

| Threatened Species | Species Specific Mitigation |
|----------------------|--|
| | integrity of the easement post-construction. |
| Pale-headed snake. | <p>A qualified herpetologist would be onsite to check all habitat features for presence of the pale-headed snake prior to clearing in areas of likely habitat.</p> <p>Removal of Hollow Bearing Trees (HBT) would be avoided. It should be noted that in order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area will be likely to cause the tree to die.</p> |
| Fauna Habitat | Habitat Specific Mitigation |
| All habitats | <p>A weed management plan or protocol will be developed and included in the CEMP. The plan will consider the findings of the field assessment as detailed in Table 3-2. The plan or procedure will include hygiene protocols to reduce the risk of spreading weeds. Excavated material that contains weeds and weed seeds or propagules will not be stored near waterways or areas of native vegetation. Noxious weed management will occur for at least two years post construction.</p> <p>An ecologist would be onsite throughout the construction period to provide advice and particularly during clearing vegetation, waterway and wetland habitats and for clearing the trench of trapped fauna. The onsite ecologist would supervise and assist with the two staged clearing process which would involve clearing all understorey and smaller vegetation, leaving more mature vegetation for a minimum of 24 hours before clearing larger trees. When removing larger vegetation, a spotter would be present at each tree to be removed to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with plant operators. Prior to clearing larger trees, an excavator or loader would be used to hit the trunk as high up the tree as possible several times. Wait at least 30 seconds. Repeat this process several times. Once the tree is on the ground the ecologist should check for sign fauna.</p> <p>Direct contact with any wildlife should be avoided wherever possible. Uninjured wildlife must be encouraged to leave the site and injured wildlife should be handled by persons trained in native fauna rescue.</p> |
| Hollow bearing trees | The removal of hollow bearing trees would be avoided. |
| Riparian vegetation | The ROW would be reduced to the minimum width feasible. Waterway crossing points will be selected to minimise the extent of riparian vegetation clearing and limited to the narrowest area practicable. Clearing of mature vegetation will be avoided. Coarse woody debris, snags and other instream and bank features would be reinstated. Terrestrial habitat features such as logs and rocks would also be reinstated. BRUSHMATTING |
| Woodlands | In selected sensitive areas the ROW would be reduced to the minimum width feasible. The removal of mature trees would be avoided. In selected areas disturbed areas would be revegetated with local provenance native grasses and shrubs. Terrestrial habitat features such as logs and rocks |

| Threatened Species | Species Specific Mitigation |
|---------------------------------|---|
| | would be placed in adjacent areas throughout construction and reinstated on completion of the works. BRUSHMATTING |
| Grasslands | Grassland habitats along the pipeline route are highly disturbed and subject to cropping, pasture improvement, ploughing or grazing. There is virtually no undisturbed grassland habitat. Terrestrial habitat features such as logs and rocks would be placed in adjacent areas throughout construction and reinstated on completion of the works. |
| Wetlands, Mangroves, Salt marsh | The method of construction and the SWMP for these areas will be planned with input from DPI, DECC (Parks and Wildlife), the relevant CMA, a specialist soil conservationist and a qualified ecologist. The ROW is being co-located with other infrastructure features wherever possible, particularly at Kooragang Island. Works will be undertaken in these areas between 1 st March and the 30 th August inclusive. This will avoid the breeding season for the green and golden bell frog and spring- summer migratory and breeding periods for wetland birds. |

3.6 FAUNA IMPACT ASSESSMENT

The following section considers potential impacts to threatened fauna species as a result of the proposal. The nature and extent of impacts considered has been guided by the factors listed under Section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act).

3.6.1 Threatened Bird Species

The project is unlikely to have a significant impact on the life cycle of threatened bird species. The breeding habitats and breeding seasons of these species have been taken into account when designing mitigation measures. Hollow bearing trees are a key breeding habitat for several threatened bird species including Masked Owl, Turquoise Parrot and Brown Treecreeper. Hollow bearing trees would be carefully managed for avoidance within the ROW, or where not possible a suite of measures would be implemented under the guidance of a project ecologist. These measures are over and above the deliberate adjustment of the route alignment to avoid significant habitat. Known breeding habitat for Grey-crowned Babbler occurs along the route and this will be avoided by conducting pre-clearing surveys that allow enough time to make minor route adjustments around active nests. The majority of construction will occur in the dry season, outside of the breeding season of most bird species and prior to the arrival of migratory species in the Kooragang wetlands.

The extent of habitat to be removed has been minimised by realigning the route to avoid removal of significant habitat identified during detailed surveys. Reinstatement of ground layer microhabitat features such as logs and fallen timber following construction will assist in maintaining foraging habitat for species such as Speckled Warbler, Brown Treecreeper and Grey-crowned Babbler will not be lost from the area. Revegetation with local provenance native ground cover and shrub species will ensure that foraging habitat (both structure and floristics) for species such as Turquoise Parrot and Diamond Firetail will persist.

Adjustments to the route alignment have been made to avoid impacts to remnant stands of native vegetation, particularly Box-Gum Woodland, which provides habitat for Brown Treecreepers. At KP 289.2 to 290 where the Turquoise Parrot was recorded the route has been realigned to more closely follow the Carnarvon Highway and avoid native vegetation clearing. With respect to migratory birds, impacts to their wetland habitat have been avoided by aligning the route through already low value disturbed habitats.

Clearing and modification of native vegetation and fauna habitat would be staged and would provide the opportunity for some fauna species to relocate to adjacent areas. Thus the extent of habitat removal and fragmentation is not considered to have significant impacts on any threatened birds species.

3.6.2 Threatened Mammals

One threatened mammal species, the Koala was recorded at several locations along the route. Habitat assessments targeted the potential presence of preferred koala feed trees. Most observations of Koalas were made between approximately KP 450 and KP 550 where large River Redgums occur in riparian areas. Riparian areas have been identified as sensitive areas supporting valuable habitat for a range of species. Riparian areas will be reinstated to pre-construction condition. In order to avoid loss of foraging and breeding habitat for this species, river crossings would be aligned to minimise tree loss and mature trees will be retained where possible. Details of sensitive watercourse crossings, as outlined in the EA, will be determined in consultation with a Government agency liaison group to ensure impacts are acceptable. Wherever possible the pipeline route will be co-located within existing infrastructure easements to avoid further fragmentation, or creation of new easements.

Other threatened ground dwelling mammals such as the Stripe-faced Dunnart and Pilliga Mouse have the potential to occur in limited sections along the pipeline route. None of these species were recorded throughout the field survey period, however potential habitat was noted, particularly for the Stripe-faced Dunnart (KP 222.5 and 289.1). Measures have been put in place to minimise impacts to these species including reinstating habitat features including coarse woody debris and bush rock. An ecologist would also be onsite to provide advice on habitat features during the clearing stages. Trenches would also be checked for any trapped individuals.

Microchiropteran bats

Seven species of Microchiropteran bats were recorded from sampled flyways along the route. Measures put in place to ensure minimal impacts on microbats including avoidance of hollow bearing trees wherever possible, which provide roosting habitat, and minimising disturbance to watercourses and wetlands that provide foraging habitat. It is considered unlikely that the project will have a significant impact to the life cycle of any of these bat species since no maternity sites are being affected and mature and hollow bearing trees are being retained. A two-stage clearing process will ensure the rescue of any bat displaced during the construction process.

Hollow bearing trees would be carefully managed for avoidance within the ROW, or where not possible a suite of measures would be implemented under the guidance of a project ecologist. These measures are over and above the deliberate adjustment of the route alignment to avoid significant habitat

3.6.3 Threatened reptiles

Five-clawed Worm Skink

The species is likely to be encountered during the clear, grade and construction stages of the project due to the fossorial nature of the species. Where possible, the pipeline has been realigned to avoid areas of Myall

Woodland EEC, black cracking soils and other areas of potential habitat for this species identified in the survey. The easement is a very small proportion of suitable habitat at the site.

Where it is not possible to avoid potential habitat, the management of construction activities through areas of potential habitat is critical in minimising any potential to impact on this species. A qualified herpetologist capable of distinguishing between *A. mackayi* and closely related species will be present during the clear and grade process to inspect surface litter and top soil that is removed during the clear and grade process as well as during trench excavation. These factors would assist in minimising risk that the proposed trenching would have a significant impact on habitat available to this species.

Soil structure rehabilitation must also occur across the easement in these areas. This includes the re-construction of soil profile as was present prior to construction, and the rehabilitation of ground micro-habitats such as fallen timber and native grasses. Weed control is crucial in ensuring the integrity of the easement post-construction.

Further, it is also recommended that within areas identified as potential habitat for this species, any open trenches must be checked by walking inside the trench, and not from above which normally occurs. Due to the nature of this burrowing species, if animals were present within the open trench, they could easily be overlooked by hiding within loose soil and rumble on the trench floor. Information gathered by the herpetologist during this monitoring, in relation to number location and surrounding microhabitat features, should be recorded to allow collection of information useful in assessing the status and ecology of this species.

Fieldwork for this project has identified a number of areas along the easement where *Anomalopus mackayi* has the potential to occur. The use of herpetologists through the clear and grade operations and trench construction and monitoring, will ensure that any *Anomalopus mackayi* that are present, are properly relocated to existing habitat, and appropriate ecological data is collected. The highly cryptic nature of the species makes it conducive to being detected during clearing and construction activities.

The burrowing nature of *Anomalopus mackayi* has meant that the ecological knowledge of this species is poor and is based on a few encounters over half a century. With the proposed amelioration measures discussed, the proposed QHGP presents an opportunity to gather information on the status of this lizard.

It is considered the proposed activity is unlikely to place any viable local population of these species at risk of extinction. Further the strategy of monitoring proposed would allow collection of information to gain a greater understanding of this species.

3.6.4 Threatened Amphibians

The recovery plan for this species identifies 43 key populations across NSW (DECC 2005). Four of these occur within the Hunter region, with the Kooragang population considered the most robust (DECC 2005). The Kooragang population has been estimated at some 1000 individuals (Pyke and White 2001) and should be regarded as nationally significant as it one of the state's largest populations.

Construction of the QHGP would occur entirely within the existing disturbed area associated with the access track that traverses through this known *Litoria aurea* habitat. By containing construction within existing vehicular tracks, direct impacts on known *Litoria aurea* habitat would be avoided. Indirect impacts such as Chytrid contamination, disruption of breeding and movement would be controlled through construction timing and the preparation of a '*Litoria aurea* management plan'.

Construction between KP822 and KP826 should only occur outside of the known breeding season of *Litoria aurea*. This confines any planning or construction activities between these KP's to between the 1st March and the 30th August inclusive, as *Litoria aurea* generally breeds between September and February (DECC

2005; Pyke and White 2001). By containing construction to this period, the likelihood of disruption of moving animals would be minimised, as activity lessens during cooler months.

The mortality of individual *Litoria aurea* from construction equipment would be managed by having an experienced herpetologist onsite during the entire construction period between KP822 and KP826 to ensure construction activities comply with the management plan, which would include 24 hr monitoring of open trenches and holes to ensure any animals entrapped are quickly released. Construction objectives for this location would involve minimising the time of open trench to during daylight hours only. Removal of any frogs by a pre-clearance survey from the direct path of construction equipment directly prior and during clearing, trenching, HDD and filling would also be undertaken.

The infection of frogs by Amphibian chytrid is a Key Threatening Process under both the NSW TSC Act and the EPBC Act. In NSW, 22 species, more than one quarter of the total NSW amphibian fauna, have been diagnosed with the disease (DECC 2008). *Litoria aurea* is one of the species of amphibian known to be affected by this disease (DECC 2005) and it has been identified as a threat to its long-term survival (DECC 2008). The proposed QHGP pipeline has the potential to spread this waterborne fungus across known habitat. Within the management plan, clear instructions on the management of the area between KP822 and KP826 should follow those within the protocols developed by NPWS to manage chytrid (NPWS 2001). The guiding principle within this document states that each individual water body should be considered a separate site, and in larger areas (such as Kooragang), a single wetland should be subdivided and considered as separate sites for chytrid management. The onsite hygiene protocols set out for persons, vehicles and equipment must be adopted within the *Litoria aurea* management plan and compliance by all persons entering and leaving each site must be administered.

With the adoption of all of these protocols within a specific management plan for this species, the proposed activity is unlikely to place any viable local population of these species at risk of extinction.

At the time of writing, a draft recovery plan has been approved for this species.

Key objectives of these recovery plans relevant to this proposal include:

- **Disease management** – a *Litoria aurea* management plan would be produced to commission the protocols outlined in NPWS (2001) for persons, vehicles and equipment.
- **Habitat management** – Construction would only occur through known *Litoria aurea* habitat within an existing easement that occurs as a degraded road. The proposal would not directly remove *Litoria aurea* habitat.

These recommendations are consistent with the objectives of the recovery plan.

3.6.5 Aquatic Habitat and the Lowland Darling River Aquatic EEC

The Lowland Darling River EEC includes all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within NSW, and including Menindee Lakes and the Barwon River. The presence and/or state of the EEC, associated aquatic fauna and aquatic habitats will vary across the Proposal route. The condition of the aquatic EEC, fauna and habitats at the time of the works would depend on season they are undertaken, as well as occurrences of rainfall prior to construction. Factors that will influence the condition of the EEC, aquatic fauna and habitats, during the construction program are likely to include:

- waterway/floodplain is dry or wet at the time of the works
- waterway has riparian vegetation (native or weedy) and the state of the vegetation

- waterway contains in stream habitat

The presence of water would be a determining factor as to whether or not the EEC/other aquatic fauna would be affected at a particular site. Works undertaken at a dry waterway/floodplain would limit the local impact on the EEC, aquatic fauna and habitat as the aquatic biodiversity at the site would be low, the number of aquatic macroinvertebrate taxa diminishes as water level reduces (Boulton 2003). Drought is an important part of the life cycle of some aquatic fauna with some species of invertebrates having dormant stages able to resist dry conditions (Williams and Allen 1987, Boulton 2003). It is unlikely that the Proposal would have an impact on the EEC that would put it at risk of local extinction. Highest potential impacts are more likely to occur at waterways where water is present as there is the potential for pollution and sedimentation of habitat and blocking fish passage during construction.

The EEC can also be affected indirectly through the disturbance or removal of instream habitat such as large woody debris, riffle beds and instream vegetation or riparian vegetation. This is likely to have more of a direct impact on the EEC/other aquatic fauna should water be present within the waterway at the time of the works. The level of impact will also depend on the construction methods used to cross a particular waterway.

The following key threatening processes from the *Fisheries Management Act 1994* also relate to the proposed works:

- Degradation of native riparian vegetation along New South Wales water courses
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams
- Removal of large woody debris from New South Wales rivers and streams.

In summary, the works have the potential to impact the EEC, aquatic fauna and habitat through:

- Blockage of fish passage during construction
- Pollution of habitat
- Filling of habitat
- Degradation of riparian vegetation
- Disturbance/loss of instream habitat
- Disturbance of river bed
- Alteration of natural flows

Mitigation measures are proposed based on the various scenarios that may be encountered when the works are undertaken at any waterway.

Table 3-8 includes the various scenarios, the potential impacts to the aquatic features and the mitigation measures that would be applied to mitigate those impacts. Mitigation measures have been proposed with reference to the following documents:

- Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries, Cronulla, 16 pp.
- NSW Department of Primary Industries (2007). Threat abatement plan - Removal of large woody debris from NSW rivers and streams.

Table 3-8: Aquatic habitat mitigation measures

| Scenario | | Potential Impacts | Mitigation Measures |
|---|---------------|---|--|
| All | | | <ul style="list-style-type: none"> Aquatic habitats would be assessed by a qualified ecologist at the time of construction and specific mitigation measures would be selected depending on the features of the site to minimise impacts. A soil and water management plan would be prepared to ensure the risk of water pollution and infilling of habitats is minimised. |
| Habitat | Water level | | |
| Good aquatic habitat condition <ul style="list-style-type: none"> High density/continuous riparian vegetation Good instream habitat (large woody debris, boulders, instream vegetation, etc.) | Water present | <ul style="list-style-type: none"> Blockage of fish passageway during construction Loss of aquatic fauna habitat (through removal of riparian vegetation) Disturbance/loss of instream habitat Riverbed disturbance Pollution of habitat Sedimentation/filling of habitat | <ul style="list-style-type: none"> Fish passage would not be blocked during construction at Class 1 and 2 waterways. Flow would not be altered during construction and operation. Consultation with DPI and an aquatic ecologist would be undertaken when designing the crossing method. As a priority, crossings should avoid areas of riparian vegetation with native species. Any riparian vegetation removed would be replaced by locally occurring native species following construction Large woody debris would be avoided where possible. Where it is not possible to avoid, large woody debris would be relocated nearby within the waterway and reinstated at the completion of works. |
| | Dry | <ul style="list-style-type: none"> Loss of aquatic fauna habitat (through removal of riparian vegetation) Disturbance of instream habitat Riverbed disturbance Filling of habitat | <ul style="list-style-type: none"> As a priority, crossings would avoid areas of riparian vegetation with a high quantity of natives and prefer sections where exotics occur. Any riparian vegetation removed would be replaced by locally occurring native species following construction Large woody debris would be avoided where possible. Where |

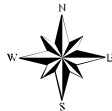
| Scenario | | Potential Impacts | Mitigation Measures |
|--|---------------|---|--|
| | | | it is not possible to avoid, large woody debris would be relocated nearby within the waterway and reinstated at the completion of works. |
| <p>Average aquatic habitat condition</p> <ul style="list-style-type: none"> Riparian vegetation medium to low density/semi continuous <p>And/or</p> <ul style="list-style-type: none"> Some instream habitat present | Water present | <ul style="list-style-type: none"> Blockage of fish passageway during construction Loss of aquatic fauna habitat (through removal of riparian vegetation) Disturbance/loss of instream habitat Riverbed disturbance Pollution of habitat Sedimentation/filling of habitat | <ul style="list-style-type: none"> Fish passage would not be blocked during construction at Class 1 and 2 waterways. Flow would not be altered during construction and operation. Consultation with DPI and an aquatic ecologist would be undertaken when designing the crossing method. Crossings should avoid riparian vegetation and instream habitat. If this is not possible crossings should minimise impact to riparian vegetation in preference to instream habitat. Any riparian vegetation removed would be replaced by locally occurring native species following construction Large woody debris would be avoided where possible. Where it is not possible to avoid, large woody debris would be relocated nearby within the waterway and reinstated at the completion of works. |
| | Dry | <ul style="list-style-type: none"> Disturbance of aquatic fauna habitat (through removal of riparian vegetation) Riverbed disturbance Filling of habitat | <ul style="list-style-type: none"> Crossings should avoid areas of riparian vegetation. Where riparian vegetation needs to be removed, sections of disturbed vegetation (presence of exotics) would be selected. Any riparian vegetation removed would be replaced by locally occurring native species following construction Large woody debris would be avoided where possible. Where it is not possible to avoid, large woody debris would be relocated nearby within the waterway and reinstated at the completion of works. |

| Scenario | | Potential Impacts | Mitigation Measures |
|--|---------------|---|--|
| Poor aquatic habitat condition <ul style="list-style-type: none"> No riparian vegetation No instream habitat | Water present | <ul style="list-style-type: none"> Blockage of fish passageway during construction Riverbed disturbance Pollution of habitat Sedimentation/filling of habitat | <ul style="list-style-type: none"> Fish passage should not be blocked during construction at Class 1 and 2 waterways. Flow would not be altered during construction and operation. Consultation with DPI and an aquatic ecologist would be undertaken when designing the crossing method. |
| | Dry | <ul style="list-style-type: none"> Riverbed disturbance Filling of habitat | |

QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
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CONSTRAINTS MAP 3.01 - LOWER HUNTER VALLEY

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



QHGP Mainline KPs Rev K

QHGP Mainline Rev K

QHGP Mainline Rev L

NSW State Forests

National Parks Estate (DECC)

Fauna constraint areas

Flora constraint areas

Roads (250,000)

Dual Carriageway

Principal Road

Secondary Road

Minor Road

Track

Threatened Species

Green & Golden Bell Frog

Patches of Swamp Oak floodplain forest EEC

- Previous Koala records
- Wetland bird habitat

- River-flat Eucalypt Forest on Coastal Floodplain EEC
- Swamp Oak Floodplain Forest EEC
- Swamp sclerophyll Forest of Coastal Floodplain EEC

- Green & Golden bell frog
- Wetland birds
- Creek flows through Ramsar site

Mangrove-Estuarine Complex & Coastal Saltmarsh EEC

Kooragang Nature Reserve

Hexham Swamp Nature Reserve

Worimi Regional Park



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.03 - BOLWARA AREA
(North of Maitland)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



QHGP Mainline KPs Rev K

QHGP Mainline Rev K

QHGP Mainline Rev L

NSW State Forests

National Parks Estate (DECC)

Flora constraint areas

Roads (250,000)

Dual Carriageway

Principal Road

Secondary Road

Minor Road

Track

Lower Hunter Spotted Gum - Ironbark Forest EEC

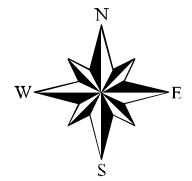
Bolwarra Heights

Bolwarra

NEW ENGLAND HIGHWAY

HUNTER RIVER

HUNTER RIVER



QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT

CONSTRAINTS MAP 3.04 - ELDERSLIE AREA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



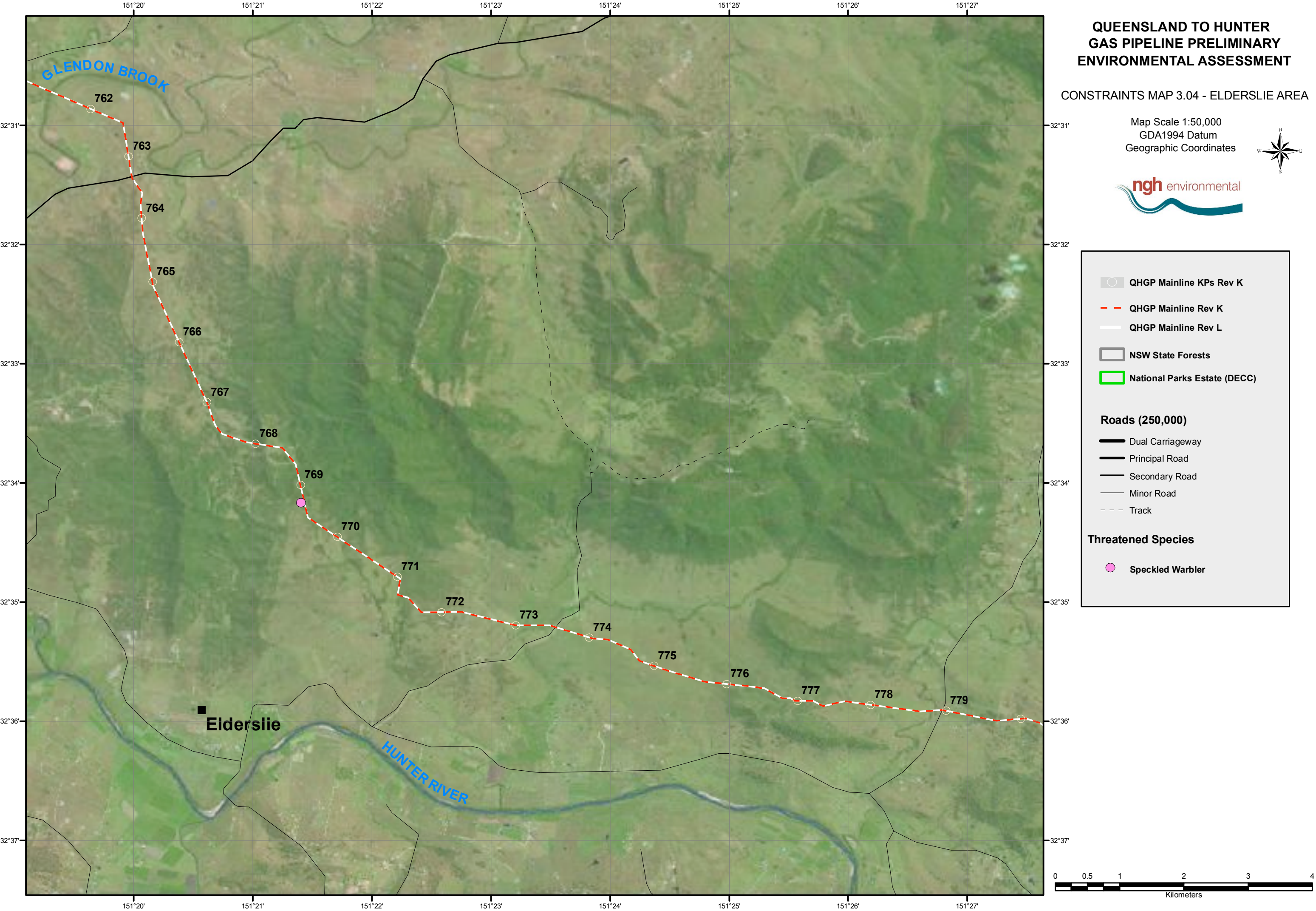
- QHGP Mainline KPs Rev K
- QHGP Mainline Rev K
- QHGP Mainline Rev L
- NSW State Forests
- National Parks Estate (DECC)

Roads (250,000)

- Dual Carriageway
- Principal Road
- Secondary Road
- Minor Road
- Track

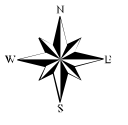
Threatened Species

- Speckled Warbler



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.07 - LIDDELL AREA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



QHGP Mainline KPs Rev K

QHGP Mainline Rev K

QHGP Mainline Rev L

NSW State Forests

National Parks Estate (DECC)

Fauna constraint areas

Roads (250,000)

Dual Carriageway

Principal Road

Secondary Road

Minor Road

Track

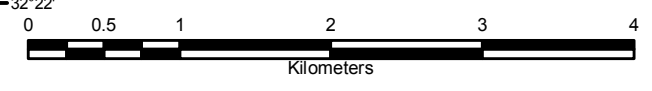
Threatened Species

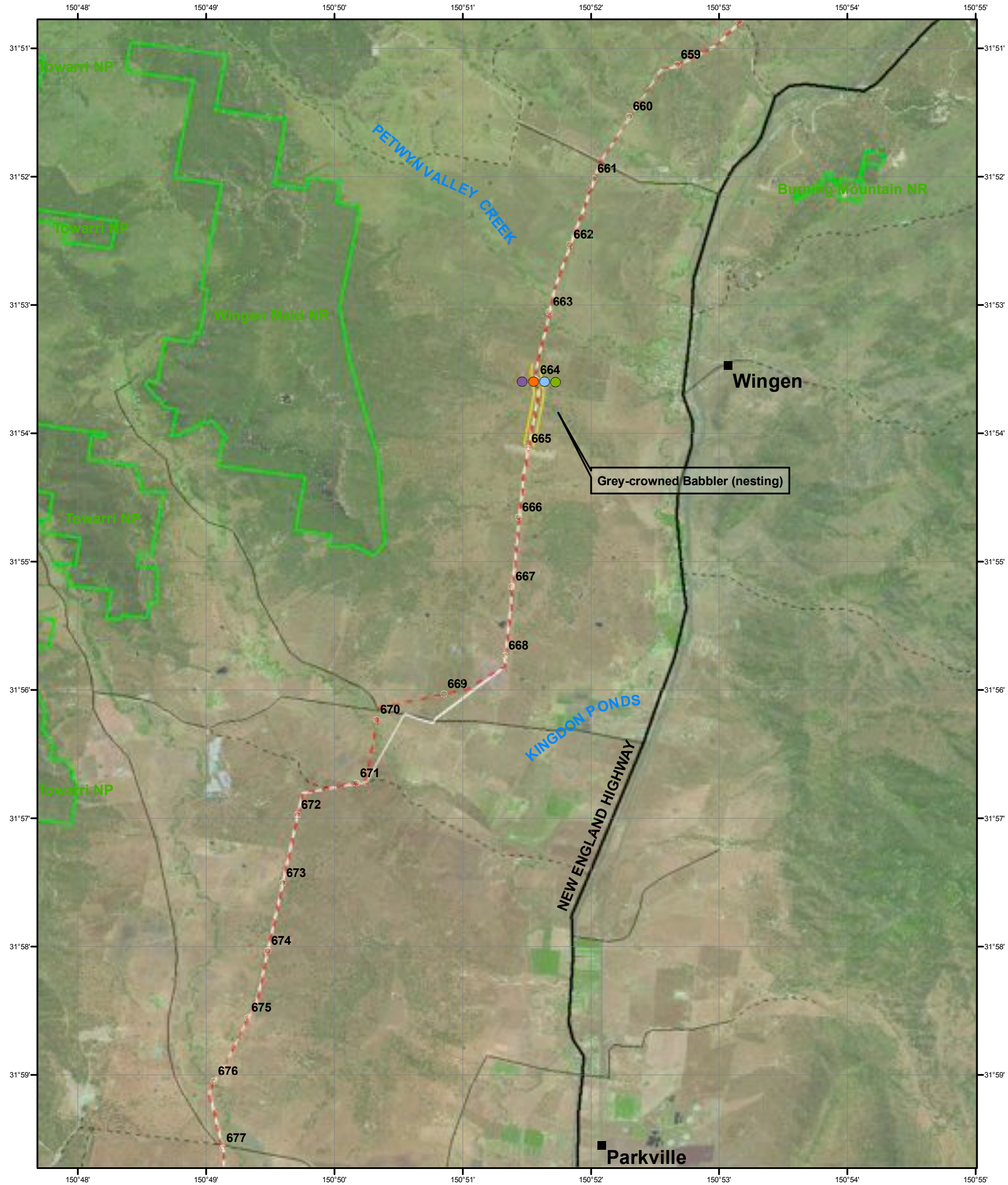
Eastern Bentwing Bat

Little Bentwing Bat

- Arboreal and hollow dependent fauna habitat

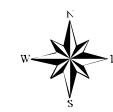
FOYBROOK















**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

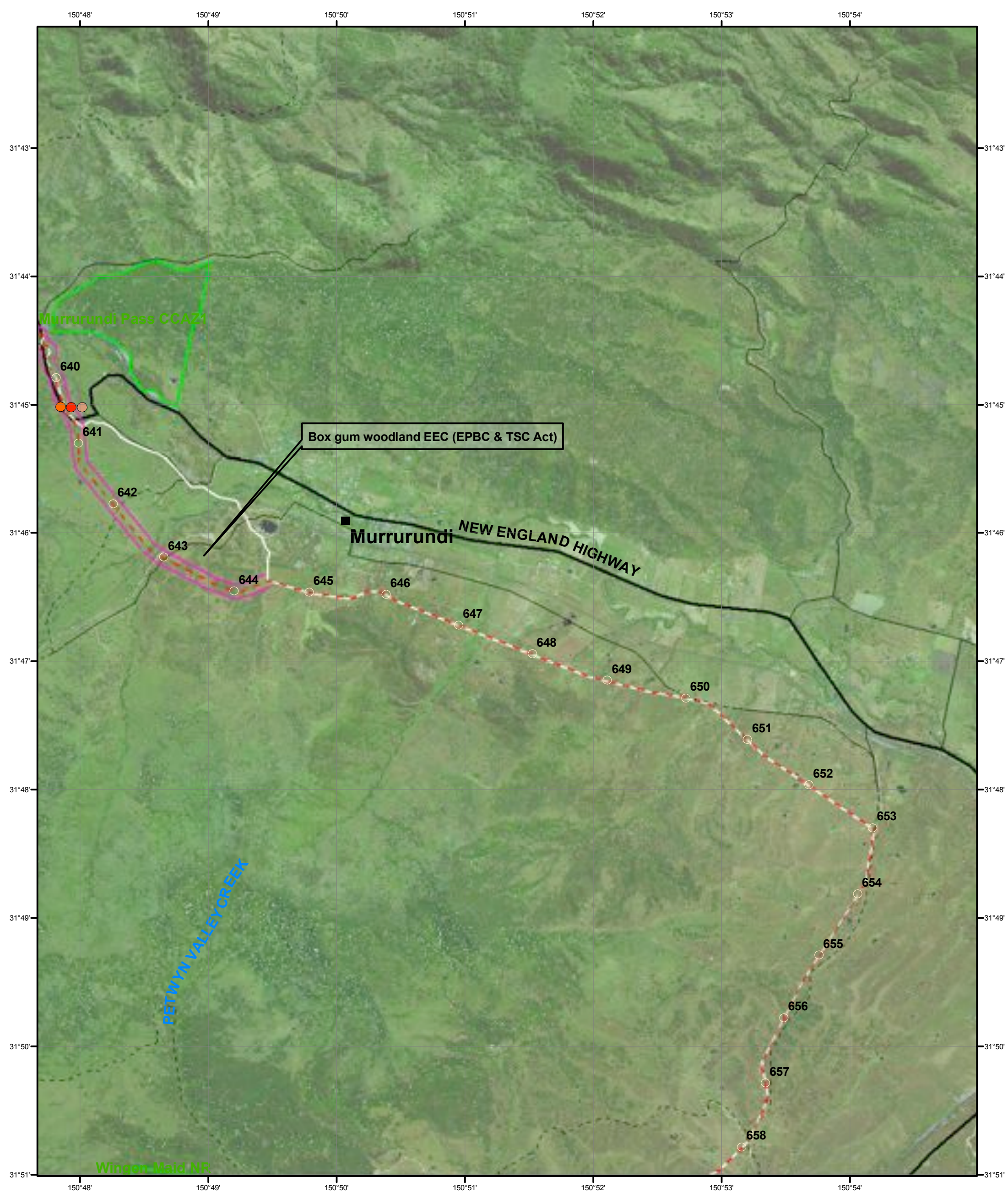
CONSTRAINTS MAP 3.10 -
PARKVILLE - WINGEN AREA
(North of Scone)



Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|---|------------------------------|---|----------------------|
|  | QHGP Mainline KPs Rev K | Threatened Species | |
|  | QHGP Mainline Rev K |  | Eastern Bentwing Bat |
|  | QHGP Mainline Rev L |  | Grey-crowned Babbler |
|  | NSW State Forests |  | Large-eared Pied Bat |
|  | National Parks Estate (DECC) |  | Large-footed Myotis |
|  | Fauna constraint areas | | |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

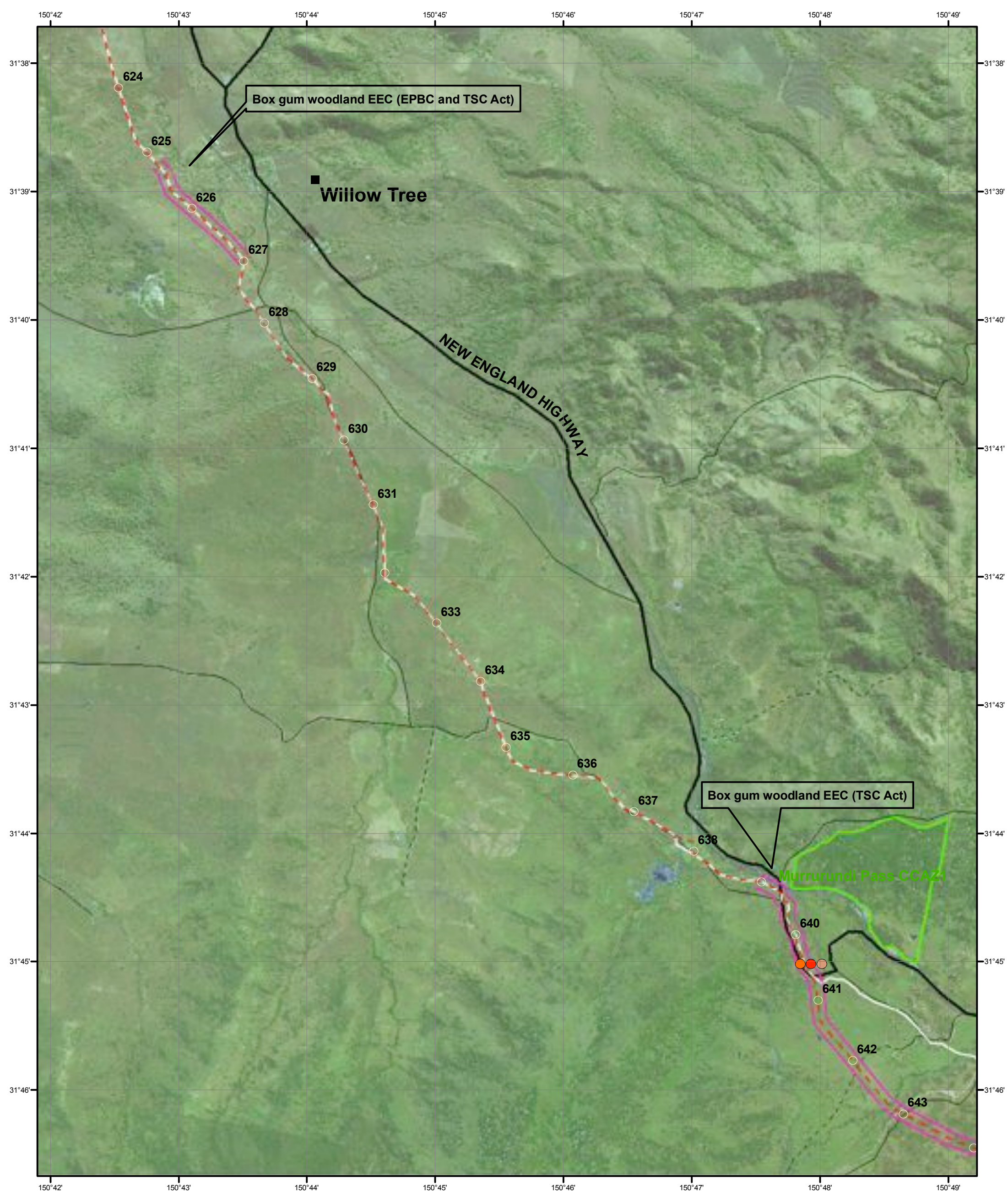
CONSTRAINTS MAP 3.11 - MURRUNDI
(Liverpool Range - East)



Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | |
|--|--|--|
|  QHGP Mainline KPs Rev K | Threatened Species | Roads (250,000) |
|  QHGP Mainline Rev K |  Brown Treecreeper |  Dual Carriageway |
|  QHGP Mainline Rev L |  Diamond Firetail |  Principal Road |
|  NSW State Forests |  Grey-crowned Babbler |  Secondary Road |
|  National Parks Estate (DECC) | |  Minor Road |
|  Flora constraint areas | |  Track |

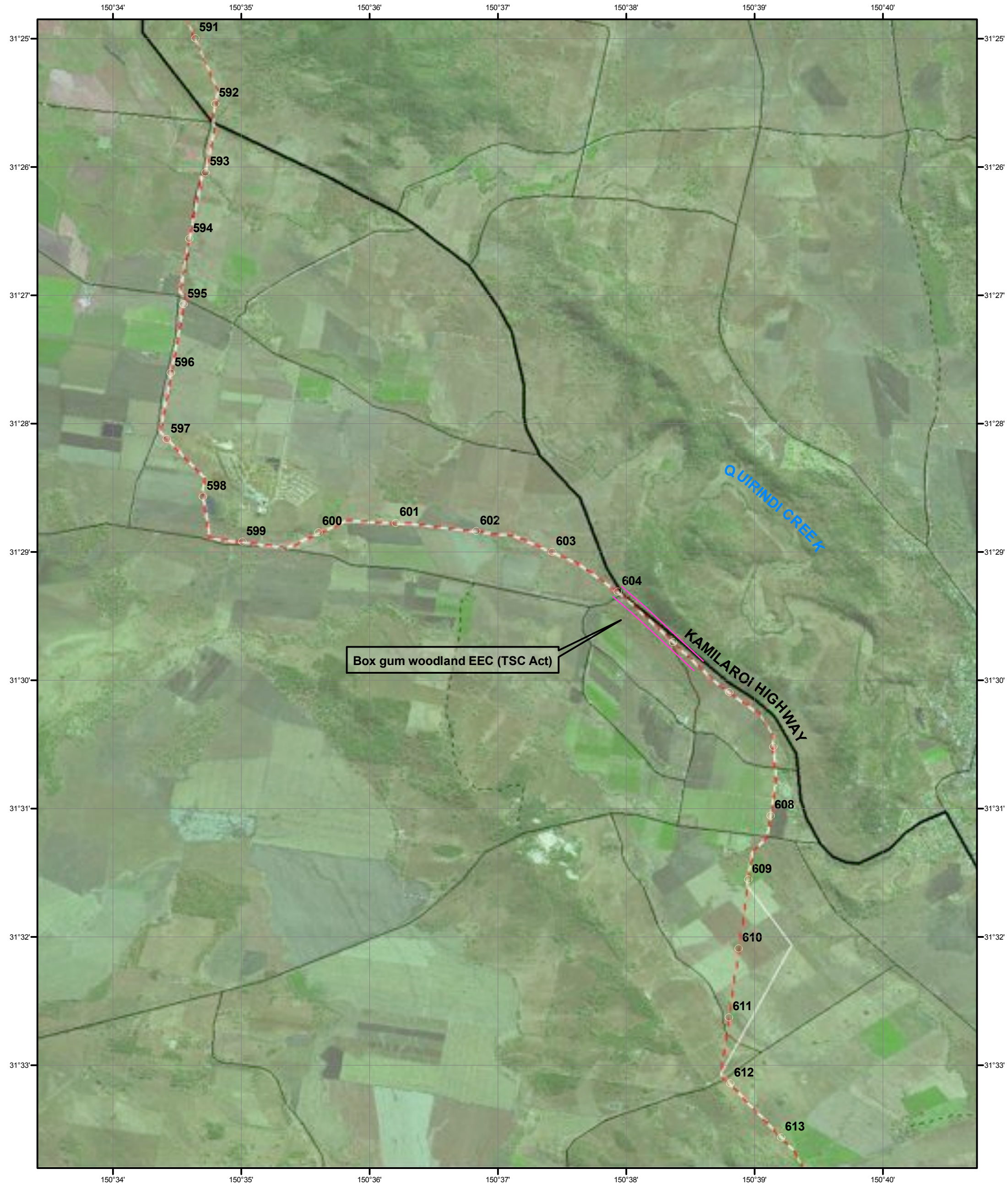


**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.12 - WILLOW TREE
(Liverpool Range - West)


Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

| | | |
|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | Brown Treecreeper | Dual Carriageway |
| QHGP Mainline Rev L | Diamond Firetail | Principal Road |
| NSW State Forests | Grey-crowned Babbler | Minor Road |
| National Parks Estate (DECC) | | Track |
| Flora constraint areas | | |





**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

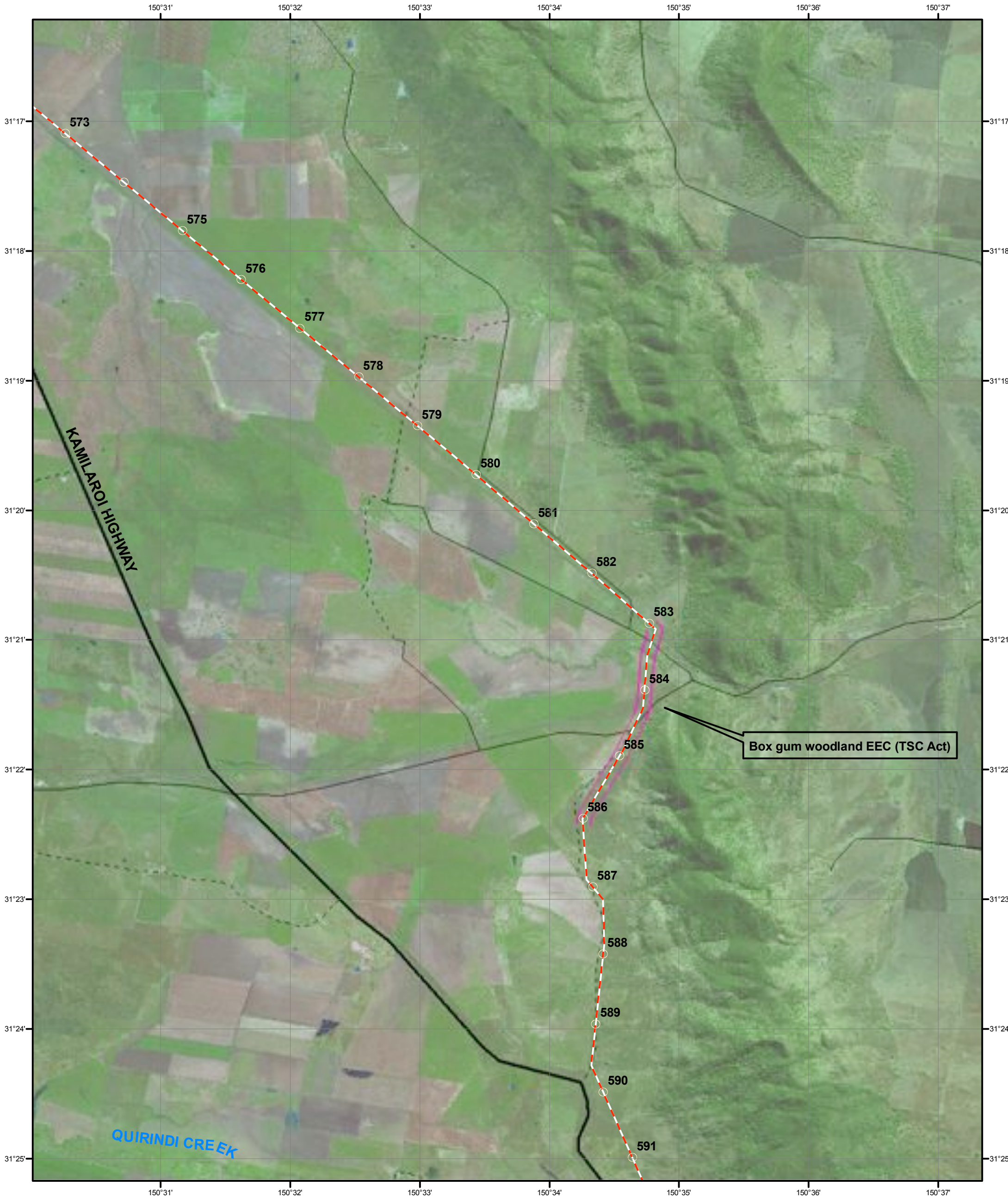
CONSTRAINTS MAP 3.14 - QUIRINDI



Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



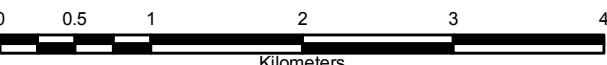
| | | |
|---|--|---|
|  QHGP Mainline KPs Rev K |  NSW State Forests | Roads (250,000)  Dual Carriageway  Principal Road  Secondary Road  Minor Road  Track |
|  QHGP Mainline Rev K |  National Parks Estate (DECC) | |
|  QHGP Mainline Rev L |  Flora constraint areas | |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.15 - WERRIS CREEK

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

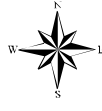


| | | |
|-------------------------|------------------------------|---|
| QHGP Mainline KPs Rev K | NSW State Forests | Roads (250,000) Dual Carriageway Principal Road Secondary Road Minor Road Track |
| QHGP Mainline Rev K | National Parks Estate (DECC) | |
| QHGP Mainline Rev L | Flora constraint areas | |
| | | |




**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.16 - BREEZA
(South of Gunnedah)

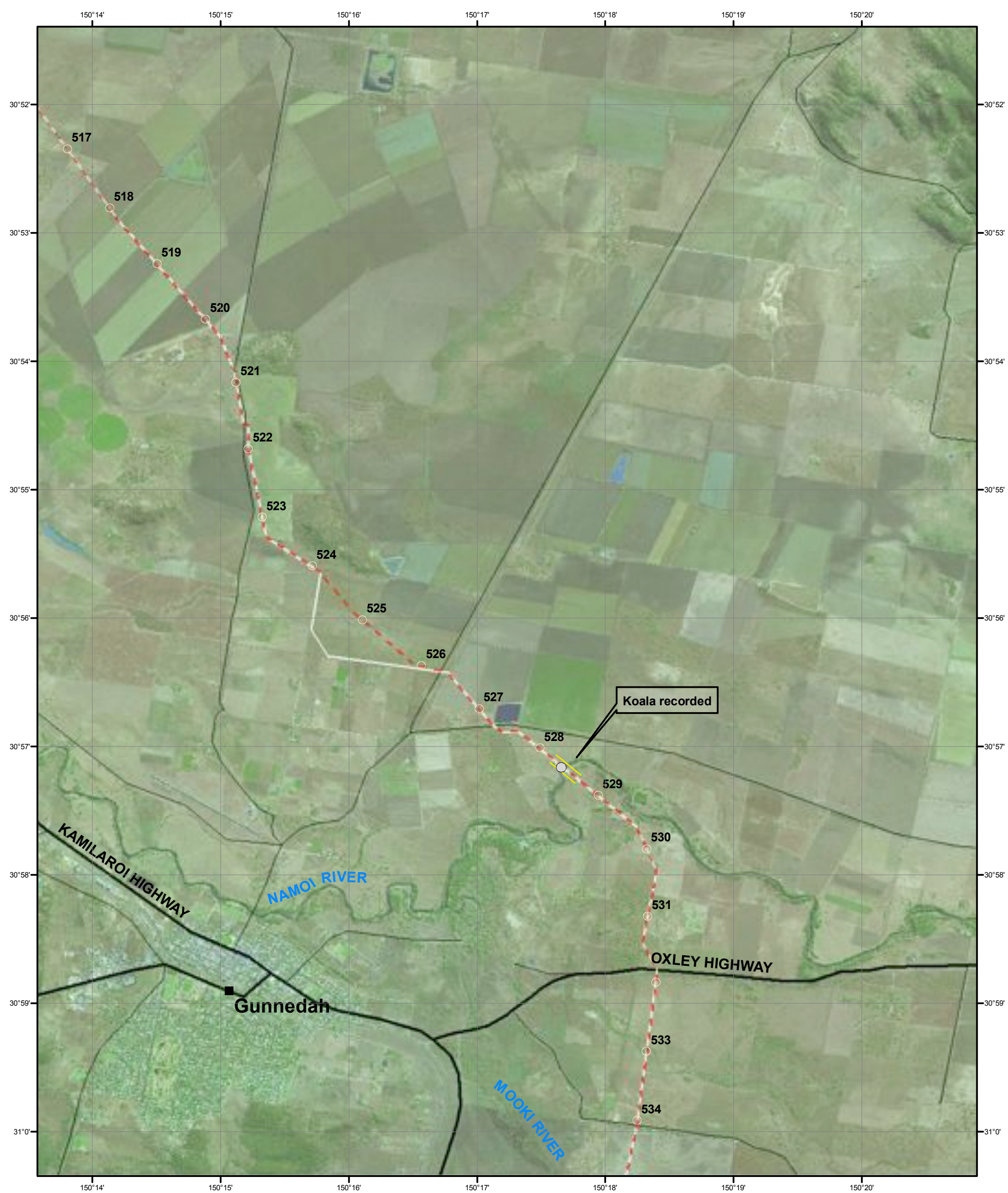


Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

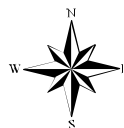





| | | | |
|---|--|---|--|
|  QHGP Mainline KPs Rev K |  NSW State Forests | Threatened Species | Roads (250,000) |
|  QHGP Mainline Rev K |  National Parks Estate (DECC) |  Koala |  Dual Carriageway |
|  QHGP Mainline Rev L |  Fauna constraint areas | |  Principal Road |
| | | |  Secondary Road |
| | | |  Minor Road |
| | | |  Track |

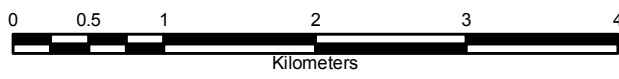


**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.18 - GUNNEDAH






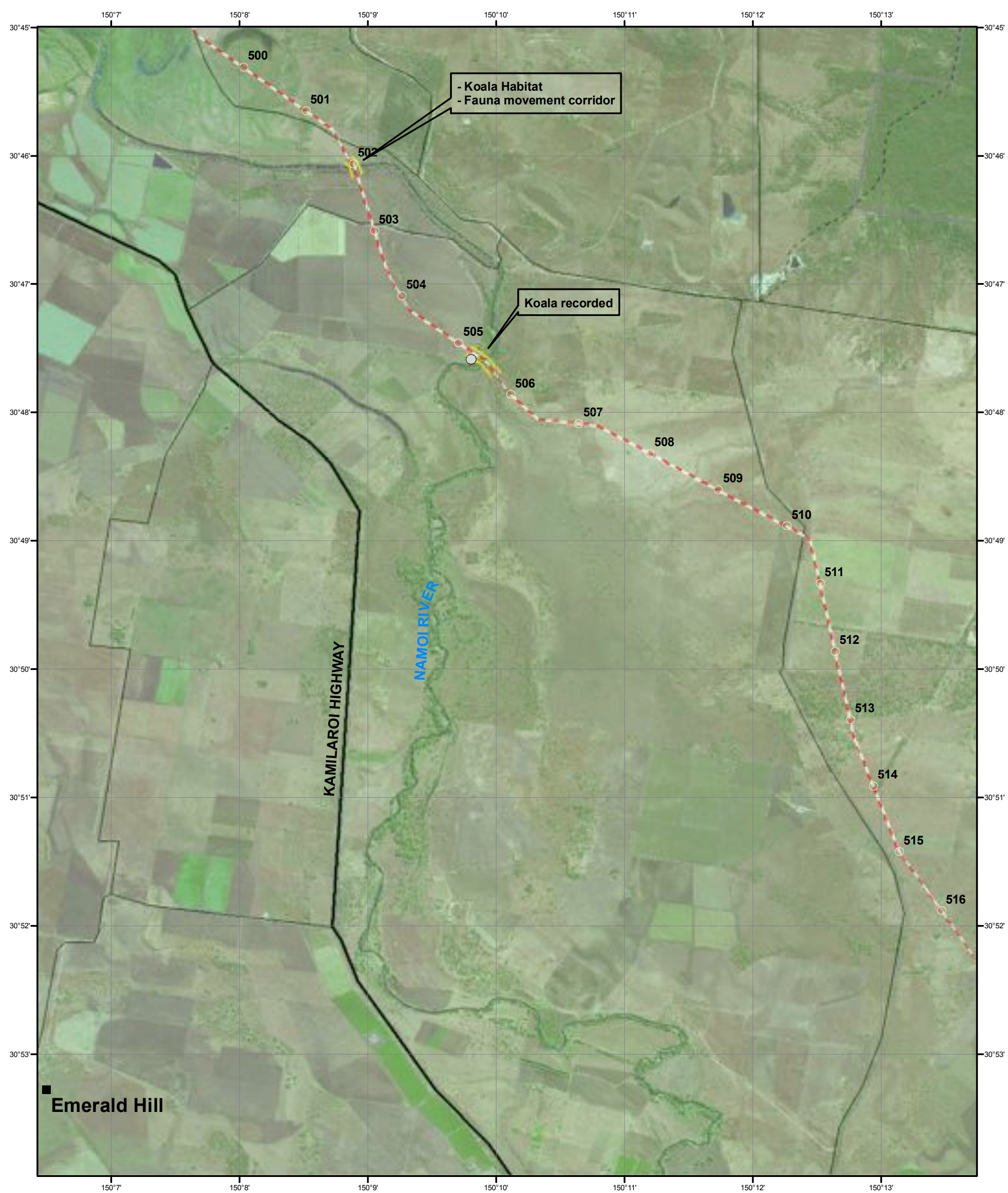
Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



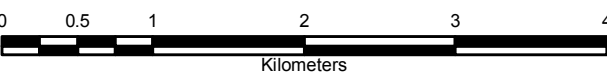


0 0.5 1 2 3 4
Kilometers

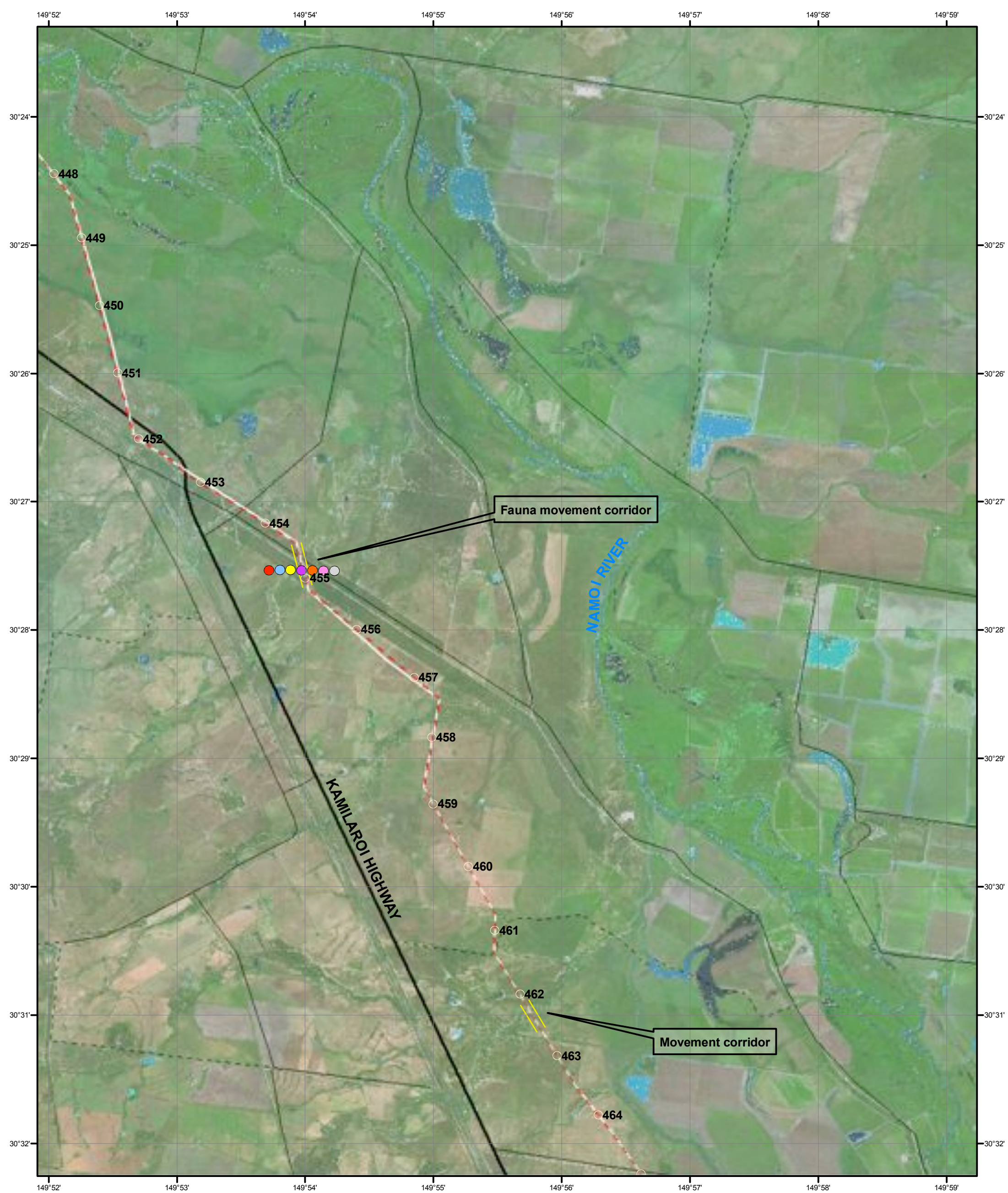
| | | | |
|---|--|---|--|
|  QHGP Mainline KPs Rev K |  NSW State Forests | Threatened Species | Roads (250,000) |
|  QHGP Mainline Rev K |  National Parks Estate (DECC) |  Koala |  Dual Carriageway |
|  QHGP Mainline Rev L |  Fauna constraint areas | |  Principal Road |
| | | |  Secondary Road |
| | | |  Minor Road |
| | | |  Track |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.19 - EMERALD HILL
(North of Gunnedah)
Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



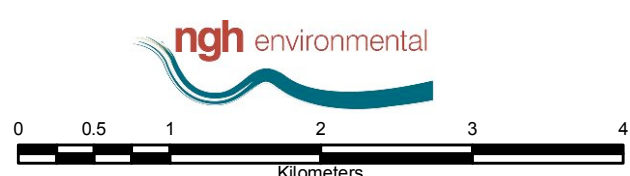
| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Koala | Roads (250,000) |
| QHGP Mainline Rev L | Fauna constraint areas | | Dual Carriageway |
| | | | Principal Road |
| | | | Secondary Road |
| | | | Minor Road |
| | | | Track |



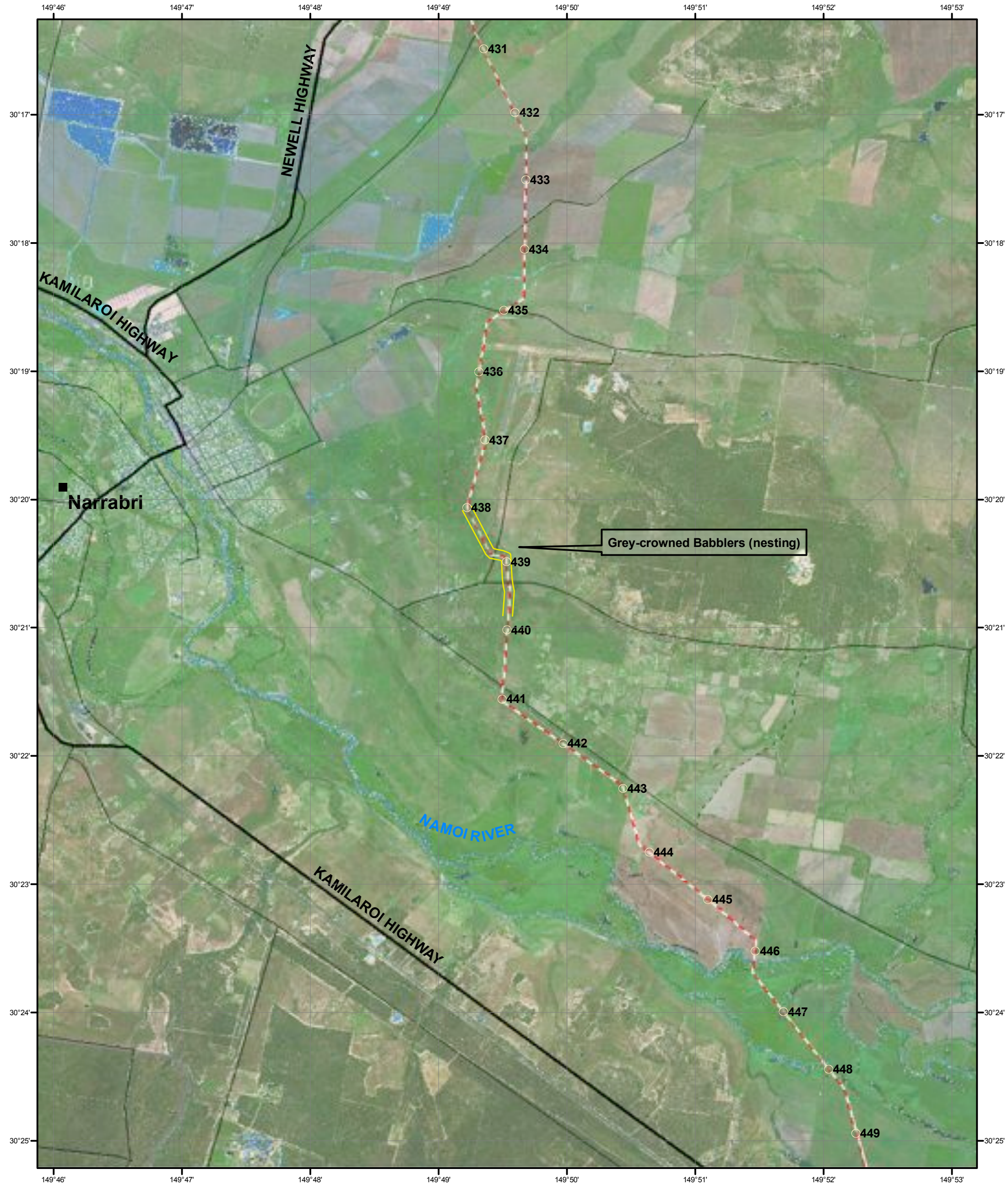
**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.22 - NAMOI VALLEY
(South East of Narrabri)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

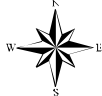


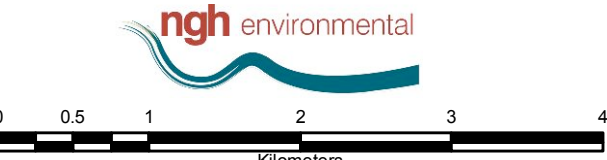
| | | |
|------------------------------|-------------------------------|------------------|
| QHGP Mainline KPs Rev K | Threatened Species | Dual Carriageway |
| QHGP Mainline Rev K | Diamond Firetail | Principal Road |
| QHGP Mainline Rev L | Grey-crowned Babbler | Secondary Road |
| NSW State Forests | Large-eared Pied Bat | Minor Road |
| National Parks Estate (DECC) | Masked Owl | Track |
| Fauna constraint areas | Speckled Warbler | |
| | Yellow-bellied Sheathtail Bat | |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.23 - NARRABRI

 Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | |
|---|--|---|
|  QHGP Mainline KPs Rev K |  NSW State Forests | Roads (250,000)  Dual Carriageway  Principal Road  Secondary Road  Minor Road  Track |
|  QHGP Mainline Rev K |  National Parks Estate (DECC) | |
|  QHGP Mainline Rev L |  Fauna constraint areas | |
















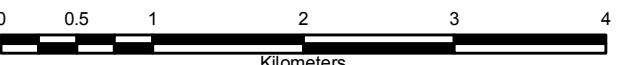
**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

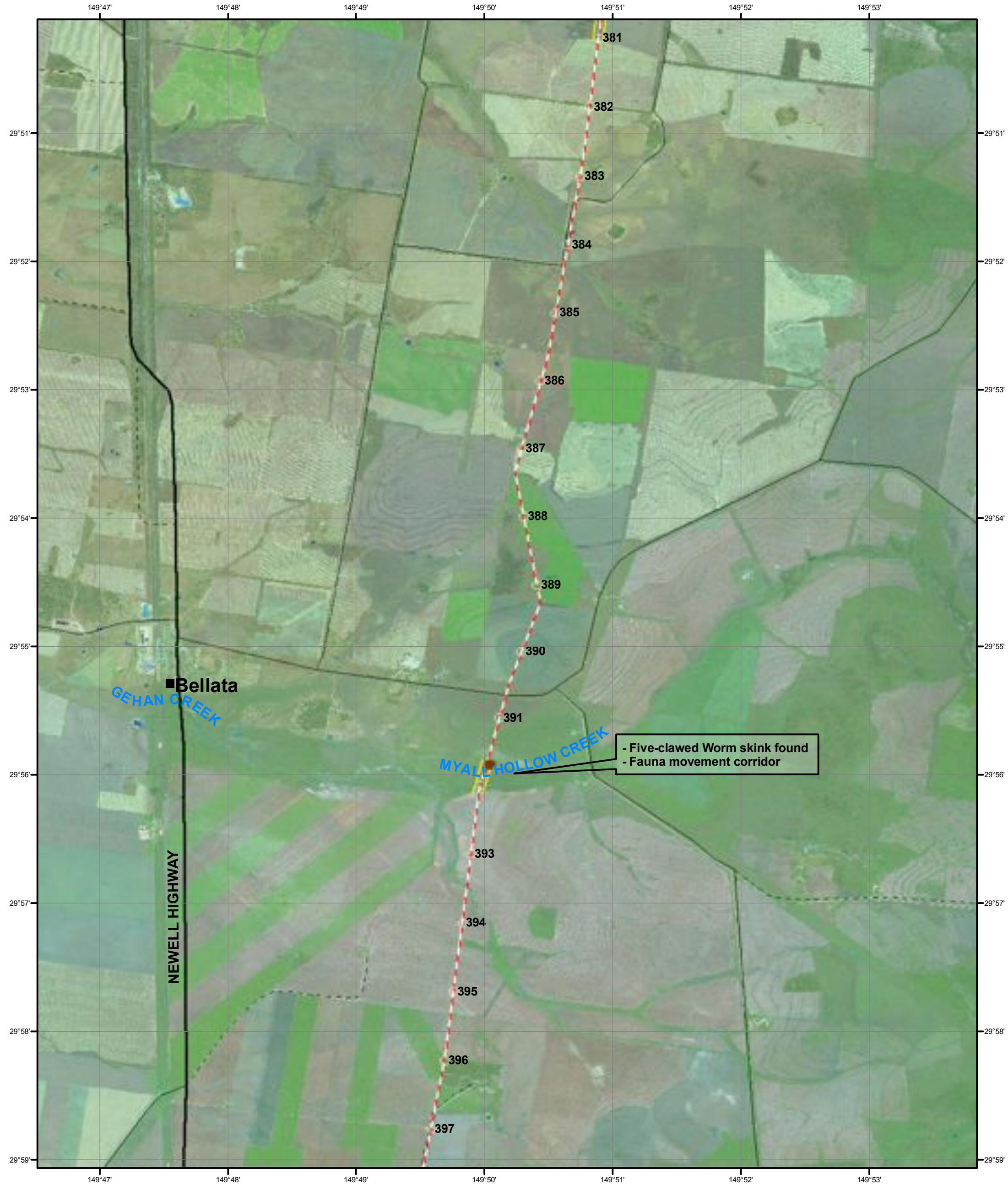
CONSTRAINTS MAP 3.25 - EDGEROI
(Ten Mile Creek)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | | | |
|---|-------------------------|---|------------------------------|---|---|
|  | QHGP Mainline KPs Rev K |  | NSW State Forests | Threatened Species | Roads (250,000) |
|  | QHGP Mainline Rev K |  | National Parks Estate (DECC) |  |  |
|  | QHGP Mainline Rev L |  | Fauna constraint areas | |  |
| | |  | Flora constraint areas | |  |
| | | | | |  |
| | | | | |  |

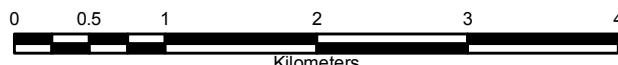




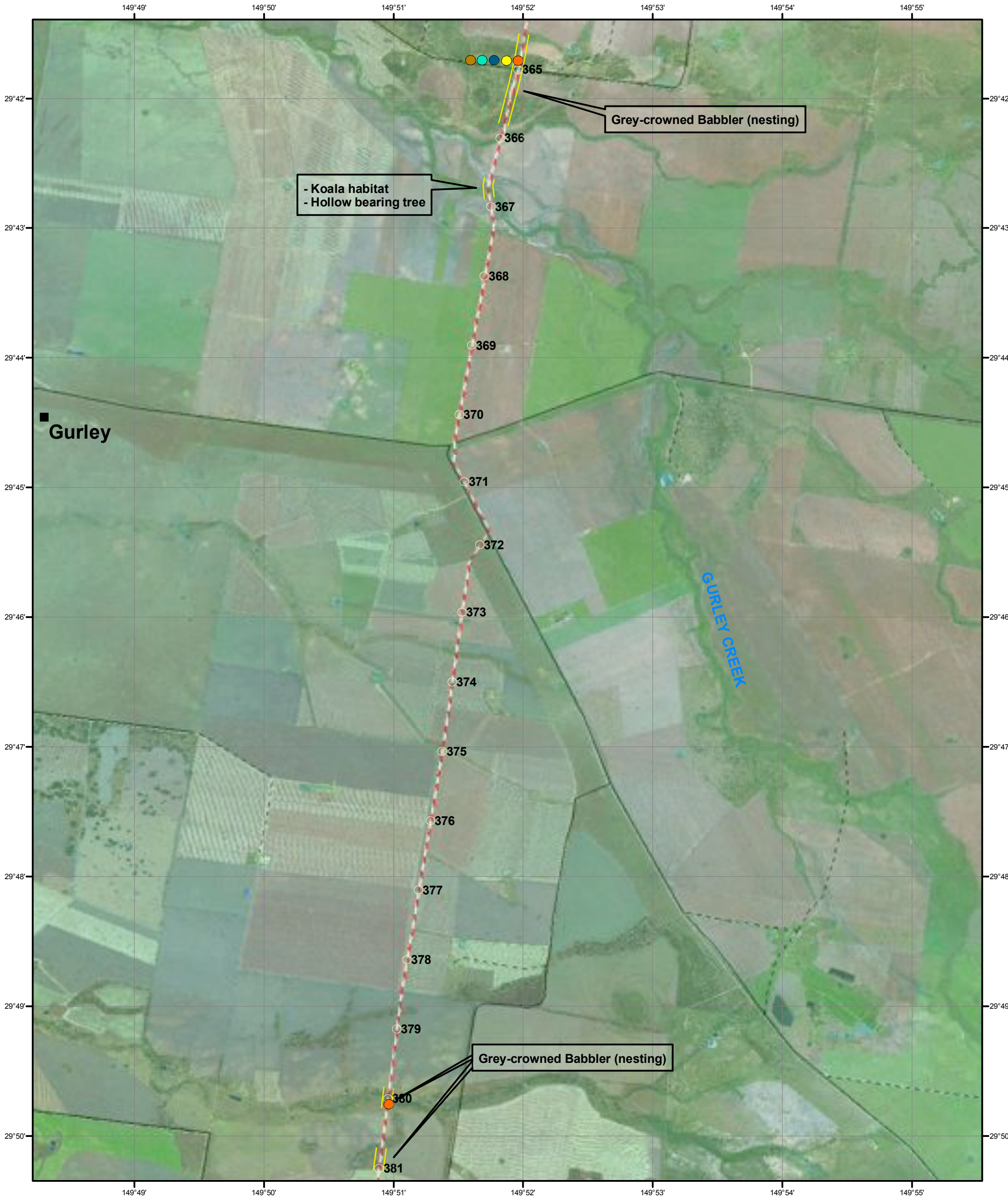
**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.26 - BELLATA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



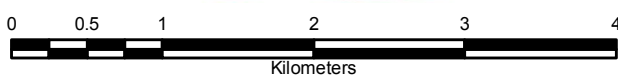
| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Five-clawed Worm-skink | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | | | Secondary Road |
| | | | Minor Road |
| | | | Track |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.27 - GURLEY AREA

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|-------------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Grey-crowned Babbler | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | Little Pied Bat | Principal Road |
| | | Pied Honeyeater | Secondary Road |
| | | Turquoise Parrot | Minor Road |
| | | Yellow-bellied Sheathtail Bat | Track |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.28 - TYCANNAH CREEK
(South of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Grey-crowned Babbler | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | | | Secondary Road |
| | | | Minor Road |
| | | | Track |

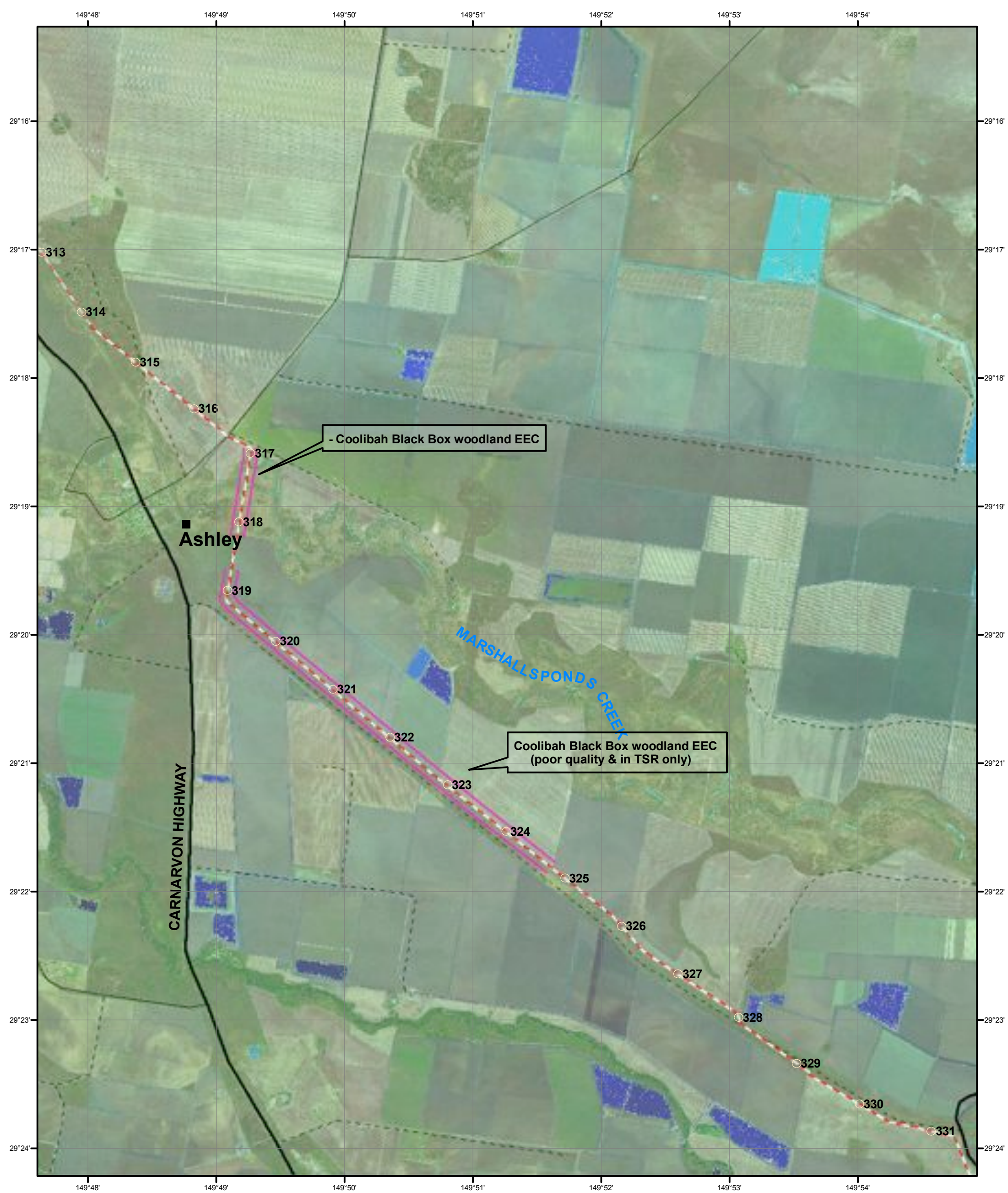


**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.29 - MEEHI RIVER
(East of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Masked Owl | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | | | Secondary Road |
| | | | Minor Road |
| | | | Track |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

**CONSTRAINTS MAP 3.30 - ASHLEY AREA
(North of Moree)**

Map Scale 1:50,000

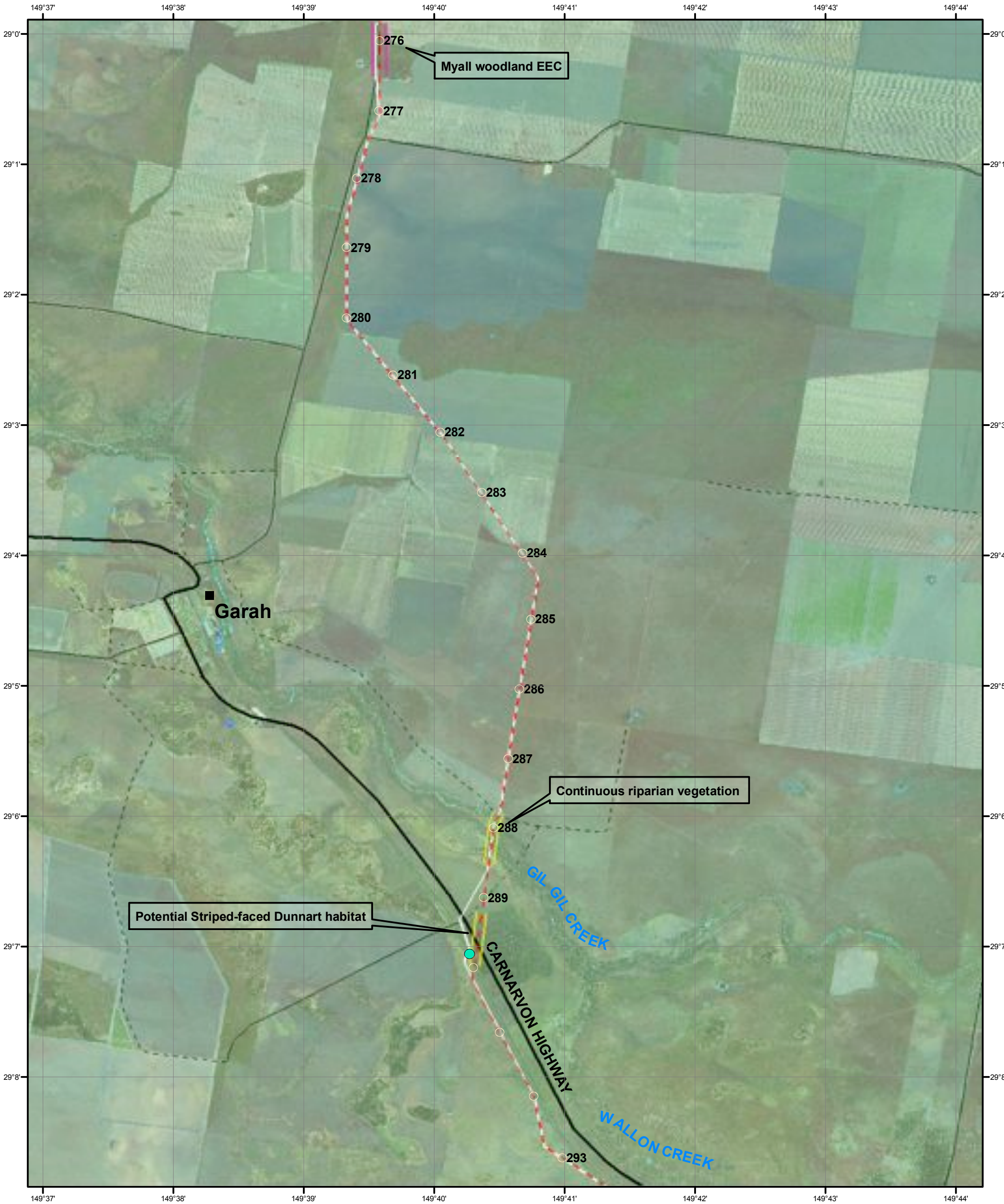
GDA1994 Datum

Geographic Coordinates



| | | |
|-------------------------|------------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Dual Carriageway |
| QHGP Mainline Rev L | Flora constraint areas | Principal Road |
| | | Secondary Road |
| | | Minor Road |
| | | Track |





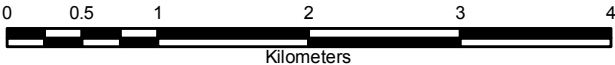
**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

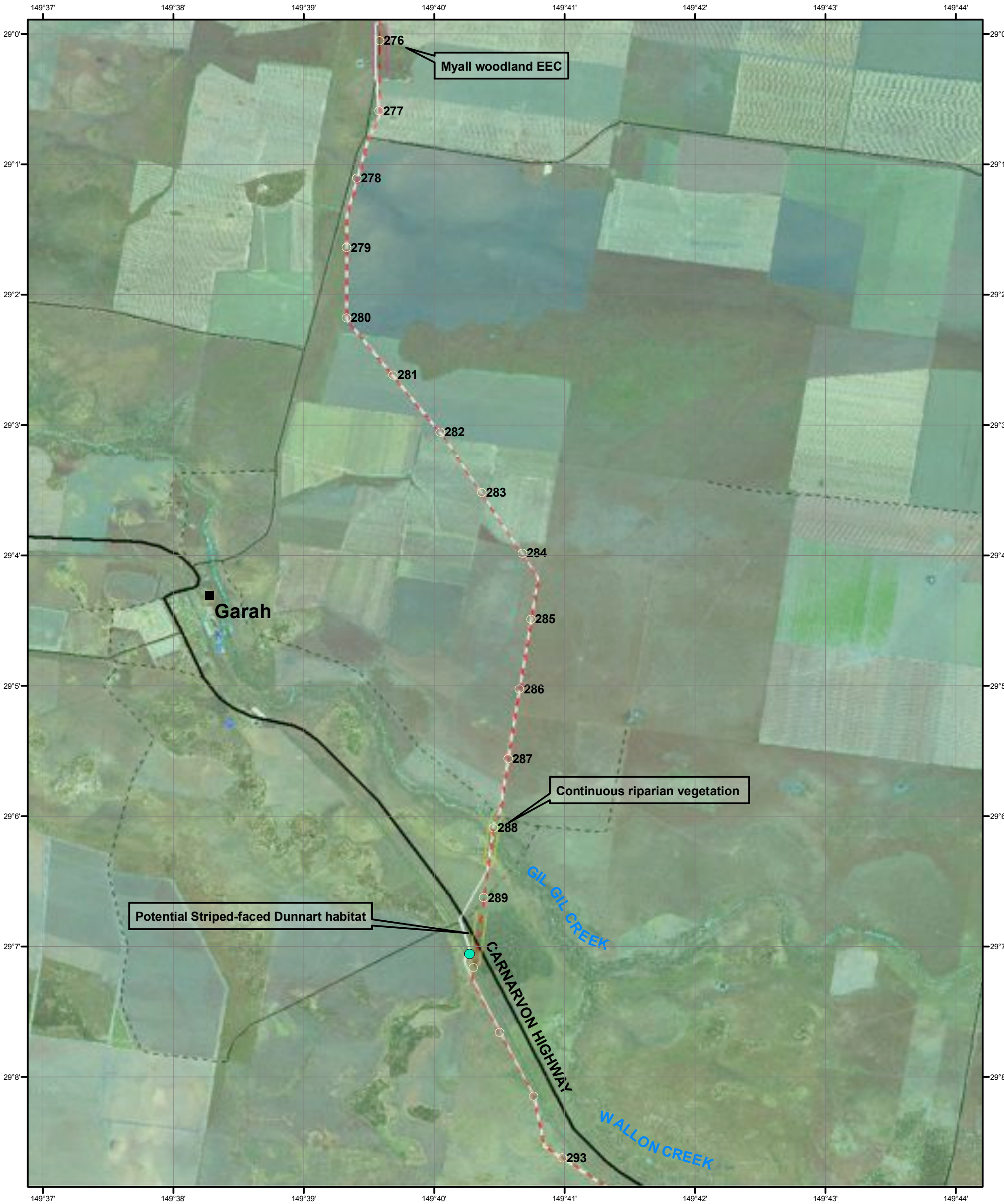
CONSTRAINTS MAP 3.32 - GARAH AREA
(North of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Turquoise Parrot | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | Flora constraint areas | | Secondary Road |
| | | | Minor Road |
| | | | Track |





**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.32 - GARAH AREA
(North of Moree)

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates

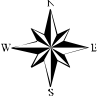


| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Turquoise Parrot | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | Flora constraint areas | | Secondary Road |
| | | | Minor Road |
| | | | Track |







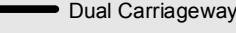


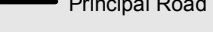

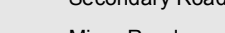
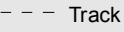
**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

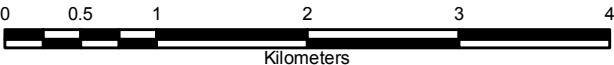
**CONSTRAINTS MAP 3.33 - BOONAL TANK AREA
(South of Boomi)**

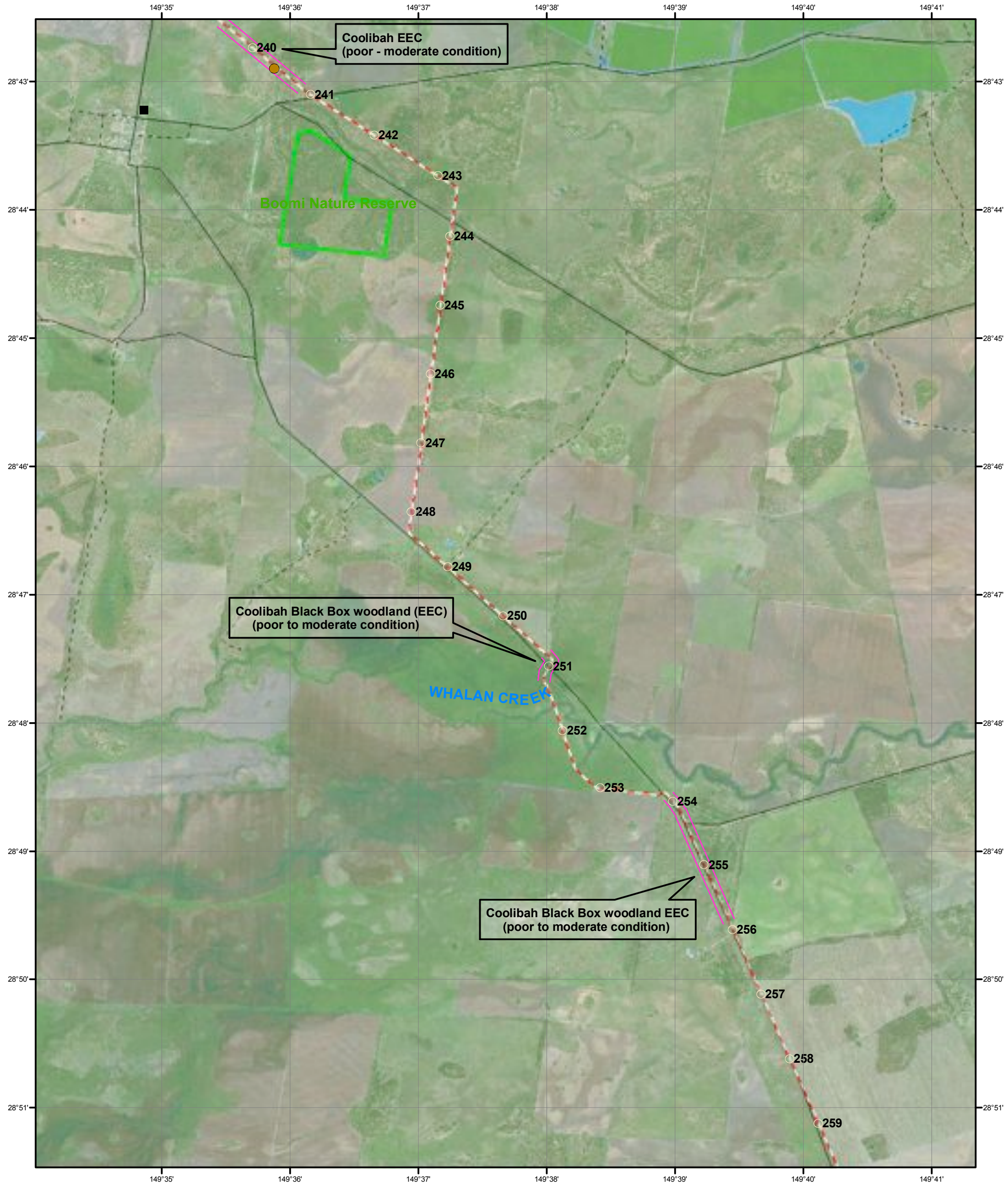


Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | |
|---|--|--|
|  QHGP Mainline KPs Rev K |  NSW State Forests | Roads (250,000) |
|  QHGP Mainline Rev K |  National Parks Estate (DECC) |  Dual Carriageway |
|  QHGP Mainline Rev L |  Fauna constraint areas |  Principal Road |
| |  Flora constraint areas |  Secondary Road |
| | |  Track |



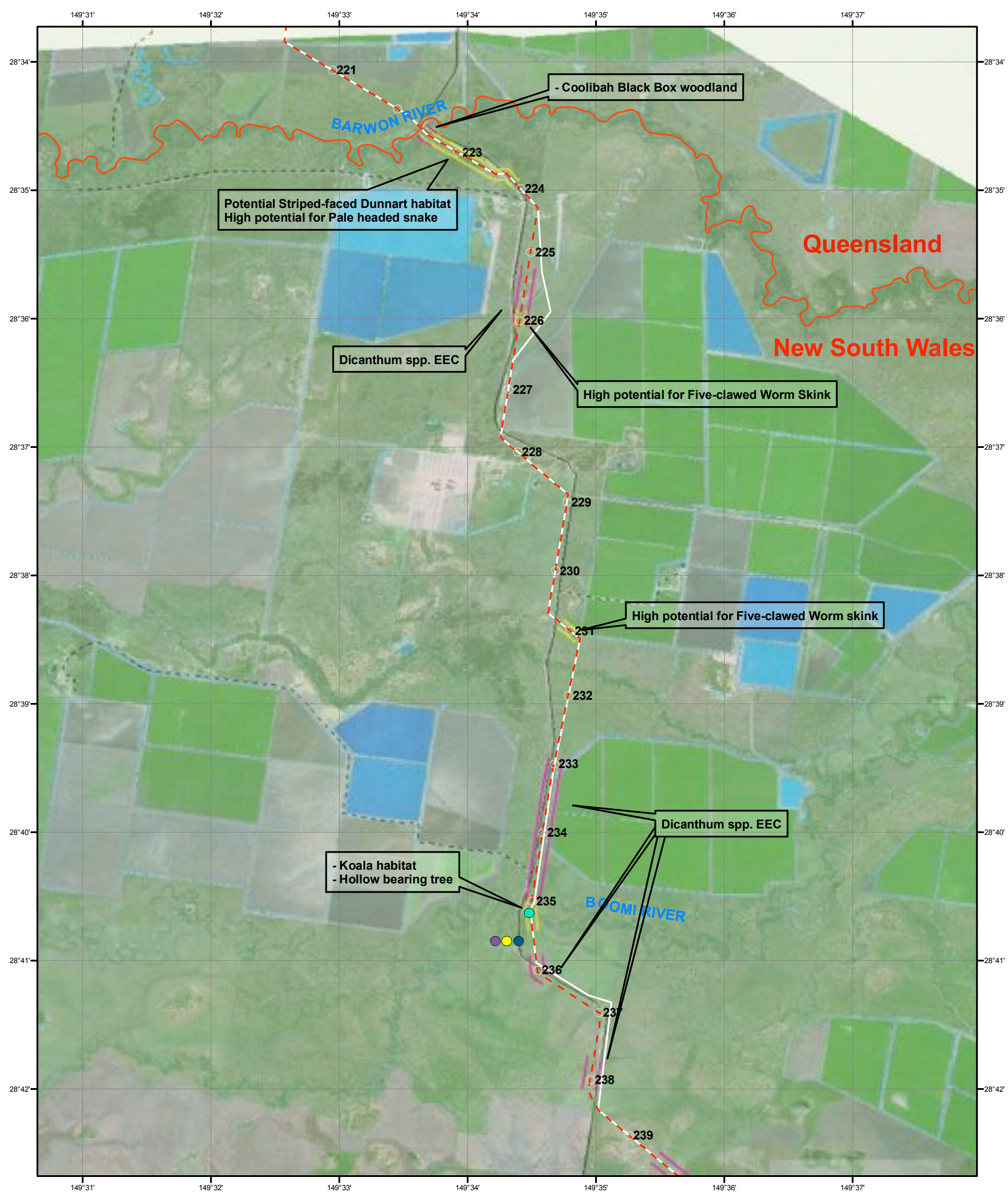


**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**
CONSTRAINTS MAP 3.34 - BOOMI SOUTH

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|---------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Pied Honeyeater | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | | Principal Road |
| | | | Secondary Road |
| | | | Minor Road |
| | | | Track |



**QUEENSLAND TO HUNTER
GAS PIPELINE PRELIMINARY
ENVIRONMENTAL ASSESSMENT**

CONSTRAINTS MAP 3.35 - BOOMI NORTH

Map Scale 1:50,000
GDA1994 Datum
Geographic Coordinates



| | | | |
|-------------------------|------------------------------|-------------------------------|------------------------|
| QHGP Mainline KPs Rev K | NSW State Forests | Threatened Species | Roads (250,000) |
| QHGP Mainline Rev K | National Parks Estate (DECC) | Yellow-bellied Sheathtail Bat | Dual Carriageway |
| QHGP Mainline Rev L | Fauna constraint areas | Turquoise Parrot | Principal Road |
| | Flora constraint areas | Beccari's Freetail Bat | Secondary Road |
| | | Little Pied Bat | Minor Road |
| | | | Track |

4 SUMMARY OF RECOMMENDATIONS

The reference code in **Table 4-1: Summary of Mitigation Measures**, includes a prefix that denotes the following:

- “C” – A constraint identified in the EA which has been investigated and can be avoided or managed.
- “N” – A new constraint, not previously identified, which can be avoided or managed.
- “P” – A previously identified constraint, which through the additional biodiversity fieldwork has been determined to no longer represent a biodiversity constraint.
- “L” – A limitation of the additional biodiversity fieldwork, where physical access was precluded from lack of access permissions.

The table below is a summary of all the measures committed to in this Biodiversity Assessment. The reference code provides a location for the measure.

Table 4-1: Summary of Mitigation Measures with location

| Management Measure | Biodiversity Issue | Reference code (ref Appendix A) |
|---|--|---------------------------------|
| <p>The Right of Way (ROW) would be constructed to ensure no net loss of mature trees, this would include minimising the ROW to a maximum 20m width. No Hollow bearing trees would be removed. All coarse woody debris (terrestrial and aquatic) would be reinstated. Fish passage would not be blocked and the method of waterway crossing would be determined in consultation with DPI and a qualified ecologist.</p> <p>A soil and water management plan would be prepared in consultation the DPI and a qualified ecologist to ensure water quality is maintained and that there is no infilling of aquatic habitat such as riffle pools.</p> <p>Any impacts to river banks would be rehabilitated to pre ROW condition.</p> <p>In order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area is likely to cause the tree to die.</p> | Coolibah Black Box Woodland Koalas Woodland Birds Hollow dependent fauna Microchiropteran bats | C1 |
| | | C7 |
| | | C10 |
| | | C12 |
| | | C13 |
| | | C14 |
| | | C15 |
| | | C18 |
| | | C19 |
| | | C20 |
| | | C21 |
| | | C22 |
| | | C23 |
| | | C24 |
| | | C25 |
| | | C26 |
| | | C28 |
| | | C30 |
| | | C33 – C39 |
| | | |
| Avoid removal of Hollow Bearing Trees (HBT) and mature vegetation. It should be noted that in order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area will be likely to cause the tree to die. | Pale-headed Snake | C2 |
| | | C19 |

| Management Measure | Biodiversity Issue | Reference code (ref Appendix A) |
|---|--|---|
| Experienced herpetologists would be present during clearing of any hollow bearing trees, during trenching and to check trenches for reptiles. All coarse woody debris would be reinstated. | | |
| Avoid removal of Hollow Bearing Trees (HBT). It should be noted that in order to save mature vegetation the area within 1m of the tree drip line should not be disturbed, disturbance of more than around 30-40% of this area will be likely to cause the tree to die. Reinstate coarse woody debris and revegetate with local provenance native grasses and ground covers. | Turquoise Parrot Speckled Warbler Grey-crowned Babbler Stripe-faced dunnart Pilliga Mouse Microchiropteran Bats | C2 C7 C16 N8 C31 C32 |
| In order to minimise impact to known Grey-crowned Babbler nesting sites works would be undertaken outside of the breeding season wherever possible (July-December) and an ecologist would check the site for nests prior to any clearing. The nest surveys would be undertaken with enough lead time to accommodate minor ROW adjustments (including narrowing the ROW) required to avoid nests should active nest be found. Reinstate coarse woody debris and revegetate with local provenance native grasses and ground covers. | Grey-crowned Babbler | C21 C23 C25 C26 C31 C32 C40 |
| To reduce the impact of fragmentation the pipeline would remain within or as close as possible to the power easement. The ROW would not create two cleared easements. | Koala Grey-crowned Babbler Speckled Warbler Masked Owl Fauna movement corridor Microchiropteran Bats | C32 |
| The ROW would be reduced to a maximum width of 20m. Soil structure rehabilitation would occur across the ROW in these areas. This includes the re-construction of soil profile as was present prior to construction, and the rehabilitation of ground micro-habitats such as fallen timber and native grasses. Weed control is crucial in ensuring the integrity of the easement post-construction. An experienced herpetologist would be present during clearing, grading and construction stages to search and examine surface litter and top soil removed and to check inside the trench. The trenches must be checked by walking inside the trench, and not from above which normally occurs as this species will burrow and may not be detected by | Five clawed worm skink | C4 C5 C27 |

| Management Measure | Biodiversity Issue | Reference code (ref Appendix A) |
|--|--|---|
| checking from above. | | |
| The construction period would be minimised and grass would be turfed to 100mm depth, stored and kept moist. Sods would not be stacked. Sods would be reinstated in rehabilitation phase. | Protection to adjacent <i>Dichanthium</i> spp. dominant grasslands of the Brigalow belt Bioregions, EPBC EEC | N1 N2 |
| The ROW has been realigned to avoid these communities or constraints. | <i>Dichanthium</i> spp. dominant grasslands of the Brigalow belt Bioregions, EPBC EEC Myall Woodland EEC Coolibah Blackbox EEC Lower hunter spotted gum ironbark forest EEC Arboreal fauna habitat Hollow dependent fauna habitat Woodland and forest bird habitat | C3 C6 C8 C9 N3 N9 N10 C41 C42 |
| ROW would be aligned to avoid all mature trees. The ROW would be minimised to a maximum width of 20m. | Box gum woodland EEC (TSC Act only) | N5 N6 N8 |
| The ROW would be aligned to avoid all mature trees. ROW only just touches this section of EEC. All disturbed areas would be revegetated with local provenance native grass and understorey species indicative of this community type. | Box gum woodland EEC (EPBC And TSC) | N7 |
| The ROW would remain as far as possible in the powerline easement. The method of construction through this area would be designed in consultation with the Hunter CMA, DPI, DECC (Parks and Wildlife) and a qualified ecologist. The patch of vegetation that encroaches into this easement on the western side would be avoided completely. | Swamp Oak Floodplain Forest EEC Koalas Wetland Birds Migratory Birds Amphibians Microchiropteran Bats | C44 |
| The ROW would remain in existing cleared areas until the area just north of the Hunter River. The Hunter River would be crossed using Horizontal Directional Drilling. The stand of <i>Grevillea parviflora</i> subsp. <i>Parviflora</i> is on the western side of the ROW and outside of the impact area of the ROW. However given its close proximity the entire population would be fenced and staff would be made aware | River Flat Eucalypt Forest on Coastal Floodplain EEC Swamp Oak Floodplain Forest EEC Swamp Sclerophyll Forest on coastal floodplains <i>Grevillea parviflora</i> subsp. | C45 |

| Management Measure | Biodiversity Issue | Reference code (ref Appendix A) |
|--|---|----------------------------------|
| of its location to ensure there is no accidental damage to this population. | <i>parviflora</i> | |
| <p>This area provides habitat to a key population of Green and Golden Bell Frog, wetland birds and is adjacent to a RAMSAR site. The ROW would be aligned with the existing access track and dyke associated with the AGL pipeline. The Environmental Management Plan prepared for the project would include a specific plan or procedure for the Green and Golden Bell Frog which would include the requirement for a herpetologist to be onsite during all works in this area to ensure construction activities comply with the management plan or procedure, which would include 24 hr monitoring of open trenches and holes to ensure any animals entrapped are quickly released. The herpetologist would also provide advice to the construction team and implement Chytrid controls. All works would occur in the winter months and would avoid the GGBF breeding season of September to February. The open trench would be restricted to during daylight hours only.</p> <p>The area provides wetland habitat of international significance, the RAMSAR wetland is located on the eastern side of the track and high quality wetland habitat on the western side of the track. Maintaining water quality in this area is of paramount importance. A site specific Soil and Water Management plan, including a water quality monitoring program, would be prepared for this area in consultation with the CMA, relevant officers from DECC Parks and Wildlife group, a specialist wetland ecologist and herpetologist. The method of construction through this area would be prepared in consultation with the specialist herpetologist and wetland ecologist.</p> | <p>Green and Golden Bell frogs</p> <p>Wetland & Migratory Birds</p> <p>Coastal Saltmarsh EEC</p> <p>Ramsar site</p> | <p>C46</p> <p>C47</p> <p>C48</p> |
| This area would be surveyed and management measures developed prior to construction if the species occurs on site. | Squirrel Gliders | L12 |
| All other areas identified as limitations in Appendix A would be surveyed prior to construction to allow refinements of the ROW that would achieve avoidance of relevant constraints. Where avoidance is not possible, measures would be developed to ensure that impacts are managed to an acceptable level. | | L1-11 |
| Targeted searches would be undertaken for <i>Sida rohlenae</i> , <i>Digitaria porrecta</i> , <i>Zannichellia palustris</i> <i>Bothriochloa bilob</i> , <i>Rhizanthella slaterii</i> , <i>Lepidium monoplocoides</i> – <i>Dichanthium</i> | Threatened flora species | Refer to section 3.1.5 |

| Management Measure | Biodiversity Issue | Reference code (ref Appendix A) |
|---|--------------------|---------------------------------|
| <i>setosum</i> , <i>Diuris tricolor</i> , <i>Swainsona murrayana</i> , <i>Eucalyptus parramattensis</i> subsp. <i>Decadens</i> , <i>Homopholis belsonii</i> , <i>Goodenia macbarronii</i> , <i>Cyperus conicus</i> . Avoidance and management measures would developed prior to construction if any of these species occurs on site | | |

Table 4-2: Mitigation measures for all fauna habitats

| Fauna Habitat | Mitigation |
|----------------------|---|
| All habitats | <p>A weed management plan or protocol would be developed and included in the CEMP. The plan would consider the findings of the field assessment as detailed in Table 3-2. The plan or procedure would include hygiene protocols to reduce the risk of spreading weeds. Excavated material that contains weeds and weed seeds or propagules would not be stored near waterways or areas of native vegetation. Noxious weed management would occur for at least two years post construction.</p> <p>An ecologist would be onsite throughout the construction period to provide advice and particularly during clearing vegetation, waterway and wetland habitats and for clearing the trench of trapped fauna. The onsite ecologist would supervise and assist with the two staged clearing process which would involve clearing all understorey and smaller vegetation, leaving more mature vegetation for a minimum of 24 hours before clearing larger trees. When removing larger vegetation, a spotter would be present at each tree to be removed to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with plant operators. Prior to clearing larger trees, an excavator or loader would be used to hit the trunk as high up the tree as possible several times. Wait at least 30 seconds. Repeat this process several times. Once the tree is on the ground the ecologist should check for sign fauna.</p> <p>Direct contact with any wildlife should be avoided wherever possible. Uninjured wildlife must be encouraged to leave the site and injured wildlife should be handled by persons trained in native fauna rescue.</p> |
| All Aquatic habitats | <p>Aquatic habitats would be assessed by a qualified ecologist at the time of construction and specific mitigation measures would be selected depending on the features of the site to minimise impacts.</p> <p>Consultation with DPI and an aquatic ecologist would be undertaken when designing the crossing method, particularly for all watercourses that contain water at the time of construction.</p> <p>Where water is present and the crossing is over a Class 1 or 2 water way, fish passage would not be blocked for any period.</p> <p>A soil and water management plan would be prepared to ensure the risk of water pollution and infilling of habitats is minimised.</p> <p>All coarse woody debris and other aquatic fauna refuge such as riffles would be reinstated following construction.</p> |

5 CONCLUSION

The biodiversity fieldwork undertaken since the public display of the Environmental Assessment (EA) has clarified the constraints identified in the EA through field validation of the biodiversity features in and around the proposal. In some areas where physical access was not possible, minor limitations have been noted, and a process has been developed to ensure that potential constraints and impacts are appropriately considered and managed prior to construction. The results of the fieldwork have led to a number of alignment refinements, which have resulted in the avoidance of significant impacts to key biodiversity features. The biodiversity constraints identified have informed the latest revision of the pipeline and led to the development of Revision L. **Figures 3-1 to 3-35** illustrates that significant effort has gone into avoiding identified biodiversity constraints. In some areas, impacts could not be directly avoided predominantly due to their being no feasible option to align the proposal around the constraint. In these areas, site specific mitigation measures have been proposed to reduce potentially adverse impacts to an acceptable level.

The site specific mitigation measures give context and provide a specific location for the implementation of measures that have been prepared to specifically address biodiversity management across the entire pipeline corridor.

Despite the considerable efforts to avoid biodiversity issues, there are inevitably some impacts associated with the pipeline, these are summarised below.

- A maximum of 6.6 linear km of Coolibah Black Box woodland EEC. In all of these areas there has been a commitment to avoidance of all mature trees and a narrowing of the corridor to a minimum width.
- 0.9 linear Kilometres of Myall woodland EEC. Wherever possible the ROW would be minimised to reduce the area of impact through this EEC. No mature trees would be removed.
- 9.1 linear kilometres of White Box Yellow Box Blakeley's Red Gum Grassy Woodland and derived Grassland with exotic ground-cover listed under the TSC Act. All mature trees would be avoided and therefore it would only be the exotic understorey that would be affected through the construction phase. It should be noted that all areas of higher quality Box Gum woodland has largely been avoided.
- Patches of River Flat Eucalypt Forest on Coastal flood plain EEC with a 1.3 linear area.
- Patches of Swamp Oak Floodplain Forest EEC in a 1.8 linear kilometre area.
- Patches of River Flat Eucalypt Forest on Coastal flood plain EEC, Swamp Sclerophyll Forest EEC and Mangrove-Estuarine Complex in a 1.3 linear kilometre area.
- Patches of Mangrove -Estuarine Complex & Coastal Saltmarsh EEC in a 5.5 km linear area.
- All areas of the identified *Dichanthium* spp. Dominant grasslands of the Brigalow belt Bioregions listed under the EPBC Act have been avoided.
- All areas of the box gum woodland that conforms to both the TSC Act and the EPBC Act have been avoided with the exception of a maximum of 1 linear kilometre north of Murrurundi. The ROW just skirts along the edge of this community in this location. No mature trees would be removed and revegetation would include local provenance native grasses and shrubs consistent with the composition of the EEC.

Given the length and scale of the project, the corridor chosen reduces impacts to the minimum feasible. The nature and extent of pipeline projects are relatively temporary in nature. The measures in this report require that habitat features such as coarse woody debris, rocks and other terrestrial fauna refuges are

reinstated. Snags, riffle pools and other aquatic habitat features would also be reinstated. Revegetation with local provenance native flora species is proposed in a number of sensitive flora communities and for a number of habitats for threatened fauna species. Avoidance of mature trees, especially hollow bearing trees would also be a priority. There is also a commitment to the management of weeds along the pipeline corridor for a period of two years. If the mitigation measures proposed are implemented successfully then impacts are not expected to be significant. Impacts are short term and are confined to the specific area of construction. Operational impacts are not anticipated.