habitat in some regions. The Project is unlikely to result in any increase in Chlamydia among koalas</p>	Low	<p>Vehicle hygiene protocols implemented during construction.</p>	Negligible	High effectiveness
Introduction and spread of invasive fauna and weed species	Moderate	<p>Implement measures for introduced flora and fauna (to be outlined in the CEMP).</p> <p>Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works.</p> <p>Educate staff on the impacts of weeds and their general environmental obligation.</p> <p>Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.</p>	Low	Moderate effectiveness

Table 5.23 Residual impact assessment for the bare-rumped sheath-tail bat

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 92.23 ha comprising (36.44 ha overlap of suitable habitat): 43.12 ha roosting 85.54 ha foraging	Severe	Utilise existing tracks. Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint. Establishing no-go areas. Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas. Rehabilitation of the disturbance footprint areas undertaken as soon as practicable with native species. Reinstatement and rehabilitation of pipeline with native species. Preparation of a CEMP.	High	Low effectiveness
Loss of roost trees including 10 large and 27 medium sized <i>E. platyphylla</i> hollows	Severe	Avoid the removal of mature (large and moderate <i>E. platyphylla</i>) trees and root systems on the periphery of the construction corridor.	Moderate	Low effectiveness
Loss of future potential roost trees including 325 small sized <i>E. platyphylla</i> hollows	Severe	Plant <i>E. platyphylla</i> tubestock to provide future potential roosting habitat in areas that currently support remnant vegetation within 400 of vegetation management watercourse.	Moderate	Moderate effectiveness
Injury or mortality due to vegetation clearing	High	Employ a fauna spotter catcher during clearing. Allow a fauna spotter catcher to check moderate to large hollow-bearing trees within the clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Low	Moderate effectiveness
Habitat fragmentation and reduced connectivity	Moderate	Plan haul roads to avoid fragmenting habitats. Reduce area cleared in specific habitats.	Low	Moderate effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species.	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

Table 5.24 Residual impact assessment for the black-throated finch (southern)

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 96.34 ha (in aggregate) comprising Nesting and foraging habitat 82.14 ha (habitat critical to the survival of the species) Foraging habitat only 14.19 ha	Severe	Utilise existing tracks. Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint. Establishing no-go areas. Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas. Preparation of a CEMP.	High	Low effectiveness
Injury or mortality due to vegetation clearing	Severe	Employ a fauna spotter catcher during clearing. Reduce speed limits within areas of potential habitat. Allow a fauna spotter catcher to walk through clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Moderate	Moderate effectiveness
Habitat fragmentation and reduced connectivity	High	Infrastructure sited within existing disturbed habitat (i.e. part of access tracks, part of substation, some access tracks).	Moderate	Low effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species.	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Moderate	Low effectiveness
Introduction and spread of invasive fauna and weed species	High	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Moderate	Low effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

Table 5.25 Residual impact assessment for the squatter pigeon (southern)

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Habitat loss of 96.32 ha of potential habitat, comprising 82.33 ha foraging and breeding habitat, 13.31 ha foraging only habitat and 0.68 ha drinking and dispersal habitat	High	Utilise existing tracks. Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint. Establishing no-go areas. Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas. Preparation of a CEMP.	Low	Moderate effectiveness
Injury or mortality due to vegetation clearing	High	Employ a fauna spotter catcher during clearing. Reduce speed limits within areas of potential habitat. Allow a fauna spotter catcher to walk through clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Low	Moderate effectiveness
Habitat fragmentation and reduced connectivity	Moderate	Infrastructure sited within existing disturbed habitat (i.e. part of access tracks, part of substation, some access tracks).	Low	Moderate effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species.	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive fauna and weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness
Disturbance of surface waterways and waterbodies.	Moderate	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

5.9 Item 5.9

Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are not inconsistent with relevant plans.

5.9.1 Response

Six MNES species were confirmed present or considered likely to occur within the Project area. Commonwealth documentation was reviewed for each of the six species, identifying key threats and threatening processes that are known to, or potentially impact the species. These are outlined in Table 5.26.

Table 5.26 Known and potential threats to MNES confirmed present or likely to occur

MNES	Key threats
<i>Eucalyptus raveretiana</i>	<p>The Commonwealth approved conservation advice and listing advice for <i>Eucalyptus raveretiana</i> identifies the main threat to the species is habitat disturbance and smothering by rubber vine. The main habitat disturbance affecting the species includes from timber harvesting, increased frequency of fires from increase in fuel load associated with weeds and introduced grasses, land management that increases stream bank erosion and loss of individuals from construction of dams. Threat from smothering by rubber vine is thought to have decreased, with implementation of biological control agents to manage the invasive weed (DEWHA 2008; TSSC 2012). No threat abatement plans have been identified as being relevant for this species.</p>
Koala	<p>The Commonwealth approved conservation advice and National Recovery Plan for the koala identifies direct threats (i.e. climate change) and ecological threatening processes (i.e. fragmentation) for the species.</p> <p>The main direct threat to the koala includes climate change. Wide-scale climate change drivers which affects koalas include the increased frequency and intensity of drought and high temperatures, increasing prevalence of weather conditions which promote bushfire, and shrinking climatically suitable area. Ecological threatening processes affects the koala, these processes can be grouped into landscape processes: habitat loss, fragmentation and degradation and population effects. Additionally, koala populations are being impacted by disease, specifically koala retrovirus (KoRV) and Chlamydia (<i>Chlamydia pecorum</i>), human related activities including habitat loss from land clearing and mining, and mortality due to encounters with vehicles and dogs. Changes in landscape includes changes to forest structure, loss of refugia, increased isolated, reduced connectivity. These landscape processes affect koala metapopulation processes. The species is also impacted synergistically by threats, i.e. habitat clearance and climate change drivers are associated with increased levels of physiological stress in wild koala populations, this can increase incidence and impact of localised threats arising from encounter mortality with dogs, vehicles, disease and food shortages. In summary, these impacts acting synergistically to reduce the populations resilience (DAWE 2022a; DAWE 2022b). No threat abatement plans have been identified as being relevant for this species.</p>
Bare-rumped sheathtail bat	<p>The Commonwealth approved conservation advice and National Recovery Plan for the bare-rumped sheathtail bat identifies threats for the species. These include one known threat, and five likely threats. The species main known threat is habitat loss. The species habitat has been subjected to extensive habitat clearance for agriculture and urban development. The species is known to roost in tree hollows, these are impacted during vegetation clearance. The Commonwealth documentation also lists five threats that are 'likely' to affect the species, these include vegetation change (i.e. clearing of vegetation for agriculture and cattle grazing, invasion by weeds), timber collection and removal (removal of mature hollow-bearing trees), competition for tree hollows by feral or native birds and mammals, disease (unknown risk of the Australian Bat Lyssavirus) and climate change (loss of climatically suitable habitat) (TSSC 2016; Schulz and Thomson 2007).</p>
Black-throated finch (southern)	<p>The Commonwealth listing advice, National Recovery Plan, Significant impact guidelines for the black-throated finch (southern) and the background paper for the Significant impact guidelines for the subspecies, identifies threats that impact the black-throated finch (southern). The subspecies began declining with the rise of pastoralism and farming. Habitat loss, fragmentation and degradation are the main threats to the subspecies, these threats degrade and alter the subspecies habitat, resulting in trampling, altering of fuel loads, changes in fire regimes, ultimately impacting habitat and food resources for the subspecies. Overgrazing by stock can alter vegetation cover, impact seed production and degrade water sources. Additionally, invasion of exotic weeds such as grasses may also impact the species, particularly where exotic grasses are not a food resource for the subspecies, and result in an increase in fuel loads and increased frequency of fires. Inappropriate fire regimes appear to severely alter habitat, especially the production of grass seeds and grass species diversity. Overgrazing, particularly by sheep and feral rabbits, and habitat clearing are likely the predominant reason for the subspecies' decline in the southern parts of its historic range. After rain at the start of the wet season, seed availability is limited, due to a number of reasons, creating a food resource bottleneck. The intensity of the resource bottleneck is dependent of rainfall patterns. Where drought and intense grazing are coupled, degrading water sources and riparian habitat, the subspecies has been known to vanish from previously occupied areas. Other additional potential threats to the subspecies includes illegal trapping of birds for captive trade, hybridisation with escapees of the northern subspecies and predation by introduced predators (TSSC 2005; BTFRT, DECC and QPWS 2007; DEWHA 2009a; DEWHA 2009b).</p>
Squatter pigeon (southern)	<p>The Commonwealth approved conservation advice and SPRAT profile for the squatter pigeon (southern) identifies threats that impact the subspecies. The population decline for the squatter pigeon (southern) in NSW has been largely attributed to overgrazing at times of drought, followed by clearing of vegetation. In Queensland, while a large proportion of habitat has been replaced with improved pastures for cattle grazing, grazing by cattle is not as destructive as grazing by sheep.</p> <p>Current threats to the subspecies include ongoing vegetation clearance and fragmentation, overgrazing of habitat by livestock and feral herbivores (e.g. feral rabbits), introduction of weeds, inappropriate fire regimes, thickening of understorey vegetation, predation by feral cats and foxes, trampling of nests by domestic stock, and illegal shooting (DCCEEW 2022a; TSSC 2015).</p>

MNES	Key threats
White-throated needletail	The Commonwealth approved conservation advice, SPRAT profile and Draft referral guideline for 14 birds listed as migratory species under the EPBC Act documentation for the white-throated needletail identifies threats that impact the species. The species is a non-breeding visitor to Australia, as such no threats to breeding places occur in Australia. The species is almost exclusively aerial, and forages aerially. Accordingly, in Australia there is evidence of direct mortality by collision with wind turbines, overhead wires, windows and lighthouses (the impact of these on the larger population requires further investigation). Additionally, the use of insecticides (particularly organochlorines) is another possible cause of decline for the species. Insecticides may result in a decreased abundance of invertebrates (food source), or result in secondary poisoning to the species via accumulation as sublethal doses in the prey. The loss of roosting habitat in forest and woodlands may also contribute to a decline in the species (TSSC 2019; DCCEEW 2022; DoE 2015).

Mitigation measures have been enacted to manage potential impacts (and potential threats) to MNES as a result of construction and operation of the Project. Mitigation measures committed by the Project and their relation to managing Commonwealth identified threats and potential impacts for the six MNES is provided in Table 5.27. Threats listed in this section have been derived by Commonwealth documentation for the six species (i.e. Commonwealth approved conservation advice, listing advice, recovery plans, significant impact guidelines and referral guidelines). The Project has committed to mitigation measures to manage potential impacts, these management measures align with actions to protect MNES from threats (i.e. weeds, habitat loss, etc). Construction and operation of the Project does not adversely affect the recovery of the species. Accordingly, the Project is not inconsistent with Commonwealth relevant documentation and plans.

Based on habitat mapping, initial breeding places surveys were undertaken as part of the ecology surveys completed by GHD in October 2021 and April 2022. Data on the location of potential breeding places for NC Act listed species will be used to direct fauna spotter/catchers to manage impacts to breeding places through the clearing process.

Impacts to black-throated finch (southern) nesting sites will be primarily avoided by temporal avoidance measures. Where temporal avoidance is not possible and clearing of breeding habitat is required during the peak breeding season, those areas cleared will be subject to targeted pre-clearance surveys in the weeks prior to clearing to identify and manage risks to individual nesting sites. This will allow spotter/catchers to identify and manage impacts to individual nesting sites.

As part of the strategy to manage impacts to breeding places, pre-clearance surveys will be undertaken in areas of potential breeding habitat for species listed under the NC Act (which also includes EPBC Act listed species) as mapped in the High Risk SMP. Pre-clearance surveys will be undertaken by suitably qualified and experienced fauna spotter/catchers, prior to the commencement of clearing works.

Table 5.27 Mitigation measures to manage threats to MNES

MNES	Commonwealth identified threats				
	Habitat loss and fragmentation	Habitat degradation /disturbance	Injury and mortality	Invasive weeds and pests	Disease
<i>Eucalyptus raveretiana</i>	Avoidance measures, site in disturbed areas, implementation of CEMP and ESCP	Sedimentation and erosion management in ESCP, CEMP	N/A	Weed management in CEMP	N/A
Koala	Minimise clearing, site in disturbed areas, no-go areas, implementation of CEMP, ESCP and HR SMP	ESCP, CEMP, reduce duration of works in waterways, monitor weather, vehicle movement and speed restrictions	Qualified and experienced fauna spotter/catcher, sequential clearing, clearing in daylight only, establish no-go areas, waste management and pest control in CEMP, vehicle movement and speed restrictions, implementation of HR SMP	Weed and pest management in CEMP	Vehicle hygiene protocols in CEMP

MNES	Commonwealth identified threats				
	Habitat loss and fragmentation	Habitat degradation /disturbance	Injury and mortality	Invasive weeds and pests	Disease
Bare-rumped sheath-tail bat	Minimise clearing, site in disturbed areas, no-go areas, implementation of CEMP, ESCP and HR SMP	Restrict artificial light, direct lighting from sensitive habitat, implementation of ESCP, CEMP, reduce duration of works in waterways, monitor weather, vehicle movement and speed restrictions	Qualified and experienced fauna spotter/catcher, flag and sign potential habitat areas, implementation of HR SMP	Weed and pest management in CEMP	Vehicle hygiene protocols in CEMP
Black-throated finch (southern)	Minimise clearing, site in disturbed areas, minimise works in waterways, no-go areas, implementation of CEMP	Site infrastructure in disturbed areas, implementation of CEMP and ESCP	Qualified and experienced fauna spotter/catcher, vehicle movement and speed restrictions, flag and sign potential habitat areas, implementation of HR SMP (i.e. temporal avoidance of active nests)	Weed and pest management in CEMP	N/A
Squatter pigeon (southern)	Minimise clearing, site in disturbed areas, minimise works in waterways, no-go areas, implementation of CEMP, ESCP and HR SMP	Site infrastructure in disturbed areas, implementation of CEMP and ESCP, restrict artificial light, direct lighting from sensitive habitat, reduce works in waterways and riparian habitats	Qualified and experienced fauna spotter/catcher, vehicle movement and speed restrictions, flag and sign potential habitat areas, implementation of HR SMP (i.e. temporal avoidance of active nests)	Weed and pest management in CEMP	N/A
White-throated needletail	Minimise clearing, site in disturbed areas	N/A	N/A	N/A	N/A

5.10 Item 5.10

Details of ongoing management, including monitoring programs to support an adaptive management approach, that validate the effectiveness of the proposed measures and overall demonstrate that environmental outcomes will be achieved.

5.10.1 Response

The adaptive management approach includes setting the outcomes (Section 5.5.1), understanding the threats and processes (Section 4), planning which management actions will be implemented and how they will be monitored and then undertaking compliance auditing and monitoring (Table 5.11 to Table 5.17) to determine effectiveness. Once this effectiveness is assessed, if required, the identified corrective actions will be implemented (Table 5.11 to Table 5.17). These corrective actions are to be reviewed and adapted if it is found that outcomes are still not being met.

An adaptive implementation program will also be implemented as part of the Offset Area Management Plan (OAMP) and will be used to ensure uncertainty is reduced over time, and that completion criteria are attained and maintained over the period of approval. As more information becomes available following ongoing performance monitoring, the management and monitoring regime will be reviewed and revised to maximise the likelihood of attaining and maintaining the outcomes to be achieved by implementing the OAMP. Any updates to the OAMP which do not result in a material change to the environmental outcomes, performance and completion criteria will be made by TCC without the requirement of informing the DCCEEW. If material amendments likely to alter the

environmental outcomes, or performance and completion criteria are proposed to the OAMP, the amendments and justification for the contingency measures will be provided to the DCCEE in writing.

Adaptive management will be used to incorporate changes in any of the following areas:

- Assimilation of new data or information - such as, updates to conservation advice or new threat abatement plans relevant to the SBTf, BRST and Koala.
- Project coordination and scheduling – to manage unforeseen disruptions to schedule such as inclement weather on contractor works for management actions and environmental consultant monitoring events.
- Annual review of risks – to refresh the mitigation measures should new threats be identified or stochastic events such as unplanned fires or floods occur.
- Annual review of management measure effectiveness – to increase the frequency or change the method of management actions where monitoring performance criteria are not met.
- Contingency for unplanned incidents – such as stochastic events including unplanned fires or floods.

The Rehabilitation Management Plan (GHD 2022) and CEMP (GHD 2022) provides details of ongoing management, including monitoring programs to support an adaptive management approach, that validates the effectiveness of the proposed measures and overall demonstrates that environmental outcomes will be achieved.

Additionally, the CEMP details performance measures, monitoring and corrective actions (Table 5.11, Table 5.12, Table 5.13, Table 5.14, Table 5.15, Table 5.16 and Table 5.17).

Adaptive management practices for the Rehabilitation Management Plan shall be implemented where monitoring indicates rehabilitated areas will not achieve rehabilitation objectives and completion criteria. Adaptive management strategies shall include a combination of the following:

- Installation or repair of erosion and sediment control measures where erosion or stabilisation issues are identified
- Removal of restricted invasive weeds and any other species observed to be inhibiting endemic ground layer establishment
- Modification of watering regime where plant health indicates insufficient or excess water has been received
- Application of fertilizer where plant health indicates nutrient deficiency
- Re-application of native grass planting and replanting of tubestock where mortality are not achieved
- Extending the rehabilitation monitoring and reporting period.

It will be the responsibility of the Contractor(s) to implement rehabilitation and adaptive management measures where rehabilitation treatments do not meet the acceptance criteria at each of the monitoring periods.

5.11 Item 5.11

Details of tangible, on-ground corrective actions that will be implemented in the event the monitoring programs indicate that the environmental outcomes have not or will not be achieved.

5.11.1 Response

The adaptive management approach includes setting the outcomes (Section 5.5.1), understanding the threats and processes (Section 4), planning which management actions will be implemented and how they will be monitored and then undertaking compliance auditing and monitoring (Table 5.12, Table 5.13, Table 5.14, Table 5.15, Table 5.16 and Table 5.17) to determine effectiveness. Once this effectiveness is assessed the identified corrective actions will be implemented where required. A summary of these corrective actions are outlined in Table 5.11 through to Table 5.17.

5.12 Item 5.12

Details of any measures proposed to be undertaken by Queensland and local governments, including the name of the agency responsible for approving each measure.

5.12.1 Response

The construction of the HPS2 is subject to a Development Application for Operational Works, assessed and decided by DSDILGP acting through SARA.

- An approved Decision Notice, SARA reference 2201-26844 SDA, for the pipeline construction works was received on 14 June 2022 with no conditions relating to rehabilitation activities. A copy of the SARA Decision Notice can be found in Appendix U. A copy of the Project Rehabilitation Management Plan (GHD 2022) (Appendix R) was included in the Development Application to SARA.
- At the time of preparation of this PD, a Development Application for a Material Change of Use for the Pump Station under the Planning Act and Planning Regulation and Burdekin Shire *IPA Planning Scheme*, March 2011 has not been submitted to Burdekin Shire Council as the Assessment Manager.

A High Risk and Low Risk SMP (GHD 2022) (Appendix T) was prepared in accordance with Section 335 of the *Nature Conservation (Animals) Regulation 2000* (NC Reg). A SMP is required where any activity has the potential to tamper with breeding place of protected animals under the NC Reg. A High Risk SMP is required where activities will affect breeding places for species listed as special least concern, least concern colonial breeders, near threatened, vulnerable, endangered, critically endangered or extinct in the wild under the NC Reg.

An application for a SMP for tampering with an animal breeding place where there is a high risk was submitted to DES on 8 February 2022. The SMP was approved by DES on 16 May 2022 and has been registered with DES as an approved SMP. The approval remains in effect until 12 May 2025. A copy of the SMP is provided in Appendix T.

Other State and Local Government Approvals required to facilitate the construction of HPS2 that are currently being obtained include:

- Development Permits for Environmentally Relevant Activities (ERA) under the *Environmental Protection Act 1994* (EPA)
- Land tenure (easements) under the *Land Title Act 1994*
- Public Utility Installation in a State Controlled Road under *Transport Infrastructure Act 1994*
- Access Works and Works in State Controlled Road under the *Transport Infrastructure Act 1994*
- Local Law Road Works Permit under Burdekin Shire Council Local Law No.1
- Owners Consent under the Planning Act and *Land Act 1994* for the Development Application for the Pump Station
- Native vegetation clearing under the *Vegetation Management Act 1999* for the Development Application for the Pump Station.
- Waterway Barrier Works under the *Fisheries Act 1994* for the Development Application for the Pump Station
- Removal of Quarry Material from a Watercourse under the *Water Act 2000* for the Development Application for the Pump Station.

5.13 Item 5.13

Outline any proposed avoidance or mitigation measures to reduce possible impacts on protected matters during the operational phase of the pipeline e.g., reducing water transfer amounts to allow environmental flows during waterbird breeding events; any flow monitoring activities.

5.13.1 Response

The HPS2 Project will transfer raw water from the Burdekin River (at the Clare Weir Storage) to the Ross River Dam. The Burdekin River is heavily regulated and the Burdekin Falls Dam (located approximately 100km upstream from the HPS2 proposed intake) is the largest water storage on the Burdekin River with a capacity of 1,860,000 ML. There are three weirs downstream of Burdekin Falls Dam in the Lower Burdekin catchment (Gorge Weir, Blue Valley Weir, Clare Weir and The Rocks Weir), together with extensive irrigation schemes that include other storages associated with levees and bunds, seasonal sand dams and the Haughton Balancing Storage.

As the Project will not affect the Ross River Dams releases regime, the Project is expected to have negligible impacts to the downstream receiving environment of the Ross River, including the Bowling Green Bay Ramsar site, located to the south of the Ross River mouth.

Collectively the water infrastructure supplies the Burdekin Haughton Scheme which supplies water for irrigation customers in the lower Burdekin region and supplements urban and industrial requirements for Townsville. Sunwater manage the scheme and they must comply with the conditions set out in the *Burdekin Haughton Water Supply Scheme Resource Operations Licence* (ROL), issued to Sunwater in December 2009 by the Department of Regional Development, Manufacturing and Water. The ROL outlines the infrastructure details, environmental release rules and all Sunwater's monitoring and operating obligations.

Any take of water from the Clare Weir Storage by the HPS2 Project would be supplemented by controlled releases from the Burdekin Dam in accordance with Sunwater's operating system to ensure adequate environmental releases. Accordingly, any take of water is expected to have negligible impact to the downstream environment and protected matters.

The Haughton Pipeline Project is a water security project supporting the Townsville's Ross River Dam water catchment by providing greater capacity to deliver raw water into the Dam to augment or 'top up' water levels during period of very low rainfall. The Ross River flows in an easterly direction from its headwaters in the Ross River Dam and discharges into Cleveland Bay, south of Townsville. The river is currently interrupted by three weirs and a dam and incorporates two distinctly different wetland ecosystems. Upstream of Aplins Weir, the river incorporates a series of palustrine wetlands, whilst below it is an estuarine environment. The construction of the weirs and dam infrastructure has considerably reduced the natural seasonal flow regime within the river.

As water from the Haughton Pipeline Project will not result in changes to the Burdekin Falls Dams release regime, the pipeline operation is expected to have negligible impact to the downstream receiving environment.

5.14 Item 5.14

Information regarding methodology/ies for pre-clearance surveys.

The PD needs to expand upon the pre-clearance surveys to mark the locations of potential breeding nests outlined in the referral documentation to detail how the impact to these areas will be reduced.

5.14.1 Response

A High Risk and Low Risk SMP (GHD 2022) (Appendix T) was prepared in accordance with Section 335 of the *Nature Conservation (Animals) Regulation 2000* (NC Reg). A Species Management Plan is required where any activity has the potential to tamper with breeding place of protected animals under the NC Reg. A High Risk SMP is required where activities will affect breeding places for species listed as special least concern, least concern colonial breeders, near threatened, vulnerable, endangered, critically endangered or extinct in the wild under the NC Reg.

This High Risk SMP applies to the potential breeding places of fauna species which are listed as special least concern, near threatened, vulnerable, endangered, critically endangered or extinct in the wild under the NC Reg or

are least concern colonial breeders that have the potential to be directly or indirectly tampered with during works for the Project.

Initial breeding places surveys were undertaken as part of the ecology surveys completed by GHD in October 2021 and April 2022. Data on the location of potential breeding places for NC Act listed species will be used to direct fauna spotter/catchers to manage impacts to breeding places through the clearing process.

Impacts to black-throated finch (southern) nesting sites will be primarily avoided by temporal avoidance measures. Where temporal avoidance is not possible and clearing of breeding habitat is required during the peak breeding season, those areas cleared will be subject to targeted pre-clearance surveys in the weeks prior to clearing to identify and manage risks to individual nesting sites. This will allow spotter/catchers to identify and manage impacts to individual nesting sites.

As part of the strategy to manage impacts to breeding places, pre-clearance surveys will be undertaken in areas of potential breeding habitat for species listed under the NC Act (which also includes EPBC Act listed species) as mapped in the High Risk SMP. Pre-clearance surveys will be undertaken by suitably qualified and experienced fauna spotter/catchers, prior to the commencement of clearing works.

All breeding places for species listed under the NC Act that will be impacted by the Project will be recorded in an electronic Animal Breeding Place Register and submitted to DES within six months of clearing. Clearing of all areas subject to pre-clearance surveys will also be supervised by experienced fauna spotter/catchers, implementing the measures detailed below.

Management of impacts through the clearing phase

Clearing of breeding places identified in the pre-clearance survey will be supervised by suitably qualified and experienced fauna spotter/catchers. By directing clearing activities, spotter catchers will manage residual impacts to breeding places identified in the pre-clearance surveys that could not be avoided.

The following are among the key measures that will be used to minimise impact to breeding places:

- Sequential clearing to allow wildlife to move to areas of refugial habitat
- Encouraging wildlife to leave on their own accord through measures including tree tapping implemented by experienced fauna spotter/catchers
- Dismantling high-risk trees in sections
- Flushing areas of squatter pigeon habitat prior to undertaking works.

Measures to manage impacts through the clearing are detailed in Table 5.28. Specific measures that will be used to manage impacts to listed species are summarised in Table 5.29.

Table 5.28 Measures to manage impacts to wildlife breeding places through the clearing phase

Objective	Action	Responsibility
Minimise adverse impact to wildlife and wildlife breeding places	Engage suitably qualified and experienced fauna spotter catchers to undertake pre-clearance surveys prior to clearing and to supervise the clearing process	Construction contractor and fauna spotter/catcher
	Restrict habitat clearing to the minimum amount necessary for the construction within the Project footprint.	
	The extent of vegetation clearing (and no-go areas) will be clearly identified on construction plans and in the field using high visibility fencing or flagging in the vicinity of high conservation significant areas. Clearing extent will be communicated to construction supervisors.	
	Establish and flag no-go areas around areas of ecological and environmental sensitivity including active breeding sites for NC Act listed species	
	All construction personnel shall attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations regarding vegetation clearing protocols. Areas identified for vegetation clearance are to be clearly defined and detailed in site inductions.	
	Inspect all hollow-bearing trees and other terrestrial breeding places prior to clearing. Where hollows can't be inspected, pre-clearance survey for bare-rump	

<p>sheath-tail Bat shall include potential roost watching at dusk with visual, thermal imaging and active anabat recording.</p>	
<p>Remove any hollows that occur within the Project footprint that do not contain fauna at the early stages of clearing to avoid fauna relocating to other hollows in the clearing footprint</p>	
<p>Undertake sequential clearing to allow fauna escape to areas outside the clearing footprint</p>	
<p>Encourage fauna to leave hollows of their own accord through tree tapping, and other measures implemented by experienced fauna spotter/catchers</p>	
<p>Where wildlife need to be physically removed from hollows, dismantle the trees in sections under the direction of trained and experienced fauna spotter/catchers and experienced clearing crews</p>	
<p>Any injury or mortality will be recorded in the register and managed</p>	
<p>Any injured or abandoned wildlife will be taken to prearranged veterinarians</p>	
<p>All nocturnal wildlife removed from trees during clearing will be housed in appropriate temporary holding facilities by experienced spotter/catchers and released at dusk into an area of nearby habitat located outside the Project footprint.</p> <p>Relocation procedures will conform with the Project's approved High-risk SMP. Wildlife will be released in an area containing the species' habitat by a suitably experienced fauna spotter/catcher (licensed under the Queensland NC Act). Potential relocation areas along the length of the pipeline and adjacent to ancillary infrastructure, will be identified in advance of disturbance/clearing taking place. Wildlife will be released, within a short distance of their capture where this is still within the animal's known home range extent, in areas with connectivity to other areas of suitable habitat and suitable ground level complexity, and in an area safe from construction (i.e. relocation in suitable habitat adjacent and behind construction to avoid individual migrating back into the construction/clearing area. The nocturnal species home ranges are detailed below:</p> <ul style="list-style-type: none"> - Koala – between 3-500 ha, females and juveniles have a smaller home range than males. Relocate koalas maximum 1 km from site (DAWE 2022a) - Bare-rumped sheath-tail bat – no scientific literature, relocate at dusk in suitable habitat (i.e. presence of >15 cm hollow bearing <i>E. platyphylla</i> in eucalypt woodland within approximately 1 km of the relocation site). <p>For all other native animals which do not, or are unable to disperse themselves, or are injured, animals will be captured using a safe and ethical technique, after efforts have been made to encourage the animal to depart the construction/clearing area of their own accord (without need for capture). Animals unable to depart on their own accord will be captured and uninjured individuals will be immediately released at the nearest suitable habitat away from clearing, per the protocol summarised above. Injured animals will be taken to the nearest appropriate veterinary clinic.</p> <p>Where fauna spotter/catchers are not trained to handle snakes, an experienced handler will be brought to the site (licensed handlers will be notified in the local area prior to vegetation clearing if the fauna spotter/catcher is not a licensed handler). Efforts will be made to prevent snakes entering the vegetation clearing area. Individuals will be released as predetermined by the fauna spotter/catcher, e.g. nocturnal species will be released at dusk to avoid disorientation or attack from predators. Snakes will be released as close as possible to the clearing area (i.e. 200 m maximum) to increase chance of successful relocation (Wolfe et al 2022).</p> <p>Several local veterinarian/wildlife carer resources in Ayr and Townsville occur within approximately 80 km:</p> <p>Ayr <u>Tropical Vets</u> 184 Queen St, Ayr QLD 4807 Phone: 07 4783 2055 <u>FNQ Wildlife Rescue</u> 24/7 Phone: 07 4053 4467</p> <p>Townsville</p>	

Wildlife Carers Townsville 0414717374 25 Aitken St, Aitkenvale QLD 4814	
Trees will be felled immediately after removing wildlife to prevent animals from returning to hollows.	
All construction works shall be restricted to daylight hours to avoid impact on nocturnal species	
Rehabilitation of temporary clearance areas including haulage and temporary access roads, stockpiles, and buried pipeline alignment will be undertaken as soon as practicable once these facilities are no longer required.	
Prepare and implement a final Construction Management Plan (CMP), including ESCP, for standards such as weed hygiene, erosion, fuels and hazardous substances, fire, etc. and will include erosion and sediment control measures.	

Table 5.29 Measures to manage impacts to wildlife breeding places of listed species

Objective	Action	Responsibility
Black throated finch (southern)	<p>Monitor</p> <p>Pre-clearance surveys of mapped habitat to locate nests</p> <p>If undertaking in the breeding season, existing nest to be observed at regular intervals (i.e. weekly) to determine the developmental stages of birds (when fledglings become independent) and subsequently when clearing can progress</p> <p>Spotter/catcher to check all suitable trees prior to clearing</p> <p>Avoid</p> <p>Minimise clearing of mapped breeding habitat for black-throated finch (southern) during the breeding season (i.e. February to May)</p> <p>If in the breeding season - fatality of eggs or chicks during the construction period will be avoided by the implementation of the following:</p> <p>Provision of an exclusion zone (i.e. no civil works and/or broad-scale clearing) surrounding the breeding place, until selective vegetation clearing within the exclusion zone is complete.</p> <p>Waiting for the finches to complete their breeding cycle (i.e. fledglings' no longer dependant on the nest) prior to selectively clearing the woody vegetation</p> <p>The establishment of any new finch nests will be prevented by the immediate removal of woody vegetation within the exclusion zone, once the once determined it is not being used for breeding purposes</p> <p>Disturbance within the breeding area will be avoided by implementing management measures in accordance with the CEMP to control impacts relating to air quality, noise, and vibration</p> <p>Disturbance within the breeding during selective clearing will be minimised by the use of low impact clearing methods (e.g. individual trees removed by hand or chain pulling)</p> <p>Relocate</p> <p>If nesting chicks are abandoned, they are to be placed in the care of a qualified Wildlife Carer.</p> <p>If birds are injured during vegetation clearing or other construction activities, they are to be placed in the care of a qualified wildlife carer</p>	Construction contractor and fauna spotter catcher
Squatter pigeon (southern)	The species carries high risk of mortality during clearing and vehicle movements. Fauna spotter catchers to flush areas of squatter pigeon on foot prior to clearing. Given the risk to the species, this will be undertaken on foraging, drinking and dispersing habitat.	Construction contractor and fauna spotter catcher
Hollow dependant fauna (bare-rumped sheathtail bat)	<p>Monitor</p> <p>Pre-clearance survey of mapped breeding habitat areas</p> <p>Marking the location of all potential roosting trees</p> <p>potential roost trees to be surveyed at dusk using visual, active Anabats, or thermal imaging to determine the present of bats, also burrow inspections if practical</p> <p>Inspect all potential roosting trees prior to clearing</p>	Construction contractor and fauna spotter catcher

	<p>Avoid</p> <p>Sequential clearing towards areas of refugial habitat and maintaining trees to allow movement of bats to refuge areas</p> <p>Do not clear potential roosting trees within the likely breeding season – evidence would be the presence of non-volant young.</p> <p>Felling trees as soon as hollows are vacated to reduce the risk of bats returning to hollows</p> <p>Relocate</p> <p>Encouraging bats to leave hollows on their own accord, tapping trees and shining spotlights down hollows</p> <p>Dismantling trees in sections if bats are potentially present</p>	
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5.15 Item 5.15

Information regarding the likely success rated of relocating fauna within the disturbance footprint.

Consideration should be given as to the timing of the action to avoid the need for relocating species, particularly during breeding periods when species may be occupying roost hollows.

5.15.1 Response

A High Risk SMP has been prepared and approved by DES. The High Risk SMP will be implemented for species listed under the NC Act (which also includes the key EPBC Act listed species). Relocation of fauna will be required in scenarios where fauna are abandoned or injured, these are fully outlined in Appendix T. The success of relocating fauna is remit with a qualified and highly experienced fauna spotter/catcher. Additional mitigation measures to avoid fauna relocation includes temporal avoidance where vegetation clearance intersects active nests (i.e. black-throated finch (southern) and squatter pigeon (southern)). Any breeding places intersected by the Project will be managed under the approved High-Risk SMP.

5.16 Item 5.16

The department anticipates a revised description of mitigation measures will be required to determine the potential residual impacts of the proposed action. In particular, rehabilitation activities are not considered by the department to be a mitigation measure. The department considers the referral information is therefore likely to have underrepresented significant impacts to listed threatened species and communities and the PD must contain a revised discussion of the residual significant impacts.

5.16.1 Response

An assessment of the predicted effectiveness of the proposed measures have been revised taking into consideration that that rehabilitation activities are not considered by the department to be a mitigation measure. The predicted effectiveness of the proposed mitigation measures is detailed in the residual impact assessment in MNES report (GHD 2022) (Appendix B) and is summarised in Table 5.30 to Table 5.33.

Table 5.30 Residual impact assessment for the *Eucalyptus raveretiana*

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Loss four individuals	High	Preliminary design has sought to minimise disturbance and removal of observed <i>E. raveretiana</i> individuals at the intake site	Moderate	Low effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness

Table 5.31 Residual impact assessment for the koala

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
Loss of 134.19 ha of potential habitat comprising: Forest and woodland 85.94ha Non-remnant suitable habitat 48.25 ha	High	Utilise existing tracks Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint Establishing no-go areas Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas Preparation of a CEMP and ESCPs	Moderate	Moderate effectiveness
Injury/mortality during construction: – Construction vehicle movements – Vegetation clearing – Entrapment/entanglement – Increase in dog attacks	High	Clearing supervised by spotter/catchers – at-risk koalas relocated before clearing Sequential clearing Restricting clearing to daylight hours only during the koala breeding season (September – November) Establishing no-go areas Restricting vehicle movements to designated areas Establishing and enforcing speed limits Signage in koala habitat areas Construct access/haulage roads in existing tracks wherever possible Pest control measures as part of the CEMP Waste management plan	Low	Moderate effectiveness
Injury/mortality during operation: – Vehicle movements (on average 1-2 per week) – Entrapment in infrastructure	Moderate	Establishing no-go areas and temporary exclusion fencing (where required) Establishing and enforcing speed limits Pest control measures as part of the CEMP Waste management plan	Low	Moderate effectiveness

Potential impacts	Risk rating	Mitigation measure	Residual risk rating	Effectiveness
– Increase in dog attacks				
Habitat degradation by increased dust run-off and sedimentation	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Barrier effects – localised restriction of koala movement	Low	Fencing installed during construction to remain temporarily during the construction phase Limiting permanent fencing to small areas of operation and maintenance infrastructure	Negligible	High effectiveness
Introduction and spread of disease: The Project is unlikely to cause an increase in the incidence or transmission of Phytophthora that can degrade koala habitat in some regions. The Project is unlikely to result in any increase in Chlamydia among koalas	Low	Vehicle hygiene protocols implemented during construction	Negligible	High effectiveness
Introduction and spread of invasive fauna and weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness

Table 5.32 Residual impact assessment for the bare-rumped sheath-tail bat

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 92.23 ha comprising (36.44 ha overlap of suitable habitat): 43.12 ha roosting 85.54 ha foraging	Severe	Utilise existing tracks Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint Establishing no-go areas Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas Rehabilitation of the disturbance footprint areas undertaken as soon as practicable with native species Reinstatement and rehabilitation of pipeline with native species Preparation of a CEMP	High	Low effectiveness
Loss of roost trees including 10 large and 27 medium sized <i>E. platyphylla</i> hollows	Severe	Avoid the removal of mature (large and moderate <i>E. platyphylla</i>) trees and root systems on the periphery of the construction corridor	Moderate	Low effectiveness
Loss of future potential roost trees including 325 small sized <i>E. platyphylla</i> hollows	Severe	Plant <i>E. platyphylla</i> tubestock to provide future potential roosting habitat within existing areas supporting remnant vegetation within 400 m of vegetation management watercourse.	Moderate	Moderate effectiveness
Injury or mortality due to vegetation clearing	High	Employ a fauna spotter catcher during clearing. Allow a fauna spotter catcher to check moderate to large hollow-bearing trees within the clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Low	Moderate effectiveness
Habitat fragmentation and reduced connectivity	Moderate	Plan haul roads to avoid fragmenting habitats. Reduce area cleared in specific habitats.	Low	Moderate effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	Low	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Negligible	High effectiveness
Introduction and spread of invasive weed species	Moderate	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Low	Moderate effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

Table 5.33 Residual impact assessment for the black-throated finch (southern)

Impact	Initial impact rating	Mitigation measures	Residual impact	Effectiveness
Total disturbance of 96.34 ha (in aggregate) comprising Nesting and foraging habitat 82.14 ha (habitat critical to the survival of the species) Foraging habitat only 14.19 ha	Severe	Utilise existing tracks Land clearing restricted to minimal amount necessary and will not extend outside of the Project footprint Establishing no-go areas Infrastructure that crosses waterways will be sited in areas where existing disturbance or degradation affects riparian areas Preparation of a CEMP	High	Low effectiveness
Injury or mortality due to vegetation clearing	Severe	Employ a fauna spotter catcher during clearing. Reduce speed limits within areas of potential habitat Allow a fauna spotter catcher to walk through clearing footprints prior to clearing. Identify areas of potential habitat with signage and flagging tape.	Moderate	Moderate effectiveness
Habitat fragmentation and reduced connectivity	High	Infrastructure sited within existing disturbed habitat (i.e. part of access tracks, part of substation, some access tracks)	Moderate	Low effectiveness
Disturbance from increased light, noise and vibration	Moderate	Restricted sources of artificial lighting. Direct lighting away from sensitive areas for the species	Low	Moderate effectiveness
Habitat degradation through increased dust, run-off and sedimentation.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions or employ and water truck to reduce dust rates.	Moderate	Low effectiveness
Introduction and spread of invasive fauna and weed species	High	Implement measures for introduced flora and fauna (to be outlined in the CEMP). Require construction vehicles to hold valid weed free declarations prior to the commencement of construction works. Educate staff on the impacts of weeds and their general environmental obligation. Identify areas of dense outcrops of introduced flora to eliminate construction vehicles from entering the area.	Moderate	Low effectiveness
Disturbance of surface waterways and waterbodies.	High	Reduce duration of works in watercourses and drainage lines. Monitor weather events when working within watercourses. Reduce speed limits during dry conditions to reduce dust generation and potential sedimentation.	Low	Moderate effectiveness

5.17 Item 5.17

The department considers the retention of a biodiversity corridor the length of the entire pipeline (of an appropriate width) may be an effective mitigation measure to reduce the impacts of habitat fragmentation and help maintain habitat connectivity between habitat patches around the Project area. The proponent may wish to investigate/propose this as an approach and provide a discussion as part of the PD.

5.17.1 Response

As detailed in the MNES report (GHD 2022), the Project area occurs within a landscape which has undergone extensive disturbance and clearing of vegetation because of agricultural and cattle grazing purposes. The condition of large areas of the Project area have been impacted by vegetation clearance, cattle grazing, agriculture, sowing of exotic pastural grasses and the presence of weeds (Plate 5.1). High levels of fragmentation exist in portions of very sparse open woodland in the east (Plate 5.2). Non-remnant cleared areas are scattered across the Project area, predominantly in the southern and northern sections (Plate 5.2). As much of the Project area has been located in open woodland areas already subject to grazing, the impacts of habitat fragmentation are expected to be relatively minor and localised. The construction of the Project will result in localised fragmentation where it intersects tracts of open woodland, in these areas clearing of vegetation for the buried pipeline (required to a width of 40 m), pump station and stockpiles are required. However, the localised scale at which this occurs is unlikely to significantly restrict fauna movement. The movement of conservation significant species that are known to occur within the Project area is unlikely to be limited by the open spaces created. Consequently, the fragmentation of habitat is expected to have only localised impacts on the composition of forest bird assemblages, reptile and small ground mammal species, by reducing the area of available habitat for edge-sensitive woodland species that only occur in intact woodland remnants.



Plate 5.1 Dense Chinese apple (left) and rubber vine (right) within the Project area



Plate 5.2 *Highly fragmented and cleared agricultural area (left), and grazing pastures (right)*

State government DES has published a landscape fragmentation and connectivity assessment tool which is used to assess connectivity impacts at the local (5km) and regional scale (20km). The LFC tool determines the significance of a proposed impact on connectivity areas by assessing:

1. Whether the change in the core ecosystem extent at the local scale (post impacts) is greater than a threshold determined by the level of fragmentation at the regional scale; or
2. If any core area (greater than or equal to one hectare) is lost or reduced to patch fragments (core to non-core).

The analysis determined there would not be a significant impact on connectivity areas as there are no core remnant areas within and adjacent to the Project area. The complete results of the assessment are provided in Appendix B.

Table 5.34 provides further assessment on the impacts of habitat fragmentation on MNES conservation significant species.

Table 5.34 *Habitat fragmentation impacts on MNES conservation significant species*

Scientific name	Common name	EPBC Act status	Impacts of habitat fragmentation
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	Squatter pigeon (southern) utilises habitats that have been subject to high levels of fragmentation, occurring in sparse, modified grassland, and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. Accordingly, the Project will result in negligible direct loss or fragmentation of habitat for the squatter pigeon (southern).
<i>Phascolarctos cinereus</i>	Koala	E	The majority of proposed infrastructure is located within woodland and open woodland, in land where fragmentation impacts already exist from agriculture and grazing pastures. The pipeline alignment will result in temporary habitat loss which will be reinstated and rehabilitated with native flora species. The Project will result in a loss of 134.19 ha of koala habitat. Habitat loss will be small in the context of the local and regional landscape and will not create large gaps that present barriers to koala movement. Large areas of habitat west and south of the Project connect the Project area via a State terrestrial corridor for koala dispersal and movement these areas will not be impacted. The Commonwealth approved conservation advice for the koala comprise koala habitat as safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches, where these areas sufficiently provide quality food and shelter trees. Accordingly, the species is unlikely to be impacted by further habitat fragmentation.

<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped sheathtail bat	V	<p>Within the Project area, bare-rumped sheathtail bat habitat has already been subjected to a high level of fragmentation, occurring in sparse, modified grassland and open woodland habitats, where connectivity is loosely maintained to larger open woodland remnants and water sources. The Project will have direct impact on habitat for the bare-rumped sheathtail bat, resulting in impact to 92.23 ha of suitable habitat (in aggregate, 36.44 ha of overlapped habitat), comprising 85.54 ha of suitable foraging and 43.12 ha of suitable roosting habitat from a relatively dispersed area. The Project footprint generally supports hollows smaller than typically required by the species, with habitat localised along the Project footprint and similar habitat persisting immediately adjacent. Along the length of the Project alignment only 10 large and 27 medium sized hollows representing potentially suitable roosting habitat for the species will be subject to clearing. An additional 325 small hollows representing future roosting habitat will also be cleared. Rehabilitation of 61.33 ha will be undertaken, including planting of <i>E. platyphylla</i> tubestock across the Project footprint to offset the loss of future potential roosting habitat for the species. The bare-rumped sheathtail bat can fly large distances and can cross open ground (TSSC 2016). As such, the species' habitat is unlikely to be fragmented by the small-scale clearing required for the Project.</p>
<i>Poephila cincta cincta</i>	Black throated finch (southern)	E	<p>Vegetation clearing for the Project will not result in vegetation loss greater than 1 km (in an east-west direction). with no broad-scale fragmentation of habitat resulting or barriers to movement imposed. While small and narrow areas (i.e. 40 m alignment width) will be cleared for the Project, the subspecies is known to traverse across inhabitable areas where distances are less than a kilometre (DEWHA 2009a). The Project is located in a landscape with existing fragmentation, particularly to the east of the Project area where large areas of vegetation have been historically cleared for sugar cane farming. The Project is unlikely to have any bearing on landscape-level connectivity and metapopulation dynamics, noting that the Project does not sever connectivity to mapped 'important habitat areas' for the subspecies.</p> <p>Localised clearance of habitat will not restrict ongoing access to riparian habitats or the capacity for the subspecies to move between habitats within the local landscape.</p>
<i>Hirundapus caudacutus</i>	White-throated needletail	V, Mig	<p>The white-throated needletail is not directly dependent on terrestrial habitats at ground level and has the capacity to fly over cleared and fragmented areas. Accordingly, the Project will result in no direct loss or fragmentation of habitat for the white-throated needletail.</p>
Key: EPBC Act – E – Endangered, V – Vulnerable, Mig - Migratory			

6. Rehabilitation requirements

6.1 Item 6.1

A description of the rehabilitation measures proposed to be undertaken. Please also include a map of any areas that will be rehabilitated (with a land-based area measurement, e.g., in hectares, indicating areas that will or will not be rehabilitated).

6.1.1 Response

Rehabilitation will be undertaken in accordance with the project Rehabilitation Management Plan (GHD, 2022) (Appendix R) and the Rehabilitation Technical Specification (GHD, 2022) (Appendix S) to all disturbed areas within the construction corridor, with the exception of a 4 m wide permanent access track. Land within the construction corridor has been categorised into two distinct rehabilitation extents, each of which will receive a different rehabilitation treatment, as follows:

- To provide future habitat values for black-throated finch, bare-rumped sheath-tail bat and koala, areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the Department of Resources (DoR) Vegetation Management Watercourse and Drainage Feature Map will be revegetated with tubestock consistent with the relevant riparian or woodland Regional Ecosystems (i.e. RE 11.3.25 or 11.3.35) and hydromulch comprising endemic grass species. These areas exclude a 10 m wide zone of influence above the pipeline which shall only be hydromulched to enable future maintenance of the pipeline.
- To achieve sufficient protection against erosion, all other areas of the pipeline construction corridor will be hydromulched with endemic grass species. These areas include minor watercourses and drainage lines that are not mapped on the DoR Vegetation Management Watercourse and Drainage Feature Map, the pipeline 10 m wide zone of influence centred about the pipeline (i.e. 5 m either side of the pipeline centerline), temporary construction access roads and stockpile yards.

Where requested by a landholder, some temporary construction areas (e.g. laydown areas, access tracks etc.) may be retained by the landholder subject to formal agreement and handover and where permitted under approvals.

The type of proposed disturbance, indicative impact and rehabilitation requirements for each of the rehabilitation extents are detailed in Table 6.1. A schematic representation of the proposed revegetation is presented in Figure 6.1.

The extents of the rehabilitation treatments, as well as the locations of DoR Vegetation Management Watercourses, and the required REs to be restored, are presented in Figure 6.2.

Table 6.1 Project construction components and rehabilitation requirements

Rehabilitation extent	Disturbance	Indicative impact	Rehabilitation requirements	Estimated extent
Remnant vegetation within 400 m of a DoR Vegetation Management Watercourse	<p><i>Temporary</i></p> <ul style="list-style-type: none"> – Clearing of remnant vegetation within a 20 m corridor of a defined distance from a mapped DoR Vegetation Management Watercourse, and 40 m corridor in all other areas – Clearing of temporary construction access roads and stockpile yards within 400 m of a vegetation management watercourse <p><i>Permanent</i></p> <ul style="list-style-type: none"> – 4 m gravel access track for access along the length of the pipeline 	<ul style="list-style-type: none"> – Clearing/felling/grubbing vegetation within construction corridor – Construction of pipeline trench within pipeline corridor – Gabion mattress scour protection to watercourse defining banks with 300mm topsoil overlaid – Construction of a 4 m wide access track 	<ul style="list-style-type: none"> – Plant tubestock of canopy, sub-canopy, shrub and ground strata (excluding grasses) outside the pipeline 10 m zone of influence and 4m access track; hydromulch with endemic grasses – Hydromulching with endemic grasses to full extent of disturbed corridor including pipeline 10 m zone of influence (i.e. pipeline's 10 m zone of influence is to remain free from tubestock planting) 	22.83 ha comprising: <ul style="list-style-type: none"> – 0.63 ha RE 11.3.25b – 22.2 ha RE 11.3.35 – 22.83 ha Hydromulch
All other areas in the construction corridor including watercourses not mapped on the DoR Vegetation Management Watercourse and Drainage Feature Map, the pipeline 10 m wide zone of influence, temporary construction access roads and stockpile yards	<p><i>Temporary</i></p> <ul style="list-style-type: none"> – Clearing of a 40 m wide pipeline construction corridor – Clearing of temporary construction access roads, stockpile yards and site construction compounds <p><i>Permanent</i></p> <ul style="list-style-type: none"> – 4 m wide gravel access track parallel to pipeline 	<ul style="list-style-type: none"> – Clearing/felling/grubbing vegetation within construction corridor – Construction of pipeline trench within pipeline corridor – Gabion mattress scour protection to watercourses with 300mm topsoil overlaid – Construction of a 4 m gravel access track 	Hydromulching with endemic grasses	111.91 ha

Rehabilitation extent - Remnant vegetation within 400m of a DoR Vegetation Management Watercourse

Plan View

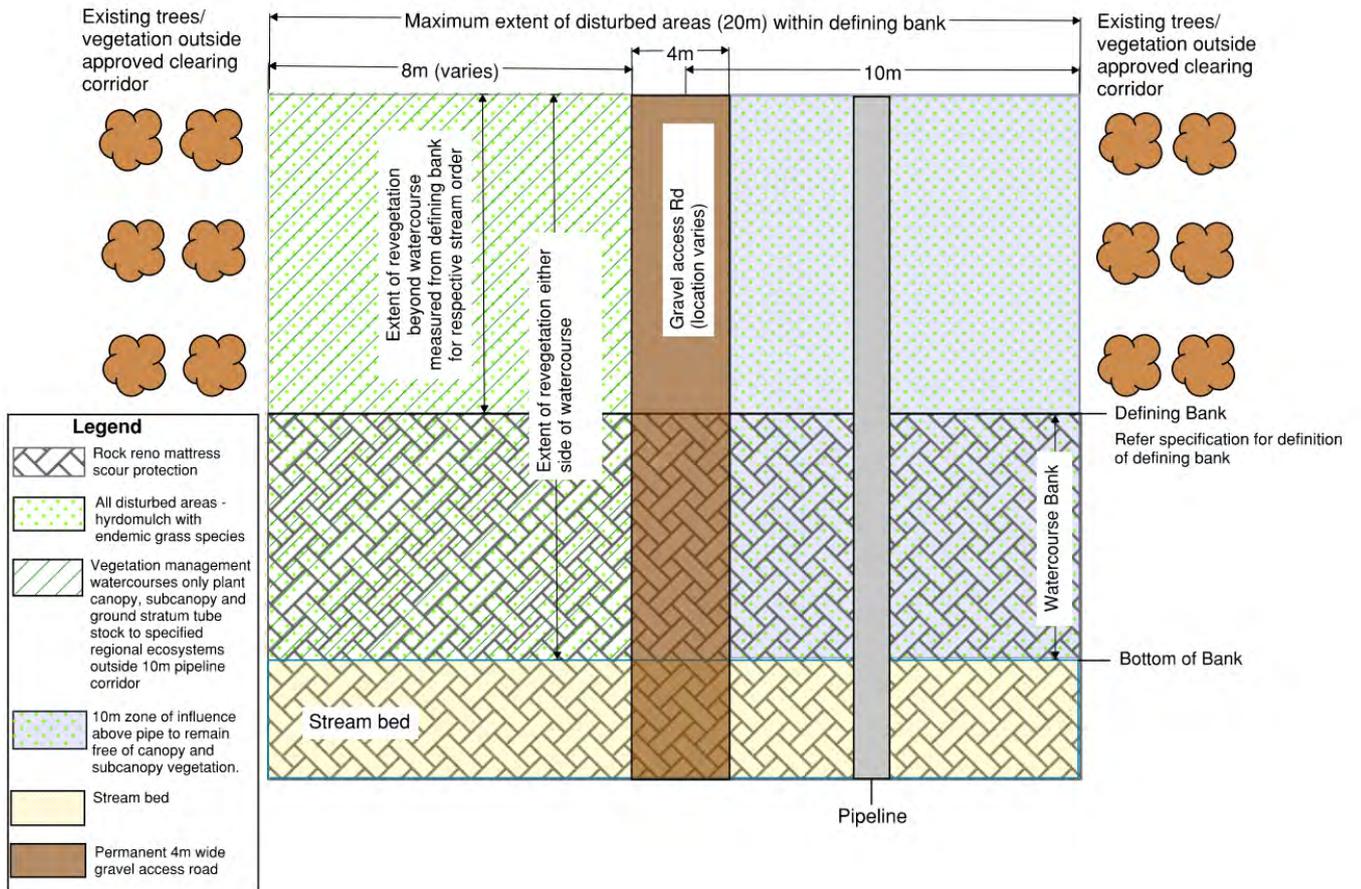
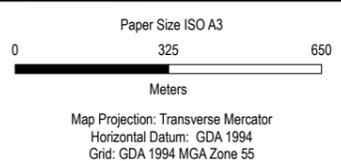


Figure 6.1 Vegetation management watercourse revegetation plan



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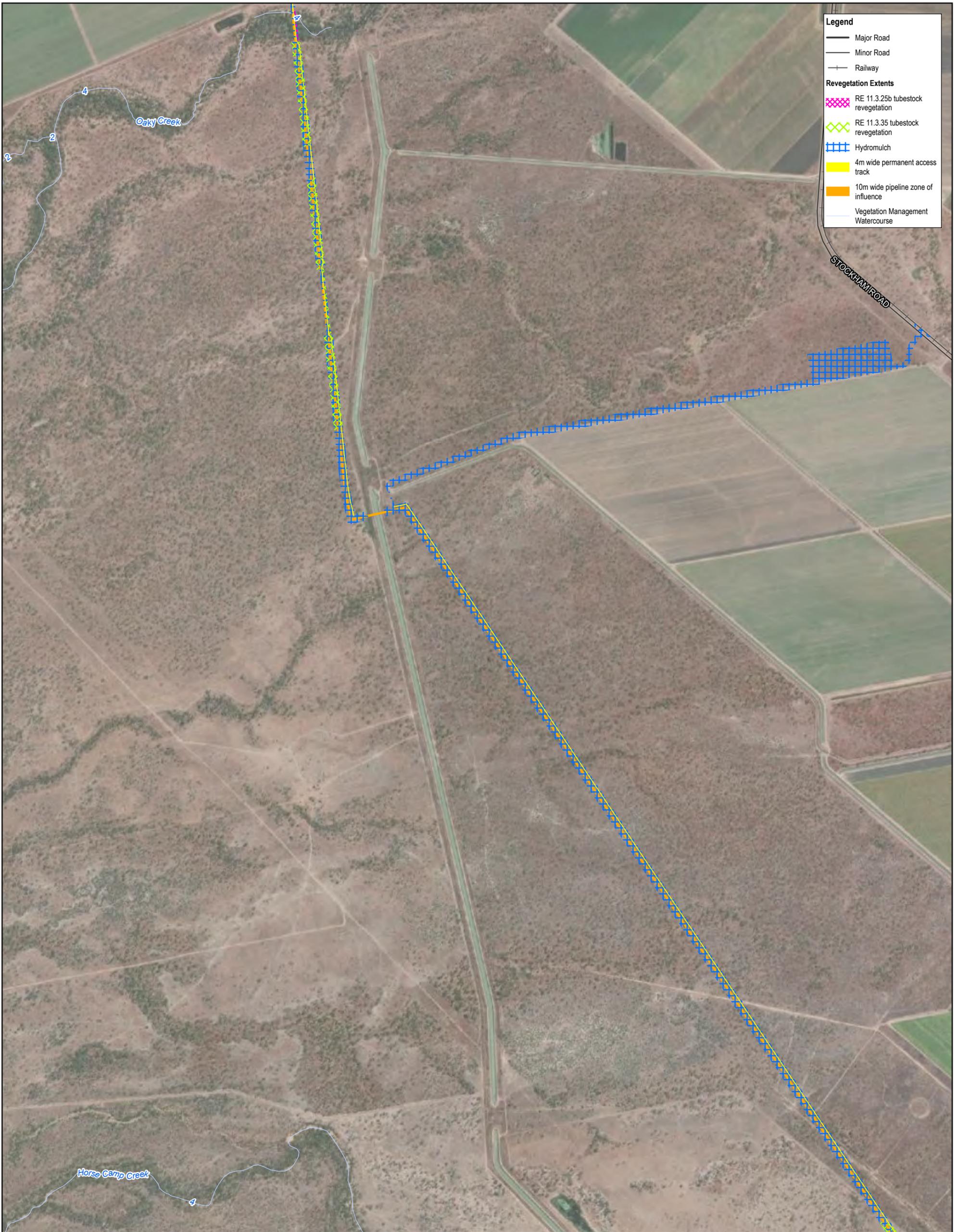


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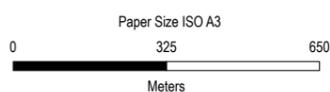
Project No. 12537606
Revision No. C
Date 7/28/2022

Revegetation extents

Sheet 1 of 6
FIGURE 6-2



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Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55

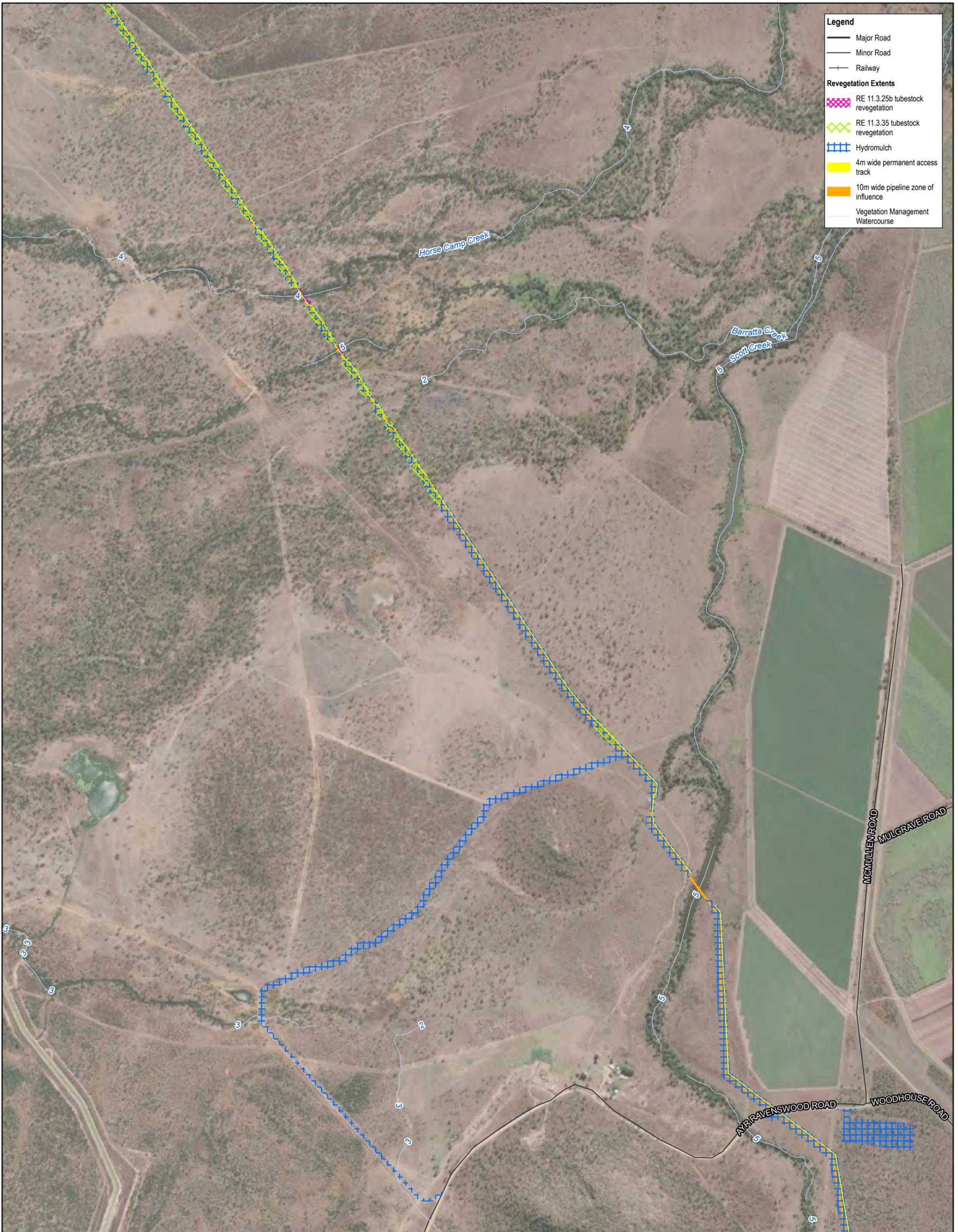


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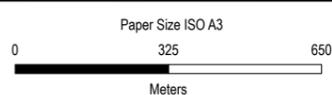
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Revegetation extents

Sheet 2 of 6
 FIGURE 6-2



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Map Projection: Transverse Mercator
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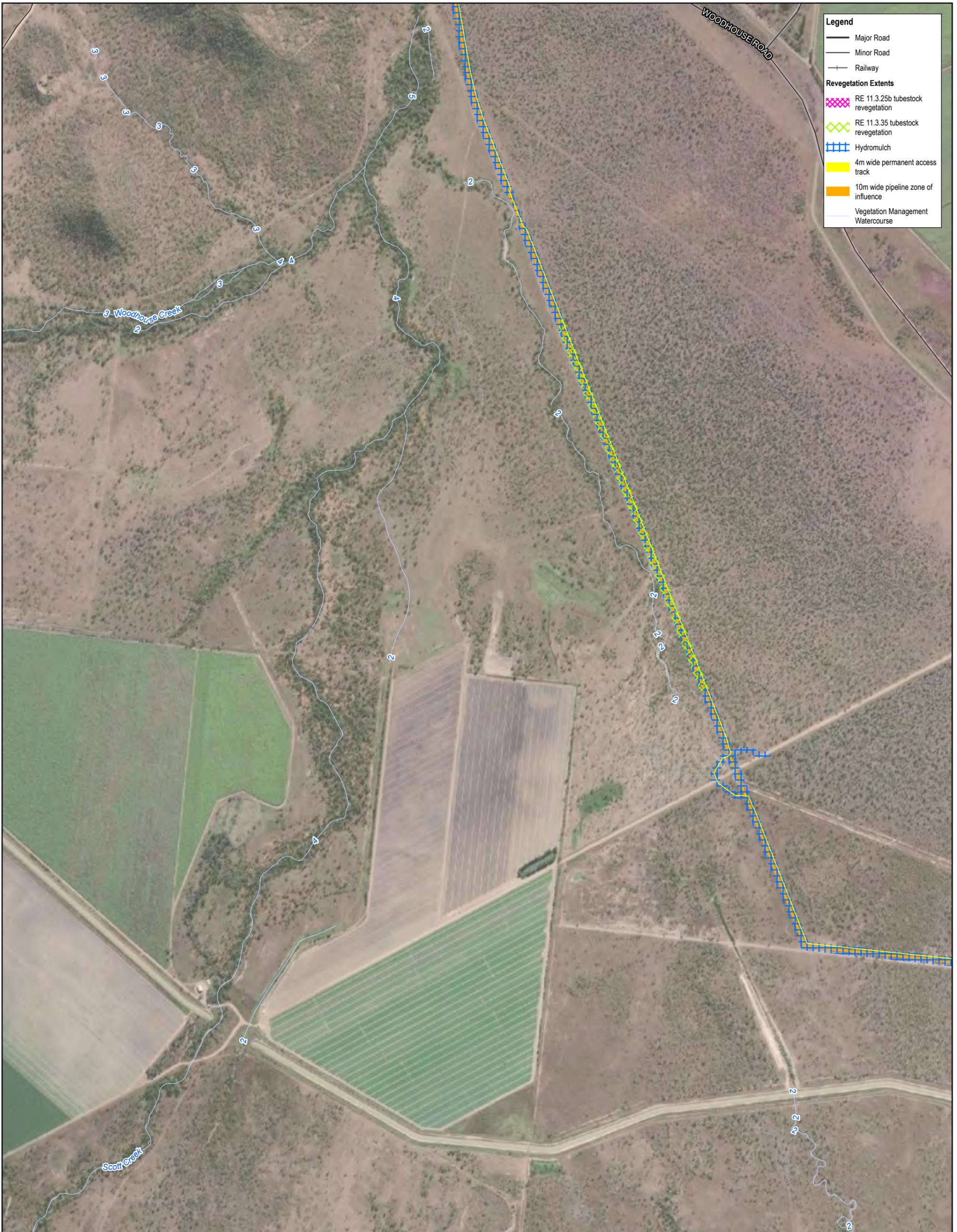


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Revegetation extents

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Sheet 3 of 6
 FIGURE 6-2



Legend

- Major Road
- Minor Road
- Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

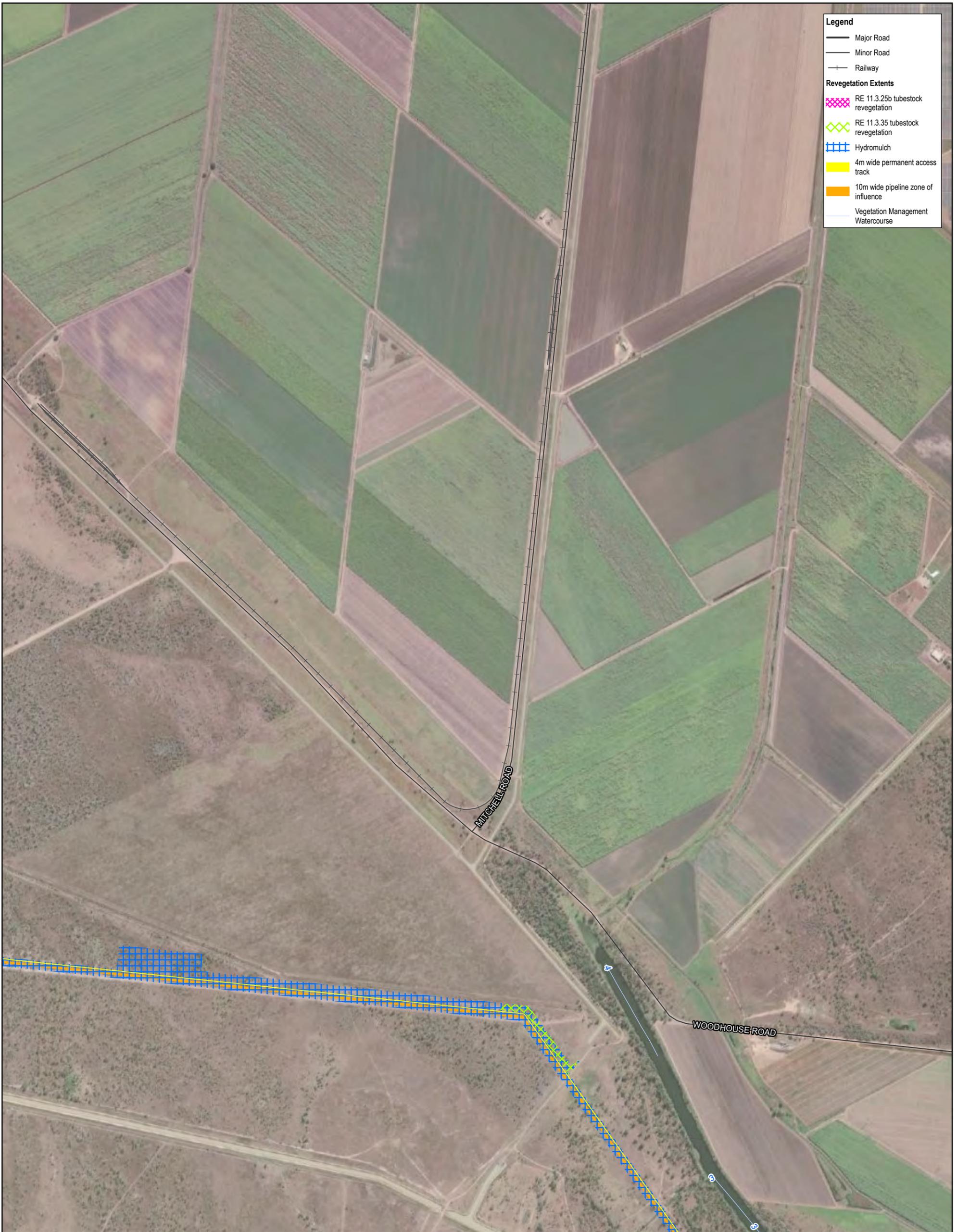


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Revegetation extents

Sheet 4 of 6
FIGURE 6-2



Legend

- Major Road
- Minor Road
- +— Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

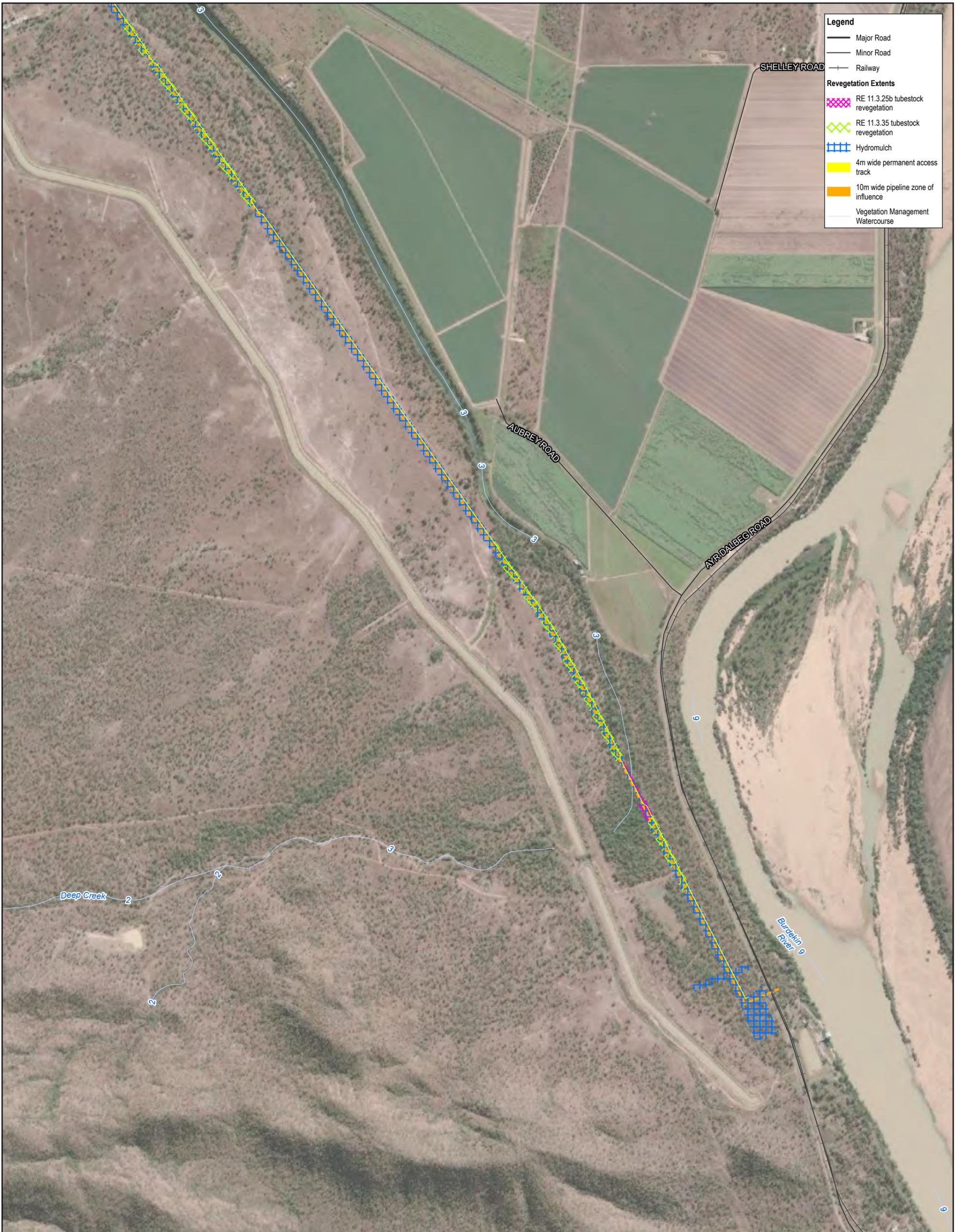


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Revegetation extents

Sheet 5 of 6
FIGURE 6-2



Legend

- Major Road
- Minor Road
- Railway

Revegetation Extents

- RE 11.3.25b tubestock revegetation
- RE 11.3.35 tubestock revegetation
- Hydromulch
- 4m wide permanent access track
- 10m wide pipeline zone of influence
- Vegetation Management Watercourse

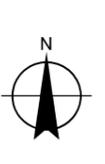
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Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
Houghton Pipeline Stage 2 - Rehabilitation Plan

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Revegetation extents

Sheet 6 of 6
FIGURE 6-2

6.2 Item 6.2

Rehabilitation acceptance criteria, including for the restoration of habitat for relevant listed threatened species and communities.

6.2.1 Response

The Rehabilitation Management Plan (GHD, 2022) (Appendix R) provides acceptance criteria for each of the two categories of rehabilitation extents, reproduced in Table 6.2.

Table 6.2 Summary of Rehabilitation Management Plan acceptance criteria

Element	Criteria
Remnant vegetation within 400 m of a DoR Vegetation Management Watercourse	
Landform	– Final landform is stable and land surface contours within riparian areas are consistent with the adjacent areas
Restricted invasive weeds	– No presence of restricted invasive weeds
Endemic groundcover	– Land is vegetated with endemic groundcover exceeding 70%
Tubestock survival	– >80% of plantings survived
Suitability	– Land is fit for purpose (i.e. supports an establishing ecosystem that will provide future habitat for black-throated finch, bare-rumped sheathtail bat and koala habitat) – Safe for humans and wildlife
All other areas	
Landform	– Final landform is stable
Restricted invasive weeds	– No presence of restricted invasive weeds
Groundcover	– Land is vegetated with groundcover exceeding 50%
Suitability	– Land is suitable for purpose (grazing pasture, bank stabilisation and pipeline operation) – Safe for humans and wildlife

6.3 Item 6.3

A summary of the procedures, including contingency measures, that will be undertaken to achieve the rehabilitation acceptance criteria.

6.3.1 Response

The Rehabilitation Management Plan (GHD, 2022) (Appendix R) provides details of the procedures, including corrective measures, that will be undertaken to achieve the rehabilitation acceptance criteria.

The procedures detailed in the Rehabilitation Management Plan (GHD, 2022) include the following:

6.3.1.1 Topsoil and subsoil management

Topsoil stripping shall occur as close to the ground works commencement date as practicable using a technique that minimises compaction and handling and preserves seed bank. Topsoil shall be stripped to a suitable depth based on analysis of the soil profile, however, will be a minimum of 100 mm (where available).

Topsoil will be collected at a time of year when the soil seed bank is likely to be at its highest (i.e. post wet season) and coincides with the proposed project commencement in April 2023.

Vegetation and topsoil shall be removed in separate stages and stripped vegetation may be temporarily placed on top of topsoil to reduce wind erosion. To avoid hard setting, watering shall be minimised during topsoil stripping or on topsoil stockpiles to only that required to mitigate dust impacts to sensitive land uses.

Topsoil shall be reused immediately or stockpiled for rehabilitation. The location of the stockpile shall be planned sufficiently such that the stockpile will not require moving until its required for rehabilitation. Stockpiles shall be located further than 40m from any waterway at sufficient high ground and shall have sediment and erosion control measures as defined in the ESCP and Section 5.2 of the IECA Best Practice Sediment and Erosion Manual (IECA, 2008).

Subsoil will be stockpiled separately for subsequent reuse as trench backfill material, in landscaping or other general fill requirements if appropriate for the use. Excess material shall be removed offsite under an approved Environmental Authority (EA) for Environmentally Relevant Activity ERA 16(2)(b) through the Department of Environmental Science (DES) to be obtained by the construction Contractor.

Topsoil stripping activities shall aim to avoid periods of predicted significant rainfall. Topsoil stripping shall be halted during periods of significant rainfall and appropriate control measures implemented and monitored for erosion and sediment control. Where required, diversion berms shall be constructed from subsoil to direct water away from sensitive infrastructure (or disturbed surfaces for erosion protection) before expected rainfall.

If required, sodic soil will be treated with gypsum at an application rate determined by soil testing. Where treating is not required or warranted, sodic soil shall be reburied under a subsoil/topsoil cap of no less than 300 mm.

Topsoil shall be stockpiled to a maximum height of 2 m. Subsoil or spoil can be stockpiled to a maximum height of 4 m. A record (via survey) of topsoil and subsoil stockpiles shall be kept, outlining the date of placement, source location, mapped location of stockpile and estimated volumes. If at risk of disturbance from construction activities, topsoil signs are to be placed on stockpiles and shall include the following details:

- Black lettering on a white background, with a lettering size that can be clearly seen from a vehicle close by
- The words "TOPSOIL STOCKPILE"
- The date of placement
- The source location (e.g. chainage or KP)
- A "KEEP OFF" warning
- Indication if the topsoil is from a weed risk area.

Stockpiles shall be stabilised where necessary and dependant on the duration and size of the stockpile, be protected using viable erosion and sediment control measures. This will include mulching, minor diversion of upslope surface water or sediment fencing. Stockpiles shall not be in or adjacent to drainage lines or areas where eroded material could be transported into surface water bodies. Topsoil stockpiles shall not be placed where they can slump into sensitive areas. Stockpiles shall be located within the disturbance area where vegetation has been cleared where they will not impede construction activities.

6.3.1.2 Soil assessment

A soil assessment within the revegetation areas shall be undertaken by the Contractor to provide site specific recommendations for soil amelioration.

The soil sampling and assessment program shall be conducted by a suitably qualified soil scientist. Soil analysis will be undertaken by an Australasian Soil and Plant Analysis Council (ASPAC) certified laboratories.

Sampling and analysis conducted on topsoil and subsoils will conform with the below.

Topsoil

Topsoil sampling shall comply with the following requirements:

- Samples shall be representative of the topsoil type (i.e. no mixing different soil types or subsoils)
- Samples shall be collected as per the frequency outlined in Table 6.3
- If sampling stockpiles, sub-samples shall be sampled from various locations and 0.5 m apart
- Composite samples shall include 10 sub-samples
- Approximately 3 kg of sample shall be collected.

Table 6.3 *Topsoil sampling frequency*

Topsoil	Frequency
In situ topsoil	1 per 2,500 m ² – With a minimum of one test per topsoil type
Site stockpile	1 per 500 m ³ – With a minimum of one test per topsoil type
Manufactured site topsoil	1 per 500 m ³ – With a minimum of one test per topsoil type
Imported topsoil	1 per 500 m ³ – With a minimum of one test per topsoil type

Laboratory analysis shall include:

- Bulk density
- Organic matter
- Wettability
- pH
- Electrical conductivity
- Extractable Phosphorus content
- Permeability
- Texture
- Water repellence (hydrophobicity)
- Dispersion
- Exchangeable Calcium, Magnesium
- Calcium/Magnesium ratio
- Exchangeable Sodium percentage
- Exchangeable Potassium, Aluminium
- Effective cation exchange capacity
- If EC > 1.2 dS/m – Soluble Chloride*
- If EC > 1.2 dS/m – Extractable Sulfur*.

Note: * not included when testing manufactured topsoil

Subsoil

Subsoil sampling shall comply with the following requirements:

- Samples shall be representative of the subsoil type (i.e. no mixing different soil types or topsoils)
- One test per subsoil type
- Composite samples shall include 10 sub-samples
- Approximately 1 kg of sample shall be collected.

Laboratory analysis shall include:

- Wettability
- pH
- Electrical conductivity
- Texture
- Water repellence (hydrophobicity)
- Exchangeable Calcium
- Exchangeable Magnesium
- Calcium/Magnesium ratio
- Exchangeable Sodium percentage
- Exchangeable Potassium
- Exchangeable Aluminium
- Effective cation exchange capacity.

6.3.1.3 Weed management

Weeds and invasive species within the construction footprint shall be managed in accordance with the Project Construction and Environmental Management Plan (GHD, 2021) (Appendix P). Washdown areas shall be established to minimise the spread of weeds. Only clean vehicles, machinery and equipment that are free from soil and plant material are to be accepted onto site. Prior to entering or leaving each property, all vehicles and equipment involved in clearing and weed removal works shall be cleaned down to remove soil and plant material to prevent spreading of weeds at the nominated washdown stations.

Weeds in the construction corridors shall be eradicated by environmentally acceptable methods using a non-residual glyphosate herbicide in any of its registered formulae, at the recommended rate. In high weed infested areas soil is to be identified and not moved/ transported to other areas within the project site and weed control methods implemented.

The rehabilitation areas shall be in a weed-free condition prior to the commencement of ground preparation operations. The contractor shall nominate the appropriate weed control methods depending on the conditions and growth characteristics of any weed species present. Weed control methods can include any of the following:

- Mechanical application of herbicide using boom spray or high-volume power applicator
- Manual application of herbicide from knapsack or similar applicator
- Manual mechanical methods, such as hand-pulling

6.3.1.4 Land stabilisation and erosion management

Disturbed areas shall be reshaped to a stable form and to blend in with surrounding natural landforms. Minimal reshaping will be required as existing flat, cleared areas have been utilised for sites such as laydown areas. Disturbed surface areas will be roughened to reduce the effects of compaction, allowing for natural regeneration processes to occur.

Natural drainage patterns shall be reinstated as close to pre-disturbance as reasonably possible. Where natural drainage patterns cannot be re-established, drainage control measures shall be implemented. Any drainage control measures shall take into consideration the potential for erosion from channelled runoff. Erosion and sediment control measures shall be developed in line with the requirements of the Project's Erosion and Sediment Control Plan.

Slope lengths and angles shall be compatible with the surrounding landscape, suitable for the proposed land use and resistant to erosion. Reconstructed landforms shall be left with a relatively natural profile to allow for topsoil placement and re-spreading.

The backfilling of trenches will ensure that soil horizons (topsoil, sub-soil) are placed similar to pre-disturbance. Once backfilled, trenches will be compacted, capped with a layer of topsoil to a level at least 75 mm above adjoining ground level.

Trench design will aim to reduce the risk of tunnel erosion and surface slumping, such as the installation of trench breakers (e.g. sand bags) at regular intervals in sections of steeper grade and specified compaction requirements to trench backfill. A diversion berm will be installed immediately down-slope of the trench breaks to ensure that seepage water will be diverted from the trench and across the rehabilitated area.

The watercourses and drainage line embankments will be reprofiled and rock mattress scour protection placed as specified in the design. Binders suitable for cold spray application may also be applied to stabilise mulched and seeded surfaces on banks in areas of high-risk erosion.

6.3.1.5 Ripping

Ripping may be required to reduce compaction and allow infiltration of rainfall into rehabilitated areas. This shall include:

- Removal of any hardstand material (i.e. gravel)
- Deep ripping of compacted areas such as hardstand and laydown areas shall take place after land stabilisation and prior to the placement of topsoil
- Deep ripping shall take place across the natural slope (i.e. parallel to contours) to reduce overland flow velocity and mitigate erosion, at a depth of approximately 0.1 m. Highly compacted areas such as hardstands, laydowns and temporary access tracks shall be ripped to a greater depth of 0.3 m

6.3.1.6 Amelioration and roughening

Any required soil amelioration, as determined through the soil assessment previously described, is to be completed. Roughening shall occur immediately after the application of amelioration agents. Roughening shall:

- Be approximately 50 mm depth
- Incorporate amelioration agents into the subsoil
- Occur when soils are dry enough to break up / crumb the surface
- Be parallel to the contour.

6.3.1.7 Topsoil re-instatement

Topsoil shall be redistributed across the area in accordance with the following steps:

- The source stockpile used during rehabilitation shall comprise topsoil taken from the area or from within similar types of soil and vegetation
- Recovery and dispersal of any soil shall not occur if the stockpiles are in a saturated condition
- Topsoil shall be respread to a depth of approximately 100 mm. Where an excess of topsoil exists, a greater depth of soil may be respread subject to not impeding overland stormwater flow
- Spreading of topsoil will occur from the far edge of the disturbed area (i.e. further from the access point), progressively moving inwards as to reduce the risk of compaction and destruction of seed bank
- Topsoil shall tie in evenly to the natural slope and adjacent vegetation to mitigate erosion risk.

6.3.1.8 Revegetation

Preparation for revegetation

Prior to hydromulching and tubestock planting, the following site preparation will be undertaken:

- Revegetation to be undertaken by a suitably qualified and experienced contractor
- Mark out the 10 m corridor over the pipeline (with star pickets and high visibility tape) that is to remain free of tubestock planting (i.e. no canopy, sub-canopy, shrub or ground strata tube-stock)
- Eradicate weeds prior to undertaking revegetation works
- Calculate material requirements for rehabilitation works well in advance of work commencement (noting there may be a requirement to propagate certain plant species)
- Contact nursery/seed providers to ascertain the availability of seed and tube-stock for use in rehabilitation work
- Nursery/seed providers must provide proof of 'local providence' for all material. A record of providence will be maintained by the contractor undertaking the work. Local providence is considered to be within 100 km of Townsville and 100 km of Ayr

Specific hydromulch and tubestock requirements are detailed in Table 6.4, and suitable plant species are recommended in Table 6.5 (hydromulch) and Table 6.6 (tubestock). Further details on these methods are provided as follows.

Application of hydromulch

- Apply hydromulching material to revegetation areas (100% cover on areas to be revegetated) at the minimum application rate as per the nominated product requirements.
- Hydromulch shall not be applied under the following weather conditions:
 - Temperature is higher than 35°C
 - Winds exceed 15 km/hr
 - Where, in the opinion of the Superintendent the surface is too wet
 - During rain periods or when rain appears imminent,

Planting of tubestock

- Tube-stock will be planted as a minimum several months before the first wet season rains and irrigated, to maximise vegetation establishment before any high velocity flows occur in watercourses and drainage features. At least 100 days will be allowed between germination of collected seeds and rehabilitation planting to ensure adequate tube-stock maturation.
- Tubestock shall have the following characteristics:
 - Tubestock to be minimum 50 mm diameter and 80 mm deep
 - Tubestock height to be 200 mm when planted
 - Plant stock is to be supplied in good health as demonstrated by the following:
 - Leaf colour and size
 - Absences of dieback
 - Absence of other plant stress indicators
 - Free from significant injury
 - Free from pests and diseases
- Tubestock planting methods will include:
 - **Identify the trunk flare.** The trunk flare is where the trunk expands at the base of the tree. This point shall be partially visible after the tree has been planted.
 - **Dig a shallow, broad planting hole.** Clear the hydromulch and dig a hole 2-3 times wider than the root ball, but only as deep as the root ball.
 - **Remove the containers or cut away the wire basket.** Inspect container tree root balls for circling roots. Straighten, cut, or remove them.
 - **Place the tree at the proper height.** Take care to dig the hole to the proper depth – and no more. If the tree is planted too deep, new roots will have difficulty developing because of a lack of oxygen.
 - **Straighten the tree in the hole.** Before backfilling, have someone view the tree from several directions to confirm it is straight.
 - **Fill the hole gently, but firmly.** Pack soil around the base of the root ball to stabilize it. Fill the remainder of the hole, firmly packing the soil to eliminate air pockets that may dry out roots. Further reduce air pockets by watering periodically while backfilling. Avoid fertilization at the time of planting.
 - **Stake the tree only if necessary.** Studies have shown that trees establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting.
 - **Mulch the base of the tree.** Mulch is organic matter spread around the base of a tree to hold moisture, moderate soil temperature extremes, and reduce grass and weed competition. Mulch is to be provided for 300 mm around planted tubestock to a depth of 100 mm
 - **Provide follow-up care.** Keep the soil moist, but not water-logged. Water trees at least once a week, barring rain, and more frequently during hot, windy weather.

Table 6.4 Hydromulch and tubestock requirements

Restored Regional Ecosystem	Hydromulch	Tubestock requirements		
		Tubestock planting rate at the following rates per stratum	Tube-stock species diversity requirements	Plant spacing requirements
11.3.25b <i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i>	<ul style="list-style-type: none"> – Endemic grass species will be used with the goal of surface stabilisation through over-seeding the rehabilitation area with endemic grass species. – Seeding rate will be sufficient for germination and sustainable cover of approximately 1000 plants per hectare, per riparian zone. – A minimum of four different native grass species will be selected from the list provided. – Bonded fibre matrix to be provided at watercourse banks as a minimum. 6-month functional longevity, minimum application rate of 5000 kg/ha (500 g/m²) and minimum wet thickness of 5 mm. – Apply hydromulching material to rehabilitation areas (100% cover on entire rehabilitation footprint) at the minimum application rate as per the nominated product requirements 	<ul style="list-style-type: none"> – 30 canopy trees per hectare – 50 sub-canopy trees per hectare – 60 shrubs per hectare – 3,000 sedges and forbs per hectare. 	<ul style="list-style-type: none"> – A minimum of four different canopy species – A minimum of three different sub-canopy species – A minimum of five different shrub species – A minimum of four different forb or sedge species. 	<p>Recommended plant spacing is as follows:</p> <p><i>Below the defining bank:</i></p> <ul style="list-style-type: none"> – Forbs and sedges can be planted in clumps of four with a minimum spacing of 1 m between clumps – Plant canopy, sub-canopy and shrub species with a minimum spacing of 2 m (stream order 3 or higher watercourses) or with a minimum spacing of 3 m (stream order 1 and 2 watercourses). <p><i>Beyond the defining bank:</i></p> <ul style="list-style-type: none"> – Plant sub-canopy, shrub, and ground strata species with a minimum spacing of 2 m – Plant canopy species with a minimum spacing of 3 m.
11.3.35 <i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains		<ul style="list-style-type: none"> – 30 canopy trees per hectare – 35 sub-canopy trees per hectare – 40 shrubs per hectare – 900 grasses per hectare. 	<ul style="list-style-type: none"> – A minimum of two different canopy species. – A minimum of two different sub-canopy species. – A minimum of two different shrub species. – A minimum of four different grass species. 	<ul style="list-style-type: none"> – Plant sub-canopy, shrub, and ground strata species with a minimum spacing of 10 – 20 m – Plant canopy species with a minimum spacing of 10 – 20 m.

Table 6.5 Endemic grass species for hydromulch mix

Scientific name	Common name	RE 11.3.35	RE 11.3.25b	All other areas
<i>Alloteropsis cimicina</i>	Carpet Grass	-	-	X
<i>Dichanthium sericeum</i>	Queensland Bluegrass	X	X	X
<i>Enteropogon acicularis</i>	Curly Windmill Grass	-	X	X
<i>Heteropogon contortus</i>	Black Speargrass	X	X	X
<i>Heteropogon triticeus</i>	Giant Speargrass	X	-	X
<i>Panicum decompositum</i>	Native Millet	-	-	X
<i>Panicum effusum</i>	Hairy Panic		X	X
<i>Setaria surgens</i>	Pigeon Grass	X	X	X
<i>Themeda triandra</i>	Kangaroo Grass	X	X	X

Table 6.6 Suitable tubestock plant species for rehabilitation of watercourses

Stratum	Lifeform	Species	Common name	RE 11.3.35	RE 11.3.25b
Canopy	Tree	<i>Casuarina cunninghamiana</i>	River She-oak	-	X
	Tree	<i>Corymbia tessellaris</i>	Moreton Bay Ash	X	X
	Tree	<i>Eucalyptus camaldulensis</i>	River Red Gum	X	-
	Tree	<i>Eucalyptus platyphylla</i>	Poplar gum	X	X
	Tree	<i>Eucalyptus raveretiana</i>	Black Ironbox	X	-
	Tree	<i>Eucalyptus tereticornis</i>	Forest red gum	-	X
	Tree	<i>Euroschinus falcatus</i>	Cudgerie	-	X
	Tree	<i>Melaleuca fluviatilis</i>	River tea tree	-	X
	Tree	<i>Melaleuca leucadendra</i>	Weeping Paperbark	-	X
	Tree	<i>Nauclea orientalis</i>	Leichhardt Tree	-	X
Subcanopy	Tree	<i>Alphitonia excelsa</i>	Soap bush	-	X
	Tree	<i>Alphitonia excelsa</i>	Soap tree	-	X
	Tree	<i>Ficus racemose</i>	Cluster Fig	-	X
	Tree	<i>Geijera salicifolia</i>	Wilga	-	X
	Tree	<i>Glochidion apodogynum</i>	Buttonwood	-	-
	Tree	<i>Lysiphyllum hookeri</i>	White Bauninia	-	X
	Tree	<i>Mallotus philippensis</i>	Kamala Tree	-	X
	Tree	<i>Melaleuca nervosa</i>	Firebark	X	X
	Tree	<i>Melaleuca viridiflora</i>	Broad-leaved paperbark	X	X
Shrub	Shrub	<i>Acacia holosericea</i>	Silky Wattle	X	X
	Shrub	<i>Alyxia ruscifolia</i>	Native Holly	-	X
	Shrub	<i>Breynia oblongifolia</i>	Coffee Bush	-	X
	Shrub	<i>Ficus opposita</i>	Sandpaper Fig	-	X
	Shrub	<i>Lophostemon grandiflorus</i>	Northern Swampbox	X	-
	Shrub	<i>Macaranga tanarius</i>	Macaranga	-	X
	Shrub	<i>Planchonia careya</i>	Cocky Apple	X	X
Ground	Forb	<i>Commelina diffusa</i>	Scurvy Weed	-	X
	Forb	<i>Commelina ensifolia</i>	Scurvy Grass	X-	X

Stratum	Lifeform	Species	Common name	RE 11.3.35	RE 11.3.25b
	Forb	<i>Dianella caerulea</i>	Blue Flax Lily	-	X
	Forb	<i>Eustrephus latifolius</i>	Wombat Berry	-	X
	Forb	<i>Lomandra longifolia</i>	Spiny-head Mat-rush	-	X
	Sedge	<i>Cyperus distans</i>	Slender Cyperus	-	X
	Sedge	<i>Cyperus javanicus</i>	Javanese Flatsedge	-	X
	Sedge	<i>Cyperus trinervis</i>	-	-	X
	Sedge	<i>Fimbristylis dichotoma</i>	Common Fringe Sedge	-	X
	Sedge	<i>Fimbristylis littoralis</i>	Lesser Fimbristylis	-	X

6.3.1.9 Fencing

Fencing of the construction corridor shall remain in place until the end of the monitoring period to protect rehabilitation areas from livestock and to control vehicle access.

6.3.1.10 Site maintenance

Maintenance of rehabilitation areas will be required to achieve Project objectives. The following maintenance obligations will be required:

- Establishment phase maintenance of rehabilitation areas
- Ongoing maintenance of rehabilitation areas.

Establishment phase maintenance

After rehabilitation is established, the following minimum maintenance tasks shall be undertaken for the first 12 weeks after completion of rehabilitation:

- Any combination of water truck, hand watering and/or temporary irrigation system shall be utilised to fully establish the plants and grass within the Project. Watering of tube-stock shall occur at least twice a week for the 12 weeks following planting. Watering may be reduced if climatic conditions provide sufficient rainfall.
- Check the planted tube-stock weekly for mortality. If greater than 5% mortality (per stratum) occurs, replace any plant losses.
- Check for germination weekly and re-apply hydromulch in any areas where germination has not been achieved within one month or if established ground cover is less than the acceptance criteria. Ripping shall be undertaken prior to re-seeding if the surface has become compacted.
- Inspection for restricted invasive weed species under the *Biosecurity Act 2014* will be undertaken weekly by personnel experienced in weed identification. If any such species are detected, control will be undertaken using appropriate control techniques (e.g. in accordance with the Department of Agriculture and Fisheries (DAF) factsheets for the relevant species).
- Weekly inspection of erosion and sediment controls and immediate corrective action.
- Inspection of watercourses following any notable weather events to ascertain if degradation of the rehabilitation works has occurred, and undertake restoration works where required.
- Removal of any shrub or canopy species from the pipeline 10 m wide zone of influence.

Ongoing maintenance

Once established, the following site maintenance activities will be undertaken until end of the 12 month defect liability period:

- Watering of tube-stock shall occur at least once every two weeks (unless climatic conditions provide sufficient rainfall)
- Check the planted tube-stock every four months for mortality. If greater than 5% mortality (per stratum) occurs, replace any plant losses.

- Check for ground cover dieback every four months and re-apply hydromulch in any areas where ground cover is less than the acceptance criteria. Ripping shall be undertaken prior to re-seeding if the surface has become compacted.
- Site inspection for restricted invasive weed species will be undertaken every four months by personnel experienced in weed identification and control will be undertaken as necessary using appropriate control techniques (e.g. in accordance with the DAF factsheets for the relevant species).
- Inspection of watercourses following any notable weather events to ascertain if degradation of the rehabilitation works has occurred, and undertake restoration works where required
- Removal of any shrub or canopy species from the pipeline 10 m wide zone of influence.

6.3.1.11 Corrective actions

Monitoring will be undertaken every four months until the end of the Defects Liability Period (12 months), and corrective actions have been developed for each of the acceptance criteria in order to facilitate achievement of same. These corrective actions are provided in Table 6.7.

Table 6.7 Acceptance criteria and corrective actions

Element	Criteria	Potential corrective actions
Remnant vegetation within 400 m of a Vegetation Management Watercourse		
Landform	– Final landform is stable and land surface contours within riparian areas are consistent with the adjacent areas	– Installation or repair of erosion and sediment control measures where erosion or stabilisation issues are identified
Restricted invasive weeds	– No presence of restricted invasive weeds	– Removal of restricted invasive weeds
Endemic groundcover	– Land is vegetated with endemic groundcover exceeding 70%	– Removal of restricted invasive weeds and any other species observed to be inhibiting endemic ground layer establishment – Re-application of hydromulch where bare patches persist
Tubestock survival	– >80% of plantings survived	– Replanting of tubestock – Modification of watering regime where plant health indicates insufficient or excess water has been received – Application of fertilizer where plant health indicates nutrient deficiency – Removal of weeds observed to be inhibiting tubestock establishment
Suitability	– Land is suitable for purpose (i.e. supports an establishing ecosystem that will provide future habitat for black-throated finch, bare-rumped sheathtail bat and koala habitat) – Safe for humans and wildlife	– All of the above
All other areas		
Landform	– Final landform is stable	– Installation or repair of erosion and sediment control measures where erosion or stabilisation issues are identified
Restricted invasive weeds	– No presence of restricted invasive weeds	– Removal of restricted invasive weeds
Groundcover	– Land is vegetated with groundcover exceeding 50%	– Re-application of hydromulch where bare patches persist
Suitability	– Land is suitable for purpose (grazing pasture, bank stabilisation and pipeline operation) – Safe for humans and wildlife	– All of the above

6.4 Item 6.4

A summary of a monitoring program (including time-based milestones) to determine the success of rehabilitation activities implemented by the proponent.

6.4.1 Response

Monitoring will be undertaken by a separate representative appointed by the TCC and undertaken every four months until the end of the Defects Liability Period (12 months). The Rehabilitation Management Plan (GHD, 2022) (Appendix R) provides details of the monitoring program, reproduced below in Table 6.8. The rehabilitated vegetation is expected to be well-established by the end of this 12-month period, and will have been subjected to all seasonal conditions, such that this length of time is considered sufficient.

Table 6.8 Summary of monitoring program

Element	Description
Photographic points	Two photographic monitoring points for each intersected Vegetation Management Watercourse will be established and marked with star pickets. Photographs will be taken at each location facing north, south, east and west.
Soil stability	Assessed visually by observing each rehabilitated watercourse as well as the length of the pipeline for signs of erosion.
Groundcover	Groundcover establishment will be assessed by randomly placing five 1x1 m quadrat at each of the intersected Vegetation Management Watercourses, as well as at an additional 10 sites along the pipeline that have been hydromulched. The following will be recorded within each quadrat: <ul style="list-style-type: none"> – Species present and individual percent cover – Litter percent cover – Rock percent cover – Cryptogam percent cover – Bare earth percent cover.
Tubestock survival	At each of the intersected Vegetation Management Watercourses, tubestock survival rate will be assessed within two quadrats each measuring 2 x 10 m.

6.5 Item 6.5

The details of any rehabilitation activities proposed to be undertaken as required by Commonwealth, State or Territory, and local government legislation. Attach relevant Commonwealth, State or Territory, and local government approvals and permits as supporting documents to the PD.

6.5.1 Response

The construction of the Haughton Pipeline Stage 2 is subject to a Development Application for Operational Works, assessed and decided by the Department of State Development Infrastructure, Local Government and Planning (DSDILGP) acting through the SARA (State Assessment and Referral Agency).

An approved Decision Notice, SARA reference 2201-26844 SDA, for the pipeline construction works was received on 14 June 2022 with no conditions relating to rehabilitation activities. A copy of the SARA Decision Notice can be found in Appendix U. A copy of the Project Rehabilitation Management Plan (GHD, 2022) (Appendix R) was included in the Development Application to SARA.

At the time of preparation of this PD, a Decision Notice had not been received from SARA for the Pump Station works component.

6.6 Item 6.6

*The department notes the referral documentation contains information about salvaging and reinstating all large and moderate sized *E. platyphylla* hollows. The department requires information about the methodology and likely success rates of salvaged hollows being utilised by roosting species. Information should be provided about the salvage and reinstatement of any other individual hollows that will be cleared as part of the action.*

6.6.1 Response

The proponent is no longer proposing to salvage and reinstate *E. platyphylla* hollows, but instead is proposing a land-based offset to mitigate residual significant impacts to MNES species as outline in the Offset Area Management Strategy (GHD, 2022) (Appendix O).

6.7 Item 6.7

*The department does not agree with the notion outlined in the referral documentation that tubestocking for cleared *E. Platyphylla* achieves a 'like for like replacement of potential roosting habitat'. This is because:*

- *The same number of trees cleared (325 small sized) have not been committed to be replaced.*
- *The newly planted trees would be well-below the maturity/age of any trees that were removed, effectively delaying the period of time they can be utilised by threatened species.*

6.7.1 Response

The proponent is no longer proposing to salvage and reinstate *E. platyphylla* hollows, but instead is proposing a land-based offset to mitigate residual significant impacts to MNES species as outline in the Offset Area Management Strategy (GHD, 2022) (Appendix O).

6.8 Item 6.8

Rehabilitation measures should use committal language e.g., 'will' and not 'may' for the department to adequately consider them as part of the assessment.

6.8.1 Response

Rehabilitation measures have been amended to include committal language.

6.9 Item 6.9

Information pertaining to the effectiveness of natural regeneration as an appropriate rehabilitation method for the area should be provided.

6.9.1 Response

The proponent is no longer proposing to use natural regeneration as a method of rehabilitation. All areas (except for the 4 m wide permanent access track) will be subject to hydromulching with endemic grass species, with planting of tubestock also proposed in areas that currently support remnant vegetation and are located within 400 m from a watercourse depicted on the Department of Resources (DoR) Vegetation Management Watercourse and Drainage Feature Map.

7. Offsets

7.1 General information required

7.1.1 Item 7.1.1

An assessment of the likelihood of residual significant impacts occurring on relevant MNES, after avoidance, mitigation and management measures have been applied.

7.1.1.1 Response

For all MNES confirmed present or considered likely to occur within the Project area, a significance of impact assessment has been made against the Significant impact guidelines 1.1 (DoE 2014) and is presented in Section 7 of the MNES (GHD, 2022) report. This was based on residual impacts after avoidance, mitigation and management measures have been applied. Matters with a significant residual impact are summarised in the introduction (Section 2) of the Offset Area Management Strategy (OAMS) (GHD, 2022), (Appendix O) and detailed below.

The OAMS proposes land-based offsets for the following MNES species that will be subject to significant residual impacts due to the Project:

- Bare-rumped sheathtail bat
- Southern black-throated finch
- Koala

A summary of habitat loss representing a significant residual impact is summarised in Table 7.1.

Table 7.1 Summary of habitat loss representing a significant residual impact

Species	Loss of habitat
Bare-rumped sheathtail bat	Loss of 92.23 ha (in aggregate), comprising: <ul style="list-style-type: none">– Foraging and roosting habitat 36.44 ha– Foraging only habitat 49.11 ha– Roosting only habitat 6.68 ha
Black-throated finch (southern)	Loss of 96.34 ha (in aggregate), comprising: <ul style="list-style-type: none">– Nesting and foraging habitat 82.14 ha– Foraging only habitat 14.19 ha
Koala	Loss of 134.19 ha

7.1.2 Item 7.1.2

A summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter.

7.1.2.1 Response

The proposed offset is summarised in Section 2 (Overview of the offset) and Section 3 (Suitability of the offset) of the OAMS (GHD, 2022). The proposed management measures for each protected matter are outlined in Section 6 of the OAMS (GHD, 2022).

A land-based offset has been proposed on seven adjacent land parcels located 2.7 km south-east of Lake Ross (Ross River Dam) in southern Townsville. The proposed offset area is shown in Figure 7.1. Details of the property descriptions, ownership and areas are summarised in Table 7.2. Ecological field investigations have been undertaken in a 300 ha part of the proposed offset area (shown in red in Figure 7.1). Additional land areas (shown in blue in Figure 7.1) are being investigated. The final proposed offset area will be determined once the outcomes of the ecological investigations are known and an optimal strategy to meet the offset requirements has been confirmed. Ecological field surveys of the additional land areas were undertaken in August 2022, and the final

offset area will be presented in the Offset Area Management Plan (OAMP) following completion of the data analysis from the recent survey.

Table 7.2 Summary of properties currently being investigated for the offset area*

Lot and Plan	Ownership	Tenure	Offset area (ha)	Total lot area (ha)
Lot 21 E124186	TCC	Deed of Grant	100	195
Lot 2 RP725617	TCC	Deed of Grant	55	59
Lot 103 EP1450	State of Queensland	Unallocated State Land	195	562.53
Lot 28 EP66	TCC	Deed of Grant	258.99	190.01
Lot 1 RP725616	TCC	Deed of Grant	32.77	32.77
Lot 2 RP725616	TCC	Freehold	79.86	79.86
Lot 3 RP725616	TCC	Deed of Grant	27.13	27.13

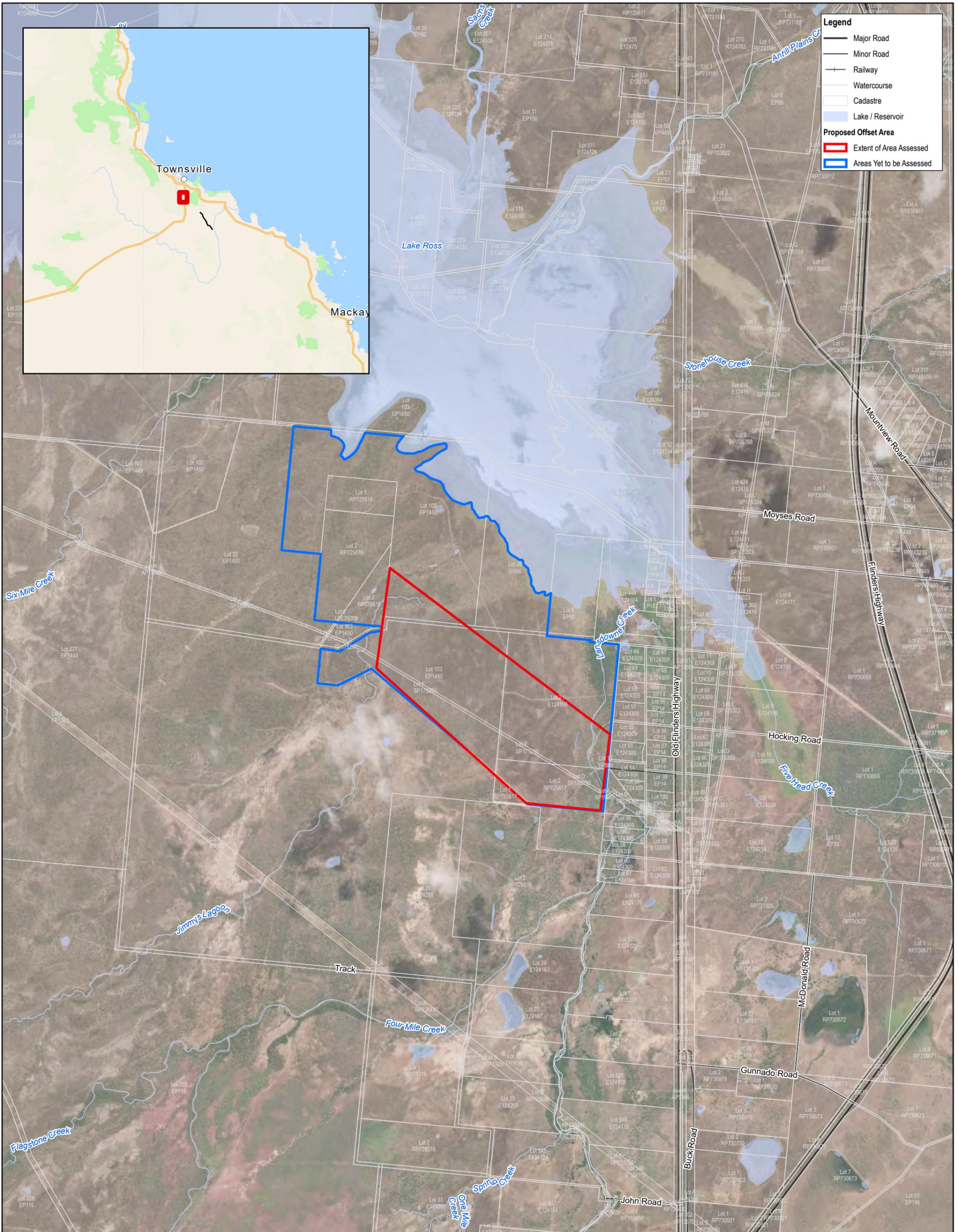
*Additional properties may be investigated, as required

Recent vegetation surveys undertaken by ecologists from Biodiversity Australia (2022b) have mapped the distribution of REs within part of the offset area (shown in red in Figure 7.1). Field verified REs that have been confirmed present within the offset area are detailed in Table 7.3. The field-verified REs are ecologically comparable to those of the impact area and provide suitable habitat values for the MNES for which impacts are being offset. The vegetation communities represent a mix of remnant and regrowth REs and non-remnant areas that previously have supported suitable woodland REs according to DoR version 12.1 pre-clear mapping. Areas of remnant RE represent existing habitat values for the MNES, whilst areas of non-remnant and regrowth REs have future potential habitat values that will be actively managed to enhance the habitat values of the proposed offset. Given the offset area provides a mix of existing habitat and future potential habitat (i.e. areas of former habitat that have been historically cleared for agriculture), the offset area offers substantial opportunities to increase habitat connectivity through the strategic replanting of regrowth and non-remnant areas.

Table 7.3 Regional Ecosystem mapping within the proposed offset area

Regional Ecosystem	VM Act Status	Description	Status	Habitat for MNES
11.3.12	Least Concern	<i>Melaleuca viridiflora</i> , <i>M. argentea</i> +/- <i>M. dealbata</i> woodland on alluvial plains	Remnant	Current value for BTF
			Regrowth	Future value for BTF
			Non-remnant	
11.3.25b	Least Concern	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest	Remnant	Current value for BTF, BRSTB, koala
			Non-remnant	Future value for BTF, BRSTB, koala
11.3.35	Least Concern	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains	Remnant	Current value for BTF, BRSTB, koala
			Regrowth	Future value for BTF, BRSTB, koala
			Non-remnant	

BTF = southern black-throated finch, BRSTB = bare-rumped sheath-tail bat



Legend

- Major Road
- Minor Road
- Railway
- Watercourse
- Cadastre
- Lake / Reservoir

Proposed Offset Area

- Extent of Area Assessed
- Areas Yet to be Assessed

Based on or contains data provided by the State of QLD 2021.
 In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3

Kilometres

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



Townsville City Council
 Houghton Pipeline Stage 2 -
 Offset Area Management Strategy

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Map of the proposed offset area

FIGURE 7.1

Habitat condition assessments have been undertaken at areas shown in red in Figure 7.2. These have confirmed the presence of suitable habitat for each of the MNES as summarised in Table 7.4. From preliminary investigations, the condition of habitat at the impact and offset areas is likely to be consistent. Both impact and offset areas have been subject to existing impacts including:

- Historical loss and fragmentation of habitat
- Exposure to decades of cattle grazing
- Exposure to inappropriate fire regimes
- Extensive coverage of invasive woody weeds (i.e. chinese apple, rubber vine) and grassy weeds (i.e. Guinea grass, grader grass)
- Localised degradation of habitat by pigs
- Extensive coverage of exotic pasture grasses.

Based on the extent and condition of habitat within the offset area, there are opportunities for habitat improvement through replanting of non-remnant areas with canopy, sub-canopy and shrub-layer species to reinstate the pre-clear RE communities, natural rehabilitation of regrowth areas, hydromulching of areas with native food grass species, extensive weed control including removal of chinese apple, rubber vine, lantana and other woody weeds and removal of invasive grassy weeds. These improvements have the potential to make a real contribution to MNES by increasing the availability of resources for foraging, shelter and breeding and increasing mobility through increased habitat connectivity. Due to the preliminary nature of the assessment, habitat condition scores have not been provided. However, the results of the surveys to date indicate the offset area has the potential to meet the requirements of a successful offset area.

Table 7.4 Summary of the area of current and future habitat for each MNES within the proposed offset area

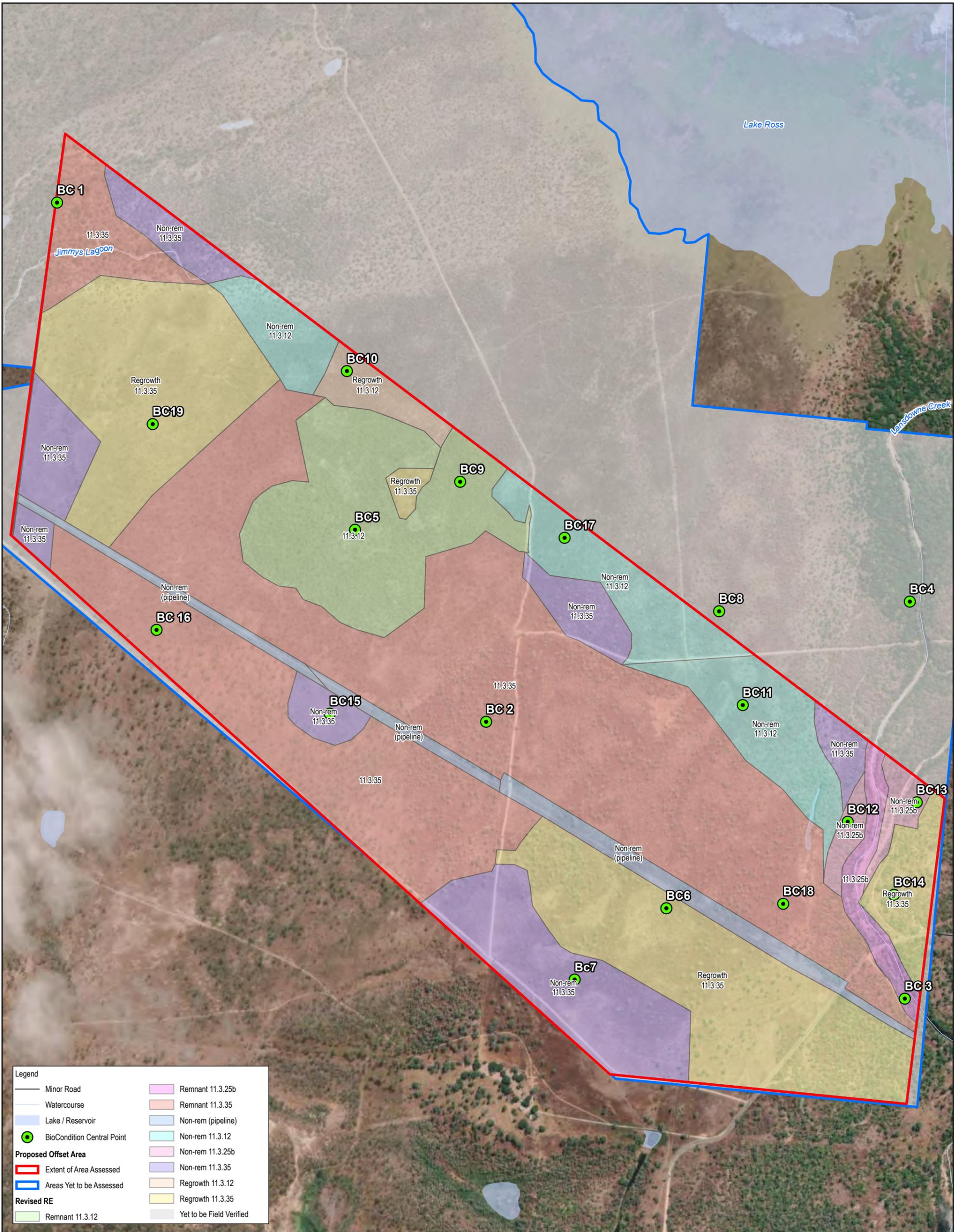
Species	Existing habitat	Future potential habitat	Additional land being investigated
Koala	151.05 ha	126.23 ha	520 ha
Southern black-throated finch	181.01 ha	161.47 ha	520 ha
Bare-rumped sheath-tail bat	151.05 ha	126.23 ha	520 ha

Table 7.5 presents a summary of the management measures proposed to enhance the ecological values of local habitats for the koala, southern black-throated finch and bare-rumped sheath-tail bat.

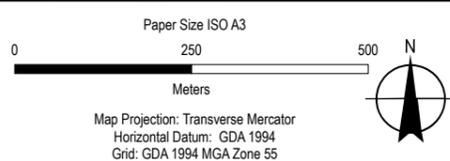
Table 7.5 Summary of management measures proposed for each relevant MNES

Koala	Southern black-throated finch	Bare-rumped sheath-tail bat
Planting of woodland vegetation in non-remnant areas to increase the availability and connectivity of food and shelter trees for the koala.	Planting of woodland vegetation in non-remnant areas – targeting areas around waterbodies to increase foraging/nesting resource availability	Planting of woodland vegetation in non-remnant areas to increase the availability and connectivity of foraging habitat and future roosting opportunities.
Natural regeneration of woodland vegetation in regrowth areas to increase food/shelter resource availability	Natural regeneration of woodland vegetation in regrowth areas to increase foraging/nesting resource availability	Natural regeneration of woodland vegetation in regrowth areas to increase foraging and future roosting resource availability
Removal and ongoing control of shrubby weeds including chinese apple, lantana, rubber vine and prickly acacia	Removal and ongoing control of shrubby weeds including chinese apple, lantana, rubber vine and prickly acacia	Removal and ongoing control of shrubby weeds including chinese apple, lantana, rubber vine and prickly acacia
	Removal and control of invasive grassy weeds and subsequent hydro-mulch planting with native grasses	
Implementation of pest management including dog baiting and shooting to reduce impact of wild dog attacks on koala	Implementation of pest management including feral pig trapping and shooting and feral cat controls to reduce impact of foraging habitat degradation by pigs and predation by feral cats	
Implementation of appropriate fire management protocols to promote	Implementation of appropriate fire management protocols to promote	Implementation of appropriate fire management protocols to promote

Koala	Southern black-throated finch	Bare-rumped sheath-tail bat
natural regeneration of habitat and reduce risk of uncontrolled fire	natural regeneration of habitat and reduce risk of uncontrolled fire	natural regeneration of habitat and reduce risk of uncontrolled fire
Maintenance of existing stock dams and waterbodies to maintain drinking opportunities.	Maintenance of existing stock dams and waterbodies to maintain drinking opportunities. Construct additional water sources to increase drinking/foraging and nesting resource availability.	
	Removal of cattle to prevent degradation of understorey vegetation	



Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



Townsville City Council
Haughton Pipeline Stage 2 -
Offset Area Management Strategy
Location of BioCondition
scoring plots within
the proposed offset area

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FIGURE 7.2

7.1.3 Item 7.1.3

If an offset area has not been nominated, include a draft OMS as an appendix to the PD. The draft OMS must meet the information requirements set out in 7.2. (Minimum requirements)

7.1.3.1 Response

An offset area has been proposed for the Project as presented in the OAMS (GHD, 2022) in Appendix O. The OAMS has been developed to respond to the requirements set out in Section 7.2 of the RFI. A cross reference table has been included in Section 1.2 of the OAMS for ease of reference.

The OAMS (GHD, 2022) identifies at least 300 ha of available land for offset and demonstrates the potential habitat availability and improvement options for each species. The exact extent of the offset area is yet to be determined and is subject to further field investigations.

7.1.4 Item 7.1.4

Where offset area/s have been nominated, include a draft OAMP as an appendix to the PD. The draft OAMP must meet the information requirements set out in 7.3, and must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (2014), available at: www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines.

7.1.4.1 Response

Upon confirmation of the final offset area, an OAMP will be developed for the Project. The OAMP will be developed in accordance with the requirements set out in Section 7.3 of the RFI and will be prepared by a suitably qualified ecologist in accordance with the Departments *Environmental Management Plan Guidelines* (DoE 2014).

7.2 Minimum Requirements for a draft Offset Management Strategy

7.2.1 Item 7.2.1

Specific details of the nature of the conservation gain to be achieved for relevant MNES, including the creation, restoration and revegetation of habitat in the proposed offset area/s.

7.2.1.1 Response

Information on the conservation gain to be achieved for each MNES is outlined in Section 6 of the OAMS (GHD, 2022). A summary of the conservation gain for individual species is provided in Table 7.6.

Table 7.6 Overview of existing threats and opportunities for habitat enhancement in the offset area

Proposed management action	Existing threat this will address	Proposed distribution of management action	Benefit for MNES
Rehabilitation of woodland REs Strategic planting and rehabilitation of tubestock is proposed for areas of non-remnant and regrowth woodland, together with seeding the ground layer with native food grass species for the southern black-throated finch	Loss and fragmentation of woodland habitat Large parts of the offset area have been historically cleared for agriculture particularly at the northern extent, reducing resource availability and habitat connectivity	Replanting and rehabilitation is proposed for non-remnant and regrowth areas	MNES benefitted: koala, southern black-throated finch and bare-rumped sheath-tail bat. This will increase the abundance and availability of key resources for all three MNES (i.e. koala food trees, foraging habitat and future roost trees for bare-rumped sheath-tail bat, nesting sites and foraging habitat for southern black-throated finch. This will increase connectivity, thereby facilitating movement of all species, increasing the ability to

Proposed management action	Existing threat this will address	Proposed distribution of management action	Benefit for MNES
			access to resources and flee wildfire and other threats.
<p>Weed management</p> <p>Active removal of woody weeds (i.e. chinee apple, rubber vine, prickly Acacia) and invasive grasses (i.e. Guinea grass, grader grass, giant ratstail grass)</p>	<p>Degradation by weeds</p> <p>Woody and invasive grassy weeds are ubiquitous across much of the offset area, substantially reducing food resource availability for the southern black-throated finch and supressing the recruitment of canopy trees used by all three MNES species.</p>	<p>Weed management will be undertaken across the offset area with weed management in areas of high ecological value (i.e. within 1 km of waterbodies) and areas of existing high weed densities.</p>	<p>MNES benefitted: Koala, southern black-throated finch, bare-rumped sheathtail bat.</p> <p>Weed management (in conjunction with reinstatement of the ground layer) will increase food resource availability for the southern black-throated finch</p> <p>Reduce suppression of native plants, allowing germination of canopy and sub-canopy species that provide key resources for all species (i.e. koala food trees, bare-rumped sheathtail bat roost trees and southern black-throated finch nest trees)</p> <p>Increase movement of koala that is currently deterred by high vegetation densities</p>
<p>Water source management</p> <p>Existing stock dams will be maintained to provide continued access.</p> <p>Additional water sources (i.e. stock troughs) will be provided at locations across the offset area to increase availability of drinking sites and expand the range of foraging and nesting habitat and seasonal waterbodies managed to enhance the ecological value of surrounding canopy and ground level vegetation</p>	<p>Waterbodies (drinking sites) are currently abundant within the offset area. However, removal of cattle could lead to the deterioration of stock dams that provide permanent drinking sites. Degradation of habitats around drinking sites reduces the quality of local foraging habitat.</p>	<p>All existing stock dams will be maintained.</p> <p>Additional drinking sites (i.e. stock troughs) will be provided across the offset area.</p> <p>Areas within 400 m of waterbodies will be subject to habitat enhancement measures to increase the ecological value of habitats surrounding drinking sites</p>	<p>MNES benefitted: Southern black-throated finch and koala.</p> <p>Continued access to suitable waterbodies across the offset area is essential to maintain access to drinking sites for the southern black-throated finch and koala and preserve the viability of nesting habitat for the southern black-throated finch.</p>
<p>Fire management</p> <p>Develop and implement appropriate fire management practices (i.e. cool mosaic burns in the appropriate season) to reduce the risk of uncontrolled wildfires and promote growth of native grasses</p>	<p>The offset area has been subject to inappropriate fire regimes with hot dry burns responsible for localised concentrations of exotic forbs and grasses (e.g. Stylo) that are known to be negatively associated with abundance of southern black-throated finch.</p> <p>Koala and the bare-rumped sheathtail bat are particularly susceptible to impact from uncontrolled wildfire – with fire a recognised threat to roosting sites for the bare-rumped sheathtail bat</p>	<p>Fire management will be undertaken across the offset area.</p> <p>Fire management will apply a patchy mosaic burn that is applied to manage existing habitat conditions.</p> <p>Areas already overgrown with exotic forbs indicative of inappropriate fire regimes will be subject to early management.</p>	<p>MNES benefitted: Koala, southern black-throated finch, bare-rumped sheathtail bat.</p> <p>Appropriate fire management will promote increased abundance and quality of food grasses for the southern black-throated finch by reducing the abundance of exotic forbs that outcompete native grasses.</p> <p>Appropriate fire management will also reduce the extent and severity of impact from uncontrolled fire events that can significantly impact the koala and bare-rumped sheathtail bat.</p>

Proposed management action	Existing threat this will address	Proposed distribution of management action	Benefit for MNES
<p>Management of pest fauna</p> <p>Develop and implement a pest fauna management plan to control influence of feral pigs, feral cats and wild dogs.</p>	<p>Mortality by dog attacks represents a local threat to koalas across their range</p> <p>Degradation of habitat by feral pigs is a significant threat to the southern black-throated finch with pigs known to target critical food resources such as cockatoo grass, a key early wet season food resource.</p>	<p>Wild dog management will be undertaken across the offset area.</p> <p>Management of feral pigs will be targeted at areas with highest pig densities – close to waterbodies.</p>	<p>MNES benefitted: Koala, southern black-throated finch.</p> <p>Wild dog management will reduce the risks of koala injury and mortality due to dog attacks.</p> <p>Controlling feral pigs and the rehabilitation of habitat degraded by pigs will increase food resource availability for the southern black-throated finch.</p>
<p>Removal of cattle</p> <p>Cattle will be removed from newly acquired lots and perimeter fencing secured to prevent cattle entering from adjoining properties.</p> <p>Reinstatement of the native ground layer will require a holistic management combining management of weeds, fire and existing pasture grasses.</p>	<p>The offset area has been subject to varying levels of cattle grazing. This has reduced the extent and quality of foraging habitat for the southern black-throated finch</p>	<p>Cattle will be removed from the offset area. Areas with high localised grazing impacts will be rehabilitated by re-establishing native food grasses</p>	<p>MNES benefitted: Southern black-throated finch.</p> <p>Removal of cattle and reinstatement of native grassy ground layer will increase food availability for the southern black-throated finch</p>

7.2.2 Item 7.2.2

Details of the environmental offset/s (in hectares) to compensate for the residual significant impacts of the proposed action on relevant MNES.

7.2.2.1 Response

The proposed offset will have a total land area of at least 300 ha. Surveys undertaken to date have confirmed the presence of between 151 ha and 181 ha of existing habitat for MNES and between 126 ha and 161 ha of future potential habitat. Additional surveys are being undertaken to investigate the value of other areas on adjacent lots. The final area of land being offset will be determined once the results of ecological investigations are available. A summary of the area of habitat provided for each MNES is provided in Table 7.7.

Table 7.7 Summary of area of existing and future potential habitat for MNES within the proposed offset area

Species	Existing habitat	Future potential habitat	Additional land being investigated
Koala	151.05 ha	126.23 ha	520 ha
Southern black-throated finch	181.01 ha	161.47 ha	520 ha
Bare-rumped sheathtail bat	151.05 ha	126.23 ha	520 ha

7.2.3 Item 7.2.3

Details of the potential offset area/s (including a map) to compensate for the residual significant impacts of the proposed action on relevant MNES.

7.2.3.1 Response

Section 2 of the OAMS (GHD, 2022) provides an overview of the proposed offset area including the areas that have been subject to field surveys and areas that are currently being investigated to add to the offsets land area. A total of eight land parcels are being investigated, all of which are under the ownership of TCC:

- Lot 21 E124186
- Lot 1 RP725617
- Lot 2 RP725617
- Lot 103 EP1450
- Lot 28 EP66
- Lot 1 RP725616
- Lot 2 RP725616
- Lot 3 RP725616

A map of the proposed offset area is shown in Figure 7.1.

7.2.4 Item 7.2.4

The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the Project site for each relevant MNES, including:

- *Total area of habitat (in hectares); and*
- *Habitat quality (e.g. using the Queensland Government Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy [2020]).*

Please note that a methodology that is suitable for each species (i.e., approved by the department or supported by literature) must be used to assess habitat quality, noting the same scoring mechanism must be used at both impact and offset sites.

7.2.4.1 Response

Methodology for calculating habitat quality to inform the Offsets Assessment Guide has been provided in Section 4 of the OAMS (GHD, 2022). This includes justification of the methodology for each species, based on the *Guide to determining terrestrial habitat quality* (DES, 2020) and the *Offsets Assessment Guide* (DSEWPaC, 2012). Criteria used to assess habitat quality for each species are summarised below.

The EPBC Act *Offsets Assessment Guide* (DSEWPaC, 2012) was used to determine the percentage of the offset liability that would be met by the proposed offset area, considering the following elements to assess habitat quality:

- Site condition
- Site context
- Species stocking rate.

The *Modified QLD Habitat Quality spreadsheet* (provided by DCCEEW) was used to input data obtained during field surveys and desktop analysis for impact areas and offset areas.

Habitat scores were weighted with the ratios of site condition 30%, site context 30%, and species stocking rate 40%, consistent with recommendations provided by DCCEEW.

Site condition and site context scores were calculated using the *Guide to Determining Terrestrial Habitat Quality* (DES, 2020), including scores for fauna species habitat (refer to Section 7.2.4.1 and 7.2.4.3) as per the Modified QLD Habitat Quality spreadsheet. Species stocking rate was informed by the results of three targeted surveys of the offset area (NRA 2017; Biodiversity Australia 2022a,b) and published information on the ecology of each species.

Site condition was calculated for each assessment unit using the following criteria detailed in the EPBC Act *Offsets Assessment Guide* (DSEWPaC, 2012):

- BioCondition data consistent with the *Guide to Determining Terrestrial Habitat Quality* (DES, 2020)
- Quality and availability of food and foraging habitat using species-specific criteria detailed in Table 7.8.

- Quality and availability of shelter using species-specific criteria detailed in Table 7.8.

Habitat quality criteria for the bare-rumped sheath-tail bat and southern black-throated finch were derived by suitably qualified ecologists from Biodiversity Australia. Habitat quality criteria for the koala were derived by suitably qualified ecologists from GHD. For each condition parameter, scores out of 25 were assigned (in accordance with the *Guide to Determining Terrestrial Habitat Quality* (DES, 2020). These were then converted to a score out of 10 to align with the EPBC Act *Offsets Assessment Guide* (DSEWPac, 2012) scoring framework as detailed in the *Modified QLD Habitat Quality spreadsheet*.

BioCondition plot methodology

Each BioCondition plot measured 100 m by 50 m and was established along the direction of the contour (i.e. along the slope rather than upslope or downslope). The location of the centre of each plot was marked with a GPS and representative photographs of the plot were taken in each aspect (i.e. north, east, south, west). Each plot was then divided into sub-plots, as illustrated by the plot layout diagram provided as Plate 7.1, and the following attributes were recorded:

- 100 m transect:
 - Tree canopy cover.
 - Shrub canopy cover.
- 100 m by 50 m plot:
 - Total number of large eucalypt and non-eucalypt trees.
 - Height of ecologically dominant layer and other canopy/sub-canopy/emergent layers.
 - Tree species richness.
 - Proportion of the dominant canopy species with evidence of recruitment.
- 50 m by 10 m plot:
 - Species richness of shrubs, grass, forbs and other native species.
 - Weed cover.
- Five 1 m by 1 m quadrats:
 - Percent cover of native perennial grass.
 - Percent cover of organic litter.

The data was entered into the DES scoring sheet and compared to representative benchmark data for each RE containing habitat for the MNES. The Queensland Herbarium (2021) has published benchmark data for individual REs, which is based on the above BioCondition assessment method using field-based reference sites that are best-on-offer for that RE. Benchmark data is used as a comparison against the data collected on site to derive the habitat quality score for each assessment unit. These scores were then incorporated into the overall condition score for each assessment unit by combining with species foraging and shelter habitat values (refer Section 7.2.4.2 and 7.2.4.3).

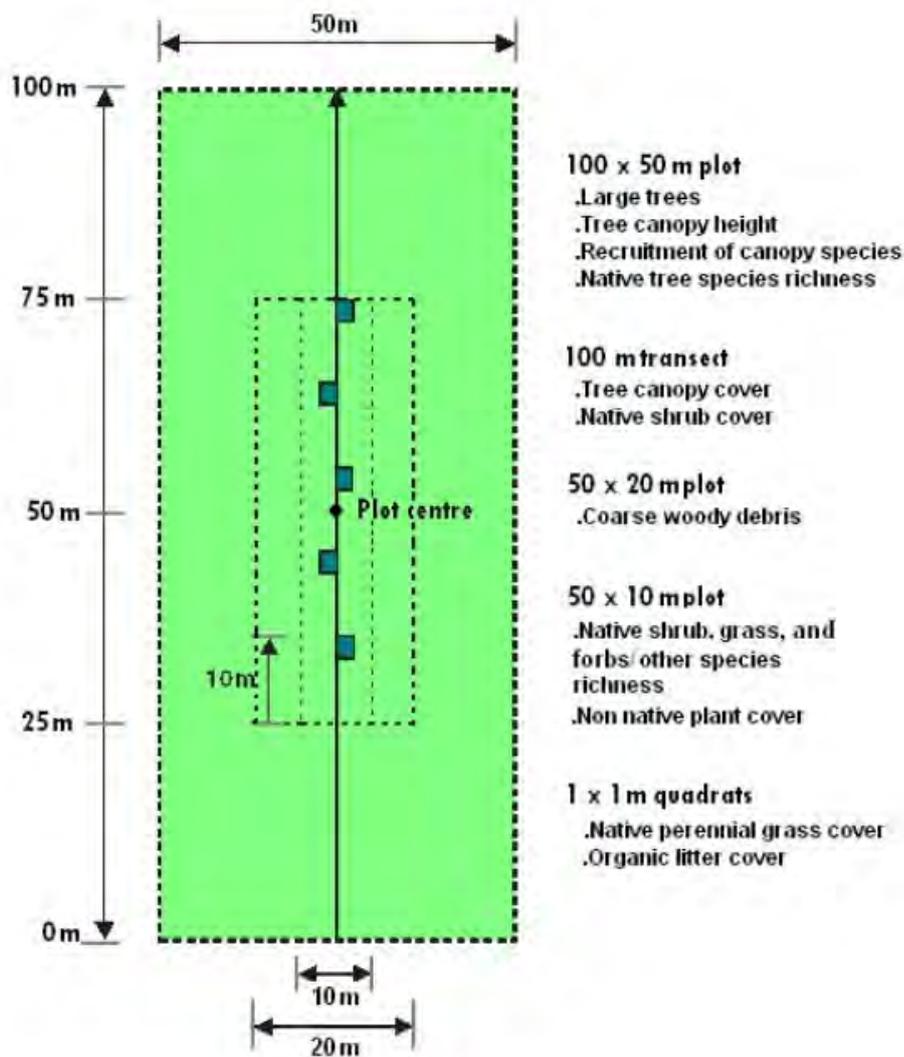


Plate 7.1 Layout of the BioCondition plot

Table 7.8 Habitat scoring criteria for each MNES within the offset area

Attribute	Scoring system				
	5	10	15	20	25
Bare-rumped sheathtail bat					
Quality and availability of food and habitat for foraging					
Presence of remnant vegetation within known range	Absent	No remnant on or adjacent to site	Adjacent to site only	Remnant vegetation in which suitable old growth trees are a component	Undisturbed old growth remnant dominated by suitable trees
Quality and availability of habitat for shelter and breeding					
Presence of preferred tree species (<i>E.platyphylla</i> or <i>M.leucadendra</i>)	Absent	Low (1 – 2 per plot)	Moderate (3 – 4 per plot)	High (5 – 8 per plot)	Very high (>8 per plot)
Presence of deep hollows in preferred species	Absent	Low (1)	Moderate (2)	High (3 – 4)	Very high (5+)
Quality and availability of habitat for mobility					

Attribute	Scoring system				
	5	10	15	20	25
Connectivity between suitable habitats	Absent	Low	Moderate	High	Very high
Absence of threats*					
Introduction of exotic weeds	Absent	Low	Moderate	High	Very high
Southern black-throated finch					
Quality and availability of food and foraging habitat					
Abundance of preferable grass species	None present	Preferred grass present but cover <10% of plots	Preferred grass cover 10 - 25% of plots	Preferred grass cover 25 – 75% of plots	Preferred grass cover > 75% of plots
Species richness of food grasses	Absent	1 -2 spp present	3 – 4 spp present	5+ spp present with annuals only	5+ spp present with annuals and perennials
Mosaic of bare patches and grass	No bare ground / 100% weed cover	< 5% or >85% bare ground	5 – 15 % or 70 – 85% bare ground	15 – 20% or 60 – 70% bare ground	20 – 60% bare ground
Quality and availability of habitat for shelter and breeding					
Availability of nesting site with known tree species	Absent	<i>E.platyphylla</i> cover 0 – 5%, <i>M.viridiflora</i> canopy < 3 m	<i>E.platyphylla</i> cover 5 – 15% or > 50%, <i>M.viridiflora</i> canopy 3 - 5 m	<i>E.platyphylla</i> cover 15 – 20% or 30 - 50%, <i>M.viridiflora</i> canopy 5 - 6 m	Numerous 20 – 30% with hollows, and/or mature <i>M.viridiflora</i> canopy (>6 m) present
Distance to water	Over 1.5 km	1 – 1.5 km	400 m – 1 km of a breeding season water source	200 m – 400 m of a breeding season water source	Within 200 m of a breeding season water source
Quality and availability of habitat for mobility					
Presence of shrubs (including invasive species)	Very high (over 70% abundance)	Mid-dense – High (50 – 70%)	Mid-dense – Low (30 – 50%)	Sparse (10 – 30%)	Very sparse (< 10%)
Presence of suitable open grassy woodland	Absent	Present but both understorey and tree canopy degraded	Suitable grassland species present but tree species absent or degraded / regrowth	Open woodland with vegetation thickening and/or low grass species diversity	High quality open woodland with low shrub density
Absence of threats*					
Clearing and fragmentation	Absent	Low	Moderate	High	Very high
Reduction in the availability of water	Absent	Low	Moderate	High	Very high
Inappropriate grazing regimes	Absent	Low	Moderate	High	Very high
Inappropriate fire regimes	Absent	Low	Moderate	High	Very high
Introduction of exotic weeds	Absent	Low	Moderate	High	Very high
Koala					
Quality and availability of food and habitat for foraging					

Attribute	Scoring system				
	5	10	15	20	25
Species richness of locally important food trees	Absent	1	2	3	4+
Abundance of non-juvenile locally important food trees	Absent	1 - 5	6 -10	10 – 20	>20
Quality and availability of habitat for shelter and breeding					
Species richness of ancillary habitat trees	Absent	1	2	3	4+
Abundance of non-juvenile ancillary habitat trees	Absent	1 - 5	6 -10	– 20	>20
Quality and availability of habitat for mobility					
Connectivity between suitable habitats	Absent	Low	Moderate	High	Very high
Absence of threats*					
Clearing and fragmentation	Absent	Low	Moderate	High	Very high
Risk of dog attack	Absent	Low	Moderate	High	Very high
Risk of vehicle strike	Absent	Low	Moderate	High	Very high
Risk of uncontrolled wildfire	Absent	Low	Moderate	High	Very high
Risk of drought	Absent	Low	Moderate	High	Very high

*Absence of threat scored against the risk matrix outlined in the Guide to determining terrestrial habitat quality (DES 2020)

7.2.4.2 Quality of food and foraging habitat

The quality and availability of food and foraging habitat was determined for each species using criteria detailed below. Food quality/availability scores were calculated for each assessment unit based on the average of all plot scores, with all criteria scored out of 25. Criteria for the bare-rumped sheath-tail bat and southern black-throated finch were derived by ecologists from Biodiversity Australia, while criteria for the koala were derived by ecologists from GHD. Justification for all criteria is detailed below.

Bare-rumped sheath-tail bat

Foraging habitat quality for the bare-rumped sheath-tail bat was scored based on the following criteria:

- **Presence and maturity of remnant woodland:** This relatively simple criteria reflects the unspecialised foraging habitat requirements of the species. The bare-rumped sheath-tail bat is known to forage in a wide range of habitats. For this reason, foraging habitat is not particularly limiting. The Commonwealth listing advice states the species occurs mostly in eucalypt forests and woodlands, generally in near-coastal areas. In Queensland, it is known to be associated with coastal lowland rainforests, and more open forests dominated by *Eucalyptus* or *Corymbia* species interspersed with coastal lowland rainforest (TSSC, 2016).

Southern black-throated finch

Foraging habitat quality for the southern black-throated finch was scored based on the average of the following criteria, each scored out of 25, with scoring parameters for each criteria shown in Table 7.8:

- **Abundance of food grass:** The abundance of preferred food grasses was calculated in 1 m x 1 m BioCondition quadrats, where preferred food grasses were the 41 grass species that have been recorded in the literature as a known food source for the species (e.g. Mula Laguna et al 2019, Williams et al 2020). This metric was consistent with performance indicators used by Buosi (2011) – “Early flowering perennial grasses, such as cockatoo grass, occur in >25% of 20 randomly-spaced 0.5 m by 0.5 m plots in areas used by southern black throated finches during the early wet season and wet season (November to February). This functional group of grasses is to be dominated by native species”.
- **Species richness of food grasses:** The number of food grass species was calculated in 1 m x 1 m BioCondition quadrats. This indicator is consistent with performance indicators by Buosi (2011) “At least six different grass species occur in 20 randomly spaced 0.5 m by 0.5 m plots in areas used by southern black throated finches. At least four shall be native”.
- **Mosaic of bare patches and grass:** The ratio of bare ground to native grasses was calculated within the BioCondition plots. Southern black-throated finch habitat must encompass patches with bare ground or low vegetation density to allow southern black-throated finches access to the seed bank (Rechetelo, 2015). Buosi (2011) provided the grazing recommendation aim for over 50% ground cover at the end of the dry season. They prefer areas with low vegetation density have a positive relationship with bare ground and a negative association with high total ground cover (Rechetelo, 2015). If bare ground is too high, then there may be too few grasses to provide sufficient food resources. In preferred habitat areas (areas with observed use), a bare ground cover of 40.59% ± 19.28% with a maximum of 85% bare ground area was measured (Rechetelo, 2015).

Koala

The quality of food and foraging habitat for the koala was scored based on the average of the following criteria:

- **The abundance of non-juvenile locally important food trees:** The number of *locally important* koala food trees in each 50 m x 100 m BioCondition plot that meet the size criteria to qualify as non-juvenile koala food trees was calculated. This was based on the definition of *locally important* food trees as specified for the Brigalow belt in Youngentob et al (2021) and the non-juvenile koala food tree definition outlined in the Queensland *Environmental Offsets Policy* (DES, 2022) (i.e. any koala habitat tree that is more than 4 m high or has a trunk with circumference of more than 31.5 cm at 1.3 m above the ground). This criteria provides a measure of the biomass of food resources available to local koalas.
- **Relative diversity of locally important koala food trees:** This was calculated by dividing the number of *locally important* koala food tree species present in each 50 m x 100 m BioCondition plot by the total number of locally important food tree species listed in the *Technical Description* for that RE community (Pollock 2018). Koalas are known to forage on a variety of food tree species. While koalas can persist in areas with only a single food tree species where that species meets its’ nutritional requirements, the provision of a diversity of food tree species increases the adaptability of foraging resources available to koalas. In north Queensland, koalas have been shown to occur in higher densities in riparian habitats where there is higher food tree species richness (Munks et al. 1996).
- **Ease of movement:** This was scored based on the relative connectivity of habitat and the anticipated physical barriers (i.e. fences, dense vegetation) and behavioural barriers (i.e. large gaps) to koala movement. This observes that while koalas are capable of moving large distances across open ground when dispersing, during foraging activities, they tend to forage preferentially through habitats that have higher levels of connectivity and pose lower risks of mortality from dog attack and other forms of misadventure (Rus et al 2020).

7.2.4.3 Quality and availability of shelter

The quality and availability of shelter was determined for each species using criteria detailed below. Shelter quality/availability scores were calculated for each assessment unit based on the average of all plot scores, with criteria scored out of 25 (as recommended in the *Guide to Determining Terrestrial Habitat Quality* DES 2020) and then converted to scores out of 10 to align with the EPBC Act QLD *Modified QLD Habitat Quality spreadsheet*.

Bare-rumped sheathtail bat

The quality and availability of shelter for the bare-rumped sheathtail bat was scored based on the average of the following criteria:

- **The abundance of preferred trees:** The number of individuals of the three preferred tree species (i.e. *Eucalyptus platyphylla*, *E. tessellaris* and *Melaleuca leucadendra*) within each 50 m x 100 m BioCondition plot. The bare-rumped sheathtail bat is an obligate hollow-roosting species (Milne et al. 2009). At the time of publication of the national recovery plan for the bare-rumped sheathtail bat (Schulz and Thomson 2007), it had only been recorded from poplar gum (*Eucalyptus platyphylla*), Darwin woollybutt (*E. miniata*) and Darwin stringybark (*E. tetradonta*), however, it has since also been located in weeping tea tree (*Melaleuca leucadendra*) (Greg Ford pers. Comm.) and Moreton Bay ash (*Corymbia tessellaris*) (Reside et al. 2016). Due to difficulties in determining their presence in tree hollows, it is likely that the species utilises hollows in a broader range of tree species, particularly eucalypts. As the bats only occur at low densities in the region (Schulz and Thomson 2007), only a small minority of available tree hollows would be likely to be utilised.
- **The abundance of suitable deep hollows in roost tree species:** The number of suitable hollows (i.e. > 10 cm diameter and > 8 m high in *E. platyphylla*, *C. tessellaris* or *M. leucadendra* (G. Ford pers Comm.) was counted in each 50 m x 100 m BioCondition plot. The bare-rumped sheathtail bat has specific hollow-requirements, only known to roost in large, deep hollows in *Eucalyptus platyphylla*, *E. miniata*, *E. tetradonta* and *Melaleuca leucadendron* (TSSC 2016).

Southern black-throated finch

The quality and availability of shelter for the southern black-throated finch was scored, based on the average of the following criteria:

- **The abundance of suitable nesting sites and known nesting tree species:** The canopy cover of typical nest tree species (i.e. *E. platyphylla* and *Melaleuca viridiflora*) was calculated for each 50 m x 100 m BioCondition plot. The woodland species *Eucalyptus platyphylla* and *Melaleuca viridiflora* are the preferred nest trees with nests occasionally recorded in *Corymbia tessellaris* and *C. dallachyana* (Rechetelo 2015). The nests are often built in a hollow branch of a tree, or in a fork of a tree, shrub or sapling (DAWE, 2022). A single tree may contain several active nests (e.g. two to five nests have been observed in one tree). Nests are used for breeding and roosting, with individuals returning each night to roost (Buosi 2011). Flocks are also negatively associated with high tree abundance (Rechetelo 2015). The mean number of large trees was 1.3/ha, medium trees 63/ha and small trees 181/ha (Rechetelo 2015). They occur in grassy open woodland (Buosi 2011), defined by Specht (1970) as having a crown cover <20% of trees 10-30m height. BioCondition benchmarks for 11.3.35 notes a 30% tree canopy cover.
- **Distance to water:** The distance to the nearest suitable breeding season drinking site was measured for each BioCondition plot. Proximity to drinking sites is a critical requirement. During the breeding season, southern black-throated finches rarely venture far from the nest and therefore need to be able to access food and drinking resources in close proximity. Southern black throated finches nest an average of 167 m from water but generally require a water source to be within 200 m of breeding and foraging areas, and no more than 400 m (Buosi 2011).

Koala

The quality and availability of shelter for the koala was scored, based on the average of the following criteria:

- **The abundance of non-juvenile ancillary habitat trees:** The number of *ancillary habitat* trees in each 50 m x 100 m BioCondition plot that meet the size criteria to qualify as non-juvenile koala habitat trees was calculated. This was based on the *ancillary habitat* trees identified for the Brigalow belt in Youngentob et al (2021) and the non-juvenile koala food tree definition outlined in the Queensland *Environmental Offsets Policy* (DES 2022) (i.e. any koala habitat tree that is more than 4 m high or has a trunk with circumference of more than 31.5 cm at 1.3 m above the ground). This criteria provides a measure of the biomass of shelter resources available to local koalas.
- **Relative diversity of ancillary habitat trees:** This was calculated by dividing the number of *ancillary habitat* tree species present in each 50 m x 100 m BioCondition plot by the total number of locally *ancillary habitat* tree species listed in the *Technical Description* for that RE community (Pollock 2018). Ancillary habitat elements such as shelter vegetation may not contribute substantially to a koala's diet but is important for movement and thermoregulation. Shelter tree species that do not provide nutritional value can play an

important role when they co-occur with *locally important* koala trees. Although these species do not constitute habitat in the absence of *locally important* koala trees, they are thought to make an important and potentially necessary contribution to koala habitat in many regions (Youngentob et al 2021).

- **The relative abundance of shrub cover:** This was calculated directly from the shrub canopy cover scores calculated from the BioCondition plot data detailed in Section 0. This provides an additional measure of shelter abundance for the koala.

7.2.5 Item 7.2.5

Details, with supporting evidence, of how the environmental offset/s meets the requirements of the department's EPBC Act Environmental Offsets Policy (2012) (Offsets Policy), available at: www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy.

7.2.5.1 Response

Information on how the proposed offset complies with the principles of the EPBC Act *Environmental Offsets Policy* (2012) is outlined in Table 7.9. The suitability of the offset in terms of the presence of the species, the suitability and extent of existing habitats and the potential for ecological improvements is outlined in Section 3 of the OAMS.

The proposed offsets have been developed in accordance with the overarching principles and aims of the EPBC Act and EPBC Act Environmental Offsets Policy (Commonwealth of Australia, 2012), as outlined in Table 7.9

Table 7.9 EPBC Act Environmental Offsets Policy Principles

Policy Principle	Compliance
1. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matters.	The proposed offset area will be legally secured and contain suitable habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala that will be maintained through removal or management of major threats (i.e. weeds), including at a property-scale for some aspects, improved the quality and extent of foraging and sheltering habitat for both species and regular monitoring and reporting of the existing populations and habitat characteristics, which will provide data for the ongoing successful management of the populations to maintain their viability. The proposed offset areas will increase connectivity to the adjacent surrounding LRSA.
2. Suitable offsets must be built around direct offsets but may include other compensatory measures.	The proposed offset area will achieve at least 100% of the direct offset requirements for the southern black-throated finch, bare-rumped sheathtail and koala.
3. Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter.	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide (DSEWPaC, 2012) and therefore is considered consistent with the statutory protection that applies to the southern black-throated finch, bare-rumped sheathtail bat and koala.
4. Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.	The offset proposal has been defined based on the EPBC Act Offsets Assessment Guide (DSEWPaC, 2012) and therefore is considered to be of a size and scale proportionate to the residual impacts on the southern black-throated finch, bare-rumped sheathtail bat and koala.
5. Suitable offsets must effectively account for and manage the risks of the offset not succeeding.	The offset area contains suitable habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala, is currently owned by the proponent, and will be legally secured prior to the impacts occurring through Voluntary Declaration process and hence protected from clearing or other major disturbances and undergo management of the southern black-throated finch, bare-rumped sheathtail bat and koala population and existing threats such as weed infestation and bushfire. Risks of the offset not succeeding will be managed through the management actions to be implemented, monitoring and timeframes, and performance indicators and ecological outcomes to be achieved. Management measures will include extensive rehabilitation, weed management, water source management, fire management, feral animal management, removal of cattle, and maintenance as appropriate.
6. Suitable offsets must be additional to what is already required, determined by law or planning	The offset area is not otherwise protected or managed as habitat for the southern black-throated finch, bare-rumped sheathtail bat and koala. The offset area is located on freehold tenured land owned by the proponent, but will be further

Policy Principle	Compliance
regulations, or agreed to under other schemes or programs.	<p>protected through the Voluntary Declaration process to become a Category A area regulated under the VM Act. This will be substantial additional protection to the existing status of Least Concern remnant vegetation (Category B).</p> <p>The proposed management of the offset areas will be additional to requirements and enforcement under law or planning regulations, such as the <i>Biosecurity Act 2014</i>.</p> <p>The Queensland Environmental Offsets Policy recognises that requirements for offsets for MNES under the EPBC Act do not need to be duplicated where the same impact and prescribed matter have been subject to assessment under the EPBC Act as a controlled action.</p> <p>The proposed rehabilitation areas which is part of the wider LRSA, will improve connectivity and quality of habitats within the refuge.</p>
7. Suitable offsets must be efficient, timely, transparent, scientifically robust and reasonable.	The proposed delivery of the offset has been based on established and standard scientific survey and management methods and will be commenced prior to the impacts occurring to the MNES. Assessments and monitoring and management programs proposed are based on documented management strategies and land management techniques that have been adapted to the locations and site characteristics, with input from species experts and other suitably qualified persons, and reference to priority management actions and species profile information, recovery plans and threat abatement plans.
8. Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The offset proposal includes responsible parties, management actions, timeframes, baseline survey and monitoring programs, review processes, reporting, and remedial action triggers and measures. Compliance reporting and non-compliance notification to DCCEEW is included.

7.2.6 Item 7.2.6

The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to each potential offset area/s for each relevant MNES, including:

- Time over which loss is averted (max. 20 years);
- Time until ecological benefit;
- Risk of loss (%) without offset;
- Risk of loss (%) with offset; and
- Confidence in result (%).

When calculating offsets, please refer to the department's published guidance: *How to use the Offsets Assessment Guide*, available at: <https://www.awe.gov.au/sites/default/files/documents/offsets-how-use.pdf>

7.2.6.1 Response

The methodology and justification used to inform the inputs for the Offsets Assessment Guide including time over which loss is averted, Time until ecological benefit, risk of loss without offset and confidence in the result are presented in Section 5 of the OAMS.

Time over which loss is averted

The proposed offset area will be owned and managed by TCC. As such, the offset can be managed for the life of the Project. Construction of the Project is proposed to last three years. To maximise the benefits of the offset, the time over which loss is averted will be set at 20 years, exceeding the impacts of the Project.

Time until ecological benefit

Time until ecological benefit will be relatively short for the southern black-throated finch. Improvement of habitat quality for these species are predominantly linked to the rehabilitation of the ground layer and increase in native food grass abundance and diversity. These values can be improved within a 5-year timeframe.

Enhancement of values for the koala and bare-rumped sheath-tail bat are more closely linked to the rehabilitation of regrowth and non-remnant woodland areas with the aims of increasing food availability and habitat connectivity for both species. Koalas are known to forage in relatively immature regrowth (Youngentob 2021) and the bare-rumped sheath-tail bat is capable of foraging widely. The benefits of the offset are therefore likely to be achieved within a 20-year timeframe.

Risk of loss without the offset

Risk of loss has been informed by the *Guidance for informing 'risk of loss' estimates when evaluating biodiversity offsets proposals under the EPBC Act* (Maseyk et al. 2017) and knowledge on existing threats detailed in Section 7.2.1.1. The land within the proposed offset area represents a mix of remnant, regrowth and non-remnant vegetation on freehold and state land. Given there is no credible evidence that the offset area will be subject to development in the foreseeable future, the default risk of loss value of 1.10 percent for the Townsville Local Government Area recommended in Maseyk et al. (2017) has been used.

Risk of loss with the offset

The potential for total loss of habitat at the site will be negligible with the land legally secured as an offset. The land as an offset will be managed and monitored specifically for the conservation of the southern black-throated finch and less likely to suffer from deterioration in habitat quality and decline of the population.

Confidence in the result

There is a moderate-high degree (70 percent) confidence in this assessment due to strong evidence for existing threats and factors limiting the shelter and foraging value. Active management of weeds and rehabilitation of the proposed offset areas provides a clear opportunity for improvement in the ecological value of habitats and reduction in the threats facing the local population. Scoring of future habitat values for anticipated improvement have been conservative to provide confidence they can be delivered and still meet the improvement requirements of the Offset. However, there are external factors that can threaten the success of the habitat and its management as an offset area, as per the risk of loss factors described above (thereby lowering the confidence level).

7.2.7 Item 7.2.7

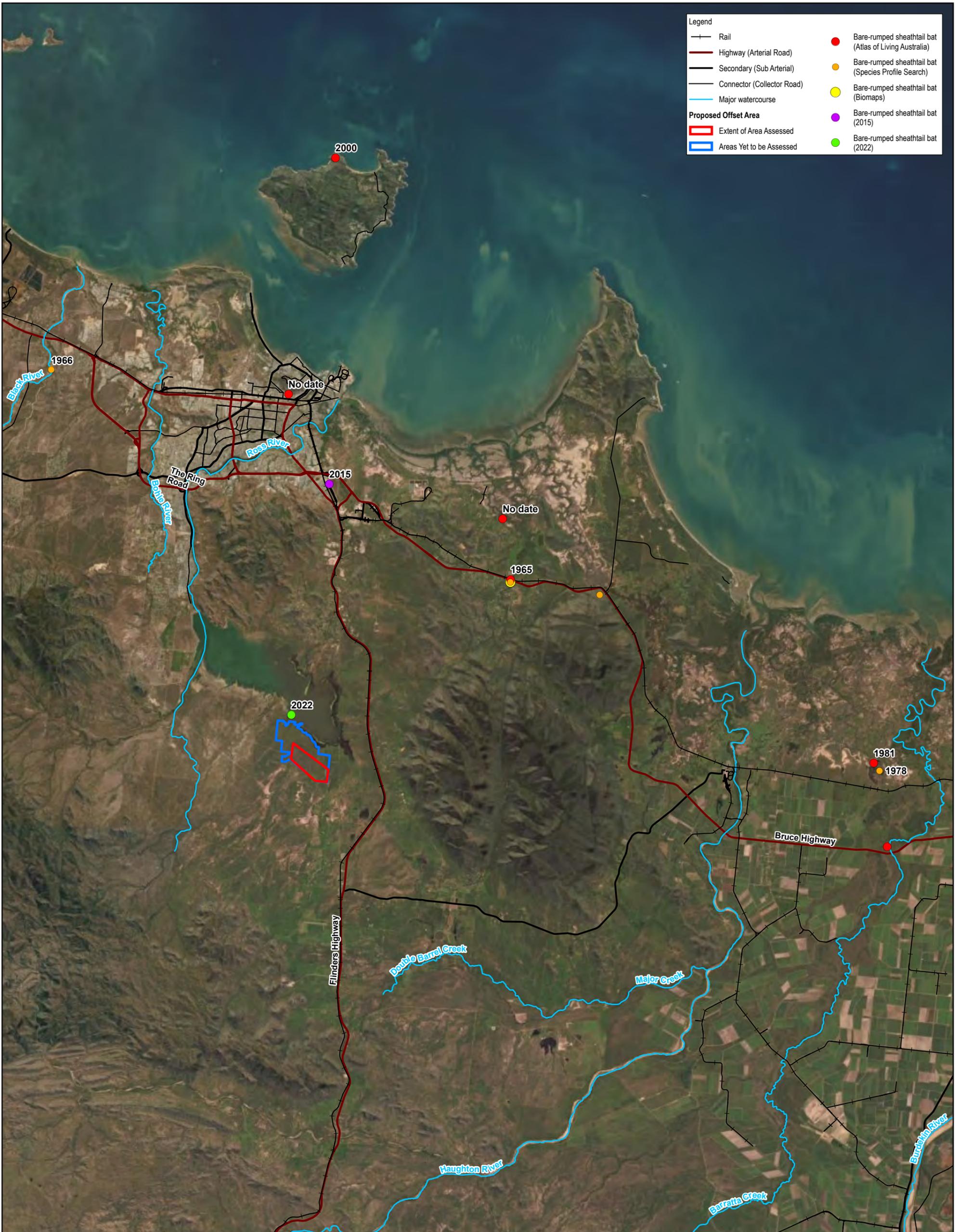
Evidence that the relevant MNES, and/or their habitat, can be present in the potential offset area/s.

7.2.7.1 Response

Evidence that each MNES and/or their habitat can be present in the potential offset area is outlined in Section 3 of the OAMS and is included below. This includes a summary of the three targeted field surveys that have been undertaken in the offset area. These confirmed the presence of the bare-rumped sheath-tail bat at the northern extent of the offset area. While the remaining three species have not been confirmed present within the offset area in targeted surveys, there is sufficient historical evidence to indicate the species and their habitat occurs within the offset area. For the koala, southern black-throated finch and bare-rumped sheath-tail bat, information on the presence and distribution of suitable habitat is mapped across the offset area. Information on the likely occurrence of each species is provided by mapping nearby historical records. For all species – the offset area occurs in proximity to nearby historical records that are within the movement range of the species and directly connected to habitats within the offset area. For the koala, historical records (from 2012 and 2021) occur in low densities. However, this low density of koala occurrence is consistent with the impact area, where koalas were only known to occur from one historical record, recorded 2 km west of the impact area in 1987. Information on the presence of each species is detailed separately below.

Bare-rumped sheath-tail bat

The bare-rumped sheath-tail bat was positively detected from a full spectrum echolocation call, captured immediately north of the offset area during targeted baseline surveys for the offset (Biodiversity Australia 2022b). The call was positively identified by bat call analysis expert Greg Ford from Balance Environmental. Numerous historical records are also known from the Townsville region, as shown in Figure 7.3. Most are relatively recent records that have been confirmed since recent advances in acoustic detection via full spectrum analysis have increased the capacity to detect the species.



Legend	
	Rail
	Highway (Arterial Road)
	Secondary (Sub Arterial)
	Connector (Collector Road)
	Major watercourse
	Extent of Area Assessed
	Areas Yet to be Assessed
	Bare-rumped sheathtail bat (Atlas of Living Australia)
	Bare-rumped sheathtail bat (Species Profile Search)
	Bare-rumped sheathtail bat (Biomaps)
	Bare-rumped sheathtail bat (2015)
	Bare-rumped sheathtail bat (2022)

Based on or contains data provided by the State of QLD 2021. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

Paper Size ISO A3
 0 2.5 5
 Kilometers
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



Townsville City Council
 Haughton Pipeline Stage 2 -
 Offset Area Management Strategy
**Bare-rumped sheathtail bat records
 near the proposed offset area**

Project No. 12537606
 Revision No. 0
 Date 7/24/2022

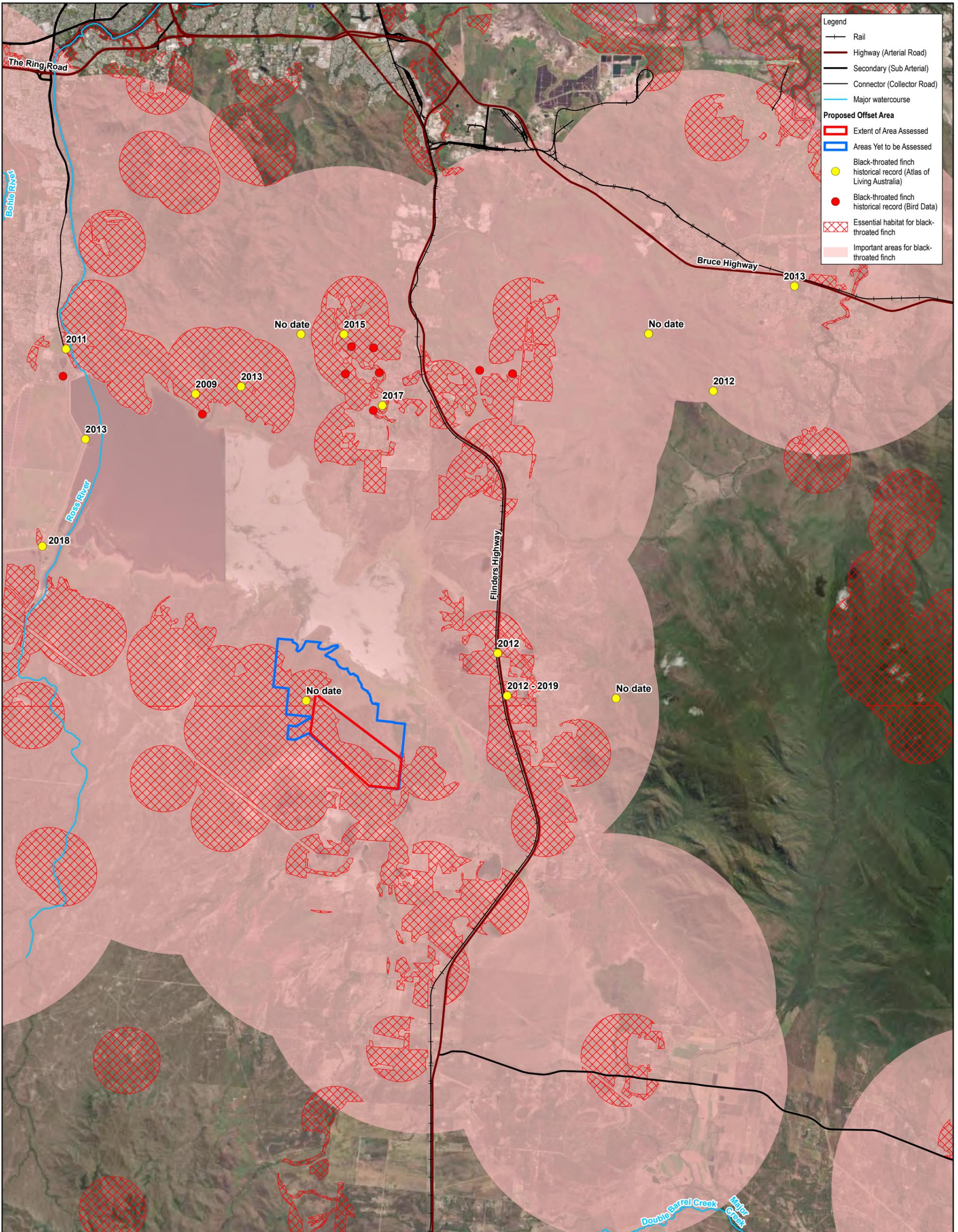
FIGURE 7.3

Southern black-throated finch

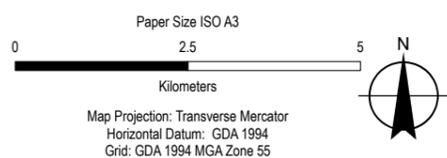
The offset area occurs within the centre of a mapped important area for the southern black-throated finch, recognised in the Commonwealth's Greater Townsville important areas mapping (DEWHA 2009). While no individual black-throated finches were recorded within the offset area in targeted surveys (Biodiversity Australia 2022), Ross River Dam area is considered a hotspot for the species, with the Atlas of Living Australia and Birddata identifying high densities of historical records of the species within the local area as shown in Figure 7.4. There are a total of 201 historical records of the southern black-throated finch within a 20 km radius of the proposed offset area. Based on this information, the species is known to occur within the proposed offset area.

Koala

Koalas are known to occur in low local densities within the Townsville coastal floodplain and surrounding coastal regions of north Queensland. Due to their low density of occurrence, targeted koala surveys undertaken in the proposed impact area using methods recommended in the former Commonwealth referral guidelines for the vulnerable koala (DoE 2014) could not detect the species. For the same reason, it is possible that targeted surveys to be undertaken in the offset area may not detect the species. However, in both instances, the presence of suitable habitat and proximity to historical koala records indicates koalas are likely to occur in low densities. In the case of the impact area, one koala was recorded 2 km west of the impact area in 1987. For the offset area, more recent records of koalas are known, with koalas recorded 6 km north of the offset area in 2012 and 14 km north-east of the offset area in 2022 (Figure 7.5). The closest record, from Oak Valley is connected to habitats within the offset area via riparian corridor along Sachs Creek and Antill Creek. This record is well within the dispersal range of the koala (i.e. 10 – 16 km). While the offset area does not represent an area of high koala densities, it is consistent with the principles of the Commonwealth Environmental Offset Policy in that it offers a 'like for like' compensation for the habitat lost within the impact area. The provision of a comparable offset in a similar area of low koala density, within the same coastal floodplain is therefore considered a suitable offset. While alternative offset areas with higher koala densities are likely to occur west of the Great Dividing Range in areas like Collinsville or Ravenswood, these areas would not compensate for the loss of koala habitat within the coastal floodplain and for that reason are not as suitable.



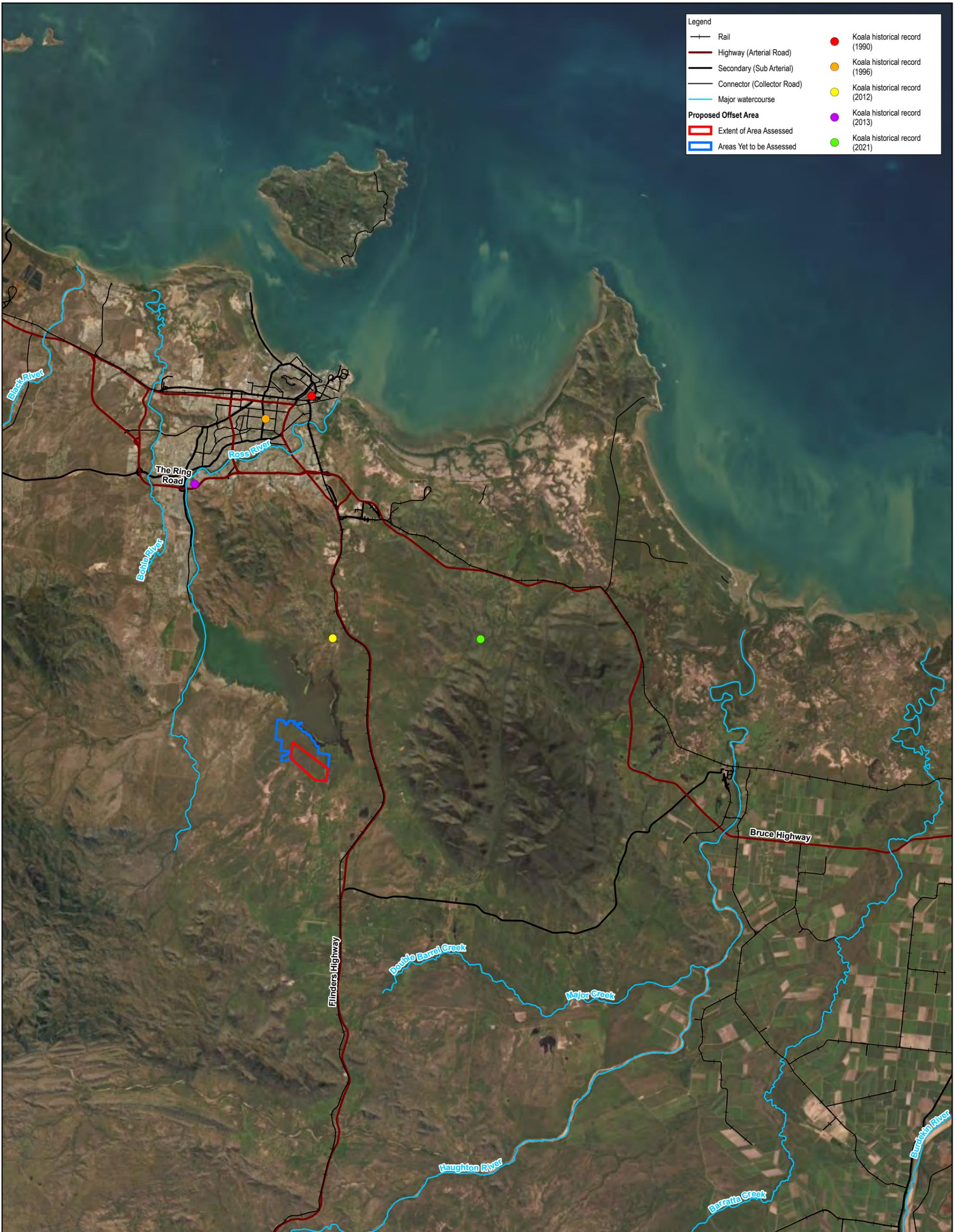
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Townsville City Council
Houghton Pipeline Stage 2 -
Offset Area Management Strategy
**Historical records of the southern
black-throated finch near the
proposed offset area**

Project No. 12537606
Revision No. 0
Date 7/24/2022

FIGURE 7.4



Legend

—+— Rail	● Koala historical record (1990)
— Highway (Arterial Road)	● Koala historical record (1996)
— Secondary (Sub Arterial)	● Koala historical record (2012)
— Connector (Collector Road)	● Koala historical record (2013)
— Major watercourse	● Koala historical record (2021)

Proposed Offset Area

▭ Extent of Area Assessed
▭ Areas Yet to be Assessed

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Paper Size ISO A3

0 2.5 5
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



Townsville City Council
Haughton Pipeline Stage 2 -
Offset Area Management Strategy

Project No. 12537606
Revision No. 0
Date 7/24/2022

**Koala records near the
proposed offset area**

FIGURE 7.5

7.2.8 Item 7.2.8

Information about how the potential offset area/s provides connectivity with other relevant habitats and biodiversity corridors.

7.2.8.1 Response

As shown in Figure 7.6, the proposed offset area is located between two State significant biodiversity corridors, mapped in Queensland's Biodiversity Planning Assessment mapping; one that covers Lake Ross, and another larger biodiversity corridor that runs east-west at the southern half of the offset area – linking Hervey's Range in the west to Toonpan in the east. A regionally significant biodiversity corridor also runs north-south through the proposed offset area, along Lansdowne Creek. By revegetating parts of the offset area that are currently support non-remnant and regrowth vegetation, the offset has the potential to increase local and regional habitat connectivity at multiple scales.

7.2.9 Item 7.2.9

Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation.

7.2.9.1 Response

Timing and indicative dates for delivery of the offset are provided in Table 7.10.

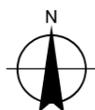
Table 7.10 Indicative timeframes for offset delivery

Action	Timing	Indicative date
Submit OAMP to DCCEEW	Prior to commencement	Q4 2022
Offset proposal (this report) approved by DCCEEW	Prior to commencement	Q1 2023
Apply for legal securing (VDec)	Prior to commencement	Q1 2023
Commence offset	Within 6 months of Project approval by DCCEEW	Q3 2023
Develop and implement monitoring	Within six months of Project approval by DCCEEW	Q2 in year 1 (2024), year 3 (2025) and year 5 (2027) Then every 5 years until relevant ecological outcome demonstrated or end of approval (whichever is sooner)
Compliance reporting	Annually	Annually from time of commencement



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Paper Size ISO A3
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 Kilometres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



Townsville City Council
 Haughton Pipeline Stage 2 -
 Offset Area Management Strategy
**Connectivity of the proposed
 offset area to State and regional
 biodiversity corridors**

Project No. 12537606
 Revision No. 0
 Date 7/27/2022

FIGURE 7.7

7.3 Minimum requirements for a draft Offset Area Management Plan

An Offset Area Management Strategy (OAMS) has been included in the Preliminary Documentation which proposes land-based offsets for MNES species that will be subject to significant residual impacts due to the Project.

An OAMP will be prepared following completion of data analysis from condition surveys recently undertaken within the offset area. The OAMP will be development in accordance with the requirements set out in Section 7.3 of the RFI and will be prepared by a suitably qualified ecologist in accordance with the Departments Environmental Management Plan Guidelines (DoE 2014) for approval prior to commencement of the proposed action.

8. Ecologically Sustainable Development (ESD)

8.1 Item 8.1

A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. More information on ESD is available at <https://www.environment.gov.au/about-us/esd>.

8.1.1 Response

A key object of the EPBC Act is: *to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources* (Section 3(1)(a)). Section 3A of the EPBC Act outlines five principles of ecologically sustainable development. An analysis of the Project’s alignment with the five principles of ecologically sustainable development as listed in Section 3A of the EPBC Act is provided in Table 8.1.

Table 8.1 Project alignment with the principles of ecologically sustainable development as outlined in Section 3A of the EPBC Act

Core objective or guiding principle	Project analysis
Decision-making processes shall effectively integrate both long-term and short-term economic, environmental, social and equitable considerations	<p>The HPS2 Project is recognized as an enabler of economic development through the provision of additional water supply security, to accommodate both short term drought resilience and longer term increased water demand due to population growth and commercial development in the region.</p> <p>Mitigation and management measures have been developed to ensure there are no long-term adverse impacts to environmental values protected under Commonwealth law. Specifically, the mitigation hierarchy has been applied such that impacts to the environment, and especially MNES, have been avoided and minimised to the extent possible, with <i>in situ</i> active and passive rehabilitation of much of the construction area to occur once the pipeline is operational.</p> <p>Recognising the potential for (significant) residual impacts to three species that are MNES, offsets will be provided where the objective is to achieve an outcome that maintains or improves the viability of these respective matters, as per the intent of the EPBC Act Environmental Offsets Policy 2012.</p>
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation	<p>The Project design, site selections and investigative works has been undertaken to limit the risk of serious or irreversible environmental damage. Ecological assessments, cultural heritage assessments and stakeholder consultation were undertaken and a range of technical specialists were engaged to apply scientific rigour to the assessment of potential impacts, avoidance measures, mitigation and management measures. The Project is not considered likely to have serious or irreversible environmental impacts (i.e. contribute to the extinction of a species or subspecies), especially noting the detailed baseline studies that have been undertaken to describe the ecological values of the Project area and the local landscape in which it is situated, and accounting for the fact that impacts have been assessed and managed through rigorous application of the mitigation hierarchy in accordance with Commonwealth significant impact guidelines.</p>
The principle of inter-generational equity—that the present generation shall ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations	<p>The HPS2 Project represents a long-term investment in Queensland’s water infrastructure with significant economic and social benefits for current and future generations</p> <p>The Project will facilitate and enable development in the region, thus benefiting the regional, state and national economies.</p> <p>Temporary construction benefits of the Project include:</p> <ul style="list-style-type: none"> – Direct Project employment during construction – Training and skills development opportunities – Direct procurement and supply opportunities. <p>Long-term operational benefits of the Project include:</p> <ul style="list-style-type: none"> – Increase water security and reliability – Direct Project employment opportunities. <p>While the Project may have short-term environmental impacts, a number of mitigation measures will be implemented to avoid and minimise serious, long-</p>

	<p>term and irreversible environmental damage – as described in rows above, this is founded on rigorous application of the mitigation hierarchy (including commitments to rehabilitation of disturbed areas post-construction <i>and</i> offsets), underpinned by detailed baseline ecological studies, all undertaken in accordance with Commonwealth significant impact guidelines and other associated policy..</p>
<p>The conservation of biological diversity and ecological integrity shall be a fundamental consideration in decision-making</p>	<p>Ecological and biocondition assessment surveys have been undertaken for the Project to identify and manage potential impacts on biological diversity and ecological integrity. The HPS2 Project site was established taking into consideration sensitive environmental areas and culturally significant areas. The Project is sited in a highly transformed landscape in which ecological integrity has been compromised by various land use regimes and pervasive threats (e.g. weeds altered fire regimes) – nonetheless, comprehensive baseline ecological surveys revealed matters of national environmental significance persist in habitats in this landscape. Noting the occurrence/likely occurrence of these MNES – namely, several threatened species – and recognising a broader need to progress this Project in an environmentally sensitive way in accordance with Queensland and Commonwealth requirements, a detailed impact management approach has been formulated. Specifically, the mitigation hierarchy has been applied such that impacts to the environment, and especially MNES, have been avoided and minimised to the extent possible, with <i>in situ</i> active and passive rehabilitation of much of the construction area to occur once the pipeline is operational. Recognising the potential for (significant) residual impacts to three threatened species that are MNES, offsets will be provided where the objective is to achieve an outcome that maintains or improves the viability of these respective matters, as per the intent of the EPBC Act Environmental Offsets Policy 2012.</p>
<p>Improved valuation, pricing and incentive mechanisms shall be promoted</p>	<p>The most significant benefit of the Project will be the increase in availability and reliability of water to accommodate increased water demand due to regional population growth. This report assesses the environmental consequences of the Project and identifies suitable mitigation and management measures for potential adverse impacts</p>

9. Economic and social matters

9.1 Item 9.1

An analysis of the economic and social impacts of the action, both positive and negative.

9.1.1 Response

The HPS2 Projects represents a \$274 million infrastructure investment by Queensland Government and TCC to provide raw water supply security for Townsville for drought proofing, population growth and industry development for the next 60 years (Jacobs, 2019, p. 1)

Historically, Townsville City has needed to implement water restrictions, with the current water supply security not meeting community expectations. In 2016, the Australian and Queensland Governments and TCC appointed the 'Townsville Water Security Taskforce' (Taskforce) to investigate short, medium and long-term solutions to water security for Townsville. The Taskforce, through community engagement, engineering and technical analysis, identified a number of dimensions defining Townsville's water security problem including (Taskforce, 2017, p. 5):

- Need for a clear plan to meet future growth in water demand
- Constraints to investment and regional economic growth due to the uncertainty of water supply, and the associated stress of that uncertainty
- Current frequency, duration and severity of restrictions (that is the level of service experienced by Townsville water users) leading to adverse economic and social impacts
- Sufficient bulk water transport capacity and reliability
- Water affordability and suitable pricing to accommodate the dry tropics
- Greater consumer choice through a user pays system
- High energy cost of pumping
- Cost of water storage and transport infrastructure
- Concerns about efficient and wise water use
- Optimal use of alternative local water sources; and
- Long term regional water source reliability.

The HPS2 Project will address Townsville's water security problems.

TCC has developed a procurement strategy for the Project to maximise local Contractor engagement. The strategy includes using an 'Interactive Tender Process' (ITP) for early Contractor involvement during the design period and shortlisting of suitable local tenderers to invite to Tender for the Project. The strategy intends to maximise opportunities for local contractors, subcontractors, businesses, suppliers and service providers.

Community and stakeholder engagement undertaken for the business case and previous Townsville Water Security Taskforce highlighted the importance of urban water security for communities in Townsville. In particular, a reliable urban water supply was identified as being critical to growing and attracting business and industry; the amenity of Townsville's public spaces, parks and landscape and ability to attract tourists to the city; the community's quality of life and wellbeing (Jacobs, 2019, p. 103).

The Project is estimated to generate around 345 new jobs during the construction period, with approximately 101 direct jobs and 244 indirect jobs during the construction period. The Project is further estimated to generate 30 new full-time equivalent (FTE) positions on an ongoing basis with 9 being directly employed and 21 being indirectly employed (Jacobs, 2019, p. 7).

The construction impacts on three private farming operations will be minimised and managed through mutually developed construction agreements inclusive of temporary and permanent land easement agreements and appropriate financial compensation. Other impacts will mainly be associated with construction including temporary access changes and road safety risk associated with increased construction traffic which will be managed through appropriate Traffic Management Plans.

9.2 Item 9.2

Details of any public consultation activities undertaken and their outcomes.

9.2.1 Response

TCC has conducted an ongoing program of consultation and public communication activities regarding the planning and progress development of the HPS2 Project.

9.2.1.1 Media and Communication

TCC has used a number of social media platforms to communicate the development of the project including TCC's website, Facebook, Youtube and LinkedIn. Samples of public communications and engagement are provided in Table 9.1 and as follows:

TCC website:

- <https://www.townsville.qld.gov.au/building-planning-and-projects/council-projects/haughton-pipeline-project>

Samples of public communications and engagement on Youtube include:

- [Haughton Stage 2 Funding Announcement](#) – July 2022
- [Cultural Heritage Survey- Pipeline alignment](#) – Dec 2021
- [Cultural Heritage Management](#) – Oct 2021
- [Stage 2 Local Business Profile – GHD](#), August 2021
- [Stage 2 Local Business Profile – Douglas Partners](#), July 2021

Table 9.1 Samples Project public communications and engagement: LinkedIn and Facebook

LinkedIn samples	Facebook samples

LinkedIn samples	Facebook samples
 <p>Townsville City Council 10,515 followers 8mo • 🌐</p> <p>Work is progressing on stage 2 of the Haughton Pipeline Duplication (Haughton River to Burdekin River). Careful and detailed design and planning is currently taking place of ...see more</p> <p>Ben Cook 0:59</p> <p>Haughton Pipeline - Local Contractor Rowlands Surveys</p>	 <p>Townsville City Council 21 May · 🌐</p> <p>Townsville City Council will host a face-to-face industry briefing for contractors, suppliers and consultants regarding the recent tender releases for Stage 2 of the Haughton Pipeline Project.</p> <p>Tuesday 31 May 11am - 12noon Townsville Stadium (Murray Sports Complex)</p> <p>Registrations are essential and close 12noon, Monday 30 May 2022.</p> <p>More information and register online: https://bit.ly/3a9vBx1</p> <p>The Haughton Pipeline Project is proudly funded by the Queensland Government in association with Townsville City Council.</p>

9.2.1.2 Landowners and stakeholders

Three key private landowners have been identified and relationships have been established, with Land Access Agreements executed in early 2021, rolled over in Sept 2021 until June 30, 2022. Access agreements have been extend for a further 12 months to June 2023.

Construction Agreements have been developed and initial drafts have been sent to landowners during May and June 2022 for consideration and negotiation. Discussions to finalise these agreements will continue during the second half of 2022.

Contacts have been established and consultation briefings have been held with key parties and stakeholders including:

- Wilmar Sugar Pty Ltd (Wilmar) (Private operator of the cane train rail network in the region and cane farm owner/operator):
 - Key outcomes: understanding of rail operation and maintenance schedule, established communication approach for planned trenchless construction of pipework under the cane train rail line, identified key Wilmar personnel for HPS2 works interface.
- Sunwater Limited (Sunwater) (Operator of Tom Fenwick Pump Station and water irrigation network in the region):
 - Key outcomes: identified key personnel for HPS2 works interface, identified works requirements for construction within Sunwater properties, site tour of pump station, approved access to Sunwater managed property for non-invasive ground sampling works and ecological environmental surveys.
- Ergon Energy Queensland Pty Ltd (Ergon) (North Queensland electricity infrastructure provider):
 - Key outcomes: identified key individuals within the organisation to discuss/progress power infrastructure requirements. Safety Advice on Working near Electrical Lines received from Ergon.
- Queensland Electricity Corporation Limited, trading as Powerlink Queensland (Powerlink) (Electricity infrastructure provider):
 - Key outcomes: identified key individuals within the organisation to discuss/progress power infrastructure requirements. Co-use approval obtained from Powerlink.
- Burdekin Shire Council (BSC) (Local government authority):
 - Key outcomes: identified key individuals and elected representatives to progress and respond to planning enquiries. Land transfer process underway for the pump station site. Letter received from BSC approving TCC to exercise Local Government Powers within the Burdekin Shire Council LGA. Briefing of Chief Executive Officer (CEO) and full Council in late 2021.
- Qld Department of Transport and Main Roads (DTMR):

- Key outcomes: identified key personnel within DTMR for State-controlled road permits and approvals. Approval in principle obtained from TMR for construction works approach across Ayr-Dalbeg Road and Ayr-Ravenswood Road.

Table 9.2 details key meetings held with key stakeholders for the HPS2 Project.

Table 9.2 Key meetings HPS2 Project (July 2020 to June 2022)

Date	Agency	Topic
01/07/2020	BSC – Director Infrastructure, Planning and Environmental Services – Manager Planning and Development	Brief regarding intent of HPS2 and discussions about requirements of BSC of TCC.
14/07/2020	Wilmar – Mill Manager + 3	Brief regarding intent of HPS2 and discussions of requirements of Wilmar of TCC. Initial discussions regarding work in the cane train rail line.
	Sunwater – Operations Manager Clare	Brief regarding intent of HPS2 and discussions of requirements of Sunwater of TCC, access to water infrastructure mapping and approvals process.
	Pacific Hydro – Site Manager	Brief regarding intent of HPS2, shared anecdotes regarding construction and building and future works.
16/07/2020	DTMR – Stakeholder and Comms Manager	Discussed stakeholder approach to land resumption required for Haughton Bridge and Bruce Highway upgrade in Haughton area.
12/08/2020	BSC – Senior planning and water staff	Introduction to the HPS2 Project, discussions about the new BSC planning scheme and established contact for future discussions.
14/08/2020	Industry Forum – Brief and overview	Potential suppliers and sub-contractors provided with a HPS2 update and outline of scope of work.
21/07/2020	NQ Cultural Heritage P/L	Discussion regarding Native Title and proposed approach for development of a Cultural Heritage Management Plan.
10/10/2020	Gudjuda Corporation – Bindal People	Initial meeting to discuss Cultural Heritage Management Plan review Stage 2 works.
19/10/2020	Landowner 3	Introduction to HPS2 Project – discussion about alignment and business continuity, solar farm prospect, building conditions, upcoming survey activities.
12/10/2020	Burdekin Chamber of Commerce	Business Breakfast - briefing and overview.
23/10/2020	Industry Tender EOI Briefing (2)	By invitation – discussions about general Project overview, pipe and pump supply, construction and installation services, contract administration services.
28/10/2020	Sunwater - Regional Manager	Overview of Project and discussions about interaction with Sunwater channels, overview of Sunwater business and local restraints/difficulties with infrastructure works. Water irrigation flows and harvesting issues.
12/11/2020	Landowner 1	Initial introduction, discussion about next stage of the HPS2 Project, proposed alignment, local conditions, requirements for works, rehabilitation of site (cane farm).
12/11/2020	Landowner 2	Initial introduction, discussion about next stage of Project, discuss proposed alignment discussions, local ground conditions, requirements for works, rehabilitation of site, access for ground investigation.
12/11/2020	Landowner 3	Advised pipeline alignment, avoid proposed solar farm, local farm infrastructure discussion. Discussion regarding stock management-possible agistment, requested access to property for survey work.
27-28/11/2020	Gudjuda Corporation -Bindal People	Continuing discussions regarding the Cultural Heritage Management Plan – Agreement executed 4 December 2020.

Date	Agency	Topic
01/12/2020	Landowner 1	Introduction to Douglas Partners - discussion regarding drilling requirements, discussions about consent for access and contact for contractor.
01/12/2020	Landowner 2	Introduction to Douglas Partners - review and discussed proposed alignments, requested access for drilling activities - display diagram showing drilling locations.
01/12/2020	Landowner 3	Introduction to Douglas Partners - discussion regarding drilling requirements, discussion about consent for access and contact for contractor. Weed management, land access agreement discussion, continuing alignment location discussion.
02/12/2020	Burdekin Customer Advisory Committee	Briefing and HPS2 Project overview presentation.
24-25/2/2021	Concept Design and review	Presentations to shortlisted contractor representatives.
29/4/2021	Interactive Tender Participants - site tour	Road trip through the Burdekin/Upper Haughton sites of proposed HPS2 route – 5 locations and 25+ participants.
03/06/2021	Environment and Service Location survey	Landowner access arranged for set up and completion of survey activities.
22/07/2021	Sunwater	Options assessment discussion and visit to pump station site, Clare office.
27/07/2021	Site tour inspection Mayor and CEO	Overflight of pipeline route, meeting with Sunwater reps, visit to and inspection of Tom Fenwick pump station site, channel network.
16/08/2021	Landowner 1	Rollover of property access licence - extension to 30 June 2021 received.
17/08/2021	Landowner 2	Rollover of property access licence - extension to 30 June 2021 received.
01/09/2021	Landowner 1 and 2	Meetings on-site: Project update, alignment update review, proposed haulage route and laydown area update/review.
02/09/2021	Landowner 3	Meetings on-site: Project update, alignment update review, proposed haulage route and laydown area update/review.
17/09/2021	Cultural Heritage meeting with Bindal representatives	Meeting to provide Project update and discuss scheduling for cultural heritage survey.
20/09/2021	Bindal Traditional Owners	Provided access and log-in details to Sunwater on-line induction for Cultural Survey property access.
21/09/2021	Bindal Traditional Owners	Notices issued to Bindal coordinators requesting cultural survey monitors for Nov 17-20 and 14-17 Dec 2021.
11-15/10/2021	Landowner 1,2,3	Drilling activities, cultural monitoring.
18-23/10/2021	Landowner 1,2,3	Drilling activities, cultural monitoring.
28/10/2021	Sunwater	Tour/inspection of Tom Fenwick Pump Station – TCC Project Director.
28/10/2021	BSC	Meeting with CEO, Director of Planning, Infrastructure and Environmental Services and Director of Community to provide Project update and discuss upcoming planning and permits requests/processes.
10-13 Nov	Landowner 1	Drilling activities, cultural monitoring.
16/11/2021	TCC	Project briefing.
16/11/2021	BSC	Project Briefing.
17/11/2021	TCC Councillors	Site Tour (postponed due to weather).
17-20/11/2021	Bindal Traditional Owners	Cultural Heritage Survey (Part 1)
20-26/11/2021	Landowner 1,2,3	Pipeline geophysical field investigation and bore well groundwater depth monitoring.

Date	Agency	Topic
29/11/2022	Landowner 1	On-site office meeting to discuss alignment of pipeline and owner's irrigation works.
01/12/2022	Townsville City Councillors	Bus tour of pipeline Stage 2 site, including brief from Sunwater at Tom Fenwick Station.
09/12/2021	Landowner 3	Site meeting - Project update, discussion regarding land requirements.
14-17/12/2021	Bindal Traditional Owners	Cultural Heritage Survey (Part 2).
02/03/2022	Cromarty property owner	Agistment discussion.
7-10/03/2022	Bindal Traditional Owners Landowner 3	Cultural Heritage monitoring – geophysical field investigation of access roads and laydown areas. Key access to gate with Landowner.
15-21/03/2022	Landowner 1, 2 and 3	Environment field survey work.
28/03/2022 to 02/04/2022	Landowner 1,2,3	Environmental field survey work.
30/03/2022	TCC CMO	Bio-investigation land assessment – offset option.
4/5/2022	Landowner 1	Land use meeting re laydown areas, compensation.
16/5/2022	Burdekin Shire Council	Meeting of project team and two BSC directors re status of project and planning approvals/requirements
25/5/2022	Landowner 2	Signed land access agreement for 2022-2023 returned to TCC
31/5/2022	Industry briefing -Townsville	Project update and contractor presentations re supply requirements – 64 attendees
1/6/2022	Burdekin business Community	Project progress and contractor Industry briefing- BSC breakfast event

9.3 Item 9.3

Details of any consultation with Indigenous stakeholders.

General Indigenous engagement

Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts.

Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes.

The department considers that best practice consultation, in accordance with the [Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act \(2016\)](#) includes:

- *Identifying and acknowledging all relevant affected Indigenous peoples and communities; committing to early engagement*
- *Committing to early engagement*
- *Building trust through early and ongoing communication for the duration of the Project, including approvals, implementation and future management*
- *Setting appropriate timeframes for consultation*
- *Demonstrating cultural awareness.*

Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.

Specific Indigenous engagement

The department notes that the proponent has sought to address possible impacts through a Cultural Heritage Management Agreement between the Bindal People and TCC. Noting the proposed area is within a Native Title claim area for the Bindal People, please outline information relating to any processes that may be required through the Queensland Government before the Project can commence. Provide relevant advice/correspondence from the Queensland Government about whether any future processes under the Native Title Act 1993 are required before the Project commences.

The department understands that there is a high chance of unrecorded cultural heritage present in the Project area. The PD should include any information where the proponent has worked (or will work) with Traditional Owners to address any potential impacts.

9.3.1 Response

Indigenous engagement (general)

The project corridor for the Haughton Pipeline Project Stage 2 is located within the traditional homelands of the Bindal People, with the new water pipeline located within the external boundary of the Bindal People #2 Registered Native Title Determination Application (QC2016/005 and QUD503/2016).

Consultation between the Bindal People #2 Native Title Applicants and TCC for the Haughton Pipeline Project Stage 2 commenced during August 2020 and the communications have been ongoing over an extended period to March 2022 (refer Table 9.3).

The consultation between the parties resulted in the agreement and execution of a Cultural Heritage Management Agreement (CHMA) under Section 23 of the Aboriginal Cultural Heritage Act (ACHA), with the CHMA executed on 04 December 2020). The cultural heritage survey and assessment process undertaken for the project was carried out under the terms and provisions of the Project CHMA.

TCC commissioned North QLD Cultural Heritage Pty Ltd in the role of Project Archaeologist, with the agreement and endorsement of the Bindal Aboriginal Party, to provide technical assistance to the Bindal People and the Proponent in carrying out the cultural heritage survey and assessment process of the project area. The Project Archaeologist has maintained consultation with the nine (9) Bindal Native Title Applicants.

The cultural heritage field survey and assessment for the approximately 28 km pipeline alignment and ancillary work areas for the Haughton Pipeline Project Stage 2 was carried out over eight (8) days in two (2) blocks of cultural fieldwork in November and December 2021. Survey Block 1 was carried out from 17 to 20 November 2021 and Survey Block 2 was carried out from 14 to 17 December 2021. The Project Archaeologist and four (4) nominated Bindal Cultural Officers participated each day in the cultural survey.

Table 9.3 details the record of engagement by TCC and the Bindal People.

Table 9.3 Record of agreement –TCC and Bindal People engagement

Date	Activity / topic	Outcome
04/08/2020	Consultation with TCC and the Bindal Aboriginal Party commenced.	TCC met with the Project Archaeologist to assist with commencing the community consultation process with the Bindal People.
21/08/2020	The Bindal Aboriginal Party was invited to attend a Stage 2 Project Industry Briefing held at the Townsville Stadium, along with prospective Contractors and Consultants for the Project.	Bindal representative and Project Archaeologist attended.
28/08/2020	Meeting – Project Archaeologist and Bindal Applicants.	Project status update, commence arranging Project start-up meeting.
September 2020	Planning discussions to coordinate date for Project Meeting #1.	Project meeting conformed for 10 October 2020.
10/10/2020	Project meeting #1 held with TCC, all Bindal applicants and Project Archaeologist.	Process for moving forward with the cultural heritage component of the HPS2 Project was discussed at length and agreed between the parties to develop a draft CHMA and conduct a second meeting.

Date	Activity / topic	Outcome
09/11/2020	TCC issued a Draft CHMA to the Bindal Aboriginal Party for the Haughton Pipeline Project Stage 2.	Preparation for the Project Meeting #2.
27-28/11/2020	Project Meeting #2 for HPS2. Meeting held at Home Hill at the offices of the Gudjuda Reference Group Aboriginal Corporation.	Discussion of, signing and execution of a Project Cultural Heritage Management Agreement (CHMA) for HPS2 and discussion/planning for upcoming geotechnical works.
03-0/12/2020	4 x Bindal People representation provided for cultural heritage monitoring for geotechnical drilling and excavation works.	Cultural heritage monitoring.
12/02/2021	Project update provided regarding progress of land access agreements.	
04/05/2021	Project update provided regarding progress of land access agreements.	
10 and 21/06/2021	Project archaeologist advised Bindal representatives: <ul style="list-style-type: none"> - TCC was continuing with the planning and options analysis for the pipeline - TCC was ready to plan a future Project meeting with the Bindal People (Project Meeting #3). 	Confirm the date of 17 September 2021 for the next Project meeting.
17/09/2021	Project Meeting #3: Project update, training and employment opportunities, cultural survey planning, geo-tech future works.	Cultural survey dates of 17-20 November 2021 and 14-17 December 2021 were agreed.
20/09/2021	TCC issued two Work Notices to the Bindal Aboriginal Party requesting cultural heritage survey and assessment of the Project corridor for HPS2 on the agreed dates of 17- 20 November 2021 and 14-17 December 2021.	Project archaeologist commenced detailed consultation with the parties relative to the cultural survey program, survey methodology and fieldwork arrangements.
17-21/11/2021	TCC, Bindal representatives and Project Archaeologists conducted/completed Block 1 of Cultural survey program.	Completed Block 1 of cultural survey.
14-17/12/2021	TCC, Bindal representatives and Project Archaeologists conducted/completed Block 2 of Cultural survey program.	Completed Block 2 of cultural survey.
20/12/2020	Project Archaeologist provided detailed set of cultural heritage management recommendations (in draft form) to the Bindal People and TCC.	Assist the TCC Project team with ongoing Project planning and design works.
18/03/2020	Full cultural heritage report was provided to the Bindal Aboriginal Party and TCC in draft form for review and comment prior to report finalisation.	

Specific Indigenous engagement Native Title

The entirety of the proposed project area for the pipeline is located within the Bindal Peoples claim area. In consultation with the Queensland Department of Resources, TCC have determined the appropriate land tenure for the installation and operation of the pipeline, where not in the road reserve, is via an easement. TCC does not propose to extinguish Native Title rights over the pipeline corridor.

The pump station is proposed to be located on Lot 33 on SP117630, which is a Reserve for the Purposes of Camping and Water, which Burdekin Shire Council are trustee of. Native Title rights need to be further considered and addressed on this property, as the Department of Resources and TCC require the site to be transferred to TCC in freehold

Due to the time associated with the freehold acquisition process, the Department of Resources has allowed TCC to enter into a five-year lease with the trustee of the site, Burdekin Shire Council, so the commencement of the pump station construction is not delayed. Burdekin Shire Council have agreed to the drafting of such lease and this process has commenced.

Native Title approach

TCC has sought advice from Native Title legal specialists at Corrs Chambers Westgarth and the Queensland Department of Resources to develop an appropriate approach to address Native Title at the proposed pump station site.

A Priority Purchase Application has been submitted to the Department of Resources and as a local government authority requiring the site for a public purpose, the State recommends the compulsory acquisition of native title rights and interests under the Acquisition of Land Act 1967, the Native Title (Queensland) Act 1993 and the Native Title Act 1993 (Commonwealth)

This is the preferred approach by all parties to extinguish native title as there presently is no claimant over the proposed pump station site. The Bindal Peoples application (QUD 503/2016) and Juru (QUD554/201) Peoples have defined their claim boundaries to the west and east of the pump station site.

A summary of the way forward is outlined in email dated 16 June 2022 (Figure 9.1) to the HPS2 Project team from a Senior Land Officer, Land Services at the Queensland Government's Department of Resources.

To assist council in meeting the project timeframes, and as an interim measure only, the department would be prepared to consider an application for trustee lease negotiated between Townsville City Council and the trustees Burdekin Shire Council. Native Title will still need to be addressed and for the interim tenure of a Trustee Lease, the facilities of Module K of the Native Title Work Procedures can be used. Module K deals with future acts that involve facilities for services to the public, established for the benefit of the community as a whole. The non-extinguishment principle applies to Module K.

With this in mind, the process would include:

1. TCC to lodge an application for Priority Purchase, including a letter of support from Burdekin Shire Council
2. BSC/TCC lodge application for Minister's Consent to a trustee lease for a term of 5 years only. The application will need to include:
 - an acknowledgment that the trustee lease is an interim tenure only until such time as Native Title can be suitably addressed to allow Council to purchase the site; and
 - provide advice as to how Council is looking to address Native Title for the purchase of the site.
3. Once Minister's Consent is provided the trustee lease can be registered in the Titles Registry, providing interim tenure for project commencement.
4. Once DoR has investigated all issues, and if approved, will make an offer to TCC subject to a number of conditions including the requirement for TCC to suitably address Native Title.

Please Note: Tenure will not be granted until any existing native title rights and interest in the land, has either:

 - Been surrendered (by way of a registered Agreement (ILUA)), or
 - The Federal Court of Australia has determined that native title rights and interests do not exist in relation to the land.
5. Once all conditions of offer have been satisfied, Governor in Council approval will be sought to issue a Deed of Grant to TCC

With respect to Council's consideration of addressing Native Title by way of section 24FA of the Native Title Act, council should note that it will be a necessary for Council to obtain a Court ruling to determine whether Native Title exists or does not exist.

Alternatively, Council may wish to consider the acquisition of Native Title process.

With respect to your EPBC response, I can confirm that the registration of the five (5) year Trustee Lease will allow the project to commence, allowing Council time to address Native Title appropriately for the issue of freehold.

Figure 9.1 Extract email dated 16 June 2022 -HPS2 | Native Title Requirements - EPBC (Land Services, Department of Resources)

9.4 Item 9.4

The below RFI was originally provided, but was subsequently amended through consultation with DCCEEW on the basis that at the time of preparing the PD response elements of the project were under a commercial tender process:

Projected economic costs and benefits of the Project, including the basis for their estimate through cost/benefit analysis or similar studies.

In July 2022 DCCEEW provided the following RFI clarification in addressing the proponent's response:

This does not require a full breakdown of costs etc of the project, just an indication of economic costs and benefits associated with the project so that the department and the public can be informed to make an assessment.

9.4.1 Response

The Stage 2 Haughton Pipeline Project Detailed Business Case (Jacobs, 2019), included a detailed cost / benefit assessment for the Project assessing both economic and non-economic benefits. A summary of key benefits from the Business Case include:

- Water security: The Project will result in high water security for Townsville for the next 60 years.
- Employment: The Project is estimated to generate around 345 new jobs during the construction period, with approximately 101 direct jobs and 244 indirect jobs during the construction period. The Project is further estimated to generate 30 new full-time equivalent (FTE) positions on an ongoing basis with 9 being directly employed and 21 being indirectly employed.
- Regional growth: The Project will have long-term positive impacts on Townsville's community, business and industry, helping to attract new industries and supporting growth and development of existing business and supporting new employment opportunities.
- Social wellbeing: High positive impacts on local amenity, quality of life and health and wellbeing of local communities would be supported, by providing water required to maintain gardens, public spaces and landscape.
- Indigenous participation: Opportunities for indigenous participation. TCC has set a specific Project Goal for Indigenous Participation, with a target of 7% of construction total labour hours to be completed by Indigenous Australian businesses and/or Indigenous Australian employees.
- Agriculture output: TCC currently relies on extraction of water from the Sunwater Upper Haughton Irrigation Channel (UHIC) during periods of low Ross River Dam levels to service Townsville City. The Project benefits agricultural producers in the region by making the current TCC extraction demands available for future users, with an estimated increase in the value of outgoing agricultural output by \$3 million per year.
- Ownership: With completion of the Project, there will be no use of Sunwater infrastructure between the Burdekin River and Townsville (Tom Fenwick Pump Station and Upper Haughton Irrigation Channel). Single ownership by TCC of the infrastructure between the Burdekin River and Ross River Dam, will allow the TCC to make all decisions itself, when to operate the pipeline, and about the level of maintenance to undertake to match TCC's risk profile. In this way, a single entity would be responsible for water transfer infrastructure and all transfer costs.
- Water reliability: Historically, Townsville City has needed to implement Level 3 water restrictions to sustain low Ross River Dam levels during periods of prolonged drought. Stochastic modelling undertaken as part of the Business Case shows the probability of Level 3 restrictions being required 1 in 250 years when demand reaches 100,000 ML/year (year 2080) with inclusion of pumping from the Burdekin River Scheme.
- Economic output: The Project is estimated to increase output in the construction sector and supporting industries during the construction period by \$274 million.

9.5 Item 9.5

Employment opportunities expected to be generated by the Project (including construction and operational phases).

9.5.1 Response

The HPS2 Project is forecast to generate significant employment opportunities in the region. The Stage 2 Haughton Pipeline Project Detailed Business Case (Jacobs, 2019, p. 7), undertook a detailed estimate of the potential generation of new full-time jobs as part of the economic assessment. The reported job generation included estimate for the Stage 1 pipeline which was underway at the time of reporting, as such the construction period estimates have been adjusted in this information response by adopting a 50% proportion between the Stage 1 (completed) and Stage 2 (this Project) works.

- The HPS2 Project is estimated to generate around 345 new jobs during the construction period, with approximately 101 direct jobs and 244 indirect jobs during the construction period.
- The HPS2 Project is estimated to generate 30 new full-time equivalent (FTE) positions on an ongoing basis with 9 being directly employed and 21 being indirectly employed.

TCC has set a specific Project Goal for Indigenous Participation, with a target of 7% of construction total labour hours to be completed by Indigenous Australian businesses and/or Indigenous Australian employees. Indigenous participation works undertaken to date include cultural heritage survey and impact assessment study, and ecology bio-condition assessment and reporting. Further indigenous participation works planned post project construction may include rehabilitation monitoring program works during the revegetation establishment and maintenance period, and monitoring and maintenance of land based offsets as part of the Project offset management strategy.

10. Environmental records of the person proposing to take the action

Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

10.1 Item 10.1

The person proposing to take the action.

10.1.1 Response

The proponent for the HPS2 Project is TCC. TCC's details are provided in Table 10.1 below.

Table 10.1 Proponent details

	Proponent Details
Organisation name (as registered for ABN/ACN)	Townsville City Council
ABN	44741992072
Business address	103 Walker Street, Townsville, 4810, QLD, Australia
Postal address	PO Box 1268, Townsville, 4810, QLD, Australia
Main phone number	13 48 10
Primary email address	enquiries@townsville.qld.gov.au

10.2 Item 10.2

For an action for which a person has applied for a permit, the person making the application.

10.2.1 Response

The entity making the application is TCC (Table 10.2).

Table 10.2 Entity details

	Entity Details
Organisation name (as registered for ABN/ACN)	Townsville City Council
ABN	44741992072
Business address	103 Walker Street, Townsville, 4810, QLD, Australia
Postal address	PO Box 1268, Townsville, 4810, QLD, Australia
Main phone number	13 48 10
Primary email address	enquiries@townsville.qld.gov.au

10.3 Item 10.3

If the person is a body corporate—the history of its executive officers in relation to environmental matters.

10.3.1 Response

Not applicable. TCC is not a body corporate. TCC is a local government organisation.

10.4 Item 10.4

If the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.

10.4.1 Response

Not applicable. TCC is not a body corporate. TCC is a local government organisation.

11. References

- Biodiversity Australia (2022a) Rapid Habitat Assessment Black Throated Finch, Prepared by Biodiversity Australia for GHD Pty Ltd.
- Biodiversity Australia (2022b) Offset Area Investigation, Prepared by Biodiversity Australia for GHD Pty Ltd.
- Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service (2007). National recovery plan for the black-throated finch southern subspecies *Poephila cincta cincta*. Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane. Available from: <http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-black-throated-finch-southern-subspecies-poephila-cincta-cincta>. In effect under the EPBC Act from 08-Jan-2008.
- Buosi, P. (2011) Management Guidelines: How to look after the Black-throated Finch. NRA Environmental Consultants and Black-throated Finch Recovery Team.
- Bureau of Meteorology (BOM) (2022a). Climate statistics for Australian locations - Summary statistics AYR DPI RESEARCH STN (site ID 033022). Available from: http://www.bom.gov.au/climate/averages/tables/cw_033002.shtml
- Bureau of Meteorology (BOM) (2022b). Ayr, Queensland April 2022 Daily Weather Observations. Available from: <http://www.bom.gov.au/climate/dwo/202204/html/IDCJDW4005.202204.shtml>
- Churchill, S.K (1998) *Australian Bats*. Sydney: Reed New Holland.
- Department of Agriculture, Water and the Environment (DAWE) (2021). Species Profile and Threats Database, Accessed November 2021. Department of Agriculture, Water and the Environment Available from: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>.
- Department of Agriculture, Water and the Environment (DAWE) (2022a). Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory. Canberra: Department of Agriculture, Water and the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/85104-conservation-advice-12022022.pdf>. In effect under the EPBC Act from 12-Feb-2022.
- Department of Agriculture, Water and the Environment (DAWE) (2022b). National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory). Department of Agriculture, Water and the Environment, Canberra. Available from: <http://www.awe.gov.au/environment/biodiversity/threatened/publications/recovery/koala-2022>. In effect under the EPBC Act from 08-Apr-2022.
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022a). Species Profile and Threats Database *Geophaps scripta scripta* — Squatter Pigeon (southern). http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022b). Species Profile and Threats Database *Hirundapus caudacutus* — White-throated Needletail https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682
- Department of the Environment (DoE) (2015). Draft referral guideline for 14 birds listed as migratory species under the EPBC Act Available from: <https://www.dcceew.gov.au/sites/default/files/documents/migratory-birds-draft-referral-guideline.pdf>
- Department of the Environment (DoE) (2016). EPBC Act referral guideline for the endangered northern quoll. Available from: <https://www.dcceew.gov.au/sites/default/files/documents/referral-guideline-northern-quoll.pdf>
- Department of Environment and Science (DES) (2020) Guide to Determining Terrestrial Habitat Quality (version 1.3: Feb 2020) - Methods for Assessing Habitat Quality Under the Queensland Environmental Offsets Policy.
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Approved Conservation Advice for *Eucalyptus raveretiana* (Black Ironbox). Canberra: Department of the Environment, Water, Heritage and the Arts.

Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/16344-conservation-advice.pdf>. In effect under the EPBC Act from 16-Dec-2008.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009a) Background paper - Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*) - EPBC Act policy statement 3.13 ([Admin Guideline]. Available from: <https://www.dcceew.gov.au/sites/default/files/documents/black-throated-finch-background.pdf>

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009b) Significant impact guidelines for the endangered black-throated finch (southern) (*Poephila cincta cincta*) - EPBC Act policy statement 3.13 ([Admin Guideline]. Available from: <https://www.dcceew.gov.au/sites/default/files/documents/black-throated-finch.pdf>

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2011) Draft Referral guidelines for the nationally listed Brigalow Belt reptiles ([Admin Guideline].

<http://www.environment.gov.au/epbc/publications/brigalow-belt-reptiles.html>

Ecological Interpretation (2021), GHD Haughton Pipeline 2 Biocondition Survey, Prepared by Ecological Interpretation for GHD Pty Ltd

Eyre, T.J., Kelly, A.L., Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2015). *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2.*

Garnett, S.T. and B.B. Baker (2020). The Action Plan for Australian Birds 2020. CSIRO Publishing, Melbourne. Available from: <https://ebooks.publish.csiro.au/content/action-plan-australian-birds-2020#tab-info>

GHD (2021). Haughton Pipeline Stage 2 Project Construction Environmental Management Plan, Prepared by GHD Pty Ltd for Townsville City Council, 17 December 2021

GHD (2022). Haughton Pipeline Stage 2 Project Matters of National Environmental Significance Report, Prepared by GHD Pty Ltd for Townsville City Council, 19 August 2022

GHD (2022). Haughton Pipeline Stage 2 Project Rehabilitation Management Plan, Prepared by GHD Pty Ltd for Townsville City Council, 3 August 2022

GHD (2022). Haughton Pipeline Stage 2 Technical Specification for Rehabilitation Works, Prepared by GHD Pty Ltd for Townsville City Council, 15 August 2022

GHD (2022). Haughton Pipeline Stage 2 Project – High Risk Species Management Plan, Prepared by GHD Pty Ltd for Townsville City Council, 8 February 2022

GHD (2022). Haughton Pipeline Duplication Project - Stage 2 Regulatory Approvals Plan, Prepared by GHD Pty Ltd for Townsville City Council, 17 March 2022

GHD (2022). Haughton Pipeline Stage 2 Offset Area Management Plan, Prepared by GHD Pty Ltd for Townsville City Council, 10 October 2022

GHD (2022). Haughton Pipeline Stage 2 Project Erosion and Sediment Control Plan, Prepared by GHD Pty Ltd for Townsville City Council, 3 August 2022

IECA (2008). Best Practice Erosion and Sediment Control. Picton NSW: International Erosion Control Association (Australiasia)

Jacobs (2019). Department of Infrastructure, Regional Development and Cities Stage 2 Haughton Pipeline Project Detailed Business Case, South Brisbane QLD: Jacobs Australia Pty Limited.

Maseyk, F., Evans, M. and Maron, M. (2017). *Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act.* Threatened Species Recovery Hub

Menkorst, P. W. (1984). Use of Nest Boxes by Forest Vertebrates in Gippsland: Acceptance, Preference and Demand, *Australian Wildlife Research*, 11, pp 255-264.

Milne, D. J., Jackling, F. C., Sidhu, M., and Appleton, B.J. (2009). Shedding new light on old species identifications: morphological and genetic evidence suggest a need for conservation status review of the critically endangered bat *Saccolaimus saccolaimus*. *Wildlife Research* 36: 496-508.

- Mula Laguna, J., Reside, A.E., Kutt, A, Grice, A.C., Buosi, P, Vanderduys, E.P., Taylor, M. and Schwarzkopf, L. (2019) Conserving the endangered black-throated finch southern subspecies: what do we need to know? *Emu - Austral Ornithology* 119(4): 331-345.
- Munks, S. A., R. Corkrey, and Foley, W.J. (1996). Characteristics of arbo-real marsupial habitat in the semi-arid woodlands of northern Queensland. *Wildlife Research* 23:185–195.
- Natural Resource Assessment Environmental Consultants (NRA) (2011) Habitat Management Guidelines for the Black-throated Finch (*Poephila cincta cincta*) in the Brigalow Belt North Bioregion. NQ Dry Tropics and the Black-throated Finch Trust, Townsville.
- Natural Resource Assessment Environmental Consultants (NRA) (2018a) Haughton Pipeline Duplication Project – Gap Analysis and Planning Assessment, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 11 May 2018
- Natural Resource Assessment Environmental Consultants (NRA) (2018b) Haughton Pipeline Duplication Project – EPBC Self-assessment, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 27 August 2018
- Natural Resource Assessment Environmental Consultants (NRA) (2018c) Haughton Pipeline Duplication Project – Supplementary Ecological Surveys, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 28 August 2018
- Natural Resource Assessment Environmental Consultants (NRA) (2021) Haughton Pipeline Stage 2 Project Environmental Analysis Report, Prepared by Natural Resource Assessments Pty Ltd for GHD Pty Ltd, 27 August 2021
- Pollock, A.B. (ed.) (2018) Technical Descriptions of Regional Ecosystems of the Brigalow Belt North. Queensland Herbarium, Department of Environment and Science: Brisbane.
- Queensland Herbarium (2021) *BioCondition Benchmark Database*. Version 3.2, December 2021.
- Rechetelo, J (2015) Movement, habitat requirements, nesting and foraging site selection: a case study of an endangered granivorous bird, the Black-throated finch. PhD thesis, James Cook University, Townsville.
- Reside, A.E., Beher, J., Cosgrove, A.J., Evans, M.C., Seabrook, L., Silcock, J.L and Maron, M. (2017). Ecological consequences of land clearing and policy reform in Queensland. *Pacific Conservation Biology* 23(3): 219. doi:10.1071/pc17001
- Rus, A.I., McArthur, C., Mella, V.S., and Crowther, M.S. (2020). Habitat fragmentation affects movement and space use of a specialist folivore, the koala. *Animal Conservation* 24: 26-37.
- Schulz, M. and B. Thomson (2007). National recovery plan for the bare-rumped sheathtail bat *Saccolaimus saccolaimus nudicluniatus*. Report to Department of the Environment and Heritage, Canberra. Brisbane: Queensland Parks and Wildlife Service. Available from: <http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-bare-rumped-sheathtail-bat-saccolaimus-saccolaimus-nudicluniatus>. In effect under the EPBC Act from 08-Jan-2008
- Specht, R.L. (1970). Vegetation. Pp. 44-67 in G.W. Leeper (ed.), *The Australian Environment*. Fourth edition. CSIRO/Melbourne University Press, Melbourne.
- Taskforce (2017), T. W. S., 2017. Interim Report, Townsville Water Security Taskforce
- Threatened Species Scientific Committee (2005). Commonwealth Listing Advice on Southern Black-throated Finch (*Poephila cincta cincta*). Available from: <http://www.environment.gov.au/biodiversity/threatened/species/poephila-cincta-cincta.html>. In effect under the EPBC Act from 15-Feb-2005.
- Threatened Species Scientific Committee (TSSC) (2012). Commonwealth Listing Advice on *Eucalyptus raveretiana* (Black Ironbox). Department of Sustainability, Environment, Water, Population and Communities. Canberra, ACT: Department of Sustainability, Environment, Water, Population and Communities. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/16344-listing-advice.pdf>. In effect under the EPBC Act from 29-Jun-2012.
- Threatened Species Scientific Committee (2015). Conservation Advice *Geophaps scripta scripta* squatter pigeon (southern). Canberra: Department of the Environment. Available from:

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/64440-conservation-advice-31102015.pdf>. In effect under the EPBC Act from 27-Oct-2015.

Threatened Species Scientific Committee (2016). Conservation Advice *Saccolaimus saccolaimus nudicluniatu*s bare-rumped sheath-tail bat. Canberra: Department of the Environment and Energy. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/66889-conservation-advice-07122016.pdf>. In effect under the EPBC Act from 07-Dec-2016.

Threatened Species Scientific Committee (2019). Conservation Advice *Hirundapus caudacutus* White-throated Needletail. Canberra: Department of the Environment and Energy. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/682-conservation-advice-04072019.pdf>. In effect under the EPBC Act from 04-Jul-2019.

Threatened Species Scientific Committee (2020). Conservation Advice *Falco hypoleucos* Grey Falcon. Canberra: Department of Agriculture, Water and the Environment. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf>. In effect under the EPBC Act from 09-Jul-2020.

Webb AA, Walker PJ, Gunn RH and Mortlock AT (1980) Soils of the Poplar Box (*Eucalyptus populnea*) communities of eastern Australia. *Australia Rangelands Journal* 2/1, 17–30.

Williams, P., McMahon, K., Collins, E., Grice, T., Mack, A., Marshall, L. and Owbridge, E. (2020). Black-throated Finch habitat values promoted by patchy fire. *North Queensland Naturalist* 50: 38-43.

Wolfe, Ashleigh & Fleming, Patricia and Bateman, Philip. (2018). Impacts of translocation on a large urban-adapted venomous snake. *Wildlife Research*. 45. 10.1071/WR17166.

Youngentob, K, Lindenmayer, D, Ford, K et al. (2021). Food intake: an overlooked driver of climate change casualties? *Trends in Ecology and Evolution* 36(8): 676-678.

Appendices

Appendix A

Project Coordinates

Appendix B

MNES Report

Appendix C

MNES Report – Desktop results

Appendix D

**MNES report - Fauna and weed species
identified during field surveys**

Appendix E

MNES report – Likelihood of occurrence

Appendix F

MNES report – Risk framework

Appendix G

MNES report - figures

Appendix H

MNES report – figure calculations

Appendix I

NRA – Gap Analysis and Planning Assessment

Appendix J

NRA – Supplementary Ecological Surveys

Appendix K

NRA – EPBC Self assessment

Appendix L

**NRA - Environmental Analysis Report
(EAR)**

Appendix M

**Biodiversity Australia – Rapid Habitat
Assessment: Black Throated Finch**

Appendix N

**Ecological Interpretation – BioCondition
Survey**

Appendix O

Offset Area Management Strategy (OAMS)

Appendix P

**Construction Environmental Management
Plan (CEMP)**

Appendix Q

**Erosion and Sediment Control Plan
(ESCP)**

Appendix R

Rehabilitation Management Plan

Appendix S

Technical Specification for Rehabilitation Works

Appendix T

Species Management Plan

Appendix U

**SARA Decision notice – Haughton
Pipeline Stage 2 2201-26844 SDA**

Appendix V

Curriculum Vitae – PD Authors and Reviewers

Appendix W

**DCCEEW Request for Further Information
(dated 10 March 2022, EPBC ref:
2021/9133)**

Appendix X

Regulatory Approvals Plan

Appendix Y

Proponents Construction Program



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→ **The Power of Commitment**