

APPROX. 21μ PAE DRAWN
 MIGHT BE NEEDED IF SPACING IS TOO CLOSE

4μ SOD PAD

~1500 PROTECTION

~500

BASE MOUNTED PACE
RAISED PAD SOLDER

ILCD - SE - DIE



Clarence Correction Centre Transmission Line

Infrastructure NSW

Contaminated Land – Stage 1 Preliminary Site Investigation Report

Final

5 March 2019

Clarence Correction Centre Transmission Line

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Document history and status

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Executive Summary

Infrastructure New South Wales (INSW) is preparing a Review of Environmental Factors (REF) under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a new electricity transmission line (the proposal), which will provide electricity to the Clarence Correctional Centre (CCC). The proposal is to be located around one kilometre to the east of Grafton, NSW, within the Clarence Valley local government area (LGA).

The proposal involves the construction, operation and maintenance of a new 12.5 kilometre, 132 kilo-volt electrical transmission line to be established between the existing TransGrid transmission line to the west and the Correctional Centre's new substation to the east.

This Contaminated Land Stage 1 Preliminary Site Investigation (PSI), has been revised and finalised following a realignment of the proposal identified in early 2018 to avoid impacts to Aboriginal heritage. This PSI has been prepared to support the preparation of the REF required under Division 5.1 of the EP&A Act and has been prepared in accordance with the following legislation and guidelines:

- *Protection of the Environment Operations (POEO) Act 1997.*
- *Contaminated Land Management Act 1997.*
- *State Environmental Planning Policy No. 55 – Remediation of Land.*
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2000).
- *National Environment Protection Measure (Assessment of Site Contamination) Measure 1999* (National Environmental Protection Council (NEPC), 1999).
- *Australian Standard AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).
- *Clarence Valley Council Contaminated Land Policy* (August 2015).

The proposal area is located across multiple properties. Starting approximately 500 metres west of the Pacific Highway, the transmission line alignment extends 1.6 kilometres to the east across the Pacific highway, Washpen Creek and Four Mile Lane. From here the transmission orientates south towards Clarenza, before crossing Tancreds Lane and then heading south east across the McPhillips and Glenugie Creeks and tying in with the CCC.

The proposal area has historically been used for the purpose of farming and grazing since at least 1958 and is still used for this purpose up to present day. The proposal area use has also remained consistent with the surrounding land use (agricultural/rural-residential land) over this period.

A review of historical records pertaining to the proposal area indicated a low potential for the proposal area to be significantly contaminated, within the proposed alignment. However, due to historical use of the region for the purposes of agriculture/horticulture, there remains a low probability for the proposal area to be impacted by potential contaminants of concern in localised areas. In accordance with the Clarence Valley Council's contaminated land policy and based on the historic and current zoning of the property as a rural landscape, it was determined that the likely source of any contamination on site would stem from the use of pesticides and herbicides. However, upon consideration of the findings from the site inspection and a review of available historical aerial imagery, as well as anecdotal information, it is likely that agricultural use of the proposal area has been limited to the grazing of livestock. Given the available information, it is unlikely the proposal area has been exposed to agricultural activities which would have used quantities of pesticide and herbicide sufficient to cause significant contamination risks.

With the exception of agricultural land use and a one off uncontrolled release of turbid water (October 2017) into surrounding land and part of Glenugie Creek that is located immediately west of the CCC construction site, this Stage 1 PSI has identified no other land use activities which could have potentially lead to the contamination of the proposal area or adjacent land uses. A site inspection revealed no fuel or chemical tanks (above or below

ground), imported fill material or stains present within the proposal area. Furthermore, no signs of the use or mass storage of hazardous chemicals were noted across the proposal area.

Some minor surface disturbance was observed around artificially constructed dams (i.e. stockpiles or bunds of excess soil), however these disturbances were minor and no potential contamination sources were observed within or in close proximity to these disturbances. During the detailed site inspection of the proposal area, minor occurrences of fly-tipped waste were observed within two properties. These wastes included scrap metal including part of a vehicle, corrugated tin sheeting, discarded timber, fence posts, tyres, and concrete. No evidence of staining or chemical spills was observed within the alignment or in close proximity to it. This fly-tipped waste may hold the potential to contain asbestos containing material (ACM) due to the unknown origin of the waste and given some waste was likely buried and unable to be observed.

Based on the tasks undertaken as part of the PSI process, the weight of evidence indicates that the proposal area is suitable, from a contamination perspective, for the proposed use as an electricity transmission line and no further contamination investigation is required at this stage.

This report has considered the statutory provisions of relevant environmental planning instruments and policies pertaining to the management of contamination, including the *State Environmental Planning Policy No.55 – Remediation of Land*.

1. Introduction

1.1 Background

Infrastructure New South Wales (INSW) is overseeing the delivery of a new electricity transmission line (the proposal) which will provide electricity to the Clarence Correctional Centre (CCC), currently under construction. This Contaminated Land – Stage 1 Preliminary Site Investigation (PSI) Report, a revision of the Jacobs (2018) PSI issued in August 2018, has been prepared to support the Review of Environmental Factors (REF) that is being prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 Locality

The proposal commences around one kilometre to the east of Grafton within the Clarence Valley local government area (LGA), in northern NSW, refer to Figure 1-1. The transmission line starts around 500 metres to the west of the Pacific Highway and extends 1.6 kilometres to the east across the Pacific Highway, Washpen Creek and Four Mile Lane. From here the transmission orientates south towards Clarenza, before crossing Tancreds Lane and then heading south east across the McPhillips and Glenugie Creeks and tying in with the CCC.

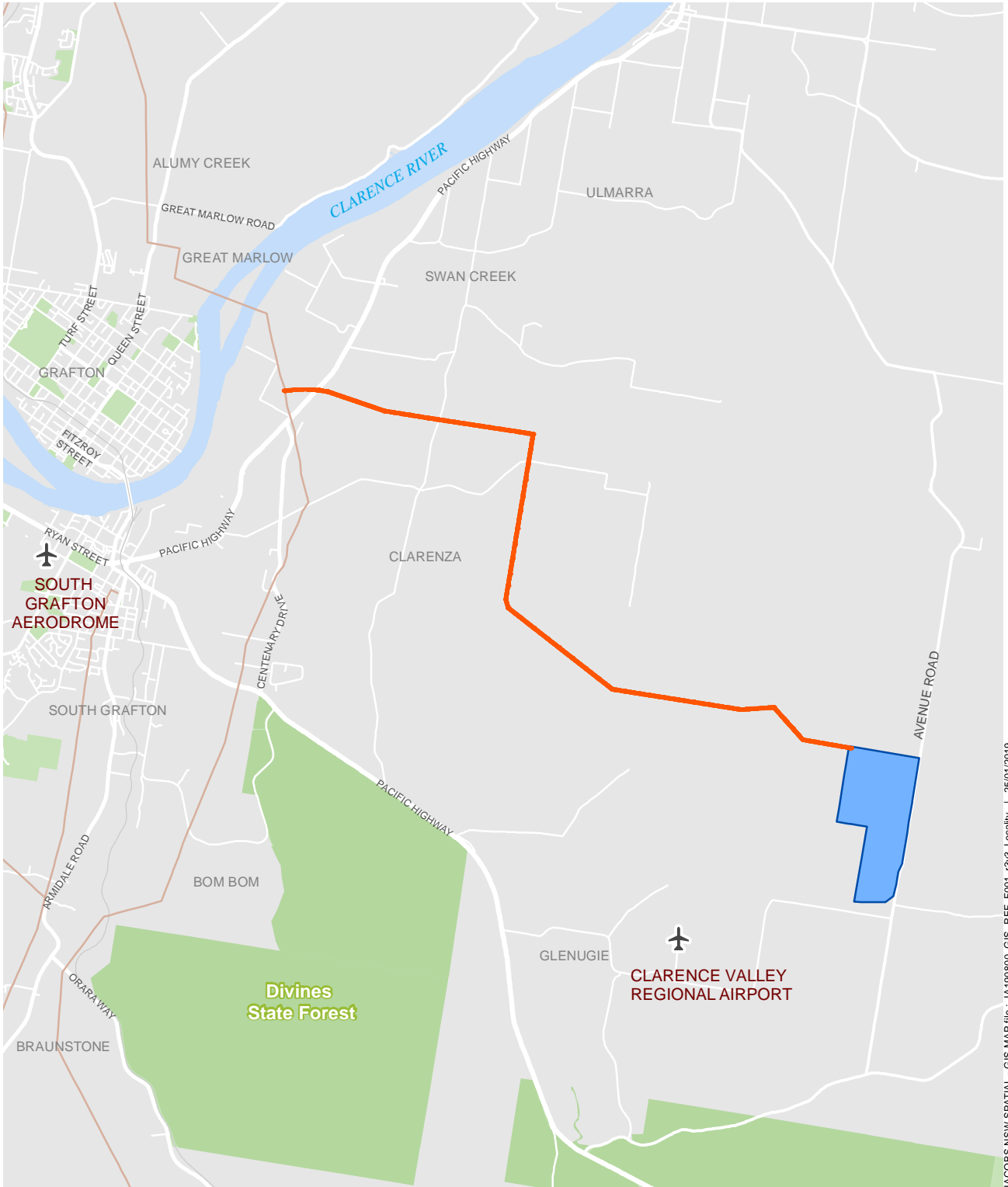
The proposal area is rural in nature, traversing a low gradient, mildly undulating landscape made up of predominantly rural/agricultural land uses. Grafton airport is located approximately 1.2 kilometres west of where the new transmission line would tie in with the CCC.

1.3 Proposal description

The proposed activity involves the construction, operation and maintenance of a new 12.5 kilometre long 132 kilovolt double circuit electrical transmission line to be established between the existing TransGrid transmission line to the west and the Correctional Centre's new substation to the east. Figure 1-2 shows the location of the proposal and access tracks are shown in Figure 1-3. At its westernmost extent it would connect into the existing 96H 132kV line that runs from Koolkhan to Coffs Harbour.

The proposal comprises:

- Approximately 12.5 kilometre of 132 kilovolt double circuit transmission line strung with a single lemon conductor and an Optical Ground Wire (OPGW) from the existing 96H transmission line Structure 339 to the new substation, including approximately 54 new structures.
- New easement clearing, construction pads, access gates, and new access tracks.
- OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
 - Splicing OPGW as required at the intersection of the new 132 kilovolt double circuit transmission line and the existing 96H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
- Removal of trees and vegetation within the 30 metre easement to enable installation of the new transmission line.
- A 100 metre investigation area around the proposed transmission line.
- Removal of 'danger trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Construction of suitable access tracks.
- Purchase of land for easements.



JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_REF_F001_r3v3_Locality | 25/01/2019

Legend

- Project locality
- Transmission line
- Clarence correctional centre
- Railway
- ✈ Airport

0 1 2km
1:90,000 @ A4

Figure 1-1 | Location of the proposal

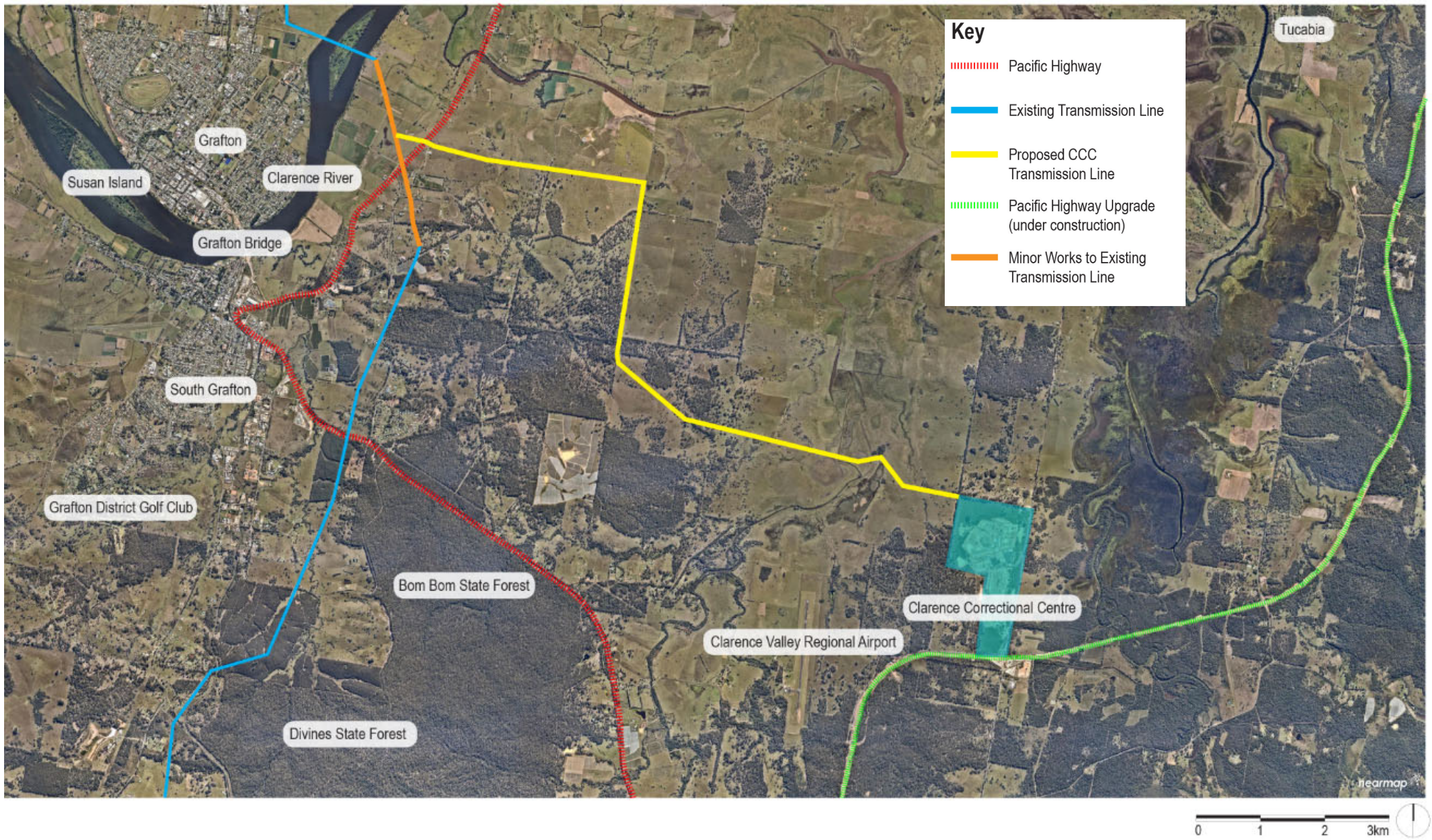


Figure 1-2 | The proposal

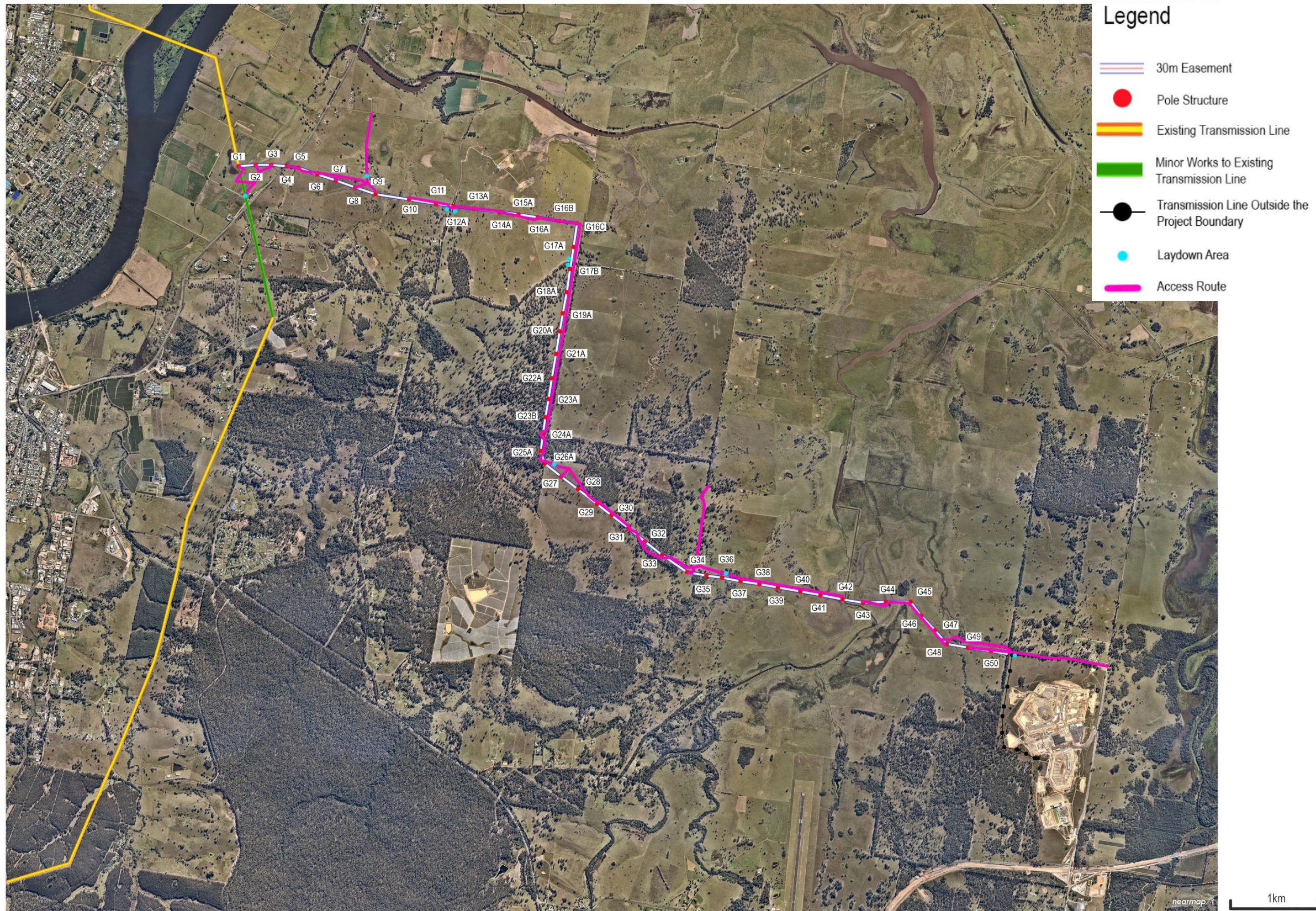


Figure 1-3 Access Roads

Ancillary works to facilitate the above works would also be required, and would involve:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys.
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials.
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment.
- Guy wire installation on structures to provide additional structural support.
- Repair or upgrade of existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

1.4 Report structure

This report is the Stage 1 Contaminated Lane PSI report and will support the preparation of the REF required under Division 5.1 of the EP&A. The structure of the report is summarised in Table 1-1.

Table 1-1: Report Structure

Section reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings.
1	Introduction: <ul style="list-style-type: none"> • Background • Locality • Proposal description • Report structure 	Overview of the proposal and description of the structure of this working paper.
2	Assessment requirements: <ul style="list-style-type: none"> • Legislative requirements 	Identifies the legislative and policy bases for this assessment and their key requirements.
3	Objectives and scope of works <ul style="list-style-type: none"> • Objectives • Scope of works 	Description of the objectives and scope works undertaken for purpose of the Stage 1 PSI.
4	Site information <ul style="list-style-type: none"> • Topography and drainage • Geology • Soils • Acid Sulfate soils risk • Hydrogeology • Sensitive environments • Previous site investigations • Site inspection 	Details of the findings from the desktop qualitative assessment of the proposal site and available records of site information including the detailed site inspection undertaken of the proposal footprint.
5	Site history <ul style="list-style-type: none"> • Historical aerial photography 	Summary of the site history using a review of available historical information for the site, including council and government records as

Section reference	Section heading	Description
	<ul style="list-style-type: none"> • New South Wales Environmental Protection Authority (EPA) contaminated Sites Register • Cattle dip tick sites • Site history summary • Potential areas of environmental interest 	well as aerial imagery of the proposal area.
6	Site condition and surrounding environment <ul style="list-style-type: none"> • Current occupier and operations • Tanks and associated services • Fill material • Odours and staining • Chemicals and hazardous wastes • Surrounding land use 	A review of the current site condition and surrounding land use using information obtained from the site inspection.
7	Conceptual Site Model	Using information gained from the PSI, information provided in the Conceptual Site Model (CSM) details the Areas of Environmental Interest (AEI) and potential source, pathways, nature and management of contamination on-site.
8	Conclusions and recommendations	Concise statement about the key findings of this report.

2. Assessment requirements

2.1 Legislative requirements

The Stage 1 works will be prepared under the provisions of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). Other relevant legislation and guidelines that are relevant to the assessment of contamination risks are outlined below in Sections 2.1.1 to 2.1.4.

2.1.1 Protection of the Environment Operations Act 1997

All disturbed soils will need to be managed during construction in accordance with the requirements of the *POEO Act 1997*, so as not to cause pollution to the surrounding environment. Pollution may take the form of the release of sediments into waterways, the movement of contaminants offsite via water flows or release of acid from acid sulphate soils. Any wastes generated during the construction activities that are to be disposed of offsite, must also comply with the requirements of the *POEO Act 1997*, requiring classification in accordance with the *NSW Environmental Protection Authority (EPA), Waste Classification Guidelines (2009)*.

2.1.2 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating, managing and remediating contaminated land and allows the NSW EPA to regulate any site contamination that poses a significant risk of harm, to ensure the contamination is managed or remediated appropriately. Any contamination investigation completed within the proposal area must comply with the requirements of the CLM Act. The NSW EPA has endorsed the investigation procedures described within the *National Environmental Protection Measure 1999 (as amended in 2013)*. Any wastes generated during the construction activities that are to be disposed of onsite, must also comply with the requirements of the CLM Act.

2.1.3 State Environmental Planning Policy No. 55 – Remediation of Land 2018

State Environmental Planning Policy No. 55 – Remediation of Land 2018 (SEPP 55) provides a state wide planning approach to the remediation of contaminated land in NSW. If significant contamination is identified during the construction activities, any remediation works will need to be completed in accordance with the requirements of SEPP 55.

2.1.4 Relevant guidelines

This report, has been prepared in general accordance with the requirements specified for a Stage 1 PSI as published in the:

- NSW EPA (2000) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2000).
- National Environmental Protection Council (1999) *National Environment Protection Measure (Assessment of Site Contamination) Measure 1999 (as amended in 2013)* (NEPC, 1999).
- Australian Standard AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).
- *Clarence Valley Council Contaminated Land Policy* (August 2015).

3. Preliminary Site Investigation objectives and scope of works

3.1 Objectives

The objectives of the PSI were to:

- Identify past and present potentially contaminating activities undertaken on and/or adjacent to the site.
- Identify potential contamination types and locations.
- Discuss the site conditions.
- Provide a preliminary qualitative assessment of site contamination.
- Assess the need for further investigations.

3.2 Scope of works

To achieve the objectives, the following works have been undertaken:

- Desktop study involving obtaining and reviewing information (where available) limited to:
 - Historical aerial photographs (approximately 10 year intervals from the 1950s).
 - Published geological, topographic, soil, acid sulphate soil and groundwater maps.
 - Search of the NSW EPA contaminated land database for notices and records pertaining to licensed activities or investigation and/or remediation orders.
 - Conduct a records search for licensed groundwater bores near property.
- Detailed, visual site inspection to assess (where present):
 - Areas of discoloured soil or water, affected plant growth and animal populations, and significant odour.
 - The presence of any stockpiled material, imported soil or fill material such as slag, ashes, potential asbestos containing materials, scrap and industrial or chemical waste, as well as signs of settlement, subsidence or disturbed ground.
 - The direction of the flow of surface water run-off from the site and adjacent properties.
 - Differences between the present conditions and the information obtained from the desktop study.
 - Location of visible features (where present), including foundations, positions of former buildings, tanks, pits, wells, drains, and bores.
 - Condition and type of groundcover e.g. bare ground, asphalt, concrete, gravel etc.
 - Chemical storage and transfer areas, including the presence of waste or chemical containers.
 - The apparent condition and use of adjacent properties.
 - Presence of sensitive environments on-site or the surrounding area of site.
- Preparation of a Stage 1 PSI report incorporating the results of the desktop study, observations from the site inspection and detailing the potential contamination risks (if any) which may be present on and/or adjacent to the site considering the planned procurement of the site for the construction of the CCC transmission line.

4. Site information

The site information presented below is based on a review of publicly available information, and observations made during site walkovers undertaken by Jacobs over the 12 June 2018 to the 15 June 2018. The footprint of the proposal is presented in Figure 1-2.

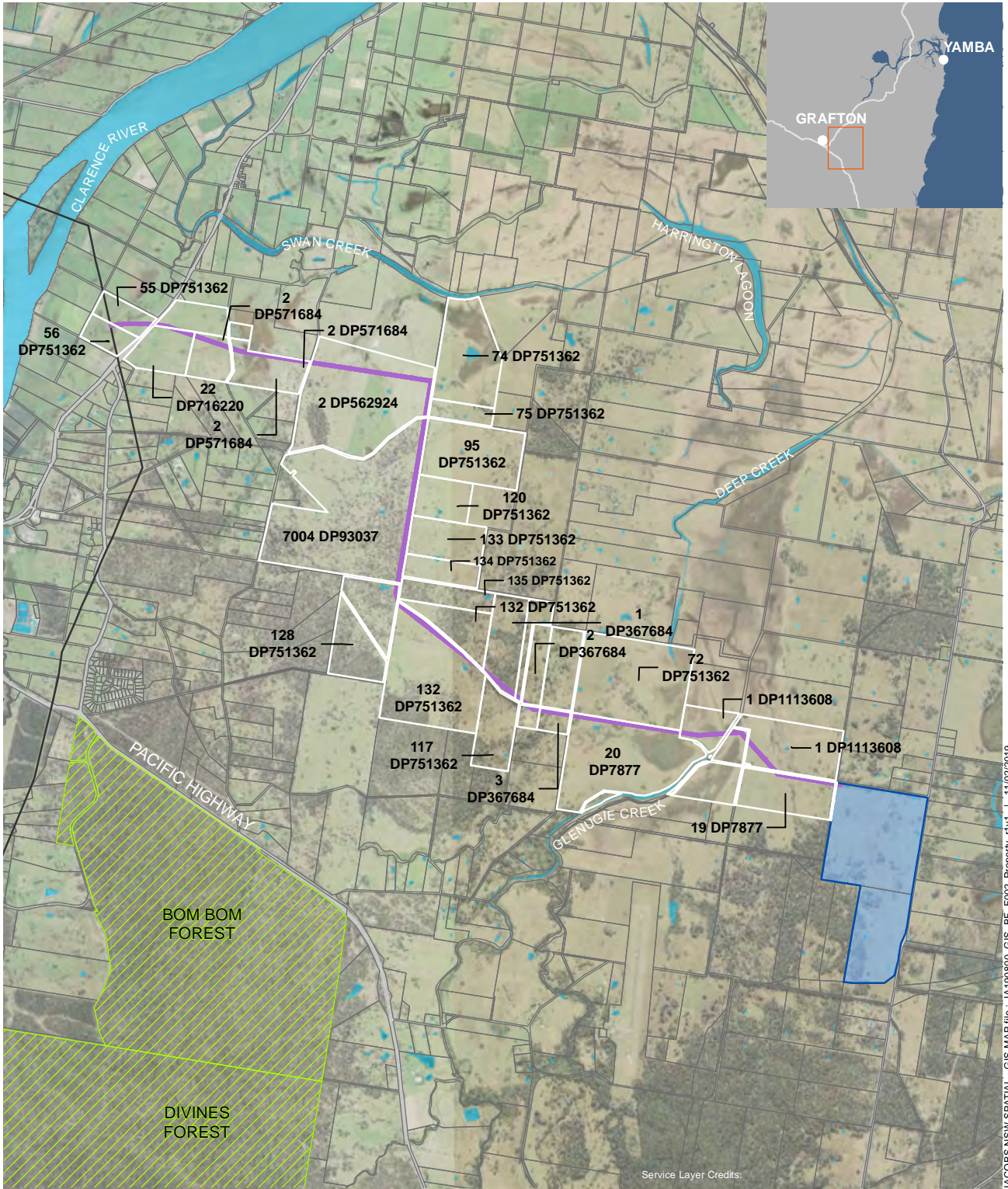
4.1 Site Identification

The alignment of the proposal intersects multiple parcels of land and these are shown in Figure 4-1. The legal description of the parcels of land where the proposal intersects that are the subject to this assessment were (in west to east order):

- Lot 55 and Lot 56 in Deposited Plan (DP) 7511362.
- Lot 22 and 23 in DP 716220.
- Lot 2 in DP 571684.
- Lot 1 in DP 1126945.
- Lot 2 in DP 562924.
- Lot 7004 in DP 93037.
- Lot 128 and Lot 132 in DP 751362.
- Lot 3 in DP 1217671.
- Lot 1, Lot 2 and Lot 3 in DP 367684.
- Lot 20 in DP 7877.
- Lot 1 in DP 1113608.
- Lot 2 in DP 1201636.
- Lot 19 in DP 7877.
- Lot 1 DP 1201636
- Lot 26 in DP 751376 (CCC).

The proposal is zoned RU2 - Rural Landscape under the *Clarence Valley Local Environmental Plan 2011*. Development for the purpose of a transmission line is permissible with consent within the RU2 Rural Landscape zone.

The proposal impacts on 19 individual private properties comprised of the lots and DP's described above and is 195 hectares in size; refer to Figure 4-1. The proposal crosses areas of road reserve for the Pacific Highway, Four Mile Lane, Tancred's Lane as well as six unnamed paper roads. The proposal area, has historically been used for livestock (mainly cattle) grazing and farming purposes. Residences within the proposal area are identified as rural residential dwellings. The proposal area is bounded by the CCC to the east, the Clarence River to the west, rural landscapes to the north, as well as rural landscapes and some land zoned as Forestry (RU3) to the south.



JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_BF_F02_Property_r1v1 | 11/02/2019

Legend

- Cadastre
- Project locality
- Transmission line
- Clarence correctional centre
- State forest

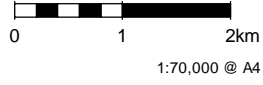


Figure 4-1 | Properties impacted by the proposal

4.2 Topography and drainage

Although the proposal intersects multiple properties and parcels of land, the topography of the proposal is typically gently undulating with natural depressions occurring throughout. The natural slopes with the proposal area, typically head down gradient towards natural drainage lines and channels located throughout the proposal area. Where the proposal is scheduled to cross over public roads, drainage lines slope parallel with the gradient of the road. With the exception of the Pacific Highway, all roads (public or private) typically follow the natural landform.

Consistent with the topography of the proposal area, the surrounding topography is gently undulating, sloping towards drainage channels which feed into Glenugie and McPhillips Creek located in the east of the proposal area, Washpen Creek located in the north-west and Swan Creek located to the north (refer to Figure 1-1).

In addition to Glenugie, McPhillips, Washpen and Swan Creek, other predominant surface water features located within a one kilometre radius of the proposal area include Deep Creek which is fed by Glenugie Creek (located approximately one kilometre north of western section of the proposal), Swan Lake which is fed by Swan Creek (located approximately 1 kilometre north of Tancreds Lane and 800 metres north of the alignment), Little Swan Creek (located less than 100 metres from the western end of the proposal) and the Clarence River (located approximately 600 metres west of the western end of the proposal). On-site there are multiple tributaries heading off-site which feed into the Glenugie, McPhillips, Washpen or Swan Creeks and Clarence River. These drainage channels appear to form a natural low point in the topography. Additionally, there are multiple artificial dams in close proximity to the proposal area which have been located at natural depressions to capture overland flows.

The majority of rain falling onto the site would fall onto unsealed (cleared and vegetated) surfaces and is expected to infiltrate into sub-soils and/or run off into the natural drainage channels and/or creeks as well as to the artificially constructed dams present within or in close proximity to the proposal area. Rain falling onto surrounding areas is expected to infiltrate into sub-soils, fall onto unsealed (cleared and vegetated) surfaces or run off across sealed surfaces (Pacific Highway) into formalised storm water drains.

4.3 Geology

The regional geology of the area comprises sedimentary rocks of the Clarence – Moreton sedimentary basin which spans from the Middle Triassic at the base to late Jurassic (230-141 Mega-annum (Ma)).

Reference to the Maclean-250K-Geological-Sheet (H5607-1) and Bare Point 1:100K Geological sheet indicates the proposal to be underlain by the Grafton Formation from the late Jurassic period which represents the upper most unit within the basin. The Grafton formation consists of dark grey-green sandstone fine to coarse grained, thinly to thickly bedded and shale and minor coal. The Grafton Formation typically forms low, rounded undulating hills due to their reduced resistance to weathering.

4.4 Soils

There are limited data on the soils of the Grafton region and no existing land systems, soil landscapes or land resource mapping are available for the proposal area. The available soil and land information is sourced from eSPADE, a Google-maps based information system that hosts all available soil and land data for NSW. Five eSPADE data sets were identified across the proposal area. In the western most section, adjacent to the Clarence River, Tenosols an alluvial soil type was identified before transitioning into Kandosols the further east and south-east from the Clarence River. Kandosols are the most prominent soil type within the proposal area, with only minor occurrences of Hydrosols (around Glenugie Creek and to the north-west of the proposal, immediately south of Swan Creek), Kurosols (to the west of the proposal, either side of the Pacific Highway) and Dermosols present (to the north-west of the proposal, immediately south of Swan Creek).

The soils of the proposal area have been described as Earths and Podzolics using the Great Soil Groups (GSG) classification of Stace et al. (1968). The Earths of the GSG would include the Kandosol soil order of the Australian Soil Classification (ASC), and are described as soils that lack strong texture-contrast, have massive or only weakly structured B horizons, and are not calcareous throughout. In addition to Kandosols, Prairie Soils

(GSG) which would include the Dermosol soil order (ASC), also occur. Similar to Kandosols, Dermosols lack a strong texture-contrast but have structured B horizon.

The Podzolics (GSG) would include the Kurosol order (ASC) and are described as acidic soils (pH<5.5 in the B horizon) with a strong texture-contrast.

4.5 Acid Sulfate soils risk

Acid Sulfate Soil (ASS) Risk Maps from the Australian Soil Resource Information System (ASRIS) database were reviewed to ascertain the potential ASS risk within the proposal area. Based on this information, the risk of encountering ASS within the proposal area varies. In the west there is a 'High Probability' with an 'unknown confidence' level of ASS around Swan Creek and its tributaries including Washpen Creek and Swan Lake, as well immediately east of the Clarence River. Additionally, there is a 'High Probability' of ASS also present in the east around Glenugie Creek and McPhillips Creek as well as their tributaries. East of the Pacific Highway, with the exception of Washpen Creek, a 'Low Probability' with a 'low confidence' level was identified before transitioning to 'Extremely Low Probability' with 'low confidence' level in the majority and the remainder of the proposal area.

4.6 Hydrogeology

4.6.1 Groundwater flow direction

The direction of groundwater flow, with the undulating nature of the topography on the proposal area, could not be definitively assessed based on current information. However, based on the regional and surrounding topography, as well as the location of the natural surface water bodies within and around the proposal area, localised groundwater would be expected to flow in a north westerly and westerly direction towards the Clarence River in the west of the proposal area, and north towards Swan Creek, which feeds into the Clarence River, to the north of the proposal. In the eastern portion of the proposal area, groundwater is expected to flow east towards Glenugie Creek.

4.6.2 Groundwater bore search

A search of the Department of Primary Industries Groundwater Database was undertaken to identify the presence of registered groundwater bores within one kilometre radius of the proposal area. Based on a review of the All Groundwater Map, one groundwater bore (GW305355) was located within a one kilometre radius of the proposal area. Located approximately 800 metres to the north of the proposed alignment section that passes through Lot 2 of DP 571684, the coordinates of the registered groundwater were listed as 4992690 (eastings) and 6716654 (northings). The depth to the standing water level was listed as 8.200 metres and total depth of the monitoring bore was 15 metres.

4.7 Sensitive environments

Based on the available information, sensitive environments which could be potentially impacted by contamination within the site (if present) are detailed below:

- Clarence River located approximately 800 metres to the west of the proposal.
- Glenugie Creek and its tributaries located in the eastern section of the proposal in Lot 20 in DP 7877 and Lot 1 in DP 1113608 of the proposal area.
- Washpen Creek and its tributaries located in the western section of the proposal in Lot 2 in DP 571684 of the proposal area.
- McPhillips Creek and its tributaries located in the eastern section of the proposal in Lot 20 in DP 7877 of the proposal area.
- Minor tributaries (1st and 2nd order streams) located within the proposal area which feed into the creeks and/or rivers located within and outside of the proposal area. These include Glenugie Creek, Washpen

Creek and McPhillips Creek located within the proposal area, as well as Swan Lake and Swan Creek located approximately 800 metres and 1 kilometre to the north respectively, Deep Creek located approximately 750 metres to the north and the Clarence River located approximately 800 metres to the west.

- Terrestrial biodiversity and livestock associated with artificially constructed farm dams (floodplain wetlands) within the proposal area.
- Terrestrial biodiversity and livestock associated with artificially constructed farm dams (floodplain wetlands) on surrounding properties affected by overland flows from the proposal area.
- Terrestrial biodiversity and livestock associated with minor tributaries on and off-site, which are naturally connected.
- Terrestrial biodiversity located within proposal area and adjacent land, particularly within bush land surrounding the proposal area.
- Residents of dwellings located within the properties where the alignment is schedule to intersect.

4.8 Previous site investigations

At the time of preparing the PSI report, no previous environmental investigations are known to have been undertaken across the proposal area, with the exception of sections of alignment to be located within the boundary of the CCC. In January/February 2016, Jacobs undertook a Stage 1 Contaminated PSI, that in conjunction with other specialist investigations and reports was used to support the preparation of an EIS which was required under part 4.1 of the EP&A Act for the construction of the CCC that at that time was referred to as the New Grafton Correctional Centre.

The objectives of the PSI completed for the EIS (Jacobs 2016) were to identify past or present potentially contaminating activities and to provide a preliminary assessment of site contamination within the CCC proposal boundary. It involved an assessment of past land use history, consultation with relevant authorities and a site inspection.

The PSI concluded, with respect to what is now known as the CCC, that the weight of evidence indicated that the site was suitable, from a contamination perspective, for the proposed use as a correctional centre and that no further contamination investigation was required. Furthermore, the PSI recommended that based on the results of the Stage 1 PSI, any potential contamination risks were to be managed under a construction environmental management plan (CEMP). As such no intrusive investigation works (i.e. Stage 2 Detailed Site Investigation (DSI)) were required in order to further define and provide a quantitative assessment of potential contamination within proposal area.

Based on available site information and information gathered during the on-site inspection and in particular the lack of evidence indicating contamination risk, there was a low risk that contaminants were present at a quantity that would trigger the need for an intrusive investigation.

However, despite the unlikelihood of contaminants being present on-site, a low to moderate risk rating was applied to potential AEIs on-site. Considering uncertainties around the use of pesticides within the proposal area, where excavation works were required within AEIs, the proposed CEMP detailed contingency measures to address unexpected finds of contaminated material if they were encountered.

5. Site history

The following list details the sources of historical information reviewed as part of this Stage 1 PSI:

- NSW Land and Property Management Authority, Land and Property Information Division (LPI): Historical aerial photographs (1958 to 2004).
- NSW EPA Contaminated Sites Register and Record of Notices.
- NSW EPA Public Register for Environmental Protection Licensed (EPL) premises or unlicensed regulated premises listed under the *POEO Act 1997*.
- NSW Department of Primary Industries Cattle dip site locator.

5.1 Historical aerial photography

Historical aerial photographs were obtained from Lotsearch Pty Ltd (Lotsearch) and from the NSW Land and Property Management Authority, Land and Property Information Division. Aerial photographs were examined for the years: 1954/1958, 1964/1966, 1978, 1987, 1994/1998, 2004/2006, 2011 (realignment aerials only) and 2017/2018. For the initial proposal alignment, aerials obtained from Lotsearch were divided into six sections (6 individual reports) and were received electronically. As such these aerials have been presented as **Appendix A.1**. The 6 sections provide images which cover the following properties:

- Lot 55 and Lot 56 in DP 7511362.
- Lot 22 and 23 in DP 716220.
- Lot 2 in DP 571684.
- Lot 1 in DP 1126945.
- Lot 2 in DP 562924.
- Lot 7004 in DP 93037.
- Lot 128 and Lot 132 in DP 751362.
- Lot 3 in DP 1217671.

Following a change in the proposal alignment in late 2018, an additional two historical aerial reports were obtained from Lotsearch in January 2019 to provide images for the extent of the realignment. These aerials are presented in Appendix A.2, and provide images which detail the realignment sections and includes the following properties:

- Lot 2 in DP 562924.
- Lot 7004 in DP 93037.
- Lot 128 in DP 751362.

In addition to the aerials obtained from Lotsearch, aerials obtained from the NSW Land and Property Management Authority, Land and Property Information Division for the Jacobs (2016) PSI report completed for the CCC in 2016 were reviewed for this assessment. As these aerials were received in hard copy form they have not been included as an appendix to this report. Hard copy aerials obtained for the Jacobs (2016) PSI of the CCC cover the following properties:

- Lot 1, Lot 2 and Lot 3 in DP 367684.
- Lot 20 in DP 7877.
- Lot 1 in DP 1113608.
- Lot 19 in DP 7877.
- Lot 1 and Lot 2 in DP 1201636.
- Lot 26 in DP 751376 (CCC).

The findings of the historical aerial photograph review are described in Table 5-1.

Table 5-1: Historical aerial photograph review

Date of aerial photography	Site	Surrounding area
1954	<p><u>Lotsearch Section 1</u> – What is now the Pacific Highway intersects the area and appears to be an unsealed road. Land to the west of the Pacific Highway is occupied by flood plains from the Clarence River including a large unnamed water body. The remainder of the area west of the Pacific Highway appeared to be occupied by rural residences associated with grazing. East of the Pacific Highway, the land has been largely cleared and appeared to be used for grazing.</p> <p><u>Lotsearch Section 2</u> – The area detailed in the aerials has been largely cleared and appears to be used for the purpose of grazing. Washpen Creek and associated with wetlands intersects the proposal area.</p> <p><u>Lotsearch Section 3</u> – The area detailed in the aerials has been partially cleared with trees scattered through. A cluster of trees is located in the south east of the area. Four Mile Lane (unsealed) intersects the area in the north-east. The land appears to have been used for grazing of livestock.</p> <p><u>Lotsearch Section 4</u> – The area detailed in the area has been partially cleared with scattered trees in the south and with a higher density of trees north of Tancreds Lane (unsealed) which intersects the proposal in the north travelling east and west. An unnamed creek/drainage line intersects the area heading in a south-east/south-west direction.</p> <p><u>Lotsearch Section 5</u> – The area detailed in the aerials has been partially cleared with trees scattered throughout. Tree density increases in the south/south-east and appears to be largely uncleared bushland. The land appears to have been used for grazing of livestock.</p>	<p><u>Lotsearch Section 1</u> – Surrounding land use is consistent with land use within the proposal area.</p> <p><u>Lotsearch Section 2</u> – Surrounding land use is consistent with land use within the proposal area. The Pacific Highway is located to the west with rural residences to the north-west. Swan Lane is located to the north and Washpen Creek is located to the south and north and appears to be feeding into Swan Creek located to the north.</p> <p><u>Lotsearch Section 3</u> – Surrounding land use is consistent with land use within the proposal area. Four Mile Lane is present to the west travelling north and south directions.</p> <p><u>Lotsearch Section 4</u> – Surrounding land use is consistent with land use within the proposal area. Tancreds lane is present traveling east and west, whilst there are scattered trees throughout. An artificially constructed dam is also present to the west of the proposal area.</p> <p><u>Lotsearch Section 5</u> – Surrounding land use is consistent with land use within the proposal area.</p> <p><u>Lotsearch Section 6</u> – Surrounding land use is consistent with land use within the proposal area. The land appears to have been subject to more clearing and more suited to use for the purposes of grazing.</p>

Date of aerial photography	Site	Surrounding area
	<p><u>Lotsearch Section 6</u> – The area detailed in the aerials appears to be largely uncleared land and dominated by bushland.</p> <p><u>Lotsearch Section 1 realignment</u> – The area detailed in the aerial appears to be largely cleared land with moderate tree coverage throughout. The eastern section of the alignment shown in the aerial appears to head in a southerly direction parallel to the property boundary of Lot 2, DP 562924 and Lot 7004, DP 93037. The alignment also intersects Tancreds Lane (southern end of Lot 2 in DP 562924). Tancreds Lane appears to be an unsealed gravel/dirt track.</p> <p><u>Lotsearch Section 2 realignment</u> – The area detailed in the aerial is comprised of cleared land with moderate to high low-density tree coverage. No other disguisable features were observed.</p>	<p><u>Lotsearch Section 1 realignment</u> – Surrounding land use is consistent with land use within the alignment. Some erosional drainage features are present to the south and south west. A farm dam is also present approximately 200 m north of the northern portion of the alignment.</p> <p><u>Lotsearch Section 2 realignment</u> – Surrounding land use is largely consistent with land use within the alignment. Land in adjacent property to the east of Lot 7004, DP 93037 has undergone significantly more clearing. A farm dam is present on the adjacent property to the east.</p>
<p>1958 (NSW Land and Property Management Authority, Land and Property Information Division)</p>	<p>In 1958 the proposal area appears to be used for agricultural land use (i.e. grazing land, no crops). The proposal area appears to have undergone large amounts of clearing around Glenugie Creek. A structure, house or farm shed can be seen within/in close proximity to the proposal area in Lot 1, DP 1113608.</p>	<p>Surrounding land use is consistent with the proposal area. Deep Creek which links with Glenugie Creek is located to the north. Glenugie Creek stretches to the north and South. No dwellings or Structures could be observed.</p>
<p>1964</p>	<p><u>Lotsearch Section 1</u> – Land use remained largely unchanged. West of the Pacific Highway, land use for the purposes of grazing has increased, however the unnamed waterbody is still present. No significant change had occurred east of the Pacific Highway.</p> <p><u>Lotsearch Section 2</u> – Land use remained largely unchanged since 1954.</p> <p><u>Lotsearch Section 3</u> – The proposal area has been subject to additional clearing. With the exception of the cluster of trees in the south-east, the majority of trees have been cleared although vegetation regrowth is present throughout.</p> <p><u>Lotsearch Section 4</u> – Land use remained largely unchanged since 1954.</p> <p><u>Lotsearch Section 5</u> – Land use remained largely unchanged since 1954.</p> <p><u>Lotsearch Section 6</u> – Land use remained largely unchanged since 1954.</p>	<p><u>Lotsearch Section 2</u> – Surrounding land use is consistent with land use inside the proposal area. Less of the area west of the Pacific Highway is covered with water. There is defined artificially constructed inlet to the Clarence River north of the proposal area. More of the land to the north is used for agricultural purposes and some crops are present. There are also more structures to the north adjacent to the Pacific Highway. These appear to be residential dwelling and also farm buildings.</p> <p><u>Lotsearch Section 2</u> – Surrounding land use remained largely unchanged since 1954. Swan Lane located to the north is more defined.</p> <p><u>Lotsearch Section 3</u> – Surrounding land use has been subject to additionally clearing. Felled trees can be seen to the west.</p> <p><u>Lotsearch Section 4</u> – Land use remained largely unchanged since 1954. A farm track is more defined heading in a north-west and south-east direction. An artificial dam can also be seen east of the southern end of the Section.</p>

Date of aerial photography	Site	Surrounding area
	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged, however there appears to be fewer trees. Some erosional drainage lines are also apparent running through or away from the northern section of the alignment. Tancreds lane is also more defined.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1954</p>	<p><u>Lotsearch Section 5</u> – Land use remained largely unchanged since 1954.</p> <p><u>Lotsearch Section 6</u> – Land use remained largely unchanged since 1954.</p> <p><u>Lotsearch Section 1 realignment</u> – With the exception of an additional erosional drainage to the east of the north east corner and in the south west of the aerial image, land use shows little to no change since 1954.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1954. Land to the west of the alignment contained one farm dam. What appears to be a drainage line can also be observed running diagonally off the south western edge of the alignment. An additional farm dam is also present on the adjacent property to the east.</p>
<p>1968 (NSW Land and Property Management Authority, Land and Property Information Division)</p>	<p>Land use remained largely unchanged since 1958.</p>	<p>Surrounding land use remained largely unchanged since 1958, however south of the proposal area multiple farm structures or dwellings are present north of Glenugie Creek. An airstrip where the current Clarence Valley Regional Airport is located can be seen to the south of the proposal area.</p>
<p>1978</p>	<p><u>Lotsearch Section 1</u> – West of the Pacific Highway, much of the area has been drained of water. The unnamed creek is still present, and a dam can be seen. The land appears to be utilised for grazing. East of the Pacific Highway, the land use has remained largely unchanged. The Pacific Highway is more defined and appears to have sealed.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1964. With the exception of trees around Four Mile Lane and the cluster of trees in the south-east, the land has been almost entirely cleared of vegetation.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1964. Increased foliage within the proposal area.</p>	<p><u>Lotsearch Section 1</u> – Land use has remained largely unchanged. The Pacific Highway to the north has been sealed. Land appears to be predominately used for grazing.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1964.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1964. Increased foliage/tree cover to the north-east. Increased land clearing has occurred to the south-west.</p>

Date of aerial photography	Site	Surrounding area
	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1964. Minor additional land clearing has occurred and less trees are present. The dam located to the north of the alignment is more pronounced as are the drainage lines running through the north east section.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1964.</p>	<p><u>Lotsearch Section 1 realignment</u> – Land use has remained largely unchanged since 1964 with only minor land clearing having occurred. Drainage lines also appear more pronounced and some ground disturbance is present to the north.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use has remained largely unchanged since 1964, however an additional four farm dams are present in the adjacent property to the east of the alignment.</p>
<p>1978 (NSW Land and Property Management Authority, Land and Property Information Division)</p>	<p>Land use remained largely unchanged from 1967. The structure that was located within Lot 1, DP 1113608 appears to longer be present.</p>	<p>Land use remained largely unchanged from 1967. The airstrip located to the south has been tarmacked and formalised.</p>
<p>1987</p>	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 1978.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1978, with the exception of more water around the creek system.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1978.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1978.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1978. A house/farm house or shed is present adjacent to the alignment in the south west is present. A dam is also present just north of the house.</p> <p><u>Lotsearch Section 6</u> – Since 1978, vegetation has been cleared within the proposal area. Other than additional clearing, land use remained largely unchanged.</p>	<p><u>Lotsearch Section 1</u> – Surrounding land use remained largely unchanged since 1978. The Pacific Highway appears to have been widened in the south west since 1978.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1978 with the exception of more water around the creek system.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1978.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1978.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1978. Some additional clearing appears to have occurred to the west and what appears to be cultivated land is present west of the house.</p> <p><u>Lotsearch Section 6</u> – Since 1978, some vegetation has been cleared within to the north and north-east of the proposal area. Other than additional clearing, land use remained largely unchanged.</p>

Date of aerial photography	Site	Surrounding area
	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1978.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1978.</p>	<p><u>Lotsearch Section 1 realignment</u> – Land use has remained largely unchanged since 1978. Two additional dams are present, with one located to the south of the northern section of the alignment and the 2nd located to the north west corner of Lot 2 in DP 562924. Some additional ground disturbance is also present to the north of the alignment in Lot 4 in DP728239 and another farm dam is also located on the adjacent property to the east of the north east corner of the alignment.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use has remained largely unchanged since 1978. A small building is present immediately to the north west of the alignment. A dam north of the building is also present.</p>
<p>1987 (NSW Land and Property Management Authority, Land and Property Information Division)</p>	<p>Land use remained largely unchanged from 1978.</p>	<p>Land use remained largely unchanged from 1978.</p>
<p>1994</p>	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 1987. The Pacific Highway has been widened. Agriculture is present (crops) west of the Pacific Highway</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1978. An additional artificial dam is visible in the northern section and appears to have been placed down gradient of a drainage line.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1987.</p>	<p><u>Lotsearch Section 1</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1987. Just north of the proposal area there appears to a structure which resembles a holding pen for livestock.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1987.</p>

Date of aerial photography	Site	Surrounding area
	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1987.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1987.</p>	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1987. A small structure can be seen in the north east corner of the aerial image, approximately 500m from the alignment.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1987. The farm dam located to the immediate north west of the alignment is more pronounced. There is also a 2nd farm dam located to the west of the alignment, approximately 400 metres to the south of the northern most dam.</p>
<p>1994 (NSW Land and Property Management Authority, Land and Property Information Division)</p>	<p>Land use remained largely unchanged from 1987.</p>	<p>Land use remained largely unchanged from 1987.</p>
<p>2004</p>	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 1994.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1994. Regrowth has been cleared.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1994.</p> <hr/> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 1994.</p>	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 1994.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 1994.</p> <hr/> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1994.</p> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 1994.</p>

Date of aerial photography	Site	Surrounding area
2004 (NSW Land and Property Management Authority, Land and Property Information Division)	Land use remained largely unchanged since 1994.	Land use remained largely unchanged since 1994.
2011	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 2004.</p>	<p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 2004. An additional farm dam can be seen approximately 150 to 200 metres from the northern section of the alignment.</p> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 2004.</p>
2017/2018	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 2004. No evidence of agriculture (cropping) present, just grazing west of Pacific Highway.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 2004. Additional trees/foilage have been planted around the unnamed creek/drainage line intersecting through the proposal area.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 2004.</p> <hr/> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 2011.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 2011.</p>	<p><u>Lotsearch Section 1</u> – No significant changes to land use since 2004. No evidence of agriculture (cropping) present, just grazing west of Pacific Highway.</p> <p><u>Lotsearch Section 2</u> – Land use has remained largely unchanged since 2004. Additional rural dwelling located along Four Mile Lane south of the proposal area. Additional structures associated with rural dwellings to the south of proposal area.</p> <p><u>Lotsearch Section 3</u> – Land use has remained largely unchanged since 2004. Two residential dwellings located along Four Mile Lane south and west of the proposal area.</p> <p><u>Lotsearch Section 4</u> – Land use has remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 5</u> – Land use has remained largely unchanged since 2004.</p> <p><u>Lotsearch Section 6</u> – Land use has remained largely unchanged since 2004.</p> <hr/> <p><u>Lotsearch Section 1 realignment</u> – Land use remained largely unchanged since 2011. However, a structure/building and what appears to be concrete or bitumen can be seen to the north of the alignment in Lot 4 of DP 728239.</p> <p><u>Lotsearch Section 2 realignment</u> – Land use remained largely unchanged since 2011</p>
2018 (NSW Land and Property Management Authority, Land and	Land use remained largely unchanged since 2004.	Land and use remained largely unchanged since 2004.

Date of aerial photography	Site	Surrounding area
Property Information Division)		

5.2 NSW Contaminated Sites Register

At the time of preparing the Stage 1 PSI report, a search of the NSW EPA Contaminated Sites Register and Record of Notices (as required under Section 58 of the *Contaminated Land Management Act 1997*) indicated that there were no contaminated sites within a one kilometre radius of the proposal area that were registered (regulated or notified) to the NSW EPA.

5.1 Environmental Protection Licensed (EPL) Premises

A review of NSW EPA Public Register for Environmental Protection Licensed (EPL) premises and unlicensed premises regulated by the EPA as listed under the *POEO Act 1997*, indicated that the proposal area and properties within 1 kilometre of the proposal area, with the exception of the CCC, were currently not regulated under an environmental protection licence or listed as an unlicensed premise regulated by the EPA.

In July 2017, a licence (EPL 20960) was issued to John Holland Pty Ltd for 'Land-based extractive activity' (i.e. excavation and storage excess soil (clay, sand, stone, gravel and rock) in an amount greater than 30,000 tonnes) at the CCC construction site.

In October 2017 after being notified by John Holland Pty Ltd of a structural failure of a sediment basin and the uncontrolled release of highly turbid water into the surrounding environment, the EPA issued a 'Clean-Up Notice' under Section 91 Protection of the Environment Operations Act 1997. In December 2017, a 'Penalty Notice' was issued for contravening the condition/s if the licence.

In February 2018, application for a s.58 licence variation, detailing revised conditions for erosion and sediment controls on-site was issued.

5.2 Cattle dip tick sites

A review of the Clarence Valley Council's *Contaminated Land Policy (2015)* indicated the presence of numerous unused cattle tick dip sites located within the Clarence Valley area. However, at the time of preparing the PSI report, a search of the NSW Department of Primary Industries Cattle dip site locator indicated there were no cattle dip sites located within a one kilometre radius of the proposal area listed for the Northern Rivers region. No evidence of a cattle dip sites was observed during site inspections undertaken over the 12 June 2018 to the 15 June 2018.

5.3 Site history summary

The historical aerial photography review indicated that the site was mostly cleared agricultural/rural landscape from the 1950s until the present day (2018), where it has remained consistent with the land use of the surrounding areas of agricultural/rural-residential land use. Minor increases in residential dwellings and other structures were observed over the years, however these appear to be related to the ongoing use of the area for livestock grazing or for stand-alone dwellings.

There were no NSW EPA contaminated site notices for the proposal area or land within one kilometre radius of the proposal area. However, a review of available information, including council records that were publicly accessible, have identified the proposal area as being potentially or actually contaminated as a result of the potential use of pesticides/herbicides during historical agricultural land use (grazing) across the area.

In July 2017 an EPL was issued for the CCC construction site. In October 2017, a clean-up notice was issued to the facility, relating to the release of highly turbid (>1000 NTU) water into the surrounding environment. The EPA's inspection identified in addition to structural failures of three sediment basins, "sediment and erosion controls had not been implemented in accordance with a 'Progressive Erosion and Sediment Control Plan' for the site". Following the issue of the 'Clean-Up Notice' an 'Penalty Notice' was issued in December 2017. No details of the penalty notice were available on POEO Public Register. In February 2018, a Licence Variation was issued to the CCC construction site, detailing revised erosion and sediment control measures required for the site.

6. Site Inspection

A site inspection across the proposal area and surrounding land (where accessible) was conducted over 13 to 15 June 2018 by a Jacobs environmental scientist. The site inspection focused on the proposal area, as well as adjacent land uses and potential AELs. The site inspection included the majority of properties scheduled to be impacted by the construction of the alignment. Upon consent to access the properties, inspections of each property were undertaken. Given the number of properties included in the inspections, the summaries of the inspections, for the purposes of this report have been divided into the individual properties and have been detailed in sequential order (west to east) in Table 6-1.

Table 6-1: Site Inspections

Property ID	Inspection Summary
Lot 55 & 56, DP 751362	<p><u>Proposal area:</u></p> <p>The area was flat with land cleared for the purposes of cattle grazing. The land eventually slopes up to the Pacific Highway at the eastern boundary of the property. Evidence of grazing activities was present. An artificial creek/drainage line was present, travelling north from Eggins Lane to artificial farm dam. The creek appeared dry during inspections. In the south-east corner of the property was a farm shed with a car parked nearby. What appeared to be locked sewer/septic access/pits were observed along the eastern boundary. An existing transmission line, heading in a north by north-west direction was also observed. It is understood that the proposal will be connected to this transmission and will orientate east across the Pacific Highway</p> <p><u>Surrounding area:</u></p> <p>The property is bounded by Eggins Lane to the south and west. South and west of Eggins Lane is agricultural land with crops. At the time of inspection these appeared to be sugar cane. The property to the north upon inspection was being used for cattle grazing. Feeders and cattle were observed. To the east was the Pacific Highway with some residential dwelling adjacent to the highway.</p>
Lot 22 and Lot 23, DP 716220	<p>Consent to access these properties had not been granted when the inspections were undertaken. Given no access and the topography, these properties were unable to be inspected. However, based on review of aerial imagery and the surrounding land use, these properties occupy land which is undulating in which they slope both west towards the Pacific Highway and after an initial rise slope down in an easterly direction. Both properties contain a residential dwelling and associated structures as well as artificial dams. One of which appears to have a drainage line, likely created from overflow, heading east towards the proposal.</p>
Lot 2, DP 571684	<p><u>Proposal area:</u></p> <p>A site inspection of the property was undertaken with the land owners present (Gordon Kelly and Allan Kelly). Starting at the western end of the property, the beginning of proposal on the property starts on a slope which heads down gradient in an easterly direction. The gradient eventually flattens out upon nearing Washpen Creek and the overflow area (swamp/wetlands) west of the Creek. The creek system appeared to support abundant bird wildlife which was indicated by the presence of multiple species of bird. Much of the property had been cleared for cattle grazing. Cattle were present at the time of the inspection. Close to the creek, a well (stock well) was observed to the south of the alignment and west of Washpen Creek. According to the land owners, a water pipe extends off the well heading in a northerly direction off the property. After crossing the creek, the gradient slopes up in an easterly direction towards Four Mile Lane. Approximately 100 metres west of Four Mile Lane, the land flattens out. Scattered trees were observed throughout the property, including hollow bearing trees as well as mature trees lining Four Mile Lane. Where the alignment is scheduled to cross the road, the road is an unsealed gravel road. Drainage was observed either side of the road where the alignment is scheduled to cross. The un-formalised drainage heads in a northerly direction downgradient toward drainage line (erosion gully) which feeds into Washpen Creek and the surrounding wetlands.</p> <p><u>Surrounding area:</u></p>

Property ID	Inspection Summary
	<p>The land surrounding the proposal area is consistent with the proposal area, Washpen Creek heads in a northerly direction towards Swan Creek and extends north and south of the alignment. As per the proposal area the land is undulating and has undergone extensive clearing. Current land use for grazing purposes. A residential dwelling within the property is located approximately 400 metres from the alignment.</p>
<p>Lot 2, DP 56294</p>	<p><u>Proposal area:</u> Consent to access this property had not been granted when the inspections were being undertaken. However, an inspection was undertaken based off what was visible from Four Mile Lane which runs parallel to the property in a north and south direction and Tancreds Land which runs parallel to the property in an easterly direction.</p> <p>The gradient of the land within the property appeared to be relatively flat, however a minor slope was visible heading in a south and east direction towards Tancreds Lane. With the exception of a large cluster of trees in the south-west and a much smaller cluster south-east of the alignment, the land had been extensively cleared. Current land use, consistent with surrounding land use, was for the purpose of cattle grazing. The property also appeared to contain multiple artificial dams designed to capture overland flows as indicated by their positioning down-gradient of drainage lines.</p> <p><u>Surrounding area:</u> A holding pen for cattle was observed along the southern boundary of the property within 100 metres of the proposed alignment, along with what appeared to be a small stockpile of soil. With no access the nature of the stockpile could not be determined. The property was bounded by mature trees along both Four Mile Lane and Tancreds Lane.</p>
<p>Lot 7004, DP 930337</p>	<p><u>Proposal area:</u> Upon completion of the site inspection, the proposal after crossing Tancreds Lane appeared to follow the natural undulations of the terrain and head in a south easterly direction on relatively flat ground. Current land use within the proposal area, at the time of the inspection was being used for cattle grazing purposes. Cattle were observed within the property. The property has undergone some clearing however trees were scattered throughout, with a much higher density of trees in the south-east. Two artificial dams (east and west) were observed in close proximity and down-gradient to the alignment with one dam to the east, located less than 100 metres away.</p> <p><u>Surrounding area:</u> The surrounding land, consistent with the wider area is undulating. West of the alignment the ground slopes in down-gradient directions towards a creek/drainage line that runs in a north-west direction away from the alignment. Although relatively flat around the alignment, in general, the ground around the alignment slopes away from the alignment in a westerly, easterly and southerly direction towards natural drainage lines and artificially constructed dams. As per the proposal area, partial land clearing has occurred. Current land use is for the purpose of cattle grazing as indicated by the presence of cattle within in the property.</p>
<p>Lot 128, DP 751362</p>	<p><u>Proposal area:</u> Inspection of the property indicated the proposal will intersect this property in its north-east corner. Only minor land clearing has occurred within the area the alignment will cross. Although the ground where the alignment crosses is relatively flat, the ground immediately west of the alignment slopes in a south westerly down-gradient direction. A large artificial dam, less than 50 metres away, was present to the west and down-gradient of the alignment. A structure was also present approximately 150 metres south-west of the alignment which upon inspection appeared to be a farm shed (e.g. a tractor along with equipment and an area set aside for wood chopping were visible).</p> <p><u>Surrounding area:</u> Land surrounding the proposal area was consistent with the wider area as it was natural undulating, with the land sloping towards drainage lines and natural creeks. To the west of the alignment, ground slopes down-gradient away from the alignment towards drainage lines/creeks. North the land is predominately flat with a slight uphill gradient. East the ground is relative flat before heading</p>

Property ID	Inspection Summary
	<p>down-gradient in an easterly to south easterly directions towards drainage lines. To the south the ground initially flat slopes down-gradient in a southerly direction. To the north, north-east and north-west, the land was being utilised for grazing purpose as is the land to the east and south. To the west and south-west much of the land is occupied by vegetation/woodlands.</p>
<p>Lot 132, DP 751362</p>	<p><u>Proposal area:</u> The property at the time of the site inspection was being utilised for the purposes of cattle grazing. This includes the proposal area and land surrounding the alignment. Ground where the alignment is scheduled to cross, although starting relatively flat in the north-west corner eventually heads down-gradient in a south to south eastern direction. Immediately north of the alignment a patch of trees is present. On the edge of this treeline in very close proximity to the alignment, if not within, fly tipped waste in the form of tyres and timber had been dumped. One hundred metres down-gradient south of the alignment is an artificially constructed dam. This dam was positioned to capture overland flow from the north and south and a natural drainage line coming from the north-west. Again, located approximately 100 metres to the south of the alignment was a drainage line/creek which heading in south eastern direction captures overflow from the dam and connects with drainage lines/creeks of adjacent property's. Upon entering the property in the north-west a raised mound of soil, contained by a three sided retaining wall of timber panels was observed. Although uncertain of the purpose of the mound, the soil appeared to be natural soil which had been pushed up to form a mound</p> <p><u>Surrounding area:</u> Land surrounding the proposal area was consistent with the wider area as it was naturally undulating, with the land sloping towards drainage lines and natural creeks. A stockpile of soil with tree limbs and stumps was observed approximately 50 metres south of the alignment. The mound appeared to have been present for some time as it was heavily vegetated. Given its close proximity to a dam, it is likely the material is composed of excess soil from the excavation or maintenance of the dam.</p>
<p>Lot 1, DP 367684 & Lot 117, DP 751362</p>	<p><u>Proposal area:</u> Although two separate properties, the current proposed alignment runs along the property boundary of the two properties'. At the time of the inspection, consent to access had only been granted for Lot, DP 367684. As such, inspection of Lot 117, DP 751362 was undertaken from within the other property, however this property will no longer be impacted. The ground where the alignment is scheduled to cross was relatively flat, however a very slight downward gradient heading south-east was present. On Lot 1, DP 367684, the land was dominated by trees with the other lot having been largely cleared. Both properties at the time of the inspection were being used for the purposes of cattle grazing with horses also present in Lot 1 DP 367684. Within Lot 1, DP 367684, an empty 5 litre plastic petrol container was present. Signs of recent tree felling indicated this had been left behind. No staining or evidence of a spill was present.</p> <p><u>Surrounding area:</u> Inspection of Lot 117, DP 751362, indicated land sloped down-gradient away from the alignment to the south and south-east in the direction of a creeks/drainage lines travelling across the property in an easterly direction. The wider area within this property was being used for the purposes of cattle grazing. Inspection of Lot 1, DP 367684 showed much of the wider area was dominated by native vegetation. The inspection showed the land sloped away from the alignment in a north and north easterly direction towards a creek/drainage line heading in an easterly direction. A small to medium sized dam was also present, approximately 200 metres north of the alignment.</p>
<p>Lot 2, DP 367684 & Lot 3, DP 367684</p>	<p><u>Proposal area:</u> Although two separate properties, both occupy similar landform with little to no differentiation between the two. As such they have been combined for the purposes of assessment. Both properties have been largely cleared, although native vegetation is scattered throughout. The two properties also appeared to be predominantly utilised for cattle grazing purposes. One dam located within Lot 2, DP 367684, was present to the south within 50 metres cross gradient of the alignment. The dam is connected to creeks/drainage coming from up-gradient to the west. Connected to the</p>

Property ID	Inspection Summary
	<p>east side of dam, a broken drainage line/creek stretches to the east onto adjacent properties. With the exception of approximately 70 metres of the alignment on the western boundary of Lot 2, DP 367684, the majority of the proposed alignment is currently scheduled to be constructed on flat ground with slopes moving away from the alignment to the north and south in an upwards gradient. The alignment does however cross over a drainage line/creek which heads an in easterly direction off Lot 3, DP 367684.</p> <p><u>Surrounding area</u></p> <p>Upon inspection of the properties, the landform surrounding the proposed alignment was sloped down from the north and south towards the alignment. Surrounding land use was also consistent, as it was also predominantly used for cattle grazing. McPhillips Creek was located within 500 metres of the alignment; however, it is not down gradient and therefore not likely to be impacted.</p>
<p>Lot 72, DP 751362 & Lot 20, DP 7877</p>	<p><u>Proposal area:</u></p> <p>Although two separate properties, the current proposed alignment runs along the property boundary of both, but impacts are constrained to Lot 20, DP 7877. Both properties have undergone extensive clearing. Land use for the two properties was also identified to be for the purposes of cattle grazing. Beginning at the western boundary of the properties, the proposed alignment for approximately 250 metres is currently positioned on flat ground atop of a low rise before dropping down to flat ground for the remaining length of the properties. Either side of the first 250 metres the land slopes in a slight downward gradient to the north and south towards McPhillips Creek. Once on flat low lying ground the proposed alignment continues to travel along the boundary of the two properties until reaching the next properties to the east. Situated on low lying ground much of the alignment is scheduled to travel east through a flood plain. During the inspection multiple sections of saturated ground were observed. Connected to McPhillips Creek less than 100 metres to the south as well Glenugie Creek to the east in which the alignment also crosses, it was evident that the low lying ground is often subject to flooding.</p> <p><u>Surrounding area:</u></p> <p>Consistent with the proposal area, the surrounding area is predominately flat with little to no gradient. As per the proposal area, the majority of the land has been cleared and is currently being used for the purposed of cattle grazing.</p>
<p>Lot 1 DP 1113608 & Lot 19, DP 7877</p>	<p><u>Proposal area:</u></p> <p>With the exception of approximately 700 metres to the east, where the alignment traverses the property boundary between two properties, much of the proposed alignment travels through only Lot 1, DP 1113608. Where the proposed alignment does traverse the property boundary of both Lot 1, DP 1113608 & Lot 19, DP 7877, the properties were observed to both occupy the same landform, both to have been extensively cleared and both to currently be used for the purposes of cattle grazing. As such and given that access, at the time of the inspection had only been granted for Lot 1, DP 1113608, both properties have been assessed together in this section.</p> <p>After crossing Glenugie Creek at the western boundary, the proposed alignment heads south-east in an upwards gradient until it reaches the top of the rise. Once it reaches the top of the rise the proposed alignment, still heading south-east, begins heading in a downward gradient towards an unnamed creek (a tributary of Glenugie Creek). Approximately 100 metres west of the creek, the alignment intersects with the property boundary dividing the two properties. Once the alignment crosses the creek, it begins to travel in an upward incline to the eastern boundary of the two properties where it enters the CCC.</p> <p><u>Surrounding area:</u></p> <p>Consistent with the proposal area, the surrounding area follows the same landform, has been extensively cleared and is currently being used for the purposes of cattle grazing. Glenugie Creek which intersects the alignment to the west and the unnamed creek which intersects the alignment to the east, extend either side of the alignment to the north and south. Walking along the alignment fly tipped waste which included concrete slabs, car body parts, scrap metal, minor timber and brick were observed atop of the hill of Lot 1, DP 1113608, which marks the highest point of the area.</p>

Property ID	Inspection Summary
	Additionally, a concrete footing was also present approximately 100 metres down-gradient to the east. The concrete footing along with the fly tipped waste corresponds to the historically aerial imagery which showed the presence of a house or farm structure such as a shed at the same location in 1958. The fly tipped waste along with the concrete footing are likely the remains of the farm building that was located in the property during the 1950s to 1960s.

It should be noted that an additional site inspection was not undertaken on the re-routed sections of the transmission line alignment following the amendments made in late 2018. In consideration of the land use covered by the re-routed sections being consistent with the land use identified for the previous alignment and that the site inspections completed over the 13 to 15 June 2018 included the majority of the area that is now covered by the proposal, an additional site inspection was not considered necessary.

7. Site Condition and Surrounding Environment

7.1 Current occupier and operations

Intersecting multiple properties, the proposal area is currently occupied by multiple private landowners with only Lot 7004, DP 93037, listed as Crown Land (managed by a trust). At the time of the undertaking the PSI, land use, with the exception of public roads, was zoned Rural Landscape (RU2) under the *Clarence Valley Local Environmental Plan 2011*. Following site inspections and a review of current and historical information, the land where the proposal will cross is currently being utilised for the purposes of grazing livestock, namely cattle. The land is typically a mix of cleared grazing land and native vegetation. Residential dwellings and other structures were also present however these were associated with the land owners and use of the land for agricultural purposes.

7.1.1 Surrounding land use

The proposal is typically surrounded by rural landscape/agricultural land use with rural residential dwellings, as follows:

- North – Rural landscape/agricultural property and residence.
- East – Rural landscape/agricultural property and residence and the CCC currently under construction.
- South – Rural landscape/agricultural land use.
- West – Rural landscape/agricultural land use bounded by the Clarence River.

7.2 Tanks and associated services

No evidence of above or below ground tanks or associated services were observed across areas of the site.

7.3 Fill material

No fill material was observed within the proposal area, however a number of stockpiles/mounds of soil were observed within Lot 2, DP 562924 and Lot 132, DP 751362. However, these appeared to be comprised of natural excavated material. No evidence of contamination was present. Multiple access tracks (farm tracks) were observed throughout the properties inspected. However, with the exception of public roads and tracks, these appeared to be comprised of natural material exposed during the clearing and construction of the tracks.

7.4 Odours and staining

No unusual odours or surface staining, that could be potentially associated with contamination were noted during the site inspection.

7.5 Chemicals and hazardous wastes

No chemicals or hazardous waste were observed across the proposal area. Only one discarded 5 litre plastic petrol container was observed during inspections, however no signs of the former contents including leaks or stains on the surface were observed.

7.6 Potential areas of environmental interest

A number of potential AElS were identified during the information review and site inspection. Table 7-1 outlines the potential AElS located in the vicinity of the site and their associated risks to environmental receptors and site users.

Table 7-1: Potential areas of environmental interest

Site No.	Potential AEI	Location relative to proposal	Potential contamination source/s	Risk rating
1	Stockpiles	Lot 2 DP 562924 Lot 132, DP 751362	Foreign waste or material not observed on the surface, buried within the stockpiles Agricultural residues in the stockpiled material (sediments/soil).	Very low
2	Historical dams down-gradient of the alignment	Across the proposal area	Agricultural residues in sediments (pesticides, metals, hydrocarbons). Unknown quality of material used to backfill dam.	Very low
3	Historical agricultural use (Grazing)	Across the proposal area.	Agricultural residues (pesticides, metals, hydrocarbons) if present are likely to be relatively diffuse in nature and confined to natural surface soils.	Low
4	Miscellaneous waste across site such as scrap metal (tin sheeting, abandoned farming equipment), timber (fence posts, bamboo), tyres or ACM	Lot 132 DP 751362 Lot 1, DP 1113608	Heavy metals from the degradation of scrap metal and within tyres. Hydrocarbon based residues from degraded tyres and vehicles. Potential asbestos with soil as a result of unseen buried demolition was from former building (Lot 1 DP 1113608).	Low
5	Potentially polluted waters of Glenugie Creek	Lot 1, DP 1113608 Lot 19 DP 127096	Heavy metals and pesticides from highly turbid waste water, released from the CCC construction site into Glenugie Creek.	Low

7.6.1 Summary of potential areas of interest

Potential areas of environmental interest and associated contaminants of concern:

- A stockpile of soils located in the north-west corner and south of the alignment in Lot 132, DP 751362, and the stockpile in Lot 2, DP 562924, represent a potential source of contamination, possibly associated with diffuse pesticide/herbicide use, heavy metals and hydrocarbons. The stockpile is considered to pose a very low risk with respect to exposure given the site history and results of the site inspection. There is a low likelihood of significant contamination being associated with the stockpile.
- The historical dams across the proposal area represent a potential source of contamination with respect to the low possibility of sediments within the dams containing agricultural residues and potential filling of the dam with materials of unknown quality. Given that these dams are unlikely to be disturbed as a result of construction activities, there is a very low risk could impact the works.
- The historical agricultural land use of the proposal area represents a potential source of contamination associated with diffuse pesticide/herbicide use. The historical land use poses a low risk with respect to contamination given that the agricultural residues (pesticides, metals, hydrocarbons) are likely to be relatively localised and diffused in nature and confined to natural surface soils. Considering the predominant use of

the site as grazing land and a lack of evidence indicating the proposal area had been used for cropping purposes, the use of pesticides/herbicides would likely have been for weed control and not crop management. As such it is unlikely pesticides/herbicides have been applied to the land in mass quantities.

- The fly tipped waste in the form of tyres and timber in Lot 132, DP 751362, and scrap metal, concrete, bricks, car body parts and timber within Lot 1, DP 1113606, represents a potential source of contamination associated hydrocarbon based contaminants from degraded materials such as tyres and heavy metals from the degradation of the scrap metal. The waste in Lot 1, DP 1113606, along historical imagery which places a house/building in the area, indicate at some stage the house/building had been demolished. The presence of waste on the surface may indicate demolition waste has been buried in the area. Given the timeline the house/building was still standing, wastes may include potential asbestos. Given the current alignment is scheduled to avoid this area by approximately 100 metres, there is a low likelihood buried waste will be encountered.
- In late 2017, an uncontrolled release of highly turbid water into the surrounding environment which may have included Glenugie Creek, was reported to the EPA. Following the notification, a clean-up notice was issued relating to the release. If the release resulted in the pollution of Glenugie Creek with highly turbid water from the CCC, creek water and sediments may have been contaminated with other contaminants of concern. Although details on the condition of the released water are unknown, it is likely that any potential contaminants would be limited to pesticides and herbicides. In 2016, Jacobs completed a Stage 1 PSI of the CCC. The findings of that investigation were as follows:
 - The site was first established for the purpose of farming and grazing in 1911 and used for this purpose up to commencement of the CCC proposal. The site use has remained consistent with the surrounding land use (agricultural/rural-residential land) since its private ownership/tenure.
 - With the exception of livestock (cattle, horses) the proposal area appeared to have been largely vacant since 1958 up to 2015.
 - With the exception of agricultural land use, no other land use activities were identified that potentially could have resulted in contamination of the proposal or adjacent land uses.
 - A site inspection revealed no tanks (above or below ground), fill material or stains (with the exception of minor staining associated with a broken down tractor) were present on-site nor any signs that the mass storage of hazardous chemicals had occurred on-site.
 - Upon consideration of the findings from the site inspection and a review of available historical aerial imagery and title deeds, it is likely that any agricultural use of the property has been limited to the grazing of livestock. As such it is unlikely that the site, given historical information, would have been exposed to activities that would have used quantities of pesticide and herbicide sufficient to cause contamination.

In consideration of the findings and conclusions from Stage 1 PSI undertaken on the CCC site (Jacobs 2016), in which any contamination risk on site was low and likely limited to pesticides and herbicides and that it was unlikely the CCC site would have been exposed to activities that would have used quantities of pesticide and herbicide sufficient to cause contamination, the risk of the released water containing contaminants is considered low. Furthermore, given the release was not on-going and that any contaminants present within the released water are likely to be in low concentration, any contamination to the surrounding land and Glenugie Creek, would be localised and highly diffused in nature.

8. Conceptual Site Model

From information gained during the PSI Jacobs have provided the following preliminary conceptual site model (CSM) in Table 8-1.

Table 8-1: Preliminary Conceptual Site Model

Source	AEI No.	Pathway	Receptor	Potential contaminants of concern	Proposed investigation / management strategy
Exposed soil and stockpiles	1	Contamination of unsealed surfaces and underlying soils/fill.	Current site users. On site construction workers.	Heavy metals, hydrocarbons (TRH, BTEX and PAH) and pesticides (OCP).	Management to be undertaken during construction in accordance with a CEMP. Waste classification to be undertaken if material is to be removed from site.
Historical site use (wastes, agriculture)	1,2,3 and 4	Contamination of unsealed surfaces and underlying soils/fill/sediments.	Current site users. On site construction workers.	Pesticides (OCP), heavy metals and hydrocarbons (TRH, BTEX and PAH).	Management to be undertaken during construction in accordance with a CEMP. Waste classification to be undertaken if material is to be removed from site.
Current site structures (house, dams etc)	2	Contamination of unsealed surfaces and underlying soils/sediments.	Current site users. On site construction workers.	Pesticides (OCPs), heavy metals, hydrocarbons (TRH, BTEX and PAH) and effluents.	Management to be undertaken during construction in accordance with a CEMP. Waste classification to be undertaken if material is to be removed from site.
Uncontrolled releases from surrounding land uses (CCC construction site)	5	Contamination of surface waters, unsealed surfaces and underlying soils/sediments.	Current site users. On site construction workers.	Pesticides (OCPs) and herbicides.	Management to be undertaken during construction in accordance with a CEMP. Waste classification to be undertaken if material is to be removed from site.

9. Discussion

A review of historical records pertaining to the proposal area indicated a low potential to be contaminated. In accordance with the Clarence Valley Council's contaminated land policy and based on the historic and current zoning of the property as a rural landscape, it was determined that the likely source of any contamination on site would stem from the use of pesticides and herbicides. However, upon consideration of the findings from the site inspection and a review of available historical aerial imagery and anecdotal information obtained from property owners, it is likely that any agricultural use of the properties has been limited to the grazing of livestock. As such it is unlikely that the proposal area, given historical information would have been exposed to activities that would have used quantities of pesticides and herbicides sufficient to cause contamination.

With the exception of agricultural land use and the one off uncontrolled release of turbid water into the surrounding land, including the part of Glenugie Creek immediately west of the CCC construction site, this Stage 1 PSI identified no other land use activities which could have potentially led to the contamination of the proposal adjacent or adjacent land uses. A site inspection revealed no tanks (above or below ground), fill material or stains present within the proposal area. Furthermore, no signs of the use or mass storage hazardous chemicals were noted across areas of the proposal area.

Some minor surface disturbances were observed around artificially constructed dams (i.e. stockpiles soils, soil bunds), however these disturbances were largely minor and no potential contamination sources were observed within these disturbances.

During the detailed site inspection of the proposal area, minor occurrences of fly-tipped waste were observed at locations within two properties (Lot 132 DP 751362 and Lot 1 DP 1113608). These wastes included scrap metal including part of a vehicle, corrugated tin sheeting, discarded timber (fence posts), tyres and concrete. No evidence of staining or chemical spills were observed within or near the proposal areas.

Following changes to the proposal alignment in late 2018, Jacobs undertook a review of historical aerials, publicly available information and notes obtained during previous site inspections to inform this assessment. This review found no new evidence that indicates the presence of additional potential contamination sources within or in close proximity to the proposal area.

Based on the tasks undertaken as part of the PSI process, the weight of evidence indicates that the proposal area is suitable, from a contamination perspective, for the proposed construction and operation of a transmission line and no further contamination investigation is required at this stage.

10. Conclusions and recommendations

10.1 Conclusions

Following a review of the available records and a site inspection, the key findings of the Stage 1 PSI include:

- Acid Sulfate Soils risk varies across the proposal area. A high probability of occurrence was noted around surface water bodies such as Washpen Creek and Glenugie Creek within the proposal area, however with the exception of natural surface water bodies and low lying areas around water bodies, the proposal area is considered a low to extremely low probability of ASS being encountered (ASRIS 2018).
- No registered beneficial groundwater users were identified in close proximity to the proposal area, however an unregistered stock bore/well was observed in Lot 2 DP 571684, within 50 metres of the alignment. Considering that the nearest registered bore identified groundwater at approximately 8 metres and the deepest excavation/borehole would be no greater than 6 metres, it is unlikely that groundwater will be impacted by the proposal or represent a risk to the users of the unregistered bore/well.
- Miscellaneous waste including scrap metal (car body parts, machine parts, corrugated tin sheeting etc), discarded timber (e.g. fence posts), tyres and minor amounts of concrete, were observed at discrete locations in Lot 132 DP 751362 and Lot 1, DP 1113608.
- The proposal area use has remained consistent with the surrounding land use (agricultural/rural-residential land) since 1958. Dwellings or farming related structures, such as farm sheds are present within the properties where the alignment will traverse, however housing is extremely low density within the proposal area and is comprised of rural dwellings. Surrounding areas, with the exception of remnant bush land, appear to have been predominantly used for agricultural purposes or rural landscapes.
- The uncontrolled release of highly turbid water into Glenugie Creek, as a result of structural failure of an on-site sediment basin from CCC construction site is not expected to impact the construction or operation of the transmission, given that any contamination would likely be localised and diffused in nature.
- There were no sites within one kilometre of the site that were either regulated or had been notified to the NSW EPA.
- Based on a review of historical aerial imagery, a review of historic and current zoning of the proposal area as a rural landscape and in accordance with Clarence Valley Council's contaminated land policy, it was determined that the likely source of any contamination on site would stem from the use of pesticides and herbicides. However, based on the use of the site for grazing purposes and not cropping it is unlikely pesticides have been in use in a quantity that would cause a significant contamination risk.
- The NSW Department of Primary Industries Cattle dip site locator indicated no cattle dip sites were located within a one kilometre radius of the proposal area.
- No evidence of hazardous chemicals and hazardous chemical storage (i.e. tanks (underground or above ground) and associated services).
- Based on the tasks undertaken as part of the PSI process including those completed following changes to the proposal alignment in late 2018, and in accordance with SEPP 55 and Clarence Valley Council's contaminated land policy, it is concluded that the weight of evidence indicates that the proposal area is suitable, from a contamination perspective, for the proposed construction and operation of a transmission line to the CCC. No further contamination investigation is required.

This working paper has considered the statutory provisions of relevant environmental planning instruments and policies pertaining to the management of contamination, including the *State Environmental Planning Policy No.55 – Remediation of Land*.

10.2 Recommendations

Based on the results of the Stage 1 PSI, it is recommended that any potential contamination risks be managed under a CEMP. As such, it is not considered that intrusive investigation works (i.e. Stage 2 Detailed Site Investigation (DSI)) are required in order to further define and provide a quantitative assessment of potential contamination within proposal area.

Based on the available site information and information gathered during the on-site inspection and in particular the lack of evidence indicating contamination risk, there is a low risk that contaminants are present and likely to be disturbed if present, at a quantity that would trigger the need for an intrusive investigation.

Given the unlikelihood of contaminants being present on-site, a low risk rating has been applied to potential AEIs within the proposal area from a contamination perspective. Considering uncertainties around the use of herbicides or pesticides within the proposal area, it is recommended that the proposal CEMP detail contingency measures to address unexpected finds of contaminated material when excavation works are required within or in proximity to the identified AEIs.

11. Glossary

ASS	Acid Sulfate Soil.
AEI	Areas of Environmental Interest.
ACM	Asbestos containing material.
APZ	Asset protection zone(s).
ASC	Australian Soil Classification.
ASRIS	Australian Soil Resource Information System.
BAL	Bushfire attack level (after AS 3959-2009 <i>Construction of buildings in bushfire prone areas</i>).
BCA	Building Council of Australia.
BFCC	Bush Fire Coordinating Committee of NSW.
CCC	Clarence Correctional Centre
CVBFMC	Clarence Valley Bush Fire Management Committee.
CSM	Conceptual Site Model.
DPE	Department of Planning and Environment.
DP	Deposited Plan.
DSI	Detailed Site Investigation.
EP&A Act	<i>Environmental Planning and Assessment Act 1979.</i>
FDR	Fire danger rating.
GSG	Great Soils Group.
INSW	Infrastructure NSW.
LGA	Local government area
NSW EPA	New South Wales Environmental Protection Authority
OPGW	Optical Ground Wire.
PBP	Planning for bushfire protection (NSW RFS, 2006).
PSI	Preliminary Site Investigation.
REF	Review of Environmental Factors.
RFS	NSW Rural Fire Service.
SFPP	Special Fire Protection Purposes development.
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011.</i>

12. References

- ASRIS (2016) *Australian Soil Resource Information System*, Accessed 30 July 2018, Available at <http://www.asris.csiro.au/>.
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Appendix A. Lotsearch Historical Aerial Imagery

A.1 Lotsearch Aerials Report – CCC Power Line Route (Section 1 to Section 6)



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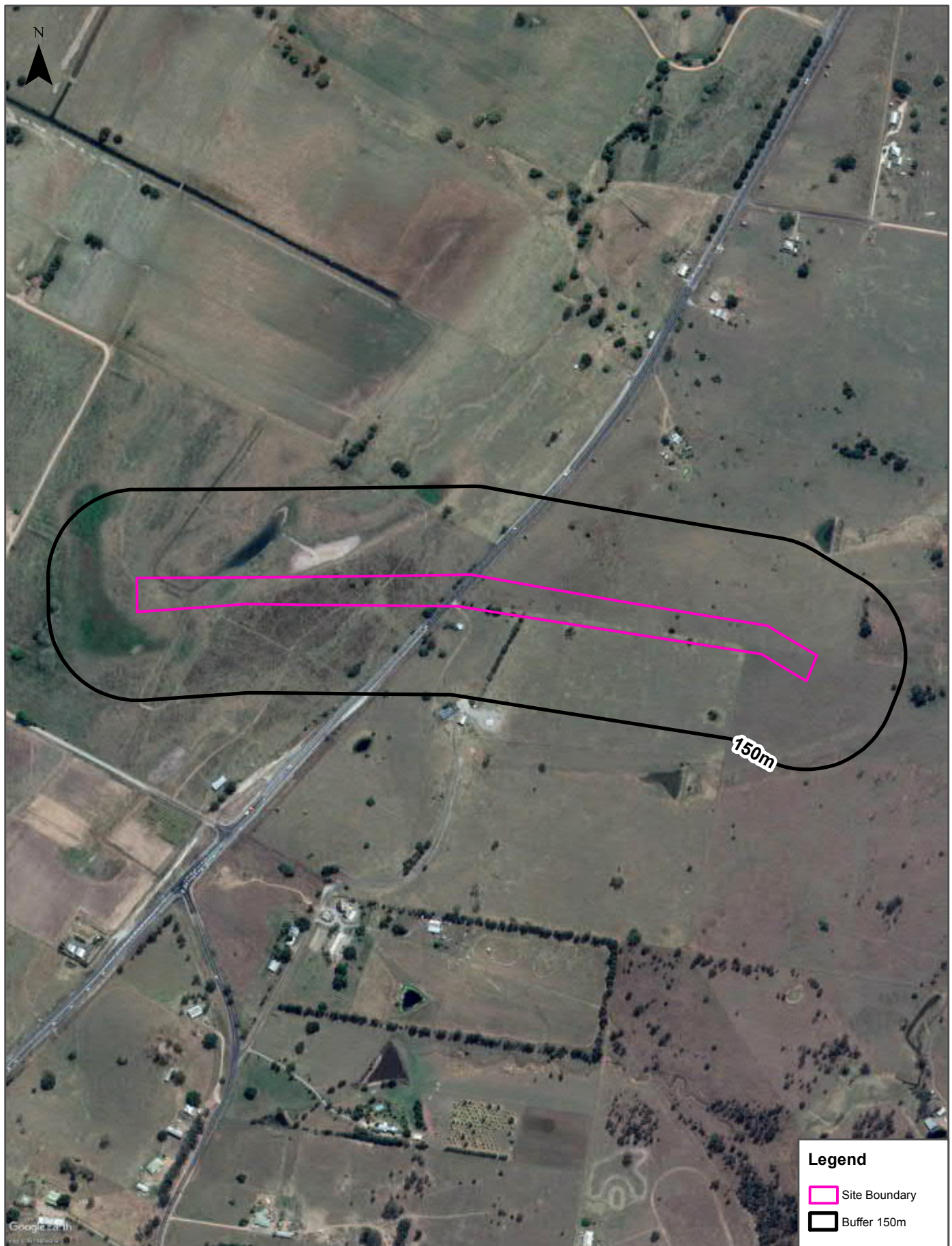
Date: 28 June 2018

Reference: LS003736

Address: Powerline Route, Grafton, NSW (Section 1)

Aerial Imagery 2017

Powerline Route, Grafton, NSW (Section 1)



Legend	
	Site Boundary
	Buffer 150m

Scale: 0 100 200 400 Meters

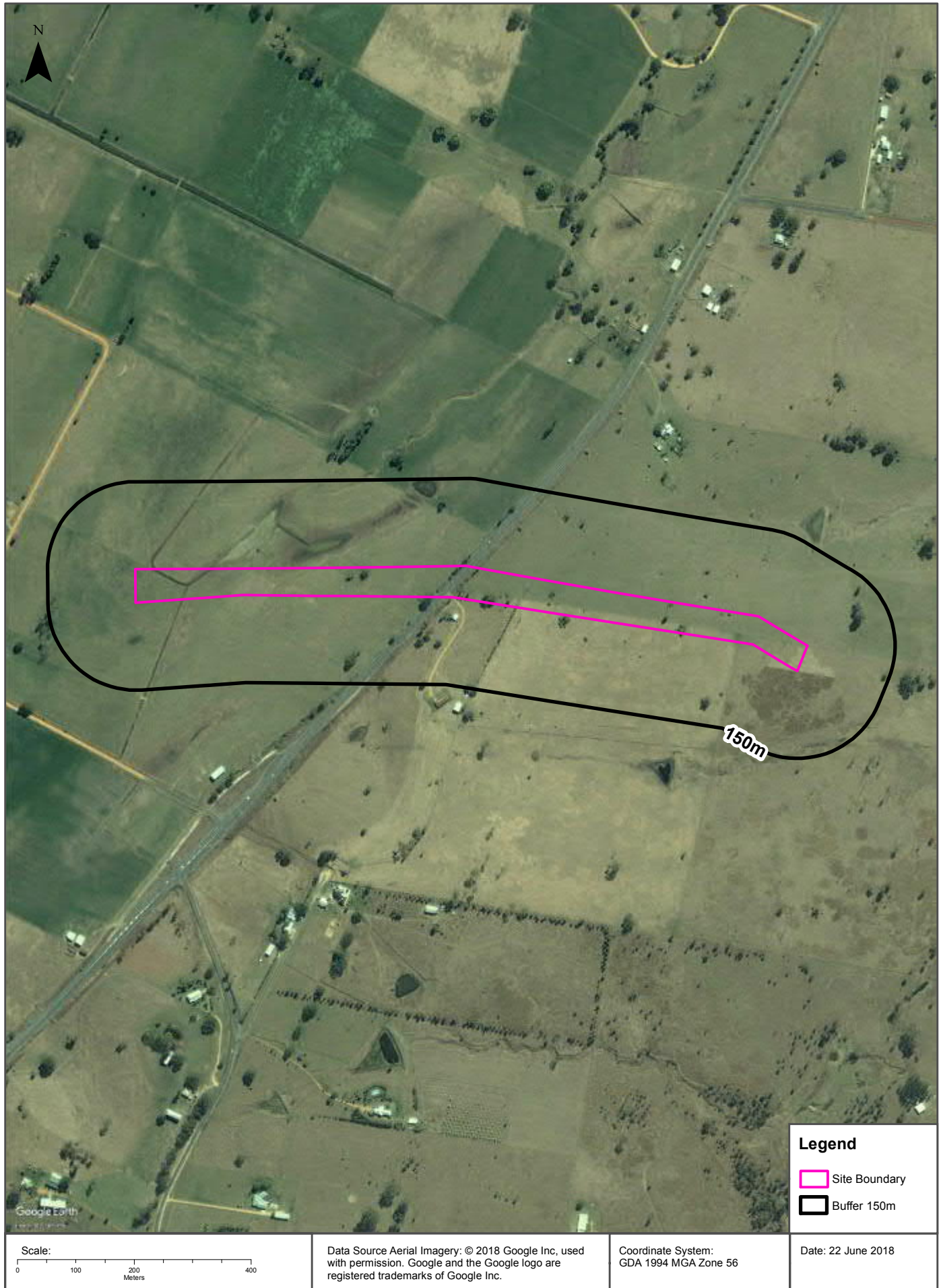
Data Source Aerial Imagery: © 2018 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 56

Date: 22 June 2018

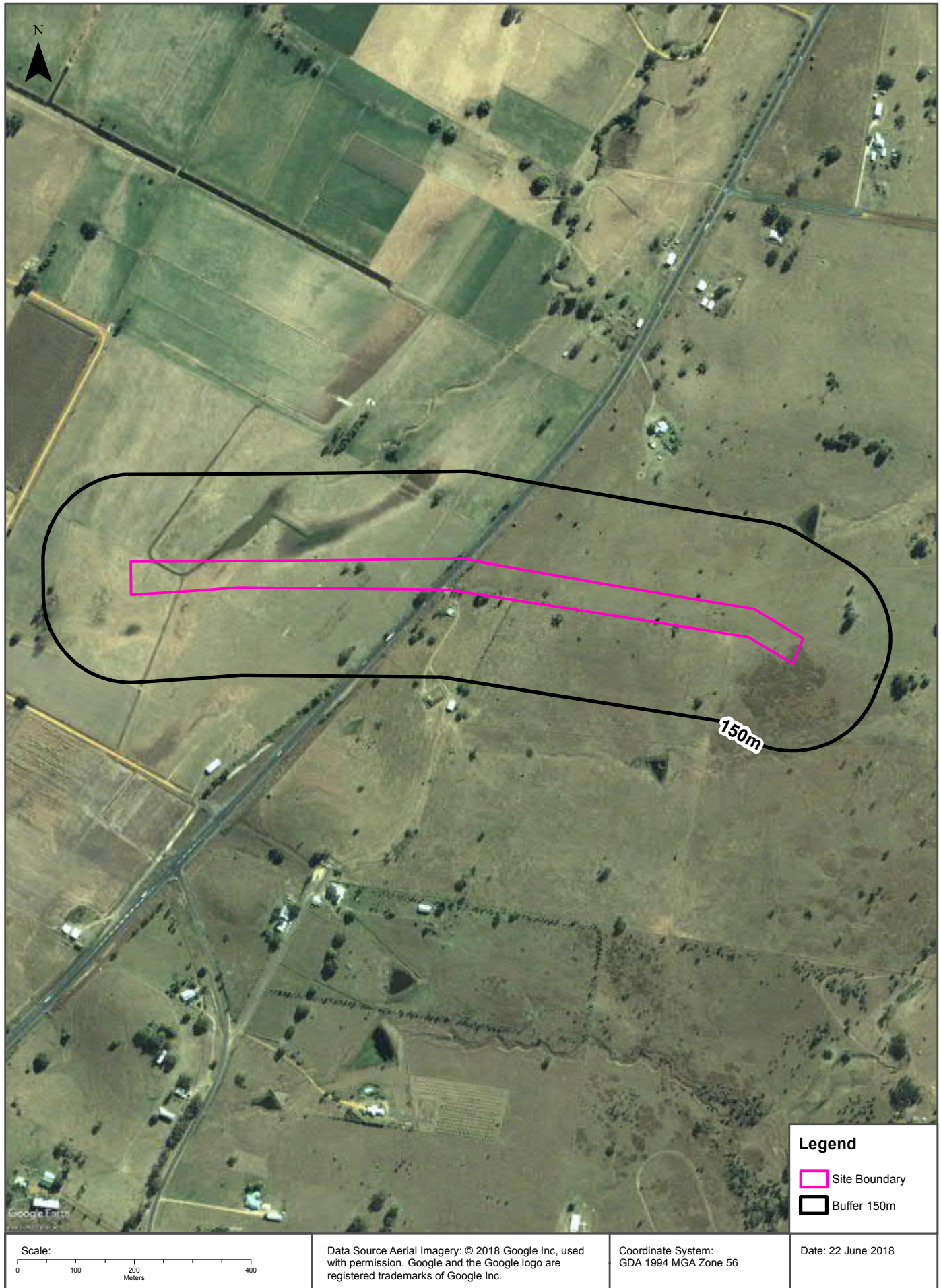
Aerial Imagery 2006

Powerline Route, Grafton, NSW (Section 1)



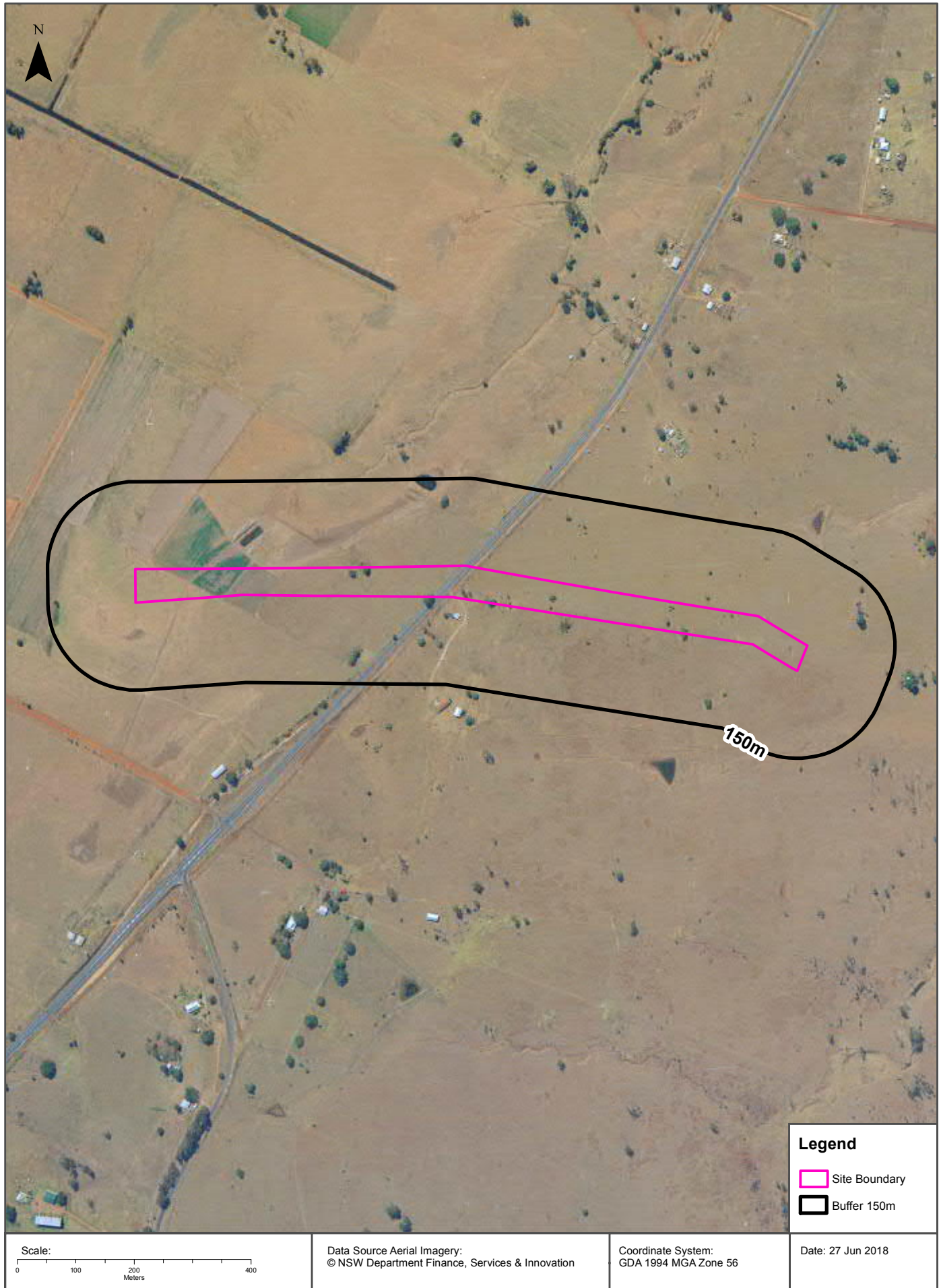
Aerial Imagery 2004

Powerline Route, Grafton, NSW (Section 1)



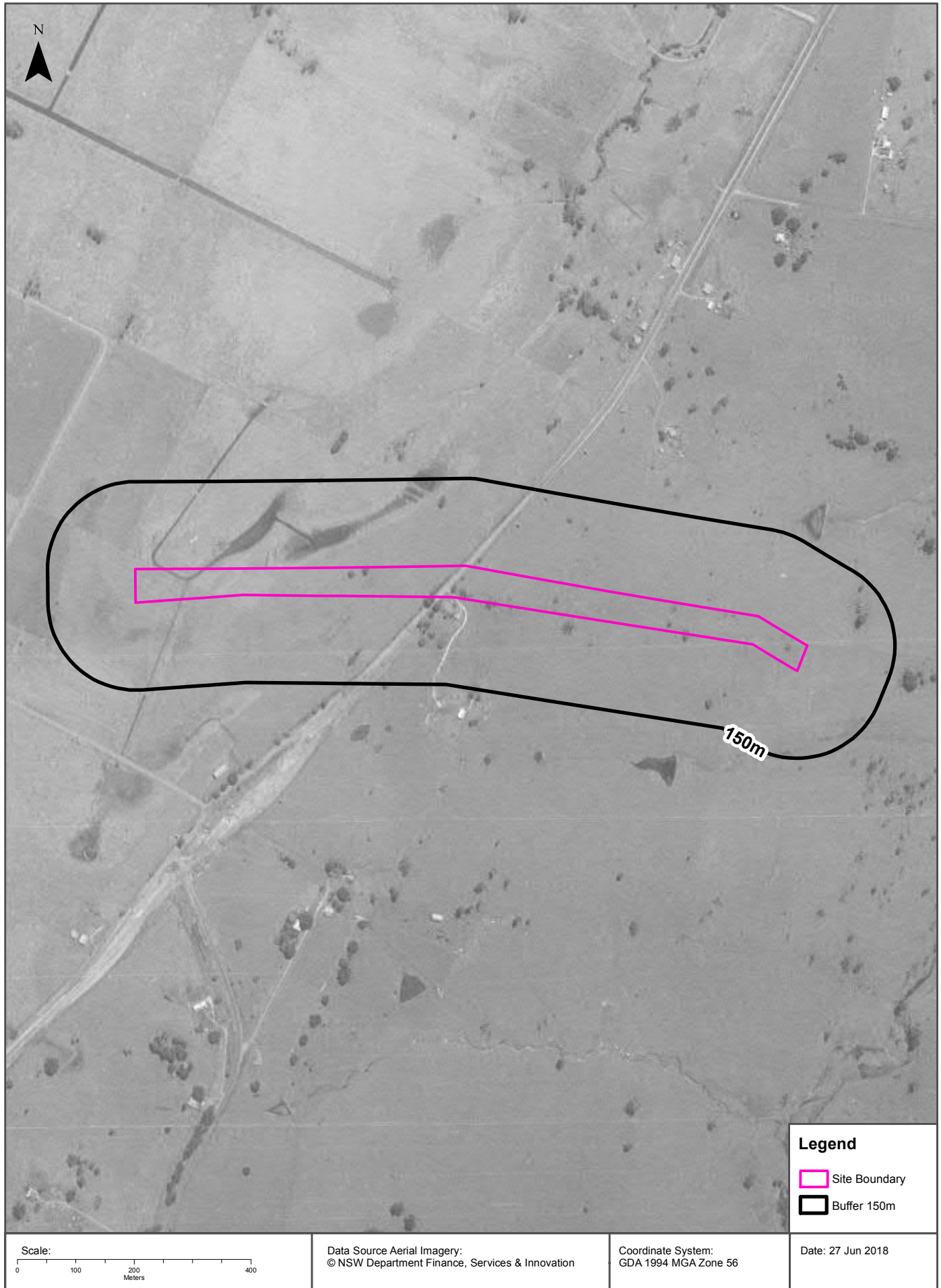
Aerial Imagery 1994

Powerline Route, Grafton, NSW (Section 1)



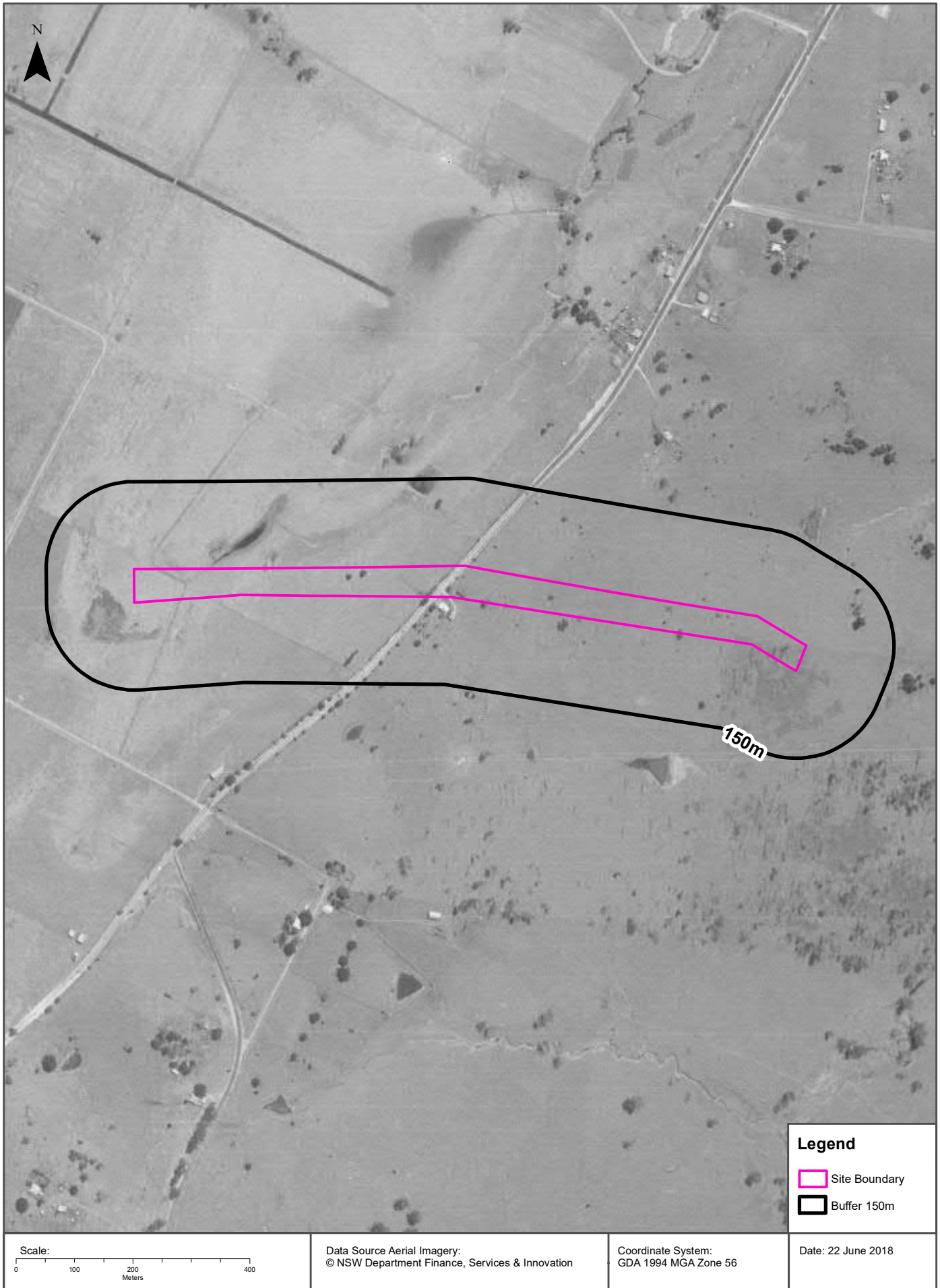
Aerial Imagery 1987

Powerline Route, Grafton, NSW (Section 1)



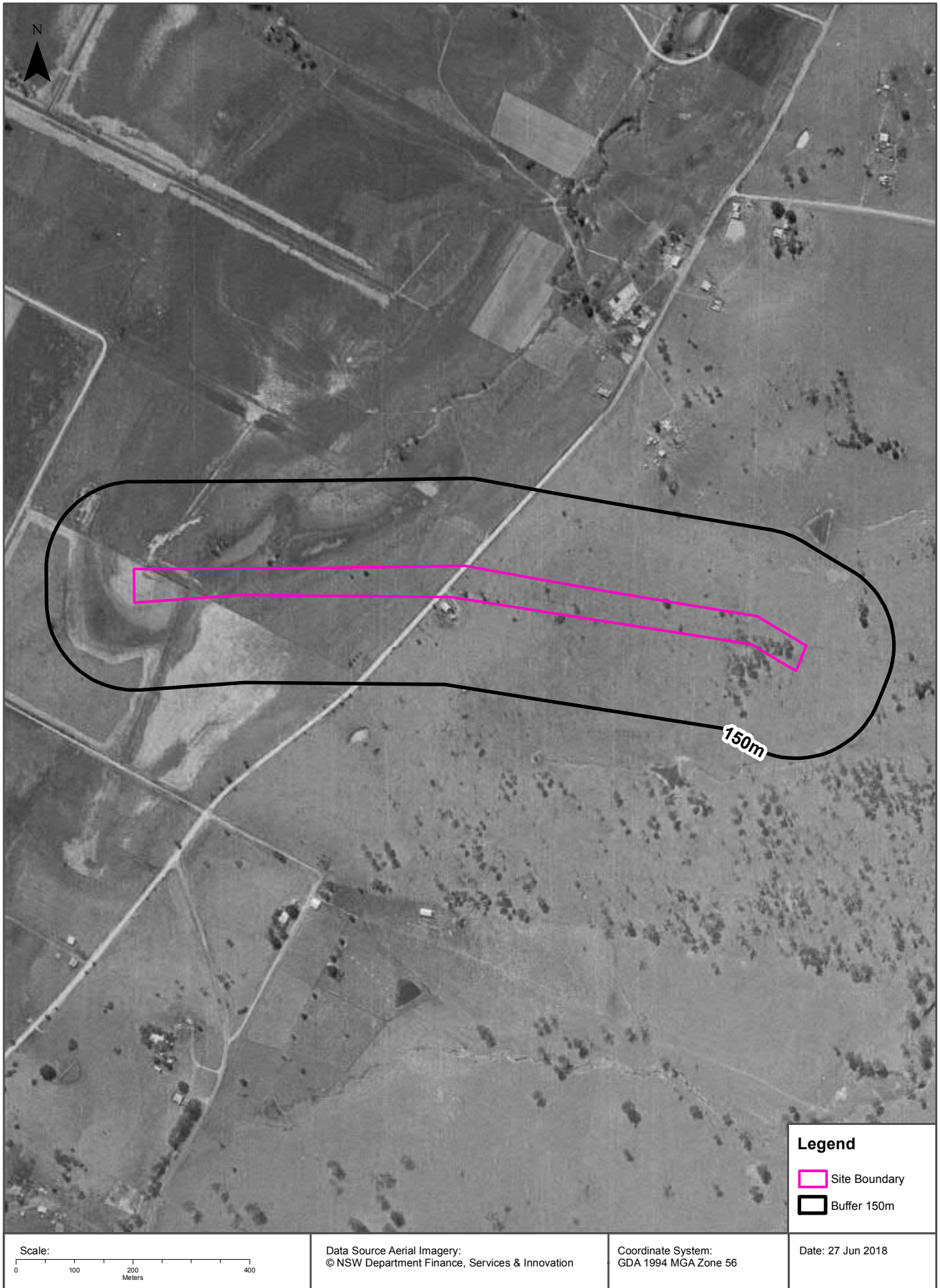
Aerial Imagery 1978

Powerline Route, Grafton, NSW (Section 1)



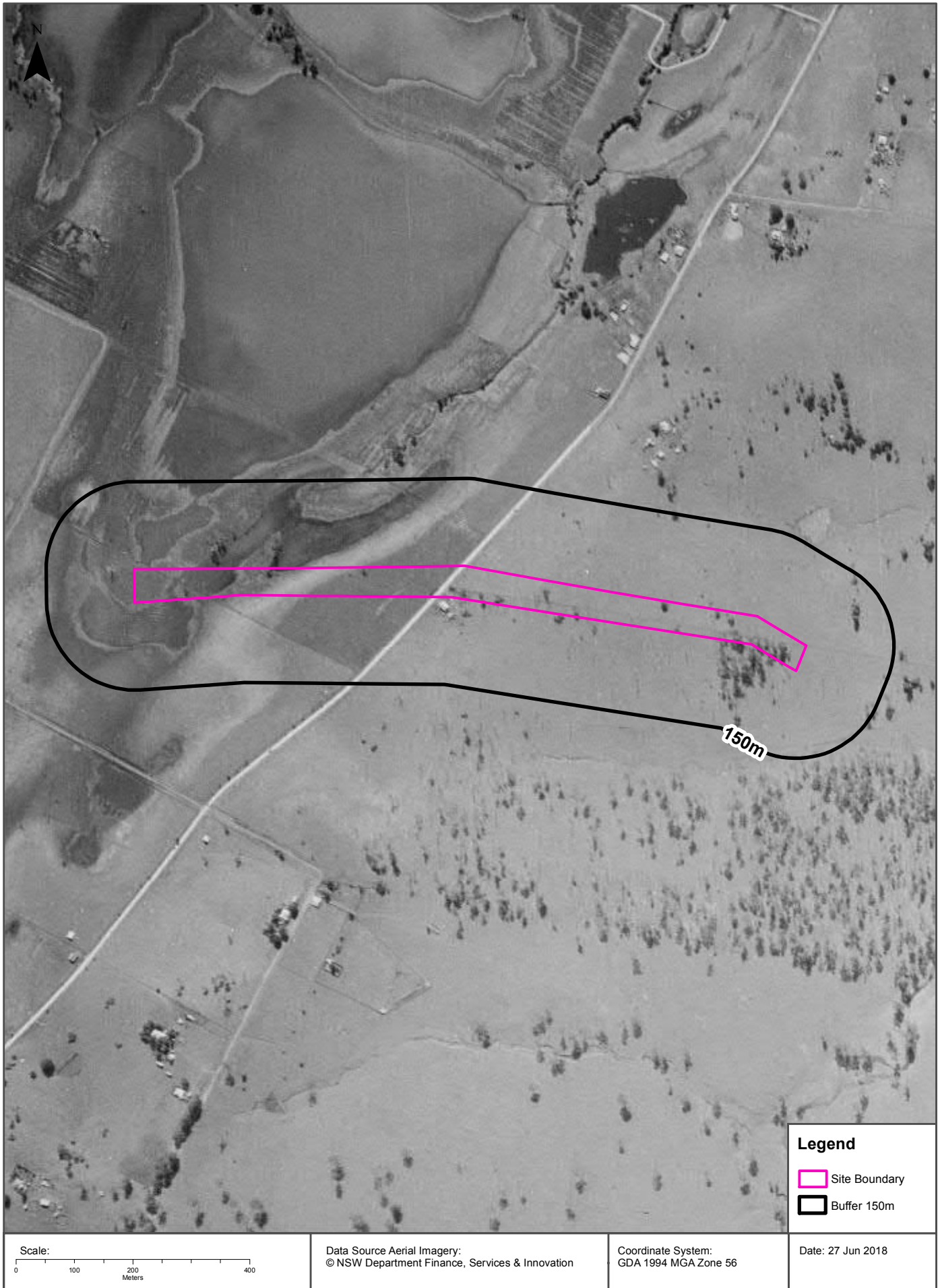
Aerial Imagery 1964

Powerline Route, Grafton, NSW (Section 1)



Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 1)



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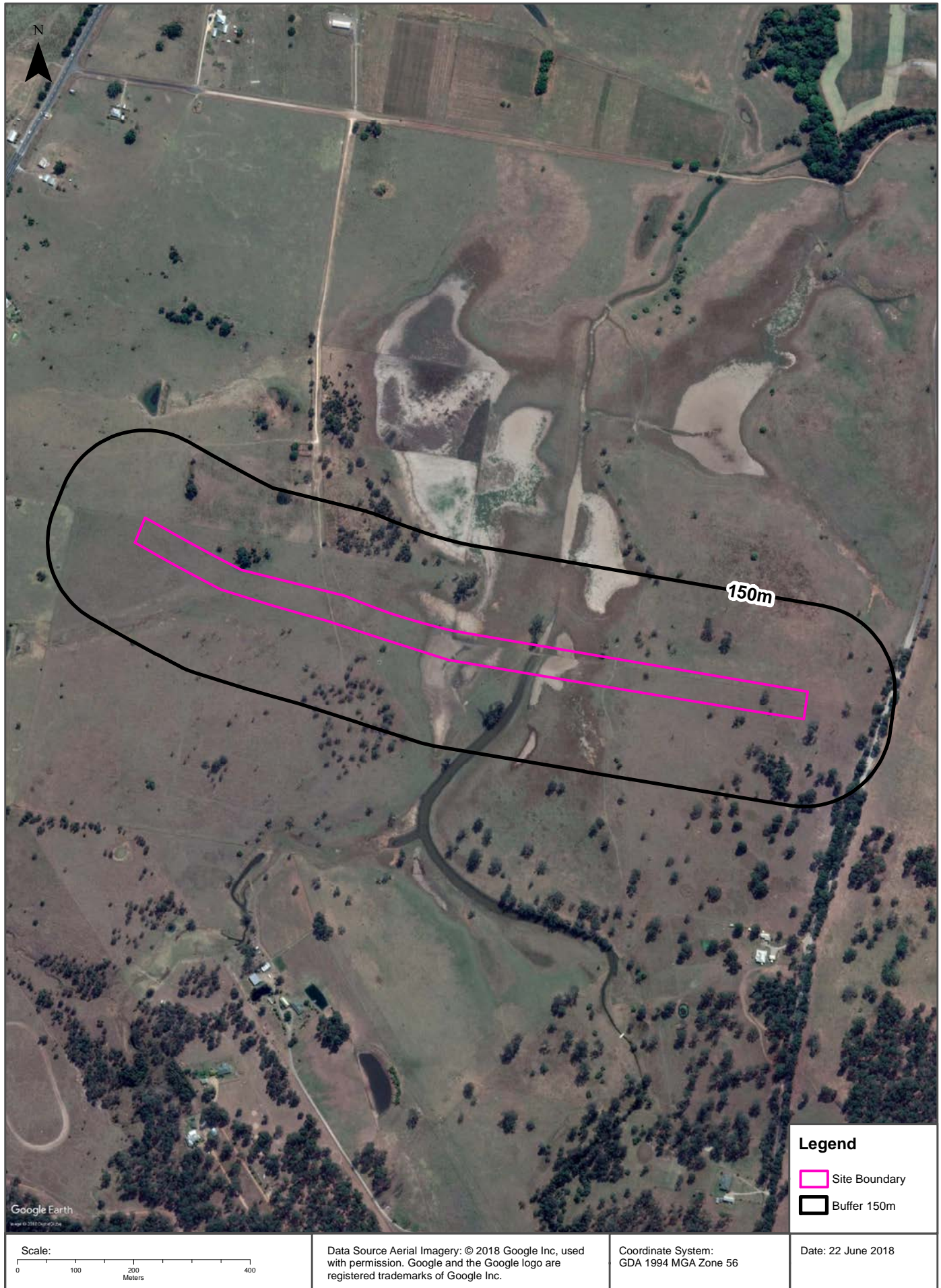
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Address: LS003737 - Powerline Route, Grafton, NSW (Section 2)

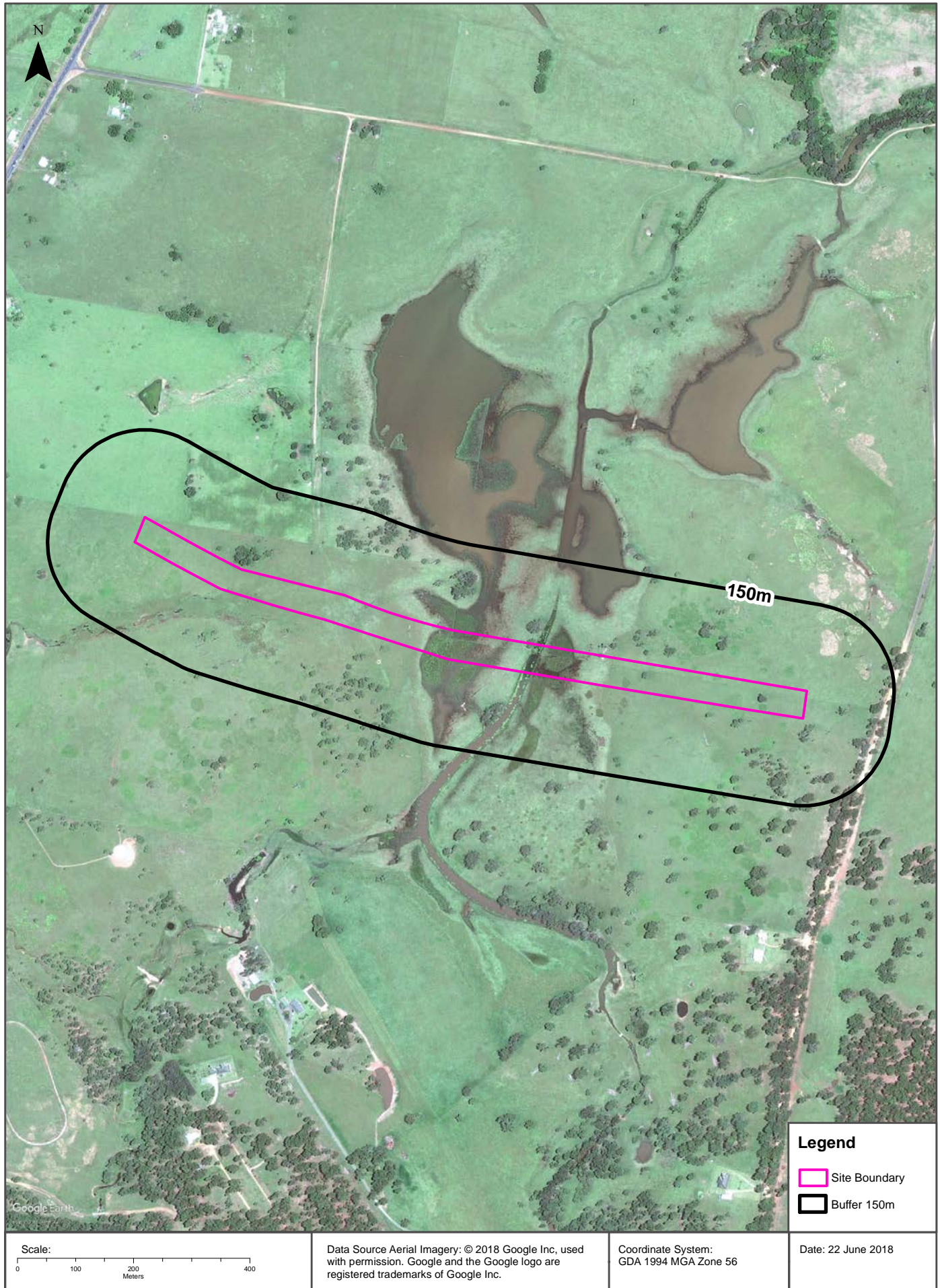
Aerial Imagery 2017

Powerline Route, Grafton, NSW (Section 2)



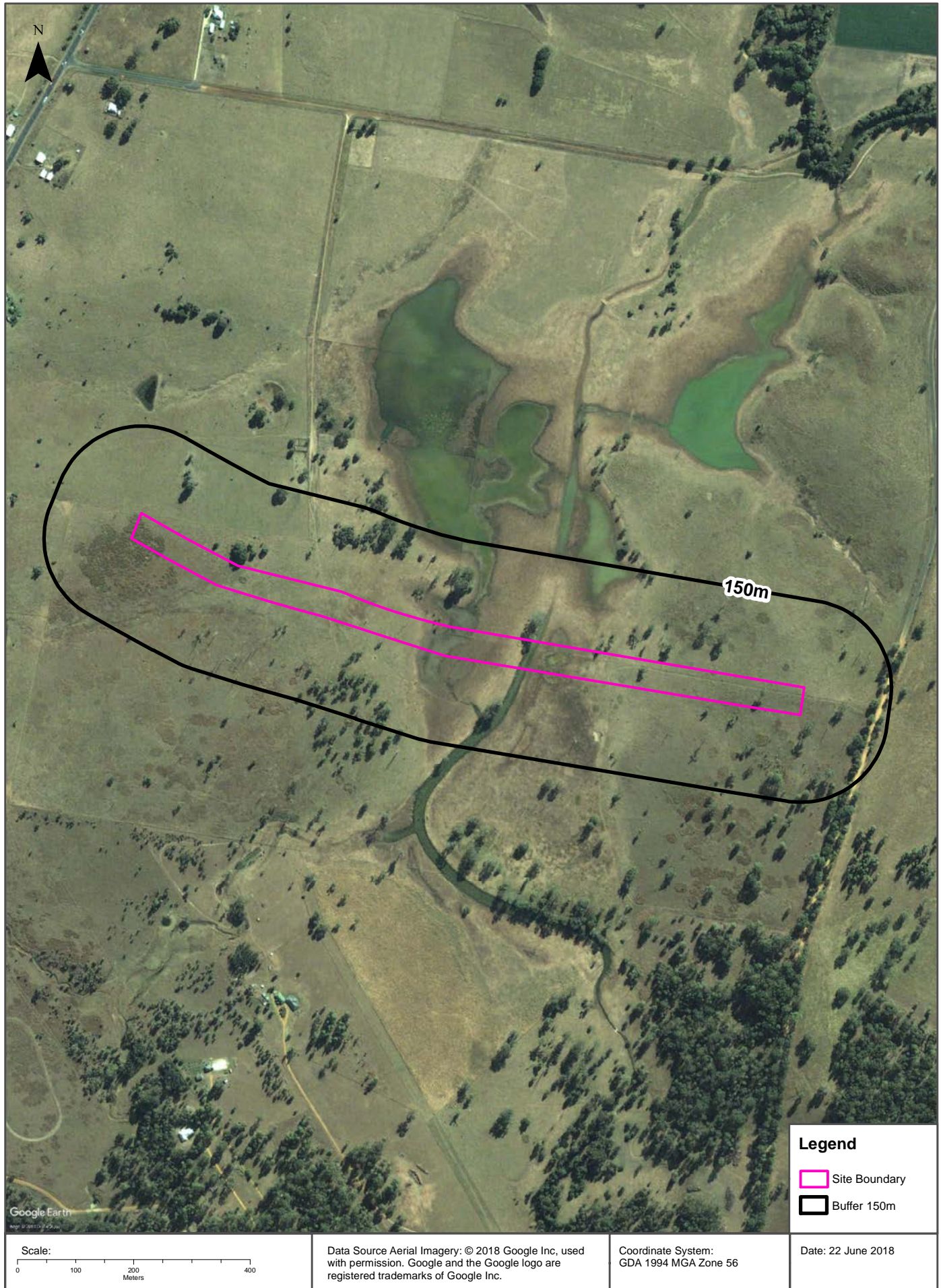
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Powerline Route, Grafton, NSW (Section 2)



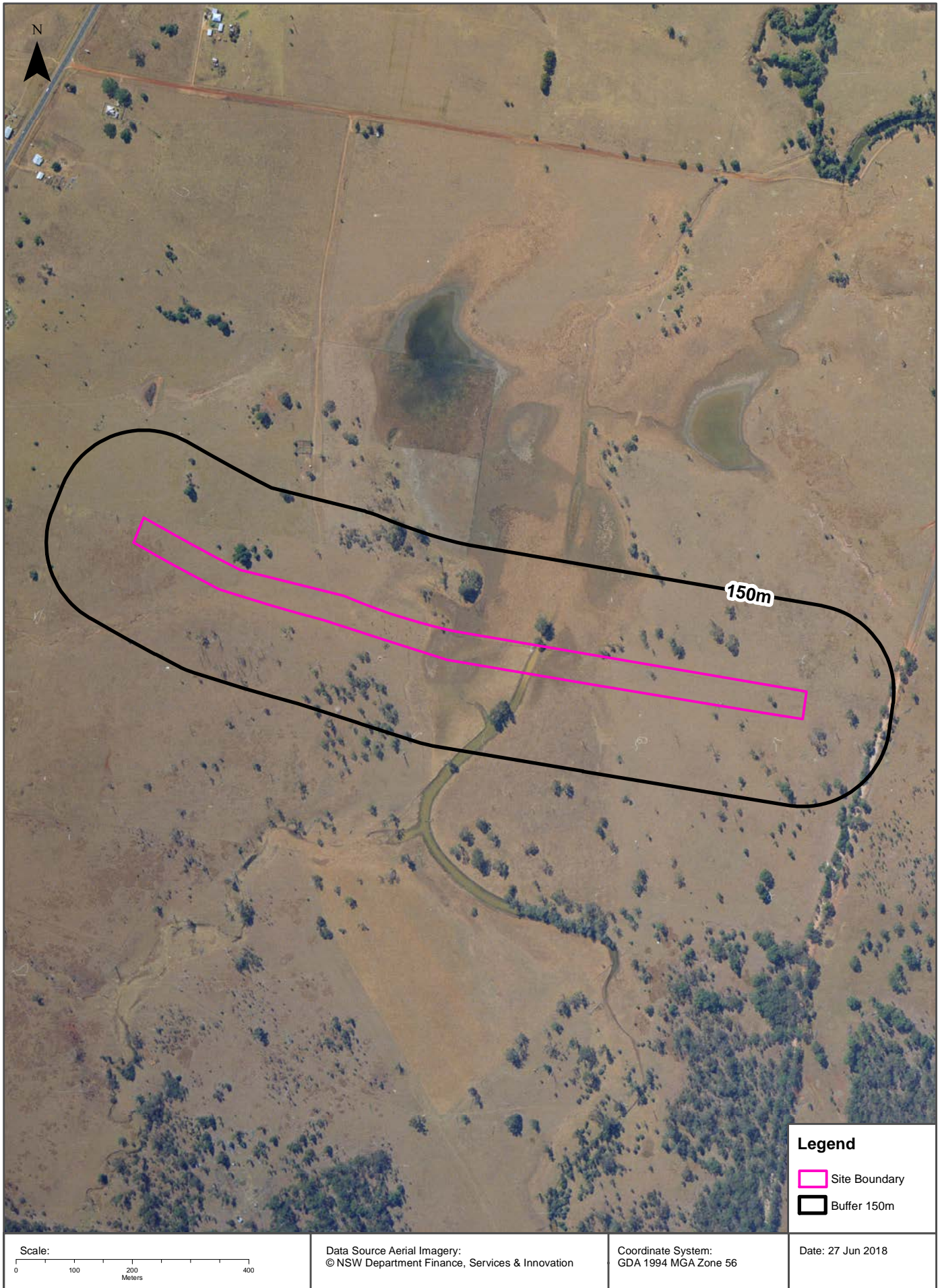
Aerial Imagery 2004

Powerline Route, Grafton, NSW (Section 2)



Aerial Imagery 1994

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Aerial Imagery 1987

Powerline Route, Grafton, NSW (Section 2)



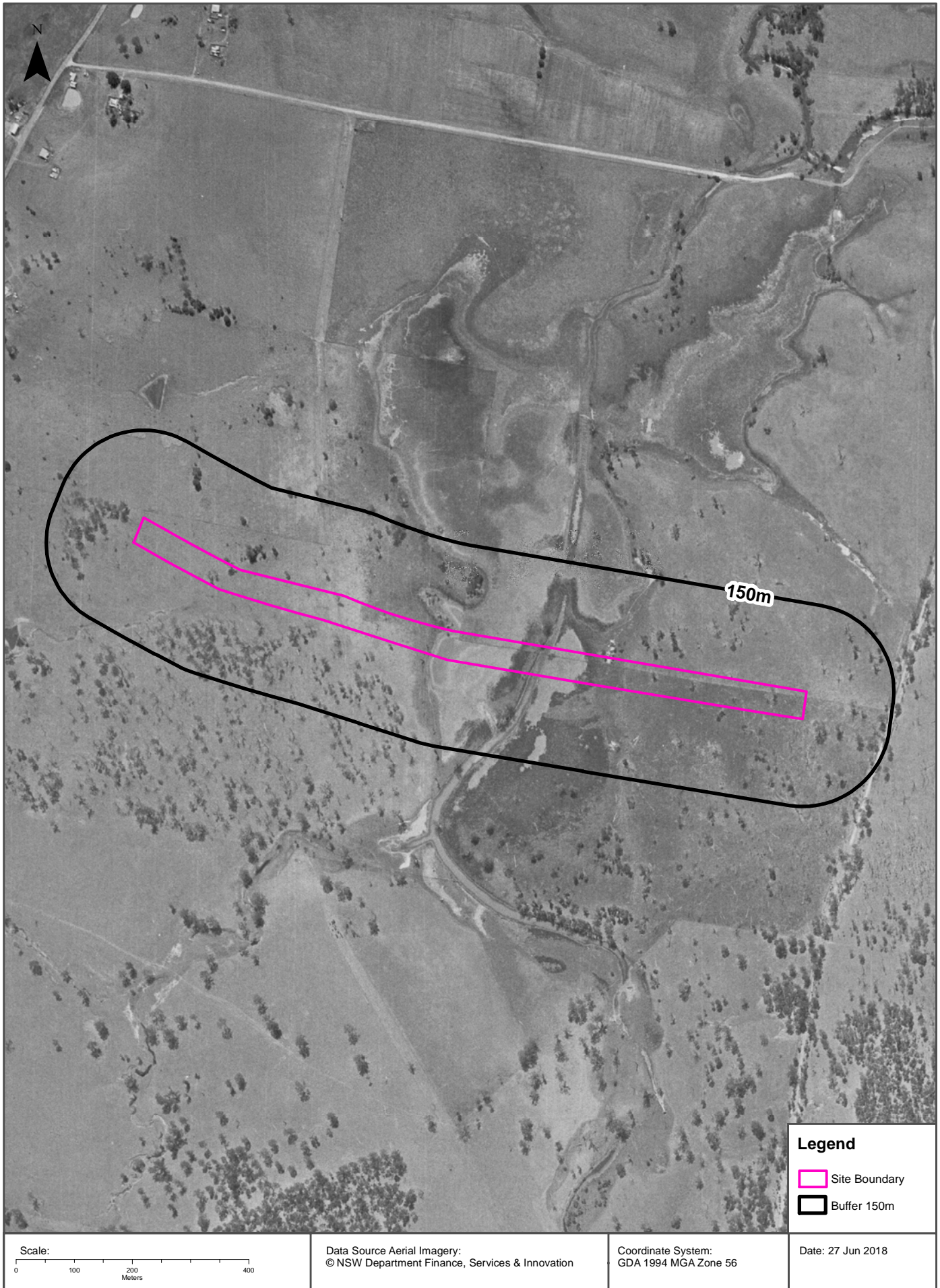
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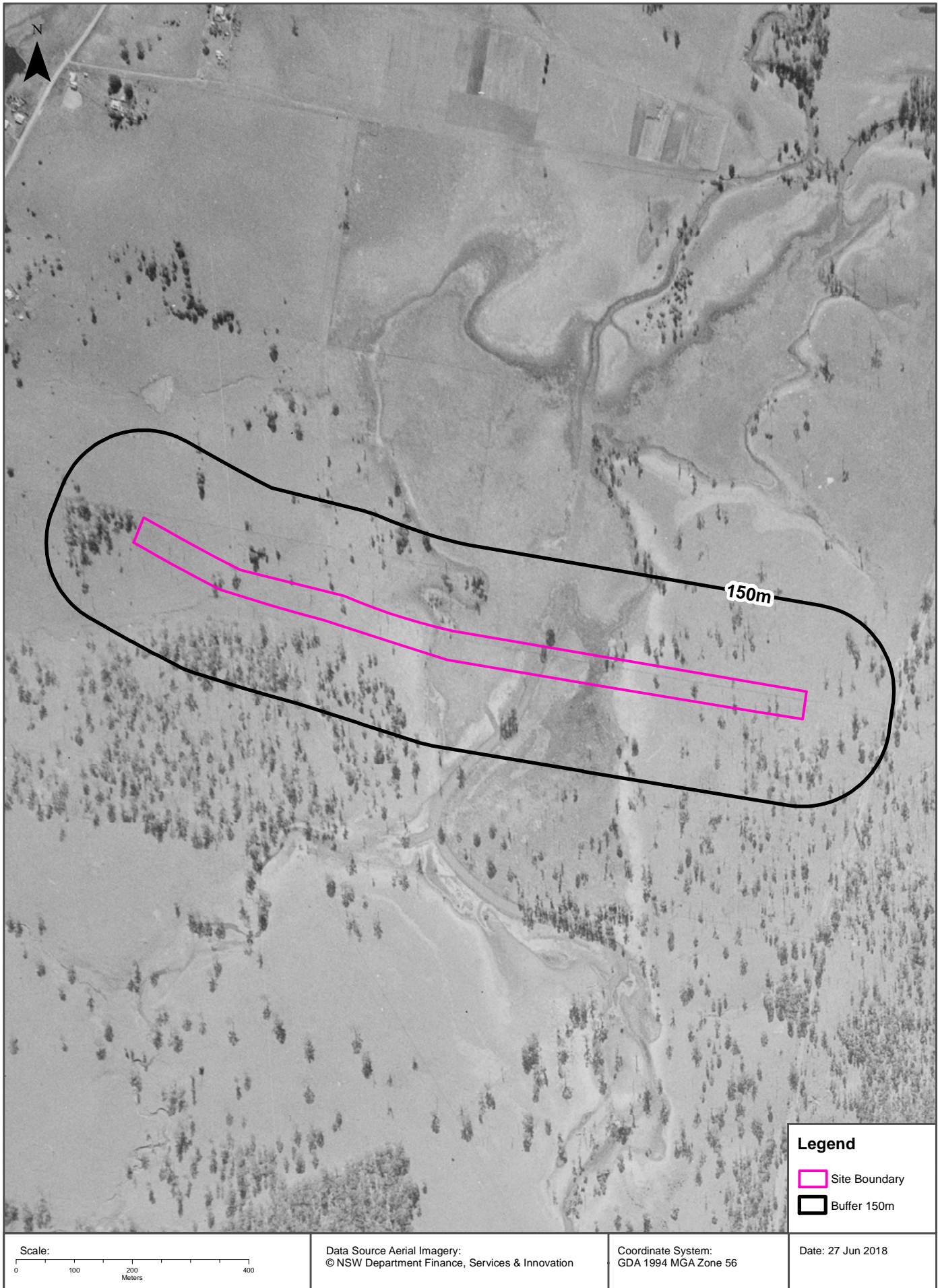
Aerial Imagery 1964

Powerline Route, Grafton, NSW (Section 2)



Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 2)



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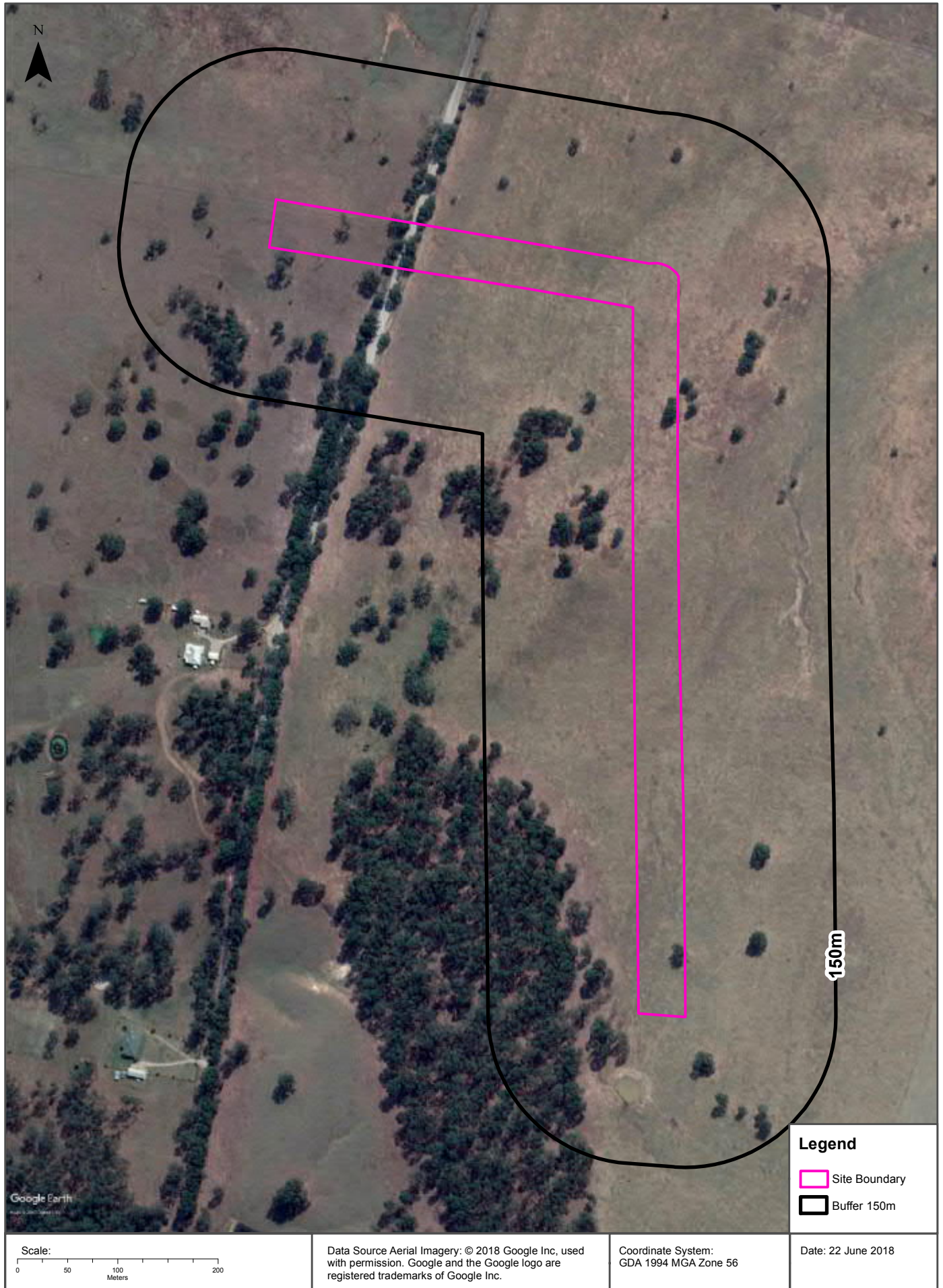
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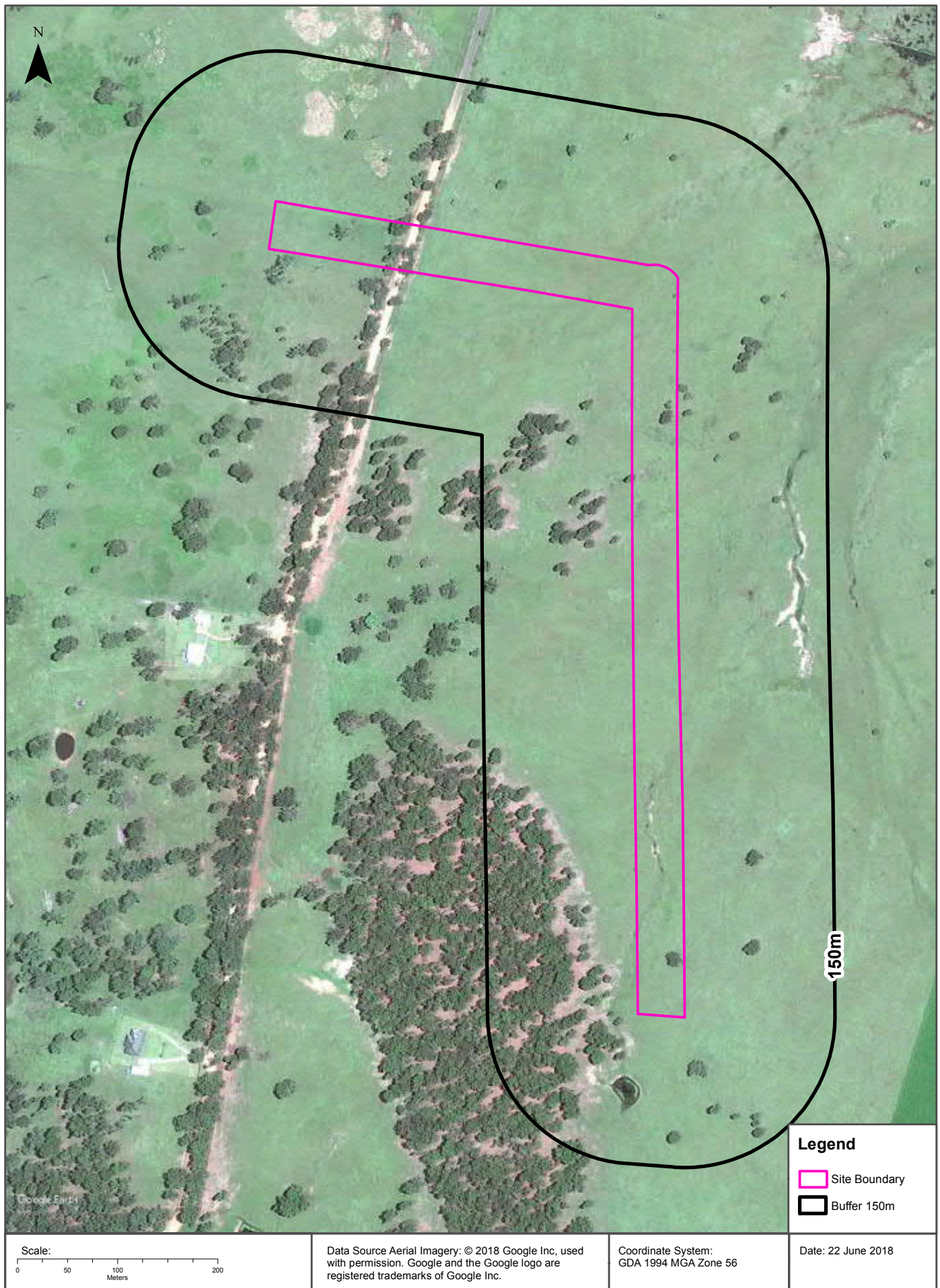
Aerial Imagery 2017

Powerline Route, Grafton, NSW (Section 3)





Aerial Imagery 2010

Powerline Route, Grafton, NSW (Section 3)



Legend

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-  Buffer 150m

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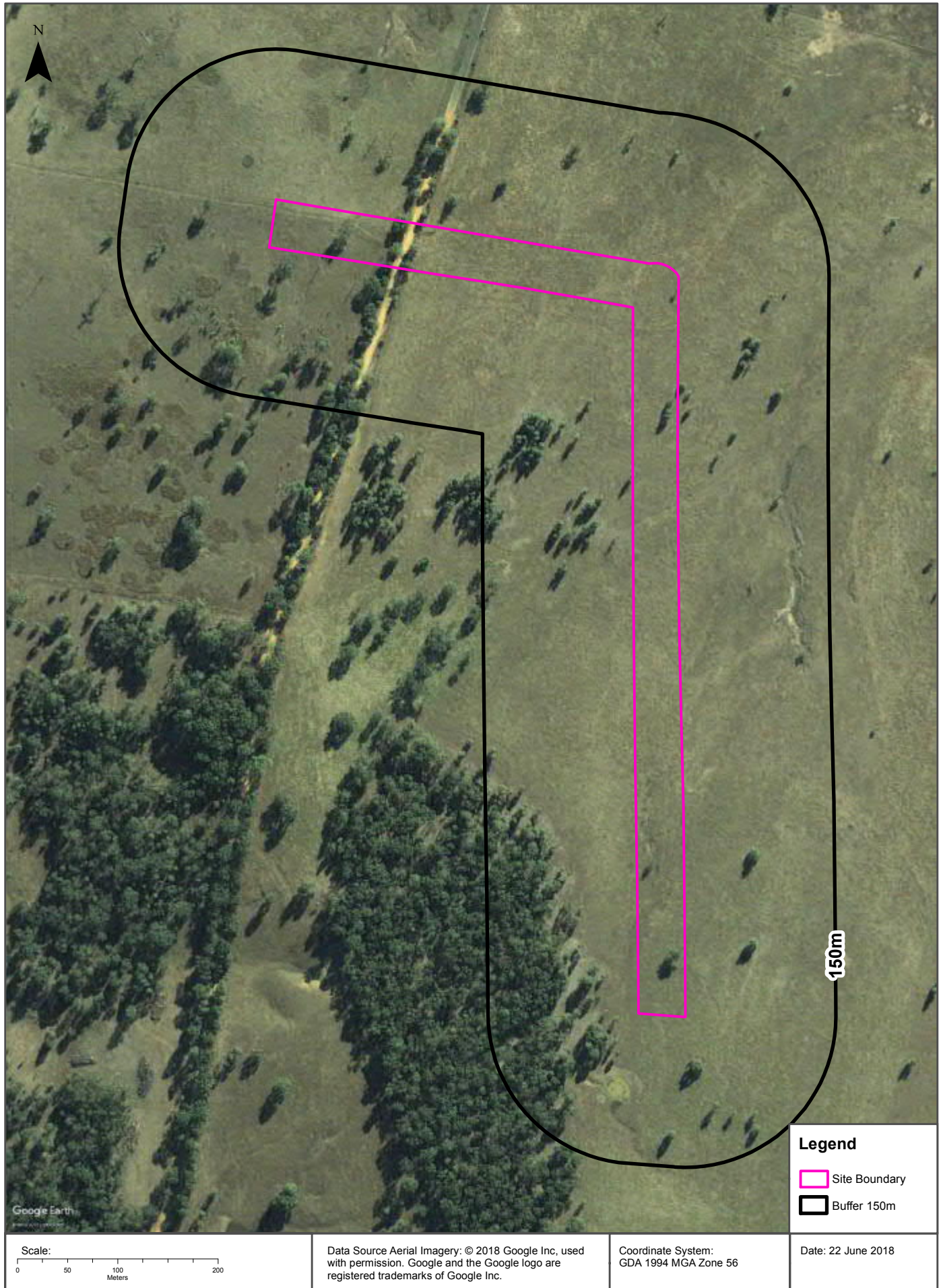
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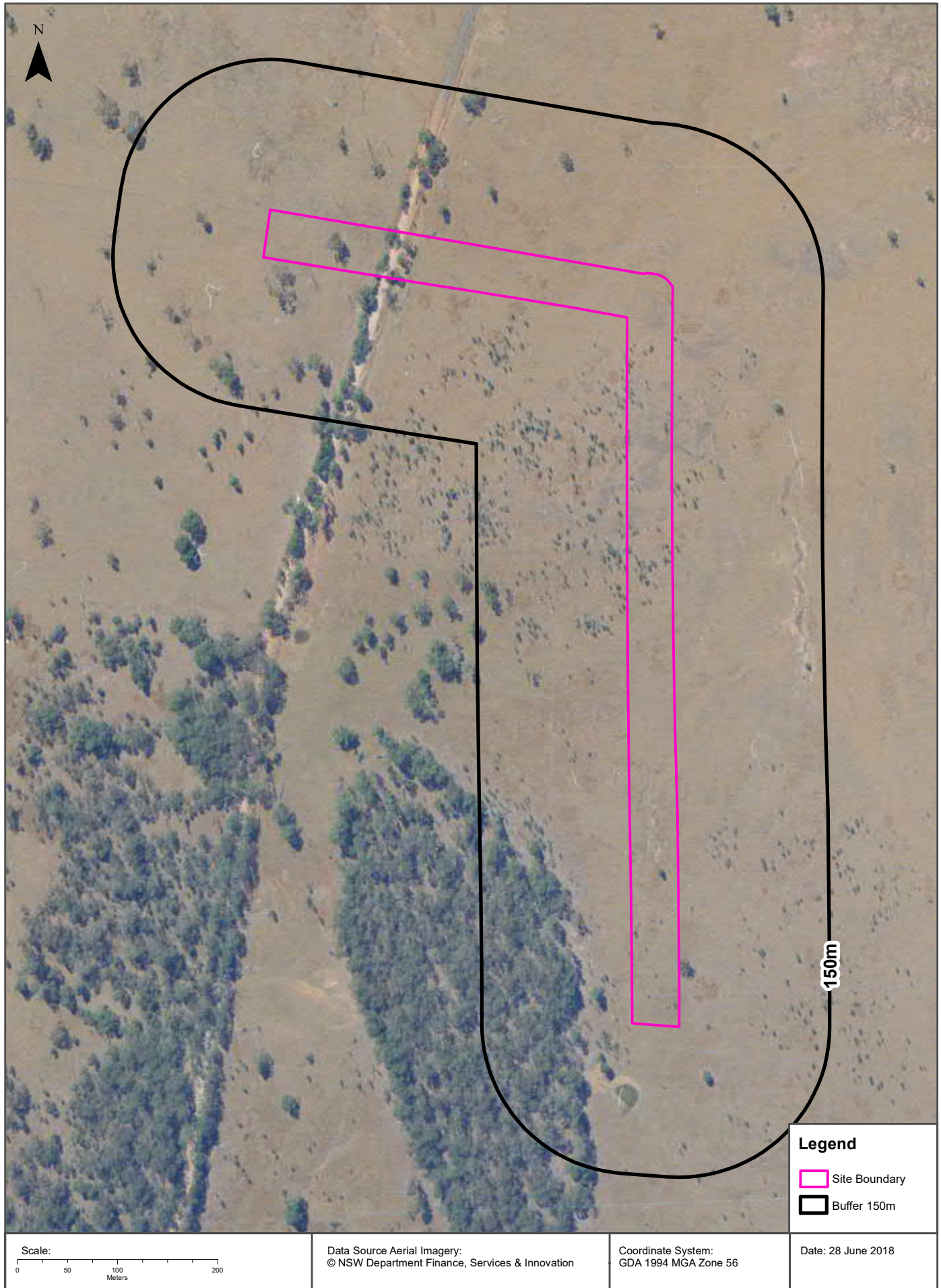
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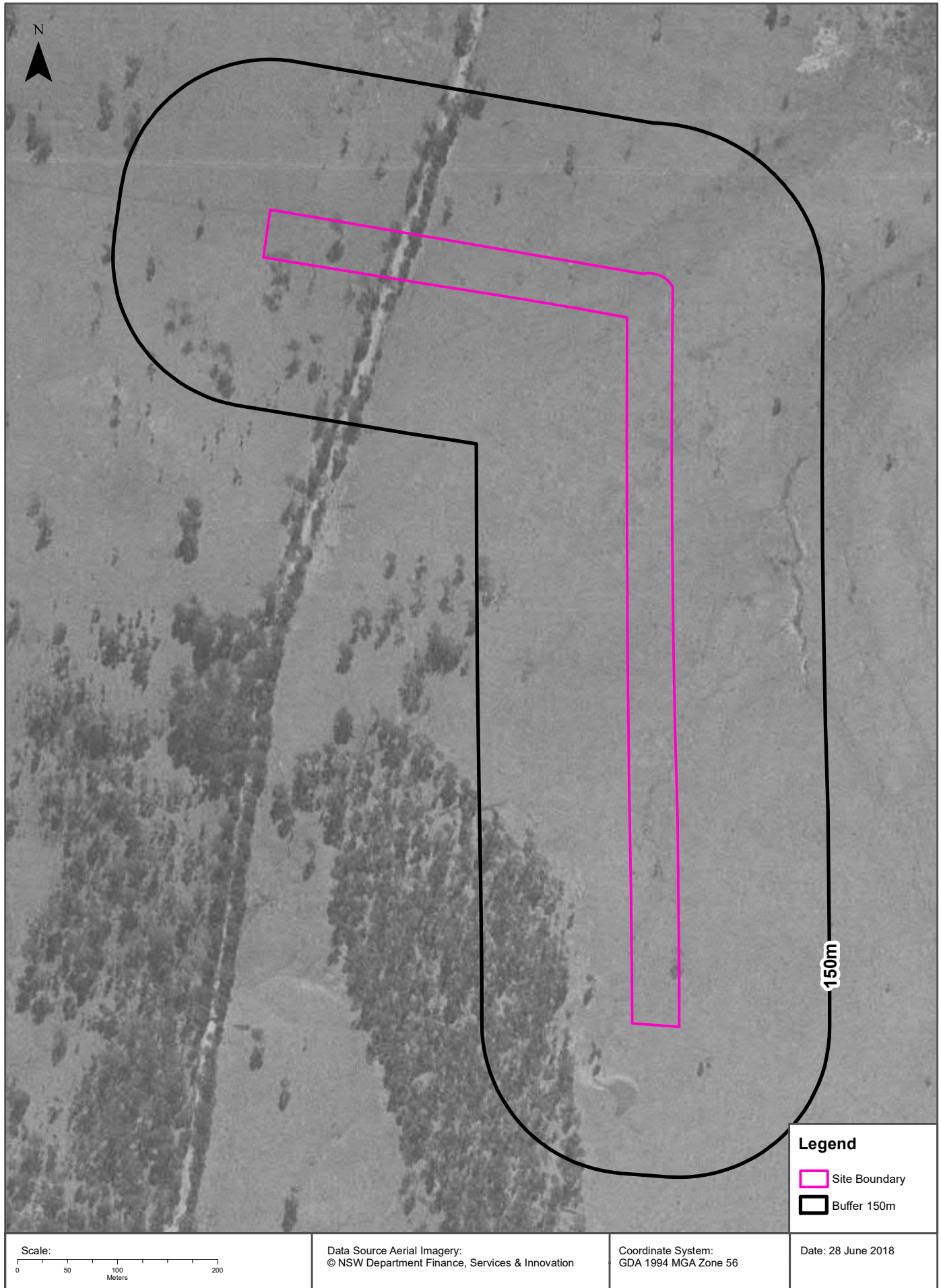
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Powerline Route, Grafton, NSW (Section 3)



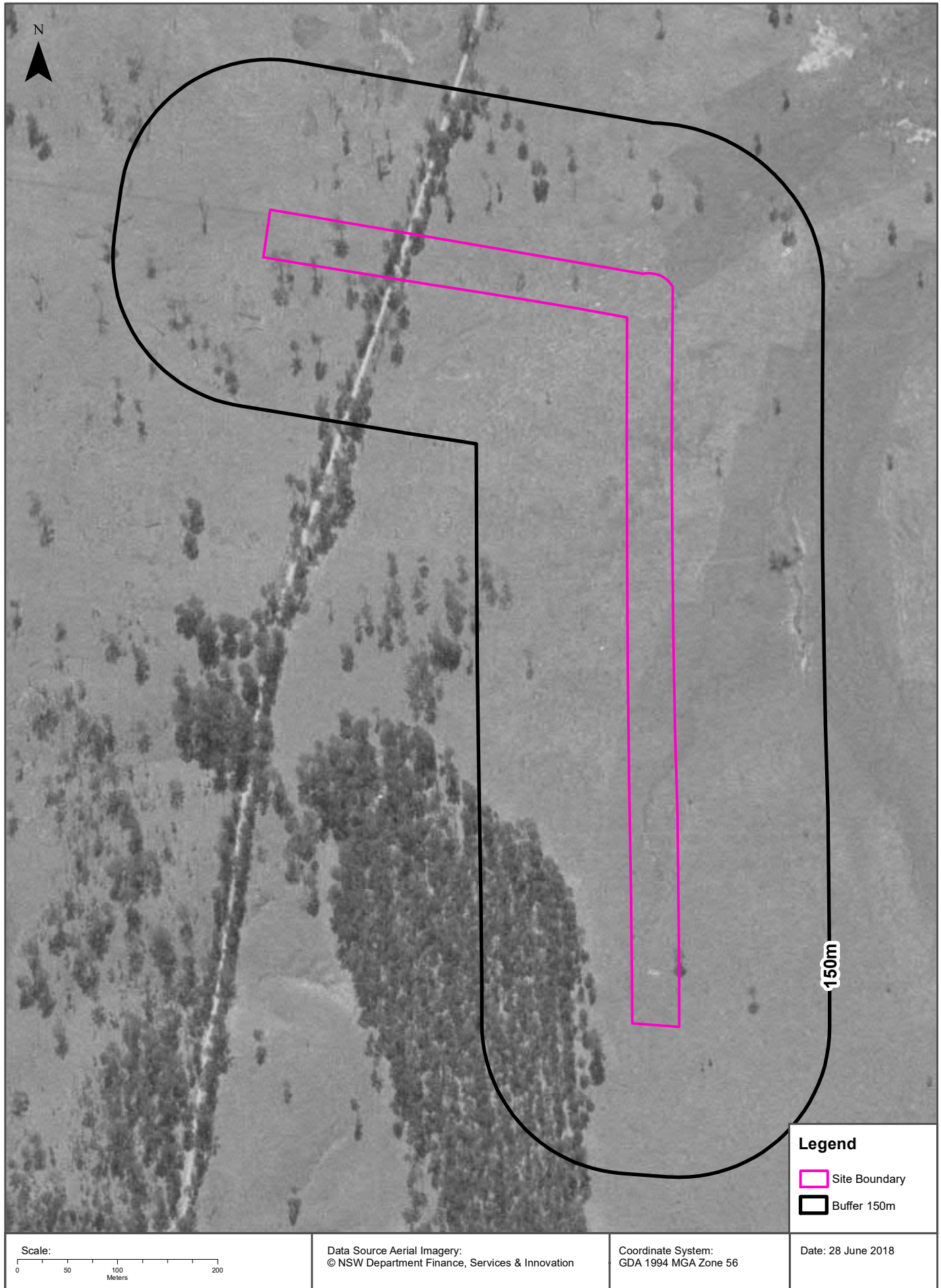
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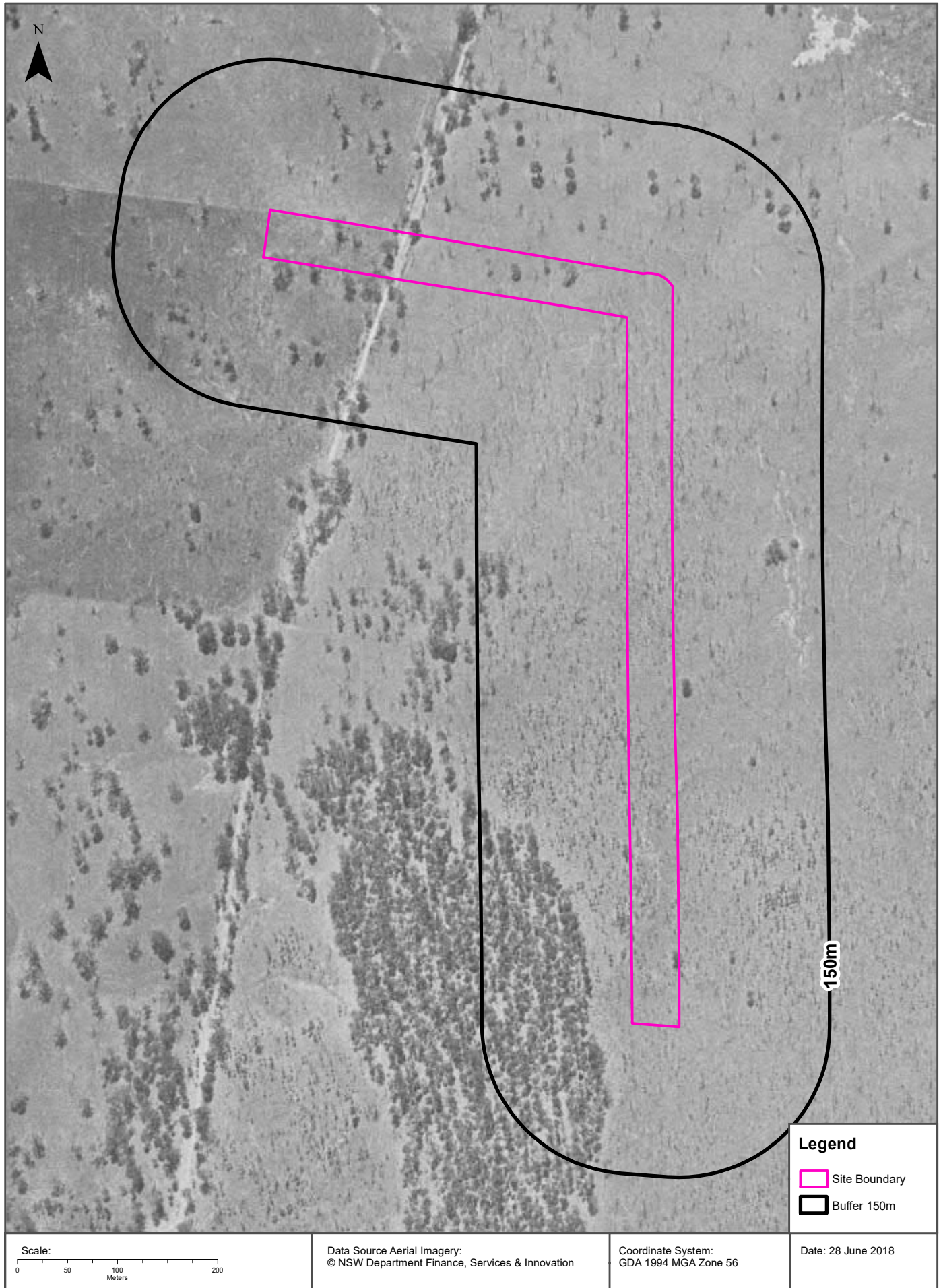
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Powerline Route, Grafton, NSW (Section 3)



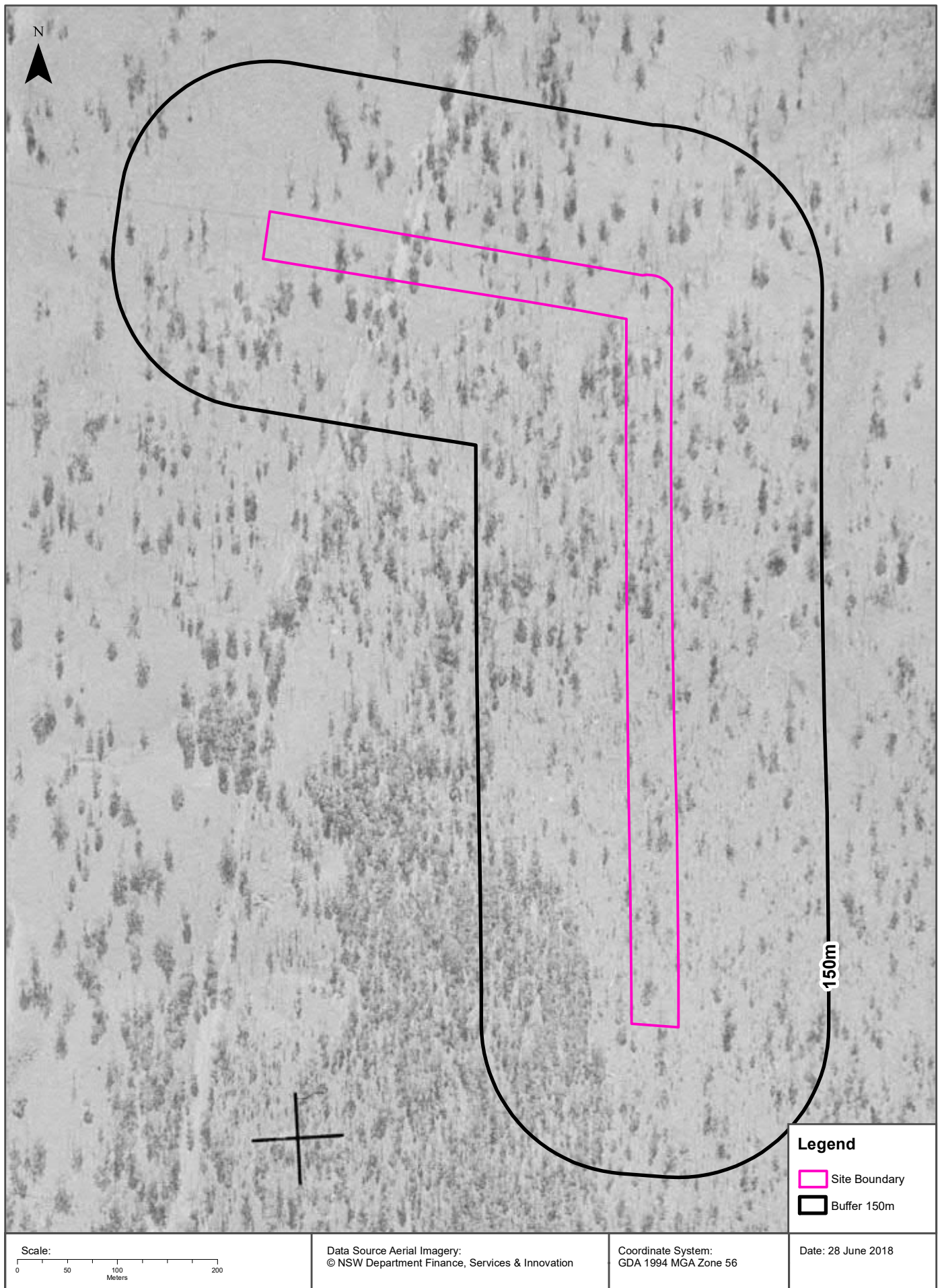
Aerial Imagery 1964

Powerline Route, Grafton, NSW (Section 3)



Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 3)



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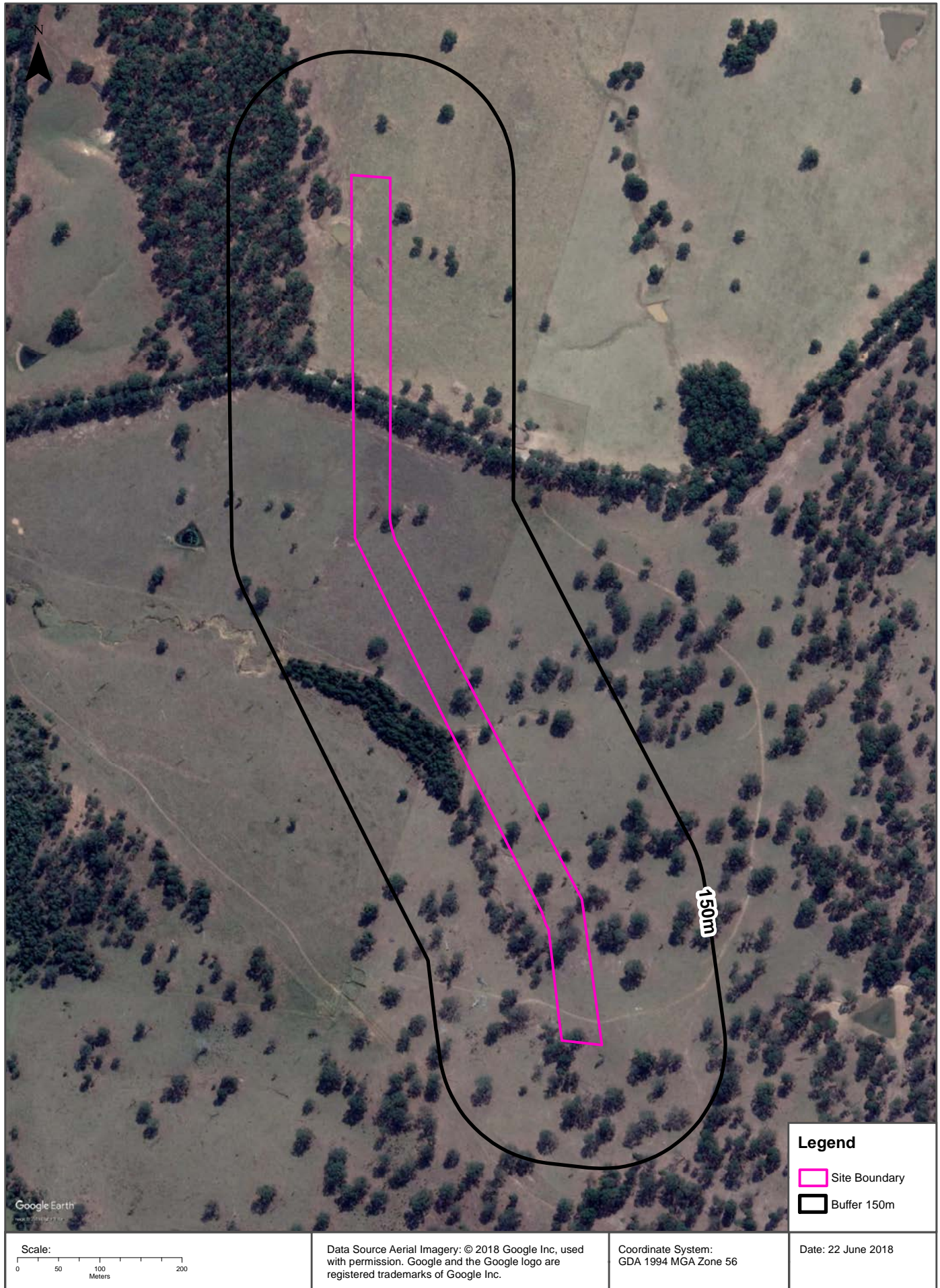
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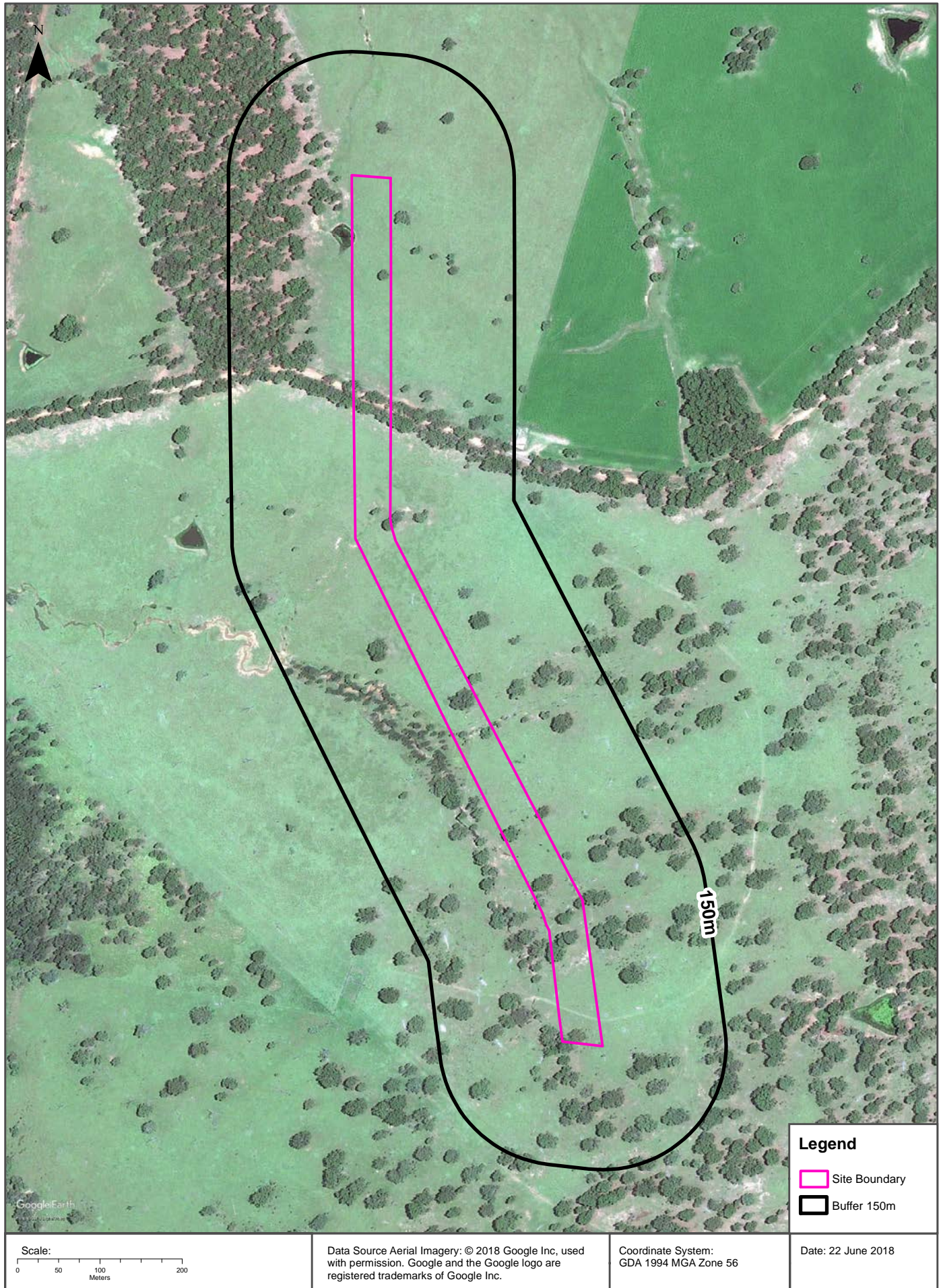
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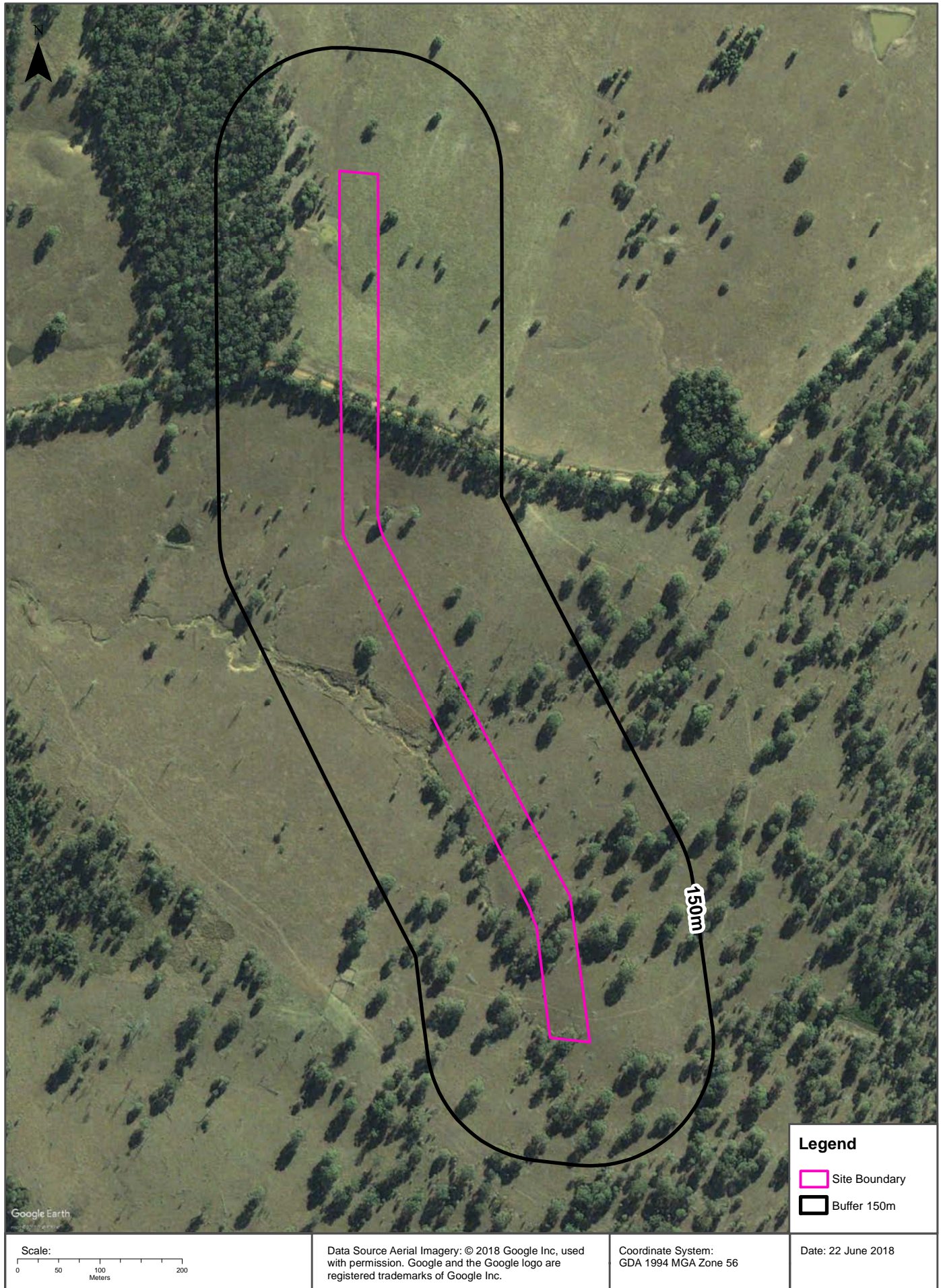
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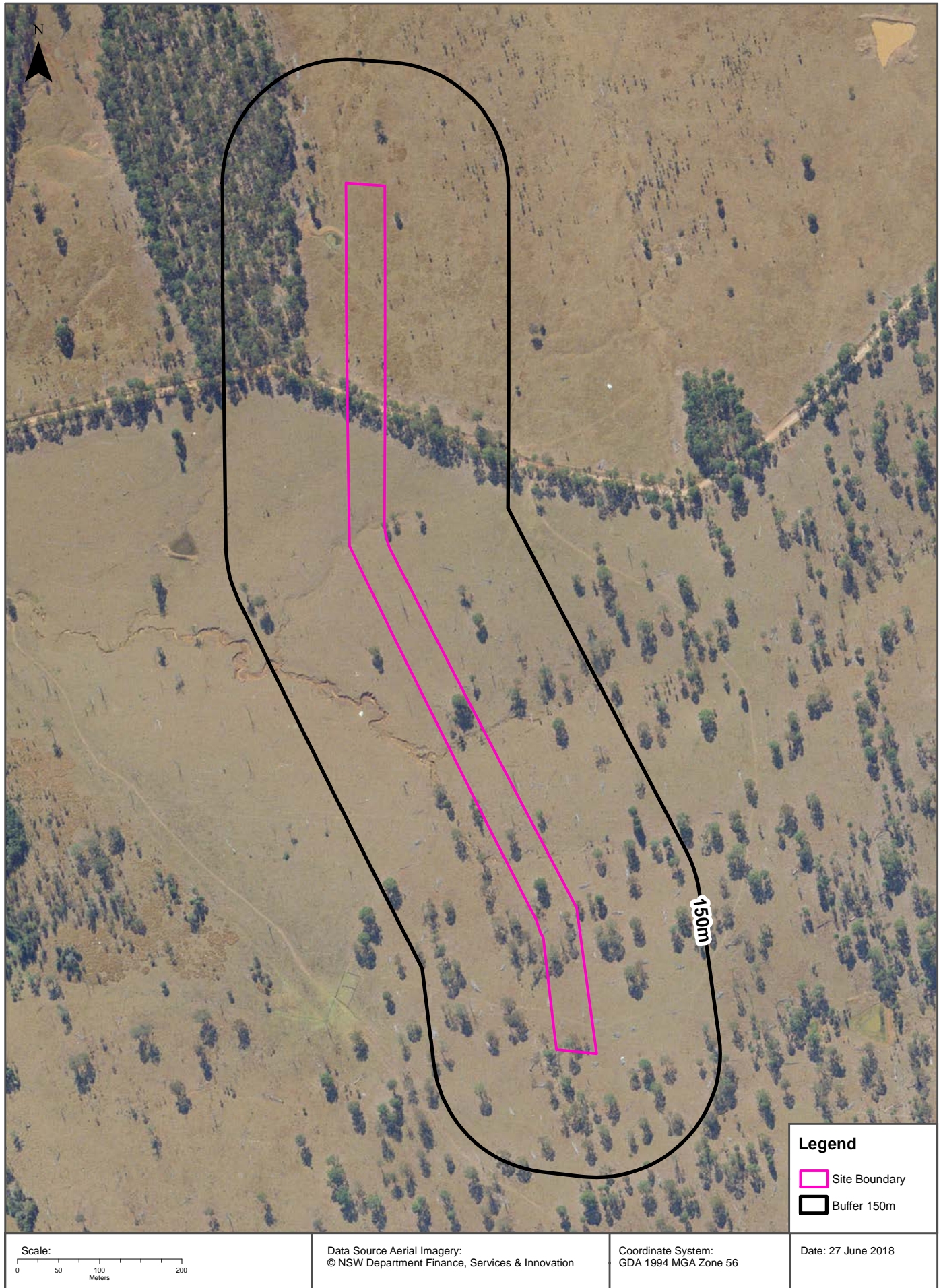
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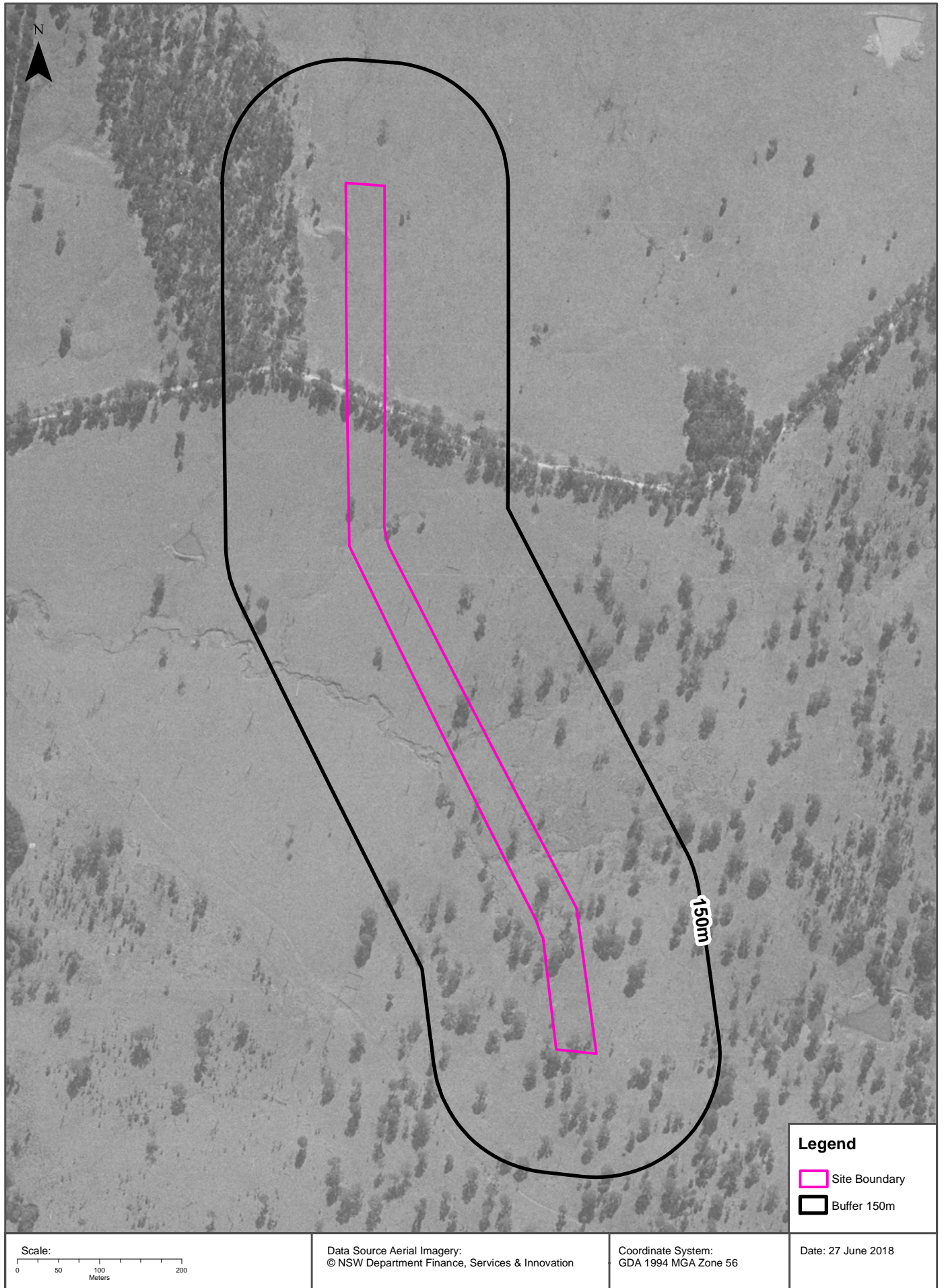
Aerial Imagery 1994

Powerline Route, Grafton, NSW (Section 4)



Aerial Imagery 1987

Powerline Route, Grafton, NSW (Section 4)



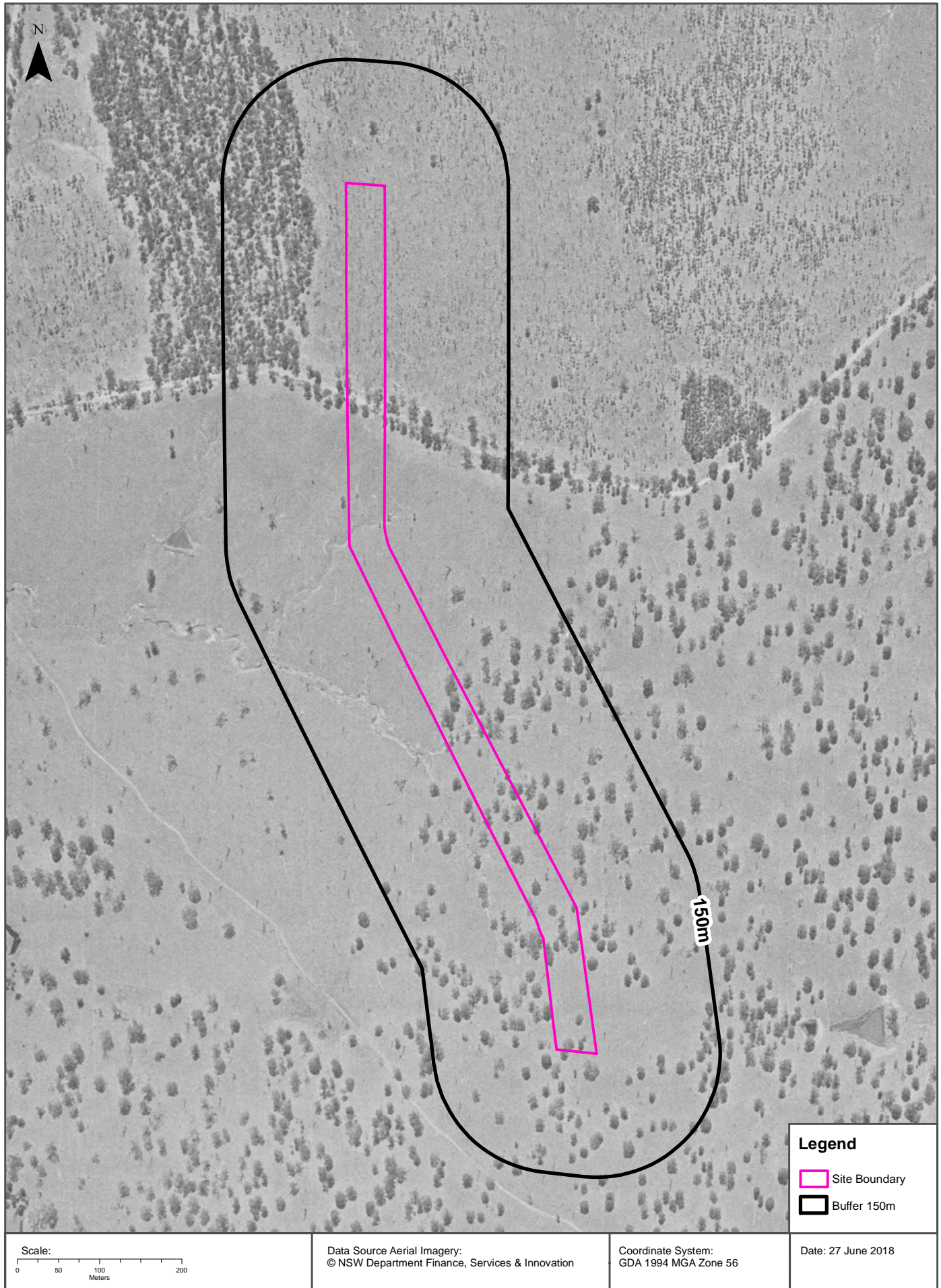
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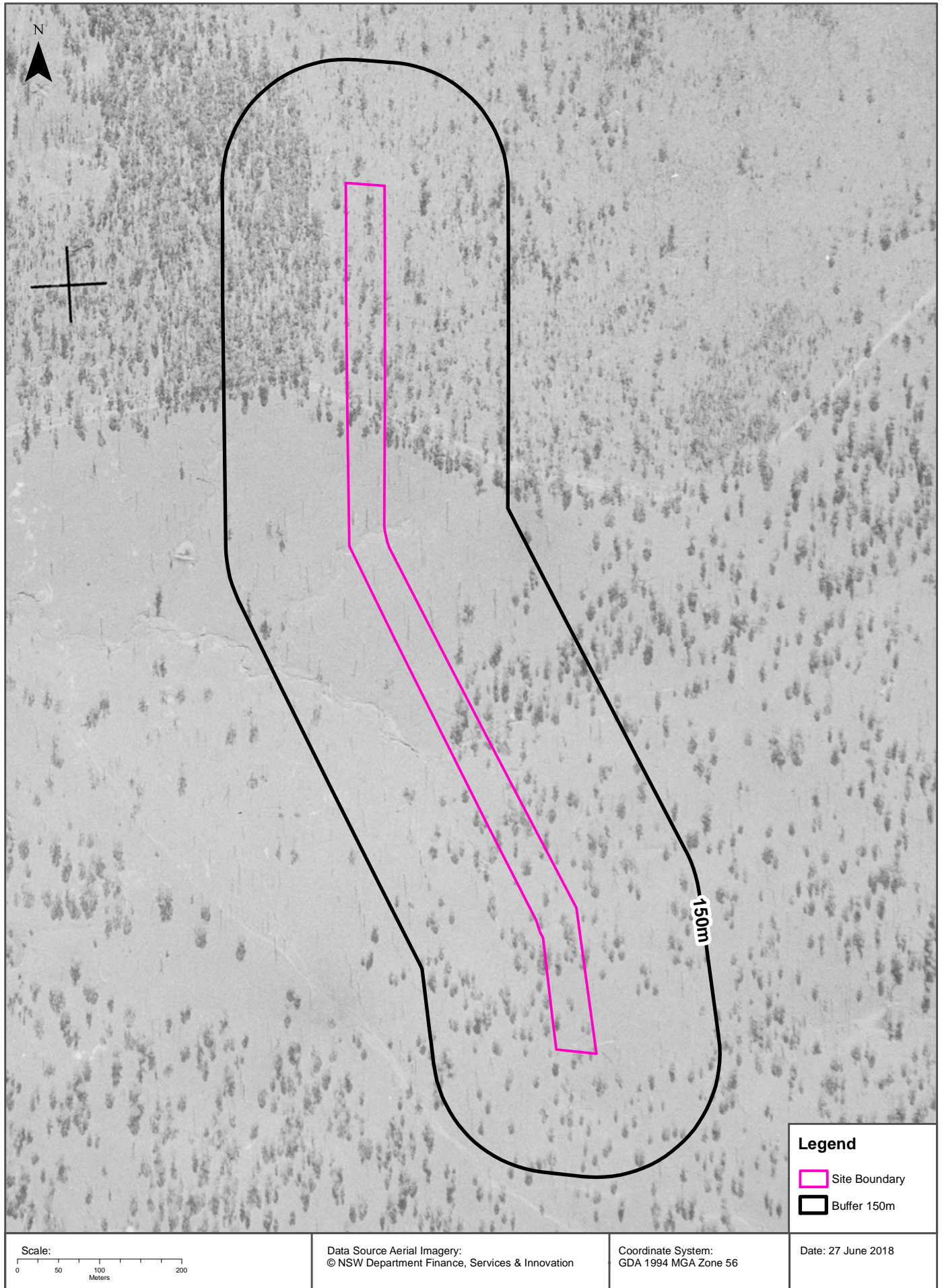
Aerial Imagery 1964

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Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 4)



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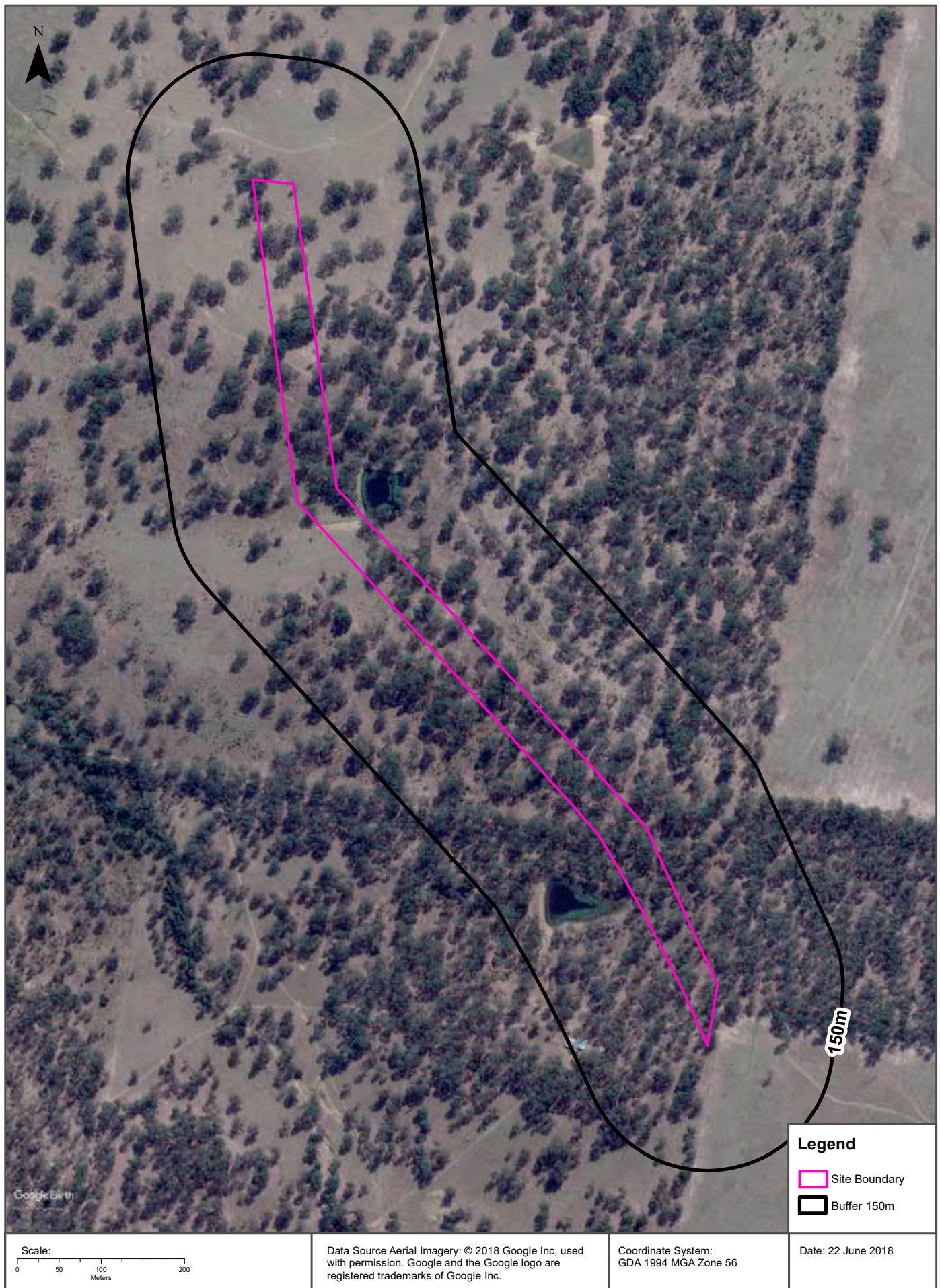
Date: 28 June 2018

Reference: LS003740

Address: Powerline Route, Grafton, NSW (Section 5)

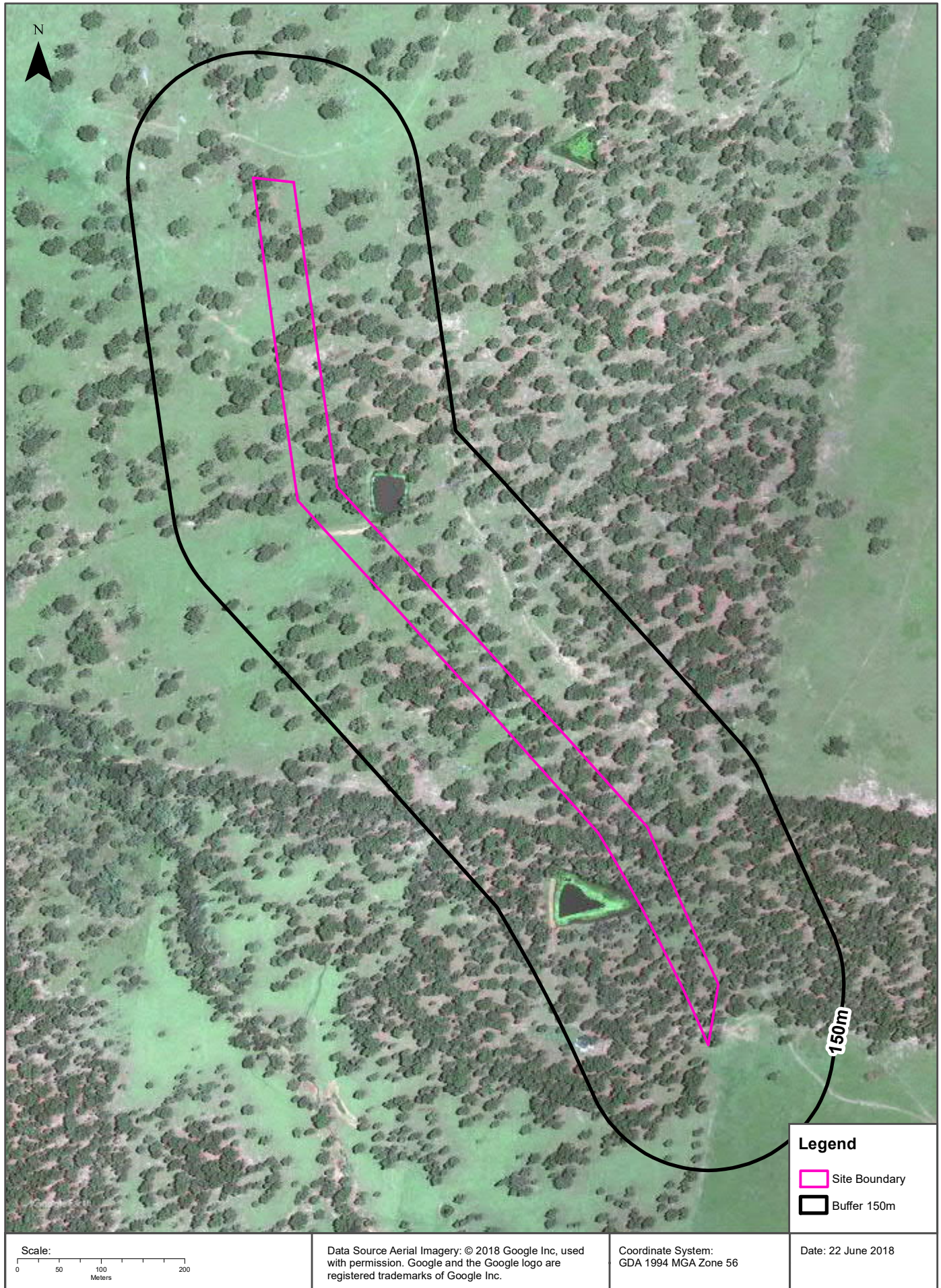
Aerial Imagery 2017

Powerline Route, Grafton, NSW (Section 5)



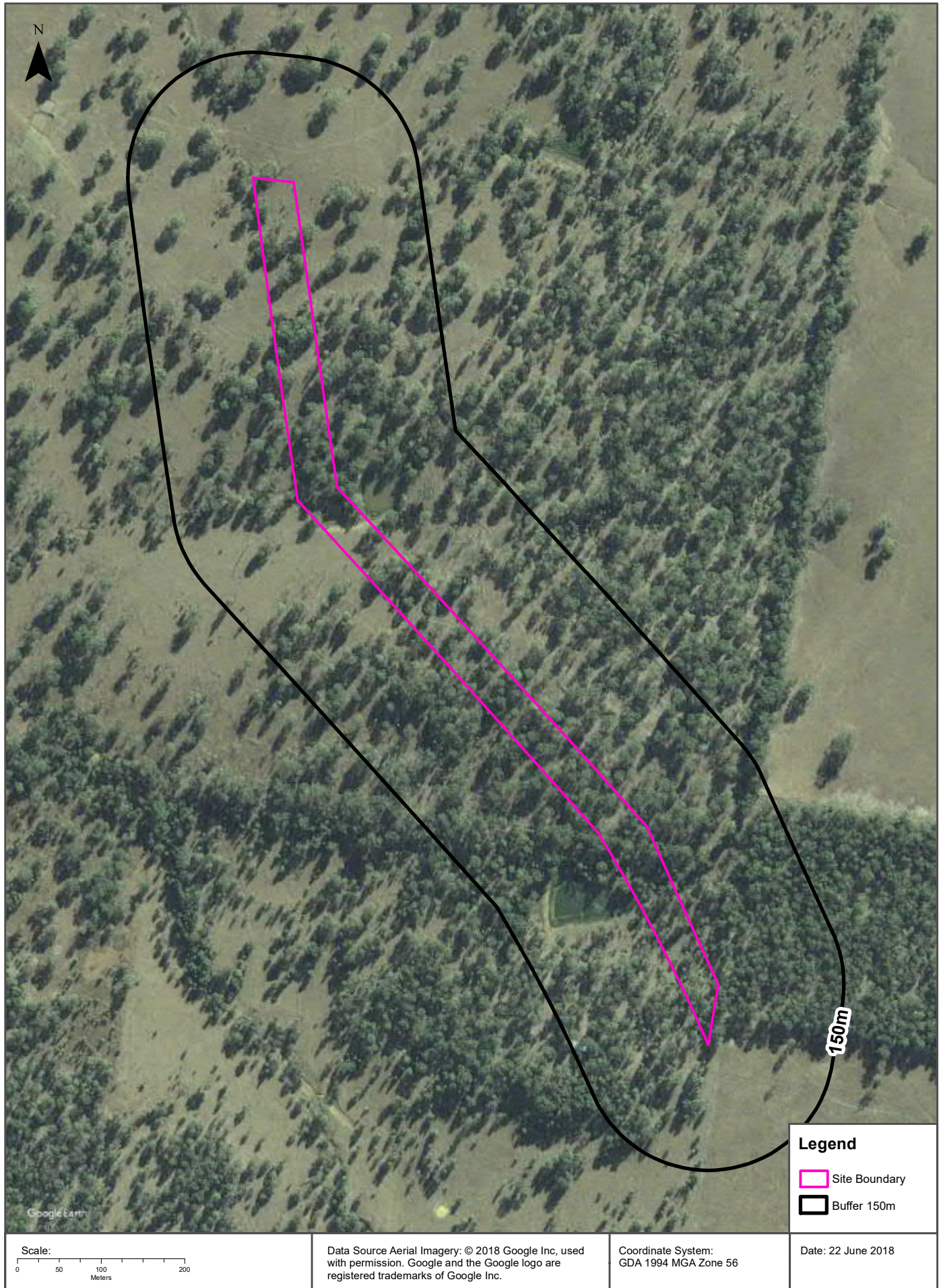
Aerial Imagery 2010

Powerline Route, Grafton, NSW (Section 5)



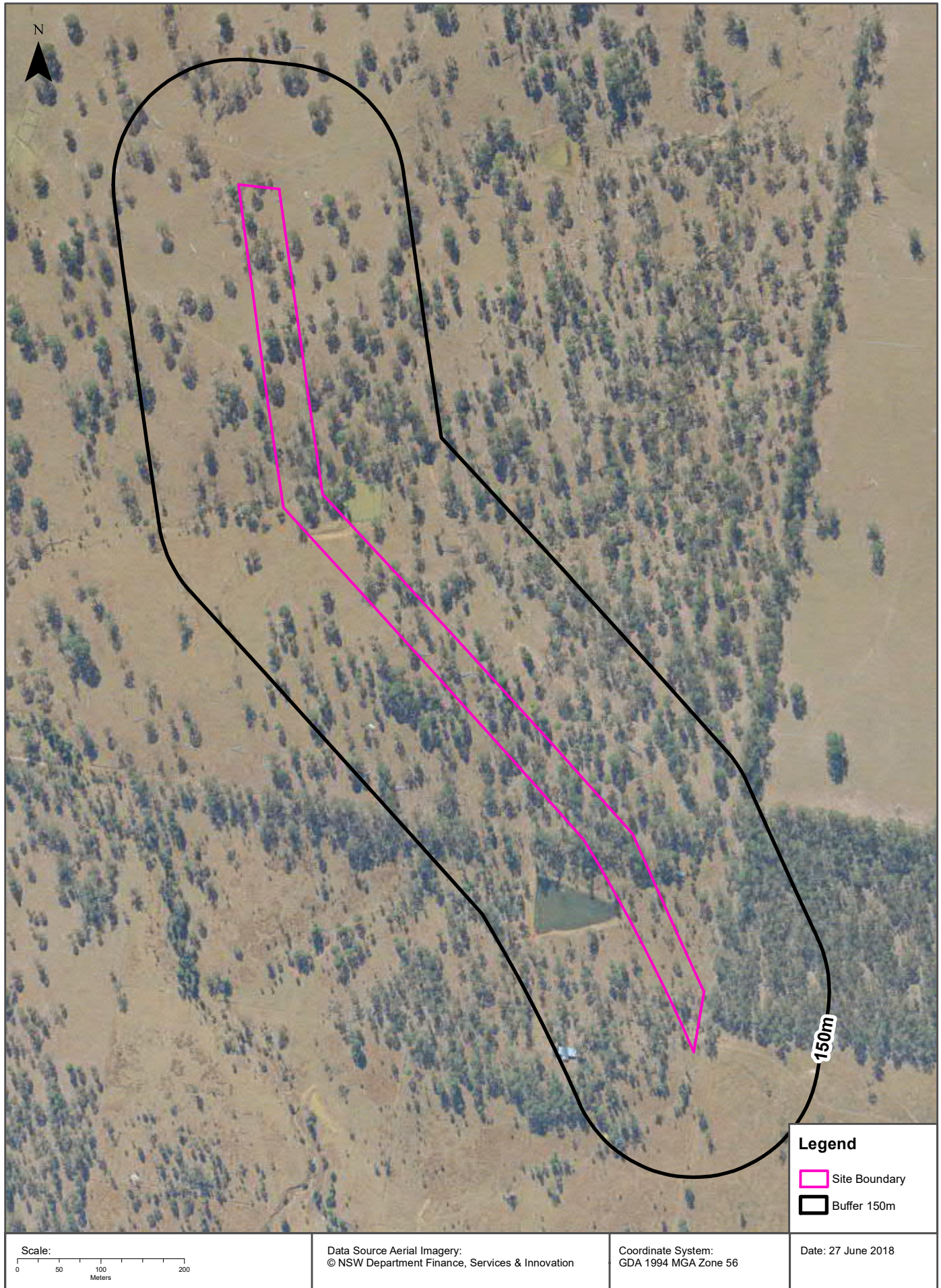
Aerial Imagery 2004

Powerline Route, Grafton, NSW (Section 5)



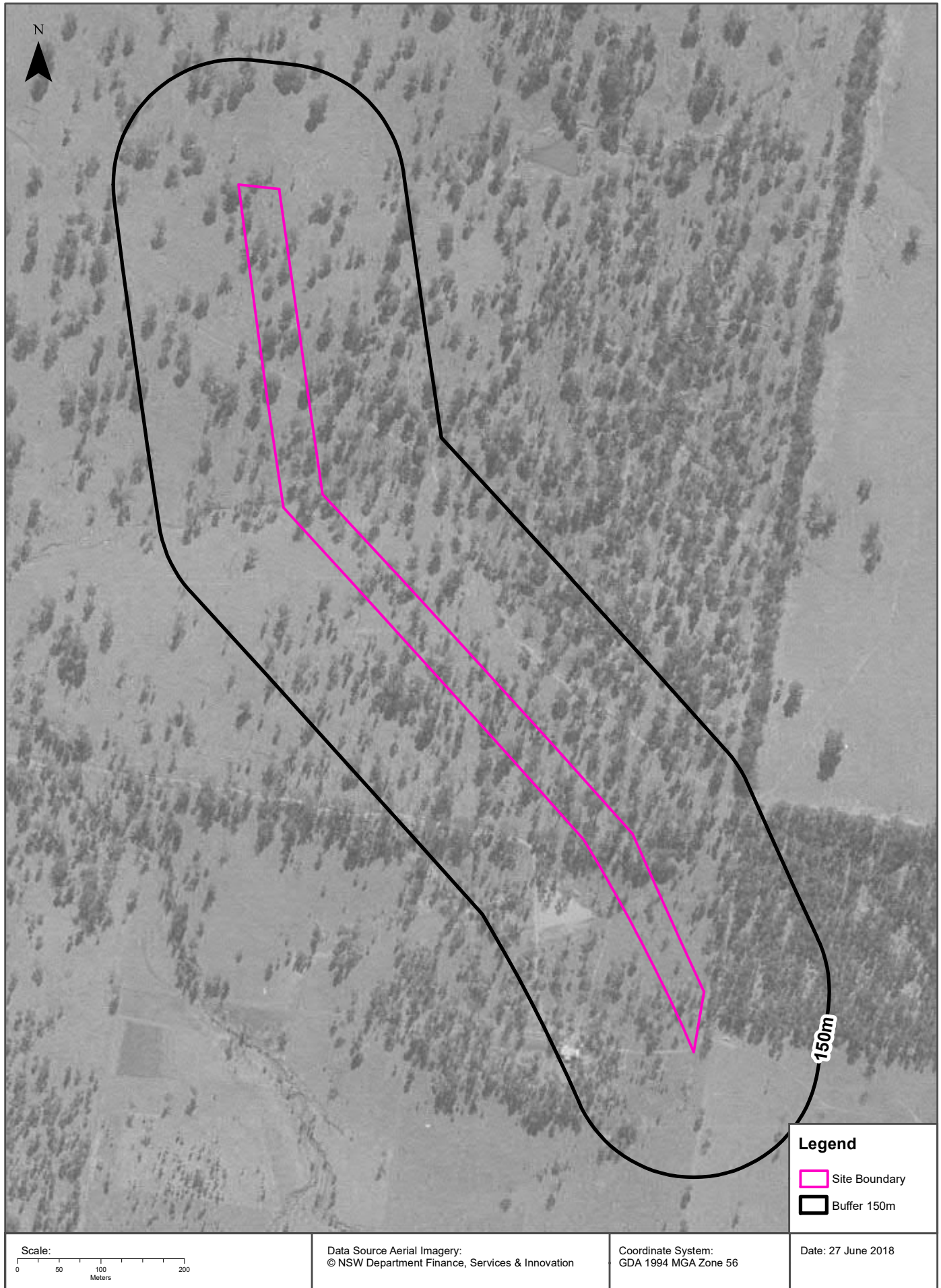
Aerial Imagery 1994

Powerline Route, Grafton, NSW (Section 5)



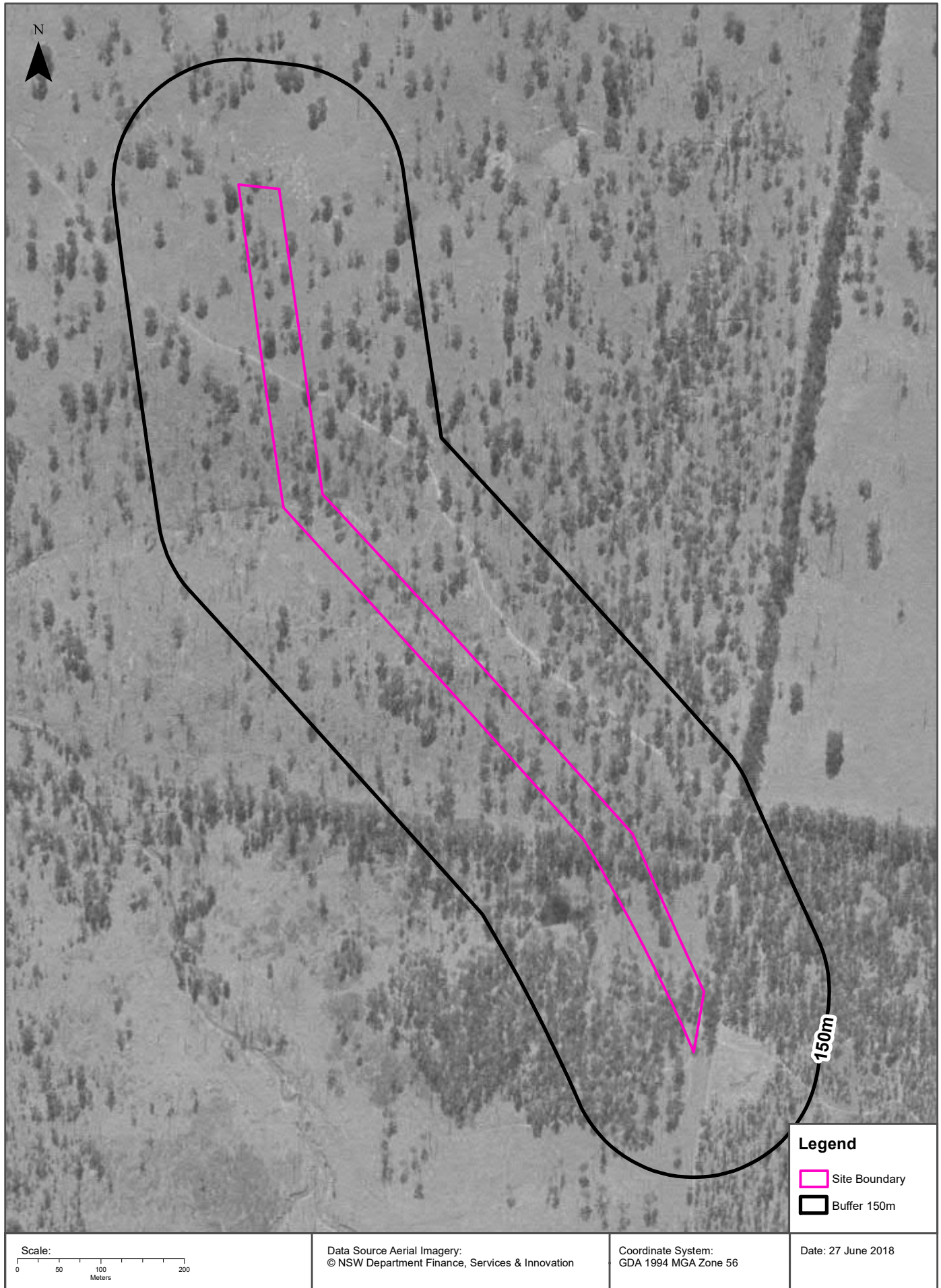
Aerial Imagery 1987

Powerline Route, Grafton, NSW (Section 5)



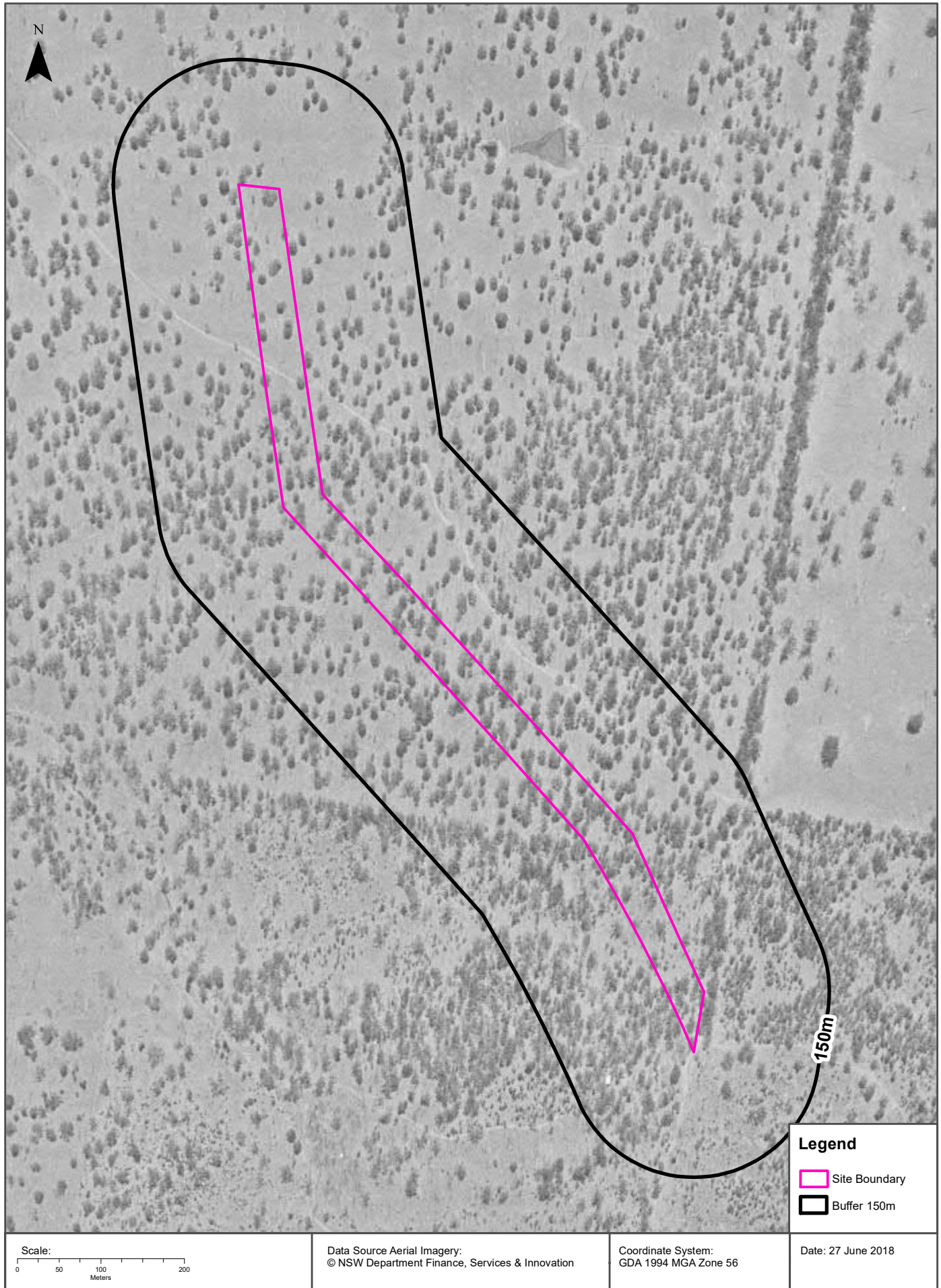
Aerial Imagery 1978

Powerline Route, Grafton, NSW (Section 5)



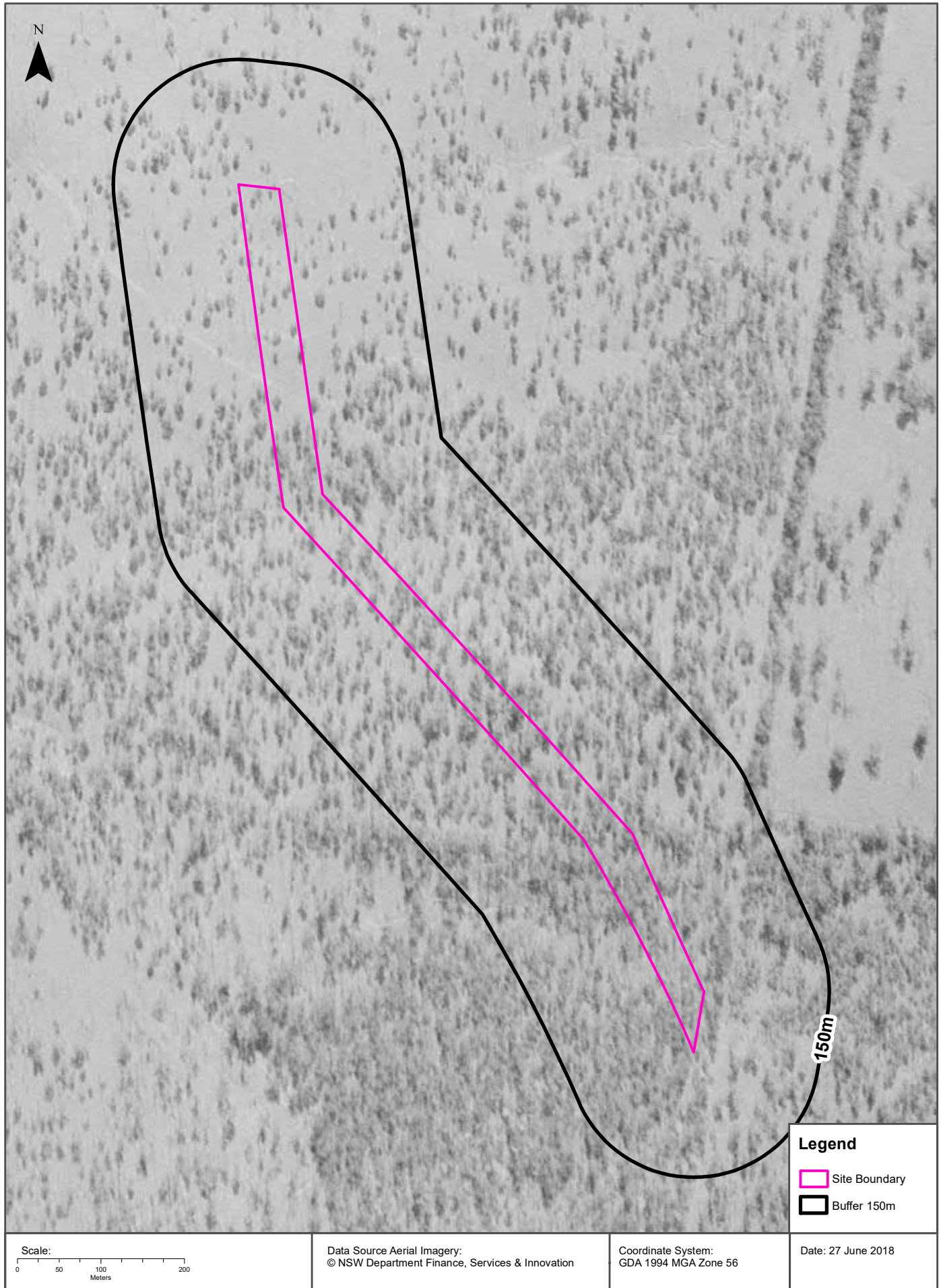
Aerial Imagery 1964

Powerline Route, Grafton, NSW (Section 5)



Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 5)



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 - (e) Lotsearch does not warrant that all land uses or features whether past or current are identified in the Report;
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2. The End User may not make the Report or any copies or extracts of the report or any part of it available to any other person. If End User wishes to provide the Report to any other person or make extracts or copies of the Report, it must contact the purchaser of the Report before doing so to ensure the proposed use is consistent with the contract terms between Lotsearch and the purchaser.
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7. Subject to paragraph 8, Lotsearch excludes liability to End User for loss or damage of any kind, however caused, due to Lotsearch's negligence, breach of contract, breach of any law, in equity, under indemnities or otherwise, arising out of all acts, omissions and events whenever occurring.
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Date: 28 June 2018

Reference: LS003741

Address: Powerline Route, Grafton, NSW (Section 6)

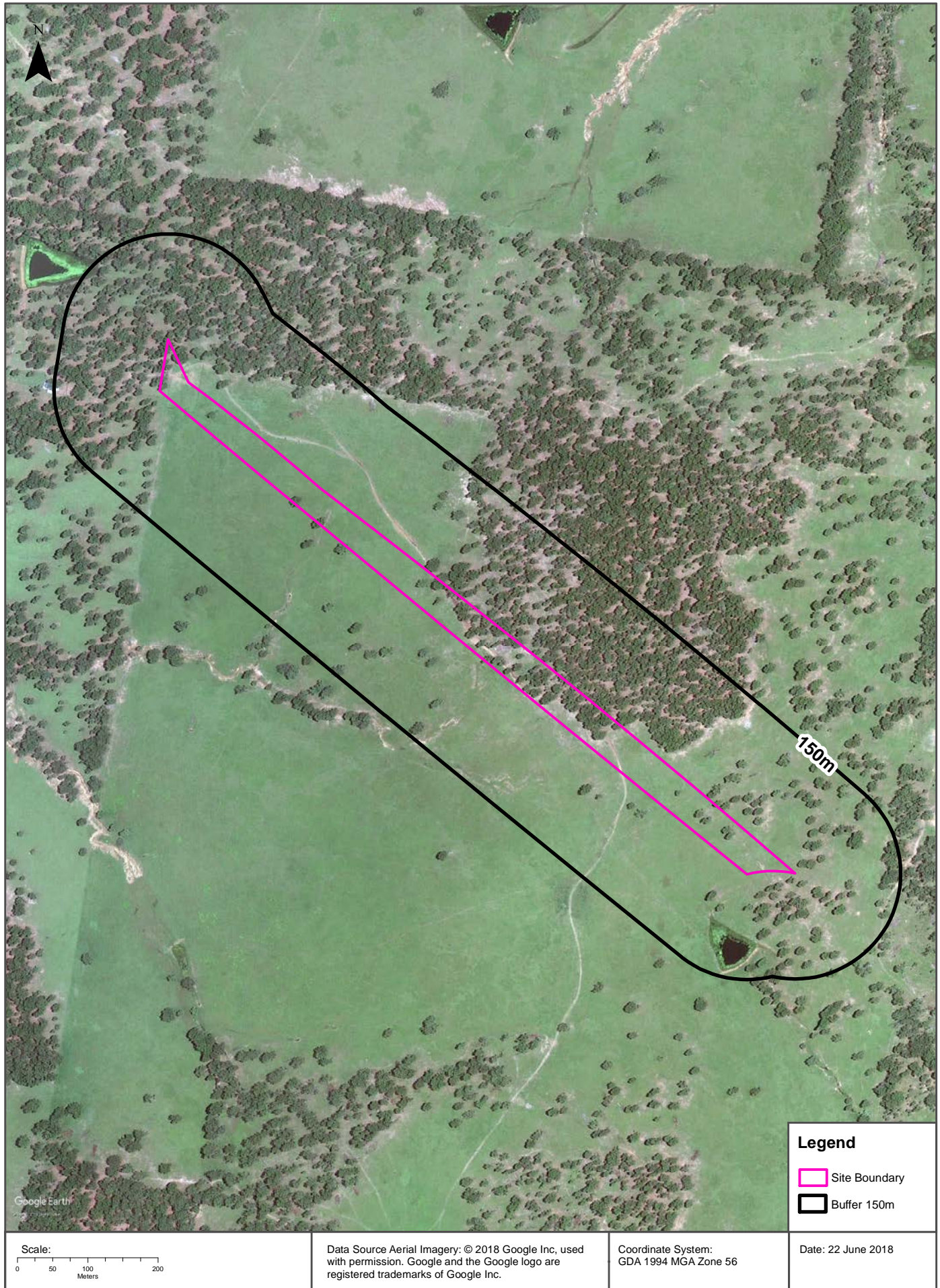
Aerial Imagery 2017

Powerline Route, Grafton, NSW (Section 6)



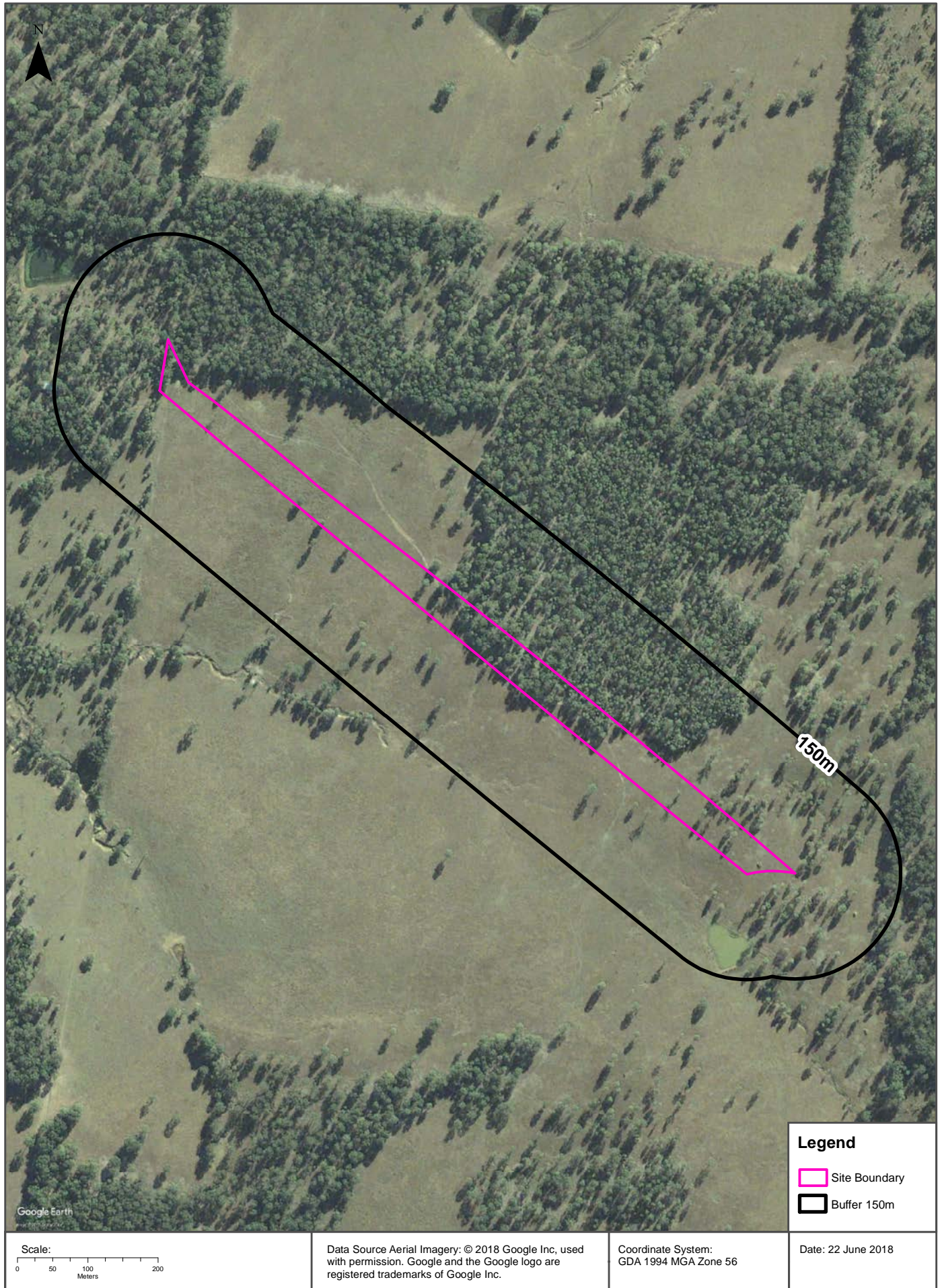
Aerial Imagery 2010

Powerline Route, Grafton, NSW (Section 6)



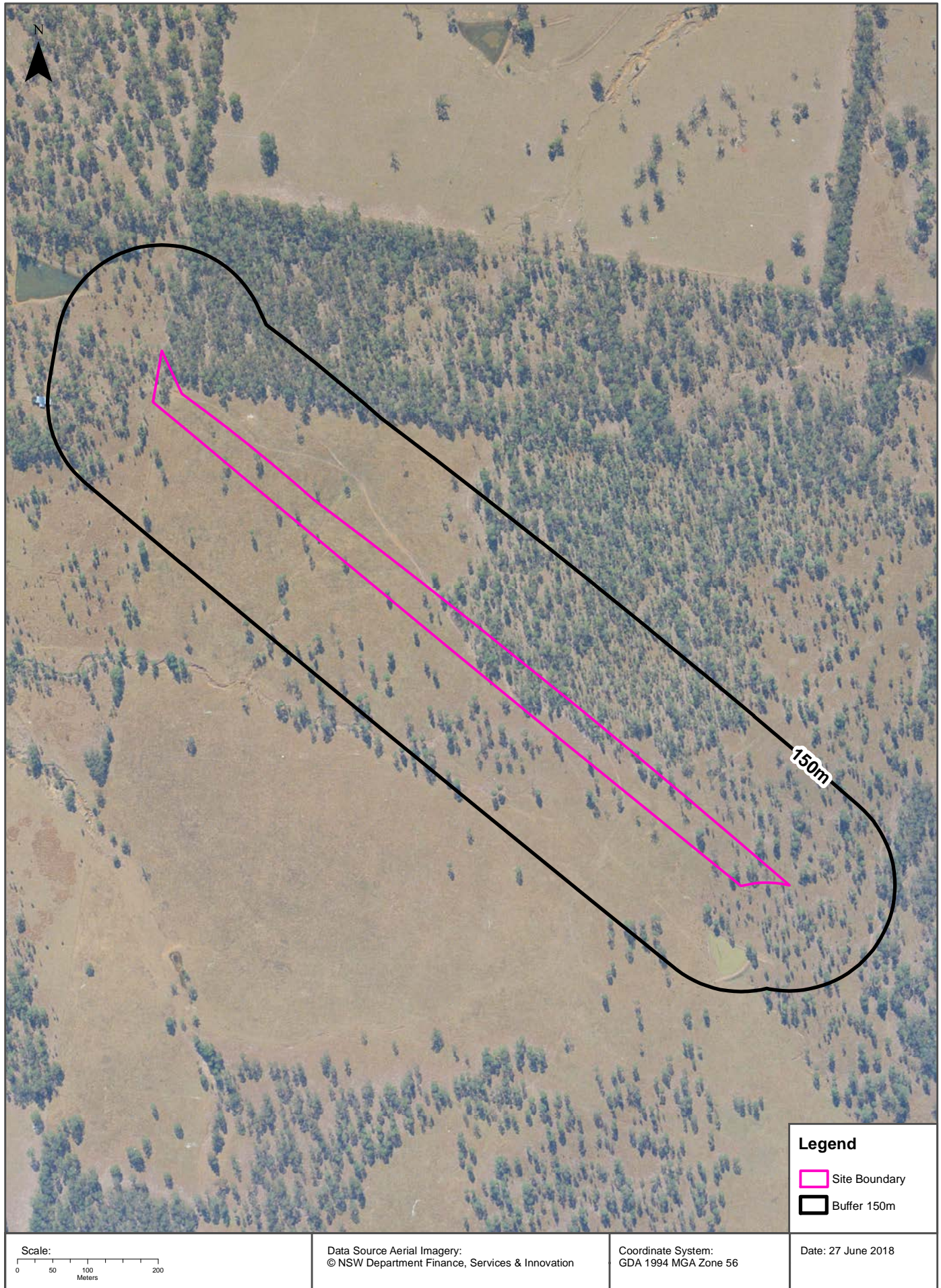
Aerial Imagery 2004

Powerline Route, Grafton, NSW (Section 6)



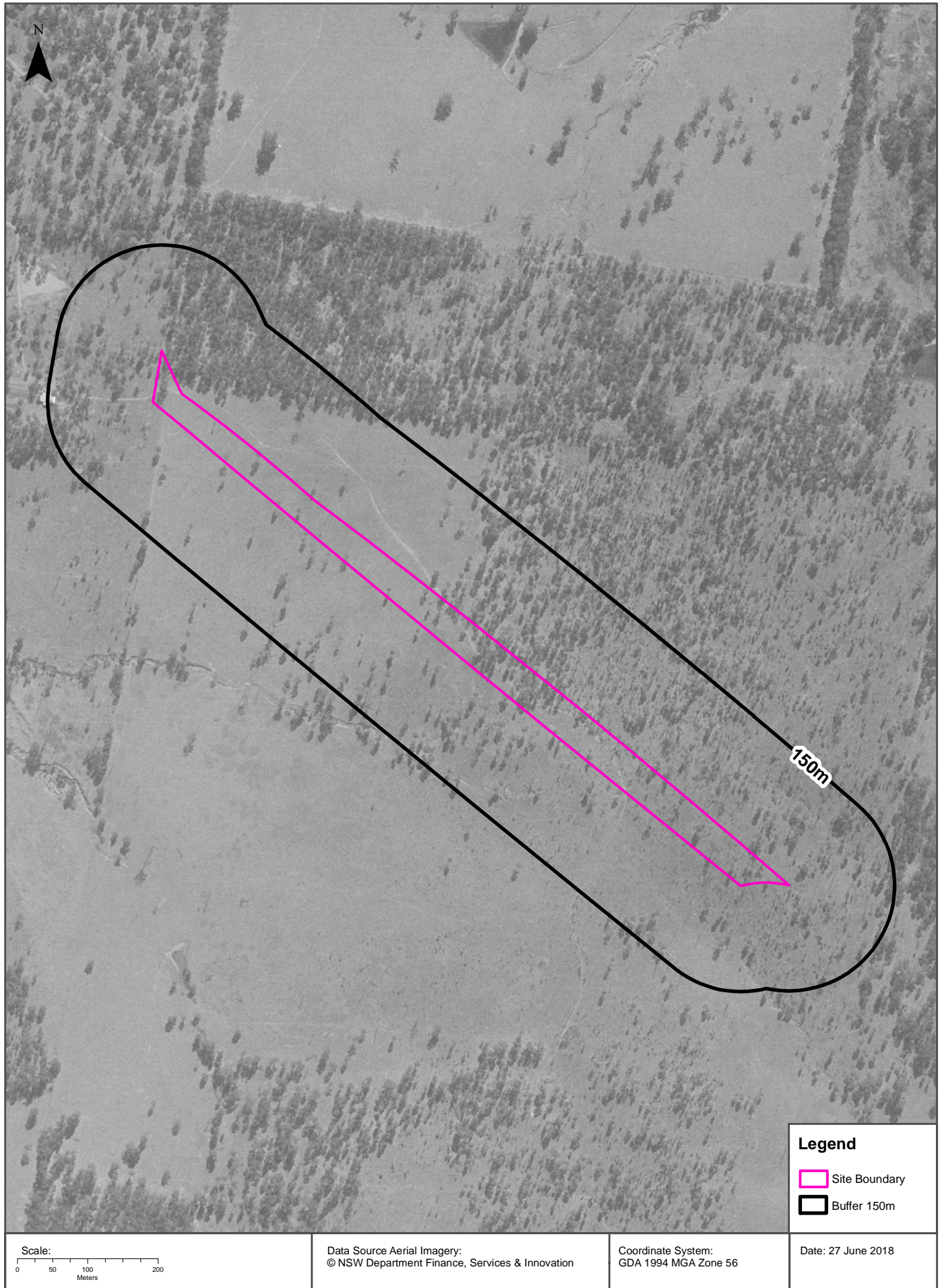
Aerial Imagery 1994

Powerline Route, Grafton, NSW (Section 6)



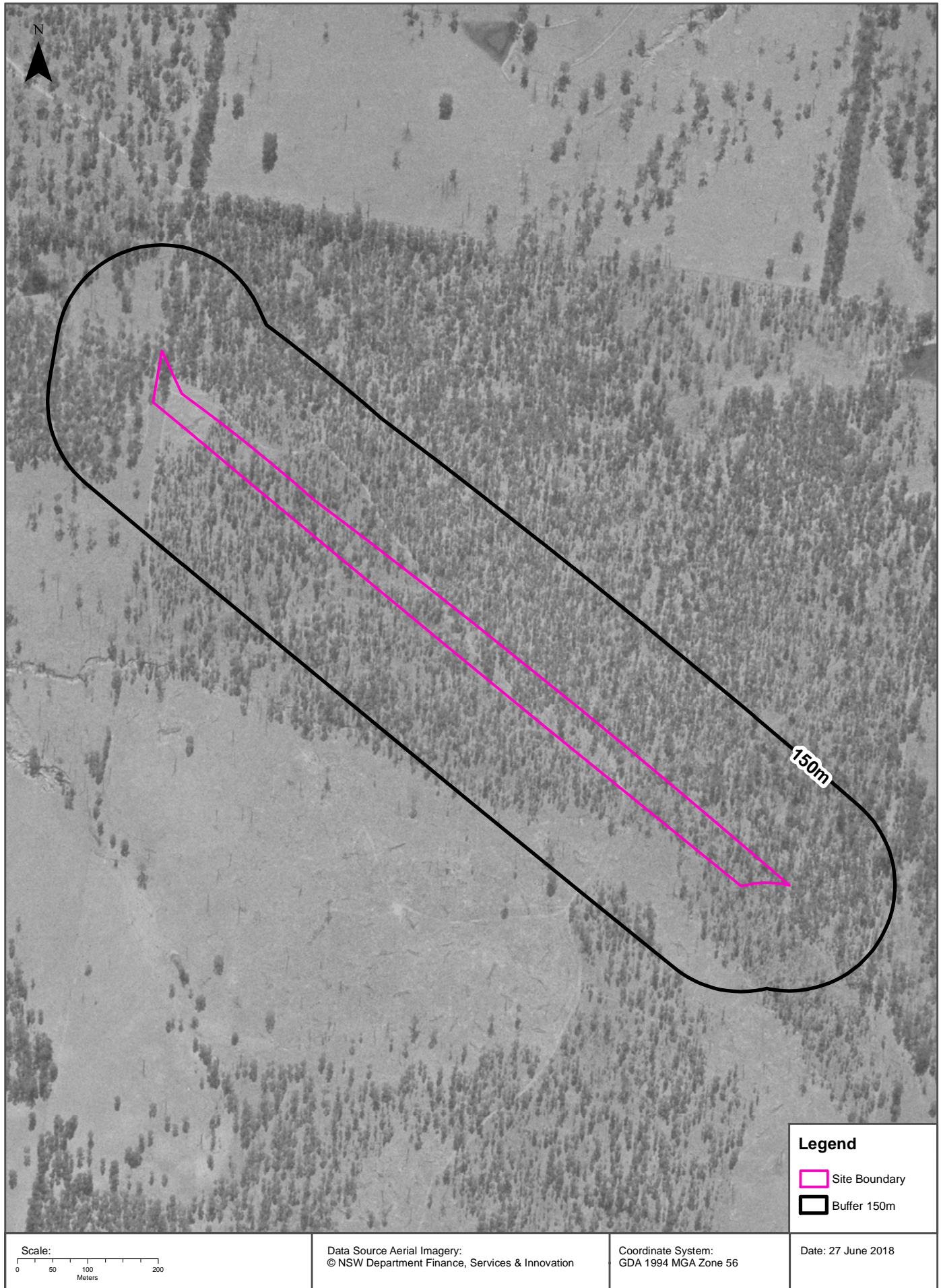
Aerial Imagery 1987

Powerline Route, Grafton, NSW (Section 6)



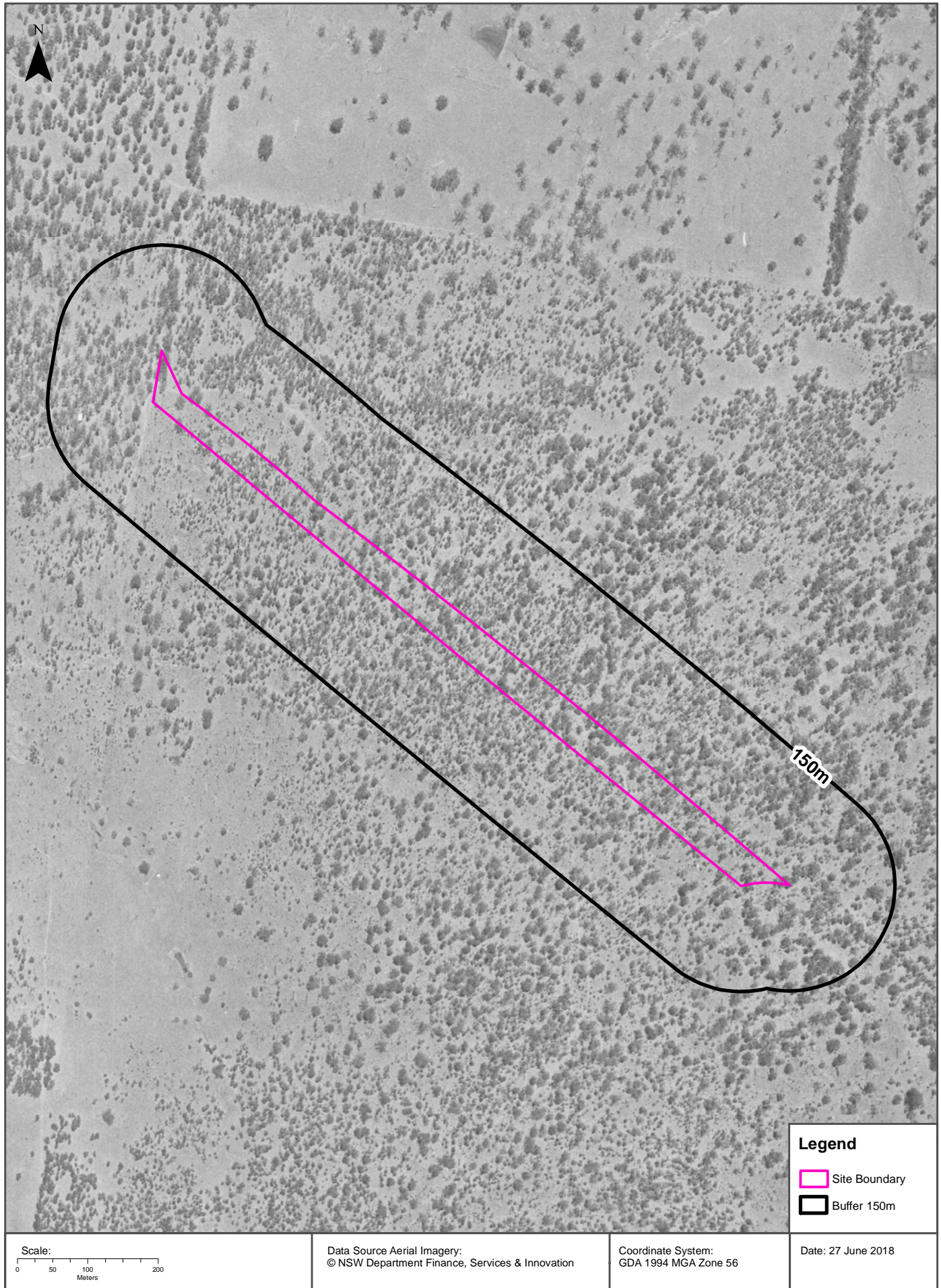
Aerial Imagery 1978

Powerline Route, Grafton, NSW (Section 6)



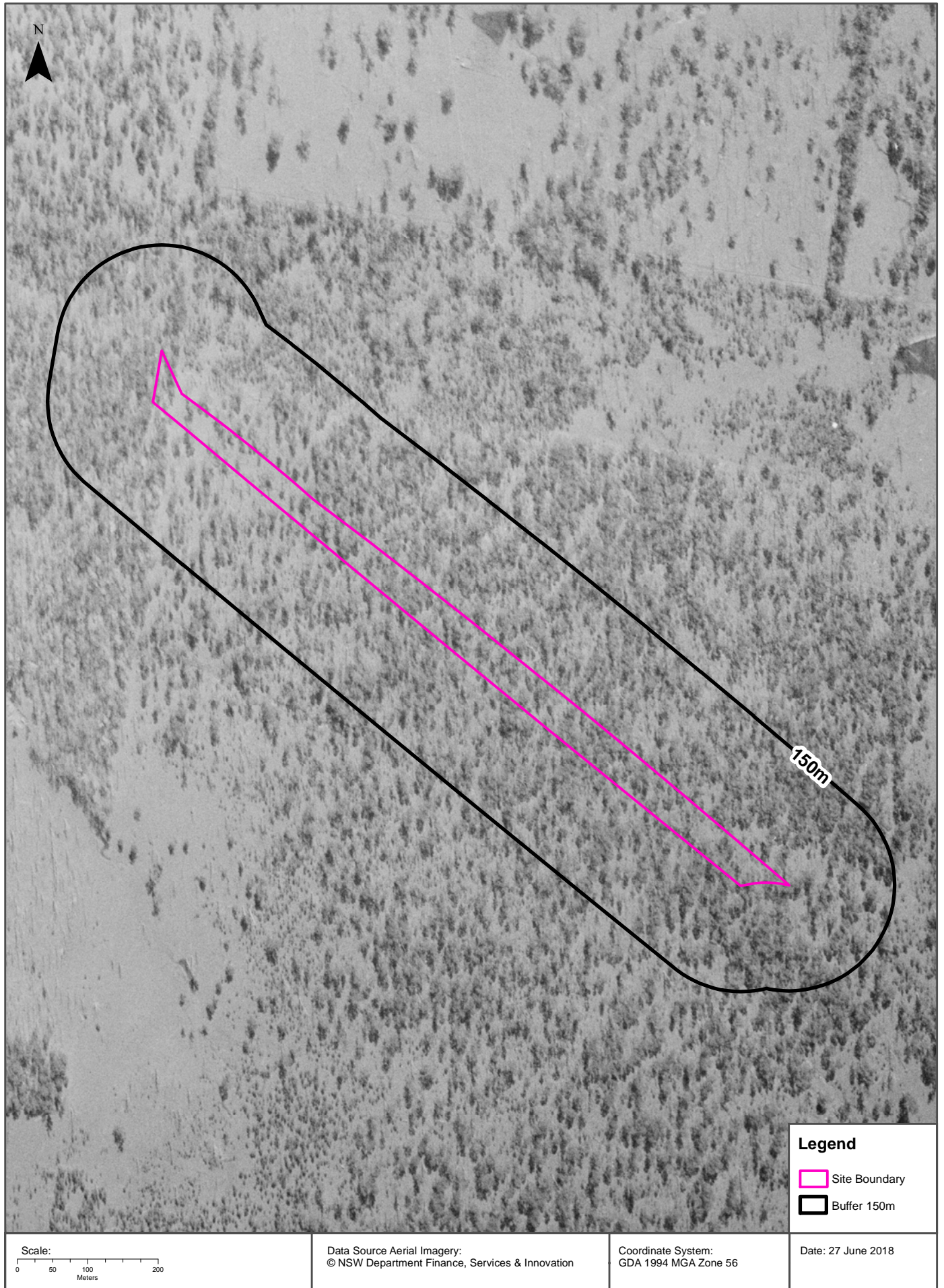
Aerial Imagery 1964

Powerline Route, Grafton, NSW (Section 6)



Aerial Imagery 1954

Powerline Route, Grafton, NSW (Section 6)



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A.2 Lotsearch Aerial Reports – CCC Power Line Re-routing (Section 1 to Section 2)



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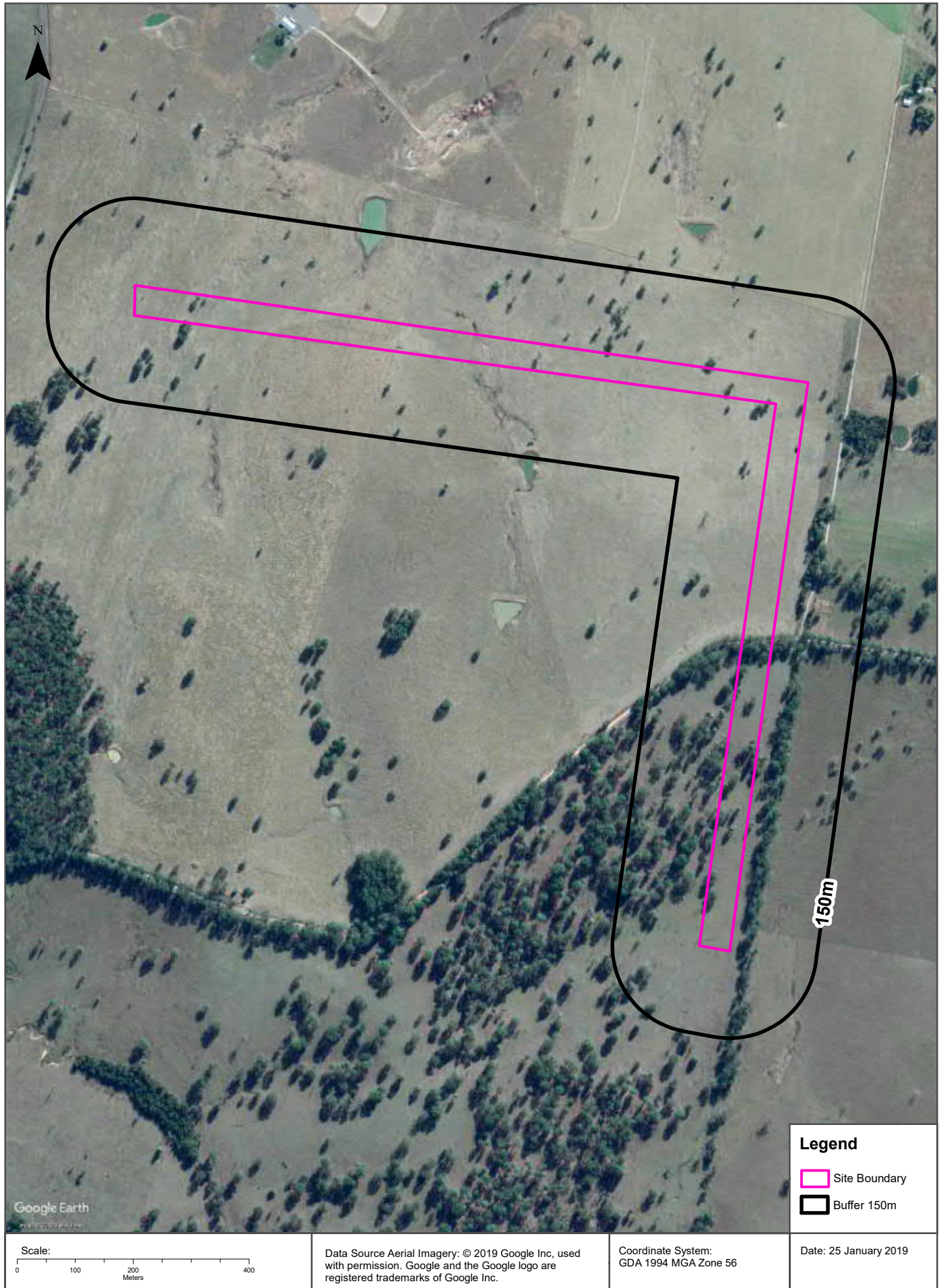
Date: 25 Jan 2019

Reference: LS004976_EA

Address: Four Mile Lane, CradENZA, NSW 2460 (Section 1)

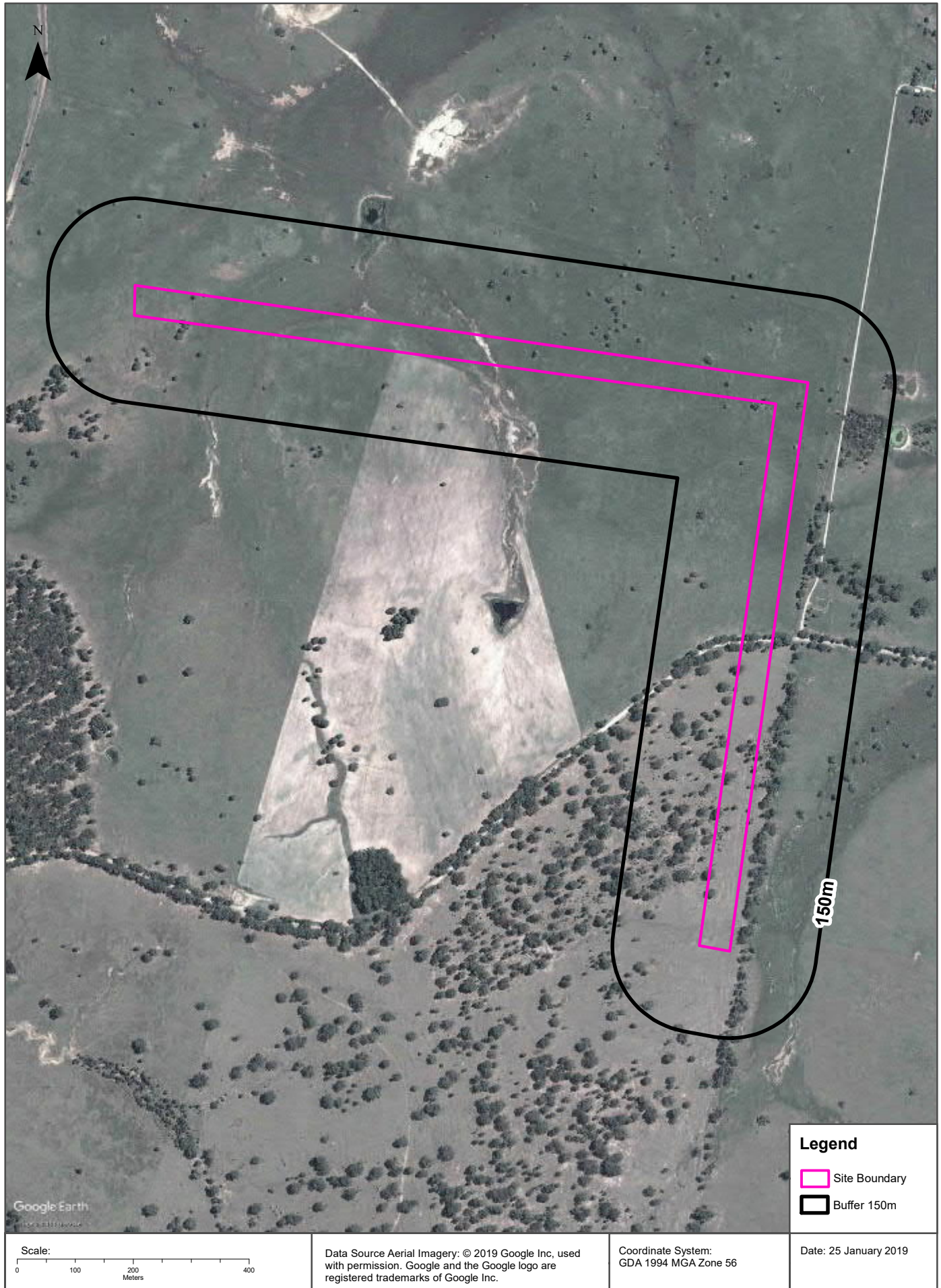
Aerial Imagery 2018

Four Mile Lane, CradENZA, NSW 2460 (Section 1)



Aerial Imagery 2011

Four Mile Lane, Cradenza, NSW 2460 (Section 1)



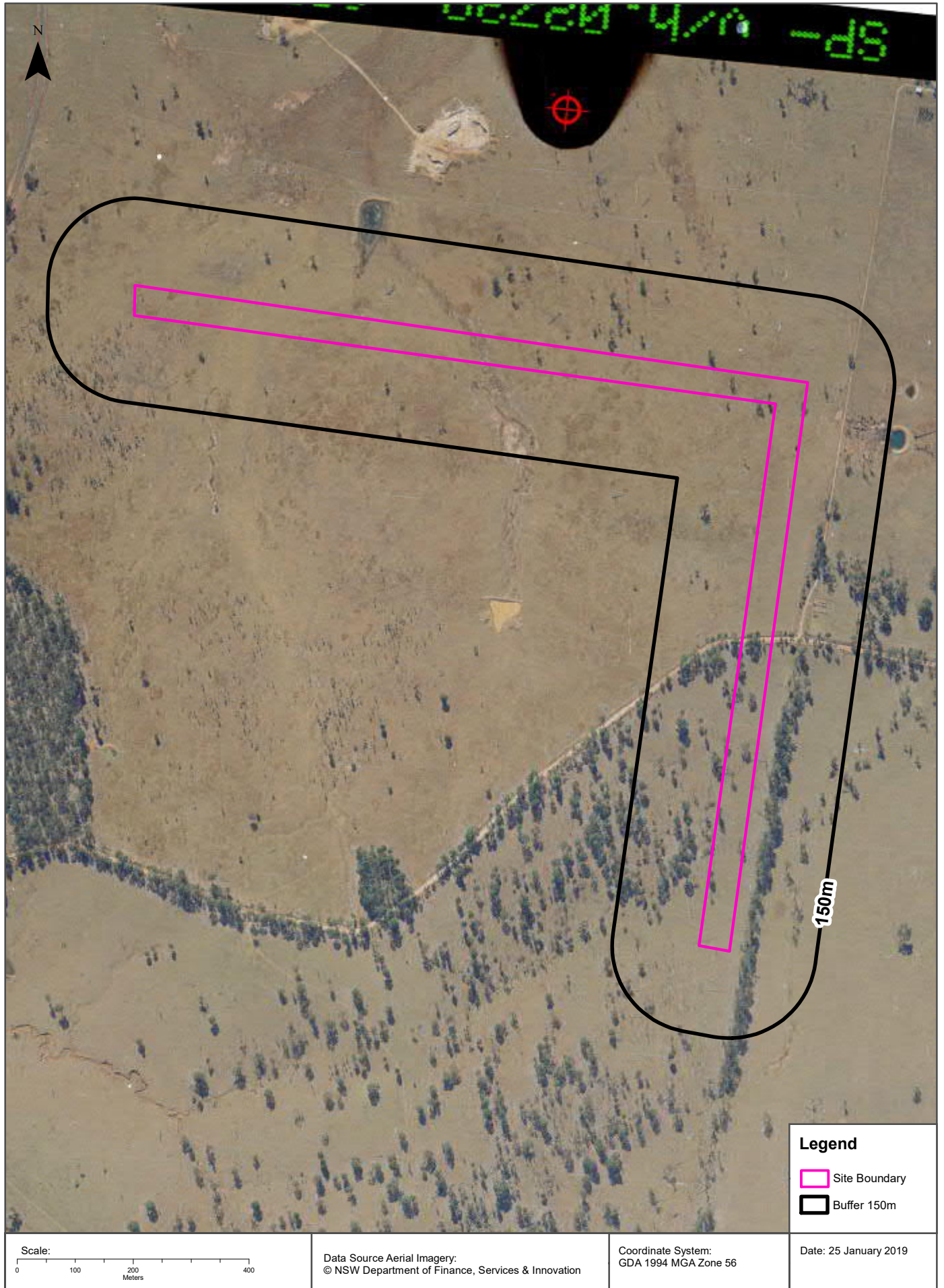
Aerial Imagery 2004

Four Mile Lane, CradENZA, NSW 2460 (Section 1)



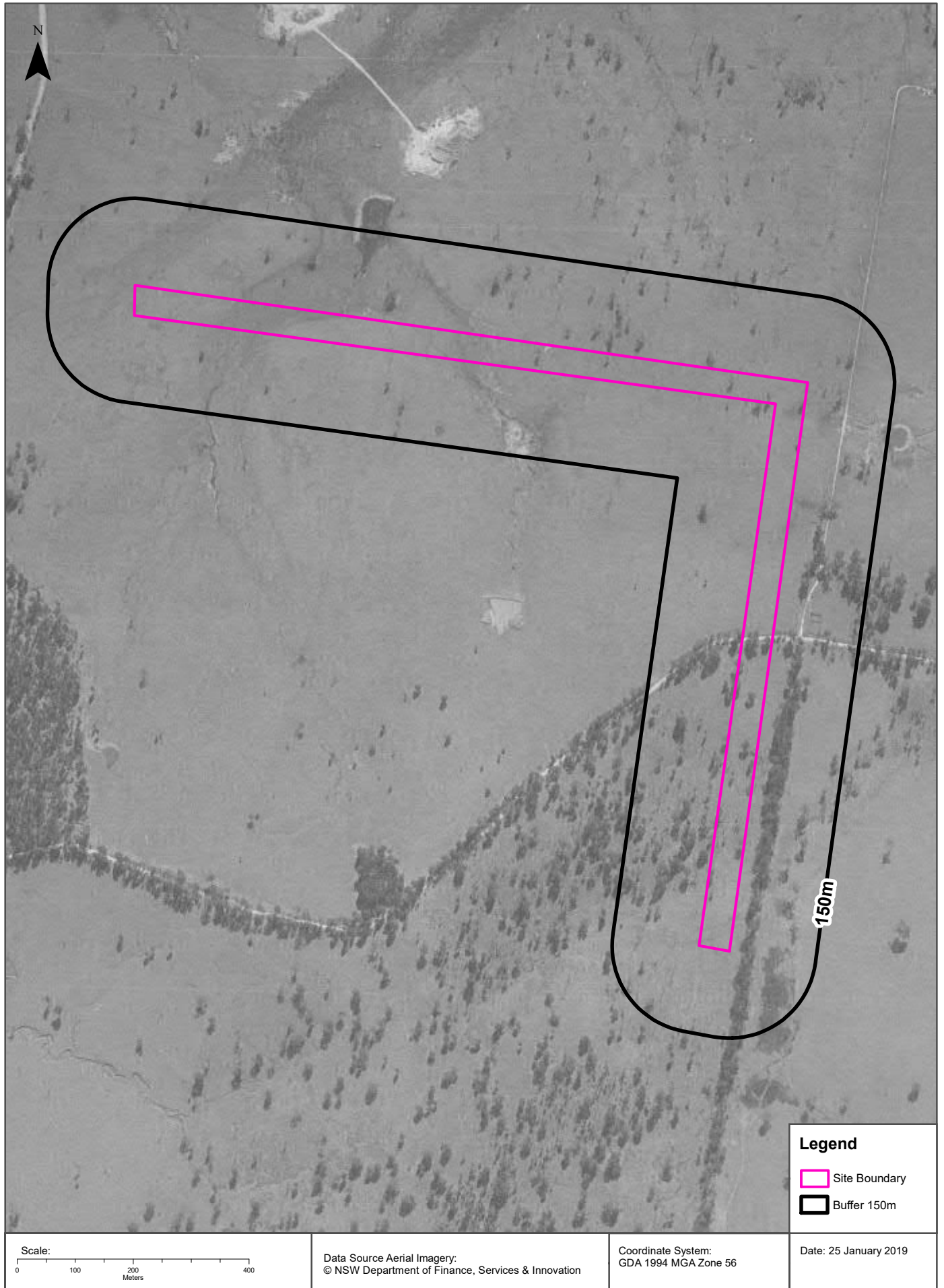
Aerial Imagery 1994

Four Mile Lane, Cradenza, NSW 2460 (Section 1)



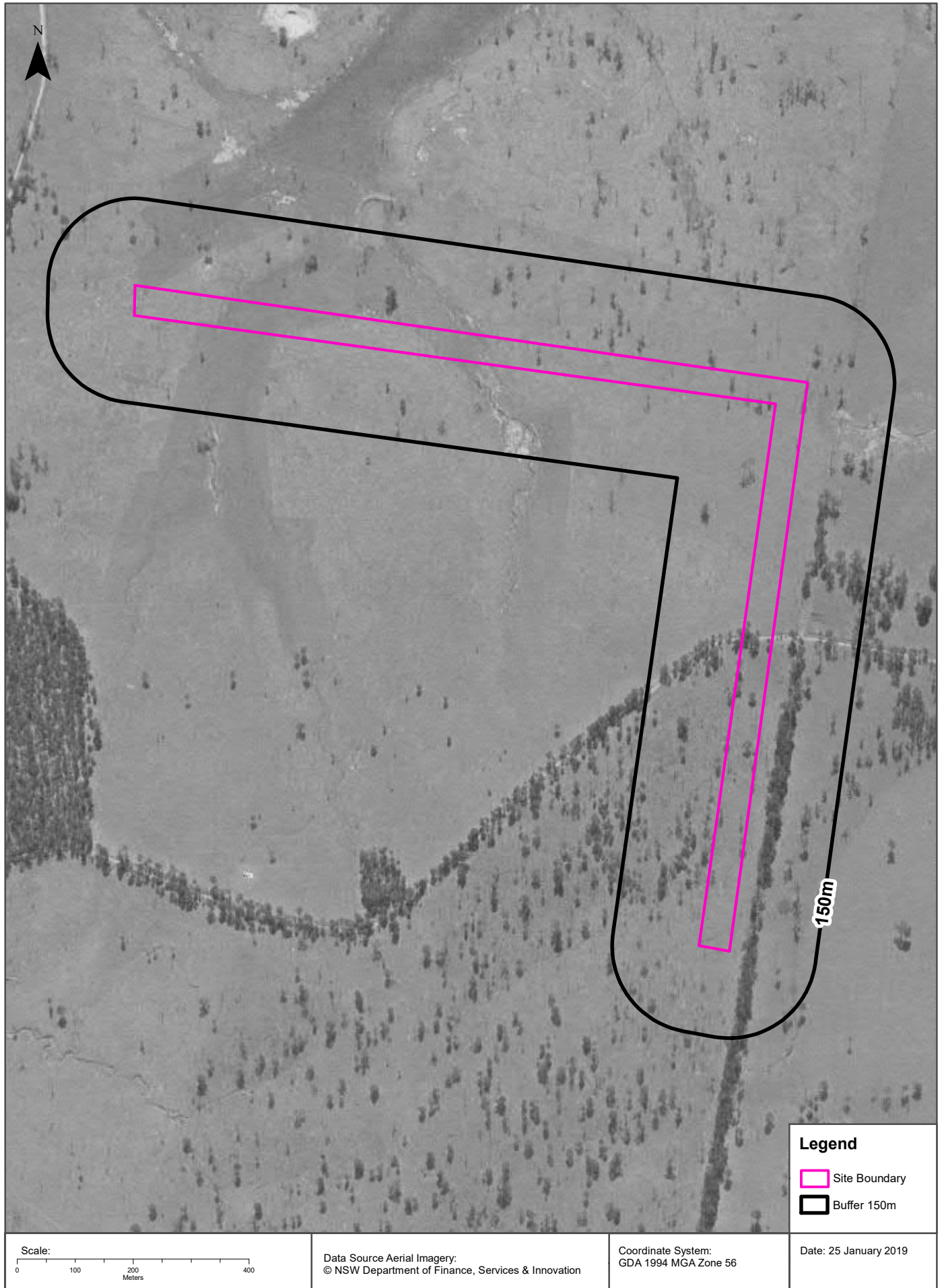
Aerial Imagery 1987

Four Mile Lane, Cradenza, NSW 2460 (Section 1)



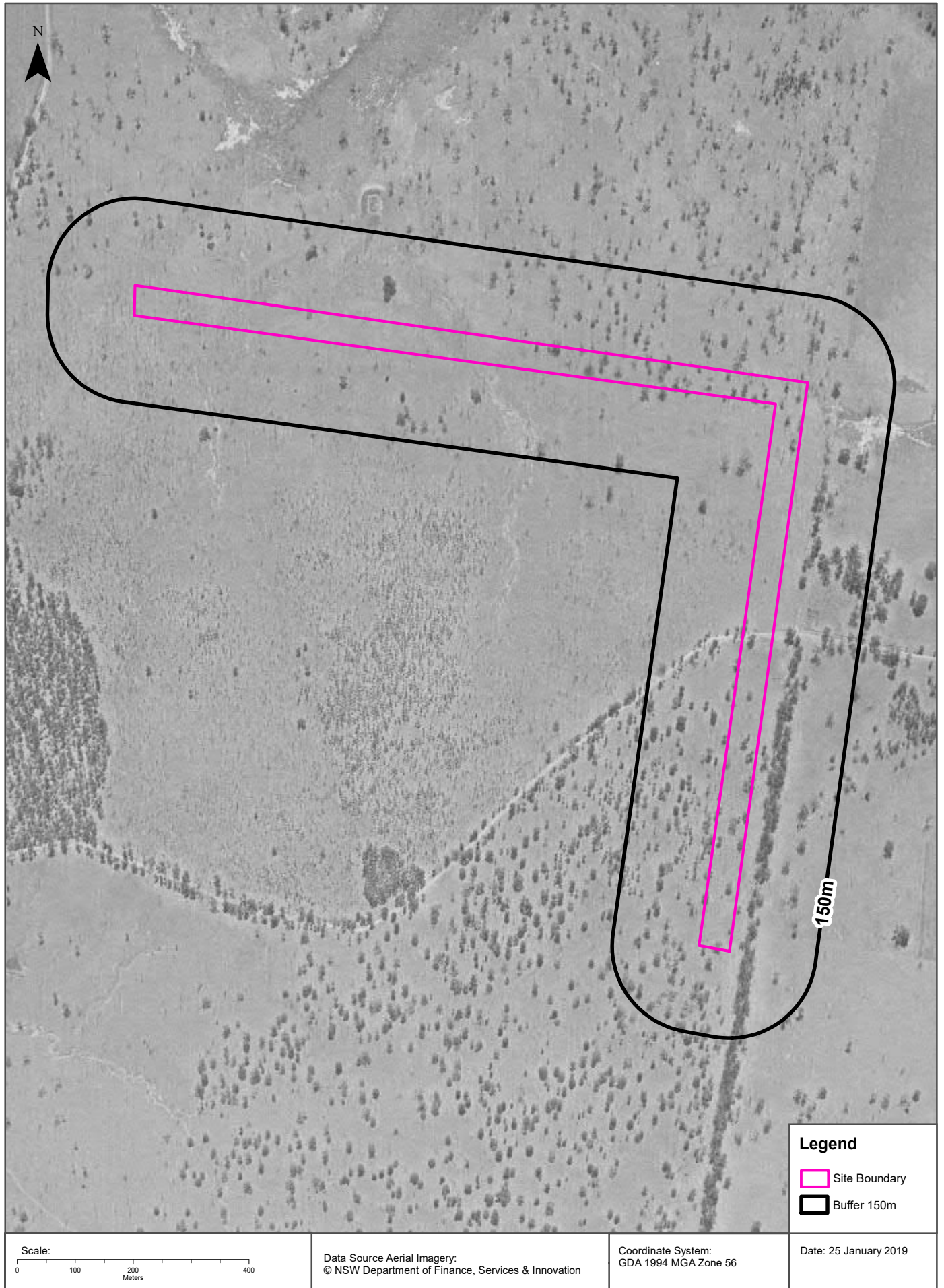
Aerial Imagery 1978

Four Mile Lane, Cradenza, NSW 2460 (Section 1)



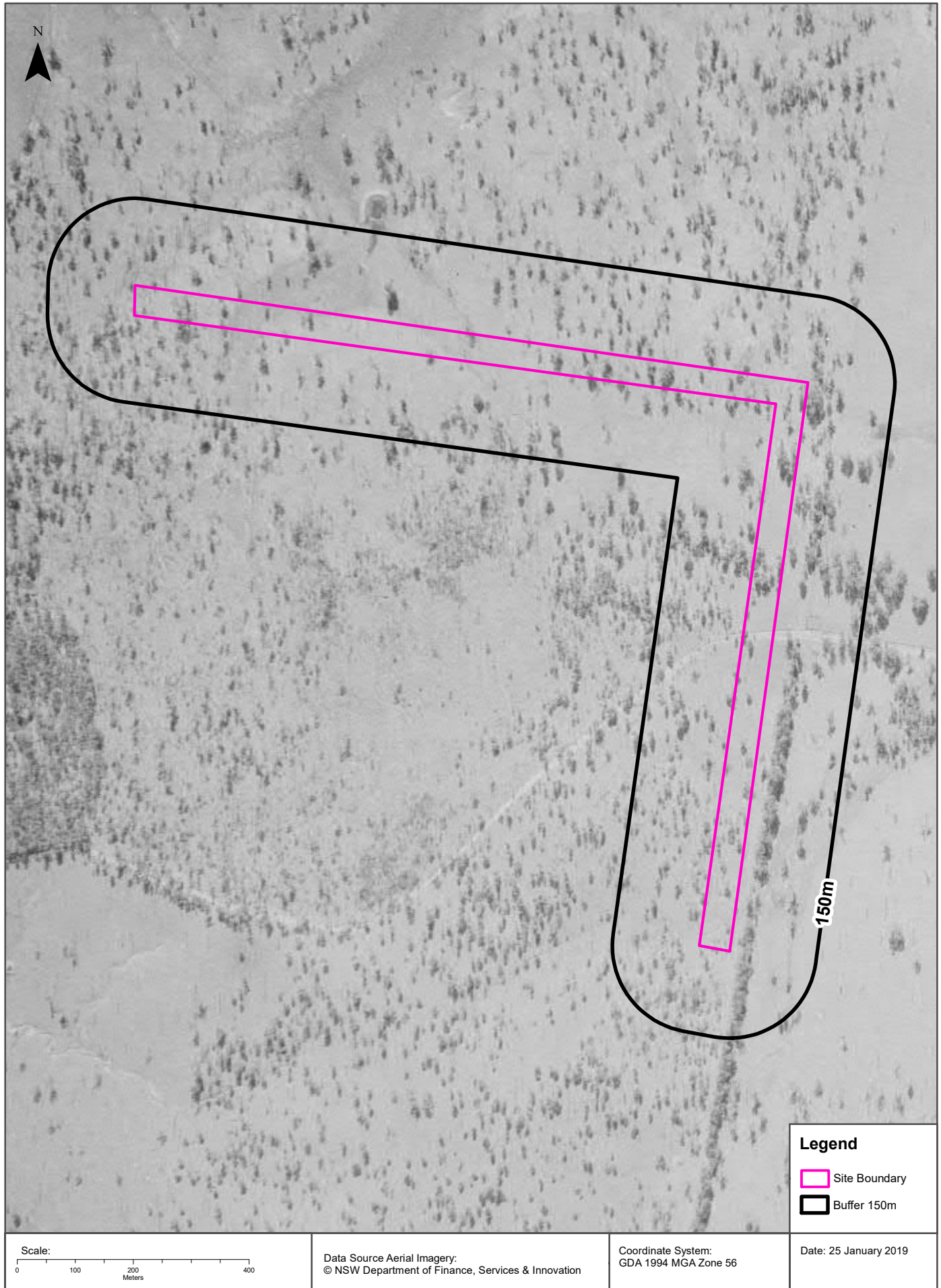
Aerial Imagery 1964

Four Mile Lane, Cradenza, NSW 2460 (Section 1)



Aerial Imagery 1954

Four Mile Lane, Cradenzia, NSW 2460 (Section 1)



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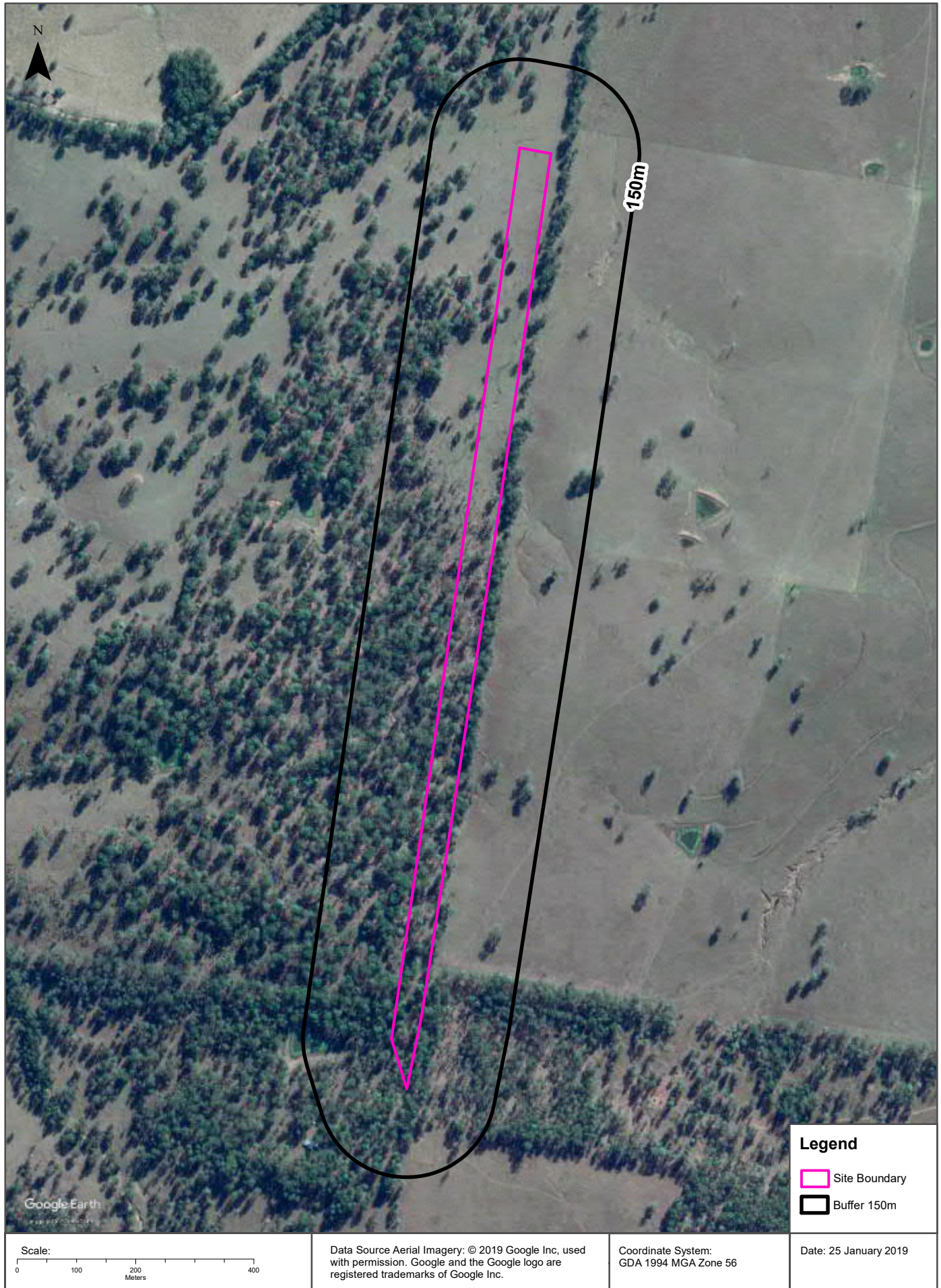
Date: 25 Jan 2019

Reference: LS004977_EA

Address: Four Mile Lane, Cradenzia, NSW 2460 (Section 2)

Aerial Imagery 2018

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



Aerial Imagery 2011

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



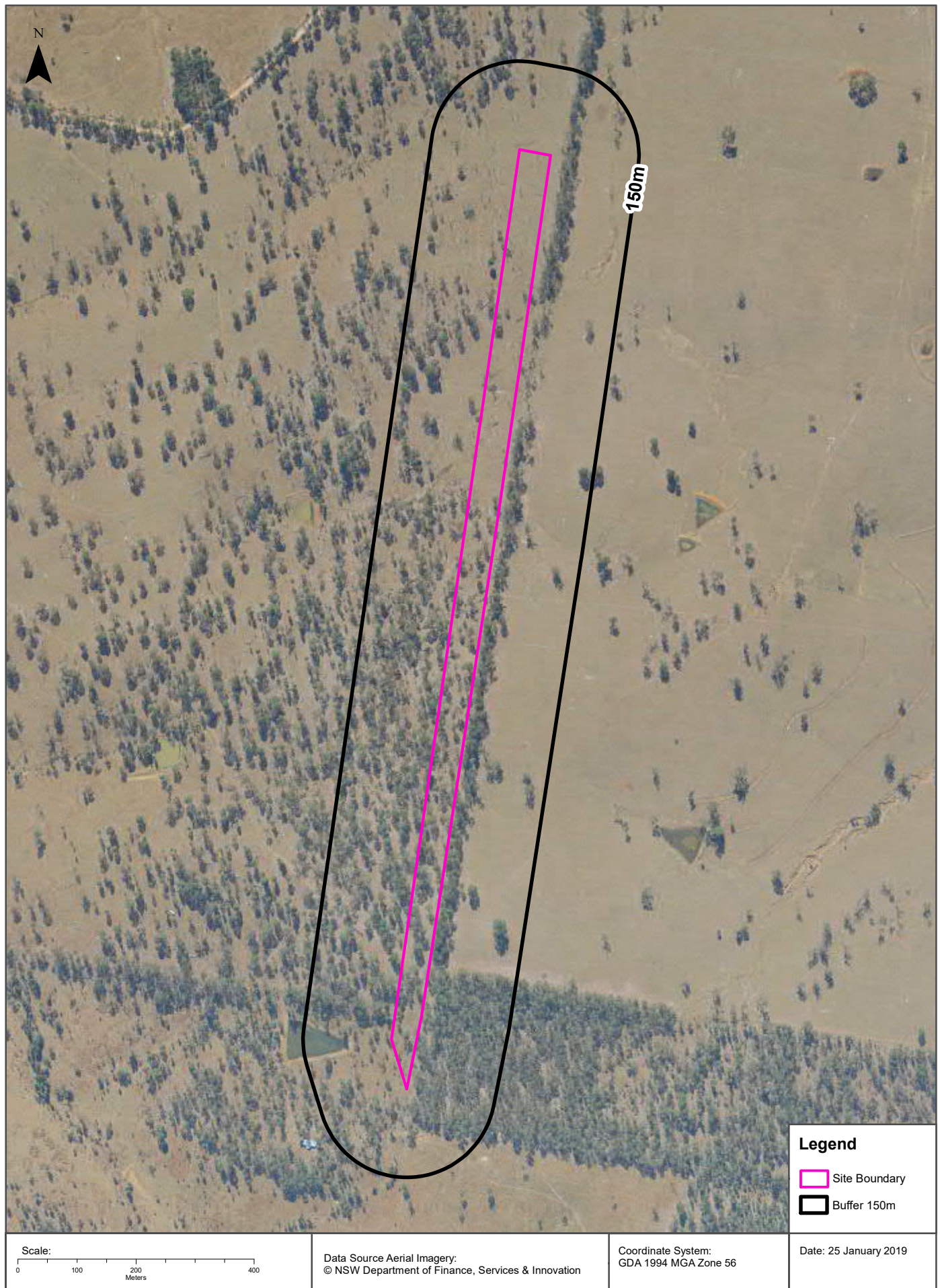
Aerial Imagery 2004

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



Aerial Imagery 1994

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



Aerial Imagery 1987

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



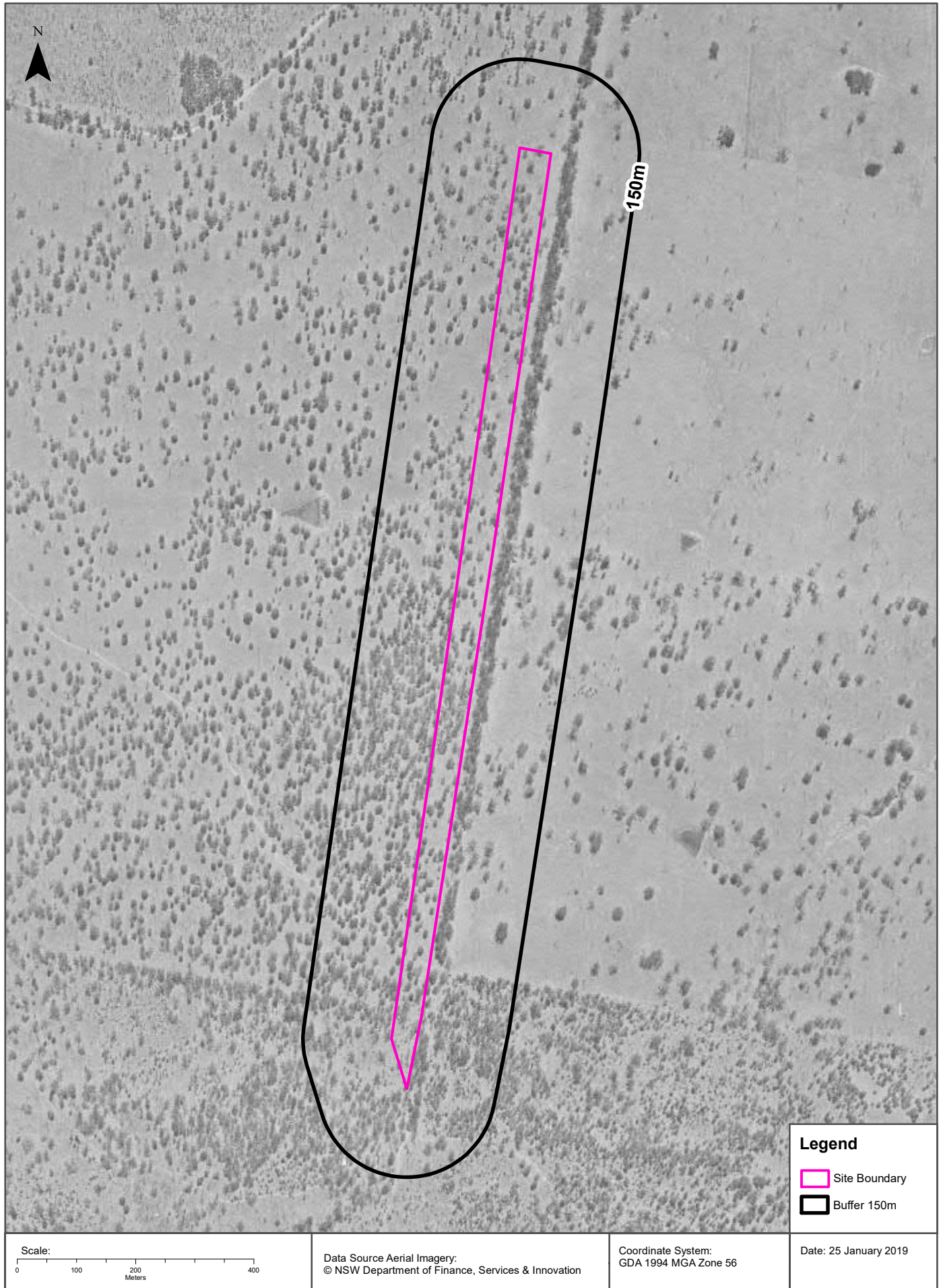
Aerial Imagery 1978

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



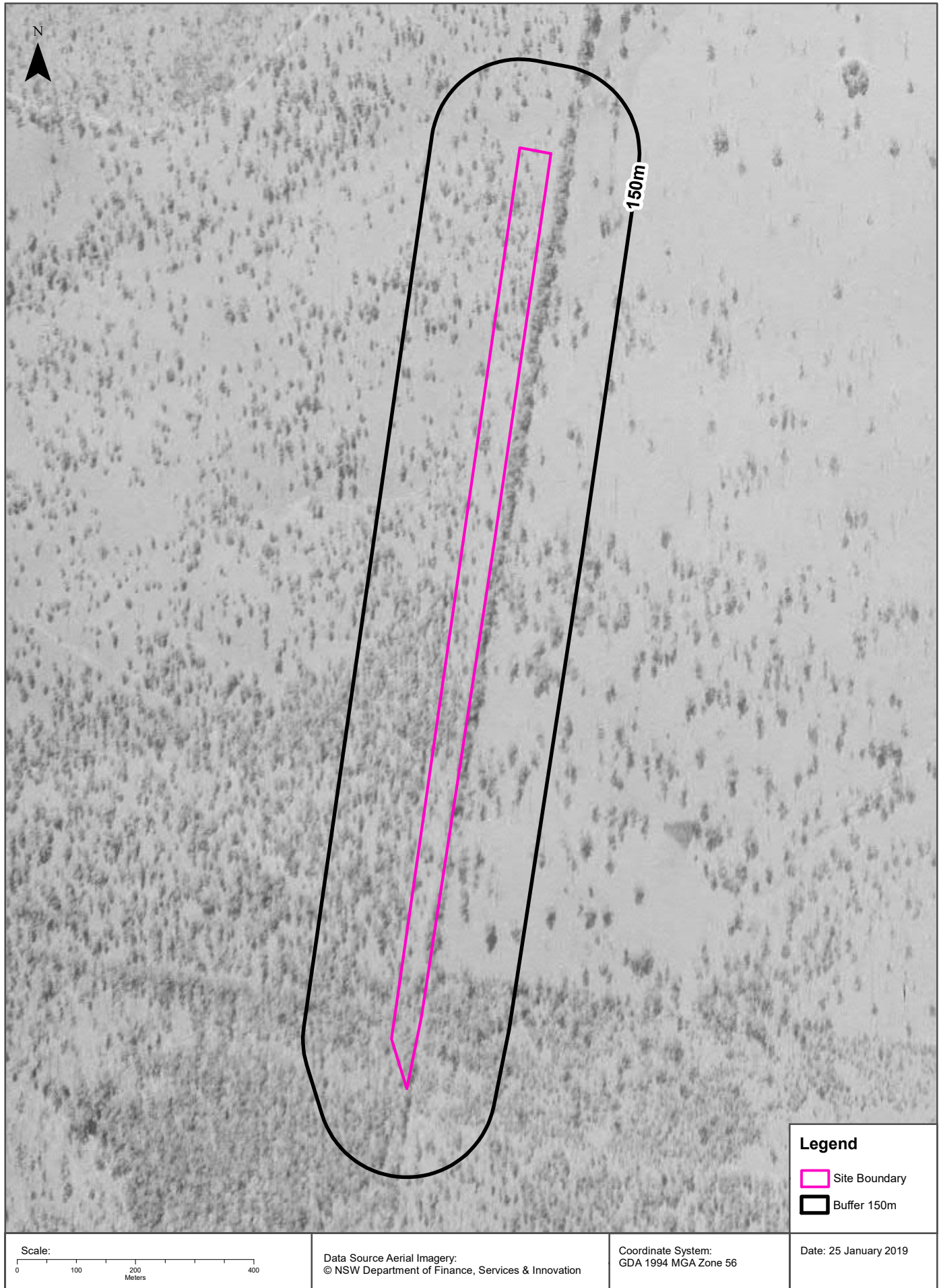
Aerial Imagery 1964

Four Mile Lane, Cradenzia, NSW 2460 (Section 2)



Aerial Imagery 1954

Four Mile Lane, Cradenza, NSW 2460 (Section 2)



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Clarence Correctional Centre Transmission Line

Infrastructure New South Wales

Flooding Assessment

Final

5 March 2019

Clarence Correctional Centre Transmission Line

Project No: IA190800
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Executive Summary

Infrastructure New South Wales (INSW) is preparing a Review of Environmental Factors (REF) under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for a new electricity transmission line (the proposal), which will provide electricity to the Clarence Correctional Centre (CCC). The proposal is to be located around one kilometre to the east of Grafton, NSW, within the Clarence Valley local government area (LGA).

The proposal involves the construction, operation and maintenance of a new 12.5 kilometre long, 132 kilovolt electrical transmission line to be established between the existing TransGrid transmission line to the west and the CCC's new substation to the east.

This flood assessment has assessed the potential for flooding-related impacts with respect to the proposal. The *Clarence River Flood Study 2013* (CVC, 2016) has been reviewed and deemed satisfactory in determining the flood risk for the proposal site. Therefore, it is considered that no additional modelling is required to determine the effect and impact of the proposal on flood behaviour. Flood results were not available for the 1:200 or 1:500 Annual Exceedance Probability (AEP) flood events, which are commonly used as a surrogate to estimate the impacts of climate change. Therefore, Probably Maximum Flood (PMF) depths have been reported to provide guidance on the range of flood depths that may be expected as a result of climate change. In addition, only depth contours were available for analysis, whilst a qualitative assessment of flood velocities has been provided.

Three sections of the proposal are flood prone: where the proposal crosses the Clarence River, Washpen Creek and Glenugie Creek floodplains. In total, 19 of 54 proposed pylons lie within the PMF flood extent. The depths of flooding in flood prone areas are significant, with maximum 1:100 AEP flood depths of 5.81 metres, 4.30 metres and 4.79 metres occurring at pylons in the Clarence River, Washpen Creek and Glenugie Creek floodplains respectively. PMF flood depths are considerably greater, exceeding seven metres at several pylons. It is anticipated that flood velocities within Washpen and Glenugie Creeks during large flood events are likely to be low, given that the flood mechanisms leading to flooding of these areas are dominated by backwater flows entering from the wider Clarence River floodplain. Flood velocities in the Clarence River floodplain are likely to be higher.

The proposal has been assessed with regards to compatibility with hydraulic functions. Given the small volume of displaced flood storage resulting from the installation of the pylons, as well as the low risk of obstruction created by the pylons, there is not considered to be any impact on the hydraulic functions of the floodplain resulting from their installation. The development of construction pads, and new access tracks should not increase the volume of fill within the PMF flood extent. The installation of access gates, fencing and other associated features within the PMF flood extent should be avoided where possible to reduce the risk of obstruction and hazard to emergency services personnel.

A key risk posed by the proposal is the reduced electrical clearance to watercraft and persons during flood events, hence risks associated with reduced clearance need to be managed accordingly.

The report recommends that flood heights and minimum distances to power lines required in the 1:100 AEP flood event and the PMF be addressed during the detailed design.

1. Introduction

1.1 Background

Infrastructure New South Wales (INSW) is overseeing the delivery of a new electricity transmission line (the proposal) which will provide electricity to the Clarence Correctional Centre (CCC), currently under construction. This Flood Assessment is being prepared to support the Review of Environmental Factors (REF) that is being prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Infrastructure NSW is the determining authority for the environmental assessment.

The proposal commences around one kilometre to the east of Grafton within the Clarence Valley local government area (LGA), in northern NSW, refer to Figure 1-1. The transmission line starts around 500 metres to the west of the Pacific Highway and extends 1.6 kilometres to the east across the Pacific highway and Washpen Creek to Four Mile Lane. From here the transmission orientates south-east towards Clarenza, before crossing the Glenugie Creek and tying in with the CCC.

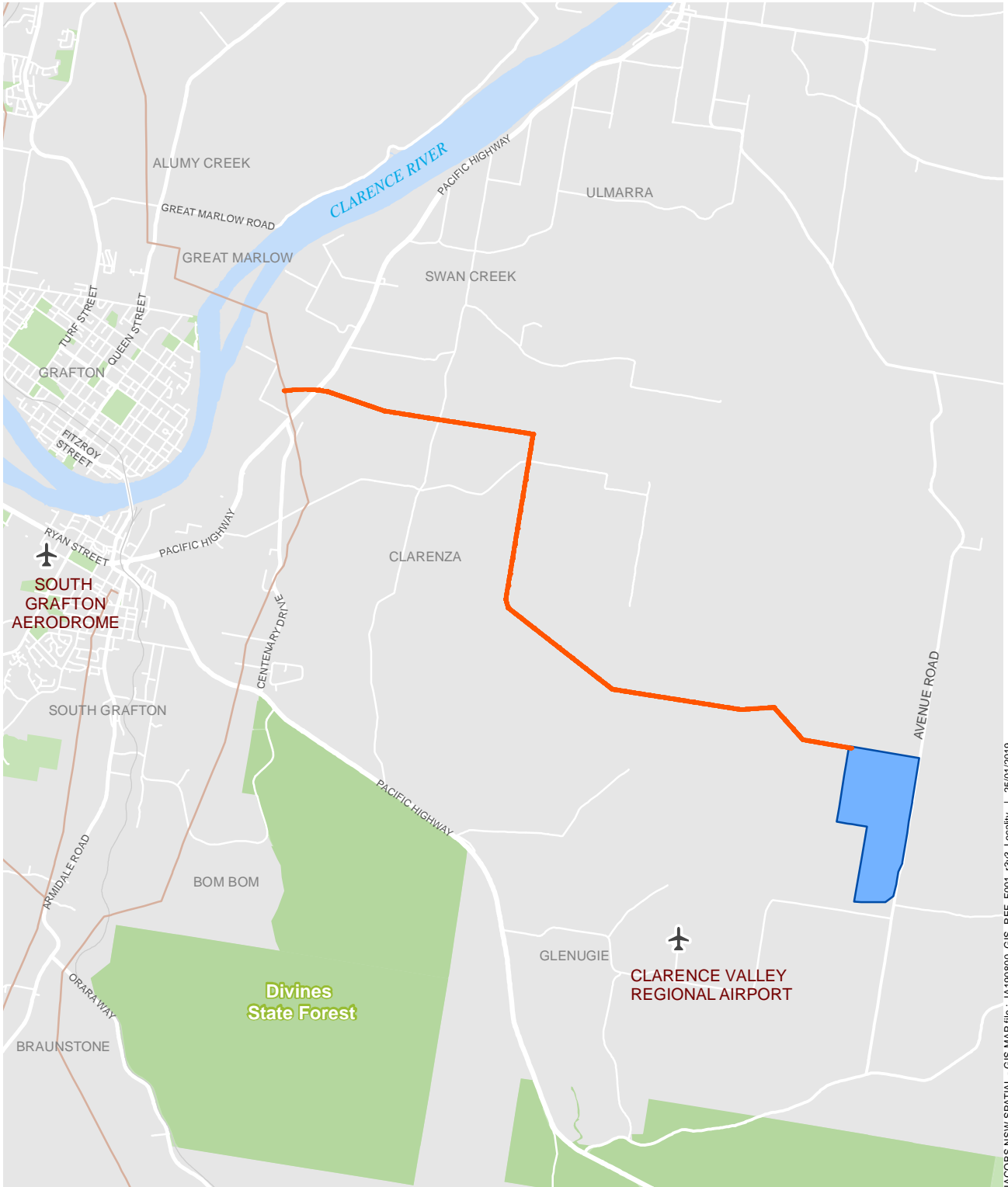
The proposal site is rural in nature, traversing a low gradient, mildly undulating landscape made up of predominantly rural / agricultural land uses. Grafton airport is located around 1.2 kilometres west of where the proposal ties in with the CCC.

1.2 Proposal description

The proposed activity involves the construction, operation and maintenance of a new 12.5 kilometre long 132 kilovolt double circuit electrical transmission line to be established between the existing TransGrid transmission line to the west and the Correctional Centre's new substation to the east. Figure 1-2 shows the location of the proposal. At its westernmost extent it would connect into the existing 96H 132 kilovolt line that runs from Koolkhan to Coffs Harbour.

The proposal comprises:

- Approximately 12.5 kilometre of 132 kilovolt double circuit transmission line strung with a single lemon conductor and an Optical Ground Wire (OPGW) from the existing 96H transmission line Structure 339 to the new substation, including approximately 54 new structures. Structures would be a combination of steel and concrete poles, generally 25 to 30 metres in height.
- In flood prone areas, pylons would be mounted above ground due to poor structural strength of soils in those areas. Ground footings would be constructed on a 4 by 4 metre concrete pad, 1.5 metres above ground.
- New easement clearing, construction pads, access gates, and new access tracks.
- OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
 - Splicing OPGW as required at the intersection of the new 132 kilovolt double circuit transmission line and the existing 96 H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line.
- Removal of trees and vegetation within the 30 metre easement to enable installation of the new transmission line.
- Removal of 'danger trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Construction of suitable access tracks.
- Purchase of land for easements.



JACOBS NSW SPATIAL - GIS MAP file: IA190800_GIS_REF_F001_r3v3_Locality | 25/01/2019

Legend

- Project locality
- Transmission line
- Clarence correctional centre
- Railway
- Airport

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Figure 1-1 | Location of the proposal

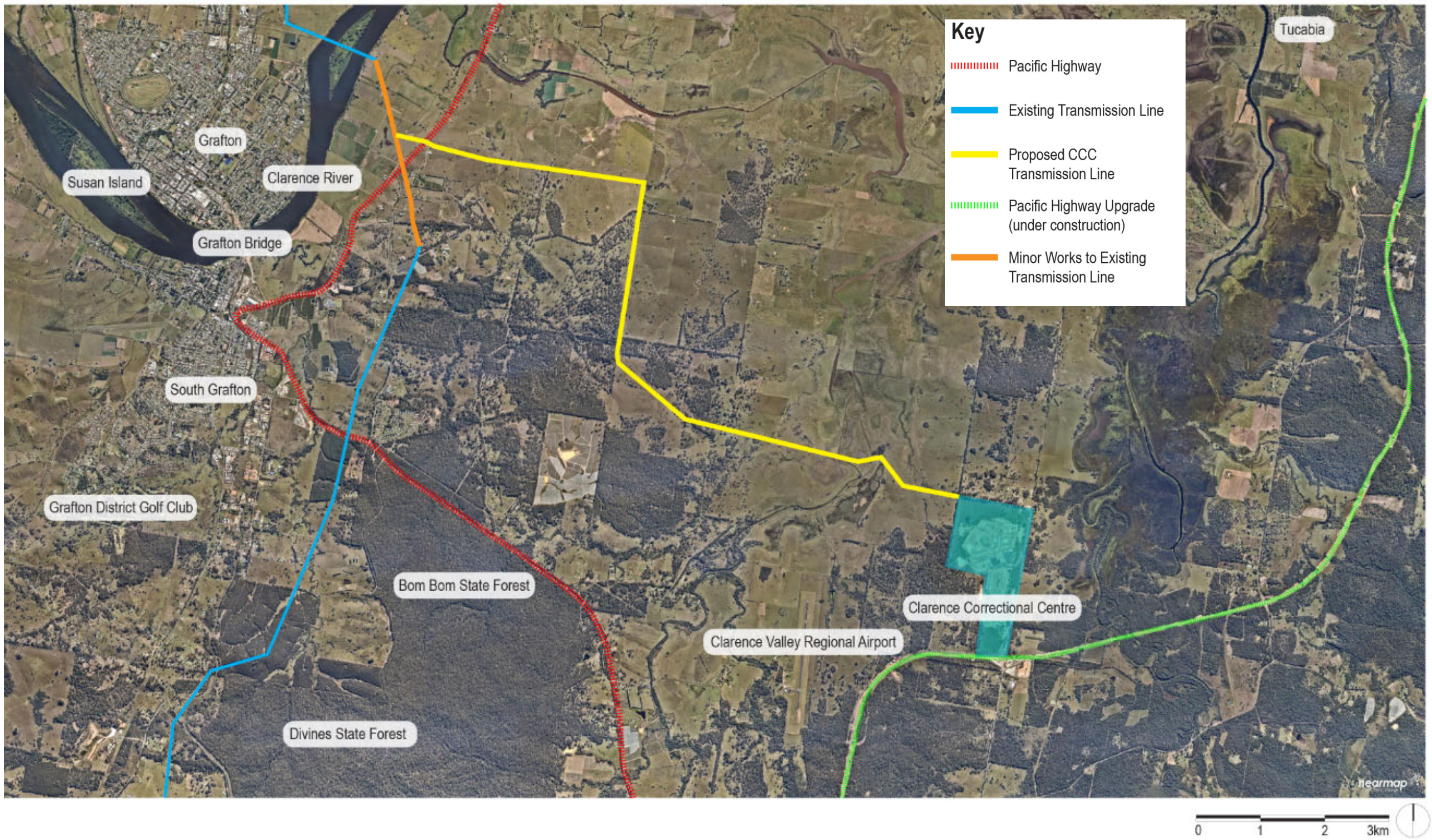


Figure 1-2 The proposal

Ancillary works to facilitate the proposal would also be required, and would involve:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys.
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials.
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment.
- Guy wire installation on structures to provide additional structural support.
- Repair or upgrade of existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

Where possible, existing access tracks would be used to access the transmission line easement. However, some additional access points to each of the transmission line pole structures would be required. These access points would be approximately four to six metres wide. The tracks would typically consist of unsealed surface roads and would allow for ongoing access during the operation of the proposed activity for maintenance purposes. As required, the surfaces would have aggregate placed on the surface, in order to minimise erosion. Track boundaries and routes would be delineated with markings. The tracks would be established such that they do not impact on existing trees as far as possible. Tracks would be built in accordance with the Best Practice Guidelines for Fire Trail Construction and Maintenance (Bushfire Coordinating Committee 2007).

Depending on the terrain, the extent of access track construction may vary from:

- Slashing long grass only.
- Excavating and grading to level natural ground.
- Importing and placement of gravel and/or road base onto natural ground.
- Boxing out the natural ground, importing gravel and/or road base and compacting.
- Site specific solution depending on the conditions encountered.

Culverts and/or causeways may be required to cross erosion gullies and/or creek crossings.

Appropriate drainage, erosion and sediment control measure would be implemented.

Figure 1-3 provides an overview of the proposed existing and new access tracks which would be used as part of the proposal. The final locations of these tracks would be determined in consultation with the landholders in order to coordinate with landholder activities and minimise impacts. The final locations would be determined so that they do not result in additional impacts to those assessed as part of this proposal (i.e. vegetation clearing amounts or different vegetation clearing class).

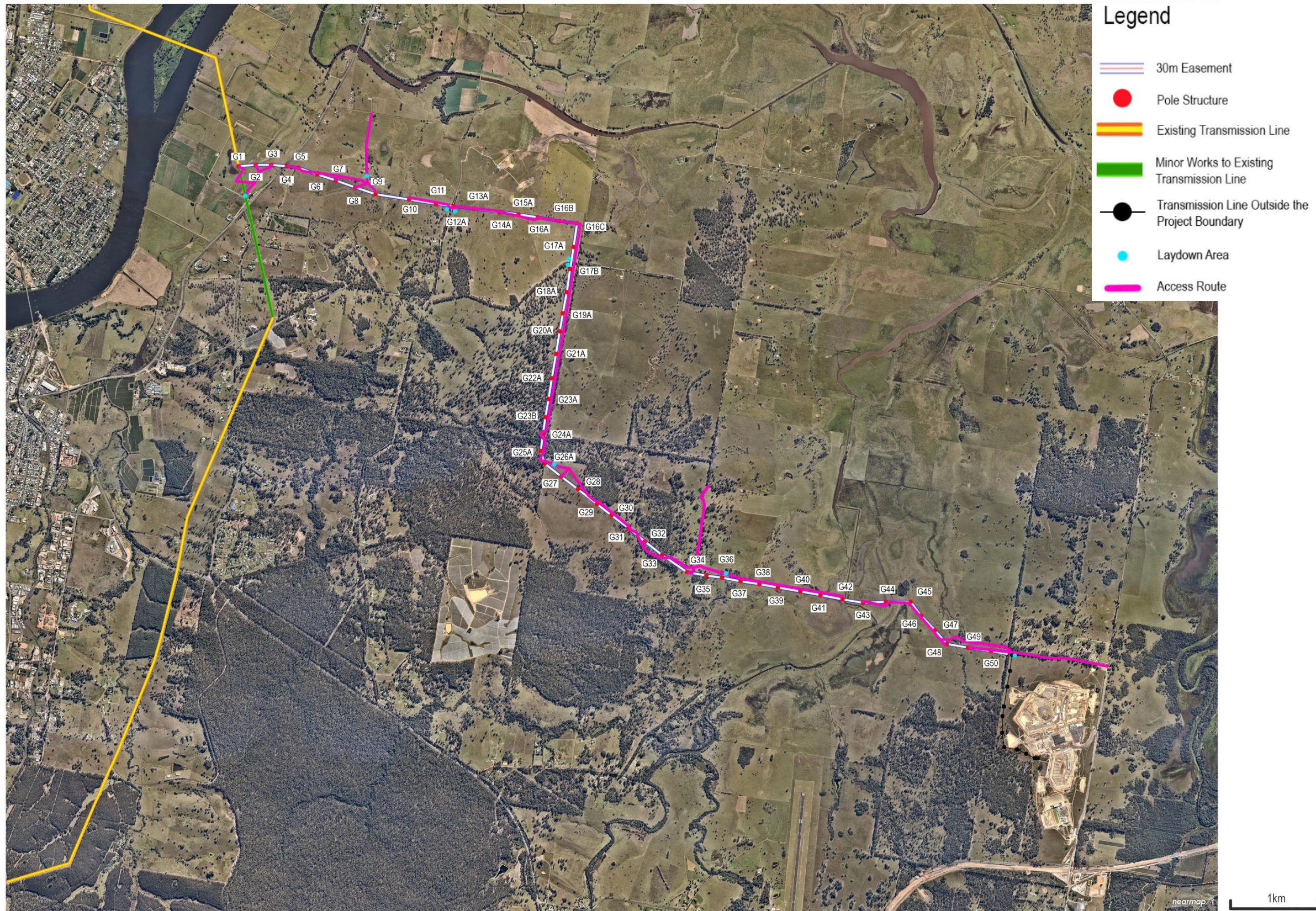


Figure 1-3 Access Roads

1.3 Report structure

This report is the working paper addressing flood risk that will be used to support the preparation of the REF required under Division 5.1 of the EP&A Act. The structure of the report is summarised in Table 1-1.

Table 1-1: Report structure

Section reference	Section heading	Description
Executive summary	Executive summary	Concise summary of this technical paper and the key findings
1	Introduction: <ul style="list-style-type: none"> • Background • Locality • Proposal description • Report structure 	Description of the proposal relevant to potential flood impacts. Provides an overview of the study objectives and structure of technical report.
2	Assessment requirements: <ul style="list-style-type: none"> • Legislative requirements 	Identifies the key legislation that this assessment must follow.
3	Assessment methodology: <ul style="list-style-type: none"> • Overview • Construction • Operation 	Describes the methodology followed to assess the impacts of the proposal during construction and operation phases.
4	Existing environment and potential impacts of the proposal: <ul style="list-style-type: none"> • Flood assessment and mapping 	Establishes existing and potential flood risk to the proposal site.
5	Management and mitigation of impacts: <ul style="list-style-type: none"> • Relevant construction activities • Operation of the facility 	Identifies key flood risk impact related construction and operational activities and assesses the potential impacts on the local environs.
6	Conclusions and recommendations	Concise statement of key findings of the construction and operational impacts of the proposal relating to flood risk.

2. Assessment requirements

2.1 Legislative requirements

2.1.1 Technical area – Flooding

The objective of this assessment is to determine whether the development of the proposal:

- Could cause changes to the current floodplain behaviour.
- Has fully considered the risks posed by floodwaters with regards to reduced ground clearance heights.

2.1.2 Technical area – Electricity Infrastructure

The following standards are applicable to the assessment of electrical infrastructure clearances and waterway crossings and are referred to in this assessment:

- Standards Australia, *Australian Standard AS6947: Crossing of waterways by electricity infrastructure* (Sydney: Standards Australia, 2009).
- Standards Australia, *Australian Standard AS7000: Overhead line design* (Sydney: Standards Australia, 2009).
- Standards Australia, *ENA NENS 04-2006: National guidelines for safe approach distances to electrical and mechanical apparatus* (Canberra: Energy Networks Association, 2006).
- NSW Maritime, *Boaters' guide to electricity cable crossings of NSW navigable waters* (Camperdown: NSW Maritime, undated).

This assessment will provide recommendations regarding electrical infrastructure clearances across sections of the proposal corridor which cross flood prone areas.

3. Assessment Methodology

3.1 Overview

This specialist flood assessment is focused on assessing the flooding impacts associated with the construction, operation and maintenance of a new 12.5 kilometre long 132 kilovolt double circuit electrical transmission line to be established between the existing TransGrid transmission line to the west and the CCC's new substation to the east. Figure 1-2 shows the location and boundary of the proposal. There are 54 pylons within the proposal boundary and a further 8 pylons within the CCC property boundary. The proposal boundary incorporates the 100 metre investigation area, access tracks and laydown areas shown on Figure 1-3.

3.2 Construction

In assessing the impacts of the proposal associated with construction, it has been assumed that no works or activities would extend beyond the proposal boundary.

This assessment has relied upon the hydraulic modelling results provided by Clarence Valley Council (the Council) for the Clarence River floodplain. As this hydraulic modelling was recently undertaken (2013) and it was carried out in accordance with the NSW Floodplain Management Manual and adopted by Council, it is considered suitable for this assessment.

3.3 Operation

In assessing the impacts of the proposal associated with operations, it has been assumed that no works or activities would extend beyond the proposal boundary.

This assessment has relied upon the hydraulic modelling results provided by Clarence Valley Council for the Clarence River floodplain. As this hydraulic modelling was recently undertaken (2013) and it was carried out in accordance with the NSW Floodplain Management Manual and adopted by Council, it is considered suitable for this assessment.

4. Existing environment and potential impacts of the proposal

4.1 Flood Assessment and Mapping

4.1.1 Base case flood risk

The flood risk to the proposal was assessed. The extent of the 1:5 Annual Exceedance Probability (AEP), 1:20 AEP, 1:100 AEP and the extreme flood events have been identified from the hydraulic modelling results as determined by the *Clarence River Flood Study 2013* (CVC, 2016) and are illustrated in Figure 4-1 and Figure 4-2. Flood depth contours and extent boundaries were available for review. No flood velocity or hazard outputs were available for review.

We have assumed that the extreme flood event can be further referred to as the probable maximum flood. It was considered that no additional hydraulic modelling was warranted as part of this assessment given the small footprint of the proposal and minimal reductions in floodplain storage posed by the pylons positioned within flood prone areas.

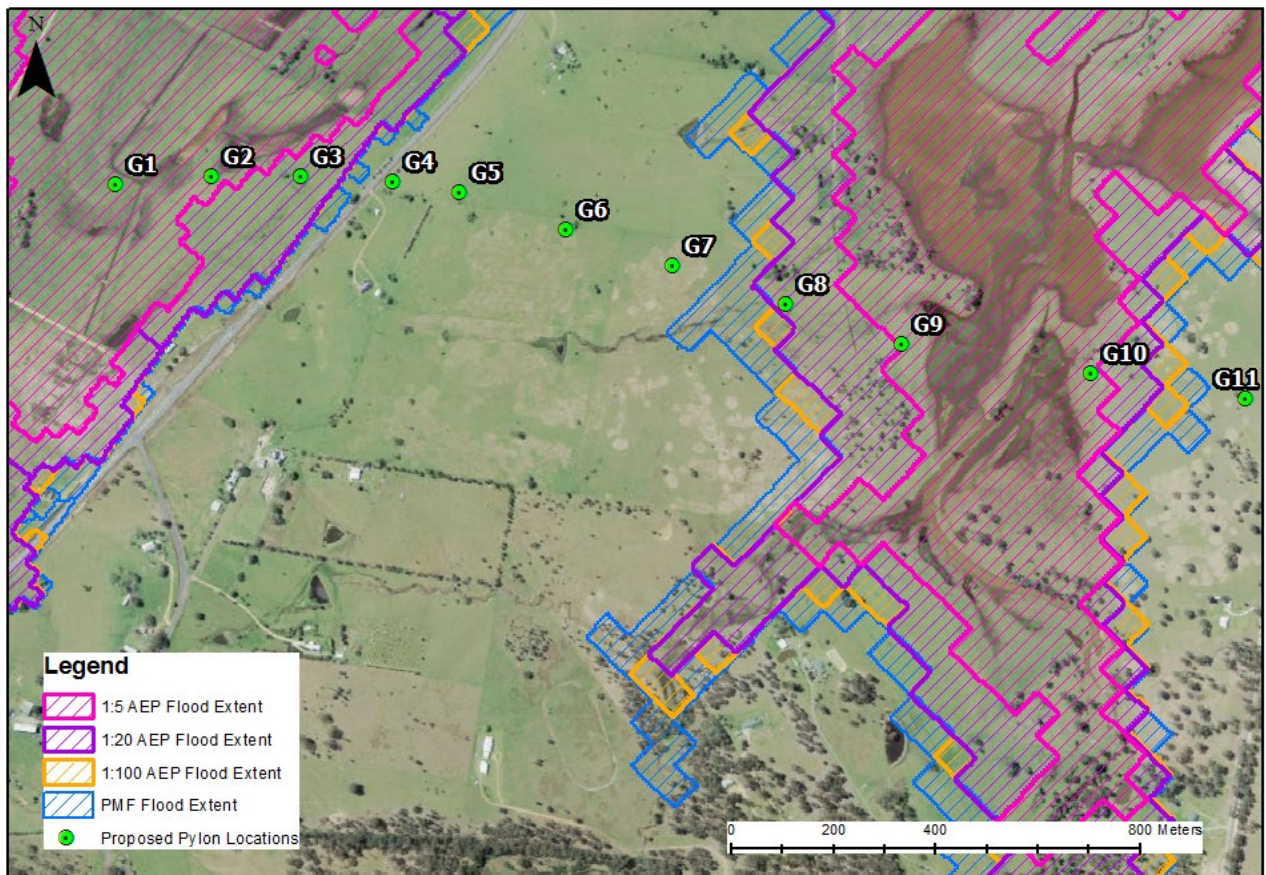


Figure 4-1: Flood extents within the proposal site – Clarence River and Washpen Creek

The depths of flooding at each pylon for 1:100 AEP flood event and the Probably Maximum Flood (PMF) have been assessed. One metre resolution elevation data (available from: <http://elevation.fsdf.org.au/>), collected on 28/04/2010, has been utilised to provide a ground height (mAHD) at each pylon. The generated product is a Digital Elevation Model (DEM), with the data used to create this DEM having an accuracy of 0.3 metres (95% Confidence Interval) vertical.

Appendix 0 contains a tabulated list of the proposed pylons, their indicative ground heights (mAHD) and the depths of flooding (metres) for the 1:100 AEP flood event and the PMF flood event.

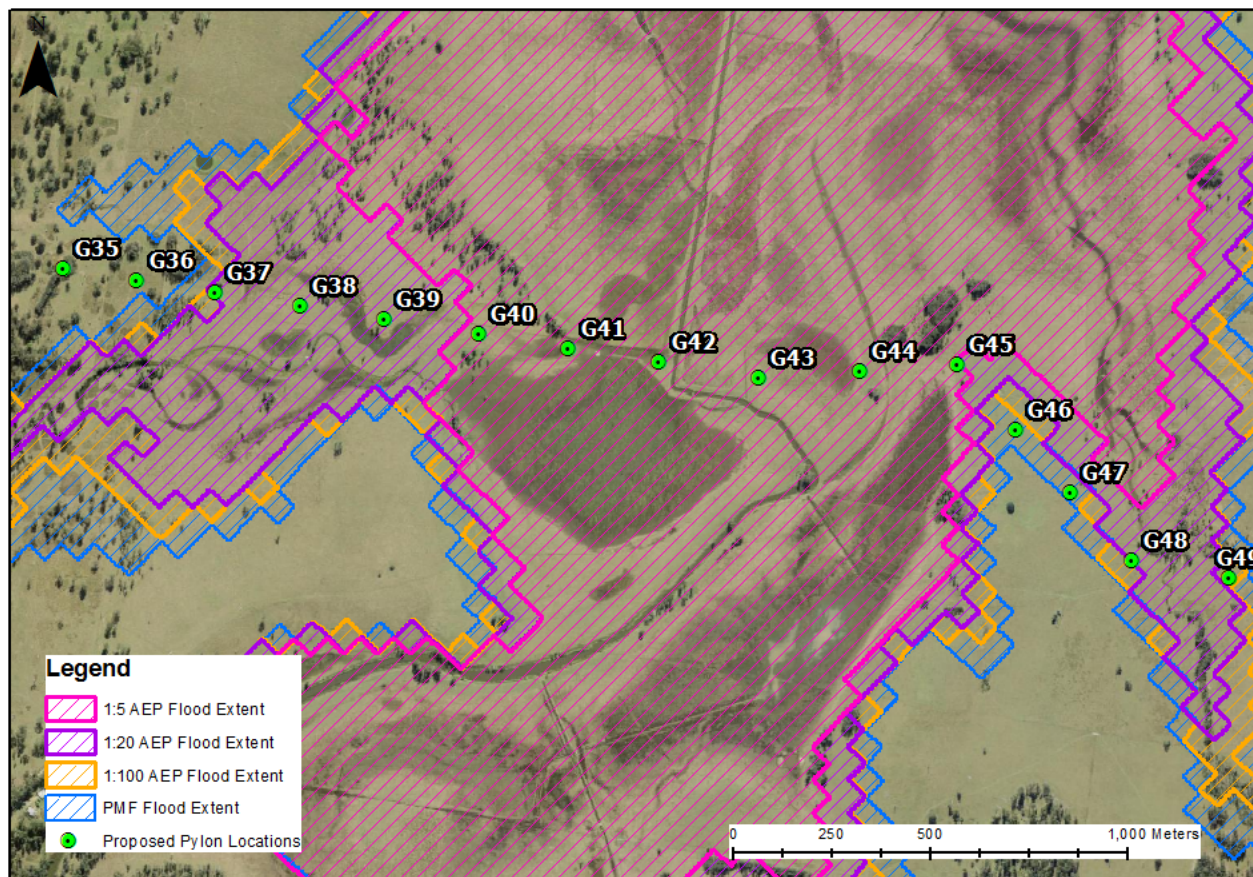


Figure 4-2: Flood extents within the proposal site – Glenugie Creek

The proposal boundary passes through three flood prone areas, with flood mechanisms discussed in more detail as follows:

- Clarence River floodplain: Three pylons (G1 – G3) are located within the Clarence River floodplain where the proposed transmission line ties into the existing 96 H Koolkhan-Coffs Harbour 132 kilovolt Transmission Line. Approximately 500 metres of the route is located in the Clarence River floodplain (refer to Figure 4-1). Pylons G1 and G2 are impacted by flooding during the 1:5 AEP flood event with flooding sourced from the backing up of Swan Creek, whilst the 1:20 AEP flood event and above will impact all three pylons. During the 1:20 AEP, floodwaters are continuous between the Clarence River and the proposal. For flood events with a rarity of 1:20 AEP or greater, this section of the proposal area is most likely to be exposed to higher velocity flows given it lies on the active floodplain of the Clarence River. The largest depth of flooding occurs at pylon G1, which is subject to a 1:100 AEP flood depth of 5.81 metres and PMF flood depth of 7.37 metres. For the three pylons, maximum 1:100 AEP flood levels range from 7.18 mAHD to 7.28 mAHD whilst the maximum PMF flood level is 8.82 mAHD. For the 1:100 AEP flood event, the higher flood level occurs at pylon G1 (closest to the Clarence River) and the lower flood levels occur at pylons G2 and G3. The difference in flood levels between the maximum PMF and the maximum 1:100 AEP flood event is up to 1.64 metres.

- Washpen Creek floodplain: Three pylons (G8 – G10) are located within the Washpen Creek floodplain, where the route crosses a defined channel (width approximately 15 metres) and an area of swampy meadow (refer to Figure 4-1). No pylons are proposed to be located within the swampy meadow. Approximately 850 metres of the route is located within the Washpen Creek floodplain. Pylons G9 and G10 are impacted by flooding during the 1:5 AEP flood event, whilst the 1:20 AEP flood event and above will impact all three pylons. The largest depth of flooding occurs at pylon G10, which is subject to a 1:100 AEP flood depth of 4.30 metres and PMF flood depth of 6.53 metres. The maximum 1:100 AEP flood level is 6.24 mAHD whilst the maximum PMF flood level is 8.47 mAHD. The difference in flood levels between the maximum PMF and the maximum 1:100 AEP flood event is 2.23 metres.
- Glenugie Creek floodplain: Thirteen pylons (G37 – G49) are located within the Glenugie Creek floodplain. The location of the proposed pylons and modelled flood extents are illustrated in Figure 4-2. Approximately 3 kilometres of the route is located within the Glenugie Creek floodplain. Pylons G40 to G45 are all impacted by flooding during the 1:5 AEP flood event. The 1:20 AEP flood event is expected to impact pylons G37 to G45, as well as G48. Two pylons (G46, G47) do not fall within the 1:100 AEP flood extent but lie within the PMF. The largest depth of flooding occurs at pylon G42, which is subject to a 1:100 AEP flood depth of 4.79 metres and PMF flood depth of 7.11 metres. The maximum 1:100 AEP flood level is 6.04 mAHD whilst the maximum PMF flood level is 8.36 mAHD. The difference in flood levels between the maximum PMF and the maximum 1:100 AEP flood event is 2.32 metres.
- Flood velocities within Washpen and Glenugie Creek during large flood events are likely to be low, given that the flood mechanisms leading to flooding of these areas are dominated by backwater flows entering from the wider Clarence River floodplain. High intensity rainfall events in local catchments could create localised high velocity flow events but these are likely to result in low depth sheet flooding restricted to the channels and adjacent floodplain areas.

As sections of the proposal fall within the mapped extent of the PMF for the Clarence River, the proposal is considered to be located on flood prone/liable land, as defined by the NSW *Floodplain Development Manual 2005*.

4.1.2 Compatibility with hydraulic functions – pylon design and other constructed features

It is important to maintain the hydraulic functions of the floodplain in order to ensure that the consequence of the proposal does not impact on flood risk elsewhere in the catchment.

Pylon Design

Due to the poor geotechnical strength and structure of soils within flood prone areas of the transmission line path, it is proposed that all pylons located within the PMF flood extent (except for G37) will be base mounted. As illustrated in Figure 4-3 and circled in red, the base consists of a 4 metre × 4 metre × 1.5 metre concrete mass with a volume of 24 cubic metres.

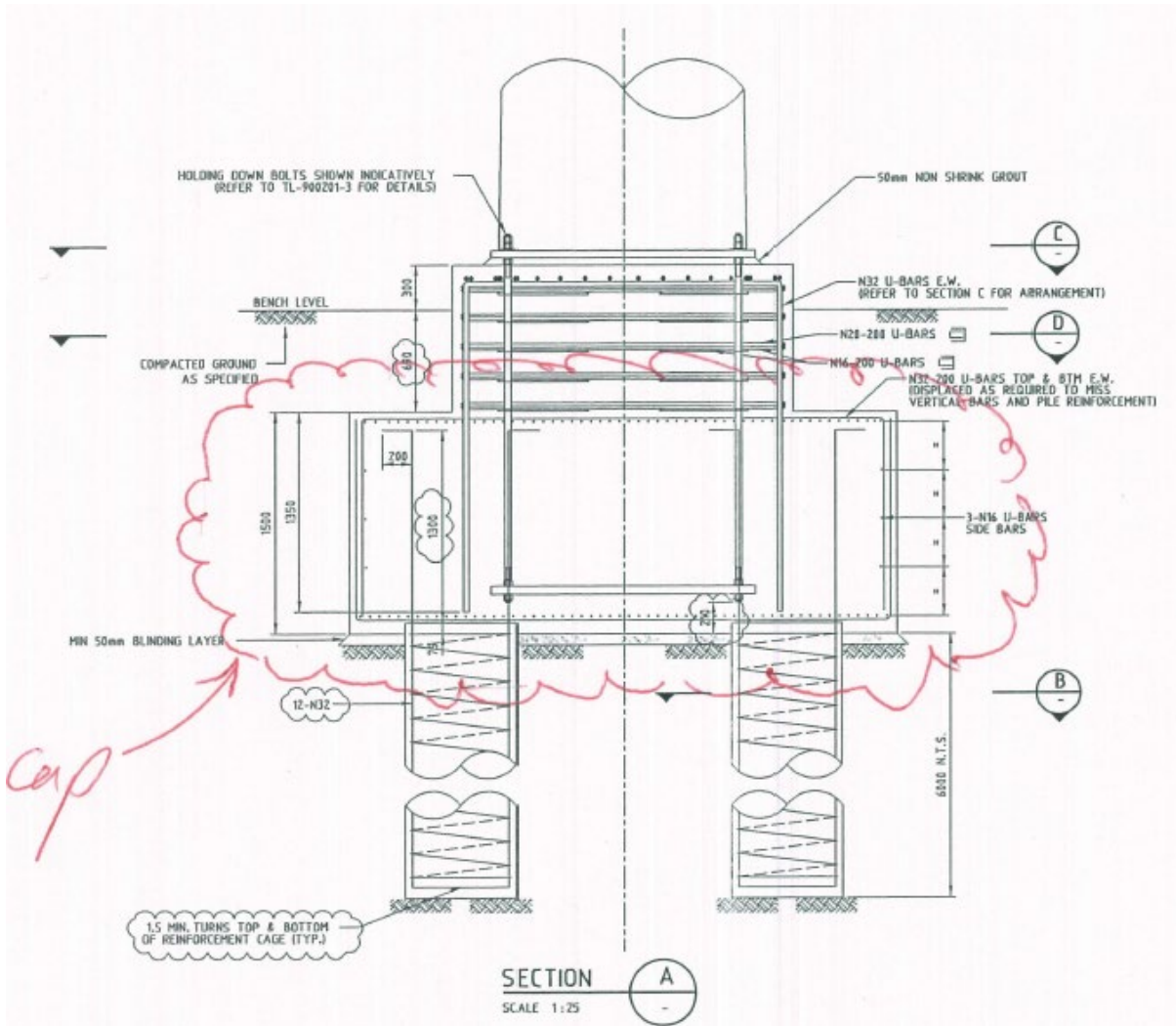


Figure 4-3: Proposed Pylon Mass Concrete Base

Positioning the mass concrete base above ground level will significantly reduce the volume of potentially acid-sulphate soils requiring disposal away from the site and also reduce construction times and costs. However, the mass of the concrete base will displace flood waters and extend up to 1.5 metres above ground level. G37 will be directly embedded, with no concrete mass base will be required.

With regards to the pole construction, it is proposed that each pylon will consist of either a single or pair of concrete poles, as illustrated in Figure 4-4. Poles will be either directly embedded into the ground (i.e. G37) or set into the concrete mass base as illustrated in Figure 4-3.

Even though the mass concrete bases are significant in size, their combined volume is insignificant in comparison to the volumes of water within the Clarence River floodplain. Given the relatively small volume of displaced flood storage resulting from their installation, as well as the low risk of obstruction created by the bases or the pylons, there is not considered to be any impact on the hydraulic functions of the floodplain resulting from the proposal.



Figure 4-4: Proposed Pylon Poles – Example Images

Other Constructed Features

In addition to the pylons, the development of construction pads, access gates, and new access tracks to enable construction and maintenance activities should consider the potential impacts on flood storage and creating obstacles in the floodplain.

4.1.3 Climate change, increase in rainfall intensity, and projected sea level rises

It is a requirement of the NSW Floodplain Development Manual 2005 to assess the proposal site for impacts associated with climate change, increases to rainfall intensity, compatibility with the hydraulic functions and stability of downstream water courses, as well as any changes to flood behaviour which may impact on the emergency management measures within the locality. This assessment has been provided in the following section.

The widely accepted methodology to assess the impact of climate change and increase in rainfall intensity is to assess the impacts to the proposal site for events greater than the flood planning level. Generally, the 1:200 AEP and 1:500 AEP flood events can be used as proxies for the effects of climate change. By assessing events greater than the adopted flood planning level, a complete flood risk profile can be developed for the proposal site.

As defined by the NSW Floodplain Development Manual, the probable maximum flood is the largest statistically probable precipitation coupled with the worst flood-producing catchment conditions. By definition, the probable maximum flood cannot increase in magnitude even under climate change conditions. Given that the flood data available for this study does not include the 1:200 AEP or 1:500 AEP flood events, the proposal has been assessed against the PMF as this will ensure that the impacts of climate change are adequately accounted for.

Two additional pylons (G46, G47), both at the Glenugie Creek crossing, are contained within the PMF flood extents, when compared to the 1:100 AEP flood extents. The major difference is in the depths of flooding which occur between the 1:100 AEP and PMF flood events. As highlighted in Section 4.1.1, the difference in maximum flood depths range from 1.64 to 2.32 metres along the proposal corridor.

A rise in sea level has the potential to impact flood behaviour in coastal river systems as a result of higher ocean levels at the river mouth. This would result in higher maximum flood heights for any given flood event in coastal areas. The implication of this is that the proposal site could be affected by the probably maximum flood at some time in the future if sea levels did rise.

The sea level rise estimates for this proposal were based on the NSW Government's Sea Level Rise Policy Statement (DECCW, 2009), which identifies increases of 0.4 metres for 2050 and 0.9 metres for 2100.

The Woolgoolga to Ballina Highway Upgrade Environmental Impact Statement (EIS) (NSW Roads and Maritime, 2012) determined that a 0.6 metre rise in sea levels would be appropriate for this locality. The sea level rise modelling carried out for the Woolgoolga to Ballina Highway Upgrade EIS showed that a 0.6 metres rise in sea levels would not impact on the smaller upper catchments rivers and creeks crossed by the Pacific Highway Upgrade (which would be adjacent to the proposal). As the proposed highway upgrade traverses close to the southern border of the proposal, it is considered that predicted sea level rises would not impact on the proposal.

5. Management and mitigation of impacts

5.1 Risk mitigation

5.1.1 Crossing of navigable waterways - Overview

A key risk posed by the proposal is reduced electrical clearance to watercraft and persons during flood events within flood prone areas. As highlighted in Chapter 4, depths of flooding along the proposal corridor can exceed seven metres for the PMF flood event and hence the risks associated with reduced clearance need to be managed accordingly.

Australian Standard AS6947 is the primary document referred for guidance on the management of risks posed by electrical infrastructure over navigable waterways. AS6947 provides guidance on the circumstances, risks and mitigation options to consider when designing electrical crossings of navigable waterways.

5.1.2 Crossing of navigable waterways – Proposal Specific Circumstances and Risks

The Clarence River floodplain, Washpen and Glenugie Creeks are only navigable during flood events. The ingress of watercraft within these areas is likely to be limited to emergency service operations and local landholders accessing stock and infrastructure.

Some of the circumstances which could lead to risks for this proposal have been highlighted in Section 2.3.4 of AS6947 and include:

- Inexperienced operators.
- Unexpected vessel heights.
- Reduced visibility.
- Failure to head warning signs.
- Signage failures.

The consequences of these circumstances range from injuries to persons (minor to fatal), damage to vessels, electricity infrastructure and possible loss of electricity supply at the CCC.

5.1.3 Crossing of navigable waterways – Mitigation options

Examples of mitigation options that may be applied to the design of a crossing to reduce the level of risk are listed in Section 2.6.3 of AS6947. Available mitigation options relevant to the Proposal include:

- Alternative route selection.
- Submarine crossings (trenched/trenchless).
- Increased overhead clearance heights.
- Installation of signage, including illumination.

The latter two options will now be discussed in more detail for the purposes of the risk assessment.

5.1.4 Emergency management measures – Clearance heights

Industry code ENA NENS 04-2006 and Australian Standards (AS6947, AS7000) provide the specifications for clearance from electrical apparatus to avoid switching surge flashover. Key points from these codes and standards to note are:

- For a 132 kilovolt system, the distance to the ground must not be less than 6.7 metres (note: in the case of waterways, floodplains and snowfields, the clearances should be determined having regard to local conditions and requirements) (Table 3.5, AS7000).

- For a 132 kilovolt system, the safe approach distance (known as safety envelope in AS6947) for ordinary persons is 3 metres (Table 1, NENS 04-2006), and the safe approach distance for mobile plant operated by ordinary persons is 3 metres (Table 3, NENS 04-2006).

As detailed in Section 3 of AS6947, the general requirements for the design of overhead crossings are that the design shall consider the following:

- Maximum height of water. For non-tidal waterways, the maximum water level is typically the peak of the bank plus wave effects.
- Maximum expected vessel height that could be reasonably expected to use the waterway near the proposed overhead crossing.
- Safety envelope (sum of safety margin and electrical clearance). This is the distance to be maintained between the conductors of the crossing at minimum design height and the maximum expected vessel height at the time of maximum water level (3000 millimetres in Table 3.1 AS6947).
- Safety margin, an allowance to accommodate unexpected events such as movement of crossing supports or similar contingencies (AS6947 recommends 2200 millimetres).
- Electrical clearance, the minimum separation in the air required to withstand the maximum likely switching surge for the nominal system voltage (800 millimetres in Table 3.1 AS6947).

Table 3.5 of AS 7000 is particularly pertinent in the application of the design standards cited above to the proposed project design, in that the “local conditions and requirements” (i.e. the flooding conditions on the floodplain) must be considered. The tables in Appendix A of this report indicate maximum depths of flooding on the floodplain along the alignment of 4.79m in the 1:100 AEP event and 7.11m in the PMF. Clearances above the flood surface to the electrical apparatus (assuming if a 6.7m clearance above ground is adopted) would be significantly reduced or entirely eliminated during these flood events. It must be noted that while not a navigable waterway, there is a likelihood of watercraft navigating the floodplain area during flood events (emergency services or stock/landowners) including potentially under or through the transmission corridor. Historically, there have been instances (e.g. 1974 Brisbane floods) where high voltage transmission lines with minimal clearance above floodwaters have arced, causing fatal injuries to people navigating the floodwaters in a watercraft in the near vicinity.

It is therefore recommended that the flood heights and minimum distances to power lines required in the 1:100 AEP flood event and the PMF be addressed during the detailed design, having regard to the requirements of the Industry Code and Australian Standards referred to above. A minimum clearance of 6.7 metres above ground level plus minor allowance for flooding is not considered sufficient, given maximum depths of flooding on the floodplain of over 7 metres.

5.1.5 Emergency management measures - Signage

Recommendations on signage requirements can be found in NSW Maritime’s guide and AS6947. Signage requirements will be dependent on the clearance heights provided for in the design of the transmission line and the findings of the formal risk assessment. Should the risk be deemed to be negligible then no signage is required. Should the risk be deemed to be tolerable, then signage should be installed in accordance with AS6947.

5.2 Construction Activities

5.2.1 Construction of pads, tracks and fencing

The following elements of design should be noted:

- The large volume of flood storage available on the Clarence River floodplain means that the flooding behaviour is not sensitive to a minor loss of floodplain storage. Hence, construction of pads (even large areas) and access tracks is unlikely to change flooding behaviour.

- The installation of access gates, fencing and other associated features within the PMF flood extent should be avoided where possible. During flood events, these features can be damaged, obstruct flood debris and become hazardous to emergency services personnel.

5.2.2 Pylon stability

Pylon footings should be designed with consideration given to the fact that they could be located in waterlogged soils and could potentially be subject to additional horizontal loadings resulting from the collection of flood debris during flood events.

6. Conclusions and recommendations

This flood assessment has assessed the potential for flooding-related impacts with respect to the proposal. The *Clarence River Flood Study 2013* (CVC, 2016) has been reviewed and deemed satisfactory in determining the flood risk for the proposal site. Therefore, it is considered that no additional modelling is required to determine the effect and impact of the proposal on flood behaviour. Flood results were not available for the 1:200 AEP or 1:500 AEP flood events, which are commonly used as a surrogate to estimate the impacts of climate change. Therefore, PMF flood depths have been reported to provide guidance on the range of flood depths than may be expected as a result of climate change. In addition, only depth contours were available for analysis and a qualitative assessment of flood velocities has been provided.

Three sections of the proposal are flood prone, where the proposal crosses the Clarence River, Washpen Creek and Glenugie Creek floodplains. In total, 19 of 54 proposed pylons lie within the PMF flood extent. The depths of flooding in flood prone areas are significant, with maximum 1:100 AEP flood depths of 5.81 metres, 4.30 metres and 4.79 metres occurring at pylons in the Clarence River, Washpen Creek and Glenugie Creek floodplains respectively. PMF flood depths are considerably greater, exceeding seven metres at several pylons. It is anticipated that flood velocities within Washpen and Glenugie Creek during large flood events are likely to be low, given that the flood mechanisms leading to flooding of these areas are dominated by backwater flows entering from the wider Clarence River floodplain. Flood velocities in the Clarence River floodplain are likely to be higher.

The proposal has been assessed with regards to compatibility with hydraulic functions. Given the small volume of displaced flood storage resulting from the installation of the pylons, as well as the low risk of obstruction created by the pylons, there is not considered to be any impact on the hydraulic functions of the floodplain resulting their installation. The development of construction pads, and new access tracks is unlikely to affect flooding behaviour. The installation of access gates, fencing and other associated features within the PMF flood extent should be avoided where possible to reduce the risk of obstruction and hazard to emergency services personnel.

A key risk posed by the proposal is reduced electrical clearance to watercraft and persons during flood events. Hence, the risks associated with reduced clearance need to be managed accordingly. The report recommends that flood heights and minimum distances to power lines required in the 1:100 AEP flood event and the PMF be addressed during the detailed design.

It is concluded that the proposal complies with the requirements of the *NSW Floodplain Development Manual 2005*.

7. References

Clarence Valley Council, *Clarence River Flood Study 2013* (Grafton: Clarence Valley Council, 2016).

NSW Government, *Floodplain Development Manual* (Sydney: Department of Infrastructure, Planning and Natural Resources, 2005).

NSW Government, *NSW Sea Level Rise Policy Statement* (Sydney: Department of Environment, Climate Change and Water, 2009).

NSW Maritime, *Boaters' guide to electricity cable crossings of NSW navigable waters* (Camperdown: NSW Maritime, undated).

NSW Roads and Maritime, *Woolgoolga to Ballina Pacific Highway Upgrade – Environmental Impact Statement, Chapter 8 Hydrology and Flooding* (St Leonards: NSW Roads and Maritime, 2012).

Standards Australia, *Australian Standard AS6947: Crossing of waterways by electricity infrastructure* (Sydney: Standards Australia, 2009).

Standards Australia, *Australian Standard AS7000: Overhead line design* (Sydney: Standards Australia, 2009).

Standards Australia, *ENA NENS 04-2006: National guidelines for safe approach distances to electrical and mechanical apparatus* (Canberra: Energy Networks Association, 2006).

8. Terms and acronyms used in this document

Acronym	Definition
AEP	Annual exceedance probability – the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage.
AHD	Australian Height Datum is a geodetic datum for altitude measurement which is the datum to which all vertical control for mapping is referred.
CCC	Clarence Correctional Centre.
CEMP	A document which sets out procedures to minimise environmental impact during the construction phase of works.
CVC	Clarence Valley Council
DA	Application submitted setting out a proposed development.
DECCW	Department of Environment and Climate Change
DEM	Digital Elevation Model
DPE	Department of Planning and Environment
EWP	Mechanical device used to provide temporary access to inaccessible areas.
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental and Planning Assessment Act 1979</i>
FPL	The Flood Planning Level (FPL) are the combinations of flood levels derived from significant historical flood events or floods of specific AEPs and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporate in management plans.
INSW	Infrastructure New South Wales
LGA	Local government area
LIDAR	Light Detection and Ranging
NSW	New South wales
OPGW	Cable which connects electricity pylons.
PMF	The Probably Maximum Flood (PMF) is the largest Flood that could be conceivably occur at a particular location, usually estimated from the probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.
REF	Review of Environmental Factors

APPENDIX A – FLOOD DEPTHS

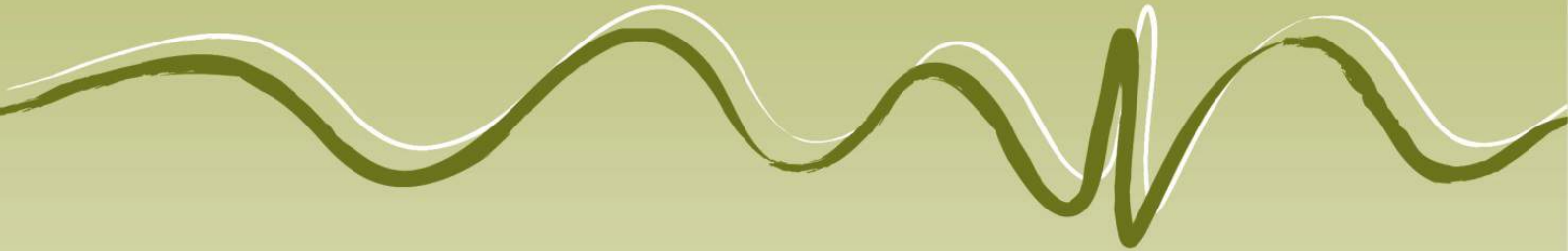
If the pylon lies outside the PMF flood extent, the reported maximum flood level (mAHD) will be blank.

Pylon Number	Ground Elevation (mAHD)	1:100 AEP Flood Depth (m)	1:100 AEP Flood Level (mAHD)	PMF Depth (m)	PMF Level (mAHD)
G1	1.469	5.81	7.28	7.35	8.82
G2	1.446	5.73	7.18	7.37	8.82
G3	4.552	2.63	7.18	4.27	8.82
G4	14.600	0		0	
G5	30.524	0		0	
G6	26.390	0		0	
G7	14.547	0		0	
G8	5.355	0.88	6.24	3.11	8.47
G9	2.482	3.76	6.24	5.99	8.47
G10	1.937	4.30	6.24	6.53	8.47
G11	16.540	0		0	
G12A	18.101	0		0	
G13A	10.787	0		0	
G14A	8.934	0		0	
G15A	8.921	0		0	
G16A	13.696	0		0	
G16B	18.350	0		0	
G16C	13.155	0		0	
G17A	18.521	0		0	
G17B	18.071	0		0	
G18A	13.194	0		0	
G19A	12.487	0		0	
G20A	16.200	0		0	
G21A	17.209	0		0	
G22A	28.977	0		0	
G23A	33.202	0		0	
G23A	40.181	0		0	
G24A	42.047	0		0	
G25A	35.254	0		0	
G26A	40.603	0		0	
G27	34.326	0		0	
G28	40.933	0		0	
G29	43.676	0		0	
G30	41.383	0		0	
G31	30.697	0		0	
G32	24.459	0		0	
G33	22.507	0		0	
G34	11.040	0		0	
G35	13.989	0		0	
G36	10.439	0		0	
G37	5.718	0.32	6.04	2.64	8.36
G38	3.329	2.71	6.04	5.03	8.36
G39	3.222	2.82	6.04	5.14	8.36
G40	2.244	3.80	6.04	6.12	8.36
G41	1.492	4.55	6.04	6.87	8.36
G42	1.253	4.79	6.04	7.11	8.36
G43	1.647	4.39	6.04	6.71	8.36
G44	1.589	4.45	6.04	6.77	8.36
G45	2.138	3.90	6.04	6.22	8.36
G46	7.414	0.00	6.04	0.95	8.36

Pylon Number	Ground Elevation (mAHD)	1:100 AEP Flood Depth (m)	1:100 AEP Flood Level (mAHD)	PMF Depth (m)	PMF Level (mAHD)
G47	7.208	0.00	6.04	1.15	8.36
G48	4.698	1.34	6.04	3.66	8.36
G49	5.186	0.85	6.04	3.17	8.36
G50	13.329	0.00		0.00	

Biodiversity Assessment

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Executive Summary

This Biodiversity Assessment was completed to assess potential ecological impacts of an electrical transmission line to service the Clarence Correctional Centre (CCC), located approximately 12 km east of Grafton, NSW (the Proposal). The proposed transmission line will connect to a high voltage substation at the CCC site, linking the CCC to the main central transmission line for the locality along the Pacific Highway. The Biodiversity Assessment informs a Review of Environmental Factors (REF) for the Proposal; approval for the Proposal is being sought under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), where INSW is both the proponent and determining authority.

As the works will be completed under part 5 of the EP&A Act, consideration of the Biodiversity Offsets Scheme under the *Biodiversity Conservation Act 2016* is not necessary and a Biodiversity Development Assessment Report (BDAR) is not required.

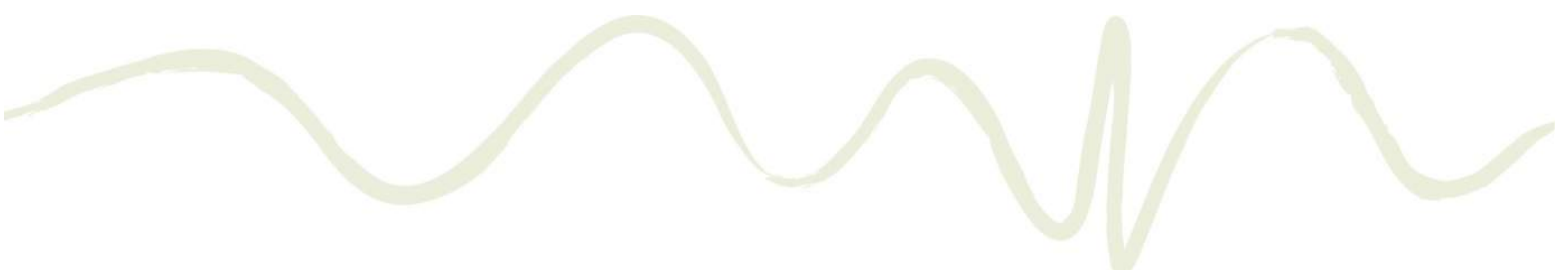
The proposed activity comprises:

- Approximately 12.5 km of 132 kV double circuit transmission line strung with single lemon conductor and optical ground wire (OPGW) from the existing 96 H transmission line, Structure 339 to the new substation, including approximately 55 new structures.
- New easement clearing and construction pads.
- OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96 H Koolkhan-Coffs Harbour 132 kV transmission line.
 - Splicing OPGW as required at the intersection of the new 132 kV double circuit transmission line and the existing 96 H Koolkhan-Coffs Harbour 132 kV transmission line.
- Removal of trees and vegetation within the 30 m wide easement to enable installation of the new transmission line.
- Removal of 'danger trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Construction of suitable access tracks and gates.

Ancillary works to facilitate the above works would also be required, and would involve:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys.
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials.
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment.
- Guy wire installation on structures to provide additional structural support.
- Repair or upgrade existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

Due to an extensive history of disturbance and modification (clearing, burning, logging, thinning and under scrubbing), the transmission line corridor does not support any intact areas of remnant vegetation, but rather comprises a patchwork of infrequent mature trees ('paddock trees'), unevenly aged forest, sub-mature regrowth and improved pasture, typically containing several native grasses. Woody vegetation shows a low level of species diversity, a lack of structural diversity and is typically homogenous between properties.



On elevated land, woody vegetation comprises dry sclerophyll forest principally dominated by Spotted Gum (*Corymbia henryi*) and/ or Grey Box (*Eucalyptus moluccana*), with occasional Grey Ironbark (*Eucalyptus siderophloia*) and infrequent Pink Bloodwood (*Corymbia intermedia*) and/ or Forest Red Gum (*Eucalyptus tereticornis*). On the floodplain and adjoining transitional areas, floodplain forest featuring Forest Red Gum, Swamp Box (*Lophostemon confertus*) and Broad-leaved Apple (*Angophora subvelutina*) occurs, along with swamp forest dominated by Swamp Oak (*Casuarina glauca*).

Formerly cleared areas on the floodplain typically comprise seasonally inundated grasslands dominated by Couch (*Cynodon dactylon*) with a range of other water tolerant species. Areas of sedgeland dominated by Pin Rush (*Juncus usitatus*) also occur. It is likely these areas would formerly have been occupied by a mosaic of swamp forest and wetland communities.

Results of field assessment are as follows:

- One threatened flora species occurs - a small population of Weeping Paperbark in the east of the TL corridor. None of these trees will be impacted.
- Vegetation characteristic of four Threatened Ecological Communities (TECs) occurs:
 1. *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions.*
 2. *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion.*
 3. *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions.*
 4. *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions.*

Some *Swamp Oak Floodplain Forest* and *Freshwater Wetlands* will be affected by the works.

- Four threatened fauna species were recorded during field surveys:
 - Dusky Woodswallow;
 - Grey-crowned Babbler;
 - Little Lorikeet; and
 - Black-necked Stork.

Based on the habitat present and the site location there is potential for a number of other threatened fauna species to occur on an opportunistic or seasonal basis.

Within the 30 m wide easement, approximately 6.55 ha of woody vegetation will require removal for the works and up to 4.5 ha of degraded freshwater wetlands may be disturbed. Select removal of infrequent scattered paddock trees (including danger trees) is also required at strategic locations, with up to 1.43 ha of danger trees requiring additional removal adjacent to the easement in areas of woody vegetation. In total, woody vegetation loss for the works is estimated as being approximately 8 hectares.

Use of public roads, road reserves and internal farm access tracks will not require any native vegetation loss. All these areas either comprise formed unsealed roads or established single vehicle tracks.



A statutory assessment was completed for the Proposal with regard to:

- State Environmental Planning Policy (SEPP) 44 - Koala Habitat Protection
- *Biodiversity Conservation Act 2016*
- *Fisheries Management Act 1994*
- *Environment Protection and Biodiversity Conservation Act 1999.*

Statutory assessments determined that potential Koala habitat does not occur, a Species Impact Statement (SIS) is not required and referral to the federal Minister of the Department of Environment and Energy is not required.

To minimise environmental impacts of the Proposal with regard to both construction and operations, a range of recommendations have been prescribed.



1. Introduction

1.1 Background

GeoLINK has been engaged by Infrastructure New South Wales (INSW) to prepare this Biodiversity Assessment to support a Review of Environmental Factors (REF) for the construction of an electrical transmission line to service the Clarence Correctional Centre (CCC) located approximately 12 km east of Grafton, NSW (the Proposal). The proposed transmission line will connect to a high voltage substation at the CCC site, linking the CCC to the main central transmission line for the locality along the Pacific Highway. Approval for the Proposal is being sought under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), where INSW is both the proponent and determining authority.

This Biodiversity Assessment has been prepared to support the REF and aims to identify the impacts of the Proposal on local biodiversity values, which may include:

- Habitat for threatened species or communities listed in the *Biodiversity Conservation Act 2016* (BC Act).
- Significant habitat trees within the project footprint.
- Koala habitat, as per State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection.
- Habitat for threatened species, populations or communities listed in the *Fisheries Management Act 1994* (FM Act).
- Habitat for threatened species or communities listed in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 The Site

The selected alignment ('the site') traverses a number of properties from the Pacific Highway in the west to the CCC in the east, passing through the localities of Clarenza and Lavadia (refer to **Illustration 1.1**). The alignment crosses three formed roads; the Pacific Highway, Four Mile Lane and Tancred's Lane. Properties affected by the selected alignment are summarised at **Table 1.1** and depicted at **Illustration 1.2**. The transmission line terminates at the boundary of the CCC at Lot 26 DP751376 Avenue Road, Lavadia (refer to **Illustration 1.2**). The alignment bisects a stock reserve (Lot 7004 DP93037) which comprises Crown Land. Road reserves under the ownership of Crown Lands will also be affected at several locations.

While the transmission line requires a cleared easement of 30 m width, a 100 m wide investigation area has been nominated for the Proposal to allow for the construction process and any minor re-alignments. In addition to the investigation area, the Proposal also includes other areas which require assessment (refer to **Illustration 1.2**):

- Access routes (typically within affected properties, but also utilising road reserves with unsealed farm tracks).
- Laydown areas (on various properties).
- An existing transmission line.

The site, laydown areas and access tracks collectively comprise the study area.

The locality comprises rural land including larger grazing properties and smaller rural residential allotments, which range from cleared pasture to lightly timbered woodland (dry sclerophyll forest). The selected alignment traverses several watercourses including Washpen Creek, Glenugie Creek, McPhillips Creek and several unnamed watercourses. Photographs of the site are provided at **Appendix A**.

Table 1.1 Properties Affected by the Transmission Line

Lot	Plan	Ownership
3	DP1217671	Private
1176	DP810935	Private
17	DP665777	Private
7	DP127096	Private
1	DP1113608	Private
19	DP7877	Private
20	DP7877	Private
No title		Crown land (within Lot 1 DP1113608)
19	DP7877	Private
2	DP1201636	Private
1	DP1201636	Private
135	DP751362	Private
1	DP367684	Private
72	DP751362	Private
2	DP562924	Private
128	DP751362	Private
117	DP751362	Private
3	DP367684	Private
132	DP751362	Private
2	DP367684	Private
22	DP716220	Private
7004	DP93037	Crown land (Reserve)
No title		Crown land (abuts southern boundary of Lot 7004 DP93037)
No title		Crown land (abuts southern boundary of Lots 1, 2 & 3 DP367684)
5	DP728239	Private
305	DP857888	Private
2	DP571684	Private
1	DP1126945	Council road reserve
56	DP751362	Private
11	DP863869	Private
20	DP7877	Private
55	DP751362	Private
56	DP751362	Private

The site occurs within the *Clarence Lowlands subregion* of the *South Eastern Queensland Bioregion* as per the Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Thackway & Cresswell 1995).



1.3 The Proposal

1.3.1 Overview

The Proposal involves the construction, operation and maintenance of a new 12.5 km long 132 kV double circuit electrical transmission line to be established between the existing TransGrid transmission line to the west and the new CCC substation to the east. The proposed activity comprises:

- Approximately 12.5 km of 132 kV double circuit transmission line strung with single lemon conductor and optical ground wire (OPGW) from the existing 96 H transmission line, Structure 339 to the new substation, including approximately 55 new structures.
- New easement clearing and construction pads.
- OPGW works, including:
 - Pulling back the coil of OPGW from Structure 328 to Structure 339 on the existing 96 H Koolkhan-Coffs Harbour 132 kV transmission line.
 - Splicing OPGW as required at the intersection of the new 132 kV double circuit transmission line and the existing 96 H Koolkhan-Coffs Harbour 132 kV transmission line.
- Removal of trees and vegetation within the 30 m wide easement to enable installation of the new transmission line.
- Removal of 'danger trees' outside the easement which have the potential to fall onto or come in contact with the transmission line.
- Construction of suitable access tracks and gates.

Ancillary works to facilitate the above works would also be required, and would involve:

- Establishment of temporary construction work sites around each structure to allow deployment of elevated work platforms (EWPs), cranes and pulleys.
- Establishment of laydown areas for the offloading and temporary storage of plant, equipment and materials.
- Construction of work benches adjacent to structures located on uneven topography. The work benches would provide a safe and level work surface for EWPs, cranes and other equipment.
- Guy wire installation on structures to provide additional structural support.
- Repair or upgrade existing access tracks and development of new access tracks (including possible watercourse crossings and installation of gates) as required for construction vehicles to gain safe access to structures.

Preliminary design plans of the Proposal are provided at **Appendix B**.

Physical works for the substation and transmission line are scheduled to commence in the first half of 2019. The works are anticipated to take 6 – 8 months to complete.

The proposal design, showing numbered pole locations and easements is provided at **Illustration 1.3**.



1.3.2 Construction

The construction impact footprint represents the construction impact boundary or the area within which construction activities would occur. Construction works would take place along the full length of the proposed activity and would include:

- Construction of the proposed transmission line alignment.
- Access points and access tracks for construction vehicles.

The construction methodology for the transmission line would consist of the following key activities:

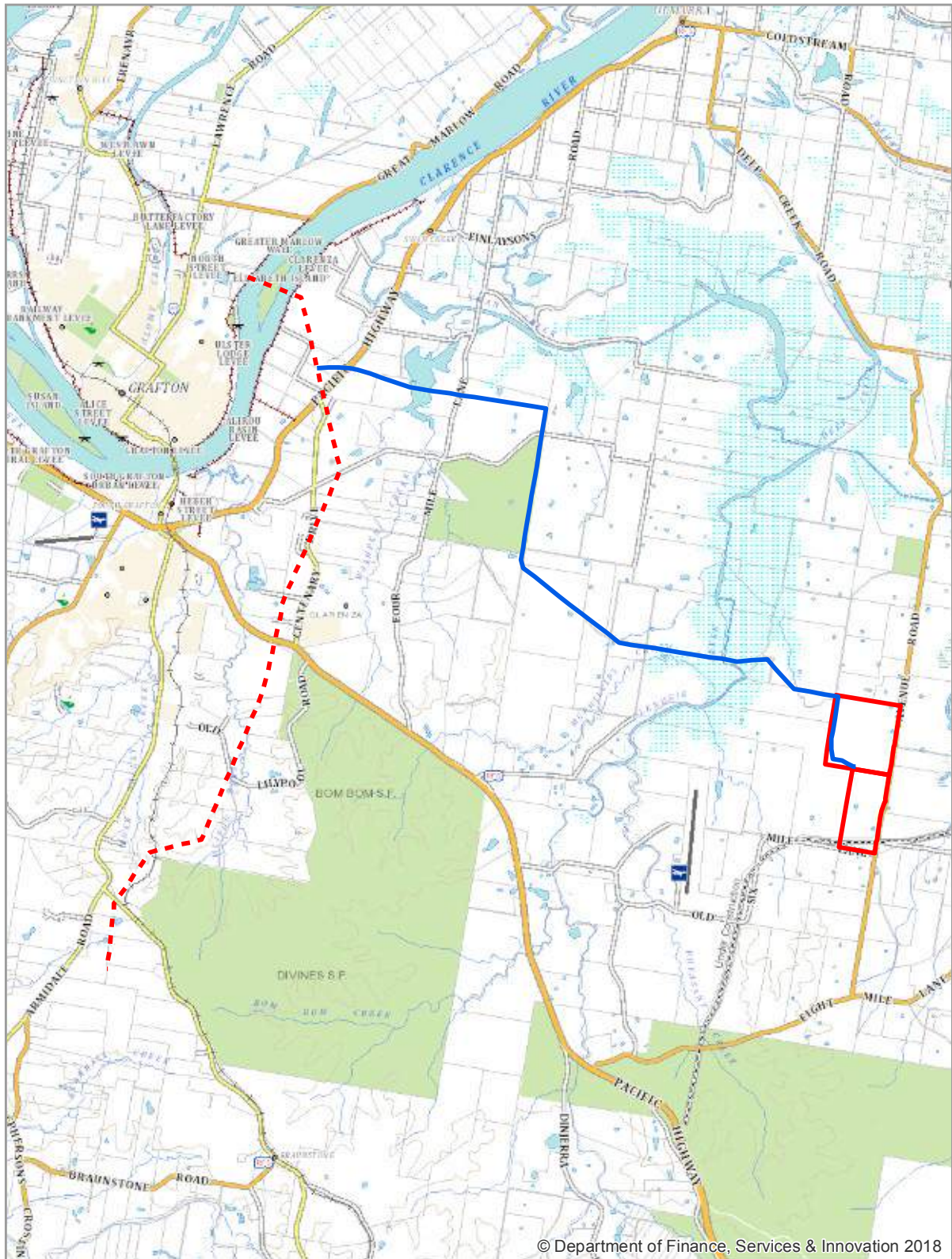
- Site establishment, early works and set out works including:
 - Site surveys for pole locations and identification of any existing services/ utilities.
 - Installation of environmental controls.
 - Vegetation clearing/ tree trimming along the transmission line easement.
 - Clearing of identified danger trees outside the easement.
- Establishment of access tracks to structures for erection of poles.
- Construction of the transmission line, including:
 - Establishment of flat benches at each of the structure sites for the construction of the transmission line structures. This would include construction of two flat working areas (or benches) within a 40 m x 40 m area around the base of each structure. These benches would provide a flat stable working platform for the set-up cranes and EWPs.
 - Excavation and installation of pole foundations (concrete foundation supports).
 - Dressing and erection of concrete and steel poles.
 - Stringing of conductors and OPGW along new transmission line.
 - Connection of new transmission line to the existing TransGrid 96 H transmission line and the new CCC substation.

1.4 Background

GeoLINK has worked with INSW to complete preliminary scoping assessments to determine the best alignment for the transmission line. Objectives of this process were to reduce impacts on vegetation and habitat, minimise impacts on landholders by buffering distances to dwellings and infrastructure/ services (e.g. cattleyards, dams) and utilising property boundaries (where possible) to locate the transmission line to minimise fragmenting agricultural land. On this basis, avoidance and minimisation of impacts to biodiversity have been considered throughout the Proposal.




As the works will be completed under part 5 of the EP&A Act, consideration of the Biodiversity Offsets Scheme under the BC Act is not necessary and a Biodiversity Development Assessment Report (BDAR) is not required.

Information shown is for illustrative purposes only



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LEGEND

-  Clarence Correctional Centre
-  Existing transmission line (minor works required)
-  Proposed transmission line

0 2 Km

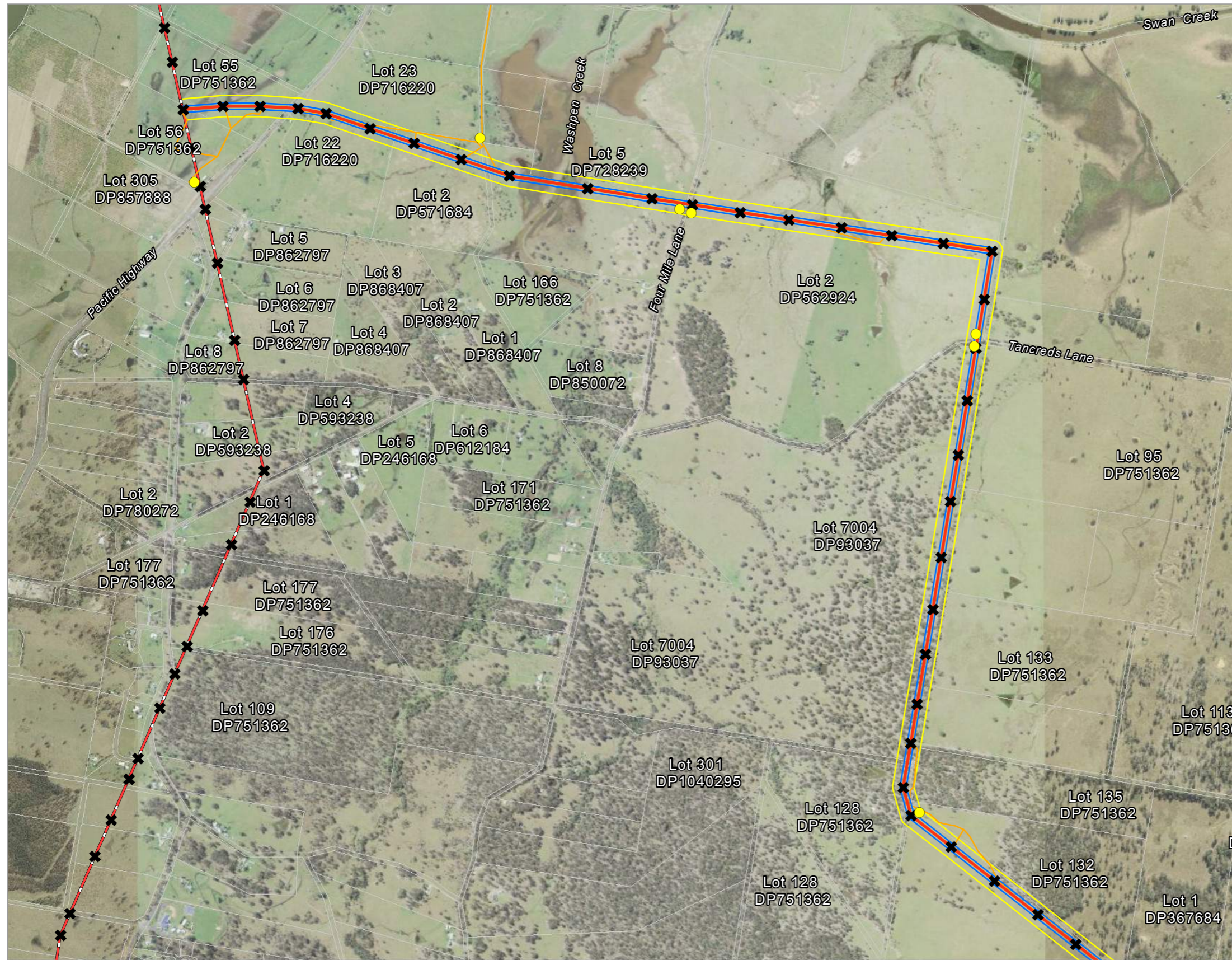


GeoLINK
environmental management and design

Clarence Correctional Centre Transmission Line - Biodiversity Assessment
2736-1129 - Rev B

Locality Plan

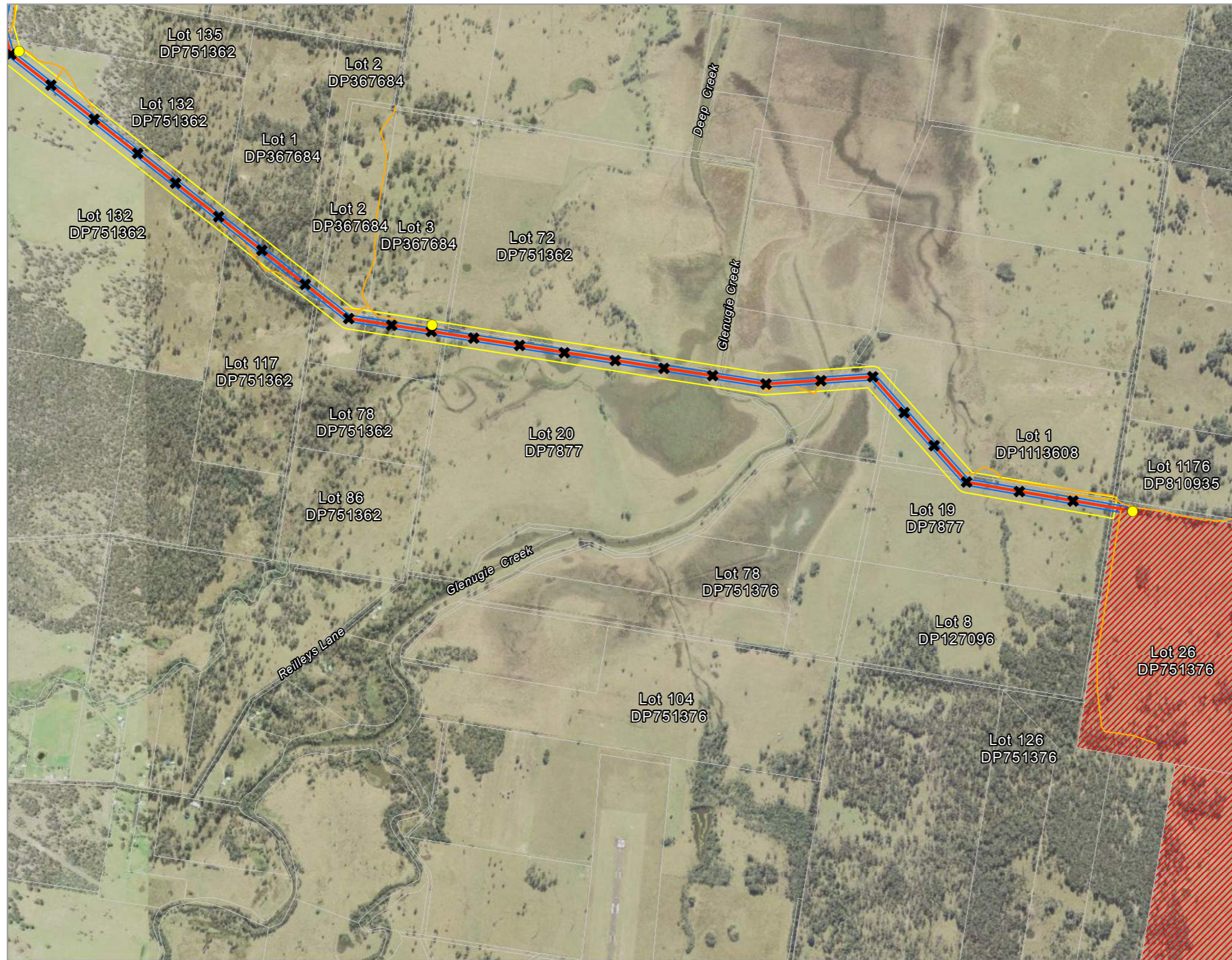
Illustration 1.1











- LEGEND**
- 100 m investigation area
 - Cadastrate
 - Existing powerline
 - Proposed CCC line route centreline - Jan 2019
 - 30 m easement
 - Access track
 - Pole location
 - Pole dump / laydown area

0 400



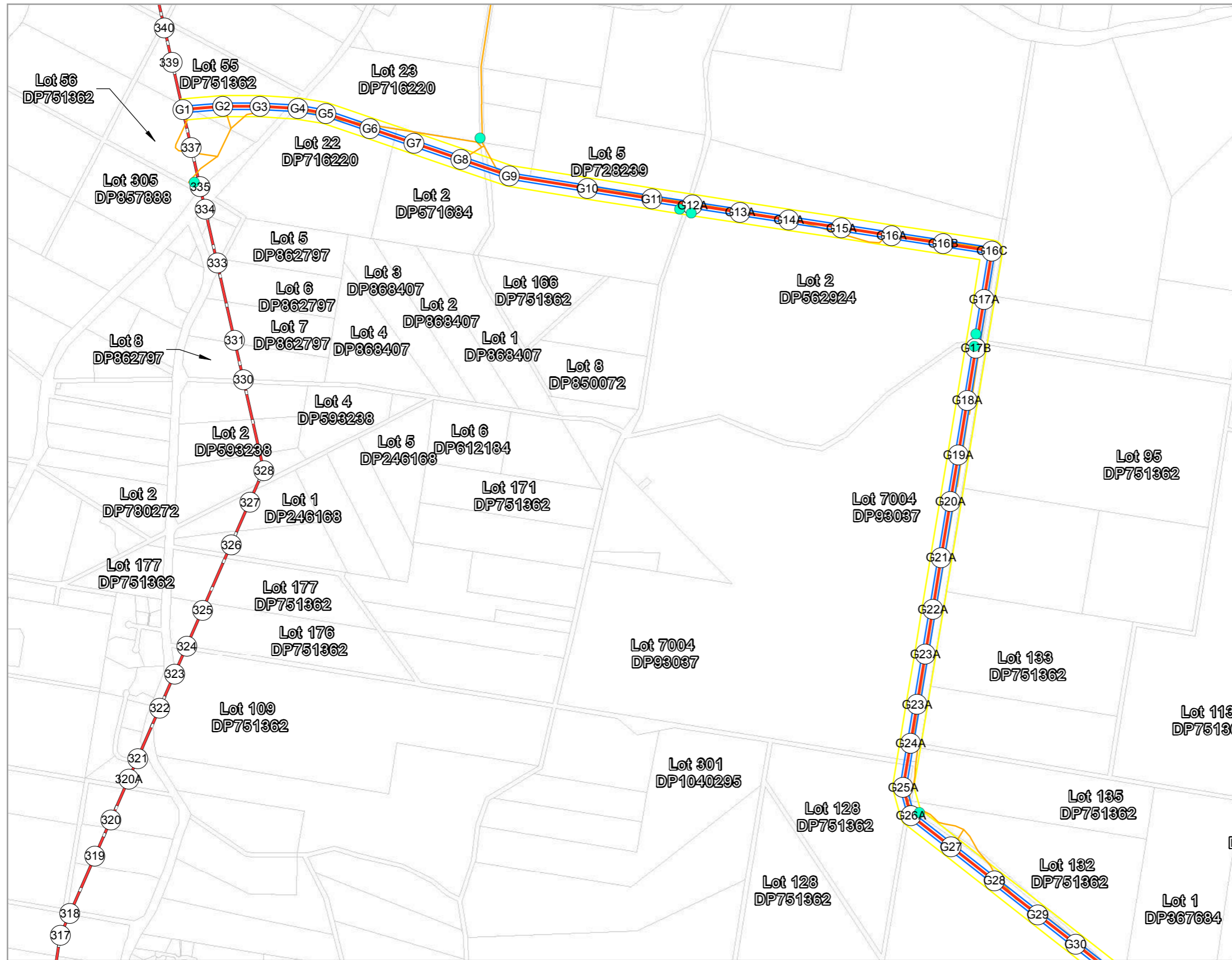


LEGEND

-  Clarence Correctional Centre
-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Pole dump / laydown area

0 400



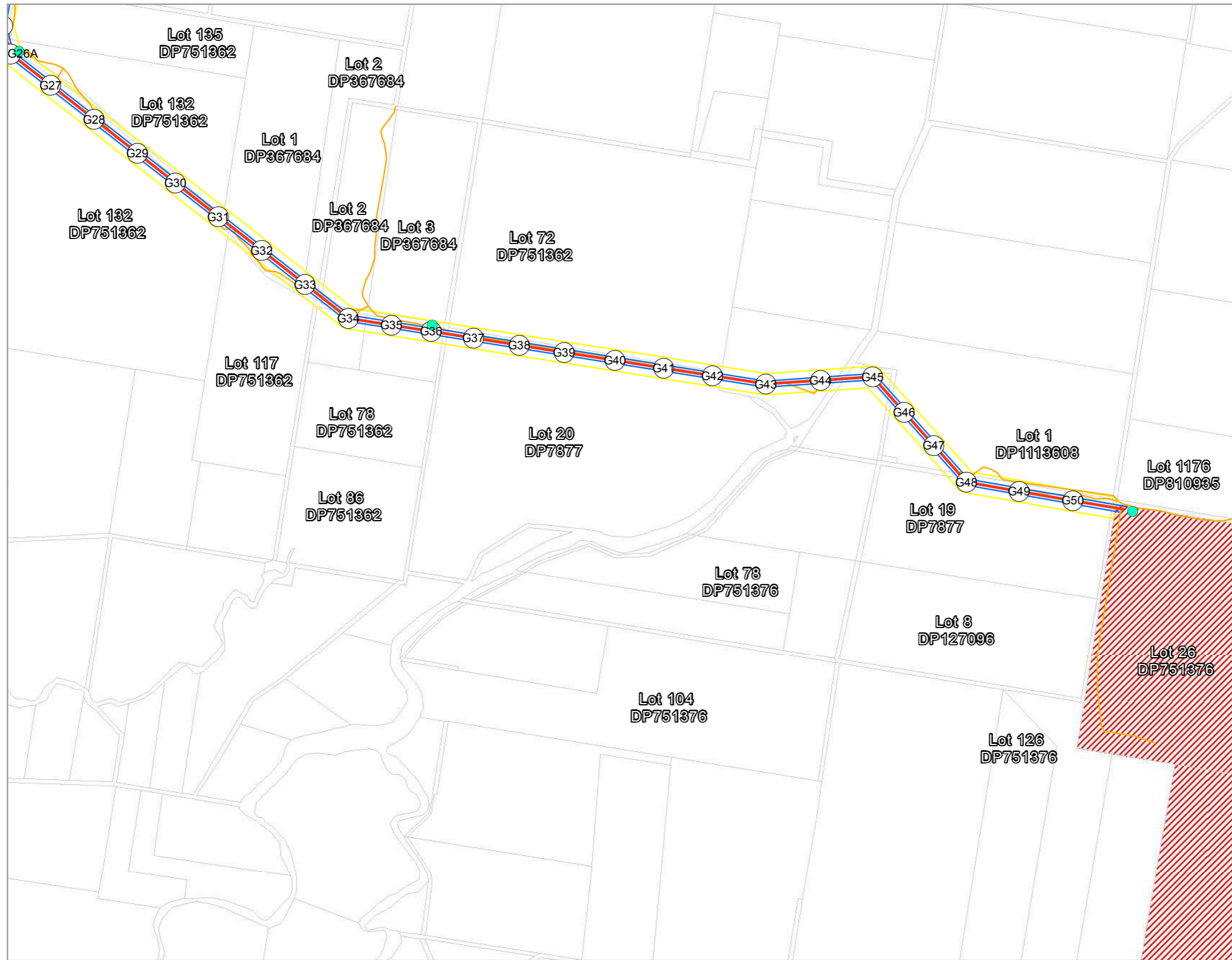


LEGEND

- Cadastre
- Existing powerline
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- 100 m investigation area
- Pole location
- Pole dump / laydown area

0 400





- LEGEND**
- Clarence Correctional Centre
 - Cadastre
 - Proposed CCC line route centreline - Jan 2019
 - 30 m easement
 - Access track
 - 100 m investigation area
 - Pole location
 - Pole dump / laydown area

0 400





2. Methodology

2.1 Preliminary Assessment

As part of the preliminary scoping process, desktop searches (BioNet Wildlife Atlas, Protected Matters Search Tool, Fisheries Spatial Data Portal) and review of the *Biodiversity Assessment Report* prepared by Jacobs (2017) for the CCC Environmental Impact Statement were completed.

Final comprehensive desktop analysis included:

- A search of the BioNet Wildlife Atlas (10 km buffer around the transmission line alignment).
- A search of the Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) within a 10 km radius of the transmission line alignment.
- Review of data in the Fisheries NSW Spatial Data Portal.
- Review of the *Biodiversity Assessment Report* (Jacobs 2017) prepared for the CCC Environmental Impact Statement.
- Review of other REFs prepared for the CCC and in the locality.
- Review of threatened species records and mapping in association with the Woolgoolga to Ballina (W2B) Pacific Highway Upgrade.
- Review of CRAFTI vegetation mapping (DEC 2005).

Preliminary assessment examined several scenarios for the alignment, with a focus on achieving the following objectives:

- Minimising native vegetation loss.
- Minimising loss of mature vegetation.
- Minimising loss of habitat trees.
- Utilising road reserves to avoid impacts on private land (ie. avoiding fragmentation of rural land).
- Maintaining buffer distances to houses or other assets (e.g. stock dams, cattleyards, property accesses).

The alignment was modified numerous times during this process and several options investigated and discarded (e.g. utilising a heavily vegetated Crown road). Options for avoiding wetland impacts at Washpen Creek and Glenugie Creek were very few as these areas had to be traversed. The final alignment was refined following field assessment, consultation with affected landholders and TransGrid engineers.

Details of the field survey methodology are provided in **Sections 2.2** and **2.3**. Results of database searches are attached at **Appendix C**.



2.2 Field Assessment

As part of the scoping review and final determination of the transmission line alignment, the study area was assessed on seven occasions (3/08/2017, 12/10/2017, 3/11/2017, 22/02/2018, 18/04/2018, 8 & 9/05/2018, 2 & 3/08/2018 and 23/01/2019) using the following methodology, with locations of any significant features were taken using a global positioning system (GPS):

- Walking survey of all areas of vegetation along the transmission line alignment (in addition to access tracks and laydown area) searching for threatened flora, identification of threatened ecological communities and completion of a general flora inventory using a modified Braun-Blanquet index.
- Mapping of vegetation and classification by dominant species to plant community type (PCT).
- Opportunistic survey of all fauna based on visual or aural observations.
- Location and marking of hollow-bearing trees or significant stags (white spray-painted 'H').

No targeted fauna survey was completed, rather assessment of fauna habitat features (wetland habitats, hollow-bearing trees, structurally complex forest) was used to predict threatened fauna habitat. Due to a detailed survey completed by GeoLINK for the W2B project in the locality, a high level of confidence can be made with regard to threatened fauna habitat use. This knowledge, combined with the findings of the *Biodiversity Assessment Report* (Jacobs 2017) assume the occurrence of threatened fauna where habitat is suitable and where the species has been recorded within the locality (based on database search results).

2.3 Conditions and Survey Limitations

While the survey only provides a 'snapshot' of fauna usage during daytime hours, site visits occurred throughout all seasons and various weather scenarios (including two days of light rain). Repeat visits also substantially improved fauna records over time and with seasonal variations. As noted, based on local fauna records and vegetation/ habitat mapping, predictions of fauna usage can be made with a high level of confidence.

On this basis, in combination with all affected vegetation being thoroughly traversed, the scope of assessment is considered adequate. This is also reflected by the historical and ongoing landuse in the locality. All of the sites affected by the transmission line have been significantly cleared, modified and thinned and all are subject to ongoing grazing or other disturbance. In this sense, the transmission line alignment is highly modified and disturbed with vegetation being highly simplified and lacking structural complexity.

Notes:

- The last two site inspections of wetland areas (Lots 55 and 56 and around Washpen Creek and Glenugie Creek) in 2018 were completed during very dry conditions where wetland vegetation had significantly died back or was very reduced in cover and standing water was absent. As such, these areas remain under-surveyed in terms of floristic diversity and structure.
- Similarly, very dry conditions present at the most recent site inspection (January 2019) indicated dieback of wetland vegetation within wetland channels within Lot 2 DP562924.
- OPGW works within the existing transmission line easement where vegetation removal is not required was not assessed in the field.
- All road access points using existing roads and Crown roads were assessed in terms of native vegetation, brief searches for threatened flora, the presence of habitat trees and the potential for vegetation loss.

3. Flora

3.1 Desktop Analysis

3.1.1 Database Search Results

BioNet search results identified records of 31 threatened flora species (including ten species also listed in the EPBC Act) (refer to **Table 3.1**) and ten Threatened Ecological Communities (TECs) from within the locality; five of TECs are also listed under the EPBC Act (refer to **Table 3.2**).

Table 3.1 Threatened Flora Recorded within the Locality

Scientific Name	Common Name	BC Act	EPBC Act
<i>Acronychia littoralis</i>	Scented Acronychia	E	E
<i>Ancistrachne maidenii</i>		V	-
<i>Angophora robur</i>	Sandstone Rough-barked Apple	V	V
<i>Arthraxon hispidus</i>	Hairy Jointgrass	V	V
<i>Belvisia mucronata</i>	Needle-leaf Fern	E	-
<i>Boronia hapalophylla</i>	Shannon Creek Boronia	E	-
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-
<i>Centranthera cochinchinensis</i>	Swamp Foxglove	E	-
<i>Corynocarpus rupestris</i> subsp. <i>rupestris</i>	Glenugie Karaka	V	V
<i>Dendrobium melaleucaphilum</i>	Spider orchid	E	-
<i>Eucalyptus tetrapleura</i>	Square-fruited Ironbark	V	V
<i>Geodorum densiflorum</i>	Pink Nodding Orchid	E	-
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E	-
<i>Grevillea quadricauda</i>	Four-tailed Grevillea	V	V
<i>Lindernia alsinoides</i>	Noah's False Chickweed	E	-
<i>Lindsaea fraseri</i>	Fraser's Screw Fern	E	-
<i>Lindsaea incisa</i>	Slender Screw Fern	E	-
<i>Marsdenia longiloba</i>	Slender Marsdenia	E	V
<i>Maundia triglochinosoides</i>		V	-
<i>Melaleuca irbyana</i>	Weeping Paperbark	E	-
<i>Melichrus hirsutus</i>	Hairy Melichrus	E	E
<i>Niemeyera whitei</i>	Rusty Plum	V	-
<i>Olax angulata</i>	Square-stemmed Olax	V	V
<i>Phyllanthus microcladus</i>	Brush Sauropus	E	-
<i>Polygala linariifolia</i>	Native Milkwort	E	-
<i>Prostanthera sejuncta</i>		V	-
<i>Quassia</i> sp. <i>Moonee Creek</i>	Moonee Quassia	E	E
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	-
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	-
<i>Rotala tripartita</i>		E	-
<i>Tephrosia filipes</i>		V	-

V = Vulnerable; E = Endangered; CE = Critically Endangered

Table 3.2 TECs within the Locality

Community	BC Act	EPBC Act
Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	E	-
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions	E	V
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions	E	-
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions	E	CE
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E	CE
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E	CE
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E	-
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions	E	-
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions	E	E
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South-East Corner Bioregions	E	-

V = Vulnerable; E = Endangered; CE = Critically Endangered

PMST results identified habitat for 13 threatened flora species and three TECs within 10 km of the study area.

3.1.2 Local Studies

The *Biodiversity Assessment Report* for the CCC site (Jacobs 2017) identified four native vegetation communities at the CCC site:

1. Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (PCT 1209).
2. Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (PCT 1211).
3. Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion (PCT: 837).
4. Coastal freshwater meadows and forblands of lagoons and wetlands (PCT 782).

No threatened flora species or communities were recorded.

REFs completed for other utility services to the CCC recorded a range of vegetation communities consistent with the dry sclerophyll forest PCTs noted in the *Biodiversity Assessment Report*. One threatened flora species was recorded; Weeping Paperbark (*Melaleuca irbyana*). A population of this species occurs on land adjacent to (east of) Avenue Road on private land.

Apart from records of Weeping Paperbark, the W2B project database does not show any other threatened fauna records in proximity to the site.



3.2 Site Assessment

3.2.1 Vegetation Communities

Due to an extensive history of disturbance and modification (clearing, burning, logging, thinning and under scrubbing), the study area does not support any intact areas of remnant vegetation, but rather comprises a patchwork of infrequent mature trees ('paddock trees'), unevenly aged forest, sub-mature regrowth and improved pasture, typically containing several native grasses. Woody vegetation shows a low level of species diversity, a lack of structural diversity and is typically homogenous between properties.

Vegetation within the study area is typically representative of vegetation types in the locality which have also been subject to similar regimes of rural management. CRAFTI vegetation mapping for the immediate locality is provided at **Illustration 3.1**. Although coarse and broad in its vegetation descriptions, the mapping provides a useful guide to the extent of woody vegetation in the locality.

On elevated land within the study area, woody vegetation comprises dry sclerophyll forest principally dominated by Spotted Gum (*Corymbia henryi*) and/ or Grey Box (*Eucalyptus moluccana*), with occasional Grey Ironbark (*Eucalyptus siderophloia*) and infrequent Pink Bloodwood (*Corymbia intermedia*) and/ or Forest Red Gum (*Eucalyptus tereticornis*). On the floodplain and adjoining transitional areas, floodplain forest featuring Forest Red Gum, Swamp Box (*Lophostemon confertus*) and Broad-leaved Apple (*Angophora subvelutina*) occurs, along with swamp forest dominated by Swamp Oak (*Casuarina glauca*).

Formerly cleared areas on the floodplain typically comprise seasonally inundated grasslands dominated by Couch (*Cynodon dactylon*) with a range of other water tolerant species. Areas of sedgeland dominated by Pin Rush (*Juncus usitatus*) also occur. It is likely these areas would formerly have been occupied by a mosaic of swamp forest and wetland communities.

Vegetation within the study area comprises nine broad communities, as summarised at **Table 3.3**. Vegetation communities are classified as per approved PCT in the BioNet Vegetation Classification system.

Vegetation mapping for the transmission line and 100 m investigation area is shown at **Illustration 3.2**. A flora inventory is provided at **Appendix D**.

Vegetation along roads to be used as vehicle access points typically comprises dry sclerophyll forest (Communities 1, 2 or 3).

3.2.2 Threatened Flora

One threatened flora species was recorded – a small population of Weeping Paperbark (*Melaleuca irbyana*) occurs in the east of the study area at Lot 1 DP113608 adjacent to a scattered stand of Swamp Oak. Weeping Paperbark comprises several consolidated patches, with scattered isolated trees and patches of trees occurring to the north (refer to **Illustration 3.2**). The closest Weeping Paperbark is approximately 75 m from the proposed alignment.

Table 3.3 Vegetation Communities

	Community	PCT
1	<p>Open forest (Spotted Gum, Grey Box) Open dry sclerophyll forest dominated by Spotted Gum (<i>Corymbia henryi</i>) and/ or Grey Box (<i>Eucalyptus moluccana</i>), with infrequent occurrence of Grey Ironbark (<i>Eucalyptus siderophloia</i>). This is the predominant forest type in the locality. The midstorey is typically absent due to under scrubbing and grazing, with infrequent species including Curracabah (<i>Acacia concurrens</i>), Salwood (<i>A. disparrima</i> subsp. <i>disparrima</i>) and Red Ash (<i>Alphitonia excelsa</i>). Low shrubs in the ground layer are limited to infrequent Coffee Bush (<i>Breynia oblongifolia</i>).</p> <p>The ground layer comprises numerous native species including Redgrass (<i>Bothriochloa macra</i>), Barbed Wire Grass (<i>Cymbopogon refractus</i>), Blady Grass (<i>Imperata cylindrica</i>), Speargrasses (<i>Aristida vagans</i>, <i>A. ramosa</i>), Weeping Grass (<i>Microlaena stipoides</i> var. <i>stipoides</i>), Whiteroot (<i>Lobelia purpuascens</i>) and occasional pasture grasses (Rhodes Grass* <i>Chloris gayana</i>, Broad-leaved Paspalum* <i>Paspalum mandiocanum</i>). Occasional scramblers include Rusty Tick Trefoil (<i>Desmodium rhytidophyllum</i>) and Twining Glycine (<i>Glycine clandestina</i>).</p>	<p>PCT1209 Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion</p>
2	<p>Open forest (Spotted Gum) As for Community 1, but regrowth in pure stands dominated by Spotted Gum, with few other canopy species present. The midstorey and ground layer are as for Community 1.</p>	<p>PCT1211 Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion</p>
3	<p>Open forest/ woodland (Forest Red Gum, Swamp Box, Broad-leaved Apple) Cleared and modified open woodland with scattered Forest Red Gum (<i>E. tereticornis</i>), Swamp Box (<i>Lophostemon confertus</i>) and Broad-leaved Apple (<i>Angophora subvelutina</i>) around low-lying pasture. No midstorey occurs. The ground layer comprises pasture with occasional native grasses (refer to Community 5).</p>	<p>PCT837 Forest Red Gum - Swamp Box of the Clarence Valley lowlands of the NSW North Coast Bioregion</p>
4	<p>Open woodland (Swamp Box) Cleared and modified open woodland dominated by Swamp Box on Lot 2 DP571684. No midstorey occurs. The ground layer comprises pasture with occasional native grasses (refer to Community 5).</p>	<p>PCT1227 Swamp Box swamp forest of the coastal lowlands of the NSW North Coast Bioregion</p>
5	<p>Open forest (Swamp Oak) Swamp forest dominated by Swamp Oak (<i>Casuarina glauca</i>) occurs at several scattered locations along watercourses and as disjunct patches of regrowth. Few other species are present, with the exception of occasional Weeping Paperbark (<i>Melaleuca irbyana</i>) at Lot 1 DP113608. Midstorey absent. Groundcover of sparse Basket Grass (<i>Oplismenus aemulus</i>) and Devil's Needles (<i>Solanum stelligerum</i>) at elevated locations, with wetland species such as Pin Rush (<i>Juncus usitatus</i>) and Common Spike-rush (<i>Eleocharis equisetina</i>) around wetland areas.</p>	<p>PCT1145 Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion</p>
6	<p>Closed forest (Teak) Tiny patch of dry rainforest on Lot 2 DP571684 dominated by two mature Teak (<i>Flindersia australis</i>). Other associated tree/ shrub species include Bitter Bark (<i>Alstonia constricta</i>), Foambark (<i>Jagera pseudorhus</i>), Small-leaved Tuckeroo (<i>Cupaniopsis parvifolia</i>), Native Holly (<i>Alchornea ilicifolia</i>) and Orange Thorn (<i>Pittosporum multiflorum</i>). This patch is highly disturbed from use as a cattle camp.</p>	<p>No equivalent</p>
7	<p>Grassland (wet meadow)</p>	<p>No equivalent. This is a derived</p>

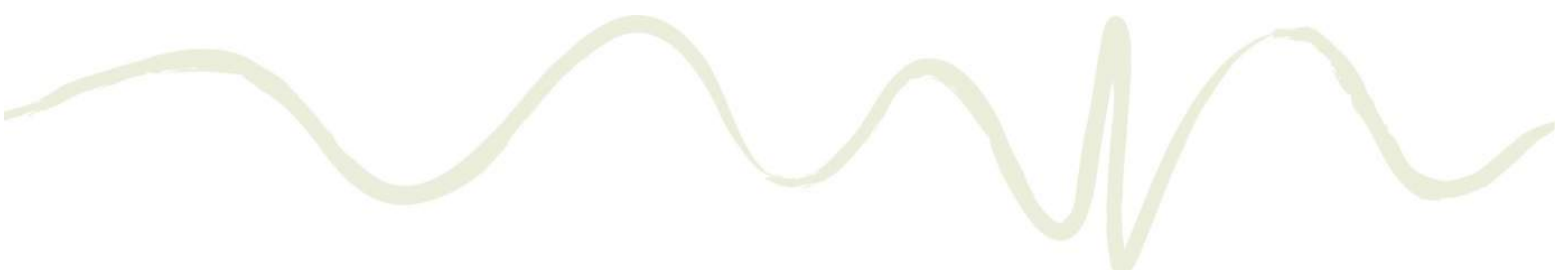
	Community	PCT
	'Wet meadow' formation dominated by Couch (<i>Cynodon dactylon</i>) and Water Couch (<i>Paspalum distichum</i>) with sparse associated species including Knotweed (<i>Persicaria attenuata</i> , <i>P. strigosa</i>), Common Spike-rush, Frogmouth (<i>Philydrum lanuginosum</i>) and Water Primrose (<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>). Water Hyacinth (<i>Eichhornia crassipes</i>) is common throughout Lot 72.	community from historical clearing of swamp forest (most likely PCT1145).
8	Grassland (pasture) Pasture grassland comprising a mix of introduced and native species, typically dominated by introduced species. Common species include Rhodes Grass, Kikuyu (<i>Cenchrus clandestinum</i>), Narrow-leaved Carpet Grass* (<i>Axonopus fissifolius</i>), Couch, Scented Top (<i>Capillipedium spicigerum</i>), Redgrass, Blady Grass, Barbed Wire Grass, Speargrass and occasional pasture weeds (Fireweed* <i>Senecio madagascariensis</i> , Balloon Cotton Bush* <i>Gomphocarpus physocarpus</i>).	n/a
9	Sedgeland (Pin Rush) Sedgeland dominated by Pin Rush (<i>Juncus usitatus</i>) within the floodplain. Other species include Knotweeds (<i>Persicaria</i> sp.), Frogmouth, Common Spike-rush, Water Primrose and Couch	No equivalent. This may be a derived community from historical clearing of swamp forest (PCT1145).

* Introduced species

3.2.3 Threatened Ecological Communities (TECs)

Vegetation is characteristic of four TECs listed in the BC Act (refer to **Illustration 3.3**):

1. Community 5 is diagnostic of the TEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions*. This TEC applies to Swamp Oak on the floodplain subject to overland flow and inundation. While disjunct areas of 'perched' Swamp Oak which are disconnected from the floodplain and are not subject to overland flow (e.g. Lots 2 and 3 DP367684) could be considered uncharacteristic of the community, it is noted that the Swamp Oak TEC may occur at up to 20 m elevation and may form part of a mosaic with other connected vegetation fringing floodplain environments (NSW Scientific Committee 2011). On this basis, a precautionary approach has been applied and perched areas of Swamp Oak are also included as this TEC.
2. Community 3 and 4 are diagnostic of the TEC *Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion*. Although highly modified, this community contains diagnostic species and is subject to overland flow and inundation.
3. Community 7 is diagnostic of the TEC *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions*. Although highly disturbed, species poor and lacking vegetation at the time of assessment, this community contains diagnostic species and is subject to overland flow and inundation. It is likely these wetland communities are highly dynamic and comprise a wet meadow for most of the year with vegetation cover depending on rainfall and grazing regimes. When inundated by large rainfall events where standing water may persist for several weeks to months whereby grasses may die back, and macrophytes become more dominant. These areas are likely to have formerly supported a mosaic of swamp forest and wetland communities (including the TECs *Subtropical Coastal Floodplain Forest* and *Swamp Oak Floodplain Forest*). Grassland communities east of the constructed drain which comprises Glenugie Creek are more elevated and contain a high proportion of pasture grasses and weeds (Fireweed, Spear Thistle) and hence not considered representative of *Freshwater Wetlands*.

- 
4. Community 6 although small and disturbed could be considered diagnostic of the TEC *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions*. This tiny patch would once have been part of a larger area of dry rainforest representing Floyd's (1990) sub-alliance 2 (*Flindersia* spp. – *Araucaria*). A larger patch (~0.35 ha) of this same sub-alliance occurs approximately 1.3 km to the north-east on Four Mile Lane.

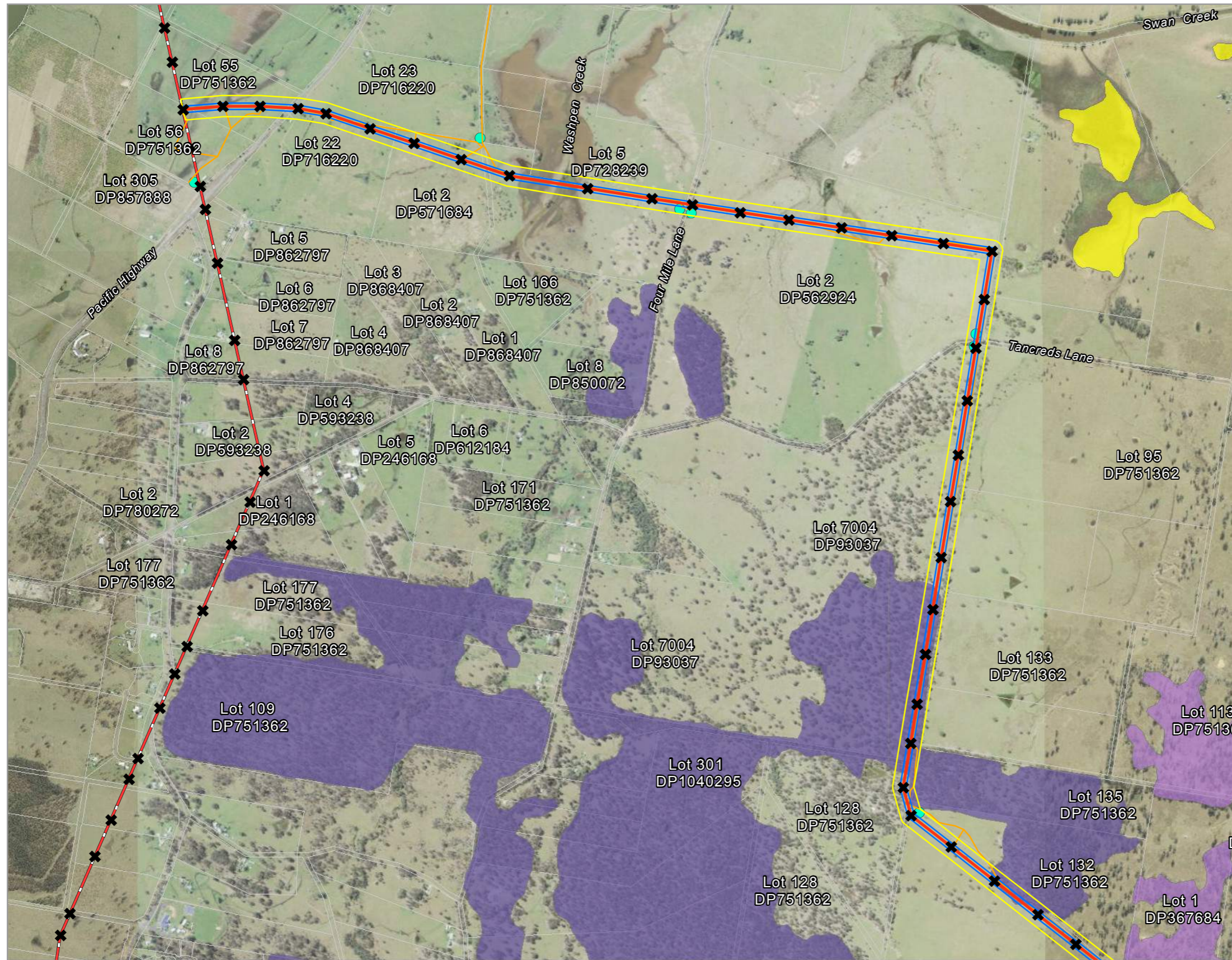
Two of these communities (*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South-East Corner Bioregions, Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions*) are also listed in the EPBC Act as the TECs *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland* and *Lowland Rainforest of Subtropical Australia* respectively.

TECs listed in the EPBC Act have prescribed condition thresholds. For lowland rainforest, the subject patch does not meet EPBC Act condition thresholds due to its small size and low species diversity. For Swamp Oak forest, scattered small patches associated with the Glenugie Creek floodplain are unlikely meet EPBC Act condition thresholds due to their small size (ie. <0.5 ha). A larger patch of Swamp Oak forest at the Crown Reserve is likely to meet EPBC Act condition thresholds as it exceeds 0.5 ha and is in good condition (due to fencing off from stock). However, this vegetation will not be impacted by the works. More extensive Swamp Oak woodlands on Lot 72 may also meet EPBC Act condition thresholds but were not assessed in the field.

Two patches of Swamp Oak that meet EPBC Act condition thresholds (>0.5 ha in area, predominantly native understorey) are bisected by the transmission line corridor within Lot 3 DP367684. No other patches of Swamp Oak which are affected by the required clearing works meet EPBC Act condition thresholds.

3.2.4 Condition

As noted, the site has been highly modified and disturbed and is subject to ongoing grazing and little intact remnant native vegetation occurs. The least disturbed vegetation occurs within road reserves (e.g. Crown road, Four Mile Lane, Tancreds Lane) and the Crown Reserve.



LEGEND

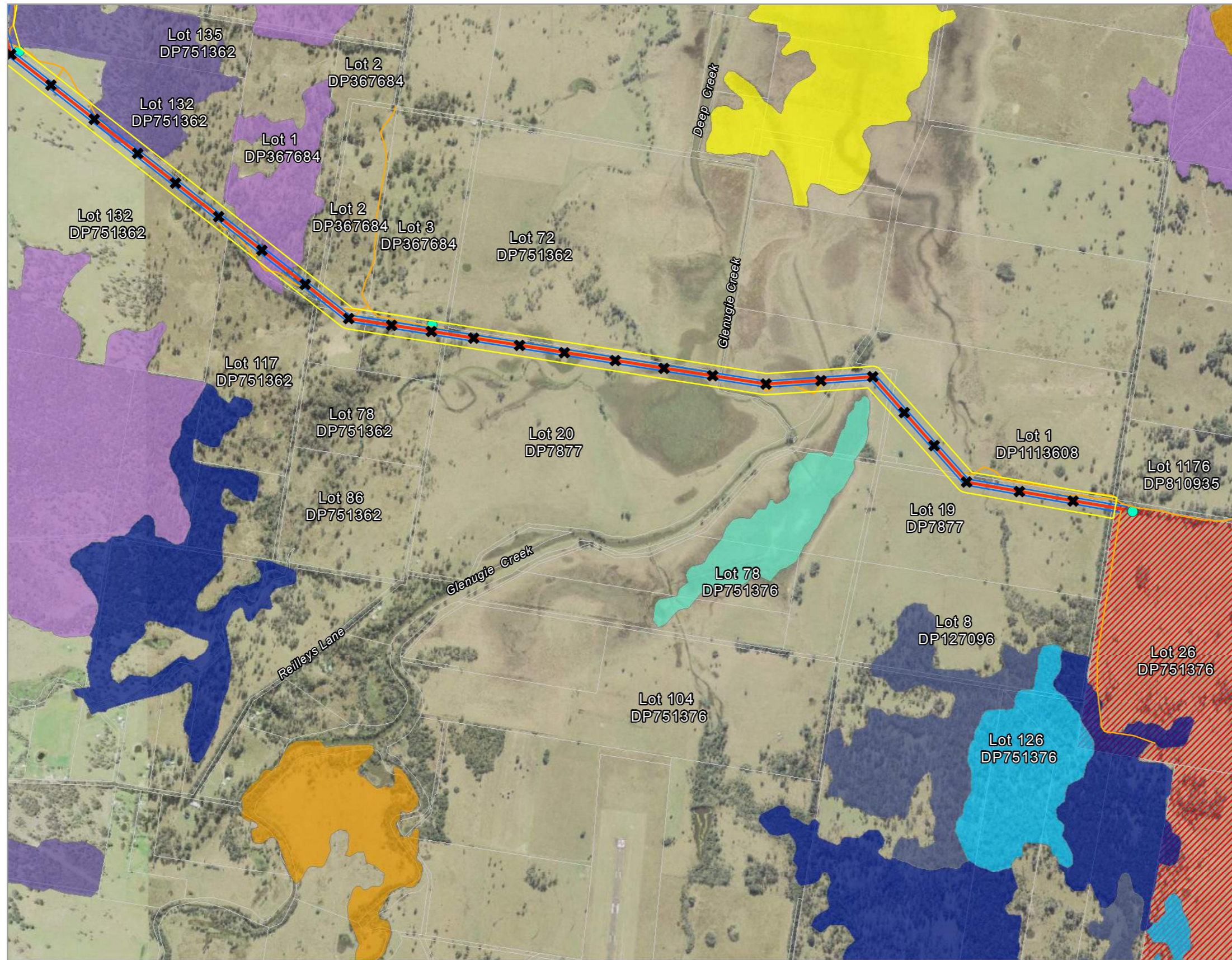
- Proposed CCC line route Jan 2019
- 30 m easement
- Existing powerline
- Access track
- 100 m investigation area
- Cadastre
- x Pole location
- Pole dump / laydown area

Northern CRAFTI VIS L1_DESC

- Alpine complex ~ Heathland
- Wet sclerophyll forest ~ Semi-mesic grassy forest ~ Grassy dry sclerophyll forest
- Wet sclerophyll forest ~ Semi-mesic grassy forest ~ Grassy dry sclerophyll forest ~ Shrubby dry sclerophyll forest

0 450





LEGEND

- Proposed CCC line route Jan 2019
- 30 m easement
- Access track
- 100 m investigation area
- Clarence Correctional Centre
- Cadastre
- ✕ Pole location
- Pole dump / laydown area

Northern CRAFTI VIS L1_DESC

- Alpine complex ~ Heathland
- Alpine complex ~ Heathland ~ unknown
- Semi-mesic grassy forest
- Swamp sclerophyll forest
- Wet sclerophyll forest ~ Sclerophyll grassy woodland ~ Grassy dry sclerophyll forest ~ Shrubby dry sclerophyll forest
- Wet sclerophyll forest ~ Semi-mesic grassy forest ~ Grassy dry sclerophyll forest
- Wet sclerophyll forest ~ Semi-mesic grassy forest ~ Grassy dry sclerophyll forest ~ Shrubby dry sclerophyll forest
- Wet sclerophyll forest ~ Semi-mesic grassy forest ~ Sclerophyll grassy woodland ~ Grassy dry sclerophyll forest ~ Shrubby dry sclerophyll forest

0 450





LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Existing powerline
- Access track
- 100 m investigation area
- Cadastre
- Danger tree
- ✕ Pole location
- Camphor Laurel
- Cockspur thicket
- Cockspur thicket and Foambark
- Cockspur thicket and Rough-leaved Elm
- Forest Red Gum
- Hard Quandong
- Hard Quandong x 2
- Silky Oak
- Small-leaved Fig





LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open woodland (Swamp Box)
- Closed forest (Teak)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area
- Cockspur thicket
- Cockspur thicket, Small-leaved
- Tuckeroo
- Hard Quandong
- Swamp Box



0 60



LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open woodland (Swamp Box)
- Grassland (wet meadow)
- Danger tree
- ✕ Pole location
- Grey Ironbark
- Spotted Gum
- Swamp Box

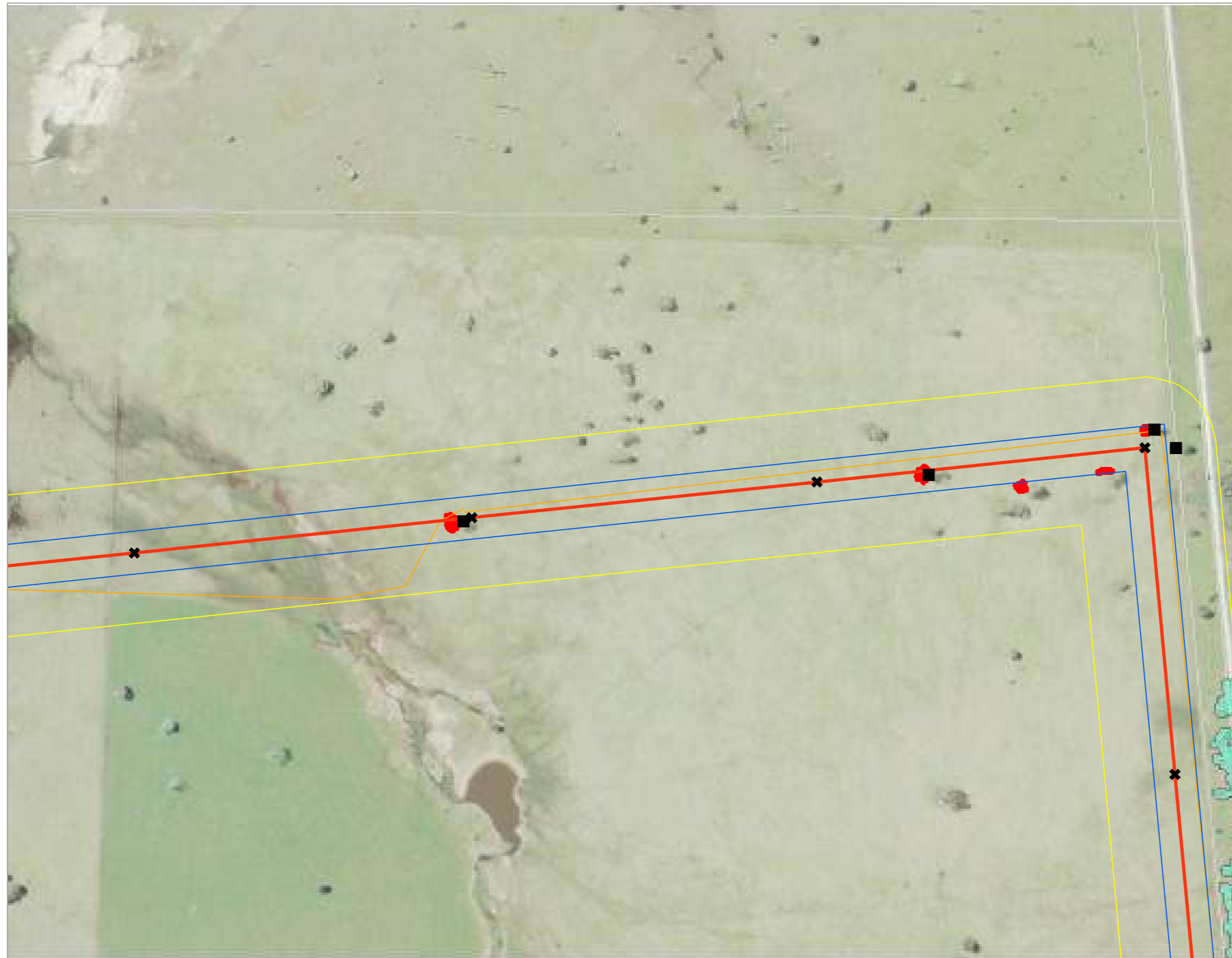




LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area
- Grey Ironbark
- Spotted Gum





LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Danger tree
- ✕ Pole location
- Swamp Box

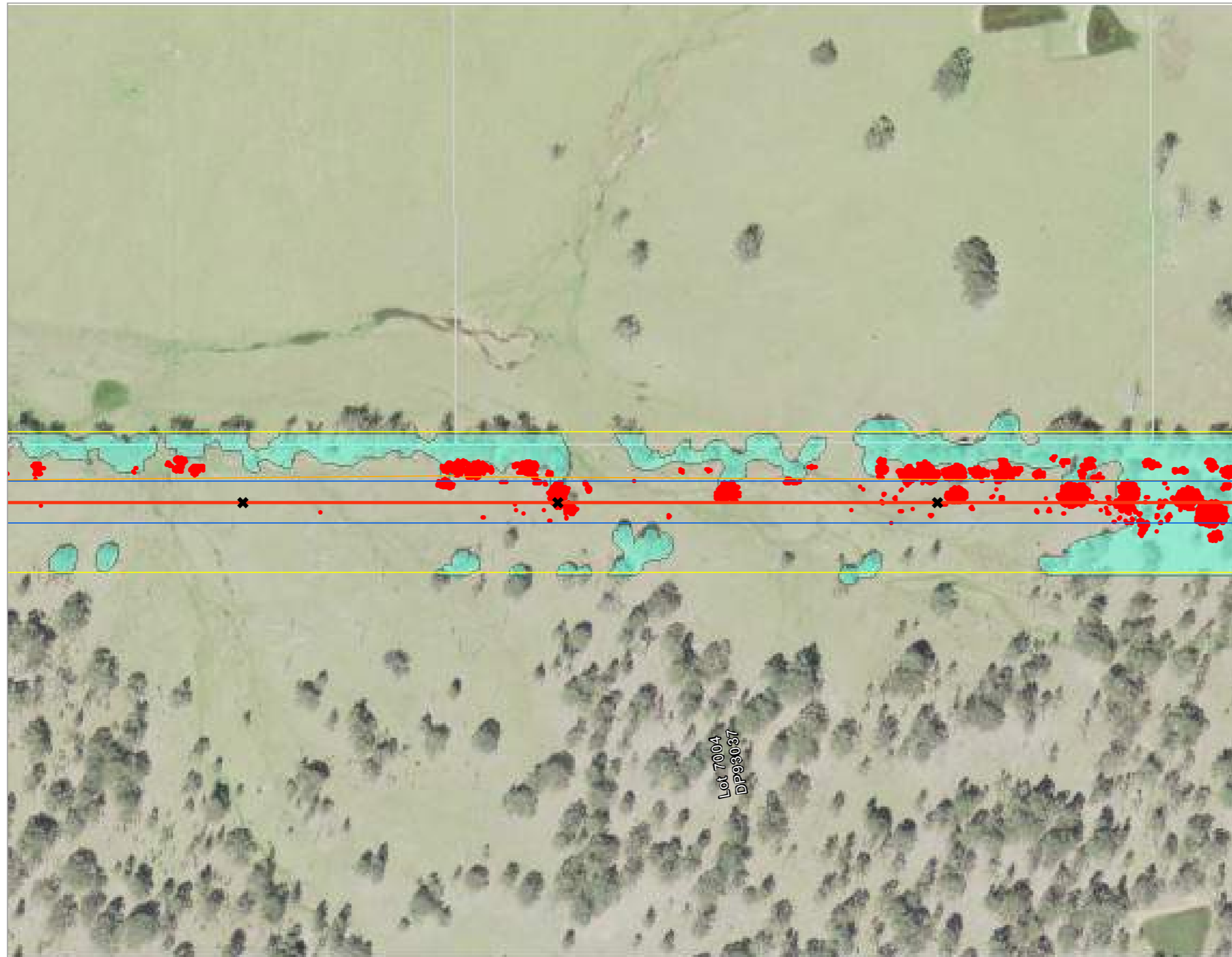












LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area





LEGEND

-  Proposed CCC line route centreline - Jan 2019
-  15 m each side (30m easement)
-  Access track
-  100 m investigation area
-  Cadastre
-  Open forest (Spotted Gum, Grey Box)
-  Danger tree
-  Pole location









0 60



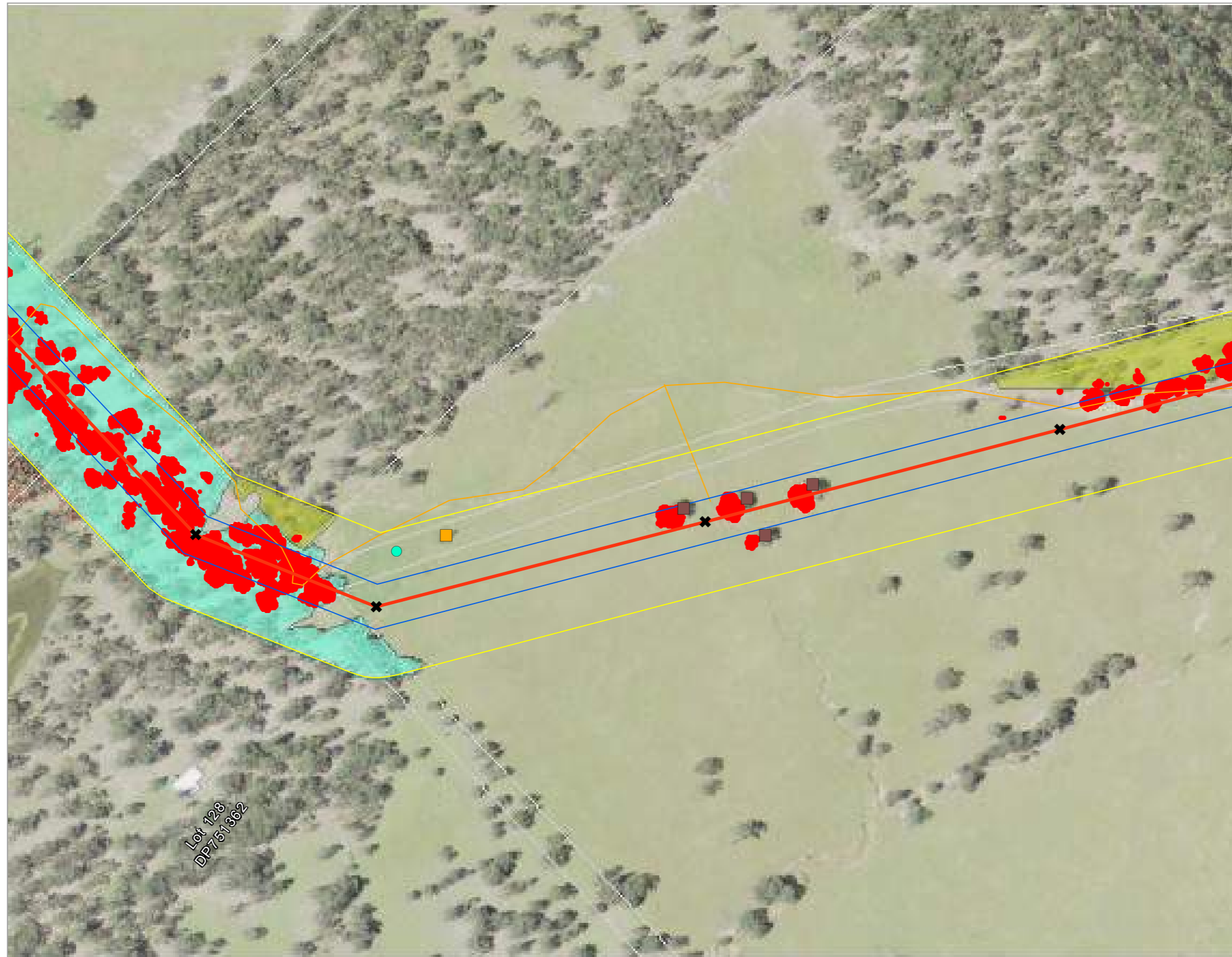
GeoLINK
environmental management and design



LEGEND

-  Proposed CCC line route centreline - Jan 2019
-  15 m each side (30m easement)
-  Access track
-  100 m investigation area
-  Cadastre
-  Open forest (Spotted Gum, Grey Box)
-  Danger tree
-  Pole location

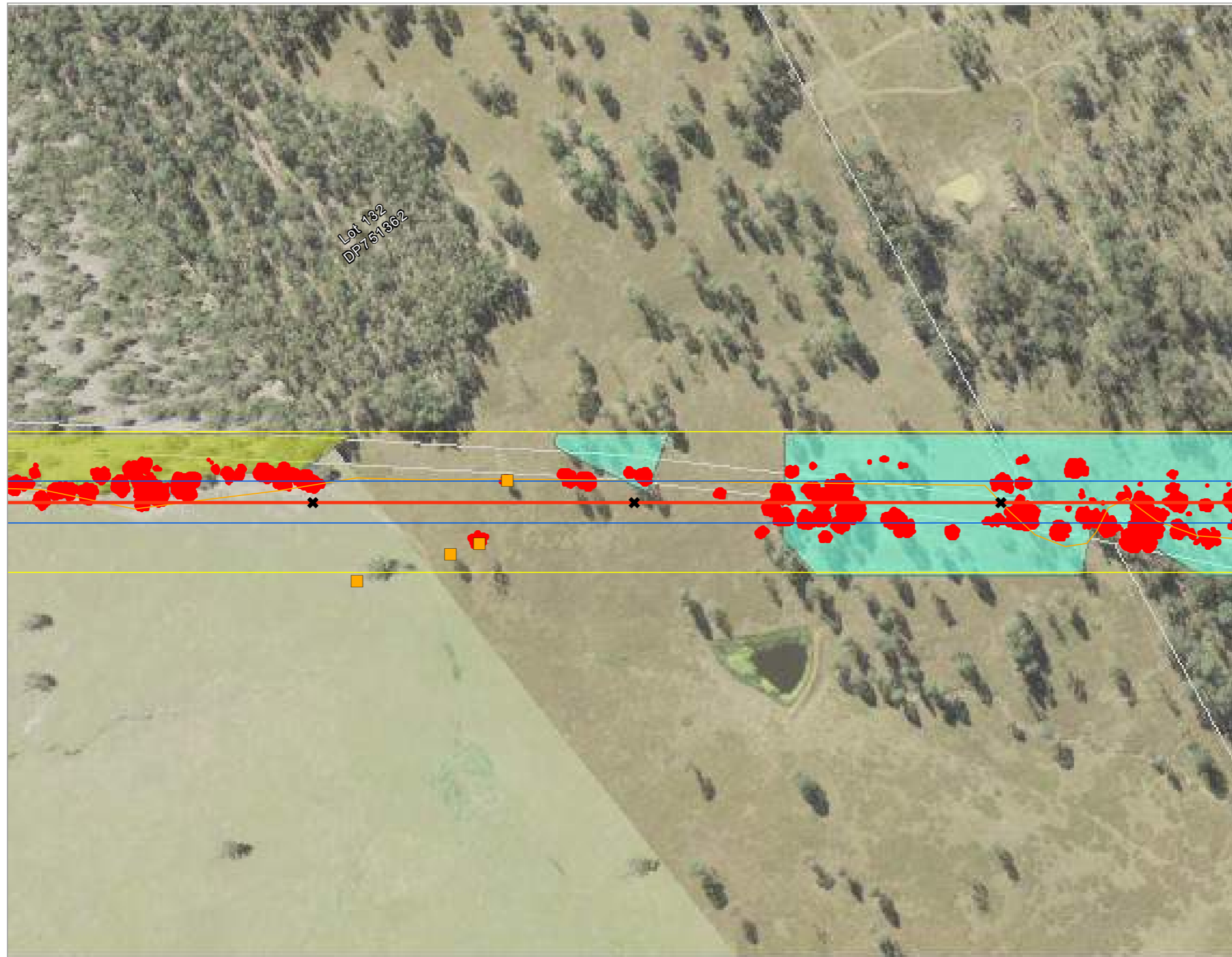




LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Open forest (Spotted Gum)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area
- Grey Ironbark
- Spotted Gum

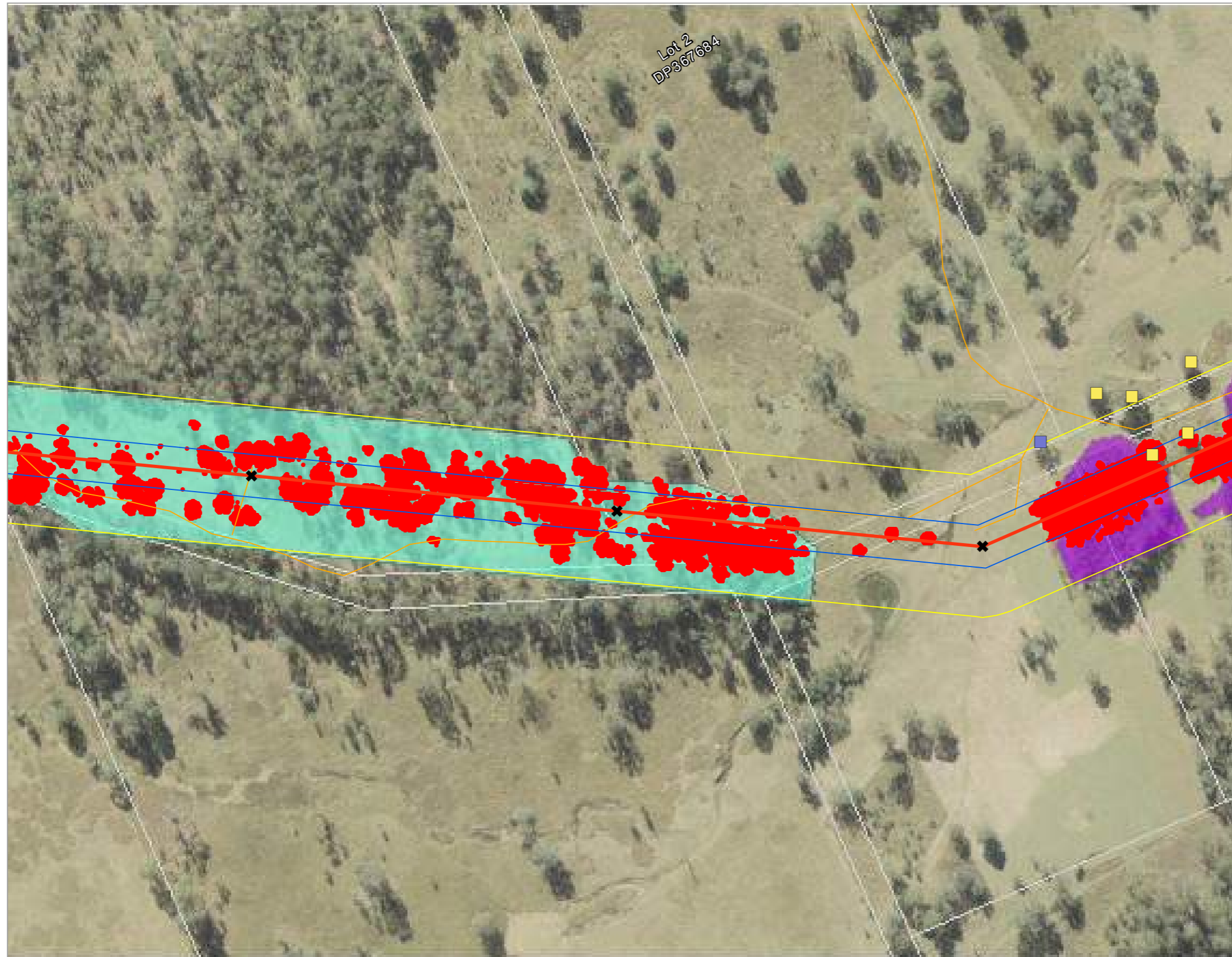




LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Open forest (Spotted Gum)
- Danger tree
- ✕ Pole location
- Spotted Gum





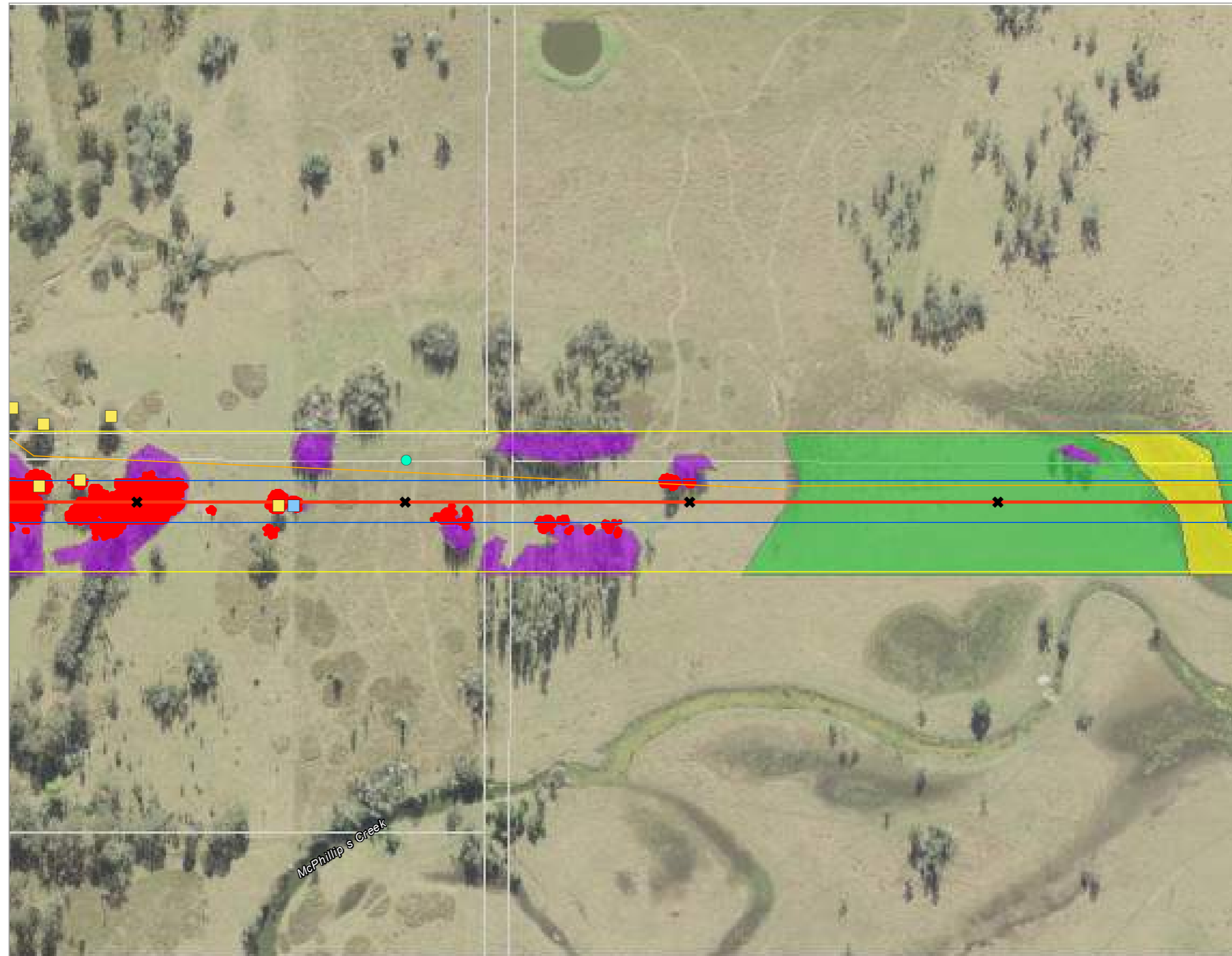
LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Spotted Gum, Grey Box)
- Open forest (Swamp Oak)
- Danger tree
- ✕ Pole location
- Broad-leaved
- Forest Red Gum

0 60



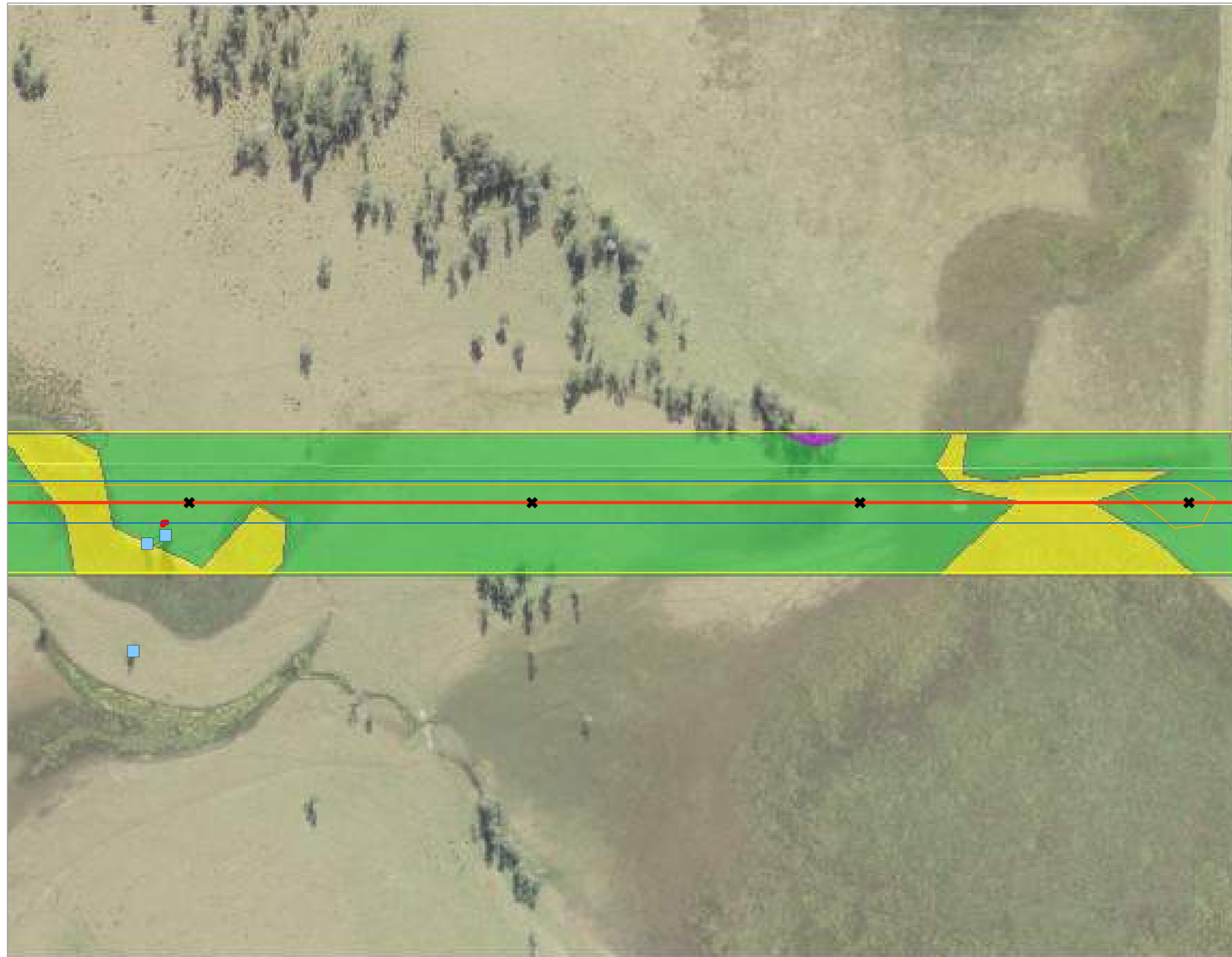
GeoLINK
environmental management and design



LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Swamp Oak)
- Grassland (wet meadow)
- Sedgeland (Pin Rush)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area
- Forest Red Gum
- Swamp Oak





LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Swamp Oak)
- Grassland (wet meadow)
- Sedgeland (Pin Rush)
- Danger tree
- ✕ Pole location
- Swamp Oak

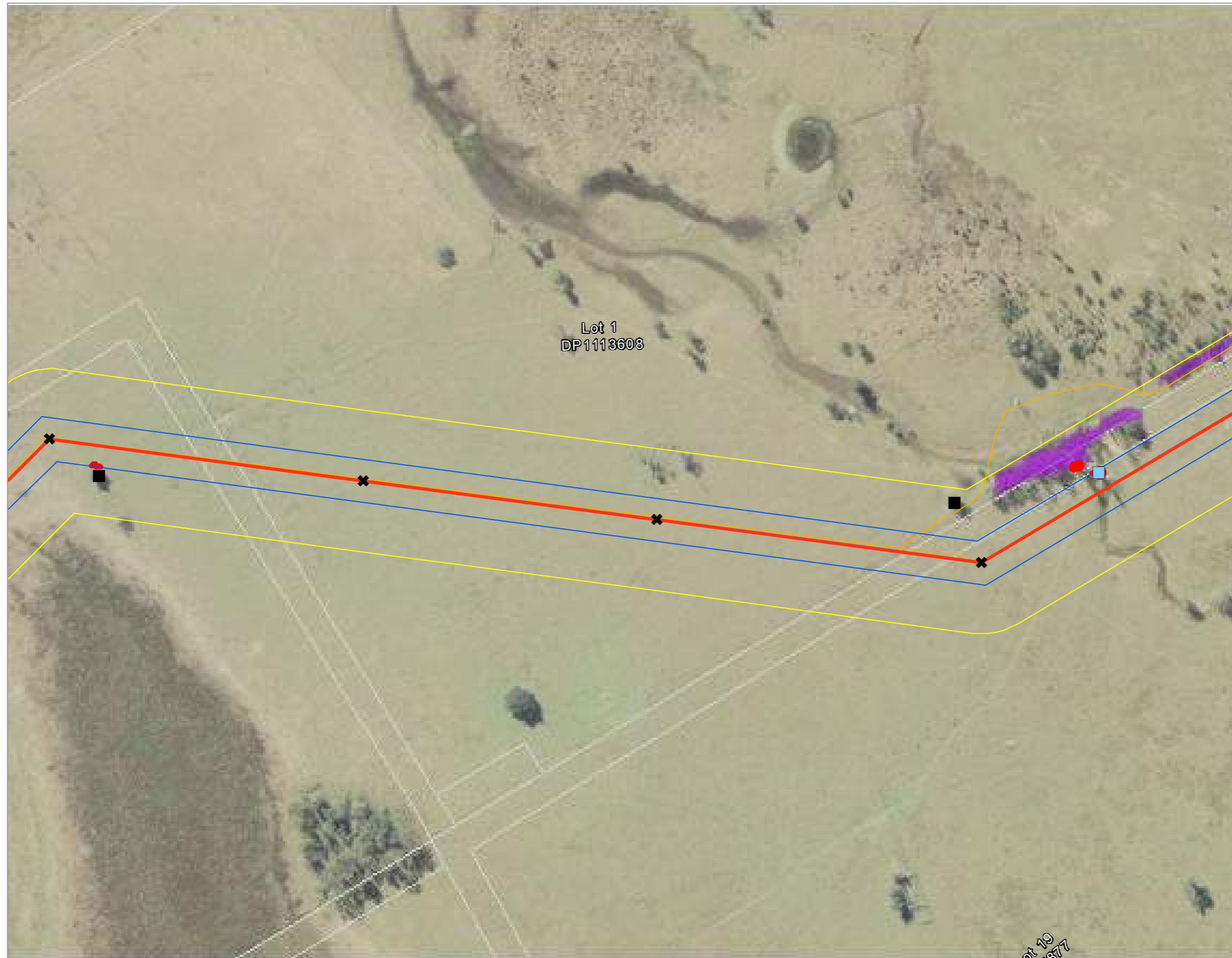




LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Swamp Oak)
- Grassland (wet meadow)
- Sedgeland (Pin Rush)
- Danger tree
- ✕ Pole location
- Swamp Box





LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- Cadastre
- Open forest (Swamp Oak)
- Sedgeland (Pin Rush)
- Danger tree
- ✕ Pole location
- Swamp Box
- Swamp Oak

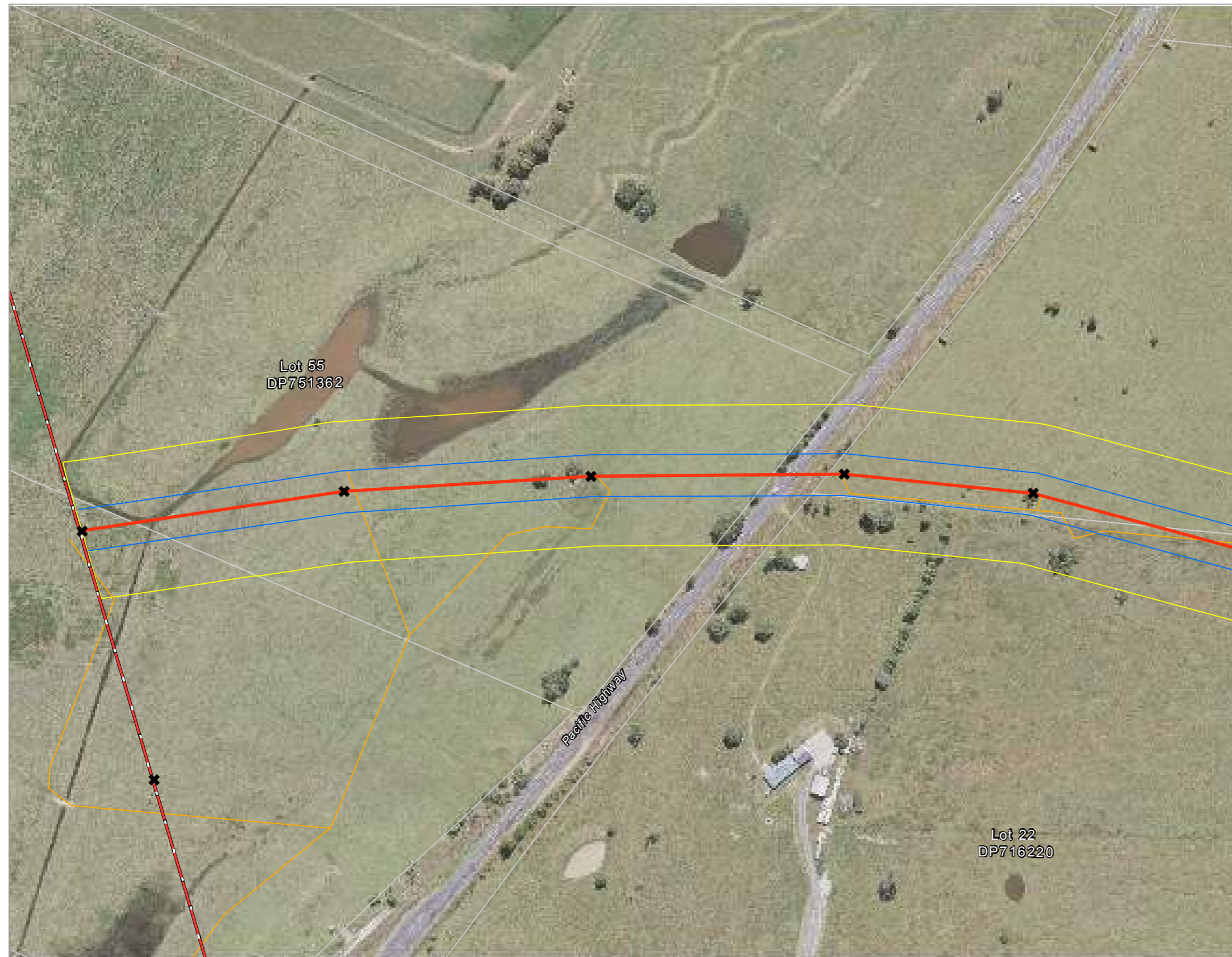











LEGEND

- Proposed CCC line route centreline - Jan 2019
- 15 m each side (30m easement)
- Access track
- 100 m investigation area
- ▨ Clarence Correctional Centre
- ▭ Cadastre
- Open forest (Spotted Gum, Grey Box)
- Open forest (Swamp Oak)
- Danger tree
- ✕ Pole location
- Pole dump / laydown area
- Broad-leaved
- Spotted Gum

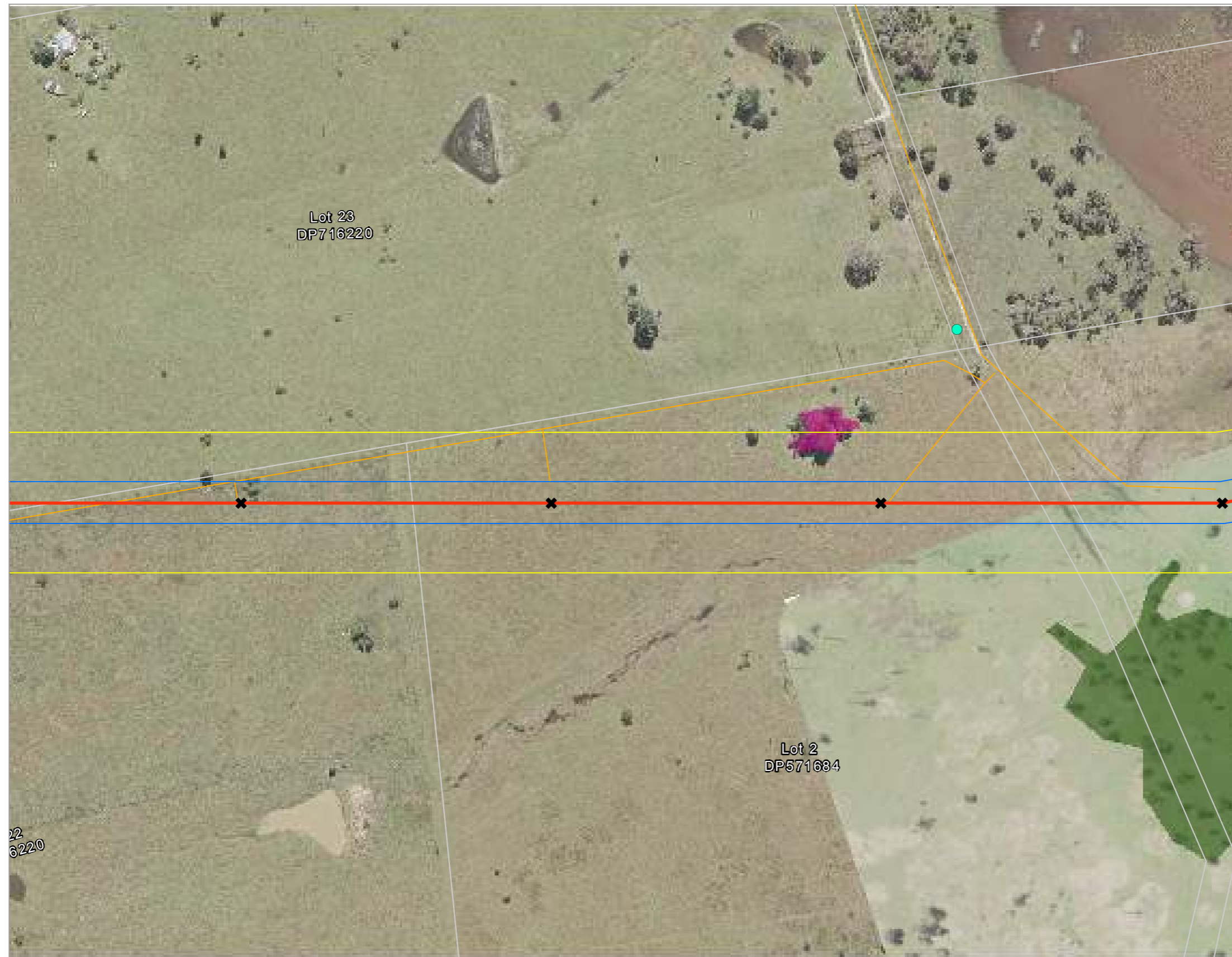




LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Existing powerline
-  Pole location













LEGEND

- 100 m investigation area
- Cadastre
- Freshwater Wetlands on Coastal Floodplains
- Lowland Rainforest
- Subtropical Coastal Floodplain Forest
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- Pole location
- Pole dump / laydown area












LEGEND

-  100 m investigation area
-  Cadastre
-  Freshwater Wetlands on Coastal Floodplains
-  Subtropical Coastal Floodplain Forest
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location

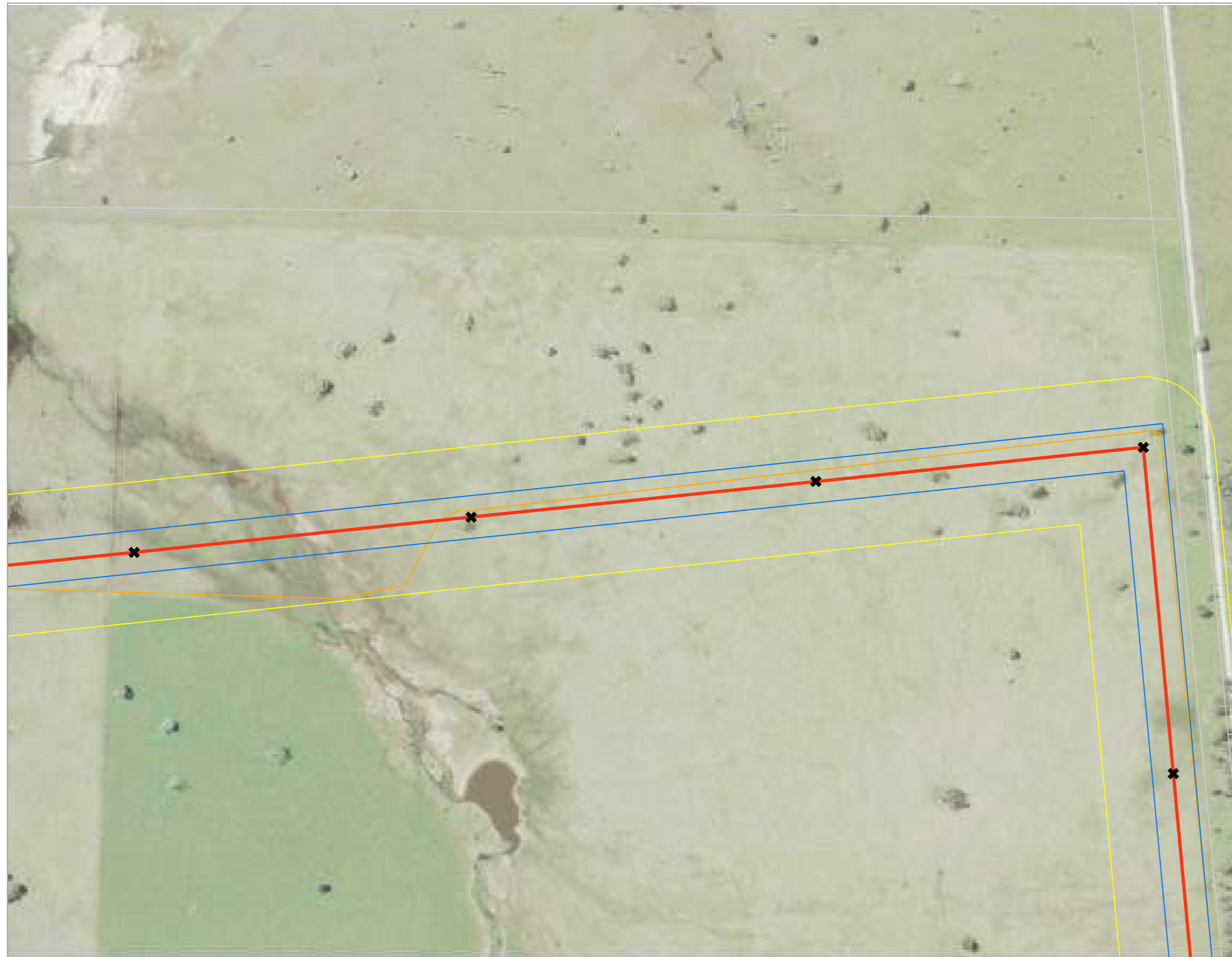










LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Pole dump / laydown area












LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location











LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Pole dump / laydown area











LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location

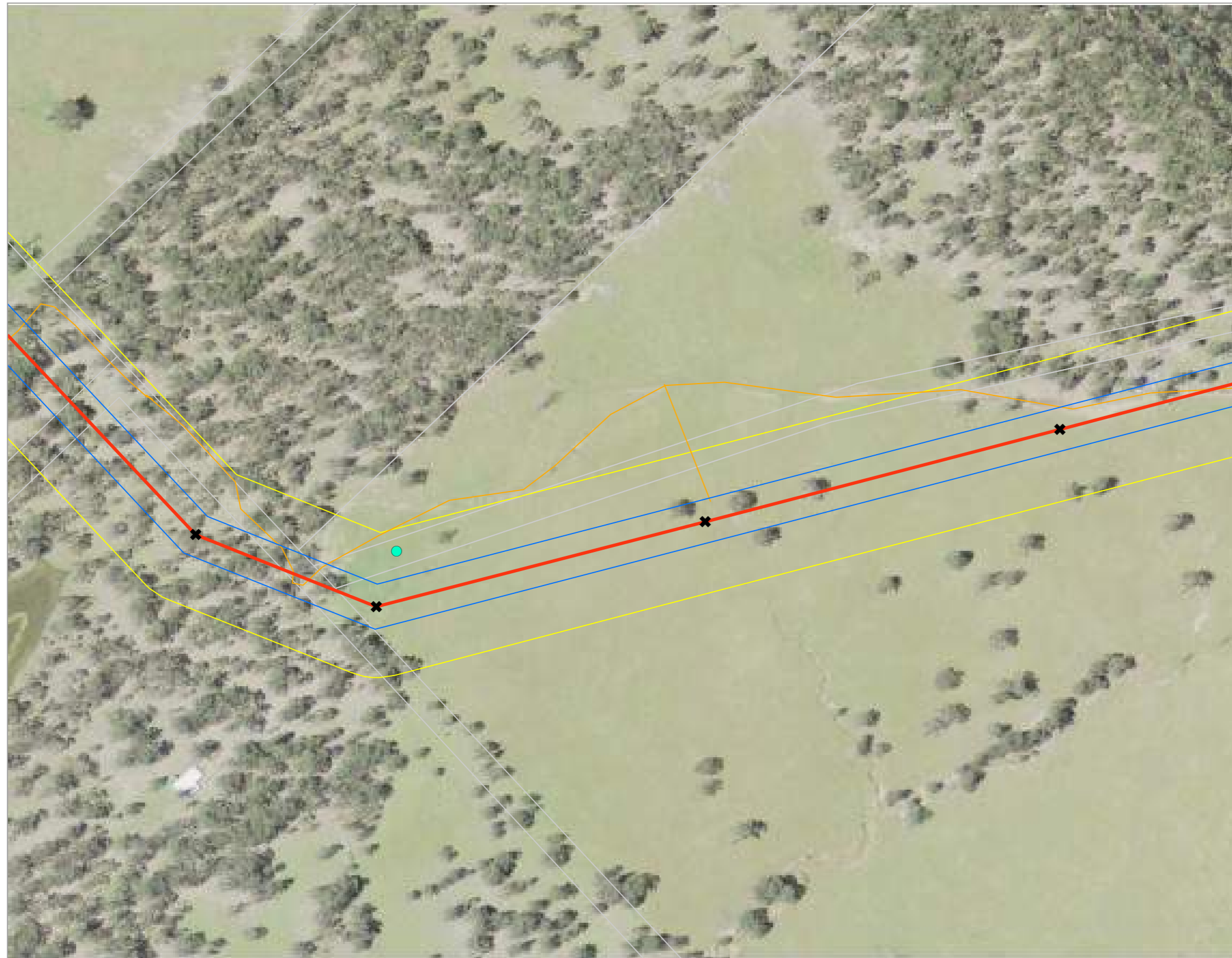











LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location











LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Pole dump / laydown area













LEGEND

-  100 m investigation area
-  Cadastre
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location

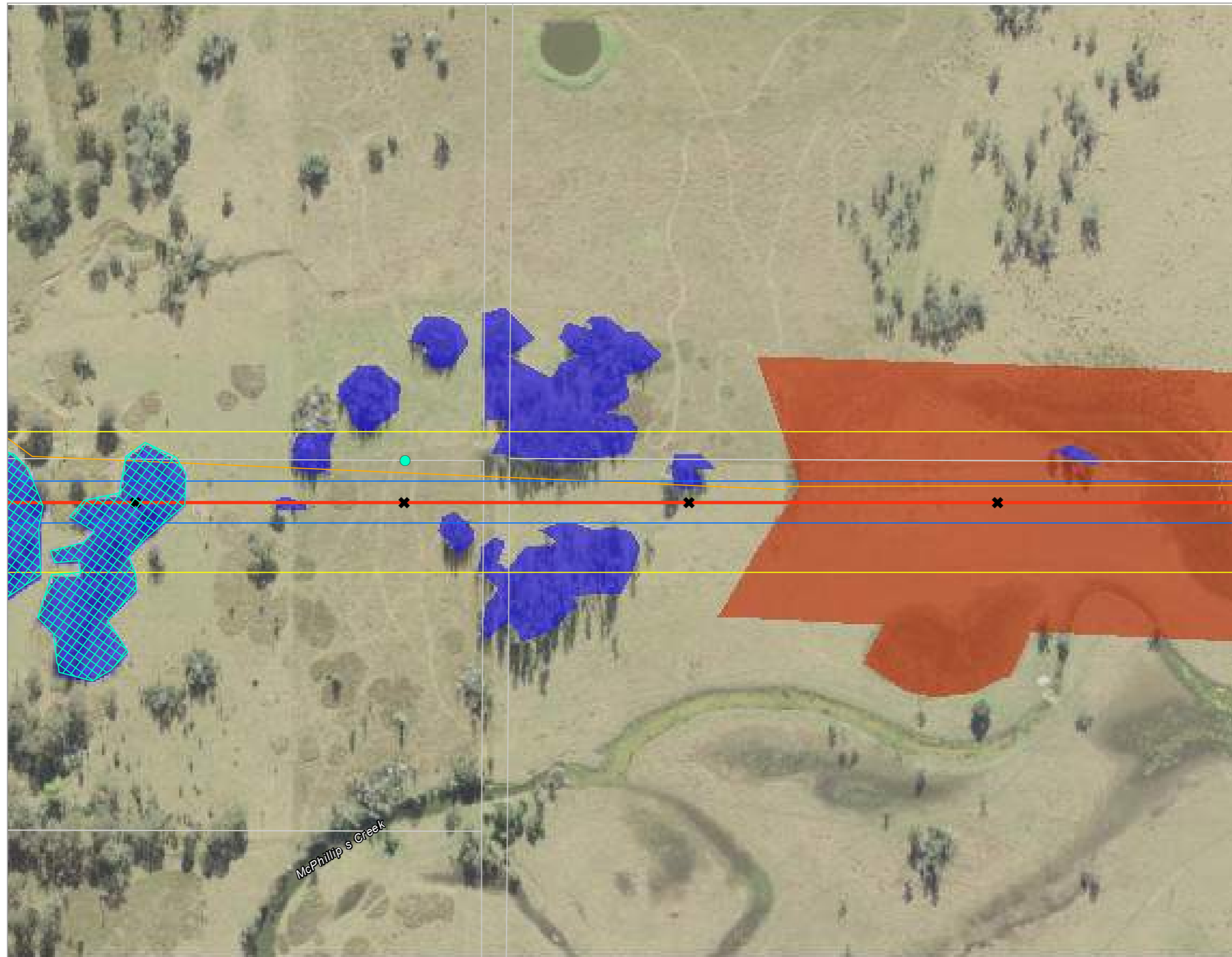




LEGEND

-  100 m investigation area
-  Cadastre
-  Coastal Swamp Oak Forest of NSW and SEQ (EPBC Act)
-  Swamp Oak Floodplain Forest
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location

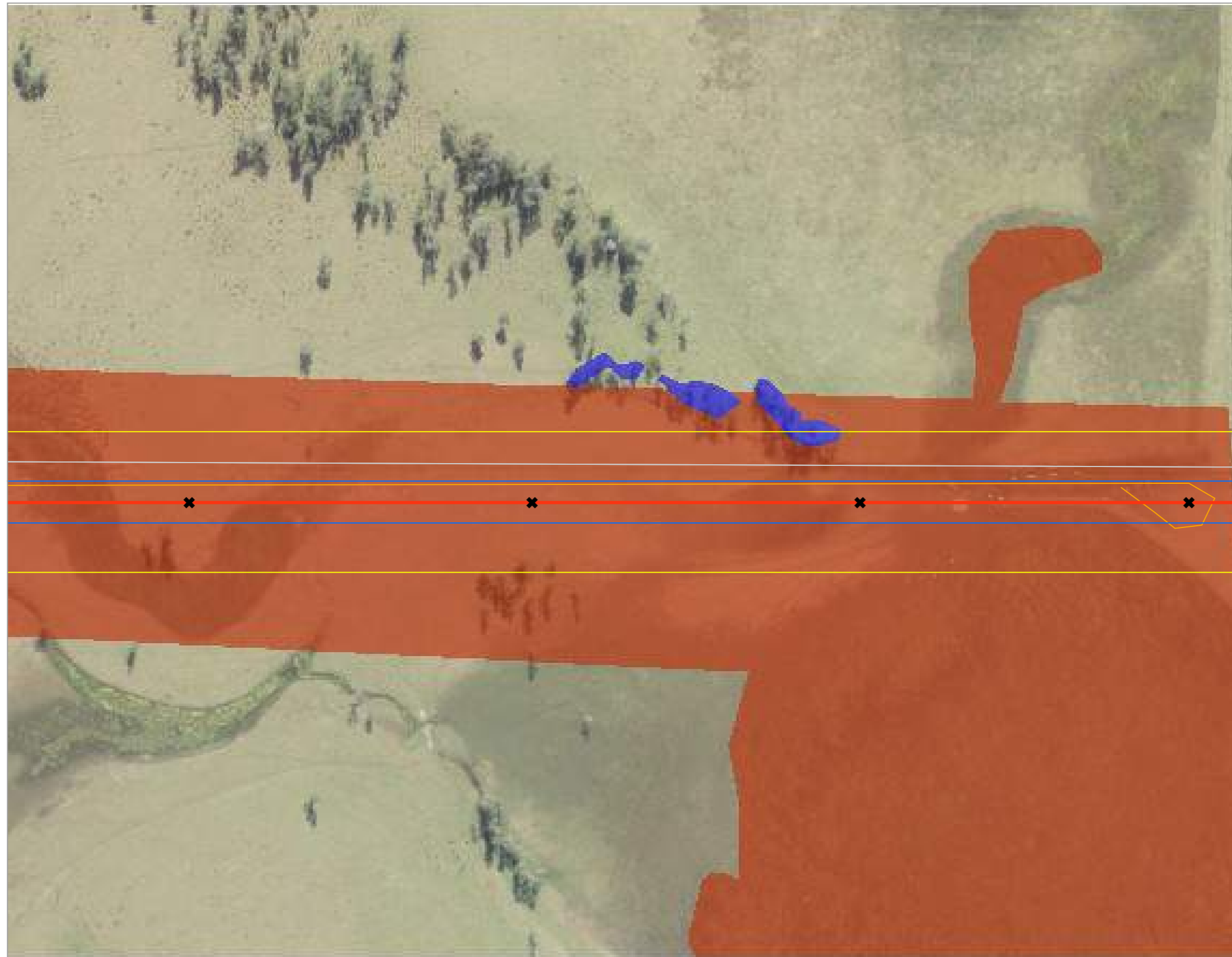












LEGEND

- 100 m investigation area
- Cadastre
- Coastal Swamp Oak Forest of NSW and SEQ (EPBC Act)
- Freshwater Wetlands on Coastal Floodplains
- Swamp Oak Floodplain Forest
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- Pole location
- Pole dump / laydown area

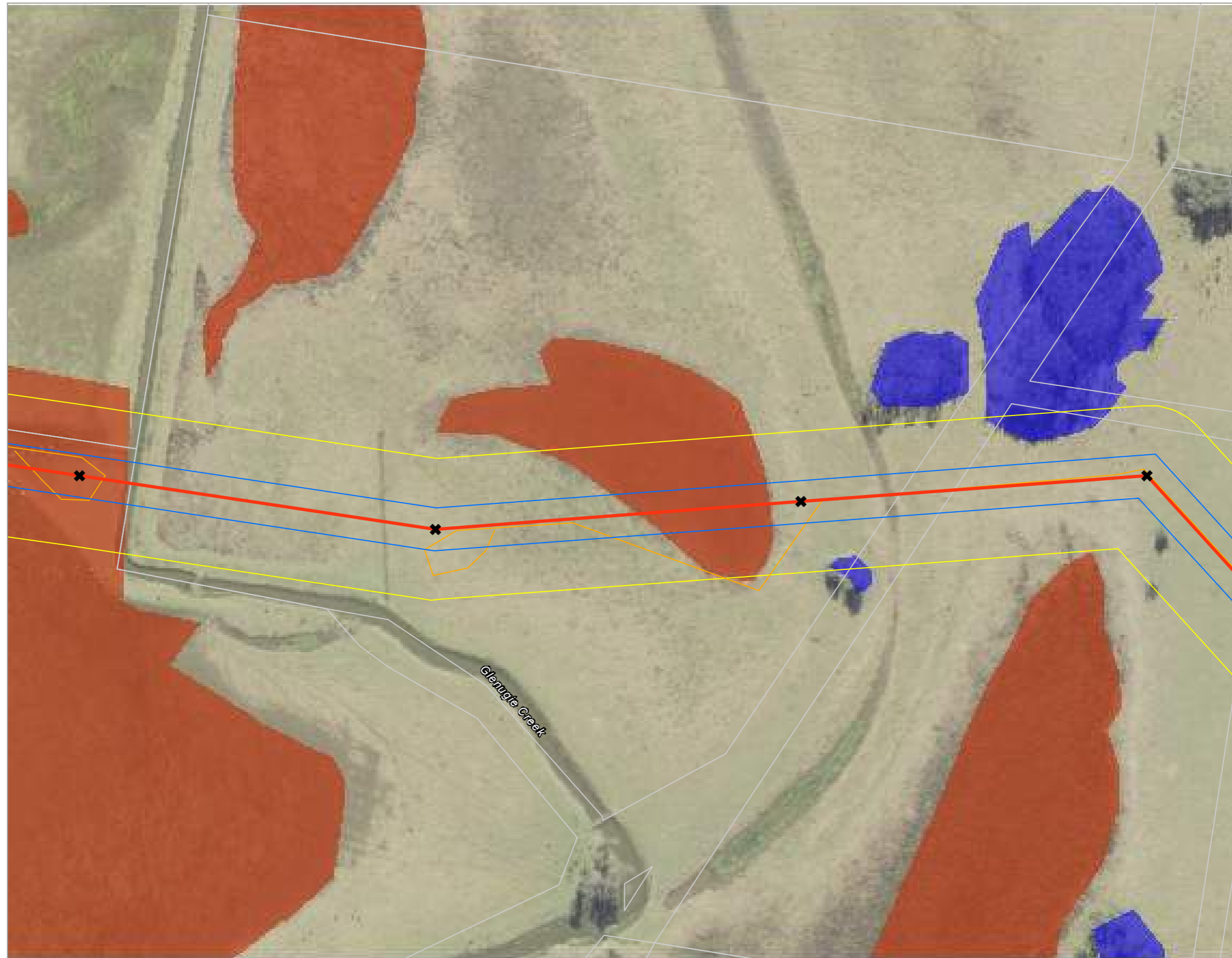












LEGEND

-  100 m investigation area
-  Cadastre
-  Freshwater Wetlands on Coastal Floodplains
-  Swamp Oak Floodplain Forest
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location

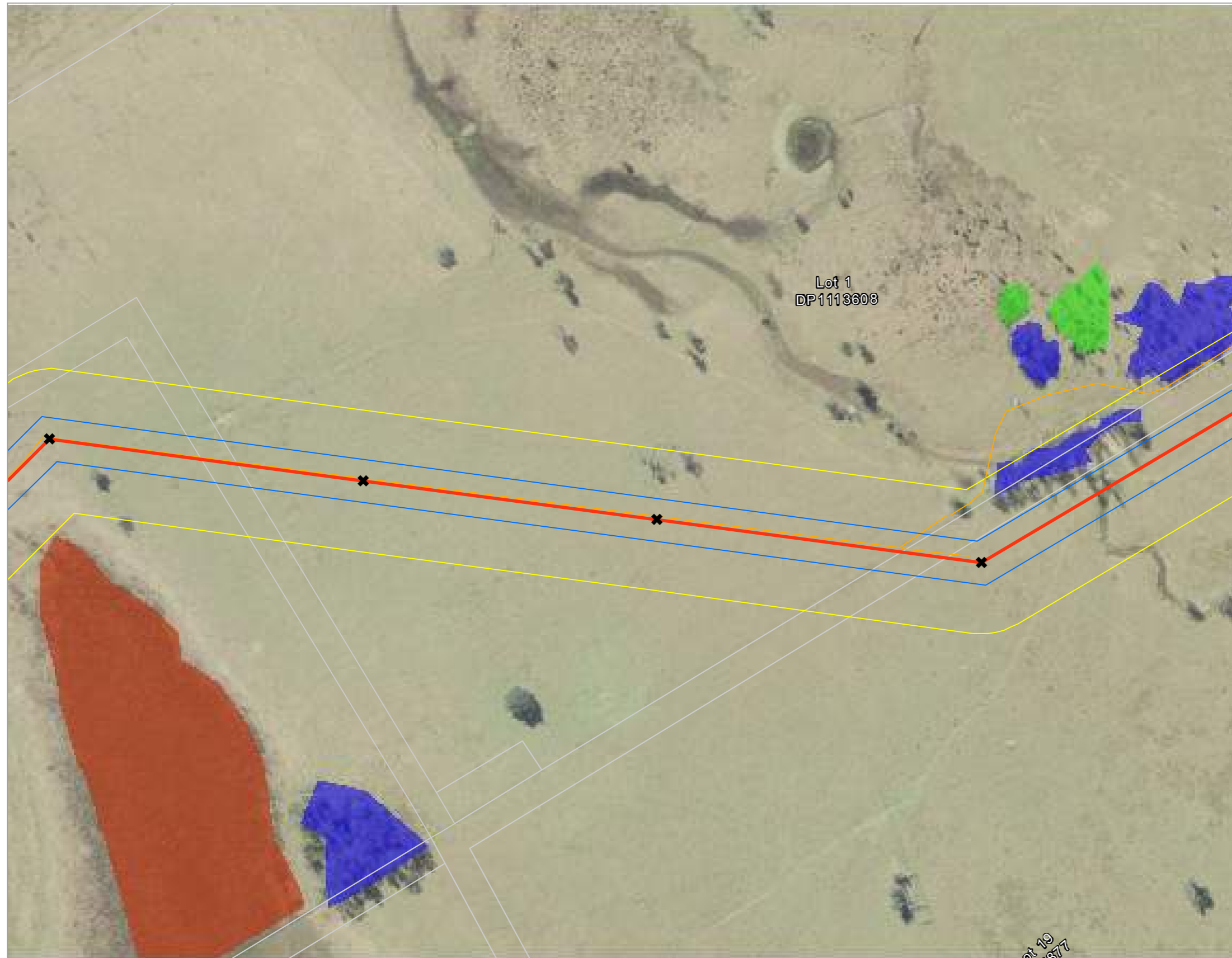













LEGEND

-  100 m investigation area
-  Cadastre
-  Freshwater Wetlands on Coastal Floodplains
-  Swamp Oak Floodplain Forest
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location














LEGEND

-  100 m investigation area
-  Cadastre
-  Freshwater Wetlands on Coastal Floodplains
-  Swamp Oak Floodplain Forest
-  Weeping Paperbark
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location





LEGEND

-  100 m investigation area
-  Clarence Correctional Centre
-  Cadastre
-  Swamp Oak Floodplain Forest
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Pole dump / laydown area



4. Fauna

4.1 Desktop Analysis

4.1.1 Database Search Results

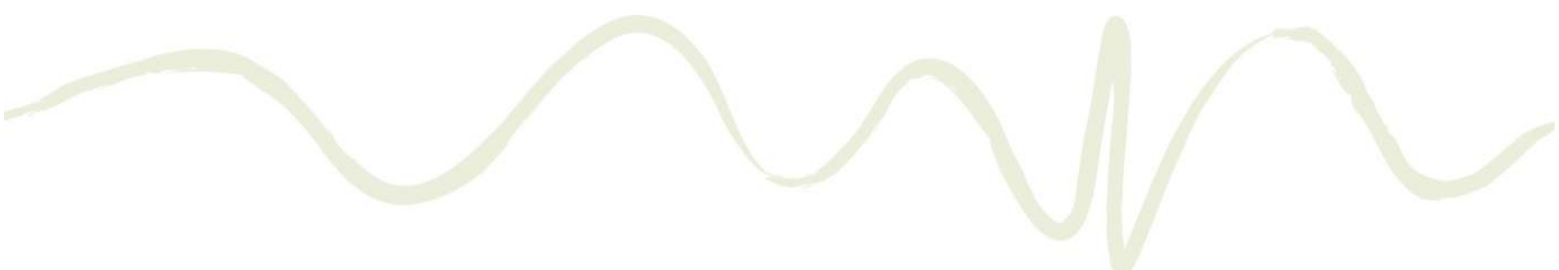
BioNet search results identified records of 68 threatened fauna species within the locality, including nine species listed in the EPBC Act (refer to **Table 4.1**). BioNet records of threatened fauna in proximity to the alignment are shown at **Illustration 4.1**.

Table 4.1 Threatened Fauna Recorded within the Locality

Scientific Name	Common Name	BC Act	EPBC Act
Invertebrates			
<i>Petalura litorea</i>	Coastal Petaltail	E	-
Amphibians			
<i>Crinia tinnula</i>	Wallum Froglet	V	-
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E
Reptiles			
<i>Cacophis harriettae</i>	White-crowned Snake	V	-
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	V	V
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V	-
Birds			
<i>Anseranas semipalmata</i>	Magpie Goose	V	-
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	V	-
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-
<i>Circus assimilis</i>	Spotted Harrier	V	-
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-
<i>Dromaius novaehollandiae</i>	Emu population in the NSW North Coast Bioregion	E	-
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	V
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-
<i>Grus rubicunda</i>	Brolga	V	-
<i>Gygis alba</i>	White Tern	V	-
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	-
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V	-

Scientific Name	Common Name	BC Act	EPBC Act
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-
<i>Lathamus discolor</i>	Swift Parrot	E	CE
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V	-
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-
<i>Ninox connivens</i>	Barking Owl	V	-
<i>Ninox strenua</i>	Powerful Owl	V	-
<i>Onychoprion fuscata</i>	Sooty Tern	V	-
<i>Pandion cristatus</i>	Eastern Osprey	V	-
<i>Petroica boodang</i>	Scarlet Robin	V	-
<i>Petroica phoenicea</i>	Flame Robin	V	-
<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V	-
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-
<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	V	-
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V	-
<i>Rostratula australis</i>	Australian Painted Snipe	E	E
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-
<i>Stictonetta naevosa</i>	Freckled Duck	V	-
<i>Sternula albifrons</i>	Little Tern	E	-
<i>Tyto novaehollandiae</i>	Masked Owl	V	-
<i>Tyto tenebricosa</i>	Sooty Owl	V	-
Mammals			
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V	-
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V	-
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-
<i>Mormopterus lumsdenae</i>	Northern Free-tailed Bat	V	-
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-
<i>Myotis macropus</i>	Southern Myotis	V	-
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V	-
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-
<i>Petaurus norfolkensis</i>	Squirrel Glider	V	-
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Planigale maculata</i>	Common Planigale	V	-
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-

V = Vulnerable; E = Endangered; CE = Critically Endangered



PMST results identified habitat for 42 threatened fauna species and 36 migratory fauna species within 10 km of the study area.

The Fisheries NSW Spatial Data Portal maps habitat for Purple Spotted Gudgeon at two locations within the site (refer to **Illustration 4.1**), including Washpen Creek in the west and Glenugie Creek in the east.

4.1.2 Local Studies

Field assessment for the *Biodiversity Assessment Report* (Jacobs 2017) recorded nine threatened fauna species at the CCC site:

- Black-necked Stork (*Ephippiorhynchus asiaticus*)
- Brolga (*Grus rubicunda*)
- Brown Treecreeper (*Climacteris picumnus victoriae*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathamii*)
- Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Little Bentwing-bat (*Miniopterus australis*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Rufous Bettong (*Aepyprymnus rufescens*).

Works at the CCC and nearby highway clearing works serviced by GeoLINK ecologists have also detected several threatened fauna species:

- Brush-tailed Phascogale (*Phascogale tapoatafa*)
- Little Lorikeet
- Rufous Bettong
- White-crowned Snake (*Cacophis harriettae*).

Other records of threatened fauna in close proximity to the site in the W2B project database include:

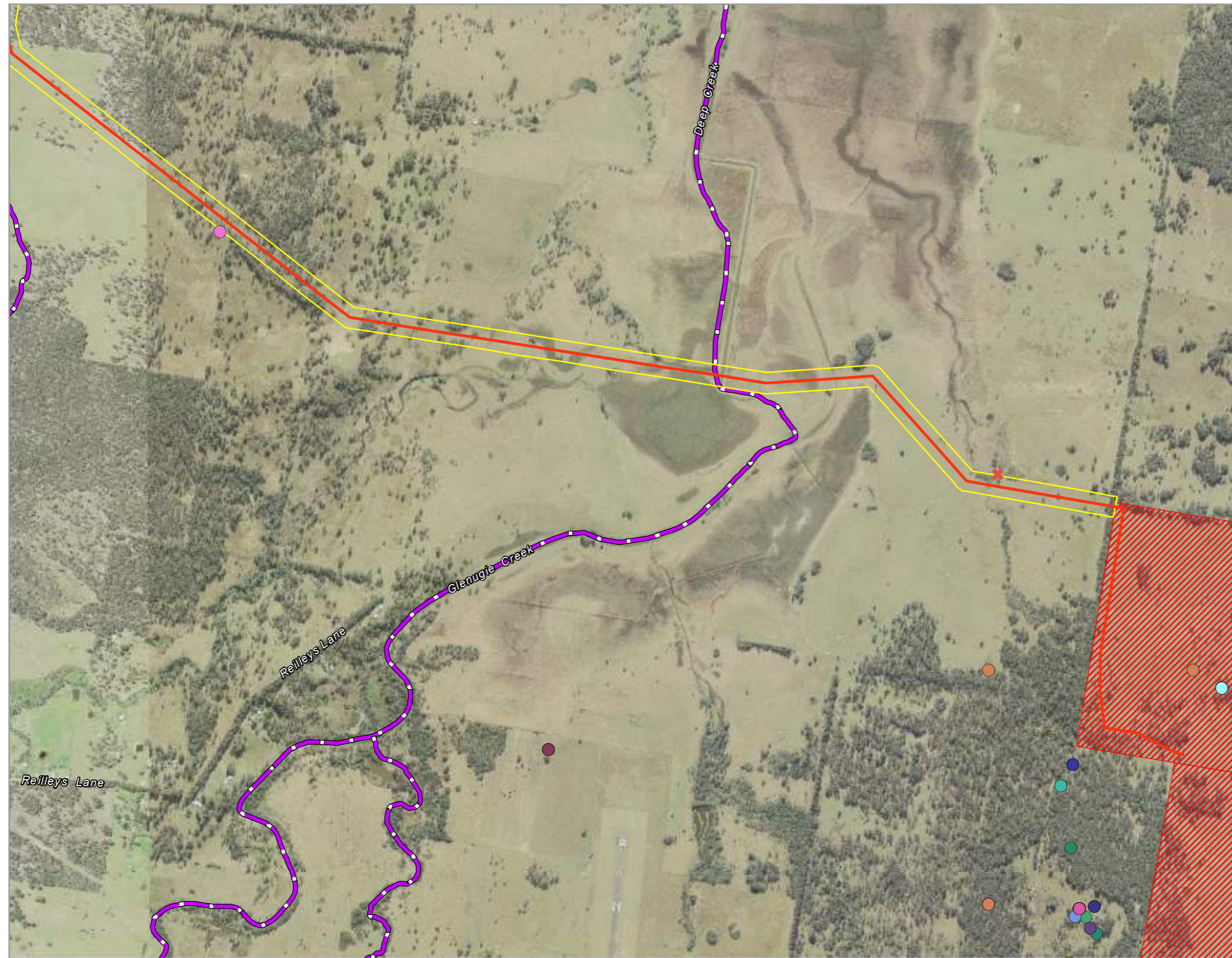
- Black-chinned Honeyeater
- Bush Stone-Curlew
- Common Blossom Bat
- Eastern Grass Owl
- Magpie Goose.



LEGEND

- Proposed CCC line route centreline - Jan 2019
- 100 m investigation area
- Existing powerline
- Purple Spotted Gudgeon (Potential habitat)
- Bionet Atlas Records**
- Black-necked Stork
- Brush-tailed Phascogale
- Bush Stone-curlew
- Comb-crested Jacana
- Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area
- Grey-crowned Babbler (eastern subspecies)
- Grey-headed Flying-fox
- Koala
- Little Eagle
- Magpie Goose
- Rufous Bettong
- Scarlet Robin
- Spotted Harrier
- Spotted-tailed Quoll
- Square-tailed Kite
- White-bellied Sea-Eagle
- Threatened Fauna (GeoLINK Survey)**
- ✦ Black-necked Stork
- ✦ Dusky Woodswallow
- ✦ Little Lorikeet





LEGEND

- Proposed CCC line route centreline - Jan 2019
 - 100 m investigation area
 - Clarence Correctional Centre
 - Purple Spotted Gudgeon (Potential habitat)
- Bionet Atlas Records**
- Black-chinned Honeyeater (eastern subspecies)
 - Brolga
 - Brown Treecreeper (eastern subspecies)
 - Brush-tailed Phascogale
 - Diamond Firetail
 - Dusky Woodswallow
 - Eastern Freetail-bat
 - Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area
 - Glossy Black-Cockatoo
 - Grey-crowned Babbler (eastern subspecies)
 - Grey-headed Flying-fox
 - Hoary Wattled Bat
 - Little Bentwing-bat
 - Little Lorikeet
 - Magpie Goose
 - Masked Owl
 - Rufous Bettong
 - Southern Myotis
 - Squirrel Glider
 - Wallum Froglet
 - Weeping Paperbark
 - White-bellied Sea-Eagle
 - Yellow-bellied Glider
 - Yellow-bellied Sheath-tail-bat
- Threatened Fauna (GeoLINK Survey)**
- ✕ Grey-crowned Babbler





4.2 Site Assessment

4.2.1 Fauna Records and Habitat

Four amphibian species, five reptile species, 92 bird species and six mammal species were recorded during field assessments (refer to **Appendix E**). A high diversity of bird species was recorded.

4.2.2 Threatened and Significant Fauna

Four threatened fauna species were recorded during field assessments (these are included at **Illustration 4.1**):

- Dusky Woodswallow: pair observed foraging over the southern portion of the Crown Reserve.
- Grey-crowned Babbler: a small family group of eight birds were observed at Lot 1 DP1113608 (east of site) in a grove of Weeping Paperbark and Swamp Oak. This same family group was observed on two of five visits to this part of the alignment. Numerous roost dormitories (n=18) are present in this area however are typically degraded (some to the point of disintegration) and do not appear to be in use.
- Little Lorikeet: pairs or small parties recorded overflying the site at Four Mile Lane, Tancreds Lane, the Crown Reserve and observed foraging on flowering Forest Red Gum adjacent to Washpen Creek. The species is likely to opportunistically utilise any dry sclerophyll forest communities within the site and locality.
- Black-necked Stork (BNS): an immature male was observed loafing in open pasture near the watercourse on Lot 2 DP571684. A pair of Black-necked Storks were also observed foraging in a small wetland on Four Mile Lane (18/04/2018), approximately 2.6 km north of the site. Black-necked Storks are known to frequent wetland habitats in the locality on a regular basis.

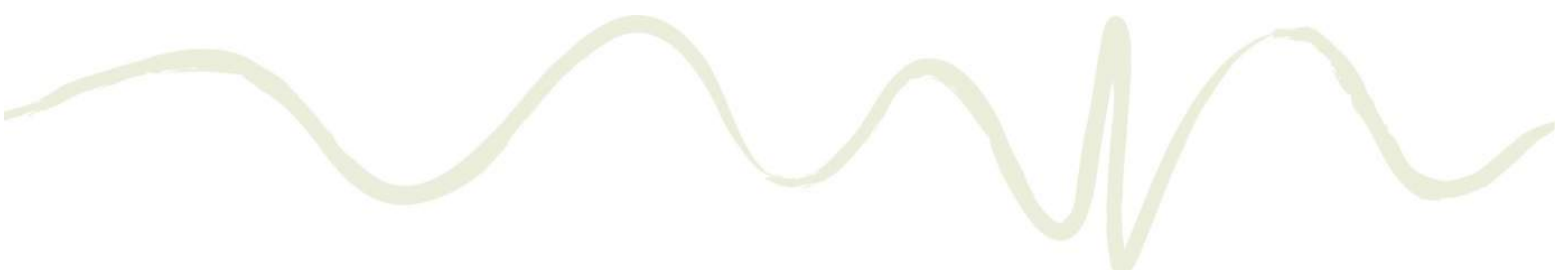
Four migratory species listed in the EPBC Act were recorded; Cattle Egret, Black-faced Monarch, Rainbow Bee-eater and White-throated Needletail. All these species are likely to range widely in the locality.

4.2.3 Fauna Habitat

While the study area has been significantly disturbed from past clearing and modification, vegetation present provides habitat for a range of fauna, notably birds. This is largely due to the site comprising a mix of various habitats including modified pasture, extensive areas of dry sclerophyll forest, and areas of swamp forest and wetlands.

Wetland environments are likely to provide good quality habitat for a range of common frog species and provide seasonal foraging habitat for a diversity of waterbirds. Areas of dry sclerophyll forest with woody debris and good ground cover also provide good reptile habitat.

Habitat for ground dwelling mammals is relatively poor due to the lack of good quality forested vegetation with an intact ground or shrub layer (with the exception being the Crown Reserve). Extensive dry sclerophyll forest provides good quality habitat for a range of arboreal mammals such as possums (Brushtail, Common Ringtail) and gliders (Feathertail, Sugar). Several species of microchiropteran bats are also likely to utilise the site as a foraging 'flyway' within a larger area of contiguous foraging habitat. Flowering eucalypts and other myrtaceae species also provide opportunistic foraging resources for flying-foxes.



Hollow-bearing trees occur scattered throughout the site, with the greatest concentrations being in the Crown Reserve (refer to **Illustration 4.2**). The eastern portion of the Crown Reserve also contains a high density of woody debris from fallen trees and branches. A number of scattered paddock trees also contain hollows.

4.2.4 Aquatic Habitat

As noted, the Fisheries NSW Spatial Data Portal maps habitat for Purple Spotted Gudgeon at Washpen Creek in the west and Glenugie Creek in the east of the study area (refer to **Illustration 4.1**). Both of these creeks comprise ephemeral wetland communities which may carry little flow for drier months in the year (winter-spring) and are significantly modified from historic clearing such that riparian vegetation is largely absent and groundcover is reduced to Couch grassland subject to continuous grazing. Water channels are highly modified, lack riparian cover, are heavily silted and contain little habitat of value to Purple Spotted Gudgeon such as gravel spawning beds.

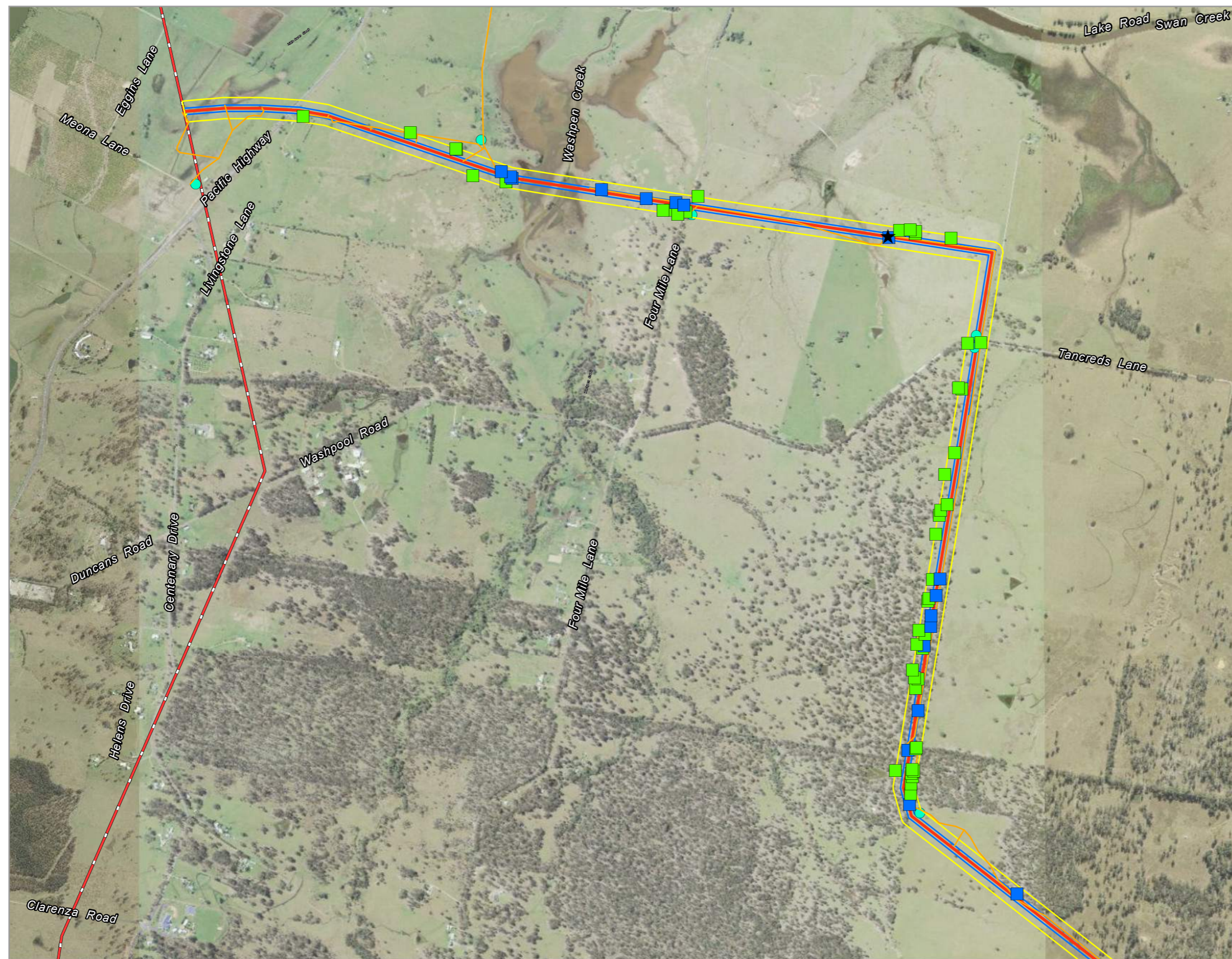
When engaged, these floodplain communities provide habitat for a range of fauna including freshwater turtles, eels, common fish species and a range of waterbirds.

4.2.5 Wildlife Corridors and Key Habitats

The study area does not occur within a mapped wildlife corridor and no Key Habitat occurs (as per Scotts 2003). Forested portions in the central portion of the study area have good connectivity to scattered sclerophyll communities south to the Pacific Highway, which adjoins Bom Bom State Forest. These linkages provide habitat for highly mobile fauna such as macropods, arboreal mammals, bats and birds.

4.2.6 Potential for Threatened Species Occurrence

Based on the desktop analysis, habitat present and survey results, several threatened fauna species have potential to occur within the study area and surrounds (refer to potential occurrence table at **Appendix F**). Tests of significance ('five-part tests') under Section 7.3 of the BC Act have been completed for threatened species recorded or considered as having potential to occur within the study area (refer to **Appendix G**).












- LEGEND**
- 100 m investigation area
 - Existing powerline
 - Proposed CCC line route centreline - Jan 2019
 - 30 m easement
 - Access track
 - Pole dump / laydown area
 - Habitat tree to be removed
 - Habitat tree retained
 - ★ Raptor nest





LEGEND

-  New Grafton Correctional Centre
-  100 m investigation area
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole dump / laydown area
-  Habitat tree to be removed
-  Habitat tree retained
-  Raptor nest

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5. Biodiversity Impacts and Mitigation

5.1 Potential Biodiversity Impacts

As noted, much of the site has been highly modified, but nevertheless retains areas of biodiversity value. Potential biodiversity impacts from construction of the Proposal include:

- Loss of native vegetation.
- Loss of habitat features (dead trees and stags, active nests or dreys).
- Injury or mortality of native fauna during vegetation/ habitat removal.
- Noise and disturbance to locally occurring fauna during the construction period.
- Reduced water quality where works occur within wetland areas.
- Potential impacts to downstream riparian environments from sedimentation and stormwater flows.
- Potential for the spread or introduction of weed propagules.

Details on each of these impacts are described in the sections below (refer also to **Illustration 5.1**).

Once operational, biodiversity impacts of the transmission line are largely limited to the risk of flying fauna colliding with the new cabling. This is a known risk for larger, less able waterbirds (e.g. Black-necked Stork, Brolga), raptors, owls and flying-foxes (including the threatened Grey-headed Flying-fox). Refer to **Section 5.2** for safeguards to minimise these risks.

During the operational phase, the transmission line would not require any significant servicing other than annual maintenance, with minor disturbance to fauna generated by the presence of vehicles; this is unlikely to be significant in a local context.

5.1.1 Native Vegetation Loss

Native woody vegetation will be impacted from clearing of the easement, including removing any adjacent danger trees (as identified by TransGrid). There is potential to retain native vegetation where shrubs are less than 3 m in height. This has particular relevance to isolated thickets of Cockspur (*Maclura cochinchinensis*) which have value to farmers as a shelter for calves.

Grassland (including wet meadows) and sedgeland communities will not require any vegetation clearing, however will be subject to disturbance from the movements of vehicles and plant within and proximate to the transmission line and where excavation is required for pole installation. This is limited to five locations in the east of the site. It should be noted that wet meadows are already subject to periods of 'boom and bust' where vegetation dies back in drier conditions and much of the sedgeland communities revert to exposed cracking clays. Following the works, it is expected that any disturbed areas will be recolonised by grasses and herbs, as already happens under natural environmental circumstances.

The extent of native vegetation loss is summarised at **Table 5.1** and **Table 5.2**. Within the 30 m wide easement, approximately 6.55 ha of woody vegetation will require removal for the works and up to 4.5 ha of degraded freshwater wetlands may be disturbed. Select removal of infrequent scattered paddock trees (including danger trees) is also required at strategic locations. GIS calculation of the danger trees (based on mapping provided by TransGrid) indicates up to 1.43 ha of danger trees may require additional removal adjacent to the easement in areas of woody vegetation. This area is likely to be an over estimation due to overlapping polygons based on crown cover and represents scattered individual trees in the field.

Note: danger tree mapping is approximate only and based on data provided by TransGrid in July 2018 and March 2019. Both datasets show similar locations of danger trees along most of the alignment but different extents of canopy.

In total, woody vegetation loss for the works is estimated as being approximately 8 hectares.

Use of public roads, road reserves and internal farm access tracks will not require any native vegetation loss. All these areas either comprise formed unsealed roads or established single vehicle tracks. While the Crown road south of the Crown appears highly forested, an established 4 m wide vehicle track occurs. This track is used to access lots to the east and accommodates fully laden logging trucks and other machinery.

Table 5.1 Vegetation Loss by Property

<i>Property/ Area</i>	<i>Vegetation Affected</i>	<i>Comments</i>
Transmission Line		
Lots 55 & 56 DP751362	Improved pasture, several Camphor Laurel*, and wet meadows (Couch).	No woody vegetation loss; vegetation impacts negligible.
Lot 23 DP716220	Loss of two immature trees (Rough-leaved Elm, Foambark) < 5 m in height.	Cockspur thickets may be retained.
Lot 22 DP716220	Loss of three immature trees (Small-leaved Tuckeroo) < 4 m in height.	Cockspur thickets may be retained.
Lot 2 DP571684	Several scattered Swamp Box (in west) and eucalypts (Ironbark, Spotted Gum) in east (paddock trees).	Dry rainforest patch retained. Vegetation loss minimal.
Four Mile Lane	Minor tree loss (Spotted Gum, Salwood) in road reserve.	
Lot 2 DP562924	Loss of isolated paddock trees (Spotted Gum, Swamp Box).	Vegetation impacts negligible.
Tancreds Lane	Minor tree loss (Spotted Gum, Grey Box) in road reserve.	
Lot 7004 DP93037 (Crown Reserve)	Loss of Spotted Gum and Grey Box along corridor of approximately 2 km (with danger trees).	~ 2.65 ha of vegetation affected.
Lot 128 DP751362	Loss of Spotted Gum and Grey Box within modified and grazed land	
Lot 132 DP751362	Loss of Spotted Gum and Grey Box within modified and grazed land.	
Lot 1 DP367684	Loss of Spotted Gum and Grey Box within modified and grazed land.	
Lots 2 & 3 DP367684	Minor loss of Spotted Gum/ Grey Box and Swamp Oak regrowth.	
Lot 72 DP751362	Minor loss of Swamp Oak regrowth.	
Lot 20 DP7877	Nominal loss of several Swamp Oak. Disturbance to wet meadows dominated by Couch.	Vegetation impacts negligible.
Lot 1 DP1113608	Disturbance to wet meadows dominated by Couch.	No woody vegetation loss; sedgeland not affected.
Lot 19 DP7877	Loss of five isolated trees (Swamp Oak x 2, Spotted Gum x 2, Broad-leaved Apple x 1).	Vegetation impacts negligible.
Road reserves adjacent to CCC site	Nominal loss of several eucalypts.	Spotted Gum with raptor nest on northern boundary retained. Vegetation impacts negligible.

<i>Property/ Area</i>	<i>Vegetation Affected</i>	<i>Comments</i>
Laydown Areas		
Lot 56 DP751362	Improved pasture, several Camphor Laurel*, and wet meadows (Couch).	No woody vegetation loss; vegetation impacts negligible.
Lot 23 DP716220	Nil	Improved pasture, with surrounding scattered trees (Teak, Brush Ironbark). A single stag will be retained. No trees will be affected.
Lot 2 DP571684 (west)	Nil (improved pasture).	Single habitat tree (a Swamp Box) will be retained; adjacent rainforest patch unaffected.
Lot 2 DP571684 (east)	Nil (improved pasture).	Nearby stag will be retained.
Lot 2 DP571684 (north)	Nil (improved pasture).	
Lot 2 DP571684 (south)	Nil (improved pasture).	
Lot 7004 DP93037 (Crown Reserve) – north	Disturbance to native pasture.	Scattered trees at edges will be retained. Logs on ground relocated.
Lot 7004 DP93037 (Crown Reserve) – west	Nil	Improved pasture, with surrounding scattered Grey Ironbark some of which contain hollows. No trees will be affected.
Lot 1 DP367684	Disturbance to native dominated pasture.	Scattered trees at edges retained.
Lot 1 DP1113608	Nil	Improved pasture, with surrounding scattered trees will not be impacted.
Lot 19 DP7877	Nil	Improved pasture.
Lot 26 DP751376 (CCC)	Disturbance to mixed grassland.	

*Introduced species

Table 5.2 Native Vegetation Impacts

<i>Community</i>	<i>PCT</i>	<i>TEC</i>	<i>Area (ha)</i>
Community 1 Open forest (Spotted Gum, Grey Box)	1209	No	6.02
Community 2 Open forest (Spotted Gum)	1211	No	0.04
Community 5 Open forest (Swamp Oak)	1227	Yes	0.49
Woody vegetation removed within 30 m easement			6.55
Danger trees (typically Community 1 Open forest)			1.43
TOTAL WOODY VEGETATION REMOVED			7.98
Community 7 Grassland (wet meadow)	n/a	Yes	3.80
Community 9 Sedgeland (Pin Rush)	n/a	Yes	0.68
Total grassland/ sedgeland disturbed			4.48



5.1.2 Habitat Features

The transmission line and associated impacts will require the removal of stags (dead trees without hollows) and hollow-bearing trees ('habitat trees') within the easement and where they have been identified as danger trees. A raptor nest (currently inactive) occurs in Lot 19 in the east of the corridor, however this tree does not require removal. A small raptor nest occurs in the east of Lot 2 DP562924 within a Swamp Box with a hollow; the tree is within the easement and will be removed. The nest was inactive at the time of most recent inspection (January 2019).

Woody debris (fallen branches, logs, stumps from former clearing and logging) will require removal and relocation on unmanaged land (road reserves, the Crown Reserve). No obvious active nests or dreys would be affected by the construction works (as of the most recent field assessment [January 2019]).

Up to 24 hollow-bearing trees/ habitat trees are likely to require removal for the works (refer to **Illustration 4.2**). This includes three (3) habitat trees on the edge of the 30 m easement; as GPS points can have inaccuracies, a cautionary approach was taken and it is assumed these trees will require removal. An estimated 80 immature stags without hollows (typically 8 metres or less in height) may also require removal within the Crown Reserve.

5.1.3 Aquatic Impacts

The transmission line corridor traverses several watercourses and floodplain environments associated with Washpen and Glenugie Creeks. However, at these locations, riparian vegetation is largely absent and aquatic vegetation will be retained. As such, impacts of the Proposal on aquatic habitat are largely limited to:

- Disturbance to wet meadows by plant/ vehicles.
- Construction of any temporary access roads (if required) at Glenugie Creek floodplain.
- Minor loss of vegetation for excavation works associated with pole installation and working pads on the Glenugie Creek floodplain.
- Potential for soil mobilisation and erosion/ sedimentation during flood events.

Given the extensive floodplain associated with Glenugie Creek, these impacts are likely to be minor in a local context, particularly due to the poor quality and highly disturbed nature of this environment.

5.1.4 Fauna Mortality

There is potential for injury or mortality to native fauna during several aspects of the construction works during initial site preparation (establishment and implementation of environmental controls), from clearance of vegetation/ habitat and from movement of vehicles and plant. It is expected these impacts would be relatively minor given that affected areas are highly disturbed and that general disturbance during the construction period would cause mobile fauna (e.g. birds, macropods) to vacate affected areas. Impacts on fauna from vehicles and plant are unlikely to be significant given that all vehicles will be moving at low speeds and that all works will be completed during daytime hours (hence reducing impacts on nocturnal fauna). The greatest potential for injury/ mortality of fauna is during the removal of habitat trees, where animals may be resident. These impacts to fauna can be adequately managed by standard mitigation measures (e.g. spotter/ catching during removal of habitat trees); refer to **Section 5.2**.

5.1.5 Noise and Disturbance to Fauna

The construction process will result in vehicles, plant and personnel accessing all parts of the alignment, in addition to access tracks and laydown areas. This will result in low levels of noise and disturbance (e.g. dust) in all these environments over the duration of the works period. Given the open and disturbed nature of the environment it is not anticipated that any significant disturbance to fauna foraging or breeding activities would occur from the construction process.

5.1.6 Water Quality Impacts

Works within the floodplain have potential for disturbance or reduction to water quality (e.g. sedimentation, turbidity, vehicle access) during the construction process. Such impacts have potential for reducing the quality of foraging habitat within wetland environments on a short-term basis. Adoption of strict erosion and sediment controls will minimise risks to aquatic environments.

5.1.7 Weed Establishment

Due to the mobilisation of plant and vehicles during construction, there is potential for weed propagules to be introduced into the site or transferred between properties. This a serious risk given the local occurrence of Tropical Soda Apple (*Solanum viarum*). The *Biosecurity Act 2015* states that: *Owners and occupiers of land on which there is tropical soda apple must notify the local control authority of new infestations; destroy the plants including the fruit; ensure subsequent generations are destroyed; and ensure the land is kept free of the plant. A person who deals with a carrier of tropical soda apple must ensure the plant (and any seed and propagules) is not moved from the land; and immediately notify the local control authority of the presence of the plant on the land, or on or in a carrier.*

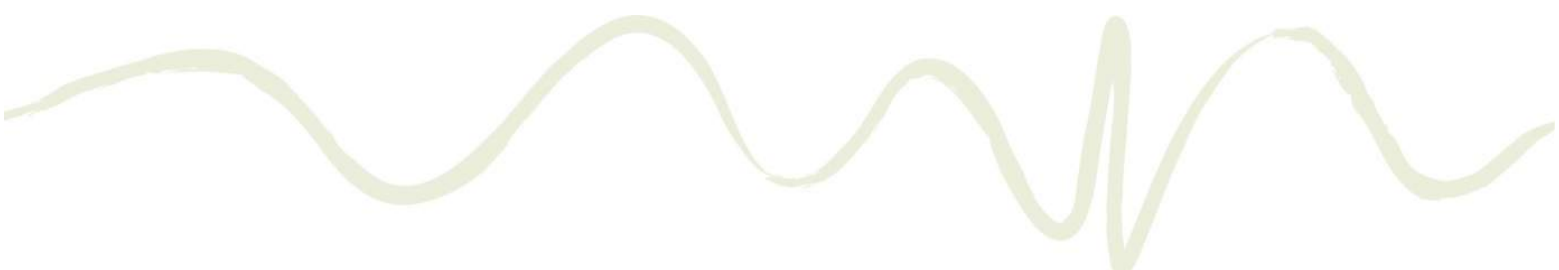
Adoption of strict weed hygiene controls will minimise the risks of weed introduction or spread (refer to **Section 5.2**).

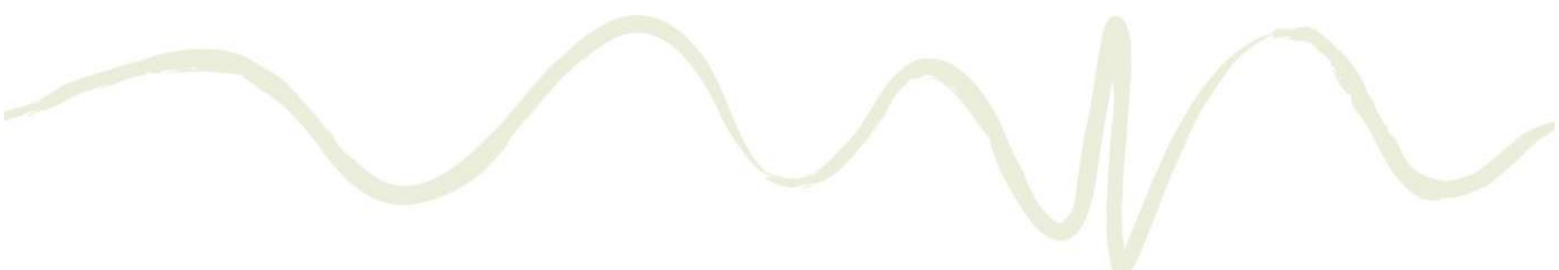
5.2 Mitigation

To minimise biodiversity impacts which may result from the Proposal, a number of mitigation measures are prescribe. Note that all mitigation measures will be included within the project Construction Environmental Management Plan (CEMP) and that and all project personnel are inducted in the requirements of the CEMP. A project ecologist will be appointed to manage biodiversity issues relating to the project during the construction phase.

Mitigation measures are as follows:

1. Clearing of native vegetation will generally not be undertaken outside of the 30 metre easement and laydown areas, with the exception of 'danger trees' which will be identified by Transgrid in consultation with the project ecologist. The limit of vegetation clearing will be clearly delineated on site prior to works commencing.
2. Areas of low shrubs (e.g. Cockspur thickets) will be retained wherever possible.
3. The extent of laydown areas are defined by 'no go' fencing with any native trees within these areas retained in-situ and protected by temporary fencing. The project ecologist will provide guidance on the location of 'no go' fencing.

- 
4. Temporary fencing will be placed around the closest patch of Weeping Paperbark to the works and this area will be defined as a 'no go' zone. The location of fencing will be determined in conjunction with the project ecologist.
 5. Plant and vehicles will utilise existing public roads and farm access tracks wherever possible to minimise vegetation disturbance.
 6. Prior to commencement, an ecologist will clearly mark all habitat trees affected by the works with flagging tape (these trees are already marked with white spray-paint) for the attention of spotter catchers during vegetation clearing. Any 'new' habitat trees (eg. trees with recently constructed nests or dreys) would be marked during this process and GPS records taken and supplied to the contractor/project supervisor.
 7. During habitat tree inspection (as per recommendation 7), attention must be paid to the raptor nest in a Swamp Box in the east of Lot 2 DP562924 to determine if the nest is occupied. If occupied the contractor/project supervisor must be informed promptly so that contingencies can be planned for.
 8. A pre-clearing survey by a suitably licensed and experienced ecologist will be completed prior to the clearing of any vegetation. If arboreal fauna are detected, a 10 m clearing buffer area will be established around trees with non-threatened fauna, while a 40 m buffer area will be established around significant fauna (e.g. Koala) and 24 hours given for the animal to move of its own volition. In the unlikely event that fauna remain following the 24 hour period, the project ecologist will advise alternative solutions.
 9. Prior to clearing, protocols will be developed with the Clarence Native Bees Landcare group regarding the identification and salvage of any native stingless bees that are found in trees to be removed (as identified by project ecologist during pre-clearing inspections). In the event that native stingless bees are within any trees to be removed, protocols for removal will be observed.
 10. If during pre-clearing surveys any 'unexpected finds' are recorded by the ecologist (eg. additional fauna features, threatened flora), these must be marked in the field, recorded by GPS and details promptly reported to the contractor/project supervisor.
 11. As the Crown Reserve provides potential refuge habitat for Rufous Bettong (due to established swards of Blady Grass in the south of the site), vegetation clearing in these areas will be preceded by flush surveys completed by the project ecologist. This will prevent the potential for any sheltering bettongs to be hit by falling trees. As a guide, flush surveys should be completed between poles G22A and G24A.
 12. Vegetation clearing will be completed in a staged process whereby non-habitat trees are cleared first (stage 1) and habitat trees are felled a minimum of two nights after initial stage clearing (stage 2). A suitably licensed and experienced ecologist will be in attendance during the clearing of any habitat trees.
 13. Woody debris (larger logs, branches) on the ground within the transmission line corridor or laydown areas will be relocated into adjacent land where they will not be subject to impact. Woody vegetation requiring removal will be chipped and retained on site for use in erosion control with larger logs placed into areas of adjacent habitat to provide fauna refuge. Millable logs will be salvaged where possible. A landowner register will be established by INSW and salvaged timber managed in accordance with landowner wishes.
 14. Where hollow-bearing trees are removed, compensatory nest boxes will be established, with one next box installed for every habitat tree removed. Nest box compensation will be confirmed with NSW Crown Lands (or other individual landowners) and detailed in a separate *Nest Box Compensation Assessment*. Nest boxes should be installed within 4 weeks of the completion of works within the various sections of the alignment
 15. A *Weed Hygiene Protocol* will be established and included in the CEMP prior to works commencing to ensure the potential for the introduction of weed propagules to the site is minimised. The *Weed Hygiene Protocol* must include consultation with affected landowners and include a targeted survey of all areas likely to be affected by the construction footprint. Any areas



of Tropical Soda Apple will be notified in accordance with requirements of the *Biosecurity Act 2015*.

16. All areas of exposed soil (including tracks access pads etc) created by the works will be seeded with non-invasive grasses (e.g. Japanese Millet) immediately following construction to prevent soil erosion.
17. Transmission line-marking techniques such as aerial marker spheres, spirals and suspended devices (swinging, flapping, and fixed) will be included within the final detailed design. These markers will be attached to earth wires to increase their visibility over wetland areas likely to be utilised by waterbirds and raptors. These spans include G8 – G11 and G38 – G49.

5.3 Compensation

Part 5 assessments under the EP&A Act do not have any mandatory requirements for offsets, as the Biodiversity Offsets Scheme only applies in respect of Part 5 assessment if a proponent elects to apply it. On this basis, no compensation or offsets are proposed.



LEGEND

- Cadastre
- 100 m investigation area
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- Existing powerline
- ✕ Pole location
- Camphor Laurel
- Cockspur thicket
- Cockspur thicket and Foambark
- Cockspur thicket and Rough-leaved Elm
- Forest Red Gum
- Hard Quandong
- Hard Quandong x 2
- Silky Oak
- Small-leaved Fig





LEGEND

- Cadastre
- 100 m investigation area
- ▨ Threatened Ecological Community (TEC)
- Open woodland (Swamp Box)
- Closed forest (Teak)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Cockspur thicket
- Cockspur thicket, Small-leaved Tuckeroo
- Hard Quandong
- Swamp Box

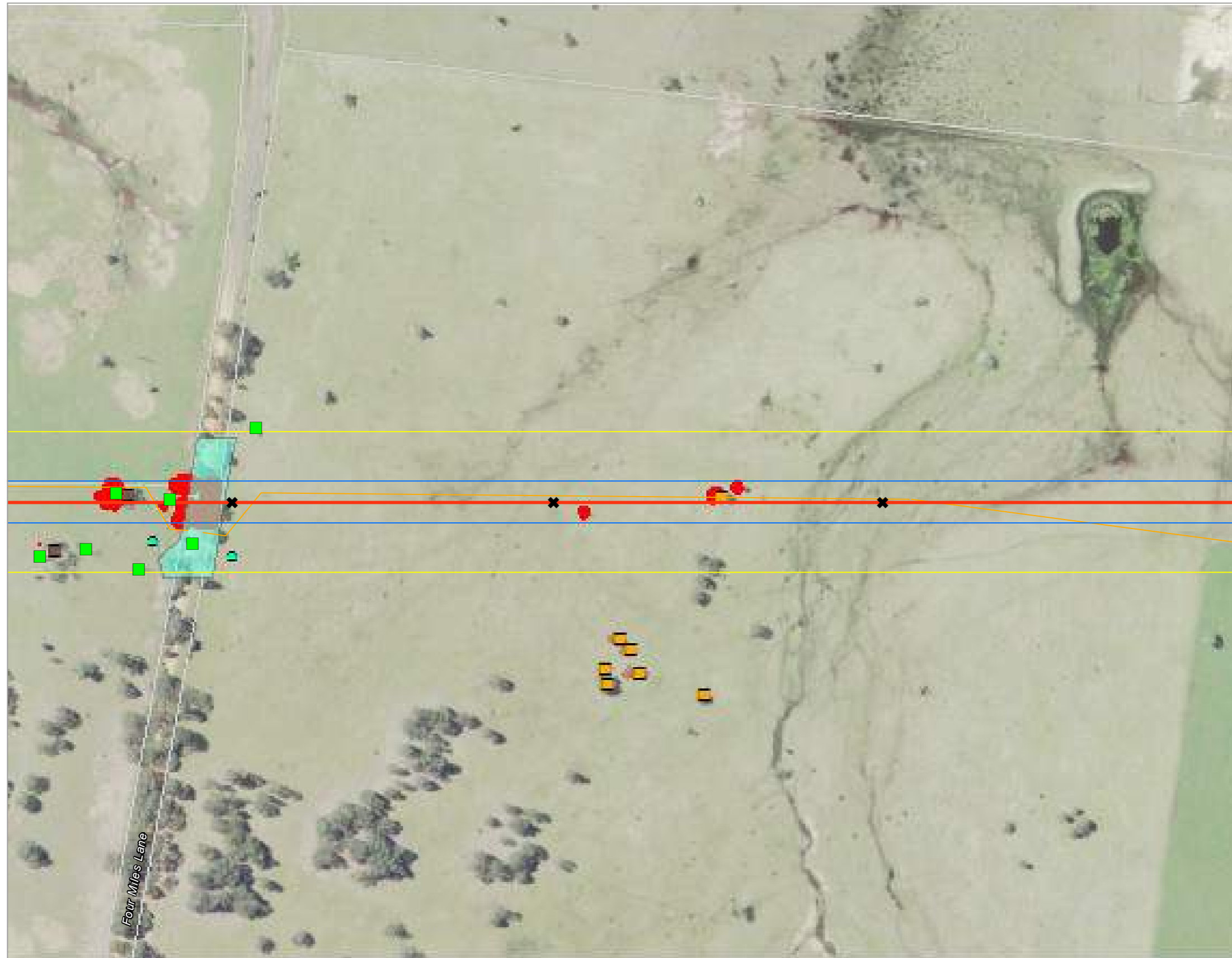




LEGEND

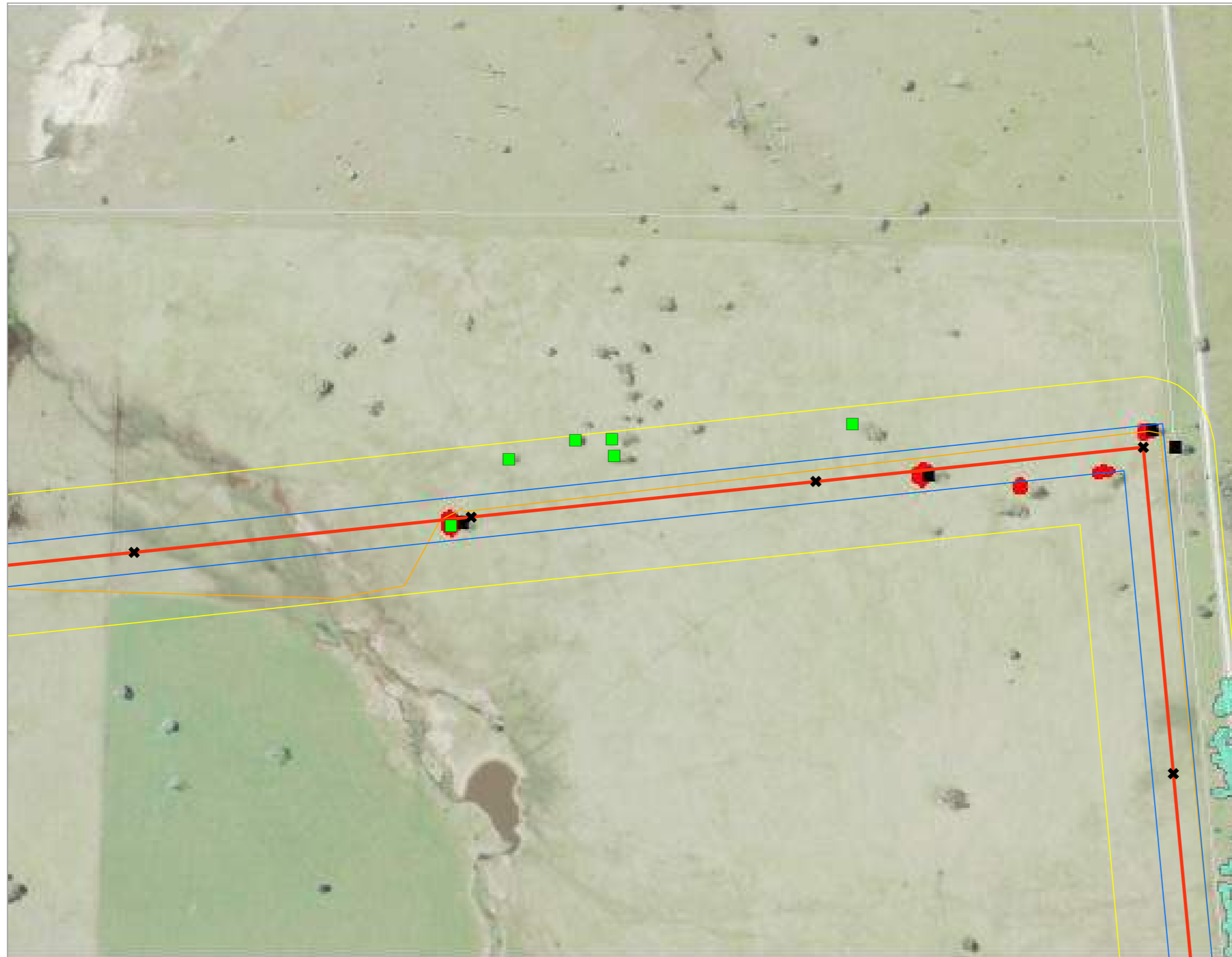
- Cadastre
- 100 m investigation area
- ▨ Threatened Ecological Community (TEC)
- Open woodland (Swamp Box)
- Grassland (wet meadow)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Grey Ironbark
- Spotted Gum
- Swamp Box














- LEGEND**
- Cadastre
 - 100 m investigation area
 - Open forest (Spotted Gum, Grey Box)
 - Danger tree
 - Proposed CCC line route centreline - Jan 2019
 - 30 m easement
 - Access track
 - ✕ Pole location
 - Grey Ironbark
 - Spotted Gum














LEGEND

-  Cadastre
-  100 m investigation area
-  Open forest (Spotted Gum, Grey Box)
-  Danger tree
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Swamp Box

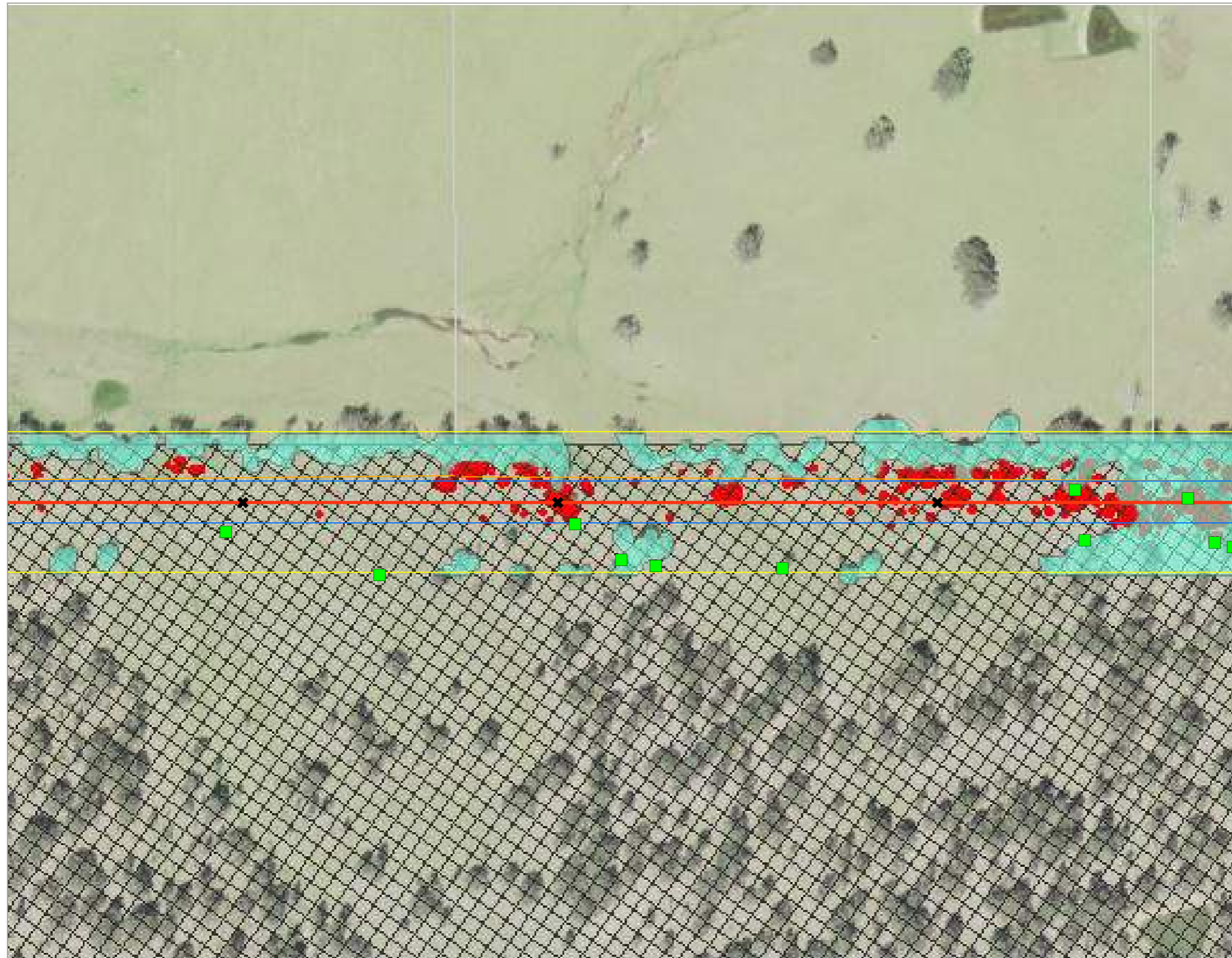




LEGEND

-  Cadastre
-  100 m investigation area
-  Open forest (Spotted Gum, Grey Box)
-  Danger tree
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Crown reserve














LEGEND

- Cadastre
- 100 m investigation area
- Open forest (Spotted Gum, Grey Box)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- Pole location
- Crown reserve

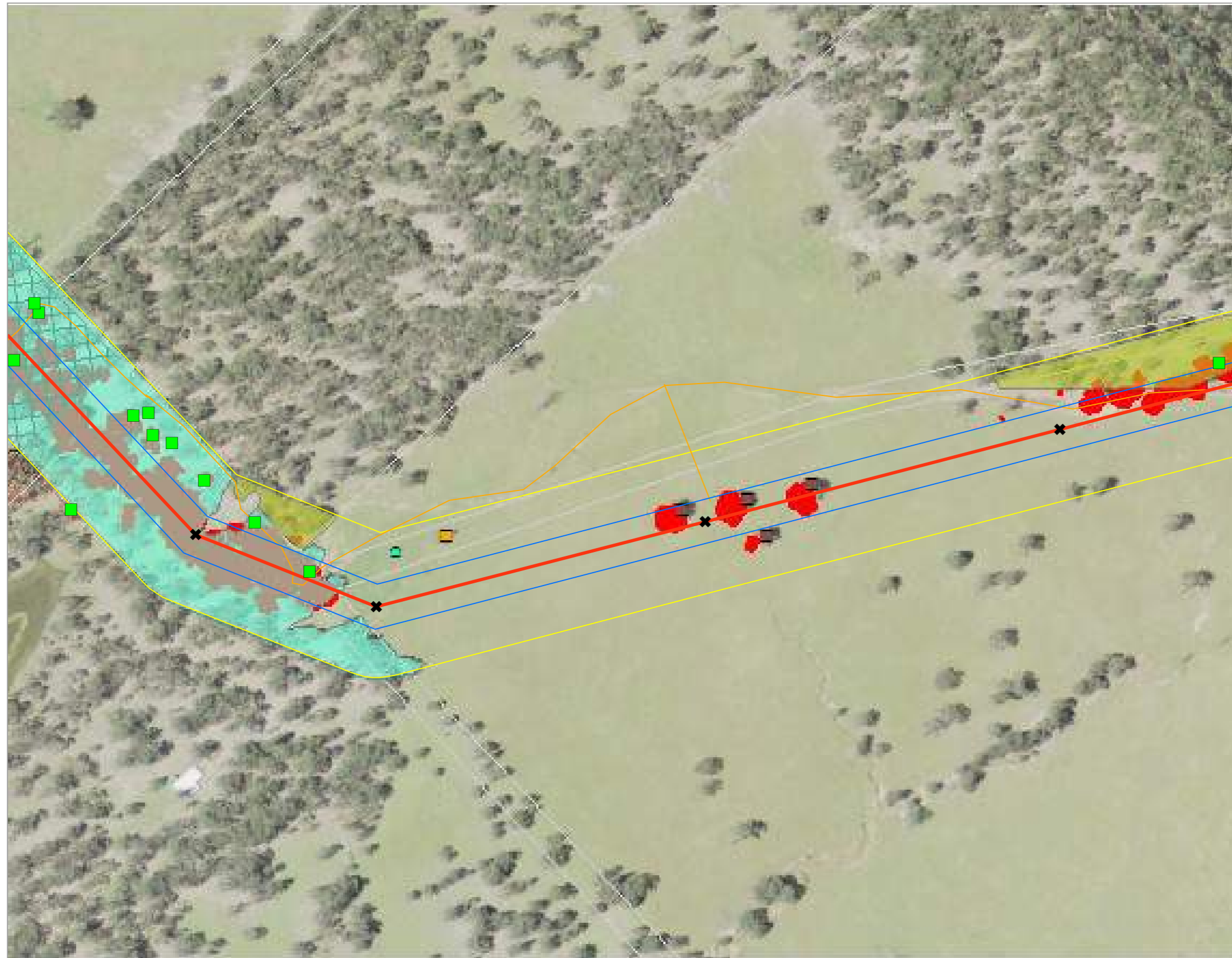




LEGEND

-  Cadastre
-  100 m investigation area
-  Open forest (Spotted Gum, Grey Box)
-  Danger tree
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Crown reserve





LEGEND

- Cadastre
- 100 m investigation area
- Open forest (Spotted Gum, Grey Box)
- Open forest (Spotted Gum)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- ▨ Crown reserve
- Grey Ironbark
- Spotted Gum

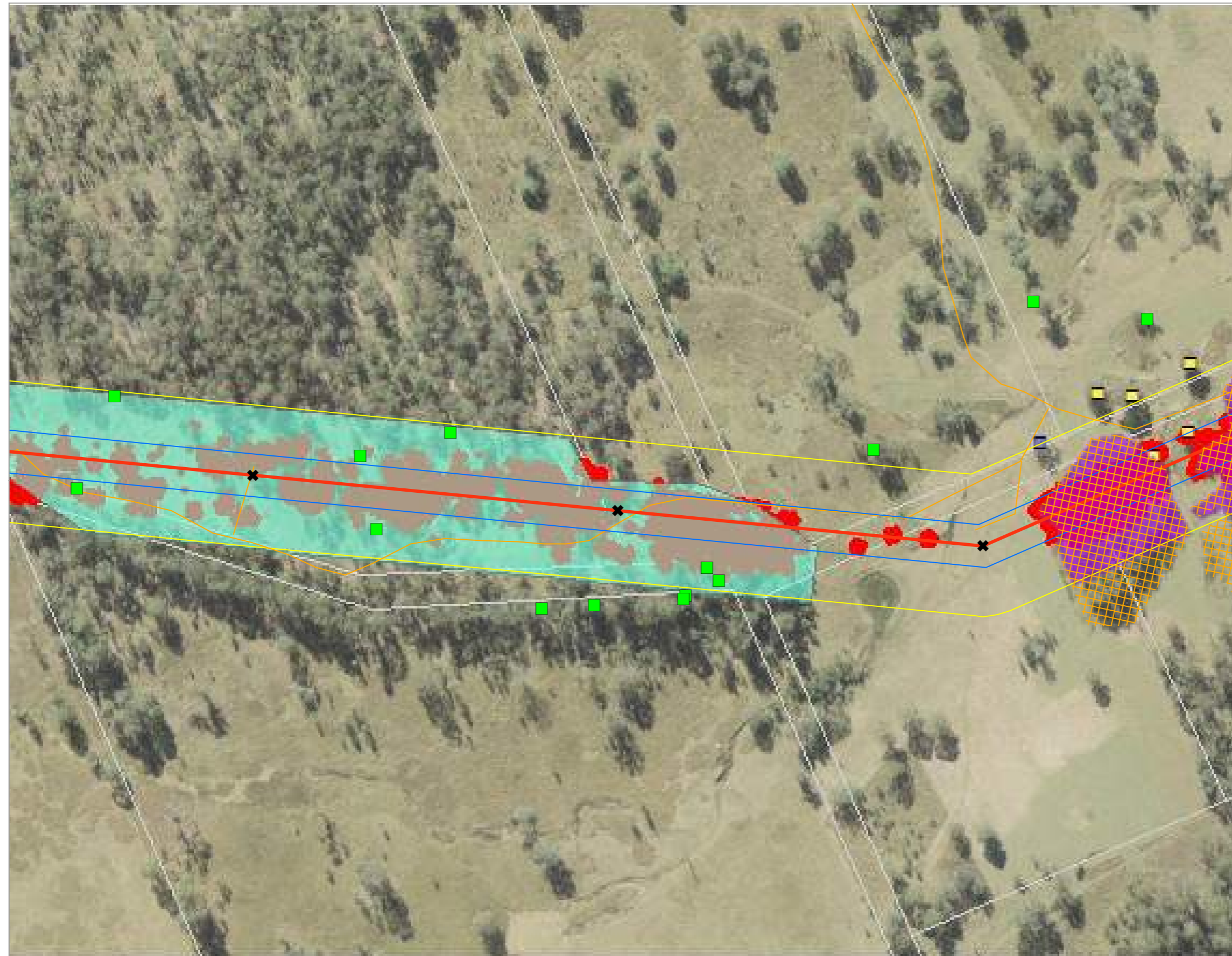




LEGEND

- Cadastre
- 100 m investigation area
- Open forest (Spotted Gum, Grey Box)
- Open forest (Spotted Gum)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Spotted Gum

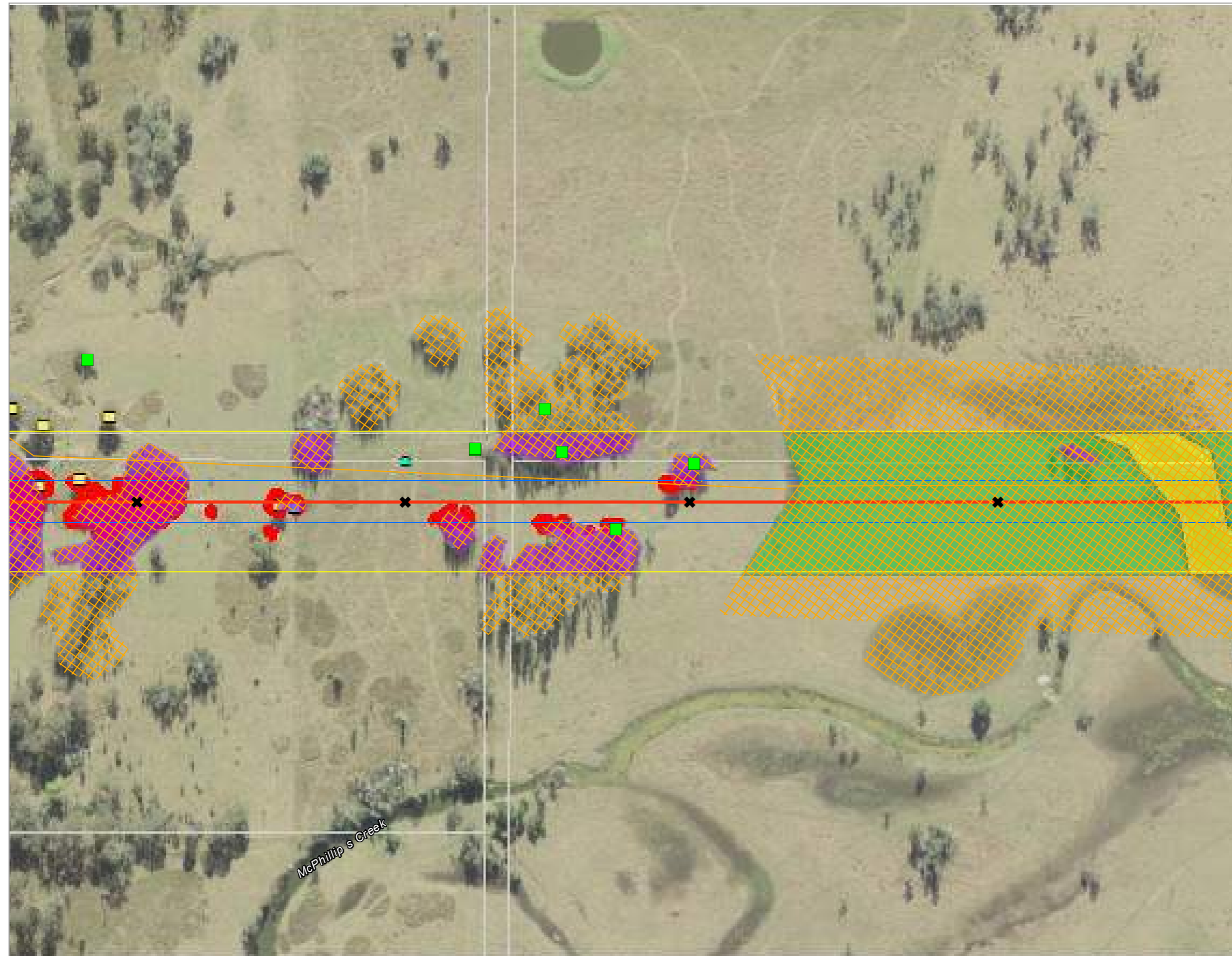




LEGEND

- Cadastre
- 100 m investigation area
- ▨ Threatened Ecological Community (TEC)
- Open forest (Spotted Gum, Grey Box)
- Open forest (Swamp Oak)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Broad-leaved Apple
- Forest Red Gum





LEGEND

- Cadastre
- 100 m investigation area
- ▨ Threatened Ecological Community (TEC)
- Open forest (Swamp Oak)
- Grassland (wet meadow)
- Sedgeland (Pin Rush)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Forest Red Gum
- Swamp Oak

















LEGEND

- Cadastre
- 100 m investigation area
- ▨ Threatened Ecological Community (TEC)
- Open forest (Swamp Oak)
- Grassland (wet meadow)
- Sedgeland (Pin Rush)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Swamp Oak

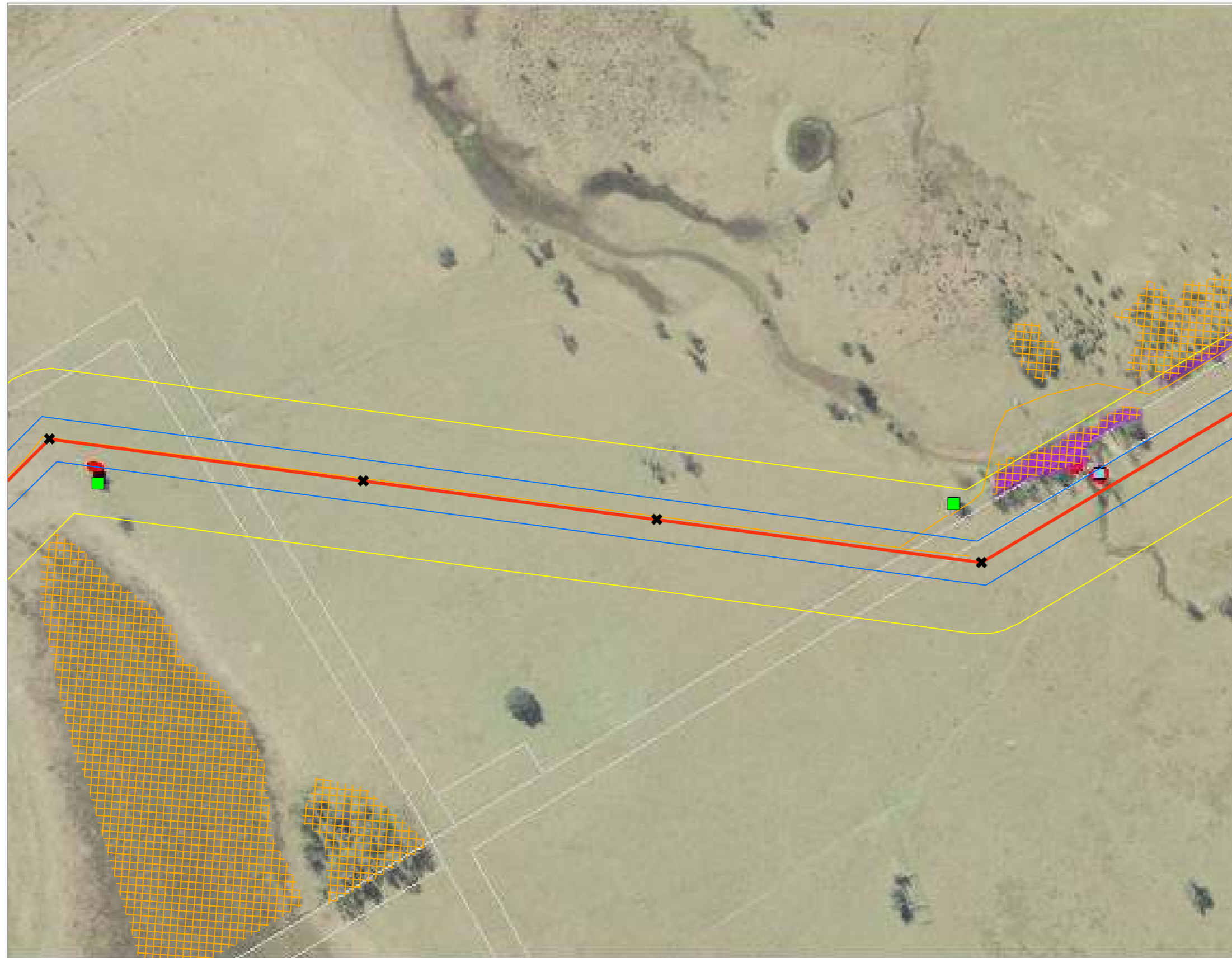




LEGEND

-  Cadastre
-  100 m investigation area
-  Threatened Ecological Community (TEC)
-  Open forest (Swamp Oak)
-  Grassland (wet meadow)
-  Sedgeland (Pin Rush)
-  Danger tree
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Swamp Box


















LEGEND

- Cadastre
- 100 m investigation area
- ⊗ Threated Ecological Community (TEC)
- Open forest (Swamp Oak)
- Sedgeland (Pin Rush)
- Danger tree
- Proposed CCC line route centreline - Jan 2019
- 30 m easement
- Access track
- ✕ Pole location
- Swamp Box
- Swamp Oak





LEGEND

-  Clarence Correctional Centre
-  Cadastre
-  100 m investigation area
-  Threatened Ecological Community (TEC)
-  Open forest (Spotted Gum, Grey Box)
-  Open forest (Swamp Oak)
-  Danger tree
-  Proposed CCC line route centreline - Jan 2019
-  30 m easement
-  Access track
-  Pole location
-  Broad-leaved Apple
-  Spotted Gum





6. Statutory Assessment

The following sections assess the findings of the site assessment with regard to relevant statutory requirements.

6.1 State Environmental Planning Policy (SEPP) 44 – Koala Habitat Protection

SEPP 44 applies to all local government areas (LGAs) listed under Schedule 1, which includes Clarence Valley LGA. The policy applies to areas of land at least 1 ha in size and may include adjoining land under the same ownership. SEPP 44 listed Schedule 2 Koala feed tree species are as follows:

- Bimble Box (*Eucalyptus populnea*)
- Broad-leaved Scribbly Gum (*Eucalyptus haemastoma*)
- Forest Red Gum (*Eucalyptus tereticornis*)
- Large-fruited Grey Gum (*Eucalyptus 84anceola*)
- Ribbon Gum (*Eucalyptus viminalis*)
- River Red Gum (*Eucalyptus camaldulensis*)
- Scribbly Gum (*Eucalyptus signata*)
- Swamp Mahogany (*Eucalyptus robusta*)
- Tallowwood (*Eucalyptus microcorys*)
- White Box (*Eucalyptus albens*).

The policy defines potential Koala habitat as areas of native vegetation where Schedule 2 trees constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Two Schedule 2 tree species occur at the site (Forest Red Gum, Tallowwood); however these trees occur infrequently and do not constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. On this basis potential Koala habitat does not occur and the policy does not apply.

6.2 Biodiversity Conservation Act 2016 (BC Act)

The BC Act requires a test of significance (five-part test) when assessing whether an action, development or activity is likely to significantly affect threatened species, ecological communities or their habitats.

Based on the potential for several threatened fauna species to occur, tests of significance have been completed (refer to **Appendix G**) based on the concept plans provided. The tests concluded that the Proposal would be unlikely to significantly increase the risk of extinction for any species or communities.

6.3 Fisheries Management Act 1994 (FM Act)

The FM Act requires a test of significance when there may be potential to impact on any species, populations and communities listed in the FM Act. Based on the poor-quality habitat at the site (cleared and disturbed floodplains), the nature of ephemeral wetlands associated with Washpen and Glenugie Creeks and that no specific construction works are required within any watercourses, it is unlikely that the Proposal would impact on any species, populations or communities listed in the FM Act. As such a test of significance is not required.

The Proposal does not require the removal of any marine vegetation for the works and hence a 'permit to harm marine vegetation' is not required.

6.4 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act protects/ regulates matters of national environmental significance (MNES), including:

- World heritage properties.
- National heritage places.
- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Based on the search results and site assessment, no significant impacts to any MNES would be likely to result from the Proposal (refer to **Table 6.1**), therefore referral to the Minister for the Environment and Energy is not required.

Table 6.1 Assessment of MNES

<i>Matter</i>	<i>Impact</i>
<i>Any impact on a World Heritage property?</i>	
No World Heritage properties occur within 10 km of the site.	Nil
<i>Any impact on a National Heritage place?</i>	
No National Heritage places occur within 10 km of the site.	Nil
<i>Any impact on a wetland of international importance?</i>	
No wetlands of international importance (Ramsar Sites) occur within 10 km of the site.	Nil
<i>Any impact on nationally threatened species and ecological communities?</i>	
Habitat for three threatened ecological communities, 55 threatened species and 42 marine species is identified within 10 km of the site. No nationally threatened flora species were recorded. Larger patches of Swamp Oak forest are likely to meet threshold criteria for the threatened ecological community <i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</i> where a patch size exceeds 0.5 ha.	Low
Two patches of Swamp Oak that meet EPBC Act condition thresholds (~0.95 ha and 0.8 ha in area) are bisected by the transmission line corridor within Lot 3 DP367684. Impacts on these patches are minor in a local context with the works requiring approximately 0.45 ha of vegetation loss to these areas in total. The majority of forest within these patches (~75%)	

Matter	Impact
<p>will be retained. No other patches of Swamp Oak which are affected by the required clearing works meet EPBC Act condition thresholds.</p> <p>While no listed threatened fauna species were recorded at the site, several may use the site and surrounds on an opportunistic or seasonal basis (e.g. Grey-headed Flying-fox). These species have all been assessed by Tests of Significance (refer Appendix G), which concluded no significant impacts were likely. An additional assessment (refer Appendix H), was completed for the Greater Glider as this species is not listed in the BC Act and so is not subject to the Tests of Significance. The assessment under the 'significant impact criteria' in the EPBC Act determined that significant impacts to the Greater Glider were unlikely to be significant.</p> <p>The Proposal would not result in the removal of habitat important to any threatened fauna species in a local context and is unlikely to significantly impact on any nationally threatened species or ecological communities.</p>	
Any impact on Migratory species?	
<p>Habitat for 36 migratory species is identified within 10 km of the site. Four migratory species was recorded (Cattle Egret, Black-faced Monarch, Rainbow Bee-eater, White-throated Needletail). No migratory species are likely to be significantly affected by the Proposal given that no significant habitat would be affected.</p>	Negligible
Any impact on a Commonwealth marine area?	
<p>No Commonwealth marine areas occur within 10 km of the site.</p>	Nil
Any impact on the Great Barrier Reef Marine Park?	
<p>The Great Barrier Reef Marine park is distant from the site.</p>	Nil
Does the Proposal involve a nuclear action (including uranium mining)?	
<p>The Proposal does not involve a nuclear action.</p>	Nil
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	
<p>The Proposal does not involve any impact on a water resource, in relation to coal seam gas development and large mining development.</p>	Nil



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<https://www.environment.nsw.gov.au/determinations/SwampOakFloodplainEndSpListing.htm>

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Scotts, D. (2003). *Key Habitats and Corridors for Forest Fauna*. Occasional Paper 32. NSW NPWS.

Thackway R. & Cresswell I. (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program Version 4*, Australian Nature Conservation Agency, Canberra.



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Appendix A
Site Photographs



Plate 1. Entry to road reserve of Avenue Road (adjacent to CCC) – formed track to be used for site access.



Plate 2. Looking west from NW corner of CCC through Lot 19 (improved pasture). Vegetation visible will be retained.



Plate 3. Stand of Weeping Paperbark (Endangered, BC Act) at Lot 1 DP1113608.



Plate 4. Degraded pasture within TL corridor at Lot 1 DP1113608.



Plate 5. Degraded pasture within laydown area at Lot 2 DP562924.



Plate 6. Roadside vegetation flanking Four Mile Lane.



Plate 7. Roadside vegetation flanking Tancreds Lane.



Plate 8. Typical open woodland within TL corridor at Crown Reserve.



Plate 9. Regrowth Spotted Gum forest at Lot 132 DP751362.



Plate 10. TL corridor at Lot 3 DP367684 looking east into Lot 20 DP7877. Stands of regrowth Swamp Oak will be retained.



Plate 11. Couch grassland (wet meadow) at Lot 20 DP7877, showing dieback and lack of species diversity and structure.



Plate 12. Laydown area at Lot 56 DP751362 (Pacific Highway) – introduced pasture, with bare soil adjacent in flood-prone area.



Plate 13. Planted Silky Oak on the western verge of the Pacific Highway (TL crossing point).



Plate 14. Cockspur thicket on Lot 23 DP716220.



Plate 15. Laydown area at western portion of Lot 1 DP571684. Single Swamp Box retained.



Plate 16. Small stand of dry rainforest in western portion of Lot 1 DP571684. Vegetation will be retained.



Plate 17. Stand of modified Swamp Box woodland (Subtropical Floodplain Forest) in western portion of Lot 1 DP571684. Vegetation will be retained.

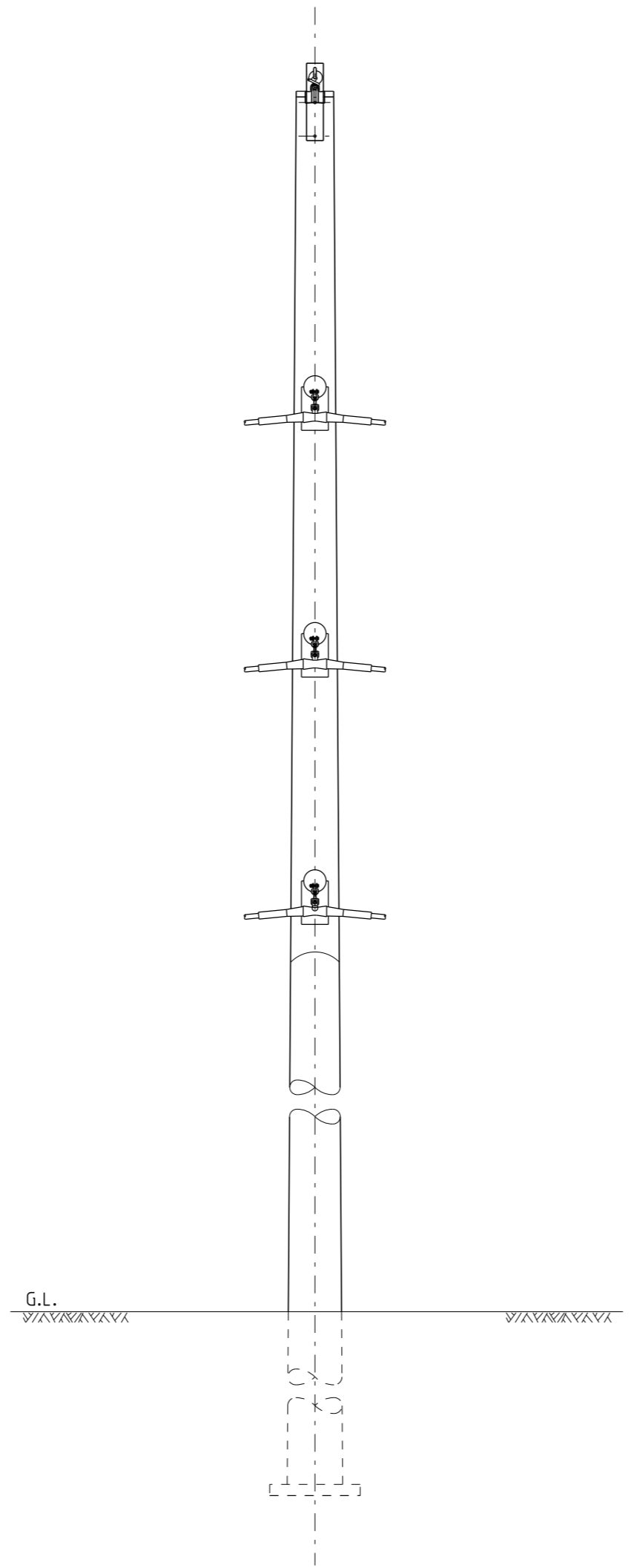
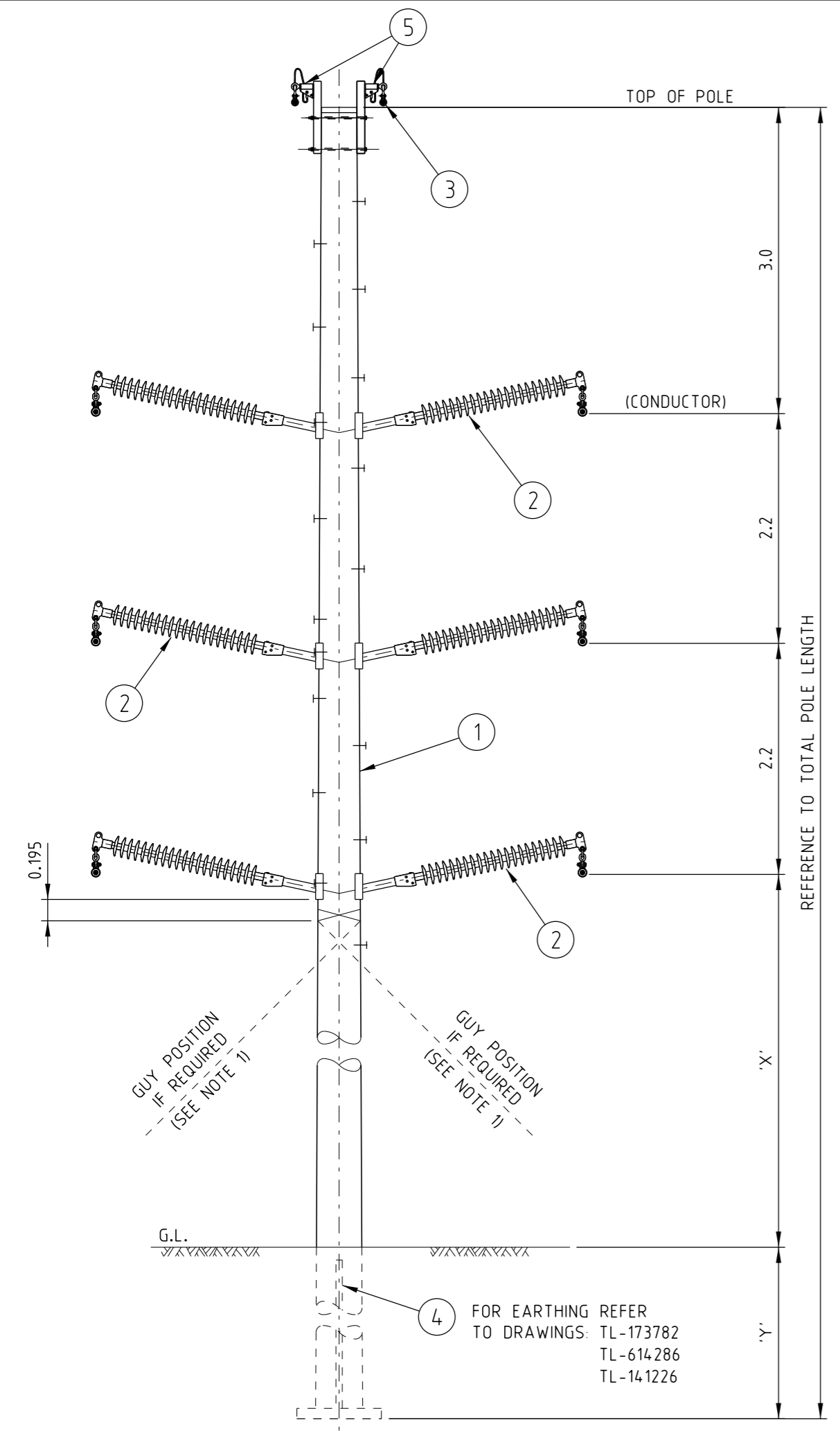


Plate 18. Entry to Crown road south of Crown Reserve showing formed vehicle track.



Appendix B

Design Plans



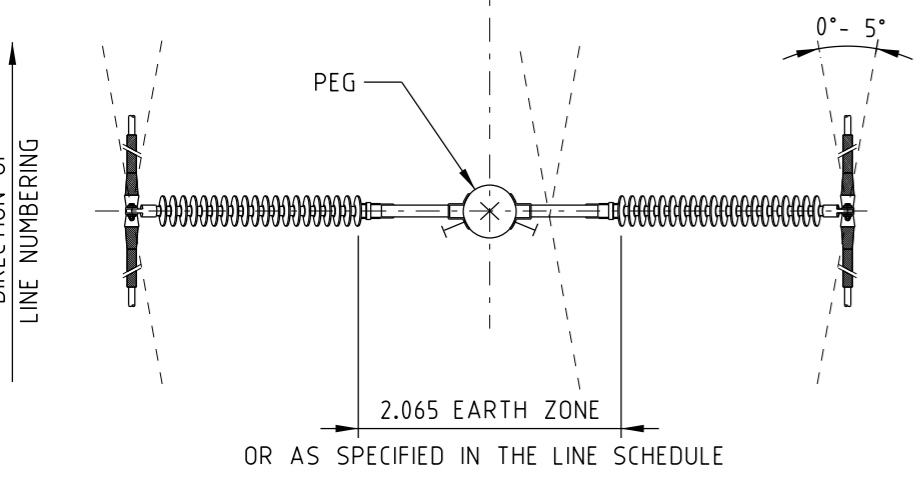
FIRST ANGLE PROJECTION
SCALE N.T.S

A. GENERAL NOTES

- A1. THE FOLLOWING INFORMATION SHALL BE OBTAINED FROM THE LINE CONSTRUCTION PARTICULARS:
 - a) POLE LENGTH AND STRENGTH DESIGNATION
 - b) STRUCTURE TYPE
 - c) FOUNDATION REQUIREMENTS
 - d) CONDUCTOR AND O.H.E.W. TYPES
 - e) ASSESSED EARTHING REQUIREMENTS
 - f) DIMENSION 'X'.
 - A2. FOR 'Y' DIMENSION, REFER TO FOUNDATION DETAILS ON TL-614096.
 - A3. STRUCTURE SHALL BE ERECTED SO THAT POLE IS VERTICAL.
 - A4. ALL DIMENSIONS ARE IN m UNLESS OTHERWISE NOTED.
- B. OVERHEAD EARTHWIRE NOTES
- B1. REFER TO TABLE 1 FOR O.H.E.W. DETAILS

TABLE 1

O.H.E.W. ARRANGEMENT ITEMS	
TYPE	DRAWING No.
OHEWx2	TL-614302
OPGW & OHEW	TL-614289



STRUCTURE FRONT
SCALE N.T.S

REQD	S/L No.	ITEM	DRG. No.	DESCRIPTION	MATERIAL
1	---	5	SEE TABLE 1	O.H.E.W. ARRANGEMENT (PAIR)	---
1	---	4	---	EARTHING	S. GALV.
2	LM 11 223	3	TL-145574	O.H.E.W. RISER	---
3	---	2	TL-614274	SUSPENSION POST INSULATOR (PAIR)	COMPOSITE
1	---	1	TL-800437	POLE ASSEMBLY	---

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AMENDMENT:



TL-800582 POLE ASSEMBLY MRJ/3

DRAWN	IMC	©TransGrid	
REVIEWED		TRANSMISSION LINES	
VERIFIED		CONCRETE POLE - 132KV	
APPROVED		STRUCTURE TYPE MRJ/3	
TENTATIVE		GENERAL ARRANGEMENT	
APPROVAL STATUS		A2	TL800338
SCALE N.T.S		03	03















Appendix C

Database Search Results

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^ rounded to 0.01°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Plants in selected area [North: -29.59 West: 152.85 East: 153.20 South: -29.86] returned a total of 1,853 records of 31 species.

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Plantae	Flora	Apocynaceae	1233	<i>Marsdenia longiloba</i>		Slender Marsdenia	E1	V	3	
Plantae	Flora	Corynocarpaceae	6662	<i>Corynocarpus rupestris subsp. rupestris</i>		Glenugie Karaka	V	V	15	
Plantae	Flora	Ericaceae	9428	<i>Melichrus hirsutus</i>		Hairy Melichrus	E1	E	115	
Plantae	Flora	Fabaceae (Faboideae)	8857	<i>Tephrosia filipes</i>			V		1	
Plantae	Flora	Grammitidaceae	9471	^ <i>Grammitis stenophylla</i>		Narrow-leaf Finger Fern	E1,3		1	
Plantae	Flora	Juncaginaceae	3363	<i>Maundia triglochinoidea</i>			V		65	
Plantae	Flora	Lamiaceae	13778	<i>Prostanthera sejuncta</i>			V		3	
Plantae	Flora	Lindsaeaceae	8129	^ <i>Lindsaea fraseri</i>		Fraser's Screw Fern	E1,3		1	
Plantae	Flora	Lindsaeaceae	8128	^ <i>Lindsaea incisa</i>		Slender Screw Fern	E1,3		79	
Plantae	Flora	Lythraceae	11643	<i>Rotala tripartita</i>			E1		2	
Plantae	Flora	Myrtaceae	8724	<i>Angophora robur</i>		Sandstone Rough-barked Apple	V	V	583	
Plantae	Flora	Myrtaceae	4007	^ <i>Callistemon linearifolius</i>		Netted Bottle Brush	V,3		1	
Plantae	Flora	Myrtaceae	4193	<i>Eucalyptus tetrapleura</i>		Square-fruited Ironbark	V	V	466	
Plantae	Flora	Myrtaceae	4255	<i>Melaleuca irbyana</i>		Weeping Paperbark	E1		91	
Plantae	Flora	Myrtaceae	4283	<i>Rhodamnia rubescens</i>		Scrub Turpentine	E4A		1	
Plantae	Flora	Myrtaceae	4284	<i>Rhodomyrtus psidioides</i>		Native Guava	E4A		5	
Plantae	Flora	Olcaceae	7557	<i>Olax angulata</i>		Square-stemmed Olax	V	V	1	
Plantae	Flora	Orchidaceae	6630	^ <i>Dendrobium melaleucaphilum</i>		Spider orchid	E1,P,2		1	
Plantae	Flora	Orchidaceae	6672	^ <i>Geodorum densiflorum</i>		Pink Nodding Orchid	E1,P,2		2	
Plantae	Flora	Phyllanthaceae	9833	<i>Phyllanthus microcladus</i>		Brush Sauropus	E1		9	

Plantae	Flora	Poaceae	4746	<i>Ancistrachne maidenii</i>		V		4
Plantae	Flora	Poaceae	4776	<i>Arthraxon hispidus</i>	Hairy Jointgrass	V	V	17
Plantae	Flora	Polygalaceae	5260	<i>Polygala linariifolia</i>	Native Milkwort	E1		1
Plantae	Flora	Polypodiaceae	8154	<i>Belvisia mucronata</i>	Needle-leaf Fern	E1		4
Plantae	Flora	Proteaceae	9298	<i>Grevillea quadricauda</i>	Four-tailed Grevillea	V	V	74
Plantae	Flora	Rutaceae	6457	<i>Acronychia littoralis</i>	Scented Acronychia	E1	E	2
Plantae	Flora	Rutaceae	11598	<i>Boronia hapalophylla</i>	Shannon Creek Boronia	E1,P		3
Plantae	Flora	Sapotaceae	11957	<i>Niemeyera whitei</i>	Rusty Plum, Plum Boxwood	V		2
Plantae	Flora	Simaroubaceae	9497	<i>Quassia sp. Moonee Creek</i>	Moonee Quassia	E1	E	249
Plantae	Flora	Orobanchaceae	7884	<i>Centranthera cochinchinensis</i>	Swamp Foxglove	E1		31
Plantae	Flora	Linderniaceae	7359	<i>Lindernia alsinoides</i>	Noah's False Chickweed	E1		21



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







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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Community				<i>Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion</i>		Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	E3		K	
Community				<i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V	K	
Community				<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K	
Community				<i>Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions</i>		Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3	CE	K	

Community	<i>Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion</i>	Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	E3	CE	K	
Community	<i>Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion</i>	Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E3		K	
Community	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E	K	
Community	<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community	<i>Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions</i>	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3		K	

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^ rounded to 0.01°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) Animals in selected area [North: -29.59 West: 152.85 East: 153.20 South: -29.86] returned a total of 5,457 records of 68 species.

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachidae	3137	<i>Crinia tinnula</i>		Wallum Froglet	V,P		8	
Animalia	Amphibia	Myobatrachidae	3075	^ <i>Mixophyes iteratus</i>		Giant Barred Frog	E1,P,2	E	5	
Animalia	Amphibia	Hylidae	3169	<i>Litoria brevipalmata</i>		Green-thighed Frog	V,P		4	
Animalia	Reptilia	Scincidae	2293	<i>Coeranoscincus reticulatus</i>		Three-toed Snake-tooth Skink	V,P	V	45	
Animalia	Reptilia	Elapidae	2645	<i>Cacophis harriettae</i>		White-crowned Snake	V,P		5	
Animalia	Reptilia	Elapidae	2675	<i>Hoplocephalus bitorquatus</i>		Pale-headed Snake	V,P		1	
Animalia	Reptilia	Elapidae	2677	<i>Hoplocephalus stephensii</i>		Stephens' Banded Snake	V,P		3	
Animalia	Aves	Casuariidae	0001	<i>Dromaius novaehollandiae</i>		Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P		294	
Animalia	Aves	Anseranatidae	0199	<i>Anseranas semipalmata</i>		Magpie Goose	V,P		89	
Animalia	Aves	Anatidae	0214	<i>Stictonetta naevosa</i>		Freckled Duck	V,P		9	
Animalia	Aves	Columbidae	0025	<i>Ptilinopus magnificus</i>		Wompoo Fruit-Dove	V,P		2	
Animalia	Aves	Columbidae	0021	<i>Ptilinopus regina</i>		Rose-crowned Fruit-Dove	V,P		1	
Animalia	Aves	Columbidae	0023	<i>Ptilinopus superbus</i>		Superb Fruit-Dove	V,P		1	
Animalia	Aves	Procellariidae	0072	<i>Ardenna carneipes</i>		Flesh-footed Shearwater	V,P	J,K	1	
Animalia	Aves	Ciconiidae	0183	<i>Ephippiorhynchus asiaticus</i>		Black-necked Stork	E1,P		1689	
Animalia	Aves	Ardeidae	0197	<i>Botaurus poiciloptilus</i>		Australasian Bittern	E1,P	E	1	

Animalia	Aves	Ardeidae	0196	<i>Ixobrychus flavicollis</i>	Black Bittern	V,P		3
Animalia	Aves	Accipitridae	0218	<i>Circus assimilis</i>	Spotted Harrier	V,P		6
Animalia	Aves	Accipitridae	0223	<i>Erythrotriorchis radiatus</i>	Red Goshawk	E4A,P, 2	V	3
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P	C	151
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P		25
Animalia	Aves	Accipitridae	0230	<i>Lophoictinia isura</i>	Square-tailed Kite	V,P,3		126
Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>	Eastern Osprey	V,P,3		68
Animalia	Aves	Gruidae	0177	<i>Grus rubicunda</i>	Brolga	V,P		46
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1,P		26
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		6
Animalia	Aves	Jacaniidae	0171	<i>Irediparra gallinacea</i>	Comb-crested Jacana	V,P		193
Animalia	Aves	Rostratulidae	0170	<i>Rostratula australis</i>	Australian Painted Snipe	E1,P	E	1
Animalia	Aves	Laridae	0972	<i>Gygis alba</i>	White Tern	V,P		1
Animalia	Aves	Laridae	0120	<i>Onychoprion fuscata</i>	Sooty Tern	V,P		3
Animalia	Aves	Laridae	0117	<i>Sternula albifrons</i>	Little Tern	E1,P	C,J,K	1
Animalia	Aves	Cacatuidae	0265	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V,P,2		177
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>	Little Lorikeet	V,P		95
Animalia	Aves	Psittacidae	0309	<i>Lathamus discolor</i>	Swift Parrot	E1,P,3	CE	14
Animalia	Aves	Psittacidae	8913	<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V,P,3		1
Animalia	Aves	Strigidae	0246	<i>Ninox connivens</i>	Barking Owl	V,P,3		33
Animalia	Aves	Strigidae	0248	<i>Ninox strenua</i>	Powerful Owl	V,P,3		61
Animalia	Aves	Tytonidae	0250	<i>Tyto novaehollandiae</i>	Masked Owl	V,P,3		31
Animalia	Aves	Tytonidae	9924	<i>Tyto tenebricosa</i>	Sooty Owl	V,P,3		2
Animalia	Aves	Climacteridae	8127	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P		117
Animalia	Aves	Acanthizidae	0504	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P		42
Animalia	Aves	Meliphagidae	8303	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V,P		108
Animalia	Aves	Pomatostomidae	8388	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P		220

Animalia	Aves	Neosittidae	0549	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P		60	
Animalia	Aves	Artamidae	8519	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P		22	
Animalia	Aves	Petroicidae	8367	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V,P		4	
Animalia	Aves	Petroicidae	0380	<i>Petroica boodang</i>	Scarlet Robin	V,P		14	
Animalia	Aves	Petroicidae	0382	<i>Petroica phoenicea</i>	Flame Robin	V,P		4	
Animalia	Aves	Estrildidae	0652	<i>Stagonopleura guttata</i>	Diamond Firetail	V,P		18	
Animalia	Mammalia	Dasyuridae	1008	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E	22	
Animalia	Mammalia	Dasyuridae	1017	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V,P		75	
Animalia	Mammalia	Dasyuridae	1045	<i>Planigale maculata</i>	Common Planigale	V,P		1	
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>	Koala	V,P	V	322	
Animalia	Mammalia	Petauridae	1136	<i>Petaurus australis</i>	Yellow-bellied Glider	V,P		106	
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolkensis</i>	Squirrel Glider	V,P		78	
Animalia	Mammalia	Potoroidae	1187	<i>Aepyprymnus rufescens</i>	Rufous Bettong	V,P		237	
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	602	
Animalia	Mammalia	Emballonuridae	1321	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V,P		7	
Animalia	Mammalia	Molossidae	1937	<i>Mormopterus lumsdenae</i>	Northern Free-tailed Bat	V,P		2	
Animalia	Mammalia	Molossidae	1329	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V,P		16	
Animalia	Mammalia	Vespertilionidae	1354	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V,P		21	
Animalia	Mammalia	Vespertilionidae	1346	<i>Miniopterus australis</i>	Little Bentwing-bat	V,P		72	
Animalia	Mammalia	Vespertilionidae	1834	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V,P		12	
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>	Southern Myotis	V,P		17	
Animalia	Mammalia	Vespertilionidae	1336	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V,P		2	

Animalia	Mammalia	Vespertilionidae	1361	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V,P	8	
Animalia	Mammalia	Vespertilionidae	1025	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V,P	2	
Animalia	Insecta	Petaluridae	1138	<i>Petalura litorea</i>	Coastal Petaltail	E1	15	



EPBC Act Protected Matters Report

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

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

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

Report created: 21/03/19 15:32:17

[Summary](#)

[Details](#)

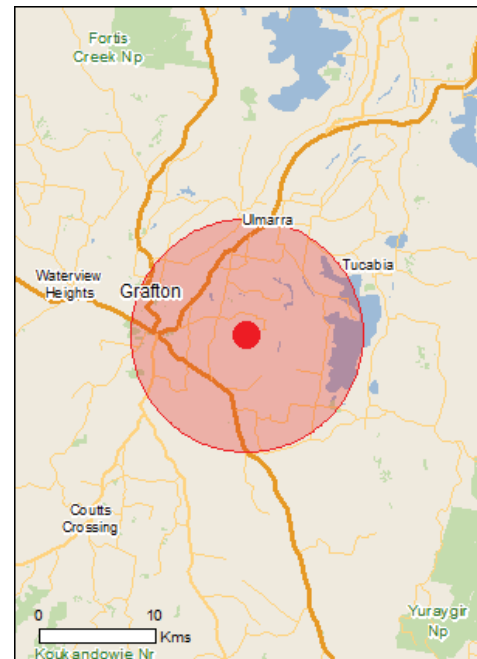
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

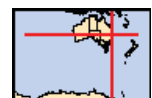
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	55
Listed Migratory Species:	36

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	42
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	1
Invasive Species:	36
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [\[Resource Information \]](#)

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

Name	Status	Type of Presence
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Erythrorchis radiatus Red Goshawk [942]	Vulnerable	Species or species

Name	Status	Type of Presence
Grantiella picta Painted Honeyeater [470]	Vulnerable	habitat known to occur within area Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat may occur within area
Insects		

Name	Status	Type of Presence
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Angophora robur Sandstone Rough-barked Apple [56088]	Vulnerable	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat may occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus tetrapleura Square-fruited Ironbark [7490]	Vulnerable	Species or species habitat likely to occur within area
Grevillea quadricauda [64651]	Vulnerable	Species or species habitat likely to occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Samadera sp. Moonee Creek (J.King s.n. Nov. 1949) [86885]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Tylophora woollsii [20503]	Endangered	Species or species habitat likely to occur within area

Reptiles

Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species

[[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Monarcha trivirgatus Spectacled Monarch [610]		within area Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

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

Name
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Service Homes Corporation
Defence - GRAFTON DRILL HALL (GRAFTON GRES DEPOT) :41 RNSWR GRAFTON

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		

Name	Threatened	Type of Presence
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel	Endangered	Species or species

Name	Threatened	Type of Presence
[1060]		habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Arandim	NSW
Forestry Management Areas in Grafton	NSW
UNE Special Management Zone No1	NSW

Regional Forest Agreements	[Resource Information]
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Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish		Species or species

Name	Status	Type of Presence
Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] <i>Chrysanthemoides monilifera</i> Bitou Bush, Boneseed [18983]		habitat likely to occur within area Species or species habitat likely to occur within area
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> Bitou Bush [16332]		Species or species habitat likely to occur within area
<i>Dolichandra unguis-cati</i> Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
<i>Eichhornia crassipes</i> Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
<i>Genista</i> sp. X <i>Genista monspessulana</i> Broom [67538]		Species or species habitat may occur within area
<i>Lantana camara</i> Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] <i>Pinus radiata</i> Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat likely to occur within area Species or species habitat may occur within area
<i>Rubus fruticosus</i> aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
<i>Salix</i> spp. except <i>S.babylonica</i> , <i>S.x calodendron</i> & <i>S.x reichardtii</i> Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
<i>Salvinia molesta</i> Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
<i>Senecio madagascariensis</i> Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name	State	
Clarence River Estuary	NSW	
Upper Coldstream	NSW	

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-29.70863 153.01098

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

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

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

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



Appendix D

Flora Inventory

Table D.1 Flora Inventory

Family	Scientific name	Common name
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet
Acanthaceae	<i>Pseuderanthemum variabile</i>	Pastel Flower
Adiantaceae	<i>Cheilanthes sieberi</i>	Mulga Fern
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed
Amaranthaceae	<i>Amaranthus viridis</i> *	Green Amaranth
Amaranthaceae	<i>Gomphrena celosioides</i> *	Gomphrena Weed
Amaranthaceae	<i>Nyssanthes diffusa</i>	Barbwire Weed
Anthericaceae	<i>Caesia parviflora</i>	Pale Grass-lily
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily
Apiaceae	<i>Centella asiatica</i>	Pennywort
Apiaceae	<i>Cyclosporum leptophyllum</i> *	Slender Celery
Apocynaceae	<i>Alstonia constricta</i>	Bitter Bark
Apocynaceae	<i>Araujia sericifera</i> *	Moth Vine
Apocynaceae	<i>Gomphocarpus physocarpus</i> *	Balloon Cotton Bush
Apocynaceae	<i>Marsdenia rostrata</i>	Common Milk Vine
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod
Asparagaceae	<i>Asparagus aethiopicus</i> *	Ground Asparagus
Asteraceae	<i>Ageratum houstonianum</i> *	Blue Billygoat Weed
Asteraceae	<i>Ambrosia artemisiifolia</i> *	Annual Ragweed
Asteraceae	<i>Aster subulatus</i> *	Wild Aster
Asteraceae	<i>Baccharis halimifolia</i> *	Groundsel Bush
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Asteraceae	<i>Centipeda minima</i> subsp. <i>minima</i>	Spreading Sneezeweed
Asteraceae	<i>Chrysocephalum apiculatum</i>	Yellow Buttons
Asteraceae	<i>Cirsium vulgare</i> *	Spear Thistle
Asteraceae	<i>Conyza bonariensis</i> *	Flaxleaf Fleabane
Asteraceae	<i>Eclipta prostrata</i>	Eclipta
Asteraceae	<i>Emilia sonchifolia</i> *	Purple Sow Thistle
Asteraceae	<i>Gamochaeta purpurea</i> *	Cudweed
Asteraceae	<i>Hypochaeris radicata</i> *	Catsear
Asteraceae	<i>Lagenophora stipitata</i>	Bottle-daisy
Asteraceae	<i>Ozothamnus diosmifolius</i>	White Dogwood
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sowthistle
Asteraceae	<i>Tagetes minuta</i> *	Stinking Roger
Bignoniaceae	<i>Jacaranda mimosifolia</i> *	Jacaranda
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Commelinaceae	<i>Commelina cyanea</i>	Scurvy Weed
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Convolvulaceae	<i>Polymeria calycina</i>	Bindweed
Cyperaceae	<i>Cyperus brevifolius</i> *	Mullumbimby Couch
Cyperaceae	<i>Cyperus eragrostis</i> *	Umbrella Sedge
Cyperaceae	<i>Cyperus exaltatus</i>	Giant Sedge

Family	Scientific name	Common name
Cyperaceae	<i>Cyperus haspan</i>	
Cyperaceae	<i>Cyperus polystachyos</i>	Bunchy Sedge
Cyperaceae	<i>Eleocharis acuta</i>	Spikerush
Cyperaceae	<i>Eleocharis equisetina</i>	Common Spikerush
Cyperaceae	<i>Fimbristylis dichotoma</i>	Fringe-sedge
Cyperaceae	<i>Gahnia clarkei</i>	Tall Saw-sedge
Cyperaceae	<i>Juncus usitatus</i>	Pin Rush
Cyperaceae	<i>Juncus polyanthemos</i>	
Cyperaceae	<i>Schoenoplectiella mucronata</i>	Club Rush
Cyperaceae	<i>Schoenoplectus validus</i>	River Club Rush
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken
Dilleniaceae	<i>Hibbertia aspera</i>	Rough Guinea Flower
Dilleniaceae	<i>Hibbertia diffusa</i>	Wedge Guinea Flower
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing Guinea Flower
Elaeocarpaceae	<i>Elaeocarpus obovatus</i>	Hard Quandong
Euphorbiaceae	<i>Alchornea ilicifolia</i>	Native Holly
Euphorbiaceae	<i>Breynia oblongifolia</i>	Coffee Bush
Fabaceae (Caesalpinioideae)	<i>Senna pendula</i> var. <i>glabrata</i> *	Winter Senna
Fabaceae (Faboideae)	<i>Crotalaria lanceolata</i> subsp. <i>lanceolata</i> *	Lance-leaf Rattlepod
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
Fabaceae (Faboideae)	<i>Desmodium gunnii</i>	Slender tick trefoil
Fabaceae (Faboideae)	<i>Desmodium rhytidophyllum</i>	Rusty Tick-trefoil
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining Glycine
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla
Fabaceae (Faboideae)	<i>Indigofera australis</i>	Australian Indigo
Fabaceae (Faboideae)	<i>Jacksonia scoparia</i>	Dogwood
Fabaceae (Faboideae)	<i>Kennedia rubicunda</i>	Dusky Coral-pea
Fabaceae (Faboideae)	<i>Lespedeza juncea</i> subsp. <i>sericea</i>	
Fabaceae (Faboideae)	<i>Macroptilium atropurpureum</i> *	Siratro
Fabaceae (Faboideae)	<i>Macroptilium lathyroides</i> *	Phasey Bean
Fabaceae (Faboideae)	<i>Trifolium repens</i> *	White Clover
Fabaceae (Mimosoideae)	<i>Acacia concurrens</i>	Curracabah
Fabaceae (Mimosoideae)	<i>Acacia disparrima</i> var. <i>disparrima</i>	Salwood
Fabaceae (Mimosoideae)	<i>Acacia falcata</i>	Hickory
Fabaceae (Mimosoideae)	<i>Acacia floribunda</i>	White Sally
Hydrocharitaceae	<i>Ottelia ovalifolia</i>	Swamp Lily
Iridaceae	<i>Patersonia glabrata</i>	Leafy Purple-flag
Juncaginaceae	<i>Cycnogeton procerum</i>	Water Ribbons
Lamiaceae	<i>Clerodendrum floribundum</i>	Smooth Clerodendrum
Lamiaceae	<i>Plectranthus parviflorus</i>	Cockspur Flower
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor Laurel
Lobeliaceae	<i>Lobelia alata</i>	Angled Lobelia

Family	Scientific name	Common name
Lobeliaceae	<i>Pratia concolor</i>	Poison Pratia
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot
Lomandraceae	<i>Lomandra confertifolia</i>	Mat-rush
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
Lomandraceae	<i>Lomandra multiflora</i>	Many-flowered Mat-rush
Loranthaceae	<i>Amyema pendula</i>	Drooping Mistletoe
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily
Lythraceae	<i>Cuphea carthagenensis</i> *	Cuphea
Malvaceae	<i>Hibiscus sp.</i> *	Ornamental Hibiscus
Malvaceae	<i>Modiola caroliniana</i> *	Red-flowered Mallow
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Menyanthaceae	<i>Nymphoides indica</i>	Water Snowflake
Moraceae	<i>Ficus obliqua</i>	Small-leaved Fig
Moraceae	<i>Ficus macrophylla</i>	Moreton Bay Fig
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur Thorn
Moraceae	<i>Streblus brunonianus</i>	Whalebone Tree
Myoporaceae	<i>Eremophila debilis</i>	Winter Apple
Myrtaceae	<i>Angophora subvelutina</i>	Broad-leaved Apple
Myrtaceae	<i>Austromyrtus dulcis</i>	Midyim
Myrtaceae	<i>Callistemon salignus</i>	Willow Bottlebrush
Myrtaceae	<i>Corymbia henryi</i>	Spotted Gum
Myrtaceae	<i>Corymbia intermedia</i>	Pink Bloodwood
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum
Myrtaceae	<i>Eucalyptus microcorys</i>	Tallowwood
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box
Myrtaceae	<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum
Myrtaceae	<i>Eucalyptus siderophloia</i>	Grey Ironbark
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Myrtaceae	<i>Eucalyptus tindaliae</i>	Grafton Stringybark
Myrtaceae	<i>Eucalyptus torelliana</i> *	Cadaghi
Myrtaceae	<i>Lophostemon suaveolens</i>	Swamp Box
Myrtaceae	<i>Melaleuca alternifolia</i>	Teatree
Myrtaceae	<i>Melaleuca irbyana</i>	Weeping Paperbark
Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark
Nymphaeaceae	<i>Nymphaea capensis</i> *	Cape Waterlily
Ochnaceae	<i>Ochna serrulata</i> *	Ochna
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaved Privet
Oleaceae	<i>Notelaea longifolia</i>	Mock-olive
Onagraceae	<i>Ludwigia peploides subsp. montevidensis</i>	Water Primrose
Orchidaceae	<i>Dendrobium linguiforme</i>	Tongue Orchid
Orchidaceae	<i>Dendrobium teretifolium</i>	Rat's Tail Orchid
Oxalidaceae	<i>Oxalis perennans</i>	Oxalis
Passifloraceae	<i>Passiflora subpeltata</i> *	White Passionflower
Philydraceae	<i>Philydrum lanuginosum</i>	Frogsmouth



Family	Scientific name	Common name
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax lily
Phyllanthaceae	<i>Bridelia exaltata</i>	Brush Ironbark
Pittosporaceae	<i>Pittosporum multiflorum</i>	Orange Thorn
Pittosporaceae	<i>Pittosporum revolutum</i>	Rough Fruit Pittosporum
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum
Plantaginaceae	<i>Plantago lanceolata</i> *	Lamb's Tongues
Poaceae	<i>Andropogon virginicus</i> *	Whiskey Grass
Poaceae	<i>Aristida ramosa</i>	Speargrass
Poaceae	<i>Aristida vagans</i>	Three-awn Speargrass
Poaceae	<i>Aristida warburgii</i>	Speargrass
Poaceae	<i>Axonopus affinis</i> *	Narrow-leaved Carpet Grass
Poaceae	<i>Bothriochloa macra</i>	Redleg Grass
Poaceae	<i>Briza minor</i> *	Shivery Grass
Poaceae	<i>Bromus catharticus</i> *	Prairie Grass
Poaceae	<i>Capillipedium spicigerum</i>	Scented Top
Poaceae	<i>Cenchrus clandestinus</i> *	Kikuyu
Poaceae	<i>Chloris gayana</i> *	Rhodes Grass
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Poaceae	<i>Digitaria sp.</i>	Summer Grass
Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgrass
Poaceae	<i>Eleusine indica</i> *	Crowsfoot Grass
Poaceae	<i>Entolasia stricta</i>	Wiry Panic
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass
Poaceae	<i>Eragrostis cilianensis</i> *	Stinkgrass
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
Poaceae	<i>Imperata cylindrica</i>	Blady Grass
Poaceae	<i>Lachnagrostis filiformis</i>	Blown Grass
Poaceae	<i>Leersia hexandra</i>	Swamp Ricegrass
Poaceae	<i>Melinis repens</i> *	Red Natal Grass
Poaceae	<i>Microlaena stipoides var. stipoides</i>	Weeping Grass
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
Poaceae	<i>Oplismenus undulatifolius</i>	Basket Grass
Poaceae	<i>Panicum maximum</i> *	Guinea Grass
Poaceae	<i>Panicum simile</i>	Two-colour Panic
Poaceae	<i>Paspalidium distans</i>	Shotgrass
Poaceae	<i>Paspalum distichum</i>	Water Couch
Poaceae	<i>Paspalum mandiocanum</i> *	Broad-leaved Paspalum
Poaceae	<i>Paspalum urvillei</i> *	Vasey Grass
Poaceae	<i>Sacciolepis indica</i>	Indian Cupscale Grass
Poaceae	<i>Setaria sphacelata</i> *	Setaria
Poaceae	<i>Sorghum halepense</i> *	Johnson Grass
Poaceae	<i>Sorghum leiocladum</i>	Wild Sorghum
Poaceae	<i>Sporobolus africanus</i> *	Parramatta Grass
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass



Family	Scientific name	Common name
Poaceae	<i>Themeda australis</i>	Kangaroo Grass
Polygonaceae	<i>Persicaria attenuata</i>	Knotweed
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed
Polygonaceae	<i>Persicaria hydropiper</i>	Water Pepper
Polygonaceae	<i>Persicaria strigosa</i>	Spotted Knotweed
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock
Pontederiaceae	<i>Heteranthera reniformis</i> *	Kidneyleaf Mud Plantain
Pontederiaceae	<i>Eichhornia crassipes</i> *	Water Hyacinth
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed
Potamogetonaceae	<i>Potamogeton octandrus</i>	Pondweed
Proteaceae	<i>Grevillea robusta</i>	Silky Oak
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash
Rutaceae	<i>Citrus x taitensis</i> *	Bush Lemon
Rutaceae	<i>Flindersia australis</i>	Teak
Sapindaceae	<i>Cupaniopsis parvifolia</i>	Small-leaved Tuckeroo
Sapindaceae	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush
Sapindaceae	<i>Guioa semiglauca</i>	Guioa
Sapindaceae	<i>Jagera pseudorhus var. pseudorhus</i>	Foambark Tree
Solanaceae	<i>Solanum americanum</i> *	Glossy Nightshade
Solanaceae	<i>Solanum linnaeanum</i> *	Apple of Sodom
Solanaceae	<i>Solanum mauritianum</i> *	Wild Tobacco
Solanaceae	<i>Solanum nigrum</i> *	Blackberry Nightshade
Solanaceae	<i>Solanum pseudocapsicum</i> *	Madeira Winter Cherry
Solanaceae	<i>Solanum seforthianum</i> *	Climbing Nightshade
Solanaceae	<i>Solanum stelligerum</i>	Devil's Needles
Thymelaeaceae	<i>Pimelea linifolia subsp. linifolia</i>	Slender Rice-flower
Thymelaeaceae	<i>Wikstroemia indica</i>	Tie Bush
Typhaceae	<i>Typha orientalis</i>	Broad-leaved Cumbungi
Ulmaceae	<i>Aphananthe philippinensis</i>	Rough-leaved Elm
Ulmaceae	<i>Trema tomentosa var. viridis</i>	Native Peach
Verbenaceae	<i>Lantana camara</i> *	Lantana
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop
Verbenaceae	<i>Verbena rigida</i> *	Veined Verbena
Vitaceae	<i>Cayratia clematidea</i>	Slender Grape

* Introduced species



Appendix E
Fauna Inventory

Table E.1 Fauna Inventory

Scientific Name	Common Name	Record Basis
Amphibians		
<i>Crinia parinsignifera</i>	Beeping Froglet	C
<i>Crinia signifera</i>	Common Eastern Froglet	C
<i>Limnodynastes peronii</i>	Striped Marsh Frog	C
<i>Litoria fallax</i>	Dwarf Green Tree Frog	C
Reptiles		
<i>Chelodina longicollis</i>	Eastern Snake-necked Turtle	O
<i>Cryptoblepharus virgatus</i>	Striped Wall Skink	O
<i>Lampropholis delicata</i>	Grass Skink	O
<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	O
<i>Varanus varius</i>	Lace Monitor	O
Birds		
<i>Acanthiza pusilla</i>	Brown Thornbill	O
<i>Acridotheres tristis*</i>	Common Myna	C
<i>Alisterus scapularis</i>	Australian King Parrot	O
<i>Anas superciliosa</i>	Pacific Black Duck	O
<i>Anthus novaeseelandiae</i>	Australasian Pipit	O
<i>Aquila audax</i>	Wedge-tailed Eagle	O
<i>Ardea intermedia</i>	Intermediate Egret	O
<i>Ardea pacifica</i>	White-necked Heron	O
<i>Artamus cyanopterus cyanopterus #</i>	Dusky Woodswallow	O
<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	O
<i>Aviceda subcristata</i>	Pacific Baza	C
<i>Bubulcus ibis ^</i>	Cattle Egret	O
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	C
<i>Cacatua roseicapilla</i>	Galah	O
<i>Cacatua sanguinea</i>	Little Corella	C
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo	C
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	O
<i>Chenonetta jubata</i>	Australian Wood Duck	O
<i>Chrysococcyx lucidus</i>	Shining Bronze-cuckoo	C
<i>Cincloramphus mathewsi</i>	Rufous Songlark	C
<i>Circus approximans</i>	Swamp Harrier	O
<i>Cisticola exilis</i>	Golden-headed Cisticola	C
<i>Colluricincla harmonica</i>	Grey Shrike-Thrush	O
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	C
<i>Coracina tenuirostris</i>	Cicadabird	C
<i>Coturnix ypsilophora</i>	Brown Quail	O
<i>Corvus orru</i>	Torresian Crow	O
<i>Cracticus nigrogularis</i>	Pied Butcherbird	C
<i>Cracticus tibicen</i>	Australian Magpie	O
<i>Cracticus torquatus</i>	Grey Butcherbird	C
<i>Cygnus atratus</i>	Black Swan	O
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	C
<i>Dendrocygna arcuata</i>	Wandering Whistling Duck	O
<i>Dicaeum hirundinaceum</i>	Mistletoebird	O

Scientific Name	Common Name	Record Basis
<i>Dicrurus bracteatus</i>	Spangled Drongo	O
<i>Egretta novaehollandiae</i>	White-faced Heron	O
<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	O
<i>Eopsaltria australis</i>	Eastern Yellow Robin	C
<i>Ephippiorhynchus asiaticus</i> #	Black-necked Stork	O
<i>Eurystomus orientalis</i>	Dollarbird	O
<i>Falco cenchroides</i>	Nankeen Kestrel	O
<i>Gallinula tenebrosa</i>	Dusky Moorhen	O
<i>Geopelia humeralis</i>	Bar-shouldered Dove	O
<i>Geopelia placida</i>	Peaceful Dove	C
<i>Gerygone olivacea</i>	White-throated Gerygone	C
<i>Glossopsitta concinna</i>	Musk Lorikeet	C
<i>Glossopsitta pusilla</i> #	Little Lorikeet	O
<i>Grallina cyanoleuca</i>	Magpie Lark	O
<i>Haliastur sphenurus</i>	Whistling Kite	O
<i>Hirundapus caudacutus</i> ^	White-throated Needletail	O
<i>Hirundo neoxena</i>	Welcome Swallow	O
<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	O
<i>Lichenostomus fuscus</i>	Fuscous Honeyeater	C
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	O
<i>Lichmera indistincta</i>	Brown Honeyeater	O
<i>Malurus cyaneus</i>	Superb Fairy Wren	O
<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	O
<i>Manorina melanocephala</i>	Noisy Miner	O
<i>Megalurus timoriensis</i>	Tawny Grassbird	C
<i>Meliphaga lewinii</i>	Lewin's Honeyeater	O
<i>Merops ornatus</i> ^	Rainbow Bee-eater	O
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	O
<i>Microeca fascinans</i>	Jacky Winter	O
<i>Monarcha melanopsis</i> ^	Black-faced Monarch	C
<i>Myzomela sanguinolenta</i>	Scarlet Honeyeater	C
<i>Neochmia temporalis</i>	Red-browed Finch	O
<i>Ocyphaps lophotes</i>	Crested Pigeon	O
<i>Oriolus sagittatus</i>	Olive-backed Oriole	C
<i>Pachycephala pectoralis</i>	Golden Whistler	O
<i>Pachycephala rufiventris</i>	Rufous Whistler	C
<i>Pardalotus punctatus</i>	Spotted Pardalote	C
<i>Pardalotus striatus</i>	Striated Pardalote	C
<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant	O
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	O
<i>Philemon corniculatus</i>	Noisy Friarbird	O
<i>Platalea regia</i>	Royal Spoonbill	O
<i>Platyercus eximius</i>	Eastern Rosella	O
<i>Podargus strigoides</i>	Tawny Frogmouth	O
<i>Pomatostomus temporalis</i> #	Grey-crowned Babbler	O
<i>Porphyrio porphyrio</i>	Purple Swamphen	O
<i>Rhipidura albiscapa</i>	Grey Fantail	O
<i>Rhipidura leucophrys</i>	Willie Wagtail	O



Scientific Name	Common Name	Record Basis
<i>Sphecotheres viridis</i>	Australasian Figbird	C
<i>Strepera graculina</i>	Pied Currawong	O
<i>Streptopelia chinensis</i> *	Spotted Turtledove	C
<i>Taeniopygia bichenovii</i>	Double-barred Finch	O
<i>Todiramphus sanctus</i>	Sacred Kingfisher	C
<i>Threskiornis molucca</i>	Australian White Ibis	O
<i>Threskiornis spinicollis</i>	Straw-necked Ibis	O
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	O
<i>Vanellus miles</i>	Masked Lapwing	O
<i>Zosterops lateralis</i>	Silvereeye	C
Mammals		
<i>Canis familiaris</i> *	Dog	O
<i>Equus caballus</i> *	Horse	O
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O
<i>Macropus parryi</i>	Whiptail Wallaby	O
<i>Macropus rufogriseus</i>	Red-necked Wallaby	O
<i>Oryctolagus cuniculus</i> *	Rabbit	O

C = Call, O = Observed

Threatened species (BC Act); ^ Migratory species (EPBC Act); * Introduced species



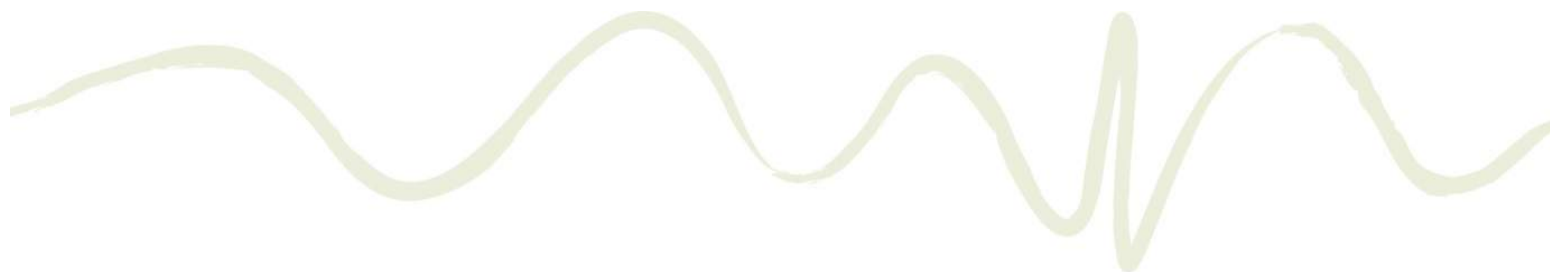
Appendix F

Potential for Threatened Fauna Occurrence

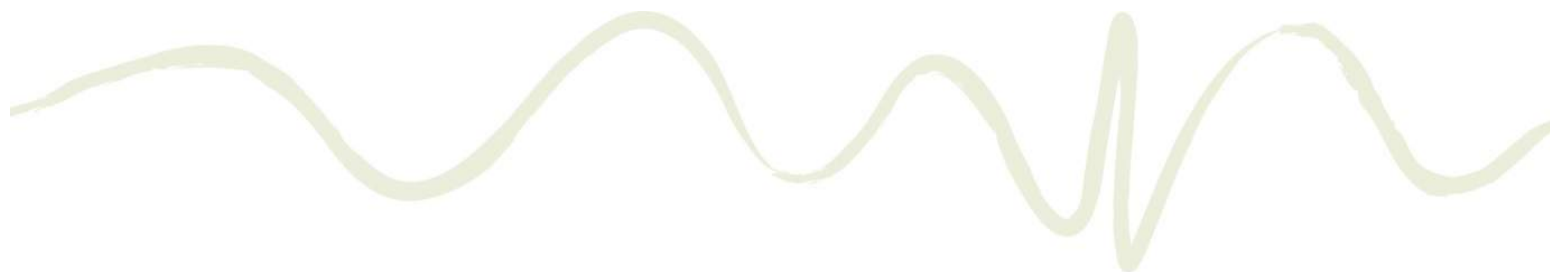
Table F.1 Threatened Fauna Potential Occurrence Assessment

Note: marine and pelagic species for which no habitat occurs are not included in the table

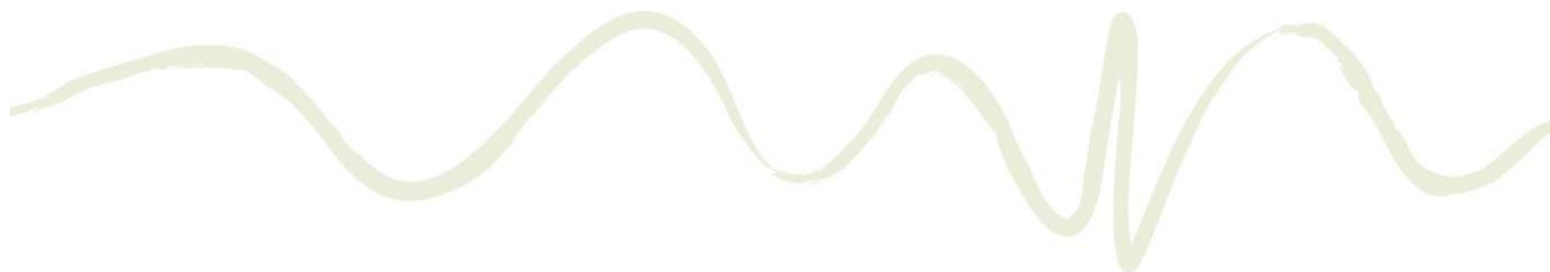
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
INSECTS						
<i>Argynnis hyperbius</i>	Australian Fritillary	E	CE	Open swampy coastal habitat where the caterpillar's food plant, Arrowhead Violet (<i>Viola betonicifolia</i>) occurs.	Low. No OEH records within locality.	Unlikely. Test of significance not required.
<i>Petalura litorea</i>	Coastal Petaltail	V	-	Permanent wetlands, swamps and bogs with free water and open vegetation.	Low	Unlikely. Test of significance not required.
AMPHIBIANS						
<i>Crinia tinnula</i>	Wallum Froglet	V	-	Acid paperbark and sedge swamps known as 'wallum', this is a banksia-dominated lowland heath ecosystem characterised by acidic waterbodies.	Low	Unlikely. Test of significance not required.
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	Rainforest, moist to dry eucalypt forest and heath, typically where surface water gathers after rain.	Low; habitat typically disturbed	Unlikely. Test of significance not required.
<i>Mixophyes balbus</i>	Stuttering Frog	V	V	Cool rainforest, moist eucalypt forest and occasionally along creeks in dry eucalypt forest.	Low	Low. No OEH records within locality; no further assessment required.
<i>Mixophyes iteratus</i>	Giant Barred Frog	V	V	Deep, damp leaf litter in rainforests, moist eucalypt forest and near dry eucalypt forest.	Low	Unlikely. Test of significance not required.
REPTILES						
<i>Cacophis harriettae</i>	White-crowned Snake	V	-	Low to mid-elevation dry eucalypt forest and woodland with well developed litter layer.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Coeranoscincus reticulatus</i>	Three-toed Snake-tooth Skink	V	V	Rainforest and occasionally moist eucalypt forest, on loamy or sandy soils.	Low	Unlikely. Test of significance not required.



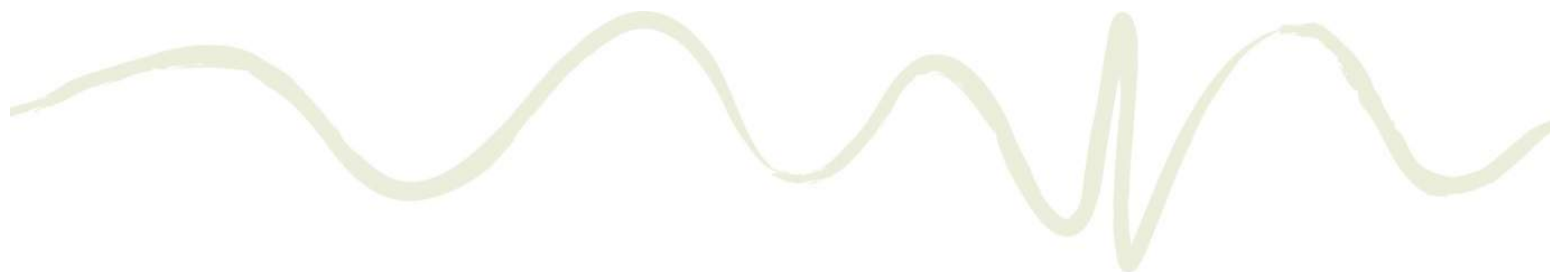
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	Dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. Favours streamside areas, particularly in drier habitats.	Low; habitat typically disturbed	Unlikely. Test of significance not required.
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V	-	Rainforest and eucalypt forests and rocky areas up to 950 m.	Low; habitat typically disturbed	Unlikely. Test of significance not required.
AVIFAUNA						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Dry open forest and woodland with an abundance of nectar-producing eucalypts, particularly box-ironbark woodland, swamp mahogany forests, and riverine sheoak woodlands.	Low	Low. No OEH records within locality; no further assessment required.
<i>Anseranas semipalmata</i>	Magpie Goose	V	-	Shallow wetlands (<1 m deep), large swamps and dams with dense growth of rushes or sedge.	Moderate	May forage in wetlands around Washpen and Glenugie Creek. Test of significance completed.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts; also recorded in shrublands, heathlands and various modified habitats.	Moderate	Recorded. Test of significance completed.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Permanent freshwater wetlands with tall dense vegetation, particularly bullrushes and spikerushes.	Low	Unlikely. Test of Significance not required.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	Lightly timbered open forest and woodland, and partly cleared farmland with woodland remnants, preferring areas with dry leaf-litter, fallen timber and sparse ground cover.	Moderate	Suitable forage habitat occurs. Test of significance completed.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	Sheoaks in coastal forests and woodlands, timbered watercourses, and moist and dry eucalypt forests of the coast and the Great Divide up to 1,000 m.	Moderate	Recorded at CCC. Potential nest trees occur. Test of significance completed.
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	Eucalyptus dominated communities with sparse shrubs and grassy understorey.	Moderate	Suitable forage habitat occurs. Test of significance completed.



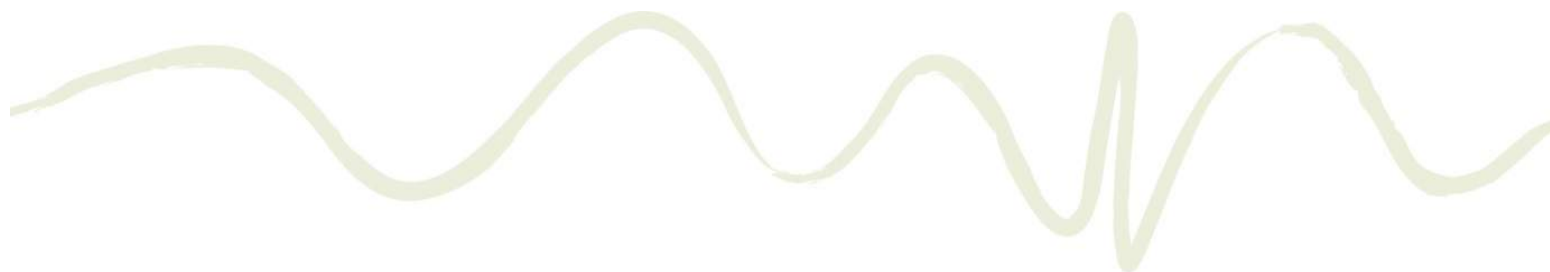
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Circus assimilis</i>	Spotted Harrier	V	-	Grassy open woodland, inland riparian woodland, grassland and shrub steppe.	Moderate	Suitable forage habitat occurs. Test of significance completed.
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	-	Eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range, and less commonly on coastal plains and ranges.	Moderate	Recorded at CCC. Test of significance completed.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Moderate	Suitable forage habitat occurs. Test of significance completed.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	High elevation open forest, woodland with dense tussock or sedge understorey adjacent to rainforest or wet eucalypt forest.	Low	No OEH records within locality; no further assessment required.
<i>Dromaius novaehollandiae</i>	Emu population in NSW North Coast Bioregion	E	-	Open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Low	Few local records. Unlikely. Test of significance not required.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	Swamps, mangroves, mudflats, dry floodplains.	Moderate	Recorded. Test of significance completed.
<i>Erythrotriorchis radiatus</i>	Red Goshawk	CE	V	In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Low	Unlikely. Test of significance not required.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Forages primarily in the canopy of open <i>Eucalyptus</i> forest and woodland, yet also sources food in <i>Angophora</i> , <i>Melaleuca</i> and other tree species.	Moderate	Recorded. Test of significance completed.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	Low	No OEH records within locality; no further assessment required.



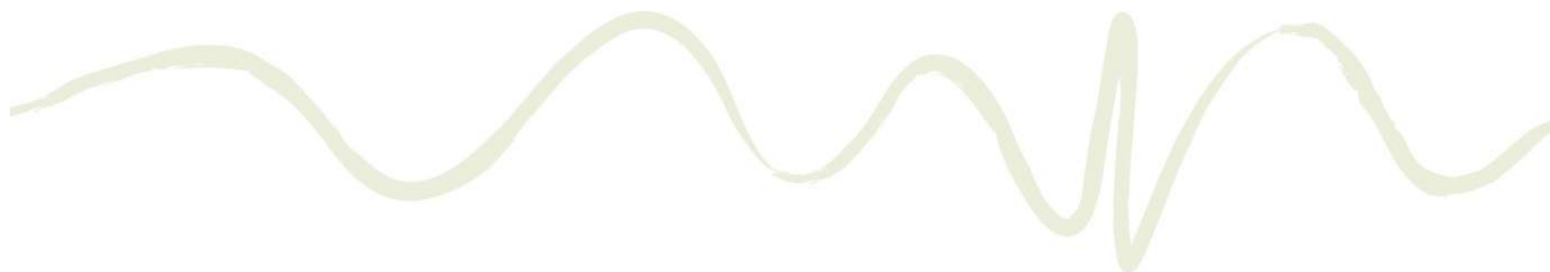
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Grus rubicunda</i>	Brolga	V	-	Shallow swamps, floodplains, grasslands and pastoral lands, usually in pairs or parties.	Moderate	Recorded at CCC and well known from locality. Test of significance completed.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	V	-	Coastal seas, rivers, fresh and saline lakes, lagoons, reservoirs and terrestrial habitats such as grasslands.	Low	Opportunistic foraging habitat occurs. Test of significance completed.
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used.	Low	Opportunistic foraging habitat occurs. Test of significance completed.
<i>Irediparra gallinacea</i>	Comb-crested Jacana	V	-	Among vegetation floating on slow-moving rivers and permanent lagoons, swamps, lakes and dams.	Low	Unlikely. Test of significance not required.
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	Dense vegetation fringing and in streams, swamps, tidal creeks and mudflats, particularly amongst swamp sheoaks and mangroves.	Low	Unlikely. Test of significance not required.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	Forests, woodlands, plantations, and banksias.	Moderate	Opportunistic foraging habitat occurs. Test of significance completed.
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Dry woodland and open forest, particularly along major rivers and belts of trees in urban or semi-urban areas. Home range can extend over at least 100 km ² .	Moderate	Opportunistic foraging habitat occurs. Test of significance completed.
<i>Melanodryas cucullata</i>	Hooded Robin	V	-	Drier Eucalypt forest, woodland, scrub with fallen logs, debris.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	-	Drier open forests or woodlands dominated by box and ironbark eucalypts, and open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Ninox connivens</i>	Barking Owl	V	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland.	Moderate	Suitable habitat occurs. Test of significance completed.



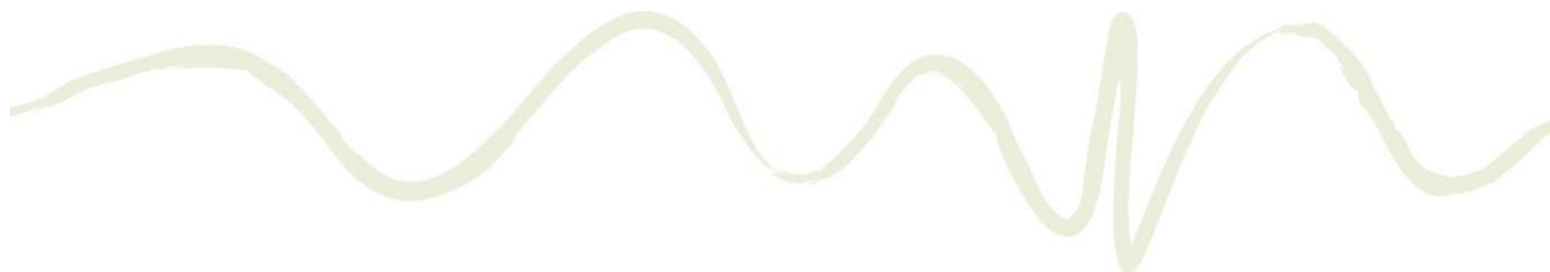
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Ninox strenua</i>	Powerful Owl	V	-	Woodland and open forest to tall moist forest and rainforest, common along drainage lines.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Pandion cristatus</i>	Eastern Osprey	V	-	Forages for fish in fresh, brackish or saline waters of rivers, lakes, estuaries with suitable nesting sites nearby.	Low	Unlikely – no important habitat occurs. Test of significance not required.
<i>Petroica boodang</i>	Scarlet Robin	V	-	Dry eucalypt forests and woodlands, usually with an open grassy understorey with few scattered shrubs. An abundance of logs and fallen timber appear to be an important habitat feature for this species.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Petroica phoenicea</i>	Flame Robin	V	-	Dry eucalypt forests and woodlands, usually with an open grassy understorey with few scattered shrubs.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V	-	Heathland and sedgeland within or adjacent to swamps.	Low	Unlikely. Test of significance not required.
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V	-	Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	Moderate	Recorded. Test of significance completed.
<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	V	-	Rainforests, low-elevation moist eucalypt forest, and Brush Box forests.	Low	Unlikely. Test of significance not required.
<i>Ptilinopus regina</i>	Rose-crowned Fruit-dove	V	-	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low	Unlikely. Test of significance not required.
<i>Ptilinopus superbus</i>	Superb Fruit-dove	V	-	Subtropical and dry rainforest, moist eucalypt forest and swamp forest.	Low	Unlikely. Test of significance not required.
<i>Rostratula australis</i>	Australian Painted Snipe	E	V	Well-vegetated shallows and margins of wetlands, dams, sewage ponds, wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, and open timber.	Low	Unlikely. Test of significance not required.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	Grassy eucalypt woodlands, open forest, mallee, temperate grassland, and secondary grassland derived from other communities, riparian areas, and sometimes in lightly wooded farmland.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Stictonetta naevosa</i>	Freckled Duck	V	-	Permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.	Low	Unlikely. Test of significance not required.
<i>Turnix melanogaster</i>	Black-breasted Button-quail	V	V	Drier rainforests and viney scrubs, often in association with Hoop Pine and a deep moist leaf litter layer.	Low	No OEH records within locality; no further assessment required.
<i>Tyto longimembris</i>	Eastern Grass Owl	V	-	Areas of tall grass, including tussocks in swampy areas, grassy plains, swampy heath, cane grass, sedges on flood plains.	Low; habitat highly disturbed	Unlikely. Test of significance not required.
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Dry eucalypt forest and woodlands.	Moderate	Suitable habitat occurs. Test of significance completed.
MAMMALS						
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V	-	Tall moist eucalypt forest to open woodland with tussock grass understorey.	Moderate	Recorded at CCC and known from locality. Test of significance completed.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Sandstone cliffs and fertile woodland valley habitat within close proximity of each other.	Low	No OEH records within locality; no further assessment required.
<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	V	-	Inhabits dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests.	Moderate	May forage in locality. Assessment of significance completed.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Dry and moist eucalypt forests and rainforests, fallen hollow logs, large rocky outcrops.	Moderate	Suitable habitat occurs. Test of significance completed.



Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest and dense coastal scrub.	Moderate	Recorded at CCC; suitable habitat occurs. Test of significance completed.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Forest or woodland, roost in caves, old mines and stormwater channels.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Mormopterus lumsdenae</i>	Northern Freetail-bat	V	-	Rainforests to open forests and woodlands often along watercourses.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Myotis macropus</i>	Southern Myotis	V	-	Bodies of water, rainforest streams, large lakes, reservoirs.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	V	-	Lowland subtropical rainforest and wet and swamp eucalypt forest, extending to adjacent moist eucalypt forest.	Low	Unlikely. Test of significance not required.
<i>Petauroides volans</i>	Greater Glider	-	V	Wide range of habitats including tall open woodland, eucalypt forests and low woodlands.	Moderate	Suitable habitat occurs. Assessed under EPBC Act.
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	Low; forest typically immature	Unlikely. Test of significance not required.
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Blackbutt, bloodwood and ironbark eucalypt forest with heath understorey in coastal areas, and box-ironbark woodlands and River Red Gum forest inland.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby	V	V	North-facing cliffs and dry eucalypt forest and woodland, inhabiting rock crevices, caves and overhangs.	Low	No OEH records within locality; no further assessment required.



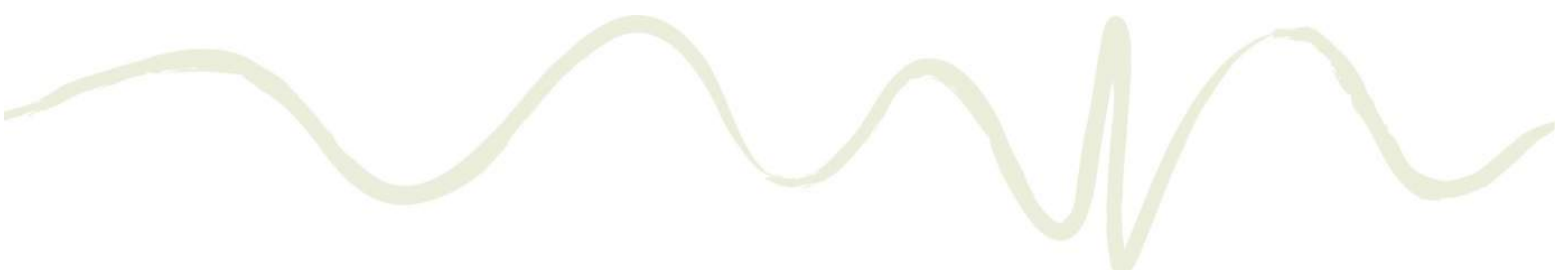
Scientific Name	Common Name	Status		Habitat Requirement (EPBC Act SPRAT and/ or OEH Threatened Species Profiles websites)	Habitat suitability	Test of Significance?
		BC Act	EPBC Act			
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	Drier forests and woodlands with hollow-bearing trees and sparse ground cover.	Moderate	Suitable habitat occurs. Test of significance completed.
<i>Phascolarctos cinereus</i>	Koala	V	V	Appropriate food trees in forests and woodlands, and treed urban areas.	Moderate	May forage in locality. Assessment of significance completed.
<i>Planigale maculata</i>	Common Planigale	V	-	Rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas with surface cover close to water.	Low.	Unlikely. Test of significance not required.
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo	V	V	Cool temperate rainforest, moist and dry forests, and wet heathland, inhabiting dense layers of grass, ferns, vines and shrubs.	Low.	No OEH records within locality; no further assessment required.
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	V	Occurs in open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	No OEH records within locality; no further assessment required.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Moderate	Recorded at CCC; suitable habitat occurs. Test of significance completed.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	Forages in a variety of habitats, roosts in tree hollows and buildings.	Moderate	May forage in locality. Test of significance completed.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest.	Moderate	May forage in locality. Test of significance completed.
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	Cave roosting species found in dry open forest and woodland near cliffs and rocky overhangs.	Low	Low; no further assessment required.

V = Vulnerable; E = Endangered; CE = Critically Endangered



Appendix G

Five-part Tests of Significance (BC Act)



Tests of significance ('five-part tests') under Section 7.3 of the BC Act have been completed for the following threatened species/ communities:

TECs:

- Swamp Oak Floodplain Forest
- Subtropical Coastal Floodplain Forest
- Freshwater Wetlands
- Lowland rainforest

Flora: Weeping Paperbark

Fauna:

Reptiles

- White-crowned Snake

Wetland birds

- Black-necked Stork
- Brolga
- Magpie Goose

Forest birds

- Black-chinned Honeyeater
- Brown Treecreeper
- Bush Stone-curlew
- Diamond Firetail
- Dusky Woodswallow
- Flame Robin
- Glossy Black-Cockatoo
- Grey-crowned Babbler
- Hooded Robin
- Little Lorikeet
- Scarlet Robin
- Speckled Warbler
- Swift Parrot
- Varied Sittella

Raptors and owls

- Barking Owl
- Little Eagle
- Masked Owl
- Powerful Owl
- Spotted Harrier
- Square-tailed Kite
- White-bellied Sea-eagle

Dasyurids

- Spotted-tailed Quoll



Macropods

- Rufous Bettong

Arboreal mammals

- Brush-tailed Phascogale
- Koala
- Squirrel Glider

Flying-foxes

- Grey-headed Flying-fox

Microbats

- Eastern Bentwing-bat
- Little Bentwing-bat
- Eastern Freetail-bat
- Greater Broad-nosed Bat
- Hoary Wattled Bat
- Northern Freetail-bat
- Southern Myotis
- Yellow-bellied Sheath-tail-bat

- a) *in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,***

Weeping Paperbark

Weeping Paperbark has a restricted distribution in NSW and occur in open eucalypt forest on poorly drained soils (usually clay, sandstone or alluvial soils). Flowering occurs between spring and summer.

Threatening processes for this species include:

- Clearing of habitat for agriculture and development.
- Fire, particularly when too frequent to allow regeneration.
- Grazing by domestic stock.
- Invasion of habitat by weeds particularly introduced grasses.
- Plantation development and logging activities.
- Roadworks, including grading and slashing.
- Risk of local extinction because populations are small and may also lack genetic diversity.

Potential Impacts from the Proposal

The small population of Weeping Paperbark in the east of the site will be retained in-situ and no trees will be affected by the works. On this basis, it would be highly unlikely that an adverse effect on the life cycle of Weeping Paperbark would occur such that a viable local population of the species is likely to be placed at risk of extinction.



White-crowned Snake (WCS)

White-crowned Snakes (WCS) favours low to mid-elevation dry eucalypt forest and woodland, particularly areas with a varied and well-developed litter layer, where their prey of small lizards may be more abundant. It is also occasionally found in moist eucalypt forest and coastal heathland.

Threatening processes for this species include:

- Clearing, fragmentation and isolation of suitable habitat due to agricultural and intensive forestry activities.
- Loss of foraging and sheltering habitat as the result of frequent burning associated with grazing and forest management.
- Collection of firewood, bush rock and mulch from areas of habitat.

Potential Impacts from the Proposal

The majority of dry sclerophyll forest (potential WCS habitat) to be removed for the works is structurally poor, disturbed from grazing and comprises relatively low-quality habitat, with the best quality habitat within the Crown reserve. The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). Woody ground debris requiring removal for the works will be relocated into adjacent habitat and will continue to provide refuge for both the WCS and prey. On this basis, it would be highly unlikely that an adverse effect on the life cycle of the WCS would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Black-necked Stork

Black-necked Storks (BNS) occur in floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. BNS usually forage in water 5-30 cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish).

BNS build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). In NSW, breeding activity occurs May - January; incubation May - October; nestlings July - January; fledging from September. Parents share nest duties and in one study about 1.3 -1.7 birds were fledged per nest.

The NSW breeding population has been estimated at about 75 pairs. Territories are large and variable in size and estimated to average about 9,000 ha, ranging from 3,000-6,000 ha in high quality habitat and 10,000-15,000 ha in areas where habitat is poor or dispersed.

Threatening processes for this species include:

- Powerlines, especially close to wetlands or over floodplains, are a significant cause of mortality of Storks and one of the most critical threats to the species in NSW.
- Modification or degradation of wetlands through changes in natural water flows. It is important to maintain or reintroduce flows to provide wetland habitats suitable for foraging by Storks as they require large amounts of vertebrate prey from such habitats.
- Loss of wetland habitat through clearing and draining for development.
- Loss of key habitat as a result of wetland drainage for flood mitigation and agricultural development.
- Degradation of wetland habitats through pollution.
- Loss of paddock trees used for nesting.

- 
- Degradation of wetlands as a result of salinity.

Potential Impacts from the Proposal

The works would comprise disturbance to a small portion of extensive floodplain environments in the locality, which would have a negligible impact on foraging or breeding habitat for BNS in a local context. Following construction of the transmission line, there is unlikely to be any impacts to foraging or breeding resources for BNS. As indicated above however, birds striking transmission lines will be a threat to be mitigated following erection of the transmission lines. Visibility markers will be attached to the transmission lines to reduce the potential for bird strike.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of BNS would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Brolga

Brolgas typically depend on wetlands, especially shallow swamps. They also often feed in dry grassland or ploughed paddocks or even desert claypans. They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs.

The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. Two eggs are laid from winter to autumn.

Threatening processes for this species include:

- At least in former times, Brolgas were poisoned and shot because of their feeding incursions into crops, following drainage of swamps.
- Loss of wetland habitat through clearing and draining for flood mitigation and agriculture.

Potential Impacts from the Proposal

The works would comprise disturbance to a small portion of extensive floodplain environments in the locality, which would have a negligible impact on foraging or breeding habitat for Brolgas in a local context. Following construction of the transmission line, there is unlikely to be any impacts to foraging or breeding resources for Brolgas. While there is potential for birds striking powerlines once installed, this will be mitigated by attaching visibility markers.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of Brolgas would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Magpie Goose

Magpie Geese typically occur on floodplains of rivers and large shallow wetlands with dense growth of rushes or sedges. They occur in aquatic or terrestrial habitats and feed on grasses, bulbs and rhizomes. Breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas. Nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW.

Threatening processes for this species include:

- Inappropriate hydrological regimes of wetland habitats through drainage of swamps, ponds, dams and other wetlands for agricultural and other human purposes.
- Degradation of habitat through water pollution (e.g. salinity, chemicals, eutrophication).
- Modification of habitat and nest loss from trampling and overgrazing.
- Predation on eggs and goslings.

- Too-frequent burning of wetlands.

Potential Impacts from the Proposal

The works would comprise disturbance to a small portion of extensive floodplain environments in the locality, which would have a negligible impact on foraging or breeding habitat for Magpie Geese in a local context. A small but significant population of Magpie Geese which frequent a small wetland off the Pacific Highway near Grafton (~ 2.5 km south of the transmission line) is unlikely to be affected by the works during the construction phase.

Following construction of the transmission line, there is unlikely to be any impacts to foraging or breeding resources for Magpie Geese. While there is potential for birds striking powerlines once installed, this will be mitigated by attaching visibility markers.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of Magpie Geese would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Black-chinned Honeyeater

Black-chinned Honeyeaters mostly occupy upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). The species also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Black-chinned Honeyeaters are gregarious and usually seen in pairs and small groups of up to 12 birds. Feeding territories are large, making the species locally nomadic. Black-chinned Honeyeaters tends to occur in the largest woodland patches in the landscape as bird's forage over large home ranges of at least 5 ha.

Breeding occurs solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. Two or three eggs are laid and both parents and occasionally helpers feed the young.

Threatening processes for this species include:

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the clearing of remnant open forest and woodland habitat.
- Poor regeneration of open forest and woodland habitats because of intense grazing.
- May be excluded from smaller remnants by aggressive species such as the Noisy Miner (*Manorina melanocephala*).
- Fragmentation of woodland habitat.
- Infestation by invasive weeds.
- Inappropriate fire regimes.
- Climate change and reduction in resources due to drought.
- Establishment of exotic pastures.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Black-chinned Honeyeater.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Black-chinned Honeyeater would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Brown Treecreeper

The Brown Treecreeper occurs in eucalypt woodlands and dry open forest of the inland slopes and plains inland of the Great Dividing Range. They mainly inhabit woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Fallen timber is an important habitat component for foraging. Hollows in standing dead or live trees and tree stumps are essential for nesting.

When foraging in trees and on the ground, they peck and probe for insects, mostly ants, amongst the litter, tussocks and fallen timber, and along trunks and lateral branches; up to 80% of the diet is comprised of ants; other invertebrates (including spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage. Nectar from Mugga Ironbark (*Eucalyptus sideroxylon*), paperbarks, and sap are also eaten, along with lizards and food scraps. Young birds are fed ants, insect larvae, moths, craneflies, spiders and butterfly and moth larvae.

The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring.

Threatening processes for this species include:

- Historical loss of woodland, forest and mallee habitats as a result of agriculture, forestry, mining and residential development.
- Fragmentation of woodland and forest remnants which isolates populations and causes local extinctions.
- Ongoing degradation of habitat, particularly the loss of tree hollows and fallen timber from firewood collection and overgrazing.
- Lack of regeneration of eucalypt over-storey in woodland due to overgrazing and too-frequent fires.
- Loss of ground litter from compaction and overgrazing.
- Inappropriate forestry management practices.
- Loss of understorey habitat.
- Competition from invasive weeds.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.

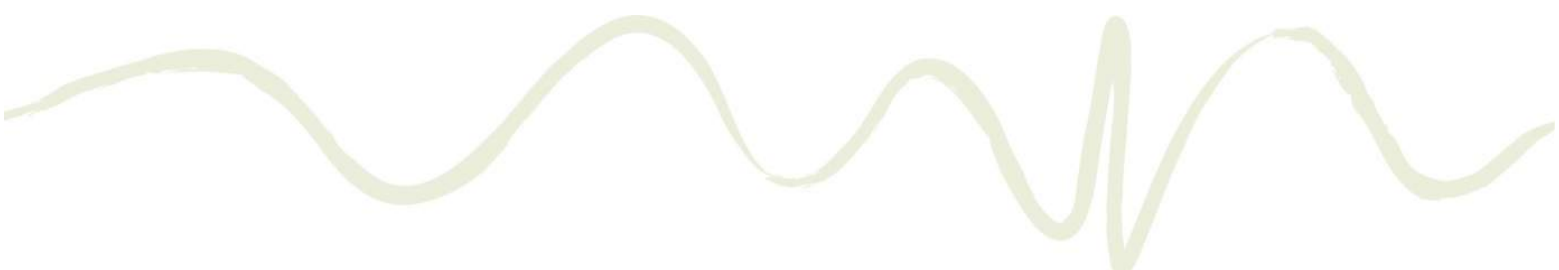
Potential Impacts from the Proposal

The majority of dry sclerophyll forest to be removed for the works is structurally poor and disturbed from grazing and comprises relatively low quality habitat, with the best quality habitat within the Crown reserve. The works may require the removal of up to 8 ha of dry sclerophyll forest habitat (inclusive of 24 hollow-bearing trees), with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping).

In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Brown Treecreeper. On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Brown Treecreeper would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Bush Stone-curlew

The Bush Stone-curlew inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The species is largely nocturnal, being especially active on moonlit nights. The diet comprises insects and small vertebrates, such as frogs, lizards and snakes. Nesting is completed on the ground in a scrape or small bare patch; two eggs are laid in spring and early summer.



Threatening processes for this species include:

- Predation by foxes and cats.
- Trampling of eggs by cattle.
- Clearance of woodland habitat for agricultural and residential development.
- Modification and destruction of ground habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, grazing and frequent fires.
- Disturbance in the vicinity of nest sites.

Potential Impacts from the Proposal

The majority of dry sclerophyll forest to be removed for the works is structurally poor and disturbed from grazing and comprises relatively low-quality habitat, with the best quality habitat within the Crown reserve. The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). Woody ground debris requiring removal for the works will be relocated into adjacent habitat and will continue to provide refuge for Bush Stone-curlew.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Bush Stone-curlew would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Diamond Firetail

The Diamond Firetail occurs in grassy eucalypt woodlands (including Box-Gum Woodlands and Snow Gum woodlands) and also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Birds feed exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season).

Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests.

Threatening processes for this species include:

- Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection.
- Poor regeneration of open forest and woodland habitats.
- Invasion of weeds, resulting in the loss of important food plants.
- Modification and destruction of ground and shrub layers within habitat through: removal of native plants, litter and fallen timber; introduction of exotic pasture grasses; heavy grazing and compaction by stock; and frequent fire.
- Predation of eggs and nestlings by increased populations of native predators such as the Pied Currawong.
- Risk of local extinction due to small, isolated populations.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Diamond Firetail.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Diamond Firetail would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Dusky Woodswallow

The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded, the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Birds are also often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber.

Dusky Woodswallows primarily eat invertebrates, mainly insects, which are captured whilst hovering and sallying above the canopy or over water. Occasionally nectar, fruit and seed are also ingested. Nesting occurs from late September to late February, with eggs present between September and January, although most eggs are present between October and early December. Clutch size is one to four and pairs may nest twice in a season. Both parents brood the eggs and feed the nestlings and fledglings need care for about a month.

Threatening processes for this species include:

- Land clearing and degradation.
- Competitive exclusion by Noisy Miners.
- Increased nest predation by currawongs, magpies and butcherbirds.
- Inappropriate fire regimes.
- Excessive grazing.
- Removal of coarse woody debris and dead trees.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Dusky Woodswallow.

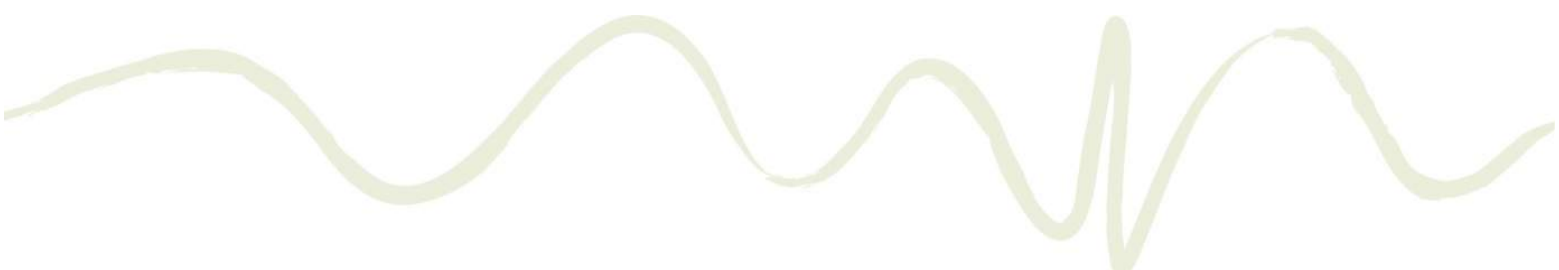
On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Dusky Woodswallow would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Flame Robin

Flame Robins occur in several forest types and prefers clearings or areas with open understoreys. It occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Breeding occurs in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. The ground layer of breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense.

Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. Flying insects are often taken in the air and sometimes gleans for invertebrates from foliage and bark.

Breeding occurs in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks; clutch size is three or four eggs.



Threatening processes for this species include:

- Clearing and degradation of breeding and wintering habitats.
- Degradation and simplification of habitat by removal of standing dead timber, logs and coarse woody debris.
- Nest predation by native and exotic predators, including artificially large populations of Pied Currawong in some areas.
- Habitat for this species may become unsuitable if dense regeneration occurs after bushfires or other disturbances.
- Competitive exclusion by over abundant Noisy Miners within habitat.
- Isolation of patches of habitat, particularly where these patches are smaller than 10 ha, and in landscapes where clearing has been heavy or where remnants are surrounded by cropping or stock grazing.
- Degradation and simplification of habitat due to overgrazing.
- Reduction of the native ground cover in favour of exotic grasses.
- Reduction in the structural complexity of habitat, including reductions in canopy cover, shrub cover, ground cover, logs, fallen branches and leaf litter.
- Reduction of size of remnant patches.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Flame Robin.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Flame Robin would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Glossy Black-Cockatoo

Glossy Black-Cockatoo inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak (*Allocasuarina diminuta*) and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. Glossy Black-Cockatoo are dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.

Threatening processes for this species include:

- Reduction of suitable habitat through clearing for development.
- Decline of hollow-bearing trees over time due to land management activities.
- Excessively frequent fire which eliminates sheoaks from areas, prevents the development of mature sheoak stands, and destroys nest trees.
- Firewood collection resulting in loss of hollow-bearing trees, reduced recruitment of hollow-bearing trees, and disturbance of breeding attempts.
- Decline in extent and productivity of sheoak foraging habitat due to feral herbivores.
- Reduced access to surface water in close proximity to foraging and nesting habitat.
- Limited information on the location of nesting aggregations and the distribution of high quality breeding habitat.
- Disturbance from coal seam gas and open cut coal mining causing loss of foraging and breeding habitat as well as disturbing reproductive attempts.
- Decline in extent and productivity of sheoak foraging habitat caused by moisture stress due to climate change.
- Forestry activity resulting in loss of hollow-bearing trees, reduced recruitment of hollow-bearing trees, degradation of foraging habitat, and disturbance of breeding attempts.
- Degradation of foraging habitat and reduced regeneration of sheoak stands due to grazing by domestic stock.

- Loss of foraging habitat due to slashing/ under scrubbing.
- Change in the spatial and temporal distribution of resources due to global warming.
- Illegal bird smuggling and egg-collecting.
- Habitat infestation by weeds such as African Boxthorn, Gazania, Buffel Grass and other invasive grasses.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 23 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Glossy Black-Cockatoo.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Glossy Black-Cockatoo would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-crowned Babbler

Grey-crowned Babblers inhabit open Box-Gum Woodlands on the slopes, and Box-Cypress Pine and open Box Woodlands on alluvial plains; in coastal regions Woodlands on fertile soils are typical habitat. Babblers live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. They feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses.

Grey-crowned Babblers build and maintain several conspicuous, dome-shaped stick nests about the size of a football, which are used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year-round, and old nests are often dismantled to build new ones.

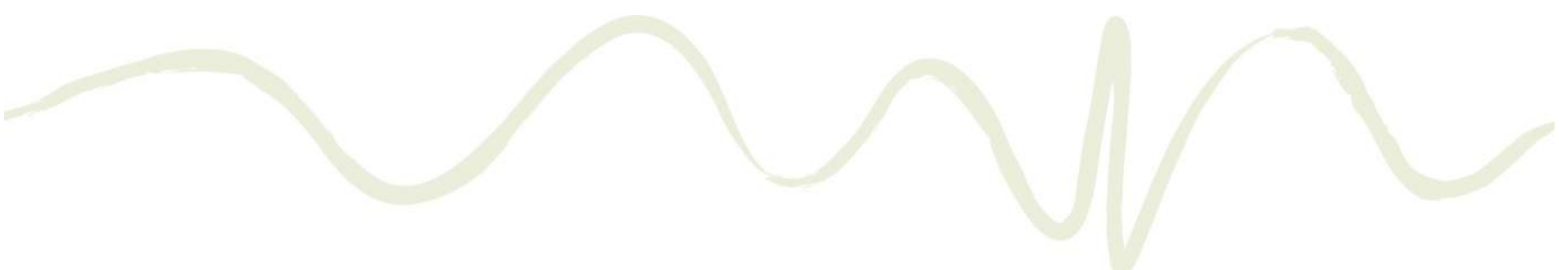
Breeding occurs between July and February. Usually two to three eggs are laid and incubated by the female. During incubation, the adult male and several helpers in the group may feed the female as she sits on the nest. Young birds are fed by all other members of the group. Territories range from one to 50 ha (usually around 10 ha) and are defended all year.

Threatening processes for this species include:

- Loss, degradation and fragmentation of woodland habitat on high fertility soils.
- Excessive total grazing pressure and loss of coarse woody debris is resulting in degradation and loss of important habitat components.
- Infestation of habitat by invasive weeds including exotic perennial grasses.
- Inappropriate fire regimes - excessive fires lead to loss of tree and shrub regeneration and absence of fire may lead to the grass sward being too dense and therefore unsuitable for foraging by babblers.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.
- Nest predation by species such as ravens and butcherbirds may be an issue in some regions where populations are small and fragmented.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). The old dormitory camp in the east of the site will not be



affected. In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Grey-crowned Babbler.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Grey-crowned Babbler would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Hooded Robin

The Hooded Robin prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. It requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.

Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. Breeding may occur any time between July and November, often several broods are reared. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground. The nest is defended by both sexes with displays of injury-feigning, tumbling across the ground. A clutch of two to three is laid and incubated for fourteen days by the female. Two females often cooperate in brooding.

Threatening processes for this species include:

- Clearing of woodlands, resulting in loss and fragmentation of habitat.
- Modification and destruction of ground habitat through heavy grazing and compaction by stock, removal of litter and fallen timber, introduction of exotic pasture grasses and frequent fire.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Reduction in resources due to drought.
- Disturbance and changes to vegetation structure due to forestry activities (e.g. fire and harvesting).

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Hooded Robin.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Hooded Robin would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet

The Little Lorikeet mostly forages in the canopy of open eucalypt forest and woodland, utilising *Eucalyptus*, *Angophora*, *Melaleuca* and other tree species. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. The species feeds mostly on nectar and pollen, but occasionally also on native fruits such as mistletoe. Nests are generally located in proximity to feeding areas if possible and entrances are small (3 cm) and usually high above the ground (2-15 m). Nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like *Allocasuarina*. The nesting season extends from May to September.

Threatening processes for this species include:

- Clearing of woodlands for agriculture.
- Loss of old hollow-bearing trees.

- Competition with the introduced Honeybee.
- Infestation of habitat by invasive weeds.
- Inappropriate fire regimes.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.
- Degradation of woodland habitat and vegetation structure due to overgrazing.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Little Lorikeet.

On this basis it would be highly unlikely that an adverse effect on the life cycle of the Little Lorikeet would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Scarlet Robin

The Scarlet Robin lives in dry eucalypt forests and woodlands, where the understorey is usually open and grassy with few scattered shrubs. The species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat.

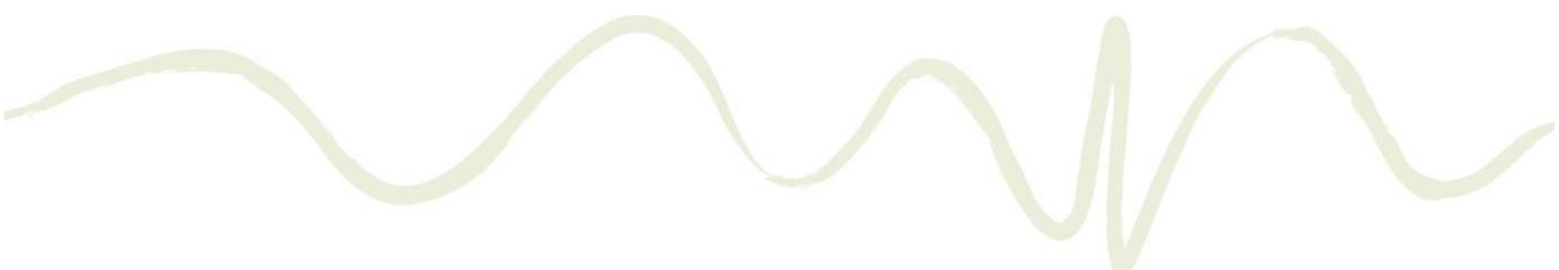
In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise two or three broods in each season.

Threatening processes for this species include:

- Historical habitat clearing and degradation.
- Habitat modification due to overgrazing.
- Reduction of size of remnant patches.
- Reduction in the structural complexity of habitat, including reductions in canopy cover, shrub cover, ground cover, logs, fallen branches and leaf litter.
- Reduction of the native ground cover in favour of exotic grasses.
- Loss of nest sites, food sources and foraging sites, such as standing dead timber, logs and coarse woody debris from depletion by grazing, firewood collection and 'tidying up' of rough pasture.
- Predation by over abundant populations of Pied Currawong.
- Predation by feral cats.
- Robbing of nests and predation of fledglings by rats.
- Isolation of patches of habitat, particularly where these patches are smaller than 10 ha, and in landscapes where clearing has been heavy or where remnants are surrounded by cropping or stock grazing.
- Habitat for the Scarlet Robin may become unsuitable if dense regeneration occurs after bushfires or other disturbances.
- Competitive exclusion by over abundant Noisy Miners within habitat.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality



(refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Scarlet Robin.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Scarlet Robin would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Speckled Warbler

The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees.

Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A clutch of three to four eggs is laid, between August and January, and both parents feed the nestlings.

Threatening processes for this species include:

- Due to the fragmented nature of the populations and their small size the species is susceptible to catastrophic events and localised extinction.
- Clearance of remnant grassy woodland habitat for paddock management reasons and for firewood.
- Poor regeneration of grassy woodland habitats.
- Modification and destruction of ground habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, heavy grazing and compaction by stock and frequent fire.
- Habitat is lost and further fragmented as land is being cleared for residential and agricultural developments. In particular, nest predation increases significantly, to nest failure rates of over 80%, in isolated fragments.
- Nest failure due to predation by native and non-native birds, cats, dogs and foxes particularly in fragmented and degraded habitats.
- Infestation of habitat by invasive weeds.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.
- Climate change impacts including reduction in resources due to drought.

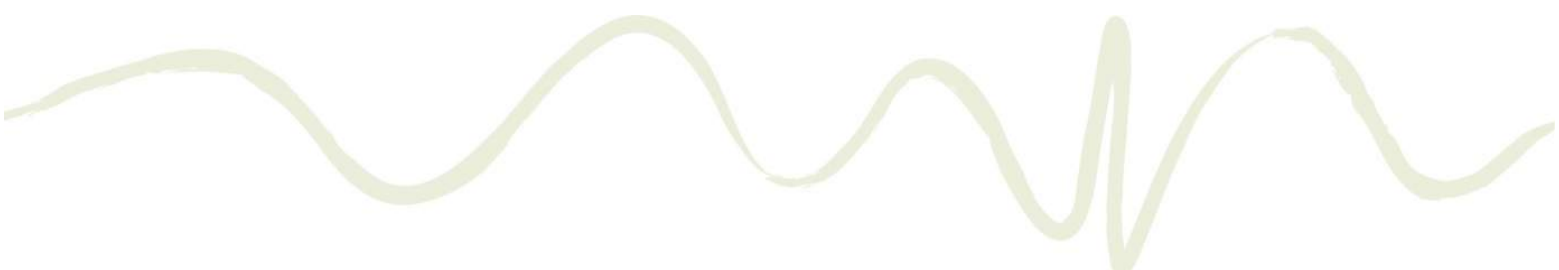
Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Speckled Warbler.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Speckled Warbler would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Swift Parrot

The Swift Parrot breeds in Tasmania during spring and summer, migrating in autumn and winter to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW, the Swift Parrot mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs)



infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. macrocarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*). Birds return to some foraging sites on a cyclic basis depending on food availability. Following winter, they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum (*Eucalyptus globulus*).

Threatening processes for this species include:

- Habitat loss and degradation.
- Changes in spatial and temporal distribution of habitat due to climate change.
- Reduction in food resources due to drought.
- Competition for food resources.
- Collision mortality.
- Psittacine Beak and Feather Disease.
- Fragmentation of woodland habitat.
- Infestation by invasive weeds.
- Inappropriate fire regimes.
- Aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources which may be utilised by Swift Parrots.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Swift Parrot would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella

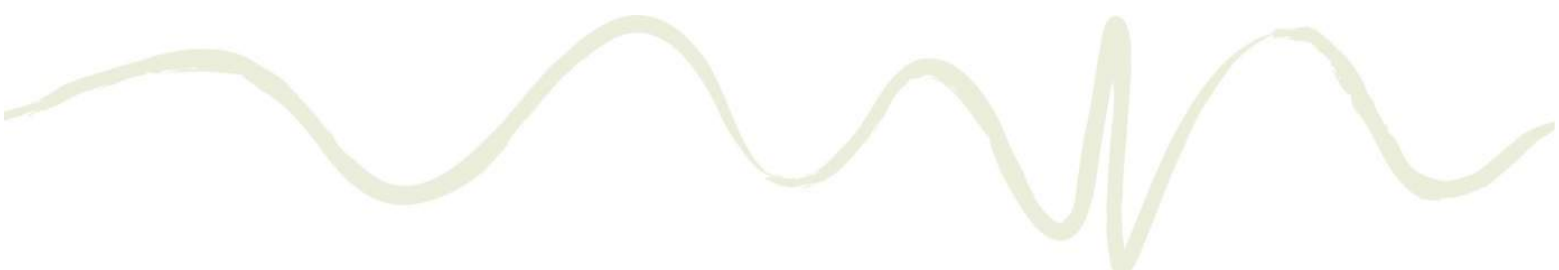
The Varied Sittella is distributed widely in NSW, extending from the coast to the far west. The NSW population has undergone a moderate reduction over the past several decades. Habitat includes eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella forages for arthropods on bark, dead branches and small branches and twigs; the nest is cup-shaped and built of plant fibres and cobwebs in an upright tree fork high in the living tree canopy.

Threatening processes for this species include:

- Habitat decline.
- Dominance of Noisy Miners in woodland patches.
- Threats include habitat degradation through small-scale clearing for fence lines and road verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection.
- Infestation of habitat by invasive weeds.
- Inappropriate fire regimes.
- Climate change impacts including reduction in resources due to drought.
- Overgrazing by stock impacting on leaf litter and shrub layer.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging or breeding resources which may be utilised by the Varied Sittella.



On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Varied Sittella would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Barking Owl

The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It roosts in shaded portions of tree canopies, including tall mid-storey trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Barking Owls preferentially hunt small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits.

The species requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 ha, with 2000 ha being more typical in NSW habitats. Nesting occurs in living eucalypts and sometimes dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas). Nesting occurs during mid-winter and spring but is variable between pairs and among years. Laying generally occurs during August and fledging occurs in November. The female incubates for five weeks, roosts outside the hollow when chicks are four weeks old, then fledging occurs two to three weeks later. Young are dependent for several months.

Threatening processes for this species include:

- Clearing and degradation of habitat, mostly through cultivation, intense grazing and the establishment of exotic pastures.
- Inappropriate forest harvesting practices that remove old, hollow-bearing trees and change open forest structure to dense regrowth.
- Firewood harvesting resulting in the removal of fallen logs and felling of large dead trees.
- Too-frequent fire leading to degradation of understorey vegetation which provides shelter and foraging substrates for prey species.
- Disturbance of nesting and excessive disturbance of foraging by inappropriate use of call-playback surveys.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Barking Owl. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

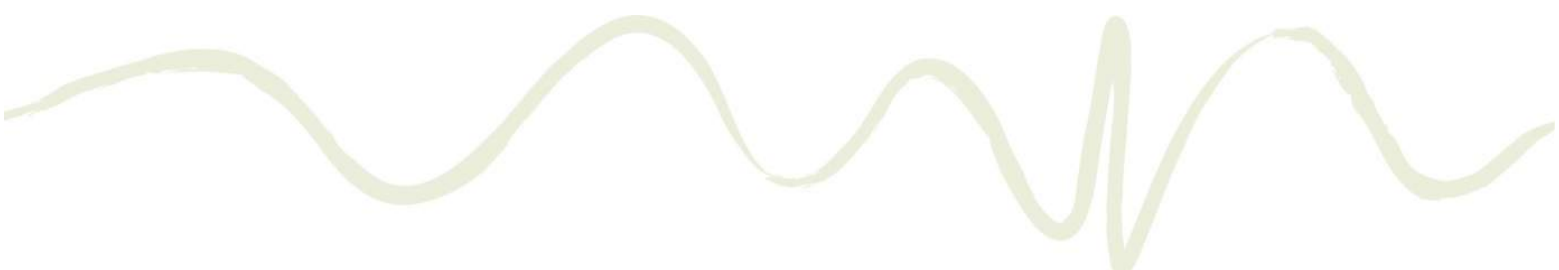
On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Barking Owl would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Little Eagle

The Little Eagle occupies open eucalypt forest, woodland or open woodland. Nesting occurs in tall living trees within a remnant patch, where pairs build a large stick nest in winter and two or three eggs are laid during spring; young fledge in early summer. Little Eagles prey on birds, reptiles and mammals, occasionally adding large insects and carrion.

Threatening processes for this species include:

- Secondary poisoning from rabbit baiting.
- Clearing and degradation of foraging and breeding habitat.



Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Little Eagle.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Little Eagle would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl

Masked Owls live in dry eucalypt forests and woodlands from sea level to 1100 m and often hunt along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 ha. Masked Owls roost and breed in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Threatening processes for this species include:

- Loss of mature hollow-bearing trees and changes to forest and woodland structure, which leads to fewer such trees in the future.
- Clearing of habitat for grazing, agriculture, forestry or other development.
- A combination of grazing and regular burning is a threat, through the effects on the quality of ground cover for mammal prey, particularly in open, grassy forests.
- Secondary poisoning from rodenticides.
- Being hit by vehicles.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Masked Owl. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

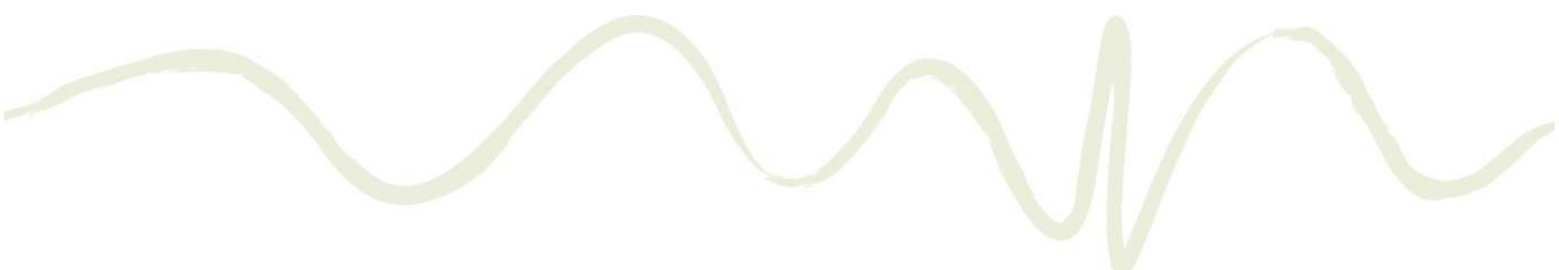
On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Masked Owl would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Powerful Owl

The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (*Syncarpia glomulifera*), Black She-oak (*Allocasuarina littoralis*), Blackwood (*Acacia melanoxylon*), Rough-barked Apple (*Angophora floribunda*), Cherry Ballart (*Exocarpus cupressiformis*) and a number of eucalypt species.

The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. Flying-foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.

Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree



hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.

Threatening processes for this species include:

- Historical loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development. This loss also affects the populations of arboreal prey species, particularly the Greater Glider which reduces food availability for the Powerful Owl.
- Inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees. Loss of hollow-bearing trees reduces the availability of suitable nest sites and prey habitat.
- Can be extremely sensitive to disturbance around the nest site, particularly during pre-laying, laying and downy chick stages. Disturbance during the breeding period may affect breeding success.
- High frequency hazard reduction burning may also reduce the longevity of individuals by affecting prey availability.
- Road kills.
- Secondary poisoning.
- Predation of fledglings by foxes, dogs and cats.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Powerful Owl. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Powerful Owl would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted Harrier

Spotted Harriers occur in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. They are found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Prey includes terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptiles, occasionally insects and rarely carrion.

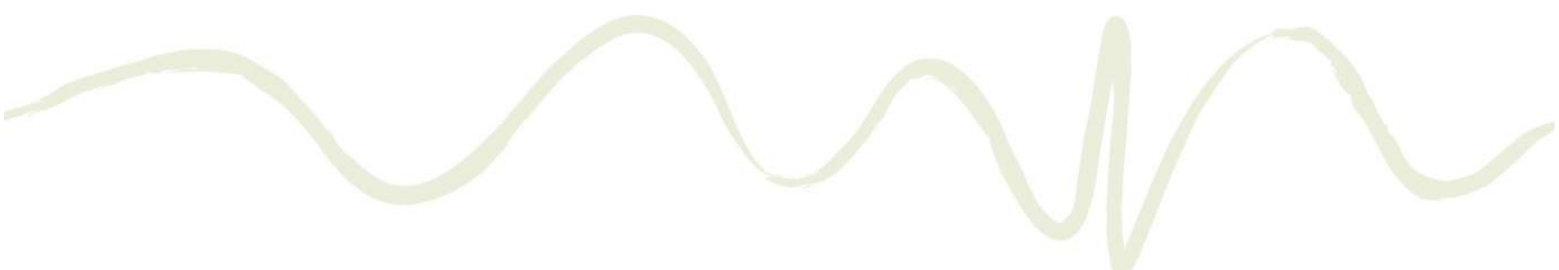
Birds build a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months.

Threatening processes for this species include:

- Loss of foraging and breeding habitat, particularly that which affects prey densities.
- Loss of mature trees from rural landscapes.
- Secondary poisoning from the use of pindone in rabbit control.
- Secondary poisoning from rodenticides.
- Lack of knowledge of locations of key breeding habitat and breeding ecology and success.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat (potential foraging and nesting habitat), with adjoining forest within the study area and adjacent lands remaining



unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). Preferred foraging habitat within wetlands and pasture areas will not be significantly affected by the works. In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Spotted Harrier.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Spotted Harrier would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Square-tailed Kite

Square-tailed Kites occur in a variety of timbered habitats including dry woodlands and open forests and show a particular preference for timbered watercourses. The species is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Large hunting ranges of more than 100 km² are utilised. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.

Threatening processes for this species include:

- Clearing, logging, burning, and grazing of habitats resulting in a reduction in nesting and feeding resources.
- Disturbance to or removal of potential nest trees near watercourses.
- Illegal egg collection and shooting.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the Square-tailed Kite.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Square-tailed Kite would occur such that a viable local population of the species is likely to be placed at risk of extinction.

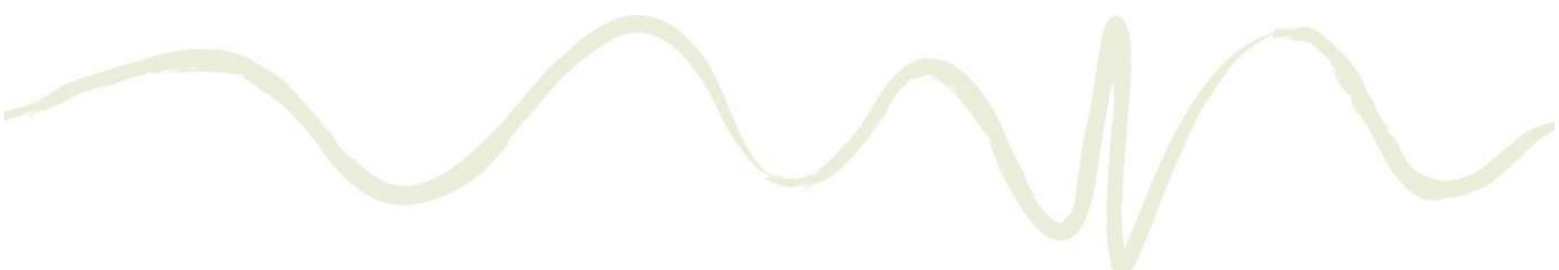
White-bellied Sea-eagle

White-bellied Sea-eagles may be solitary or live in pairs or small family groups consisting of a pair of adults and dependent young. Resident pairs are territorial and occupy nesting territories of hundreds of hectares. Foraging habitat consists of coastal seas, rivers, fresh and saline lakes, lagoons, reservoirs and terrestrial habitats such as grasslands. The diet of the White-bellied Sea-eagle consists mainly of waterbirds, freshwater turtles and fish.

Breeding habitat consists of large trees, usually living or less often dead, within mature open forest, gallery forest or woodland. In subtropical eastern NSW White-bellied Sea-eagles nest at least 220 m from human settlements; nests may be abandoned if disturbed. The breeding period extends from June to January, eggs are typically laid in June to September and young birds remain in the nest for 65–70 days. After fledging, young birds may associate with their parents for a few years before dispersing, potentially over large distances.

Threatening processes for this species include:

- Clearing, degradation or reclamation of saltmarsh, mangroves, sea grass and other riparian or shallow water vegetation.
- Increased mortality.

- 
- Decreased nesting success.
 - Reduced foraging resources.

Potential Impacts from the Proposal

The works are unlikely to require the removal of any suitable foraging habitat, and no known nest sites will be impacted. In a local context, the works are unlikely to result in significant impacts to foraging resources or a reduction in the prey base for the White-bellied Sea-eagle.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the White-bellied Sea-eagle would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll

Spotted-tailed Quolls occur across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.

Quolls are generalist predators with a preference for medium-sized (500 g-5 kg) mammals. Spotted-tailed Quolls consume a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. They also eat carrion and take domestic fowl.

Females occupy home ranges up to about 750 ha and males up to 3500 ha. They are known to traverse their home ranges along densely vegetated creeklines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.

Threatening processes for this species include:

- Loss, fragmentation and degradation of habitat.
- Competition with introduced predators such as cats and foxes.
- Deliberate poisoning, shooting and trapping, primarily in response to chicken predation.
- Roadkill.
- Competition for habitat and other resources by the cane toad.

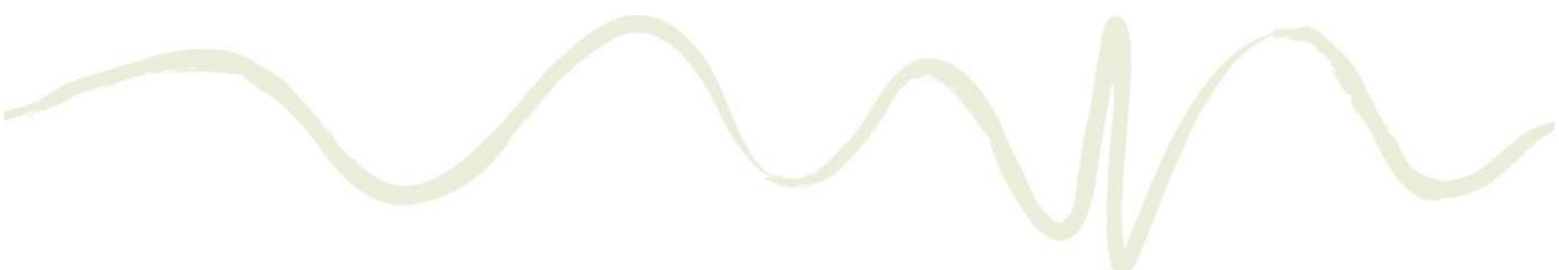
Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or refuge habitat for the Spotted-tailed Quoll due to its wide-ranging behaviour and large home range. Risk of roadkill from plant and vehicles would be minimised due to the works occurring within daytime hours.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Spotted-tailed Quoll would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Rufous Bettong

Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter. They sleep during the day in cone-shaped nests constructed of grass in a shallow depression at the base of a



tussock or fallen log. At night they feed on grasses, herbs, seeds, flowers, roots, tubers, fungi and occasionally insects.

Threatening processes for this species include:

- Changes to the grassy understorey by inappropriate burning and grazing.
- Competition from rabbits.
- Predation by feral cats and foxes, whose numbers appear to increase when dingoes are reduced through baiting.
- Loss of habitat through clearing, logging and collection of fallen timber.
- Poor knowledge of the species' abundance and distribution in the western parts of its range.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources or refuge habitat for the Rufous Bettong and no barriers to movement would be created. Risk of roadkill from plant and vehicles would be minimised due to the works occurring within daytime hours.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Spotted-tailed Quoll would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Brush-tailed Phascogale

Brush-tailed Phascogales prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. They are agile climbers foraging preferentially in rough barked trees of 25 cm DBH or greater. The diet mostly comprises arthropods but also includes other invertebrates, nectar and sometimes small vertebrates. Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. Brush-tailed Phascogales nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.

Threatening processes for this species include:

- Loss and fragmentation of habitat.
- Loss of hollow-bearing trees.
- Predation by foxes and cats.
- Competition for nesting hollows with the introduced honeybee.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected, and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Brush-tailed Phascogale. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees. Risk of roadkill from plant and vehicles would be minimised due to the works occurring within daytime hours.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Brush-tailed Phascogale would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Koala

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW, it mainly occurs on the central and north coasts, with populations on the western side of the Great Dividing Range. Habitat consists of eucalypt woodlands and forests, in which the Koala feeds on more than 70 eucalypt species and 30 non-eucalypt species. Preferred browse species differ across regions. Koalas are inactive for most of the day and do most of their feeding and moving during the night. Although predominantly arboreal, Koalas will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than 2 ha to several hundred hectares in size. Generally solitary, the Koala has complex social hierarchies based on a dominant male with a territory that overlaps that of several females, with sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

In Clarence Valley LGA, preferred food trees include Forest Red Gum (*Eucalyptus tereticornis*), Swamp Mahogany (*E. robusta*), Tallowwood (*E. microcorys*) and Small-fruited Grey Gum (*E. propinqua*), with several other species recognised as secondary feed trees.

Threatening processes for this species include:

- Loss, modification and fragmentation of habitat.
- Predation by feral and domestic dogs.
- Intense fires that scorch or kill the tree canopy.
- Road-kills.
- Human-induced climate change, especially drought.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging and refuge habitat for the Koala, with forest types of low quality and lacking preferred feed tree species. Risk of roadkill from plant and vehicles would be minimised due to the works occurring within daytime hours.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Brush-tailed Phascogale would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Squirrel Glider

Squirrel Gliders inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. They prefer mixed species stands with a shrub or Acacia mid-storey. Squirrel Gliders live in family groups of a single adult male one or more adult females and offspring and require abundant tree hollows for refuge and nest sites. The diet varies seasonally and consists of *Acacia* gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

Threatening processes for this species include:

- Habitat loss and degradation.
- Fragmentation of habitat.
- Loss of hollow-bearing trees.
- Loss of understorey food resources.
- Inappropriate fire regimes.
- Reduction in food resources due to drought.

- Mortality due to entanglement on barbed wire.
- Occupation of hollows by exotic species.
- Mortality due to collision with vehicles.
- Predation by exotic predators.
- Changes in spatial and temporal distribution of habitat due to climate changes.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for Squirrel Gliders. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees. Fragmentation of habitat areas would not be significant to dispersal, as the transmission line corridor fragments only one large patch of vegetation and the 30 m easement width is of a width which may be traversed by Squirrel Gliders.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Squirrel Glider would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox (GHFF)

Grey-headed Flying-foxes (GHFF) have a distribution that typically extends approximately 200 km from the coast of Eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. Foraging areas include subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. GHFF feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines, as well as from cultivated gardens and orchards. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. GHFF may travel up to 50 km from the camp to forage; commuting distances are more often <20 km.

Threatening processes for this species include:

- Clearing of woodlands for agriculture.
- Loss of roosting and foraging sites.
- Electrocution on powerlines, entanglement in netting and on barbed-wire.
- Heat stress.
- Conflict with humans.
- Incomplete knowledge of abundance and distribution across the species' range.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). No known roost habitat would be affected. In a local context, the works are unlikely to result in significant impacts to foraging resources for GHFF. While there is potential for GHFF to strike powerlines, this will be mitigated by installation of visibility markers.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of GHFF would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Eastern and Little Bentwing-bat

Bentwing-bats occur in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Roosting occurs in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Little Bentwing-bats often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.

In NSW, the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five nursery sites/ maternity colonies are known in Australia.

Threatening processes for these species include:

- Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic.
- Destruction of caves that provide seasonal or potential roosting sites.
- Changes to habitat, especially surrounding maternity/ nursery caves and winter roosts.
- Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals.
- Predation from foxes, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.
- Predation from feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges.
- Introduction of exotic pathogens such as the White-nosed fungus.
- Hazard reduction and wildfire fires during the breeding season.
- Large scale wildfire or hazard reduction can impact on foraging resources.
- Poor knowledge of reproductive success and population dynamics.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging habitat for Bentwing-bats and no roost habitat would be affected.

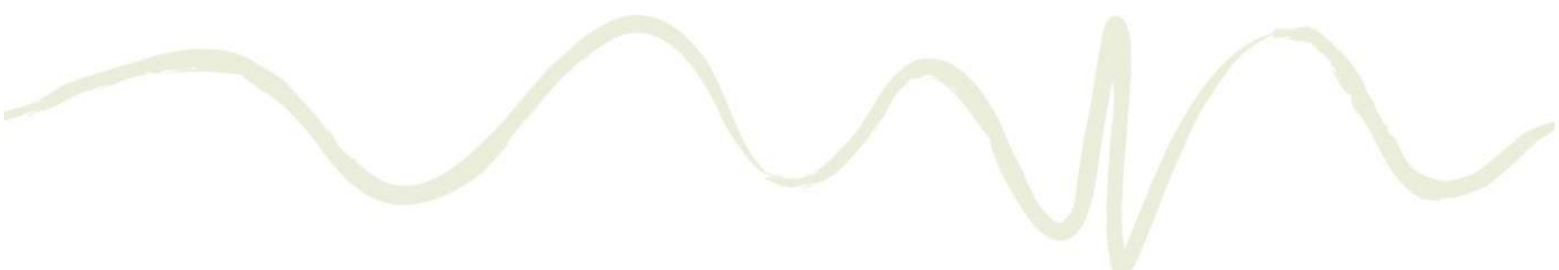
On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Eastern or Little Bentwing-bats would occur such that a viable local population of these species is likely to be placed at risk of extinction.

Eastern Freetail-bat

The Eastern Freetail-bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. They typically roost in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally; probably insectivorous.

Threatening processes for this species include:

- Loss of hollow-bearing trees.
- Loss of foraging habitat.
- Application of pesticides in or adjacent to foraging areas.
- Artificial light sources spilling onto foraging and/ or roosting habitat.
- Large scale wildfire or hazard reduction burns on foraging and/or roosting habitat.



Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Eastern Freetail-bat. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Eastern Freetail-bat would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat

The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although usually roosting in tree hollows, the species has also been found in buildings. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of the reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of a single young.

Threatening processes for this species include:

- Disturbance to roosting and summer breeding sites.
- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
- Loss of hollow-bearing trees.
- Pesticides and herbicides may reduce the availability of insects or result in the accumulation of toxic residues in individuals' fat stores.
- Changes to water regimes are likely to impact food resources, as is the use of pesticides and herbicides near waterways.

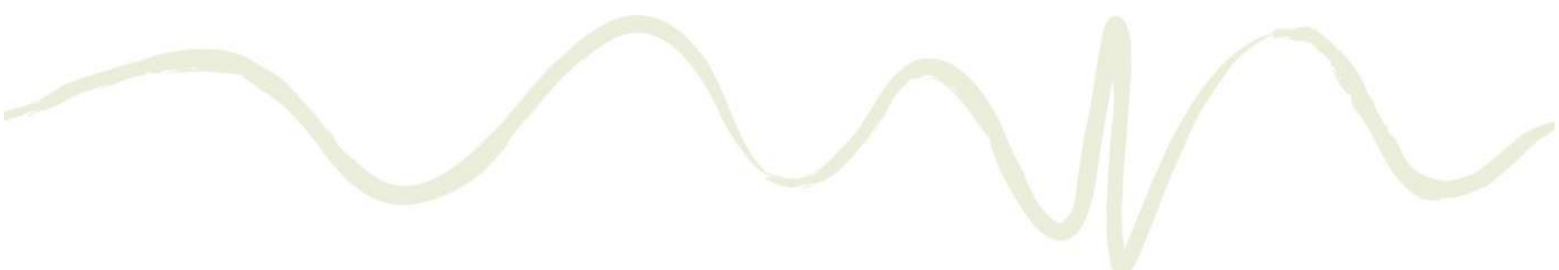
Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Greater Broad-nosed Bat. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Greater Broad-nosed Bat would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Hoary Wattled Bat

In NSW, the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat. The species roosts in hollows and rock crevices and



will occupy urban areas with suitable habitat. Birthing usually occurs during October and November when twins are born.

Threatening processes for this species include:

- Clearing and fragmentation of dry forest and woodland habitat through clearing for agriculture and development.
- Loss of tree hollows for roosting and maternity sites from forest management favouring younger stands of trees.
- Loss of hollow-bearing trees used for roosting and maternity sites as a result of too-frequent burning for grazing and forestry management activities.
- Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals. The use of pesticides also reduces available insect food sources.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Hoary Wattled Bat. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Hoary Wattled Bat would occur such that a viable local population of the species is likely to be placed at risk of extinction.

Northern Freetail-bat

Northern Freetail-bats utilise a range of vegetation types in northern Australia, from rainforests to open forests and woodlands, and are often recorded along watercourses. They can also occur in towns and cities. Roost typically occurs in tree hollows, but relatively large colonies have been found under house roofs in urban areas in Queensland.

Threatening processes for this species include:

- Clearing of forest and woodland habitat for agricultural, residential and infrastructure development.
- Loss of hollow-bearing trees used for roosting and maternity sites as the result dieback, too frequent burning and forest management favouring younger stands.
- Use of pesticides.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Northern Freetail-bat. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Northern Freetail-bat would occur such that a viable local population of the species is likely to be placed at risk of extinction.



Southern Myotis

Southern Myotis forage over streams and pools catching insects and small fish by raking their feet across the water surface. They generally roost close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. In NSW, females have one young each year usually in November or December.

Threatening processes for this species include:

- Loss or disturbance of roosting sites.
- Clearing adjacent to foraging areas.
- Application of pesticides in or adjacent to foraging areas.
- Reduction in stream water quality affecting food resources.

Potential Impacts from the Proposal

The proposed works would have no significant impact on foraging habitat of the Southern Myotis in the context of substantial foraging habitat over the Glenugie Creek and Washpen Creek floodplains. No known roost colonies in the locality would be affected.

On this basis, it is considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the Southern Myotis such that a viable local population of the species is placed at risk of extinction.

Yellow-bellied Sheathtail-bat

The Yellow-bellied Sheathtail-bat forages in most habitats across a very wide range, with and without trees; the species appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements of Sheathtail-bats are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

Threatening processes for this species include:

- Disturbance to roosting and summer breeding sites.
- Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions.
- Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat.
- Pesticides and herbicides may reduce the availability of insects or result in the accumulation of toxic residues in individuals' fat stores.

Potential Impacts from the Proposal

The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). In a local context, the works are unlikely to result in significant impacts to foraging resources for the Yellow-bellied Sheathtail-bat. Loss of habitat trees will result in a minor reduction in potential nesting opportunities in the locality with retained forests continuing to support hollow-bearing trees.

On this basis, it would be highly unlikely that an adverse effect on the life cycle of the Yellow-bellied Sheathtail-bat would occur such that a viable local population of the species is likely to be placed at risk of extinction.



b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

- Swamp Oak Floodplain Forest (SOFF): approximately 0.49 ha of SOFF will be removed for the works. SOFF occurs as scattered disjunct patches within floodplain areas in the east of the site, all of which will be retained in situ. The works are unlikely to affect the extent of this community such that its local occurrence is likely to be placed at risk of extinction.
- Subtropical Coastal Floodplain Forest (SCFF): a single Swamp Box will be removed from a patch of highly modified SCFF in the west of the site. This is unlikely to affect the extent of this community such that its local occurrence is likely to be placed at risk of extinction.
- Freshwater Wetlands: approximately 4.48 ha of modified and degraded Freshwater Wetlands in floodplain areas will be disturbed and subject to further degradation from traffic from vehicle and plant, access roads and excavation for power poles. These degraded communities occur extensively in both floodplain areas, particularly around the Glenugie Creek floodplain. On this basis, the works are very minor in a local context and are unlikely to affect the extent of this community such that its local occurrence is likely to be placed at risk of extinction.
- Lowland rainforest: the small patch of Lowland rainforest in the west of the site will be retained in situ.

c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

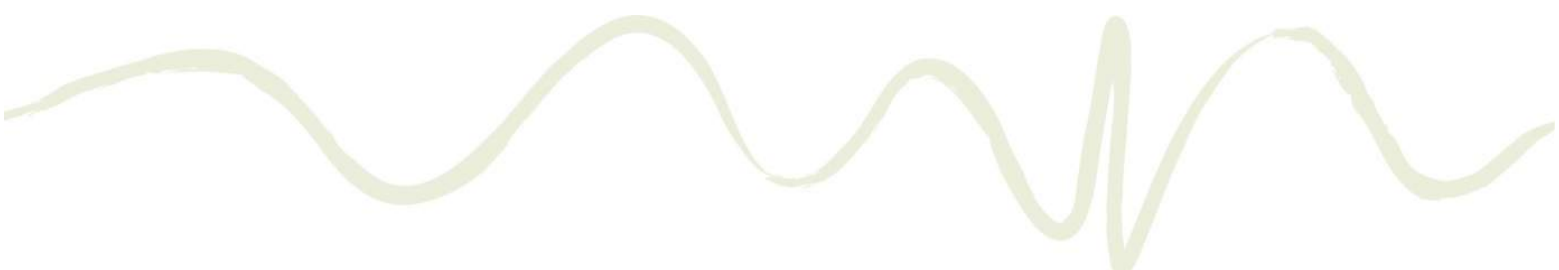
TECs:

- Swamp Oak Floodplain Forest (SOFF): approximately 0.49 ha of SOFF will be removed for the works. This represents a small proportion of the local population of SOFF scattered across the Glenugie Creek floodplain.
- Subtropical Coastal Floodplain Forest (SCFF): a single Swamp Box will be removed from a patch of highly modified SCFF in the west of the site. This will not affect SCFF at the site or in the locality.
- Freshwater Wetlands: modified and degraded Freshwater Wetlands in floodplain areas will be disturbed and subject to further degradation from traffic from vehicle and plant, access roads and excavation for power poles. These degraded communities occur extensively in both floodplain areas, particularly around the Glenugie Creek floodplain. On this basis, the works are very minor in a local context.
- Lowland rainforest: no habitat will be removed.

Flora: Weeping Paperbark: no habitat will be removed; all trees will be retained in situ.

Fauna:

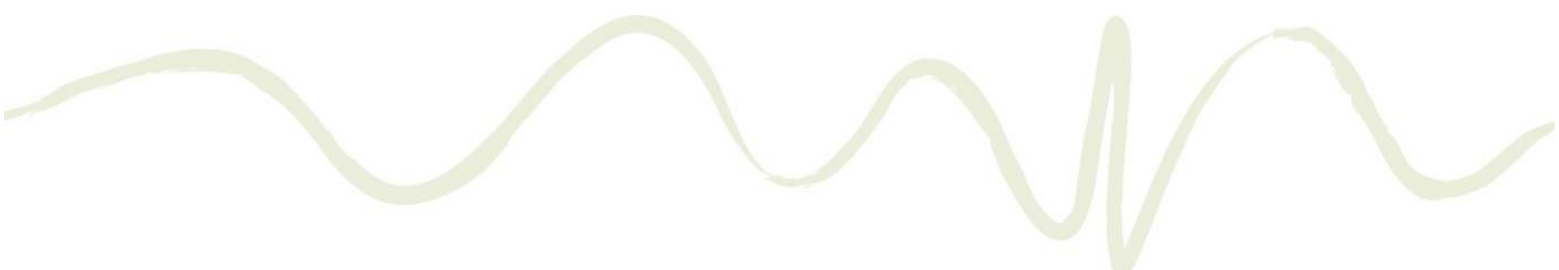
- Reptiles (White-crowned Snake): minor loss of dry sclerophyll forest habitat in a local context. Retained areas of adjacent forest will continue to provide foraging and refuge resources.

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- Wetland birds (Black-necked Stork, Brolga, Magpie Goose): Disturbance to habitat from noise and construction with negligible impacts to foraging or potential nesting habitat. While there is potential for birds to strike the powerlines following installation, this will be mitigated by attaching visibility markers.
 - Forest birds (Black-chinned Honeyeater, Brown Treecreeper, Bush Stone-curlew, Diamond Firetail, Dusky Woodswallow, Flame Robin, Glossy Black-Cockatoo, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Scarlet Robin, Speckled Warbler, Swift Parrot, Varied Sittella): minor loss of dry sclerophyll forest habitat in a local context, including nesting opportunities for hollow-dependent species (24 habitat trees removed). Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources.
 - Raptors and owls (Barking Owl, Little eagle, Masked Owl, Powerful Owl, Spotted Harrier, Square-tailed Kite, White-bellied Sea-eagle): minor contraction of foraging habitat, and loss of potential nest hollows through clearing of habitat trees (24 habitat trees removed). Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources. While there is potential for birds to strike the powerlines following installation, this will be mitigated by attaching visibility markers.
 - Dasyurids (Spotted-tailed Quoll): minor contraction of foraging habitat. Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources.
 - Macropods (Rufous Bettong): minor contraction of foraging and refuge habitat within the Crown reserve. Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources.
 - Arboreal mammals (Brush-tailed Phascogale, Koala, Squirrel Glider): minor contraction of foraging habitat, and loss of potential den hollows through clearing of 24 habitat trees. Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources.
 - Flying-foxes (GHFF): minor contraction of foraging habitat. Retained areas of adjacent forest will continue to provide foraging resources. While there is potential for GHFF to strike powerlines following installation, this will be mitigated by attaching visibility markers.
 - Microbats (Eastern Bentwing-bat, Eastern Freetail-bat, Greater Broad-nosed Bat, Hoary Wattleed Bat, Little Bentwing-bat, Northern Freetail-bat, Southern Myotis, Yellow-bellied Sheathtail-bat): minor contraction of foraging habitat, and loss of potential tree roost sites through clearing of 24 habitat trees. Retained areas of adjacent forest will continue to provide foraging, refuge and breeding resources.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

TECs:

- Swamp Oak Floodplain Forest (SOFF): SOFF patches will be partly fragmented by the powerline at several locations. However, SOFF in the site and adjacent land is highly fragmented from former clearing and thinning and has very poor connectivity. In this context, the works will not contribute substantially to further fragmentation of this community.
- Subtropical Coastal Floodplain Forest (SCFF): the works will not result in any fragmentation of SCFF at the site or in the locality.
- Freshwater Wetlands: the works will result in minor disturbance of freshwater wetlands, however will not fragment these extensive floodplain communities, nor limit potential for propagule movement or establishment.
- Lowland rainforest: the small patch is already highly isolated; the works will not affect this vegetation further.



Flora: Weeping Paperbark: scattered patches of Weeping Paperbark are already highly isolated; the works will not affect this vegetation further.

Fauna:

- Reptiles (White-crowned Snake): minor fragmentation of habitat; this is unlikely to affect species movement or result in significant barriers to dispersal.
- Wetland birds (Black-necked Stork, Brolga, Magpie Goose): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.
- Forest birds (Black-chinned Honeyeater, Brown Treecreeper, Bush Stone-curlew, Diamond Firetail, Dusky Woodswallow, Flame Robin, Glossy Black-Cockatoo, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Scarlet Robin, Speckled Warbler, Swift Parrot, Varied Sittella): minor fragmentation of habitat; this is unlikely to affect species movement or result in significant barriers to dispersal.
- Raptors and owls (Barking Owl, Little Eagle, Masked Owl, Powerful Owl, Spotted Harrier, Square-tailed Kite, White-bellied Sea-eagle): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.
- Dasyurids (Spotted-tailed Quoll): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.
- Macropods (Rufous Bettong): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely to result in significant barriers to dispersal.
- Arboreal mammals (Brush-tailed Phascogale, Koala, Squirrel Glider): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.
- Flying-foxes (Grey-headed Flying-fox): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.
- Microbats (Eastern Bentwing-bat, Eastern Freetail-bat, Greater Broad-nosed Bat, Hoary Wattled Bat, Little Bentwing-bat, Northern Freetail-bat, Southern Myotis, Yellow-bellied Sheath-tail-bat): no significant fragmentation of habitat would occur; the works (both in construction and operational phases) are unlikely result in significant barriers to dispersal.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

TECs:

- Swamp Oak Floodplain Forest (SOFF): approximately 0.49 ha of SOFF will be removed for the works. This represents a small proportion of the local population of SOFF scattered across the Glenugie Creek floodplain and is unlikely to be of local importance.
- Subtropical Coastal Floodplain Forest (SCFF): no SCFF habitat will be substantially removed, fragmented or isolated.
- Freshwater Wetlands: modified and degraded Freshwater Wetlands in floodplain areas will be disturbed and subject to further degradation from traffic from vehicle and plant, access roads and excavation for power poles. These degraded communities occur extensively in both floodplain areas, particularly around the Glenugie Creek floodplain. On this basis, areas affected by the works are of relatively minor importance in a local context.
- Lowland rainforest: no habitat will be removed, fragmented or isolated.

Flora: Weeping Paperbark: no habitat will be removed, fragmented or isolated.

Fauna:

- Reptiles (White-crowned Snake): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Wetland birds (Black-necked Stork, Brolga, Magpie Goose): habitat to be disturbed is minor in a local context where floodplain environments occur extensively.
- Forest birds (Black-chinned Honeyeater, Brown Treecreeper, Bush Stone-curlew, Diamond Firetail, Dusky Woodswallow, Flame Robin, Glossy Black-Cockatoo, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Scarlet Robin, Speckled Warbler, Swift Parrot, Varied Sittella): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Raptors and owls (Barking Owl, Little eagle, Masked Owl, Powerful Owl, Spotted Harrier, Square-tailed Kite, White-bellied Sea-eagle): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Dasyurids (Spotted-tailed Quoll): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Macropods (Rufous Bettong): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Arboreal mammals (Brush-tailed Phascogale, Koala, Squirrel Glider): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Flying-foxes (Grey-headed Flying-fox): habitat to be removed is minor in a local context where dry sclerophyll forests occur extensively.
- Microbats (Eastern Bentwing-bat, Eastern Freetail-bat, Greater Broad-nosed Bat, Hoary Wattled Bat, Little Bentwing-bat, Northern Freetail-bat, Southern Myotis, Yellow-bellied Sheathtail-bat): habitat to be removed is minor in a local context where fragmented forest communities occur extensively.

d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No areas of outstanding biodiversity value have been declared in Clarence LGA.

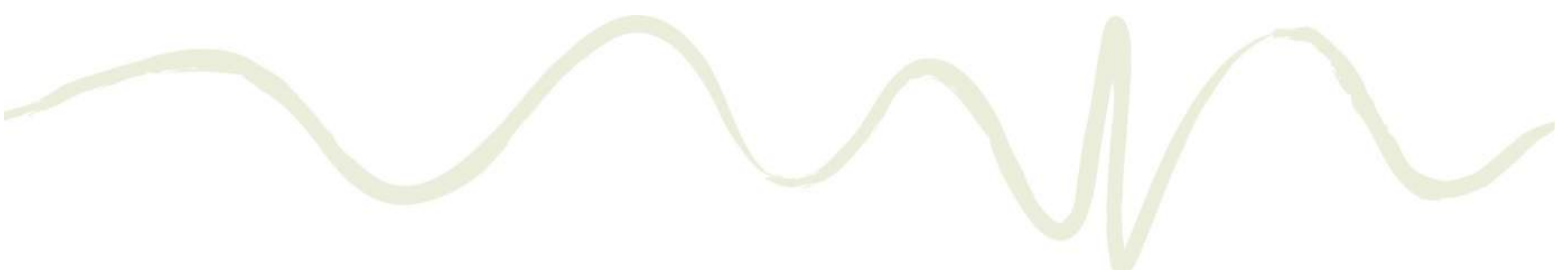
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A key threatening process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species or ecological communities. KTPs listed in the BC Act, and whether the Proposal is recognised as a KTP is shown in **Table G.1**.

Table G.1 Key Threatening Processes

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Aggressive exclusion of birds by noisy miners (<i>Manorina melanoccephala</i>)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands		✓	
Anthropogenic climate change			✓
Bushrock removal			✓

Key Threatening Process (as per Schedule 4 of the BC Act)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	Possible	Unlikely
Clearing of native vegetation	✓		
Competition and grazing by the feral European Rabbit (<i>Oryctolagus cuniculus</i>)			✓
Competition and habitat degradation by feral goats (<i>Capra hircus</i>)			✓
Competition from feral honeybees (<i>Apis mellifera</i>)			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest eucalypt dieback associated with over-abundant psyllids and bell miners			✓
Habitat degradation and loss by Feral Horses, <i>Equus caballus</i>			✓
Herbivory and environmental degradation caused by feral deer			✓
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition			✓
Importation of red imported fire ants (<i>Solenopsis invicta</i>)			✓
Infection by <i>Psittacine circoviral</i> (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Infection of native plants by <i>Phytophthora cinnamomi</i>			✓
Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae			✓
Introduction of the large earth bumblebee (<i>Bombus terrestris</i>)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch Broom (<i>Cytisus scoparius</i>)			✓
Invasion and establishment of the Cane Toad (<i>Bufo marinus</i>)			✓
Invasion, establishment and spread of Lantana (<i>Lantana camara</i>)			✓
Invasion of native plant communities by African Olive (<i>Olea europaea L. subsp. cuspidata</i>)			✓
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i> (bitou bush and boneseed)			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of the Yellow Crazy Ant (<i>Anoplolepis gracilipes</i>) into NSW			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss of hollow-bearing trees	✓		
Loss or degradation (or both) of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (<i>Canis lupus familiaris</i>)			✓
Predation by the European Red Fox (<i>Vulpes vulpes</i>)			✓
Predation by the feral cat (<i>Felis catus</i>)			✓
Predation by <i>Gambusia holbrooki</i> (Plague Minnow or Mosquito Fish)			✓
Predation by the Ship Rat (<i>Rattus rattus</i>) on Lord Howe Island			✓
Predation, habitat degradation, competition and disease transmission by feral pigs (<i>Sus scrofa</i>)			✓
Removal of dead wood and dead trees	✓		



The Proposal may be characteristic of four KTPs:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands: floodplain works may require temporary access tracks within floodprone areas. While the works have potential to result in erosion and sedimentation impacts, streamflow is unlikely to be substantially affected in the context of highly modified floodplains which have been historically disturbed, trained and drained.
- Clearing of woody native vegetation along the transmission line corridor (~ 8 ha).
- Loss of hollow-bearing trees (est. 24 trees affected). Numerous hollow-bearing trees occur within sclerophyll forests in the site and adjacent lands. The loss of habitat trees for the works represents a small proportion of available hollow-bearing trees in the locality.
- Removal of dead wood and dead trees (removal of stags and movement and relocation of woody debris within the transmission line corridor). These impacts are minor given that all dead wood removed for the works will be relocated into adjacent areas of habitat.

On this basis the degree that the Proposal would contribute to any threatening process is not considered likely to place the local population of any of the subject species or communities at significant risk of extinction.

Conclusion

The transmission line corridor will result in the loss of up to 8 ha of dry sclerophyll forest habitat, disturbance of approximately 4.5 ha of degraded freshwater wetlands and loss of up to 24 hollow-bearing trees. The main impacts of the works are the loss of vegetation/ habitat and hollow-bearing trees within sclerophyll forests. While some fragmentation of habitat will also occur, the transmission line corridor width of 30 m is unlikely to significantly affect the threatened fauna considered in this assessment. Impacts on TECs are relatively low, with freshwater wetlands (wet meadows) likely to regenerate following disturbance from plant and vehicles. Operational impacts of the transmission line are largely limited to the potential for collision by wetland birds, raptors/ owls and flying-foxes; this will be mitigated by installation of line markers at strategic locations.

Given that the study area and adjacent land support extensive areas of floodplain wetlands and scattered sclerophyll forests, it is considered unlikely that the local population of any of the subject species/ communities would be placed at significant risk of extinction as a result of the Proposal, and a Species Impact Statement is not required.



Appendix H

EPBC Act Significant Impact Criteria Assessment for Threatened Species



EPBC Act Significant Impact Criteria Assessment for Greater Glider

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

- ***lead to a long-term decrease in the size of a population;***

The Proposal is considered unlikely to have a significant impact on any populations of Greater Gliders as:

- Only a limited area of marginal habitat would be directly affected; and
- Habitats locally would continue to provide habitat for the local population.

The incremental extent to which the proposed works may contribute to other threats to the Greater Glider would not be significant given:

- The proposed works would be undertaken following the mitigation measures detailed in **Section 5.2** which would reduce such risk of such impacts.

Overall, the Proposal is not considered likely to lead to a significant long-term decrease in the size of the local important population of the Greater Glider.

- ***reduce the area of occupancy of the species;***

The habitat to be affected by the proposed works has potential only to form a fraction of the wider range of the local population of the Greater Glider. The habitat to be removed or modified is unlikely to alone support central breeding areas. Potential habitat would remain available following the completion of the works. Additionally, effective implementation of the safeguards provided in **Section 5.2** would ensure any indirect impacts of the proposed works on adjacent habitats are minimal. Overall the Proposal is not expected to result in a significant reduction in the area of occupancy for any populations of Greater Glider.

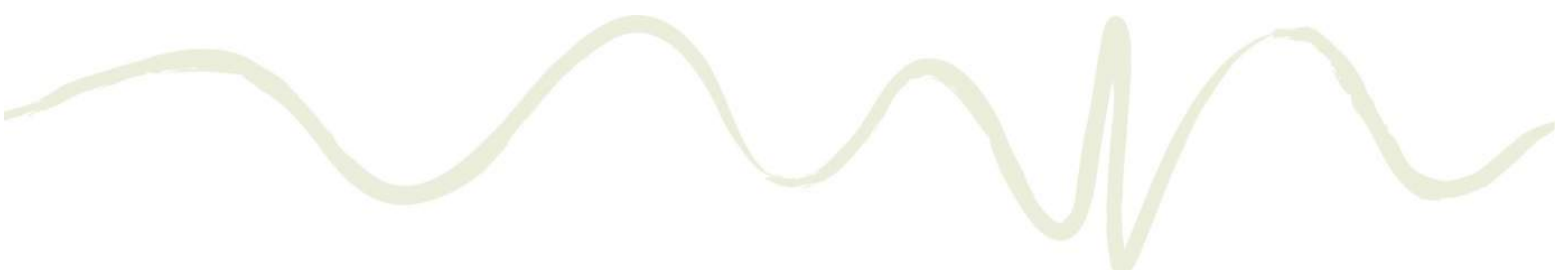
- ***fragment an existing population into two or more populations;***

The majority of dry sclerophyll forest to be removed is structurally poor, disturbed from grazing and comprises relatively low-quality habitat, with the best quality habitat within the Crown reserve. The works may require the removal of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees, with adjoining forest within the study area and adjacent lands remaining unaffected and occurring extensively in the locality (refer to CRAFTI vegetation mapping). The proposed clearing would not result in additional significant fragmentation of the landscape.

- ***adversely affect habitat critical to the survival of a species;***

The Proposal is not considered likely to significantly affect habitat critical to the survival of the Greater Glider as:

- The study area does not contain habitat listed on the Register of Critical Habitat for the Greater Glider;
- The habitat to be directly affected has potential only to form a fraction of potential habitat for any population of Greater Glider;
- Similar and better quality potential habitats are extensive locally, and would not be substantially indirectly affected, especially with implementation of the mitigation measures detailed in **Section 5.2**;
- Given the nature of the proposed works and modified nature of the local landscape, the current dispersal potential for the Greater Glider would be expected to be retained post installation of the transmission line; and

- 
- The occurrence potential for the Greater Glider within the study area would largely be retained post installation of the transmission line.

- ***disrupt the breeding cycle of a population;***

With consideration of the previous points, particularly the limited extent and quality of habitat within the site, it is considered unlikely that the breeding cycle of any population of Greater Glider would be significantly affected by the Proposal.

- ***modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent the species is likely to decline;***

The Proposal would result in the loss/ modification of up to 8 ha of dry sclerophyll forest habitat and up to 24 hollow-bearing trees from the study area. While this is a cumulative impact, no population of Greater Gliders are considered unlikely to be significantly affected given:

- The area to be impacted is assessed as providing moderate habitat;
- Habitat locally would continue to be available following installation of the transmission line;
and
- The Proposal would not result in isolating habitat for the Greater Glider.

Overall, the Proposal is not considered likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Greater Glider is likely to significantly decline.

- ***result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;***

No invasive species for the Greater Glider or its habitat are considered likely to become established or dispersed as a result of the proposed works.

- ***introduce disease that may cause the species to decline; or***

No diseases that may affect the Greater Glider or its habitat are considered likely to become introduced or spread as a result of the proposed works.

- ***interfere substantially with the recovery of the species.***

While the Proposal may impose some minor negative impacts to potential habitat for the Greater Glider, the nature of the Proposal is such that the recovery of this species is unlikely to be substantially interfered with by the Proposal.

Conclusion

The Proposal is considered unlikely to result in a significant impact on the Greater Glider or its habitat. Consequently, referral to the Department of Environment and Energy and approval by the Minister is not required.

Appendix H Aboriginal Heritage Due Diligence Assessment

Appendix H has been removed in accordance with section 161 of the National Parks and Wildlife Act 1974. The Act enables information about Aboriginal places, objects and culture to be withheld – or kept confidential – in the public interest.

For access to publicly accessible information about recorded Aboriginal objects and declared Aboriginal Places in NSW, a free basic Aboriginal Heritage Management System (AHIMS) search can be undertaken via the National Parks and Wildlife Service AHIMS website.

For information on how to undertake this search please refer to:
<https://www.environment.nsw.gov.au/licences/WhatInformationCanYouObtainFromAHIMS.htm>