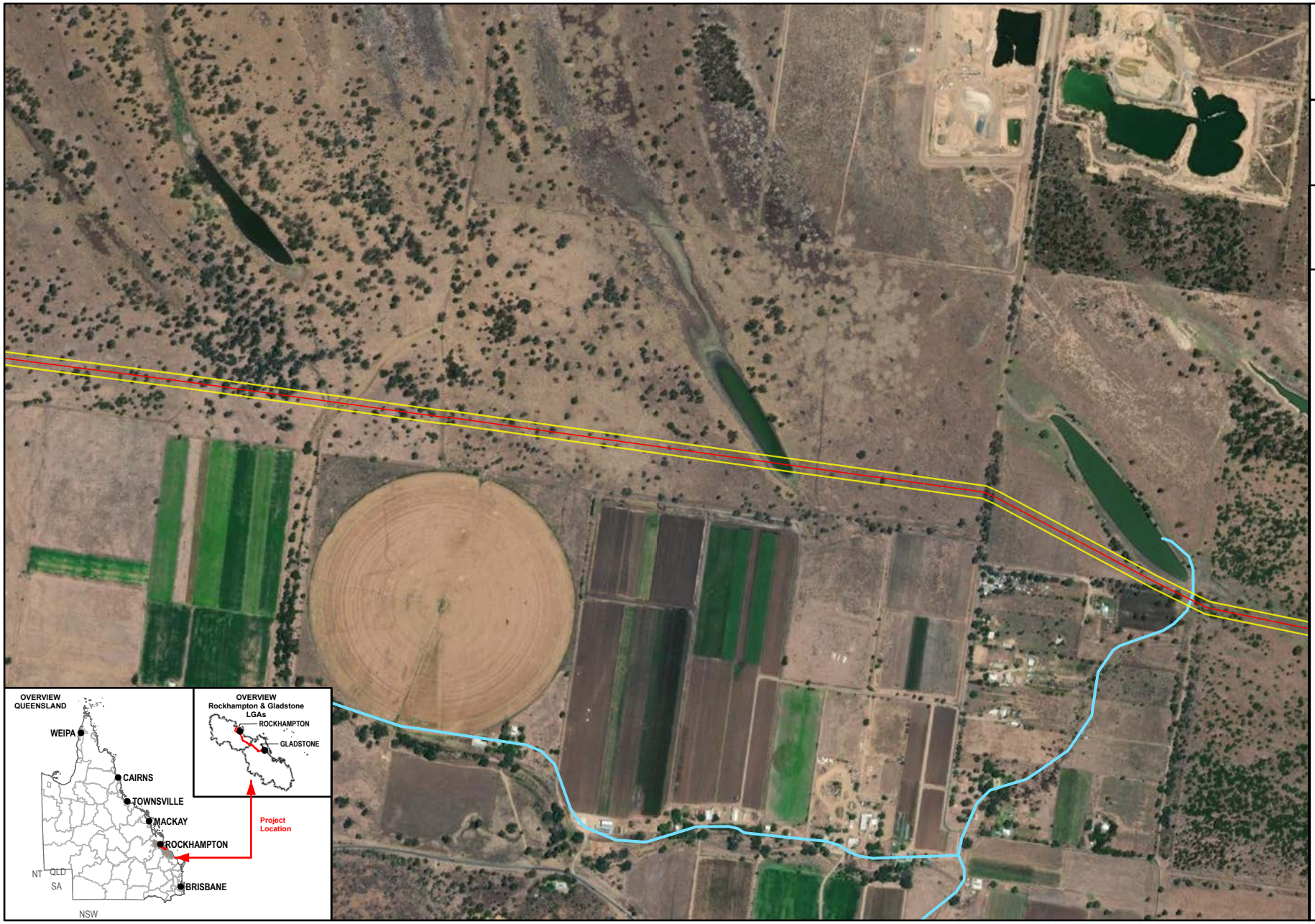

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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-13b1
Distribution of Powerful Owl Habitat Within the SGIC SDA Study Area
000-G-MAP-2435 Version:3 Date:19/09/2022

7.2.2.9 Greater glider (southern and central)

Conservation status and species ecology

The greater glider (southern and central) is listed as endangered under the EPBC Act and NC Act but was not listed as an MNES at the time of the approval. The species is restricted to tall eucalypt forests and woodlands with relatively old trees and abundance of hollow-bearing trees (DCCEEW 2022a). The species has a specialist folivorous diet, mostly comprising of eucalypt leaves (Eyre *et al.* 2022) and displays seasonal food preferences. As a result, the species requires access to forests with a diversity of eucalypt species to provide a consistent food source throughout the year (DCCEEW 2022a). The species has been most frequently recorded feeding on trees including *Corymbia citriodora*, *C. intermedia*, *Eucalyptus fibrosa*, *E. moluccana* and *E. portuensis*, with *C. citriodora* and *E. tereticornis* being important species in greater glider habitat (Eyre *et al.* 2022).

During the day, the species dens in tree hollows, with particular preference for large hollows (diameter >10 cm) in large, mature trees (DCCEEW 2022). Both live and standing dead hollow-bearing trees provide suitable denning habitat for the species; however, they are known to prefer live hollow-bearing trees (DCCEEW 2022a). The availability of mature, hollow-bearing trees is a limiting factor. In southern Queensland, the species require at least 2 to 4 live den trees within 2 ha of suitable habitat, whereas in NSW, the species has been found to be absent from forests with fewer than six hollow-bearing trees per ha (DCCEEW 2022a). The greater glider (southern and central) have also been recorded in regrowth forests, where hollow-bearing trees are sufficient (DCCEEW 2022a).

The species has a relatively small home range, typically 1 – 4 ha (DCCEEW 2022a). Studies revealed that the occupation of a small (< 3 ha) home range is consistent throughout the species Australian geographic range (Eyre *et al.* 2022). Given the species' limited capacity for dispersal, and reluctance to cross vegetation gaps, it is sensitive to habitat fragmentation (DCCEEW 2022). However, small or fragmented habitat patches that area connected to larger habitat patches can facilitate dispersal of the species and/or enable recolonization.

Field survey results and distribution of suitable habitat

The greater glider (southern and central) was not recorded during the field surveys within the SGIC SDA study area. Survey effort for the greater glider (southern and central) included one night of 2-3 hours of spotlighting and faecal pellet searches at nine locations within potentially suitable habitat in the SGIC SDA study area. Suitable habitat is widely distributed within the region and the species has been historically recorded at 14 locations within the desktop search extent (10 km buffer), the most recent recorded in 2011. Many of these records have been historically recorded in riparian habitats, in close proximity to drainage lines and watercourses, as well as elevated areas.

Suitable foraging habitat was recorded in eucalypt woodland areas retaining preferred tree species at numerous locations within the southern proportion of the SGIC SDA pipeline alignment. Suitable denning habitat was less widespread, restricted within an area retaining of remnant, mature vegetation within the SGIC SDA study area, approximately 3.5 km northwest of Mount Larcom. This woodland retains large, mature eucalypt trees supporting suitable hollows, and is connected to large patches of remnant woodland. The *Guide to greater glider habitat in Queensland* (Eyre 2022) states that an area containing more than 20 trees that are greater than 46.5 ± 7.5 cm DBH (DBH threshold for the Brigalow bioregion) within 1 ha represents suitable habitat for the species. This assessment was undertaken within the open woodland area identified as suitable denning habitat (diameter >10 cm), and 28 trees larger than DBH threshold were recorded within 1 ha of this area. Based on these results, this area represents suitable habitat for the species due to the high density of suitably large trees. The distribution of predicted greater glider (southern and central) habitat is mapped in Figure 7-14.

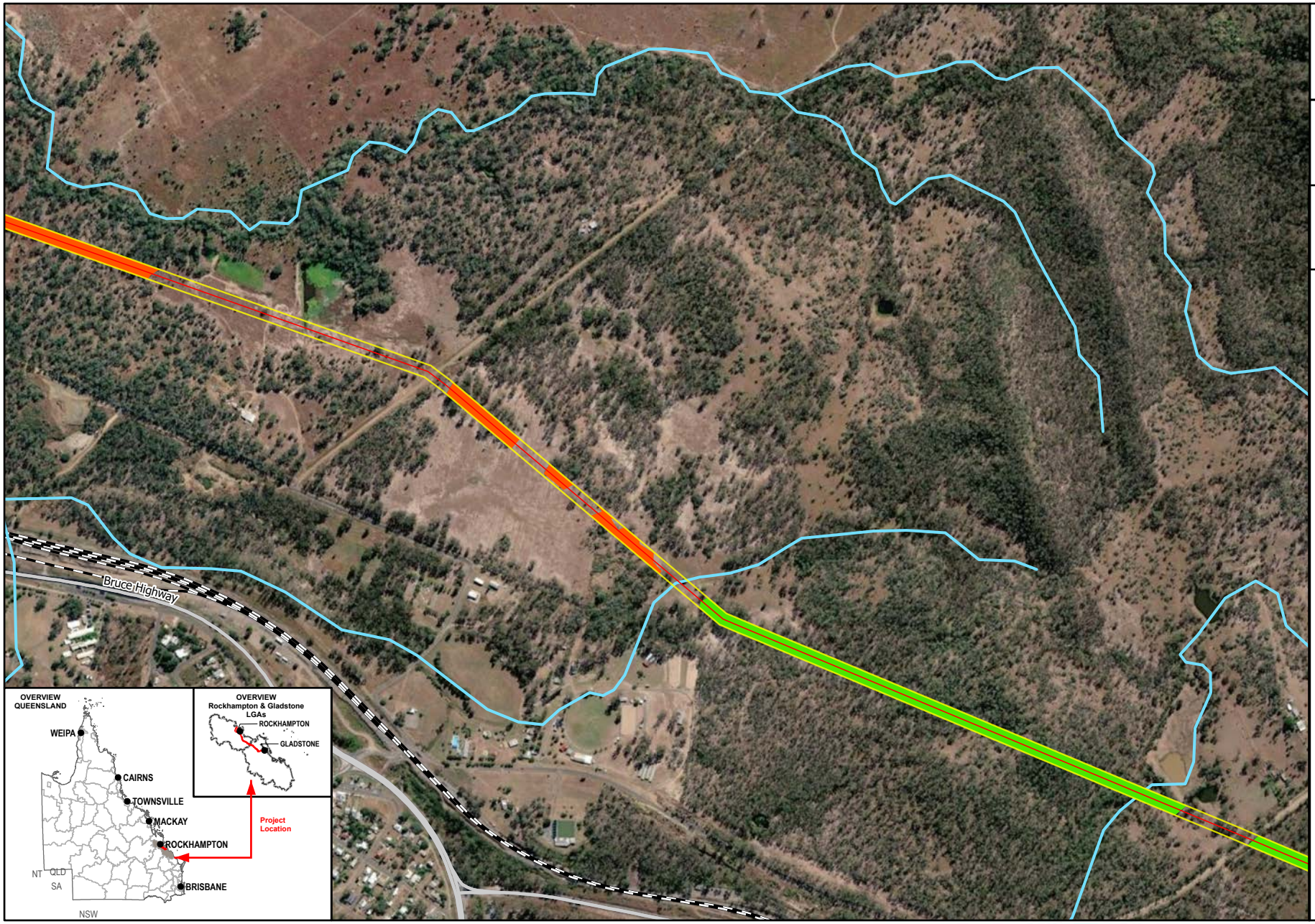
Significance of impact assessment

The project is likely to result in a significant residual impact on the greater glider (southern and central). A significance of impact assessment of the project on the greater glider (southern and central) (endangered under the EPBC Act and NC Act) is provided in Table 7-27.

Table 7-27 Significance of impact on the greater glider (southern and central)

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The greater glider (southern and central) has been historically recorded at 14 locations within the desktop search extent (10 km buffer). At a national level, all populations of the greater glider (southern and central) are considered important populations (DCCEEW 2022a). The project will result in the clearing of 3.63 ha of predicted foraging habitat and 26.29 ha of denning habitat for the species, representing 0.22% of habitat available within a 5 km buffer. The SGIC SDA pipeline alignment largely supports regrowth vegetation (retaining few hollow-bearing trees), younger remnant vegetation or open landscapes that have been previously cleared for agricultural practices. The remaining areas support remnant vegetation, providing suitable foraging and denning sites for the greater glider (southern and central). Clearing has the potential to cause direct mortality and injury of individuals. This risk will be mitigated by the employment of a fauna spotter-catcher during clearing to check hollows in large fallen trees and relocate any encountered individuals. Sequential clearing will also be adopted to allow species to self-disperse and tree felling will occur towards cleared areas, rather than towards standing vegetation. The project is not considered likely to lead to a long-term decrease in the size of the greater glider (southern and central) local population. Considering the greater glider (southern and central) has been recorded extensively within the surrounding landscape, the local population of the species is anticipated to remain largely unaffected due to the availability of habitat within the surrounding landscape. The loss of vegetation within the SGIC SDA pipeline alignment is unlikely to (1) limit movement of resident or transient individuals; nor (2) affect the availability of resident or transient individuals to acquire key resources. The project is unlikely to lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	**Unlikely** The project will result in a loss of 29.92 ha of predicted habitat for the greater glider (southern and central); however, much of this lacks key resources – namely mature, hollow-bearing *Eucalyptus* trees. Suitable denning habitat within the SGIC SDA pipeline alignment is located within an area retaining remnant, mature vegetation within the SGIC SDA study area, approximately 3.5 km north west of Mount Larcom. The maximum width of clearing required for construction of the SGIC SDA pipeline alignment is 30 m. Once the pipeline has been installed and buried, a maximum width of 10 m will be permanently cleared with the remaining 20 m to be rehabilitated. Clearing along the SGIC SDA pipeline alignment is unlikely to impact the species' ability to move nor access resources in adjacent habitats, as the proposed clearing extent is narrow (30 m) and mostly linear, and unlikely to generate edge effects or impact ecosystem structure and functioning. Given the minimal loss of 29.92 ha of suitable habitat, negligible impact of local and landscape connectivity, and low levels of disturbance during the operation phase, it is unlikely to have any significant indirect impact on the species. While there will be a localised loss of habitat for the greater glider (southern and central) (including ecological significant locations), this will not have a bearing on the species' extent of occurrence. Accordingly, the project is unlikely to reduce the extent of occurrence of the species, especially noting the definition of extent of occurrence per the Queensland *Significant Residual Impact Guideline* (DEHP 2014b): *Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon*.
Fragment an existing population	**Unlikely** Greater gliders have been recorded gliding up to 100 m (Menkhorst and Knight 2011), but it is more widely accepted that their typical maximum gliding distance is 60 m (Weston 2003), and an average glide length is typically 25 to 35 m (with a launch height of 20 to 25 m) (Australian Museum Business Service 2001). The ability to glide at these distances enables gliders to traverse relatively open habitat providing that the distance between trees does not exceed the species' gliding capability (references within Ball and Goldingay 2008). Even when the distance between trees exceeds the maximum gliding distance, some glider species will glide some of the distance and then move across the ground to the next tree for the remaining short distance (van der Ree *et al*. 2003). The maximum width of clearing required for construction of the SGIC SDA pipeline alignment (i.e. 30 m) is not considered to exceed the volplane distance of the species (>100 m). As such, habitat loss within the SGIC SDA pipeline alignment is not expected to impact connectivity with surrounding greater glider (southern and central) habitat retained on either side of the corridor as the habitat losses will be localised and is unlikely to create large gaps that present new barriers to greater glider (southern and central) movement.

Significant residual impact criteria	Potential to occur
	Connectivity to extensive areas of suitable habitat will persist in the surrounding landscape allowing opportunities for movement. Furthermore, large areas of remnant habitat are located within Mount Stowe State Forest, Calliope Conservation Park and Mount Larcom. Therefore, the SGIC SDA pipeline alignment is unlikely to fragment an existing greater glider (southern and central) population.
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** As detailed above, the species' capacity to move locally and regionally is unlikely to be limited by any localised clearing necessary to construct the SGIC SDA pipeline alignment. As a result, the project is unlikely to cause any form of genetic isolation at a population level.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	**Unlikely** The project is unlikely to result in the introduction or spread of invasive species beyond current levels. The implementation of a site-specific Weed and Pest Management Plan will further reduce potential impacts of invasive species. As such, the project is not expected to result in invasive species that are harmful to the greater glider (southern and central) becoming established in the species' habitat.
Introduce disease that may cause the population to decline	**Unlikely** Disease is not a known threat to the species; however, greater glider habitat is susceptible to *Phytophthora cinnamomi* due the soil fungus's ability to infect eucalypt species. Clearance of vegetation will engage standard hygiene protocols to limit the potential for introduction or spread of phytophthora throughout the SGIC SDA pipeline alignment (i.e. beginning works with clean vehicles and undertaking clearing works during dry conditions). Considering the implementation of strict biosecurity protocols, the project is unlikely to introduce a disease that may cause the species to decline.
Interfere with the recovery of the species	**Unlikely** The project is unlikely to interfere with the recovery of the species. The greater glider (southern and central) has been widely recorded within region, with large, contiguous patches of suitable habitat located adjacent to the project. Although the project will remove 29.92 ha of predicted habitat, equating to 0.22 % of habitat available within a 5 km buffer, the remaining habitat is connected to an extensive network of suitable habitat to facilitate dispersal of the species and enable recolonization. The project is expected to clear a maximum corridor width of 30 m, that is well below the species maximum volplane distance (> 100 m) and is unlikely to produce fragmentation or habitat isolation. The risk of individual mortality or injury during construction will be addressed via the mitigation measures in the CEMP and the use sequential clearing and an experienced fauna spotter-catcher during clearing. Noting the above points relating to very limited if any effects on local populations (e.g. declines), extent of occurrence, fragmentation, invasive species, and disease, the project is not considered likely to interfere with the recovery of the greater glider (southern and central).
Result in disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species	**Likely** The project will require the clearing of 3.63 ha of potentially suitable foraging habitat and 26.29 ha of potentially suitable denning habitat for the greater glider (southern and central). Although the SGIC SDA pipeline alignment has largely been placed within or adjacent to areas that have been previously cleared, the project will result in a loss of species preferred feed and den tree species, including *Corymbia citriodora*, *Eucalyptus moluccana*, *E. tereticornis* and *E. crebra.* Four tree species have been identified as frequently used foraging trees (Eyre *et al.* 2022), two of which were recorded within the SGIC SDA study area, including *C citriodora* and *E moluccana.* In some months, the species has also been identified to favour *E. tereticornis* and *E. crebra* (Eyre *et al.* 2022), which were both observed throughout the SGIC SDA study area. A study undertaken by Smith *et al.* 2007, found that greater gliders within the Brigalow Belt bioregion preferred certain tree species, including *E. fibrosa, E. moluccana* and *C citriodora*, for denning and foraging. While the project is not expected to cause a long-term decline in the local population, reduce its extent of occurrence, cause adverse habitat fragmentation effects nor interfere with the recovery of the species, the loss of suitable greater glider (southern and central) habitat within the SGIC SDA pipeline alignment is likely to result in disruption to ecological significant foraging and breeding locations.
Conclusion	A conservative assessment has identified that the project is likely to result in a significant residual impact on the greater glider (southern and central). Although the GSDA pipeline alignment has been located within areas that have been previously cleared for agricultural practices and linear infrastructure such as railways, roads, access tracks and pipelines, the project will require the clearing of 2992 ha of woodland areas retaining preferred food trees and suitable denning habitat (diameter > 10 cm) within the SGIC SDA pipeline alignment.



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:

1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2. Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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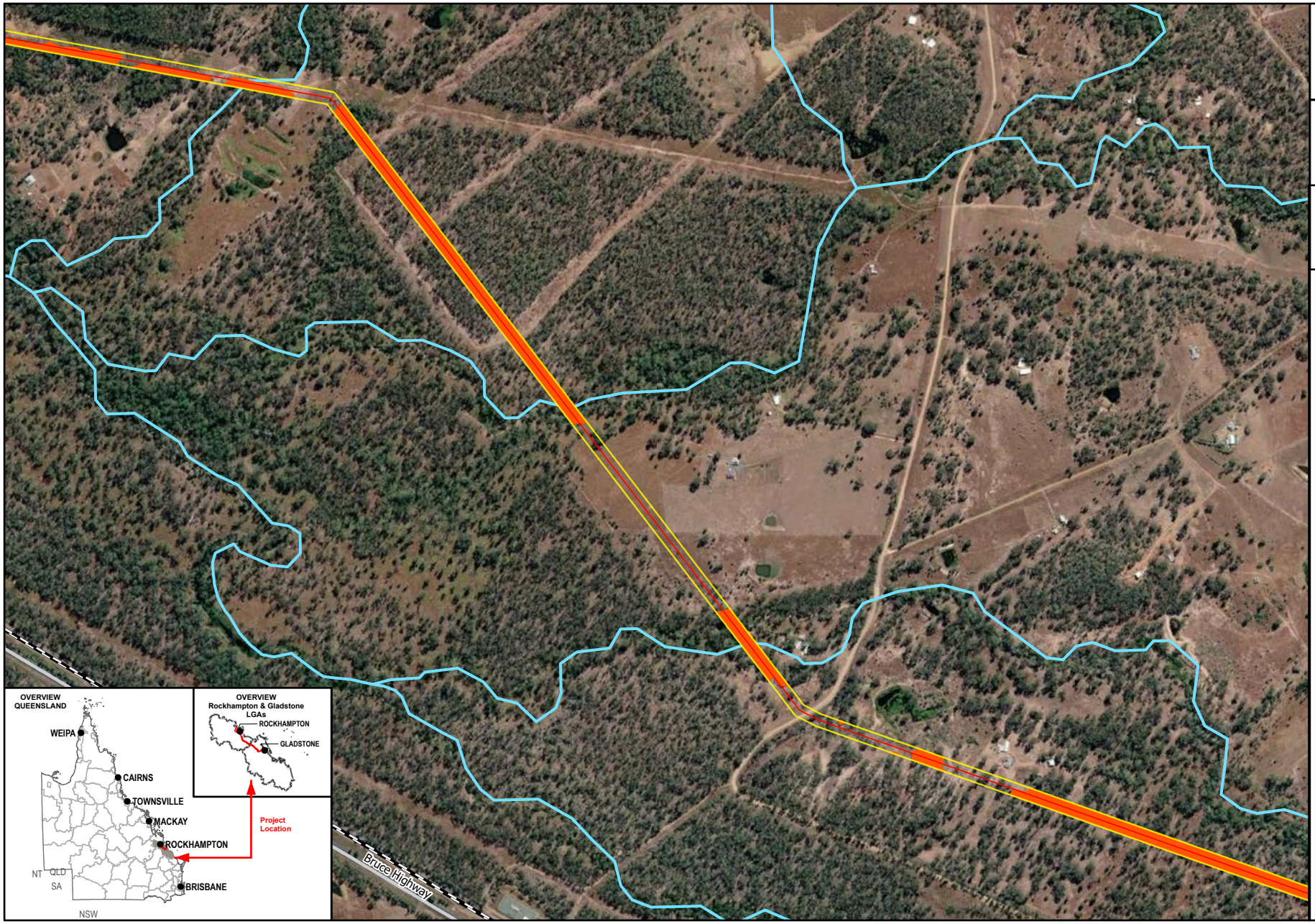
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14a
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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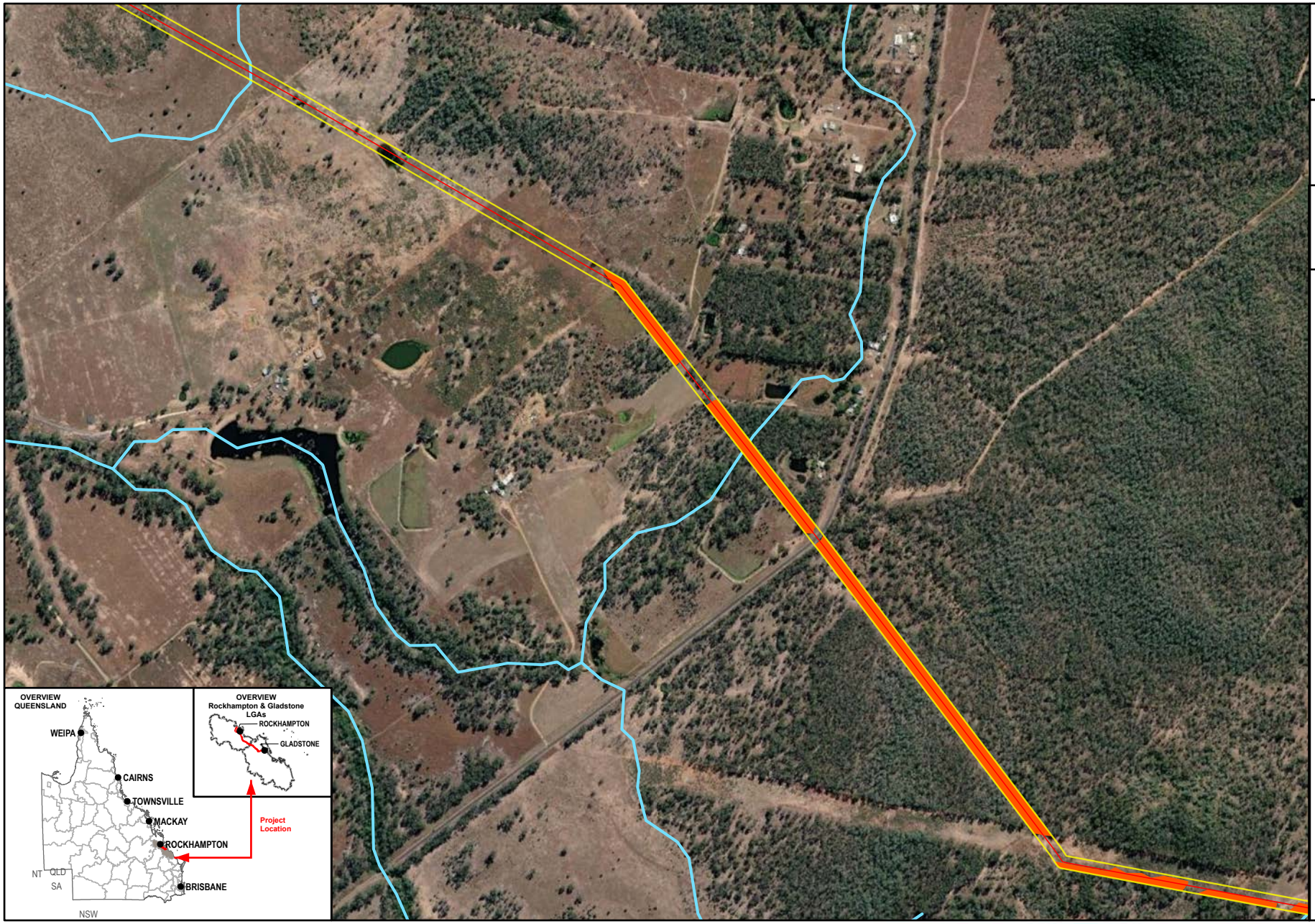
Figure 7-14b
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways

Data Sources:
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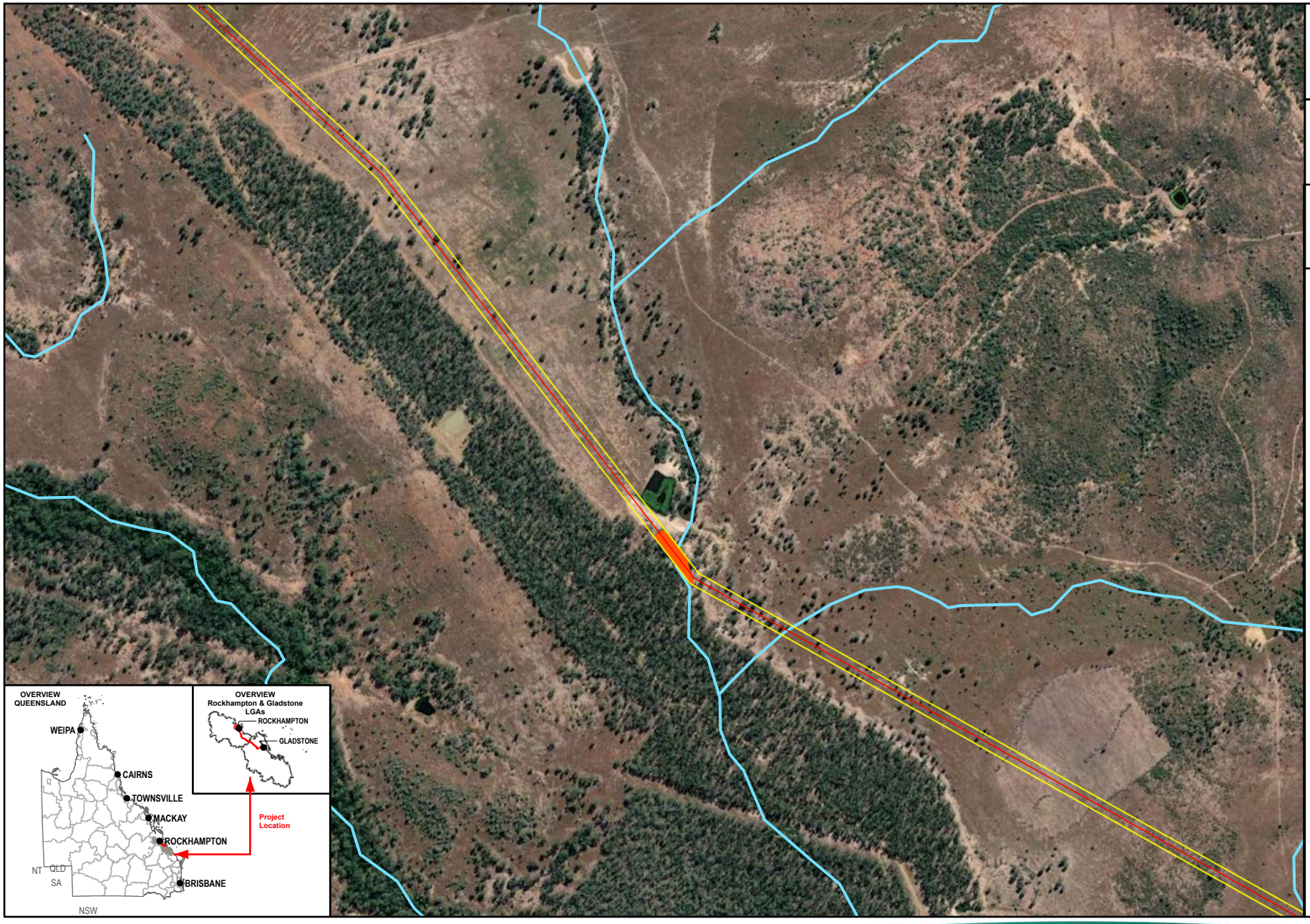
Figure 7-14c
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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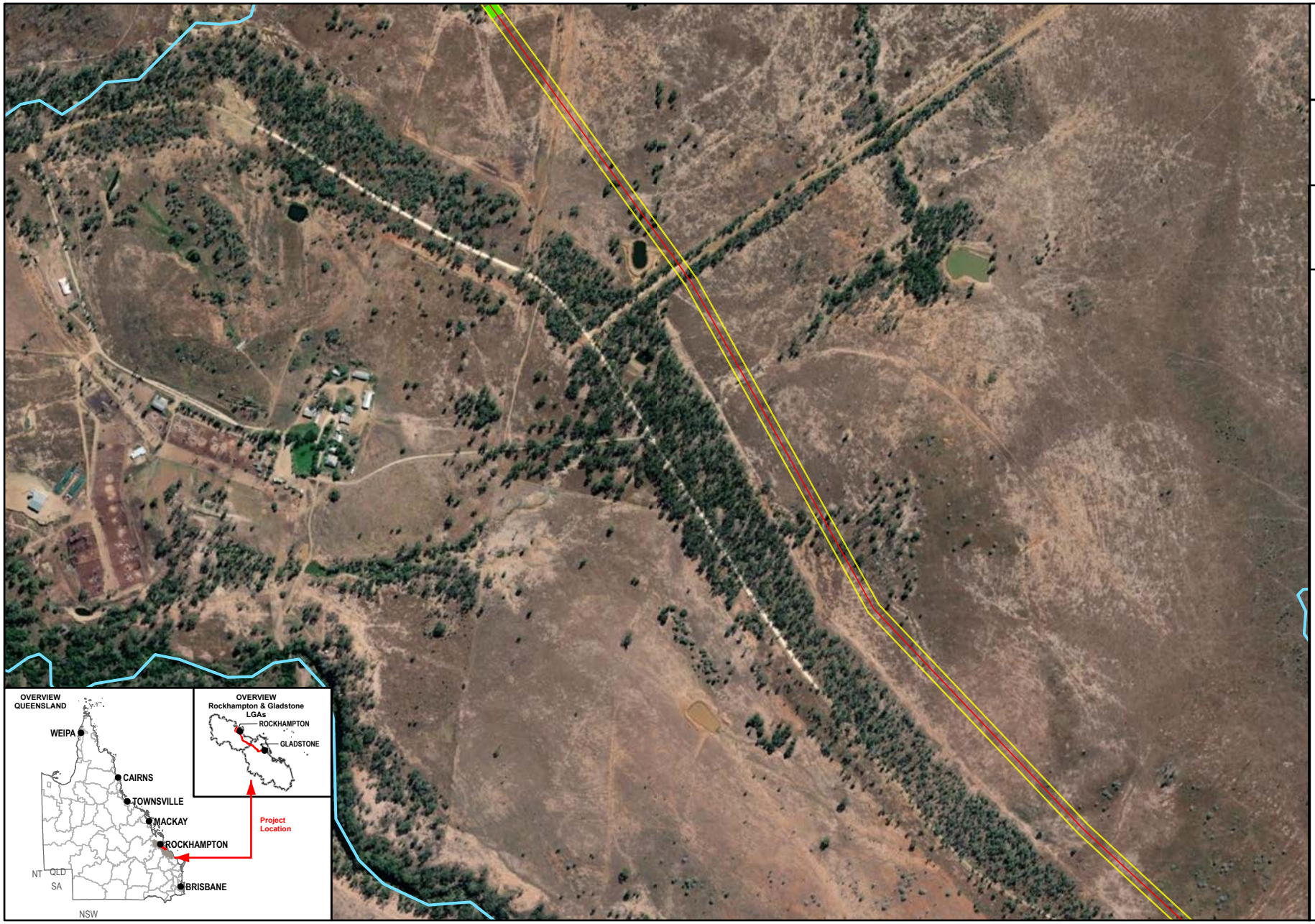
Figure 7-14d
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Waterways

Data Sources:
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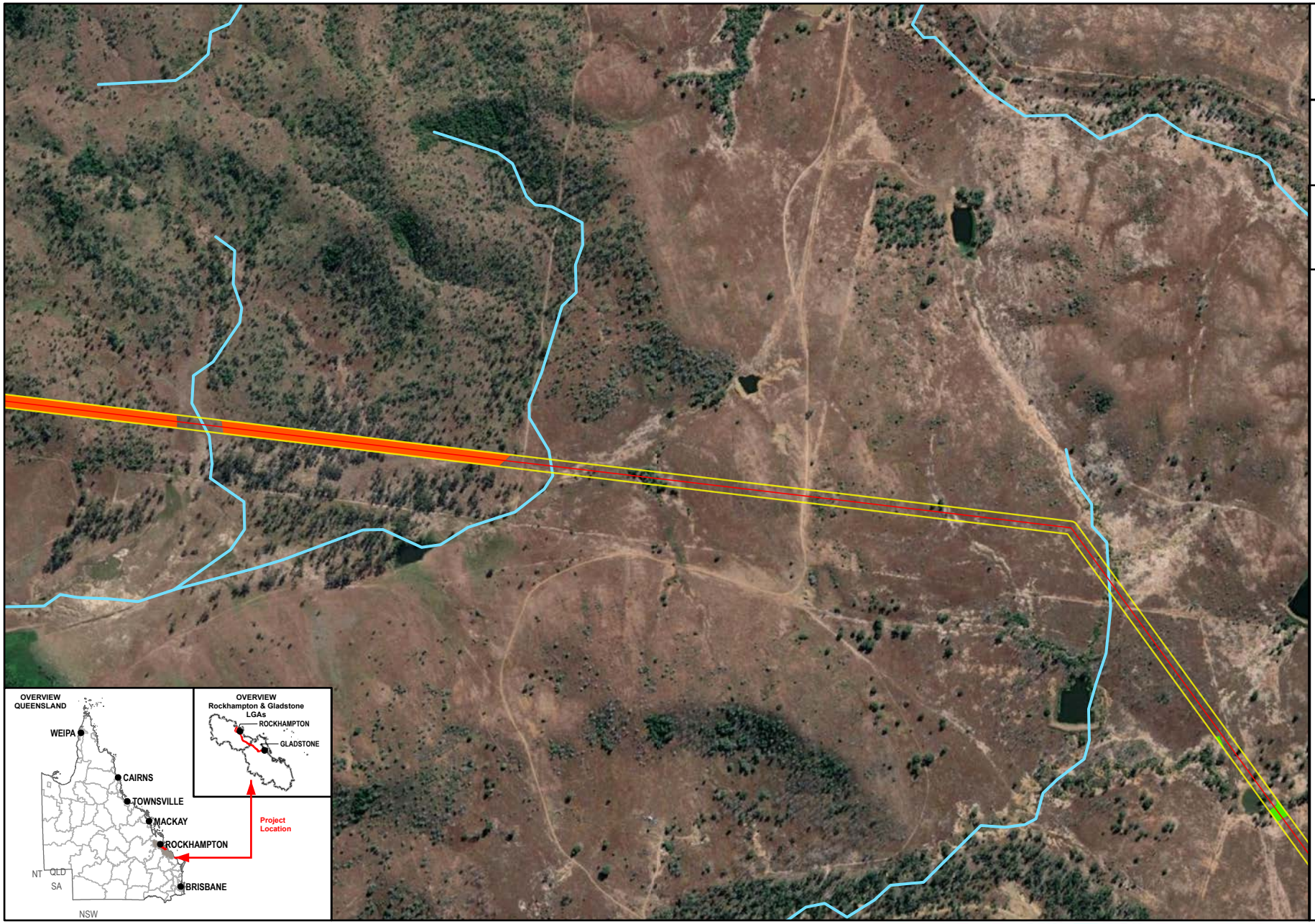
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14e
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways

Data Sources:
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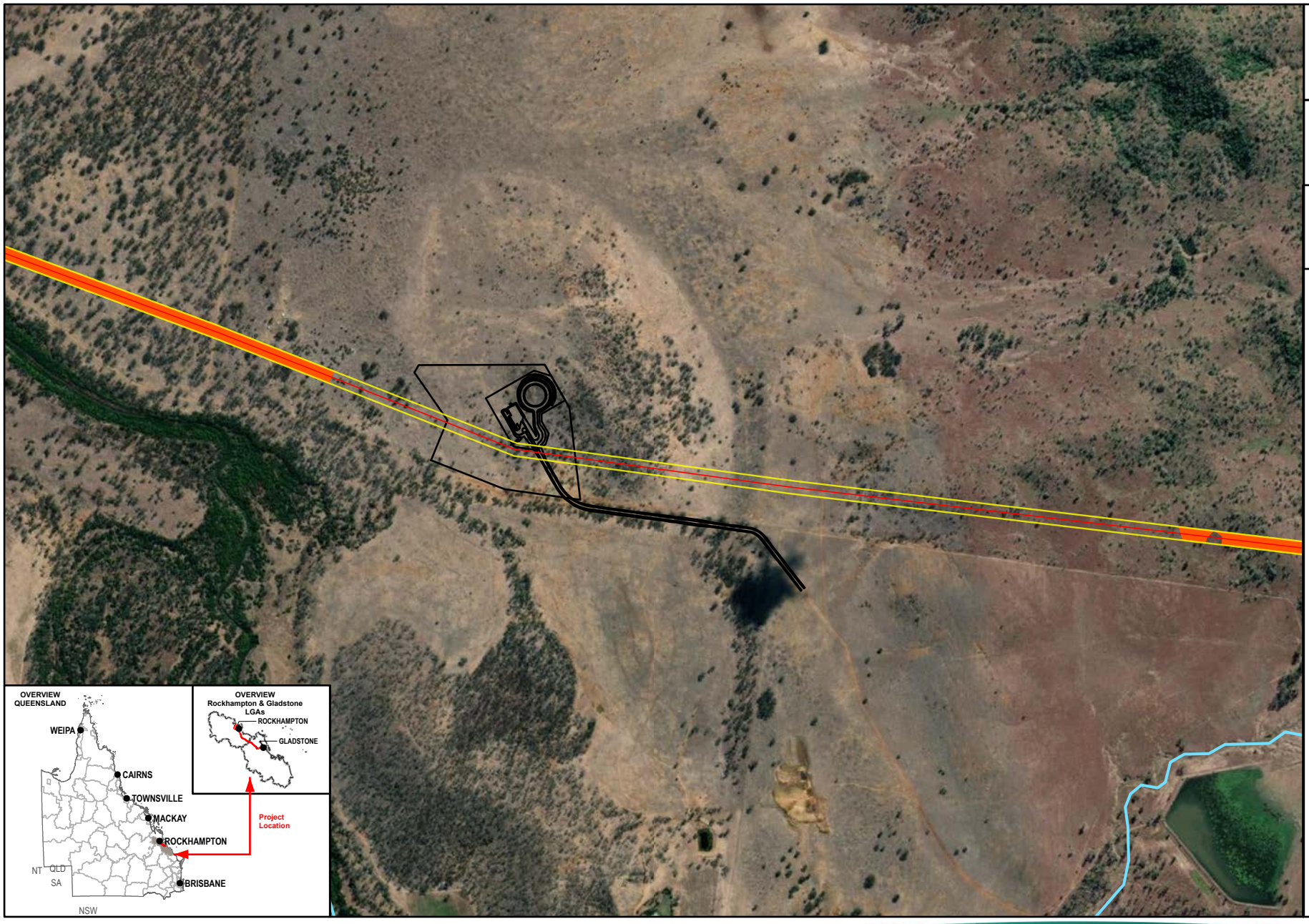
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14f
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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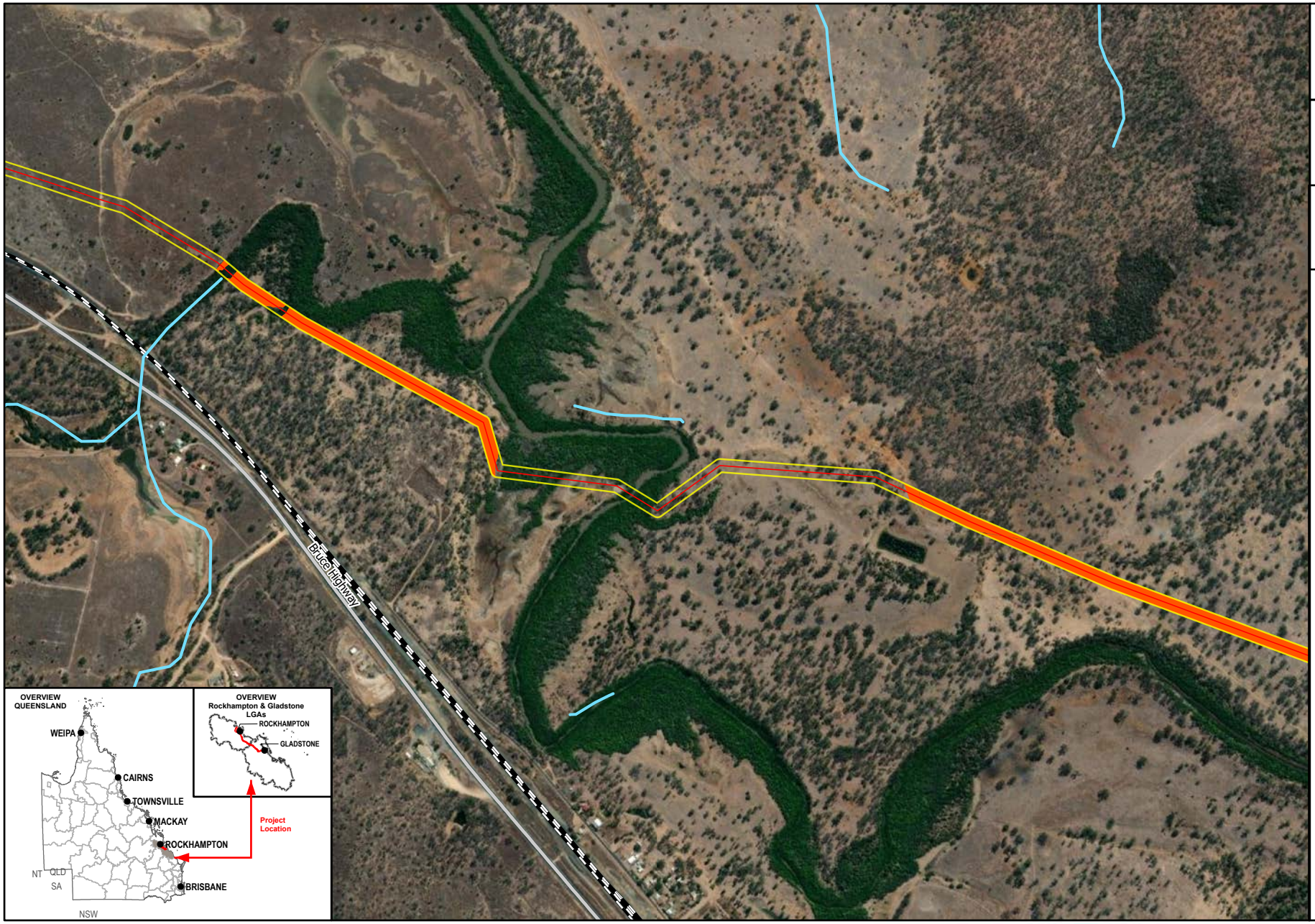
Figure 7-14g
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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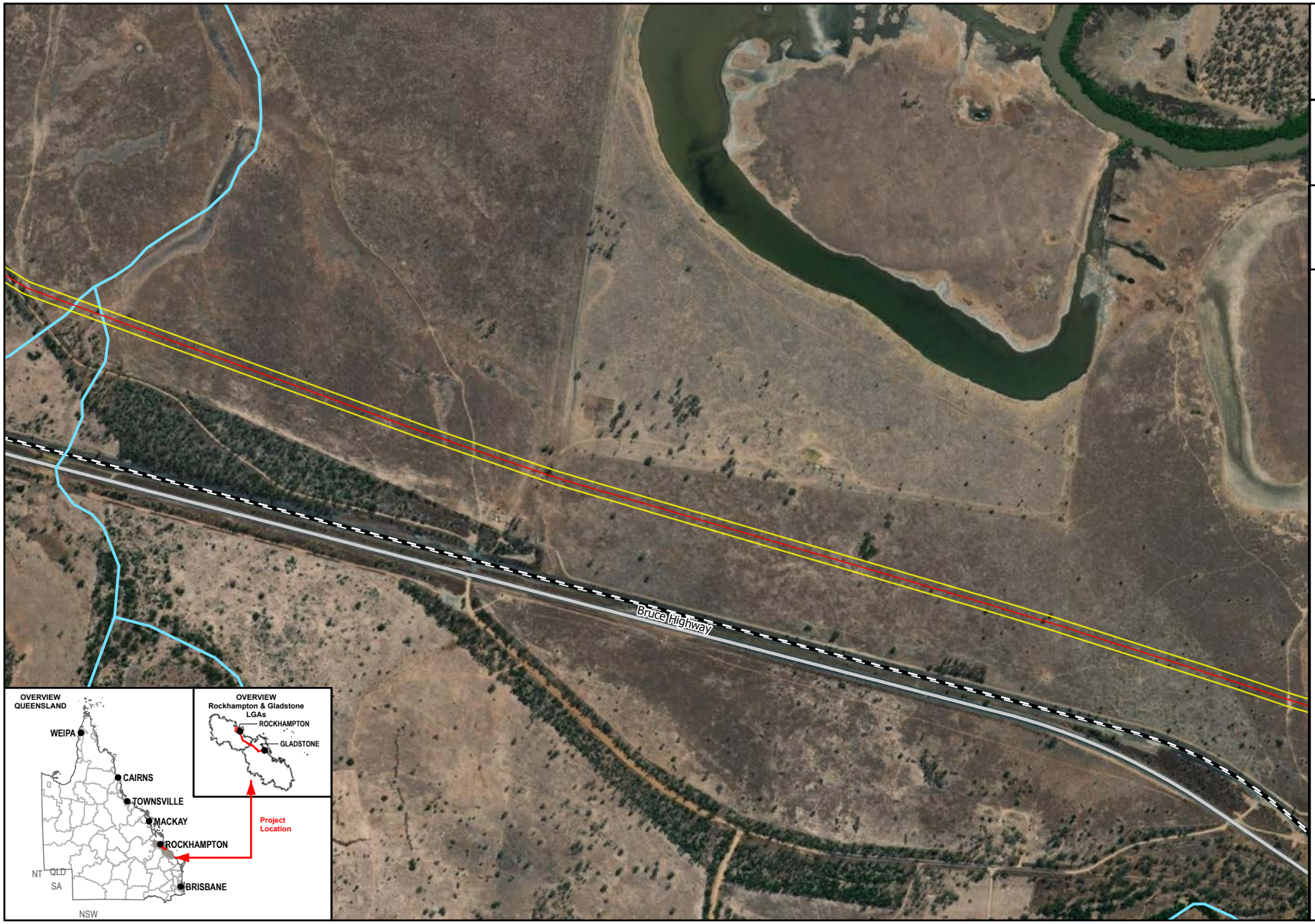
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14h
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
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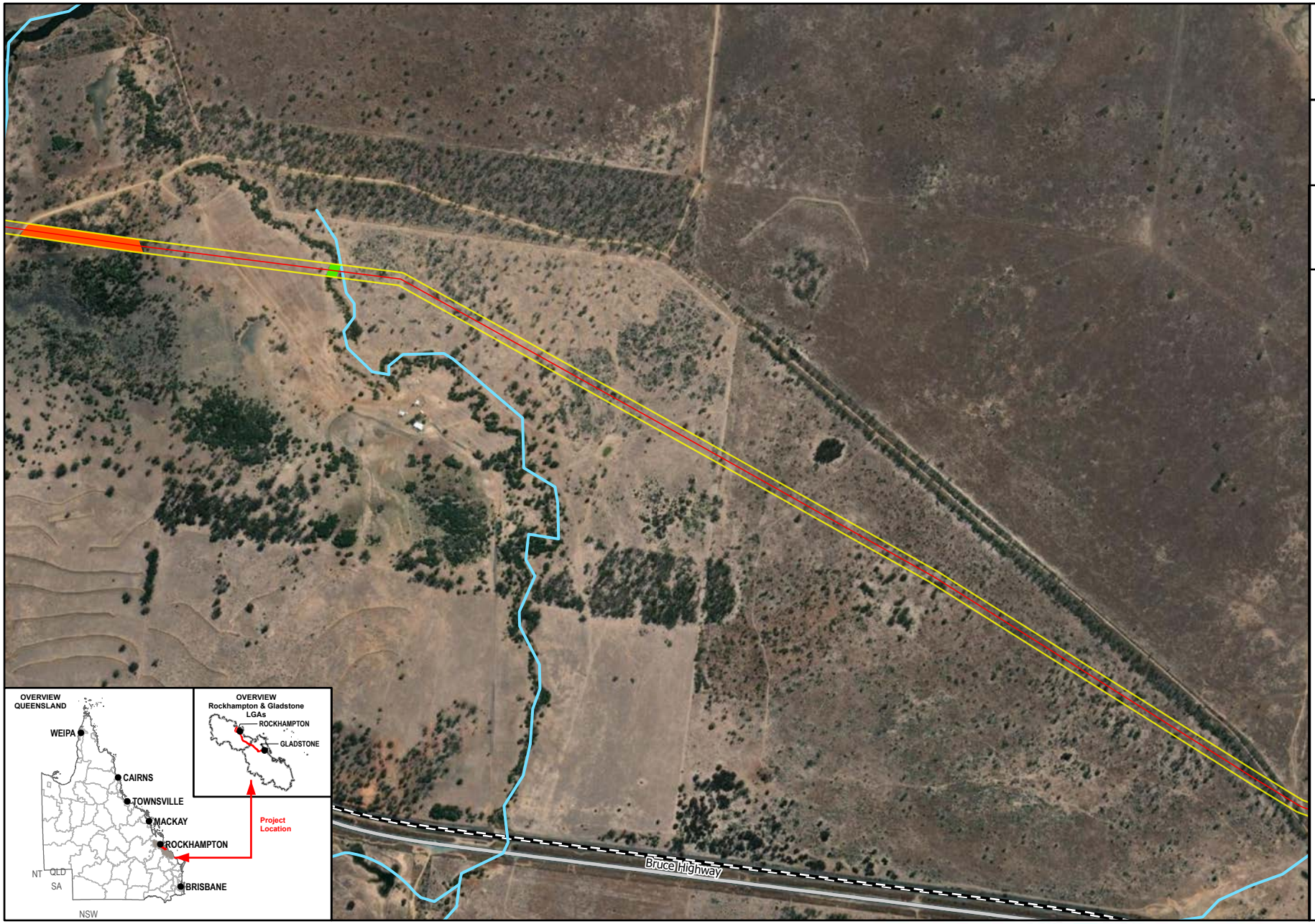
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14i
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:

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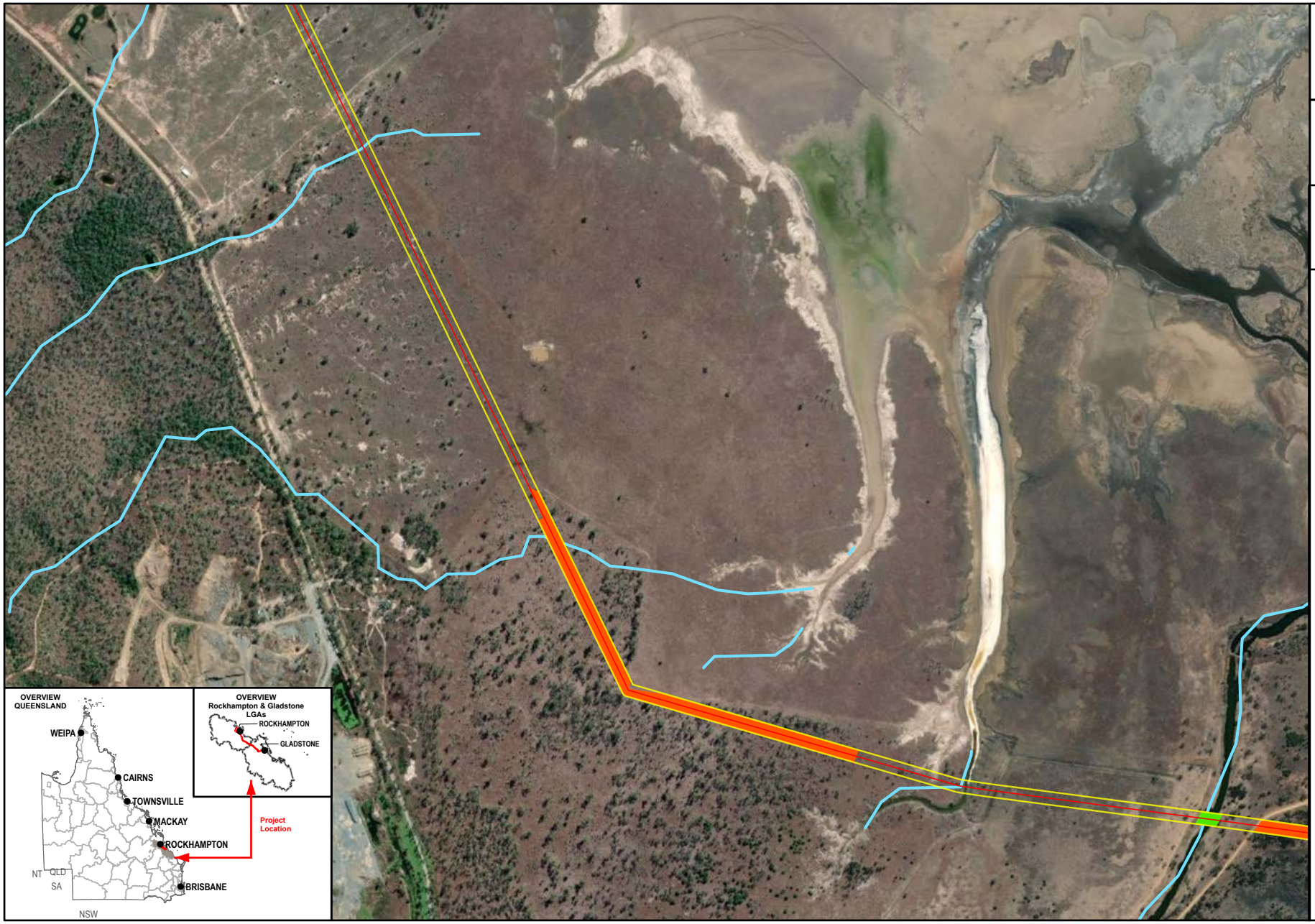
Figure 7-14j
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways

Data Sources:
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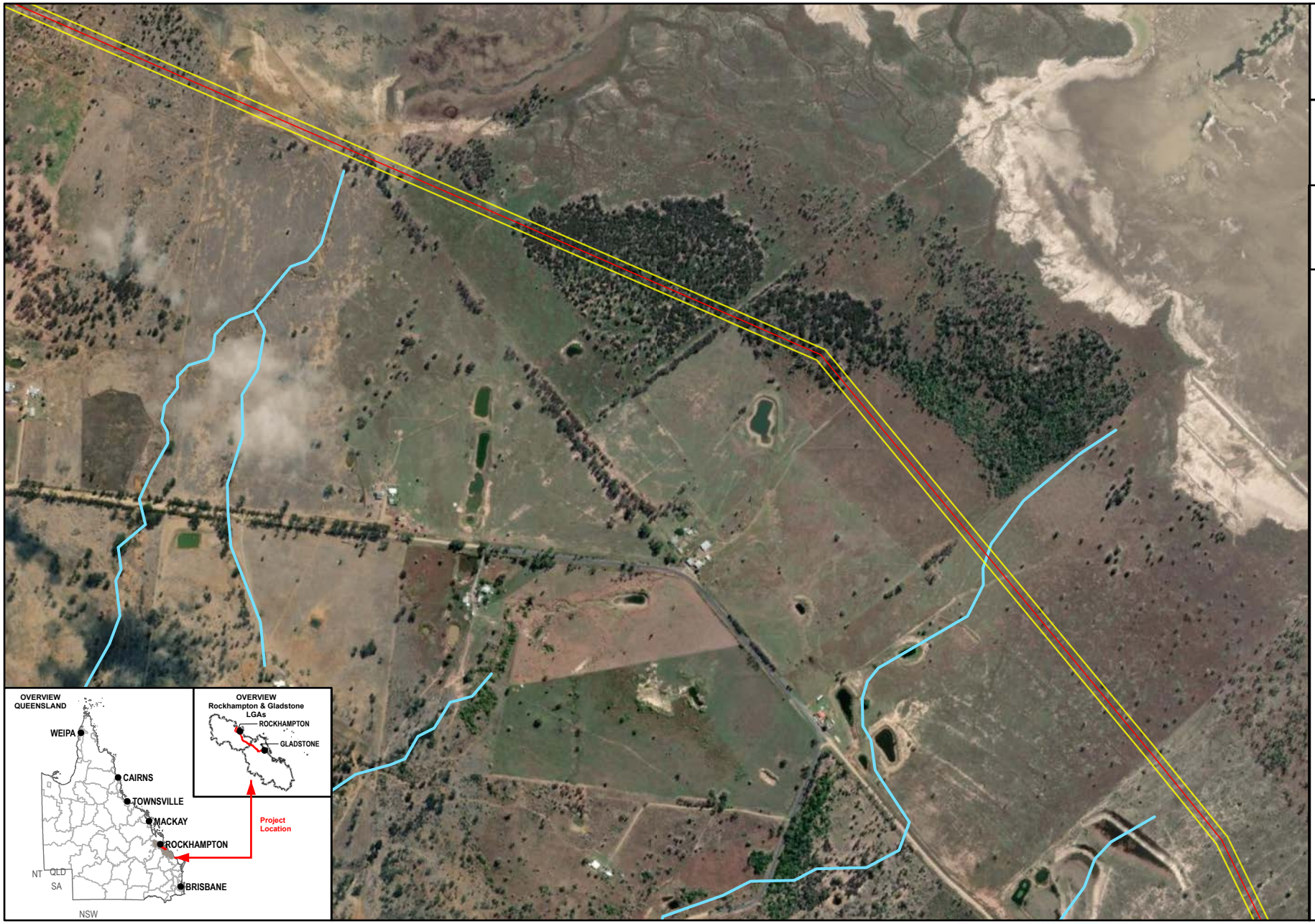
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14k
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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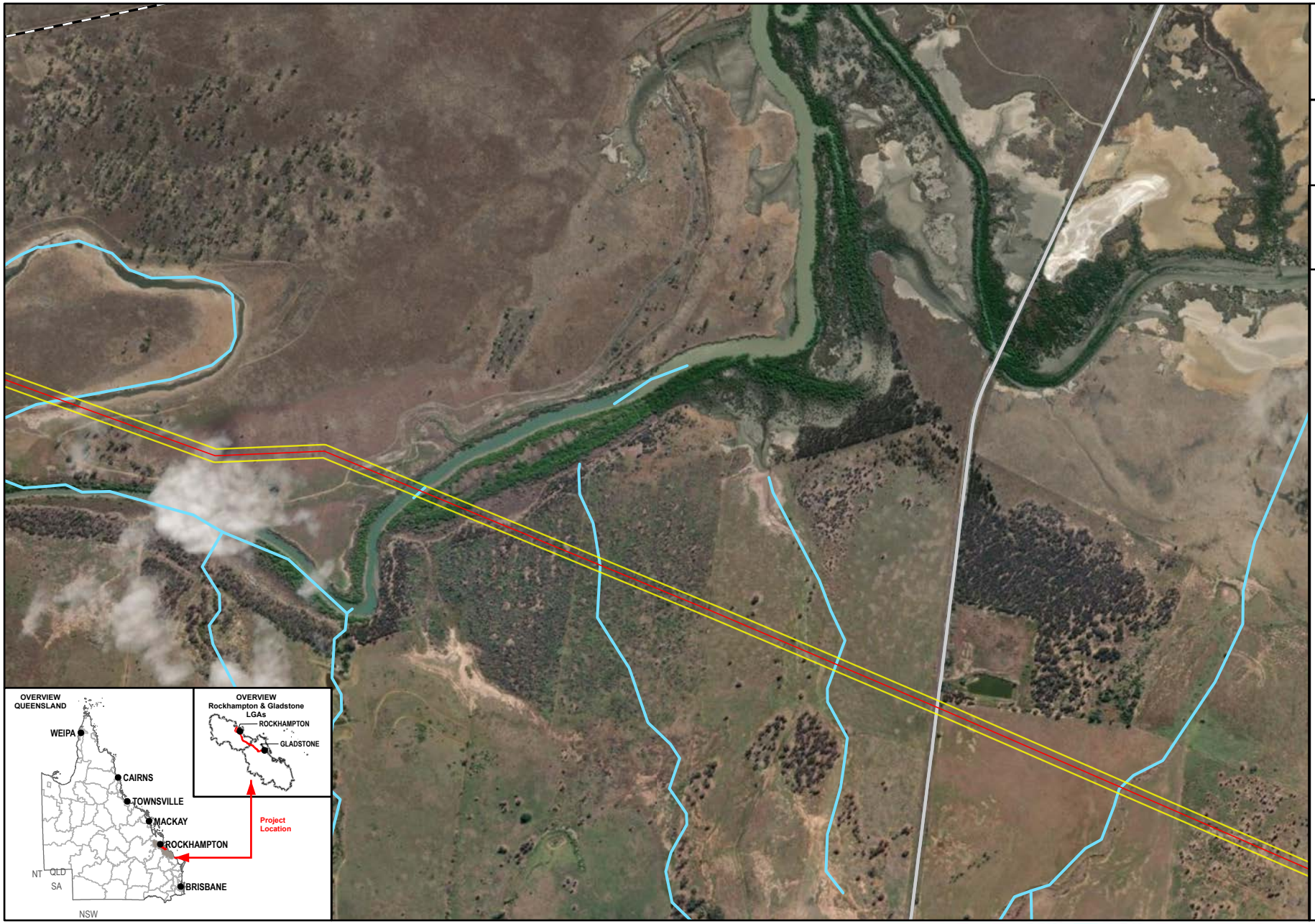
Figure 7-14l
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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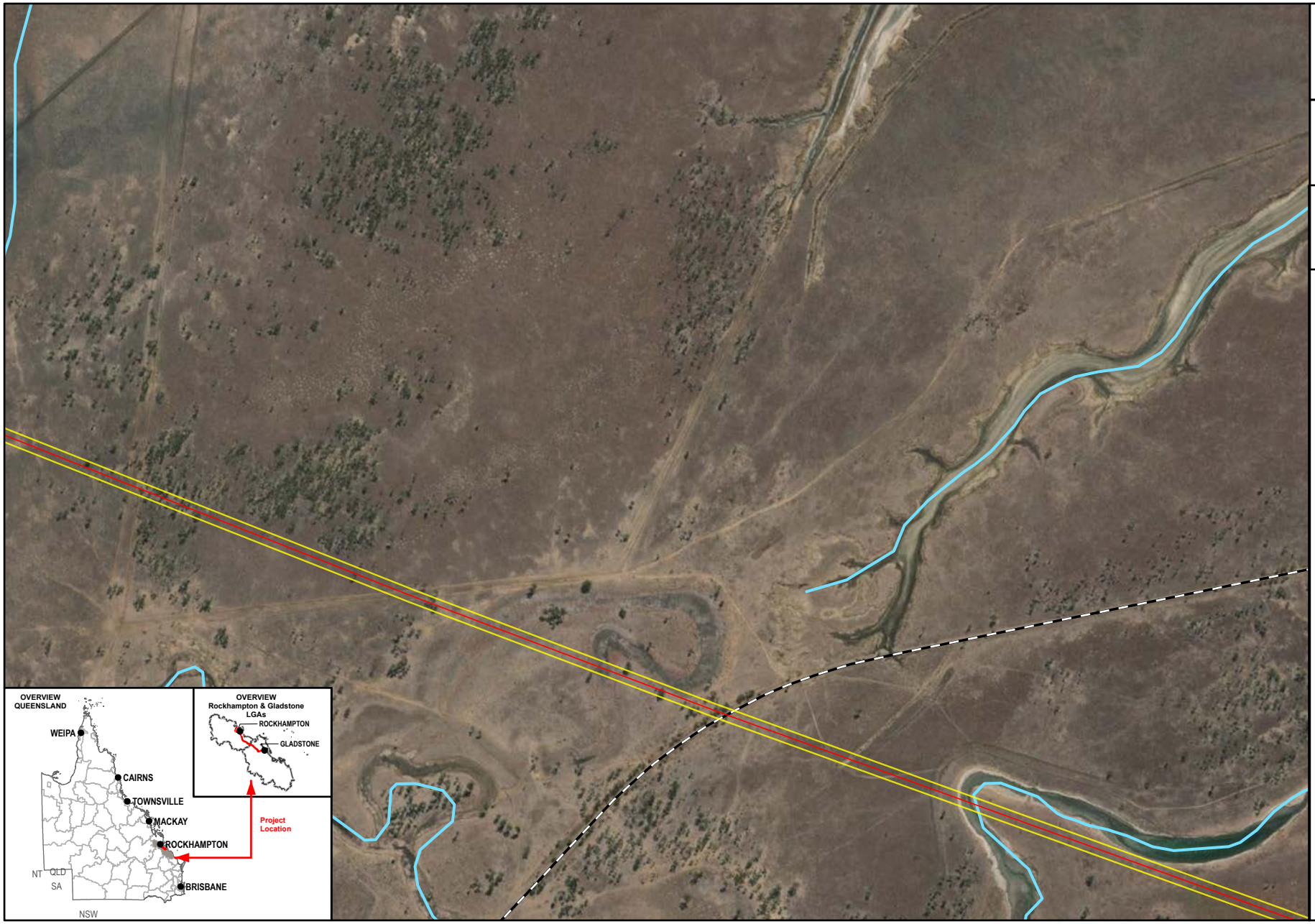
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14m
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
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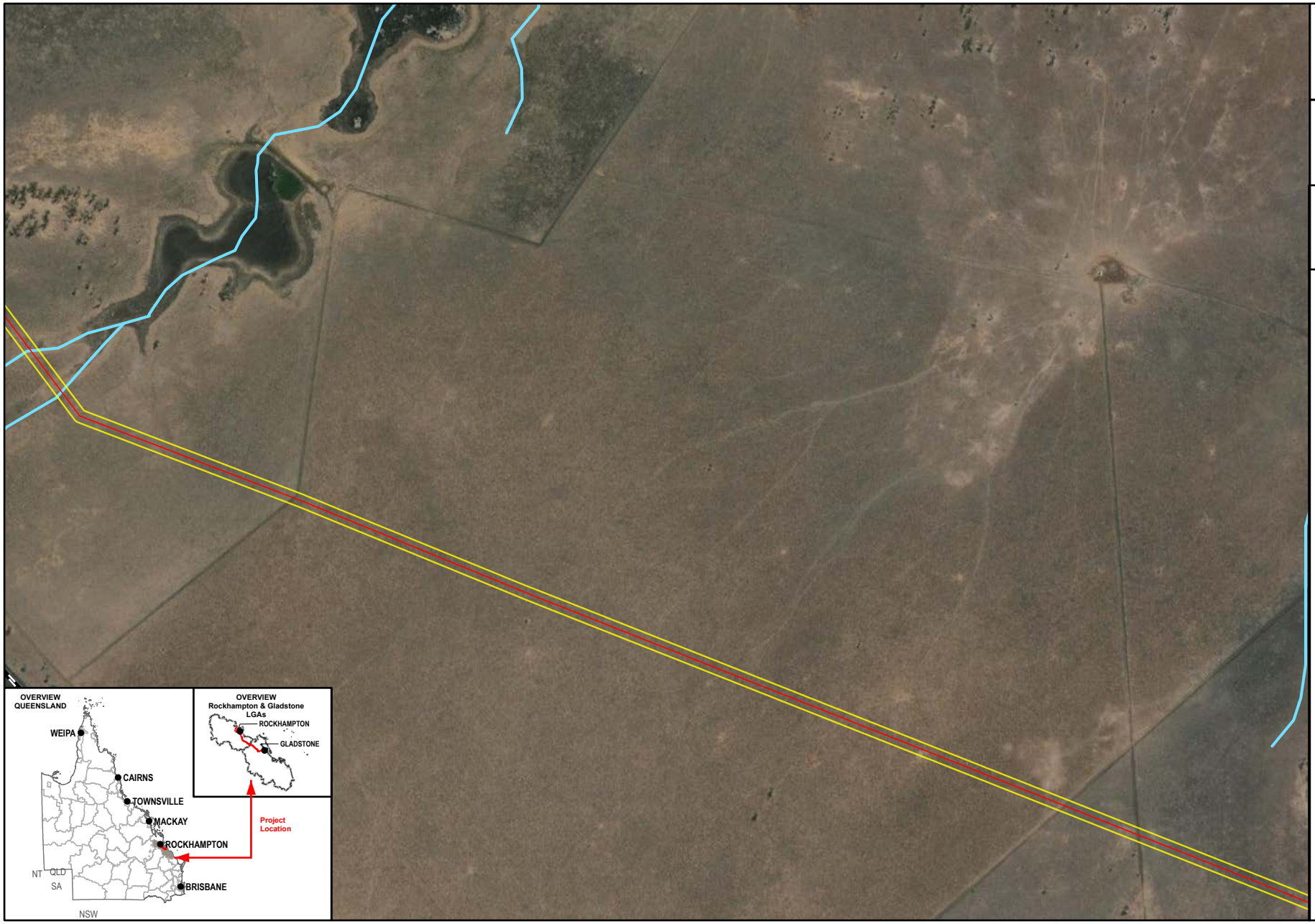
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

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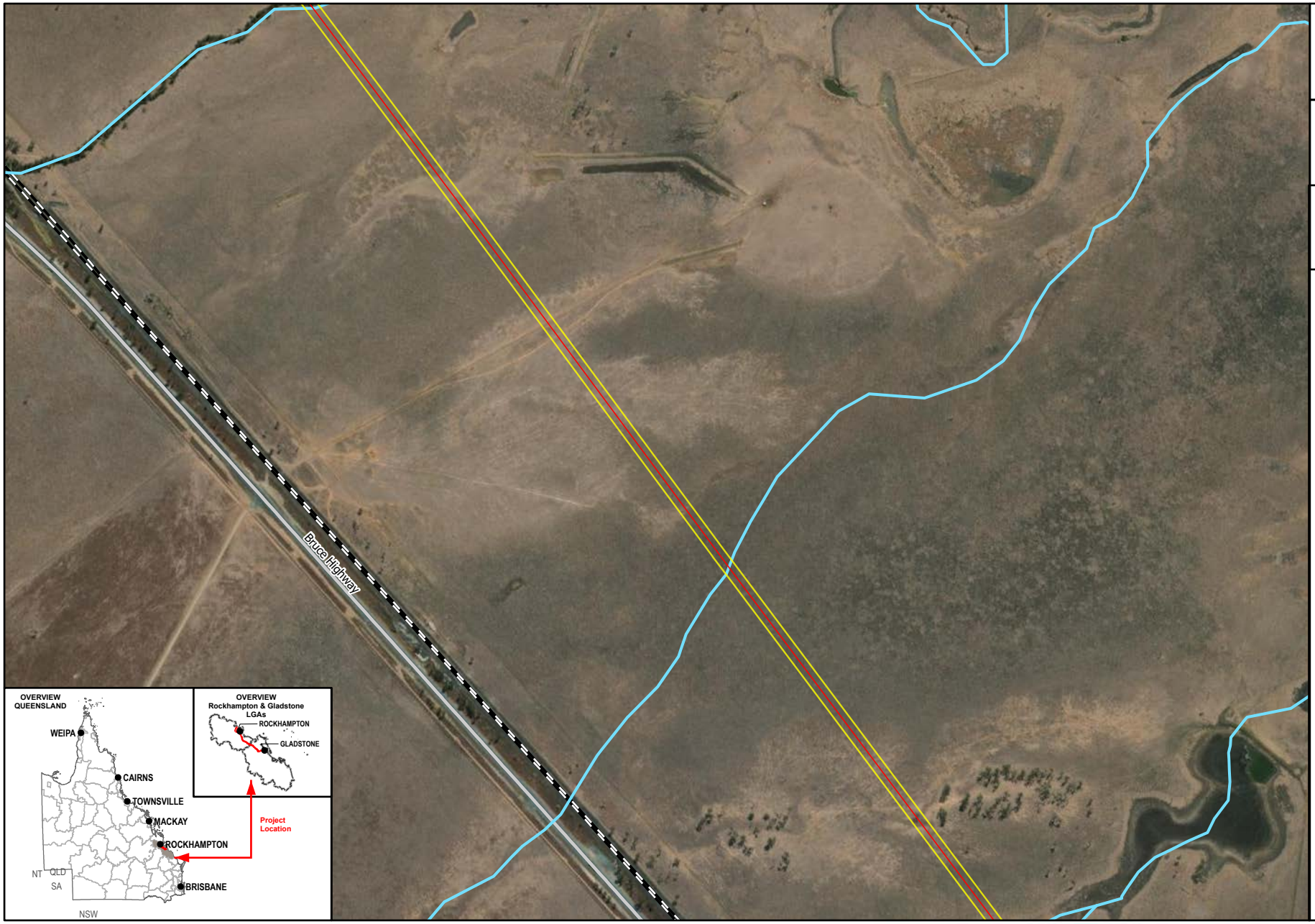
Figure 7-14o
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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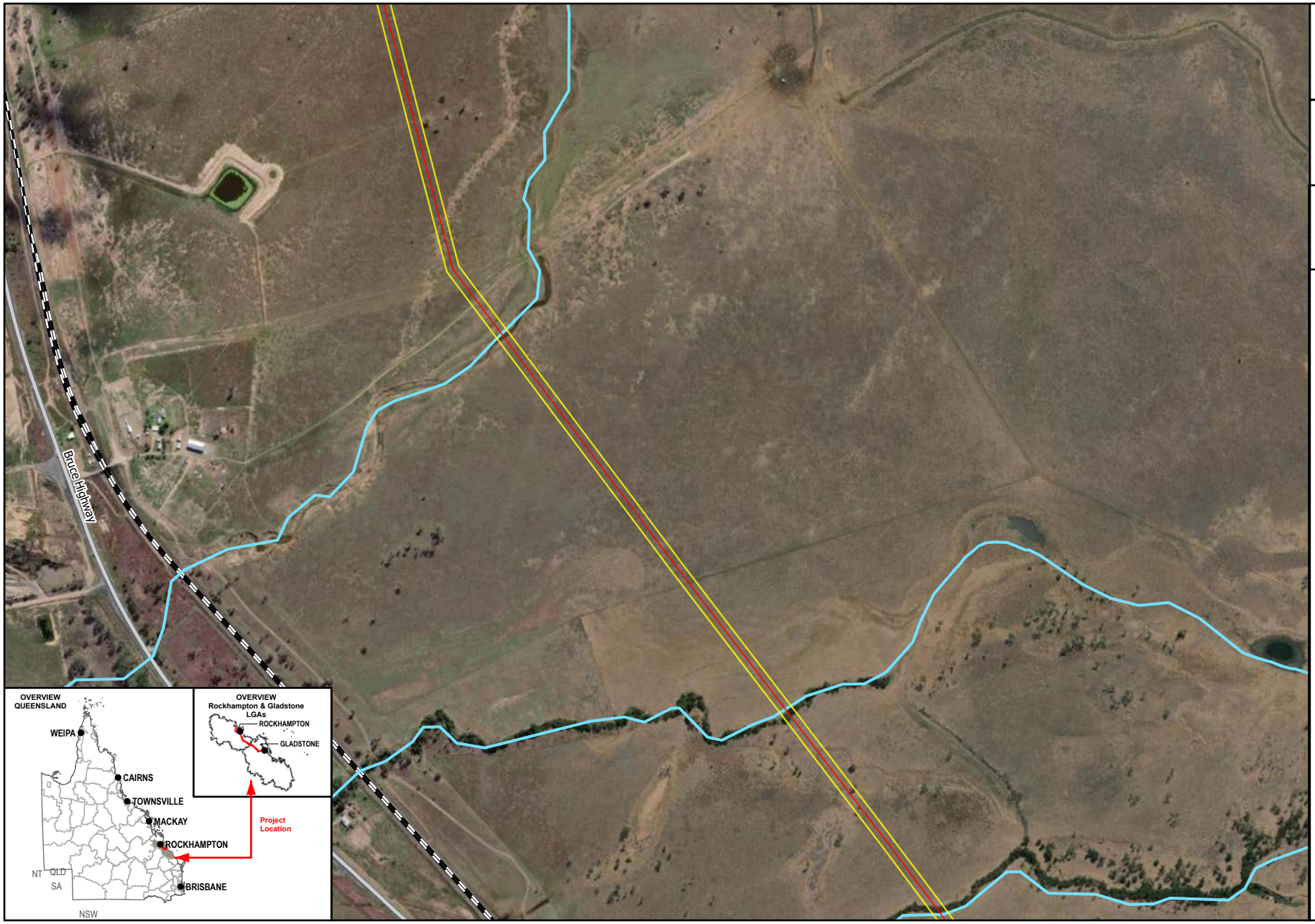
Figure 7-14p
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
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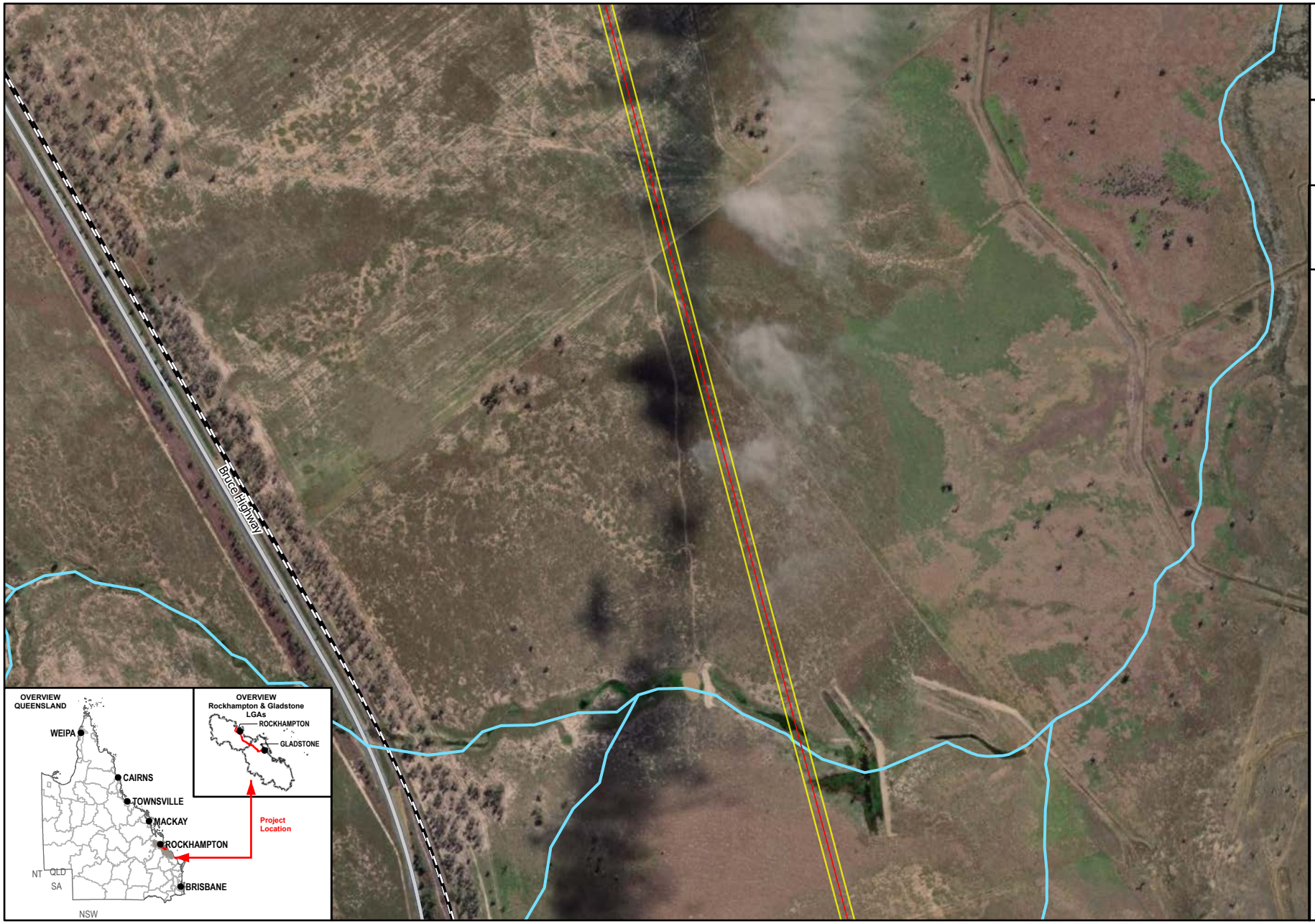
Figure 7-14q
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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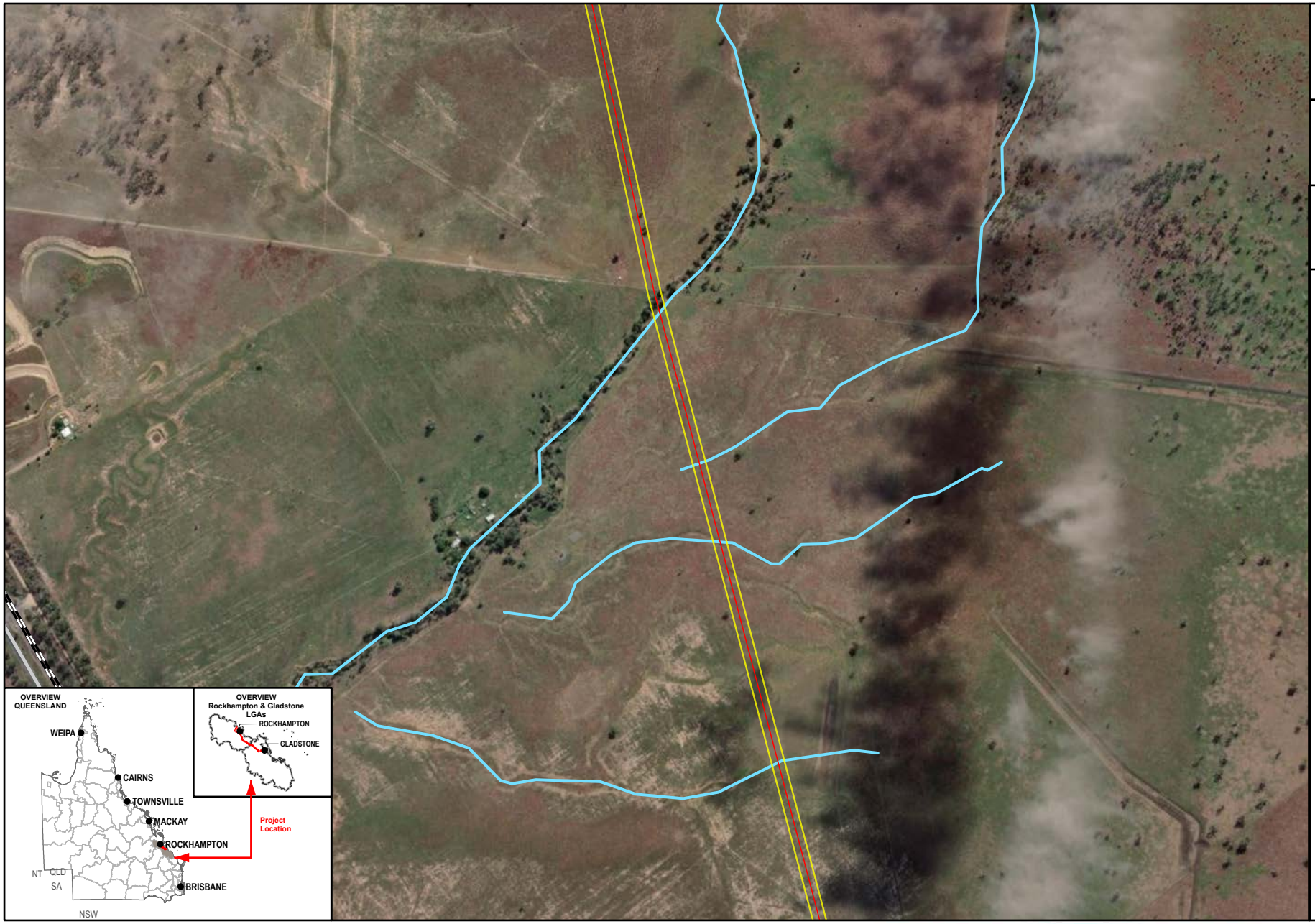
Figure 7-14r
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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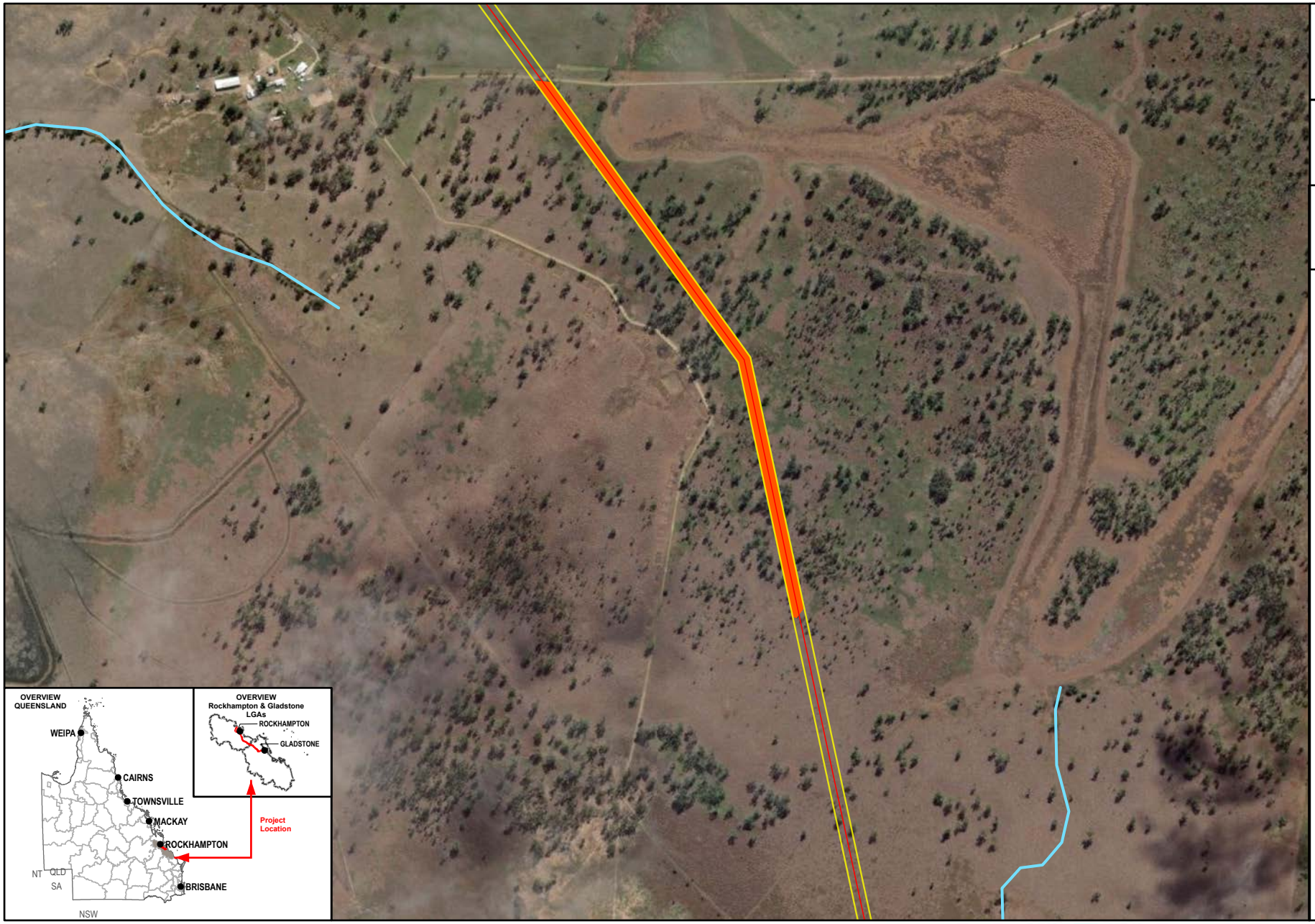
Figure 7-14s
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways

Data Sources:
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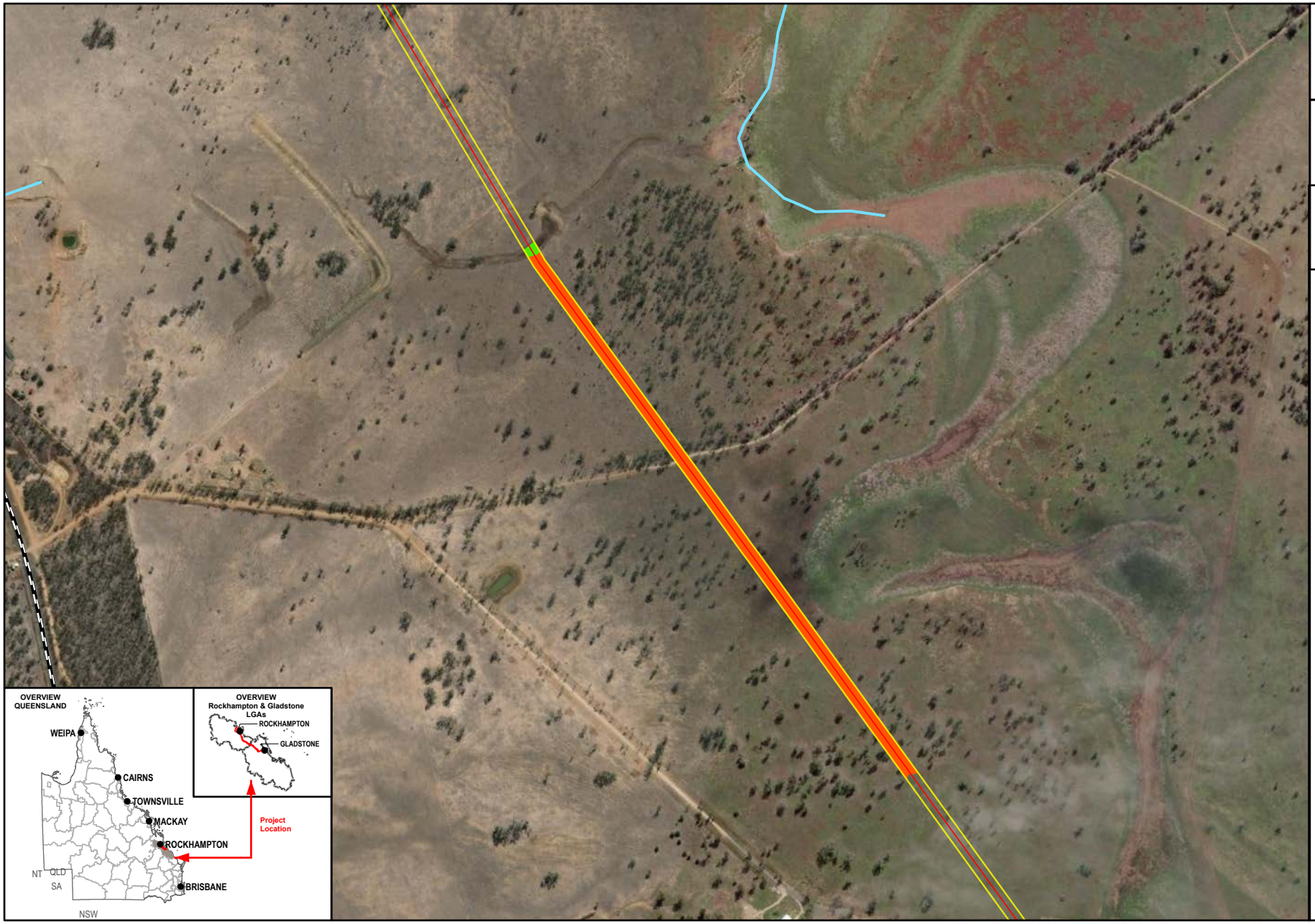
Figure 7-14t
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Foraging Habitat
- Potential Denning Habitat
- Waterways
- Railways

Data Sources:
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Figure 7-14u
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
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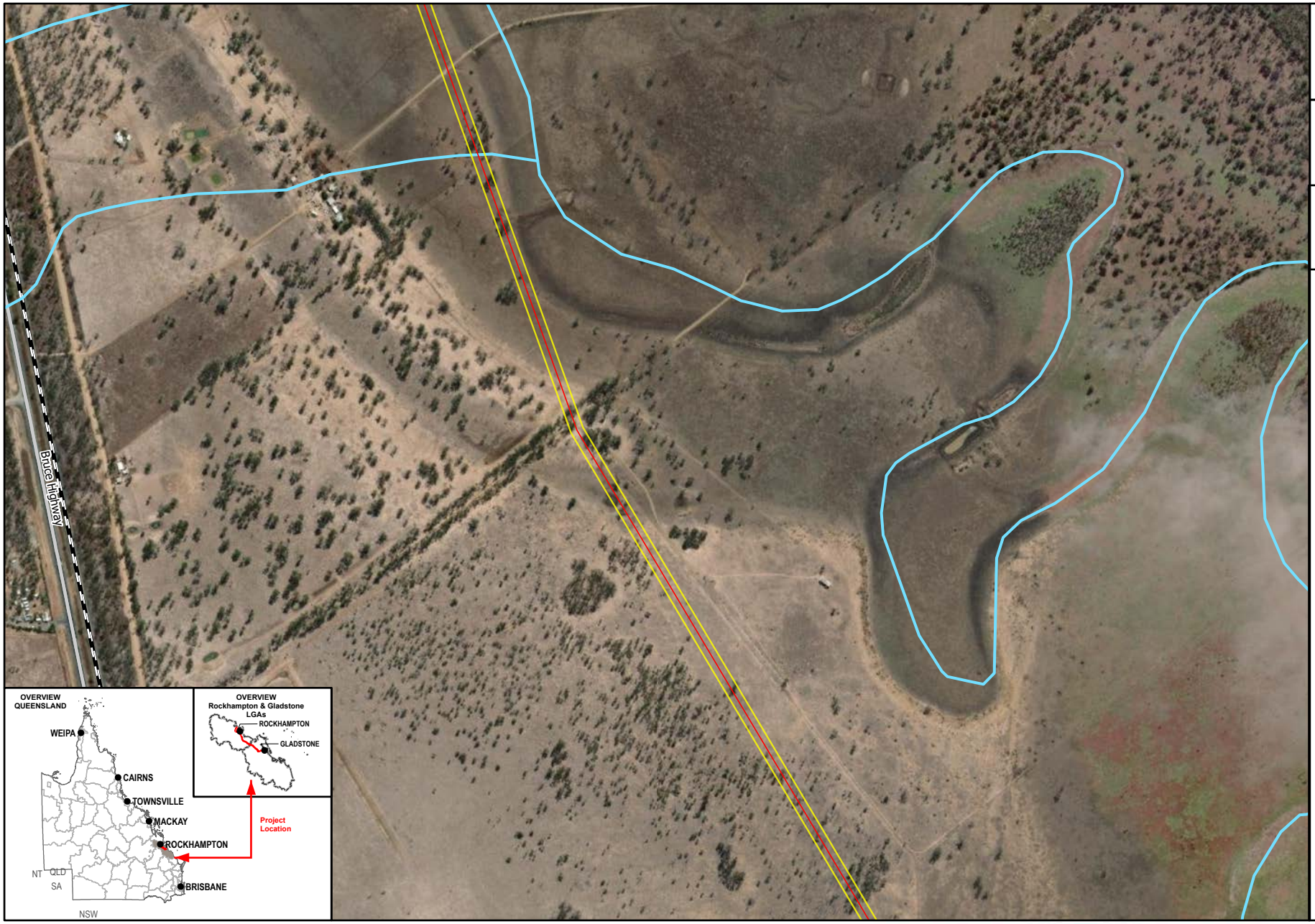

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- SGIC SDA Pipeline Alignment
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- Railways

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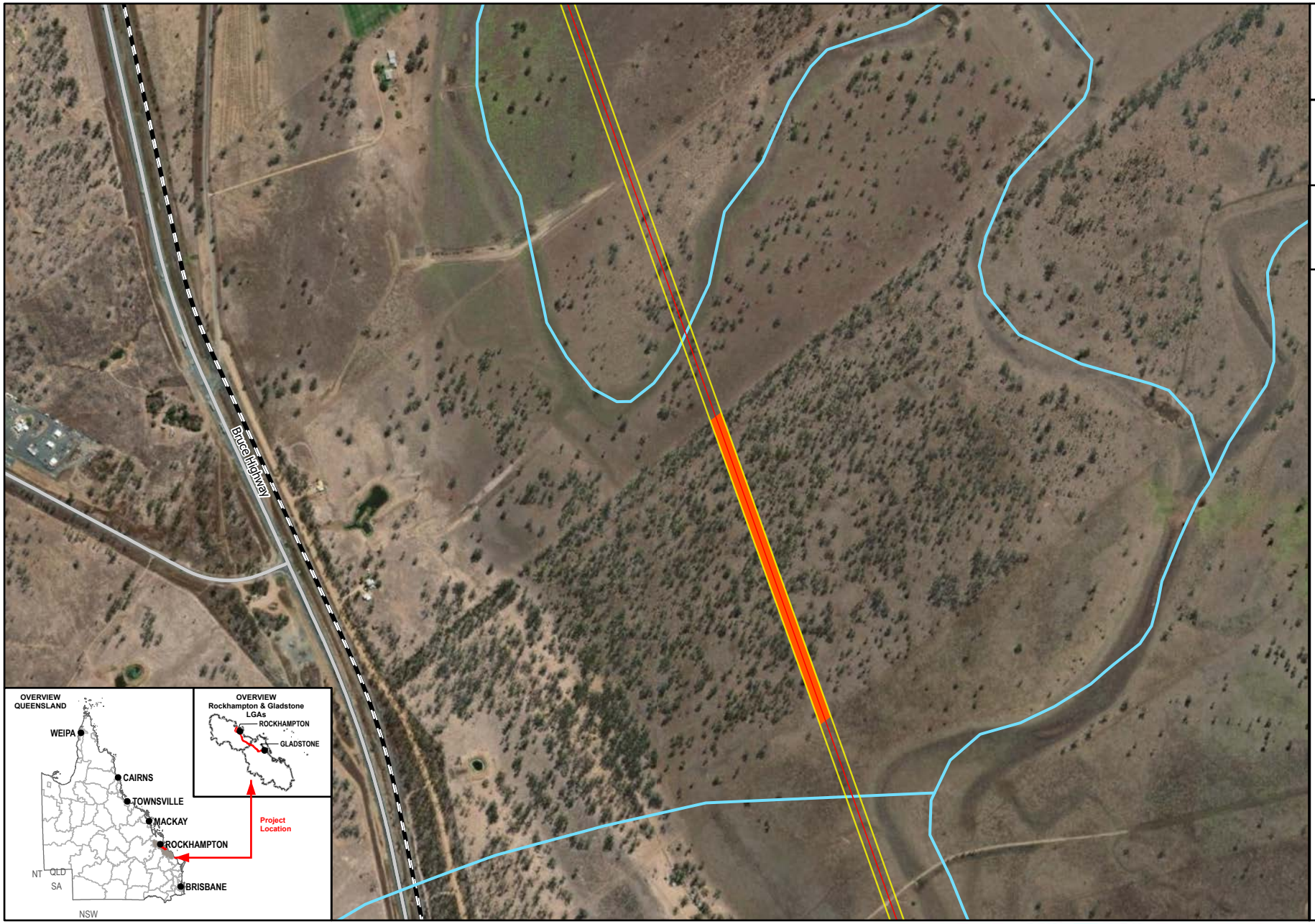
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14v
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
000-G-MAP-2436 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:

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Figure 7-14w
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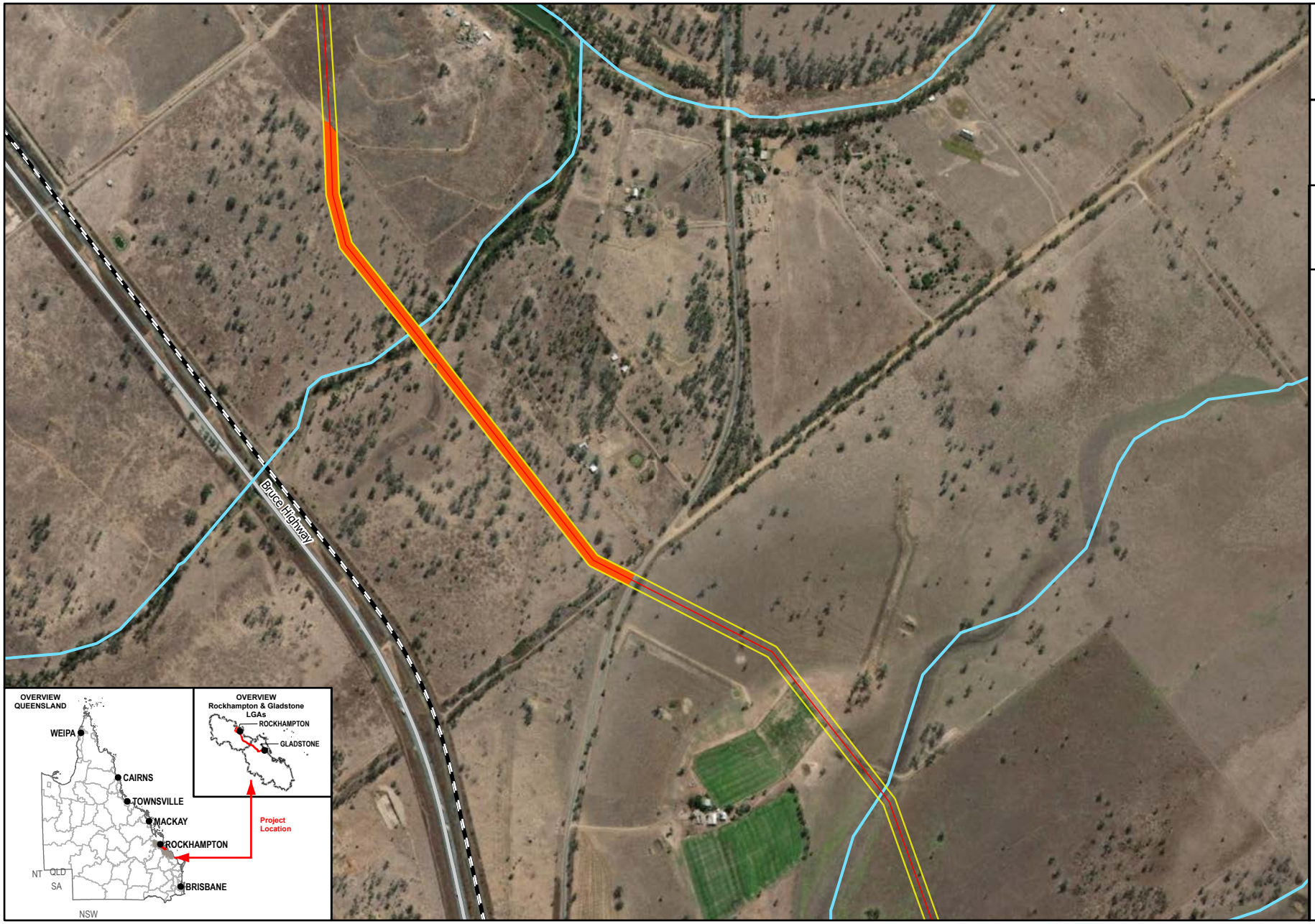

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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-14x
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
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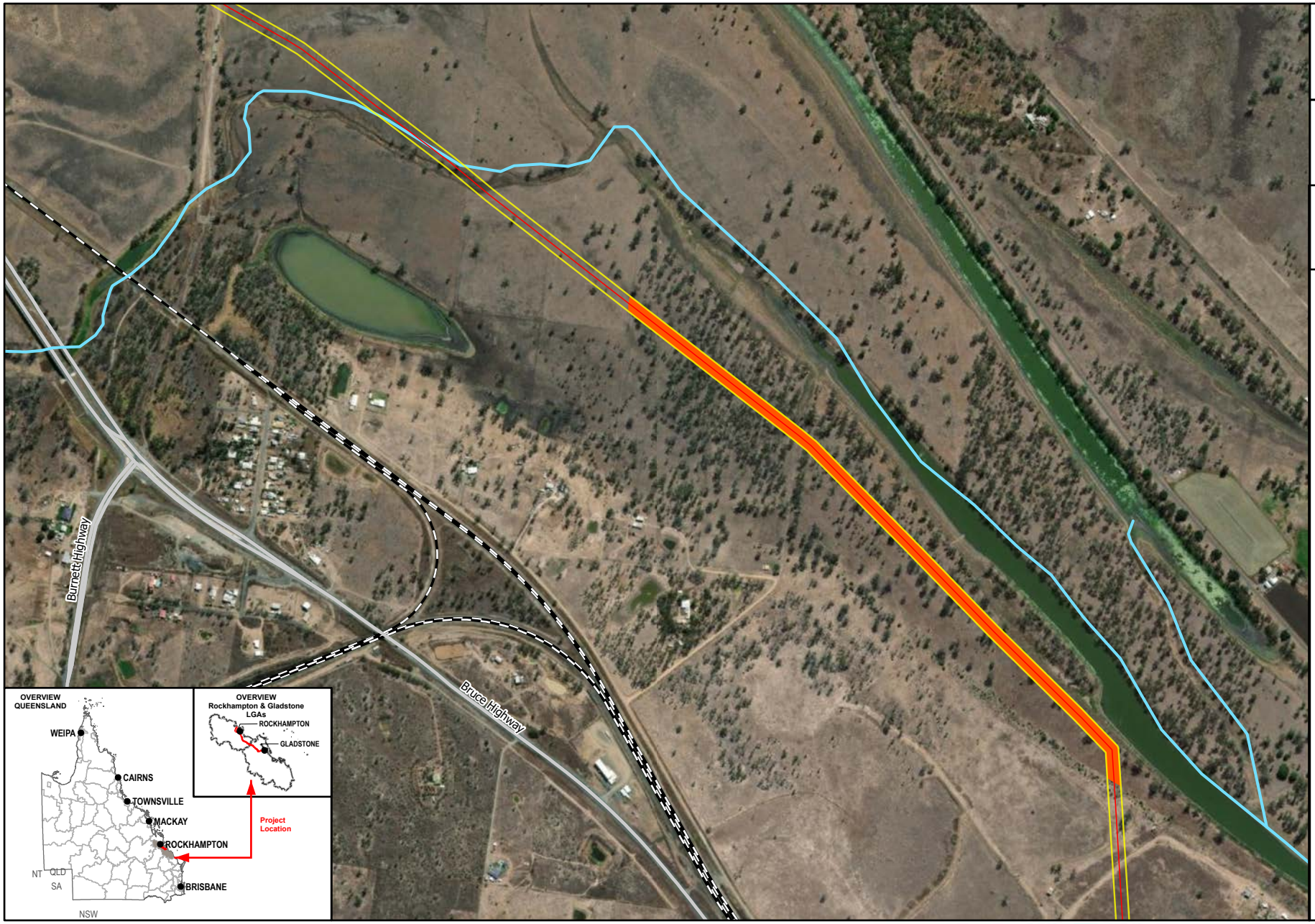

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Figure 7-14y
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
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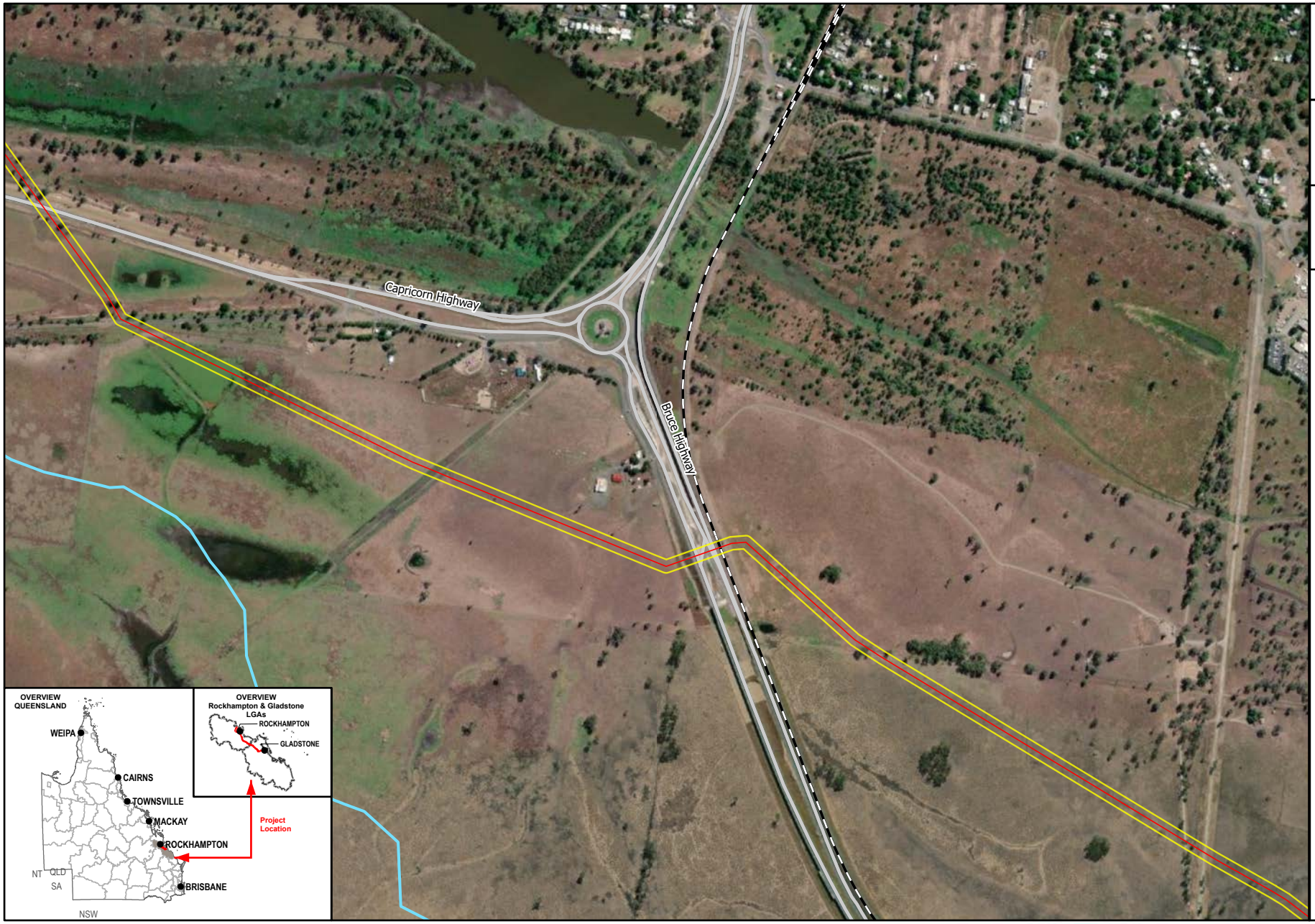

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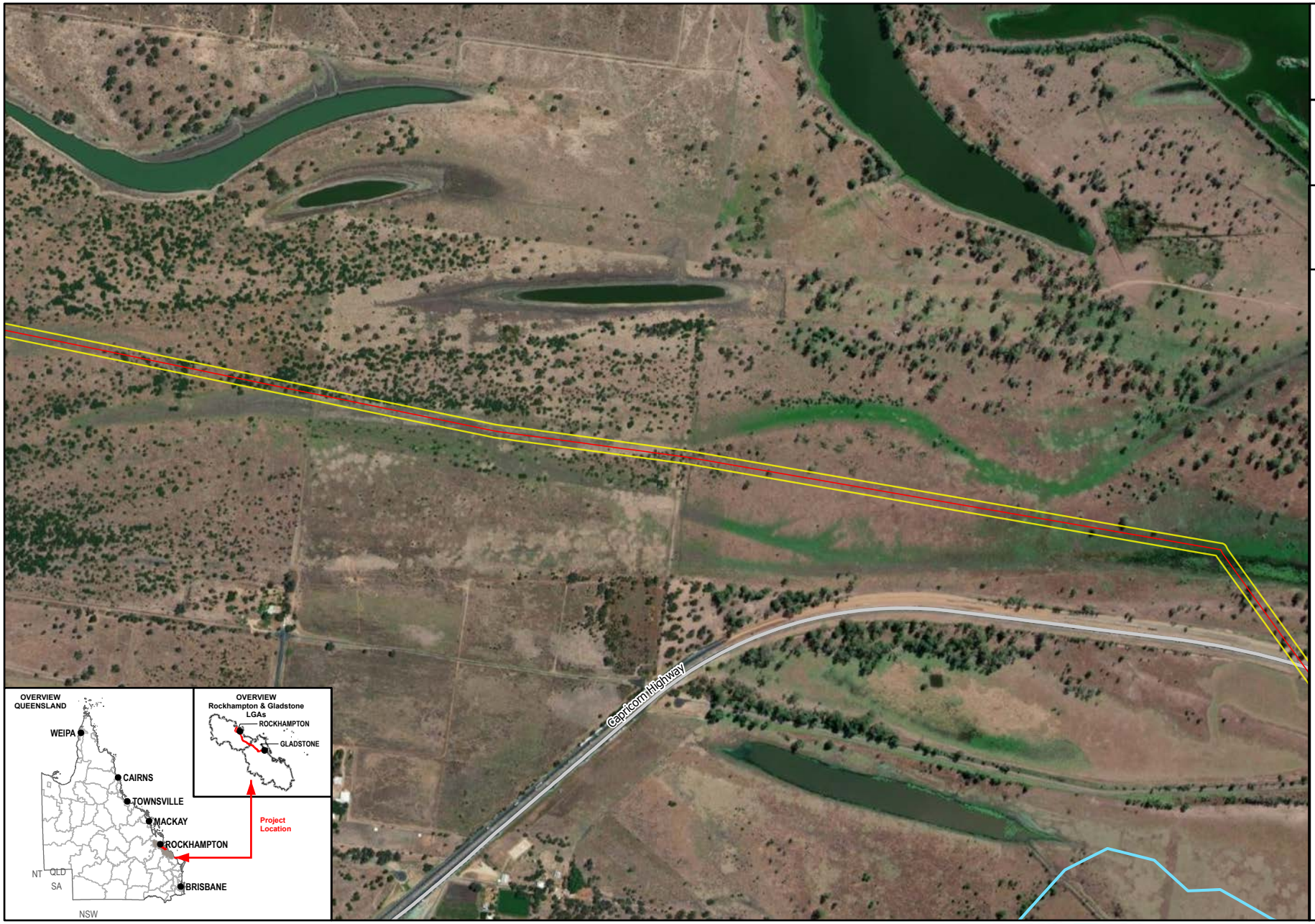

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- SGIC SDA Pipeline Alignment
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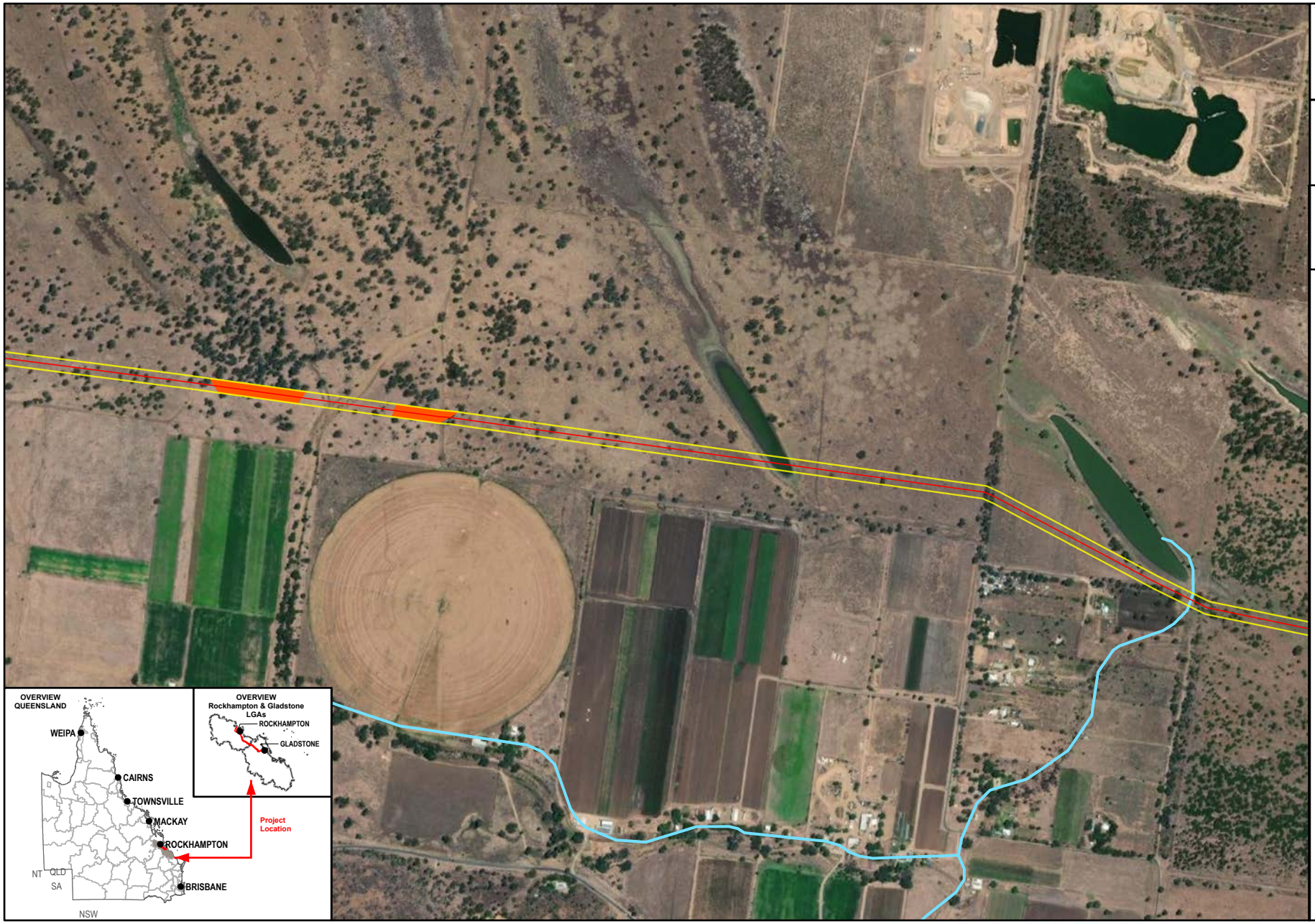

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Predicted Greater Glider Habitat

Habitant Type

- Potential Denning Habitat
- Waterways

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Figure 7-14b1
Distribution of Greater Glider Habitat Within the SGIC SDA Study Area
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7.2.2.10 Yellow-bellied glider (south-eastern)

Conservation status and species ecology

The yellow-bellied glider (south-eastern) (*Petaurus australis australis*) is listed as vulnerable under the EPBC Act and NC Act but was not listed as an MNES at the time of the approval. The subspecies occurs in eucalypt-dominated forest and woodland (DAWE 2022a). The subspecies can occur in dry and wet sclerophyll, with abundance highly dependent on forest age and floristics. The subspecies prefers large tracts of mature, old growth forest that are able to provide suitable habitat for foraging and denning requirements. These requirements include floristic diversity, high proportion of winter-flowering and smooth-barked gums to provide year-round foraging resources. The subspecies is nocturnal, during the day yellow-bellied glider (south-eastern) dens in hollow-bearing trees, usually over one meter in diameter, primarily, living hollow-bearing smooth-barked eucalypts are used (DAWE 2022a). The subspecies occurs in family groups of between two to six individuals, covering a home range of approximately 50-65 ha, large home-ranges are required to maintain subpopulation viability (DAWE 2022a).

Field survey results and distribution of suitable habitat

No yellow-bellied glider (south-eastern) individuals or V-shaped incisions on smooth-barked eucalypts were recorded during the field surveys within the SGIC SDA study area. Survey effort for the yellow-bellied glider (south-eastern) included one night of 2-3 hours of spotlighting within potentially suitable habitat in the SGIC SDA study area. Suitable habitat was recorded within the SGIC SDA study area, and the species has been historically recorded at 10 locations within the desktop search extent, the most recent record recorded in 2014. Many of these records have been historically recorded in riparian habitats, in close proximity to drainage lines and watercourses, as well as elevated areas.

Suitable foraging habitat occurs in numerous locations within the southern proportion of the SGIC SDA pipeline alignment and suitable denning habitat was observed within an area retaining of remnant, mature vegetation within the SGIC SDA study area, approximately 3.5 km northwest of Mount Larcom. This woodland retains large, mature eucalypt trees supporting suitable hollows, and is connected to large patches of remnant woodland (> 200 ha^2). The distribution of predicted yellow-bellied glider (south-eastern) habitat is mapped in Figure 7-15.

Significance of impact assessment

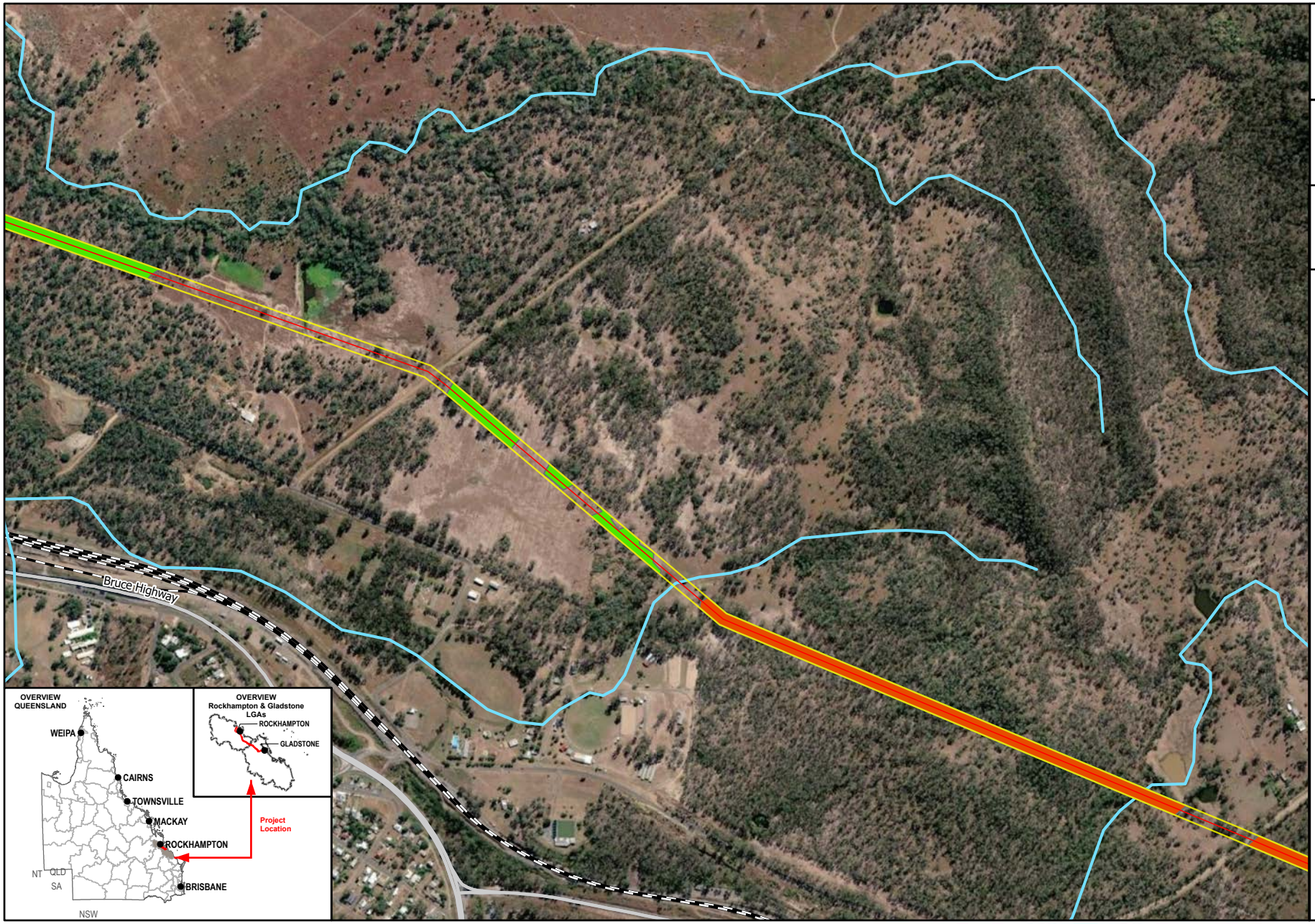
The project is likely to result in a significant residual impact on the yellow-bellied glider (south-eastern). A significance of impact assessment of the project on the yellow-bellied glider (south-eastern) (vulnerable under the EPBC Act and NC Act) is provided in Table 7-28.

Table 7-28 Significance of impact on the yellow-bellied glider (south-eastern)

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The yellow-bellied glider (south-eastern) has been historically recorded at 10 locations within the desktop search extent (10 km buffer). Due to a lack of population information, all local yellow-bellied glider (south-eastern) population are considered important populations (DAWE 2022a). The project will result in the clearing of 3.61 ha of predicted foraging habitat and 26.29 ha of denning habitat for the species, representing 0.22% of habitat available within a 5 km buffer. The species is reliant on smooth-barked eucalypts for foraging given its tendency to acquire sap by incising directly into the bark. Mature smooth-barked eucalypt trees are moderately abundant within the SGIC SDA pipeline alignment; however, a low abundance of suitable denning habitat were recorded. The SGIC SDA pipeline alignment largely supports regrowth vegetation (retaining few hollow-bearing trees), younger remnant vegetation and open landscapes that have been previously cleared for agricultural practices. The remaining areas support remnant vegetation, which were identified as suitable denning sites for the yellow-bellied glider (south-eastern). Clearing has the potential to cause direct mortality and injury of individuals. This risk will be mitigated by the employment of a fauna spotter-catcher during clearing to check hollows in large fallen trees and relocate any encountered individuals. Sequential clearing will also be adopted to allow species to self-disperse and tree felling will occur towards cleared areas, rather than towards standing vegetation. The project is not considered likely to lead to a long-term decrease in the size of the yellow-bellied glider (south-eastern) local population. Considering the species has a large capacity for movement and can periodically move to access areas of foraging habitat, the species' local population is

Significant residual impact criteria	Potential to occur
	anticipated to remain largely unaffected due to the availability of habitat within the surrounding landscape. The loss of vegetation within the SGIC SDA pipeline alignment is unlikely to (1) limit movement of resident or transient individuals; nor (2) affect the availability of resident or transient individuals to acquire key resources. The project is unlikely to lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	**Unlikely** The species is reliant on access to smooth-barked hollow-bearing trees (i.e. *Eucalyptus tereticornis* and *Corymbia citriodora*) for denning and foraging. As mentioned above, mature smooth-barked eucalypt trees are moderately abundant within the SGIC SDA pipeline alignment, with low densities of suitable denning habitat. Suitable denning sites were observed in mature woodland within the SGIC SDA study area, approximately 3.5 km northwest of Mount Larcom. The maximum width of clearing required for construction of the SGIC SDA pipeline alignment is 30 m. Once the pipeline has been installed and buried, a maximum width of 10 m will be permanently cleared with the remaining 20 m to be rehabilitated. Clearing along the SGIC SDA pipeline alignment is unlikely to impact the species as the proposed clearing extent is narrow (30 m) and mostly linear, and unlikely to generate edge effects or impact ecosystem structure and functioning. Given the loss of 29.90 ha of suitable habitat, negligible impact of local and landscape connectivity, and low levels of disturbance during the operation phase, it is unlikely to have any significant indirect impact on the species. While there will be a localised loss of habitat for the yellow-bellied glider (south-eastern) (including ecological significant locations), this won't have a bearing on the species' extent of occurrence. Accordingly, the project is unlikely to reduce the extent of occurrence of the species, especially noting the definition of extent of occurrence per the Queensland *Significant Residual Impact Guideline* (DEHP 2014b): *Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon*.
Fragment an existing population	**Unlikely** Linear impacts along the SGIC SDA pipeline alignment is not considered to exceed the species' volplane distance and are unlikely to cause any fragmentation in the species habitat, as yellow-bellied gliders (southern) has been recorded to glide to a maximum distance of 140 m (DAWE 2022a). Connectivity to extensive areas of suitable habitat will persist in the surrounding landscape allowing opportunities for movement. Furthermore, large areas of remnant habitat are located within Mount Stowe State Forest, Calliope Conservation Park and Mount Larcom. Therefore, the SGIC SDA pipeline alignment is unlikely to fragment an existing yellow-bellied glider (south-eastern) population.
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** As detailed above, the species' capacity to move locally and regionally is unlikely to be limited by any localised land clearing necessary to construct the SGIC SDA pipeline alignment. As a result, the project is unlikely to cause any form of genetic isolation at a population level.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	**Unlikely** The predation by European red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*) are listed as a threat to the yellow-bellied glider (south-eastern). It has been shown that European red foxes are able to climb trees where to can predate on living gliders, with feral cats likely eating the subspecies through scavenging (DAWE 2022a). The project is not considered likely to increase the incidence of any invasive species (particularly European red foxes and feral cats) that could threaten the yellow-bellied glider (south-eastern), especially noting mitigation measures in place to manage invasive species.
Introduce disease that may cause the population to decline	**Unlikely** The yellow-bellied glider (south-eastern) is potentially susceptible to adverse impact from *Phytophthora cinnamomi* due the soil fungus's ability to infect *Eucalyptus* species. Biosecurity requirements (e.g. weed and seed declarations) will be implemented throughout the project, and thus, this risk has been assessed as low.
Interfere with the recovery of the species	**Unlikely** The project is unlikely to interfere substantially with the recovery of the species. The yellow-bellied glider (south-eastern) has been widely recorded within region, with large, contiguous patches of suitable habitat located adjacent to the southern section of the SGIC SDA pipeline alignment. Although the project will remove 39.56 ha of predicted habitat, equating to 0.22 % of habitat available within a 5 km buffer, the remaining habitat is connected to an extensive network of suitable habitat.

Significant residual impact criteria	Potential to occur
	The impacts of the SGIC SDA pipeline alignment are expected to be relatively benign, as the maximum corridor width (30 m) is well below the species maximum volplane distance (> 100 m) and is unlikely to produce fragmentation or habitat isolation. The risk of individual mortality or injury during construction will be addressed via the mitigation measures in the CEMP and the use of sequential clearing and an experienced fauna spotter-catcher during clearing. Noting the above points relating to very limited if any effects on local populations (e.g. declines), extent of occurrence, fragmentation, invasive species, and disease, the project is not considered likely to interfere with the recovery of the yellow-bellied greater glider (south-eastern).
Cause disruptions to ecologically significant locations of a species	**Likely** The project will require the clearing of 29.92 ha of potentially suitable foraging and denning habitat for the yellow-bellied glider (south-eastern). Although the SGIC SDA pipeline alignment has largely been placed within or adjacent to areas that have been previously cleared, the project will result in a loss of species preferred trees species, including *Corymbia citriodora, Eucalyptus moluccana* and *E. tereticornis*, for foraging and denning. While the project is not expected to cause a long-term decline in the local population, reduce its extent of occurrence, cause adverse habitat fragmentation effects nor interfere with the recovery of the species, the loss of suitable yellow-bellied glider (south-eastern) habitat within the GSDA pipeline alignment is likely to result in disruption to ecologically significant foraging and breeding locations.
Conclusion	A conservative assessment has identified that the project is likely to result in a significant residual impact on the yellow-bellied glider (south-eastern). Although the SGIC SDA pipeline alignment has been located within areas that have been previously cleared for agricultural practices and linear infrastructure such as railways, roads, access tracks and pipelines, the project will require the clearing of 29.92 ha of woodland areas retaining preferred food trees and suitable denning habitat within the SGIC SDA pipeline alignment.



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- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Potential Foraging Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report Figure 7-15a Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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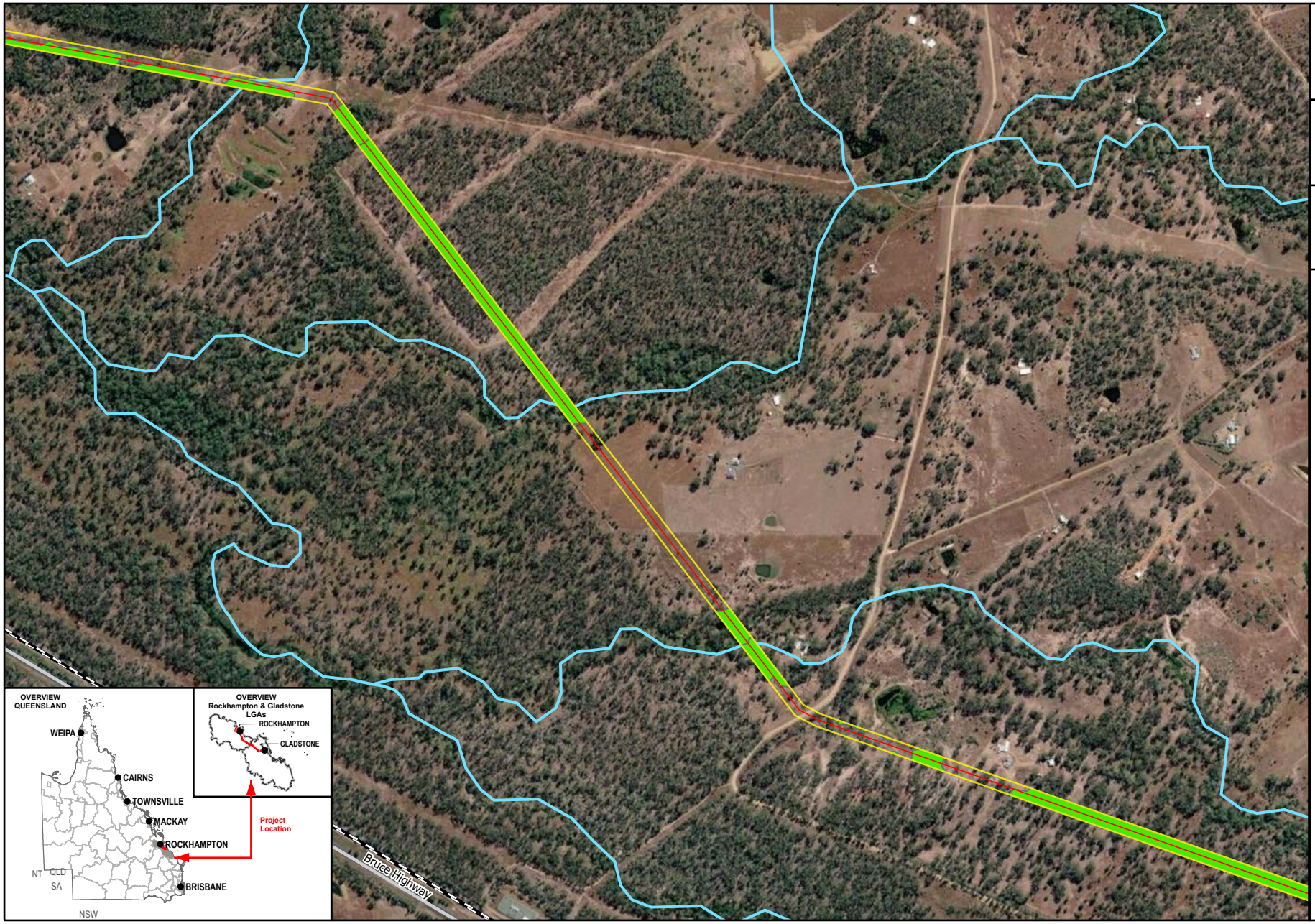

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- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Waterways
- Main Roads
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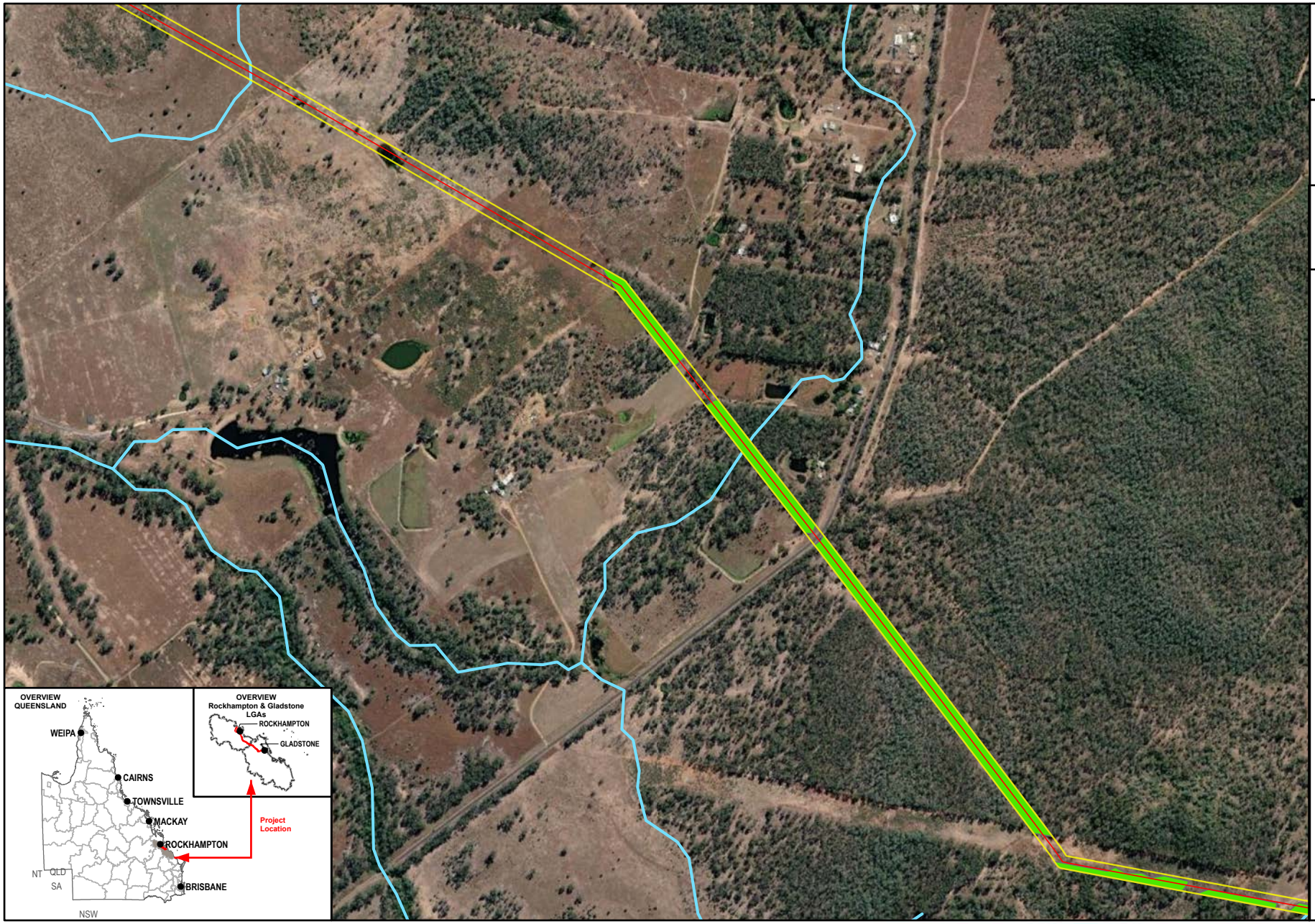

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- SGIC SDA Pipeline Alignment
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Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Potential Foraging Habitat
- Waterways

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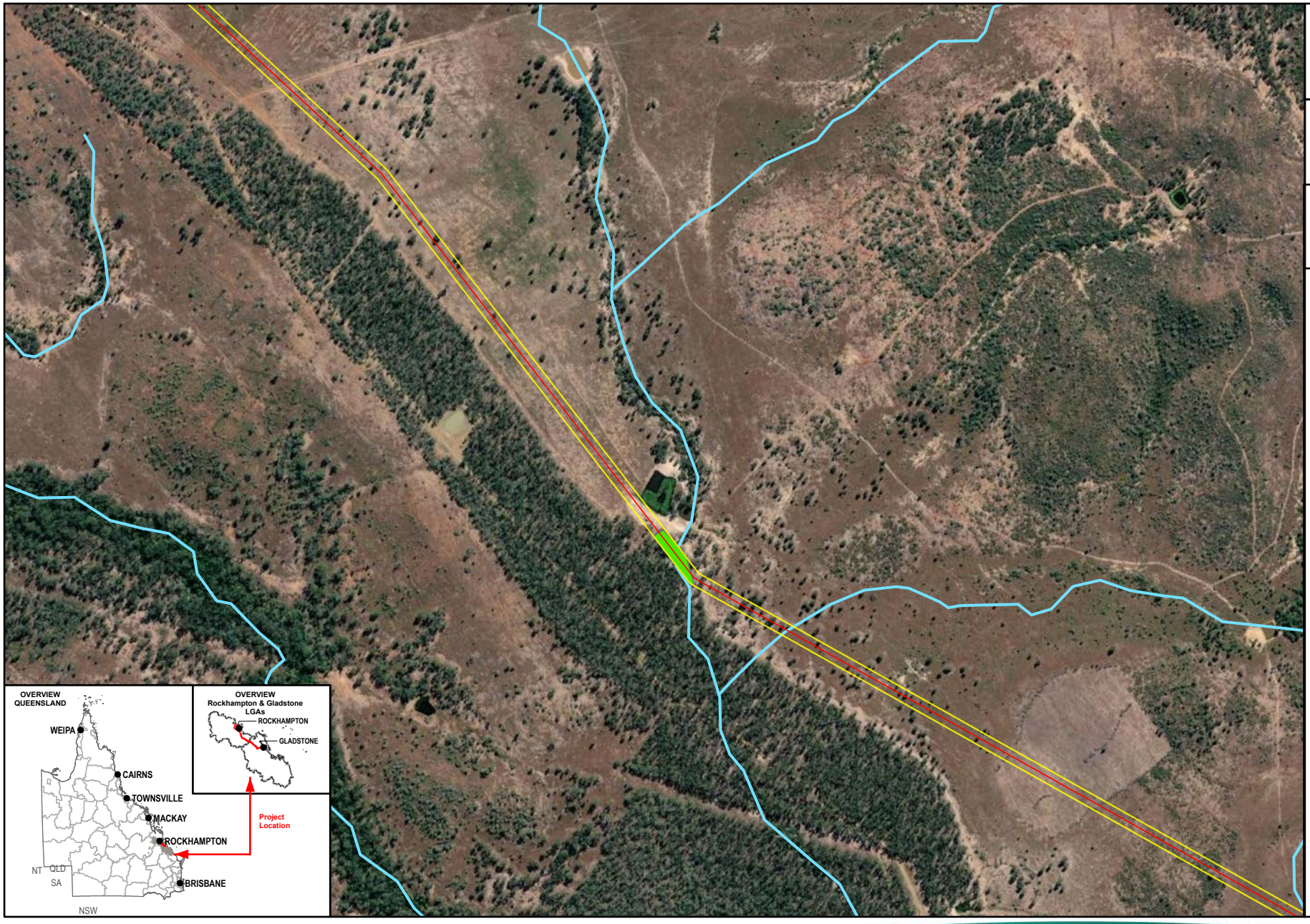

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Habitat Type

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15d
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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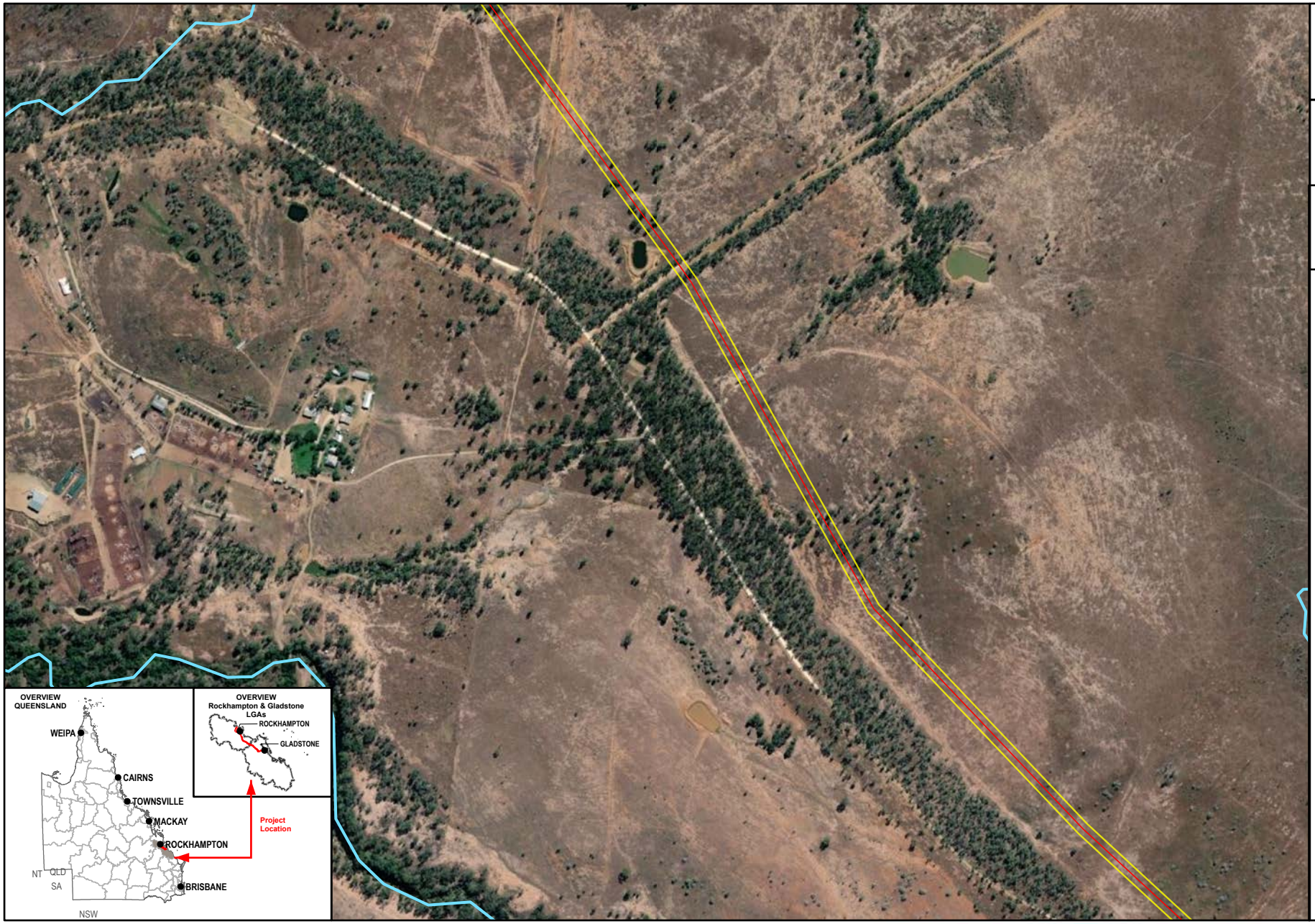

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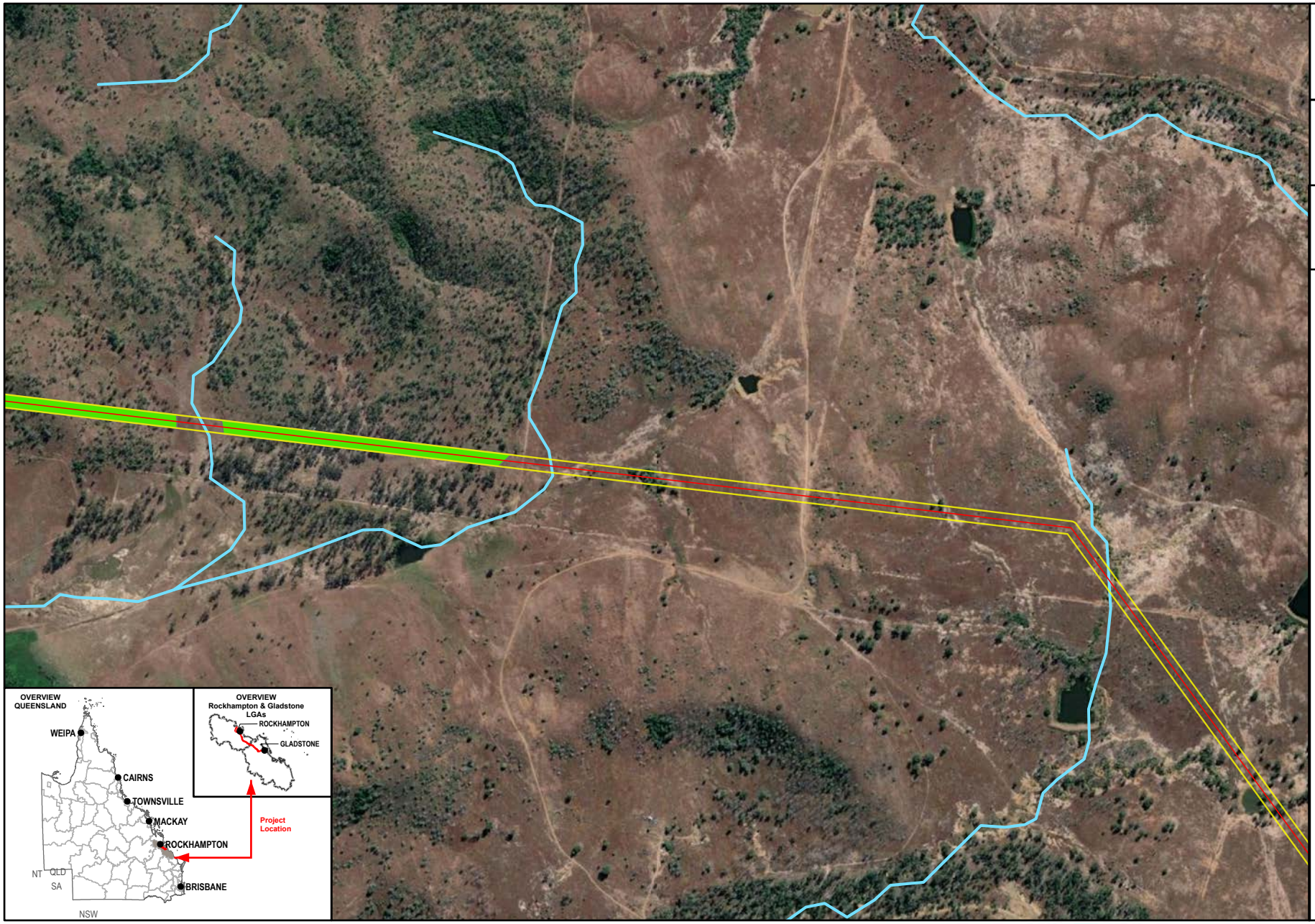

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Habitat Type

- Potential Denning Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
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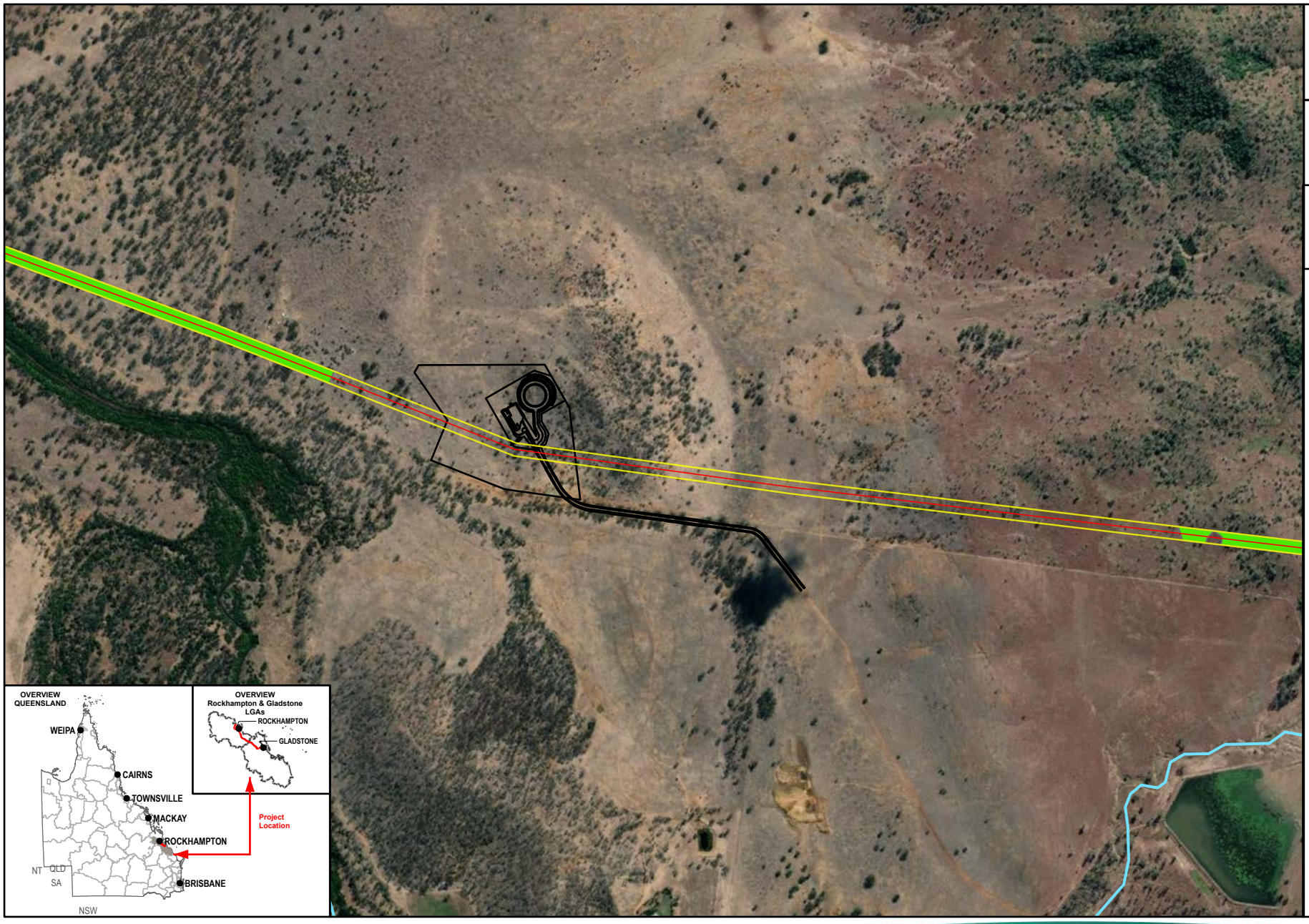
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15f
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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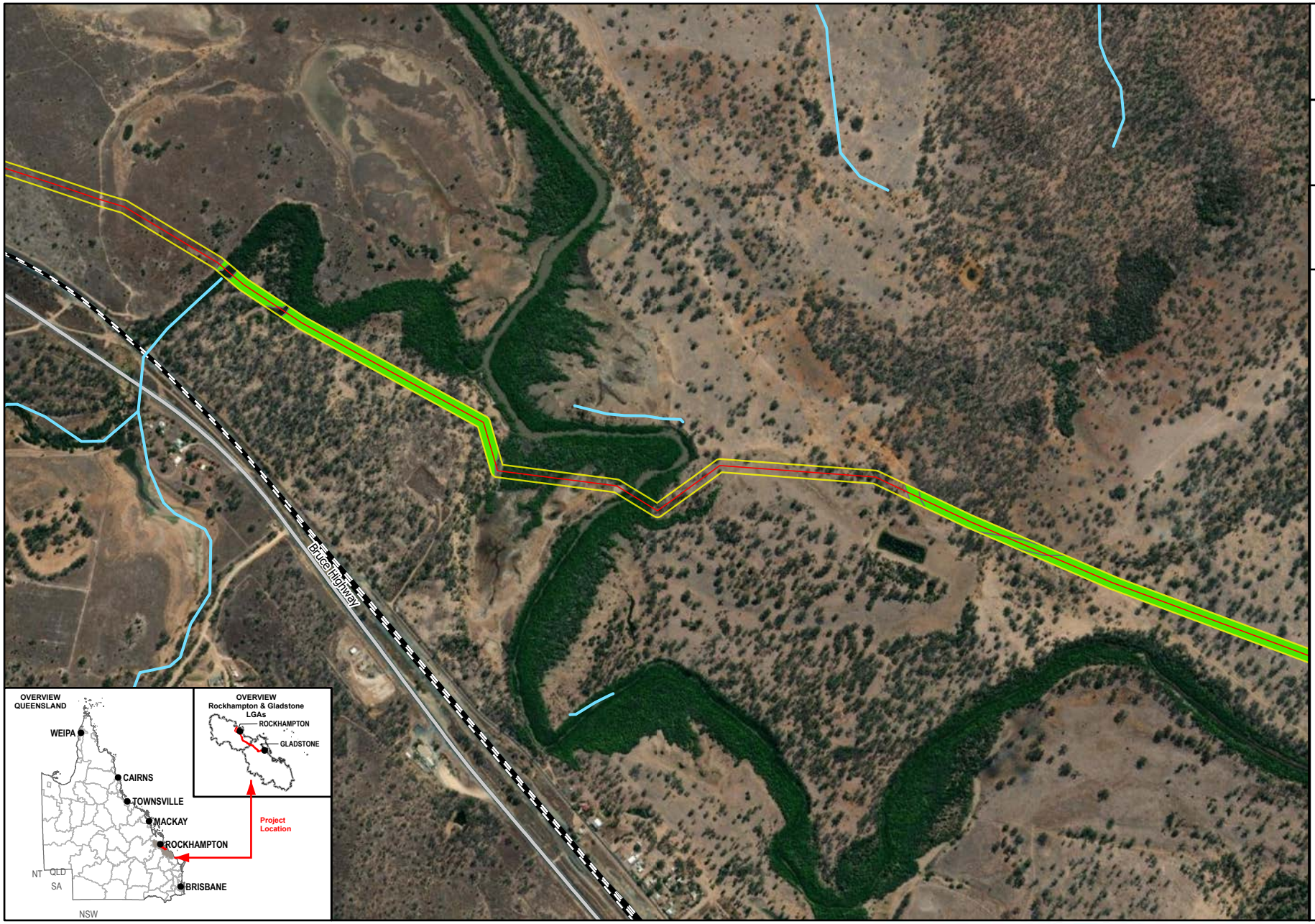
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report

Figure 7-15g Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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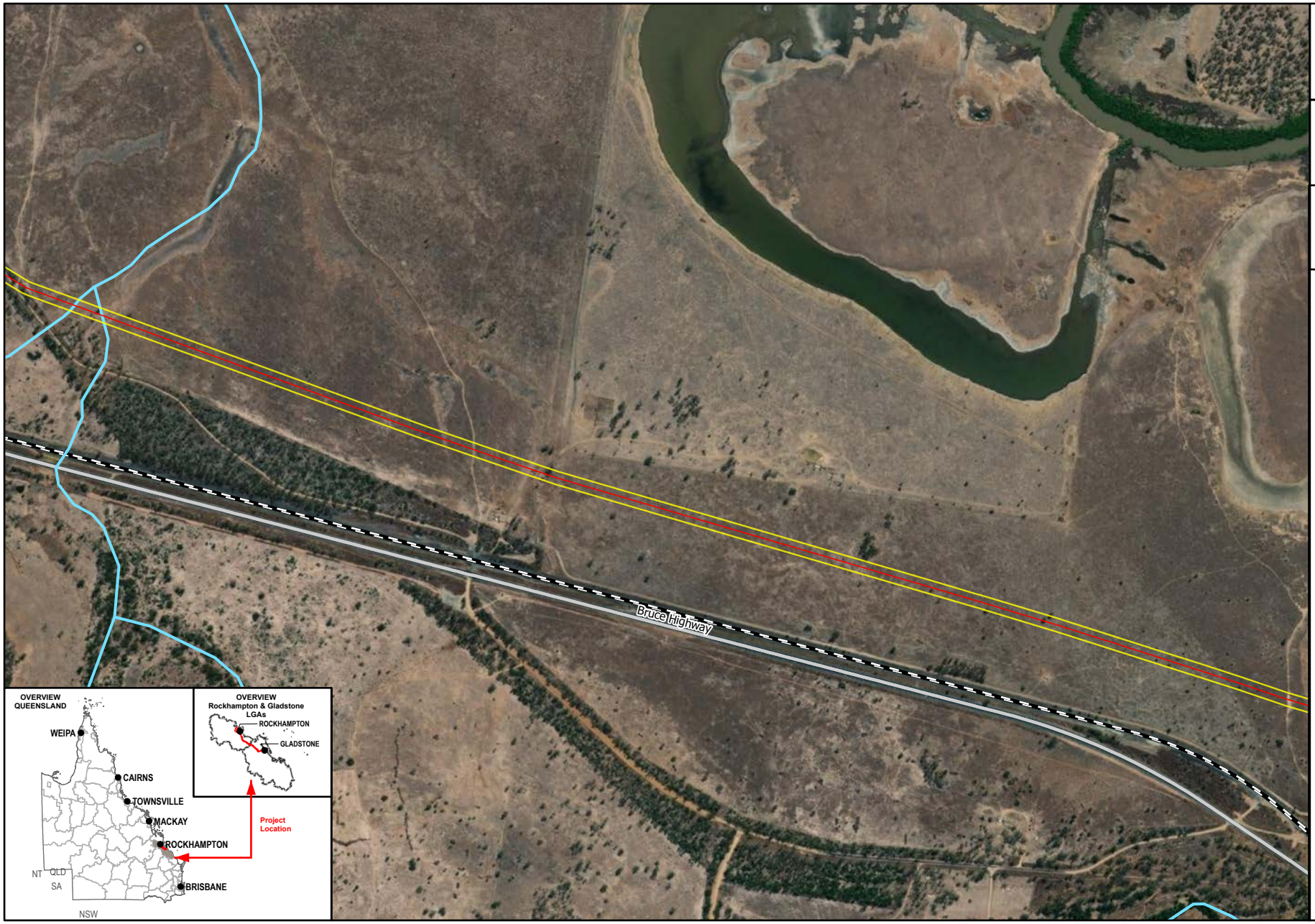
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15h
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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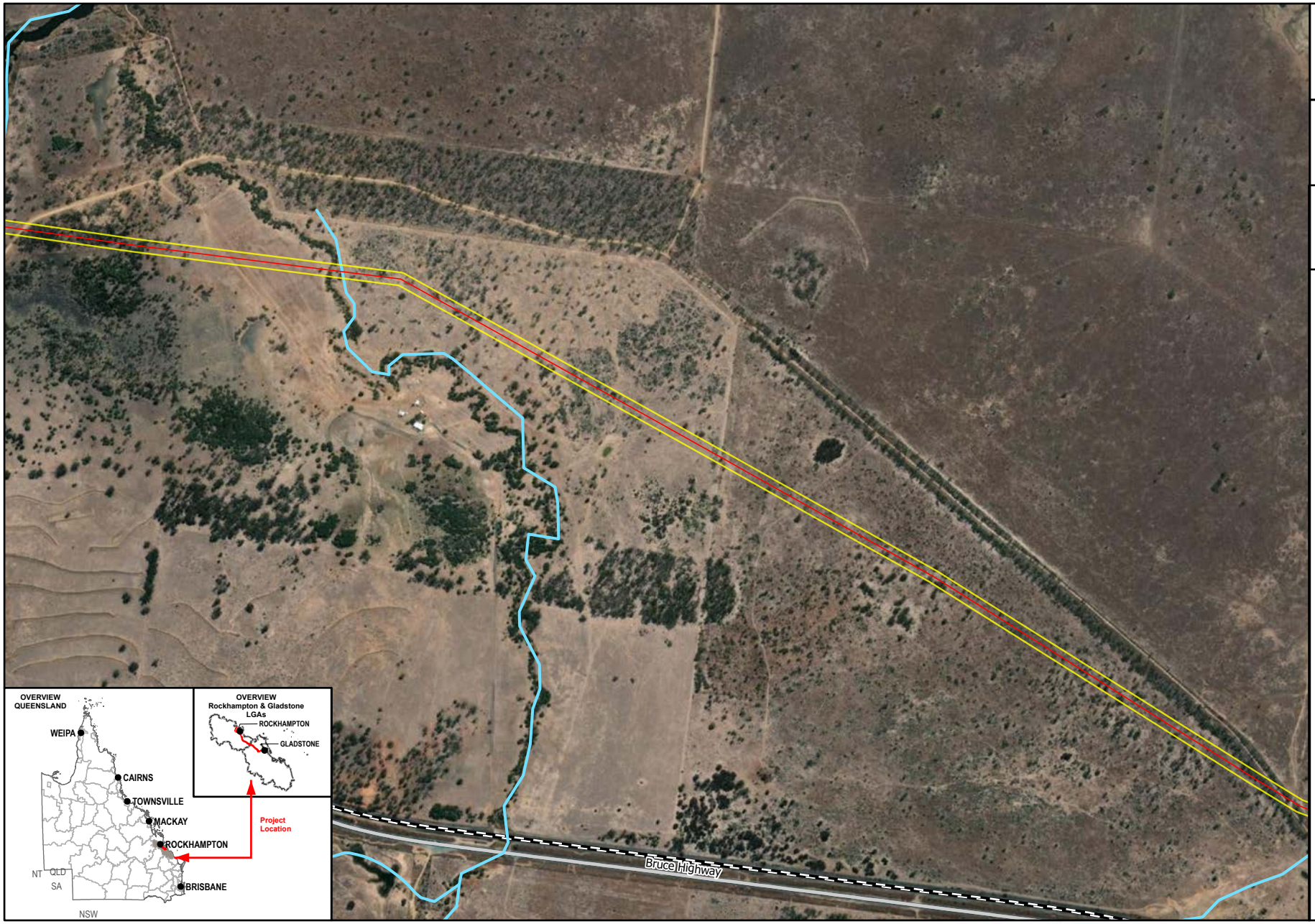

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15j
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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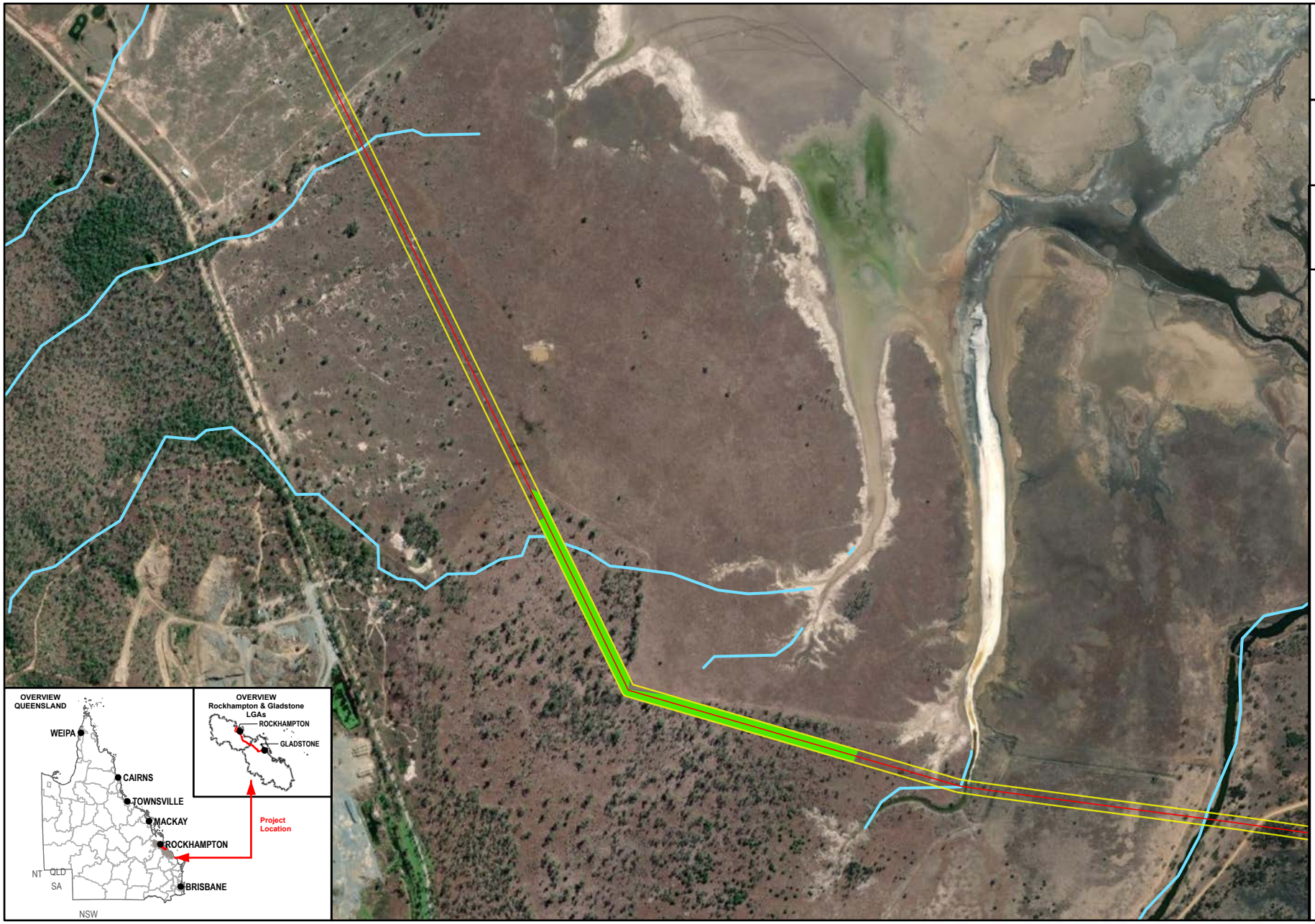

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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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Figure 7-15k
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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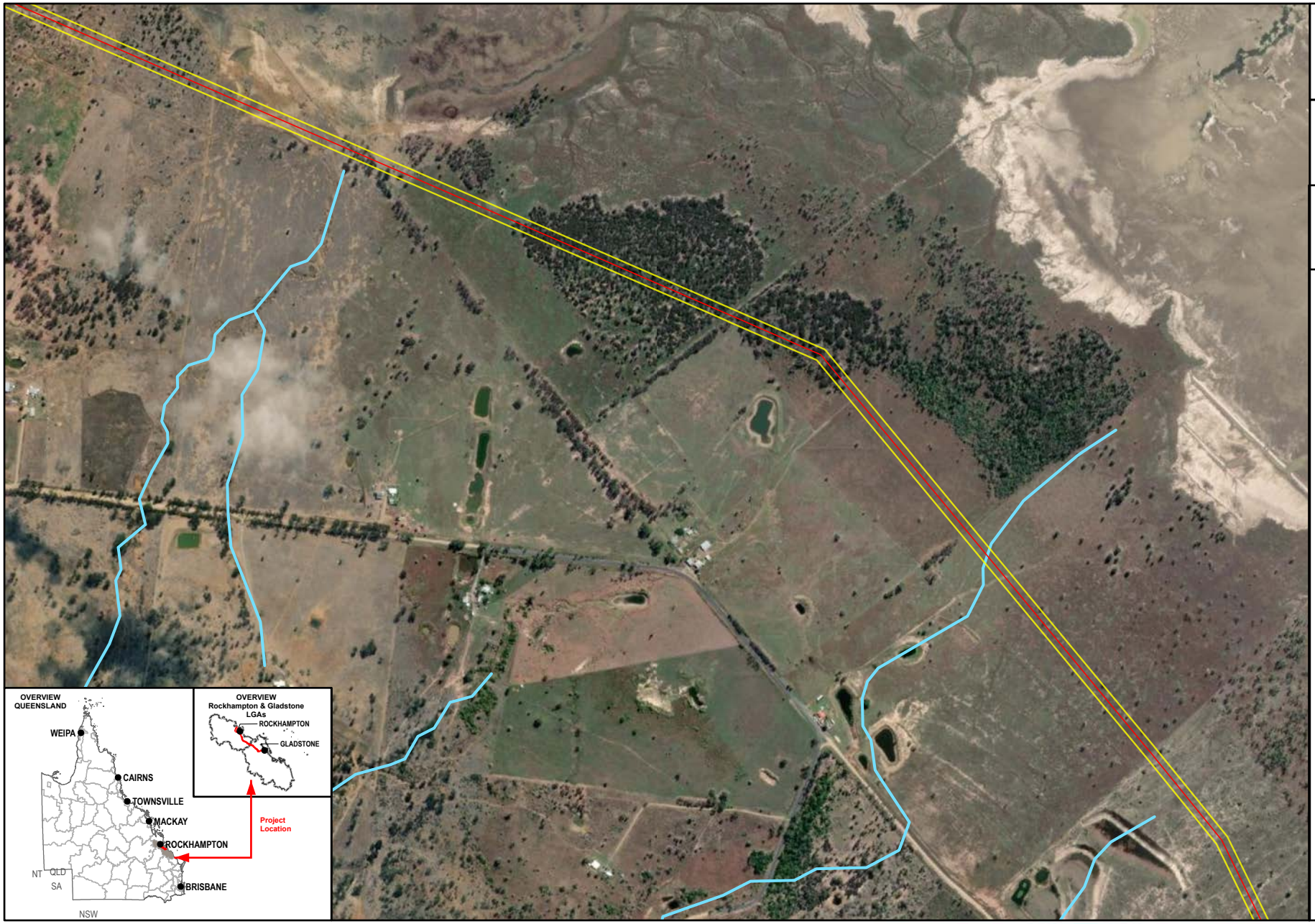

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15l
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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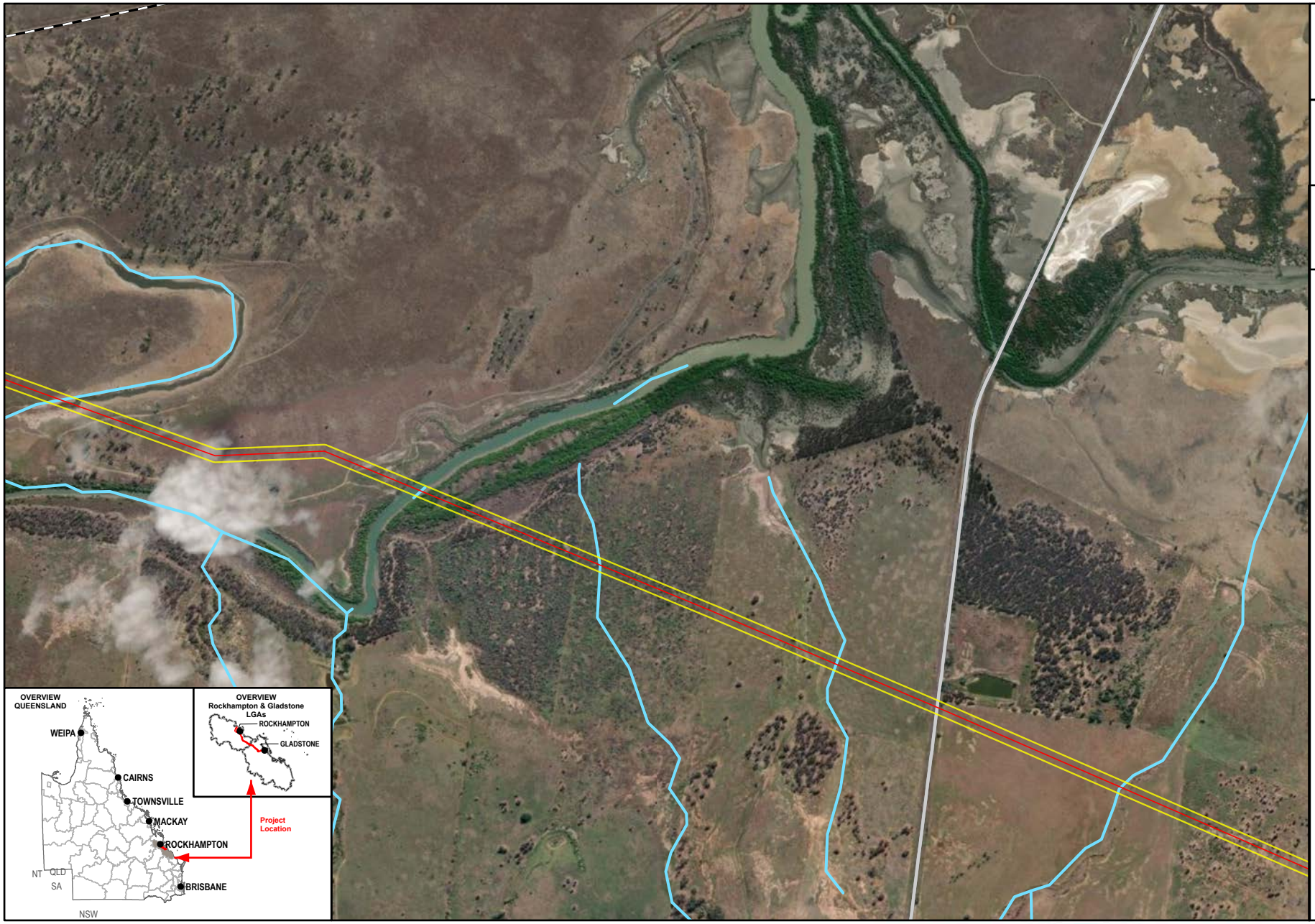

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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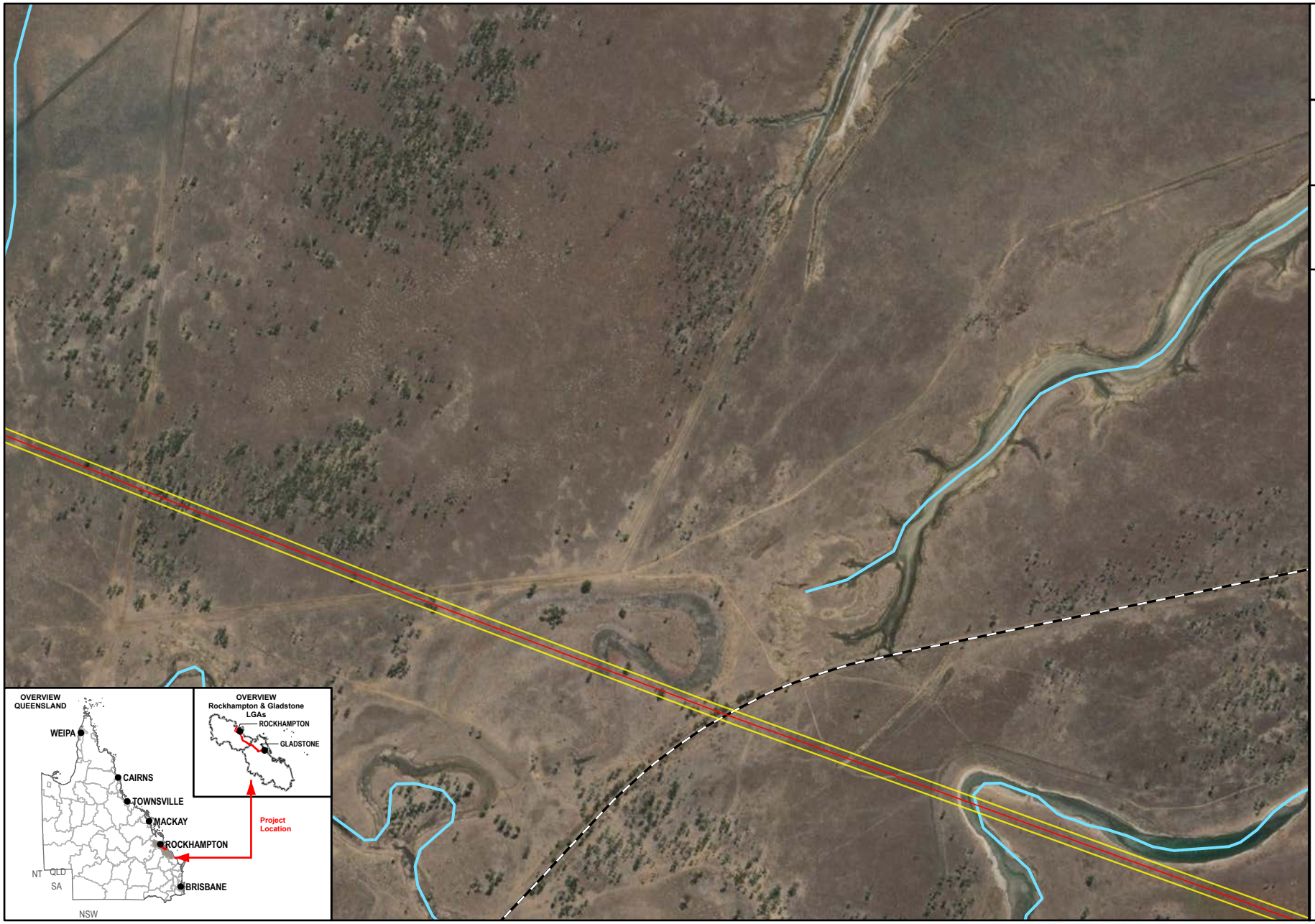
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15m
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
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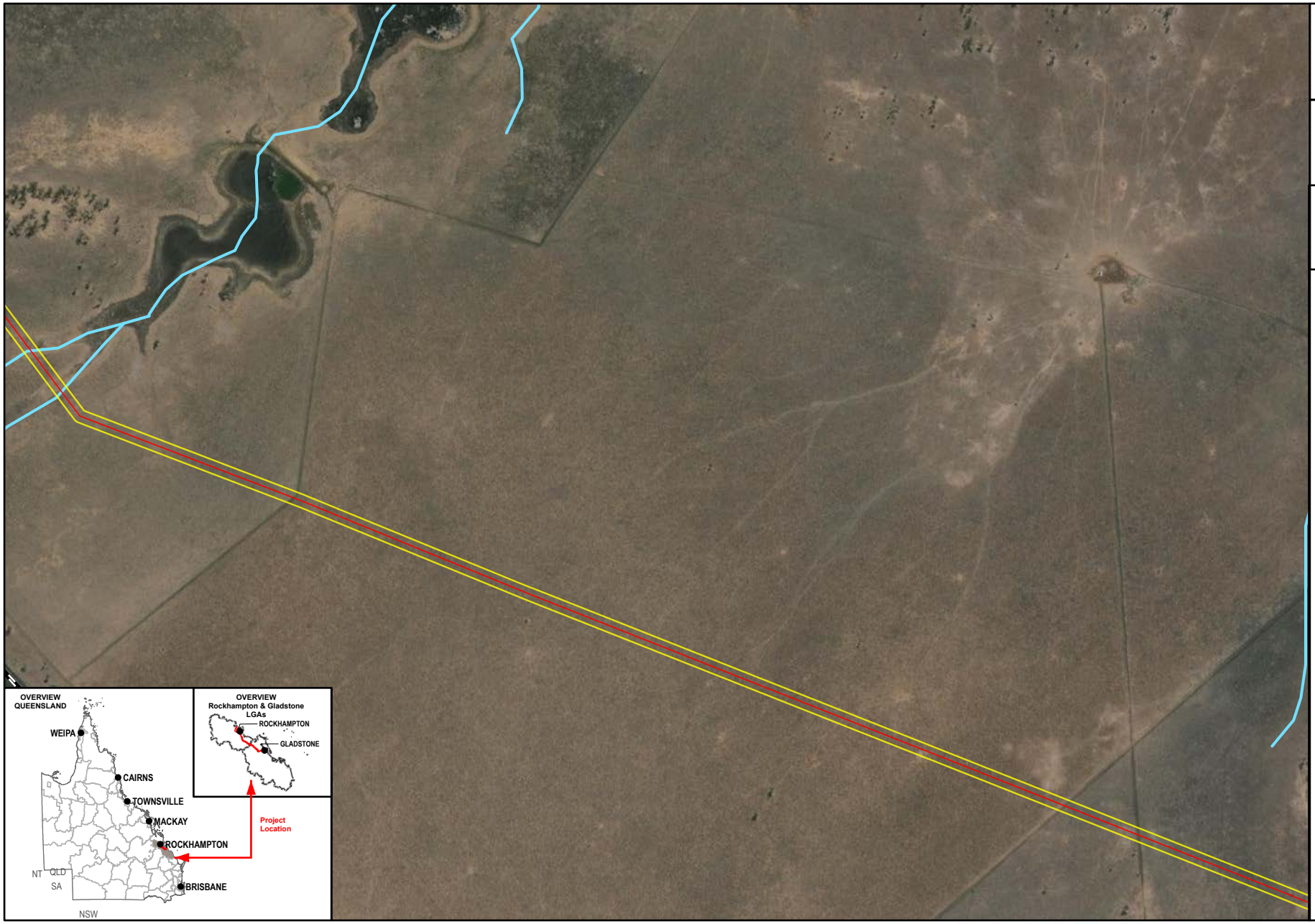

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
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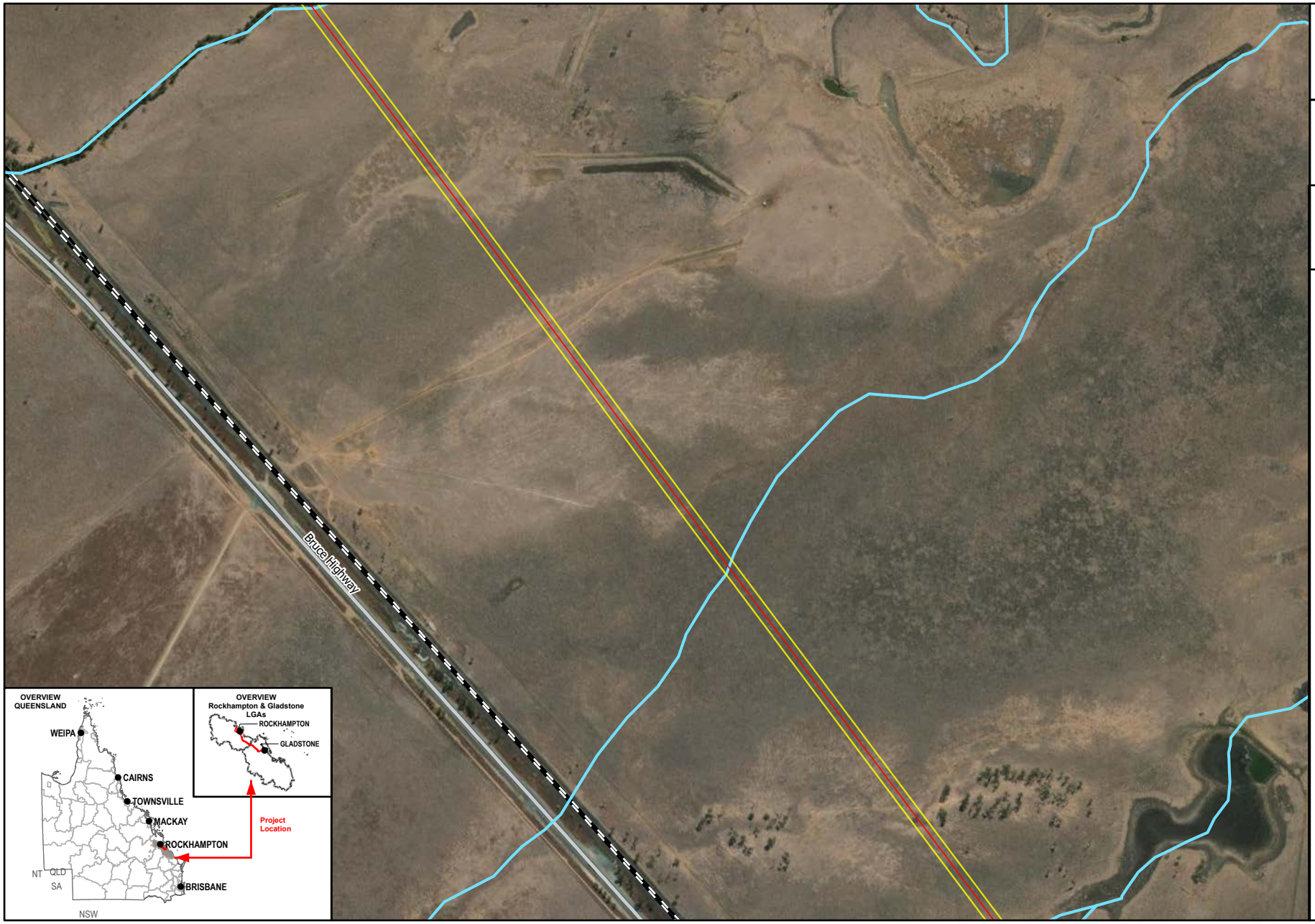
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15o
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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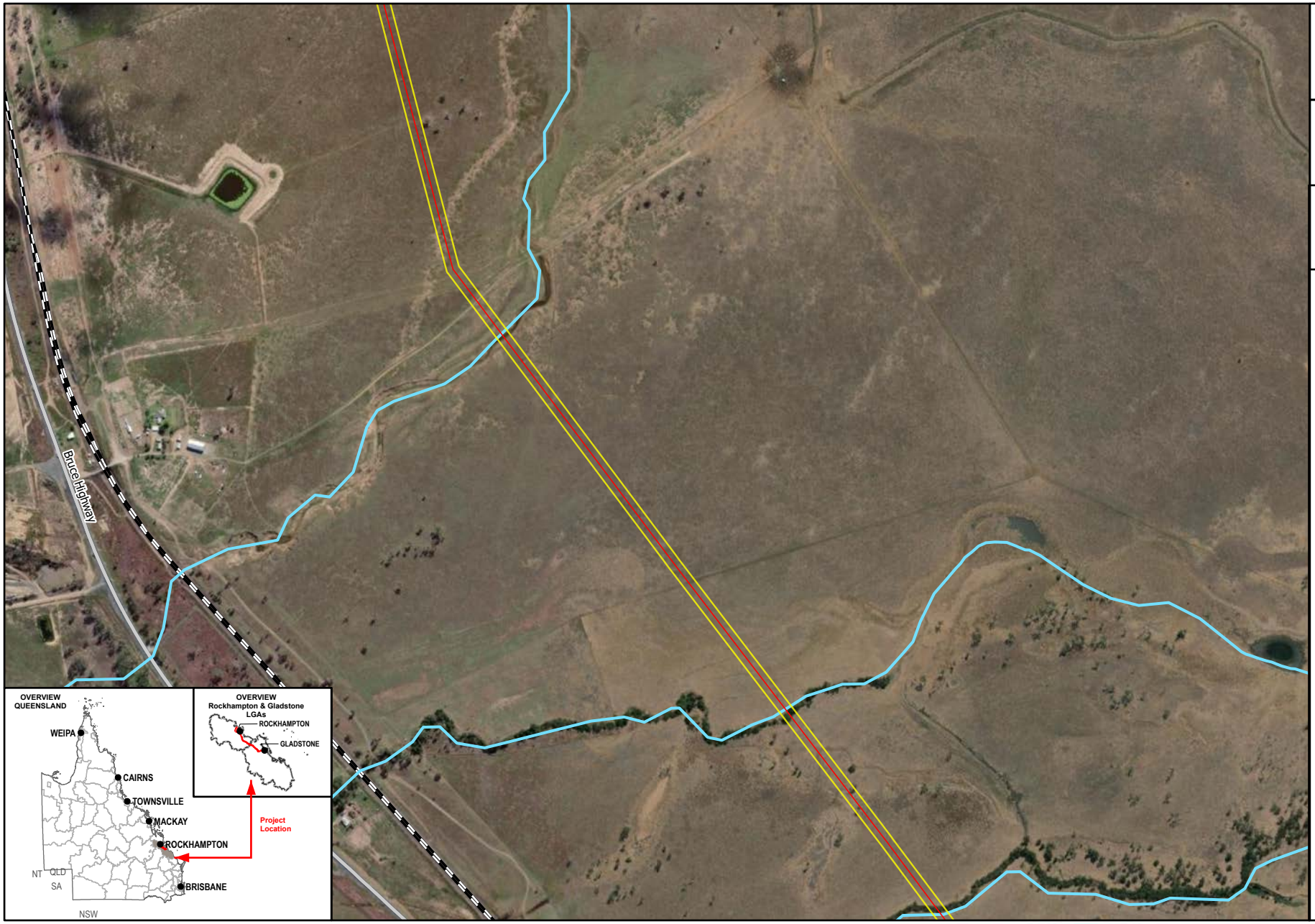

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15q
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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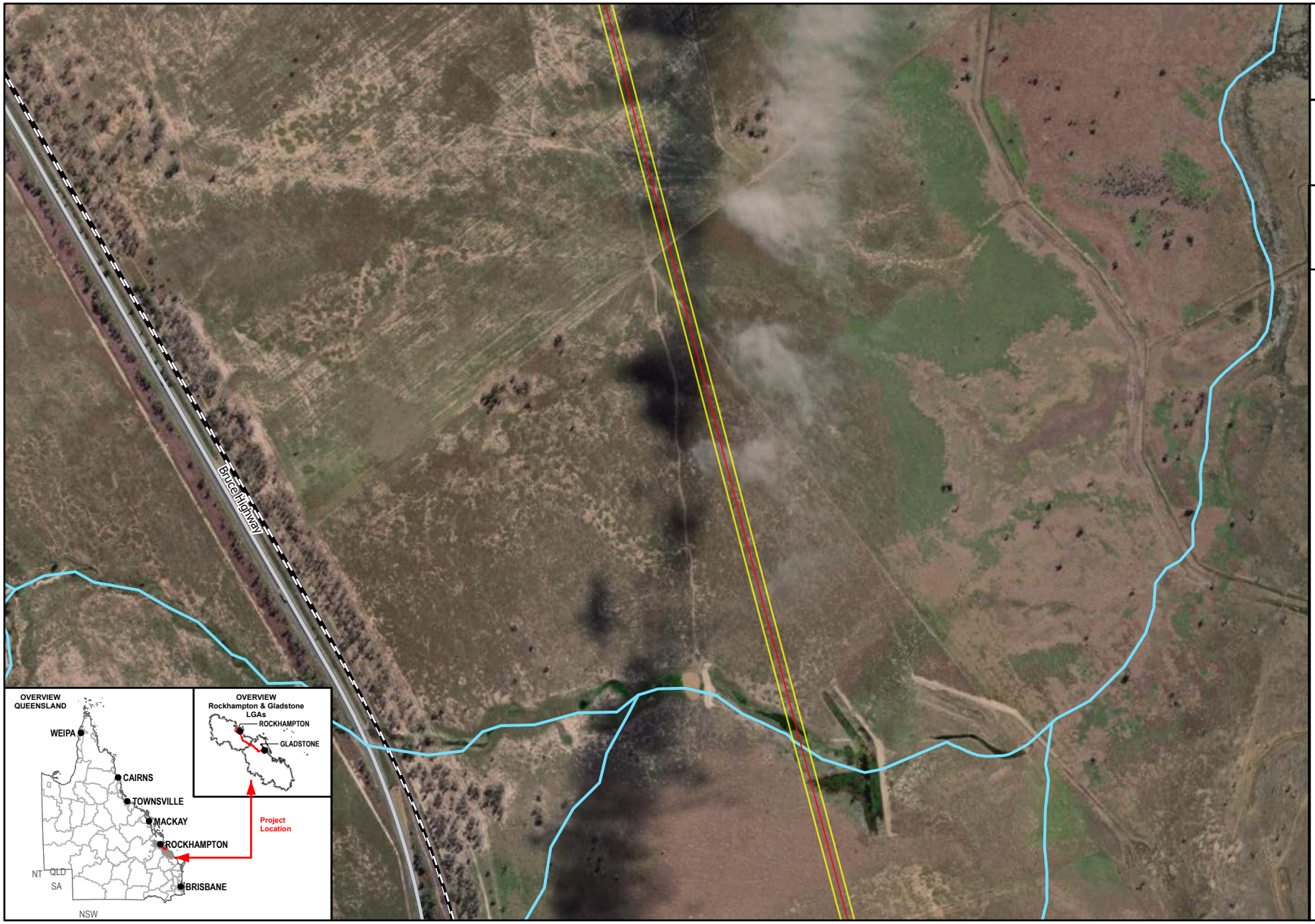

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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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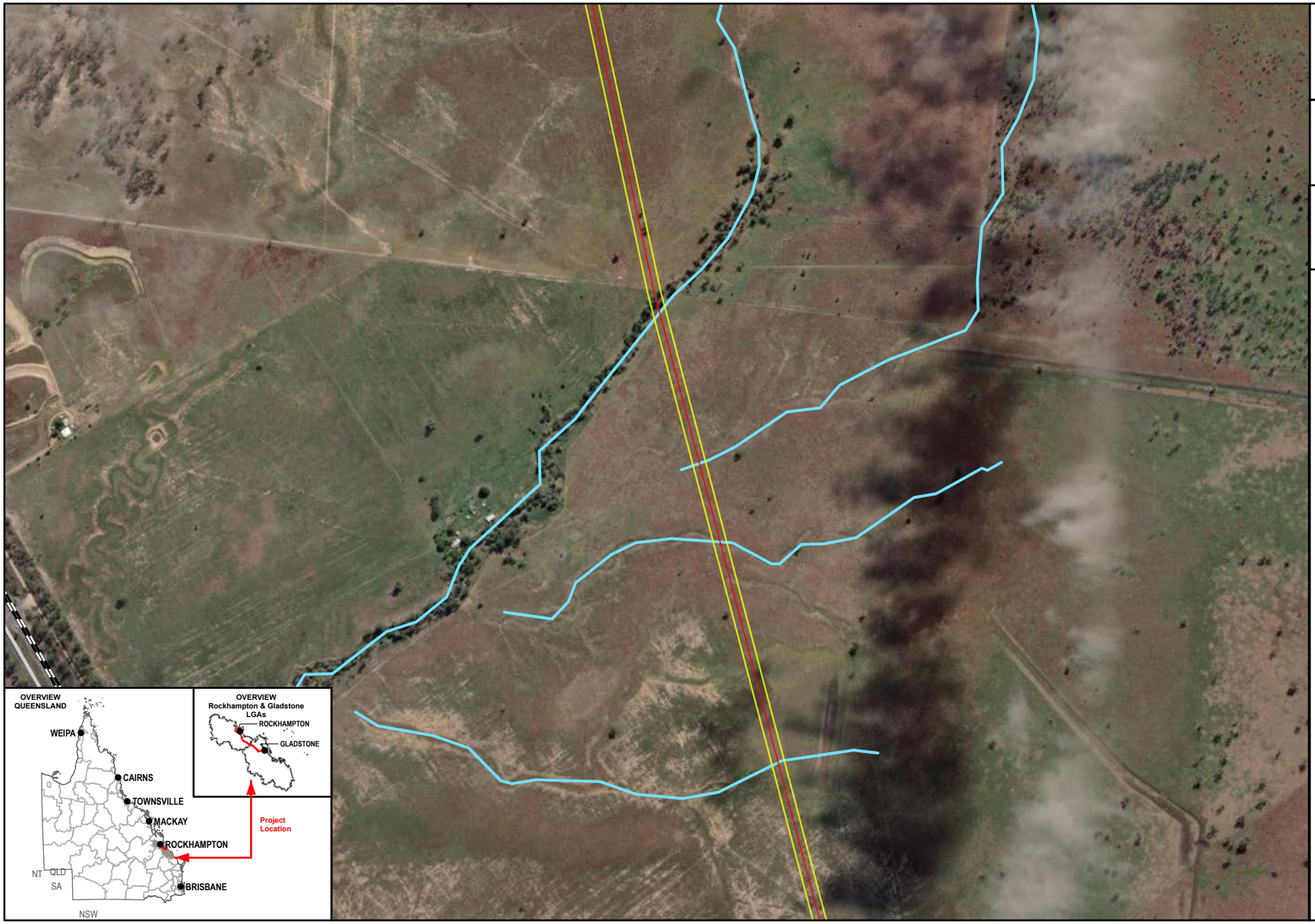
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15r
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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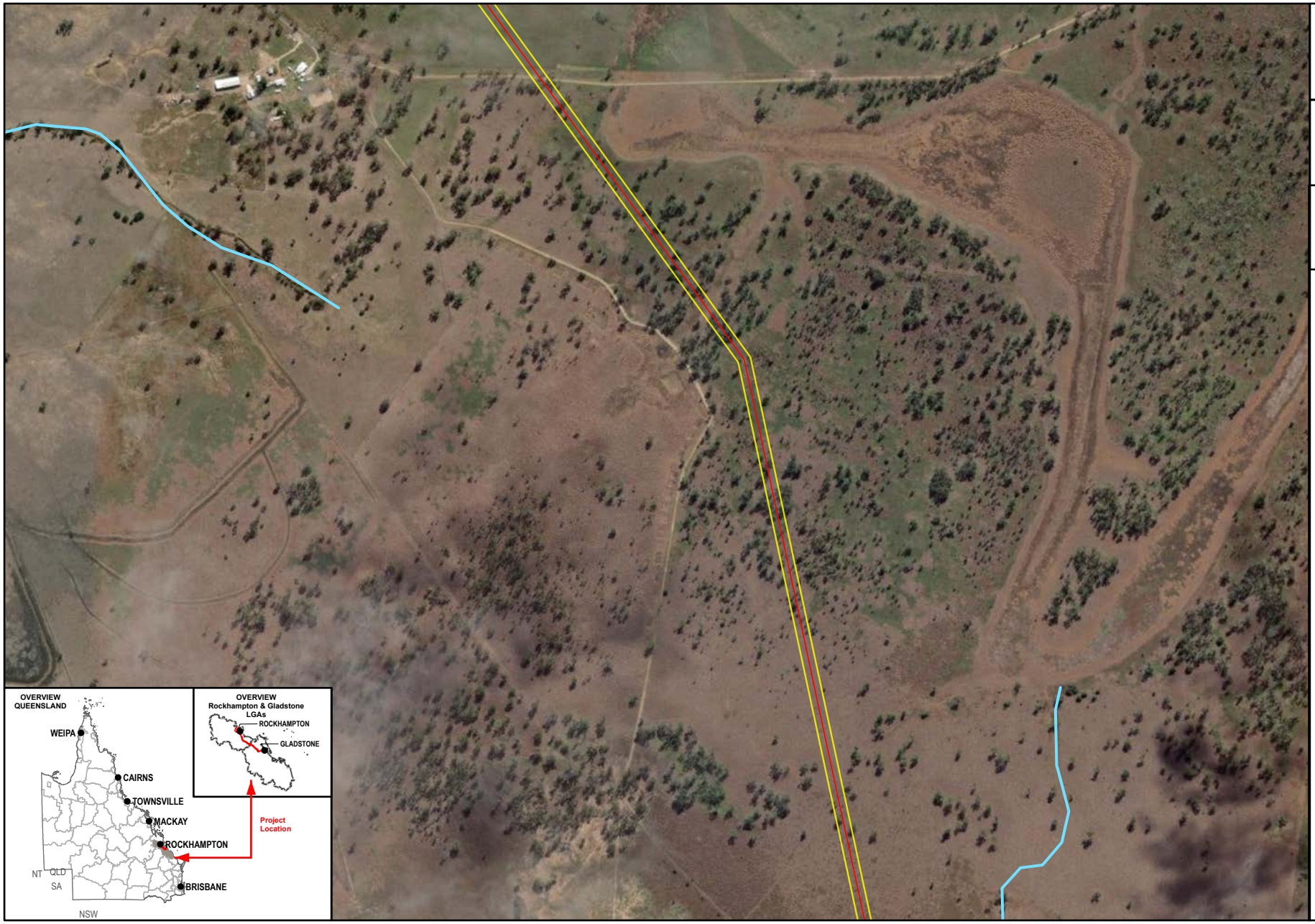

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- SGIC SDA Pipeline Alignment
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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15t
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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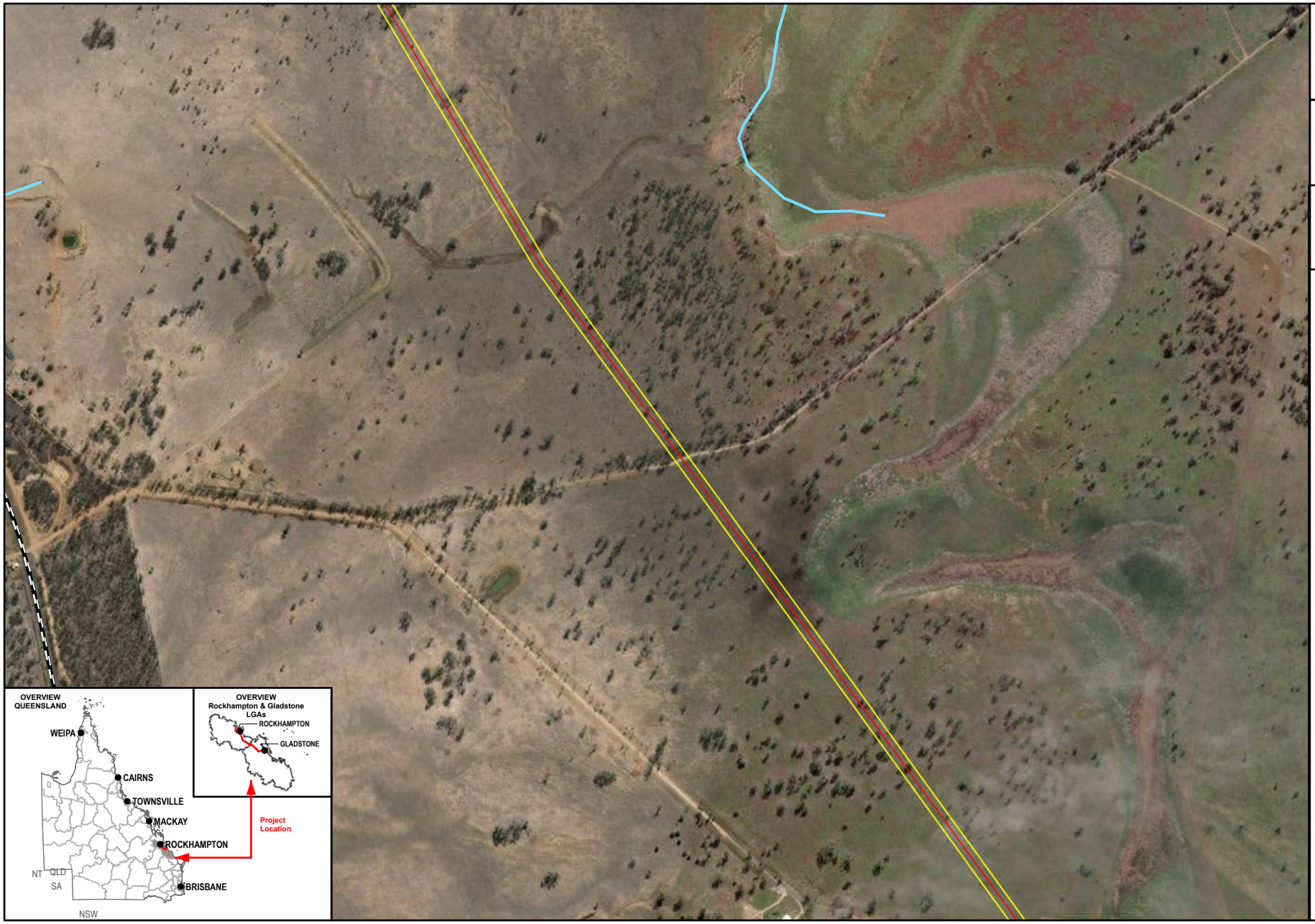

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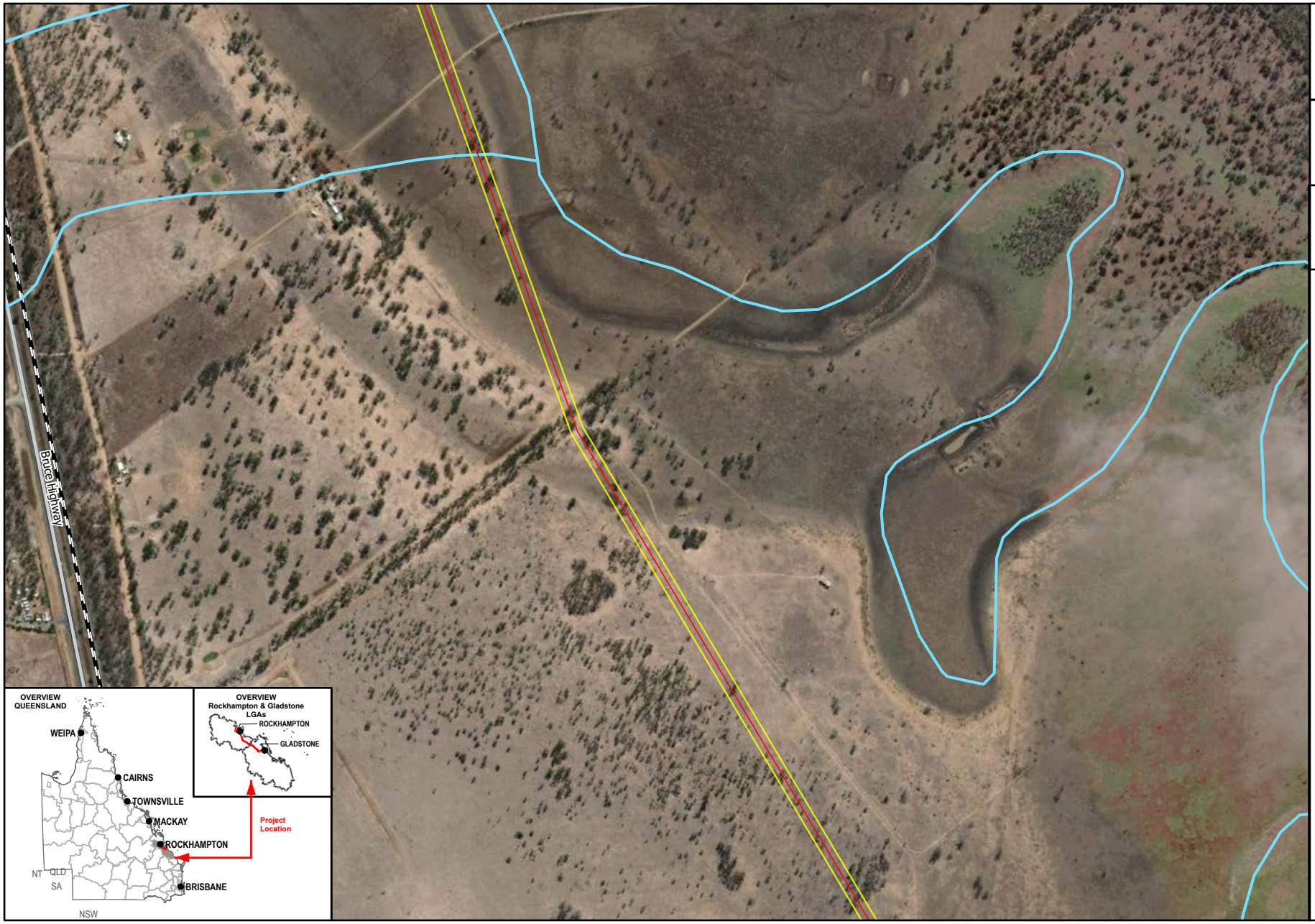
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15u
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

000-G-MAP-2437 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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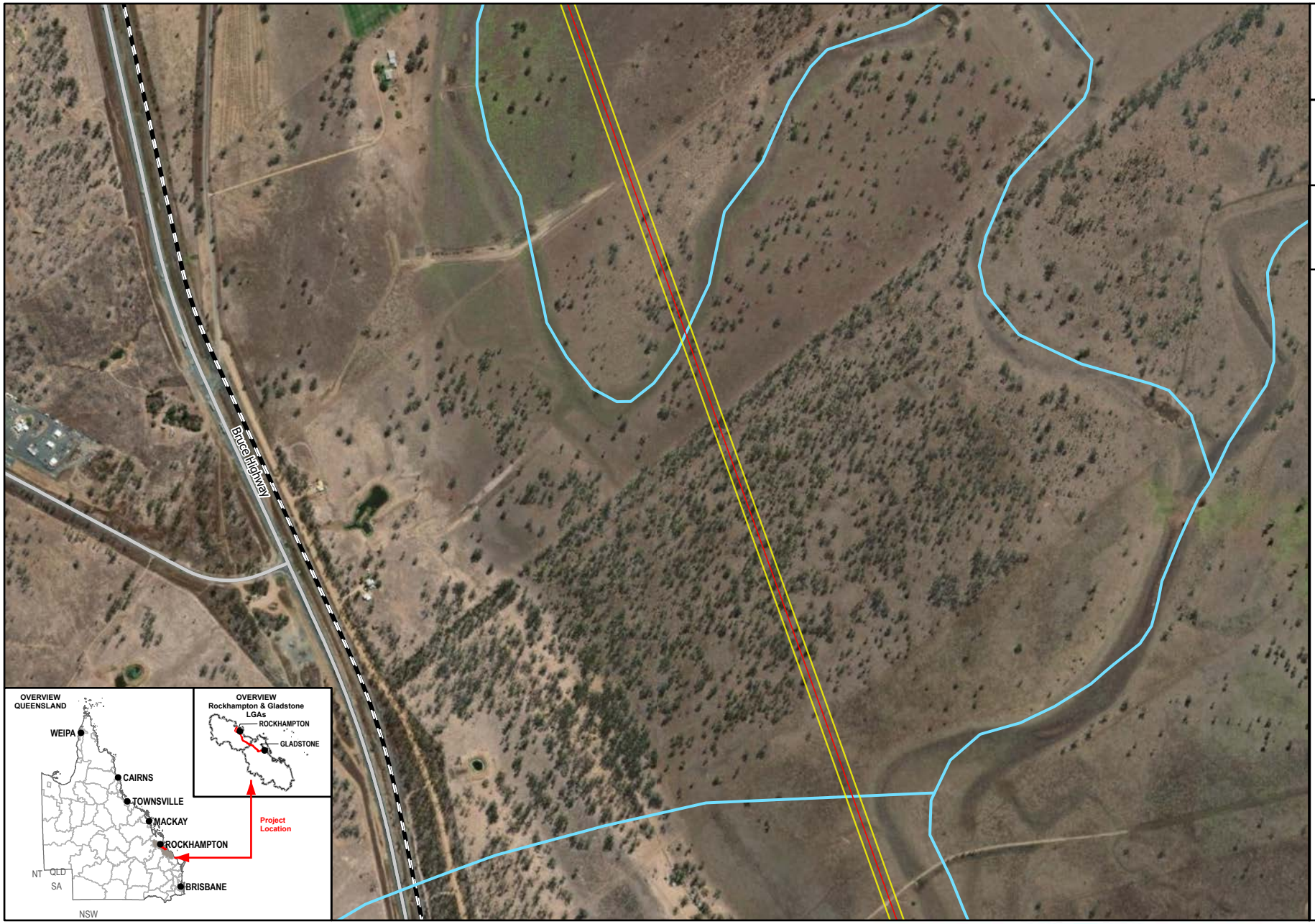

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Figure 7-15w
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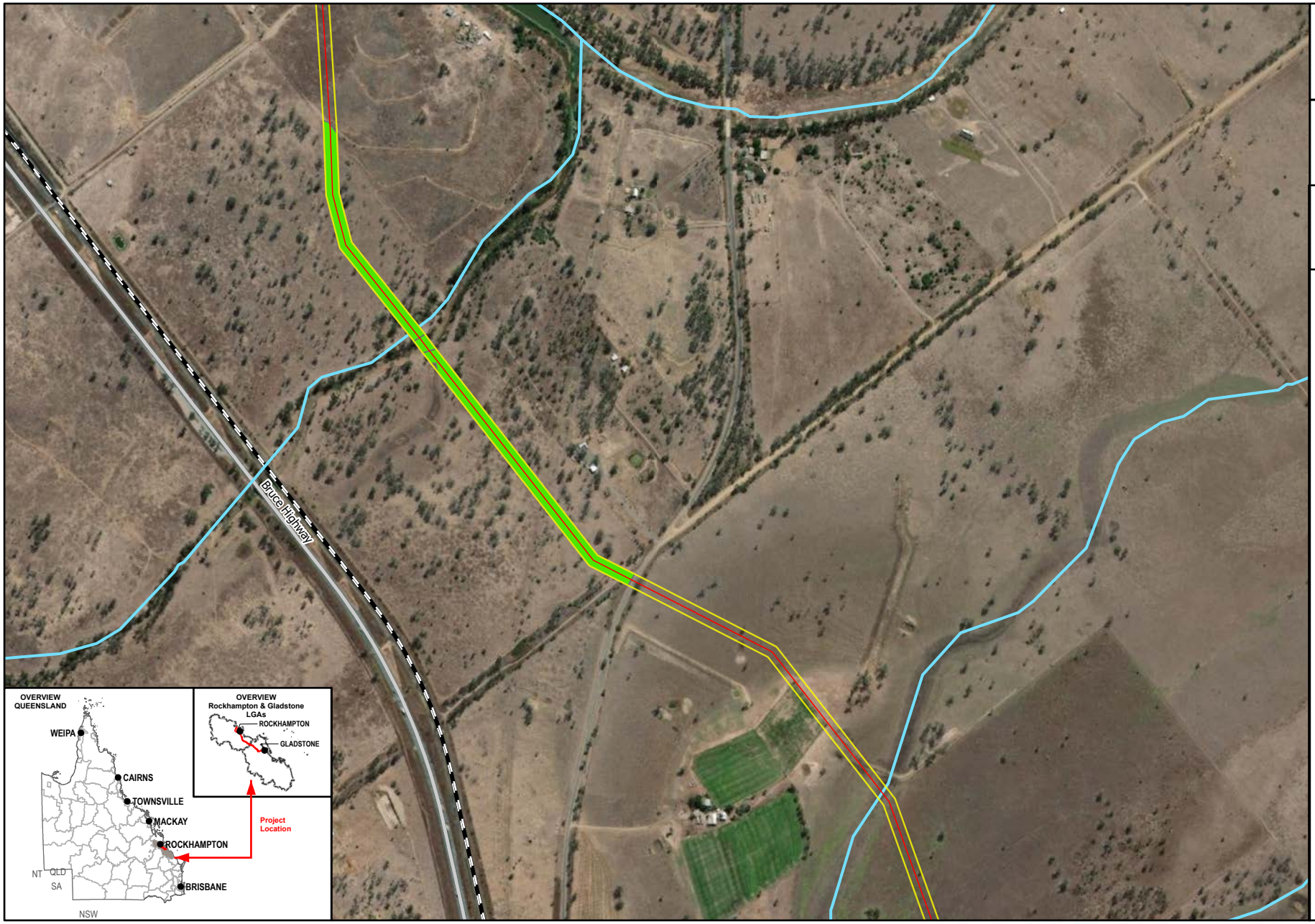

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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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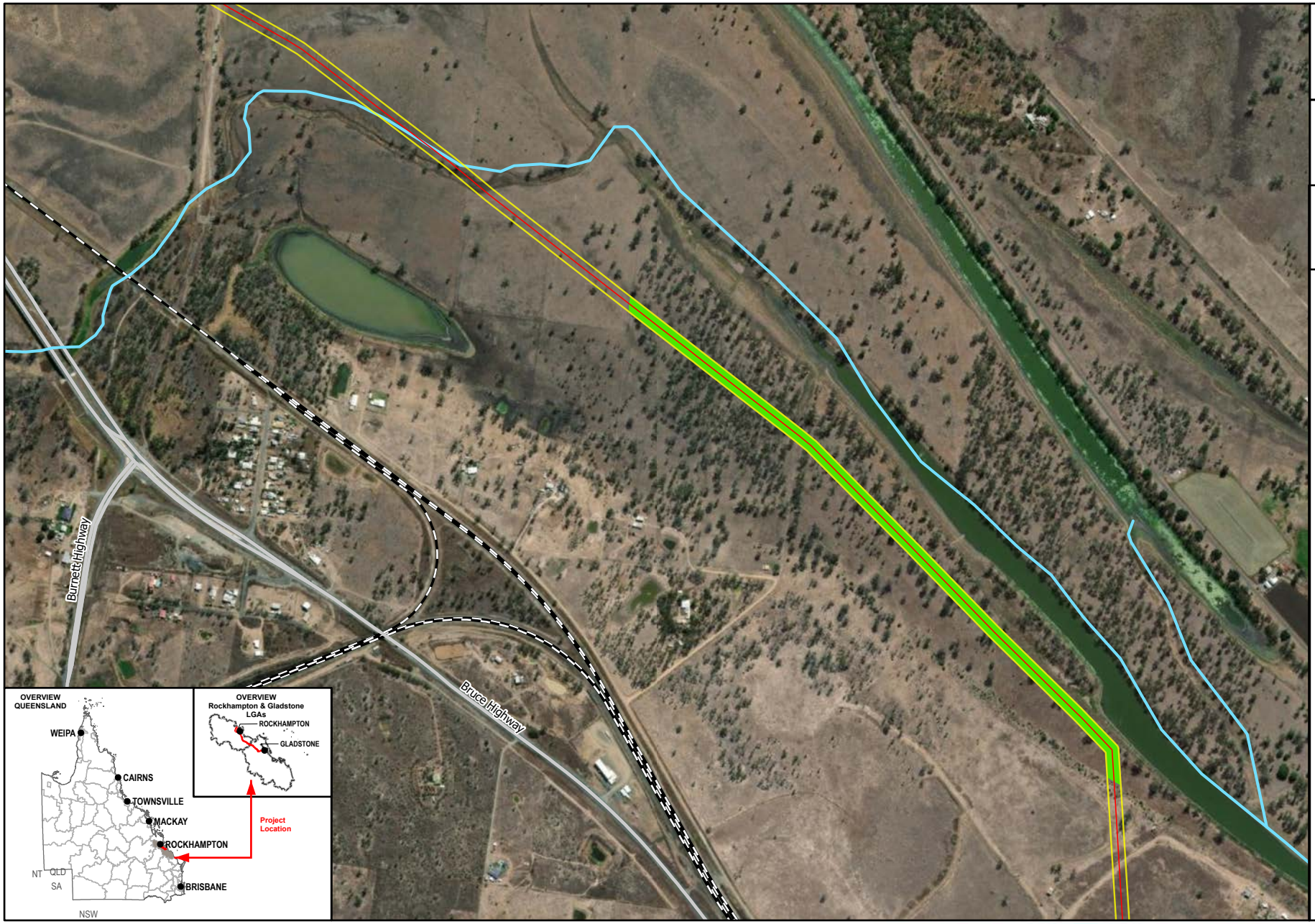

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Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Denning Habitat
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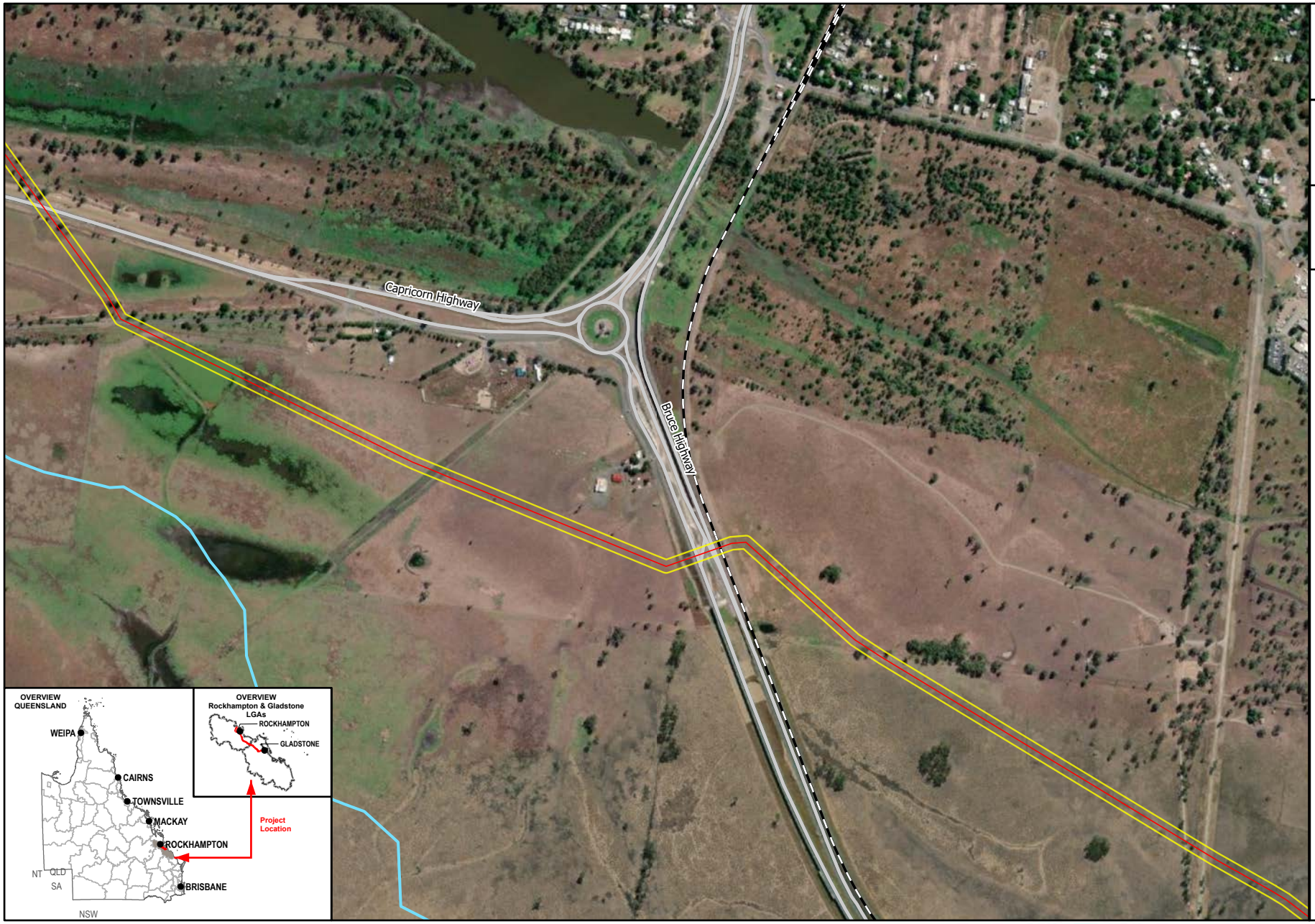

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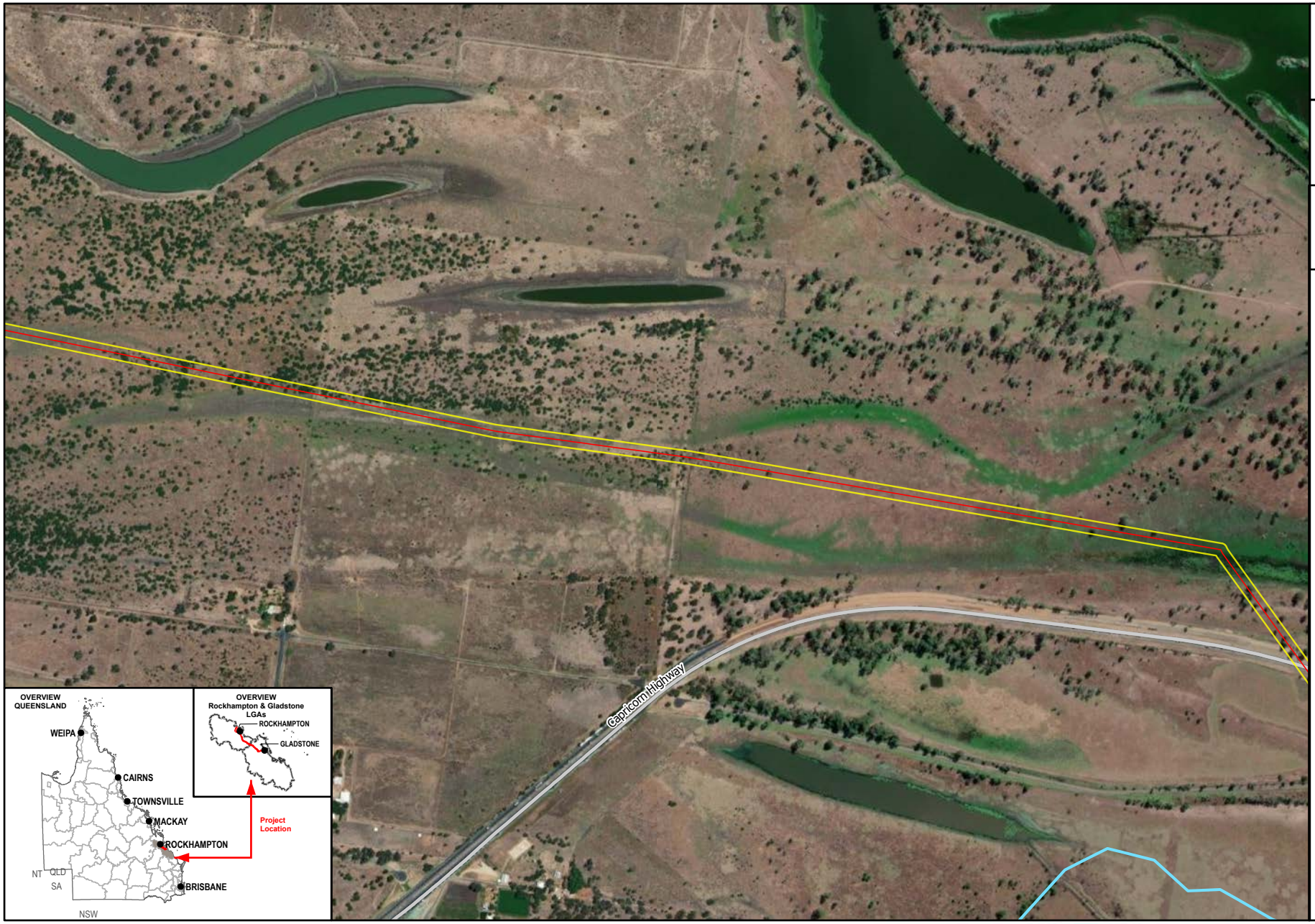

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Legend

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Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-15a1
Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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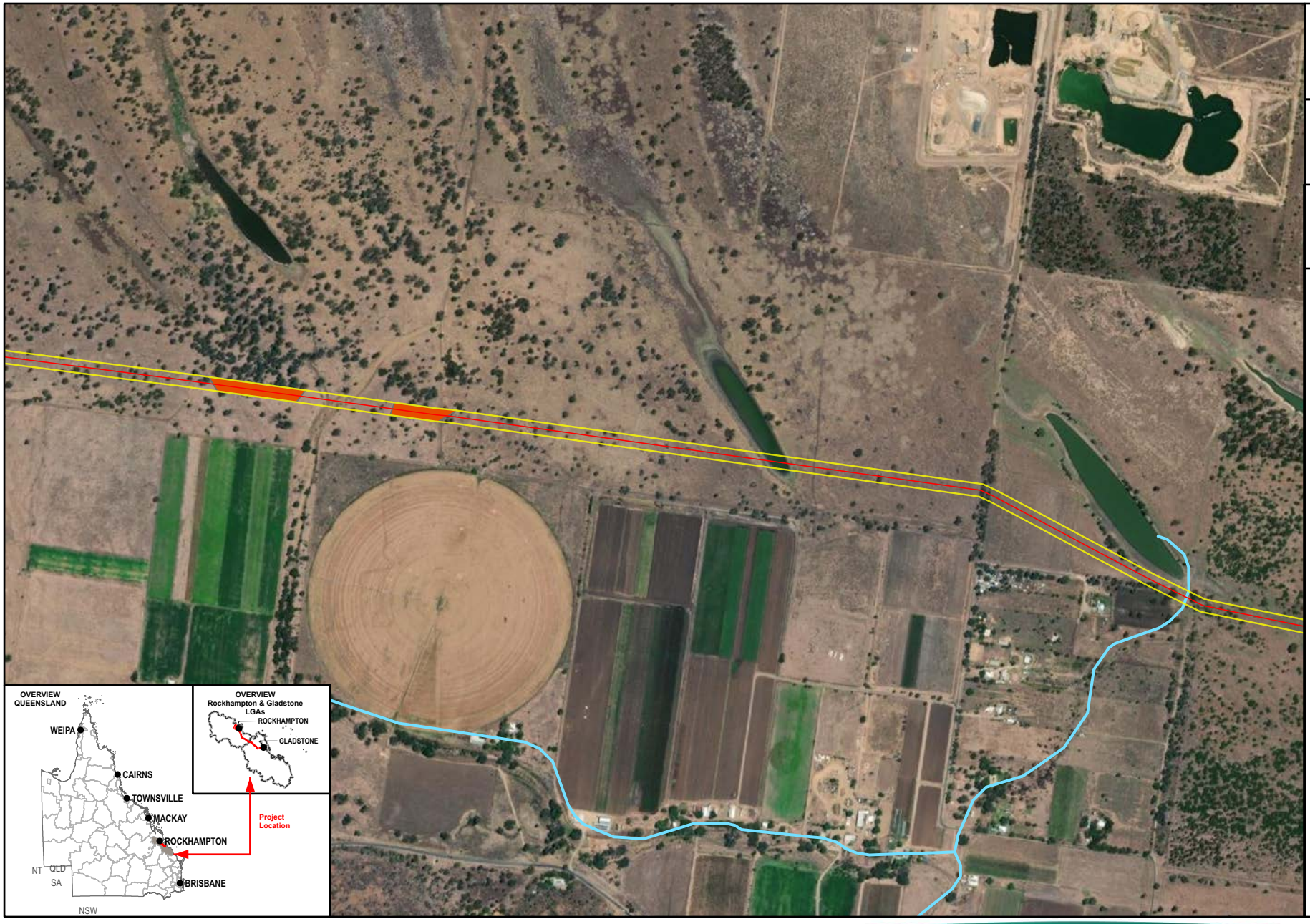

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- SGIC SDA Pipeline Alignment
- Study Area

Predicted Yellow-bellied Glider (South-eastern) Habitat

Habitat Type

- Potential Foraging Habitat
- Waterways

Data Sources:
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Figure 7-15b1

Distribution of Yellow-bellied Glider (south-eastern) Habitat Within the SGIC SDA Study Area

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7.2.2.11 Koala

Conservation status and species ecology

The koala is listed as endangered under the EPBC Act and NC Act but was not listed as an MNES at the time of the approval. The koala occurs in Queensland, New South Wales, the Australian Capital Territory, Victoria and South Australia. The species' occurrence is discontinuous across its distribution with several subpopulations separated by cleared lands and unsuitable habitat (DAWE 2022b). They are a wide-ranging species, typically occurring in forests and woodlands dominated by *Eucalyptus* species (DAWE 2022b). The species occurs in coastal and inland habitats – in Queensland this spans north Queensland to the Herberton area, westwards into semi-arid parts of central Queensland, and south into New South Wales (DAWE 2022b). The koala's range is restricted by food, habitat and environmental requirements, resulting in highly variable home range sizes. In Queensland and New South Wales, home ranges vary from 3 to 500 ha (DAWE 2022b), with home range increasing as trees become more widely spaced (DAWE 2022b; Youngentob 2021). Males typically have larger home ranges than females, and in general, home ranges are larger in semi-arid woodlands than in mesic coastal forests (DAWE 2022b). Since European colonisation, the koala's distribution and population size has declined significantly as a result of vegetation clearance and climate change drivers (DAWE 2022b).

In Queensland, koala inhabit moist coastal forests, southern and central western subhumid woodlands and eucalypt woodlands adjacent to waterbodies in semi-arid western parts of the state (Youngentob 2021). The species' occurrence is patchy, fragmented and often occurs in low-density populations across a number of bioregions including north to Einasleigh Uplands and Wet Tropics, Desert Uplands, Central Mackay Coast, Mitchell Grass Downs, Mulga Lands, Brigalow Belt North, Brigalow Belt South, and Southeastern Queensland where they are most frequently sighted (DAWE 2022b; Youngentob 2021).

The koala is an obligate folivore and its highly specialised diet Is defined by the availability and palatability of a limited variety of *Eucalyptus, Corymbia* and *Angophora* species (Youngentob 2021). Primary food species differ across the species' range – koalas have been recorded to feed on more than 120 species of *Eucalyptus, Corymbia* and *Angophora* species. The koala is a relatively sedentary species, with movement increasing during the breeding period (September to February) (DAWE 2022b).

In the assessment of habitat quantity and quality, the National Recovery Plan for the koala (DAWE 2022c) highlights the importance of considering landscape patch size, form, and spatial configuration within the context of the wider landscape, which can vary among landscapes and varies regionally (DAWE 2022c). Research has shown that koalas move very differently through different landscapes, depending on the level of habitat connectivity that has been retained (DAWE 2022c). In contiguous landscapes with high connectivity, koalas move slowly between koala habitat trees along vegetated watercourses, roadsides, and other areas of functional connectivity. This increases their energetic efficiency and reduces their susceptibility to predation (DAWE 2020c). In more fragmented landscapes, koalas follow more direct movement pathways and demonstrate an increased willingness to cross open areas at ground level to move between isolated patches of vegetation (DAWE 2022c) albeit their safety is at risk and the open and exposed landscape proves to be a hostile environment (DAWE 2022c). In the context of a contiguous landscape, where high levels of linear habitat connectivity are retained along watercourses, vegetated roadsides and fence lines and where dog attacks on livestock have been reported by local landholders, large open paddocks are expected to receive low levels of utilisation by koalas.

Field survey results and distribution of suitable habitat

Koala scratches (on smooth-barked trees) and faecal pellets were recorded at one location adjacent to Boat Landing Creek during the Arup (2008) field surveys. The species was not recorded during the 2022 field surveys. Survey effort for the koala included two nights of 2-3 hours of spotlighting and faecal pellet searches at nine locations within potentially suitable habitat in the SGIC SDA study area. Historical records for the species' have been recorded at 14 locations within the desktop search extent (10 km buffer), the closest record approximately 930 m from the SGIC SDA pipeline alignment. Many of these records have been historically recorded within woodland habitats.

Potential habitat for this species' is predominately located within the southern extent of the SGIC SDA study area, within woodland habitats and fringing riparian vegetation retaining koala food trees (i.e. *Melaleuca*, *Eucalyptus*, *Corymbia* and *Acacia* species). The northern extent of the SGIC SDA pipeline alignment is largely cleared for agricultural purposes; however, fringing riparian vegetation and highly fragmented patches of remnant vegetation

retaining koala food trees persist within the area. The distribution of predicted koala habitat was based on criteria detailed in Appendix F and is mapped in Figure 7-16. Habitat assessments undertaken within the SGIC SDA study area involved taking representative photos of the vegetation and general habitat. 18 habitat assessment sites within the SGIC SDA study area were selected to illustrate suitable habitat for the koala, as well as presenting photos of areas that do not represent suitable habitat due to the lack of koala food and shelter trees. Each survey photo reference number refers to the photo that was taken at that habitat assessment site and is presented in Appendix G. Of those 18 habitat assessment site photos, nine photos (photo number 10, 11, 14, 15, 17, 21, 23, 24 and 25) represent suitable koala habitat.

Significance of impact assessment

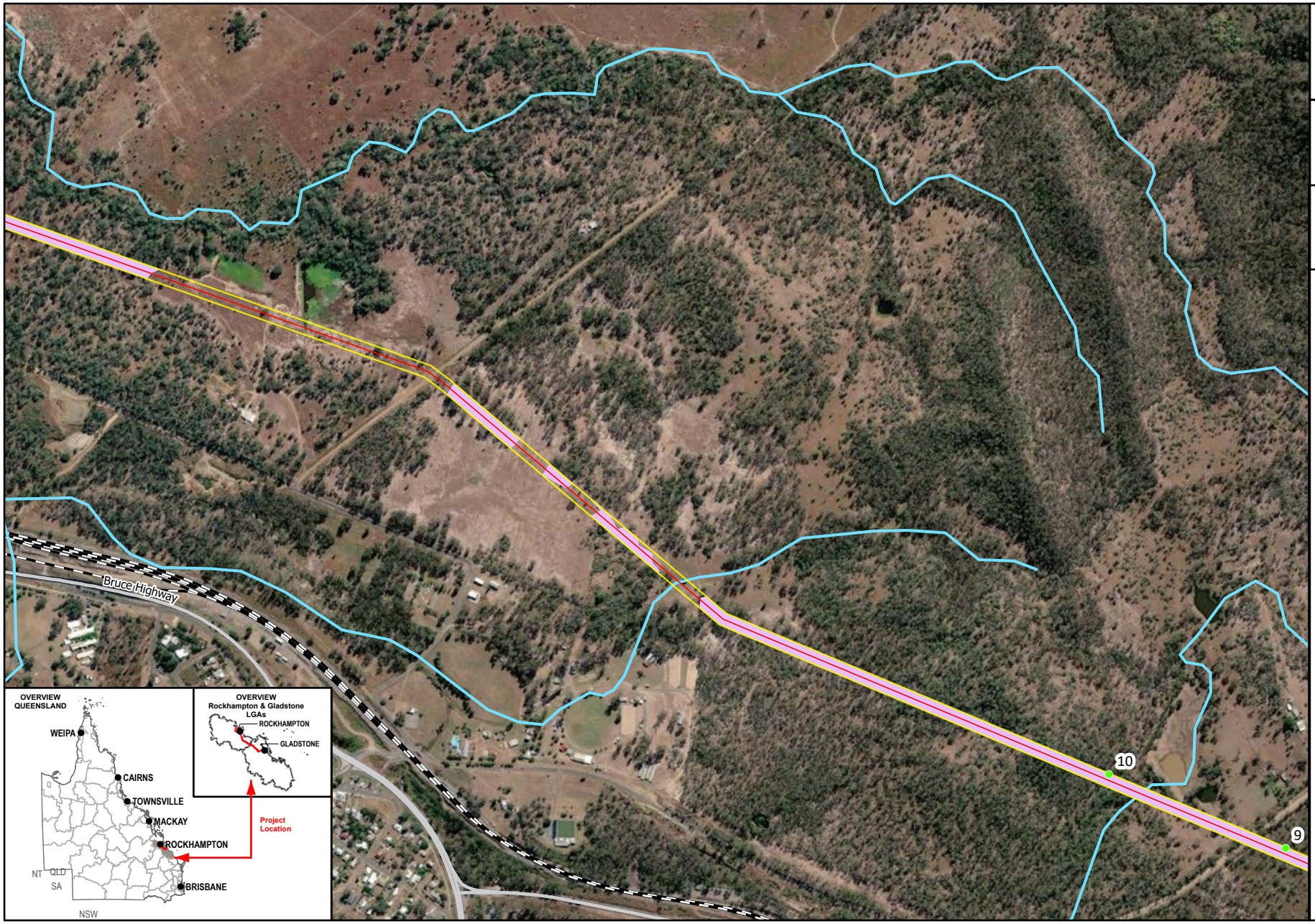
The project is likely to result in a significant residual impact on the koala. A significance of impact assessment of the project on the koala (endangered under the EPBC Act and NC Act) is provided in Table 7-29.

Table 7-29 Significance of impact on the koala

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The koala population within the SGIC SDA study area is considered an important population in the accordance with the Commonwealth approved conservation advice. The koala has been historically recorded at 14 locations within the desktop search extent (10 km buffer), the closest record approximately 930 m from the SGIC SDA pipeline alignment. Koala scratches and faecal pellets were recorded during the Arup (2008) field surveys within the SGIC SDA study area; however, no individuals or evidence of presence was recorded during the 2022 field surveys. Based on the ecological field surveys and species ecology, koalas are predicted to occur at low densities within the GSDA pipeline alignment. The project is anticipated to result in the loss of 49.25 ha of suitable koala habitat. This represents 0.36 % of regional habitat (i.e. available within a 5 km buffer). The maximum width of clearing required for construction of the SGIC SDA pipeline alignment is 30 m. Once the pipeline has been installed and buried, a maximum width of 10 m will be permanently cleared with the remaining 20 m to be rehabilitated. The SGIC SDA pipeline alignment largely supports remnant and regrowth vegetation in the southern extent, and open landscapes with fringing riparian vegetation in the northern extent. However, the northern and southern areas of the SGIC SDA pipeline alignment retain suitable koala food trees (i.e. *Melaleuca*, *Eucalyptus*, *Corymbia* and *Acacia* species). Relatively large areas of suitable habitat will persist in the surrounding landscape within the southern extent, and patches of woodland areas and riparian corridors within the northern extent, allowing opportunities for movement. Construction and operation impacts associated with the project are unlikely to have permanent impacts on the persistence of local and regional koala populations. Based on the scarcity of historical records and lack of koala traces in field surveys, koalas are likely to occur in low local densities. While the loss of 49.25 ha of suitable habitat will reduce the local availability of koala food and shelter trees, this is unlikely to lead to excessive competition for resources, given the low koala densities. The local loss of resources is therefore likely to be absorbed within remaining habitat in areas adjacent to the GSDA pipeline alignment. Therefore, the local koala population is not expected to experience a significant reduction in foraging and breeding success due to any increase in competition for resources.
Reduce the extent of occurrence of the species	**Unlikely** The project is anticipated to result in the loss of 49.25 ha of suitable koala habitat. This represents 0.36 % of regional habitat (i.e. available within a 5 km buffer). A maximum width of 30 m will be cleared for construction of the SGIC SDA pipeline alignment, with 20 m to be rehabilitated after the pipeline has been installed and buried. The SGIC SDA pipeline alignment has been largely placed in landscapes that have been previously cleared (open grass paddocks and regrowth vegetation) and has largely avoided areas retaining intact and fragmented remnant vegetation. Much of the surrounding landscape is similar to the landscape present within the GSDA pipeline alignment, such as cleared open landscapes, riparian corridors, and regrowth and remnant vegetation. The project is unlikely to disrupt connectivity to the extent that movement between remnant patches will be disrupted. As such, there will be not expected to be a change in the extent of occurrence of the species, especially noting the definition of extent of occurrence per the Queensland *Significant Residual Impact Guideline* (DEHP 2014b): *Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon*.

Significant residual impact criteria	Potential to occur
Fragment an existing population	**Unlikely** A maximum width of 30 m will be cleared for construction of the SGIC SDA pipeline alignment, with 20 m to be rehabilitated after the pipeline has been installed and buried. The SGIC SDA pipeline alignment has been largely placed in landscapes that have been previously cleared and in areas that retain regrowth vegetation. Habitat loss within the SGIC SDA pipeline alignment is not expected to impact connectivity with surrounding koala habitat as the habitat losses will be localised and is not considered to create large gaps to disrupt koala movement. Large areas of suitable koala habitat will persist within woodland and riparian corridor habitats immediately adjacent to the SGIC SDA pipeline alignment. Therefore, the project is unlikely to fragment an existing koala population. It is noted that the local koala population in the landscape is likely to be very low, noting the low number of historic records and no contemporary records from 2022 field surveys.
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** As detailed above, the species' capacity to move locally and regionally is unlikely to be limited by any localised land clearing necessary to construct the SGIC SDA pipeline alignment. As a result, the project is not considered to cause any form of genetic isolation at a population level.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	**Unlikely** Invasive species including wild dogs already occur throughout the area. Predatory species are attracted to prey opportunities presented by cleared corridors or prey moving away from disturbance areas. While new infrastructure has the potential to increase the risk of wild dog attack on koala by facilitating regional movement of dogs, these threats are already present within the receiving environment and are not likely to be exacerbated by the project. Feral animal control measures will be implemented throughout the duration of the project and have been designed to mitigate such risks. There is also potential for the spread of invasive weeds during the construction and operation phase. This potential will be addressed within the CEMP and could provide the opportunity to enhance the quality of the environment utilised by the koala by providing mitigation measures to combat introduced species. The eradication of ground-covering weeds could enhance local koala movement. If mitigation measures are implemented correctly, the project is unlikely to result in the introduction of invasive species that are harmful to the koala.
Introduce disease that may cause the population to decline	**Unlikely** 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 measure such as sequential clearing, site speed limits, use of experienced spotter-catchers during clearing and the requirement to allow koalas to self-disperse will reduce disturbance-related stress and risk of disease. Additionally, the species is susceptible to *Phytophthora cinnamomi* due the soil fungus's ability to infect *Eucalyptus* species. Biosecurity requirements (e.g. weed and seed declarations) will be implemented for the project, and thus, this risk has been assessed as low.
Interfere with the recovery of the species	**Unlikely** The project is expected to be relatively benign with no substantial long-term increase in mortality or any substantial barrier effects due to loss of habitat connectivity. All impacts are expected to be localised. Impacts along the SGIC SDA pipeline alignment are expected to be consistent with existing levels of impact from habitat fragmentation and exposure to road noise and traffic. The risk of koala mortality of injury will be managed by the mitigation measures contained within the CEMP, and an experienced and suitably qualified fauna spotter-catcher will be employed during all clearing works. Accordingly, the project is unlikely to substantially interfere with the recovery of the species.
Result in disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species	**Likely** The project will require the clearing of 49.25 ha of potentially suitable foraging and breeding habitat for the koala. Although the SGIC SDA pipeline alignment has been largely placed within or adjacent to areas that have been previously cleared, the project will result in a loss of koala food and shelter trees (i.e. *Melaleuca*, *Eucalyptus, Corymbia* and *Acacia* species). While the project is not expected to cause a long-term decline in the local population, reduce its extent of occurrence, cause adverse habitat fragmentation effects nor interfere with the recovery of the species, the loss of suitable koala habitat within the SGIC SDA pipeline alignment is likely to result in disruption to ecologically significant locations.

Significant residual impact criteria	Potential to occur
Conclusion	The project is likely to result in a significant residual impact on the koala. Although the SGIC SDA pipeline alignment has been largely placed within or adjacent to areas that have been previously cleared, the project will require the clearing of 49.25 ha of suitable foraging habitat (.e. *Melaleuca*, *Eucalyptus, Corymbia* and *Acacia* species) and breeding habitat.



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Legend

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- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Waterways
- Main Roads
- Railways

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Figure 7-16a
Distribution of Koala Habitat Within the SGIC SDA Study Area
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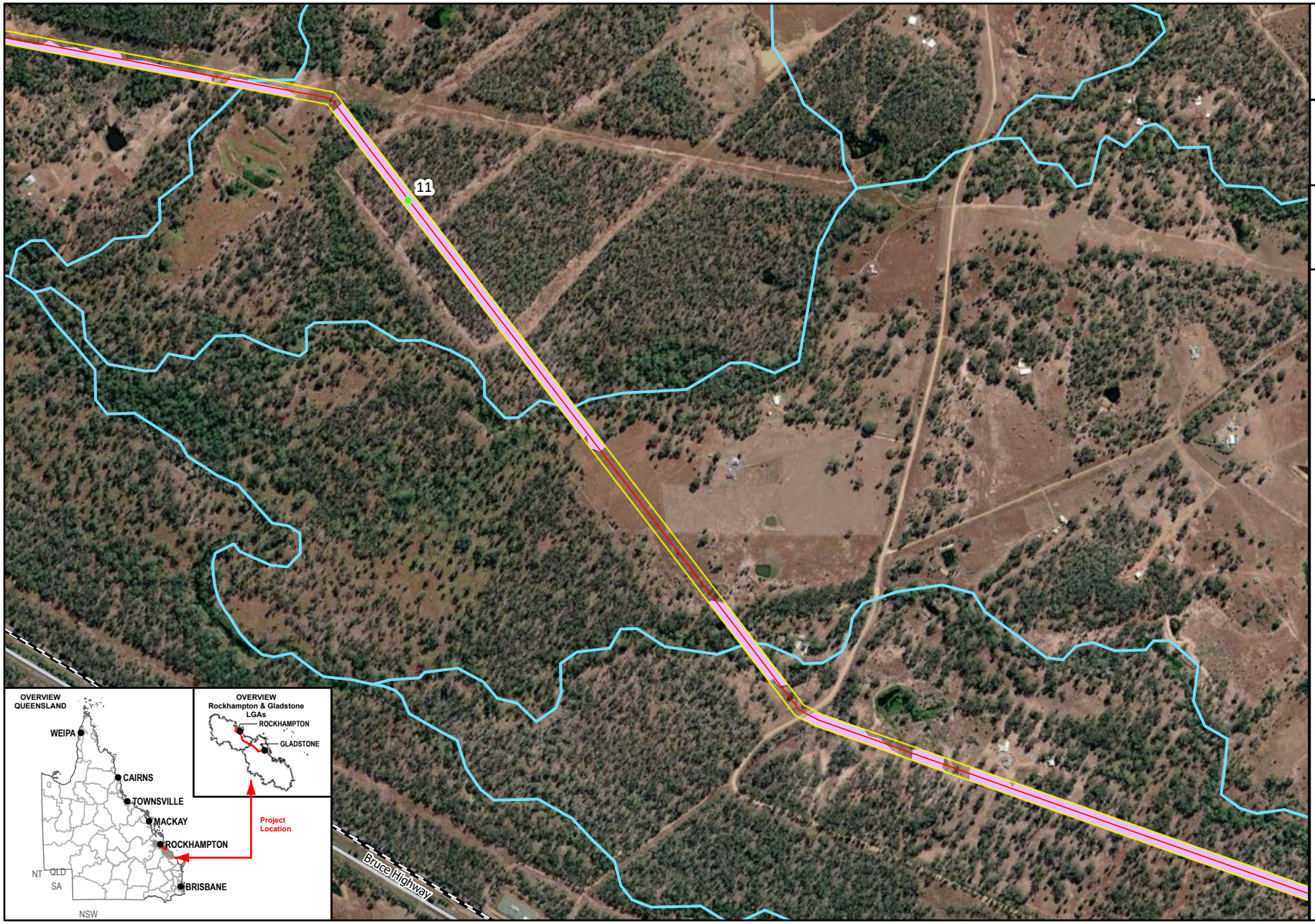

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Data Sources:
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2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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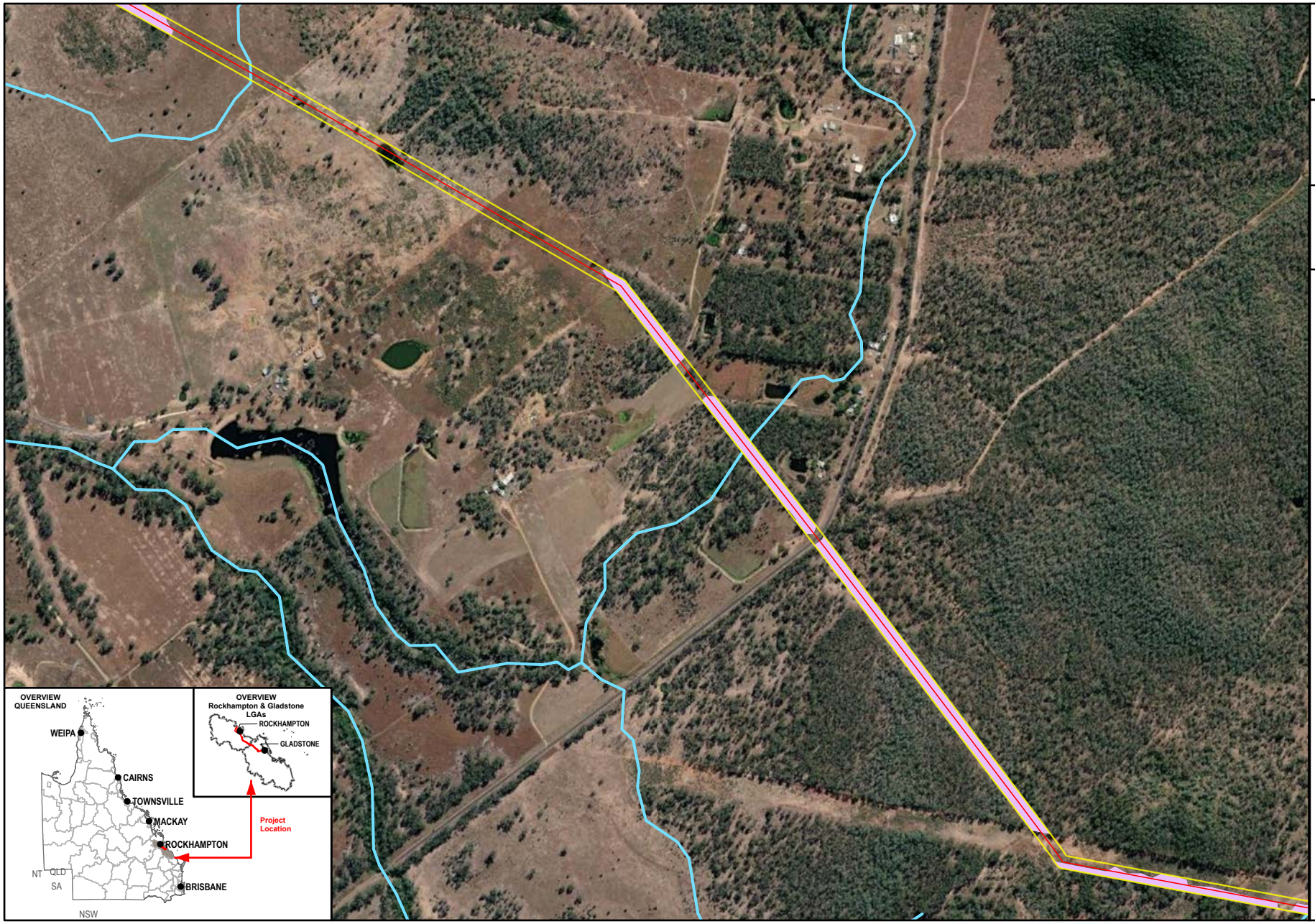
PROJECTION UTM Zone 56
(Datum GDA2020)

Compiled by:YS16239

Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16b
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Koala Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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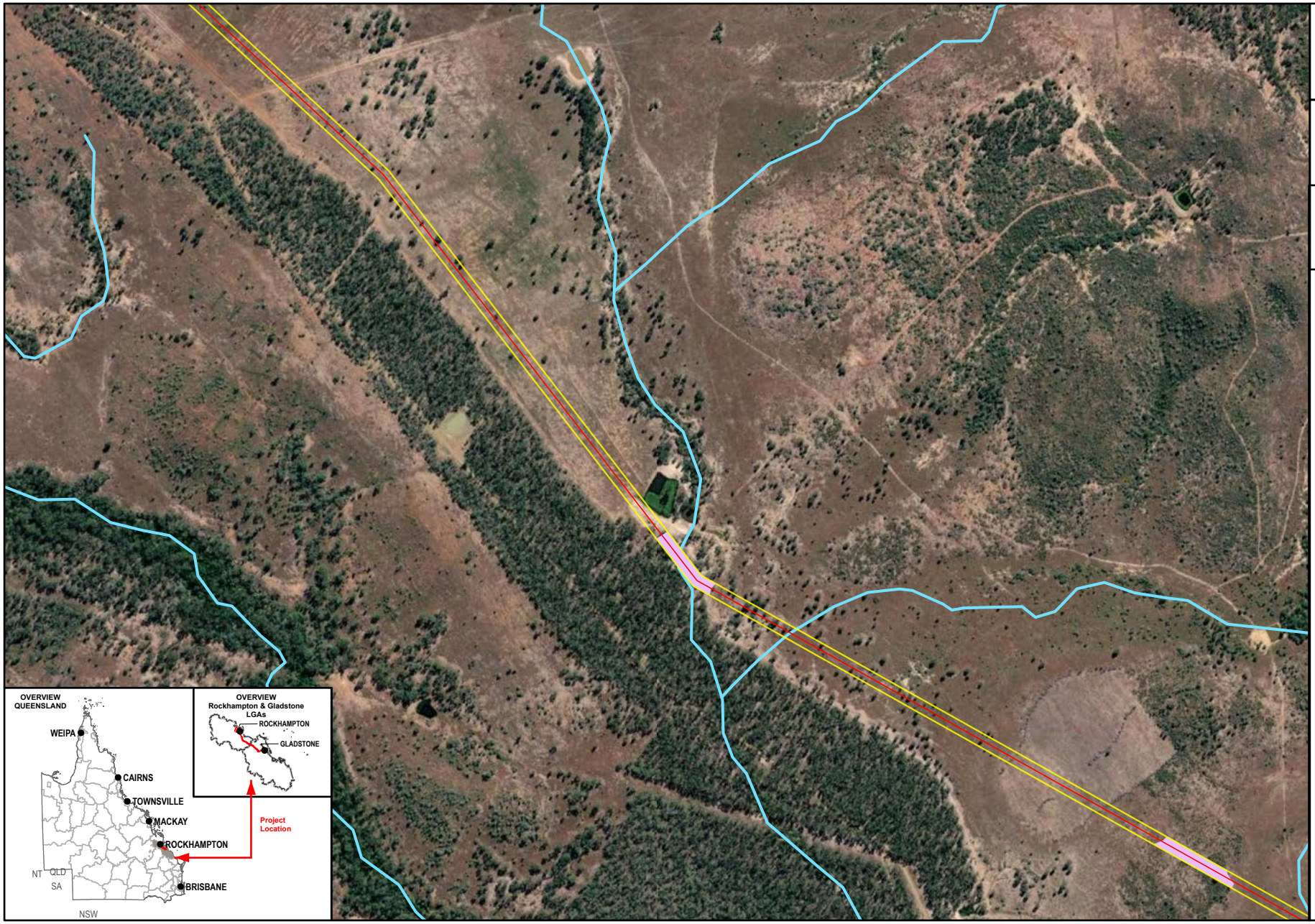
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16c
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Koala Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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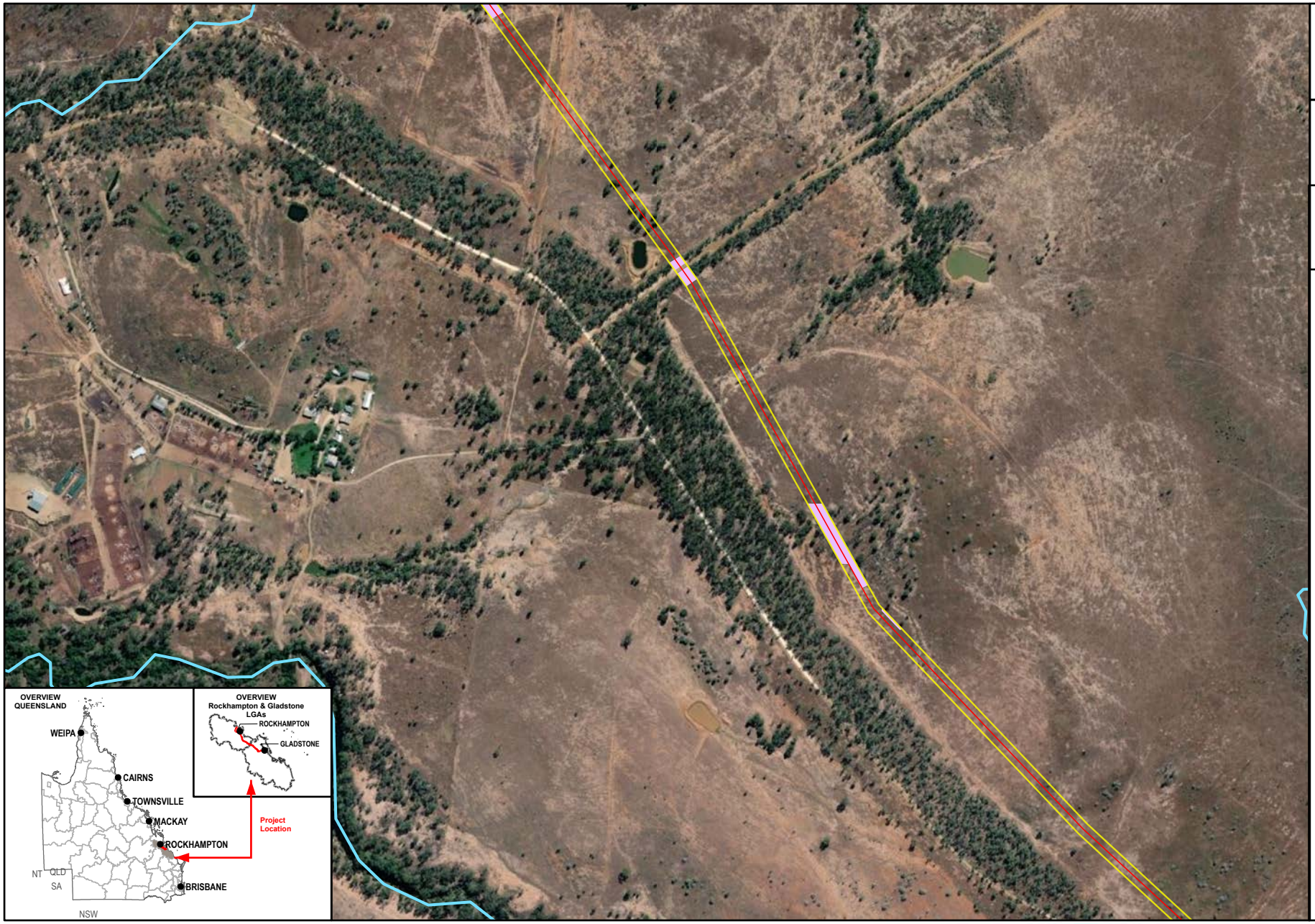
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16d
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Koala Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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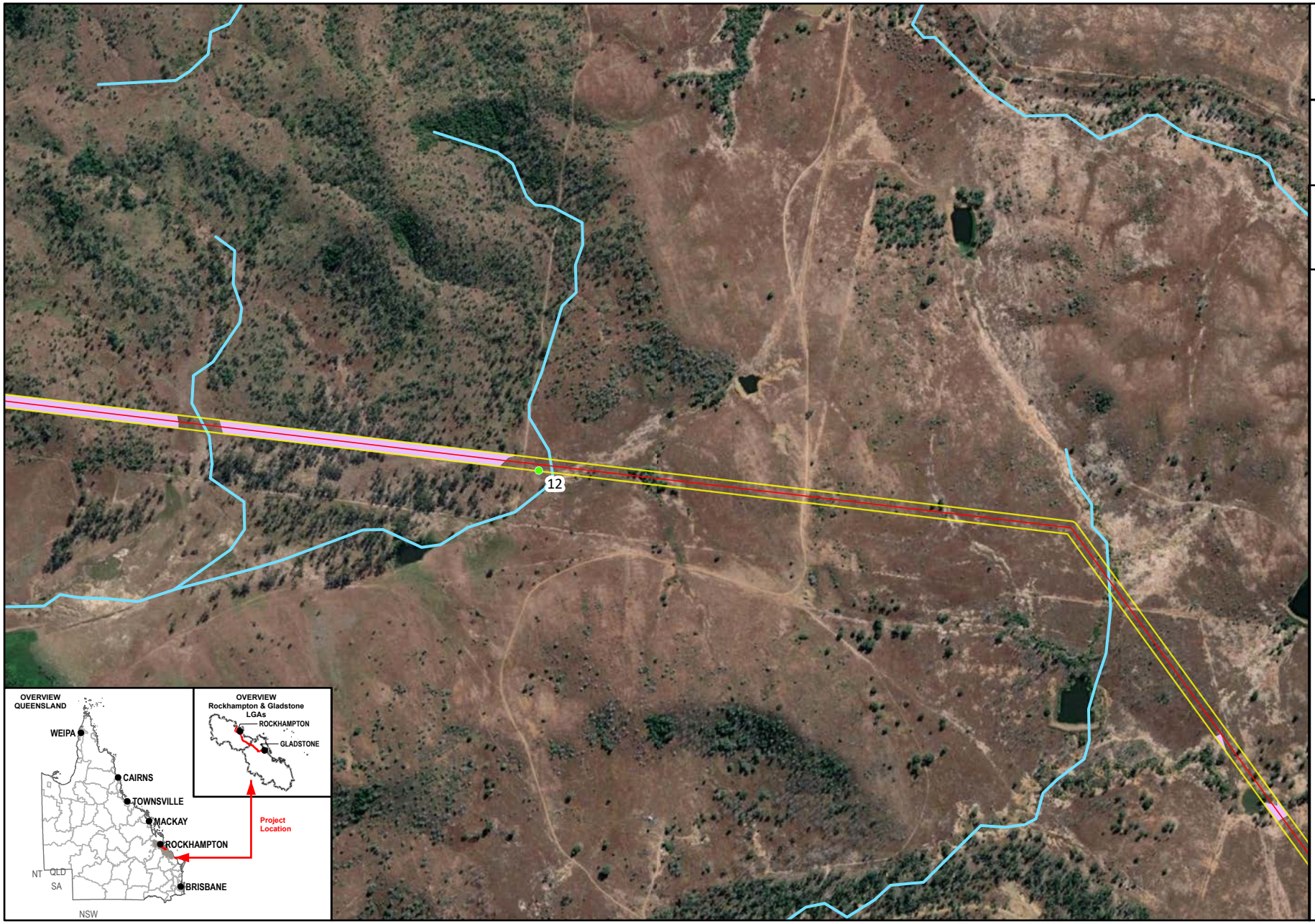
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16e
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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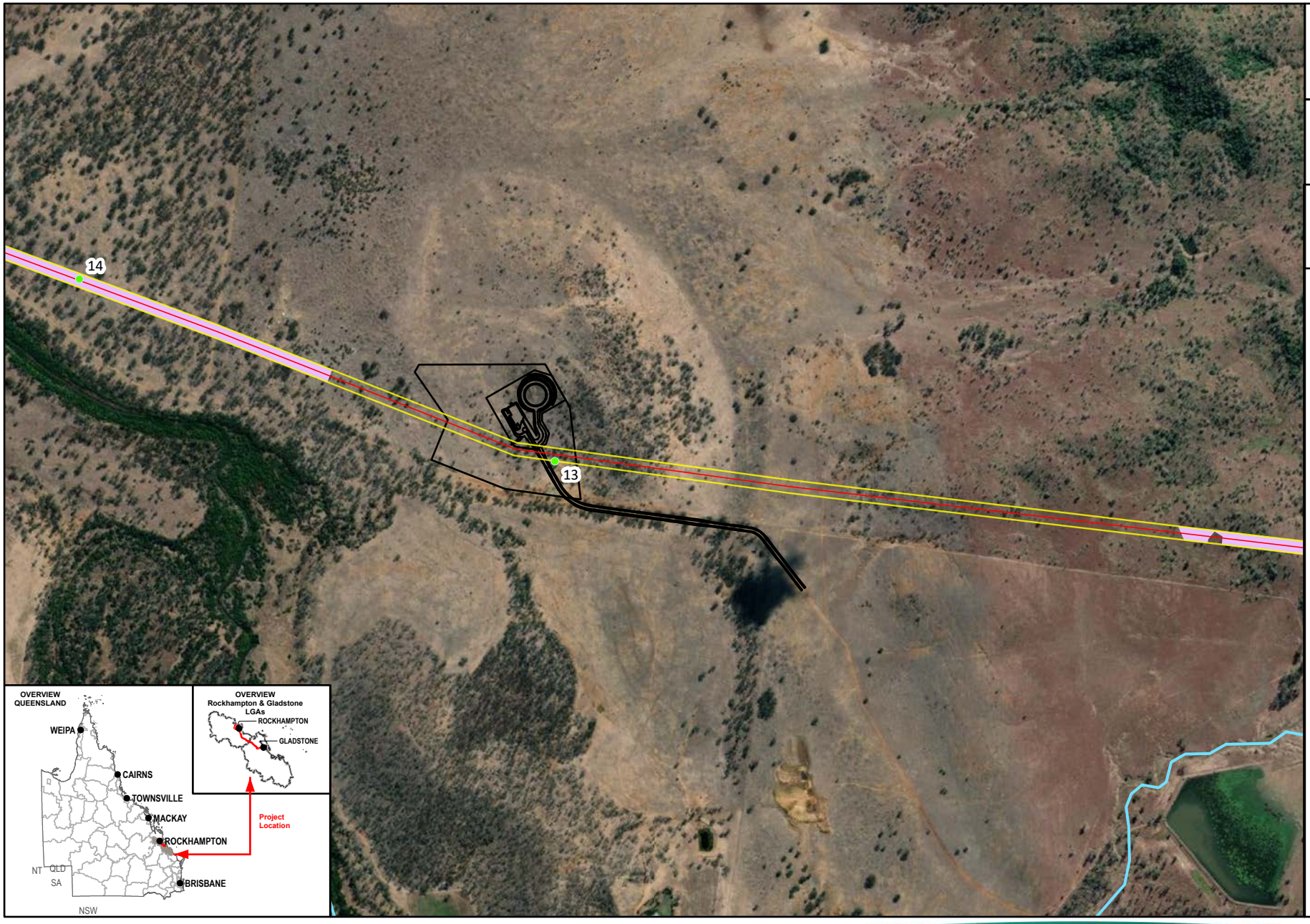
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16f
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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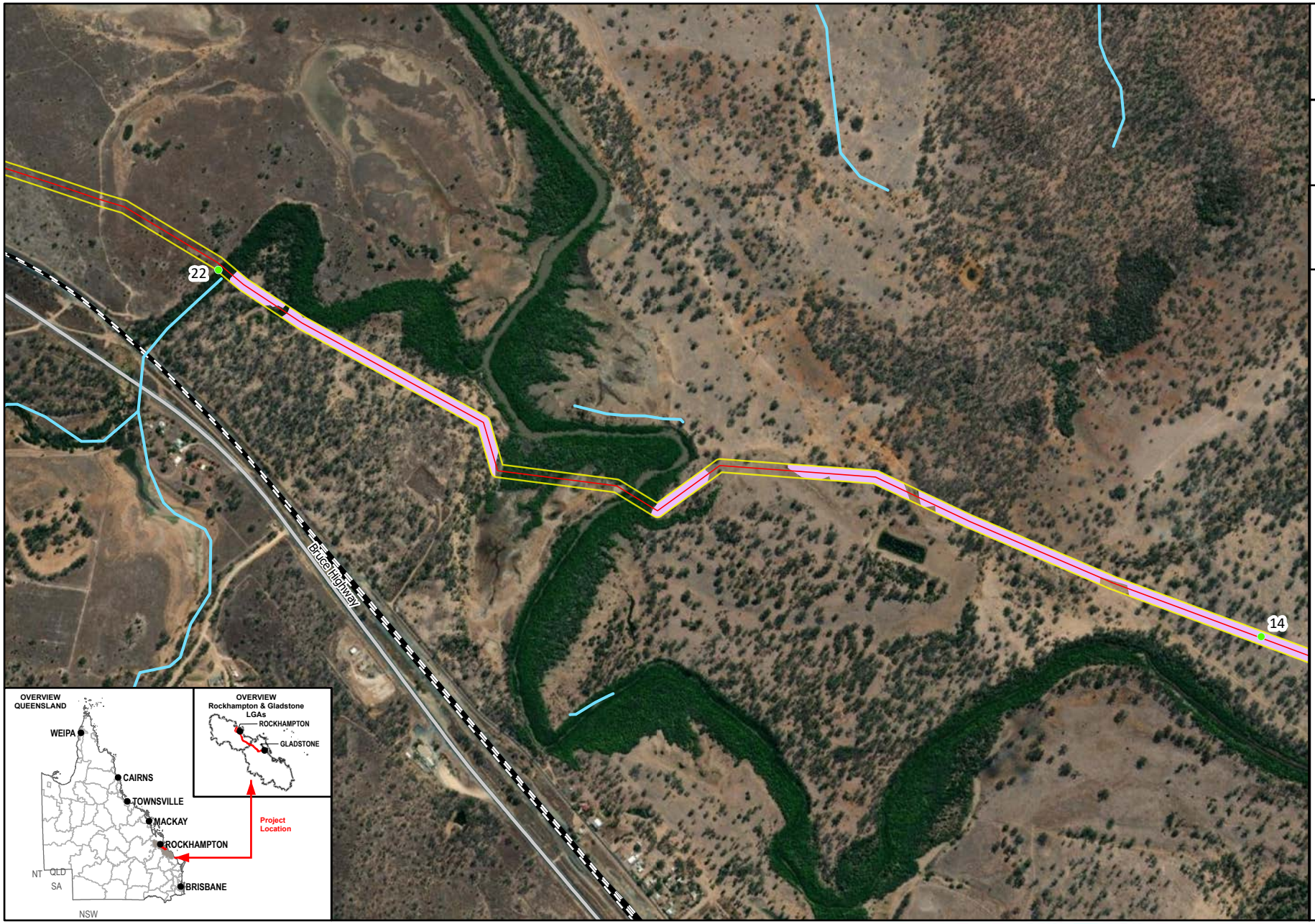
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16g
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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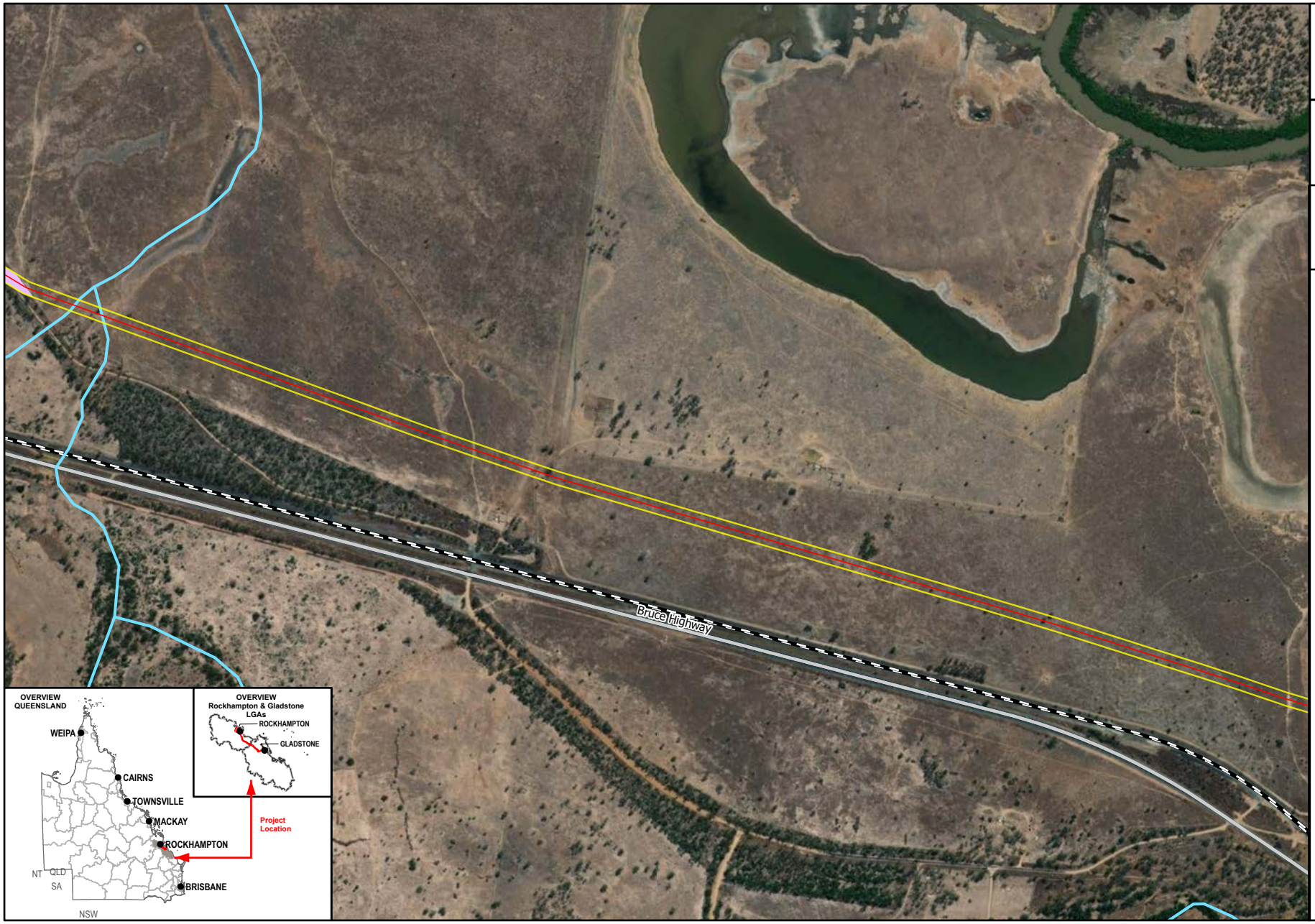
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16h
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Koala Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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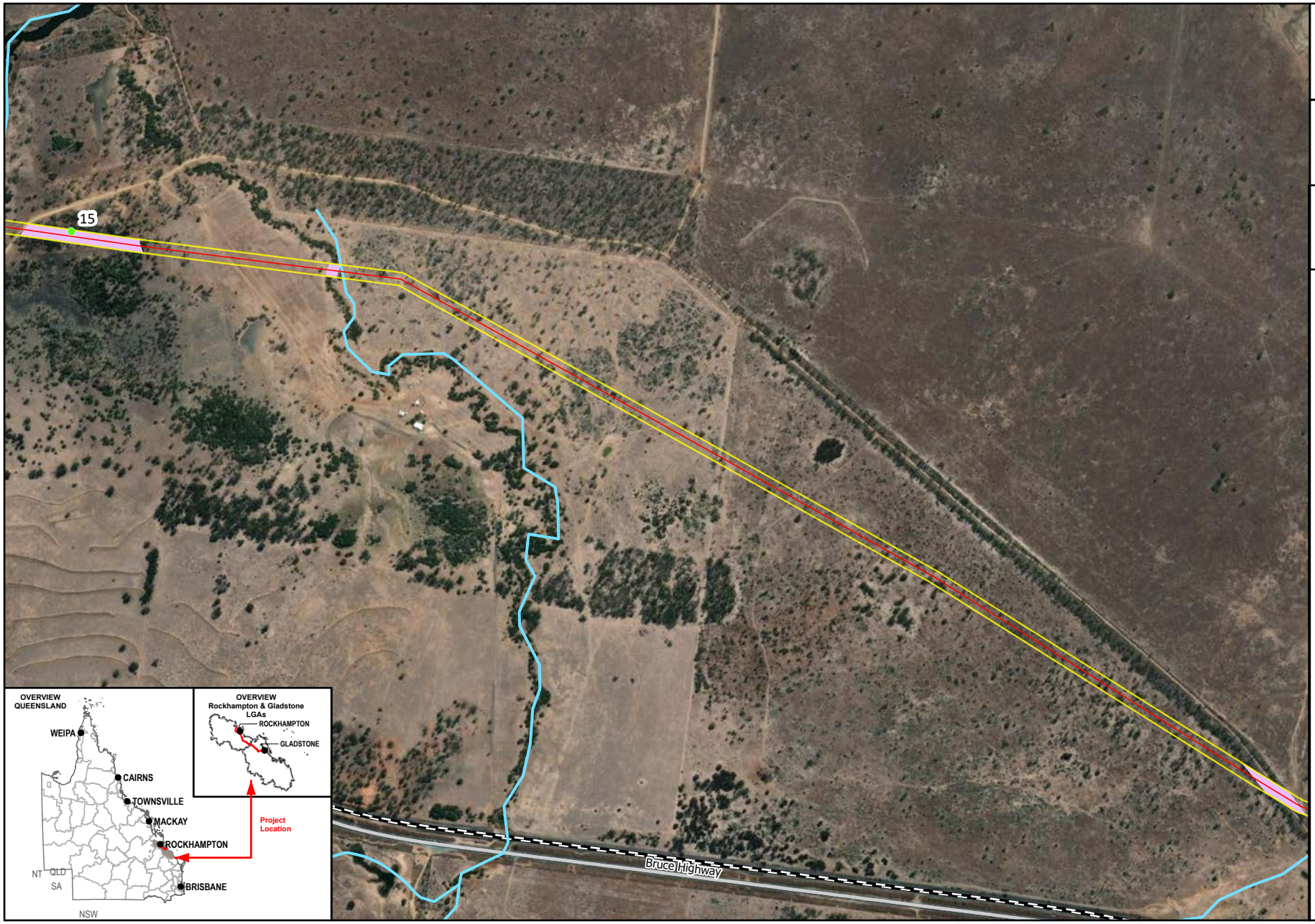
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16i
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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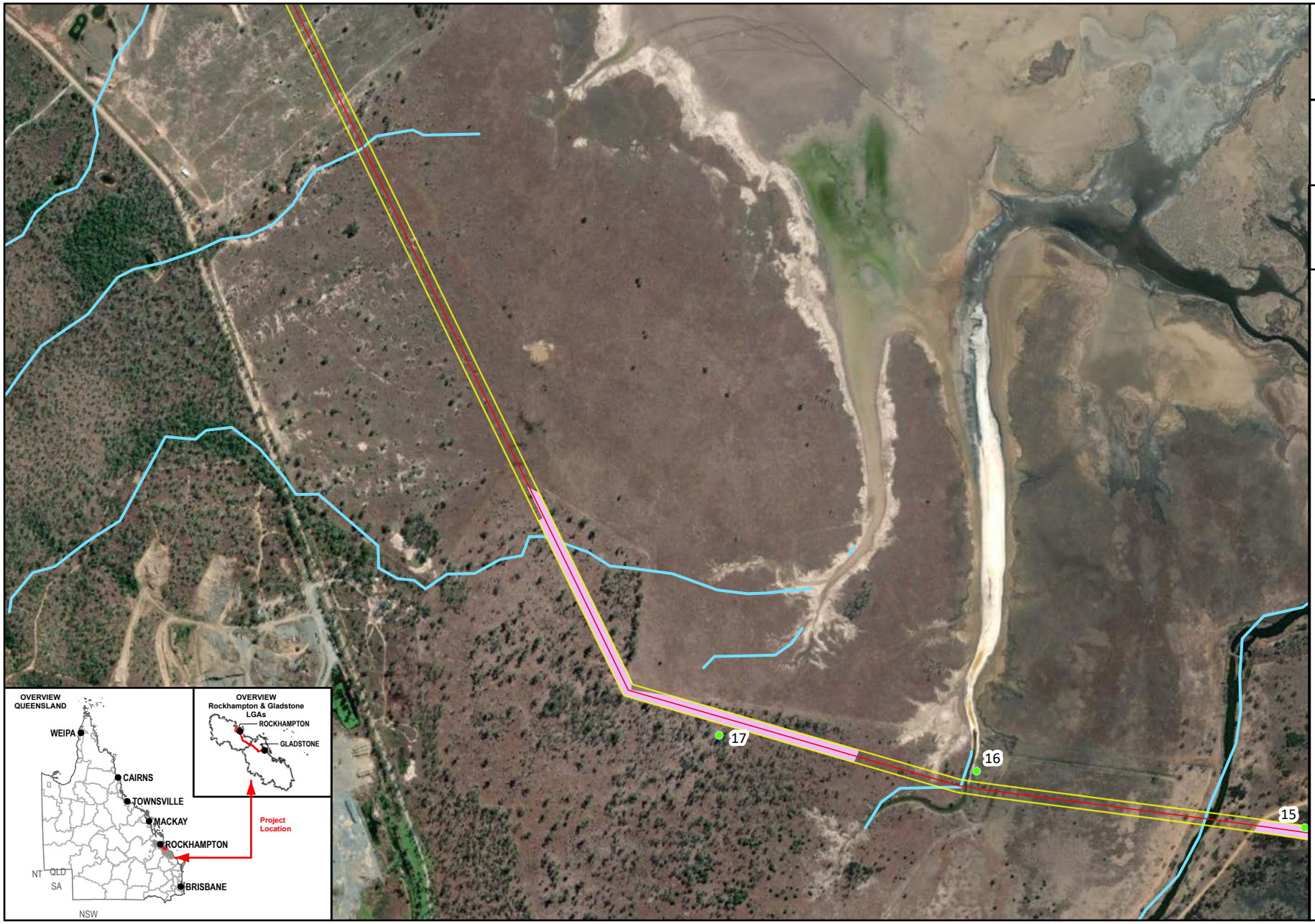
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16j
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Predicted Koala Habitat
- Waterways

Data Sources:
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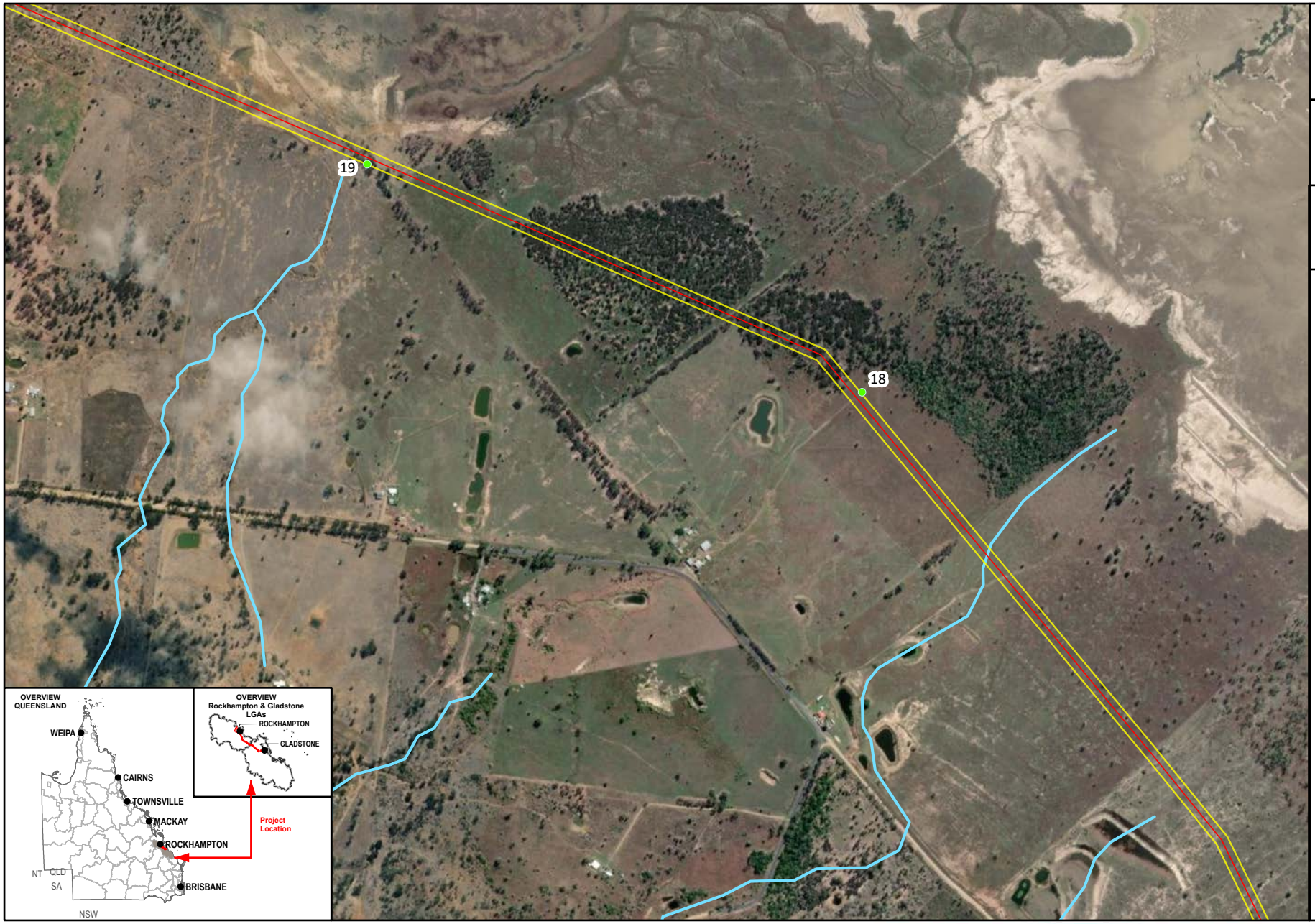
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16k
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Waterways

Data Sources:
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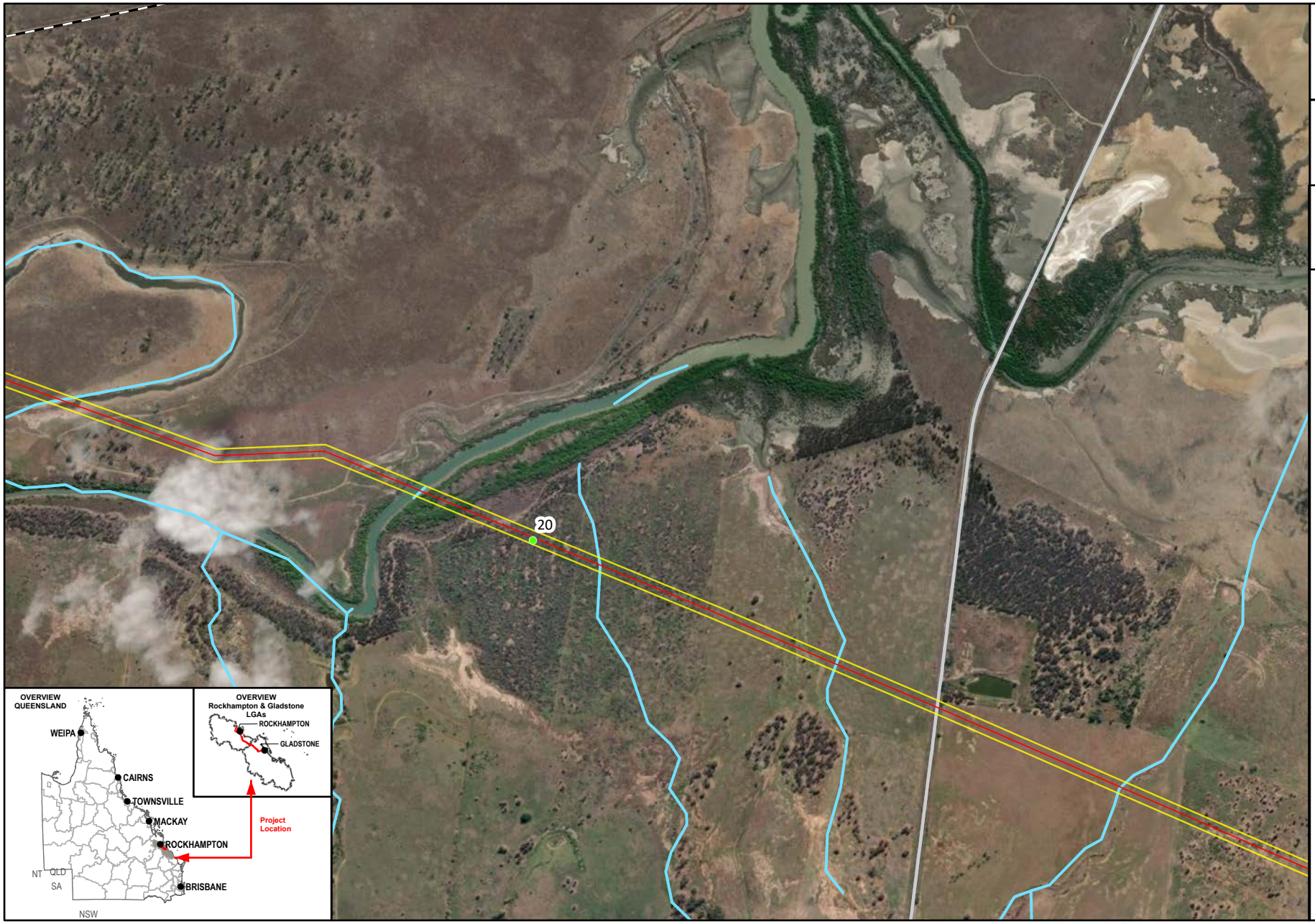
Fitzroy to Gladstone Pipeline Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16l
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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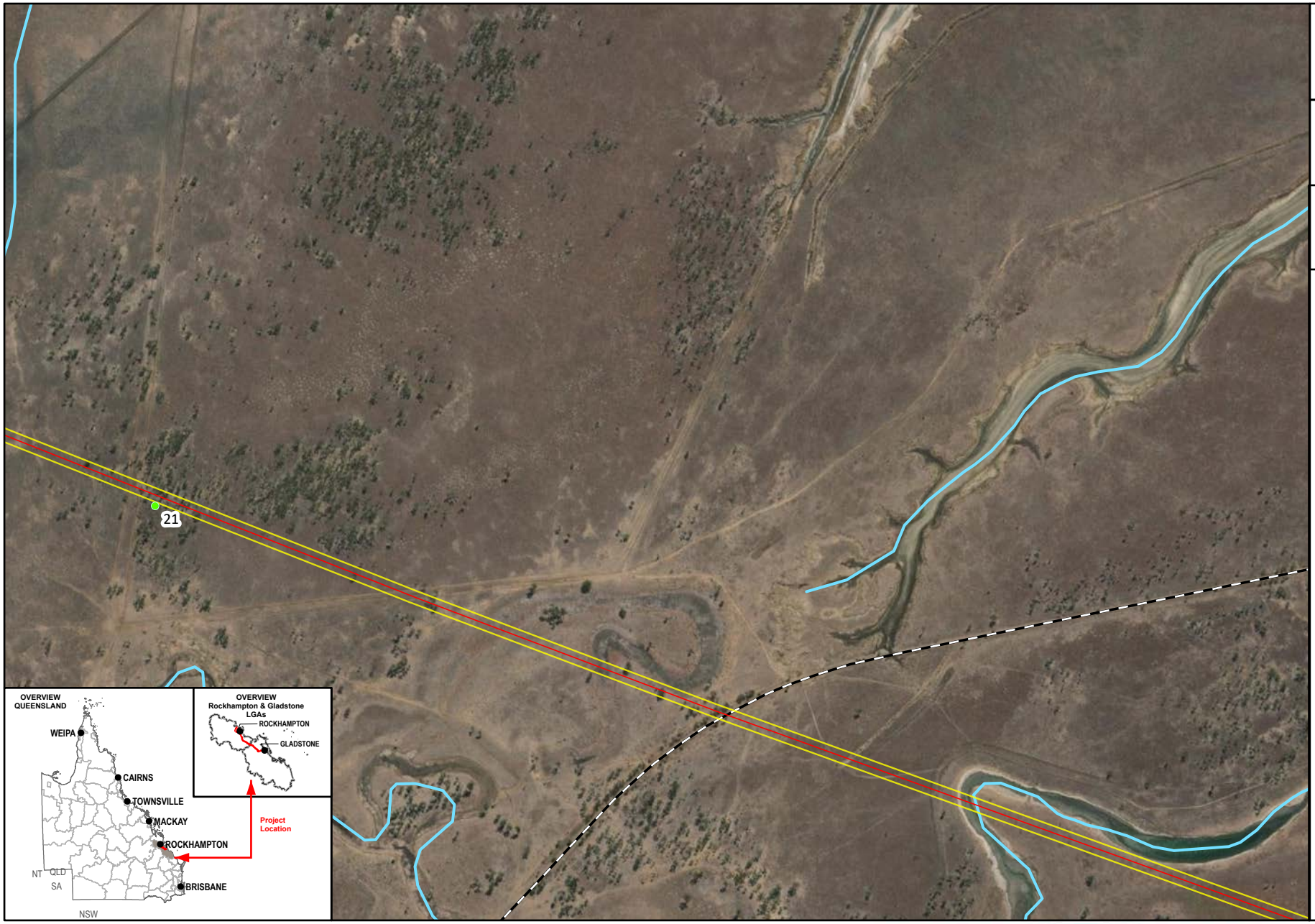
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16m
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Survey Photo Reference Number
- Waterways
- Railways

Data Sources:
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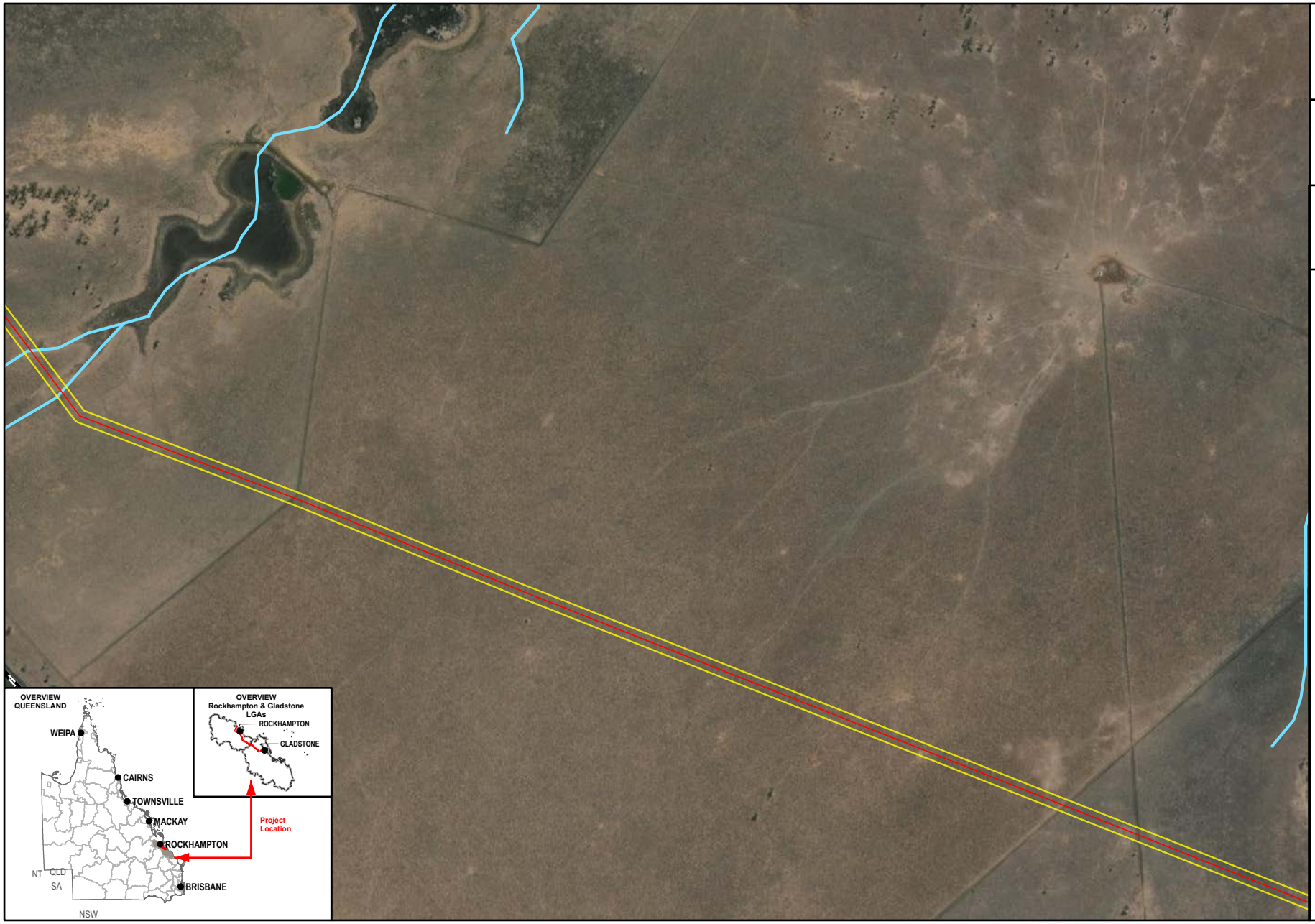
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16n
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
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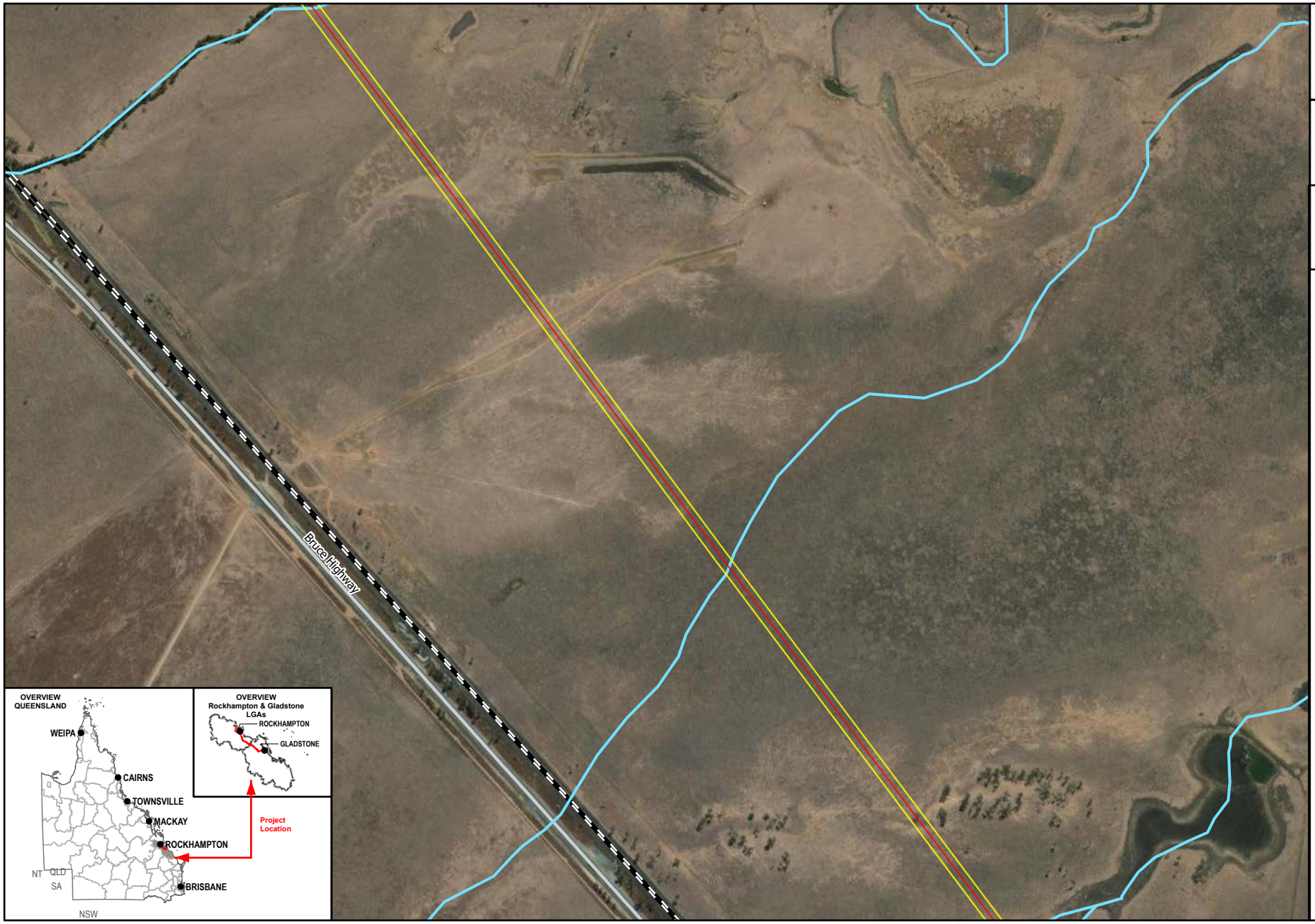
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16o
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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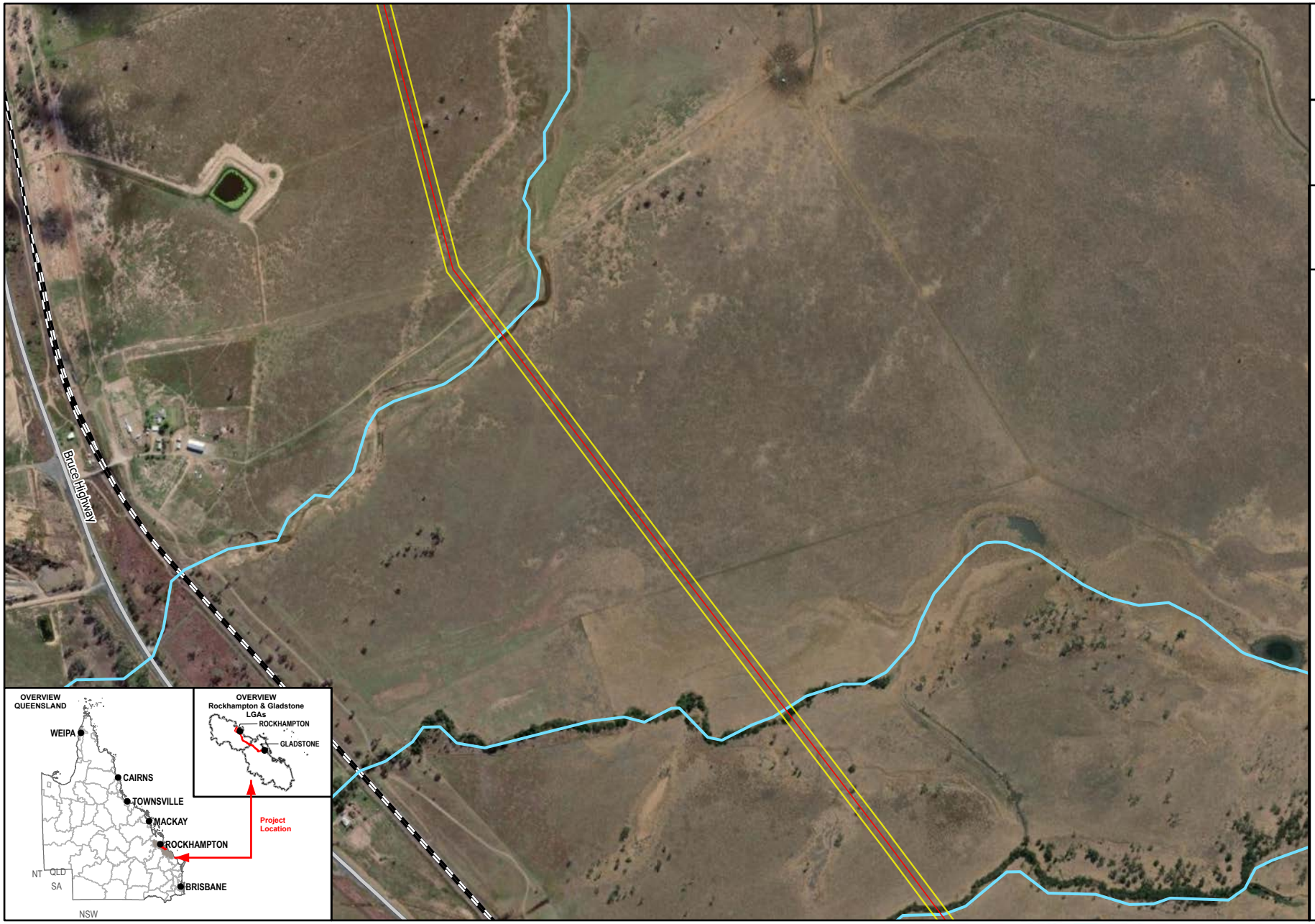
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16p
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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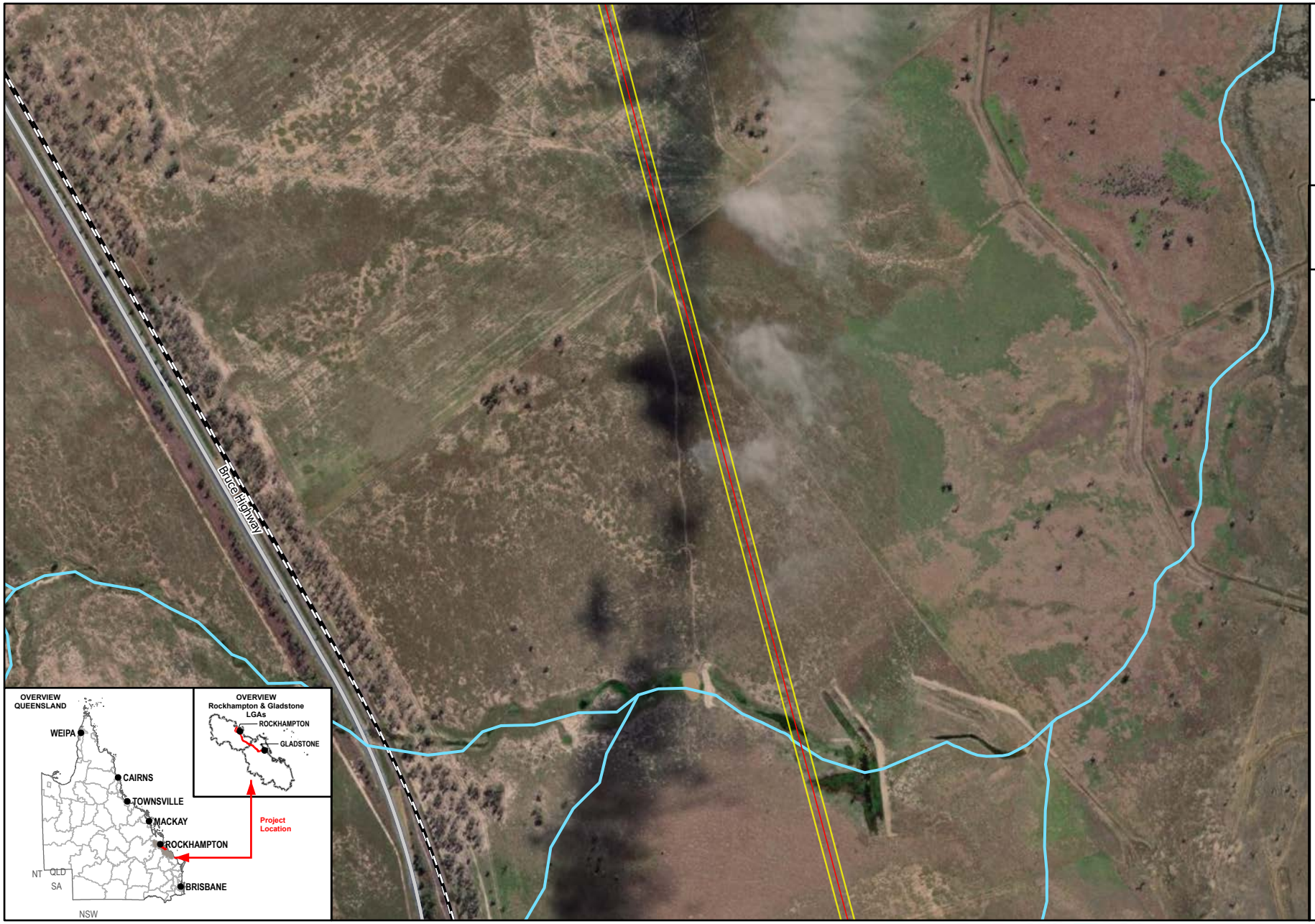
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-16q
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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Figure 7-16r
Distribution of Koala Habitat Within the SGIC SDA Study Area
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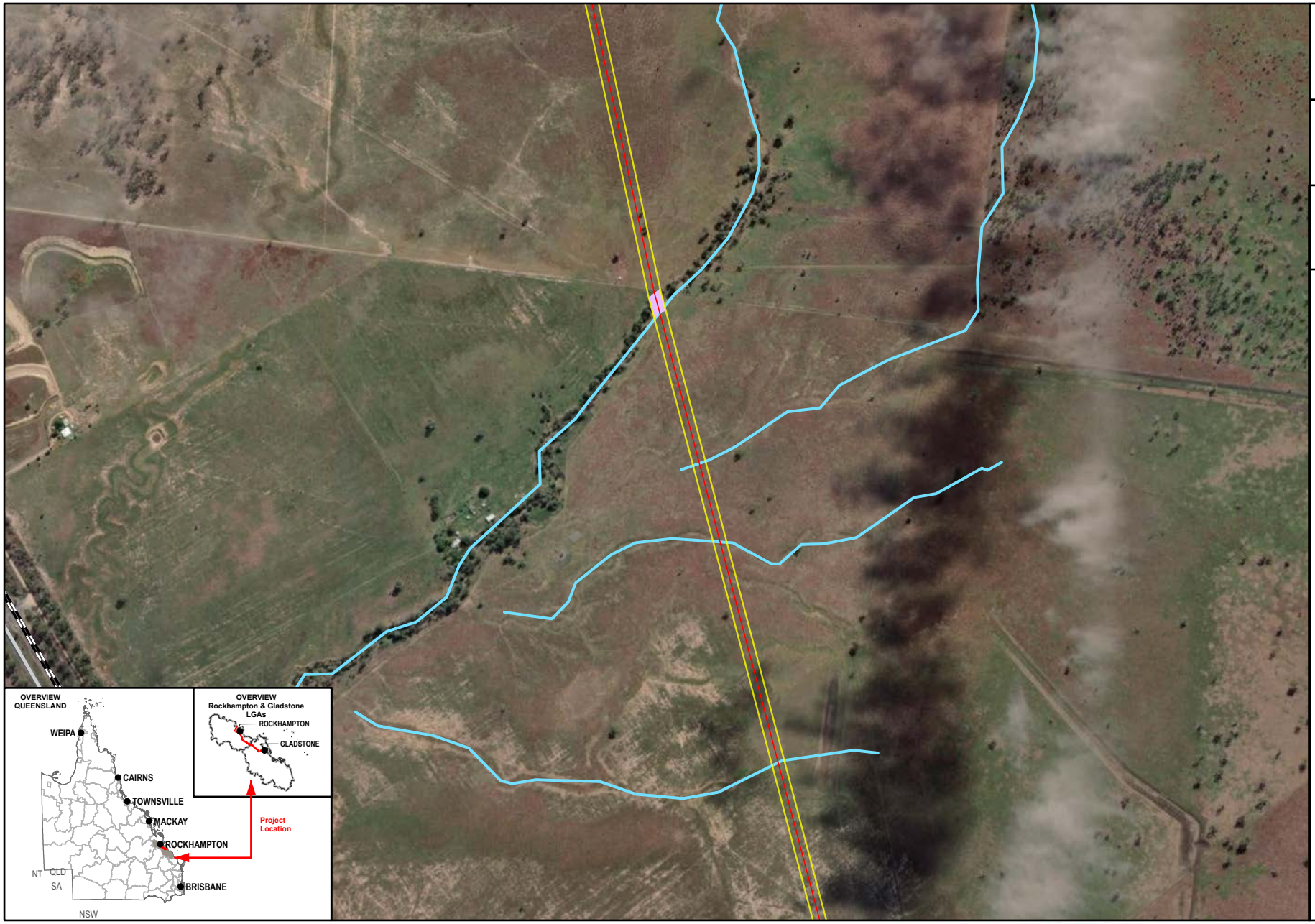

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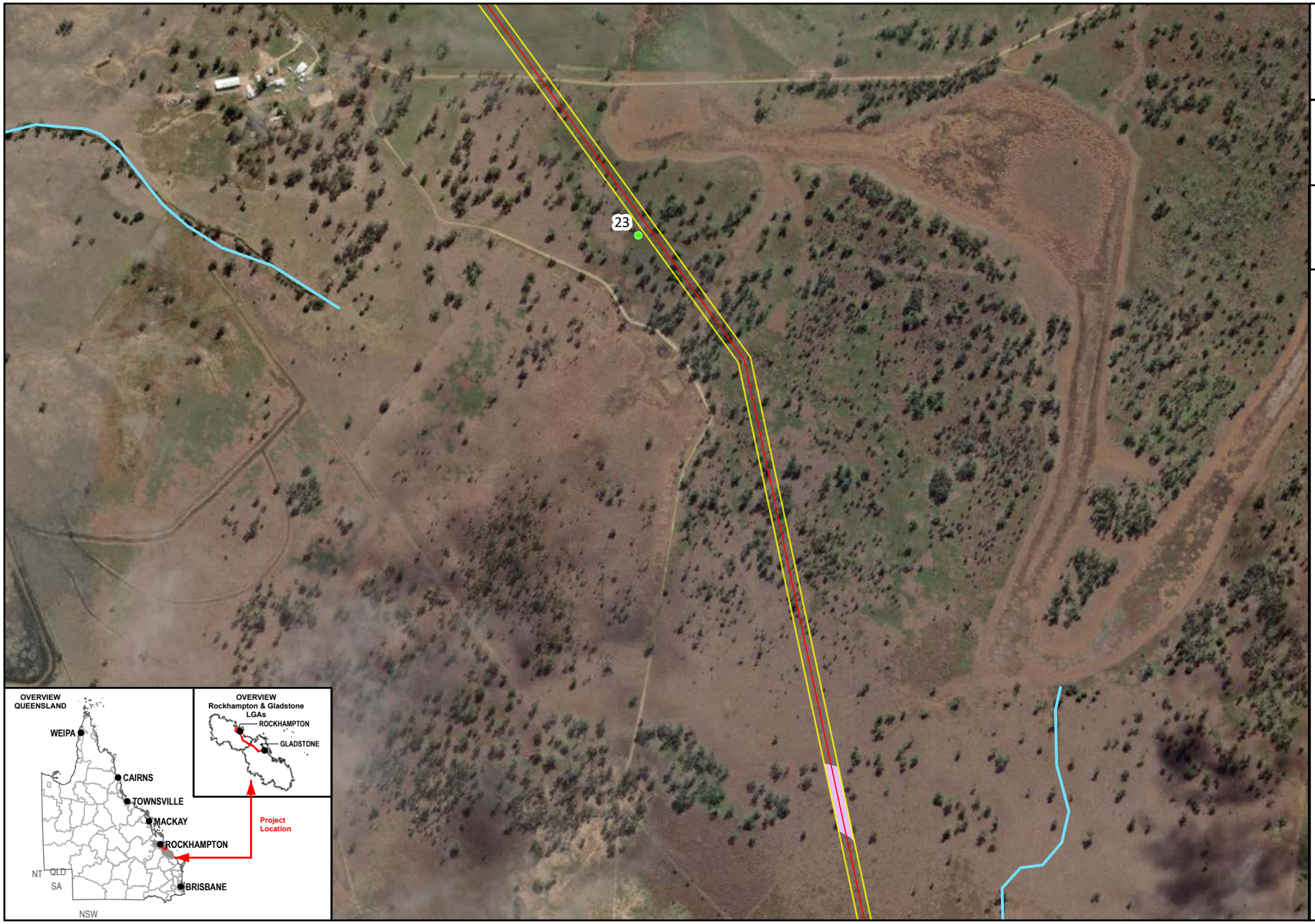

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Distribution of Koala Habitat Within the SGIC SDA Study Area
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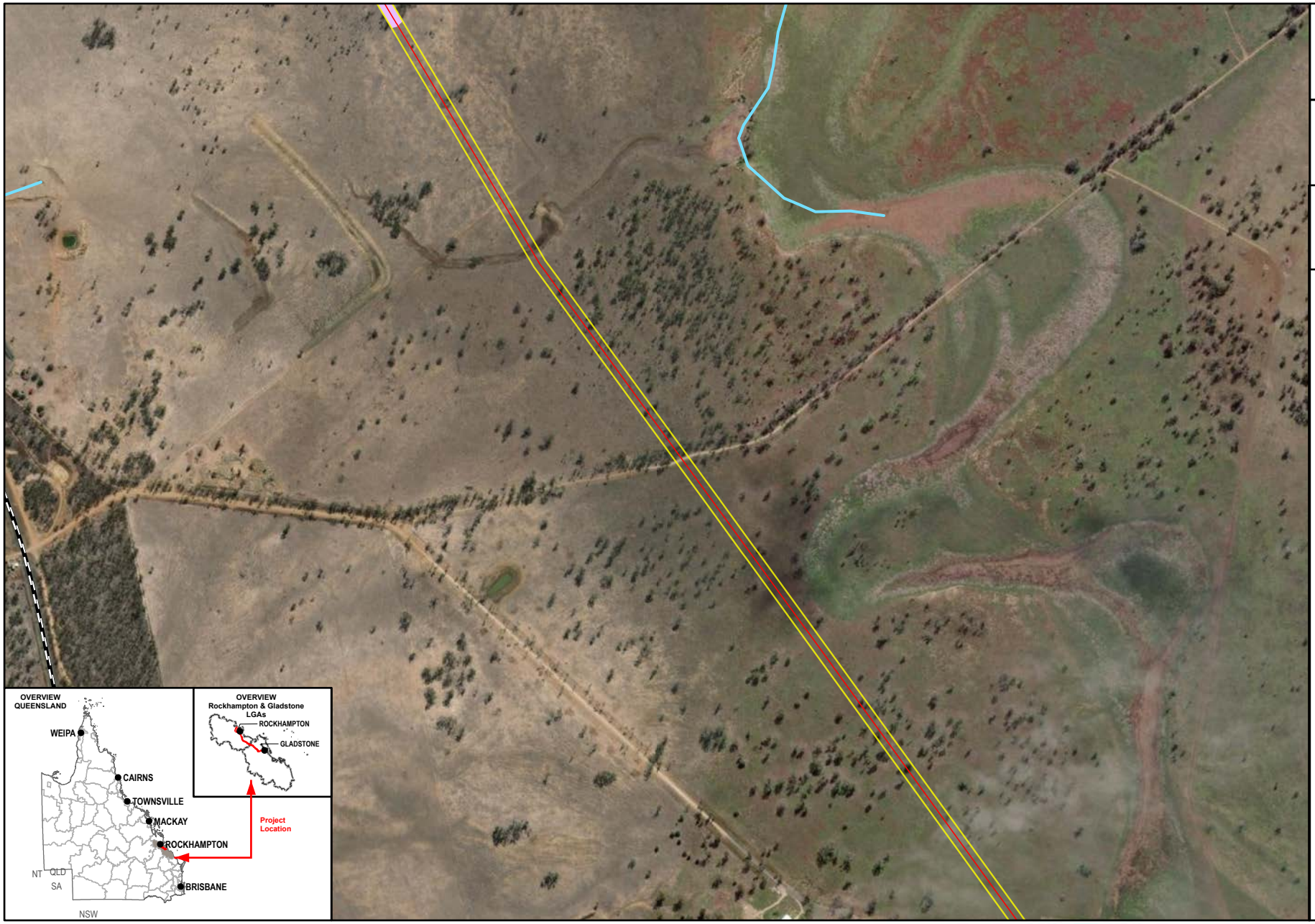

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Figure 7-16u
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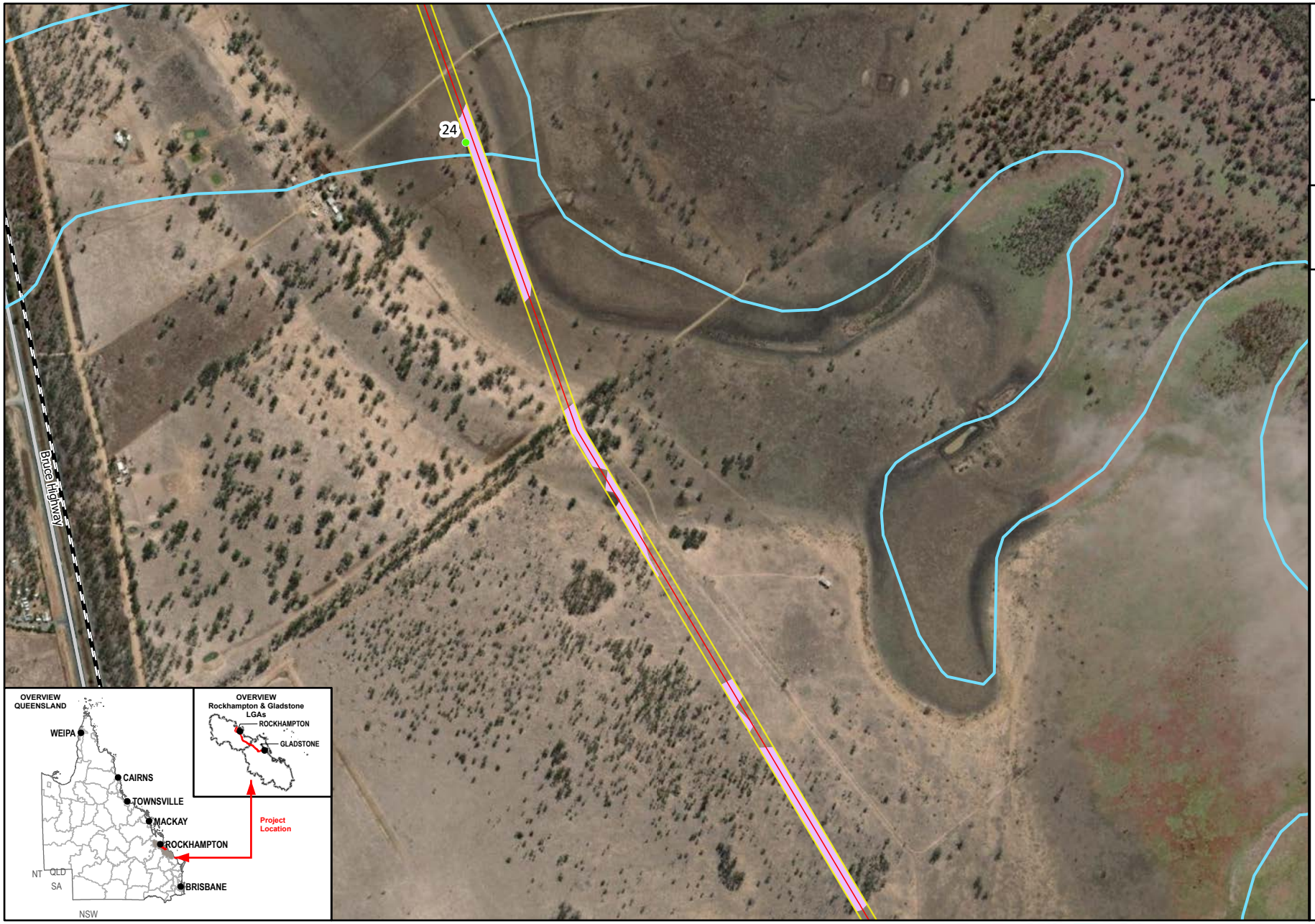

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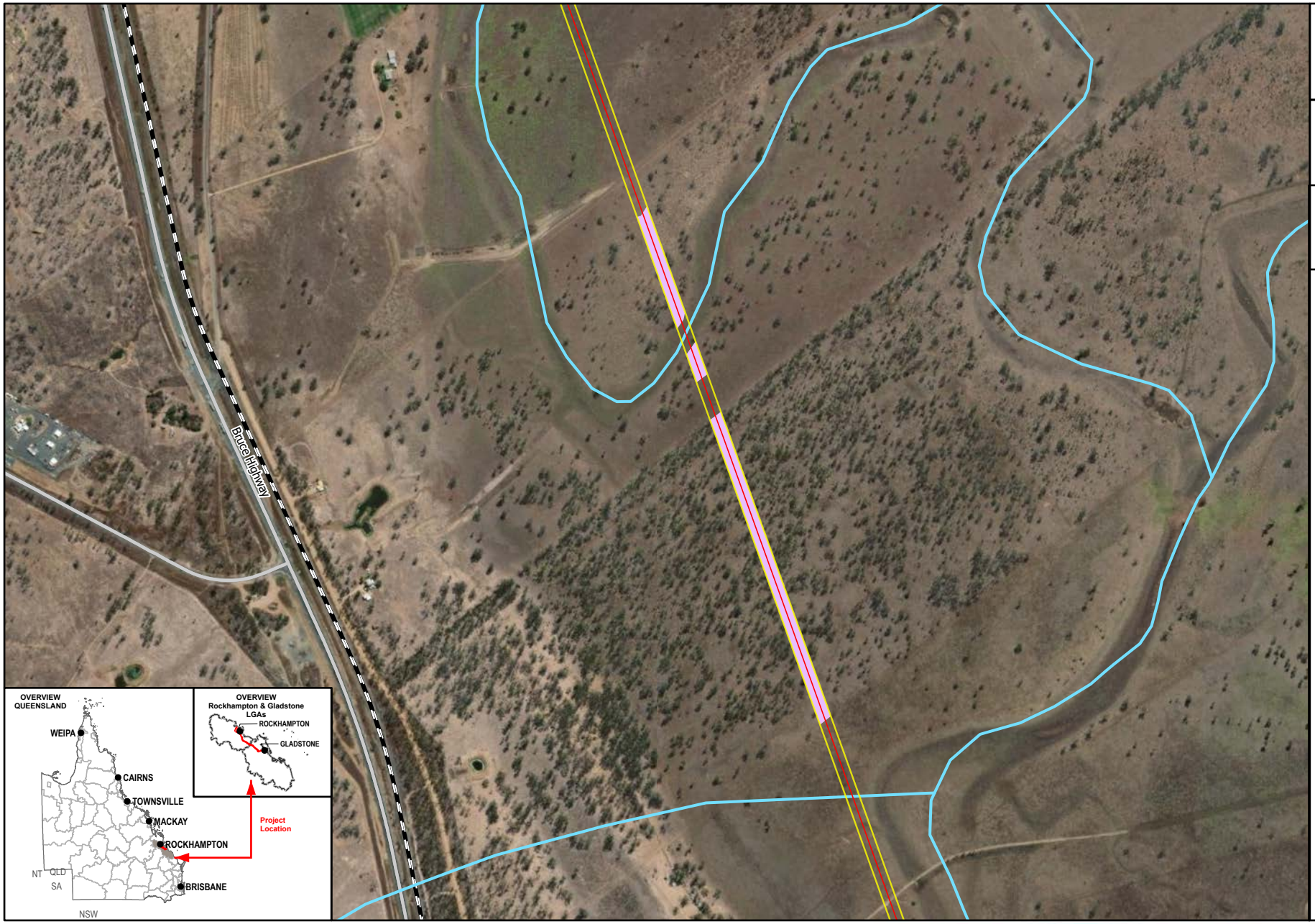
Figure 7-16v
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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- Study Area
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Figure 7-16w
Distribution of Koala Habitat Within the SGIC SDA Study Area
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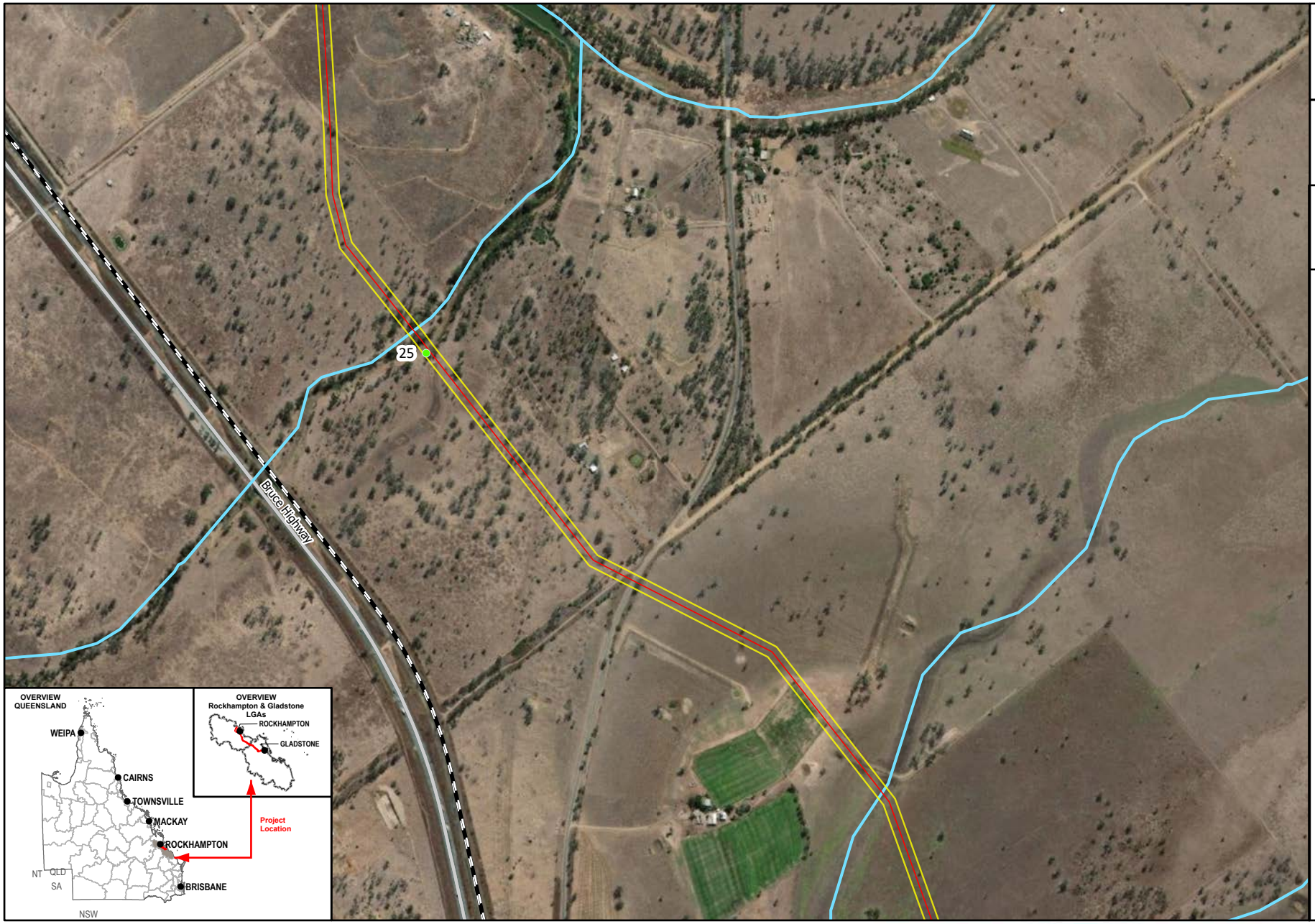

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Distribution of Koala Habitat Within the SGIC SDA Study Area
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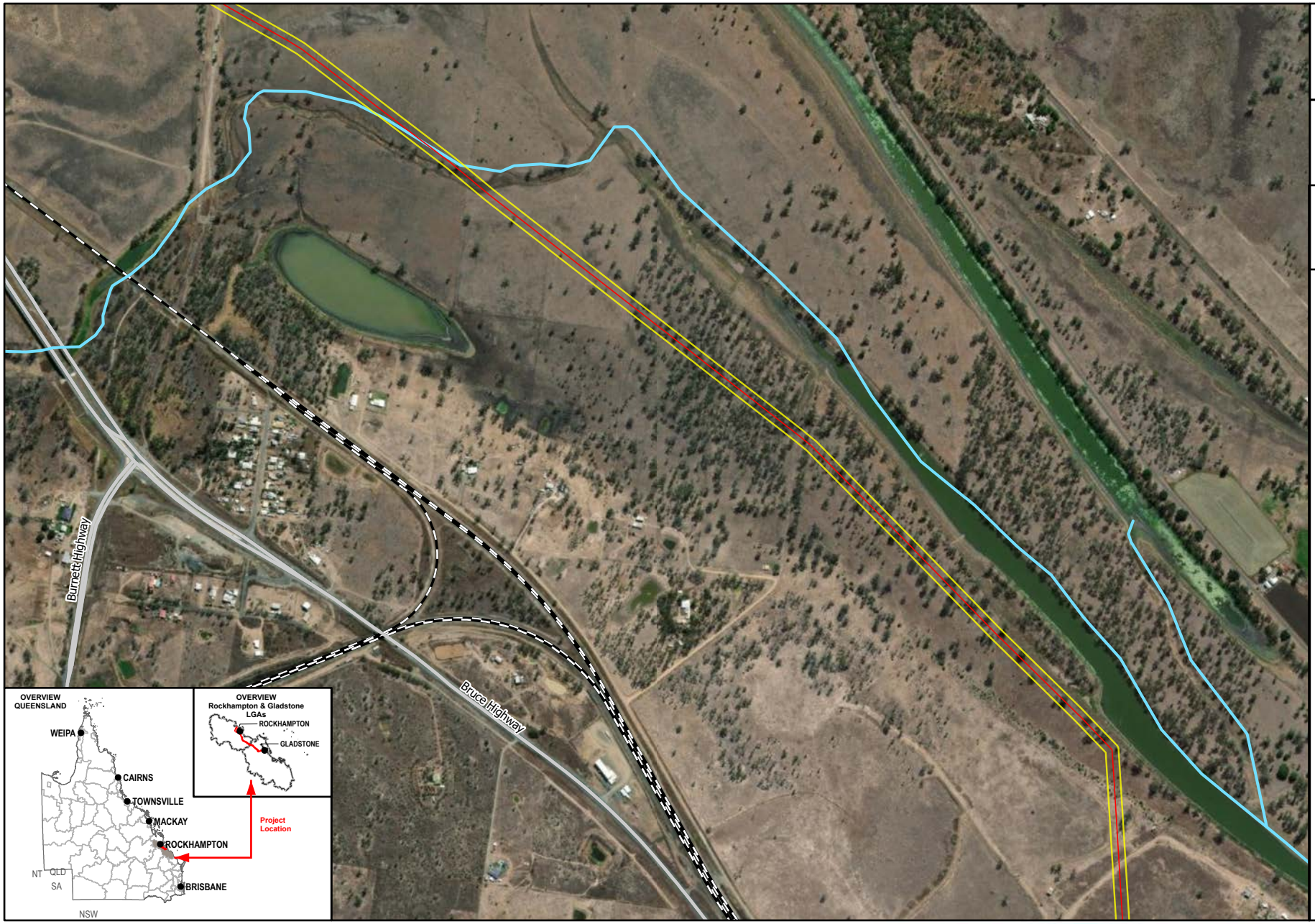

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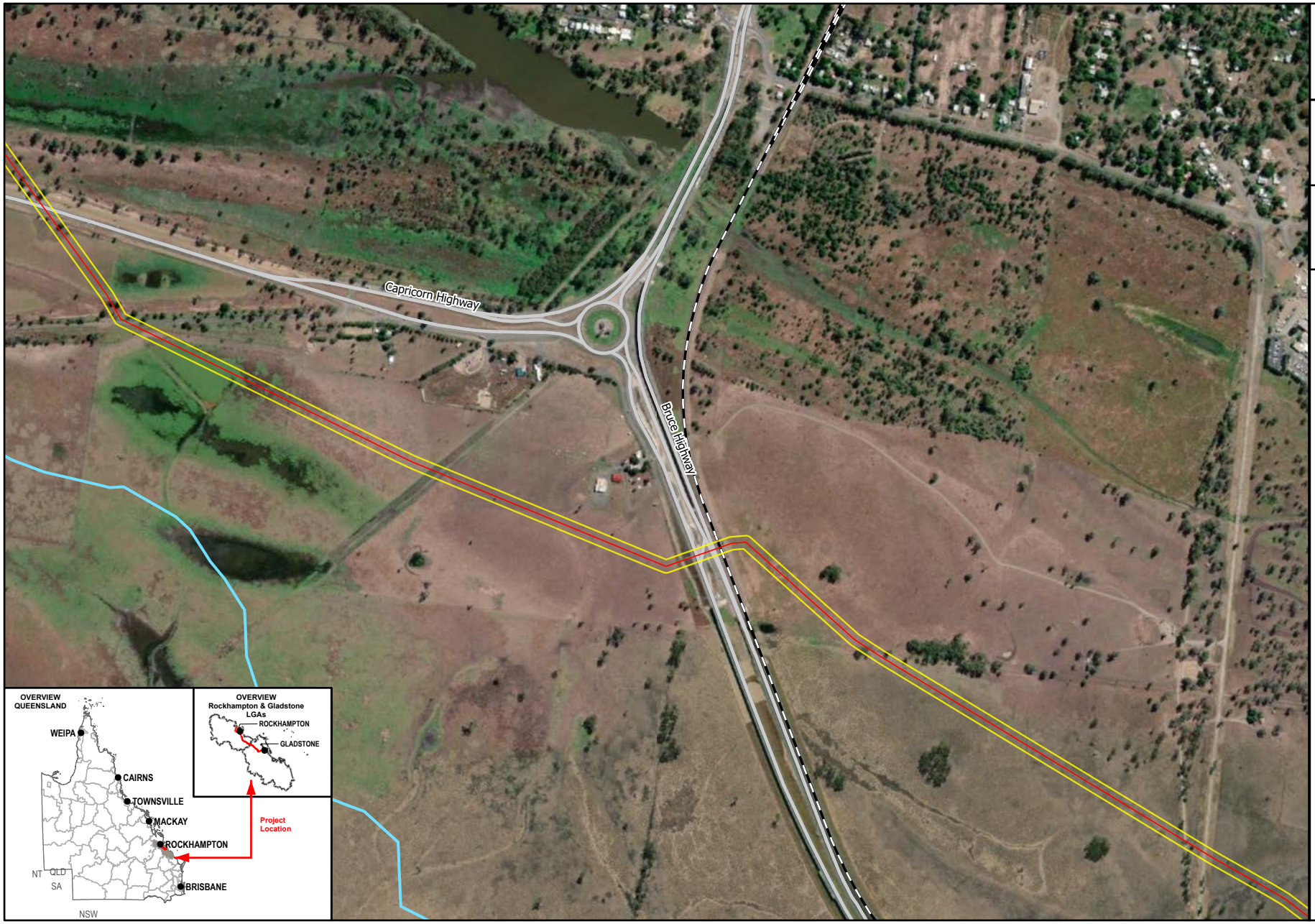
Figure 7-16y
Distribution of Koala Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:3 Date:19/09/2022



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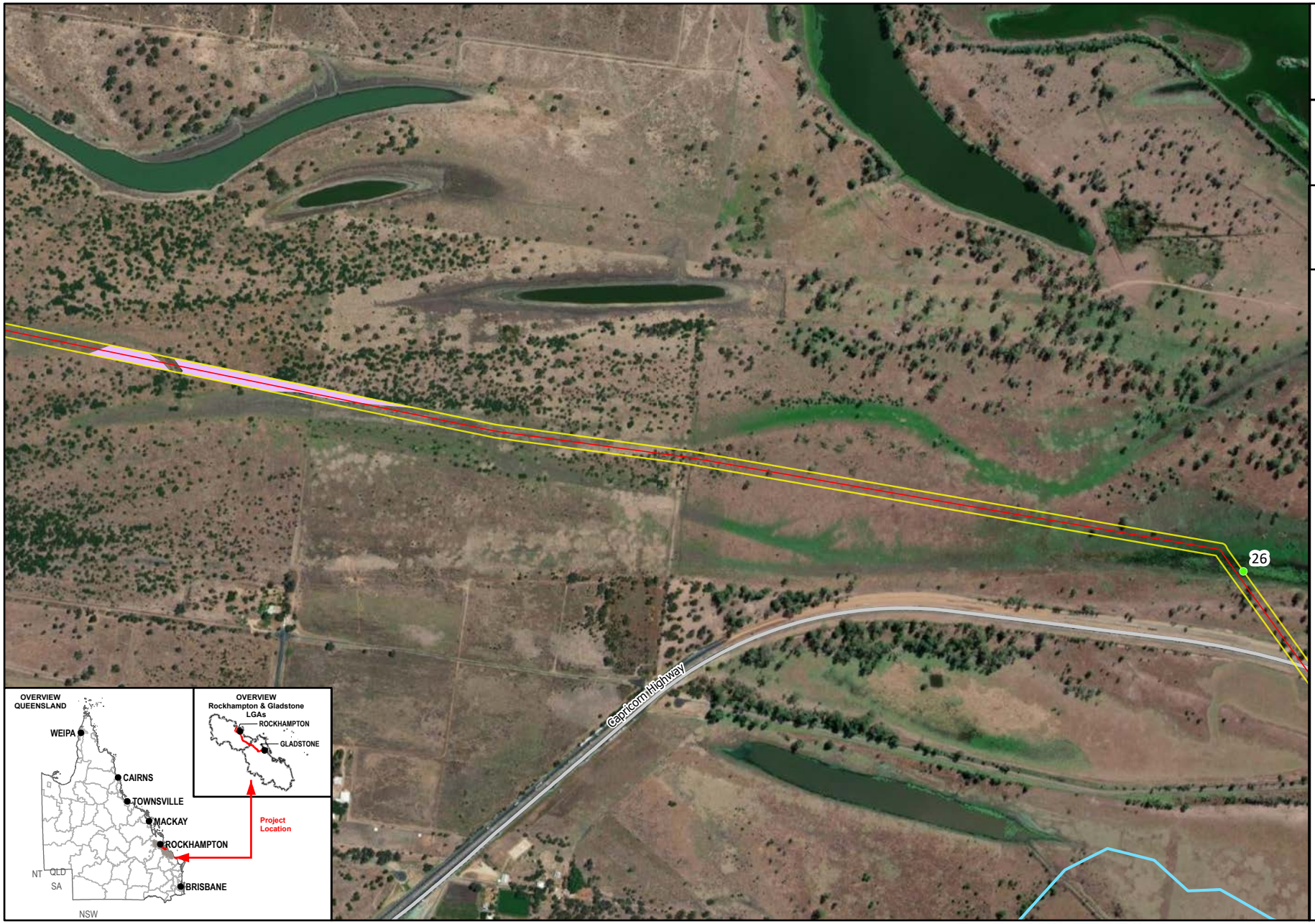

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Figure 7-16a1
Distribution of Koala Habitat Within the SGIC SDA Study Area
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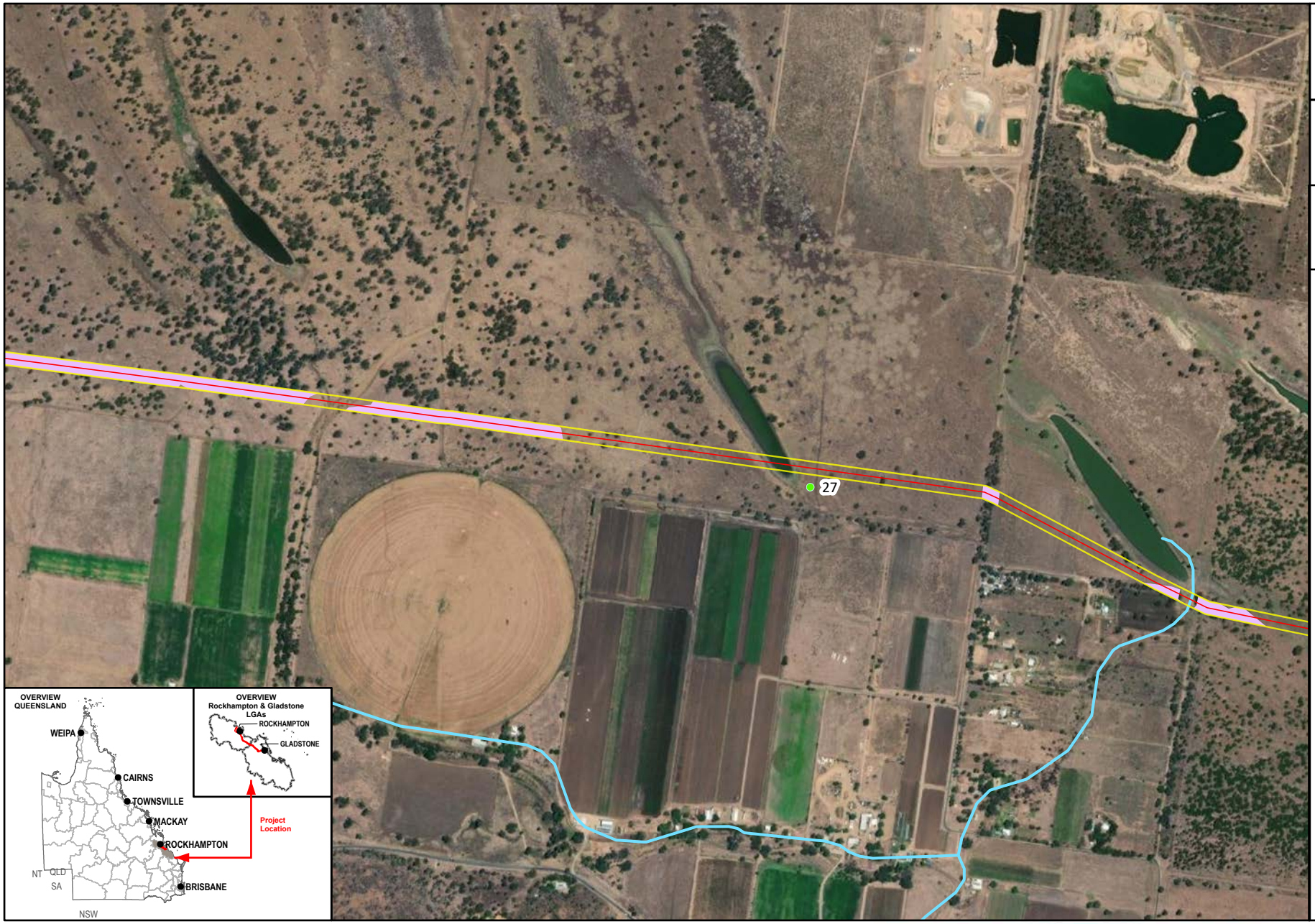

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Distribution of Koala Habitat Within the SGIC SDA Study Area
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7.2.2.12 Grey-headed flying-fox

Conservation status and species ecology

The grey-headed flying-fox is listed as vulnerable under the EPBC Act and is not listed under the NC Act. The species was listed as an MNES at the time of the approval. The grey-headed flying-fox is one of the largest bats in the world (DAWE 2021) and Australia's only endemic flying-fox and occurs on the east coast of Australia from Ingham in Queensland to Adelainde in South Australia (DCCEEW 2022j). The species selectively forages for food where it is readily available, and hence, only utilises a small proportion of its range at any given time. A small number of local areas can support a continued presence of the species (DAWE 2021). Typically, patterns of occurrence and relative abundance for the species fluctuate between seasons and years in line with food availability (DCCEEW 2022j).

The species maintains one intermixing population throughout Australia. The grey-headed flying-fox requires foraging habitat and roosting sites, with it being a canopy-feeding frugivore and nectarivore, with the species diet supplemented with leaves DCCEEW 2022j; DAWE 2021). The species roosts in camps in areas ranging from continuous forests to patches of vegetation as small as 1 ha. Typically, camps are associated with water sources, in vegetation communities including rainforest, Melaleuca, mangroves and riparian vegetation (DCCEEW 2022j). The grey-headed flying-fox forages in canopy vegetation in a variety of habitats ranging from rainforests, open forest, open and closed woodlands and vegetation dominated by *Melaleuca* and *Banksia* species (DAWE 2021; DCCEEW 2022j). Major foraging sources for the species include blossoms from genus *Eucalyptus, Corymbia, Angophora, Melaleuca, Banksia* and *Syzygium* spp (DAWE 2021). Few of the grey-headed flying-fox foraging species flower in winter, or flower reliably in winter. As such, the species is subject to recurrent food shortages during winter and spring, with foraging resources typically restricted to coastal lowlands of south-east Queensland and northern New South Wales. As a result, the species continually migrates throughout its range to access food resources that are patchily distributed and seasonally available (DAWE 2021; DCCEEW 2022j).

Important winter and spring foraging habitat includes woodlands with *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora, C. eximia, C. maculata* (south from Nowra), *Grevillea robusta* and *Melaleuca quinquenervia or Syncarpia glomulifera* (DAWE 2021).

Grey-headed flying-foxes roost in groups of various sizes on exposed limbs of large trees (DCCEEW 2022j). The species typically utilise the same roosting site for longs periods of time (DCCEEW 2022j). The species commutes daily to foraging sites, which are usually within 15 km of the roosting site but can travel up to 40 km at night-time to different feeding areas as food resources change (DAWE 2021; DCCEEW 2022j).

Grey-headed flying-fox seasonally breed during a single event each year. Mating of grey-headed flying-foxes occurs in early autumn followed by the larger roosting camps tending to disperse in pursuit of available food resources (DAWE 2021; DCCEEW 2022j). Males and females segregate in October, when females give birth. Females give birth to their young following six months of gestation. As most adult grey-headed flying-foxes conceive one young annually, there is a low maximum rate of population growth. Females have a high tendency for aborting or abandoning their young in response to environmental stress such as a lack of food or high temperatures (DAWE 2021; DCCEEW 2022j).

Field survey results and distribution of suitable habitat

The grey-headed flying-fox or any flying-fox camps were not recorded during the field surveys within the SGIC SDA study area. Survey effort for the grey-headed flying-fox included two nights of 2-3 hours of spotlighting within potentially suitable habitat in the SGIC SDA study area. Suitable habitat was recorded within the SGIC SDA study area, and the species has been historically recorded at four locations within the desktop search extent, the most recent record recorded in 2003. The closest record is approximately 3 km east of the southern extent of the SGIC SDA pipeline alignment. Suitable foraging habitat was recorded in eucalypt woodland areas retaining important winter and spring foraging tree species, including *Eucalyptus tereticornis, E. crebra, Corymbia citriodora* and *Melaleuca quinquenervia*. The distribution of predicted grey-headed flying-fox habitat is mapped in Figure 7-17.

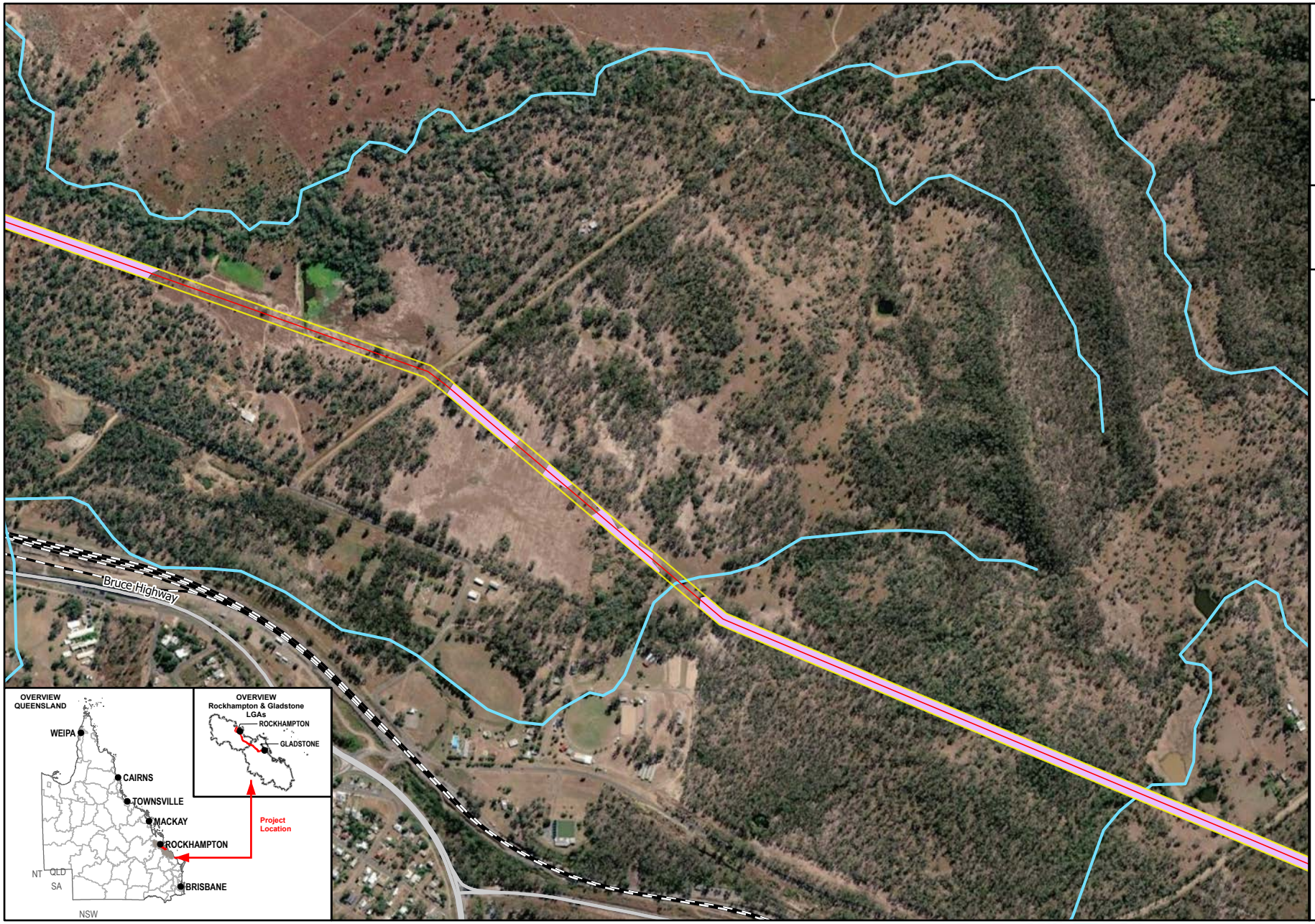
Significance of impact assessment

The project is likely to result in a significant impact on the grey-headed flying-fox. As the species is not listed under the NC Act, a significance of impact assessment on the grey-headed flying-fox (vulnerable under the EPBC Act) was undertaken in accordance with the Commonwealth *Significant Impact Guidelines 1.1* (DoE 2013) and is provided in Table 7-30.

Table 7-30 Significance of impact on the grey-headed flying-fox

Significant impacts criteria	Assessment
Lead to a long-term decrease in the size of an important population of the species	**Unlikely** The grey-headed flying-fox population is a single, interbreeding population and therefore not considered an important population under the definition outlined in the Commonwealth *Significant impact guidelines 1.1* (DoE 2013). The grey-headed flying-fox has been historically recorded at four locations within the desktop search extent (10 km buffer), the most recent record recorded in 2003. The project will result in the loss of 19.21 ha of potential foraging habitat for the species, most of which would constitute habitat critical to the survival of the species due to the local abundance of key food tree species (i.e. *Eucalyptus tereticornis, E. crebra, Corymbia citriodora* and *Melaleuca quinquenervia*). This habitat is not within 20 km of the nearest nationally important flying-fox camp (i.e. the range in which the species typically forages), and therefore the project is unlikely to lead to a long-term population decrease.
Reduce the area of occupancy of an important population	**Unlikely** As detailed above, the local population is unlikely to represent an important population. The project will result in the loss of 19.21 ha of habitat, most of which would constitute habitat critical to the survival of the species. However, the loss of habitat this is not considered likely to reduce the area of occupancy of the species.
Fragment an existing important population into two or more populations	**Unlikely** The grey-headed flying-fox has an extensive range with the capacity to move large distances between camps at a national level. The loss of habitat attributed to the project will have localised impact that is unlikely to pose any barrier to movement. As such, impacts attributed to the project are not considered to fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Likely** The project will result in the loss of 19.21 ha of foraging habitat, likely to be habitat critical to the survival of the species due to the abundance of important winter and spring foraging tree species (i.e. *Eucalyptus tereticornis, E. crebra, Corymbia citriodora* and *Melaleuca quinquenervia*). Based on the extent of the impact, this is likely to represent a significant adverse impact on habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	**Unlikely** The project is unlikely to disrupt the breeding cycle of an important population or an important grey-headed flying-fox camp. The project will have no direct impact on roosting habitat. The nearest camp is located approximately 9 km to the west along Middle Creek in Kabra.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely** The project will result in the loss of 19.21 ha of potential foraging habitat, representing habitat critical to the survival of the species. The nearest nationally important flying-fox camp is located approximately 241 km southeast of the SGIC SDA pipeline alignment. As suitable foraging habitat is not within 20 km of a nationally important flying-fox camp, the habitat is unlikely to represent habitat utilised by the camp on a regular basis. However, it is within the species' foraging range (i.e. within 50 km of a camp) and may be important for supporting individuals at the camp, particularly during the winter and spring resource bottlenecks.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely** No invasive species are listed among the threats to the grey-headed flying-fox in the Commonwealth approved conservation advice for the species. The project is unlikely to introduce or encourage the spread of any invasive species that could adversely affect the species.

Significant impacts criteria	Assessment
Introduce disease that may cause the species to decline	**Unlikely** The grey-headed flying-fox is susceptible to Lyssavirus. While this is generally stable in the population, exposure to significant ecological stress can cause an increase in the incidence of Lyssavirus that can cause local declines in the species (DAWE 2021). The project will have no direct impact on camps or roosting impacts, where there would typically be increased capacity for external impacts to cause adverse stress to an extent required to induce an increase in Lyssavirus.
Interfere substantially with the recovery of the species	**Unlikely** The project will result in the loss of 19.21 ha of potential foraging habitat, representing habitat critical to the survival of the species. The nearest nationally important flying-fox camp is located approximately 241 km southeast of the SGIC SDA pipeline alignment. As suitable foraging habitat is not within 20 km of a nationally important flying-fox camp, the habitat is unlikely to represent habitat utilised by the camp on a regular basis. However, it is within the species' foraging range (i.e. within 50 km of a camp) and may be important for supporting individuals at the camp, particularly during the winter and spring resource bottlenecks.
Conclusion	A conservative assessment has identified that the project is likely to result in a significant impact on the grey-headed flying-fox. Although the SGIC SDA pipeline alignment has been largely placed within or adjacent to areas that have been previously cleared, the project will require the clearing of 19.21 ha of suitable foraging habitat, likely to be habitat critical to the survival of the species due to the abundance of important winter and spring foraging tree species (i.e. *Eucalyptus tereticornis, E. crebra, Corymbia citriodora* and *Melaleuca quinquenervia*).



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Grey-headed Flying-fox Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
(Datum GDA2020)

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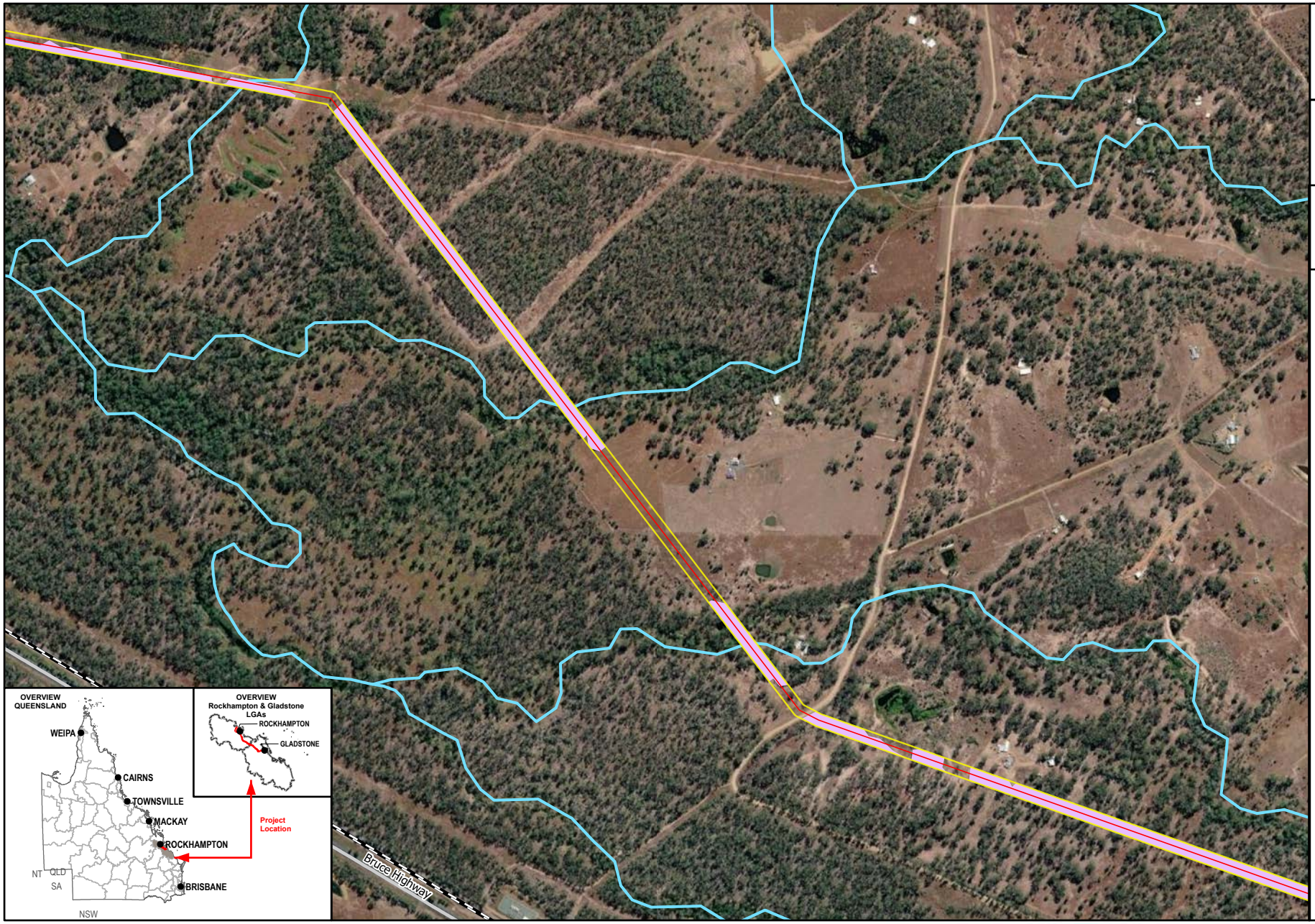
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17a
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Grey-headed Flying-fox Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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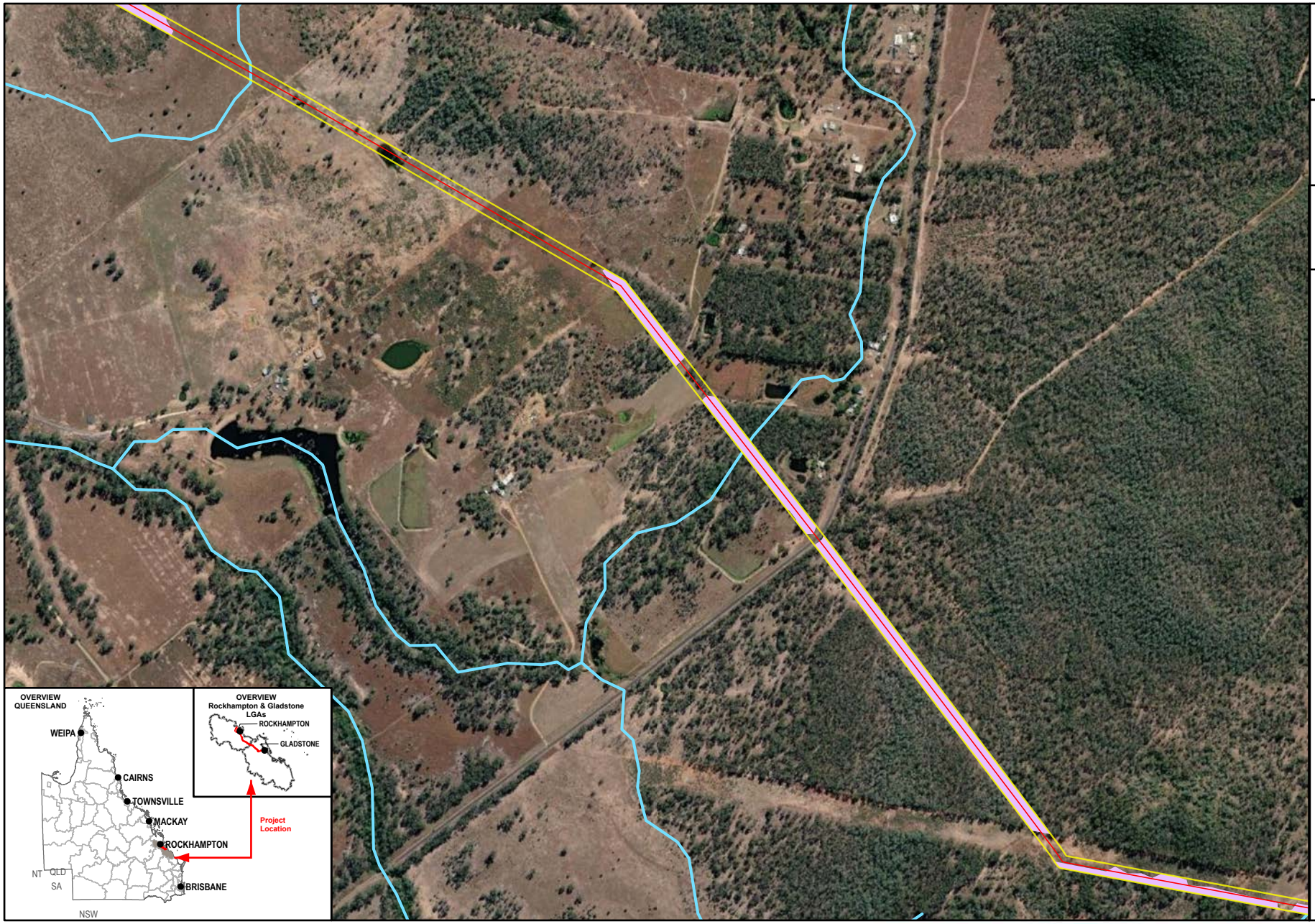
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17b
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Grey-headed Flying-fox Habitat
- Waterways

Data Sources:
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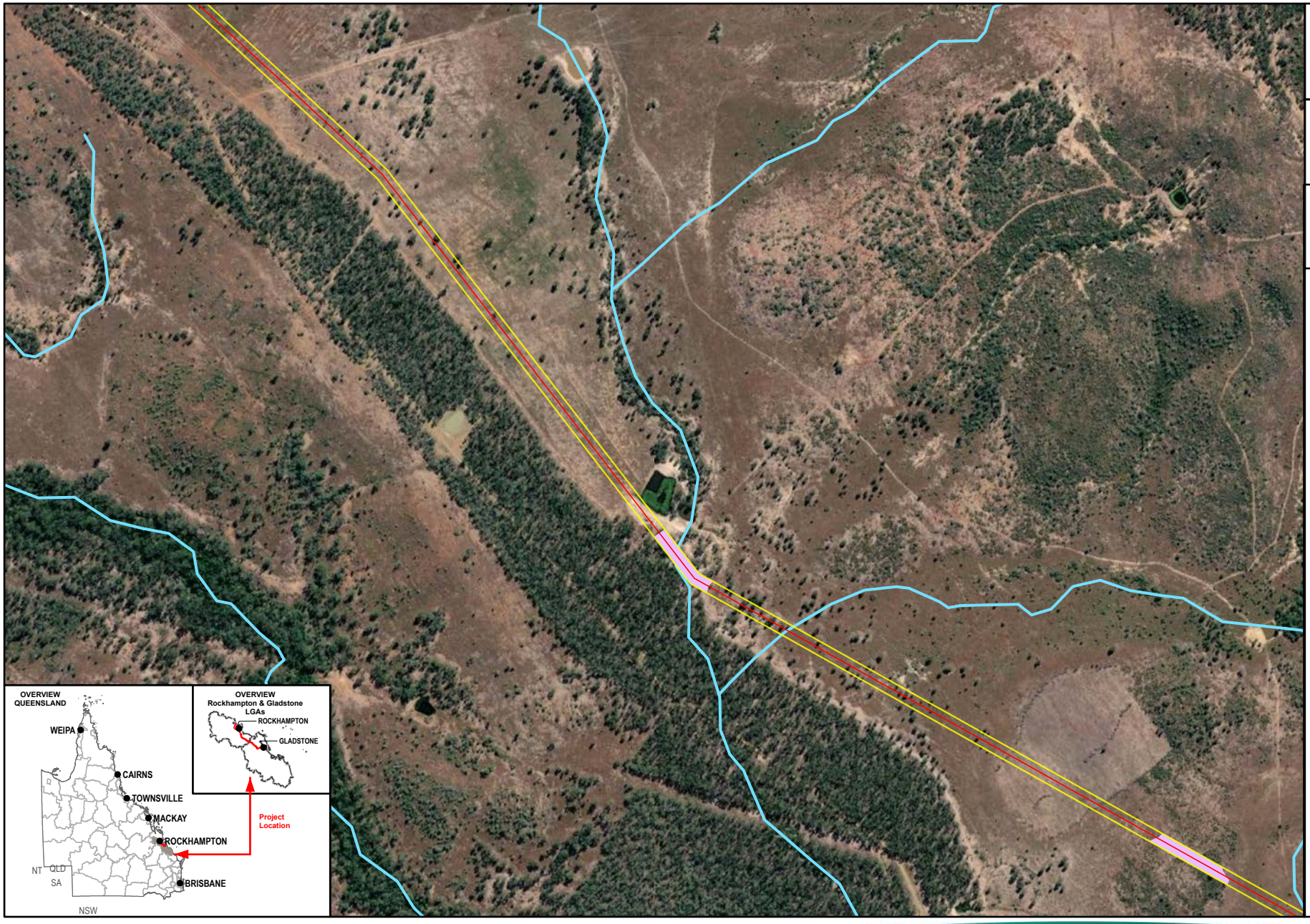
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17c
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Grey-headed Flying-fox Habitat
- Waterways

Data Sources:
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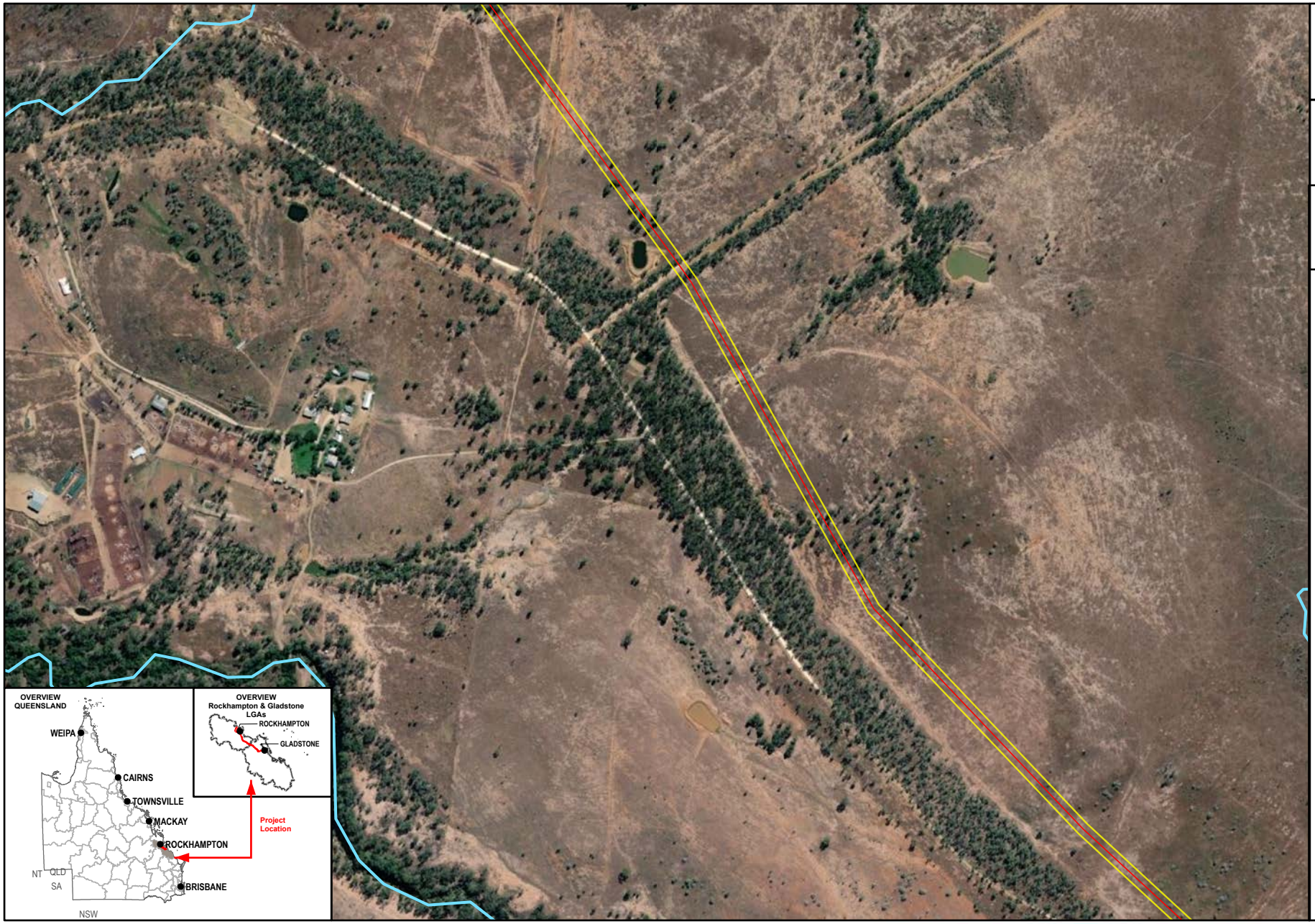
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17d
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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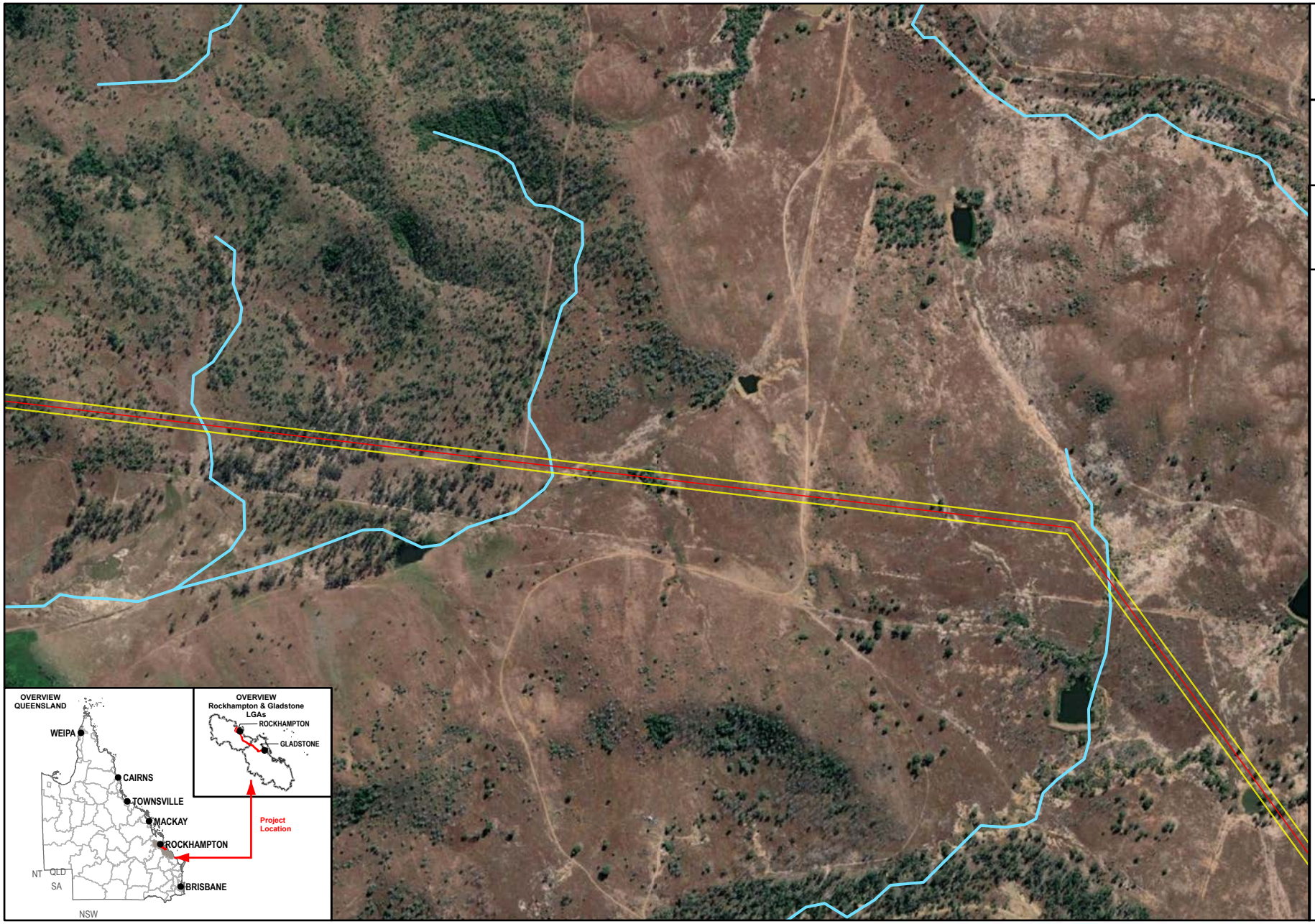
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17e
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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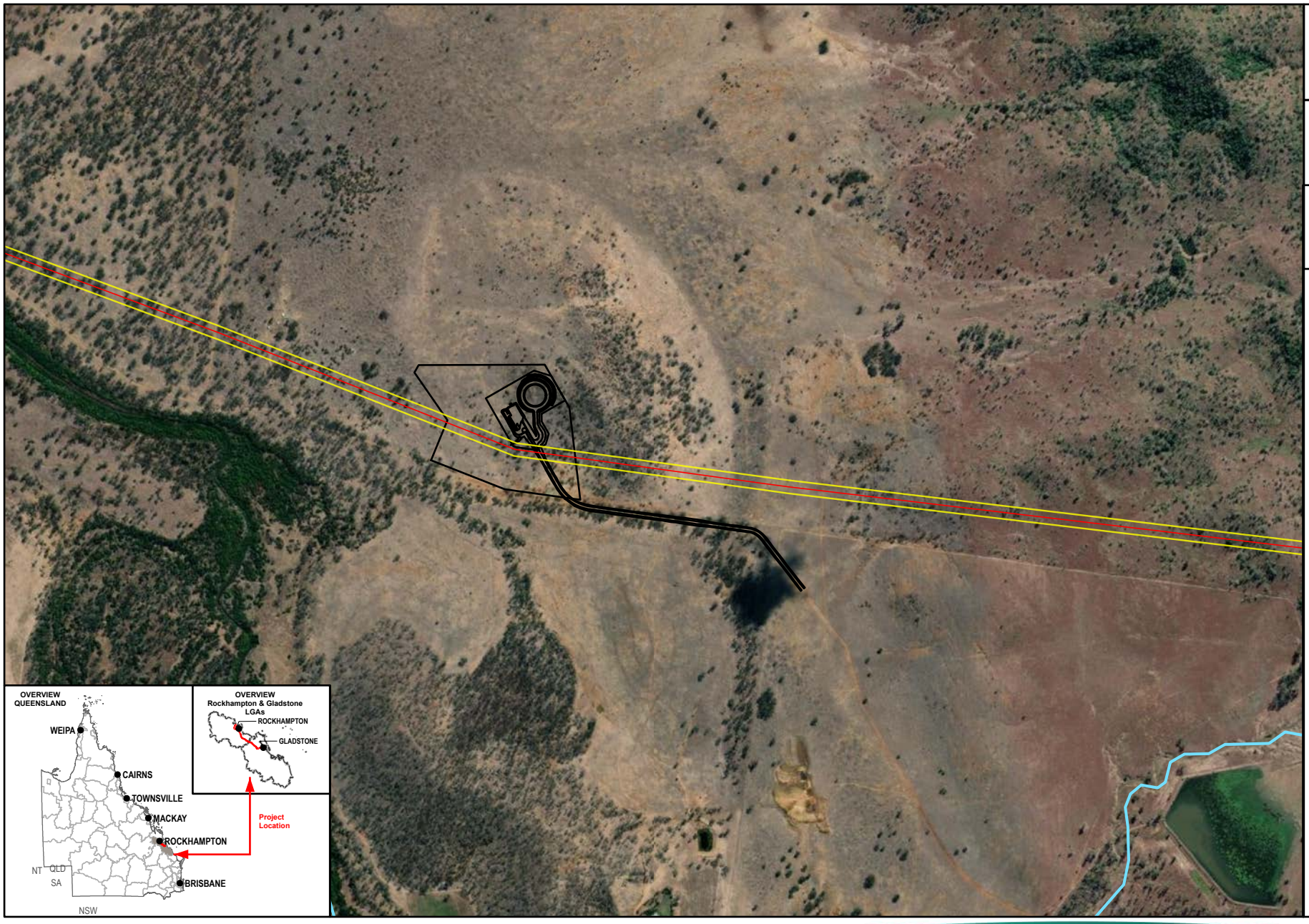
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17f
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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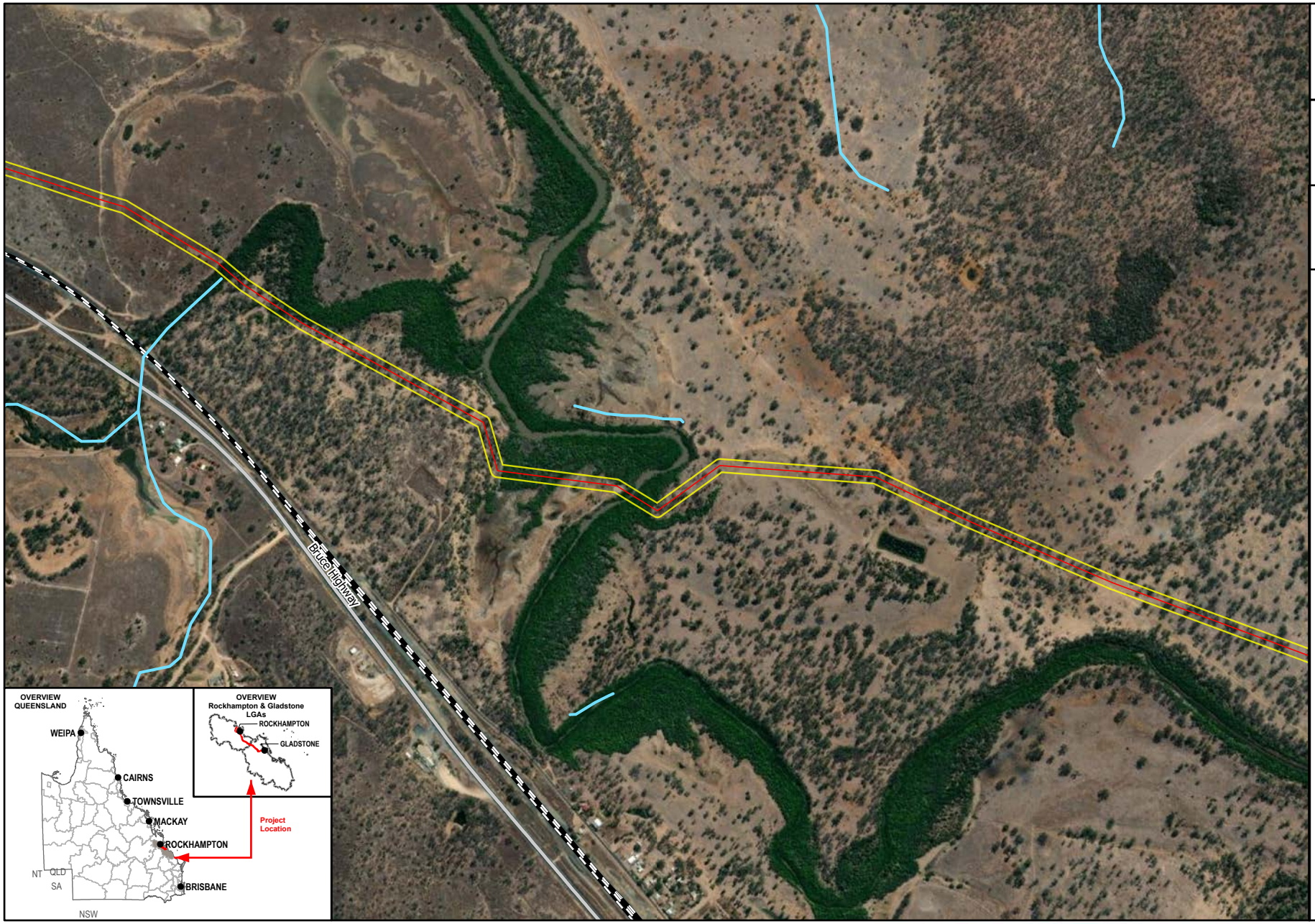
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17g
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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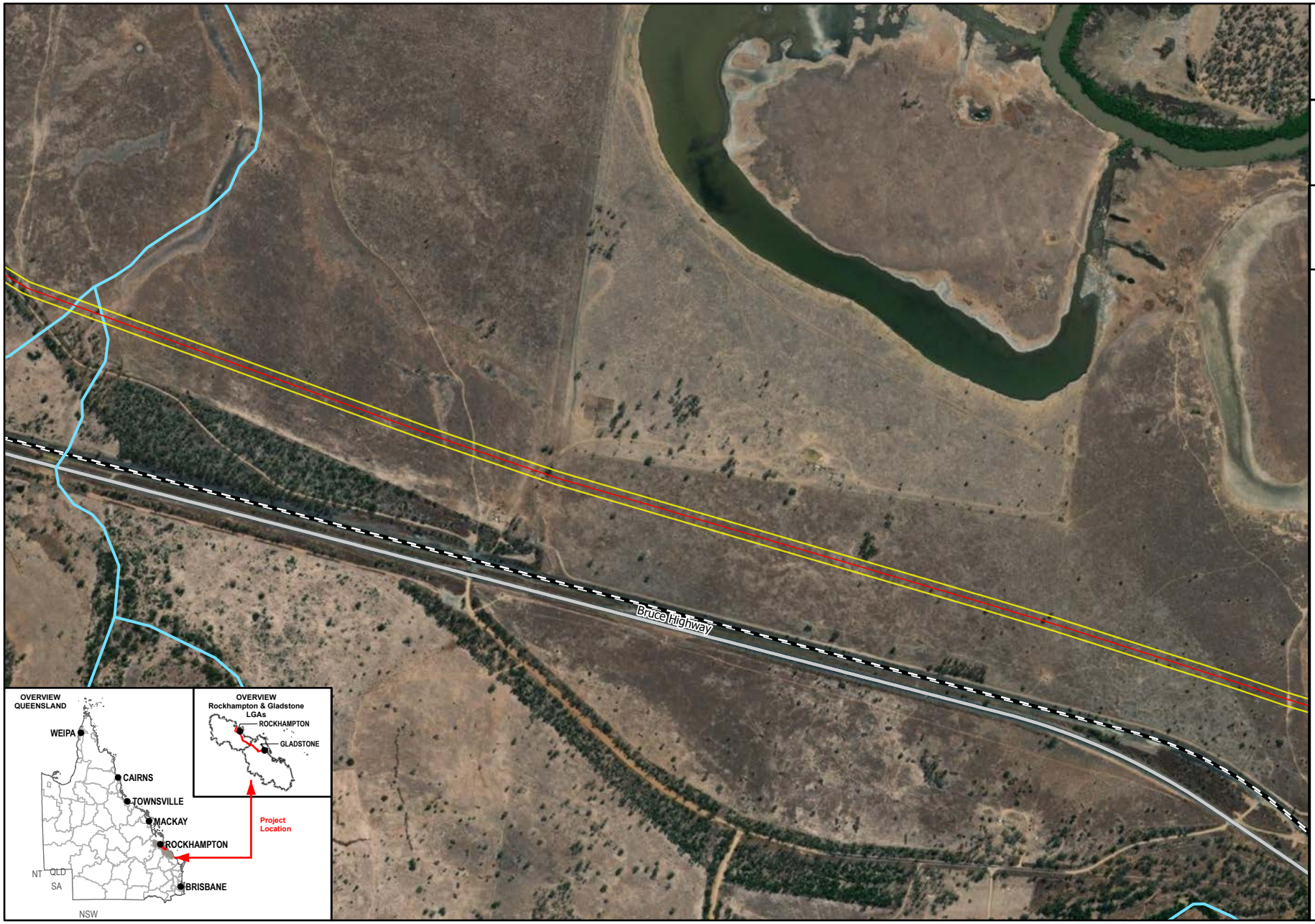
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17h
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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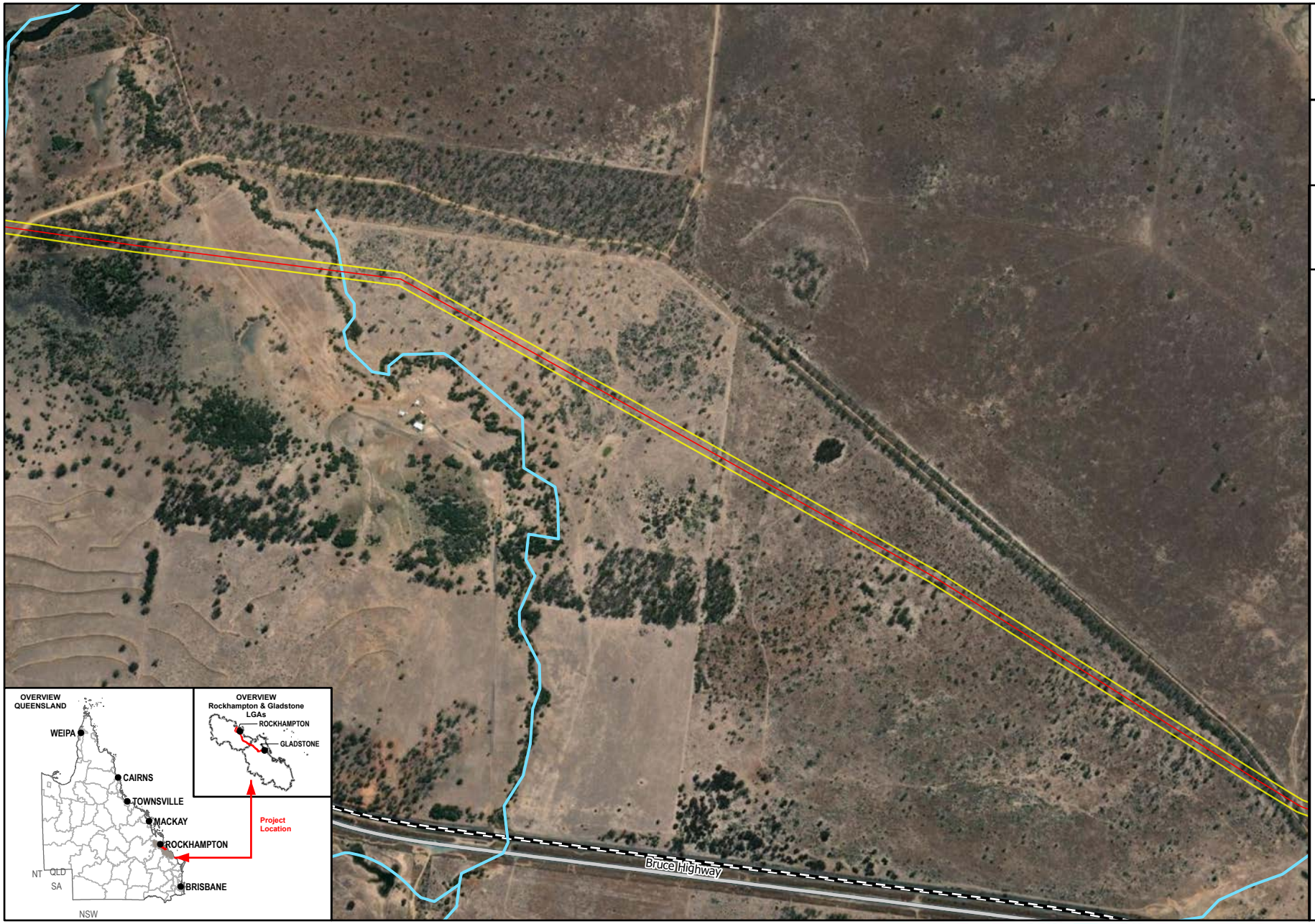
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17i
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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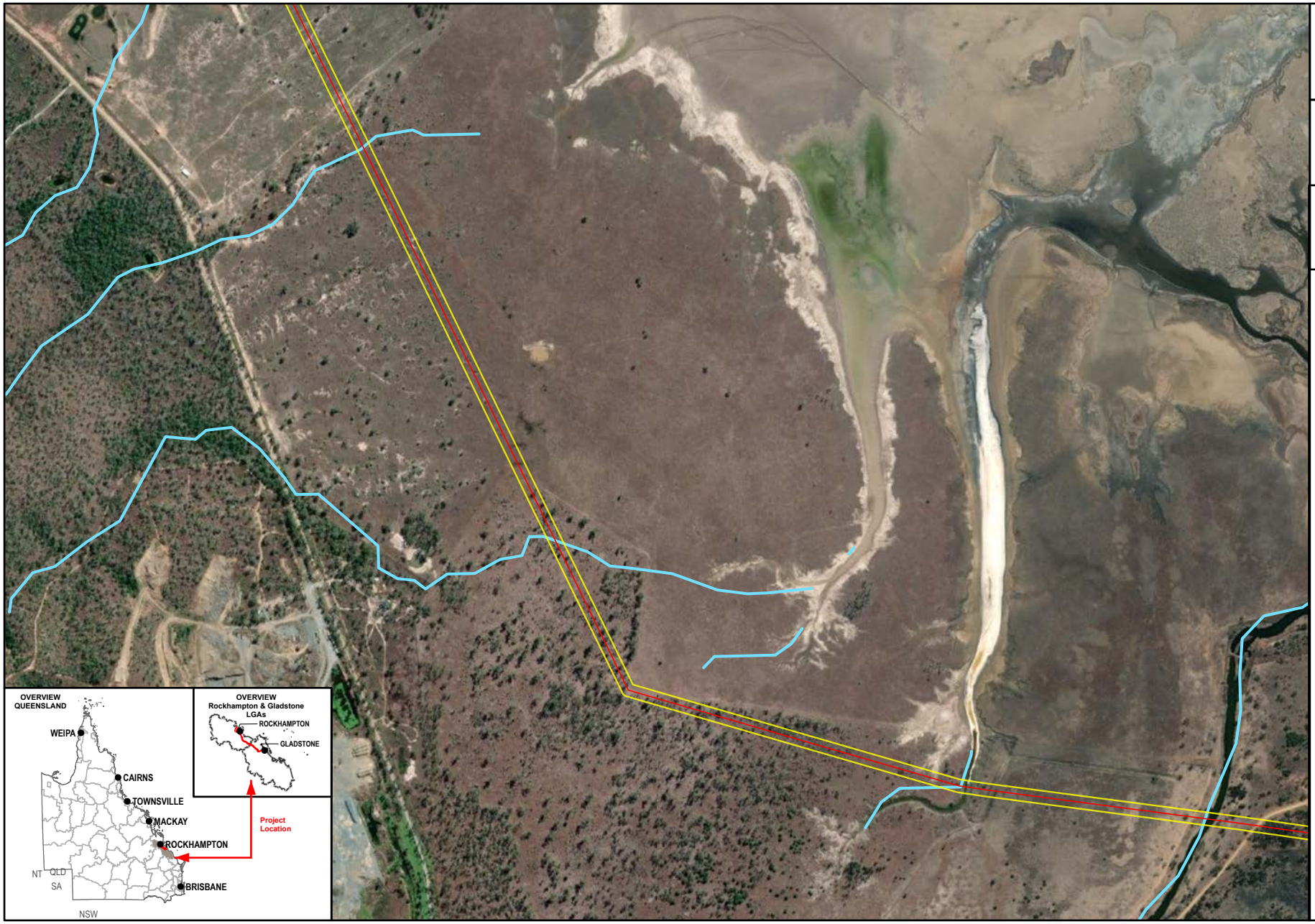
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17j
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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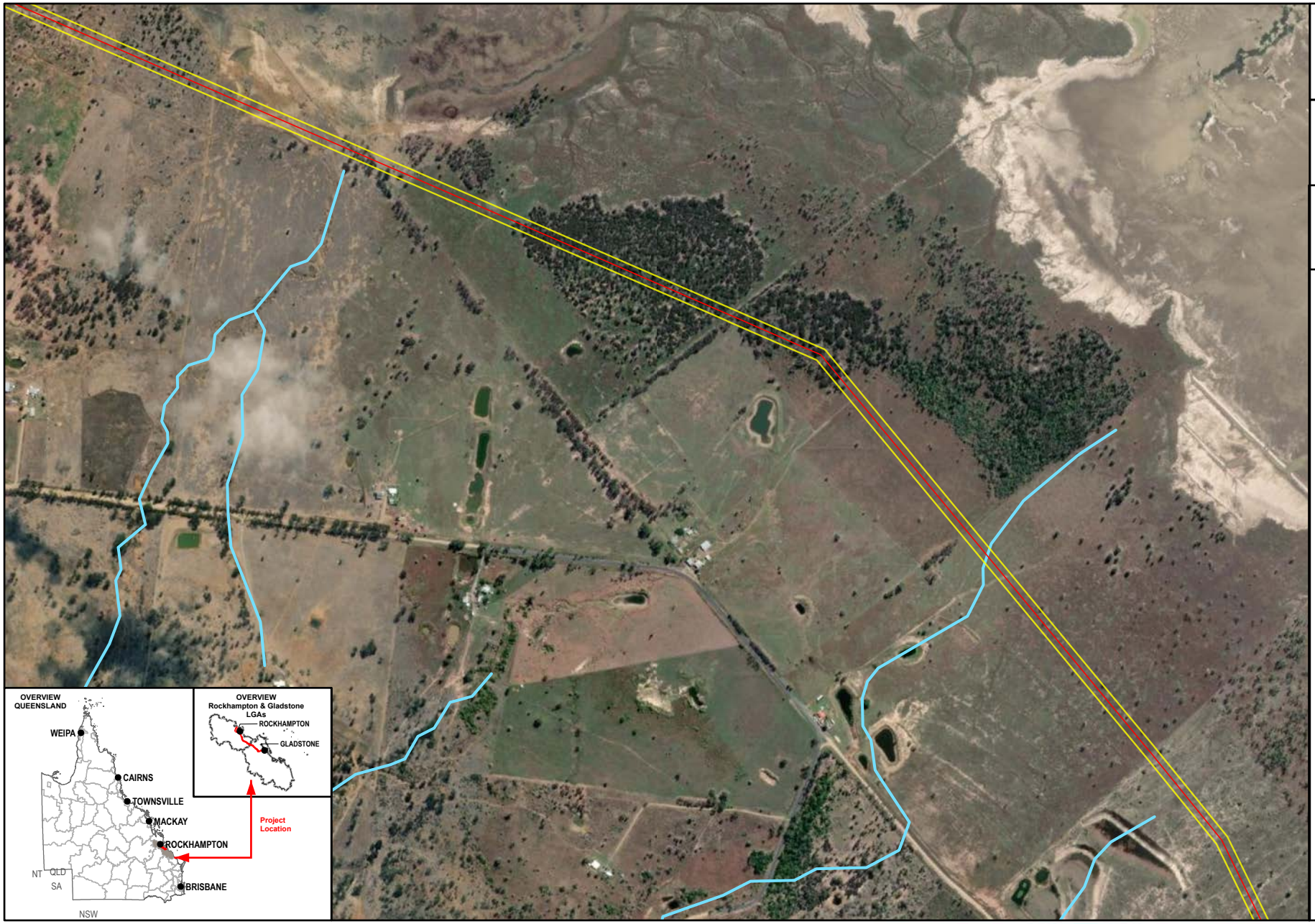
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17k
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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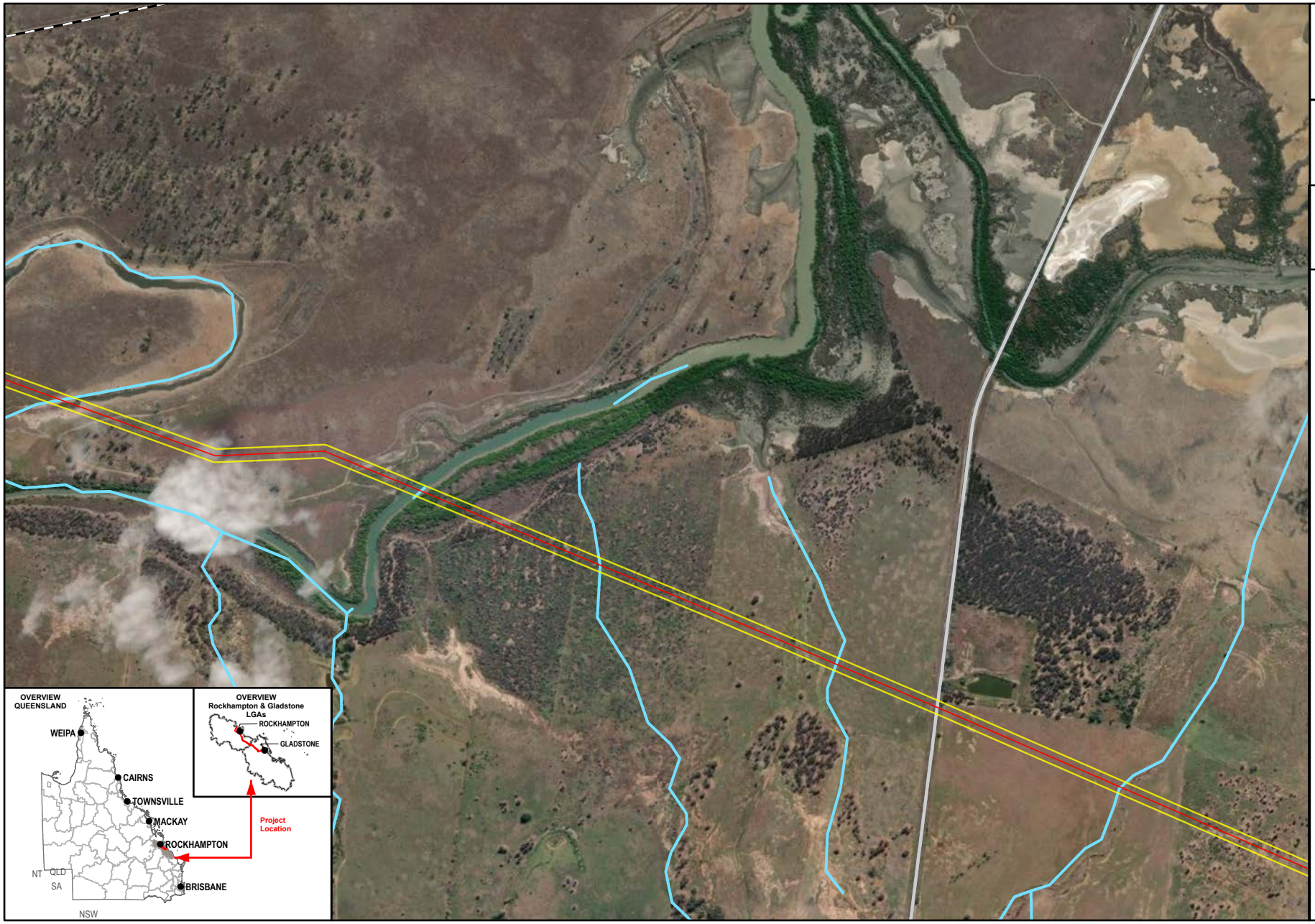
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17l
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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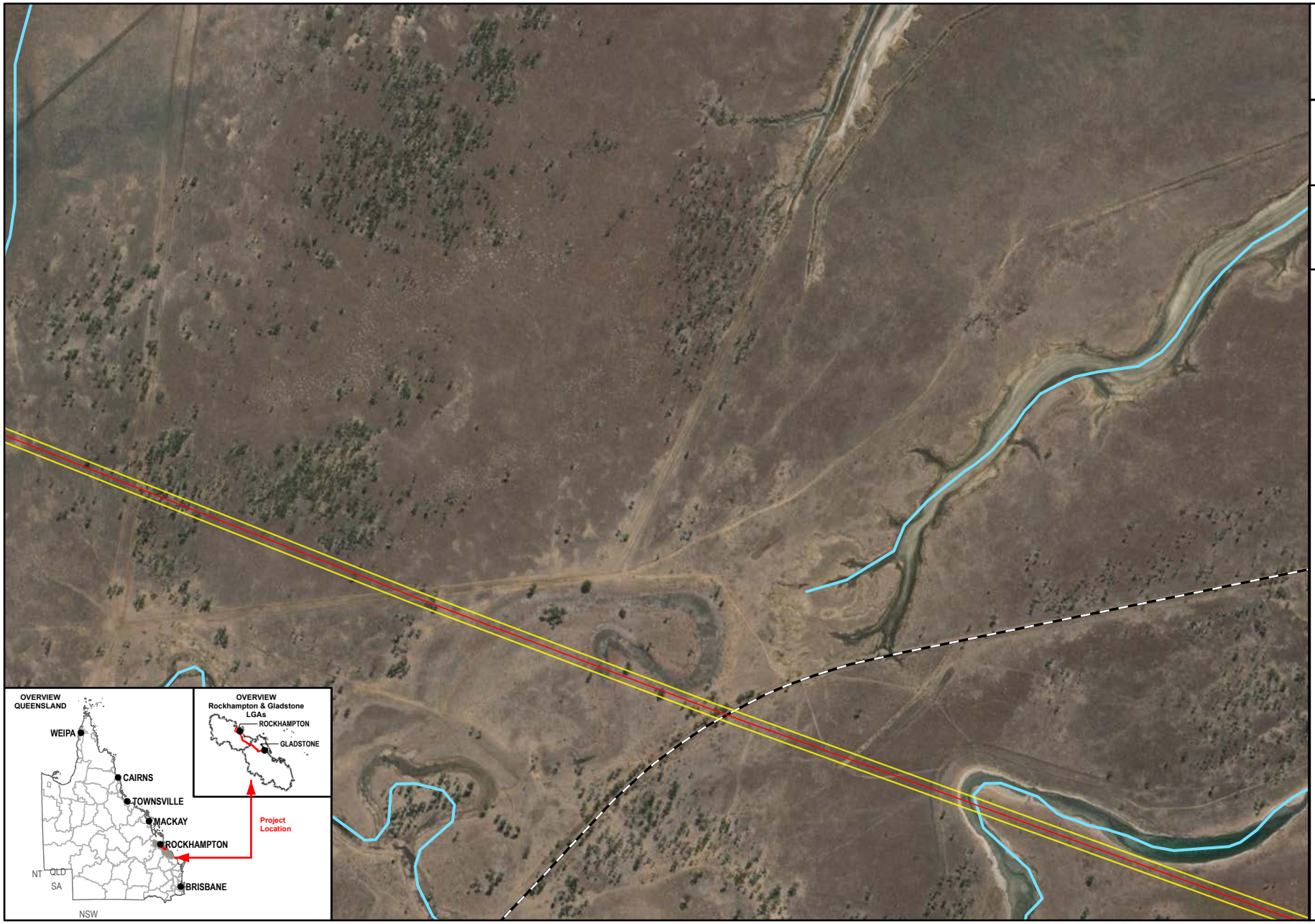
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17m
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
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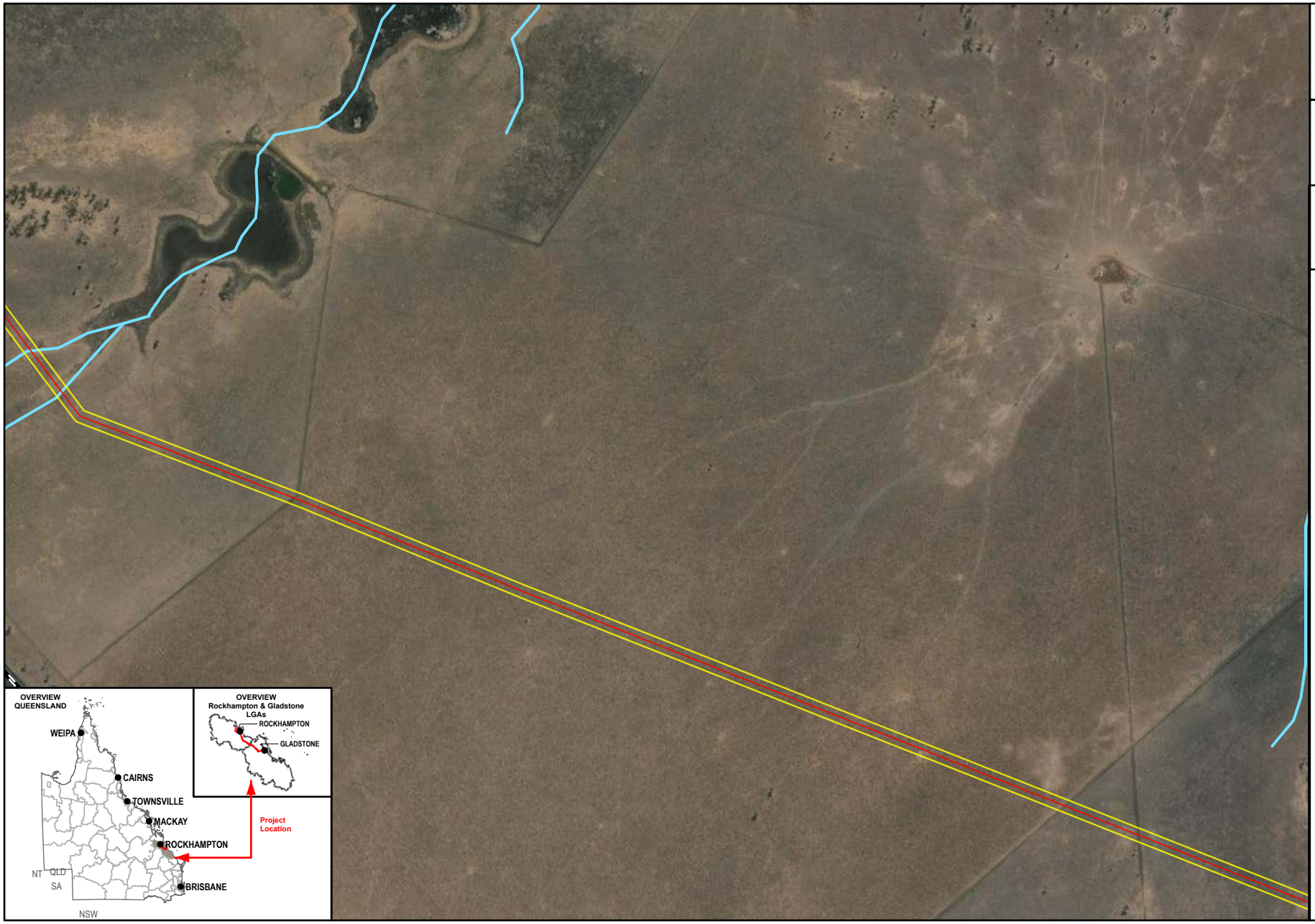
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17n
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

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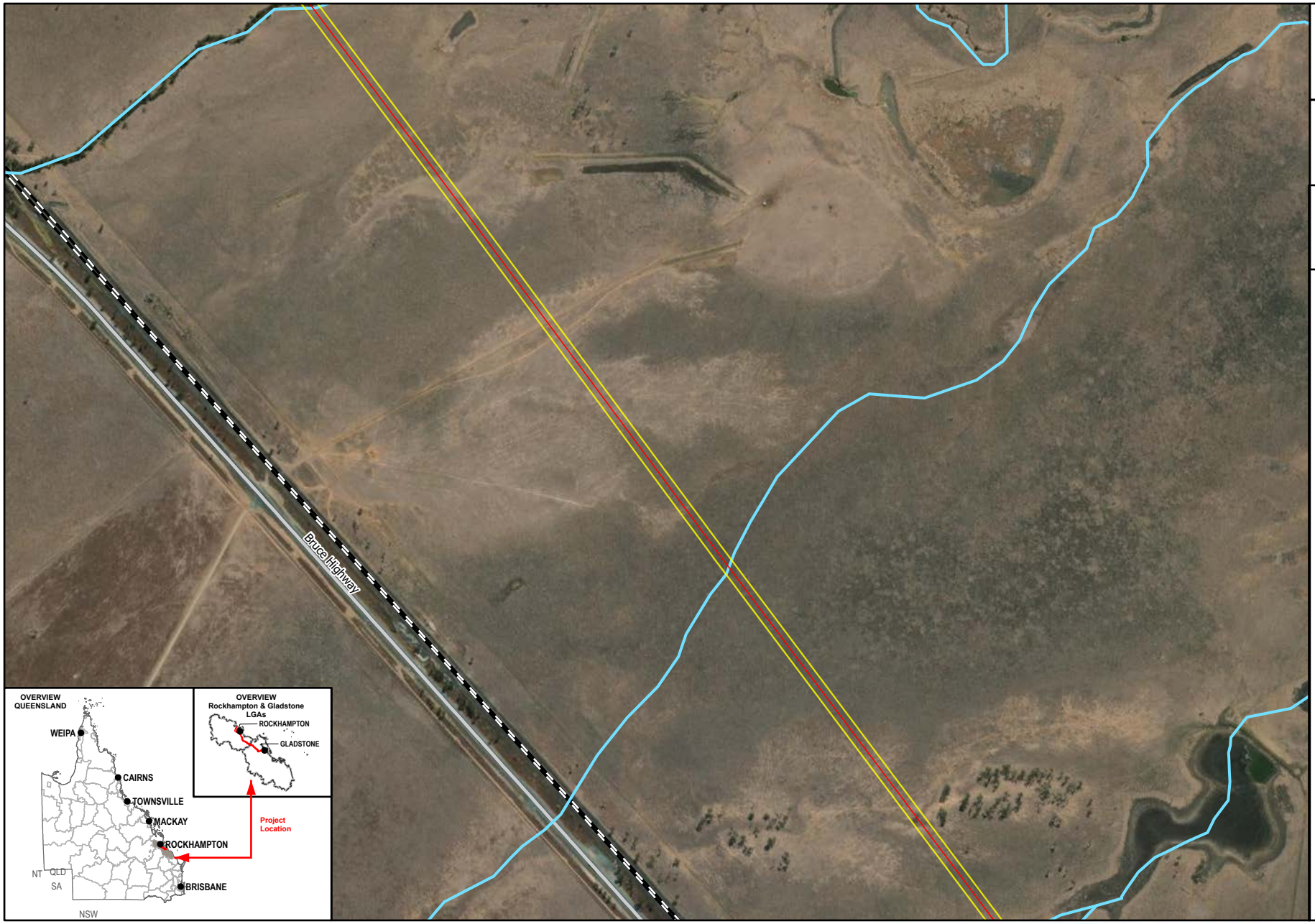
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-17o
Distribution of Grey-headed Flying-fox Habitat Within the SGIC SDA Study Area
000-G-MAP-2438 Version:4 Date:19/09/2022



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- Waterways
- Main Roads
- Railways

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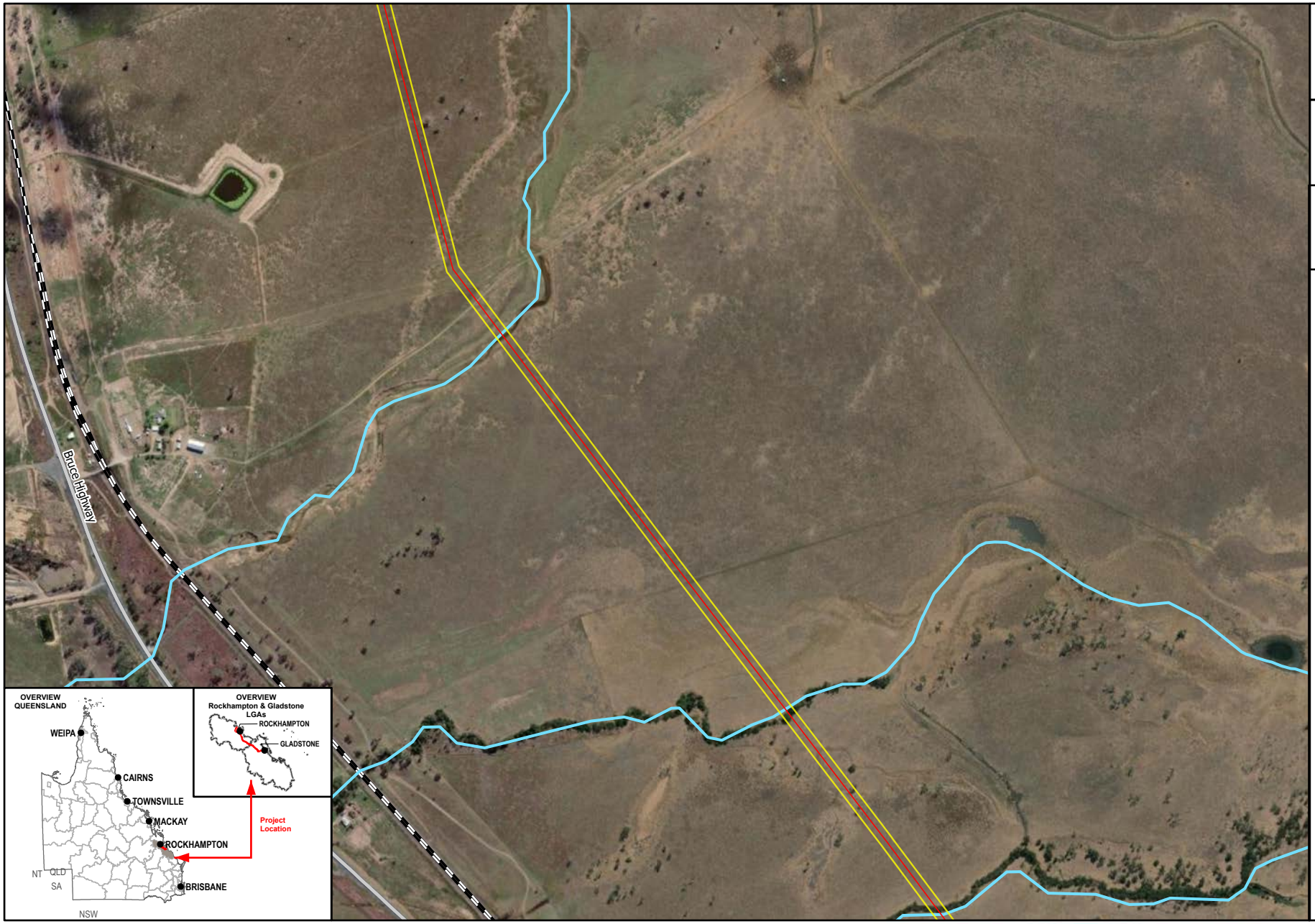

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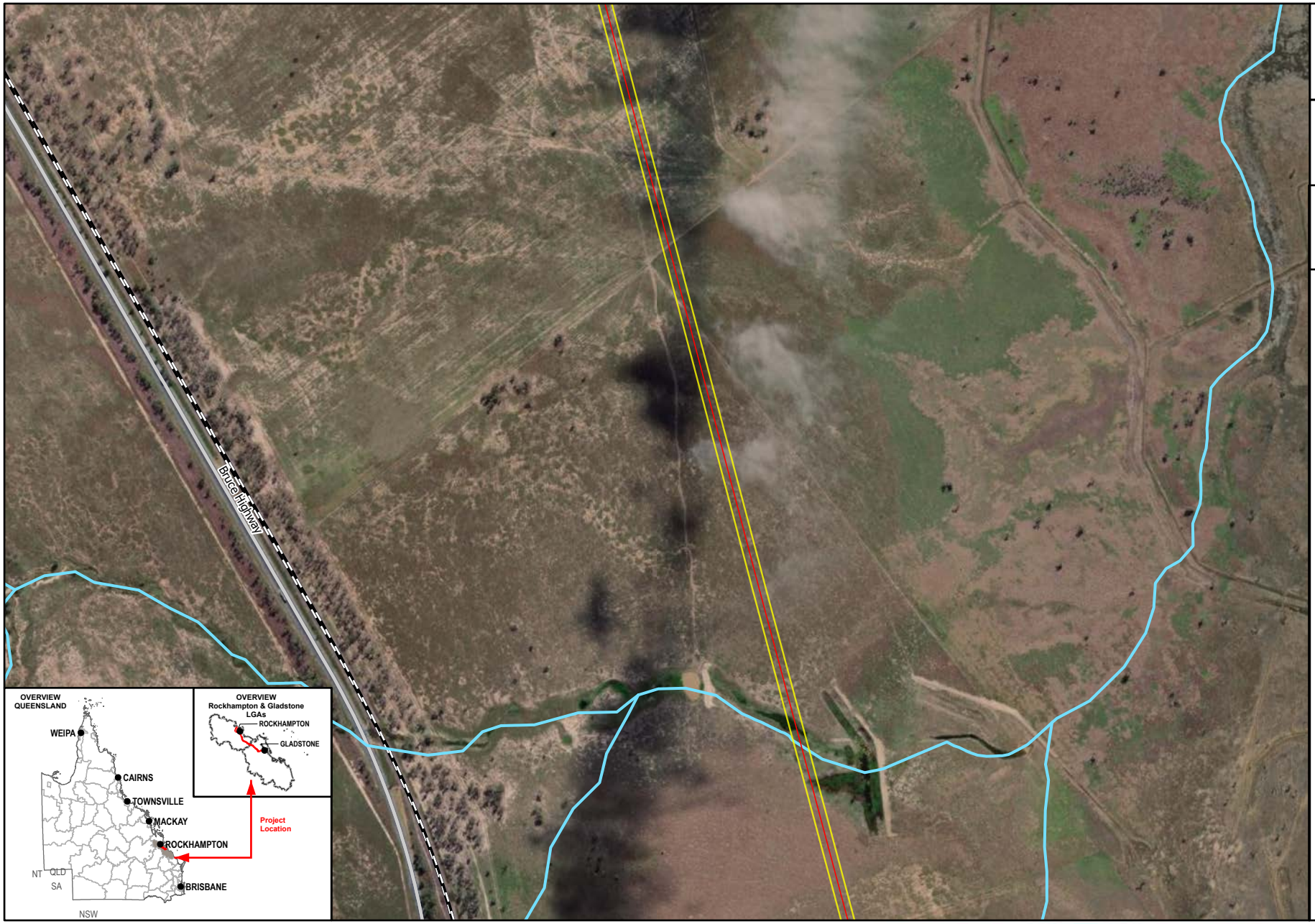

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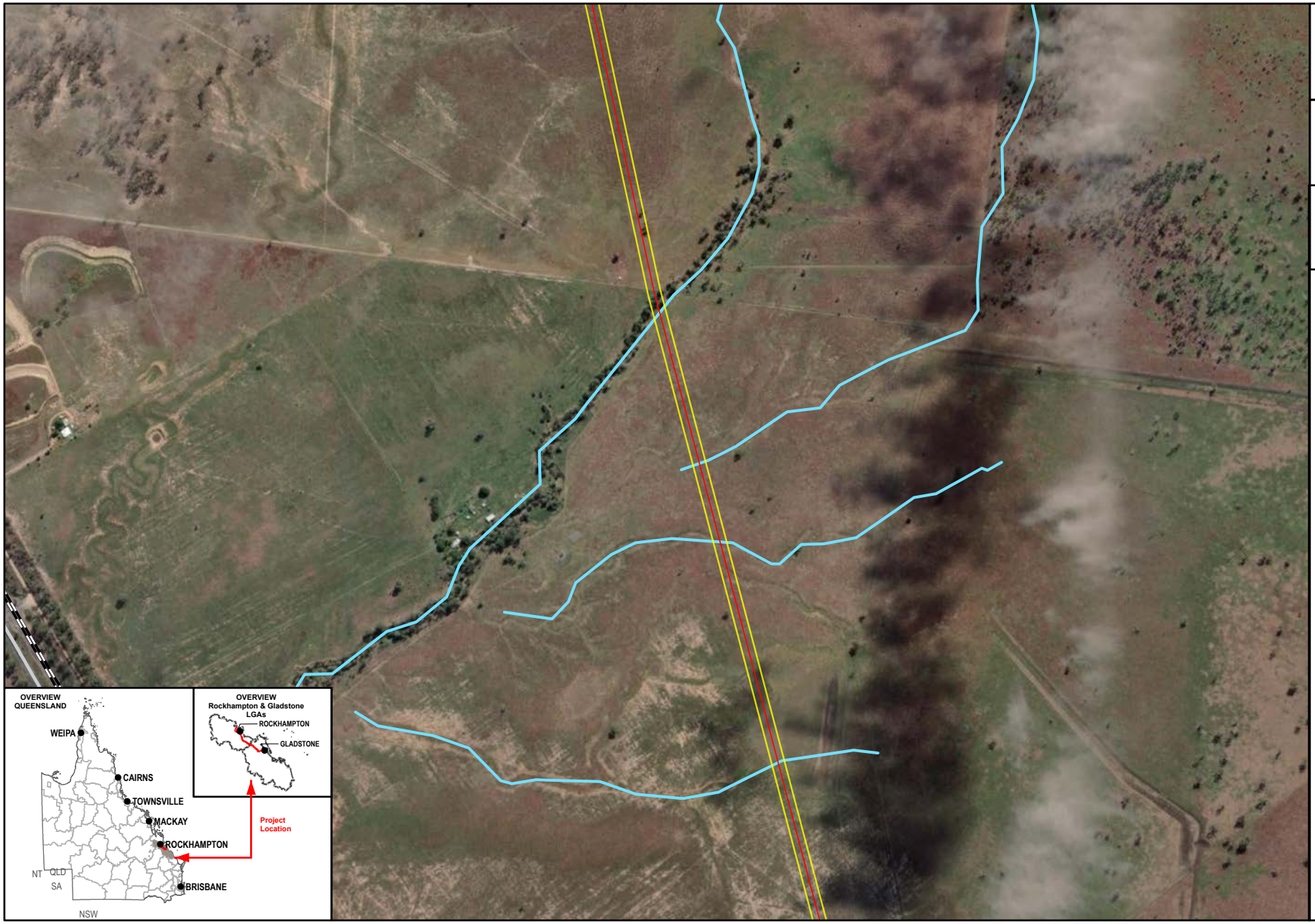

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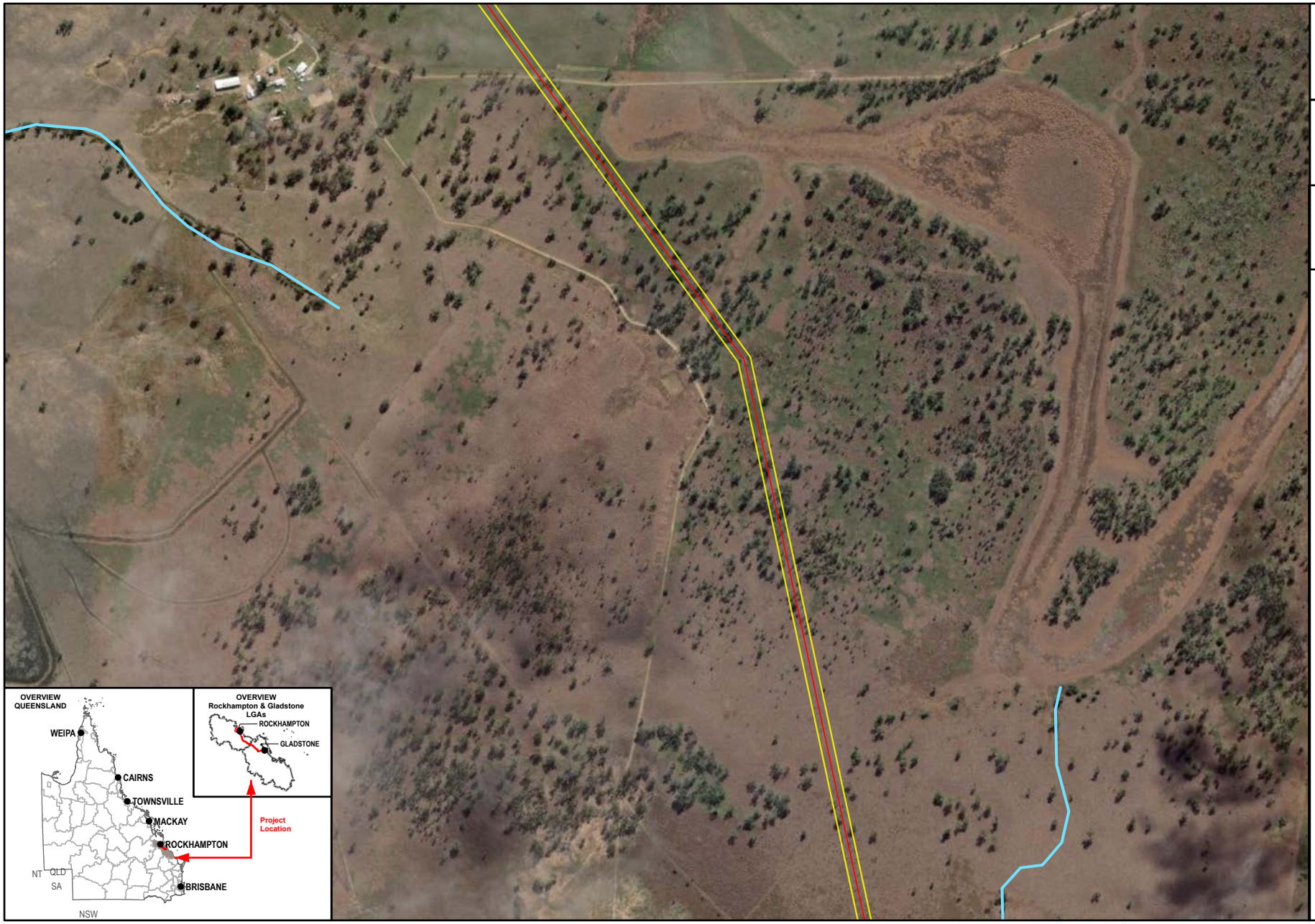

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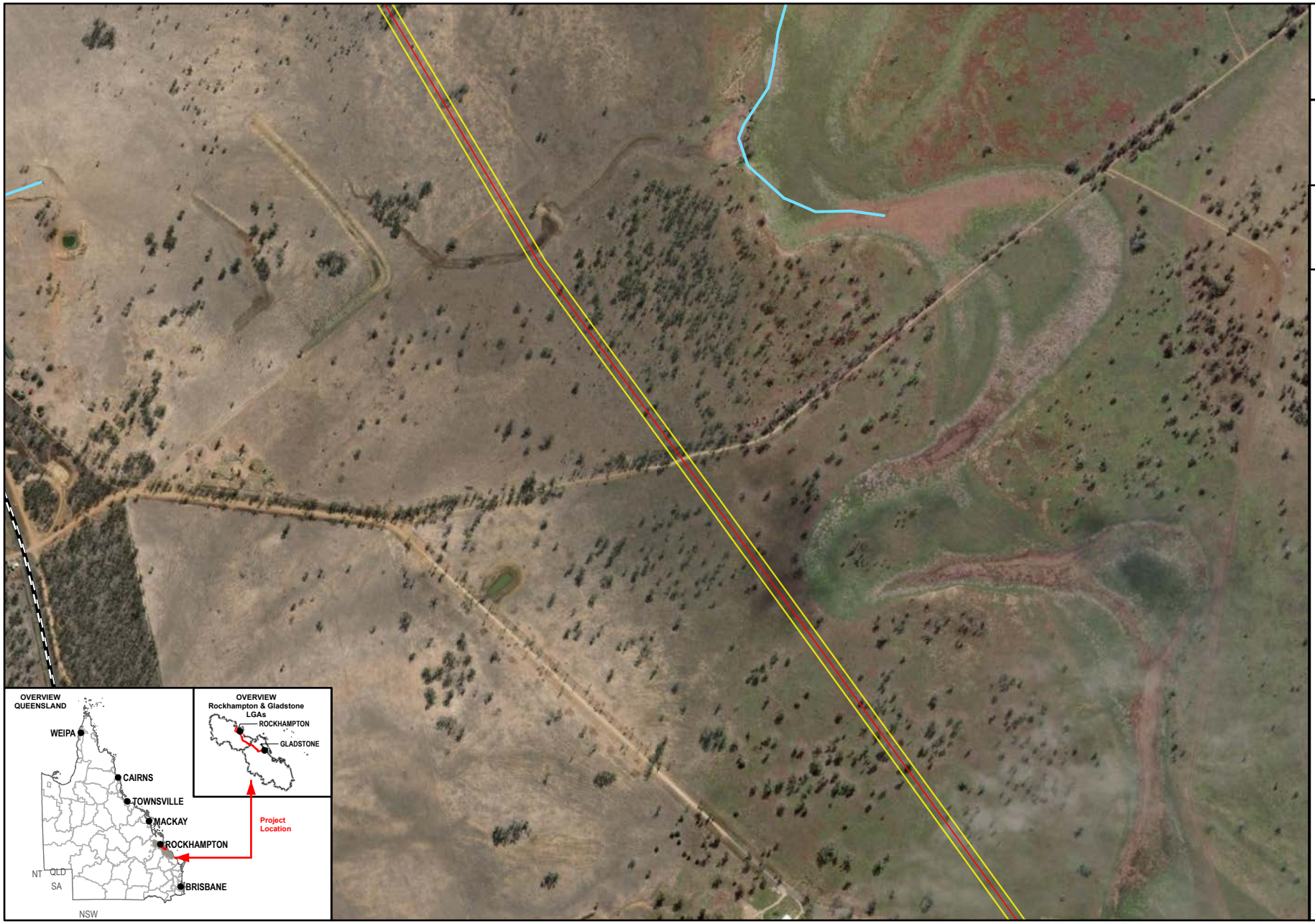

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Figure 7-17u
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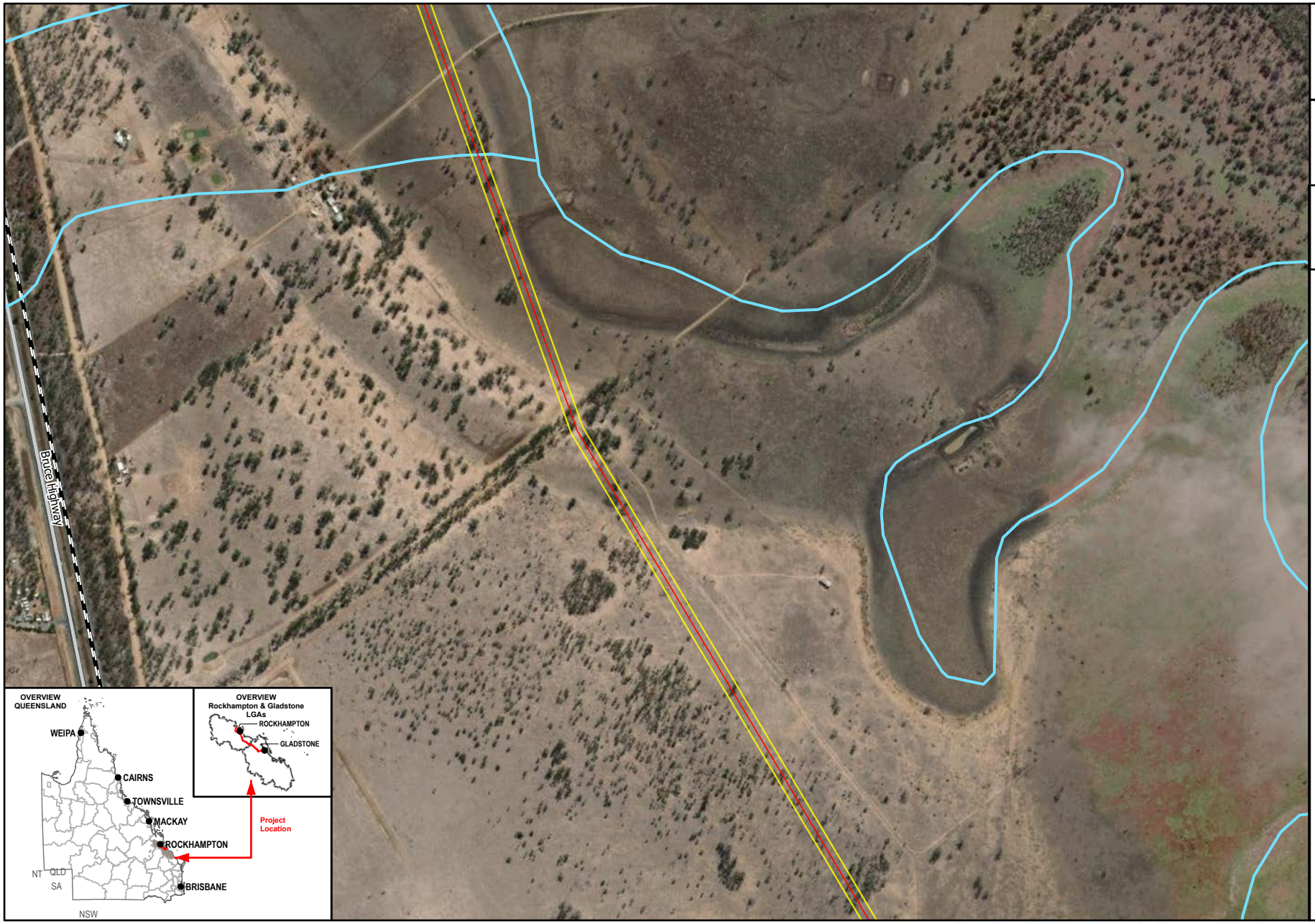

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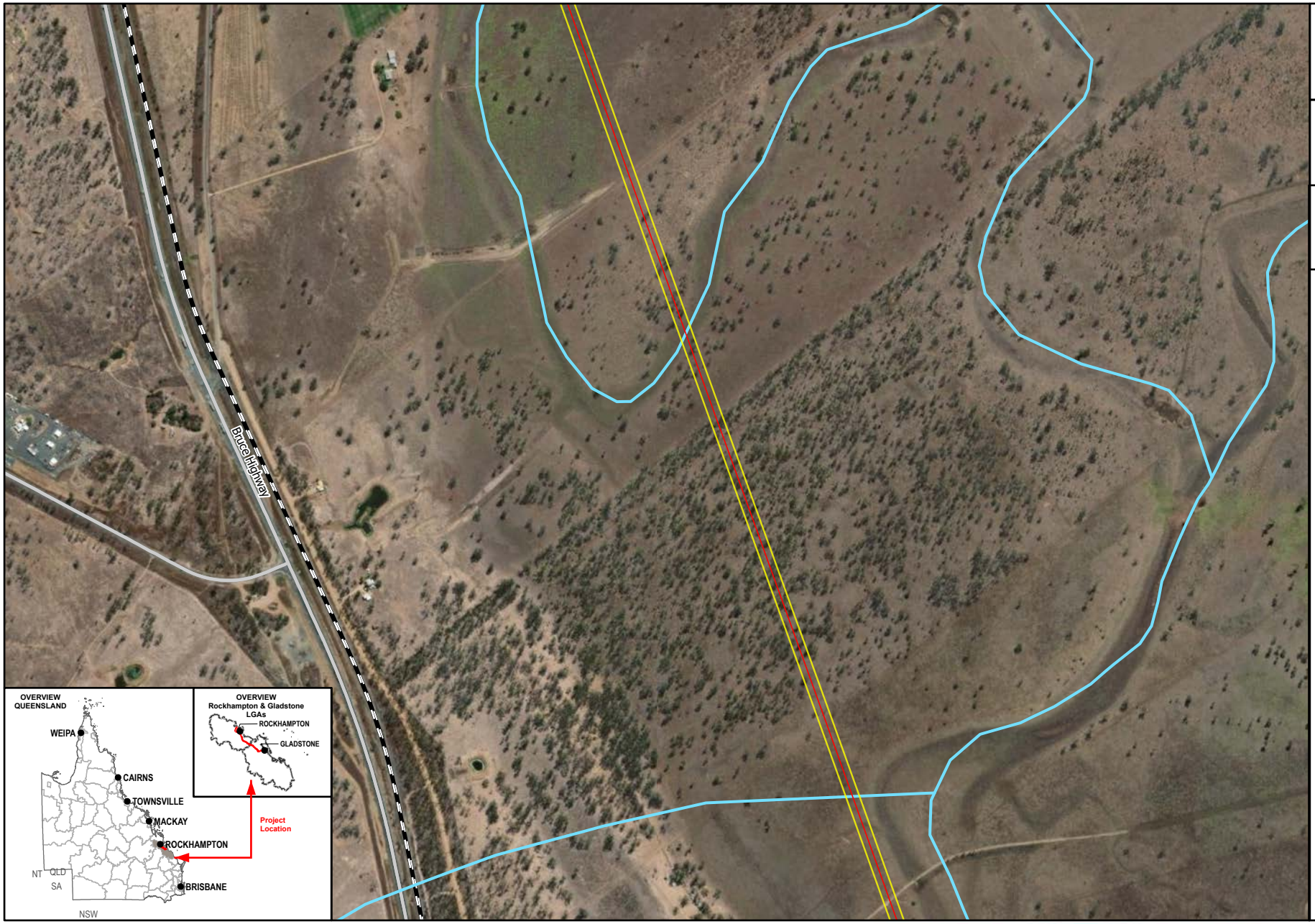

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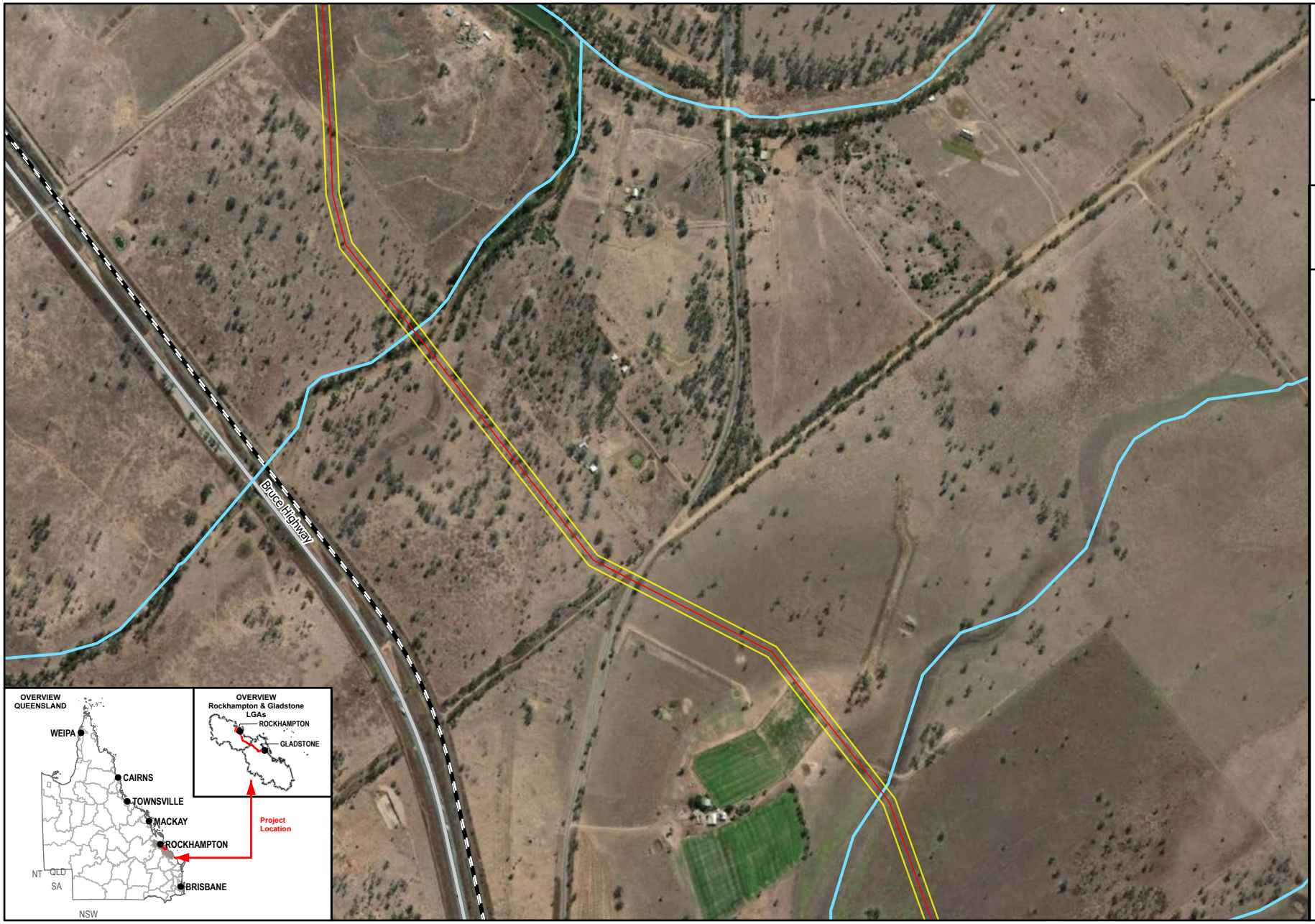

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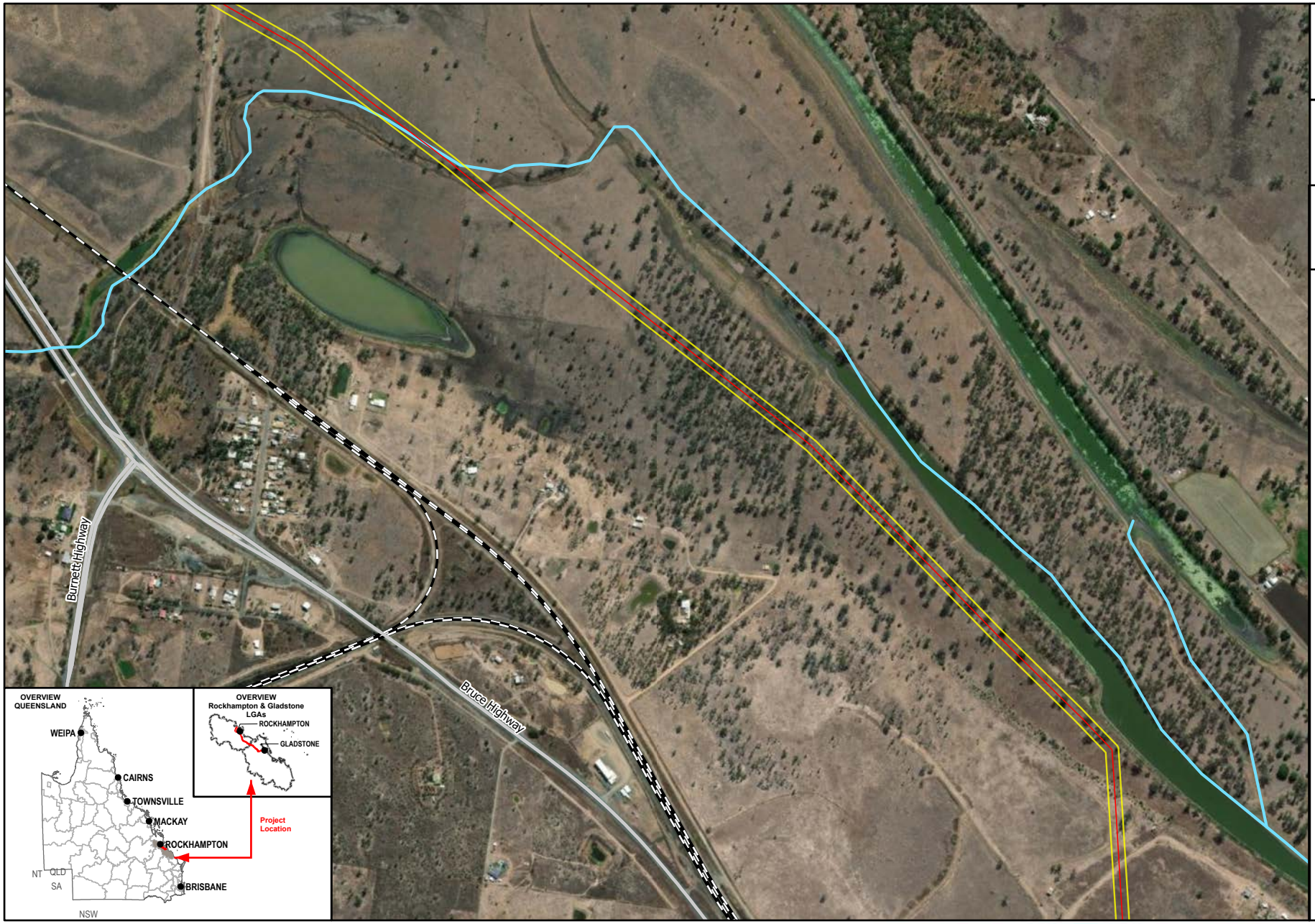

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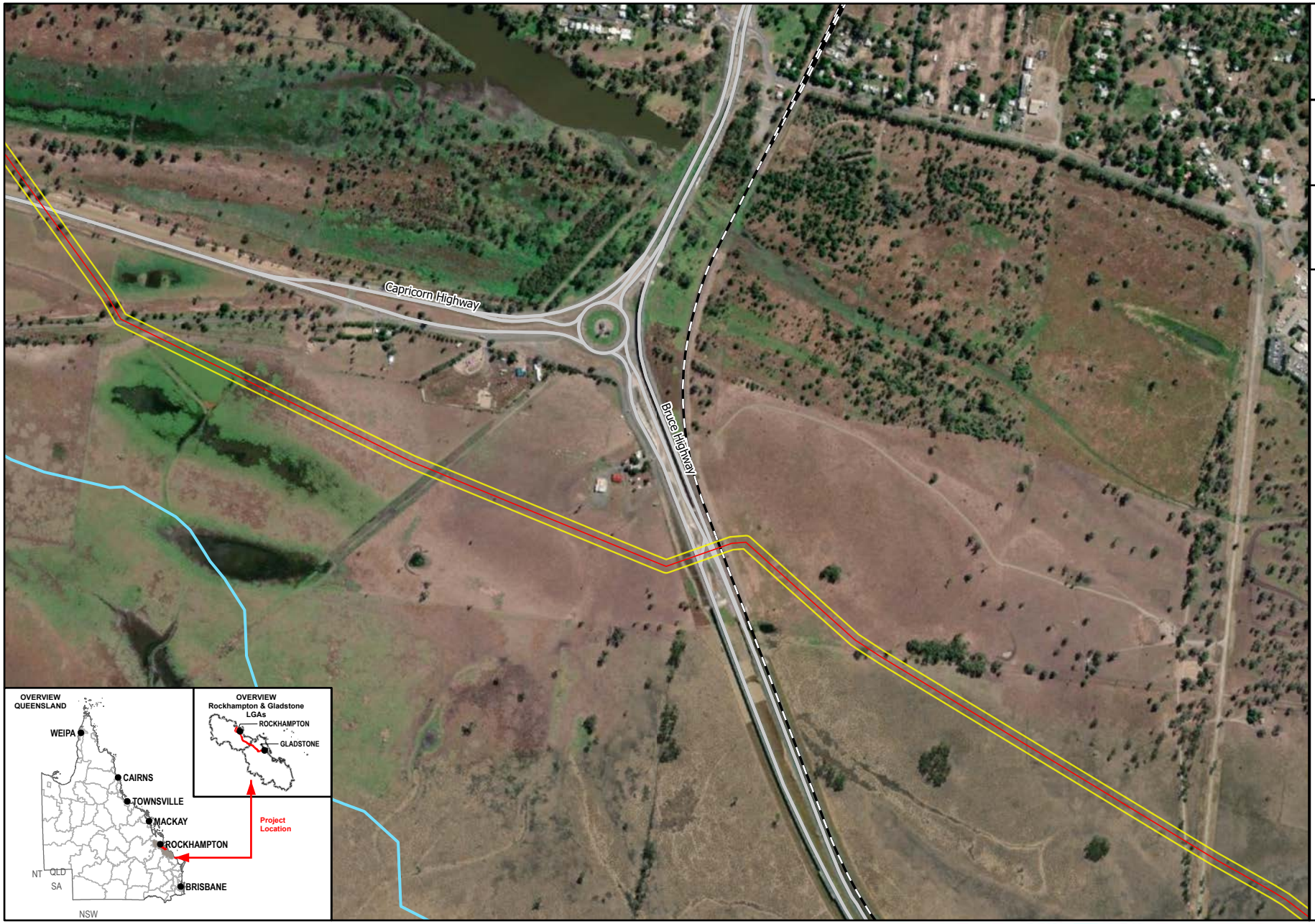

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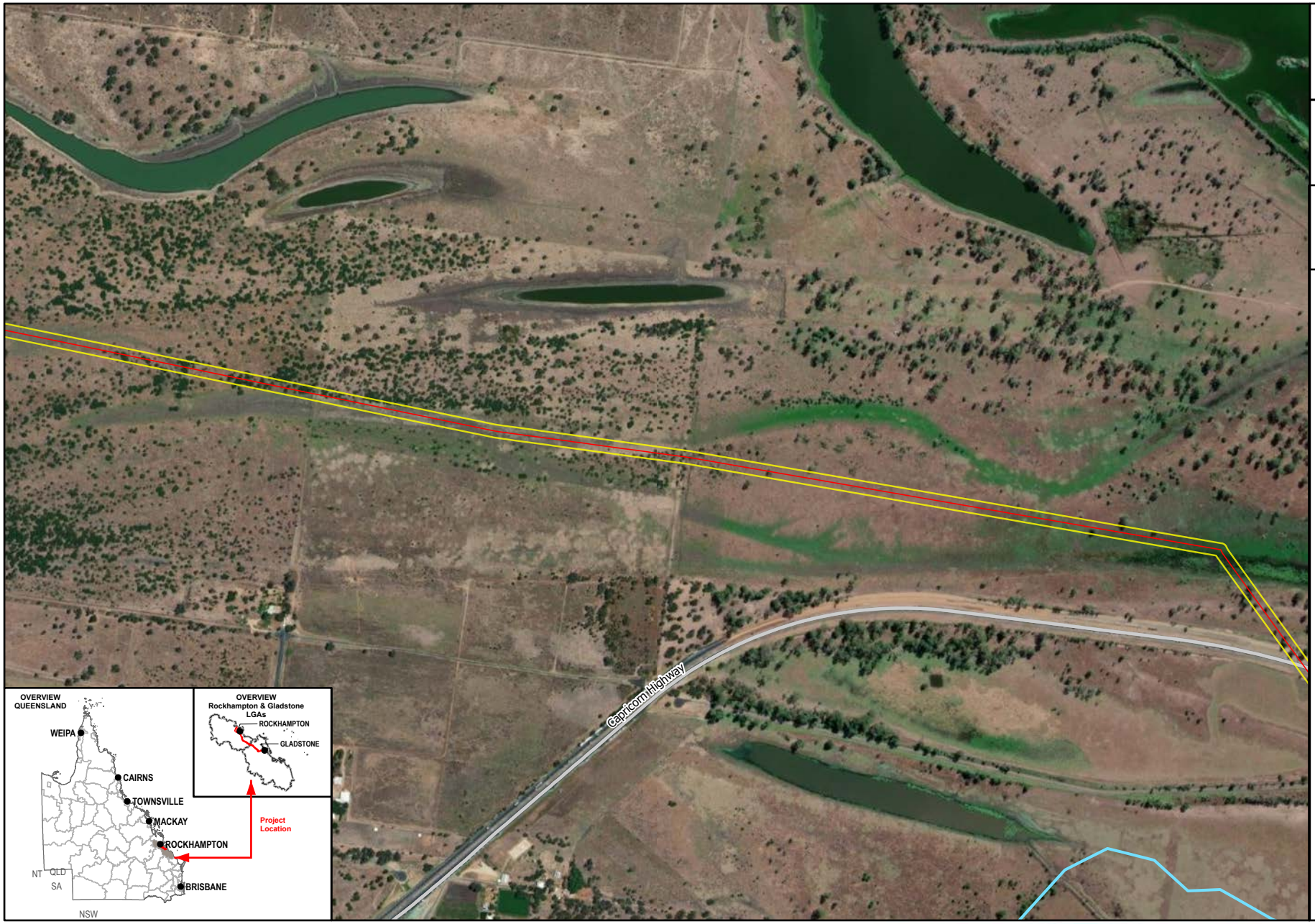

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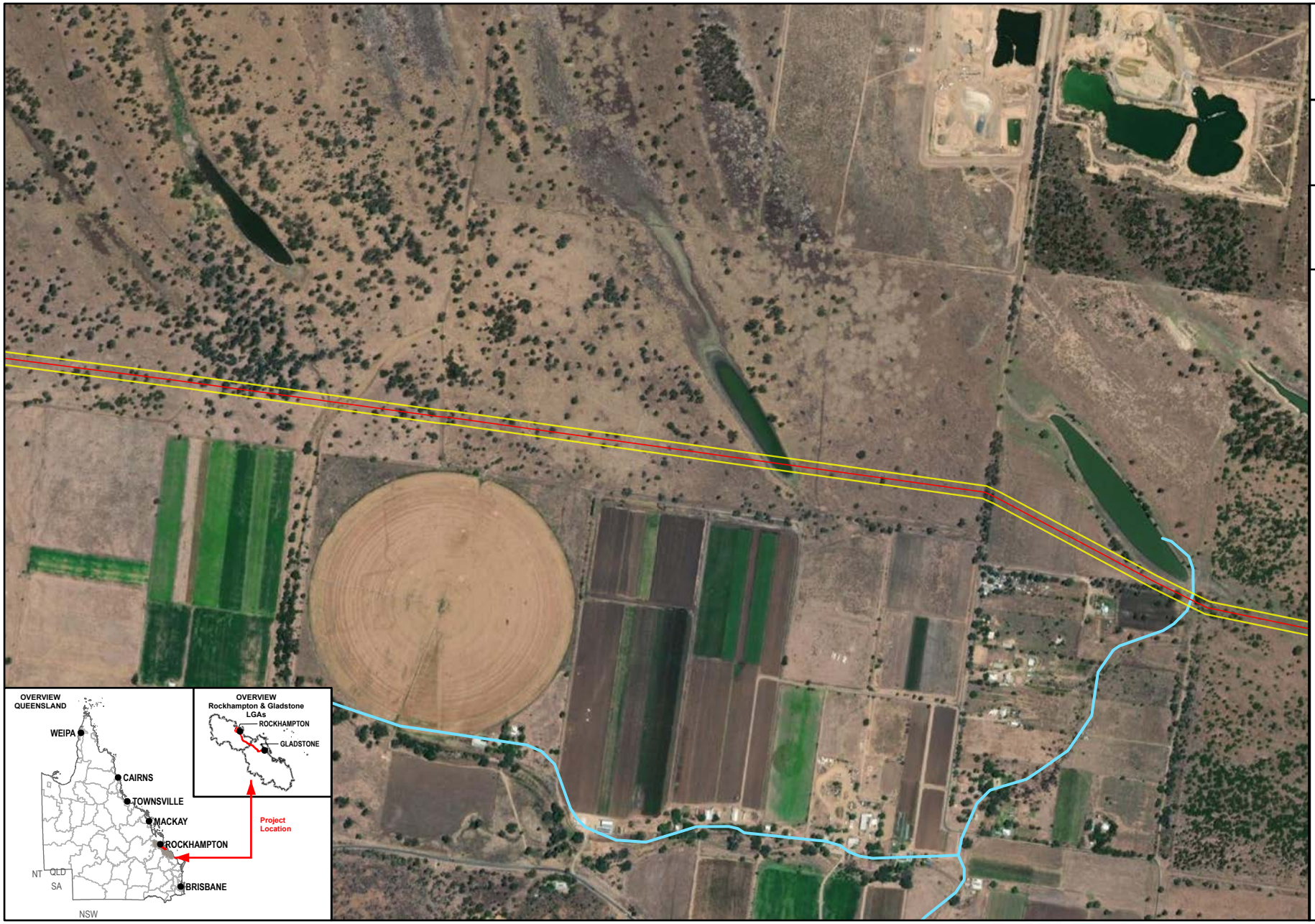

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7.2.2.13 Australian painted snipe

Conservation status and species ecology

The Australian painted snipe is listed as endangered under the EPBC Act and NC Act and was listed as an MNES at the time of the approval. The Australian painted snipe is recorded in wetlands in all states of Australia. The most common occurrence is eastern Australia, scattered through much of Queensland, NSW, Victoria, and southeastern South Australia (DoE 2022). They occur in shallow freshwater wetlands, both ephemeral and permanent, including lakes, swamps, inundated or waterlogged grassland/saltmarsh, dams, sewage farms and bore drains (DSEWPC 2013). Nests are often placed in a scrape in the ground and is either a shallow bowl shaped made of dry grass or other material or has scant lining (DoE 2022). These are often located in swamps, cane grass swamps, flooded areas, grazing lands, among cumbungi, sedges, grasses, saltwater couch, saltbush, and grass. The diet of the Australian painted snipe consists of vegetation, seeds, insects, worms and molluscs, crustaceans and other invertebrates (DoE 2022).

Field survey results and distribution of suitable habitat

The Australian painted snipe was not recorded during the field surveys within the SGIC SDA study area. Survey effort for the Australian painted snipe included two bird surveys within suitable wetland habitats in the SGIC SDA study area. The species is considered likely to occur due to the presence of suitable habitat and the species has been historically recorded at six locations within the desktop search extent (10 km buffer). Suitable habitat for the species was recorded at freshwater waterbodies and seasonal wetlands within the SGIC SDA study area. The distribution of predicted Australian painted snipe habitat is mapped in Figure 7-18.

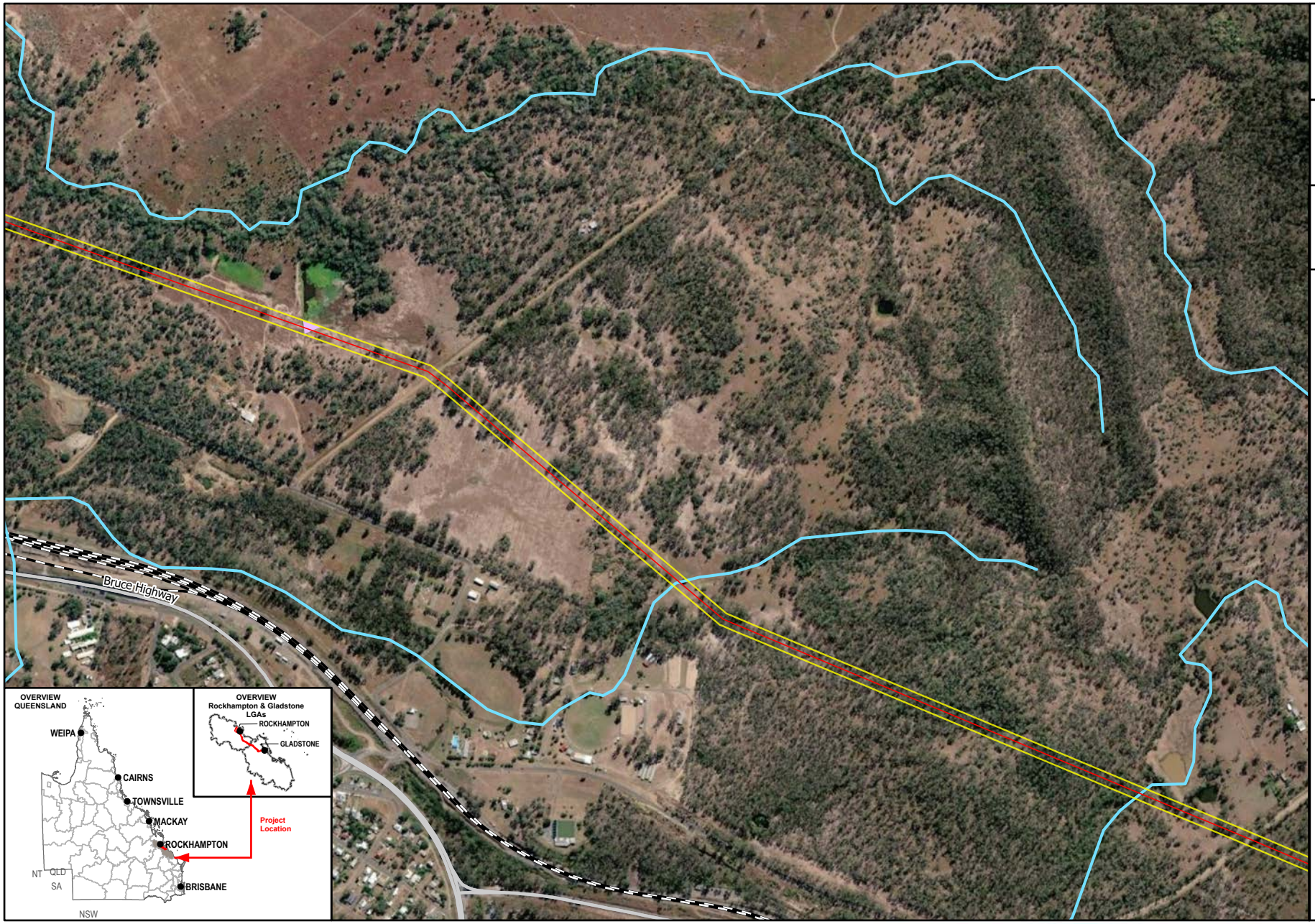
Significance of impact assessment

The project is considered unlikely to result in a significant residual impact on the Australian painted snipe. A significance of impact assessment of the project on the Australian painted snipe (endangered under the EPBC Act and NC Act) is provided in Table 7-31.

Table 7-31 Significance of impact on the Australian painted snipe

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The Australian painted snipe is not considered to have a limited geographic distribution as it occurs within suitable habitat in all states and territories, although the Murray Darling Basin is considered a stronghold. There are no records for the species directly within SGIC SDA pipeline alignment; however, there are records within the greater Gladstone and Rockhampton region. Given the irregularity of records, there does not appear to be a resident local population and individuals sighted are likely transient. As such, the removal of 13.55 ha of potential habitat identified within the disturbance footprint is highly unlikely to lead to a long-term decrease in the size of the species' population.
Reduce the extent of occurrence of the species	**Unlikely** Occurrence of the species within the SGIC SDA pipeline alignment has not been recorded; however, records in the greater area are variable temporally and spatially. The species has irregular movements almost continent wide, and individuals likely access suitable foraging habitat based on availability. As such, the removal of 13.55 ha of potential habitat is unlikely to reduce the extent of occurrence of the species. Although the removal of habitat may marginally reduce availability of resources at a local scale, the habitat impacted by the project is not considered likely to reduce the extent of occurrence of the species within the greater landscape or subregion.
Fragment an existing population	**Unlikely** A maximum width of 30 m will be cleared for construction of the SGIC SDA pipeline alignment, with 20 m to be rehabilitated after the pipeline has been installed and buried. As the SGIC SDA pipeline alignment is narrow and linear and the Australian painted snipe is highly mobile, the project is unlikely to fragment the Australian painted snipe population.

Significant residual impact criteria	Potential to occur
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** The species' capacity to move locally and regionally is unlikely to be limited by any localised land clearing necessary to construct the SGIC SDA pipeline alignment. As a result, the project is not considered to cause any loss of gene transfer that would cause genetically distinct populations to form.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	**Unlikely** Numerous invasive weeds and pasture grasses are currently well established within the SGIC SDA pipeline alignment. Implementation of a site-specific Weed and Pest Management Plan will reduce the risk of further weed spread. Therefore, the project is unlikely to result in the establishment of novel invasive species affecting Australian painted snipe habitat.
Introduce disease that may cause the population to decline	**Unlikely** Disease is not listed as a potential threat to the species. The project is unlikely to introduce a disease that may cause the species to decline.
Interfere with the recovery of the species	**Unlikely** Noting the above points relating to very limited if any effects on local populations (e.g. declines), extent of occurrence, fragmentation, invasive species, and disease, the project is not considered likely to interfere with the recovery of the Australian painted snipe.
Result in disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species	**Unlikely** While disturbance to individuals may be experienced during construction, this disturbance will be short-term such that no impact on the lifecycle of this species is anticipated. Furthermore, any disturbance during construction will be highly localised and therefore unlikely to impact ecologically significant locations of a species. This conclusion is based on the small extent of the proposed impact. Similarly, owing to the narrow clearing extent, food resources in the local landscape for the species areunlikely to be substantially reduced and movement patterns are not anticipated to be impacted as there will be no functional disruption in habitat connectivity.
Conclusion	The project is unlikely to result in a significant residual impact on the Australian painted snipe. The project will result in a loss (13.55 ha) of potentially suitable foraging habitat for the Australian painted snipe; however, due to the narrow clearing extent, food resources in the local landscape for the species areunlikely to be substantially reduced and movement patterns are not anticipated to be impacted as there will be no functional disruption in habitat connectivity.



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
(Datum GDA2020)

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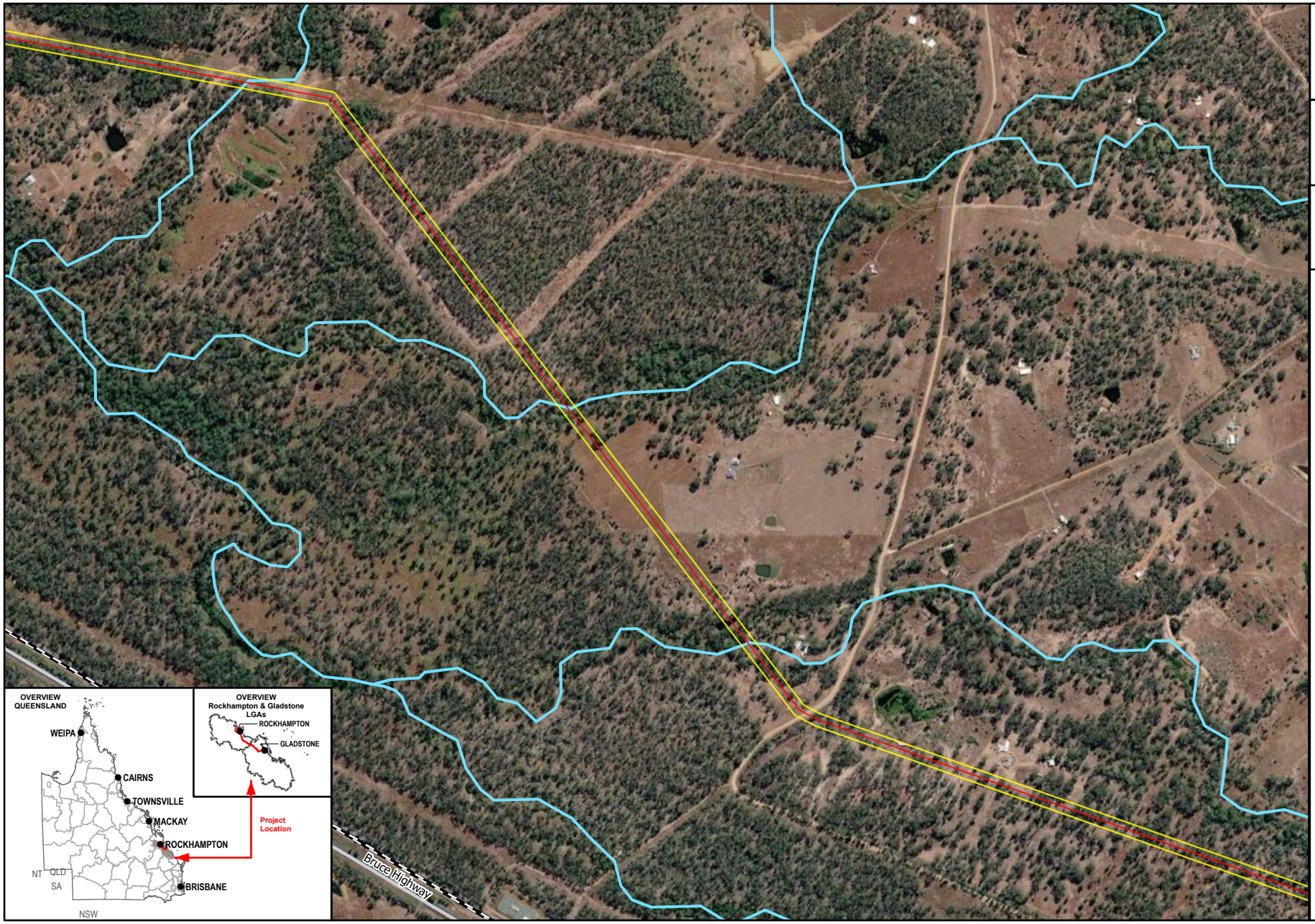
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18a
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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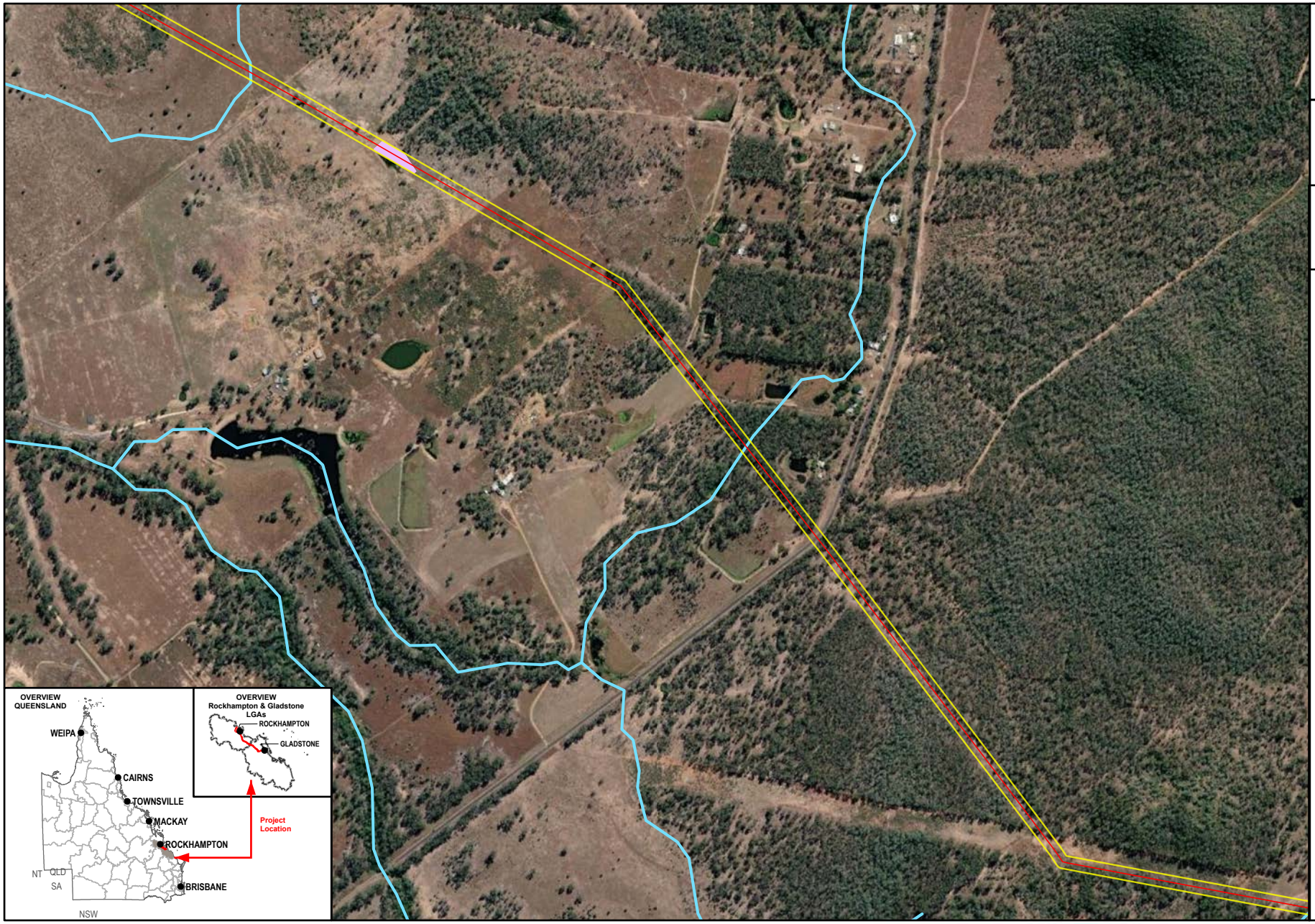
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18b
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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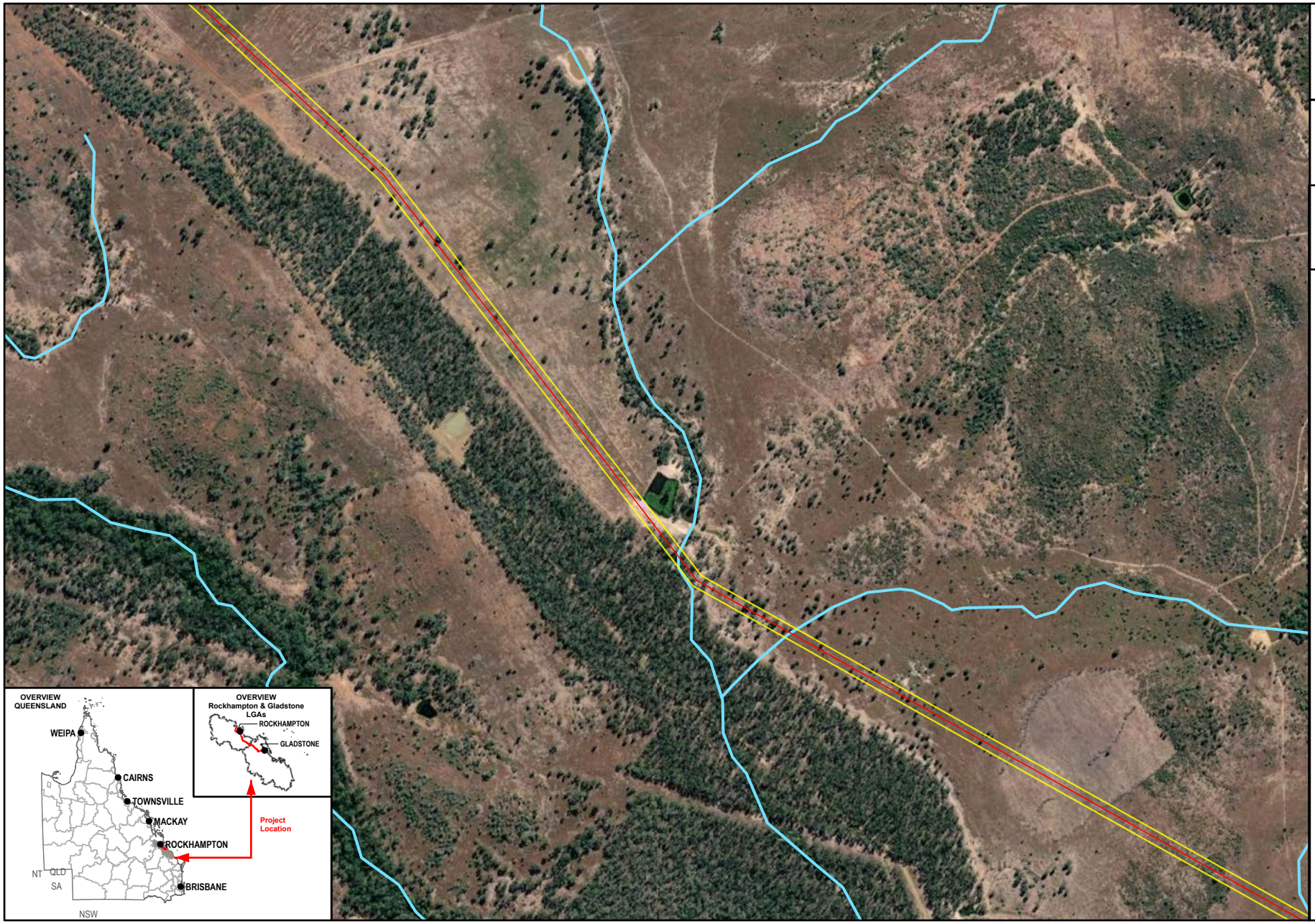
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18c
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways

Data Sources:
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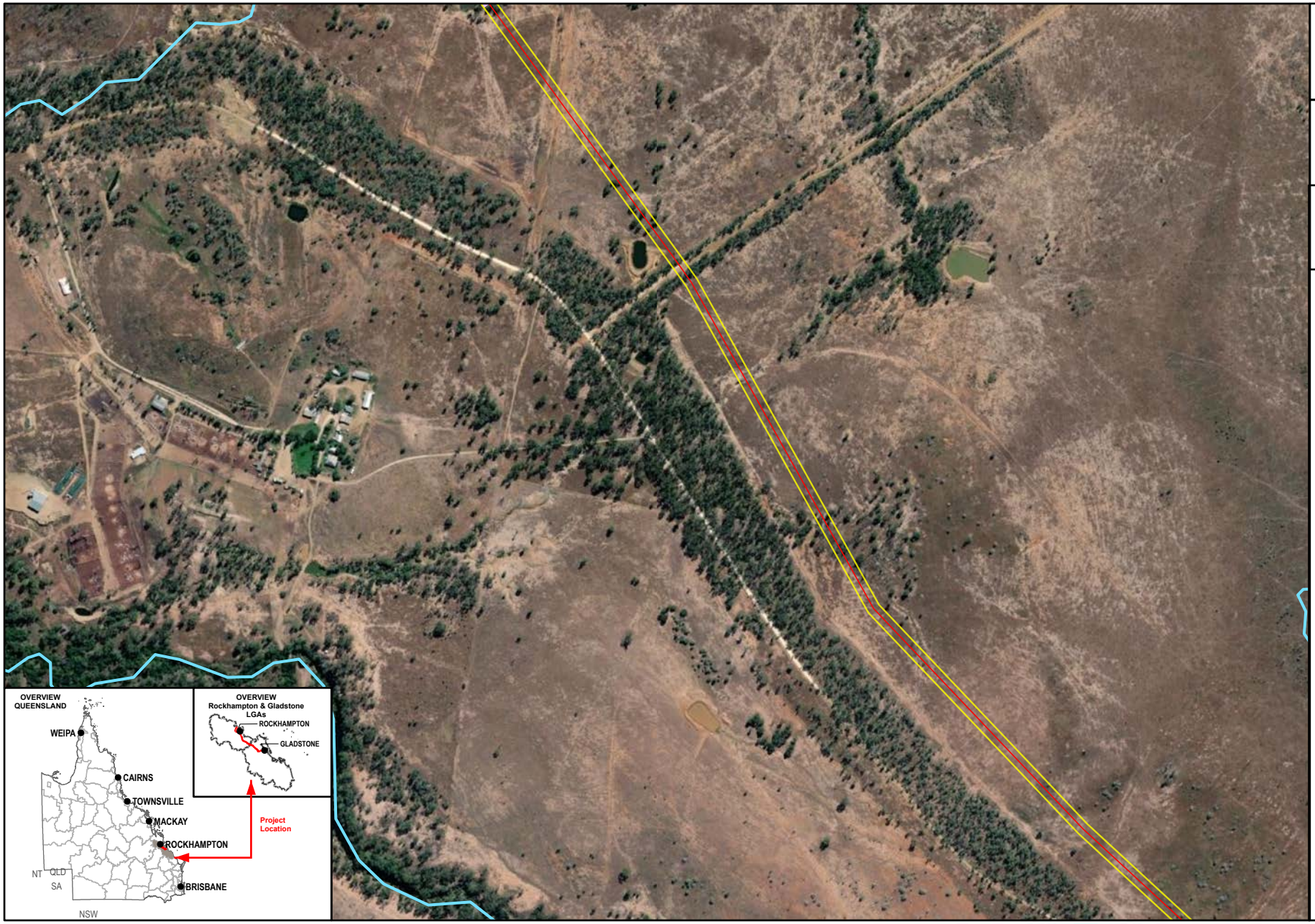
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18d
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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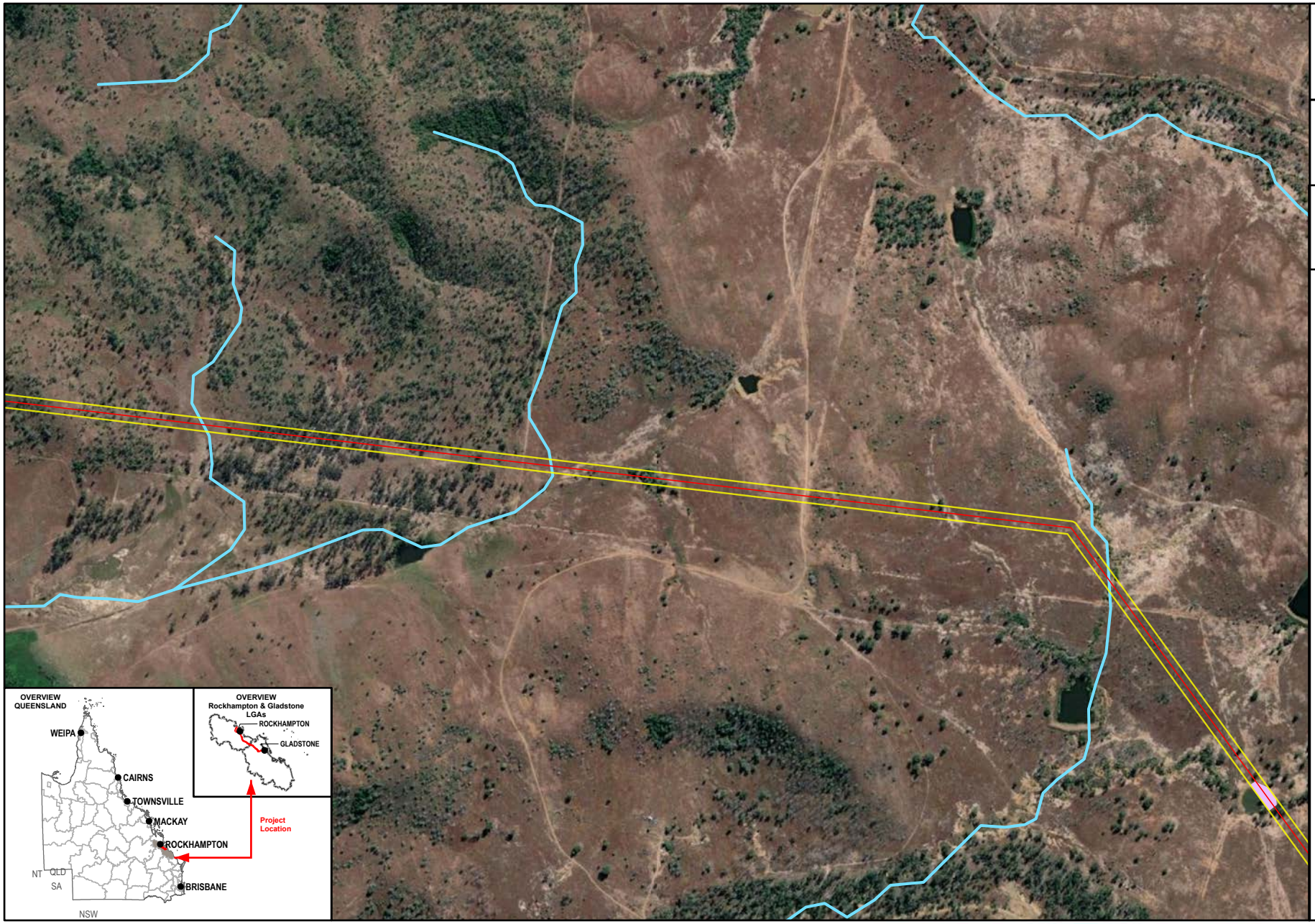
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18e
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways

Data Sources:
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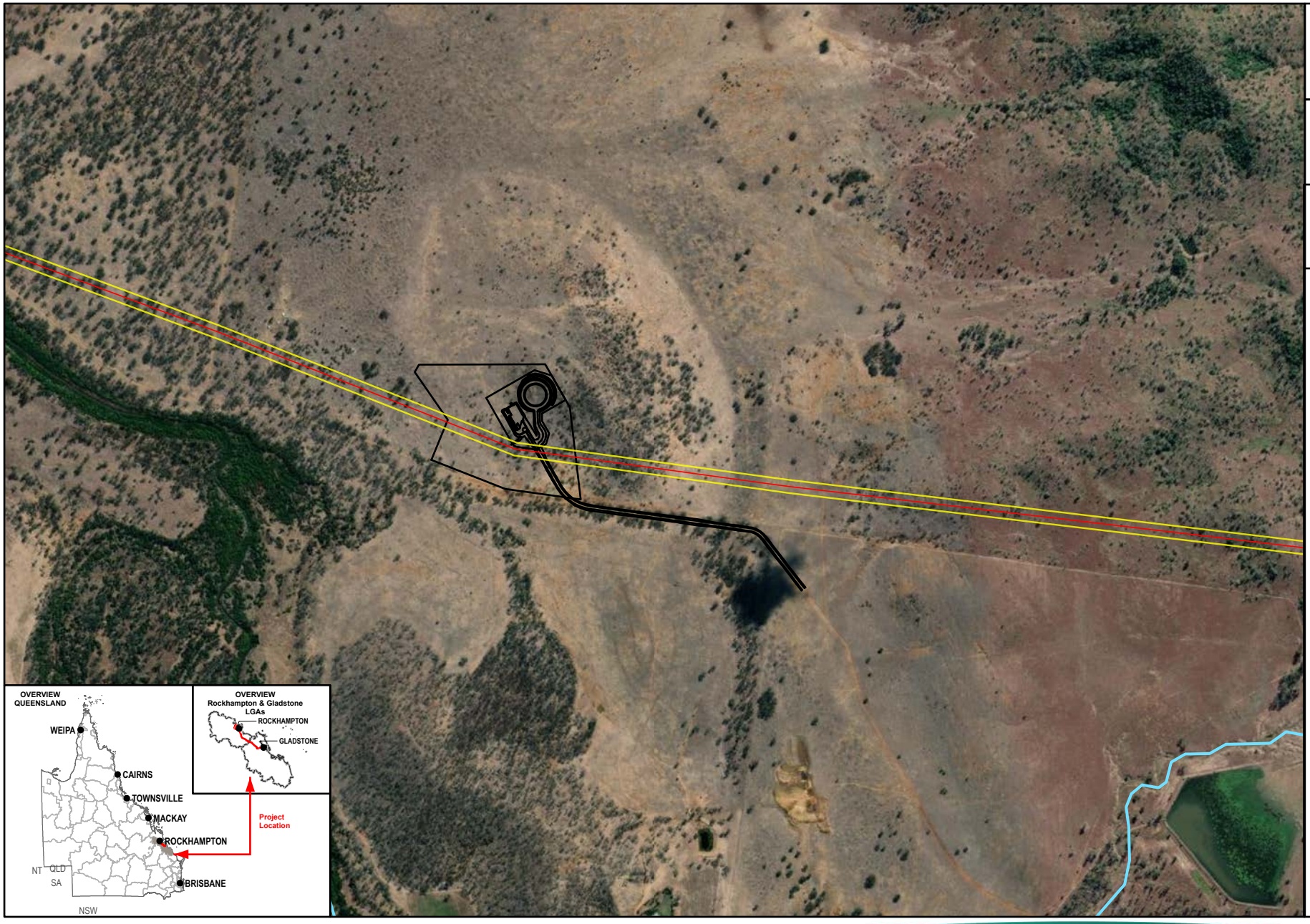
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18f
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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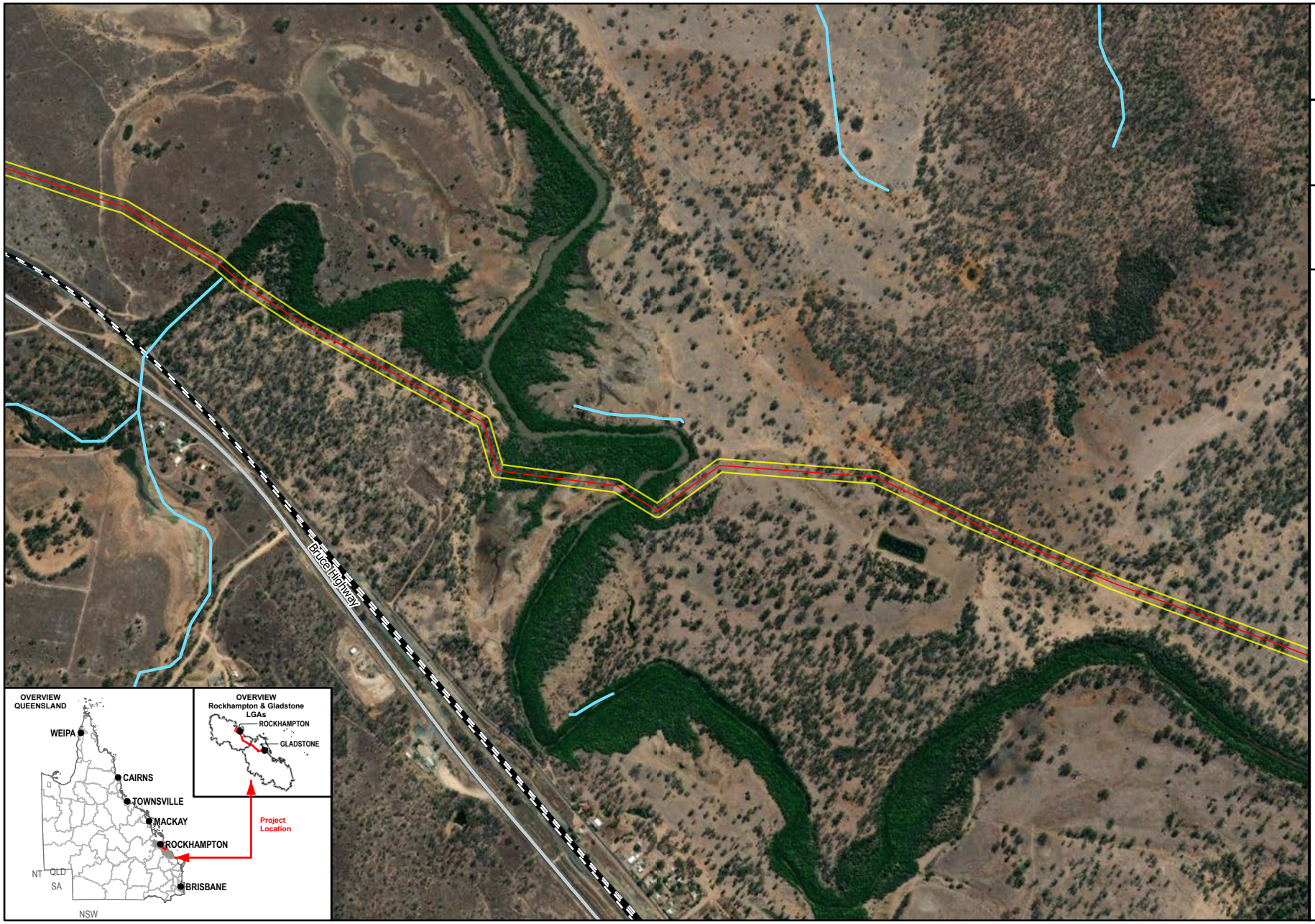
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18g
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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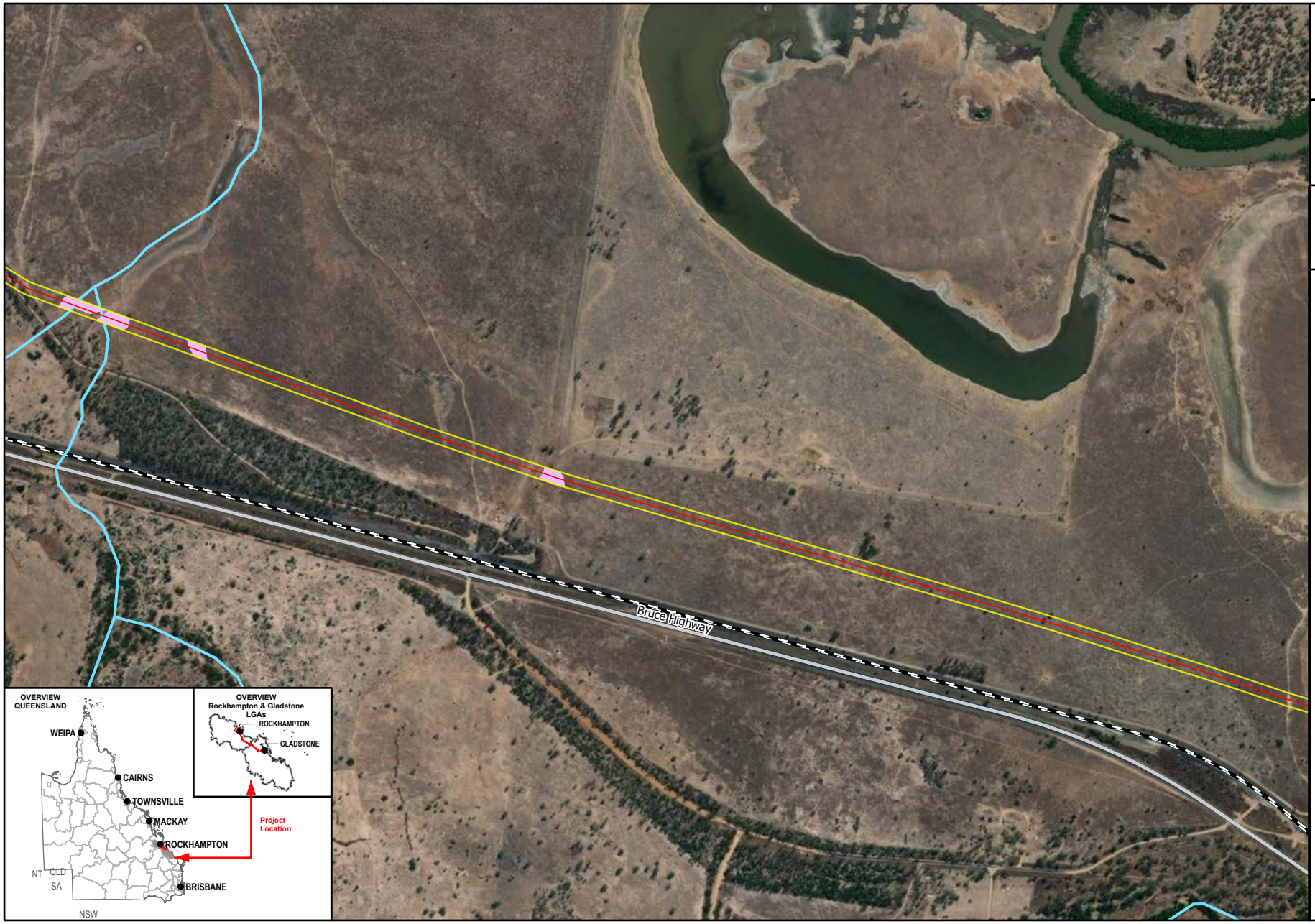
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18h
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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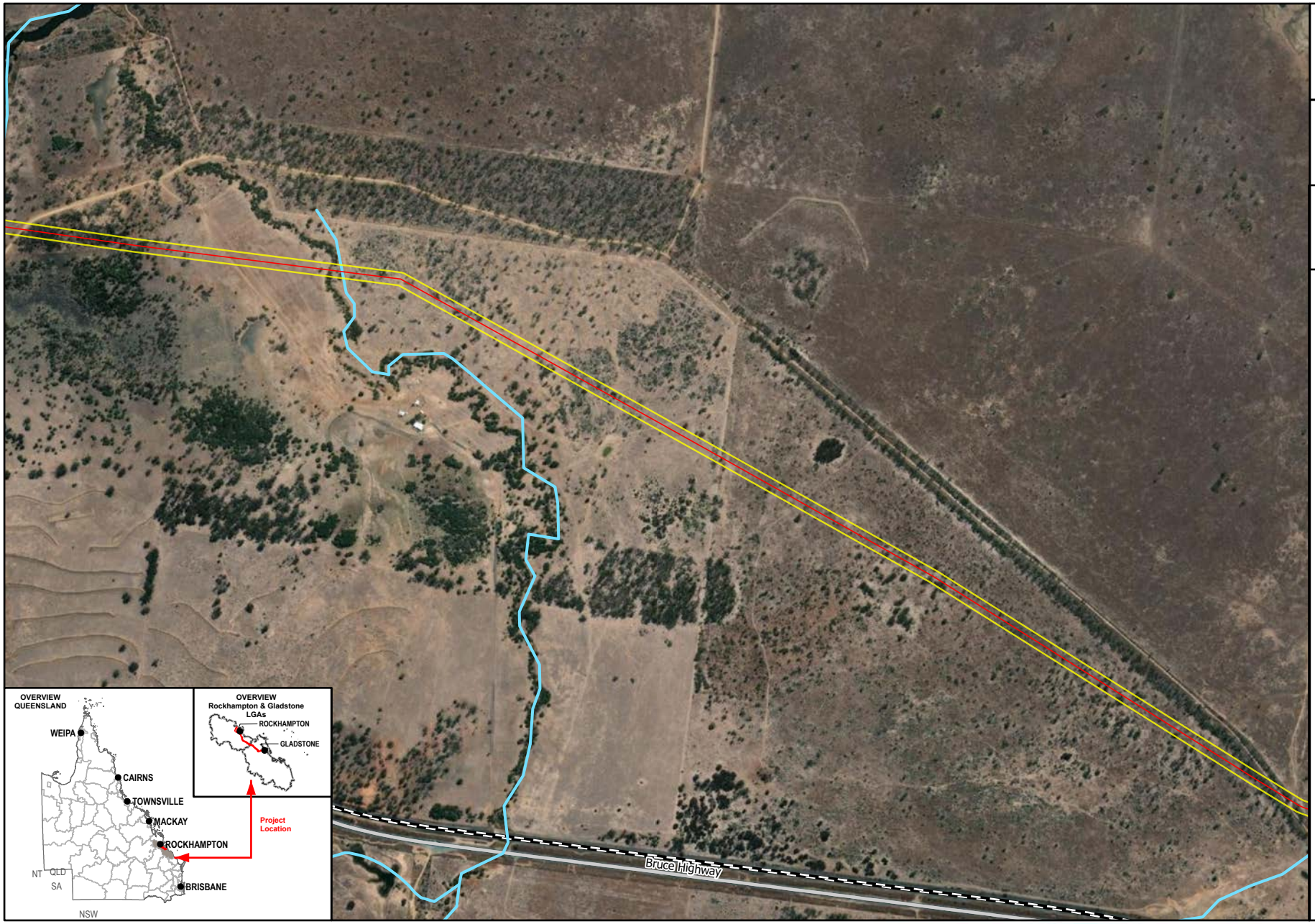
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18i
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
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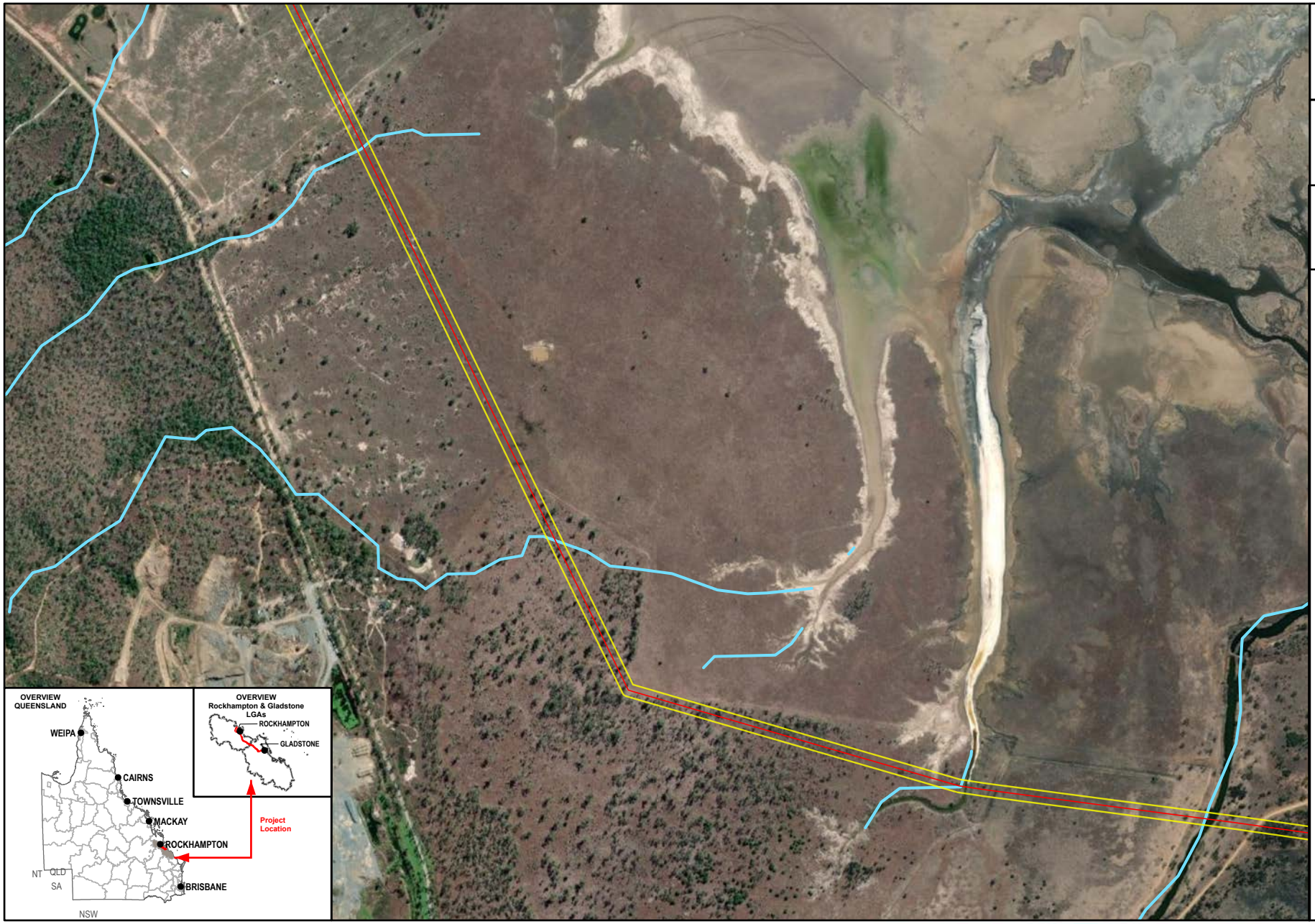
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18j
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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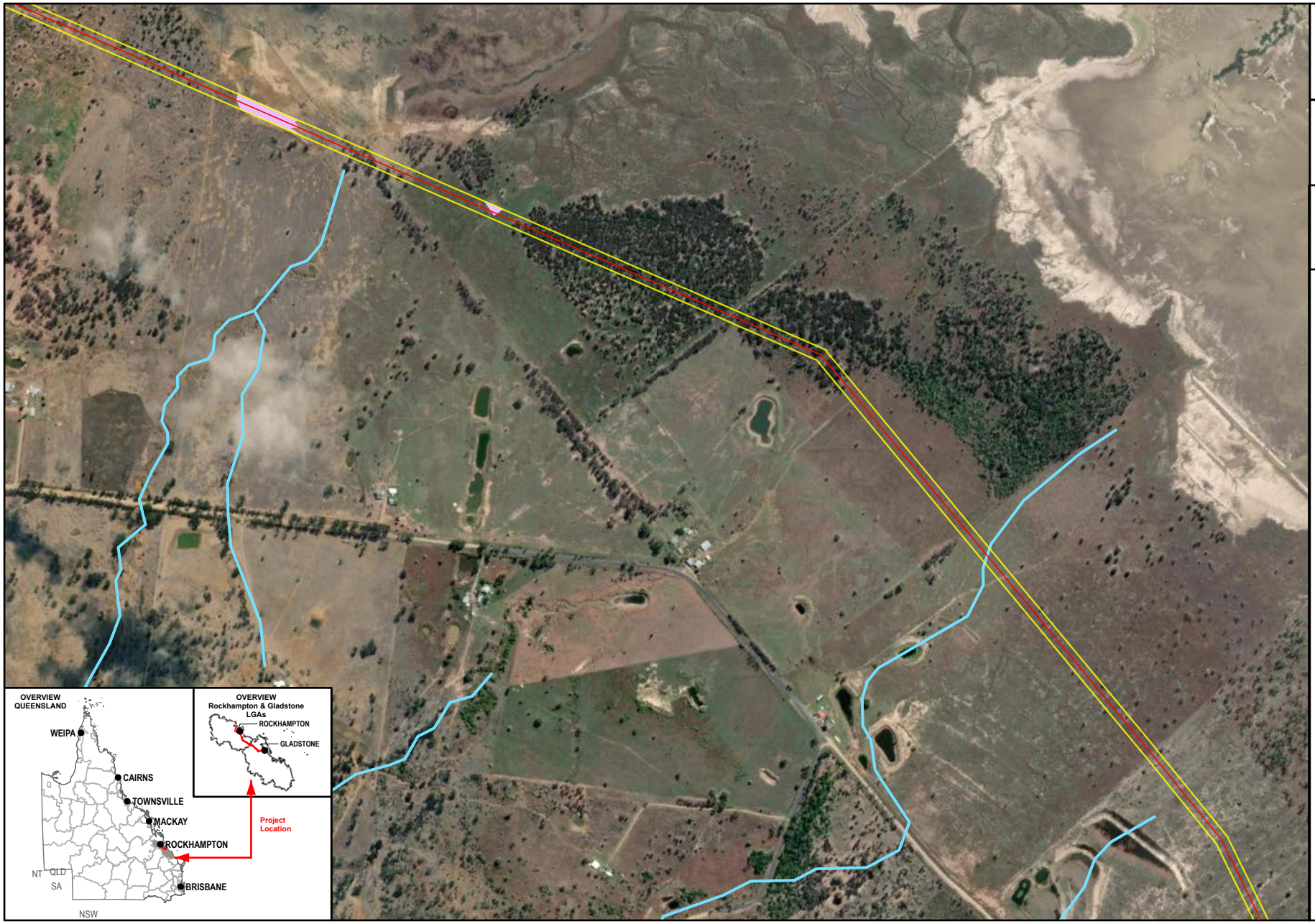
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18k
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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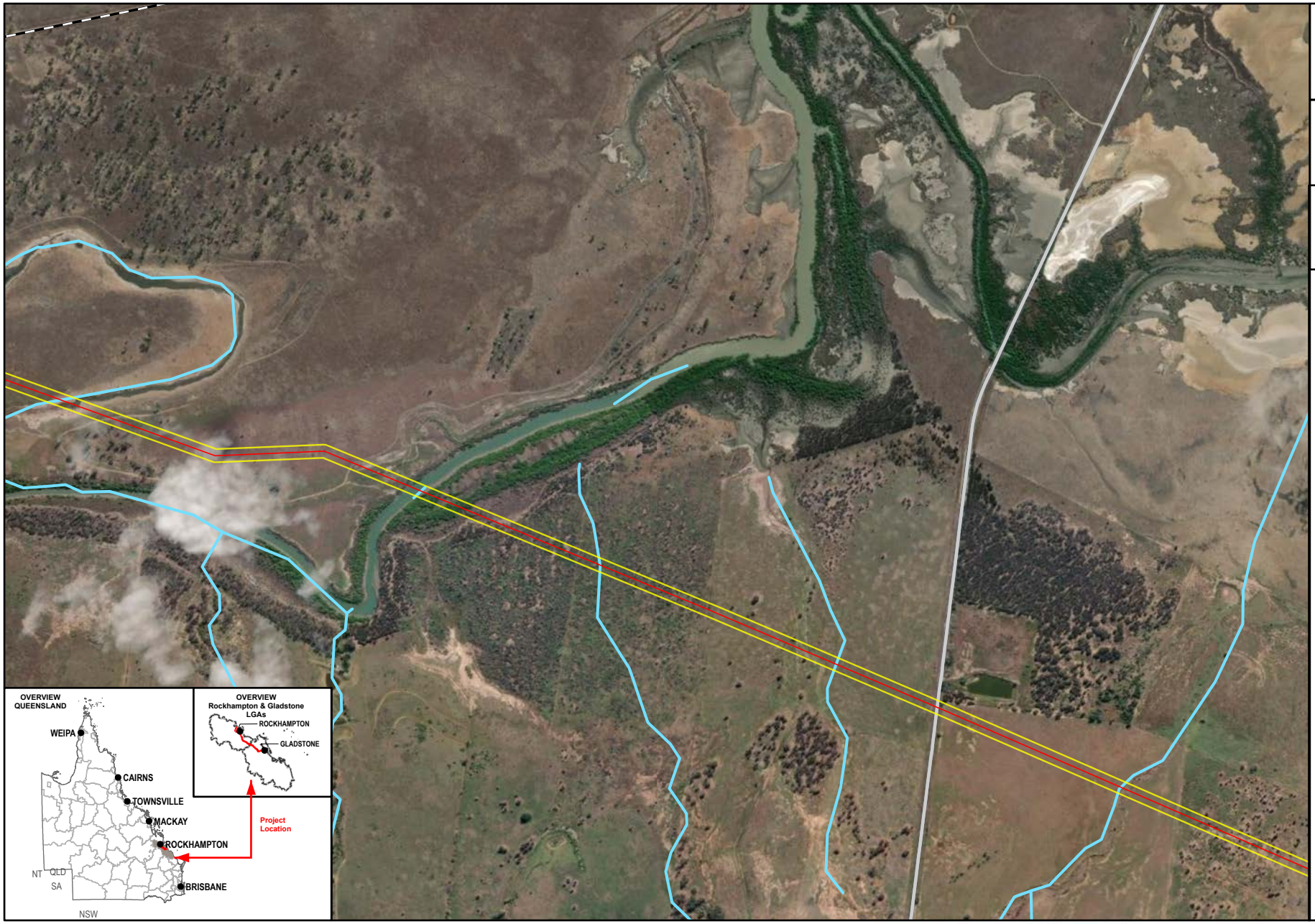
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18l
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
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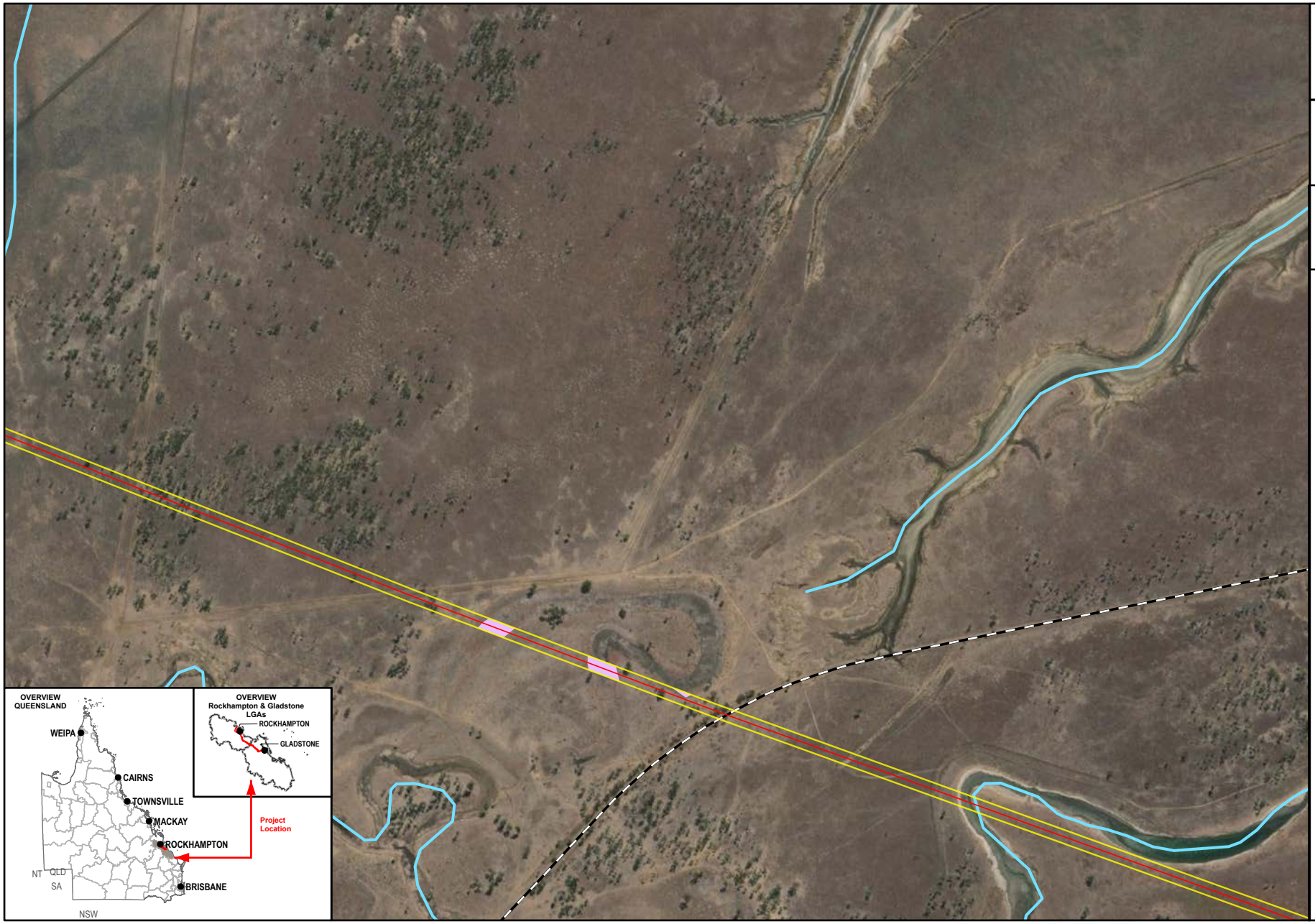
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18m
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways
- Railways

Data Sources:
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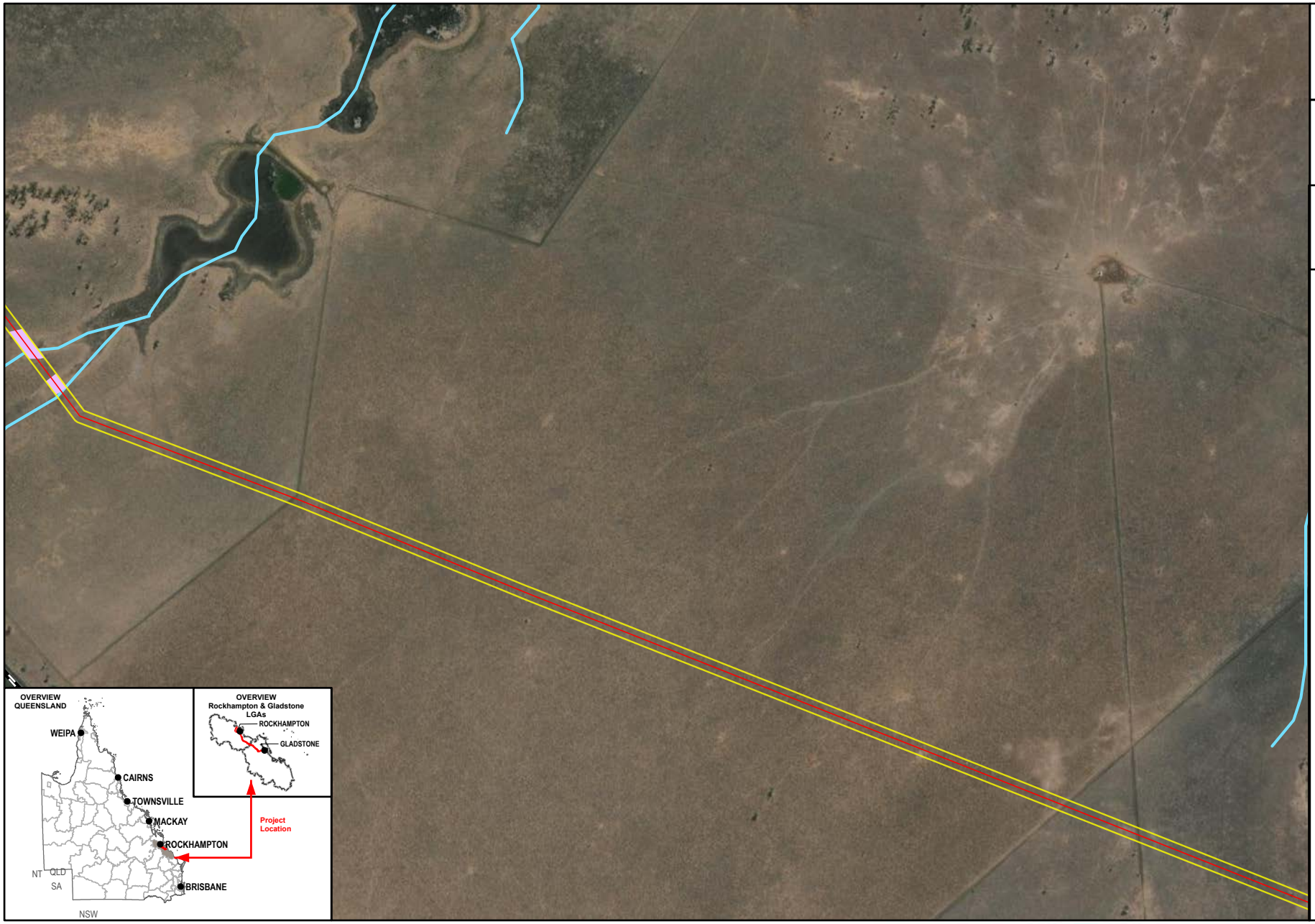
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18n
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Australian Painted Snipe Habitat
- Waterways
- Railways

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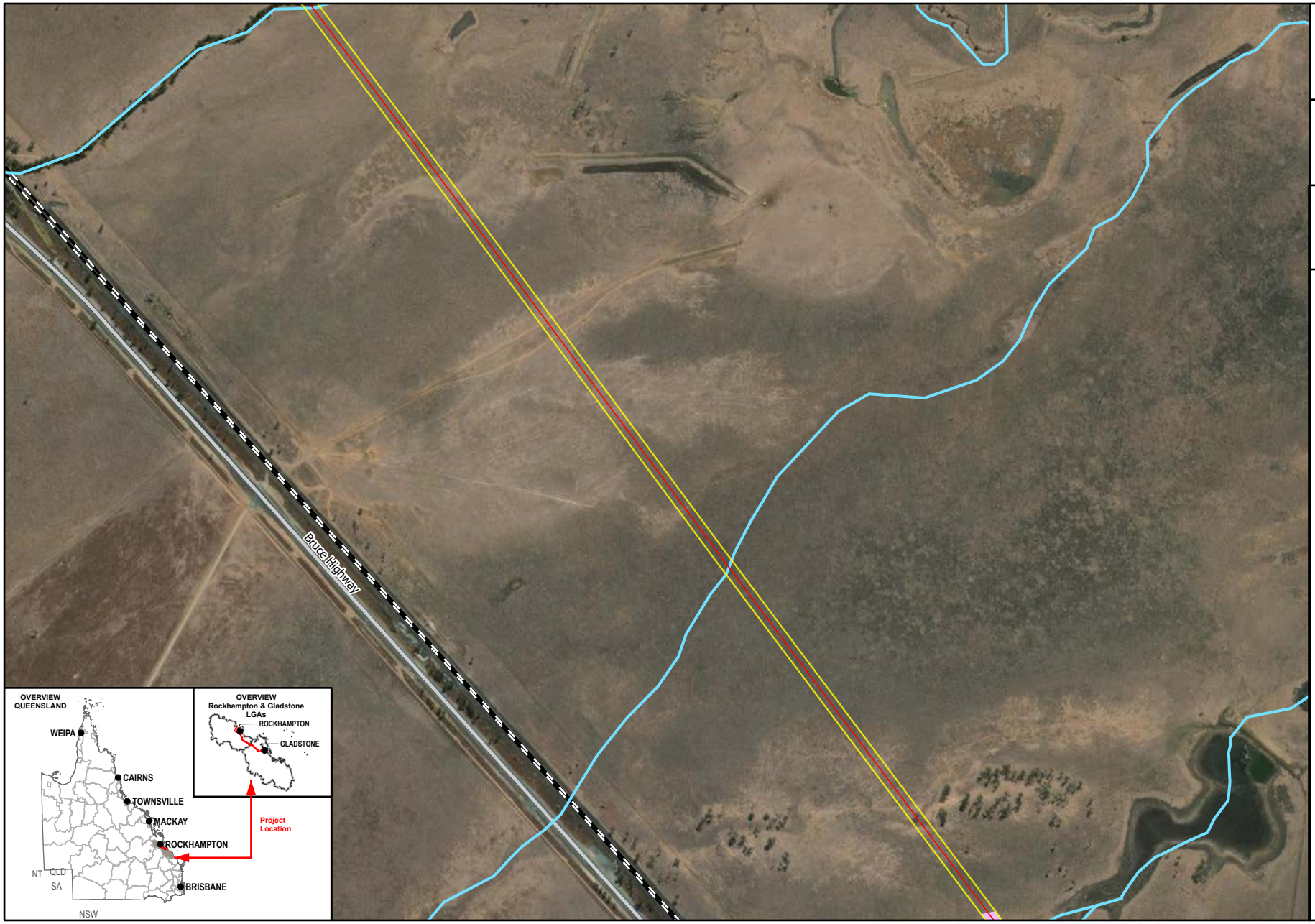
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-18o
Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
000-G-MAP-2439 Version:4 Date:19/09/2022



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- Study Area
- Predicted Australian Painted Snipe Habitat
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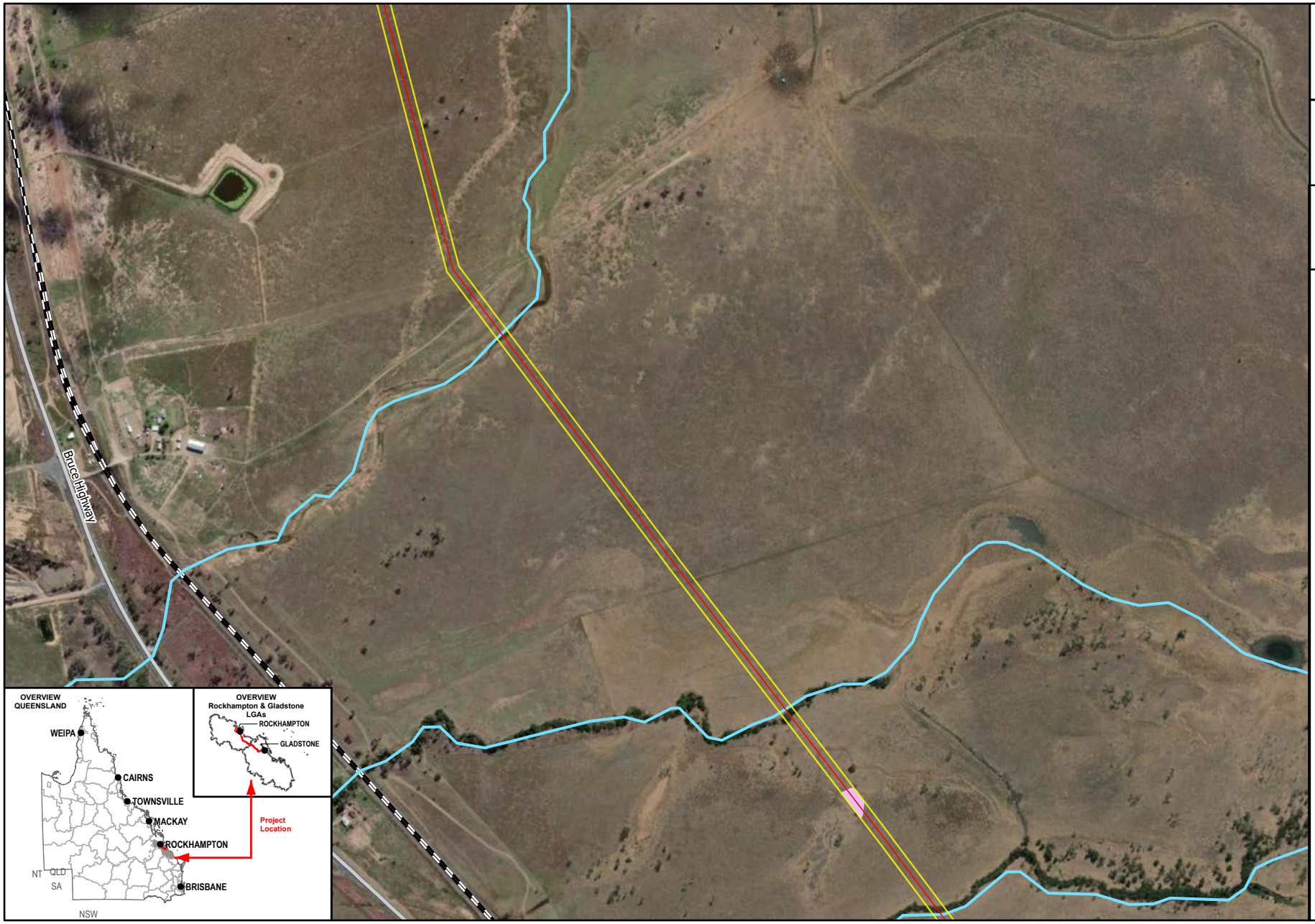

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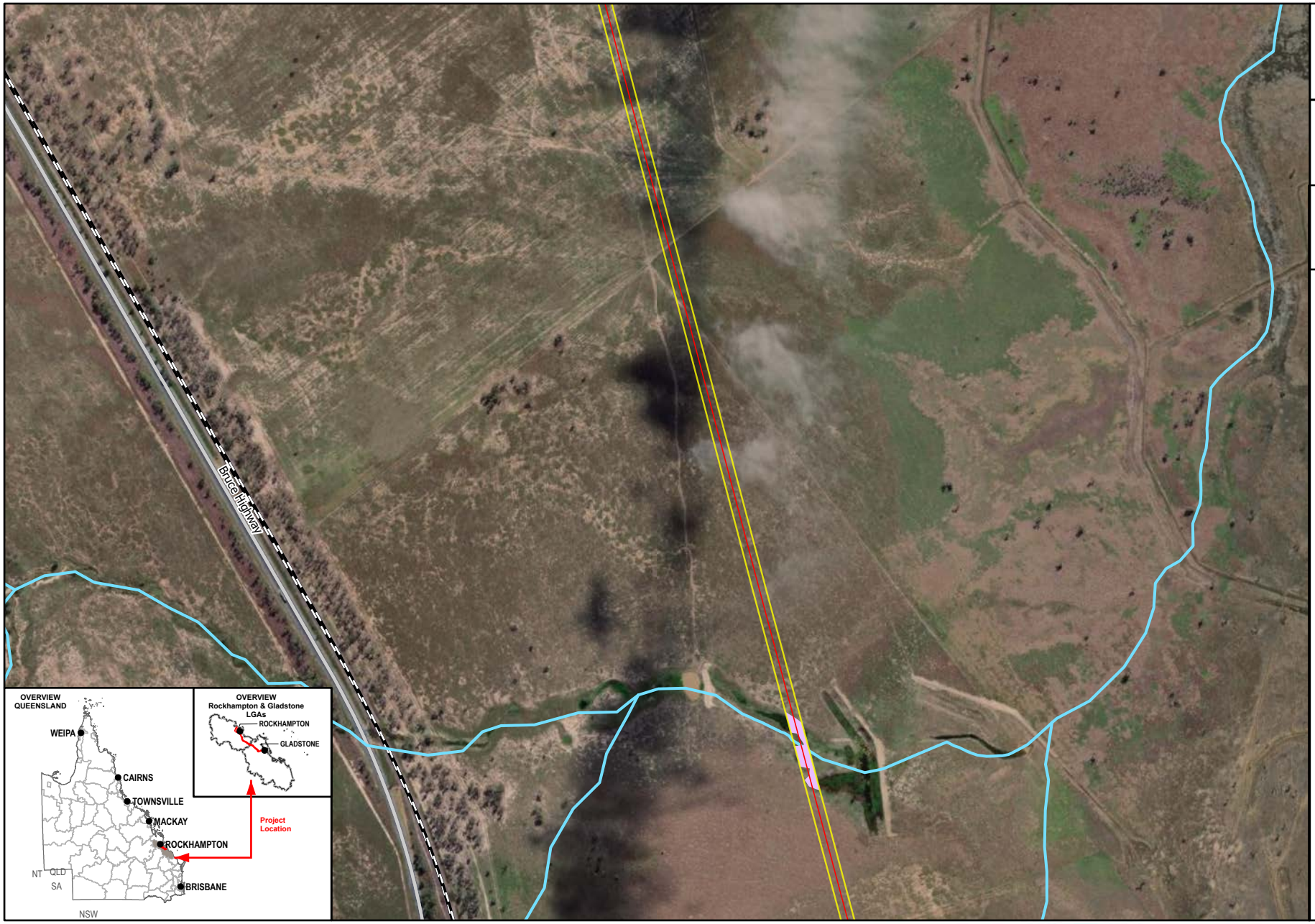

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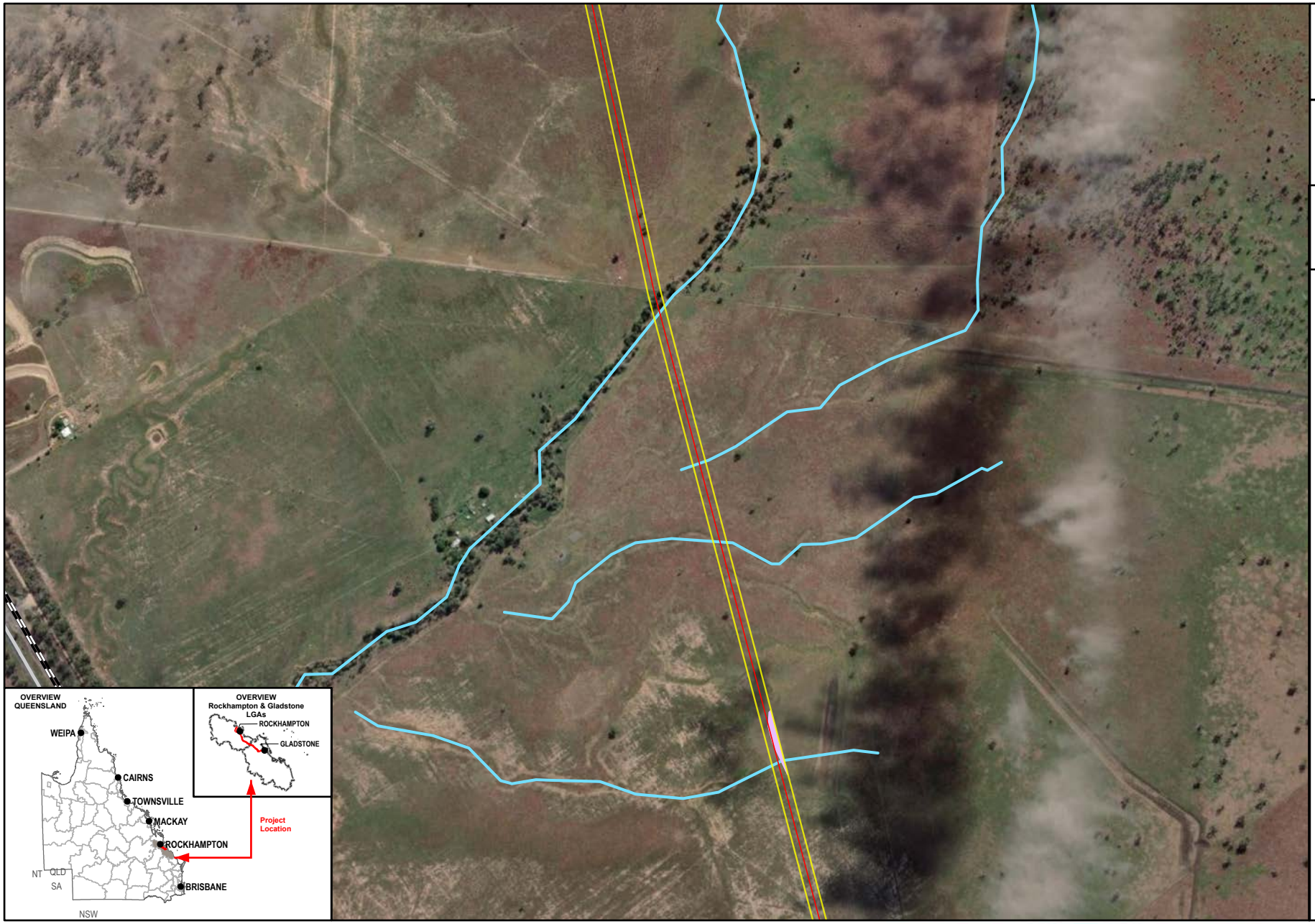

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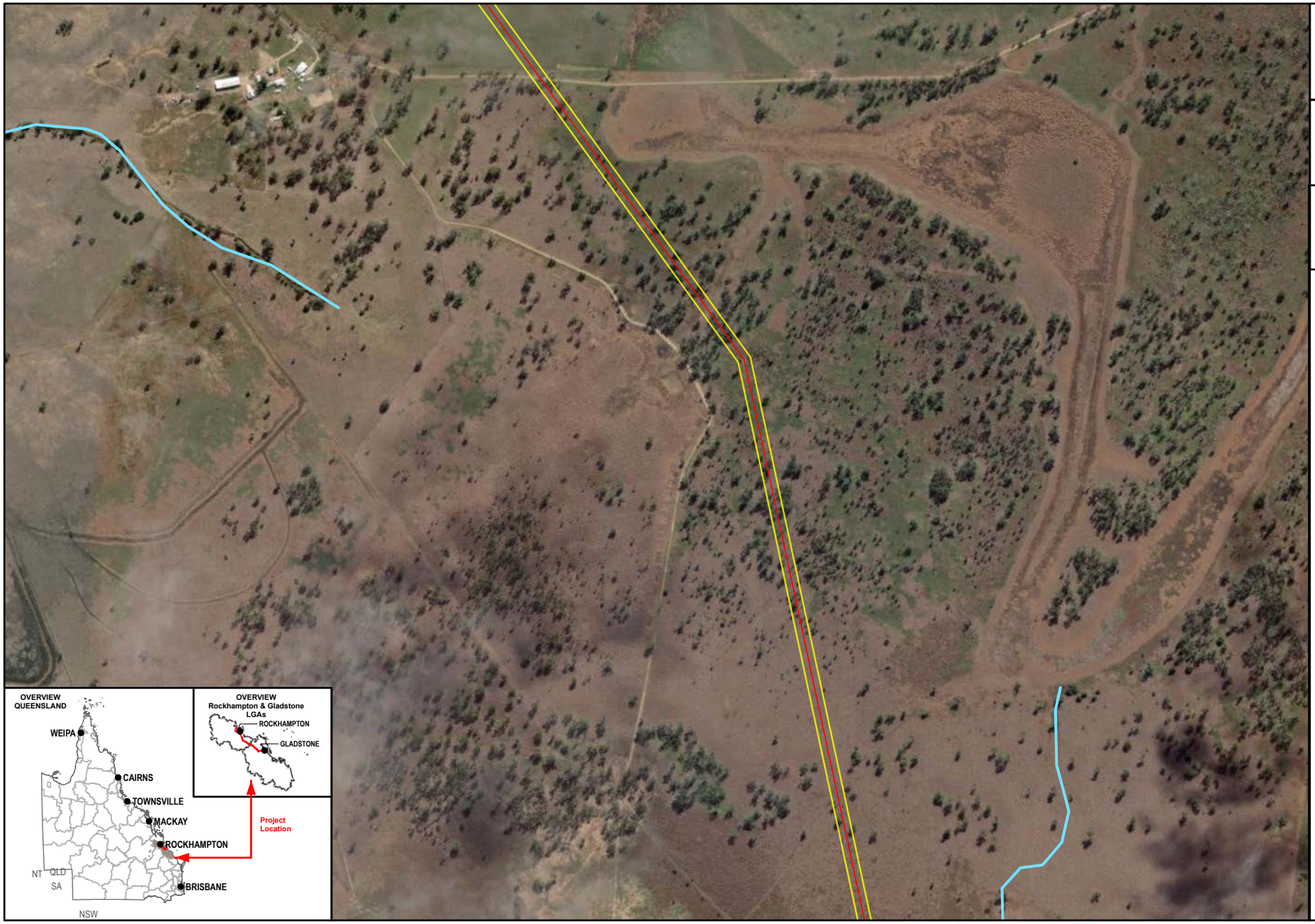

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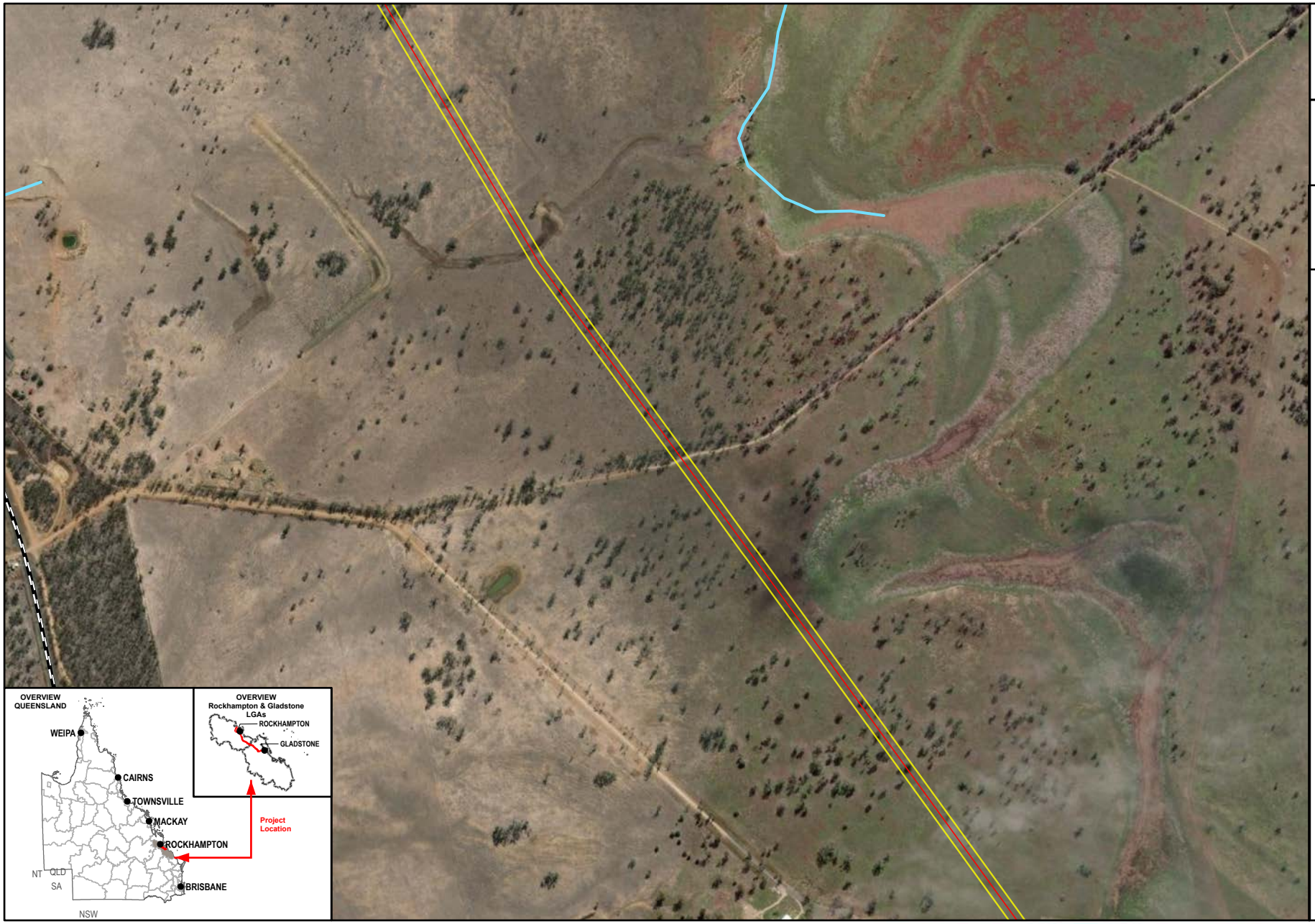

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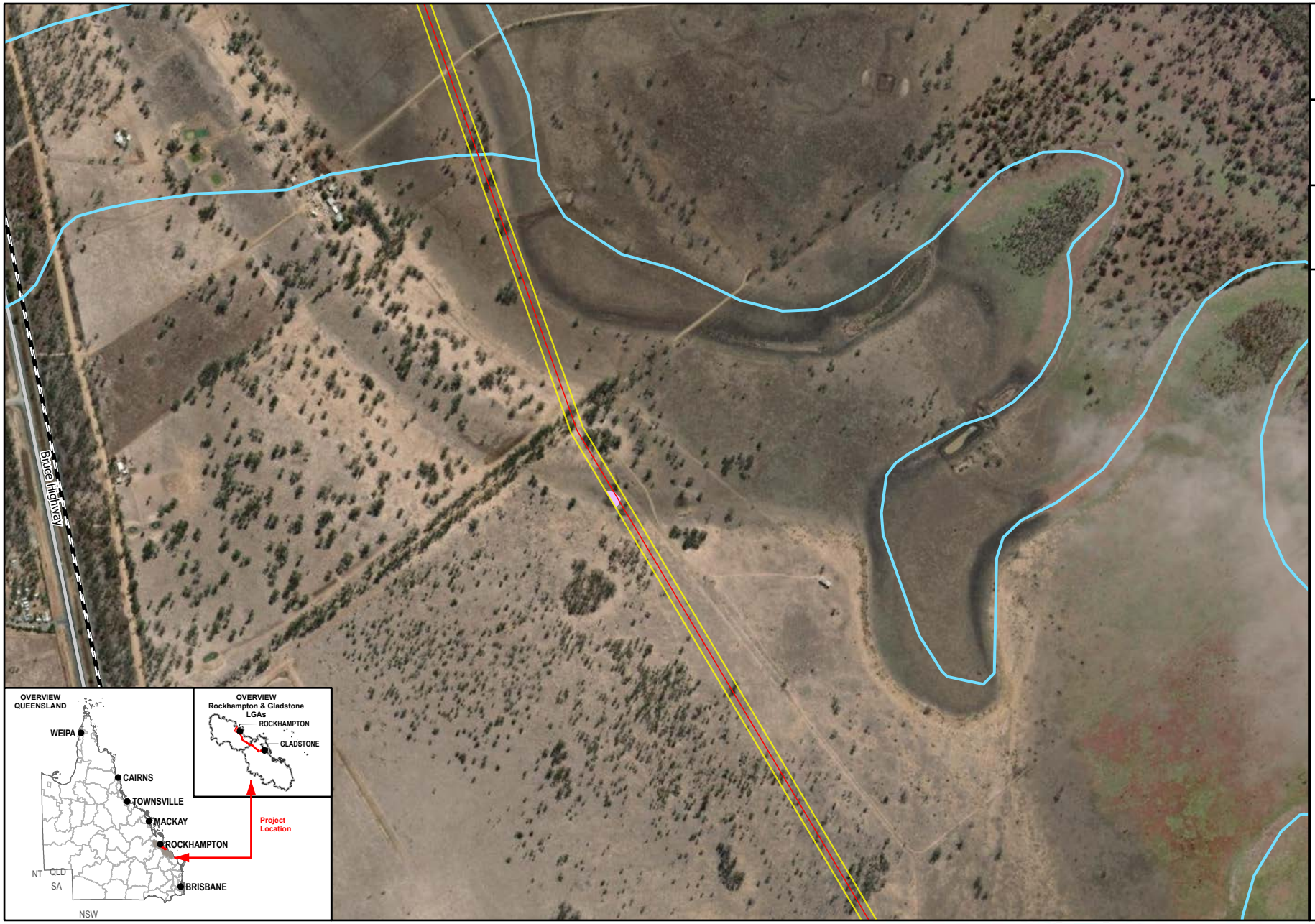

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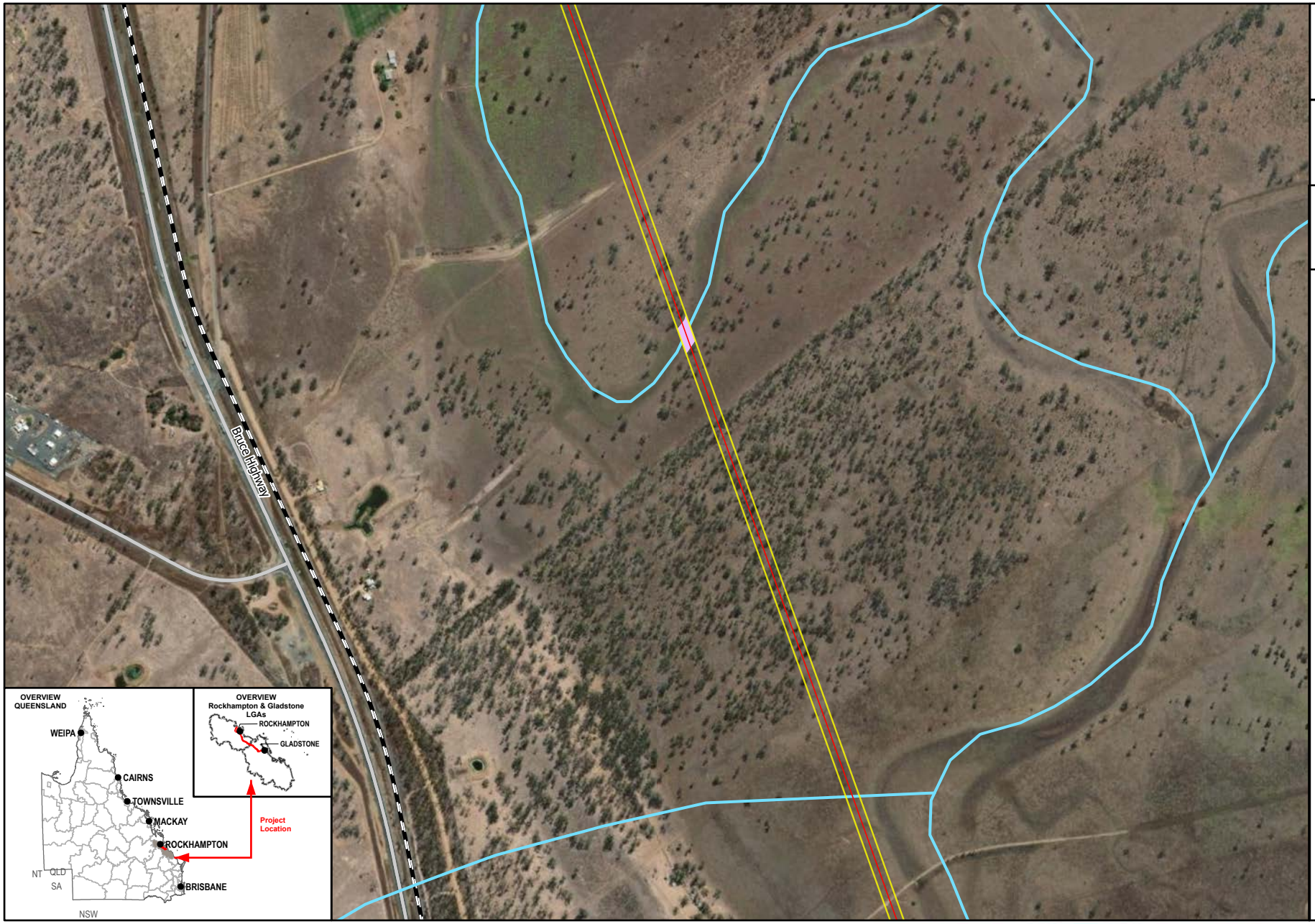

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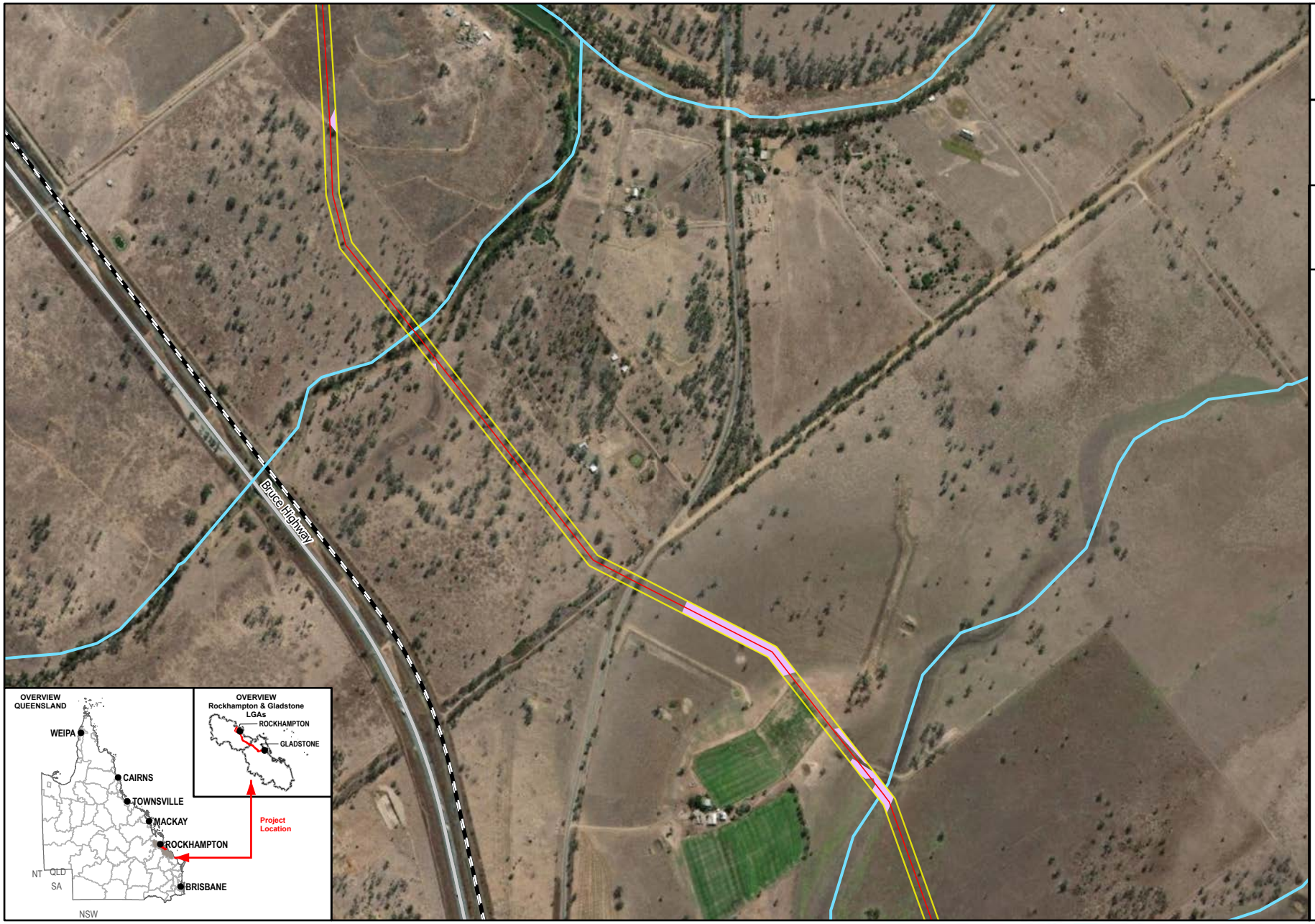

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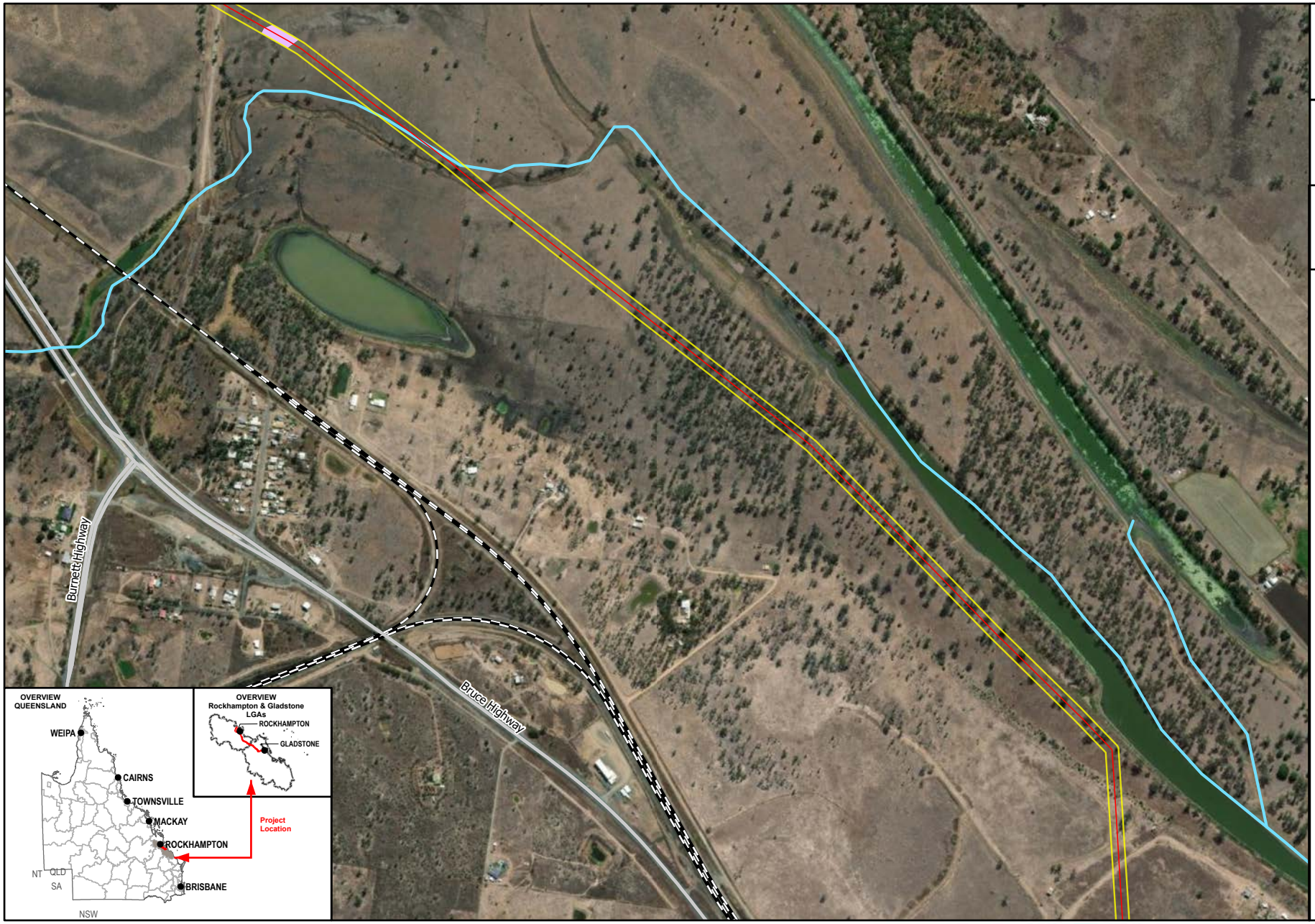

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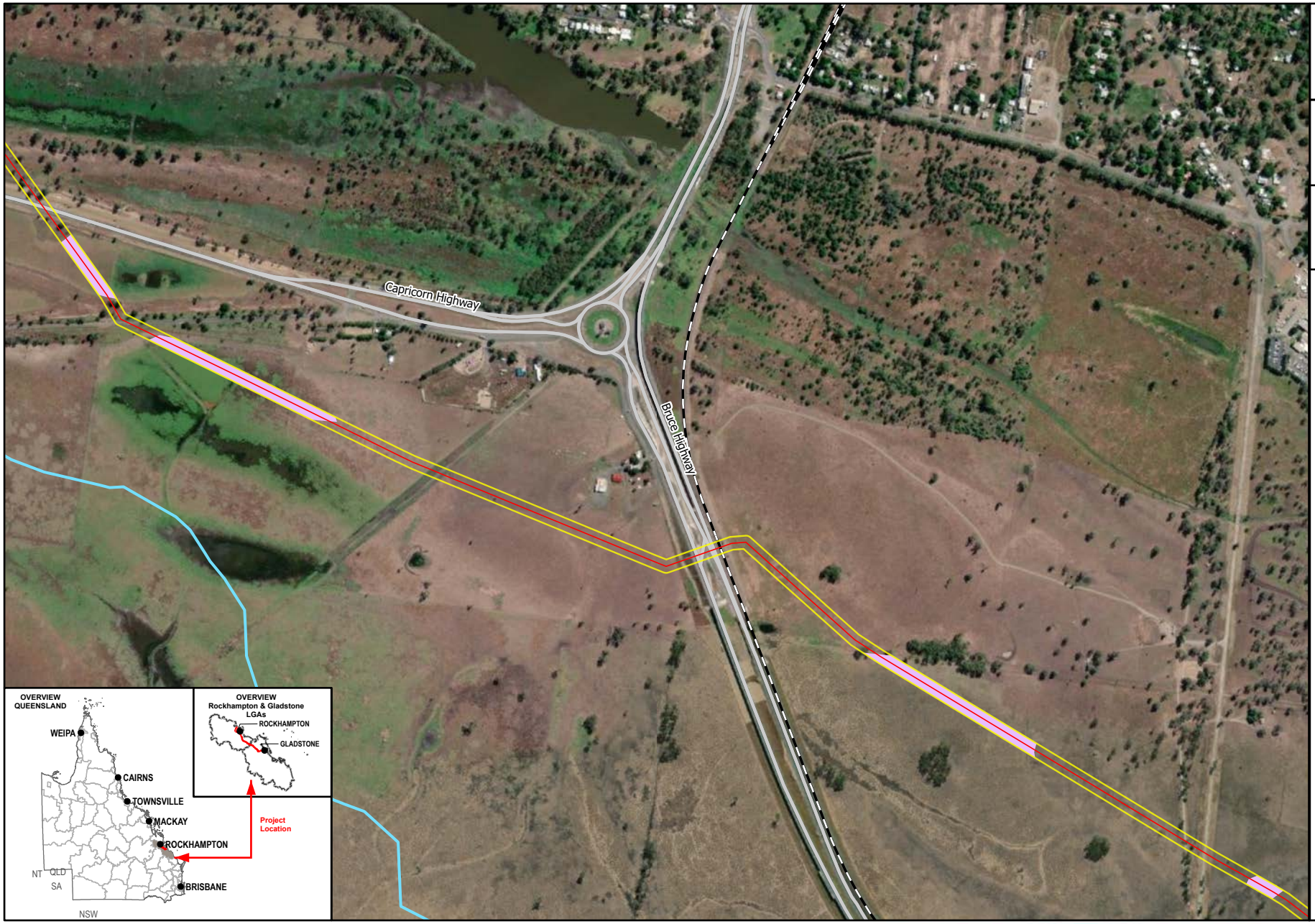

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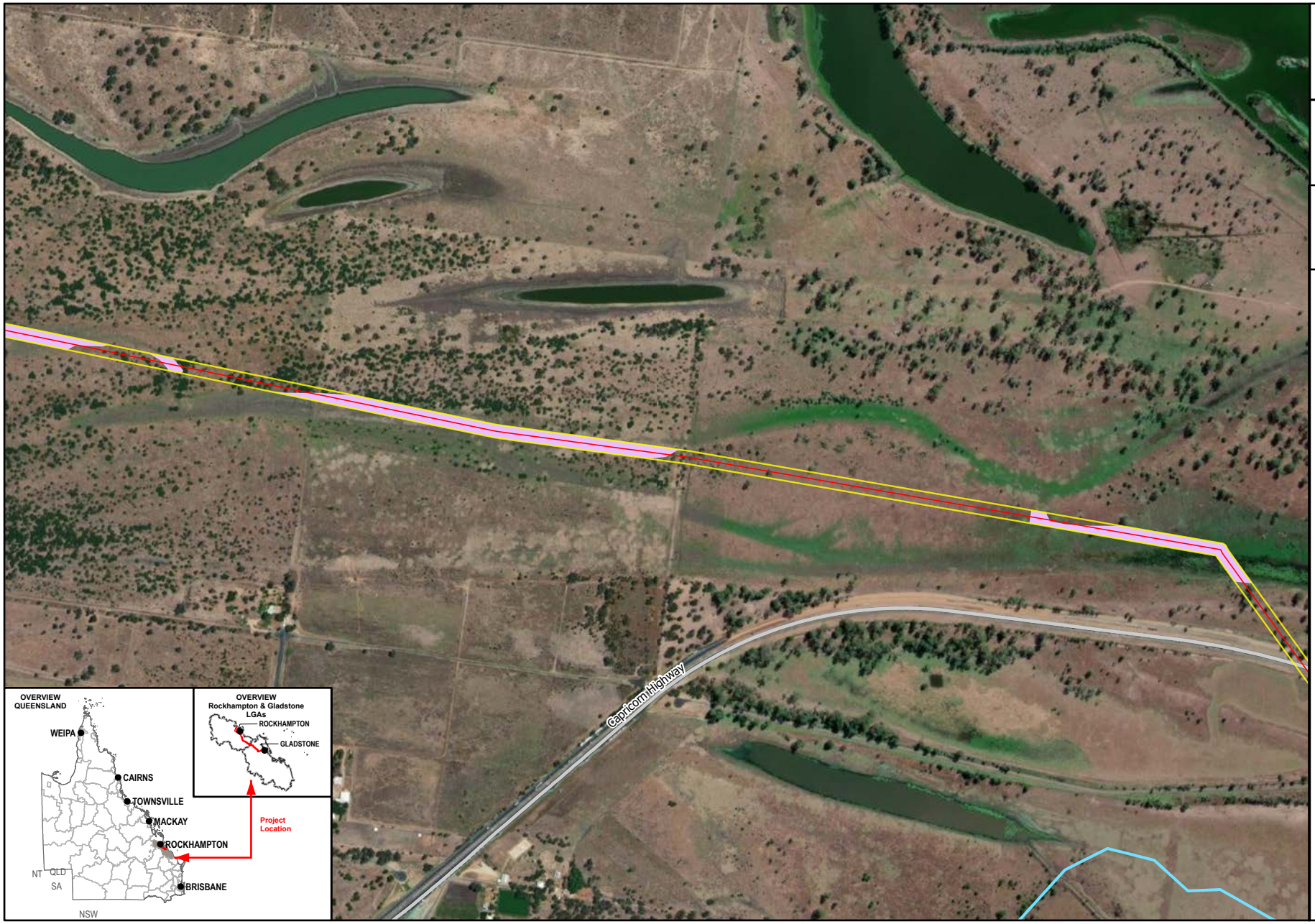

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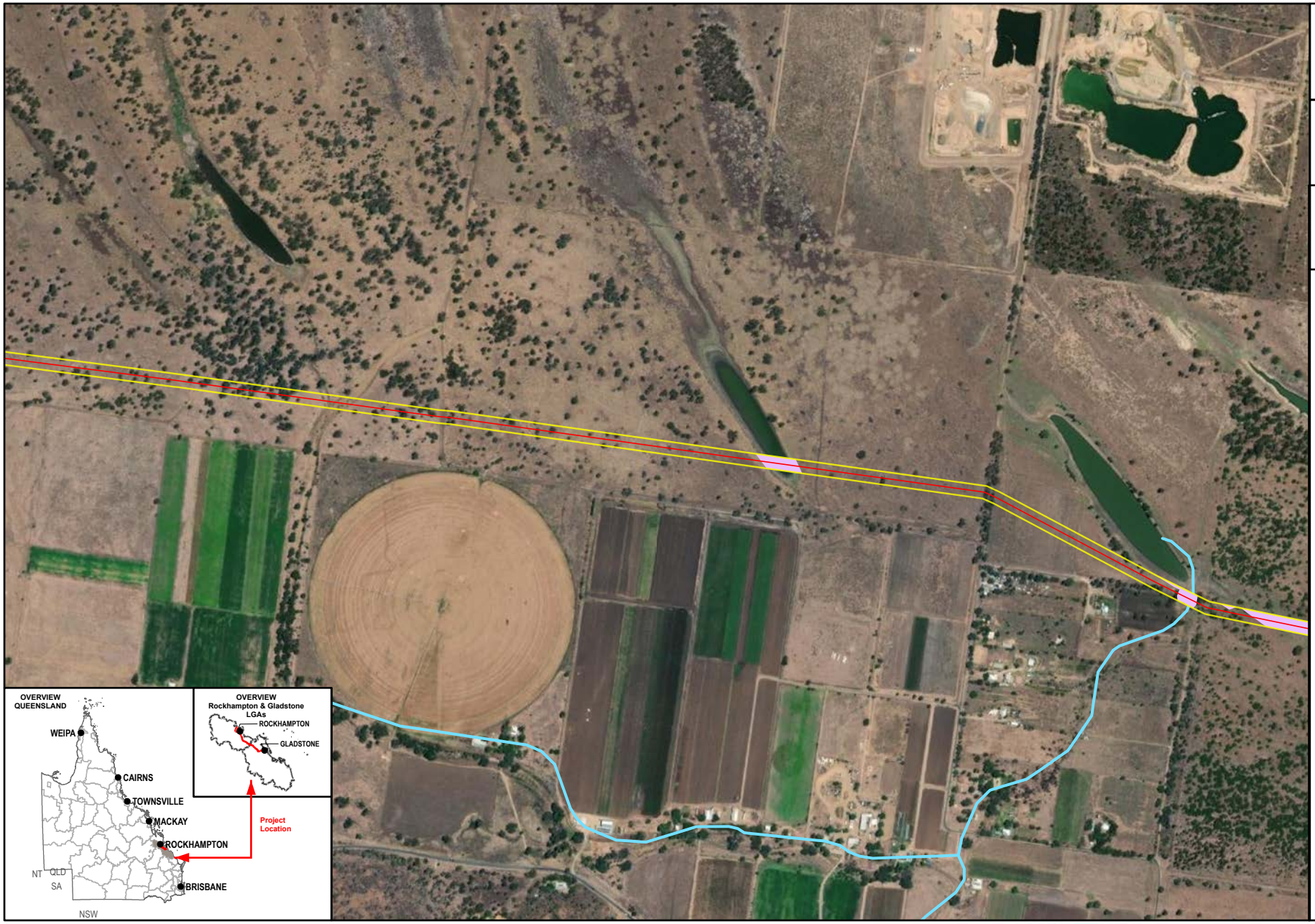

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Distribution of Australian Painted Snipe Habitat Within the SGIC SDA Study Area
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7.2.2.14 Green turtle

Conservation status and species ecology

The green turtle is listed as vulnerable under both the EPBC Act and the NC Act and listed as an MNES at the time of the approval. The species can be found in waters in sub-tropical and temperate regions throughout the world and are capable of migration large distances of over thousands of kilometres between foraging and breeding grounds. The species can inhabit a range habitat types, including open ocean habitat, pelagic feeding grounds, nearshore waters, shallow coastal habitats and into estuarine waters. Green turtles feed mostly on seagrasses and algae, although immature animals are carnivorous. The southern Great Barrier Reef population has major rookeries on the Islands of the Capricorn Bunker Group and minor breeding aggregations on mainland beaches for Bustard Head to Bundaberg (DAWE 2021).

Field survey results and distribution of suitable habitat

The green turtle was recorded present in Inkerman Creek (site 4) and potential habitat for the species was noted to be present in Raglan Creek (site 2) during the 2022 surveys (Figure 7-19). No historical records for the green sea turtle were found within the desktop extent (10 km buffer). All other sites surveyed along the SGIC SDA were outside the known range and did not contain suitable habitat for the green turtle. No breeding habitat for the green turtle occurs within the SGIC SDA.

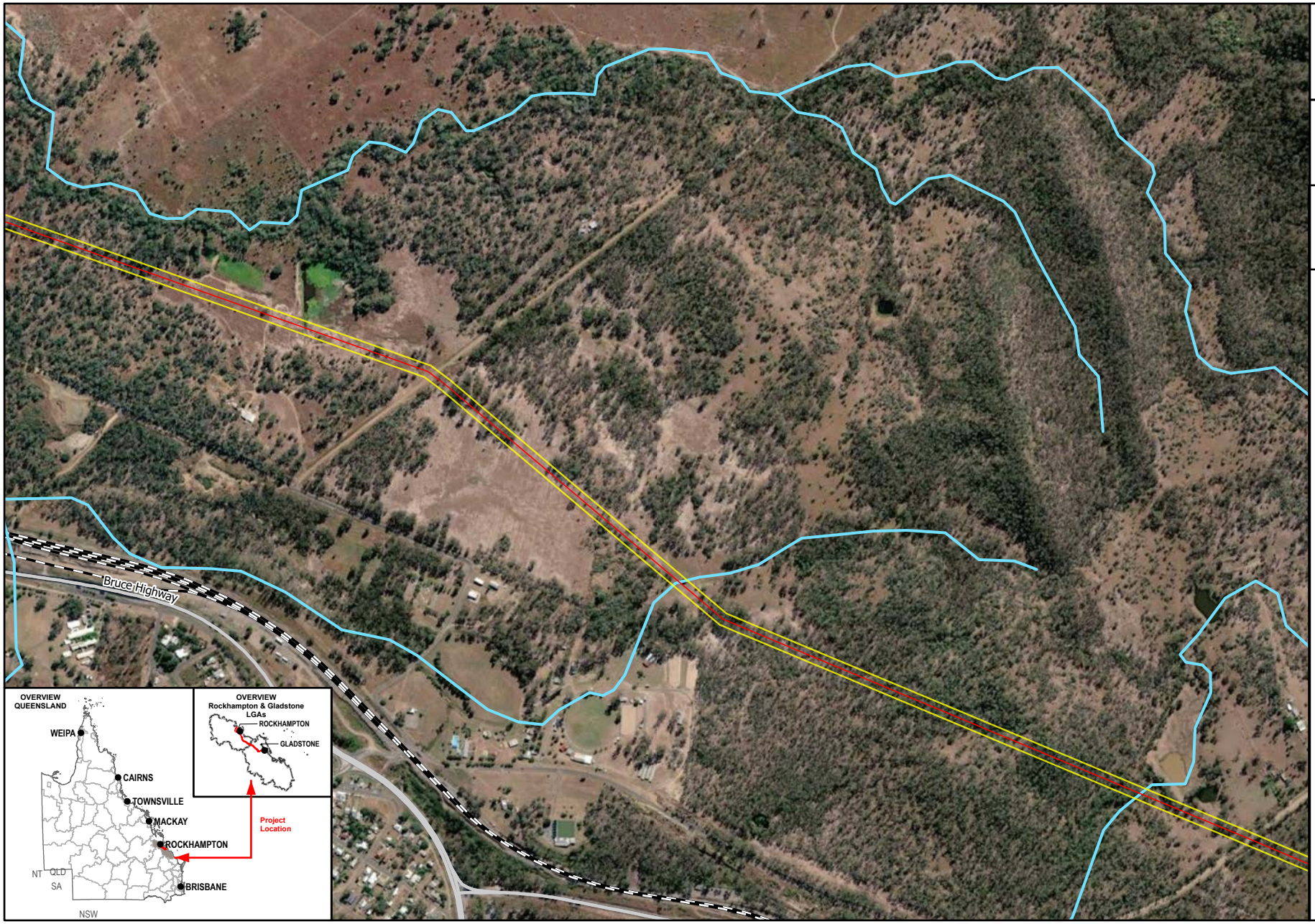
Significant Residual Impact Assessment

The project is unlikely to have a significant residual impact on the green turtle due to the temporary nature of the works and construction techniques that minimise disturbance of the creek bed and bank and avoid creating barriers for the creeks' connectivity. A significance of impact assessment of the project on the green turtle (vulnerable EPBC Act and NC Act) is provided in Table 7-32.

Table 7-32 Significance of impact for the green turtle

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The green turtle is known to occur in Inkerman Creek and likely to occur in Raglan Creek. Individuals of this species are likely to forage and rest within these creeks, particularly during high tide. No suitable breeding habitat for the green turtle is present within the SGIC SDA pipeline alignment. Construction works at site 2 (Raglan Creek) and site 4 (Inkerman Creek) will consist of trenchless methods to minimise disturbance of the creek bed and bank, reducing the potential effects of the local population of the green turtle. Design and implementation of a CEMP will further minimise risk to individuals and achieve protection of habitat, such that no long-term decrease in the size of the population is expected to occur. Following construction, habitat will be restored and operation of the pipeline will have no direct or indirect impacts on the species or their habitat.
Reduce the extent of occurrence of the species	**Unlikely** Construction works at sites that green turtles are known or likely to occur (site 2 and 4) will consist of trenchless methods to minimise impacts to connectivity of Raglan and Inkerman Creeks. The works will be restricted temporally to a small, localised area, with measures in place to ensure no long-term impacts to habitat. Following construction, habitat will be restored, and operation of the pipeline will have no direct or indirect impacts on the species or their habitat. These measures ensure that it is unlikely that a reduction of the extent of occurrence of the species will occur.
Fragment an existing population	**Unlikely** All works will be conducted in accordance with DAF's 'ADR for operational work that is constructing or raising waterway barrier works' (DAF 2018)to facilitate connectivity and flow. Temporary and localised disturbance to the creeks during construction is unlikely to fragment the existing population of the green turtle.

Significant residual impact criteria	Potential to occur
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** The species breeding grounds do not occur within the SGIC SDA pipeline alignment. During the construction and operation phase there will be no permanent barriers to green turtle movement and therefore is unlikely to result in genetically distinct populations forming as a result of habitat isolation. The project is not considered to result in the fragmentation of the species and therefore genetically distinct populations forming due to habitat isolation is unlikely.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	**Unlikely** Introduced fish species in the Fitzroy River Delta are not known to be a key threatening process to the green turtle. The implementation of the CEMP including a Weed Management Plan and Introduced Management Plan will reduce the risk of introducing new invasive species or spreading existing weeds within the river, which could cause degradation of habitat. The management actions proposed for the control of weed and pest species are considered sufficient such that no significant impact to the green turtle and/or the species' habitat is likely to occur.
Introduce disease that may cause the population to decline	**Unlikely** There are no known diseases that this species is susceptible to or threatened by that proposed works have the potential to introduce. Therefore, it is considered unlikely that construction works for the waterway crossings will have the potential to introduce disease to the extent that the green turtle population will decline.
Interfere with the recovery of the species	**Unlikely** The Recovery Plan for Marine Turtles in Australia which the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is responsible for outlines of the recovery strategies for the species (DAWE, 2017). Relevant to the project, the recovery strategy aims at minimising chemical and terrestrial discharge with the implementation of best management of industrial, urban and agriculture runoff. Spill risk and spill response strategies are to be implemented. The species is known to occur in Inkerman Creek and may occur in Raglan Creek. A CEMP will be designed and implemented to avoid and minimise risk of water quality degradation from temporary construction activities. Following construction, habitat will be restored and operation of the pipeline will have no direct or indirect impact on green turtles or their habitat. No impact will occur to the downstream marine environment or any green turtle nesting habitat. These measures will ensure that the project is unlikely to contribute to key threating processes or interfere with recovery actions.
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species	**Unlikely** The duration of works conducted in Inkerman Creek and Raglan Creek will be less than 180 days. During construction, temporary and localised disturbance may occur to a small number of green turtles that may utilise these creeks for foraging and resting. Substantially suitable habitat will remain downstream such that this disturbance is unlikely to impact the availability of foraging resources. A CEMP will be designed and implemented to protect habitat quality within and downstream of the construction areas. All habitats will be restored following construction and the pipeline will have no direct or indirect impacts on green turtles or their habitat during operations. These measures result that the project is unlikely to cause disruption to ecologically significant locations of a species.
Conclusion	No direct loss of habitat or disturbance to bed and banks at Raglan Creek will occur during the construction or operational phases. The project is unlikely to have a significant residual impact on the green turtle.



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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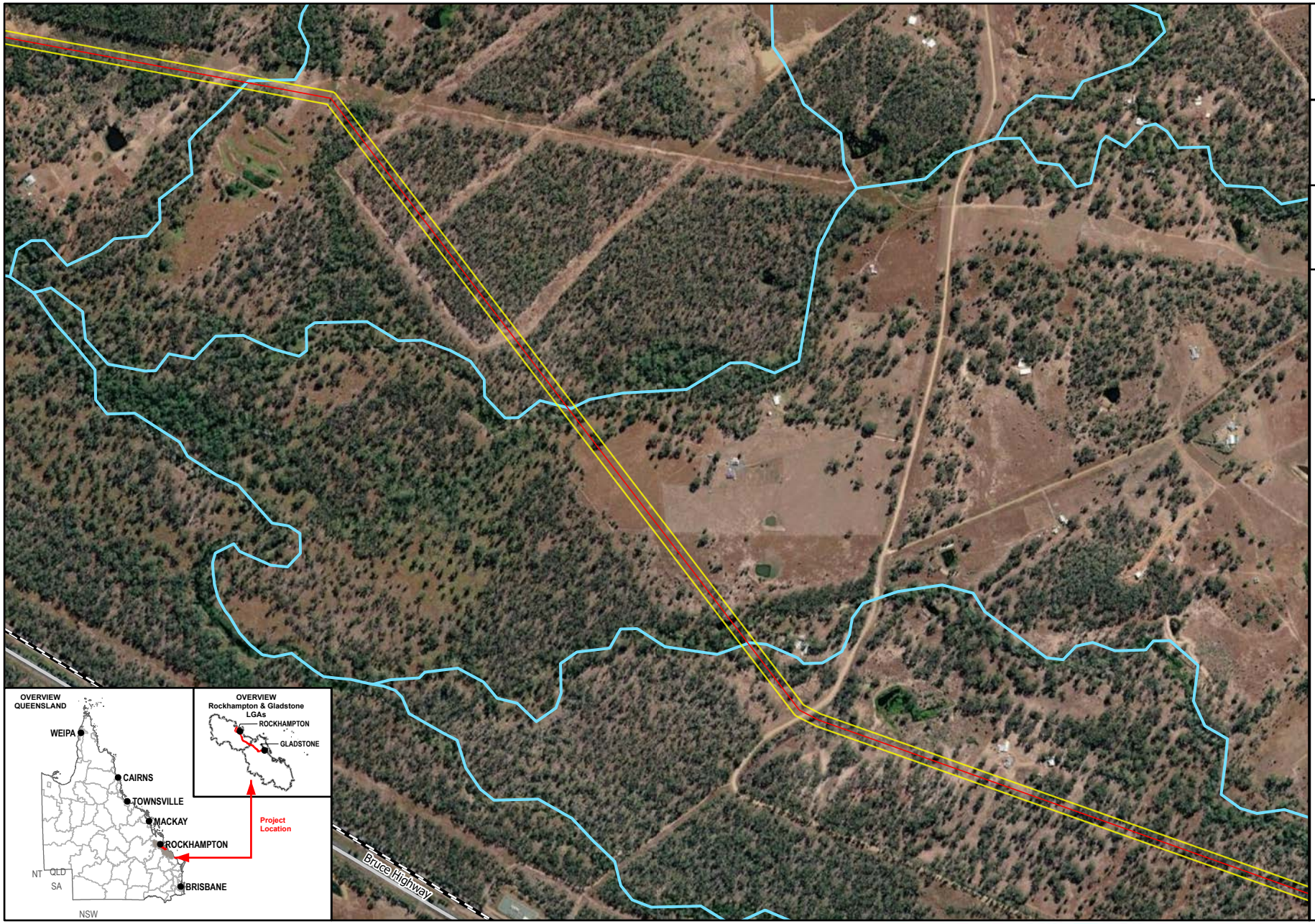
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19a
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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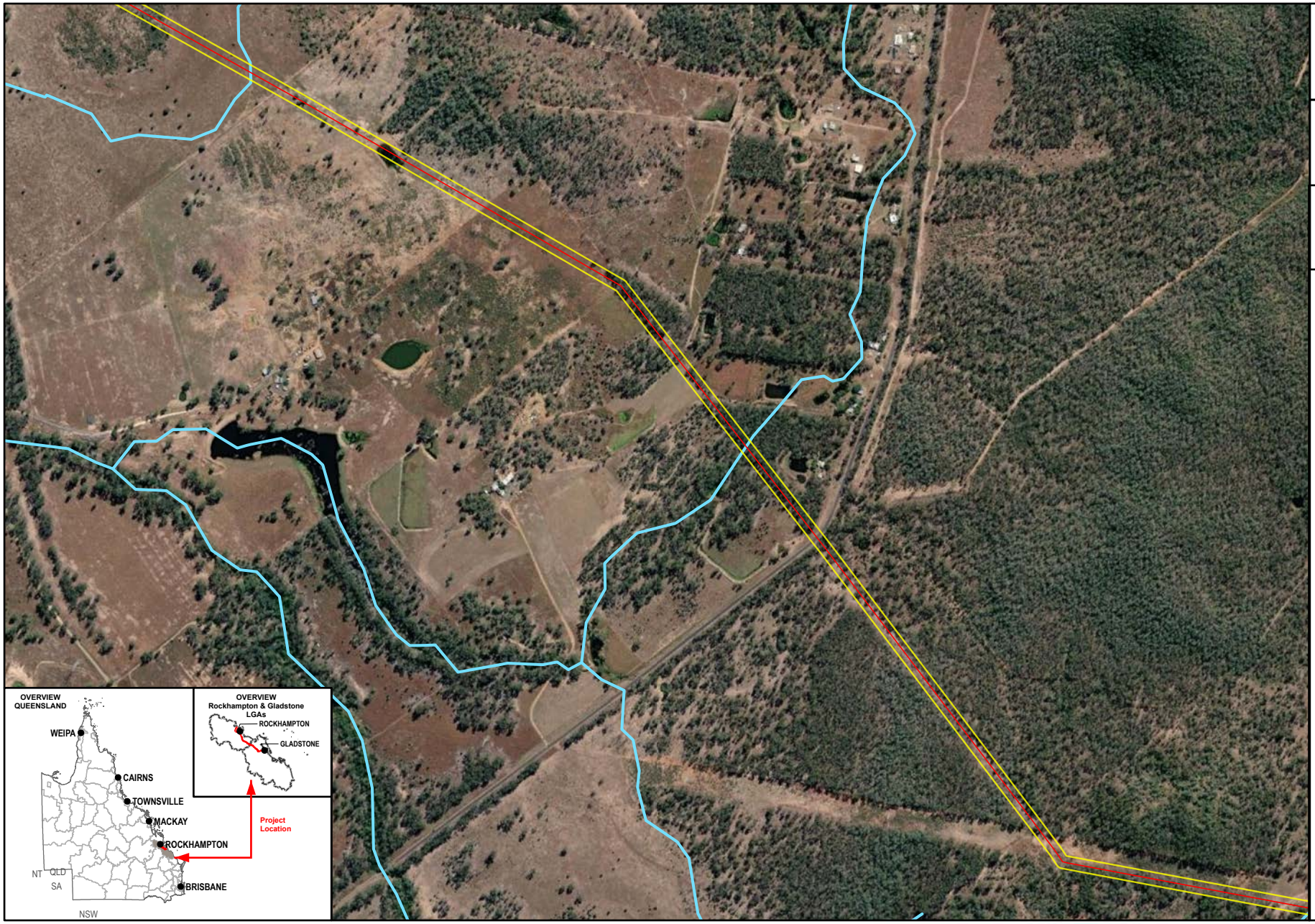
Figure 7-19b
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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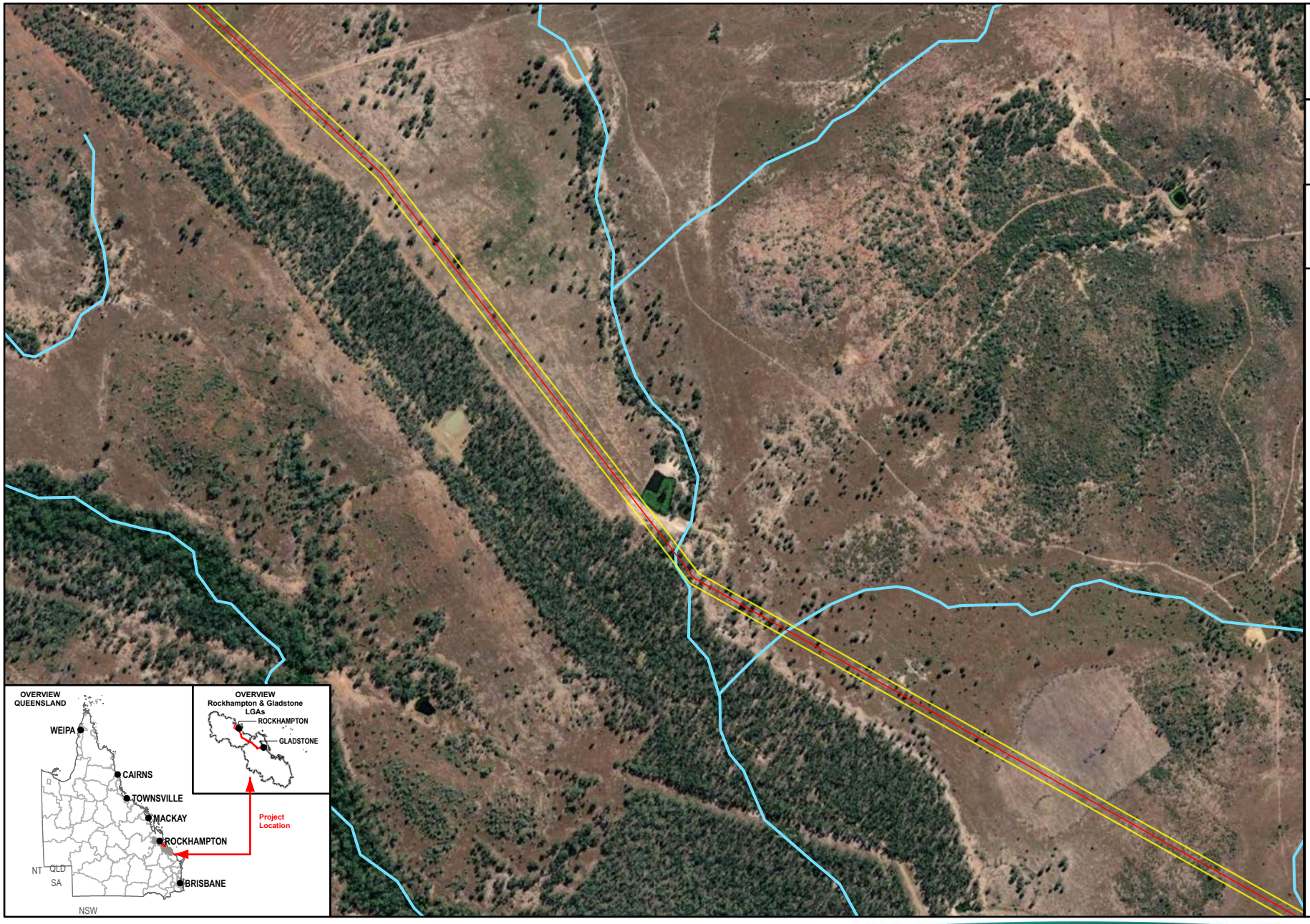
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19c
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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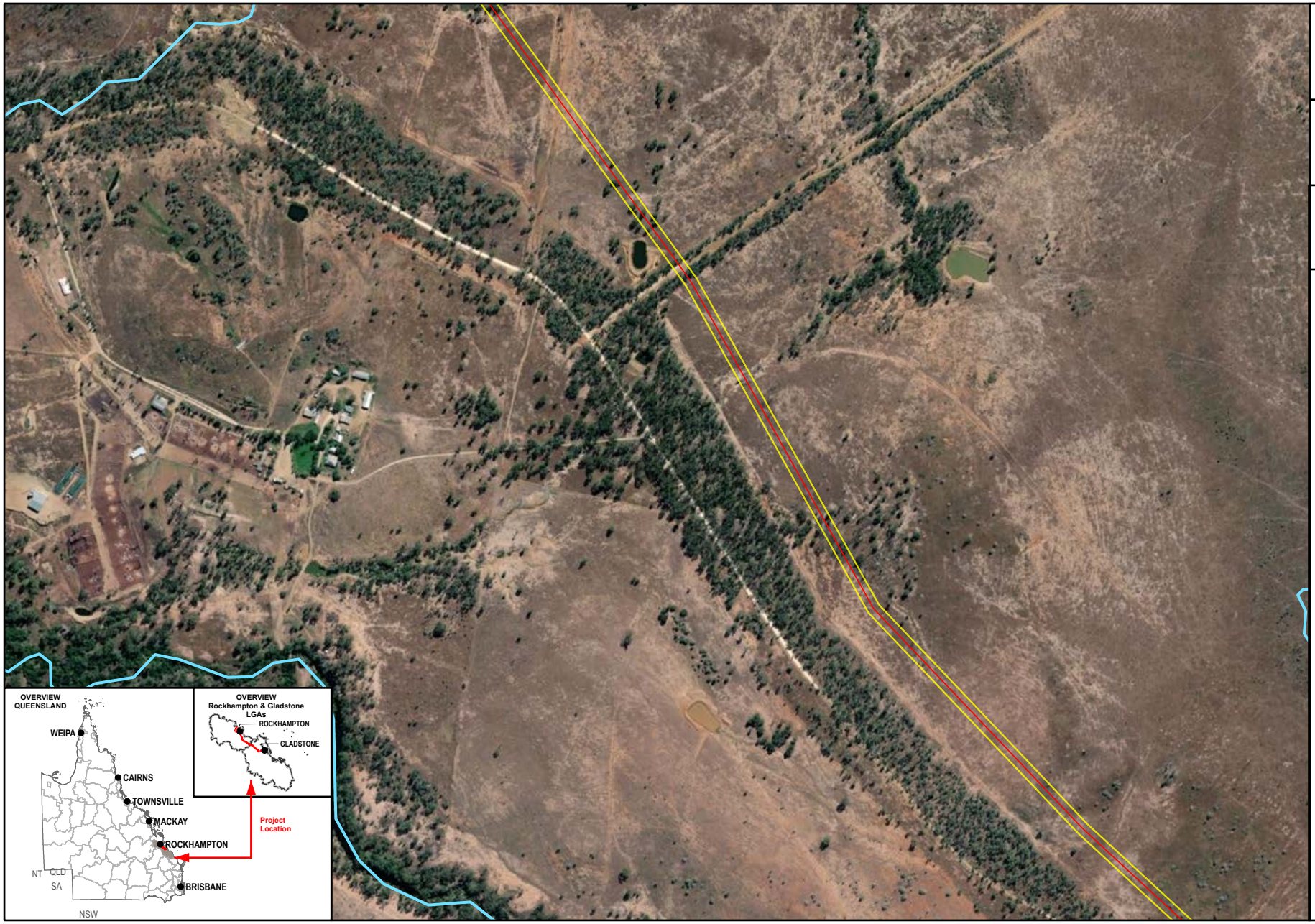
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19d
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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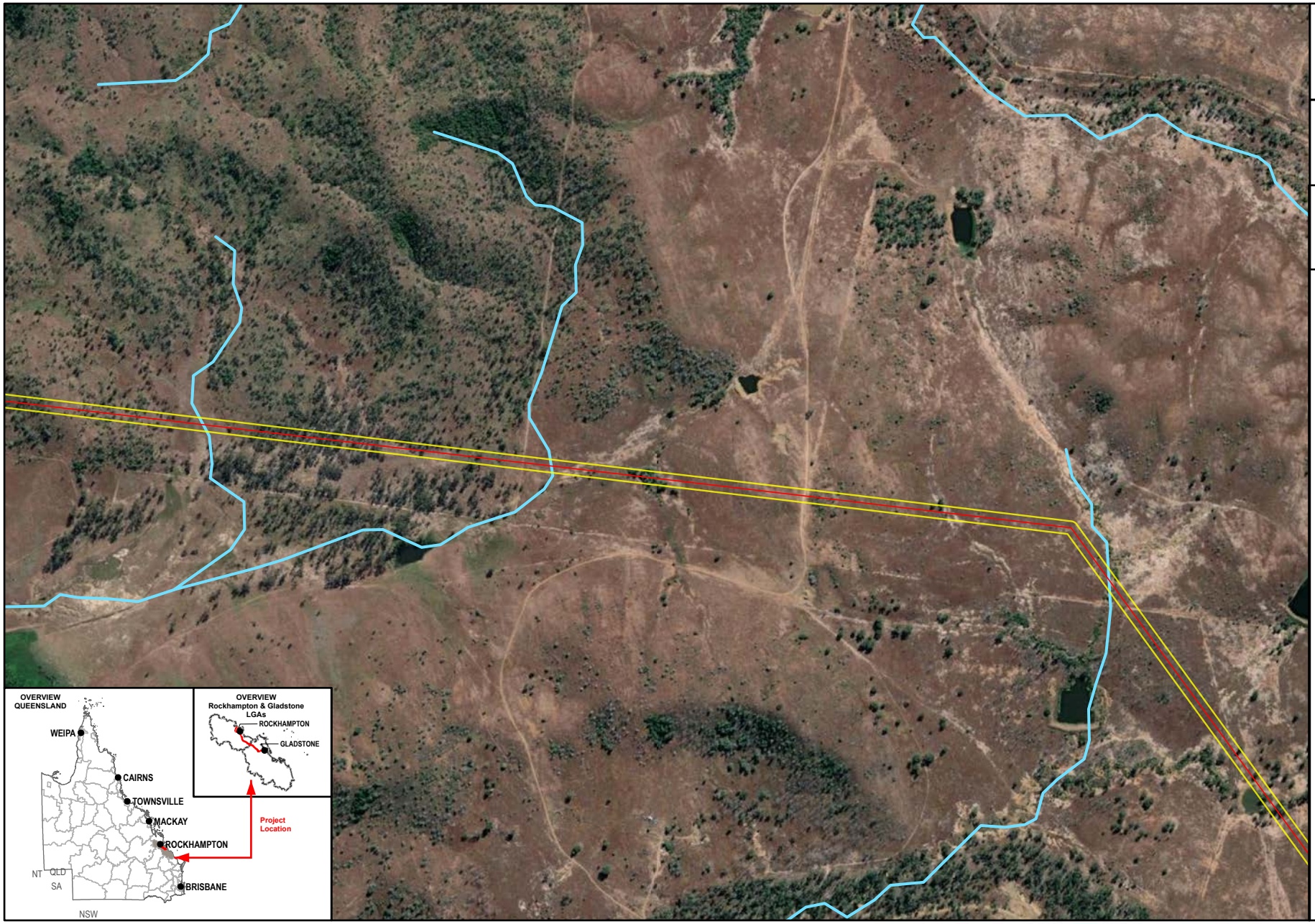
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19e
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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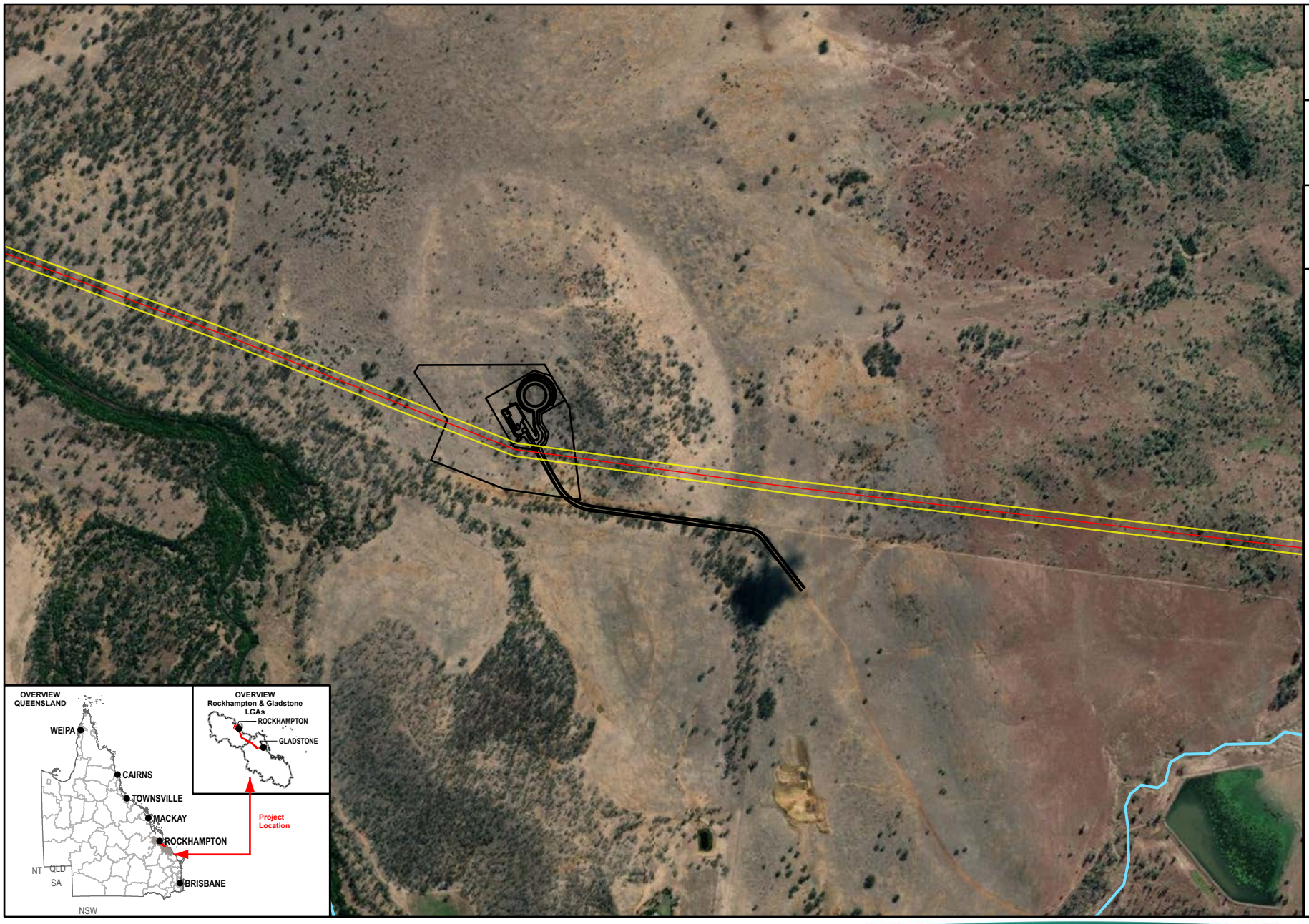
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19f
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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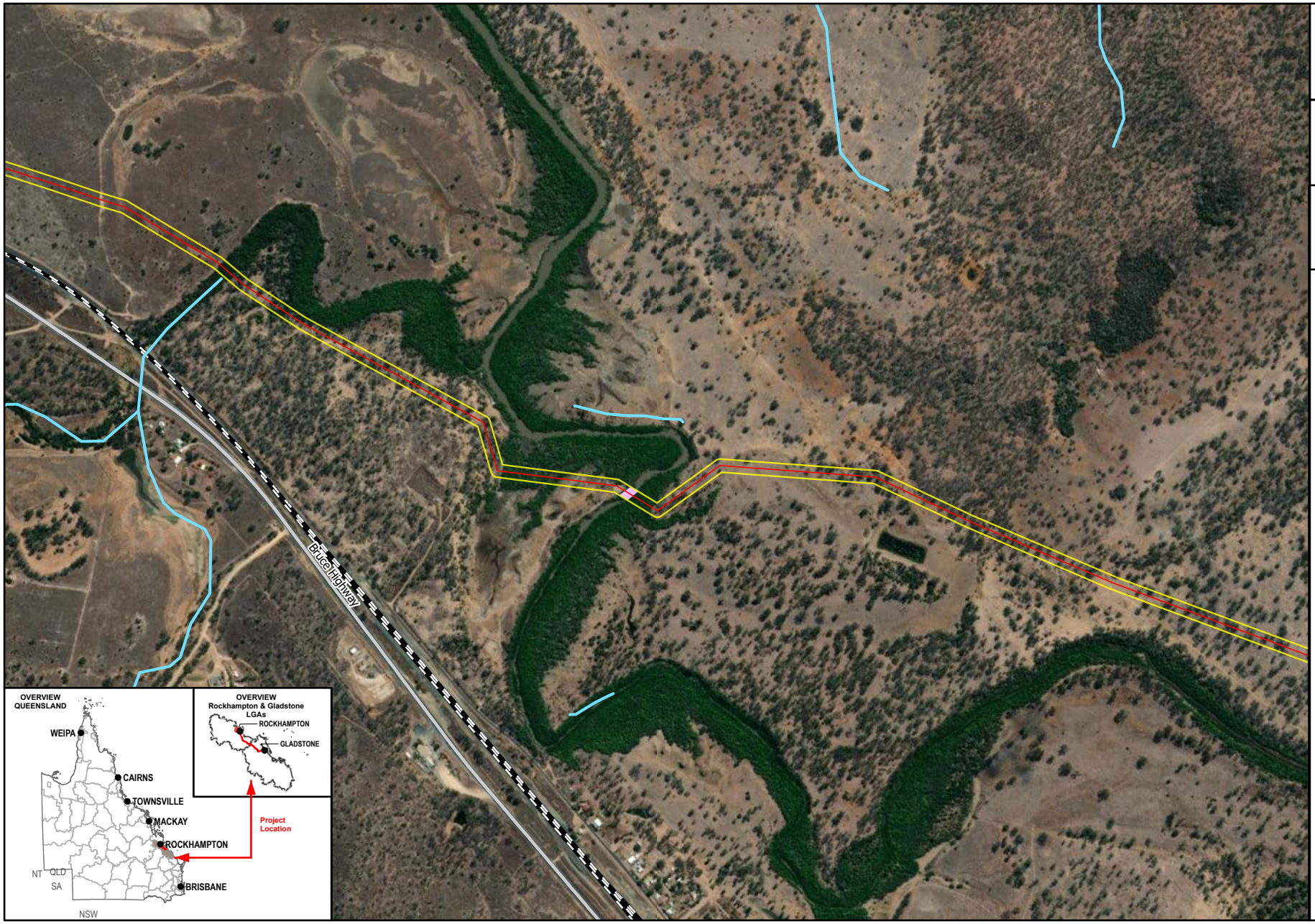
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19g
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Green Turtle Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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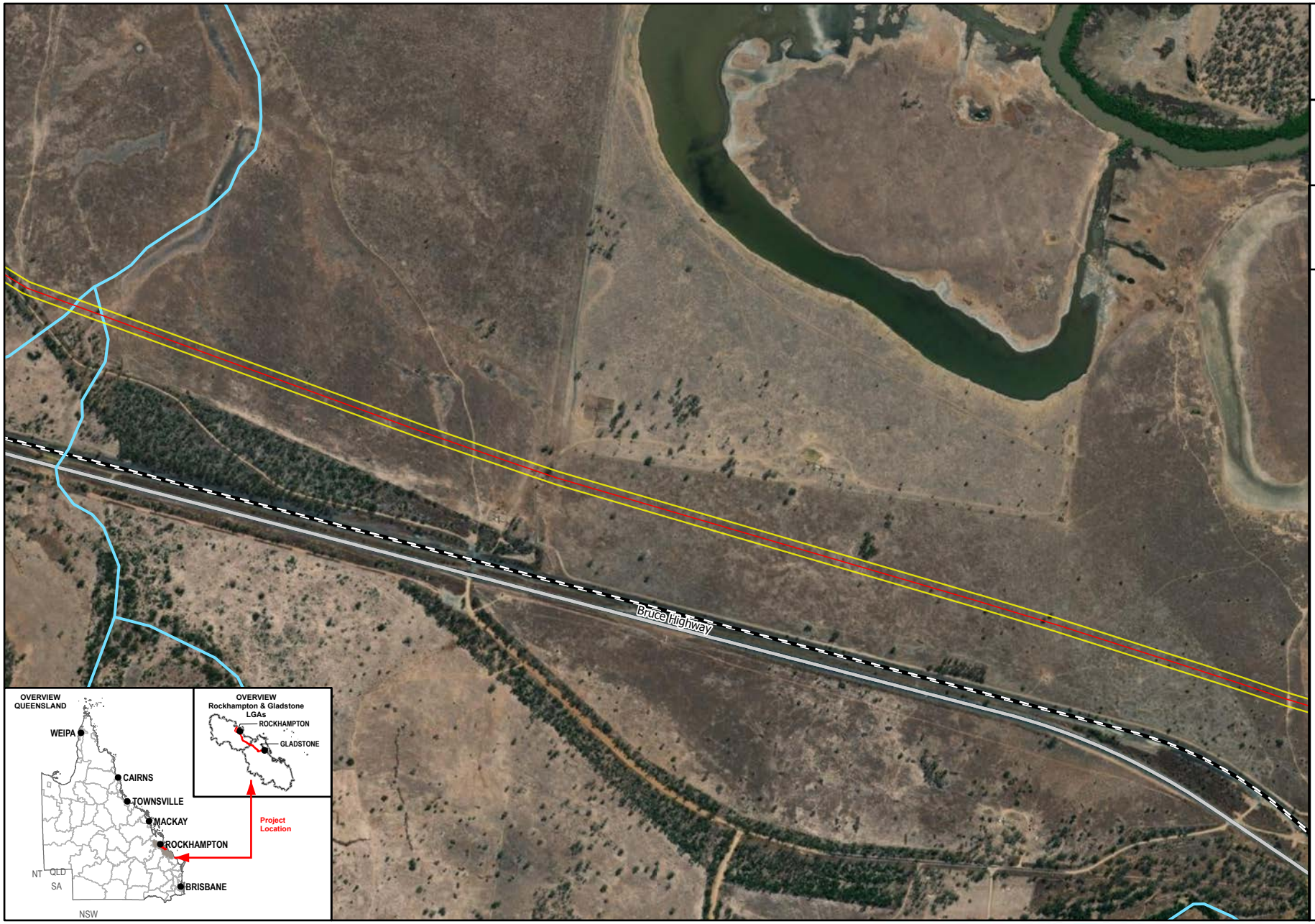
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19h
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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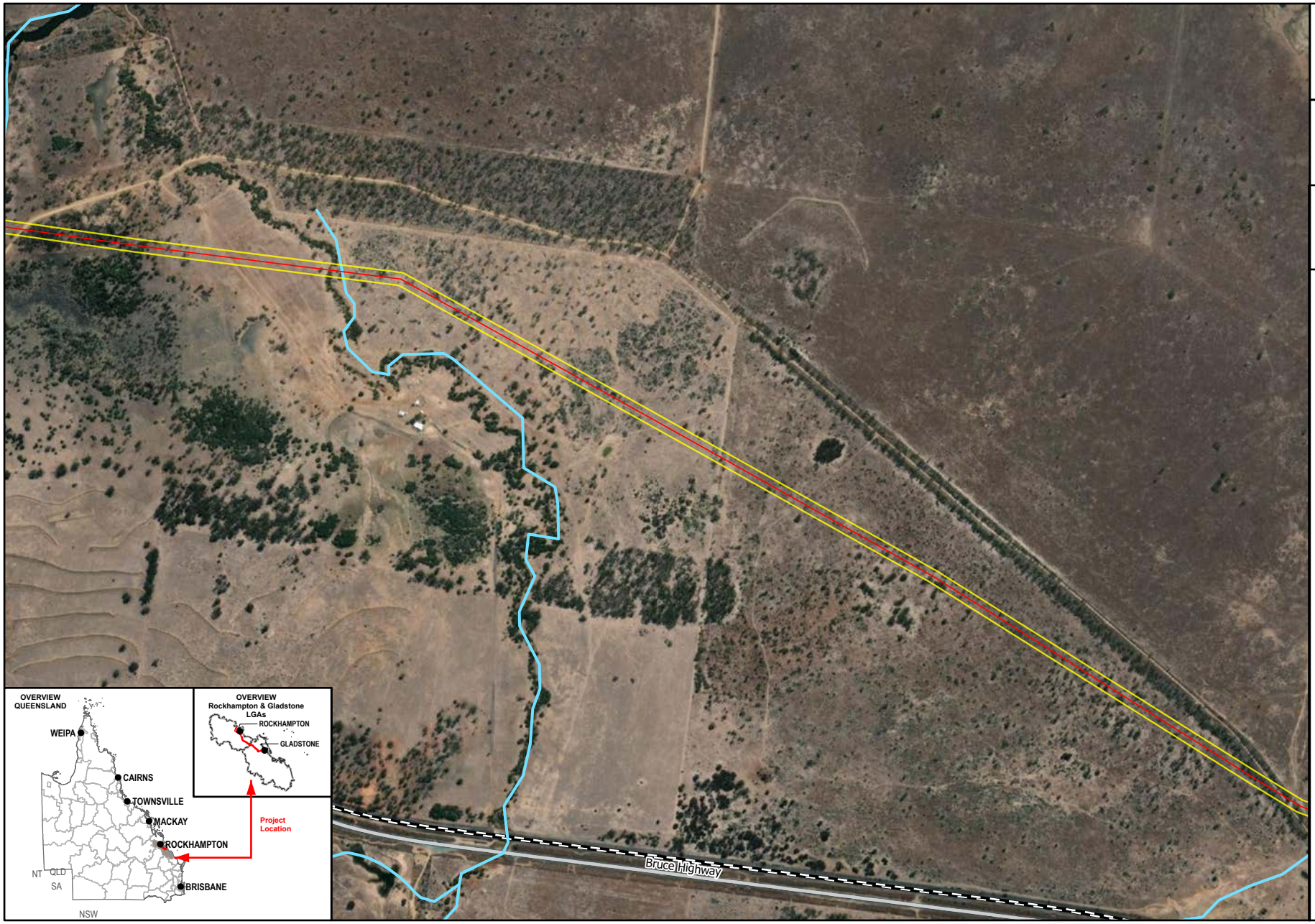
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19i
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
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Figure 7-19j
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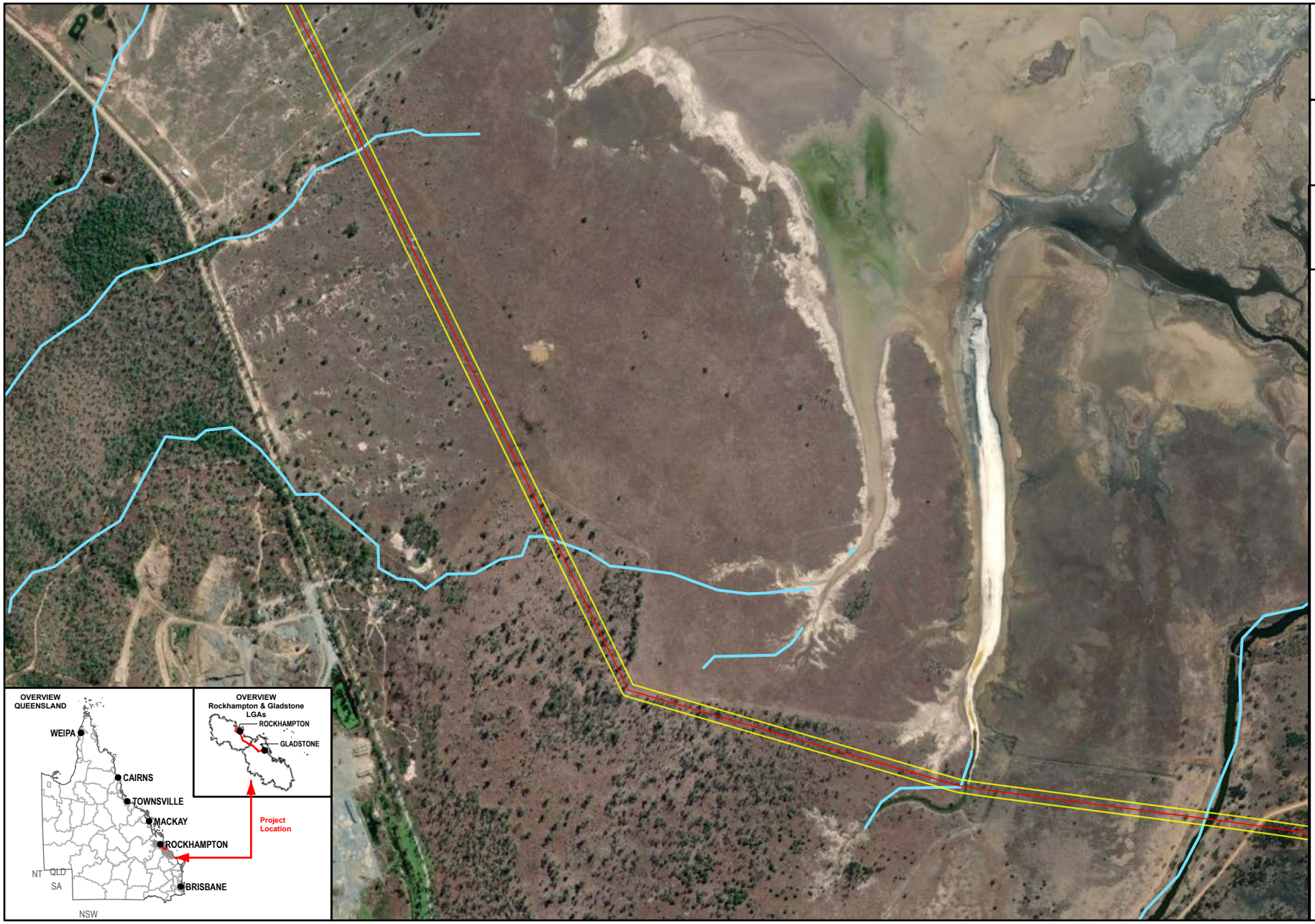
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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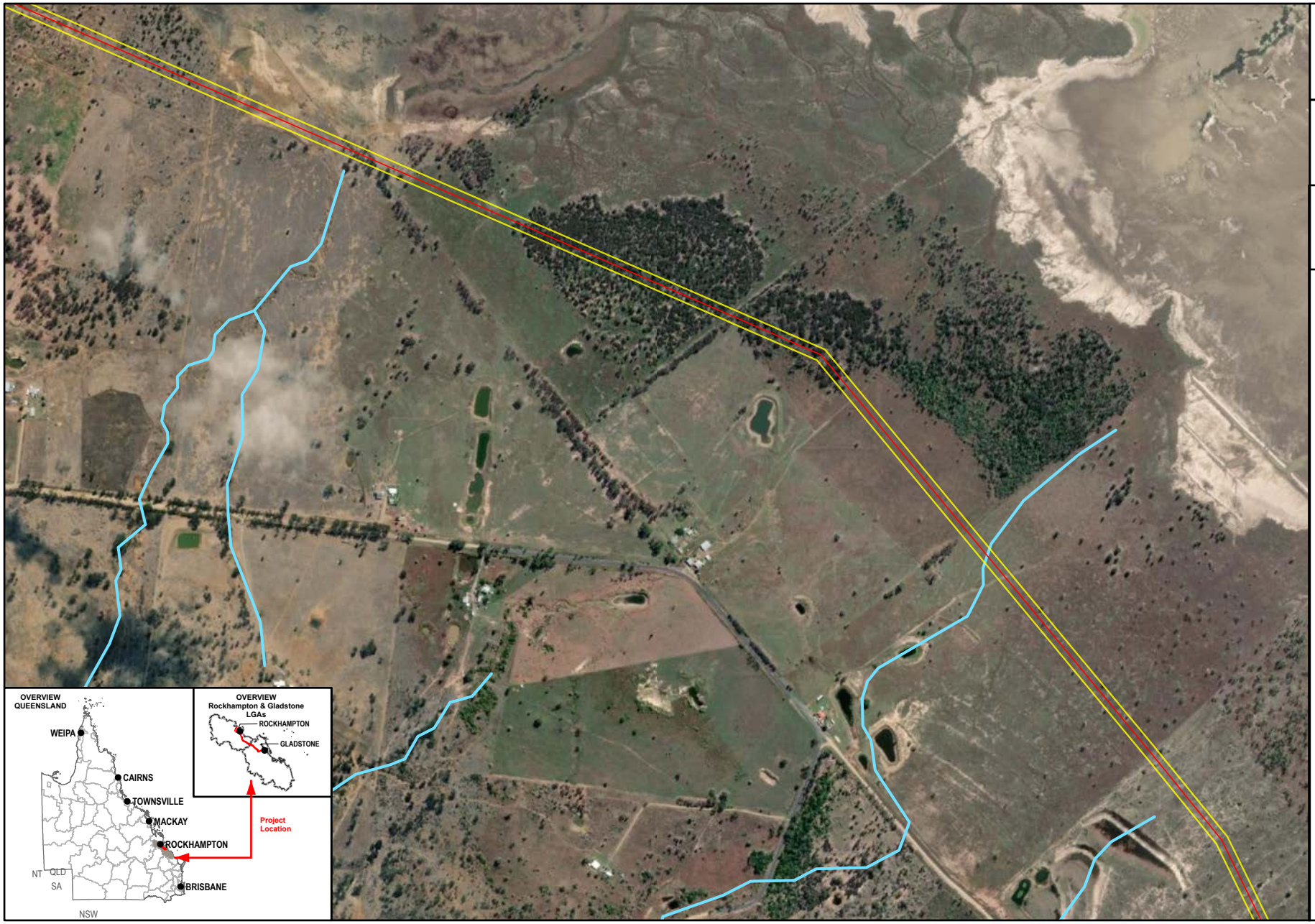
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19k
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
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- Waterways

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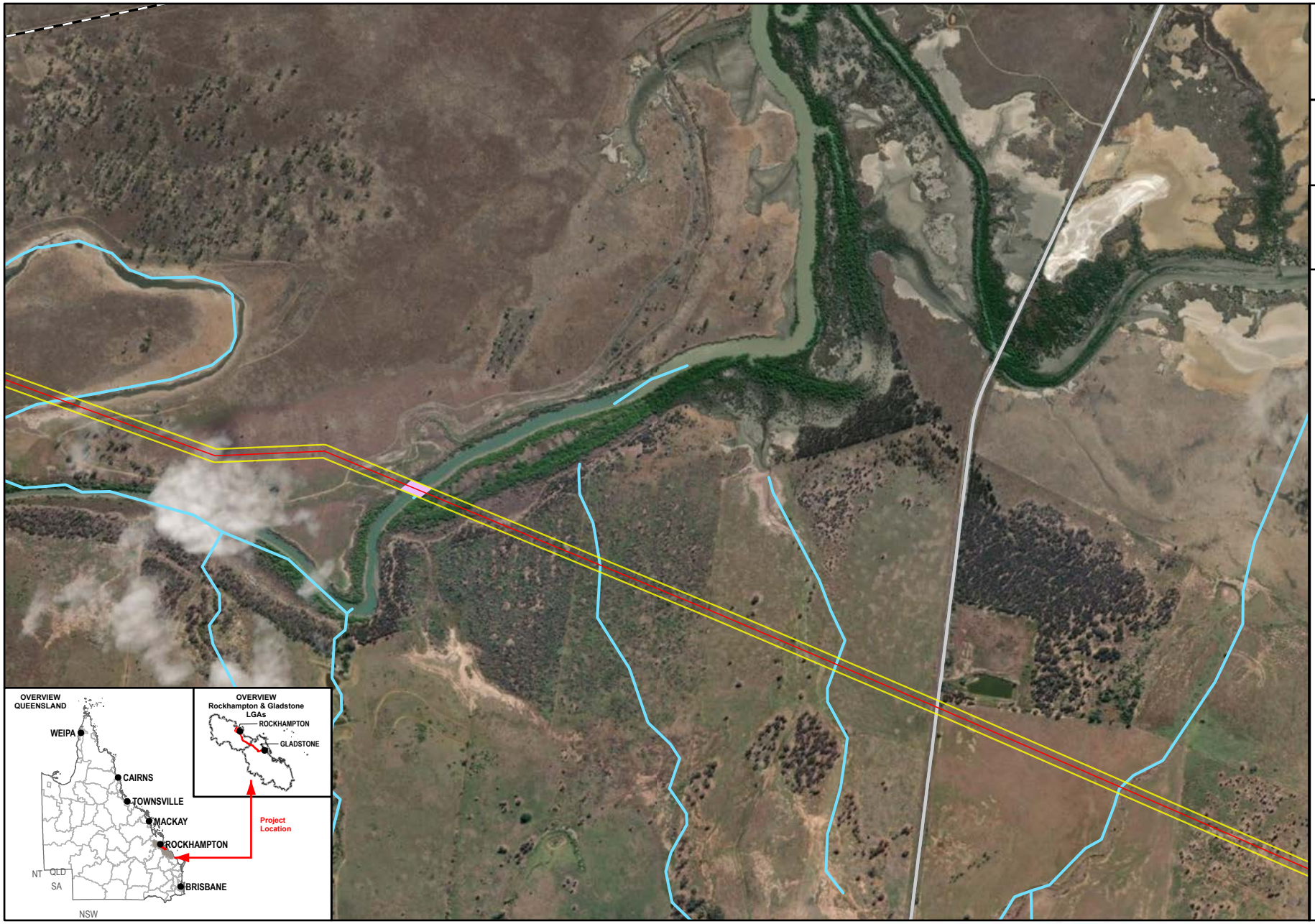
Figure 7-19l
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Green Turtle Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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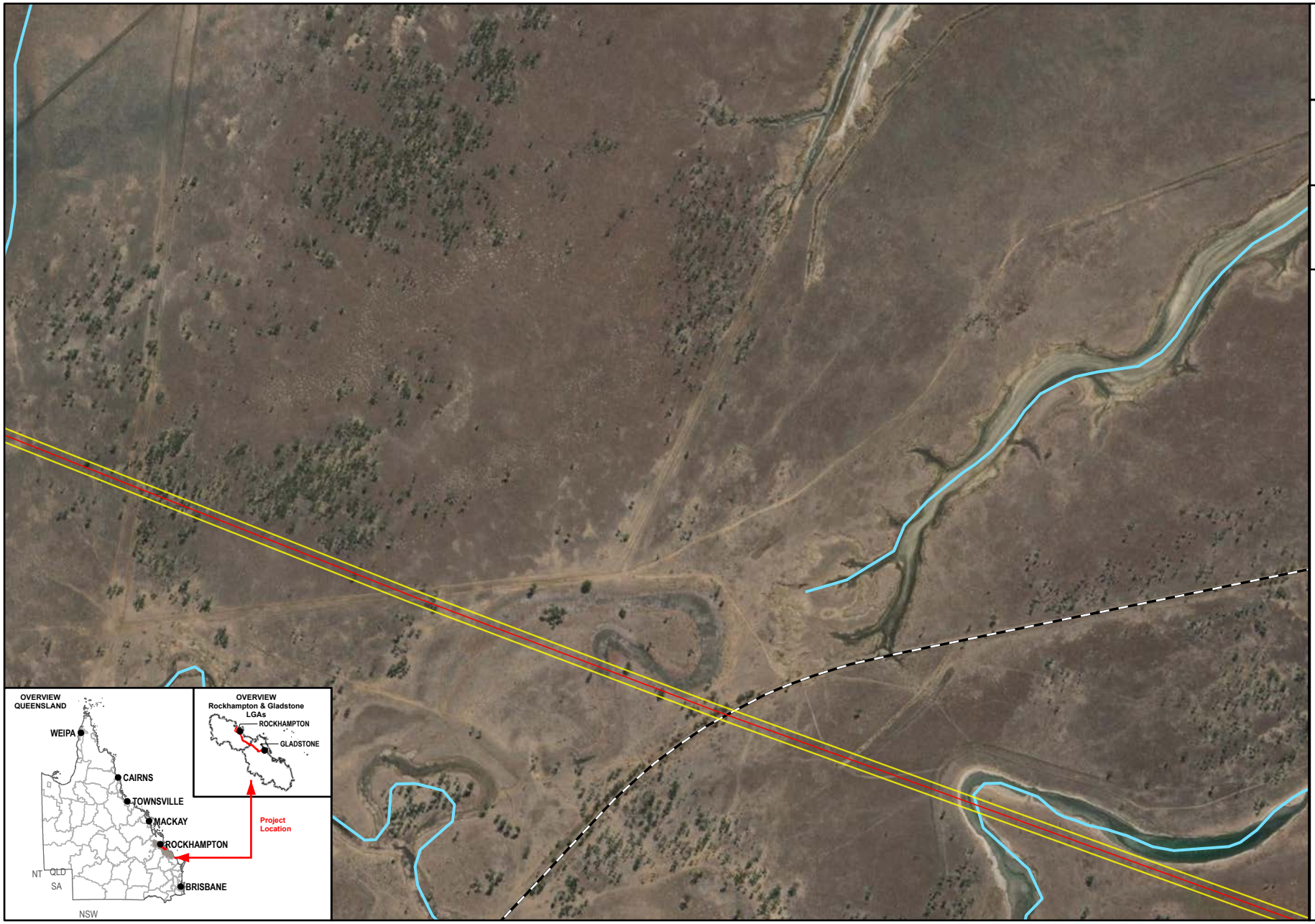
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-19m
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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- Railways

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Baseline Terrestrial and Aquatic Ecology Technical Report
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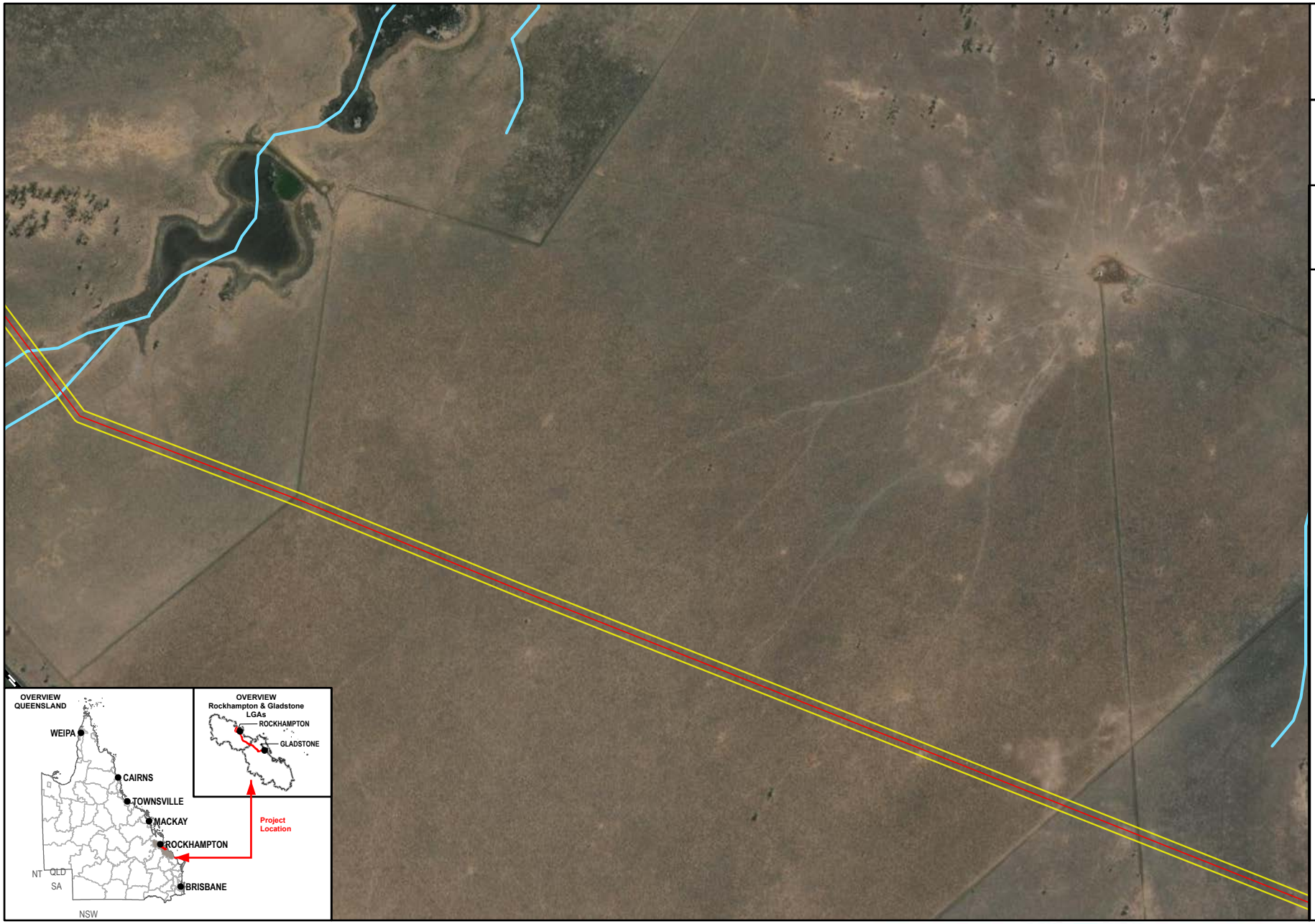
Distribution of Green Turtle Habitat Within the SGIC SDA Study Area
000-G-MAP-2440 Version:3 Date:20/09/2022



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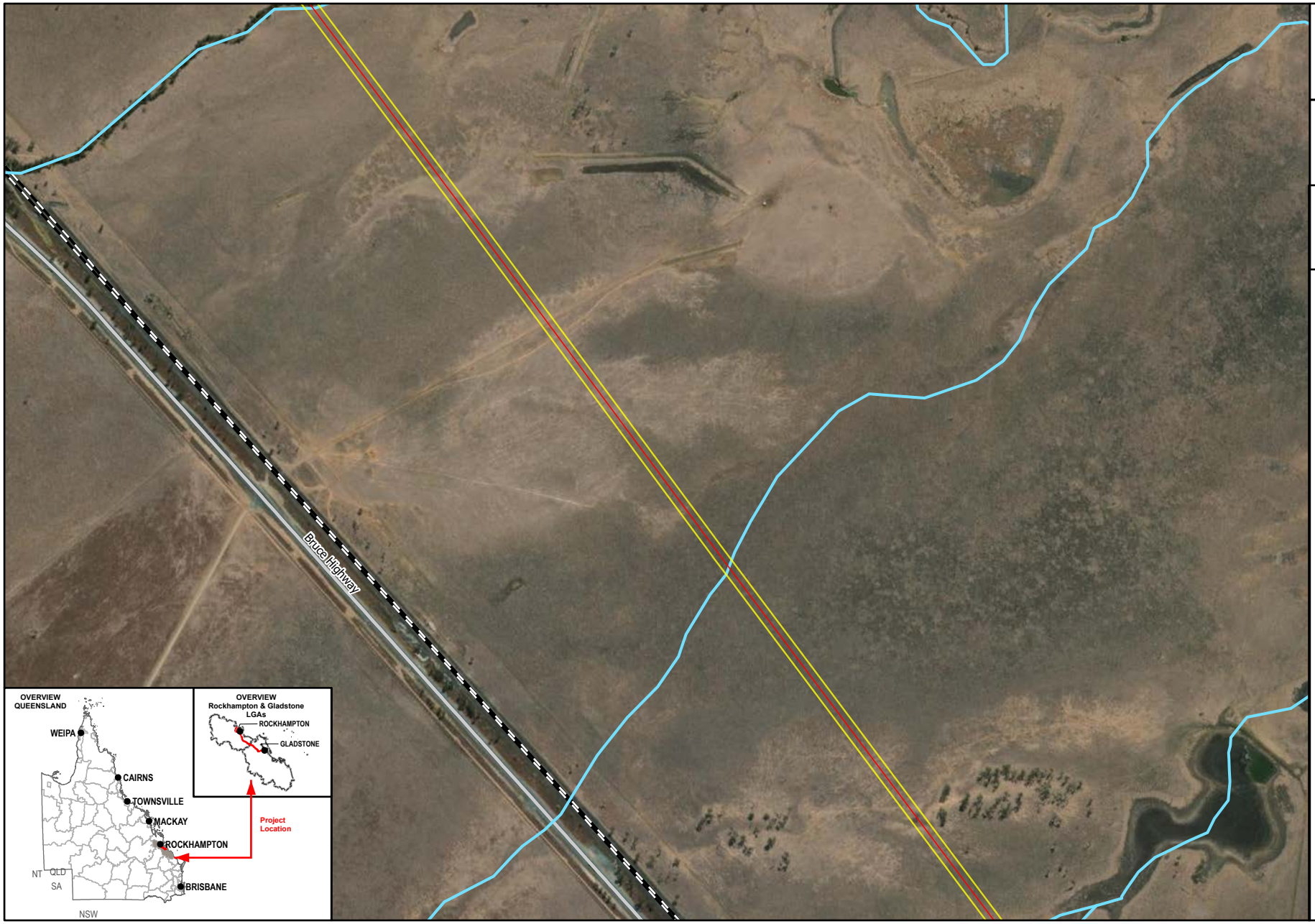

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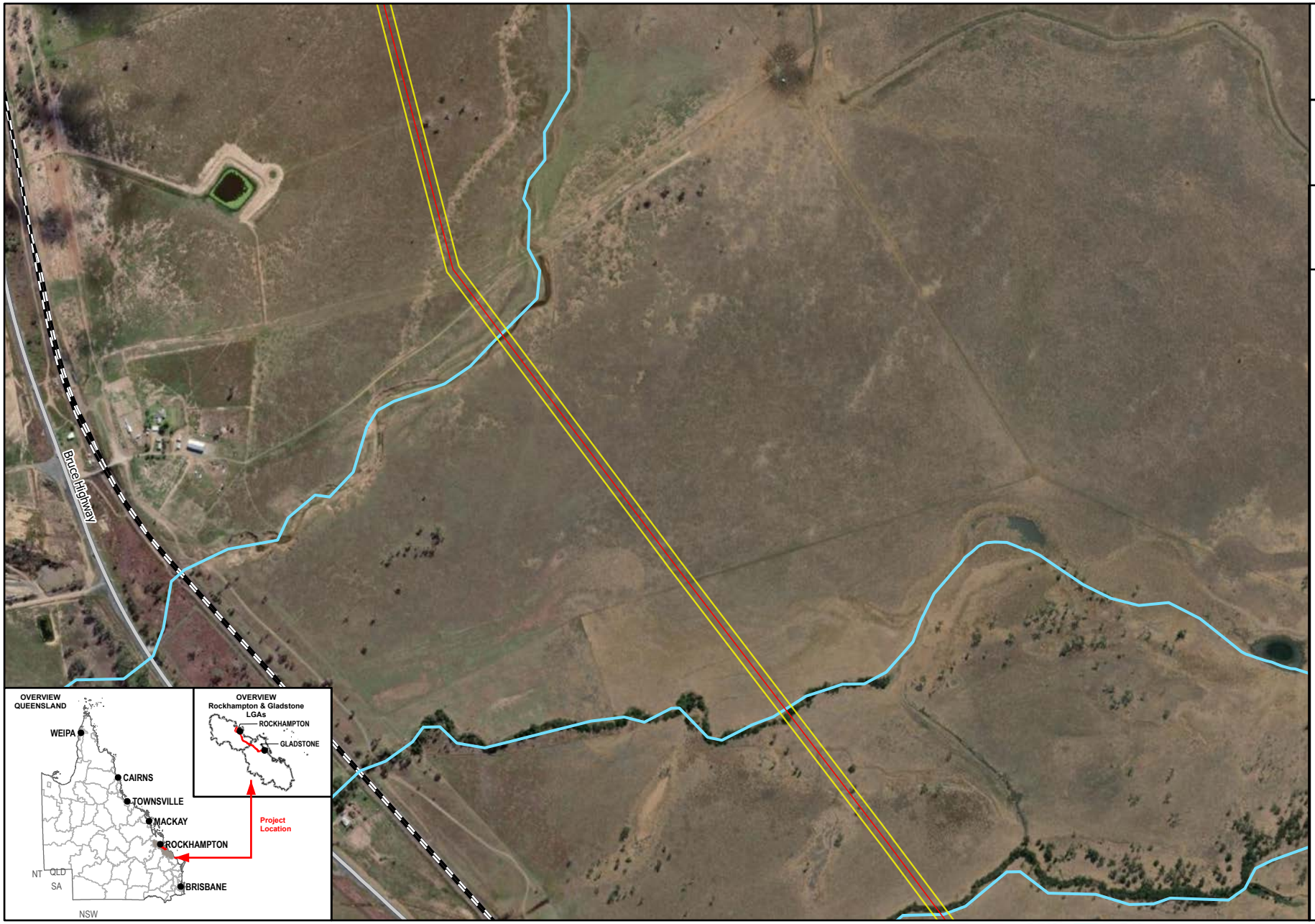

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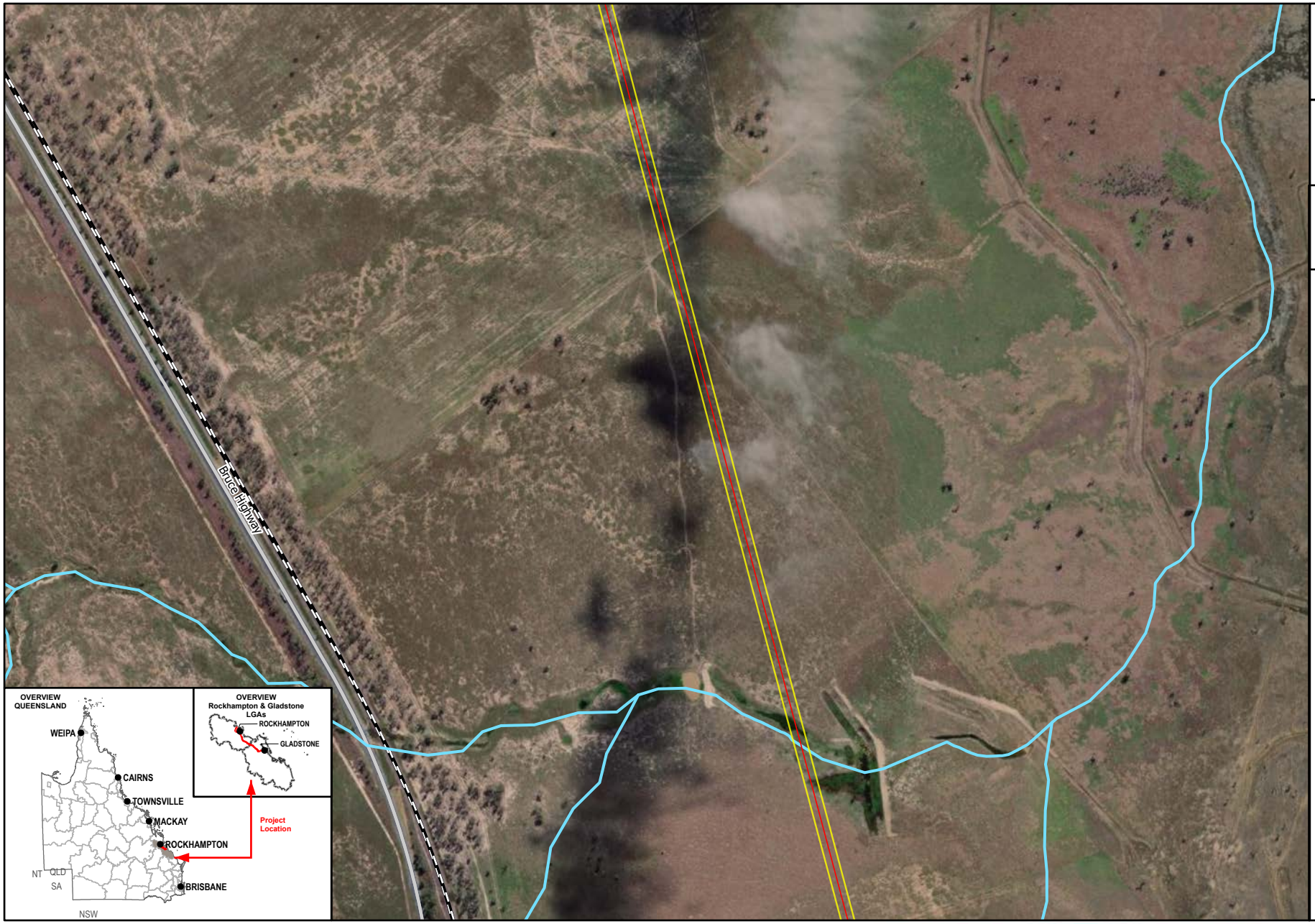

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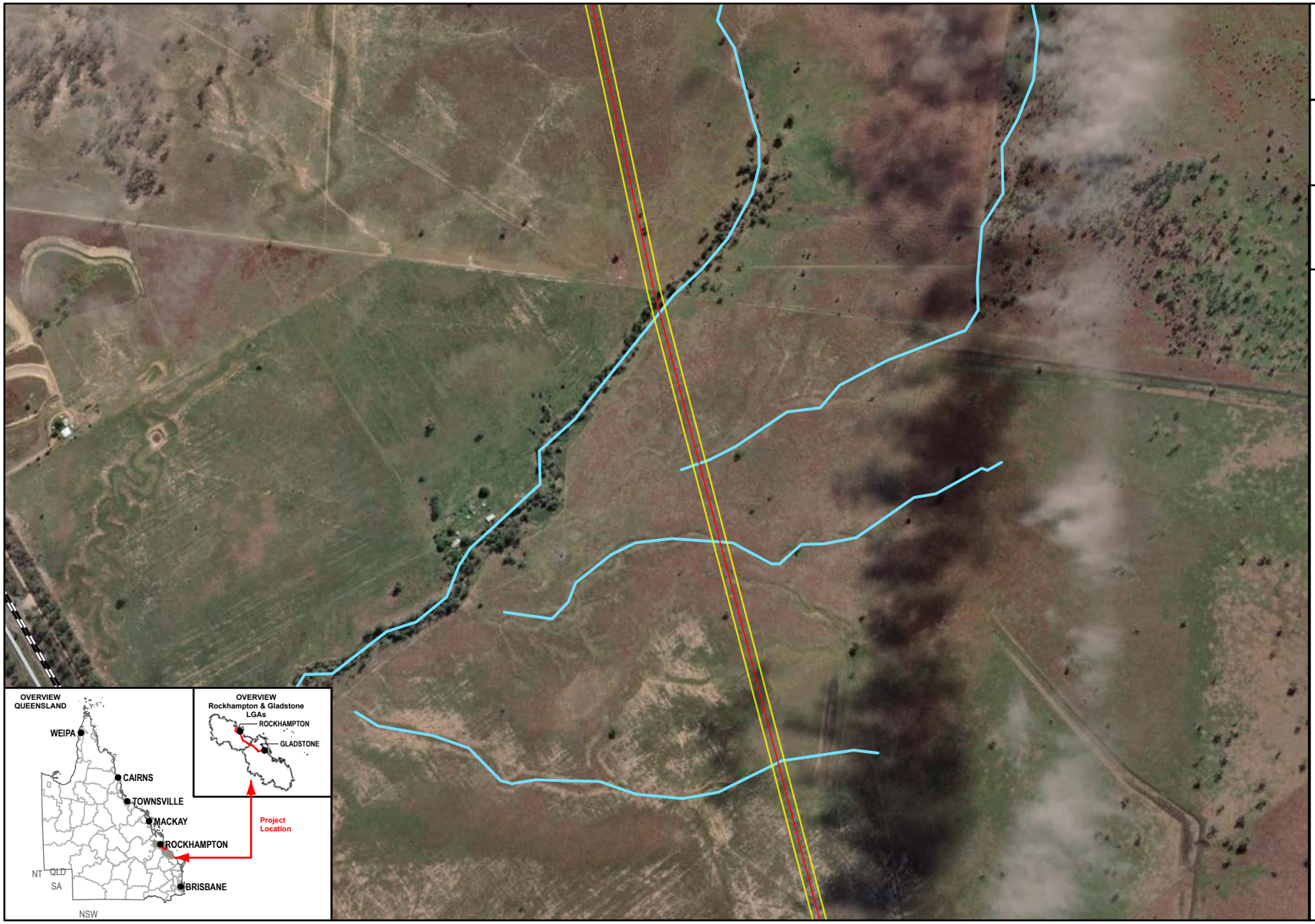

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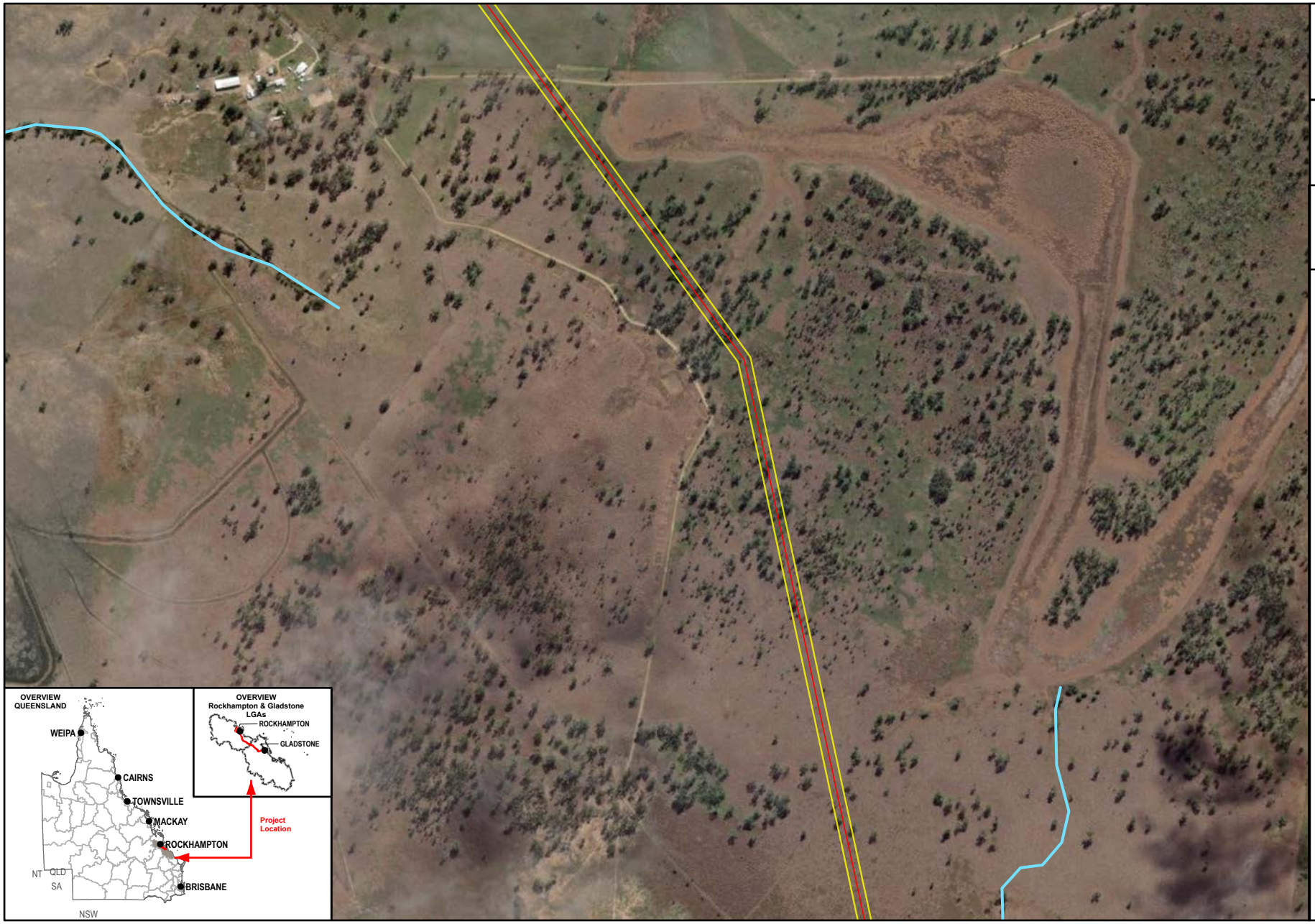

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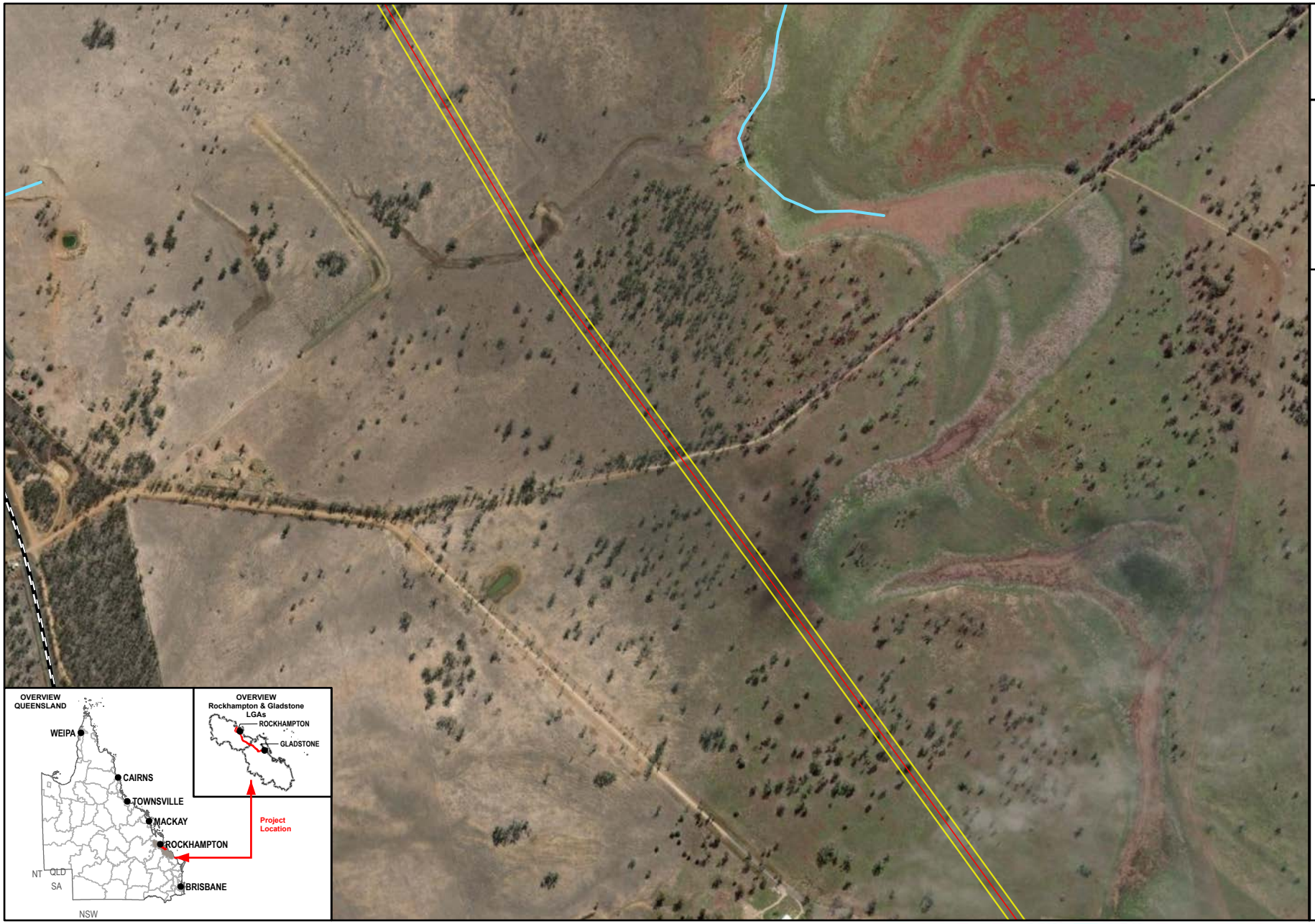

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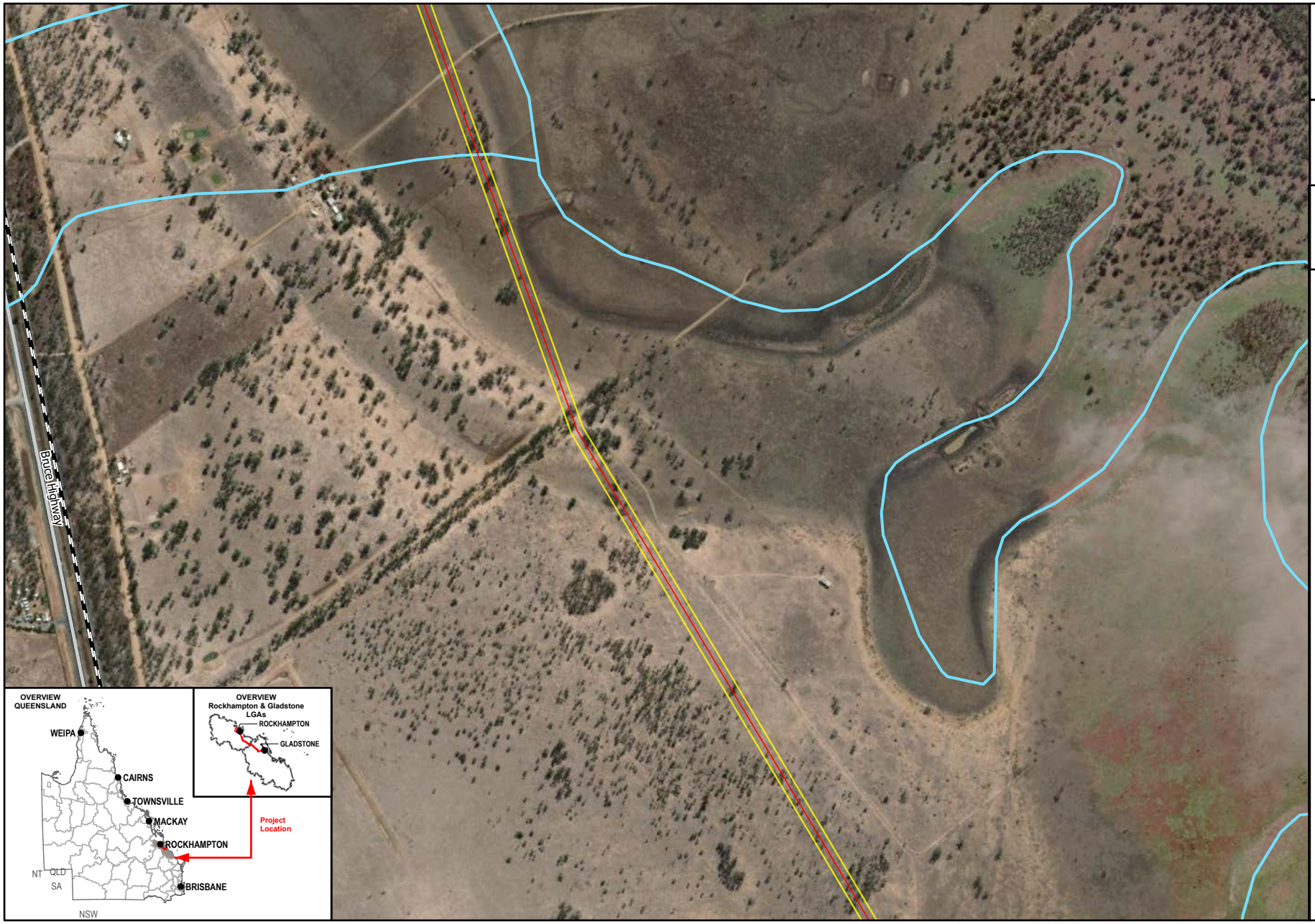

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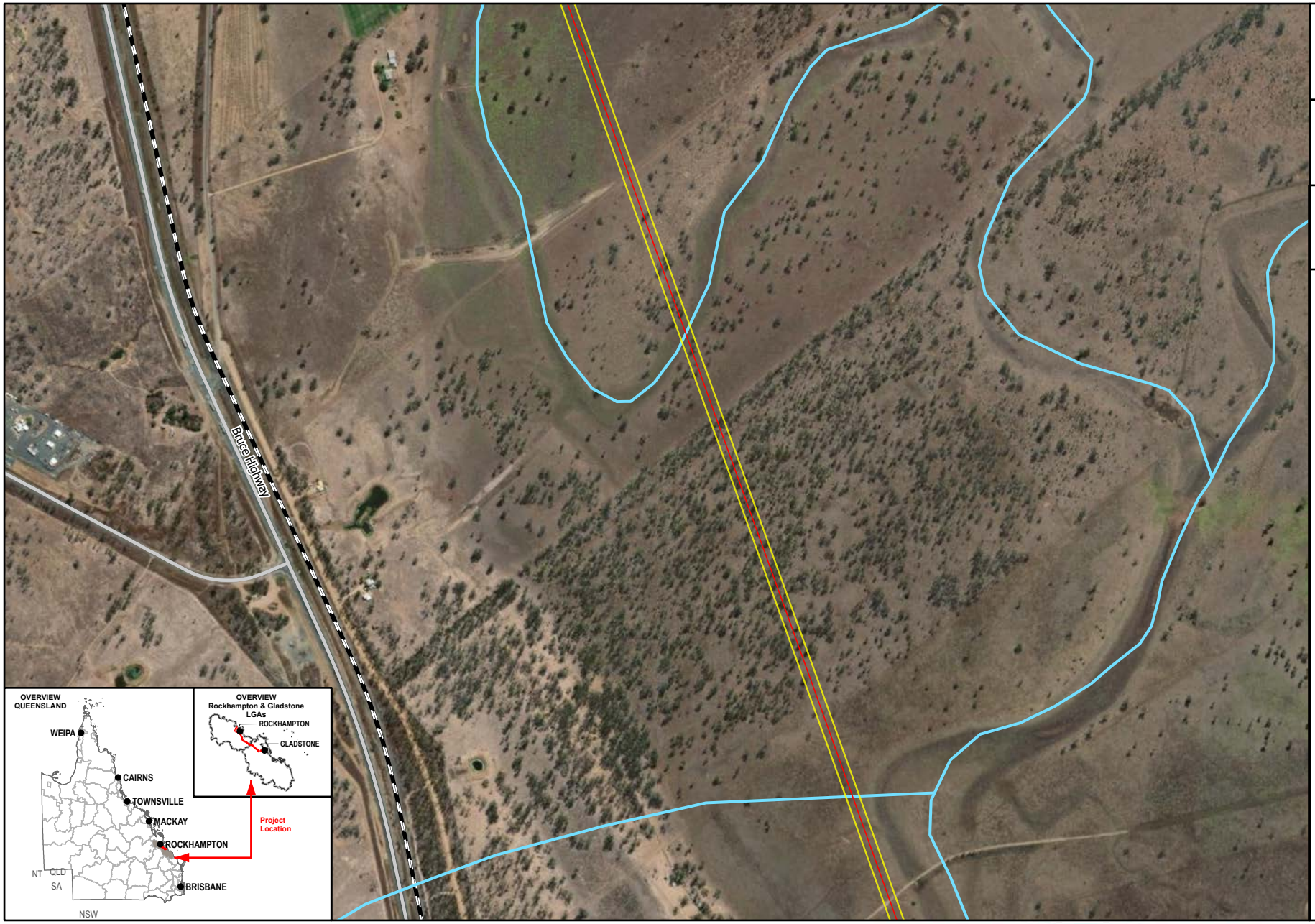

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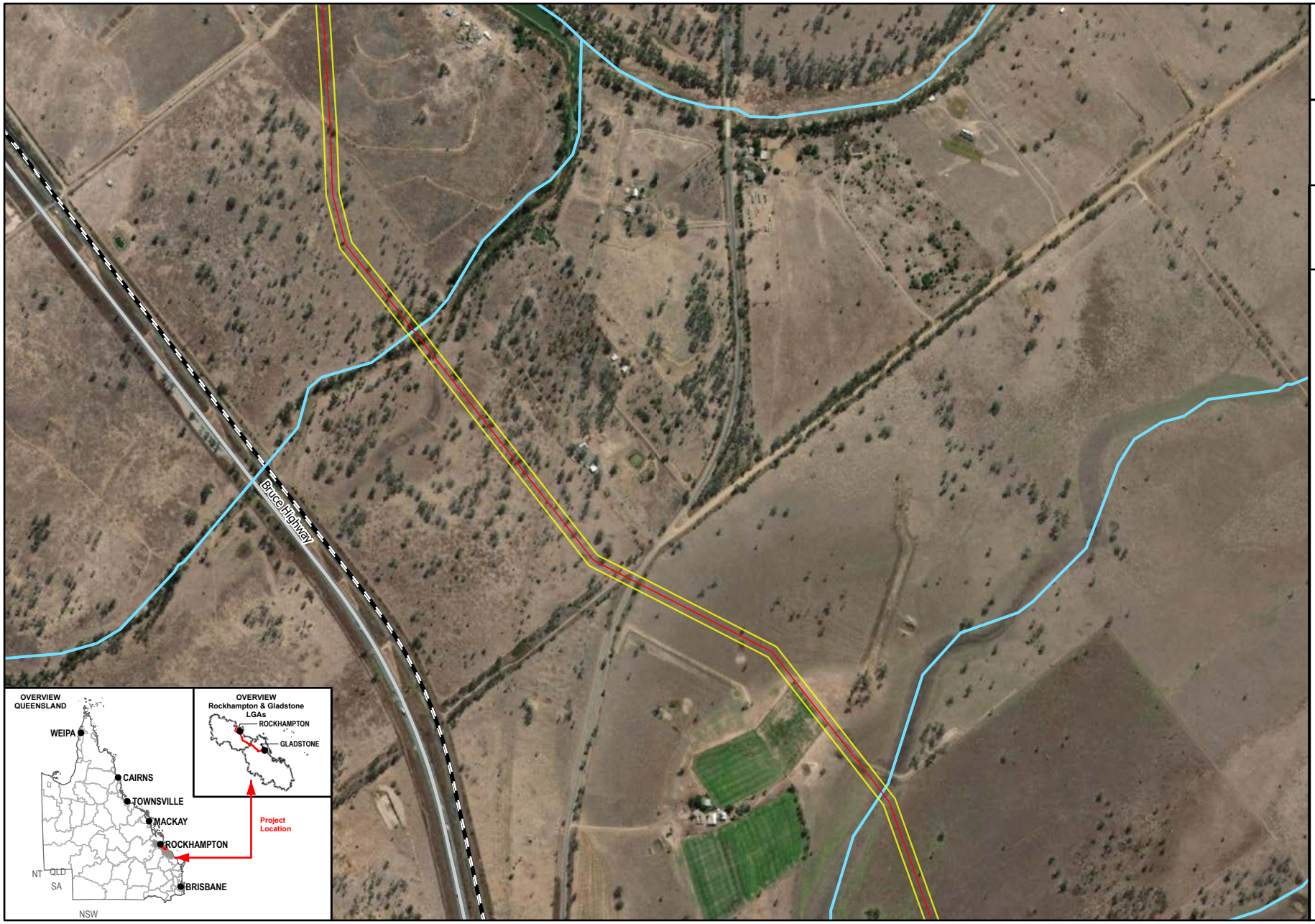

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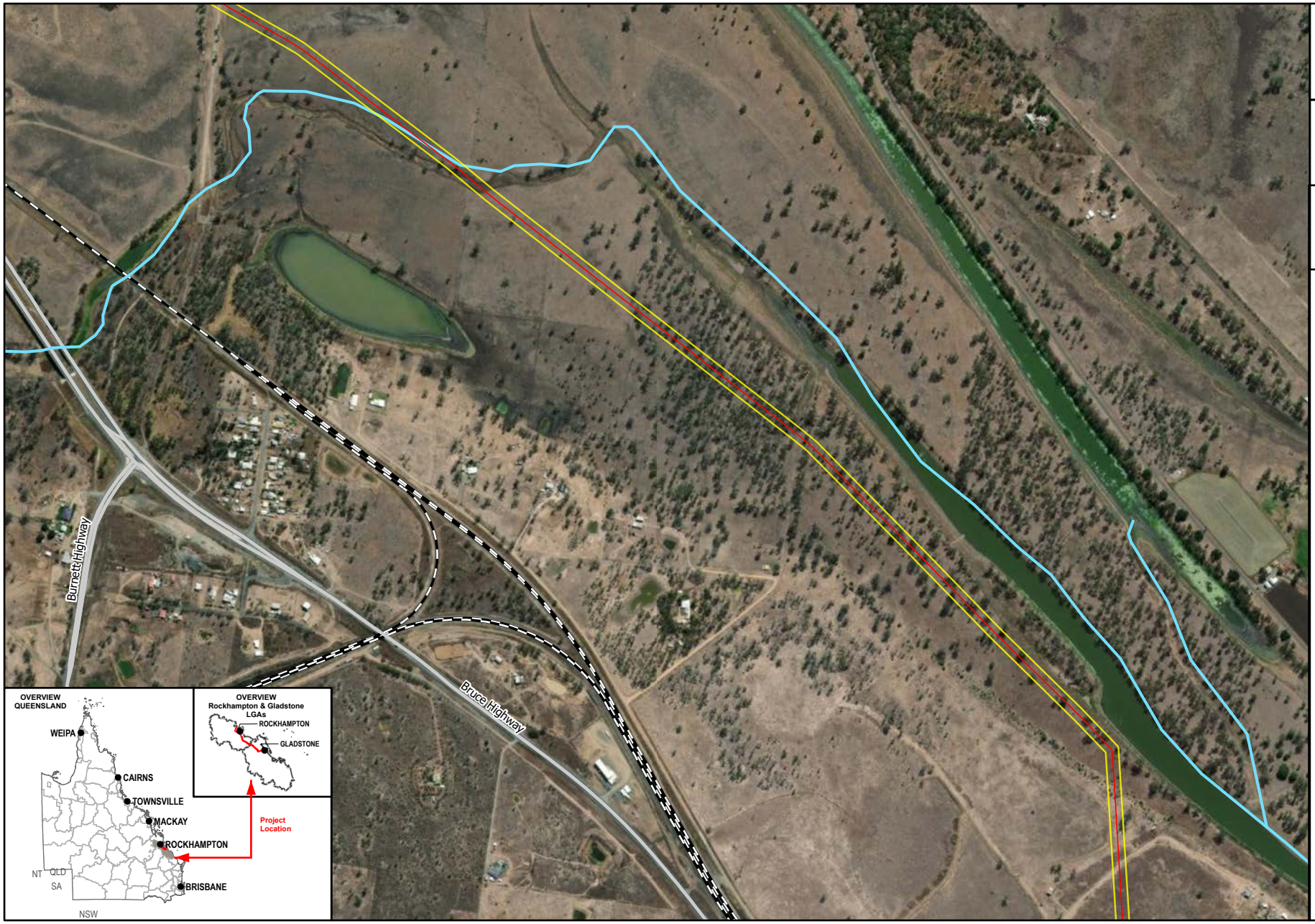

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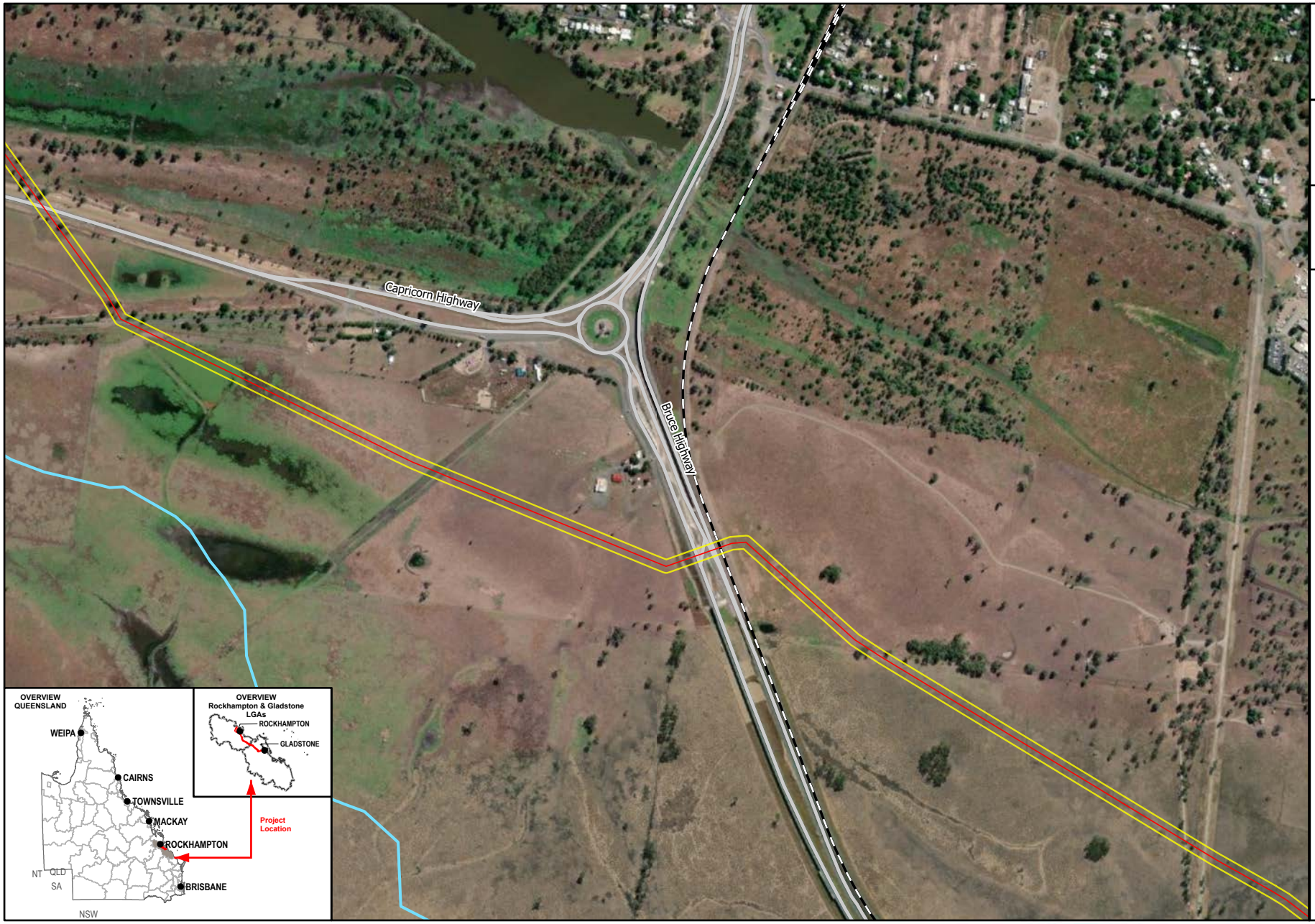

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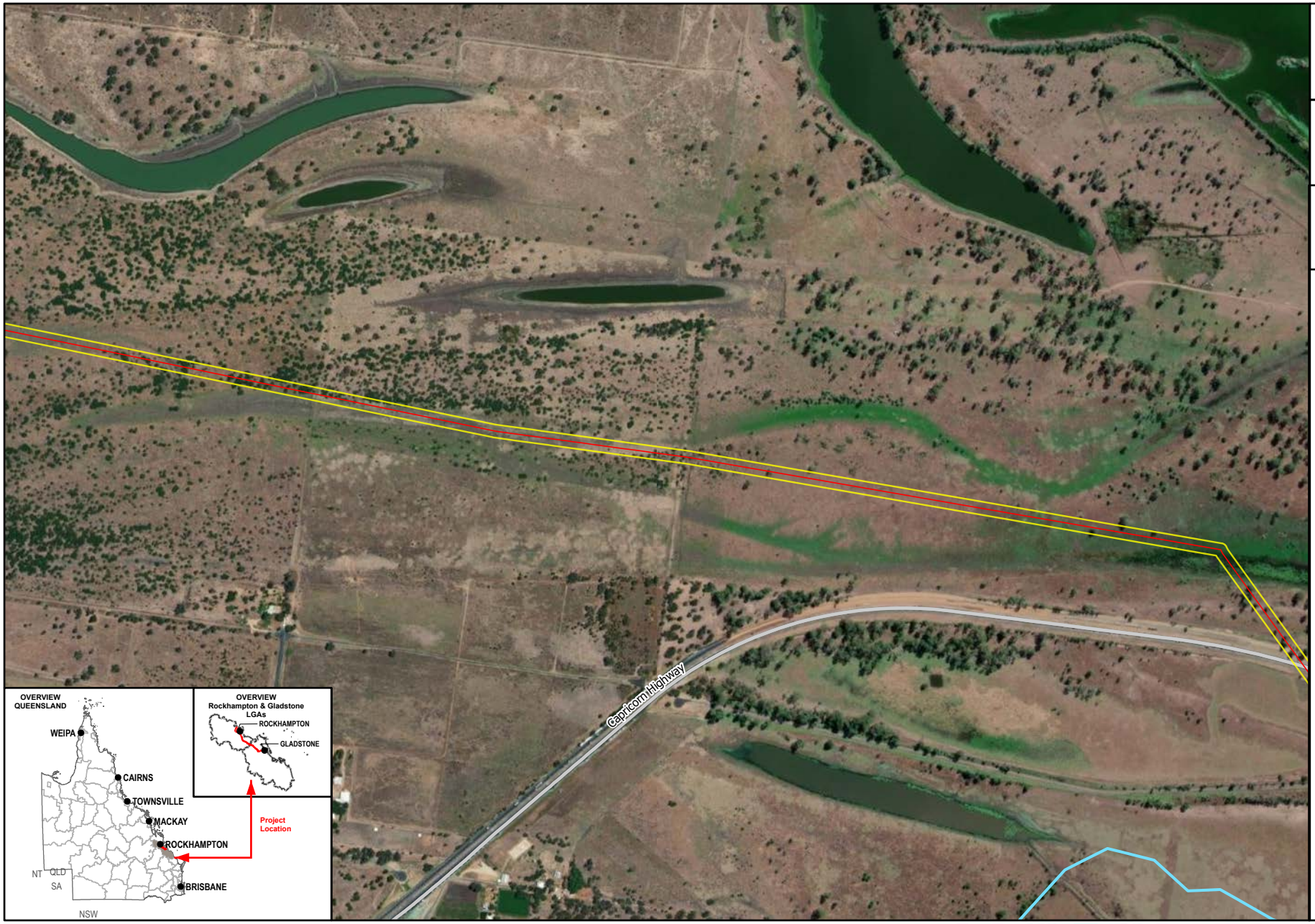

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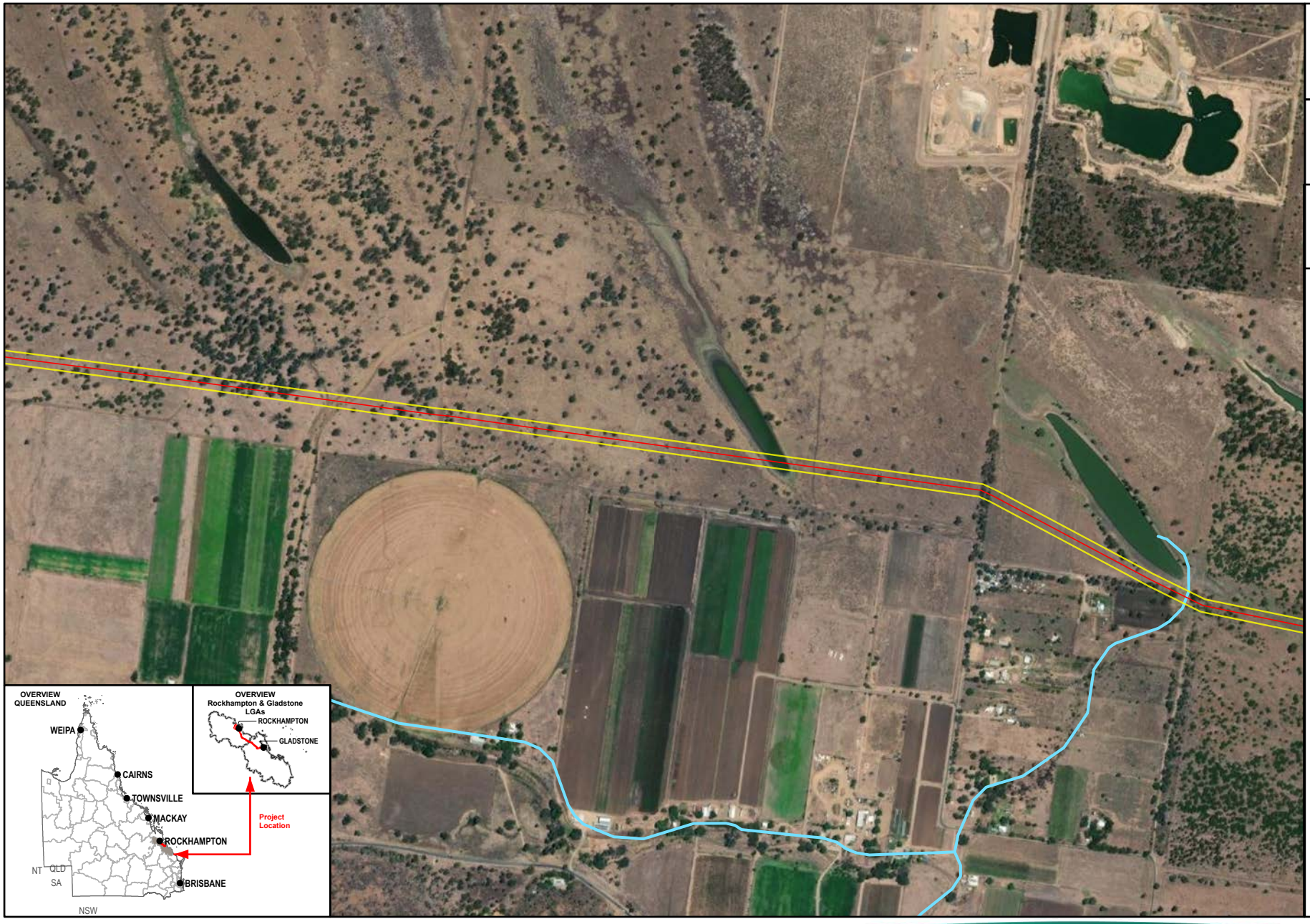

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7.2.2.15 Estuarine crocodile

Conservation status and species ecology

The estuarine crocodile is listed as marine and migratory under the EPBC Act and vulnerable under the NC Act. The species is found in a wide range of habitats including rivers, estuaries, creeks, swamps, lagoons and billabongs. Within Queensland, the distribution of the estuarine crocodiles generally extends from Gladstone in the south through to the Cape York Peninsula in the north and across to the border with the Northern Territory in the west. Individual estuarine crocodiles have historically been observed as far south as the New South Wales border, with occasional contemporary records in the Mary River catchment. This species is limited in their upstream movement primarily by physical barriers such as escarpments and instream water infrastructure such as dams and weirs (Cogger 2000).

Field survey results and distribution of suitable habitat

The estuarine crocodile was not recorded during field surveys but is considered likely to occur with two historic records occurring in the Fitzroy River within the desktop search extent (10km buffer). Optimal habitat also occurs within Raglan Creek (site 2) and Inkerman Creek (site 4) (Figure 7-20). Both sites are estuarine tidal creeks that connect to the Fitzroy River Delta and are considered suitable foraging and nesting habitat. Twelve Mile Creek (site 3) and Gavial Creek (site 6) contain sub-optimal habitat for the species and therefore the estuarine crocodile may occur within these waterways. Site 30 is an isolated floodplain billabong near the Fitzroy River, movement from estuarine crocodiles in and out of this billabong is able to occur during floods. The billabong contains sub-optimal habitat for the species but would be able to support a small crocodile throughout the year, not just during flood times and therefore the species may still occur at this location. All other sites surveyed along the SGIC SDA were outside the known range and did not contain suitable habitat for the estuarine crocodile.

Significant Residual Impact Assessment

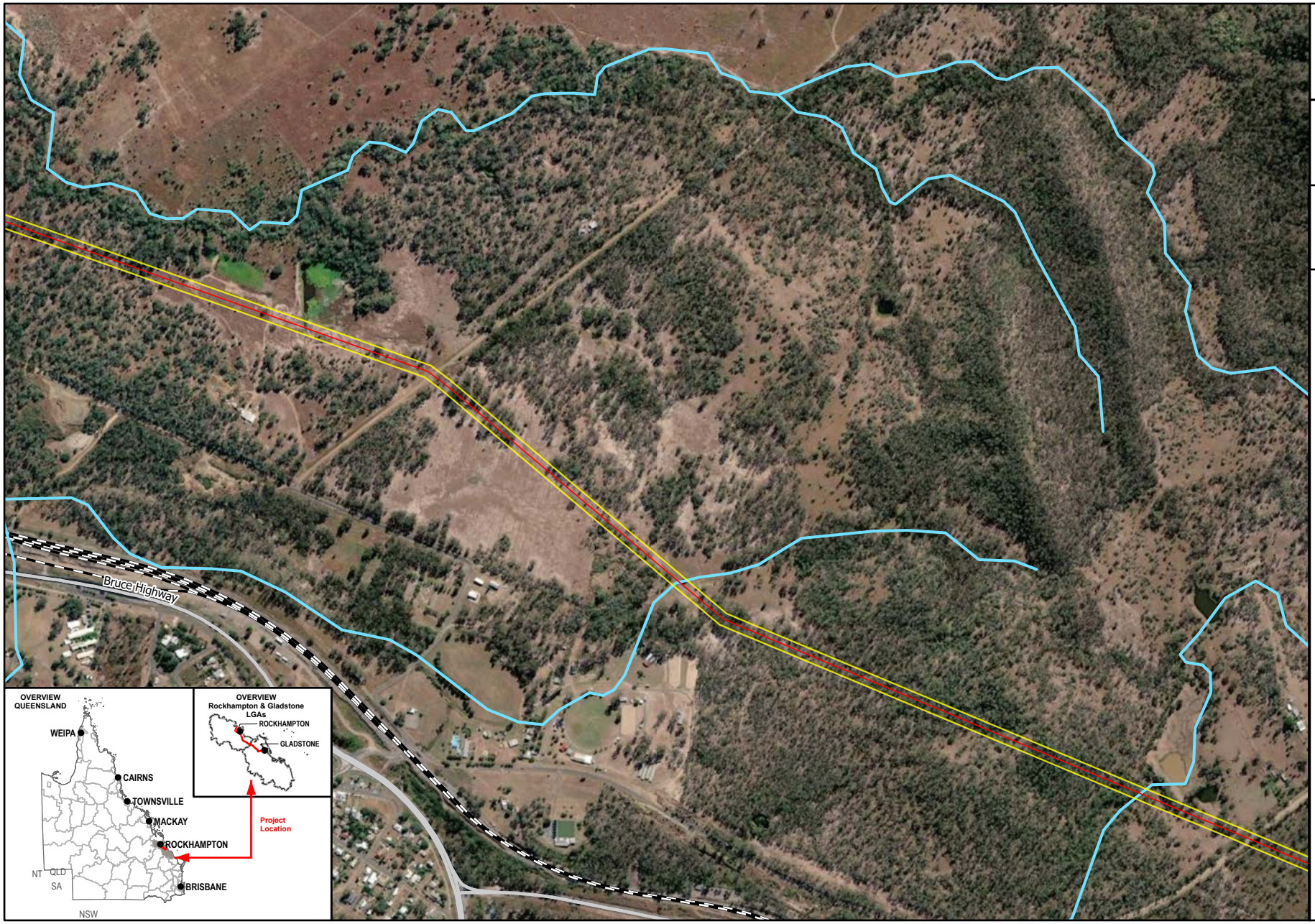
The project is unlikely to have a significant residual impact on the estuarine crocodile due to the temporary nature of the works and construction techniques that minimise disturbance of the creek bed and bank and avoid creating barriers for the creeks' connectivity. Restoration of habitat, including potential nesting banks, will also occur following construction. A significance of impact assessment of the project on the estuarine crocodile (migratory EPBC Act, vulnerable NC Act) is provided in Table 7-33.

Table 7-33 Significance of impact for estuarine crocodile

Significant residual impact criteria	Potential to occur
A long-term decrease in the size of a local population	**Unlikely** The estuarine crocodile is found in a wide range of habitats including rivers, estuaries, creeks, swamps, lagoons and billabongs. Within Queensland, the distribution of the estuarine crocodiles generally extends from Gladstone in the south through to the Cape York Peninsula in the north and across to the border with the Northern Territory in the west. This species is limited in their upstream movement primarily by physical barriers such as escarpments and instream water infrastructure such as dams and weirs (Cogger 2000). The estuarine crocodile was predicted to occur within the study area due to the presence of nearby historical records and areas of suitable habitat along the SGIC SDA pipeline alignment. Sites 2 and 4 both provide optimal foraging habitat with potential nesting habitat areas. Sites 3, 6 and 30 contain sub-optimal foraging habitat and marginal breeding habitat and therefore the species may occur at these locations. Proposed works for pipeline crossing creeks include trench and trenchless methods (trenchless methods are the preferred methods for any wetted creek crossings). Any trenched works conducted within creeks will be designed for minimal vegetation removal and minimal disturbance of the creek bed and bank as far as reasonably practicable. A maximum 30 m corridor for the SGIC SDA pipeline alignment will be cleared for the trench. The impact area for all sites will be rehabilitated with bed and banks restored to pre-works profile. Loss of habitat and restricted movement will be temporary and is therefore unlikely to lead to a long-term decrease in the size of the local population.

Significant residual impact criteria	Potential to occur
Reduce the extent of occurrence of the species	**Unlikely** The estuarine crocodile was predicted to occur within the study area due to the presence of nearby historical records and areas of suitable habitat along the SGIC SDA pipeline alignment. Sites 2 and 4 both provide optimal foraging habitat with potential nesting habitat areas. Sites 3, 6 and 30 contain sub-optimal foraging habitat and marginal breeding habitat and therefore the species may occur at these locations. All works at these sites will be conducted in accordance with DAF's 'ADR for operational work that is constructing or raising waterway barrier works' (DAF 2018). The works will be restricted temporally to a small, localised area, with measures in place to avoid long-term impacts to habitat. Following construction, habitat will be restored, and operation of the pipeline will have no direct or indirect impacts on the species or their habitat. With these measures in place, it is unlikely that a reduction of the extent of occurrence of the species will occur.
Fragment an existing population	The works will be restricted temporally to a small, localised area, with measures in place to ensure fragmentation of the species does not occur. Specifically, any restriction on flow or crocodile movement will be temporary with works undertaken within a maximum of 180 days (DAF's 'ADR for operational work that is constructing or raising waterway barrier works' (DAF 2018)). Following construction, habitat will be restored, and operation of the pipeline will have no direct or indirect impacts on the species or their habitat. These measures will ensure that no fragmentation of the population will occur.
Result in genetically distinct populations forming as a result of habitat isolation	**Unlikely** The potential for habitat isolation during the construction phase of the project will occur outside of the estuarine crocodile active breeding season and will be limited to a maximum of 180 days (DAF's 'ADR for operational work that is constructing or raising waterway barrier works' (DAF 2018)). Once construction is complete, there will be no permanent barriers to crocodile movement and therefore the project is unlikely to result in genetically distinct populations forming as a result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	**Unlikely** Introduced fish species in the Fitzroy River and surrounding waterways are not known to be a key threatening process to the estuarine crocodile. The implementation of the CEMP and a Weed and Pest Management Plan will reduce the risk of introducing new invasive species or spreading existing weeds within the waterways, which could cause habitat degradation. As such, the project is not expected to result in the establishment of invasive species in crocodile habitat.
Introduce disease that may cause the population to decline	**Unlikely** There are no known diseases that this species is susceptible to or threatened by that proposed works have the potential to introduce. Therefore, it is considered unlikely that construction and operation of the pipeline will have the potential to introduce disease to the extent that the estuarine crocodile population will decline.
Interfere with the recovery of the species	**Unlikely** Relevant to the project, habitat destruction is a major threat to the species (DAWE, 2022d). Threat abatement and recovery of the estuarine crocodile is focused on the management of marine waters (DAWE, 2022d). A maximum 30 m corridor for the SGIC SDA pipeline alignment will be cleared for the trench. The impact area for all sites will be rehabilitated with bed and banks restored to pre-works profile. Loss of habitat and restricted movement will be temporary. Crocodile habitat won't be permanently destroyed, ensuring the project is unlikely to contribute to key threating processes or interfere with recovery actions.

Significant residual impact criteria	Potential to occur
Result in disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species	**Unlikely** The works will be restricted to a small, localised area around the site. The duration of works will be less than 180 days (DAF's 'ADR for operational work that is constructing or raising waterway barrier works' (DAF 2018)) and will be restricted to avoid construction during the active breeding season (wet season) of the species. Pre-clearance surveys will be undertaken prior to the construction to identify risks to individuals and breeding habitat, and a high-risk SMP prepared if required. Works to be conducted at creek sites 2, 4, 3, 6 and 30 will ensure that crocodiles cannot enter the construction zone whilst installation of the pipeline structure occurs. Following construction, habitat will be restored, and operation of the pipeline will have no direct or indirect impacts on the species or their habitat. These measures result that the project is unlikely to cause disruption to ecologically significant locations of a species.
Conclusion	Restricted movement and loss of estuarine crocodile habitat is considered minimal and temporary; therefore, the project is not considered to have a significant residual impact on the species.



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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PROJECTION UTM Zone 56
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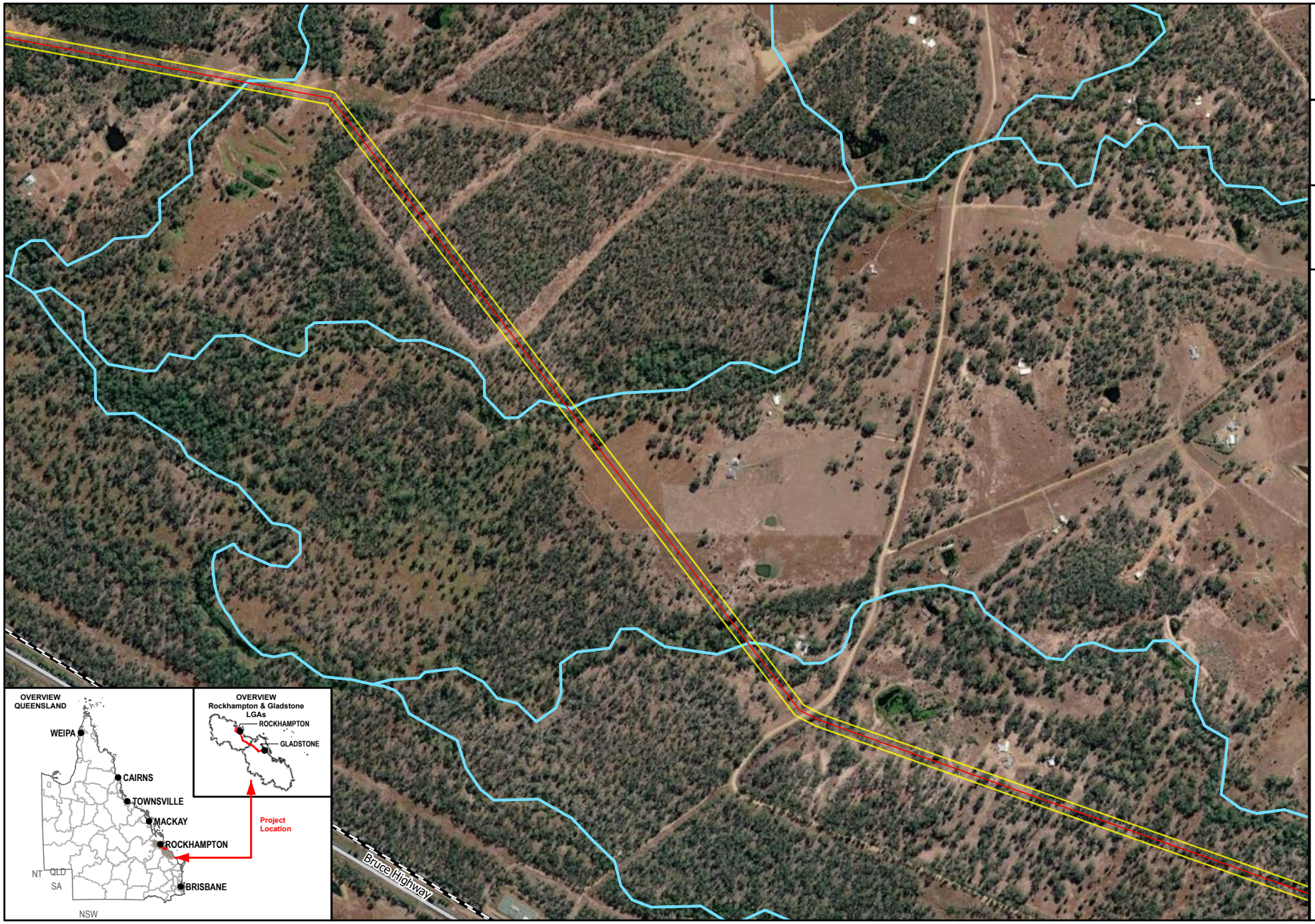
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20a
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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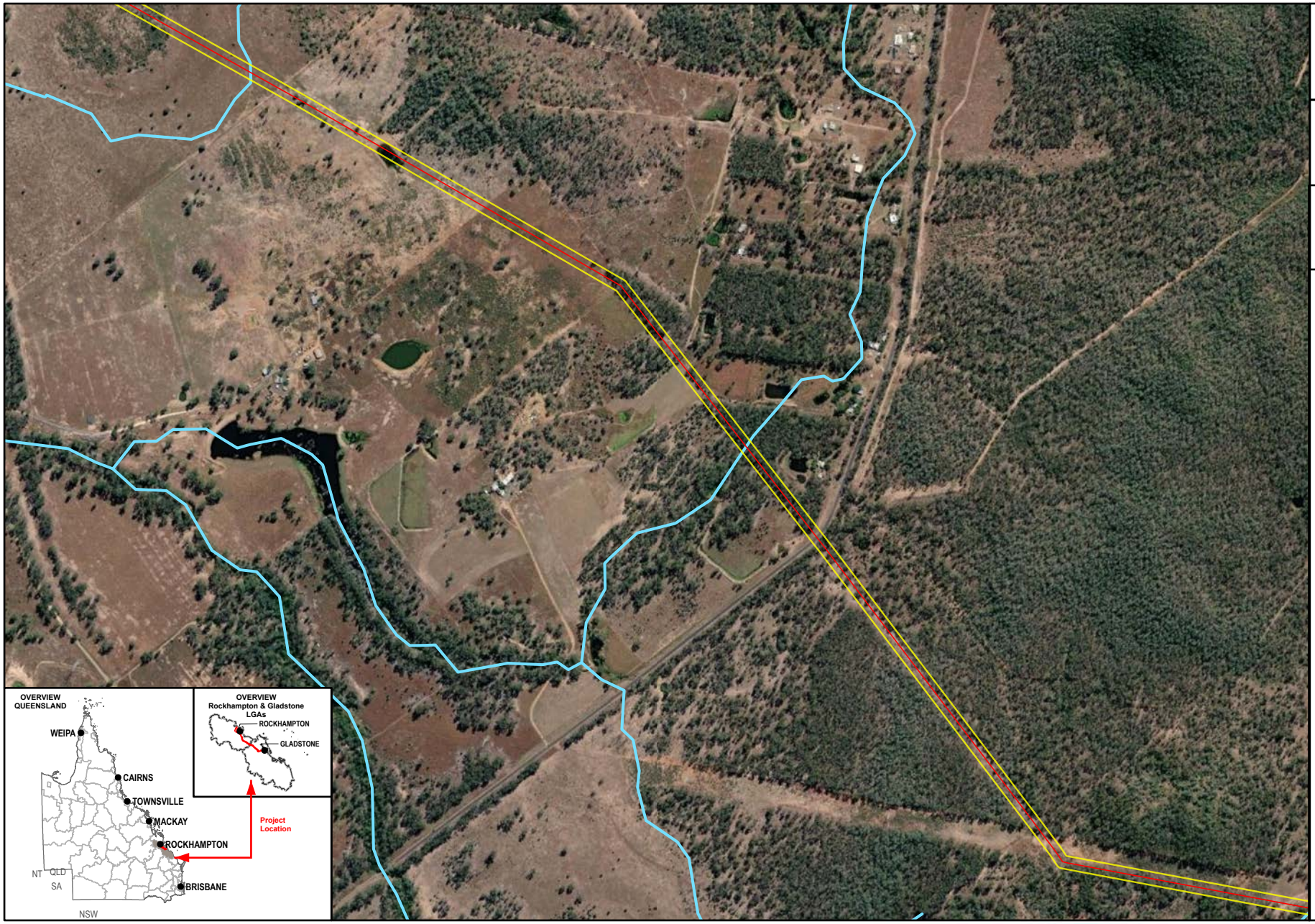
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20b
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

Data Sources:
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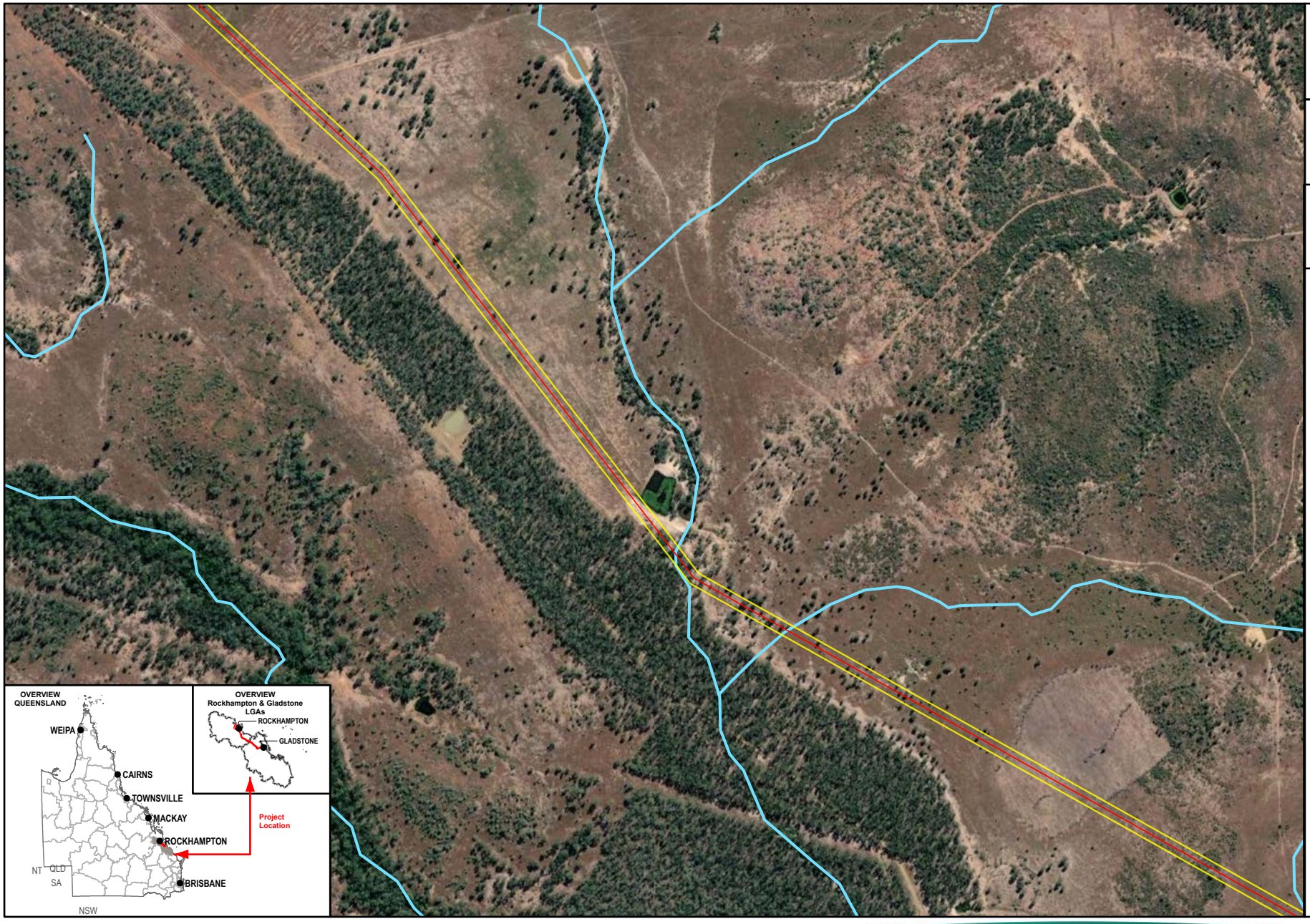
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20c
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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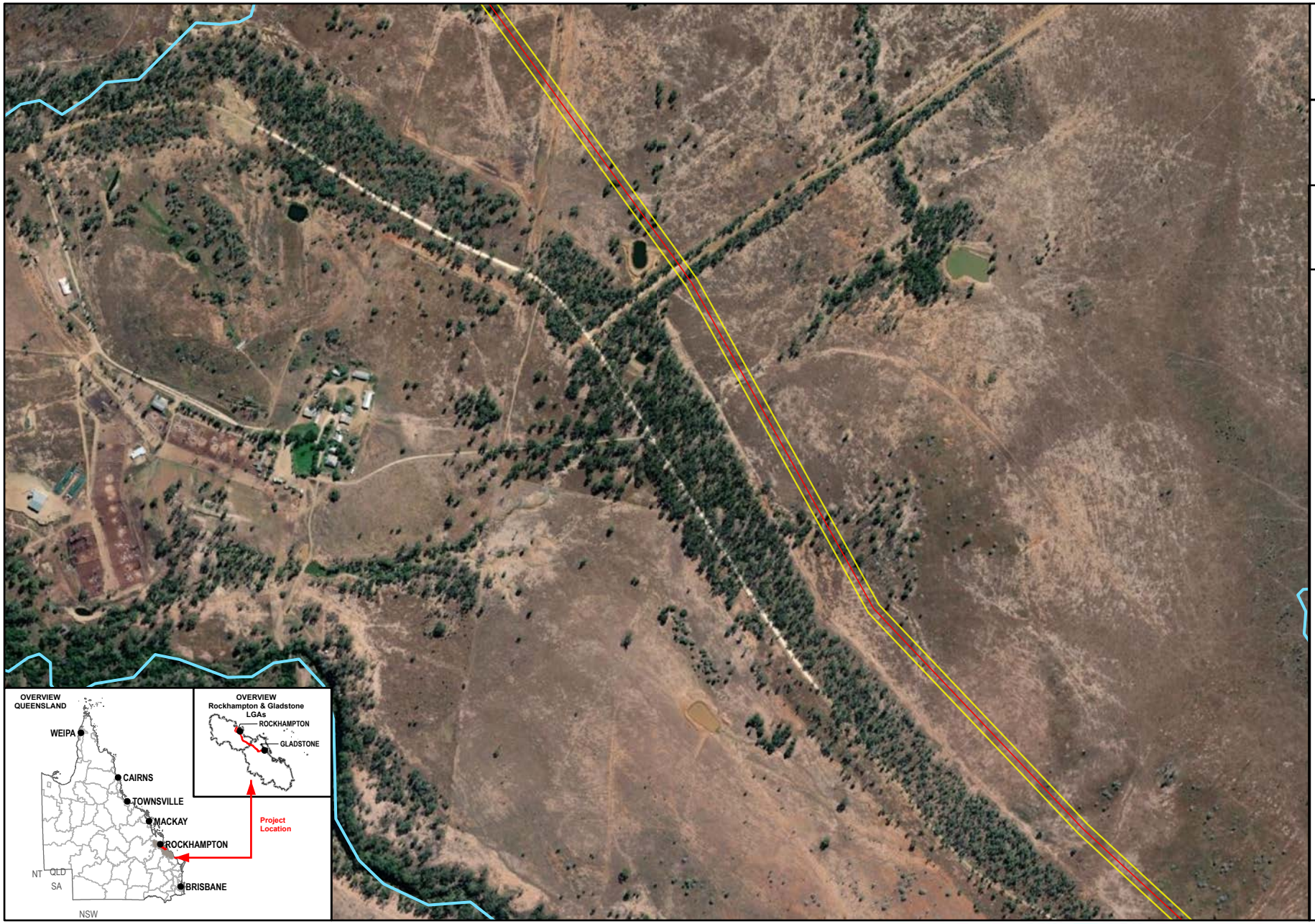
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20d
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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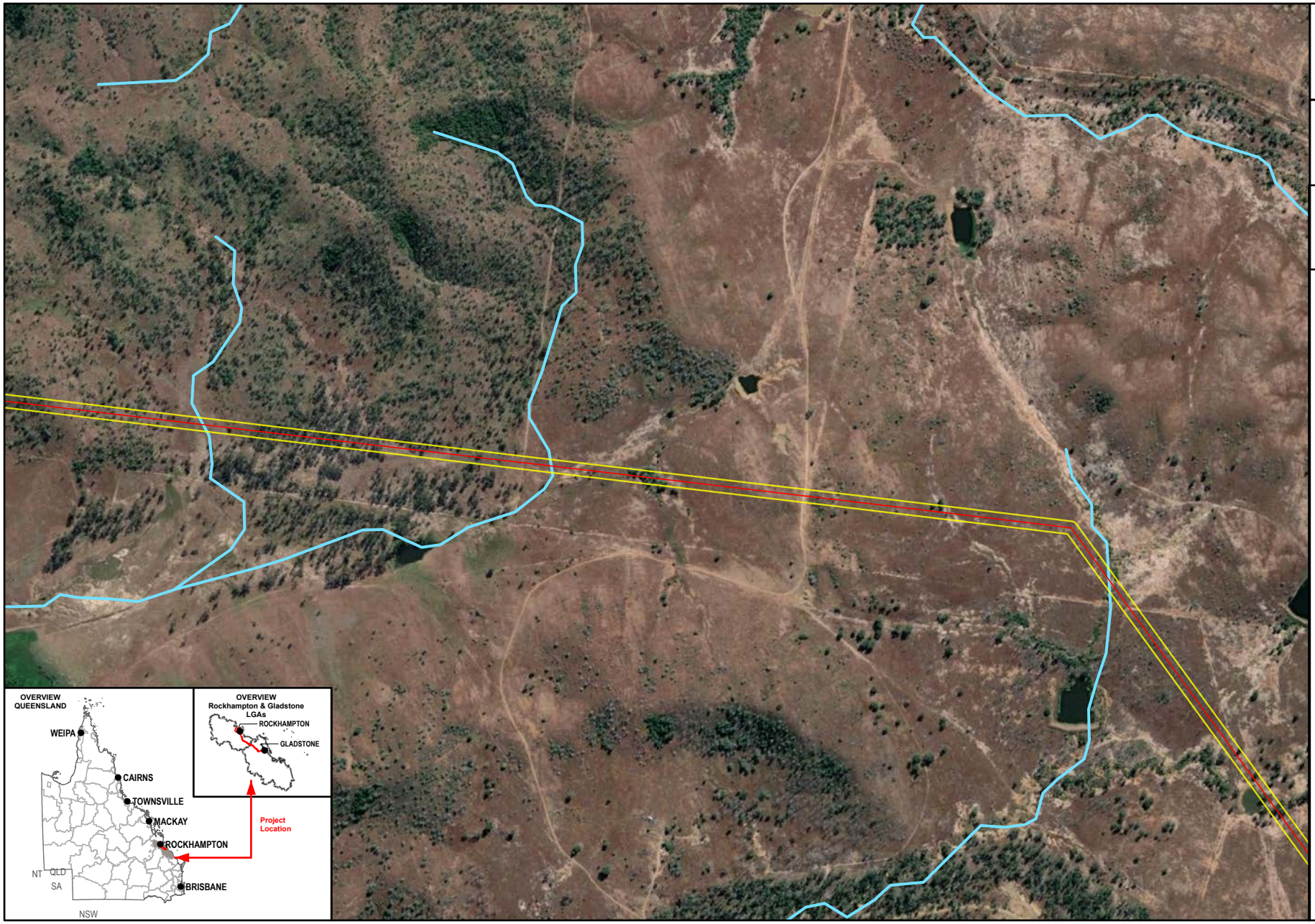
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20e
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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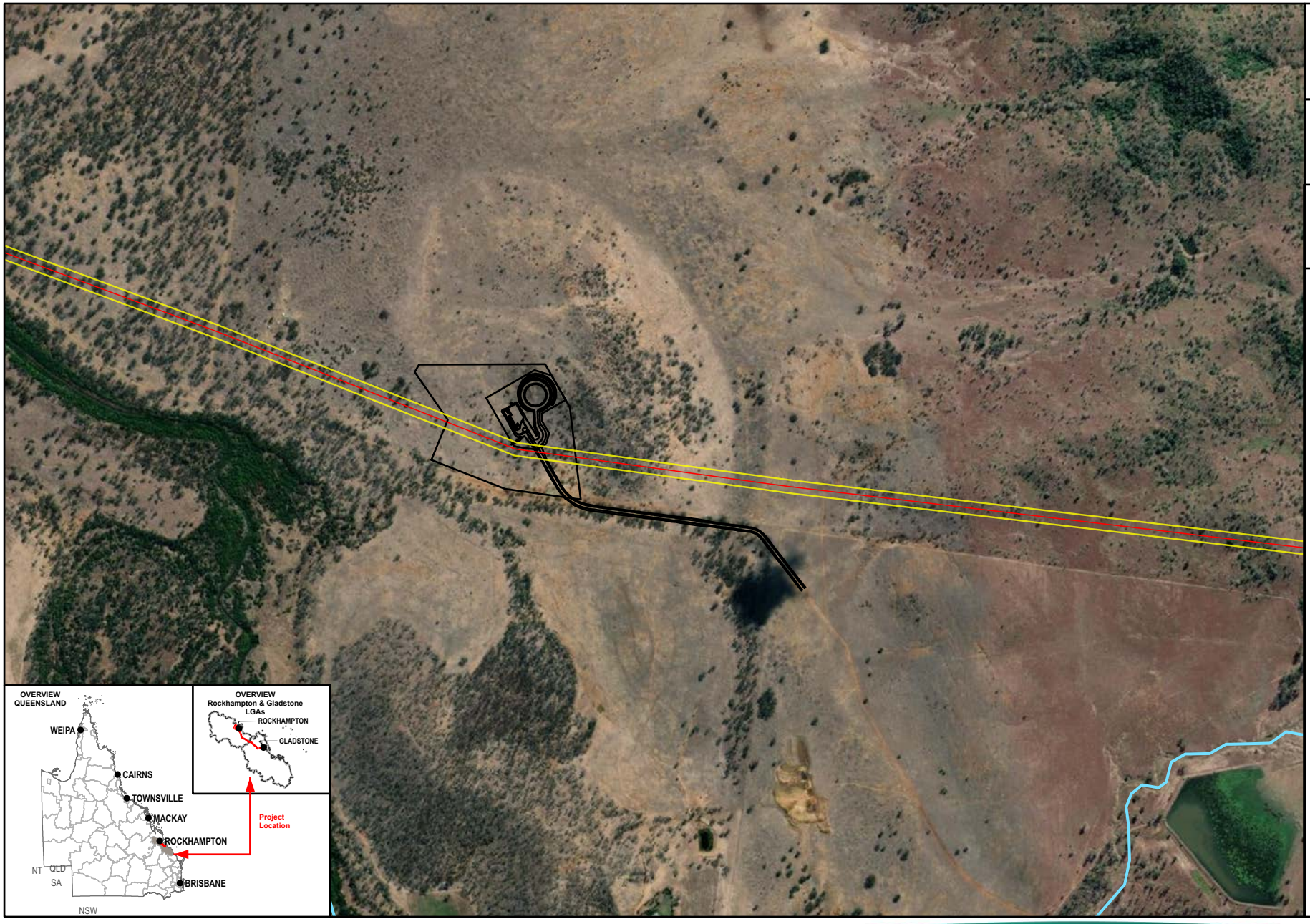
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20f
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Raglan Pump Station and Reservoir Layout
- Waterways

Data Sources:
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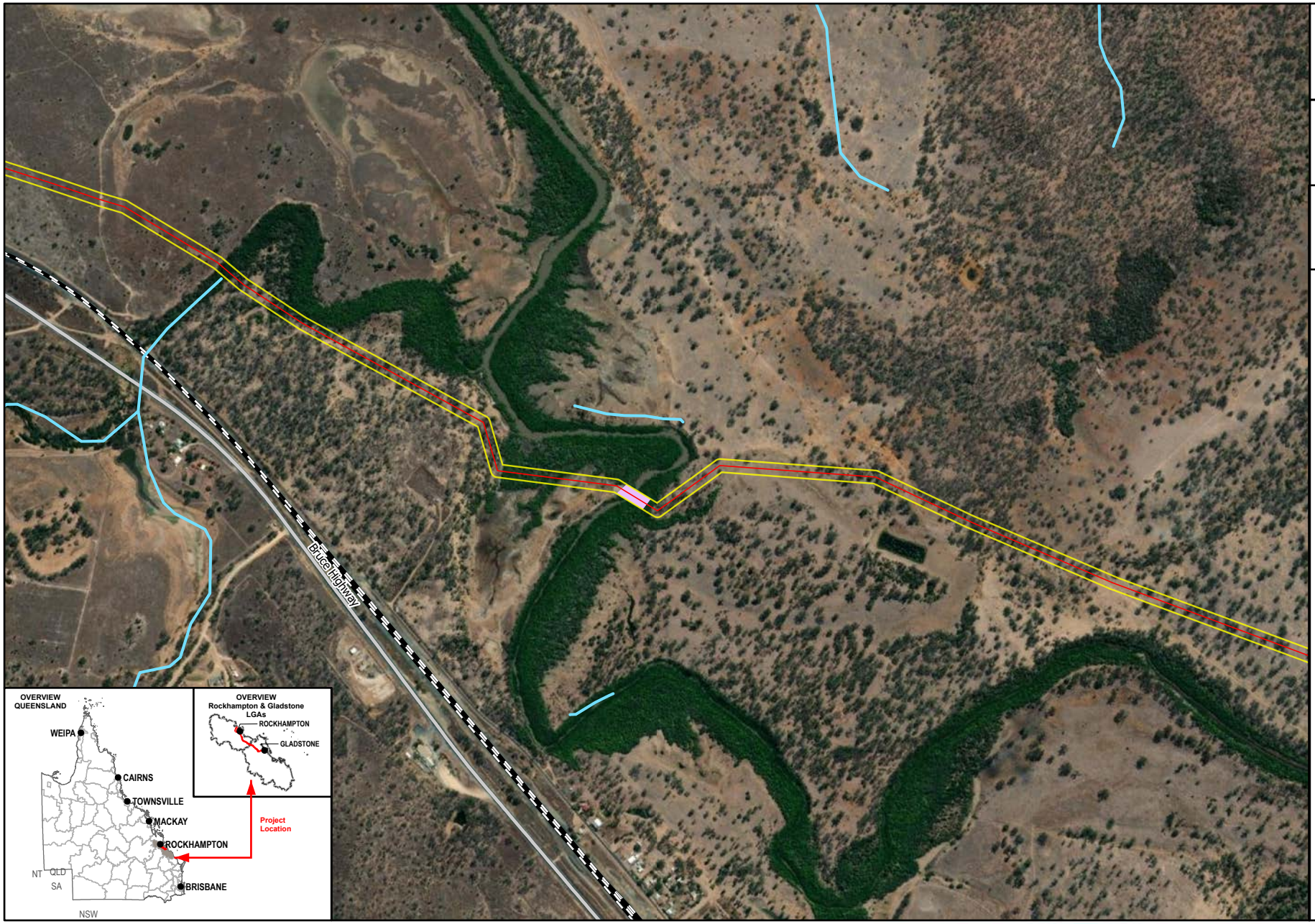
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20g
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Estuarine Crocodile Habitat
- Waterways
- Main Roads
- Railways

Data Sources:
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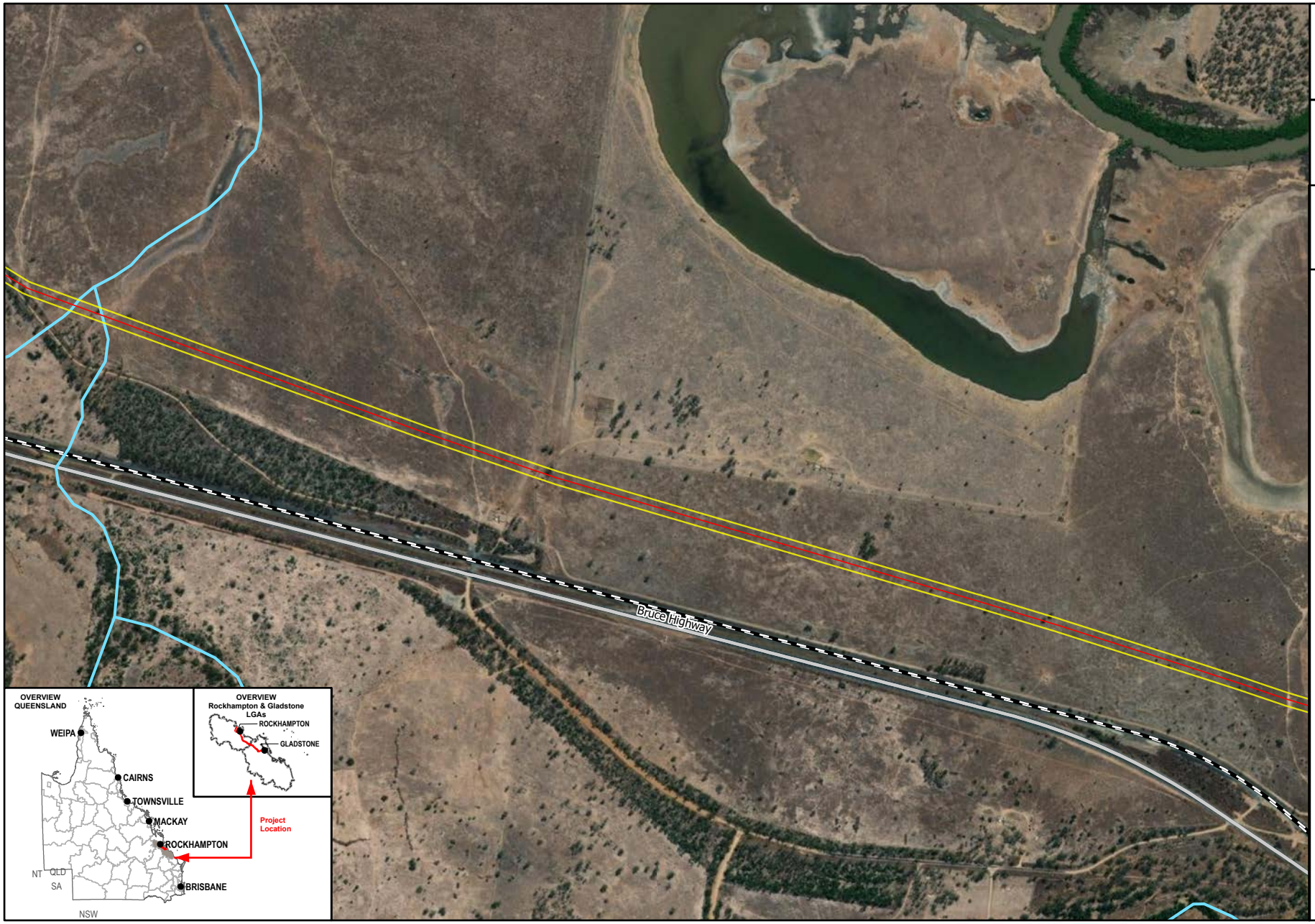
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20h
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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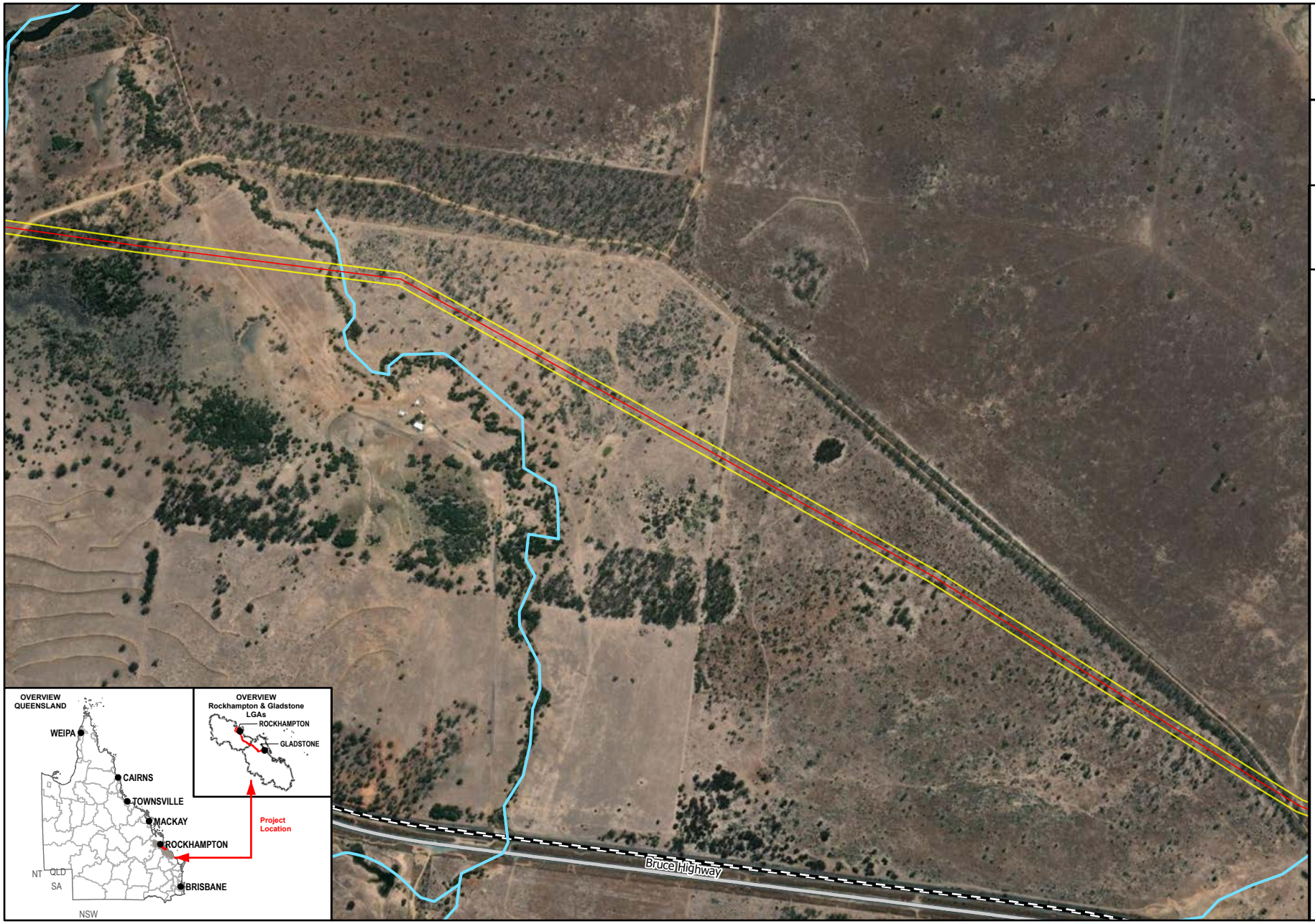
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20i
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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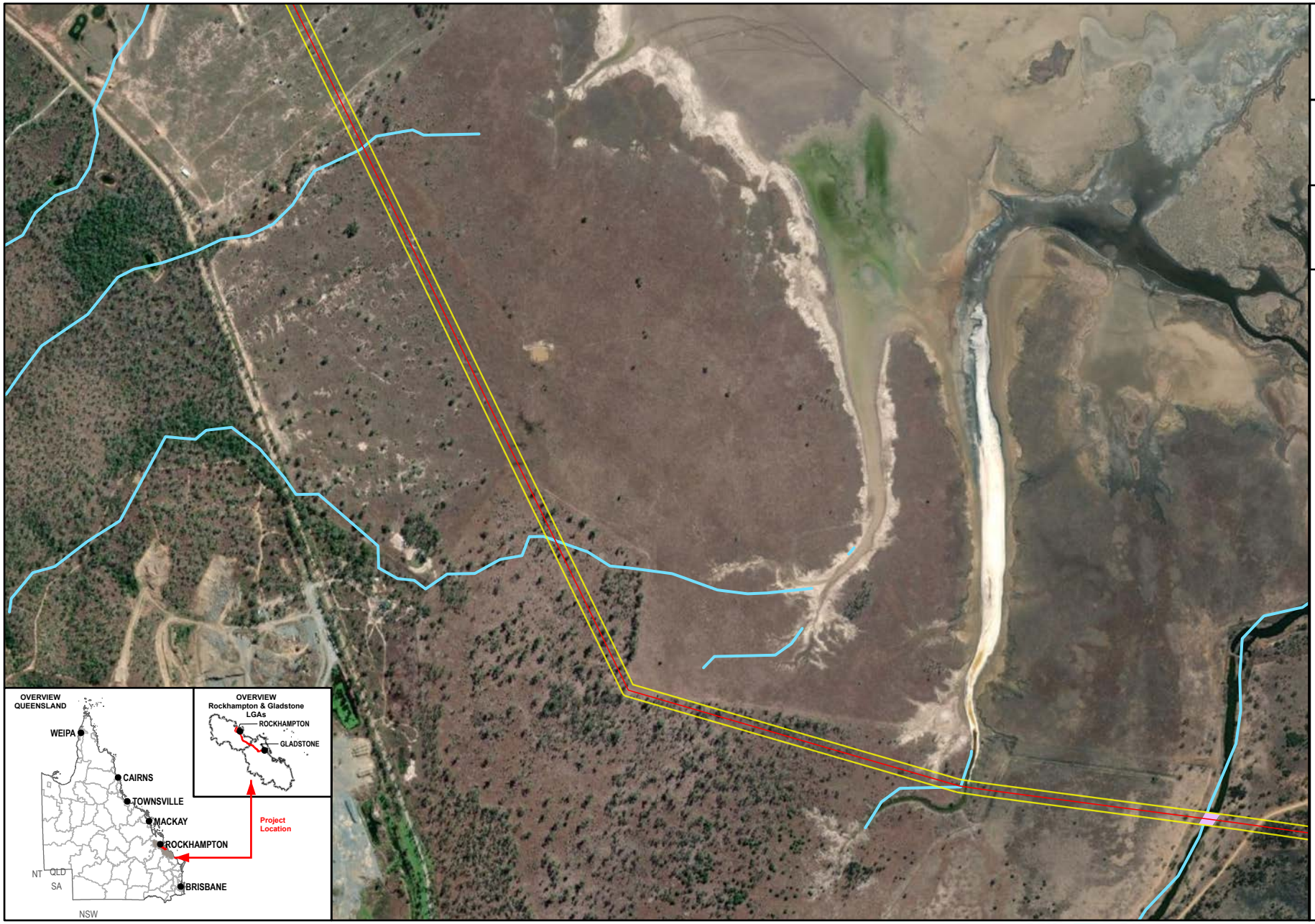
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20j
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Predicted Estuarine Crocodile Habitat
- Waterways

Data Sources:
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(Datum GDA2020)

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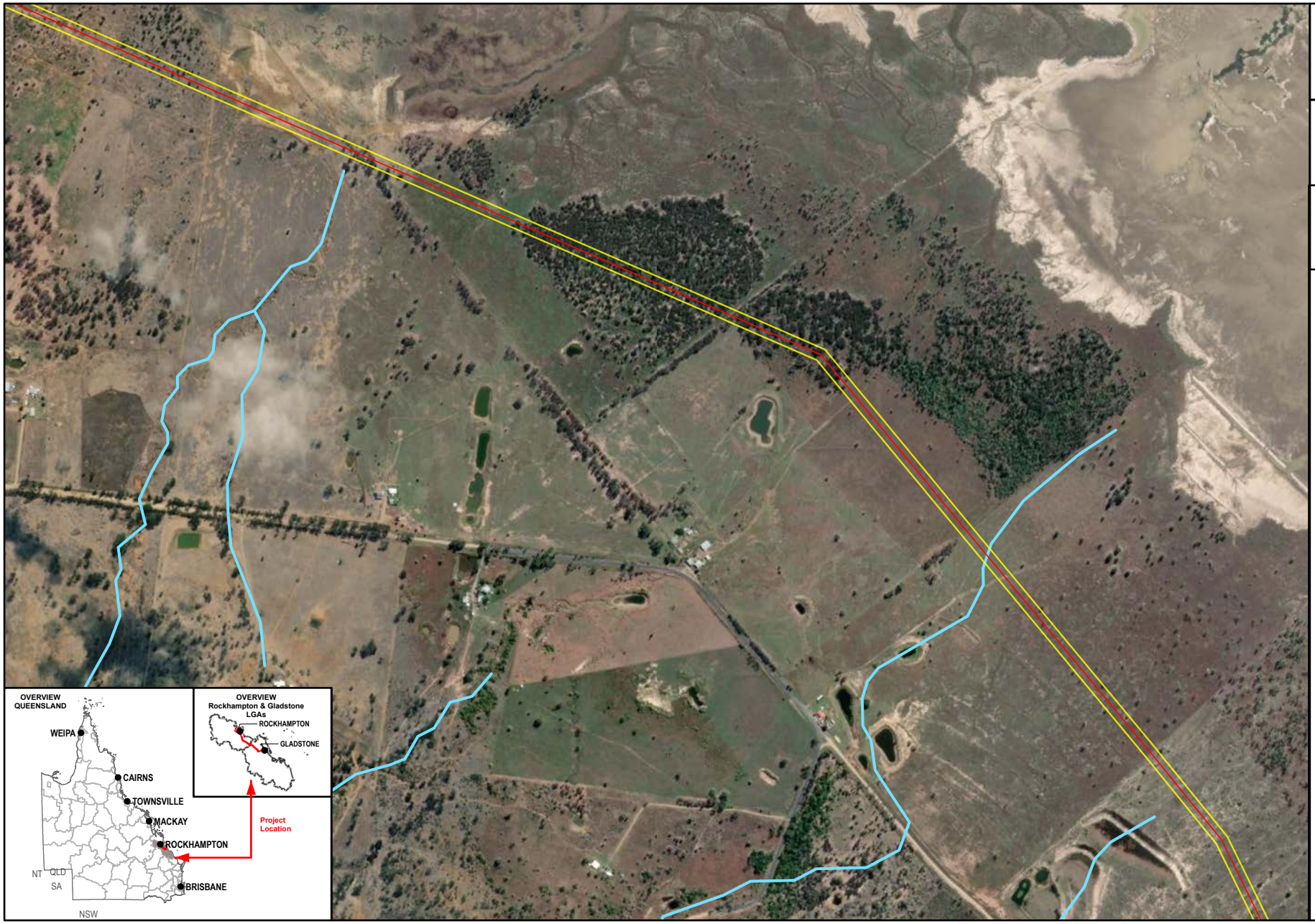
Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20k
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
- Study Area
- Waterways

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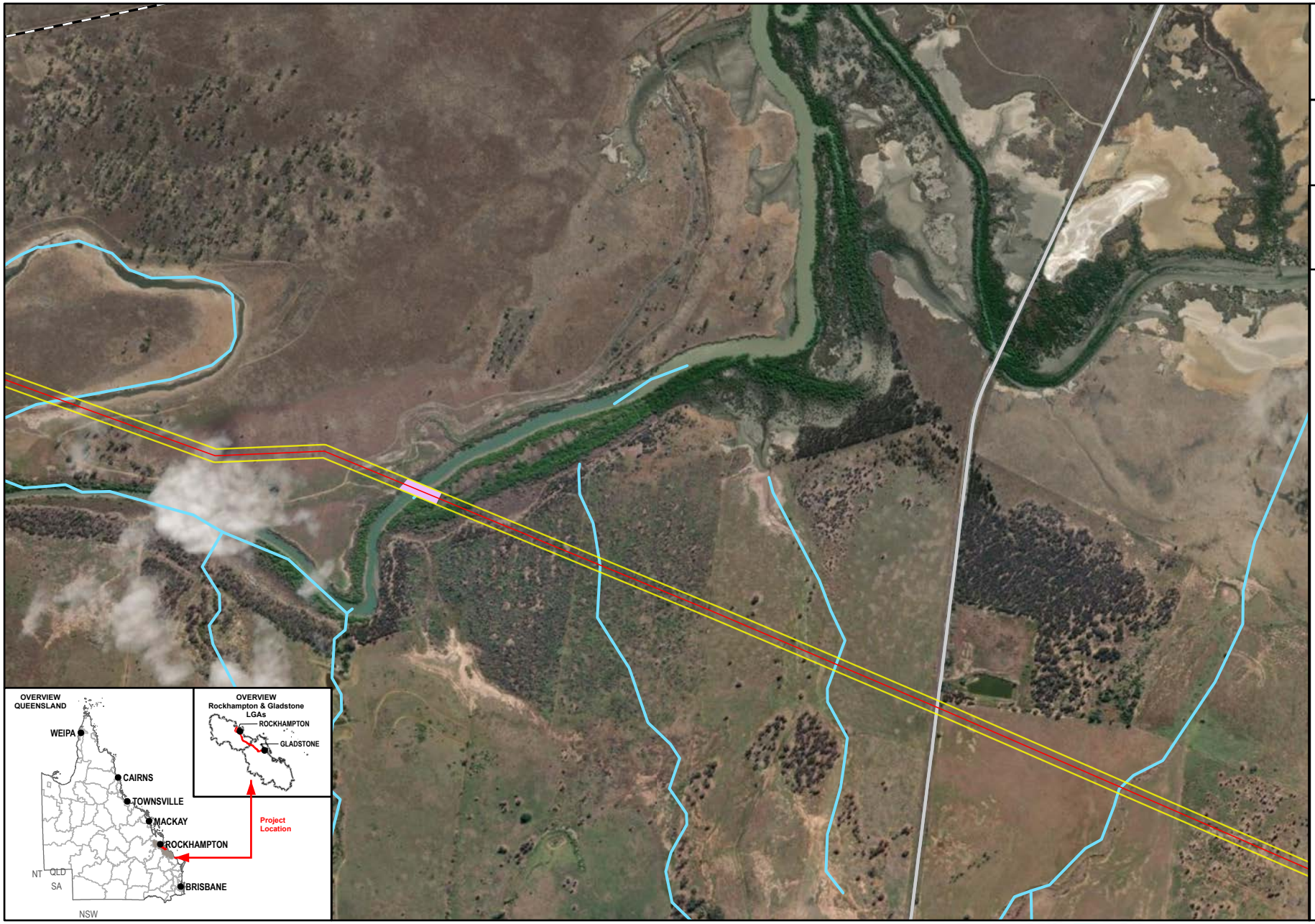
Figure 7-20l
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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- SGIC SDA Pipeline Alignment
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- Predicted Estuarine Crocodile Habitat
- Waterways
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- Railways

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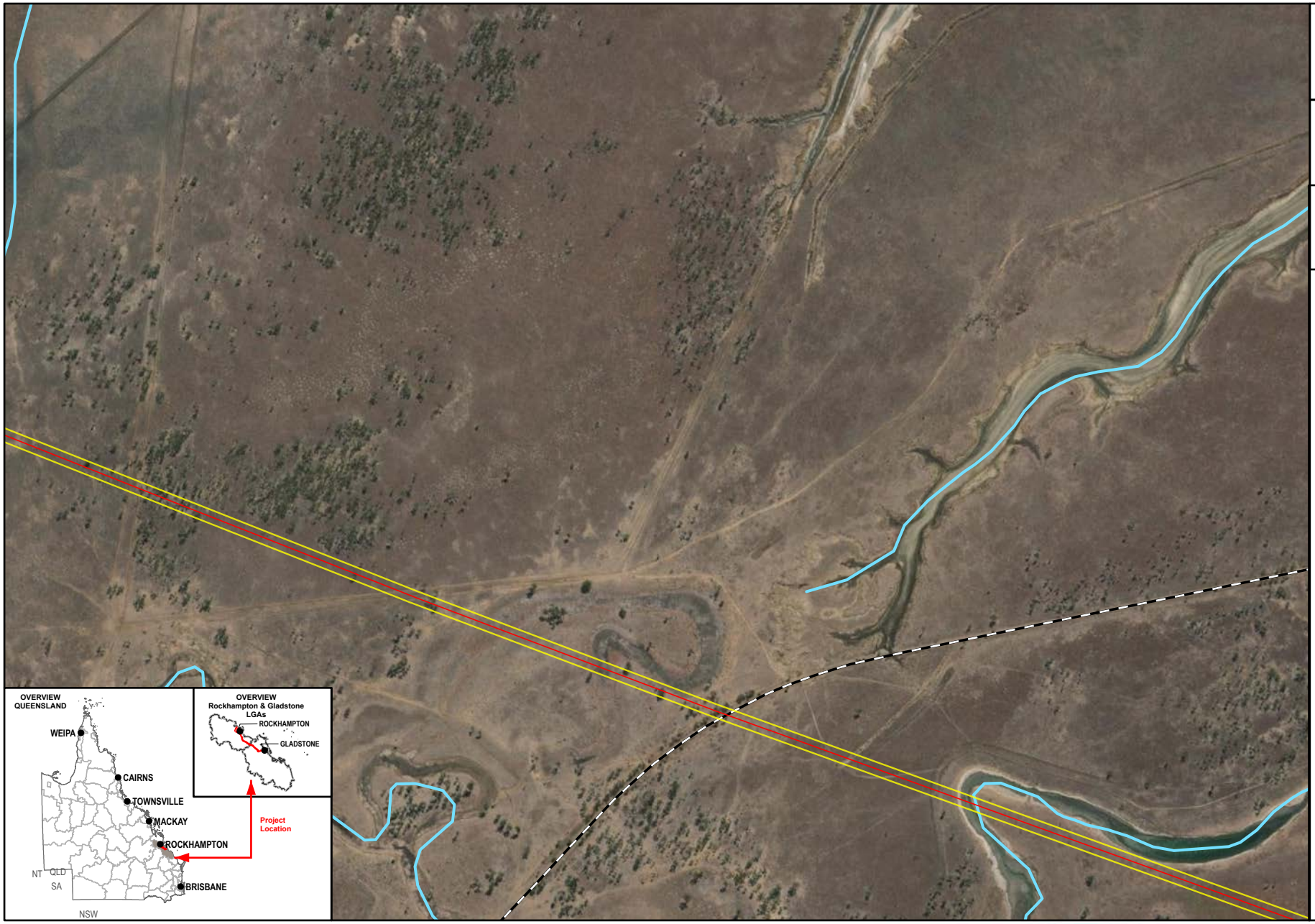
Ph: 07 4976 3000 www.gawb.qld.gov.au

PROJECTION UTM Zone 56
(Datum GDA2020)

Compiled by:YS16239

Fitzroy to Gladstone Pipeline
Baseline Terrestrial and Aquatic Ecology Technical Report
Figure 7-20m
Distribution of Estuarine Crocodile Habitat Within the SGIC SDA Study Area
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Railways

Data Sources:
1. Base Layers (Roads, waterway, locality, LGA etc) @ QSpatial, 2021
2.Imagery @ Esri, Maxar, GeoEye, Earthstar Geographics, CNES-Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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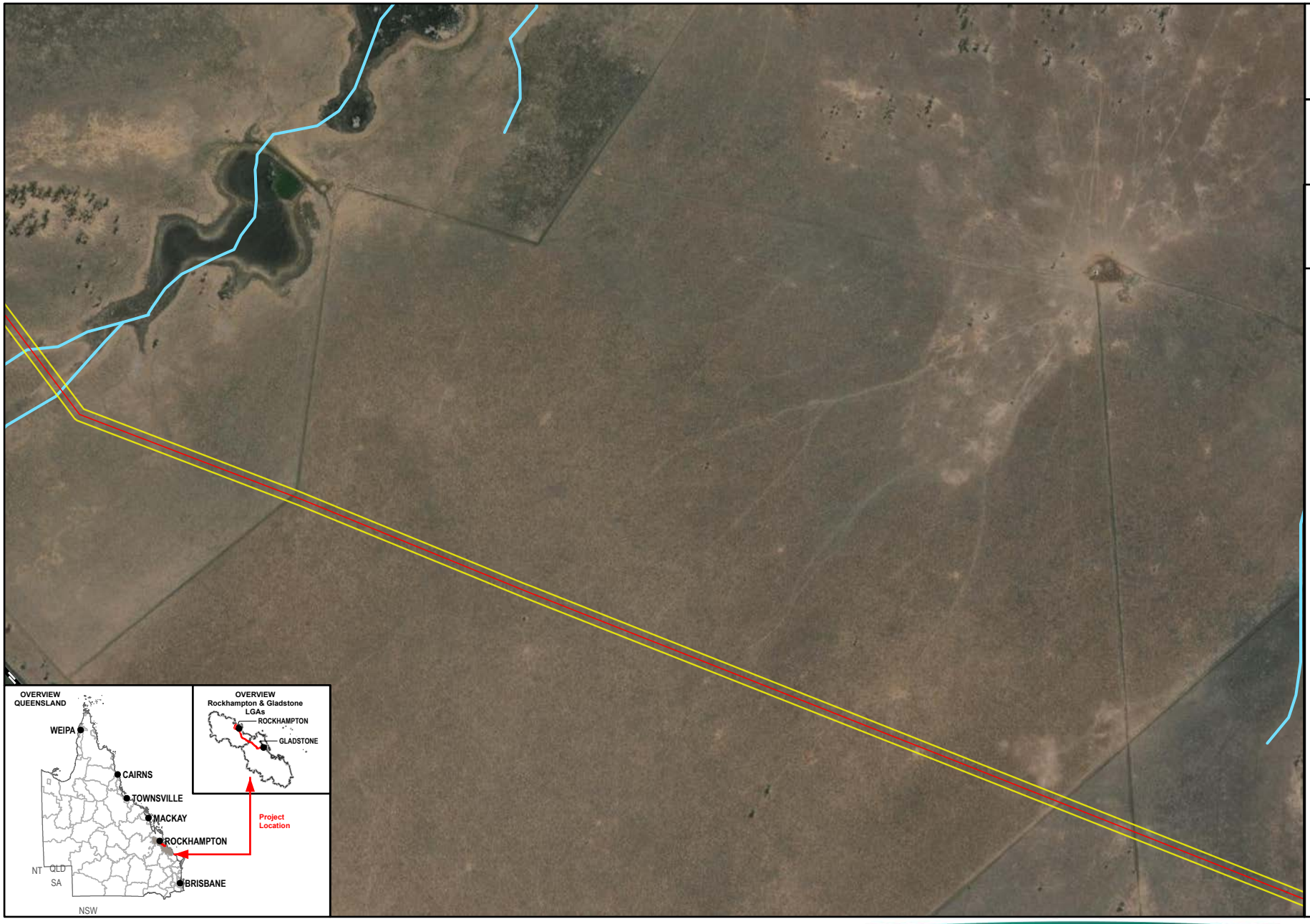

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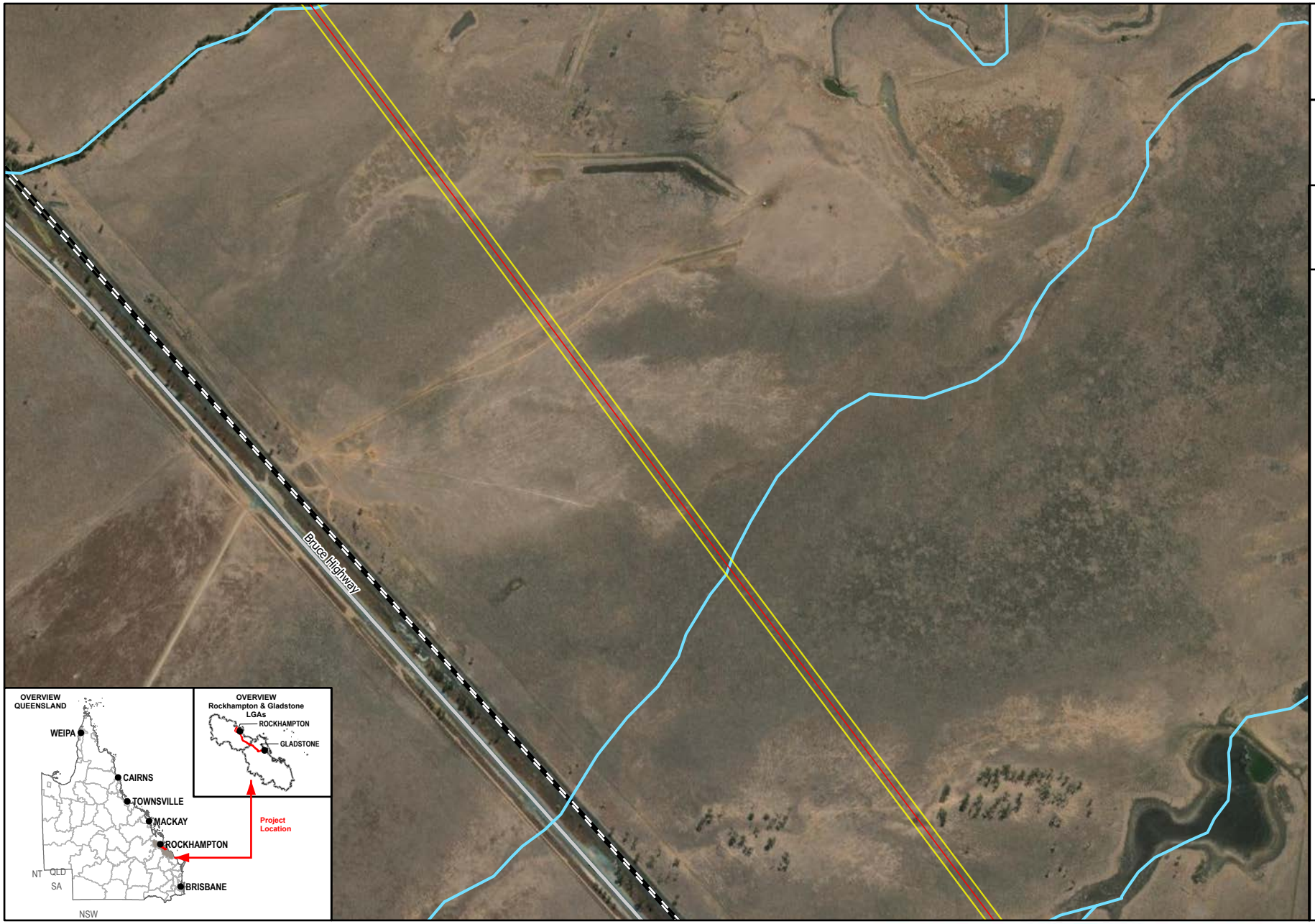

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Legend

- SGIC SDA Pipeline Alignment
- Study Area
- Waterways
- Main Roads
- Railways

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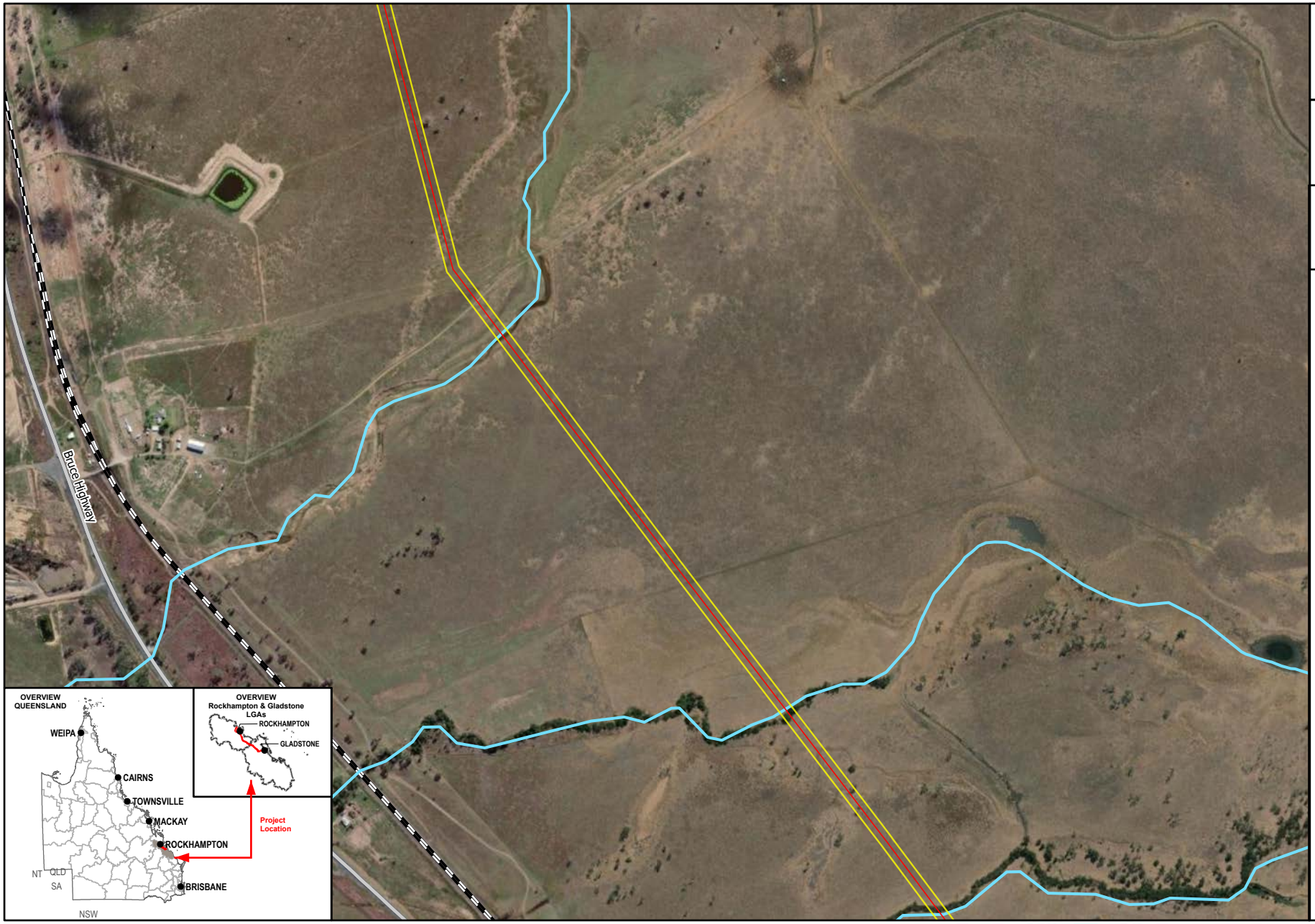

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Figure 7-20q
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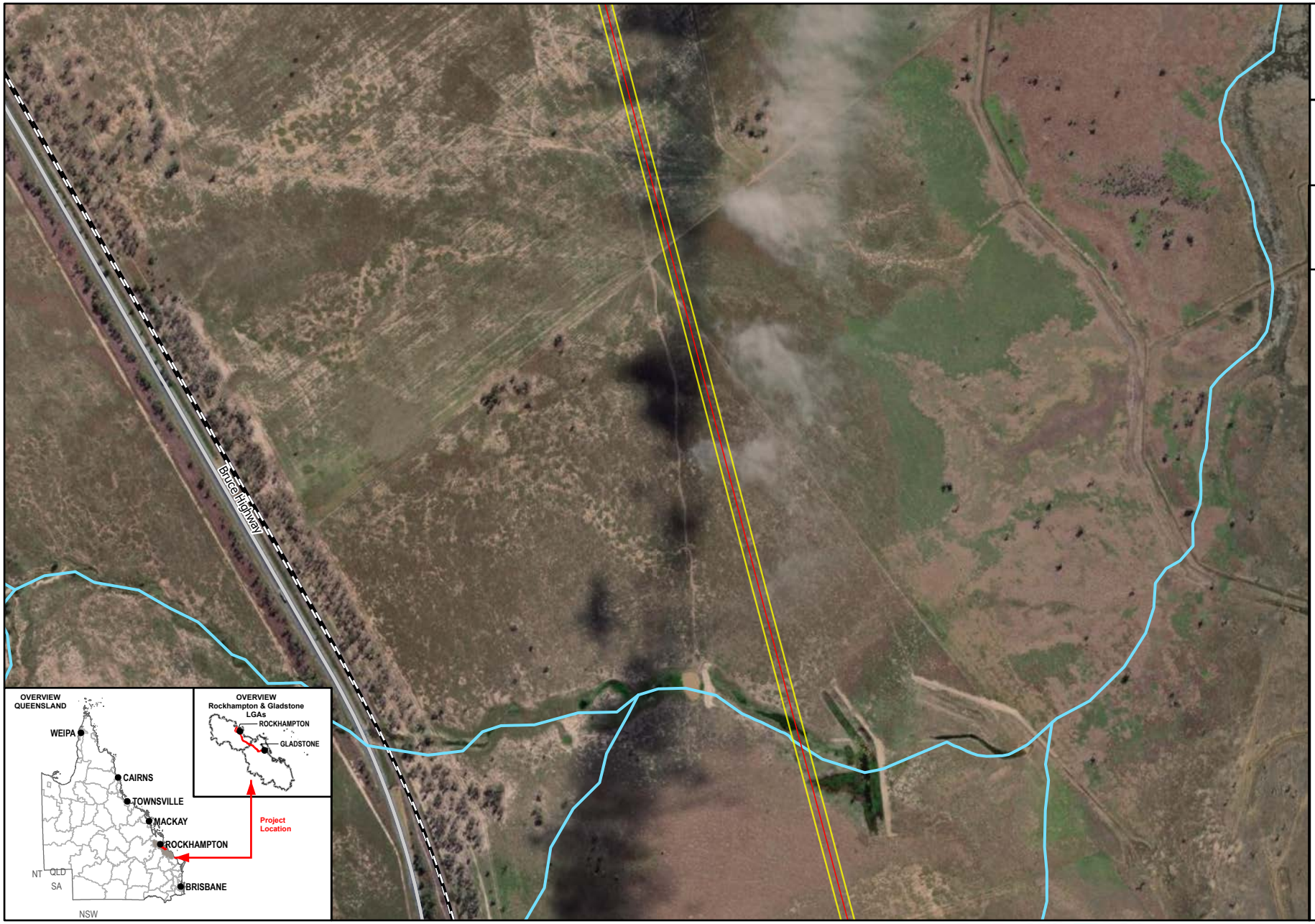
000-G-MAP-2441 Version:3 Date:20/09/2022



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Legend

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- Waterways
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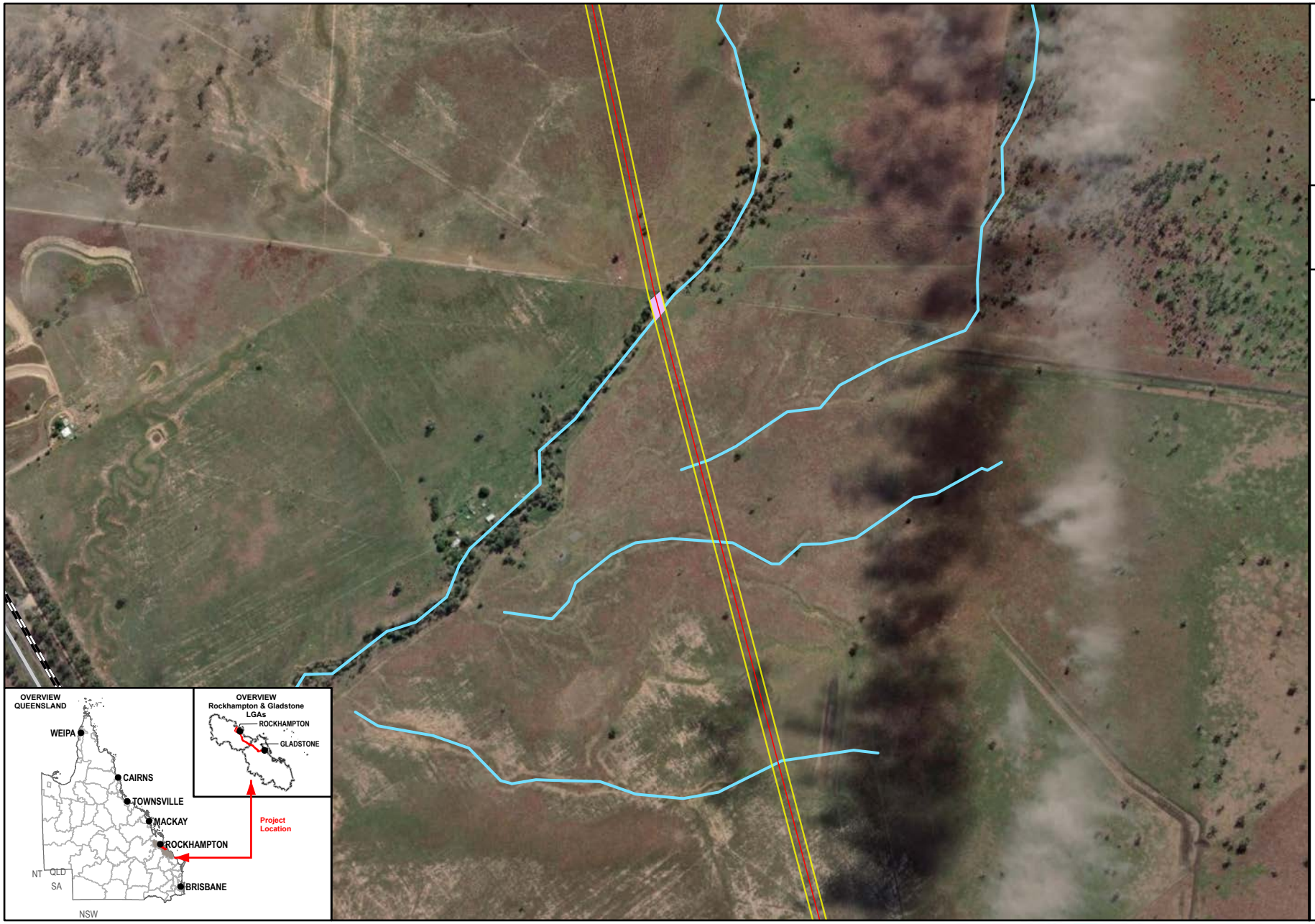

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- Study Area
- Predicted Estuarine Crocodile Habitat
- Waterways
- Main Roads
- Railways

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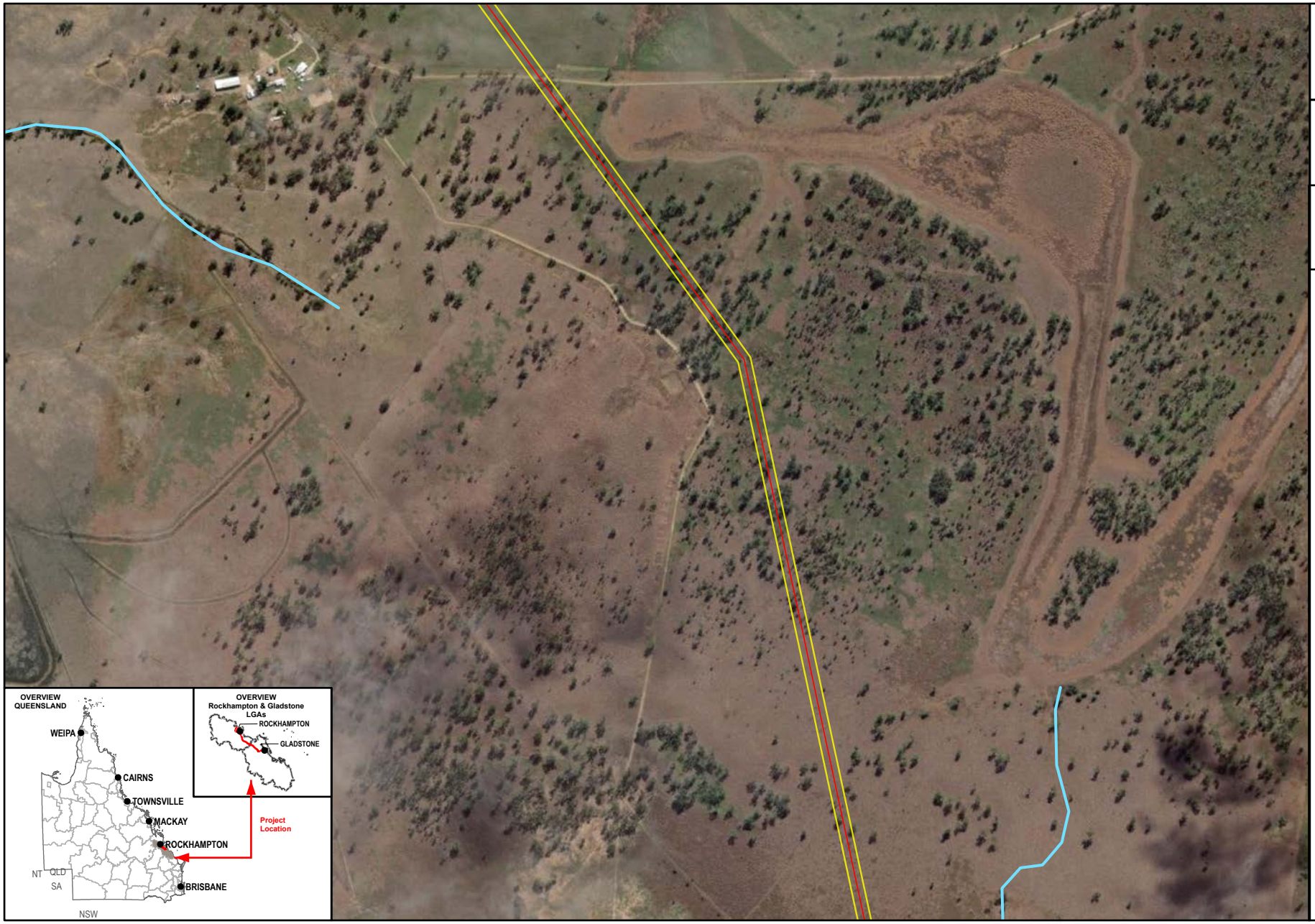

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