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Preliminary Site Investigation

Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program Improvements on The Northern Road and Londonderry Road Flood Evacuation Routes

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Abbreviations

Abbreviations / Acronyms	Description
AEI	Areas of Environmental Interest
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
BTEX	Benzene, toluene, ethylbenzene and xylene
CH	Chainage (defined from project control string MC10)
CLM	Contaminated Land Management
CSM	Conceptual Site Model
EPA	Environmental Protection Authority
EPL	Environmental Protection Licences
LGA	Local government area
NEPM	National Environmental Protection Measure
OCP	Organochlorine pesticides
OPP	Organophosphate pesticides
PAH	Polycyclic Aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PFAS	Per- and poly- fluoroalkyl substances
POEO	Protection of the Environment Operations
PSI	Preliminary Site Investigation
RAAF	Royal Australian Air Force
REF	Review of environmental factors
RFS	Rural Fire Service
SAQP	Sampling, Analysis and Quality Plan
TfNSW	Transport for NSW
TRH	Total recoverable hydrocarbons
VHC	Volatile halogenated compounds
VOC	Volatile organic compounds

Executive Summary

SMEC Australia Pty Ltd (SMEC) was engaged by Transport for New South Wales (TfNSW) to prepare a concept design and review of environmental factors (REF) for the Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Improvements – State Roads Proposal. The Proposal is located within the Penrith and Hawkesbury local government areas (LGAs) and the suburbs of Richmond, Londonderry, Berkshire Park, Cranebrook, Llandilo, Jordan Springs, Cambridge Gardens, Cambridge Park, Penrith and Kingswood. The Preliminary Site Investigation (PSI) has been prepared to inform the development of the concept design and REF.

The area covered by this investigation is shown in Figure 1–1 (Section 1.5) and primarily includes sections of The Northern Road and Londonderry Road, herein referred to as 'the Site'. A description of the Proposal is presented in Section 1.3. The investigation focuses on land within the existing road corridor and outwards up to about 10m, with exceptions such as site compounds/laydown areas which extend beyond the construction works area. Site compounds are proposed to be utilised as temporary placement areas during the construction phase. It is anticipated that these areas will experience minimal ground disturbance, as they are designated solely for temporary construction materials storage.

The NSW and Australian Governments have committed $33 million towards planning for more than 100 improvements that will make the Hawkesbury-Nepean Valley flood evacuation road network more resilient to flooding. Road infrastructure improvements have been identified across four Western Sydney LGAs: Penrith, Hawkesbury, Blacktown, and The Hills. The proposed improvements include road shoulder widening, culvert upgrades, new bridge structure, road raising, pinch point upgrades and drainage improvements. These improvements will make evacuation routes better able to withstand local flash flooding which can cause early closure of evacuation routes.

The Hawkesbury-Nepean Valley has the highest flood risk in NSW due to its unique landscape and large existing population. Floods in the Hawkesbury-Nepean Valley have a significant impact on people's lives, livelihoods, and homes.

The key objective of Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program is to improve drainage on the road network to better withstand local flash flooding and to increase capacity to evacuate by road during major flood events.

The Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program has two components – State Road Improvements (on the Transport for NSW managed roads of The Northern Road and Londonderry Road) and Regional/Local Road Improvements (on the mostly local council managed road network), this proposal refers to the State Road Improvements only, being The Northern Road and Londonderry Road flood evacuation routes.

Specifically, the objectives of this PSI were to:

- Assess the potential for contamination to be present at the Site from past or present activities
- Provide recommendations on the need for further investigations or ongoing management based on the findings.

To fulfil the above objectives, the following scope of works was undertaken:

- A desktop review of relevant information, including:
  - Review of published information relating to the Site including geological and topographical maps
  - Review of selected historical aerial photographs
  - A search of NSW Environmental Protection Authority (EPA) contaminated land and *Protection of the Environment Operations Act 1997* (POEO Act) licence online databases
  - Search of nearby registered groundwater bores
  - Review of relevant online records
  - Review of relevant online resources
- A site visit by an experienced environmental engineer
- Developing a preliminary conceptual site model (CSM)

- Preparation of this report which presents the findings of the investigation including conclusions and recommendation as per the objectives identified above.

Based on the Site history and Site observations, five Areas of Environmental Interest (AEI) and potentially contamination sources were identified including:

- AEI 1 – Fill of unknown origin and/or quality
- AEI 2 – Areas near former/existing building structures from weathering and/or ineffective demolition of hazardous building materials.
- AEI 3 – Areas near Londonderry TestSafe – NSW Rural fire brigades/rural fire service training area – PFAS contaminated site located east of Londonderry Road (Chainage Reference: MC30 CH.8000-8300)
- AEI 4 – Areas near former Castlereagh Regional Waste Disposal Depot located at south-east of The Northern Road (Chainage reference: MC10 CH.1800-4100) from historical waste disposal
- AEI 5 – Areas adjacent to service stations and wreckers observed during the Site visit from storage and dispensing of fuels (may have also included mechanical repairs and use of oils, lubricants and degreasers and waste material storage), and RAAF Base Londonderry (due to data gaps).

Some data gaps were noted, as follows:

- Due to the relatively poor quality of some of the available historical aerial photographs and limited aerial photographs available, and the large scale of the Site, it is difficult to discern small scale features at the Site
- Due to the length of the Site it was not practical to assess the full history of adjacent nearby properties
- Limited information was publicly available on the use of RAAF Base Londonderry in relation to current and historical use.

Our qualitative assessment of the potential for contamination to be present within the various identified AEI ranges from low to moderate-high. A conceptual site model was developed which indicates that potential contaminants of concern associated with these AEIs could impact on media and a range of on/offsite receptors could be impacted by contamination if it were present, including human receptors and ecological receptors.

Overall AEI 1 (Fill of unknown origin and/or quality – across the majority of the Site, including fly tipped wastes on road verges) may have the higher likelihood of a plausible source-pathway-receptor linkage. Other identified sources are outside the Site and migration of contamination onto the Site may be limited to groundwater (if contamination was present).

A Detailed Site Investigation should be conducted to assess identified AEIs, comprising additional targeted site history searches, sampling and analysis of relevant media to assess the Site with respect to contamination, fill data gaps, develop the conceptual site model and assess the need for remediation/management relating to the proposed construction. Due to the size of the Site, SMEC consider a suitable approach would be to undertake judgemental sampling targeting the individual AEIs in areas where disturbance (or higher degrees of disturbance are proposed, e.g. trenching and soil stripping etc). The sampling strategy, depths and media will depend on the likely construction/disturbance details. A Sampling, Analysis and Quality Plan should be prepared prior to the investigation. Any additional assessment should be carried out in accordance with national and NSW EPA endorsed guidelines. Based on the results, the need for further stages of assessment or remediation can then be assessed.

Whilst further investigation is recommended to reduce the likelihood of unexpected finds during construction, AEI 2 (Areas near former/existing building structures) may be able to be managed through an unexpected finds procedure prepared as part of the Construction Environmental Management Plan and implemented during construction. AEI 2 was assessed as having a 'low' likelihood of contamination and structures may not have encroached directly into the Site. The unexpected finds procedure should also apply to the whole Site in the event of an unexpected find.

1. Introduction

1.1 General

SMEC Australia Pty Ltd (SMEC) was engaged by Transport for New South Wales (TfNSW) to prepare a concept design and review of environmental factors (REF) for the Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Improvements – State Roads Proposal. The Proposal is within the Penrith and Hawkesbury local government areas and traverses the suburbs of Richmond, Londonderry, Berkshire Park, Cranebrook, Llandilo, Jordan Springs, Cambridge Gardens, Cambridge Park, Penrith and Kingswood. A Preliminary Site Investigation (PSI) has been prepared to provide guidance as to the contamination risks of the proposal for the development of the concept design and the REF.

The investigation focuses on land within the existing road corridor and outwards up to about 10m, with exceptions such as site compounds/laydown areas which extend beyond the construction works area. Site compounds are proposed to be utilised as temporary placement areas during the construction phase. It is anticipated that these areas will experience minimal ground disturbance.

The Site location is presented in Figure 1–1, and a close-up map of the Site boundary and site compounds are presented in Figure 1, Appendix A.

1.2 Project Overview

The NSW and Australian Governments have committed $33 million towards planning for more than 100 improvements that will make the Hawkesbury-Nepean Valley flood evacuation road network more resilient to flooding. Road infrastructure improvements have been identified across four Western Sydney LGAs: Penrith, Hawkesbury, Blacktown, and The Hills. The proposed improvements include road shoulder widening, culvert upgrades, new bridge structure, road raising, pinch point upgrades and drainage improvements. These improvements will make evacuation routes better able to withstand local flash flooding which can cause early closure of evacuation routes.

The Hawkesbury-Nepean Valley has the highest flood risk in NSW due to its unique landscape and large existing population. Floods in the Hawkesbury-Nepean Valley can and have had a significant impact on people's lives, livelihoods, and homes.

The key objective of Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program is to improve drainage on the road network to better withstand local flash flooding and to increase capacity to evacuate by road during major flood events.

The Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program has two components – State Road Improvements (on the Transport for NSW managed roads of The Northern Road and Londonderry Road) and Regional/Local Road Improvements (on the mostly local council managed road network), this proposal refers to the State Road Improvements only, being The Northern Road and Londonderry Road flood evacuation routes.

1.3 Proposal Description

The proposal area generally includes the road corridors of The Northern Road, Londonderry Road, Andrews Road and Vincent Road as follows:

- The Northern Road between the intersection with Richmond Road/Blacktown Road, Bligh Park in the north, and Borrowdale Way, Cranebrook in the south
- Londonderry Road from 270m south of Southee Road, Hobartville to the intersection with The Northern Road, Llandilo excluding approximately 270m north and 300m south of the existing intersection at The Driftway, Londonderry
- Route A9 (The Northern Road/Richmond Road) from 130m north of Andrews Road, Cranebrook to Boomerang Place, Cambridge Gardens in the south
- Andrews Road, Cranebrook from The Northern Road to the Andrews Road Baseball Complex west of Greygums Road, Cranebrook

- Vincent Road, Cranebrook, for approximately 70m west from The Northern Road
- Identified isolated areas along Route A9 (Richmond Road/Parker Street) between Gascoigne Street and Great Western Highway, Kingswood for the installation of flood evacuation signage.

The proposal area includes a buffer from the outer edge of the designed works to facilitate construction work. The buffer is generally 10m in width but is reduced to 6m or less in specific areas, to minimise impacts on sensitive areas. In some locations the proposal area comprises the entire road corridor, for example the area where drainage will be installed along Andrews Road and south of Andrews Road along The Northern Road.

Key features of the proposal include:

- Widening of the southbound shoulder pavement on the following roads, a total of approximately 20km, to provide a second outbound lane reserved for drivers to use during emergency flood evacuations. This will include culvert and drainage extensions to accommodate a wider road corridor, and connecting drainage along:
  - Londonderry Road between 270m south of Southee Road and The Northern Road, Londonderry
  - The Northern Road between Richmond Road and Borrowdale Way, in Londonderry, Berkshire Park, Cranebrook, Llandilo, and Jordan Springs
- Drainage improvements including upgrades to culvert crossings, drainage channels, and pit and pipe networks at identified locations to improve resilience in localised flooding events. Work would include:
  - Culvert upgrades, and associated drainage channel work:
    - Along sections of The Northern Road associated with raising of low points as outlined below
    - On Carrington Road at the intersection with The Northern Road, Londonderry
    - At two locations on The Northern Road approximately 50m and 130m north of the intersection of Carrington Road, Londonderry
    - On The Northern Road approximately 250m north of Toorah Road, Londonderry
    - On Vincent Road at the intersection with The Northern Road, Cranebrook
    - On Fifth Avenue at the intersection with The Northern Road, Llandilo
  - New roadside drainage channels (including vegetated and concrete of various widths):
    - Along Londonderry Road (adjacent to the southbound shoulder), from 270m south of Southee Road, Hobartville to the intersection with The Northern Road, Llandilo
    - Along The Northern Road (adjacent to the southbound shoulder), from the intersection with Blacktown Road/Richmond Road, Bligh Park to Ninth Avenue, Llandilo
    - Along The Northern Road (adjacent to the northbound shoulder) at road raising areas (described in further detail below)
  - Underground drainage network upgrades:
    - Along The Northern Road (southbound), Cleeve Place and Star Crescent, Cambridge Gardens from Trinity Drive to Boomerang Place, including approximately 60m along Trinity Drive, Cambridge Gardens
    - Along The Northern Road, Cranebrook (northbound) from approximately 115m north of Andrews Road, Cranebrook to Trinity Drive, Cambridge Gardens including new drainage crossings underneath The Northern Road
    - Along Andrews Road from The Northern Road up to the Andrews Road Baseball Complex in Cranebrook
  - Raising of low points along sections of The Northern Road, affecting all road lanes located:
    - Starting from around 120m North of Whitegates Road, Londonderry heading northwards (about 345m length)
    - Starting from around 200m North of Spinks Road, Llandilo heading northwards (about 920m length)
    - Starting from around 270m north of Fifth Avenue to around 435m south of Fifth Avenue, Llandilo

  - Starting from around 185m north of Vincent Road to around 105m south of Vincent Road, Cranebrook
  - Starting from around 50m south of Ninth Avenue to about 365m south of Ninth Avenue, Cranebrook
- Extend, replace or add new culverts at selected locations along Londonderry Road and The Northern Road to maintain property access (e.g. driveways) as required.
- Realignment of The Northern Road, Cranebrook (within the road corridor), between around 330m north of Seventh Avenue, Llandilo to around 280m south of Vincent Road, Cranebrook to reduce project impacts on adjacent sensitive receivers and improve road safety.
- Adjustments to the following intersections to facilitate a secondary outbound lane for drivers to use during a flood evacuation event. These may include changes to existing median, traffic islands, kerbs and line marking at:
  - The Northern Road and Richmond Road and Blacktown Road, Bligh Park
  - Londonderry Road and The Northern Road and Cranebrook Road, Cranebrook
  - The Northern Road and Vincent Road, Cranebrook
  - The Northern Road and Ninth Avenue, Jordan Springs
- Installation of new signage to be displayed during emergency flood evacuations to facilitate a second left turn at the existing Parker Street/Great Western Highway intersection in Penrith under traffic control.
- Adjustments as required to connect Londonderry Road and The Northern Road to local roadways, side roads and access roads.
- Relocation and/or adjustments of various road furniture (such as signage, road safety barriers, street lighting, kerb and island adjustment etc) throughout the proposal area.
- Relocation of bus stops at:
  - The Northern Road (northbound) approximately 30m south of Vincent Road. To relocate this bus stop approximately 130m to the south
  - The Northern Road (southbound) approximately 210m south of Ninth Avenue. To relocate this bus stop approximately 20m to the north
- Utility and driveway adjustments as required within the proposal area.
- Landscaping as required.
- Provision of temporary ancillary facilities to support the construction works including office and staff amenities, site compound and laydown areas:
  - Road reserve adjacent to the Francis Greenway Correctional Complex, Berkshire Park (site 1)
  - Road reserve adjacent to 245 The Northern Road, Berkshire Park (site 2)
  - 557 The Northern Road, Berkshire Park (site 3)
  - Road reserve adjacent to 107 Fifth Avenue, Llandilo (site 4)
  - Road reserve adjacent to 902 The Northern Road, Llandilo (site 5)
  - 1042 The Northern Road, Llandilo (site 6)
  - Council reserve, Greenwood Parkway, Jordan Springs (site 7)
  - Part of the Richmond Race Club, Londonderry Road, Londonderry (site 8)
  - Council reserve, Andrews Road, Penrith (site 9)
  - Council reserve, Parker Street, Penrith (site 10)

Refer to Figure 1–1 for an overview of the proposal.

The final construction staging of the proposal would be determined by Transport and the construction contractor. However, it is anticipated that the permanent works would be carried out in stages, with an early works component. Subject to funding availability, the construction is expected to commence in 2026 and completed in 2030.

1.4 Objectives

The overall objectives of the investigation were to:

- Assess the potential for contamination to be present within the proposal area (referred to as 'the Site' in this report) from past or present activities
- Provide recommendations on the need for further investigations or ongoing management based on the findings.

1.5 Scope of Work

To fulfil the above objectives, the following scope of works was undertaken:

- A desktop review of relevant information, including:
  - Review of published information relating to the Site including geological and topographical maps
  - Review of selected historical aerial photographs
  - A search of NSW Environmental Protection Authority (EPA) contaminated land and *Protection of the Environment Operations Act 1997* (POEO Act) licence online databases
  - Search of nearby registered groundwater bores
  - Review of relevant online records
  - Review of relevant online resources
- A site visit by an experienced environmental engineer
- Developing a preliminary conceptual site model (CSM)
- Preparation of this report which presents the findings of the investigation including conclusions and recommendation as per the objectives identified in Section 1.4 above.

This report was prepared with reference to the following:

- National Environment Protection Council, National Environment Protection (Assessment of site contamination) Measure 1999, as amended in 2013
- NSW EPA (2020), Consultants Reporting on Contaminated Land, Contaminated Land Guidelines, April 2020
- NSW EPA (2022) Sampling design part 1 – application, Contaminated land guidelines, August 2022
- Transport for NSW QA Specification PS213, Contamination Assessment. Version for: Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvements – State Roads, dated September 2022
- Transport for NSW (2023) Contaminated Land Management Procedure Ref: EMF-LM-PR-0016 version 4.1, dated January 2023.

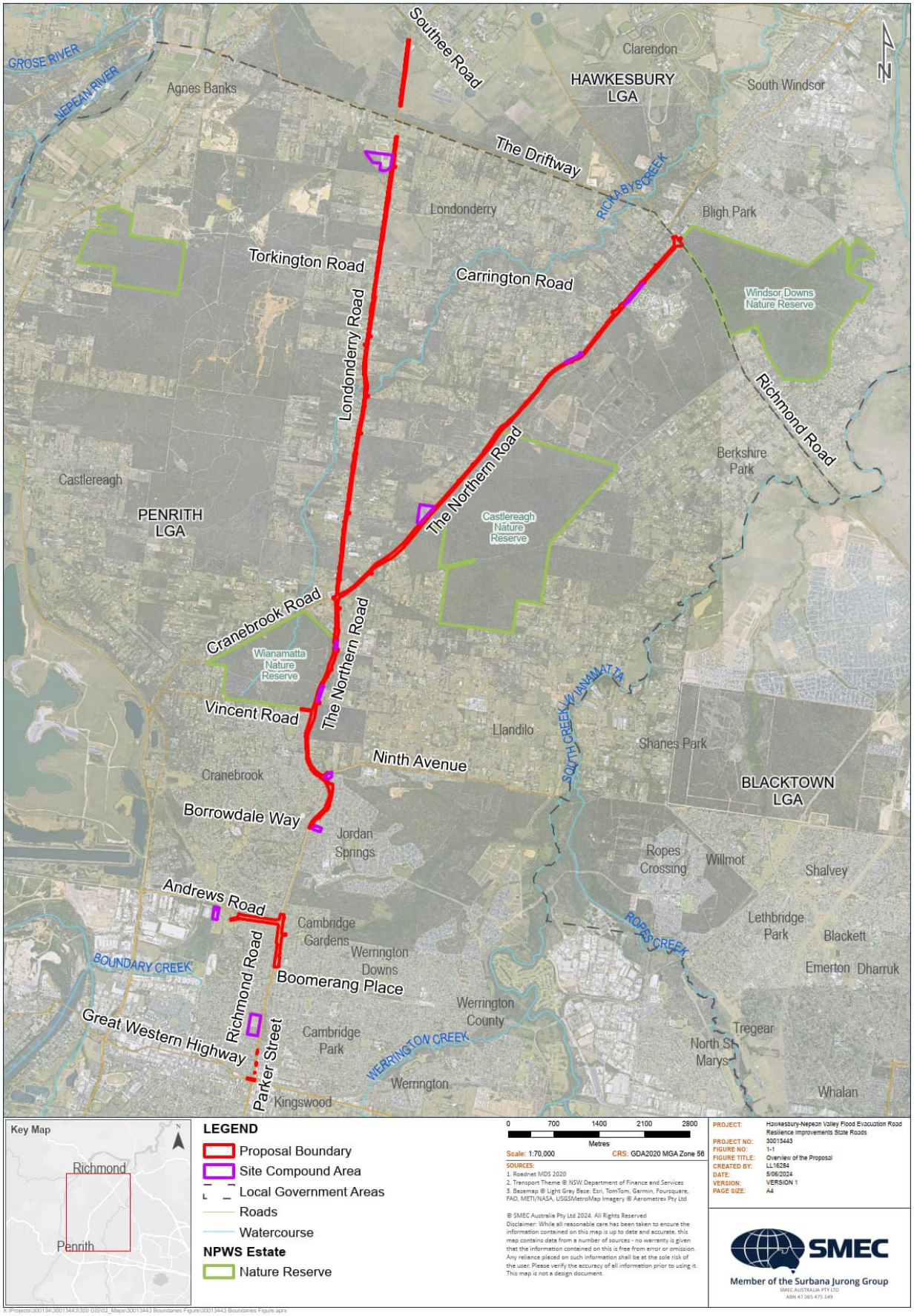

Figure 1–1: Overview of the Proposal

2. Site Description

2.1 Site Location and Description

A summary of information about the Site is presented below in Table 2–1. The Site location and layout is presented in Figure 1, Appendix A.

The investigation predominantly focuses on land within the existing road corridor and outwards up to about 10m, with some exceptions such as site compounds/laydown areas which extend beyond the construction works area as previously described in Section 1.3. The Site location, investigation area and site works boundary are presented in Figure 1–1.

Table 2–1: Summary of Site information.

Address	Various (includes The Northern Road and Londonderry Road (refer to Figure 1–1) in the suburbs of Londonderry, Llandilo, Bligh Park, Jordan Springs, Cranebrook, Cambridge Gardens and Werrington Downs) The proposed road alignment is approximately 25km long and is situated within road corridors.
Council Area	The investigation area is primarily within the Penrith LGA, with the northern extent of Londonderry Road within the Hawkesbury LGA.
Area	Approximately 102.7 ha (the full area shown in Figure 1–1).
Owner	The Site (as presented in Figure 1–1) predominantly comprises land owned by TfNSW but also some neighbouring properties outside of TfNSW land.
Zoning	Reference to Department of Planning and Environment's Environmental Planning Instruments dataset (accessed via NSW ePlanning Portal 29 May 2023), the Site is predominantly zoned: • SP2 Infrastructure (Classified Road) The surrounding area is zoned: • R2 Low Density Residential • R3 Medium Density Residential • R4 High Density Residential • IN1 General Industrial • RU4 Primary Production Small Lots • RU5 Village • RE1 Public Recreation • SP1 Special Activities (Education Agriculture) • SP2 Infrastructure (Waste or Resource Management Facility) • SP2 Infrastructure (Future Road) • SP2 Infrastructure (Water Supply System) • SP2 Infrastructure (Correctional Centre) • C1 National Parks and Nature Reserves • C2 Environmental Conservation. Land zoning areas on and nearby the Site are shown in Figure 2B, Appendix A.
Current Land Use	Public road and road corridor
Proposed Land Use	Public road and road corridor

Surrounding Land Use	**The Northern Road (south of the Vincent Road intersection)** • Developed urban area with low density housing and associated infrastructure, schools, light industry and public open space • Nepean Hospital located to the south of the road corridor • Regional park and natural reserve located to the south and west of the road corridor **The Northern Road (north of Vincent Road intersection)** • Rural land - Primary production/agricultural land to the north-west of the road corridor with some residential dwellings • Natural reserve, former Castlereagh Regional Waste Disposal Depot and Francis Greenway Correctional Complex (formerly John Morony Correctional Centre) to the south-east of the road **Londonderry Road** • Rural land - Primary production/agricultural land to the west and south of the road corridor with some residential dwellings and public open spaces • St Paul's Grammar School to the west of the road • RAAF Base Londonderry to the east of the road Surrounding land use features are presented in Figure 1, Appendix A.

2.2 Site Environmental Setting

A summary of the Site environmental setting is presented below in Table 2–2.

Table 2–2: Summary of Site environmental setting.

Topography and Landforms	A review of topographic information sourced from NSW Spatial Services dataset (accessed through MinView 29 May 2023) indicates a generally low-lying and flat landscape within the Hawkesbury-Nepean Valley floodplain, with the existing ground surface elevation typically ranging between RL 20m and 40m AHD. The north-east trending Rickabys Creek and its various tributaries intersect both alignments at several crossings. The topography at the southern end of the Proposal along The Northern Road comprises a section of undulating terrain with steeper natural slopes and higher elevations typically between RL 50m to 60m AHD.
Regional Geology	With reference to the Seamless Geology dataset (accessed through MinView 29 May 2023), the general geology is summarised as follows: • The northern portion of the Site is underlain by alluvial and fluvial deposits such as: – Londonderry Clay described as Clay, patches of ferruginised, consolidated sand – Rickabys Creek Gravel described as Conglomerate, matrix-supported – Alluvial floodplain deposits described as Silt, very fine- to medium-grained lithic to quartz-rich sand, clay • The remaining southern portion is predominantly underlain by Bringelly Shale described as Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal Geology units are shown in Figure 2A, Appendix A. The Geotechnical Interpretive Report (SMEC, 2024) provides details on subsurface conditions as identified from geotechnical investigations by TfNSW. The geotechnical model units are presented below in Table 2–3.

Acid Sulfate Soils	Acid Sulfate Soils (ASS) are naturally occurring soil and sediment, distinguished from other soil or sediment materials by having properties and behaviour that have either: • Been affected by the oxidation of Reduced Inorganic Sulfur (RIS) (principally the mineral iron pyrite), or • The capacity to be affected considerably by the oxidation of their RIS constituents. The factor common to all ASS is that RIS components have either had, or may have, a major influence on the properties or behaviour of these soil materials. These soils are typically found in low-lying coastal areas and saline inland areas. However, they have been identified in a wide range of environmental settings (Sullivan et al., 2018). These conditions are typical of marine or estuarine sediments of the recent Quaternary geological age which are deposited in low-lying sections (typically below RL 5m AHD) of coastal floodplains, rivers and creeks. The *CSIRO Atlas of Australian Acid Sulfate Soils map* (Fitzpatrick et al., 2011) indicates that the Proposal location sits predominately in an area with an extremely low (1% to 5%) to low (6% to 70%) probability of ASS occurrence for an inland landscape. Based on the acid sulfate soils (ASS) risk mapping on the NSW government eSPADE website (accessed on 29 May 2023), the Site is situated outside of areas of known ASS risk, therefore in areas of 'no known occurrence'. ASS can be present at higher elevations inland and can be associated with saline environments. Therefore, the presence of Quaternary age sediments along the Rickabys Creek catchment and associated tributaries does not preclude ASS occurring within the Proposal area if the conditions for formation of RIS were favourable. The Geotechnical Factual Report (TfNSW, 2023) conducted preliminary laboratory screening testing for ASS during site investigations targeting lower lying areas adjacent to natural drainage depressions and watercourses. Seven selected samples were screened with field (pH_F) and field peroxide (pH_{FOX}) pH testing across three boreholes. The Geotechnical Interpretive Report (SMEC, 2024) indicated that two samples collected at 2.5m depth reported pH_{FOX} values between 3 and 4, indicating that sulfidic material may be present. The report noted that based on Stone et, al, (1998), the peroxide test is most useful for clays containing low levels of organic matter, and least useful on sands or gravels which may give false results, and field screening is a qualitative method that is not a substitute for analytical laboratory testing in the identification of acid sulfate soils. The report recommended that further ASS testing be performed during detailed design to confirm the field screening results.
Vegetation	The Site is a road corridor. Some vegetation is present on the road verges. A separate assessment is being carried out with details on vegetation clearance and biodiversity impacts.
Hydrology	A review of nearby waterbodies was undertaken using NSW Spatial Services data set: perennial and non-perennial water courses. The data set was accessed via the NSW Government's MinView website (accessed 29 May 2023), the data indicated that there are no perennial (permanently flowing) watercourses present within a 500m buffer of the Site. Surface water is expected to shed off the roads onto road verges and follow the general topography downslope. In the South between the intersection with the Great Western Highway and up to Ninth Avenue (Chainage Reference: MC20 CH. 3000) runoff may end up moving broadly to the east through stormwater drainage or overland drainage lines, eventually reaching South Creek/Wianamatta, which flows northerly and into the Hawkesbury River. In sections of the Site further north, runoff may end up moving broadly to the north through stormwater drainage or overland drainage lines, eventually reaching South Rickabys Creek, which also flows northerly and into the Hawkesbury River. Approximate locations of watercourses are shown on Figure 1, Appendix A.
Hydrogeology	A review of the NSW Department of Industry, WaterNSW (website) Real-time Water Data Viewer was carried out on 29 May 2023 to identify registered groundwater bores within the vicinity of the Site. Twenty-four (24) registered bores were recorded within a 500m buffer of the Site, a summary is presented in Table 2–4. The Commonwealth of Australia (Geoscience Australia) Hydrogeology Map of Australia (accessed 29 May 2023) indicated that the underlying aquifers are anticipated to consist of porous, extensive aquifers of low to moderate productivity. Hydrogeological conditions and groundwater levels along the route are expected to vary considerably with topographic changes and proximity to drainage features. Groundwater is expected to be encountered at shallow depth within the low-lying alluvial deposits, and within weathered bedrock at higher elevation. Three groundwater monitoring wells were installed as part of the Geotechnical Factual Report (TfNSW, 2023). Data from ongoing groundwater level monitoring provided by TfNSW has reported groundwater depths ranging between 2.06mbgl and 8.1mbgl during the period of about May-June 2023 to February 2024. With reference to the Soils, Surface and Groundwater Assessment (SMEC, 2024), groundwater is expected to flow from areas of higher elevation towards the north-east trending Rickabys Creek and its various tributaries. Groundwater underlying the alluvial soils in the Bringelly Shales is anticipated to follow the same general pattern of flow towards points of discharge along drainage lines, creeks and rivers.

Table 2–3: Geotechnical model units (SMEC, 2024)

Unit No.	Unit	Material	Typical material description
1	**Existing Fill and Topsoil**		
1a	Existing Fill	Fill material encountered in existing road embankments and pavements.	Gravelly SAND and Sandy GRAVEL mixtures, with secondary fines components.
1b	Topsoil	Surficial soils containing organic matter.	Variable (sand, silt, clay and gravel mixtures).
2	**Quaternary Alluvium**	Alluvial sediments deposited along drainage lines associated with the tributaries of Rickabys Creek.	Interbedded Clayey/Silty SAND, fine to medium grained, loose and Sandy/Silty CLAY, low plasticity, typically firm to stiff.
3	**Tertiary Alluvium**		
3a	Alluvial Terrace Deposits	Alluvial terrace soils deposited along the high-level margins of the Hawkesbury-Nepean River floodplain.	Clayey SAND, fine to medium grained, medium dense to dense and Sandy CLAY, low plasticity, stiff to very stiff.
3b	Londonderry Clay	Older alluvial sediments deposited on an elevated terrace of the Hawkesbury-Nepean River floodplain that forms the upper part of the Tertiary sequence.	Silty/Sandy CLAY, various plasticity, stiff and very stiff to hard, with iron-cemented deposits, sand lenses and ironstone gravel.
3c	Rickabys Creek Gravel	The basal unit of the Tertiary alluvial sequence, exposed where the overlying Londonderry Clay has been eroded.	Sandy Clayey GRAVEL, fine to coarse grained, medium dense to dense, with sand lenses and hard clay cemented by iron oxides.
4	**Residual Soil**	Residual soils derived from weathering of Bringelly Shale	Silty CLAY, with gravel/sand components, medium to high plasticity, very stiff to hard.
5	**Bringelly Shale**	Siltstone, claystone, mudstone and shale found to comprise the majority of the Bringelly Shale formation. Occasionally interbedded with sandstone.	Siltstone / Shale, highly to moderately weathered, very low to low strength, grading with depth into slightly weathered to fresh, low to medium strength.

Table 2–4: Summary of registered groundwater bores within 500 m of the Site

Bore ID	Bore Type	Status	Installation Date	Bore Depth (m)	Standing Water Level (m bgl)	Distance and direction from the Site
The Northern Road South (south of the junction of The Northern Road and Londonderry Road)						
GW111617	Other	Functioning	20/10/2011	210	69	0m
GW104342	Irrigation	Functioning	11/07/2002	210	51	200m west of the Site
GW111111	Other	Functioning	30/07/2010	168	45	210m west of the Site
GW108895	Exploration	Unknown	4/06/2008	14.7	6.3	250m south-west of the Site
GW028486	Irrigation	Functioning	29/11/2018	32.3	NR*	300m east of the Site
The Northern Road North (north of the junction of The Northern Road and Londonderry Road)						
GW107938	Water supply	Functioning	23/03/2006	168	45	200m south-east
GW108281	Water supply	Unknown	7/07/2005	198	NR	30m south-east
GW111798	Water supply	Functioning	24/05/2010	180	39	180m north-west
GW112491	Water supply	Functioning	31/01/2012	270	33	90m north-west
GW107913	Water supply	Functioning	10/11/2005	216	NR	70m north-west
GW109920	Water supply	Unknown	26/02/2009	168	35	190m north-west
GW104371	Irrigation	Functioning	6/08/2002	210	NR	220m north-west
GW102315	Irrigation	Abandoned	7/03/1997	37	NR	310m north-west
GW107486	Water supply	Functioning	8/09/2004	216	22	180m north-west
GW102435	Dewatering	Functioning	21/05/1999	250	NR	500m south-east
Londonderry Road						
GW105057	Water supply	Functioning	14/11/2003	128.5	21	150m west
GW111745	Irrigation	Functioning	27/01/2010	168	26.5	65m east
GW109205	Other	Unknown	13/08/2008	186	57.4	270m east
GW103569	Stock and Dome	Unknown	1/04/1997	140	115	170m west
GW042769	Irrigation	Decommissioned	1/10/1976	29	NR	120m east
GW109629	Commercial and Industrial	Unknown	20/07/2007	120	14.4	160m west
GW013891	Irrigation	Unknown	1/08/1958	100.5	NR	160m west
GW047570	Water supply	Functioning	1/11/1980	13.1	NR	450m west
GW109371	Other	Unknown	29/09/2008	22.9	11.4	500m north

Notes: *NR – No records available

3. Site History and Observations

3.1 General

Site history information was reviewed from the following information sources:

- Review of historical and recent aerial photographs from the years 1947, 1955, 1961, 1970, 1978, 1986, 1991, 1998, 2004, 2005, 2013, 2018, 2021 and 2023
- A search of NSW EPA Contaminated Land records under the *Contaminated Lands Management Act 1997* (CLM Act) and licence records under the POEO Act
- Selected online records
- Other publicly available information searches
- Site visit and walkover

Given the large linear size of the Site and it being a public road/road corridor, reviewing historical titles, local council records or Schedule 11 hazardous material searches were not considered relevant or practical and were not reviewed as part of this investigation.

3.2 Summary of Site History

Based on the data reviewed a summary of the Site history is provided below with details of specific searches included in subsequent sections.

- Historic aerial photographs indicate that the Site has had development prior to 1947 and has been utilised as a road/road corridor except for a section of what is now Parker Street. This section appears to have been established in 1961 based on the historic aerial photo. The general present-day position of Parker Street, Andrews Road, The Northern Road and Londonderry Road appears to have remained the same since 1947.
- Various structures for residential, industrial or agricultural use have been constructed and/or demolished along both sides of the road corridor
- Former Castlereagh Regional Waste Disposal Depot (extent and location shown in Figure 1 (1 of 9), Appendix A) is located adjacent to the Site within Berkshire Park at the south-east of The Northern Road (Chainage reference: MC10 CH.1800-4100). The Depot commenced operation as an interim liquid waste disposal facility in 1974 and ceased to accept liquid and putrescible waste in 1998. The Depot was reported being associated with on- and off-site contamination due to leakage of clay lined cells
- Londonderry TestSafe & Fire and Rescue NSW (919 Londonderry Rd, Londonderry NSW 2753, extent and location shown in Figure 1 (3 of 9), Appendix A) located immediately east of the Site off Londonderry Road (Chainage Reference: MC30 CH.8000-8300) was reported as a per- and poly-fluoroalkyl substances (PFAS) contaminated site by NSW EPA, and is undergoing investigation and remediation by TestSafe Australia.

3.3 Historical Aerial Photograph Review

Historic aerial photographs from years 1947, 1955, 1961, 1970, 1978, 1986, 1991, 1998, 2004, 2005, 2013, 2018, 2021 and 2023 were reviewed to assess potential historic sources of contamination within the Site. The 1947 to 2013 aerial photos were sourced from NSW Spatial Services Historical Imagery Portal and the 2018 to 2023 aerial photos were sourced from MetroMap (website).

Relevant Site features and surrounding Site conditions observed from the aerials are summarised in Table 3–1 below. A selection of aerial photos is presented in Appendix B.

Table 3–1: Historical aerial photo review

YEAR	SITE DESCRIPTION AND SURROUNDING AREA	
	Onsite	Offsite
Aerial Photo 1947 (black and white [B/W])	The Site appears to be generally developed and utilised as road corridor, similar to the present-day position. A section of what is now Parker Street appears to be undeveloped and grassed.	There is development in the southern part of the Site. Residential dwellings appear to be predominantly located along both sides of Parker Street. The area to the west and southeast of the southern section of The Northern Road (Chainage Reference: MC20 CH.2900-3800) appears to be cleared with structures of unknown use constructed. There is less development along the northern portion of The Northern Road (Chainage reference: MC10 CH.0-7500 and MC20 CH.100-2600), some farm buildings with associated access tracks, probable water storage tanks, agricultural and grazing land is prevalent. There is some development along Londonderry Road. A racecourse appears to be located to the east of the Londonderry Road (Chainage Reference: MC30 CH.1800-2200) and the Londonderry RAAF Base appears to be established to the east (Chainage Reference: MC30 CH2900-3700).
Aerial Photo 1955 (B/W)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with more residential dwellings constructed along both sides of Parker Street, and structures of unknown uses are constructed.
Aerial Photo 1961 (B/W)	The section of what is today referred to as Parker Street appears to be developed and established. The rest of the Site is generally similar to previous photo.	More residential dwellings constructed along both sides of Parker Street, and structures of unknown uses are constructed. The Francis Greenway Correctional Complex appears to be constructed to the southeast of the northern portion of The Northern Road (CH600-1200) and area to the northwest appears to be cleared.
Aerial Photo 1970 (B/W)	Generally similar to previous photo.	Further development to the surrounding land is shown. More residential dwellings are constructed along Richmond Road and Parker Street. Some structures of unknown uses are constructed along both sides of the road corridor. The TestSafe Londonderry facility is visible.
Aerial Photo 1978 (B/W)	Generally similar to previous photo.	Further development to the surrounding land is shown. More residential dwellings are constructed along Andrews Road, Richmond Road and Parker Street. Some parcels of land along both sides of the road corridor appear to be cleared with some farm/rural buildings constructed. Castlereagh Regional Waste Disposal Depot appears to be constructed.
Aerial Photo 1986 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes (i.e. demolition and/or construction) to the farm/rural buildings and residential dwellings.

YEAR	SITE DESCRIPTION AND SURROUNDING AREA	
	Onsite	Offsite
Aerial Photo 1991 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes (i.e. demolition and/or construction) to the farm/rural buildings and residential dwellings. Former Castlereagh Regional Waste Disposal Depot appears to be expanded and the boundary extended closer to the Site.
Aerial Photo 1998 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes to the farm/rural buildings. More residential dwellings are constructed to the west of Andrews Road, Richmond Road and Parker Street.
Aerial Photo 2005 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes (i.e. demolition and/or construction) to the farm/rural buildings and residential dwellings. The Francis Greenway Correctional Complex appears to be expanded and the boundary extended closer to the Site.
Aerial Photo 2013 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes (i.e. demolition and/or construction) to the farm/rural buildings and residential dwellings. Area to the southern portion of The Northern Road appears to be cleared with residential dwellings constructed.
Aerial Photo 2018 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo with some changes (i.e. demolition and/or construction) to the farm/rural buildings and residential dwellings.
Aerial Photo 2021 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo.
Aerial Photo 2023 (Colour)	Generally similar to previous photo.	Surrounding areas appear generally similar to the previous photo

It is noted that some historical photographs are poor quality or obscured by shadows/vegetation and accordingly, it is difficult to assess all existing and former building locations.

3.4 NSW EPA Records

3.4.1 Contaminated Land Record of Notices

A search of the NSW EPA Contaminated Land records was carried out through the NSW EPA website on 1 June 2023. The contaminated land public record is a searchable database of:

- Orders made under Part 3 of the CLM Act
- Notices available to the public under section 58 of the CLM Act
- Approved voluntary management proposals under the CLM Act that have not been fully carried out and where EPA approval has not been revoked
- Site audit statements provided to the EPA under section 53B of the CLM Act that relate to significantly contaminated land

- Where practicable, copies of anything formerly required to be part of the public record
- Actions taken by EPA (or the previous State Pollution Control Commission) under sections 35 or 36 of the *Environmentally Hazardous Chemicals Act 1985* (EHC Act).

The results indicated there were no notices for the Site. The Castlereagh State Forest located immediately south-east of the Site had six former notices under the EHC Act and refer to the property having been contaminated by the prescribed activity of the disposal of chemical wastes (namely wastes contaminated with copper, cadmium, lead, manganese and zinc). The EPA appears to have revoked previous notices stating that previous notice requirements have been complied with and that the subject land was considered suitable for continuing low sensitivity land use (details and previous reports were not however available).

A Search of the Contaminated Land Records of Notice Search (accessed 1 June 2023) showed one registered site located within a 500m buffer of the Site and one located within a 1km buffer of the Site:

- Caltex Cambridge Park, 1 Boomerang Place, Cambridge Park (approximately 20m east of the Site). Activity that caused contamination: Service Station. The property is listed as 'Regulation under CLM Act 1997 not required'
- 7-Eleven Service Station Penrith, 30 Henry Street, Penrith (approximately 700m west of the Site). Activity that caused contamination: Service Station. The property is listed as 'Regulation under CLM Act 1997 not required'

3.4.2 POEO Database Search

A search of the NSW EPA POEO Act registers was carried out through the NSW EPA website on 1 June 2023. The following licensed activities were recorded within a 1km buffer of the Site:

- Licensed solid waste landfilling (EPL 4601) activity was recorded immediately south-east of the Site at Castlereagh Waste Management Centre, The Northern Road, Berkshire Park, NSW, 2765
- Licensed extractive (EPL 3058) activity was recorded approximately 800m west of the Site at Hi-Quality Londonderry Clay Pit, Wilshire Road, Londonderry, NSW, 2753
- Delicensed hazardous, industrial or Group A waste generation or storage (EPL 11417) activities were record approximately 80m south of the Site at Lady Davidson Private Hospital, 9 Barber Avenue, Kingswood, NSW 2747.

3.5 Review of Online Searches

A high-level review of online resources was carried out and search results relevant to this investigation are summarised below:

- Castlereagh Regional Waste Disposal Depot located within Berkshire Park to the south-east of The Northern Road (Chainage reference: MC10 CH.1800-4100, refer to Figure 1, Appendix A) was reported to have commenced operation as an interim liquid waste disposal facility in 1974, then continued to expand and operate for approximately 20 years until eventually ceased to accept liquid and putrescible waste in 1998.
  - It was reported that solid and liquid wasted are stored within waste cells lined by "impermeable" clay based on the Environmental Impact Statement (Metropolitan Waste Disposal Authority 1986)
  - Based on the report A Review of Issue Relating to The Disposal of Urban Waste in Sydney, Melbourne and Adelaide: An Environmental History (Phillip 2002), the effectiveness of the waste cells was dependent on the low permeability of clay and the levels of inter-reactivity of the substances placed in cells. However, the exact types and amount of the waste sent to the depot remained unknown to the public.
  - A rehabilitation and closure plan of the facility was proposed by Waste Service NSW in 2004.
- Londonderry TestSafe & Fire and Rescue NSW (667 The Northern Road, Londonderry, 2753, extent and location shown in Figure 1 (3 of 9), Appendix A) located east of Londonderry Road (Chainage Reference: MC30 CH.8000-8300) and west of The Northern Road (Chainage reference: MC10 CH.6700) was reportedly being contaminated by PFAS from historical use of fire-fighting foams by the EPA, and is undergoing investigation as part of the NSW Government PFAS Investigation Program.
  - EPA notes that PFAS compounds have been identified both on- and off-site at the Londonderry facility and precautionary dietary advice have been supplied to residents of downstream properties

- EPA also notes that TestSafe Londonderry has constructed a retention dam to capture any surface water to minimise the amount of run-off from the Site, as well as implemented surface and groundwater monitoring program.

3.6 Previous Reporting

TfNSW carried out a geotechnical investigation along parts of the Proposal and reported in a Geotechnical Factual Report (TfNSW, 2023). A summary of information considered relevant has been included in earlier sections relating to geology and acid sulfate soils. The factual report also included some preliminary laboratory analysis for a suite of contaminants from 2 boreholes and 17 test pits located within the Site. Samples were analysed from both fill and natural soils from a depth range of 0.0 m to 2.51m. Table 3–2 below provides a summary of the analysis from the laboratory reports included in the TfNSW factual report.

Table 3–2: Summary of Contamination Test Results (TfNSW, 2023)

Analyte	Number of Samples	Concentration Range	Health Investigation Levels (commercial/industrial)[1]
Heavy Metals			
Arsenic	21	<5-18mg/kg	3,000 mg/kg
Cadmium	21	<1.0mg/kg	900 mg/kg
Chromium (total)	21	7-56mg/kg	3,600 mg/kg (based on chromium VI)
Copper	21	<5-64mg/kg	240,000 mg/kg
Lead	21	7-94mg/kg	1,500 mg/kg
Mercury	21	<0.1mg/kg	730 mg/kg (inorganic)
Nickel	21	2-36mg/kg	6,000 mg/kg
Zinc	21	<5-199mg/kg	400,000 mg/kg
Polychlorinated Biphenyl's (PCB)	21	<0.1mg/kg	7 mg/kg
Organochlorine Pesticides (OCP)	21	<0.05-<0.2mg/kg	50-3,600 mg/kg
Organophosphorus Pesticides (OPP)	21	<0.05-<0.2mg/kg	2,000 mg/kg (chlopyrifos)
Phenolic Compounds	21	<0.1-<2.0mg/kg	660-240,000 mg/kg
Polycyclic Aromatic Hydrocarbons (PAH)			
PAH Total	21	<0.5-25.0mg/kg	4,000 mg/kg
Benzo(a)pyrene	21	<0.5-2.0mg/kg	40 mg/kg
Benzo(a)pyrene TEQ	21	<0.5-2.6mg/kg	40 mg/kg
Total Petroleum Hydrocarbons (TPH)	21	<10-<100mg/kg	-[1a]-
BTEXN	21	<0.2-<1mg/kg	-[1a]-
Toxicity Characteristic Leaching Procedure (TCLP)			
Arsenic	21	<0.1mg/L	-
Cadmium	21	<0.05mg/L	-
Chromium	21	<0.1mg/L	-
Copper	21	<0.1mg/L	-
Lead	21	<0.1mg/L	-
Mercury	21	<0.001mg/L	-

Analyte	Number of Samples	Concentration Range	Health Investigation Levels (commercial/industrial)[1]
Nickel	21	<0.1mg/L	-
Zinc	21	<0.1-0.5mg/L	-
Benzo(a)pyrene	21	<0.0005mg/L	-

Table Notes:

1. *For initial comparison purposes only, we have shown Health Investigation Levels (Commercial/Industrial, HIL-D) for some contaminants sourced from National Environmental Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013. Other criteria such as ecological investigation levels, management limits or vapour criteria not shown.*

1a. Guideline depends on various factors – not provided

We note the factual report does not provide justification for why samples were selected and does not provide details on aspects of field quality control such sample methods, sample storage and handling, decontamination etc. therefore the data can only be regarded as preliminary.

Based on a preliminary review, the concentrations do not exceed health investigation levels under a 'commercial/industrial' land use setting (HIL D from NEPM, 2013). With respect to waste classification for offsite disposal to a licenced waste facility, individual results appear to meet criteria for General Solid Waste. We note that assessment of health risks and waste classification requires a detailed assessment, and this comparison does not imply all soils meet health/ecological criteria or that the soil has a particular classification.

3.7 Site Observations

A two-day Site inspection was undertaken on 8 and 9 June 2023 along the road corridor by an experienced SMEC environmental engineer. A summary of relevant observations is provided below. Observations made for The Northern Road and the Londonderry Road are grouped separately. We note that the locations of the proposed Site Compound areas were not known at the time of the Site walkover, hence not specifically viewed or included in this section.

Selected photographs are included in Appendix C and locations of Site observations are presented in Figure 2C, Appendix A.

Overall Site:

- In general terms the Site was observed to be predominately flat
- Generally stormwater runoff was inferred to drain along either side of the road corridor (refer to Photo 1, Appendix C)
- Some litter was observed in parts of the road verges (such as plastic, food wrappers, etc.)

The Northern Road:

- There was a slight westward slope down on the west side of the road corridor, which was observed along most of the Site footprint between the Great Western Highway and Trinity Drive. Surface water is suspected to drain in this direction (west)
- A service station and car wash were observed between Cox Avenue and Copeland Street (refer to Figure 2C (6 of 9), Appendix A and Photo 2, Appendix C)
- A tank (suspected water storage) was observed east of the Site near Glebe Place (refer to Figure 2C (6 of 9), Appendix A)
- The area south of the road corridor sloped southward along Andrews Road. A hill was observed along the north side of the road corridor (refer to Figure 2C (6 of 9), Appendix A)
- A petrol station was observed adjacent to Boomerang Place and Star Crescent, east of the Site (refer to Figure 2C (6 of 9), Appendix A and Photo 3, Appendix C)
- A heavily vegetated area was observed to the east of Site, north of Newham Drive (refer to Figure 2C (5 of 9), Appendix A)

- Between Borrowdale Way and Ninth Avenue, the land either side of the road sloped eastward, while the road corridor was flat. Surface water is expected to drain in this direction (east)
- A tank (suspected water storage) was observed west of the road corridor, north of Borrowdale Way (refer to Figure 2C (5 of 9), Appendix A and Photo 4, Appendix C)
- Between Ninth Avenue and Cranebrook Road the Site was predominately flat, with a slight slope away from the road corridor on either side
- Agricultural land use and livestock was observed on properties east of the road corridor, between Ninth Avenue and Cranebrook Road. A heavily vegetated reserve was observed to the west, with residential properties south of Vincent Road (refer to Figure 2C (4 of 9), Appendix A and Photo 5 and 6, Appendix C)
- At the junction between Londonderry Road and The Northern Road, what appeared to be an industrial lot with trucks and equipment stored onsite was observed to the west of the road. A petrol station was also observed at the junction, to the east of the road (refer to Figure 2C (4 of 9), Appendix A and Photo 7, Appendix C)
- Francis Greenway Correctional Complex is observed south of Toorah Road and to the east of the road corridor (refer to Figure 2C (1 of 9), Appendix A and Photo 15, Appendix C)
- The Northern Road, north of the Londonderry Road intersection, was predominately flat with some gentle undulation along the road corridor
- A RFS training area was observed west of The Northern Road and appeared fenced off (refer to Figure 2C (3 of 9), Appendix A and Photo 16, Appendix C)
- Along The Northern Road, adjacent to the RFS training area, open drain lines were observed to run between the road corridor and adjoining properties. Surface water is expected to drain parallel to the roadway (refer to Figure 2C (3 of 9), Appendix A)
- Along The Northern Road, north of the RFS training area, signage along the roadway notes that the road is subject to flooding (refer to Figure 2C (3 of 9), Appendix A)
- Castlereagh Nature Reserve (east of the Site) was observed to be heavily treed (refer to Figure 2C (3 of 9), Appendix A and Photo 17, Appendix C)
- A wrecker was observed on the west side of The Northern Road, opposite the south end of the Castlereagh Nature Reserve (refer to Figure 2C (3 of 9), Appendix A and Photo 18, Appendix C)
- An industrial lot (with scraps and cars onsite) was observed to the west of The Northern Road, south of Carrington Road (refer to Figure 2C (1 of 9), Appendix A)
- The area east of Site used as the Castlereagh Regional Waste Disposal Depot was observed to be heavily vegetated and at the same elevation as the road corridor. No apparent batters, mounding or surface waste was observed. The landfill extent was unable to be visually determined (refer to Figure 2C (2 of 9), Appendix A)

The Londonderry Road:

- The Site was predominately flat along Londonderry Road
- Along Londonderry Road, at approximately Smeeton Road, tanks were observed on the property east of Site, along with “hazard” signage (refer to Figure 2C (4 of 9), Appendix A and Photo 8, Appendix C)
- A property to the west of Londonderry Road (near the intersection with Cherrybrook Chase) was observed to have several disused vehicles/equipment stored (refer to Figure 2C (9 of 9), Appendix A)
- North of Cherrybrook Chase, Londonderry Road was a small overpass over a culvert, water appeared to drain under the road in this location (refer to Figure 2C (9 of 9), Appendix A)
- Bags of unknown waste were observed on the road verge on the west side of the road corridor, approximately midway between Spencer Road and Cherrybrook Chase. The road corridor was predominately flat, with land either side sloping gently westward (refer to Figure 2C (9 of 9), Appendix A and Photo 9, Appendix C)
- A service station was observed south of Carrington Road, east of the road corridor, and west of the corridor just north of Carrington Road (refer to Figure 2C (8 of 9), Appendix A and Photo 10, Appendix C)

- A petrol station was observed west of the road corridor, opposite to the Londonderry RAAF base (refer to Figure 2C (8 of 9), Appendix A and Photo 11, Appendix C)
- At the RAAF base area, Londonderry Road was predominately flat with a slight slope away from the road corridor to the east (refer to Figure 2C (8 of 9), Appendix A and Photo 12, Appendix C)
- A property north of The Driftway was observed to be used as a university "Climate Change Research" area. Some relatively large above ground tanks (unknown use) were observed in the north of this property (refer to Figure 2C (7 of 9), Appendix A and Photo 13 and 14, Appendix C)
- The areas either side of the road corridor, north of The Driftway, were observed to be densely vegetated to the west, and grassed fields to the east (refer to Figure 2C (7 of 9), Appendix A)

3.8 Data Gaps

The following data gaps have been identified:

- Due to the relatively poor quality of some of the available historical aerial photographs and limited aerial photographs available, and the large scale of the Site, it is difficult to discern small scale features at the Site
- Due to the length of the Site it was not practical to assess the full history of adjacent nearby properties
- Limited information was publicly available on the use of RAAF Base Londonderry in relation to current and historical use.

These data gaps are not unusual for a linear project of this size. These data gaps are considered in the Preliminary Conceptual Site Model (Section 4) below and can be managed in later stages of this project as per recommendations in Section 5.

4. Preliminary Conceptual Site Model

4.1 Overview

A critical element of any site assessment is the development of a conceptual site model (CSM). The CSM describes the environmental setting, identifies contaminant sources (potential areas of concern and associated contaminants), modes of contaminant movement (migration pathways), the person/ecosystem components/environmental values potentially affected by the contamination (potential receptors) and how exposure may occur (exposure routes).

The development of the CSM is an iterative process, whereby the initial CSM is developed in the first stage of site assessment and revised as more detailed information on the site and the nature of contamination becomes available. A preliminary CSM has been prepared which presents potential source(s), pathway(s) and ecological/human receptor(s) linkages. Potential source(s), pathway(s) and ecological/human receptor(s) are identified below.

The preliminary CSM is used to identify risks to human health, the environment and environmental values, as well as uncertainties or critical gaps in information that need to be addressed in subsequent stages.

For a risk to exist all three components (source, pathway, receptor) of the CSM must exist. The CSM is made up of contaminants of potential concern (CoPC) and receptors that could be exposed to the CoPC.

4.2 Potential Contamination Sources

Areas of Environmental Interest (AEI) and Contaminants of Potential Concern (CoPC) were assessed based on-site history information and preliminary site observations. These AEIs were identified on the basis of contamination that could be present and could affect the Site with respect to the proposed road uses and/or could affect construction. Broad diffuse sources for example high nutrients in groundwater from historical agricultural uses are not considered relevant in the context of the proposed works as the Site is not likely the source and groundwater is not likely to be intersected in the majority of the construction works.

Identified AEIs and CoPC are summarised in Table 4–1 below. AEIs identified are presented in Figure 3, Appendix A.

Table 4–1: Summary of identified AEIs and CoPC

AREA OF ENVIRONMENTAL INTEREST / SOURCE		LIKELIHOOD OF CONTAMINATION [1]	MEDIA POTENTIALLY AFFECTED	CoPC [2]	Comments
AEI 1	Fill of unknown origin and/or quality – across the majority of the Site (including fly tipped wastes on road verges)	Moderate-high (but sporadic)	Soil (Potentially groundwater)	Metals, TRH, BTEX, PAH, OPP, OCP, PCB, asbestos	Some fill may have been used for road construction and general levelling. Areas with potential for deep fill were generally not observed. Some localised deeper areas of fill could be present in local low points such as over drainage lines etc. Some fly tipping was noted and could have been sporadic over the history of the Site on road verges.
AEI 2	Areas near former/existing building structures from weathering and/or ineffective demolition of hazardous building materials	Low	Soil	Asbestos Lead (from lead-based paints) Zinc (from weathering of galvanised iron	Generally structures were not observed on the Site along the road corridor, but structures could have been in close proximity based on review of the historic imagery, where impacts from weathering or poor demolition could result in some residual impacts. This is more relevant to parts in the south of the Site in higher built-up areas.
AEI 3	Areas near Londonderry TestSafe – NSW Rural fire brigades/rural fire service training area – PFAS contaminated site located east of the Londonderry Road (Chainage reference: MC30 CH.8000-8300) and west of The Northern Road (Chainage reference: MC10 CH.6700)	Moderate	Soil Groundwater	PFAS	Public information suggests PFAS impacts from a property adjoining the Site and that impacts could also be migrating offsite. The degree and extent are not known.
AEI 4	Areas near former Castlereagh Regional Waste Disposal Depot located at the south-east of The Northern Road (Chainage reference: MC10 CH.1800-4100) from historical waste disposal	Moderate	Groundwater	Cadmium, arsenic, vinyl chloride, chloroform, toluene, formaldehyde, phenol, chlorinated hydrocarbons, trichloroethene and dichloromethane + others depending on wastes disposed	Historical waste disposal practices have occurred on land adjacent the Site in disposal cells. Groundwater if impacted could be affected outside the landfill and under the Site.
AEI 5	Areas adjacent to service stations, wreckers and commercial/industrial areas (refer to Figure 2C and 3, Appendix A for locations) from activities such as storage and dispensing of fuels, mechanical repairs, use of oils, lubricants, degreasers, waste material storage etc. Also includes a portion of a hospital and RAAF Base Londonderry (due to data gaps)	Moderate	Soil Groundwater	Metals, TRH, BTEX, PAHs, phenols, VHC, VOCs, (potentially fuel additives - ethanol, MTBE and lead) + others depending on uses	Some service stations, wreckers and commercial/industrial land use areas were identified. Areas nearby may be impacted from adjacent activities. One Site Compound is located at the wrecker identified west of The Northern Road (Chainage reference: MC10 CH.5500-5900). There was no publicly available information on the use of RAAF Base Londonderry.

Table Notes

[1] This is our qualitative assessment of likelihood of contamination being detected from the data reviewed, not financial or other risk associated if contamination were to be detected (Low, Moderate or High). These findings are limited to the existing proposed works and are not suitable for informing future land use options and contamination liabilities.

[2] Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH (total recoverable hydrocarbons), BTEX (benzene, toluene, ethylbenzene, xylene), PAH (polyaromatic hydrocarbons), OCP (organochlorine pesticides), OPP (organophosphate pesticides), PCB (polychlorinated biphenyl's), MTBE (methyl tert-butyl ether)

4.3 Exposure Pathways

The pathways of exposure consist of:

- A transport mechanism; and,
- A route of exposure.

Based on Site history information, there is potential for the following contamination pathways to exist at the Site:

- Disturbance of potential soil contamination and exposure by ingestion, dermal contact or inhalation
- Air transport of particulates (dust/fibres) and exposure by inhalation (if soil is disturbed)
- Migration of run-off contaminated from contact with impacted soil, and exposure to ecological receptors (aquatic and terrestrial ecosystems)
- Leaching from soils into on-site groundwater followed by off-site migration (vertical and lateral)
- Contaminated groundwater migration for the Site to off-site surface water receptor (lateral)
- Contaminated groundwater migrating onto Site from offsite sources and exposure by direct contact and vapour inhalation (in trenches)

4.4 Potential Receptors

4.4.1 Human Receptors

Based on the proposed development for a road, the potential future receptors comprise:

- Construction workers in civil works programs
- Intrusive maintenance workers within the site (i.e. maintenance of buried services)
- Future short-term construction workers associated with the proposed development
- Nearby residents and workers

Future road users such as motorists and cyclists are not considered to be plausible receptors of subsurface contamination due to their transiting through the area.

4.4.2 Ecological Receptors

Based on the information available, and the current and proposed land use the potential ecological receptors could comprise of:

- Downgradient aquatic ecosystems such as surface water bodies, and
- On/off-site terrestrial organisms and plants.

4.5 Potential Source Pathway Receptor Linkages

Potential source-pathway-receptor linkages are where contaminated media (e.g. soil, surface water and/or groundwater) (if present) has the potential to adversely impact on human health or ecological values for the Site via complete exposure pathways. For a risk to exist all three components (source, pathway, receptor) of the CSM must exist.

The potential receptors for concern for which there are potential contamination pathways are summarised in Table 4–2.

Table 4–2: Potential contamination pathways and receptors

Source	Potential Pathway		Potential Receptor(s)
	Scenario	Exposure Pathway(s)	
Contaminants associated with AEI 1 to 5	• Direct exposure during excavation/stockpiling of contaminated soils • Direct exposure with impacted groundwater or vapour intrusion into trenches • Surface water runoff from excavated/exposed soils during construction impacting down-gradient soils and surface waters	• Dermal contact • Inhalation of soil dust and/or fibres • Incidental ingestion (humans and animals) • Vapour inhalation	• Future Site maintenance/operational workers and visitors • Construction workers during construction phase • Terrestrial and aquatic organisms and plants • Surface waters (on-site and off-site)

Overall AEI 1 (Fill of unknown origin and/or quality – across the majority of the Site, including fly tipped wastes on road verges) may have the higher likelihood of a plausible source-pathway-receptor linkage. Other identified sources are outside the Site and migration of contamination onto the Site may be limited to groundwater (if contamination was present). Interaction with groundwater is likely to be limited during construction, therefore at this stage it is assessed that there is a low likelihood of a plausible source-pathway-receptor linkage for these other AEI. An exception could be AEI 3 – the Londonderry TestSafe – NSW Rural fire brigades/rural fire service training area where PFAS could potentially migrate via surface water movements.

5. Conclusions and Recommendations

Site history information indicates that the Site has had development prior to 1947 and has been utilised as a road/road corridor except for a section of what is now referred to as Parker Street. This section appears to have been established in 1961 based on historic aerial photographs. The general present-day position of the road corridor appears to have remained the same since 1947.

Based on the Site history and Site observations, five Areas of Environmental Interest (AEI) (presented in Figure 3, Appendix A) and potentially contamination sources were identified including:

- AEI 1 – Fill of unknown origin and/or quality
- AEI 2 – Areas near former/existing building structures from weathering and/or ineffective demolition of hazardous building materials.
- AEI 3 – Areas near Londonderry TestSafe – NSW Rural fire brigades/rural fire service training area - PFAS contaminated site located east of Londonderry Road (Chainage Reference: MC30 CH.8000-8300) and west of The Northern Road (Chainage reference: MC10 CH.6700)
- AEI 4 – Areas near former Castlereagh Regional Waste Disposal Depot located at the south-east of The Northern Road (Chainage reference: MC10 CH.1800-4100) from historical waste disposal
- AEI 5 – Areas adjacent to service stations, wreckers and commercial/industrial areas (refer to Figure 2C and 3, Appendix A for locations) from activities such as storage and dispensing of fuels, mechanical repairs, use of oils, lubricants, degreasers, waste material storage etc. Also includes a portion of a hospital and RAAF Base Londonderry (due to data gaps).

Some data gaps were noted as follows:

- Due to the relatively poor quality of some of the available historical aerial photographs and limited aerial photographs available, and the large scale of the Site, it is difficult to discern small scale features at the Site
- Due to the length of the Site it was not practical to assess the full history of adjacent nearby properties
- Limited information was publicly available on the use of RAAF Base Londonderry in relation to current and historical use.

Our qualitative assessment of the potential for contamination to be present within the various identified AEI ranges from low to moderate-high (refer to Table 4–1). A conceptual site model was developed which indicates that potential contaminants of concern associated with these AEIs could impact on media and a range of on/offsite receptors could be impacted by contamination if it were present, including human receptors and ecological receptors.

Overall AEI 1 (Fill of unknown origin and/or quality – across the majority of the Site, including fly tipped wastes on road verges) may have the higher likelihood of a plausible source-pathway-receptor linkage. Other identified sources are outside the Site and migration of contamination onto the Site may be limited to groundwater (if contamination was present).

A Detailed Site Investigation should be conducted to assess identified AEIs, comprising additional targeted site history searches, sampling and analysis of relevant media to assess the Site with respect to contamination, fill data gaps, develop the CSM and assess the need for remediation/management relating to the proposed construction. Due to the size of the Site, SMEC consider a suitable approach would be to undertake judgemental sampling targeting the individual AEIs in areas where disturbance (or higher degrees of disturbance) are proposed, e.g. trenching and soil stripping etc. The sampling strategy, depths and media will depend on the likely construction/disturbance details. A Sampling, Analysis and Quality Plan (SAQP) should be prepared prior to the investigation. Any additional assessment (if required) should be carried out in accordance with the NEPM (2013) and NSW EPA endorsed guidelines. Based on the results, the need for further stages of assessment or remediation can then be assessed.

Whilst further investigation is recommended to reduce the likelihood of unexpected finds during construction, AEI 2 (Areas near former/existing building structures) may be able to be managed through an unexpected finds procedure prepared as part of the Construction Environmental Management Plan and implemented during construction. AEI 2 was assessed as having a 'low' likelihood of contamination and structures may not have encroached directly into the Site. The unexpected finds procedure should also apply to the whole Site in the event of an unexpected find.

6. References

Australian PFAS Chemicals Map website: pfas.australianmap.net

ePlanning Spatial Viewer website: planningportal.nsw.gov.au/spatialviewer

eSPADE v2.2 website: espade.environment.nsw.gov.au

Geological Survey of NSW 2009. Surface geology of New South Wales - 1:1 500 000 map. Geological Survey of New South Wales, NSW Department of Primary Industries, Maitland, Australia

Metropolitan Waste Disposal Authority (1986) Environmental impact statement for the extension and continuation of the Castlereagh Regional Waste Disposal Depot at Berkshire Park. Website: data.nsw.gov.au/data/dataset/environmental-impact-statement-for-the-extension-and-continuation-of-the-castlereagh-regional-83494

Minview, Geoscience website: minview.geoscience.nsw.gov.au

National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013, National Environment Protection Council.

NSW Department of Industry, WaterNSW Website: realtimedata.waternsw.com.au

NSW EPA (2020), Consultants Reporting on Contaminated Land, Contaminated Land Guidelines, April 2020

NSW EPA (2022) Sampling design part 1 – application, Contaminated land guidelines, August 2022

NSW EPA (2021) PFAS Investigation Program: Londonderry TestSafe and Fire and Rescue NSW. Website: www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program/pfas-investigation-sites/londonderry-testsafe-and-fire-and-rescue-nsw

Nicholls Philip (2002) A review of issue relating to the disposal of urban waste in Sydney, Melbourne and Adelaide. An environmental history Website: digital.library.adelaide.edu.au/dspace/bitstream/2440/21771/2/02whole.pdf

SMEC (2024) Geotechnical Interpretive Report: Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Improvements State Roads Concept Design & REF, prepared for TfNSW, ref: HNV-PS231-RPT-000002

SMEC (2024) Soils, Surface and Groundwater Assessment: Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Improvements State Roads Concept Design & REF, prepared for TfNSW, ref: HNV-PS211-RPT-000009

Transport for NSW QA Specification PS213, Contamination Assessment. Version for: Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvements – State Roads, dated September 2022

Transport for NSW (2023) Contaminated Land Management Procedure Ref: EMF-LM-PR-0016 version 4.1, dated January 2023

Transport for NSW (2023) Hawkesbury Nepean Valley Flood Resilience Upgrade Geotechnical Factual Report (File No: GEO5573/2, Report No: 2023/003 dated 7 July 2023)

Waste Service NSW (2004) Castlereagh Waste Management Centre: Rehabilitation and Closure Plan: Review of Environmental Factors

Appendix A

Figures

Figure 1 – Site Boundary and Location

Note that this figure comprises 9 sheets

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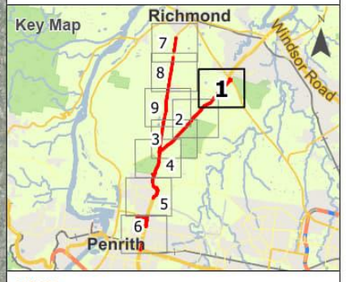
LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Cadastre
- Local Government Areas
- Watercourses

Chainage

100 MC10



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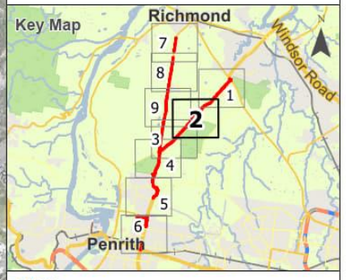

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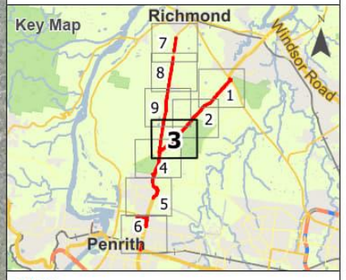

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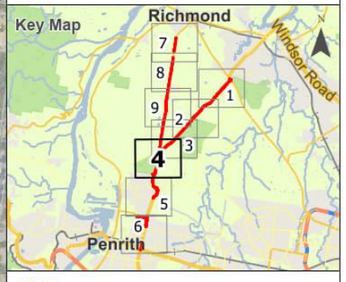

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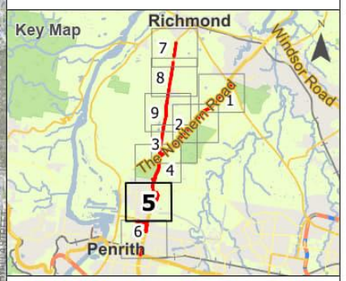

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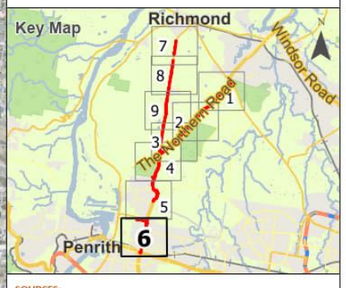

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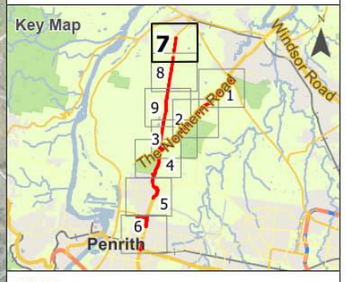

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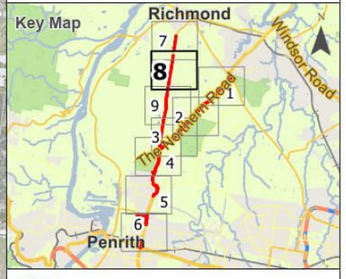

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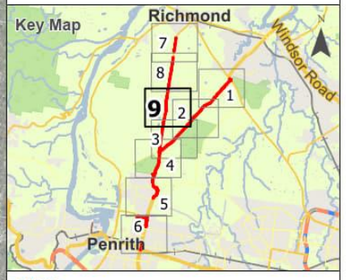

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Figure 2A – Regional Geology

Note that this figure comprises 9 sheets

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, position approximate
- Linearment
- Syncline, position accurate

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

- CZ_a - Unconsolidated alluvial clay, silt, sand, and gravel deposits.
- NM__d - Clay, patches of ferruginised, consolidated sand.
- NM__i - Conglomerate, matrix-supported.
- Q_af - Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.

Rock Units - PERMIAN TRIASSIC BASINS

- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.

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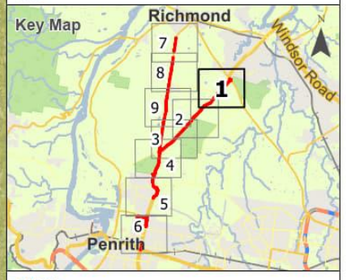

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4. Basemap:

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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (1 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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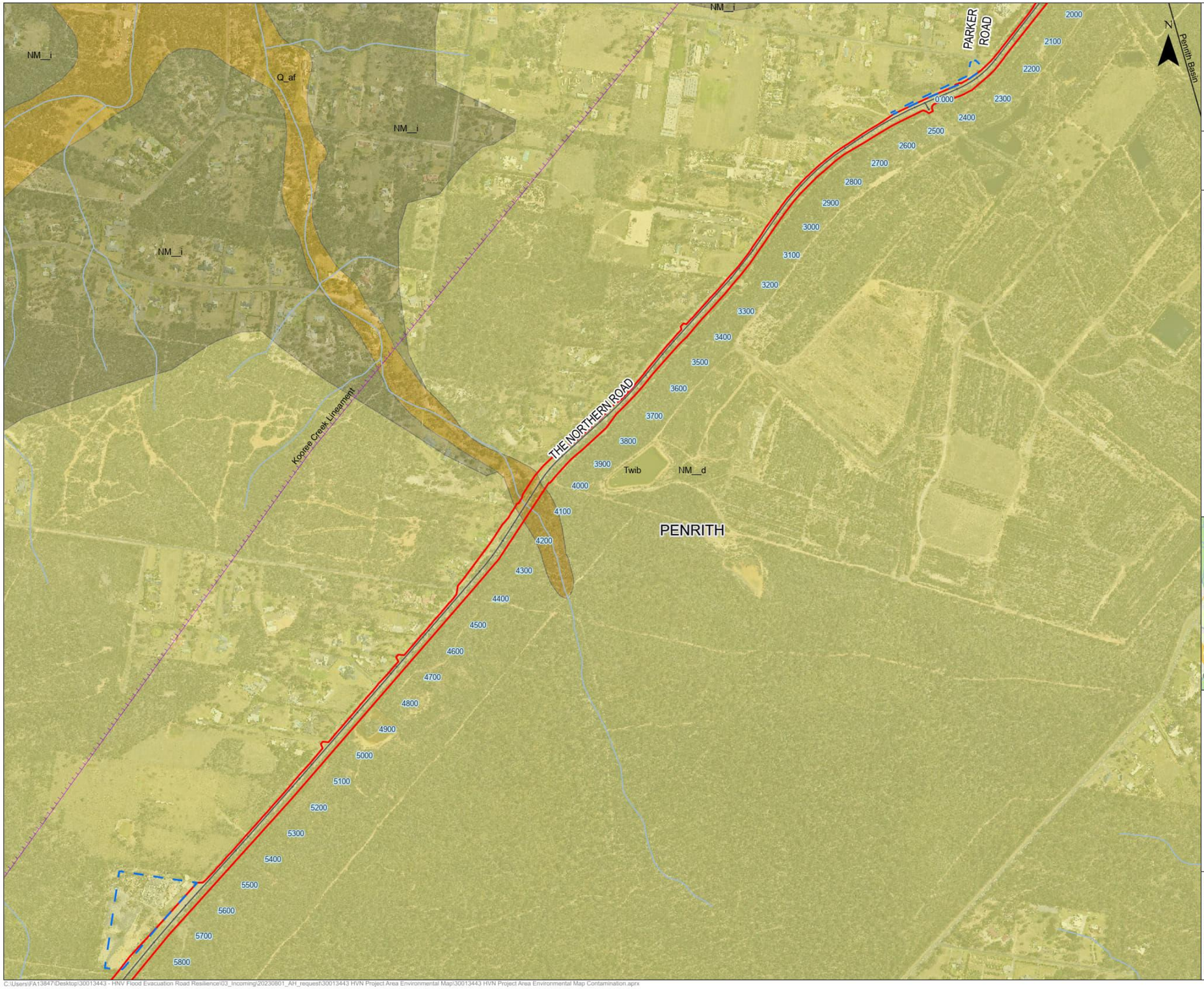

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Linearment
- Syncline, position accurate

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

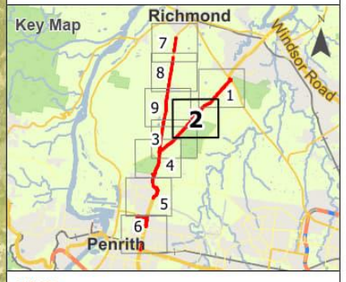
- NM__d - Clay, patches of ferruginised, consolidated sand.
- NM__i - Conglomerate, matrix-supported.
- Q_af - Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.

Rock Units - PERMIAN TRIASSIC BASINS

- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.

Chainage

100 MC10



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (2 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Linearment

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

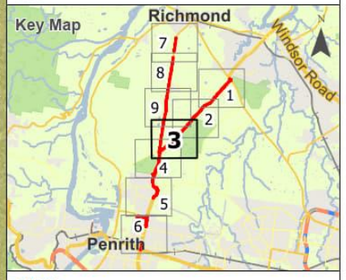
- NM__d - Clay, patches of ferruginised, consolidated sand.
- NM__i - Conglomerate, matrix-supported.
- Q_af - Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.

Rock Units - PERMIAN TRIASSIC BASINS

- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.

Chainage

- 100 MC10
- 100 MC20
- 100 MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (3 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
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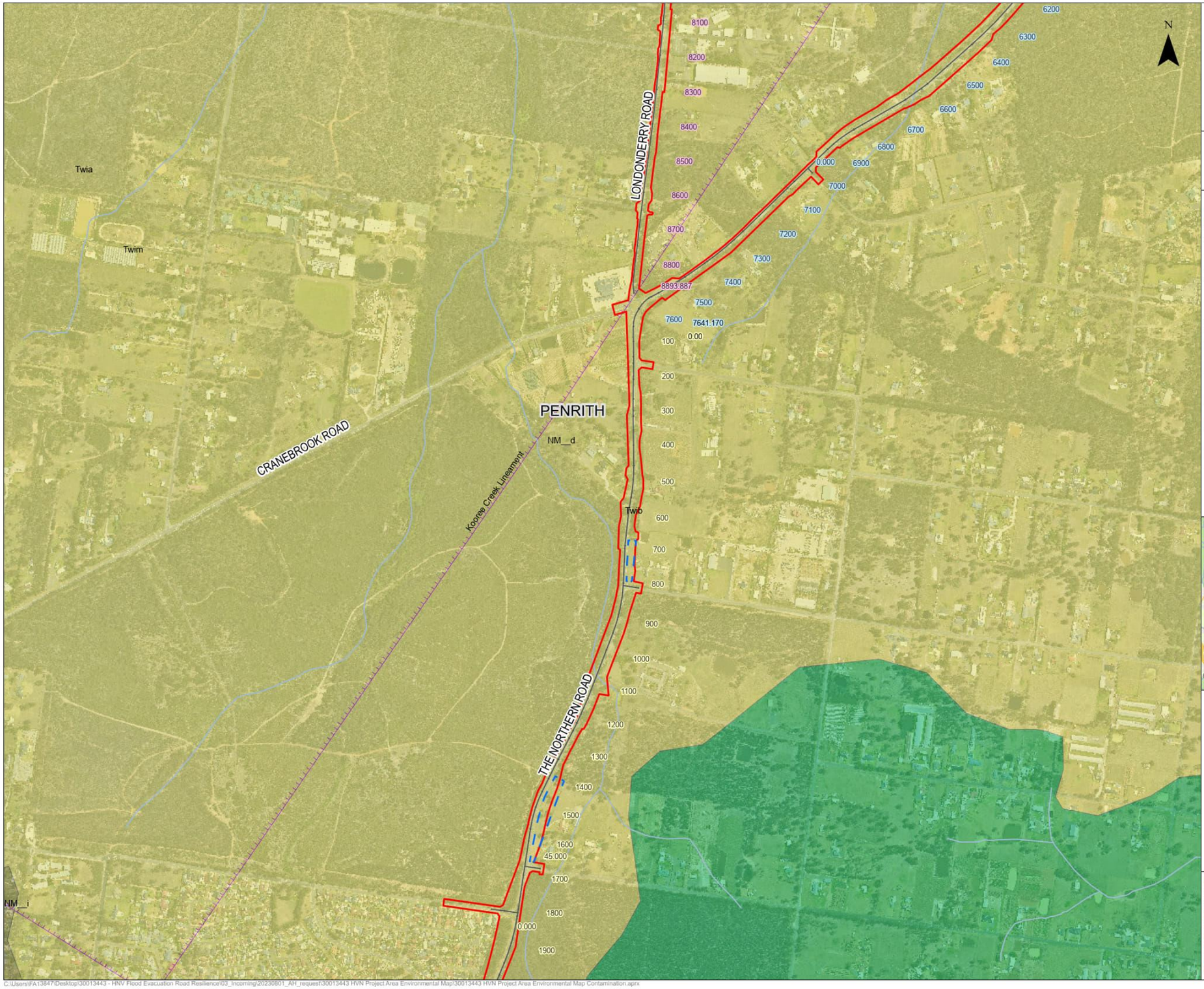

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, inferred
- Linearment

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

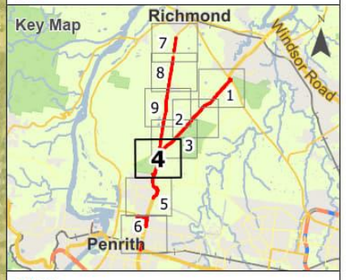
- NM__d - Clay, patches of ferruginised, consolidated sand.
- NM__l - Conglomerate, matrix-supported.

Rock Units - PERMIAN TRIASSIC BASINS

- Twia - Ashfield Shale: Black to light grey shale and laminite.
- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.
- Twim - Minchinbury Sandstone: Fine- to medium-grained lithic sandstone.

Chainage

- MC10
- MC20
- MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (4 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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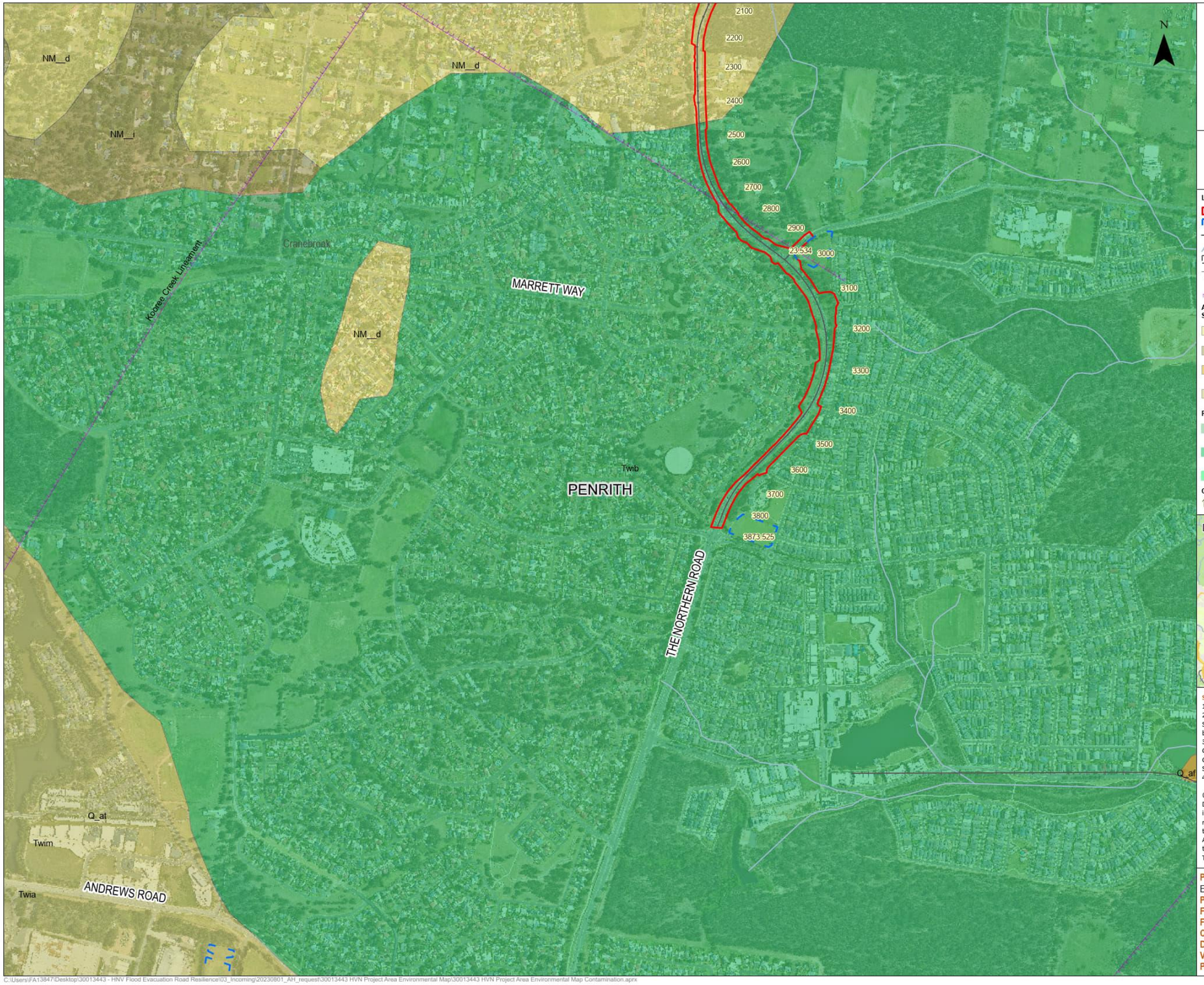

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, inferred
- Linearment

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

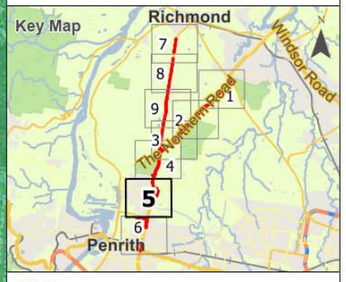
- NM__d - Clay, patches of ferruginised, consolidated sand.
- NM__i - Conglomerate, matrix-supported.
- Q_af - Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.
- Q_at - Silt, clay, (fluvially-deposited) fine- to medium-grained quartz-lithic sand, polymictic gravel.

Rock Units - PERMIAN TRIASSIC BASINS

- Twia - Ashfield Shale: Black to light grey shale and laminite.
- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.
- Twim - Minchinbury Sandstone: Fine- to medium-grained lithic sandstone.

Chainage

100 MC20



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (5 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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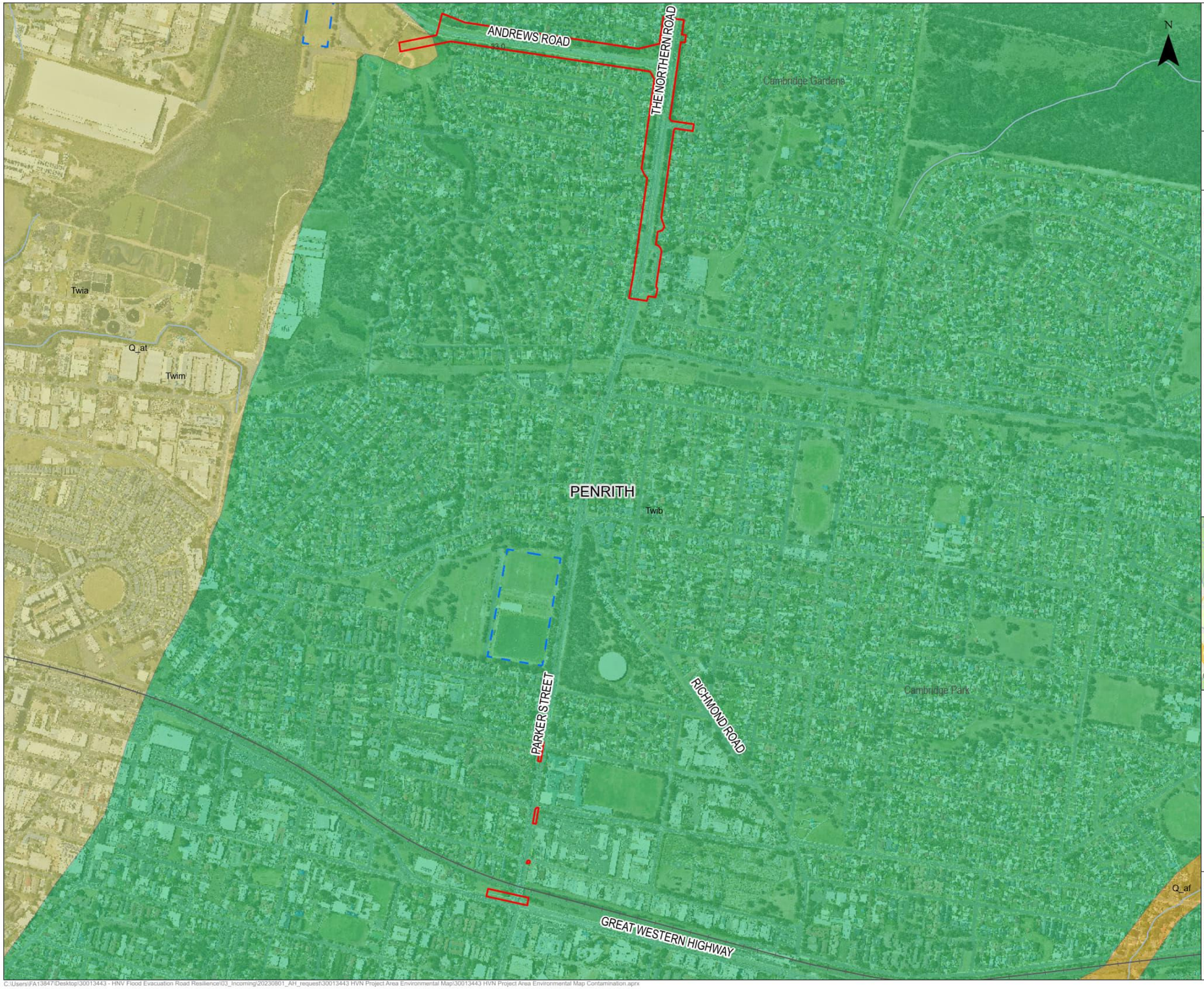

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LEGEND

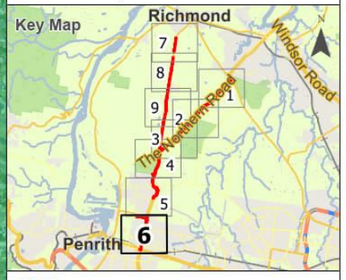
- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, inferred

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

- Q_af - Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.
- Q_at - Silt, clay, (fluvially-deposited) fine- to medium-grained quartz-lithic sand, polymictic gravel.

Rock Units - PERMIAN TRIASSIC BASINS

- Twia - Ashfield Shale: Black to light grey shale and laminite.
- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.
- Twim - Minchinbury Sandstone: Fine- to medium-grained lithic sandstone.



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PROJECT NO:	30013443
FIGURE NO:	Figure 2A (6 of 9)
FIGURE TITLE:	Regional Geology
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PAGE SIZE:	A3

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, position approximate
- Geological boundary, inferred

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

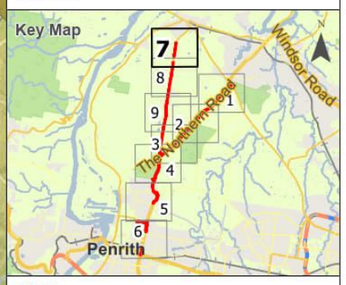
- CZ_a - Unconsolidated alluvial clay, silt, sand, and gravel deposits.
- CZ_ath - High-level terrace deposits of sand and gravel.
- NM__d - Clay, patches of ferruginised, consolidated sand.
- QP_at - Silt, clay, (fluvially-deposited) fine- to medium-grained quartz-lithic sand, polymictic gravel.

Rock Units - PERMIAN TRIASSIC BASINS

- Twia - Ashfield Shale: Black to light grey shale and laminite.
- Twib - Bringelly Shale: Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.
- Twim - Minchinbury Sandstone: Fine- to medium-grained lithic sandstone.

Chainage

100 MC30



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PROJECT NO:	30013443
FIGURE NO:	Figure 2A (7 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, position approximate
- Geological boundary, inferred

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

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Rock Units - PERMIAN TRIASSIC BASINS

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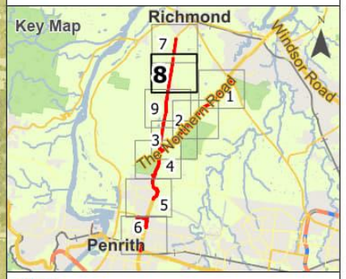
Chainage

100 MC30



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4. Basemap:

PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (8 of 9)
FIGURE TITLE:	Regional Geology
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DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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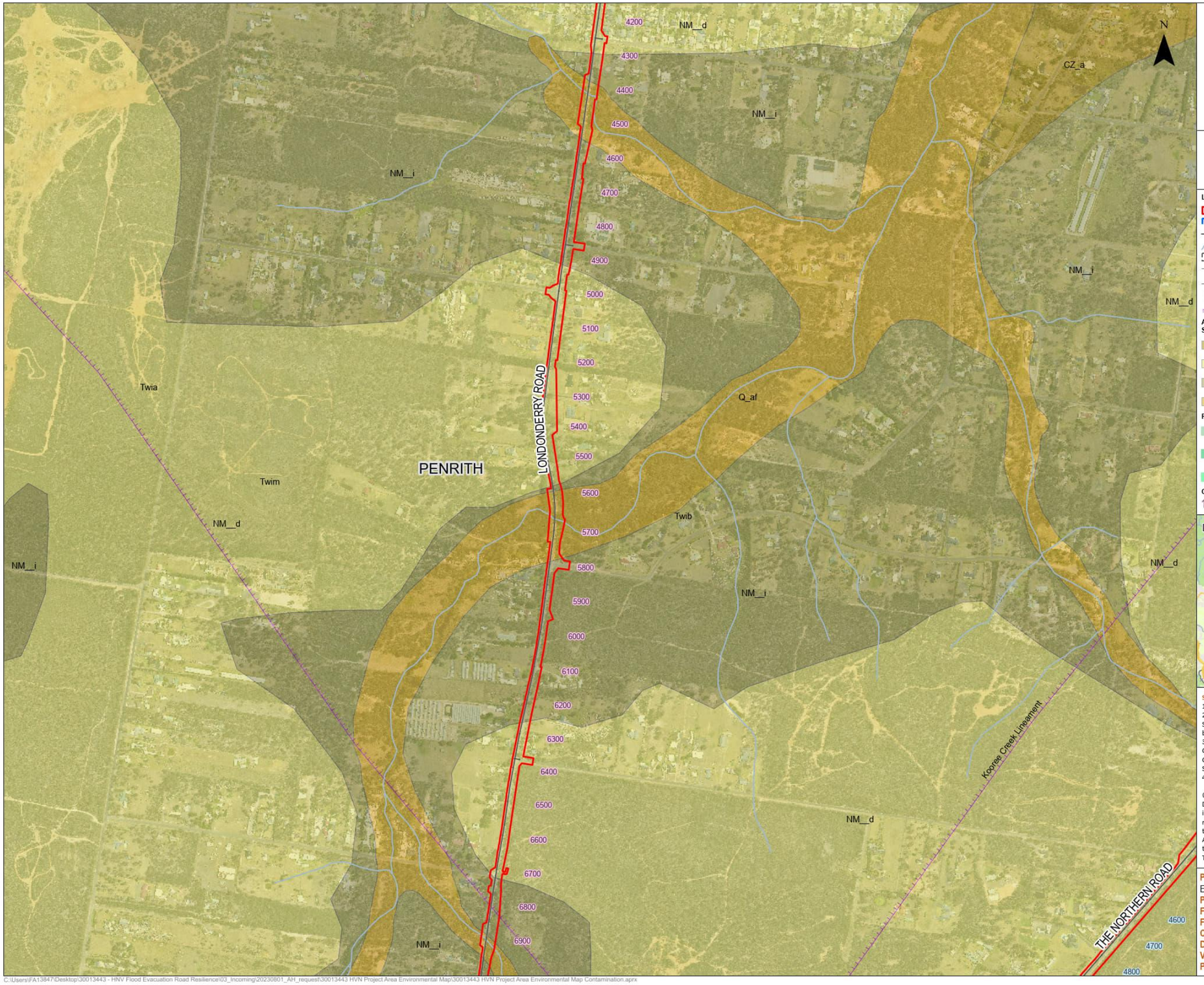

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LEGEND

- REF Boundary
- Site Compound
- Control Strings
- Watercourses
- Local Government Areas
- Geological boundary, position accurate
- Geological boundary, position approximate
- Geological boundary, inferred
- Linearment

Alluvium/fluvial - CENOZOIC SEDIMENTARY PROVINCE

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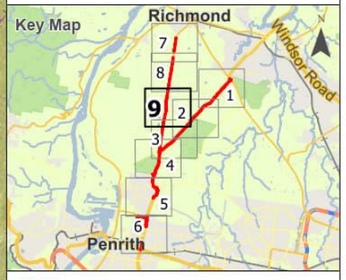
Chainage

100 MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2A (9 of 9)
FIGURE TITLE:	Regional Geology
CREATED BY:	FA13847
DATE:	12/06/2024
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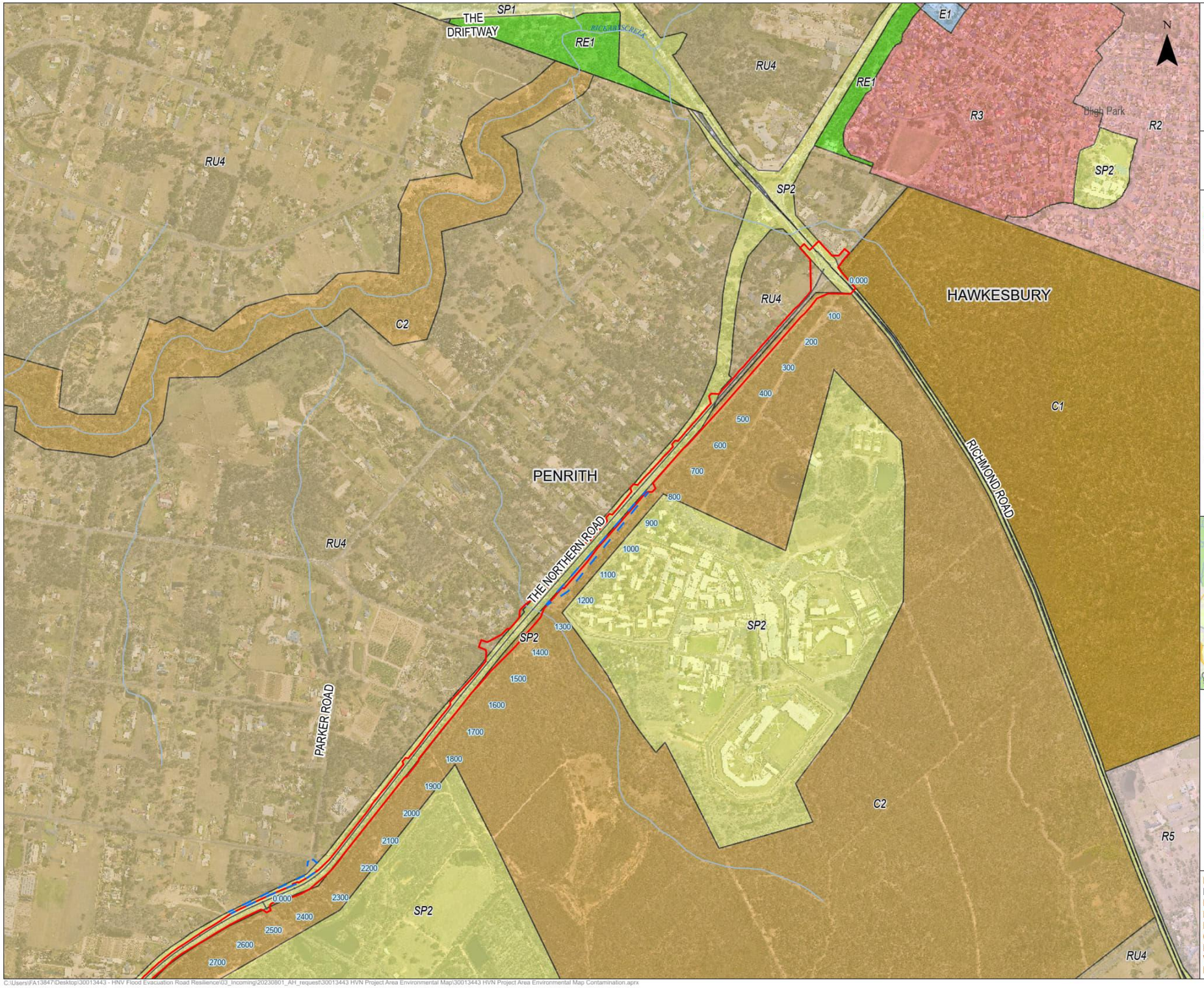
Figure 2B – Land Zoning

Note that this figure comprises 9 sheets



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (1 of 9)
FIGURE TITLE:	Land Zoning
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
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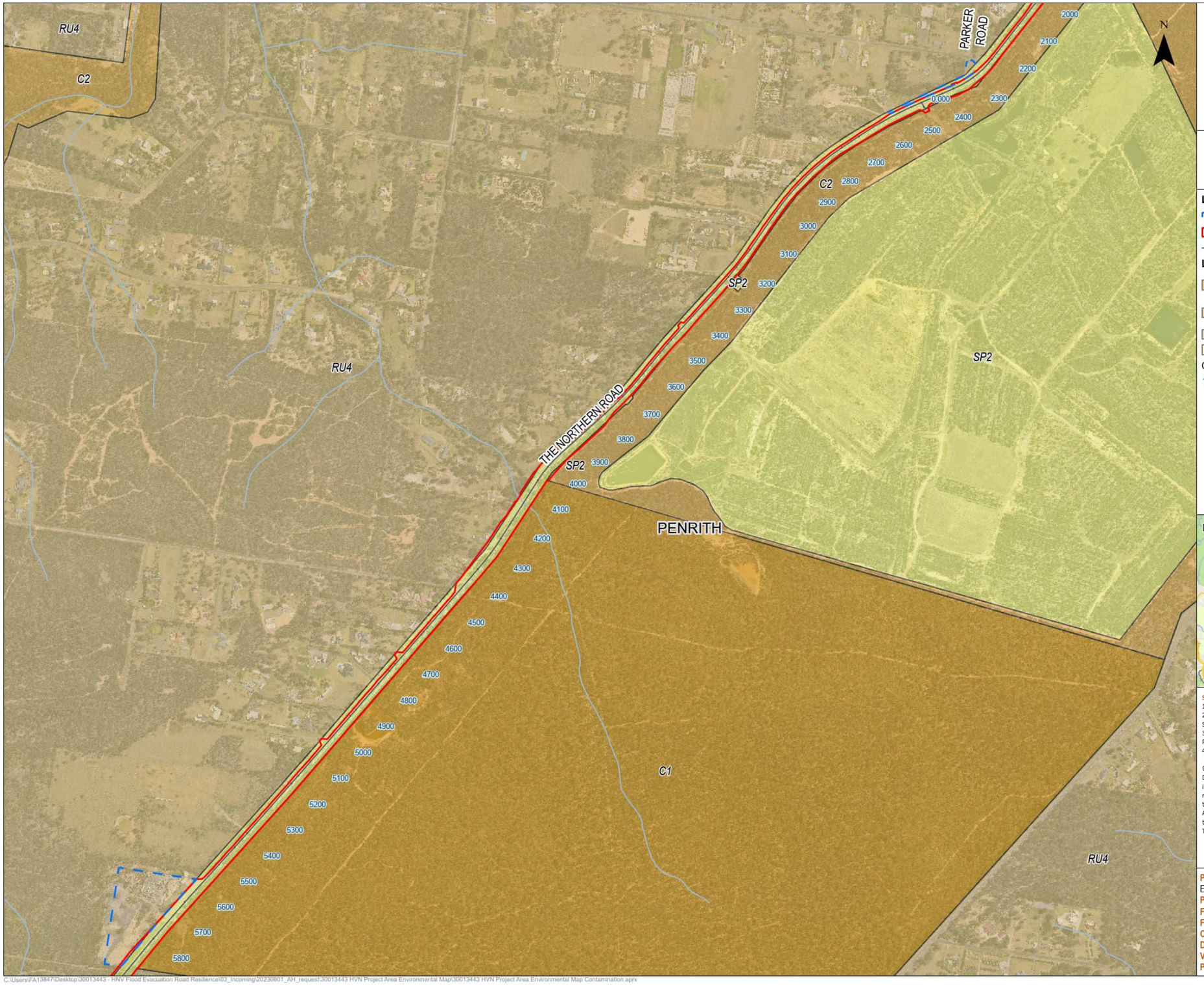

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0 100 200 300 400
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LEGEND

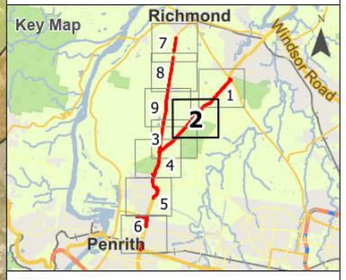
- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation; C2, Environmental Management
- RU4 - Primary Production Small Lots
- SP2 - Infrastructure

Chainage

100 MC10



SOURCES:

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4. Basemap:

PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (2 of 9)
FIGURE TITLE:	Land Zoning
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
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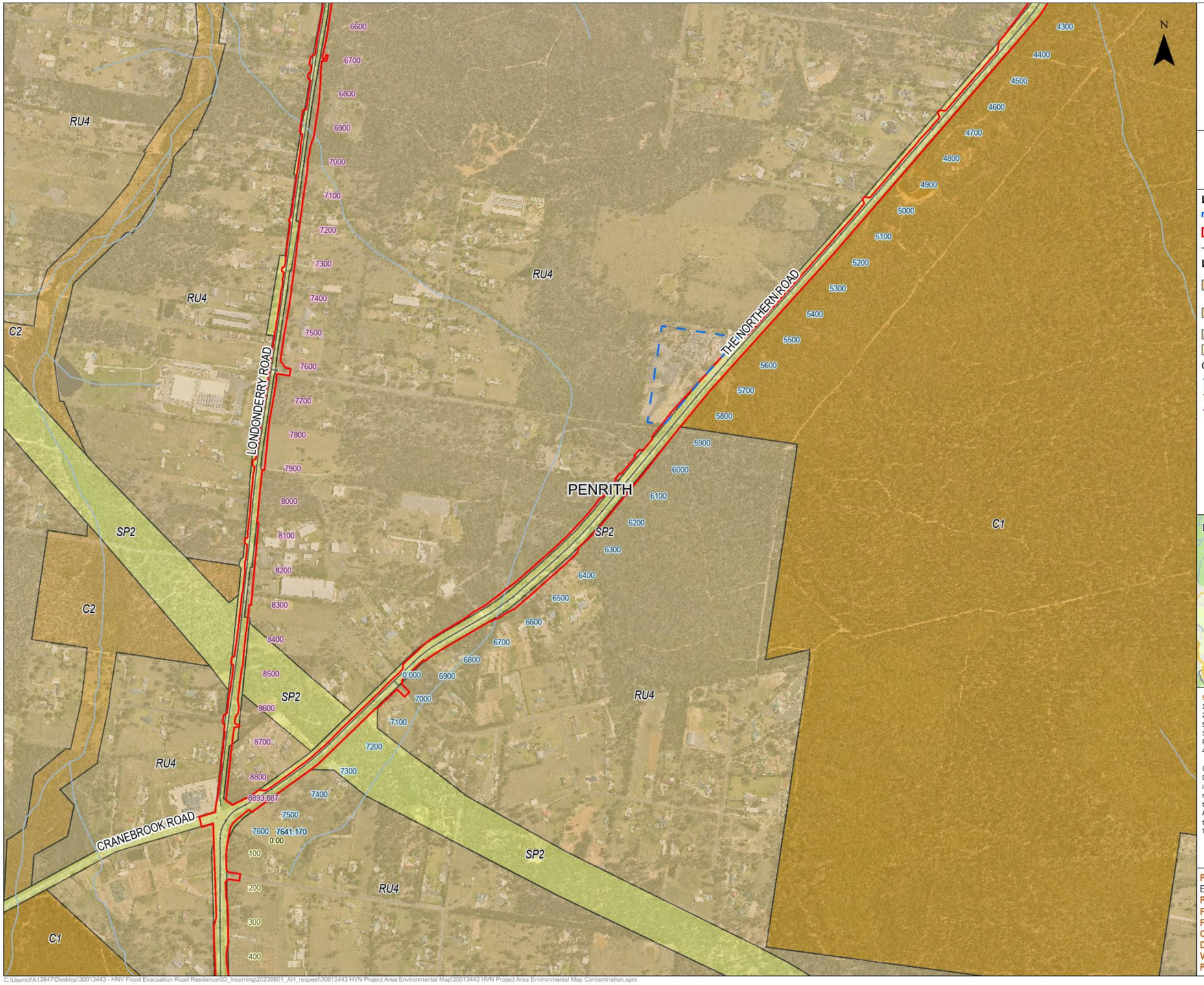

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LEGEND

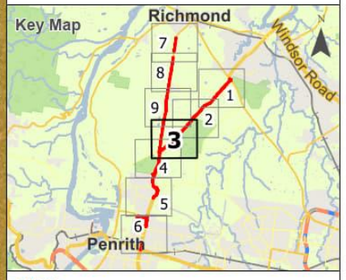
- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation; C2, Environmental Management
- RU4 - Primary Production Small Lots
- SP2 - Infrastructure

Chainage

- 100 MC10
- 100 MC20
- 100 MC30



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4. Basemap:

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PROJECT NO:	30013443
FIGURE NO:	Figure 3 (3 of 9)
FIGURE TITLE:	Land Zoning
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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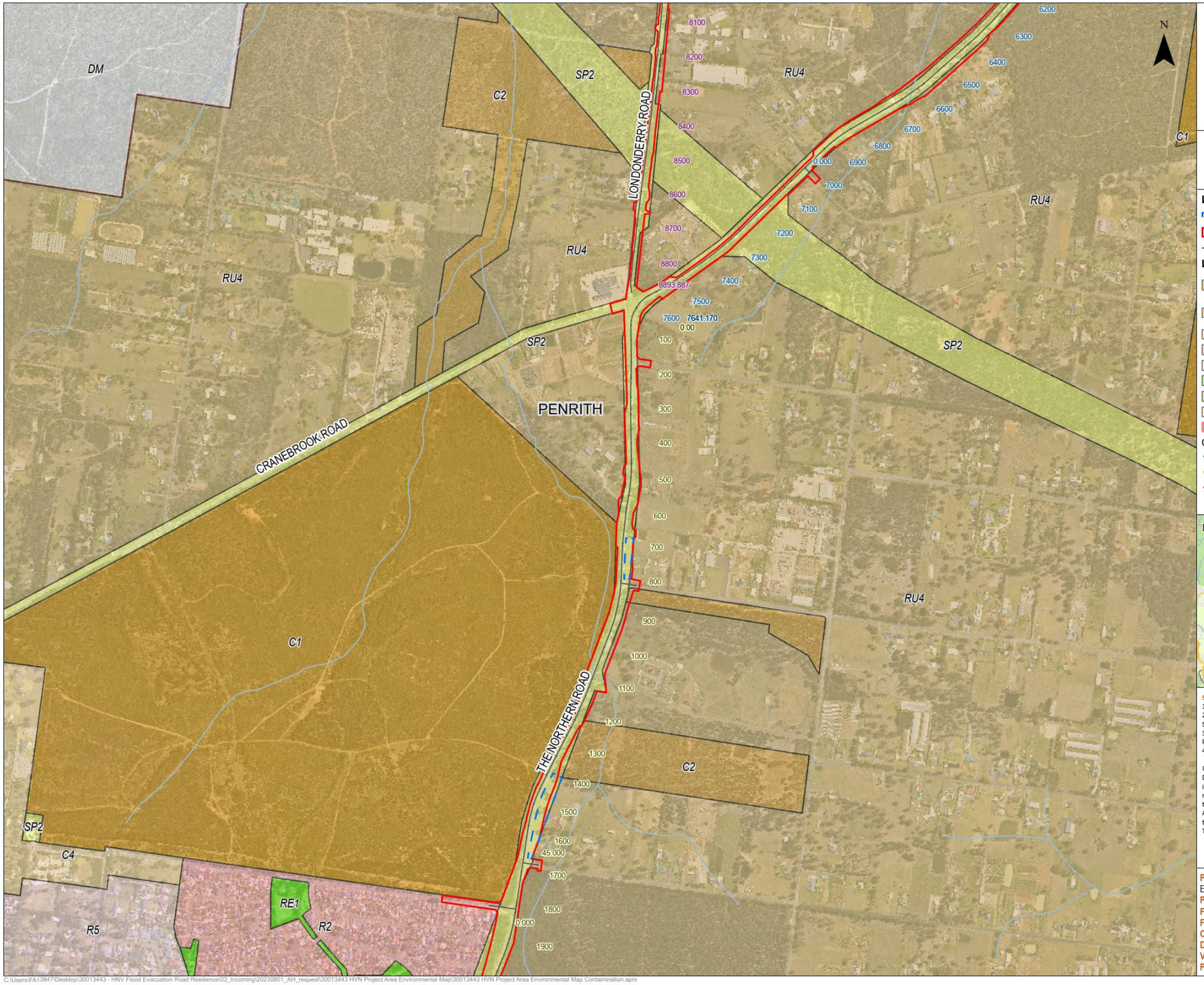

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LEGEND

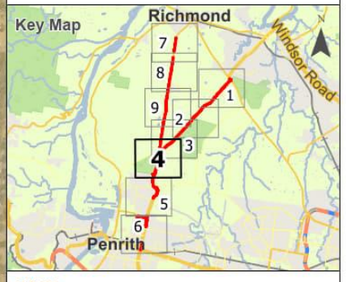
- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation; C2, Environmental Management
- C4 - Environmental Living
- R2 - Low Density Residential
- R5 - Large Lot Residential
- RE1 - Public Recreation
- RU4 - Primary Production Small Lots
- SP2 - Infrastructure
- DM - Deferred Matter

Chainage

- 100 MC10
- 100 MC20
- 100 MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (4 of 9)
FIGURE TITLE:	Land Zoning
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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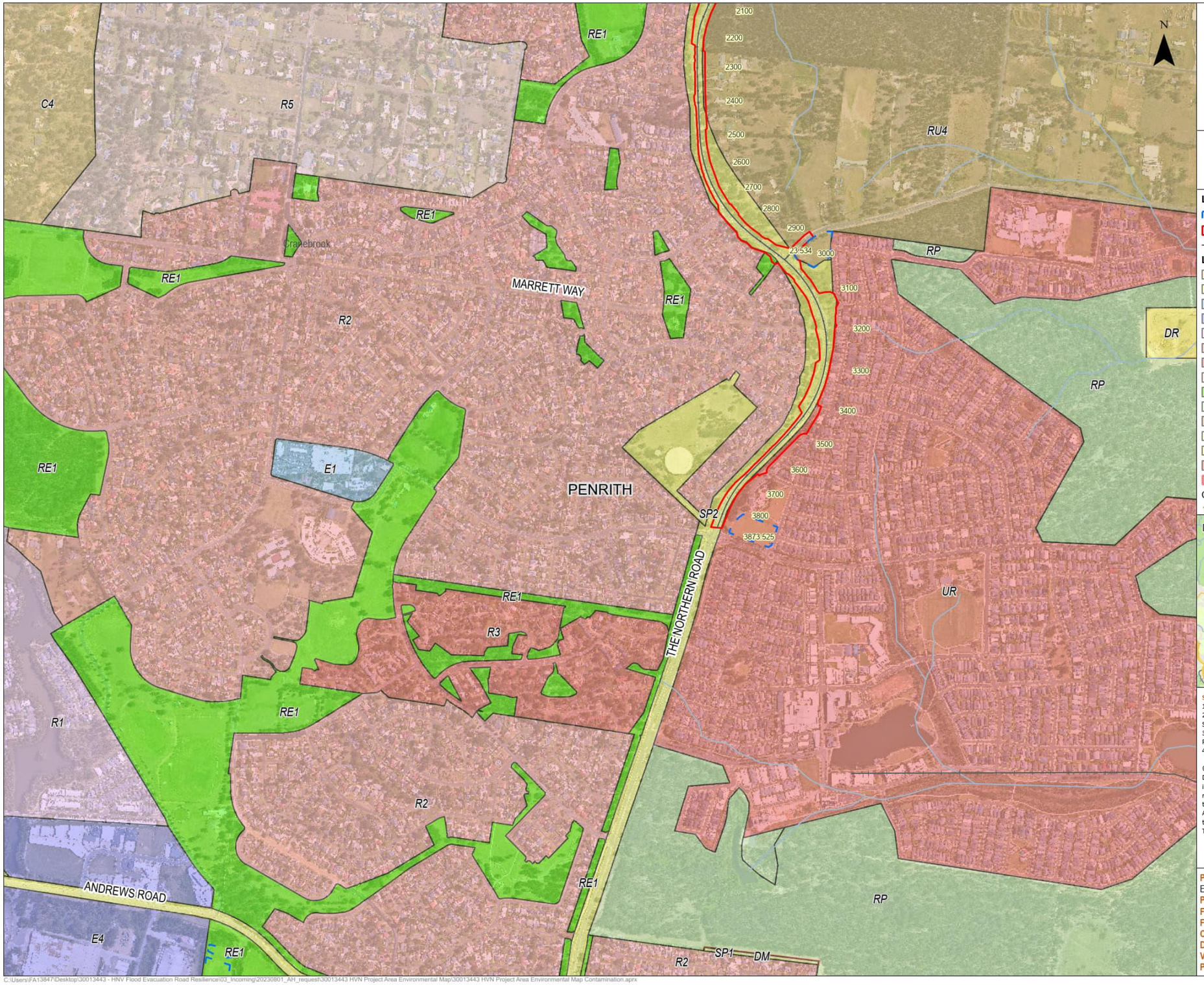

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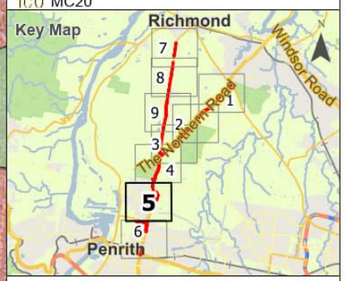
LEGEND

- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C4 - Environmental Living
- DR - Drainage
- E1 - Local Centre
- E4 - General Industrial
- R1 - General Residential
- R2 - Low Density Residential
- R3 - Medium Density Residential
- R5 - Large Lot Residential
- RE1 - Public Recreation
- RP - Regional Park
- RU4 - Primary Production Small Lots
- SP1 - Special Activities
- SP2 - Infrastructure
- UR - Urban
- DM - Deferred Matter

Chainage
100 MC20



PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (5 of 9)
FIGURE TITLE:	Land Zoning
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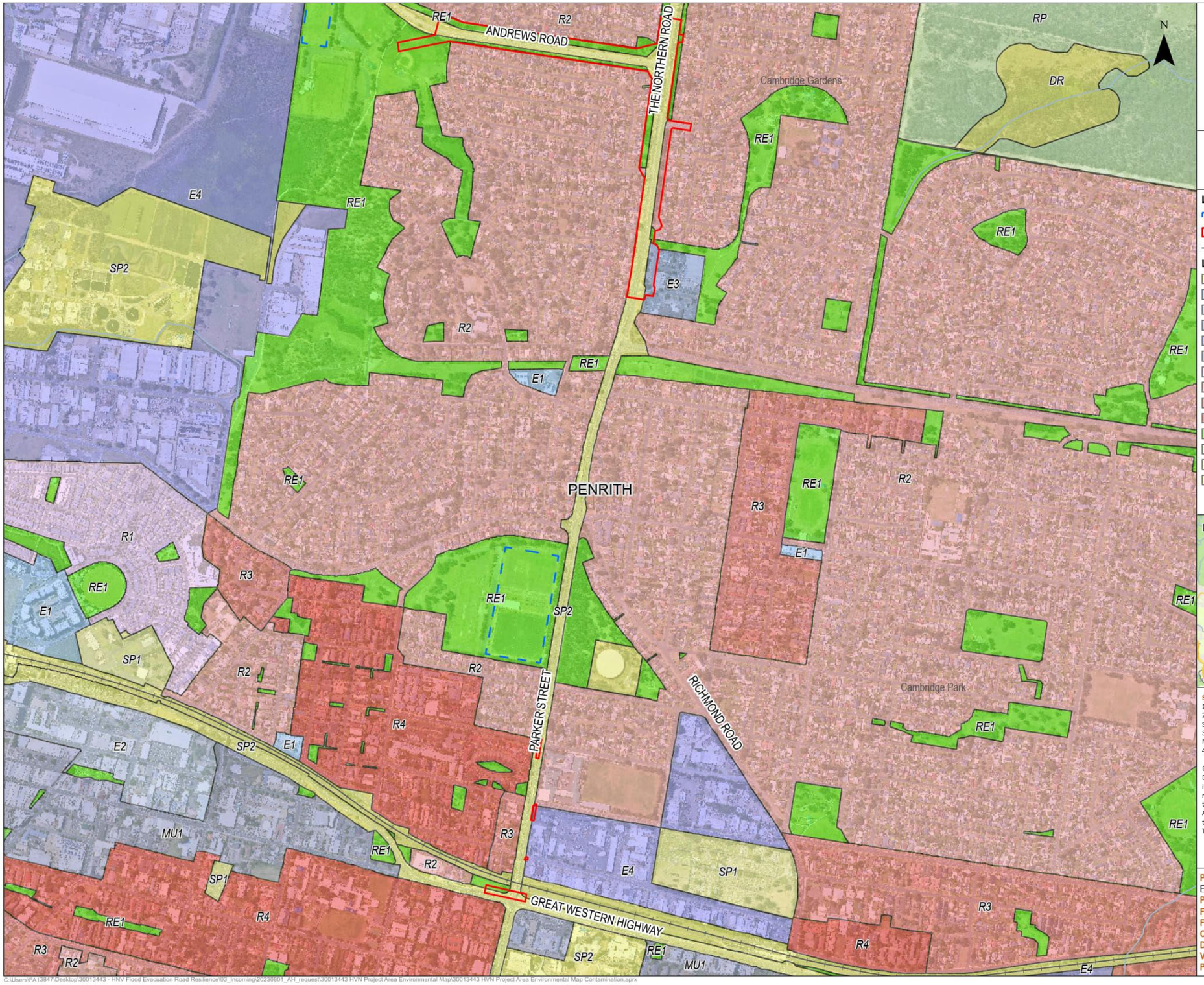

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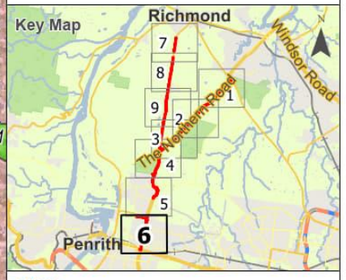
LEGEND

- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- DR - Drainage
- E1 - Local Centre
- E2 - Commercial Centre
- E3 - Productivity Support
- E4 - General Industrial
- MU1 - Mixed Use
- R1 - General Residential
- R2 - Low Density Residential
- R3 - Medium Density Residential
- R4 High Density Residential
- RE1 - Public Recreation
- RP - Regional Park
- SP1 - Special Activities
- SP2 - Infrastructure



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PROJECT NO:	30013443
FIGURE NO:	Figure 3 (6 of 9)
FIGURE TITLE:	Land Zoning
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LEGEND

- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- E1 - Local Centre
- R2 - Low Density Residential
- R3 - Medium Density Residential
- RE1 - Public Recreation
- RE2 - Private Recreation
- RU4 - Primary Production Small Lots
- SP1 - Special Activities
- SP2 - Infrastructure

Chainage

100 MC30

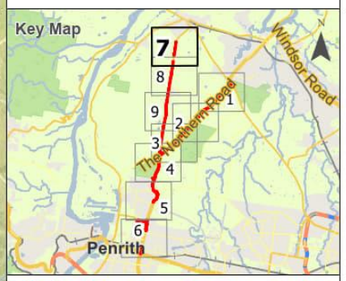

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FIGURE TITLE:	Land Zoning
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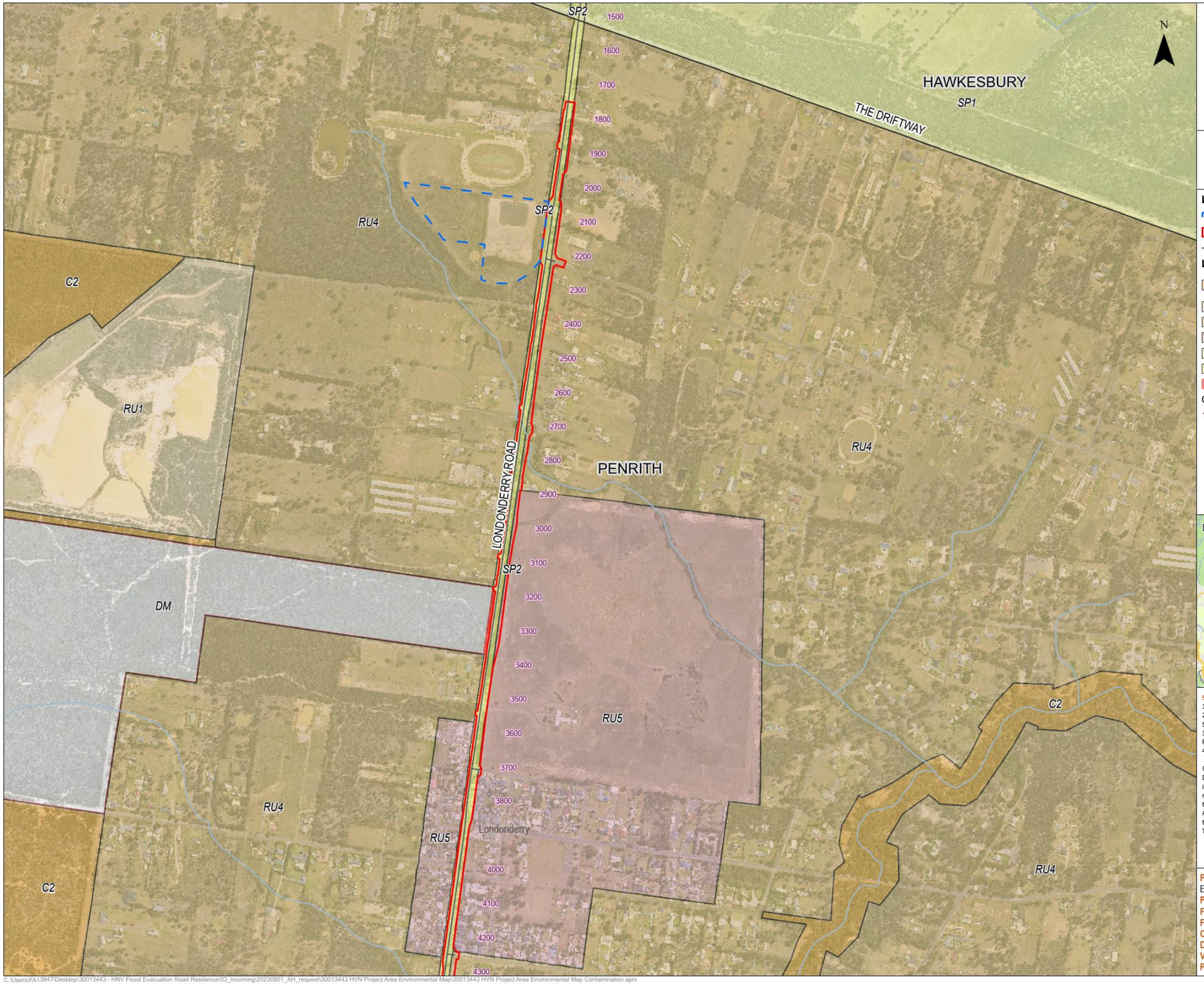

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LEGEND

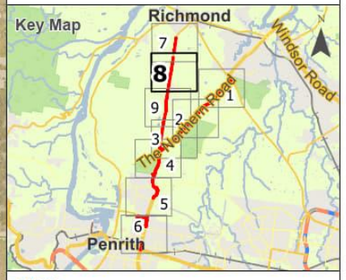
- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C2 - Environmental Conservation; C2, Environmental Management
- RU1 - Primary Production
- RU4 - Primary Production Small Lots
- RU5 - Village
- SP1 - Special Activities
- SP2 - Infrastructure
- DM - Deferred Matter

Chainage

100 MC30



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PROJECT NO:	30013443
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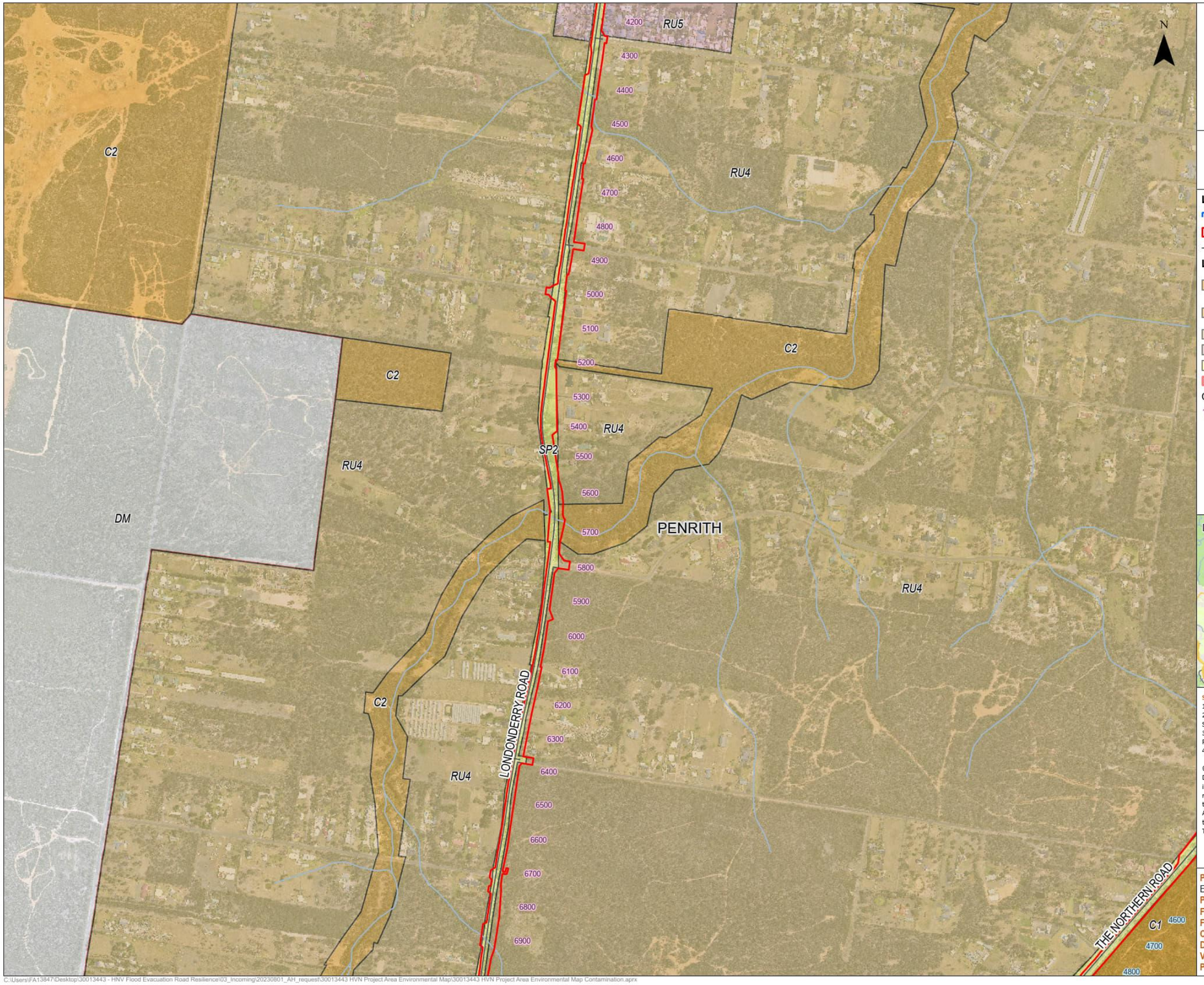

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LEGEND

- Site Compound
- REF Boundary
- Control Strings

Land Zoning

- C1 - National Parks and Nature Reserves
- C2 - Environmental Conservation; C2, Environmental Management
- RU4 - Primary Production Small Lots
- RU5 - Village
- SP2 - Infrastructure
- DM - Deferred Matter

Chainage

100 MC30

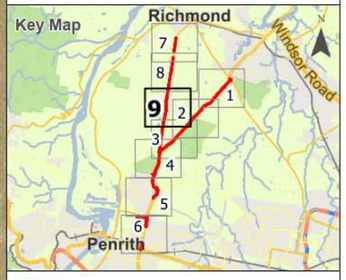

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FIGURE NO:	Figure 3 (9 of 9)
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Figure 2C – Site Observation

Note that this figure comprises 9 sheets

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PROJECT NO:	30013443
FIGURE NO:	Figure 2C (1 of 9)
FIGURE TITLE:	Site Observation
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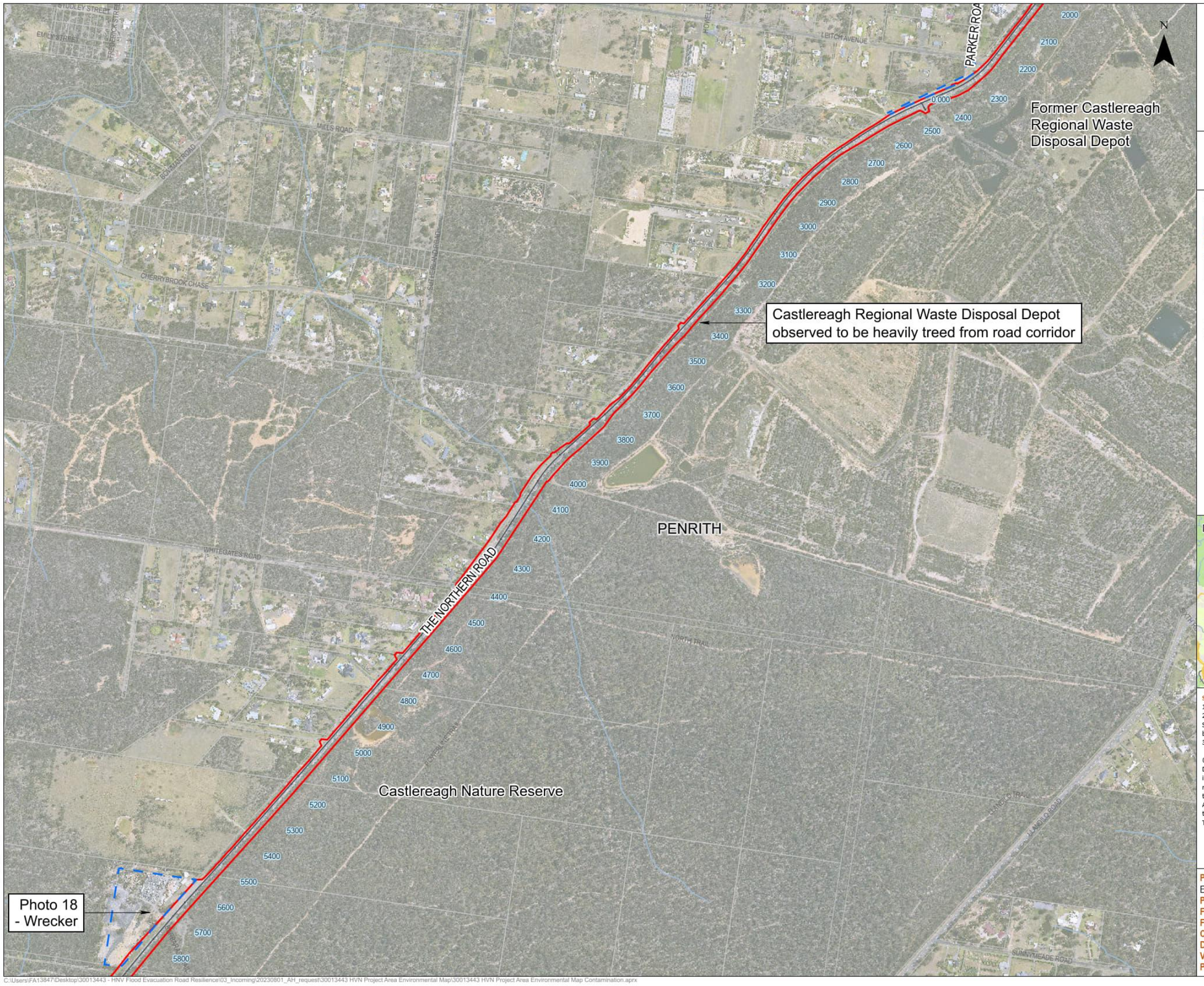

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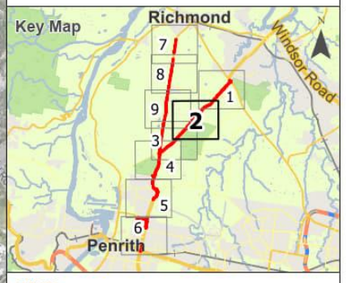
LEGEND
- REF Boundary
- Site Compound
- Cadastre
- Control Strings
- Watercourses

Chainage
100 MC10



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PROJECT NO:	30013443
FIGURE NO:	Figure 2C (2 of 9)
FIGURE TITLE:	Site Observation
CREATED BY:	FA13847
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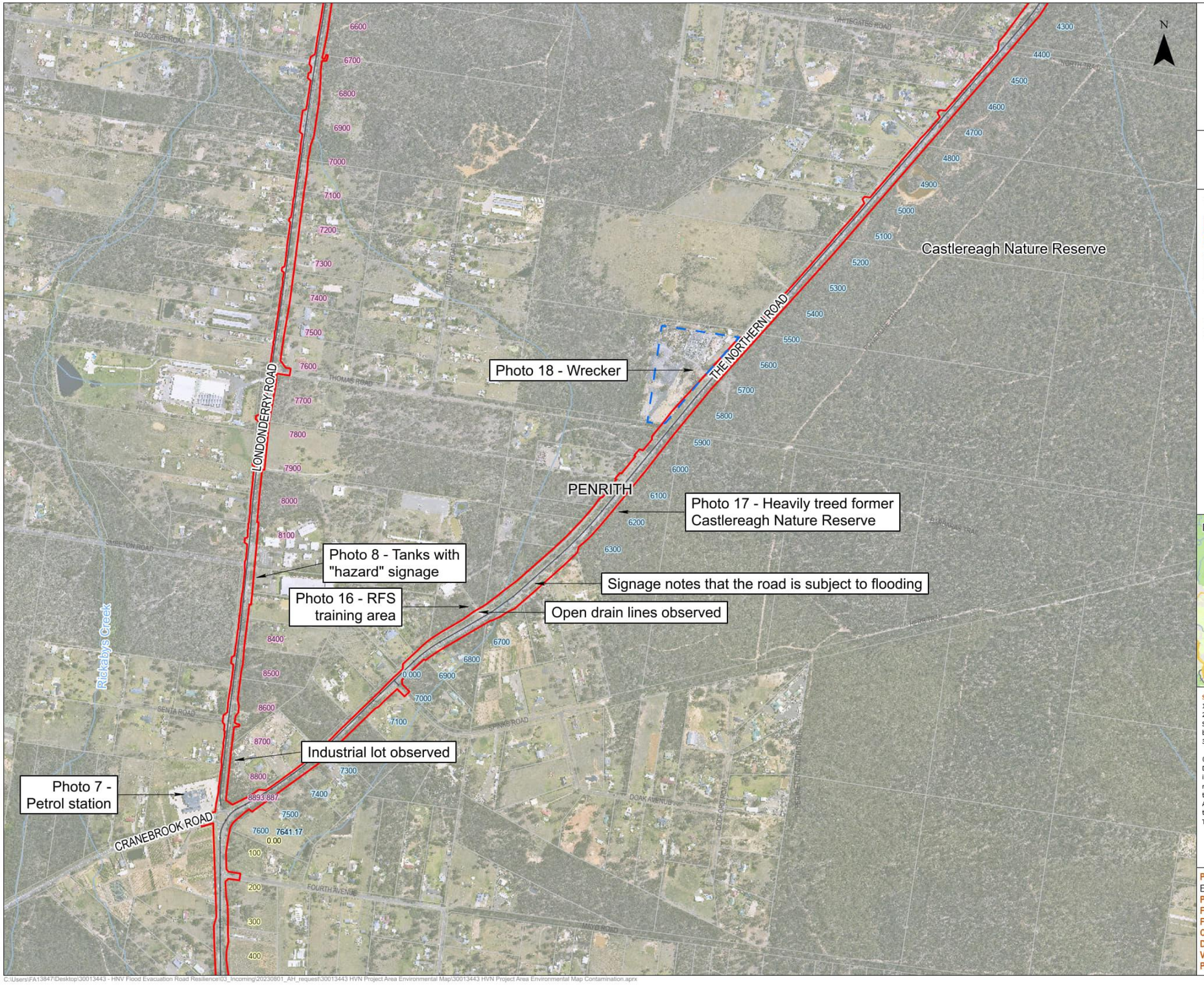

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LEGEND
- REF Boundary
- Site Compound
- Cadastre
- Control Strings
- Watercourses

Chainage
- MC10
- MC20
- MC30

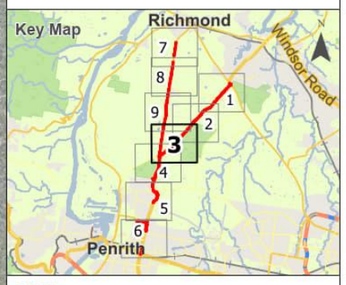

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FIGURE NO:	Figure 2C (3 of 9)
FIGURE TITLE:	Site Observation
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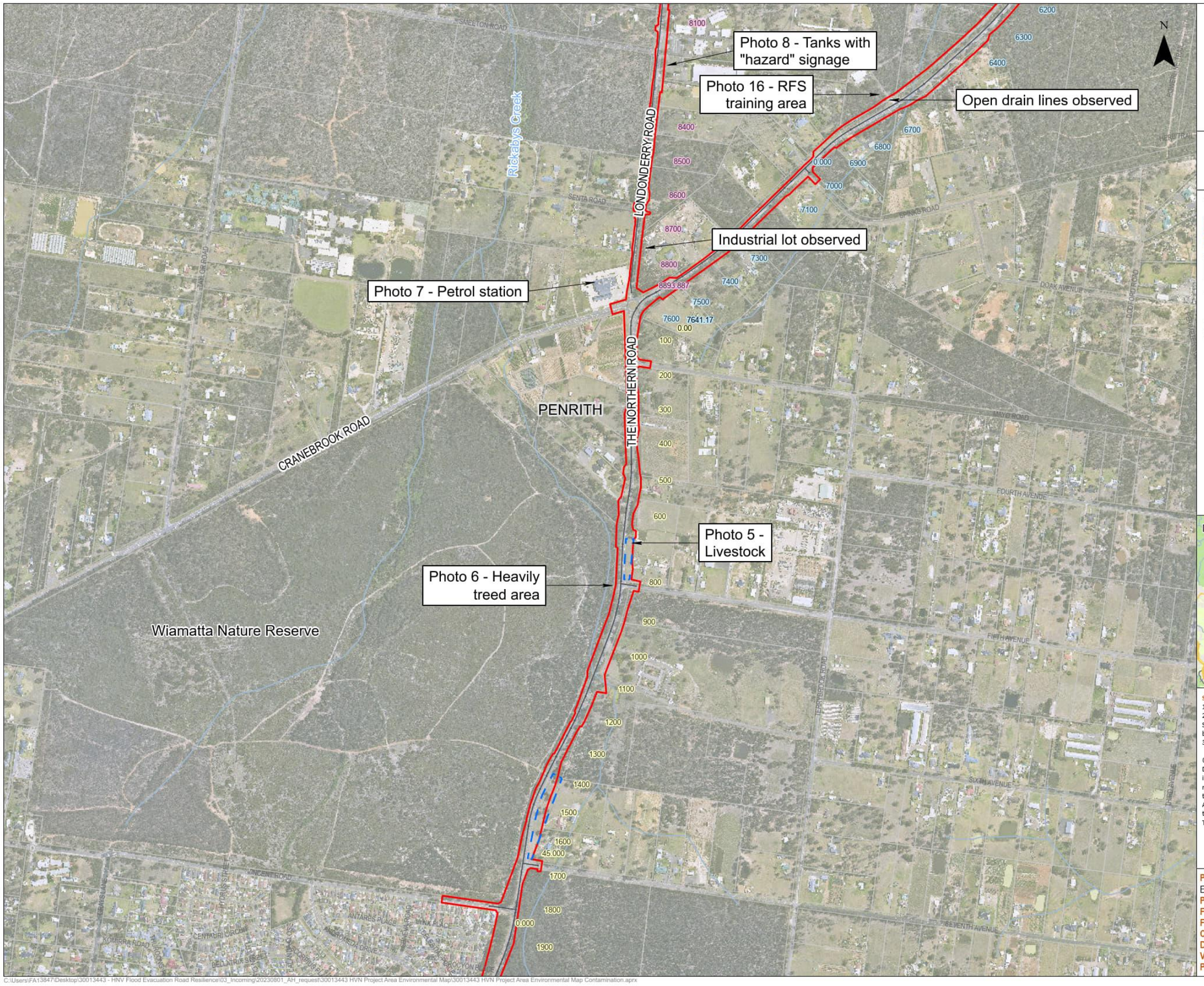

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LEGEND
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- MC10
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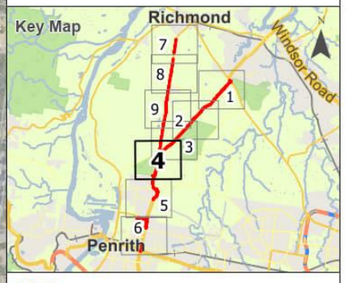

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FIGURE NO:	Figure 2C (4 of 9)
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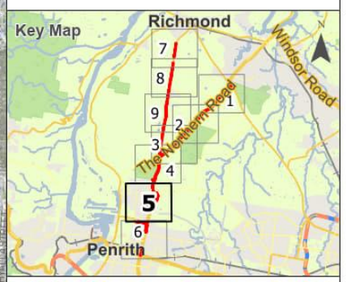
LEGEND
- REF Boundary
- Site Compound
- Cadastre
- Control Strings
- Watercourses

Chainage
100 MC20



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PROJECT NO:	30013443
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FIGURE TITLE:	Site Observation
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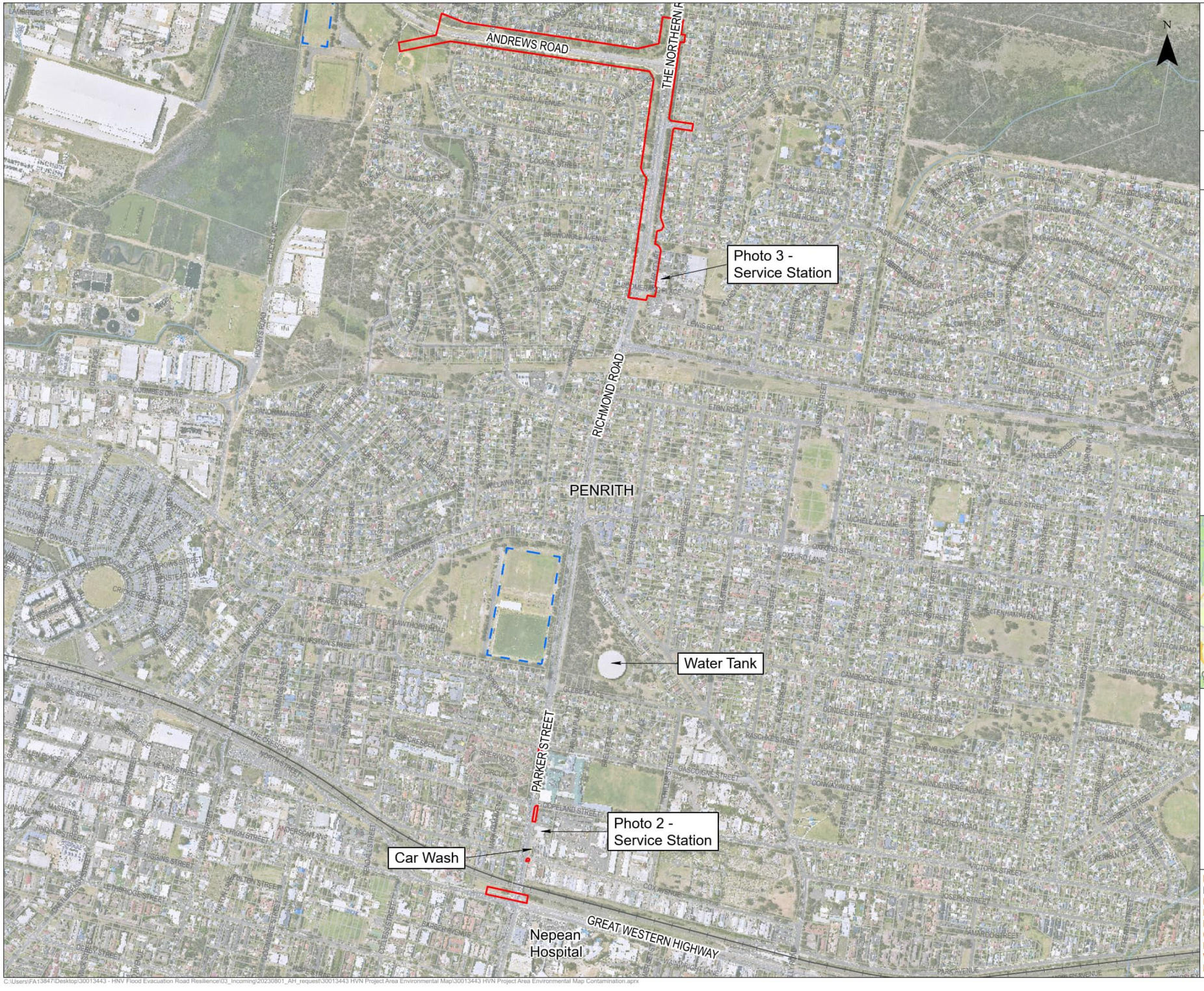

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LEGEND
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- Site Compound
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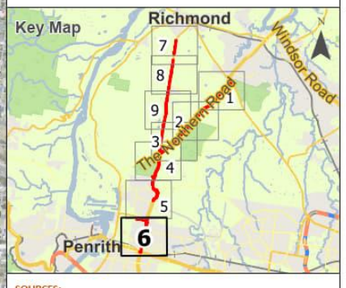
- Watercourses



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2C (6 of 9)
FIGURE TITLE:	Site Observation
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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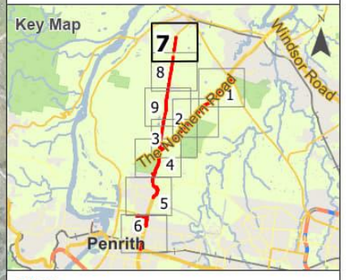
0 100 200 300 400
Meters
1:10,000

LEGEND
- REF Boundary
- Site Compound
- Cadastre
- Control Strings
- Watercourses

Chainage
100 MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2C (7 of 9)
FIGURE TITLE:	Site Observation
CREATED BY:	FA13847
DATE:	12/06/2024
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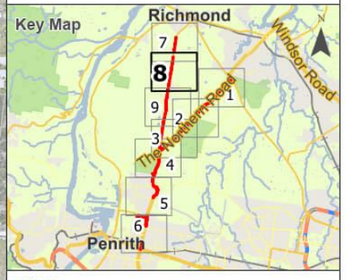
Chainage
100 MC30



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 2C (8 of 9)
FIGURE TITLE:	Site Observation
CREATED BY:	FA13847
DATE:	12/06/2024
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LEGEND

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- Cadastre
- Control Strings
- Watercourses

Chainage

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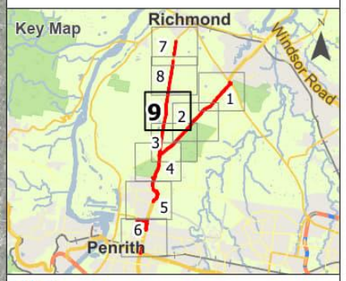

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PROJECT NO:	30013443
FIGURE NO:	Figure 2C (9 of 9)
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Figure 3 – Areas of Environmental Interest

Note that this figure comprises 9 sheets

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LEGEND

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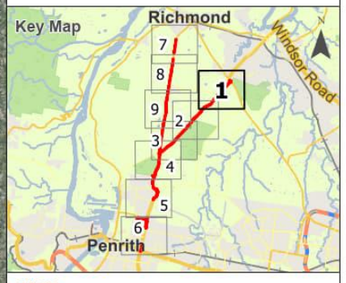
- AEI 4 - Areas near Castlereagh Regional Waste Disposal Depot
- AEI 5 - Areas near service stations and wreckers

Chainage

100 MC10



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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (1 of 9)
FIGURE TITLE:	Areas of Environmental Interest
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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LEGEND

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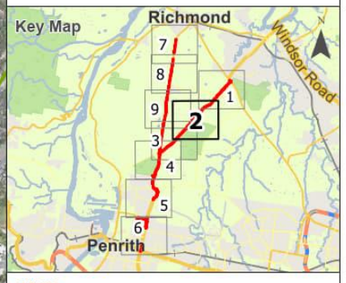

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PROJECT:	Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvement Project
PROJECT NO:	30013443
FIGURE NO:	Figure 3 (2 of 9)
FIGURE TITLE:	Areas of Environmental Interest
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DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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LEGEND
- REF Boundary
- Site Compound
- Control Strings
- Watercourses
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- AEI 5 - Areas near service stations and wreckers

Chainage
- 100 MC10
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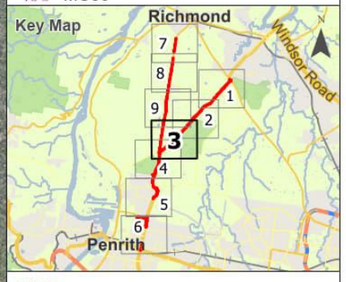

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PROJECT NO:	30013443
FIGURE NO:	Figure 3 (3 of 9)
FIGURE TITLE:	Areas of Environmental Interest
CREATED BY:	FA13847
DATE:	12/06/2024
VERSION:	VERSION 1
PAGE SIZE:	A3

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Chainage
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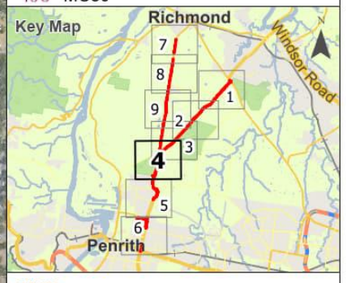

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PROJECT NO:	30013443
FIGURE NO:	Figure 3 (4 of 9)
FIGURE TITLE:	Areas of Environmental Interest
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VERSION:	VERSION 1
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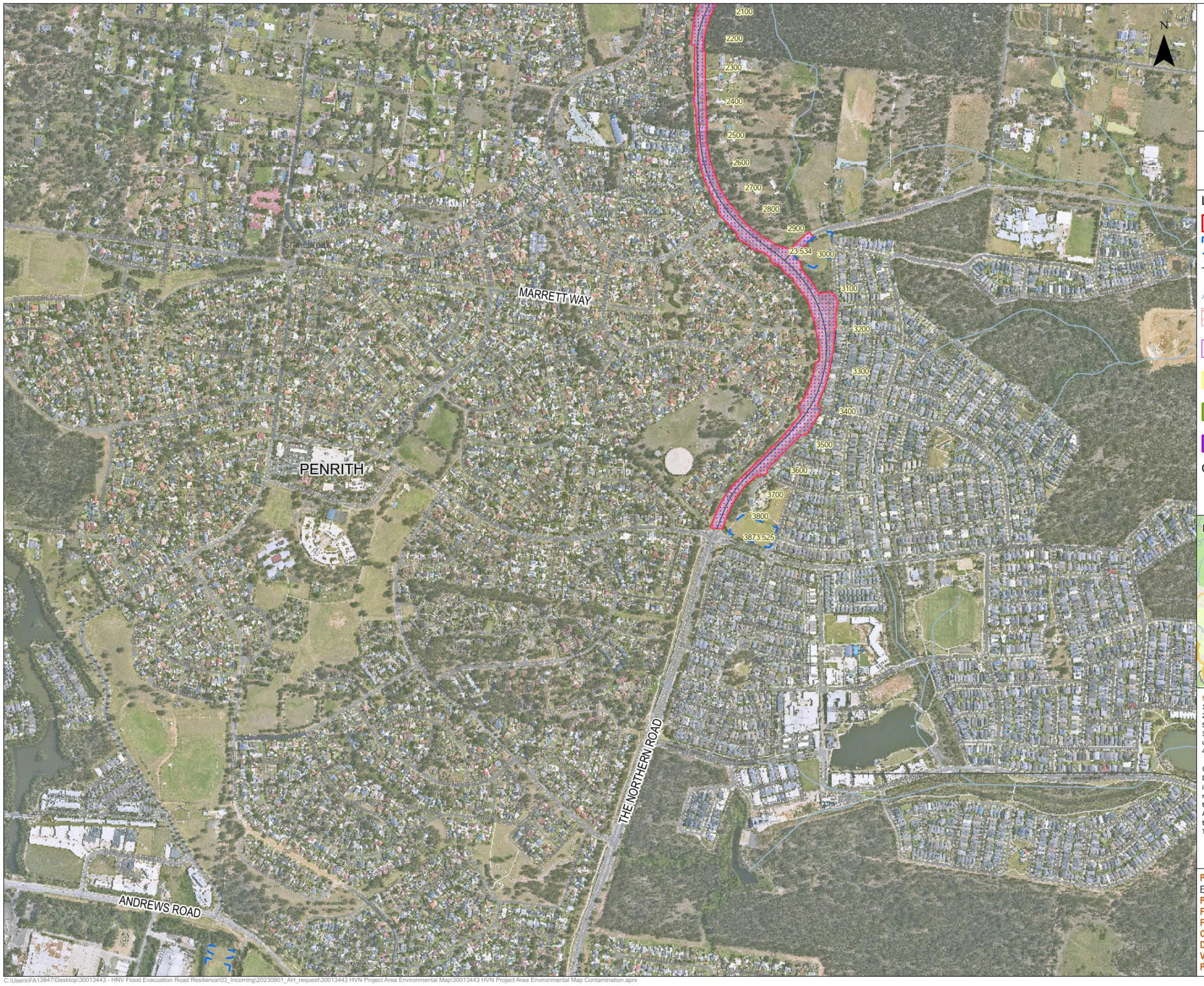

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LEGEND
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- AEI 5 - Areas near service stations and wreckers

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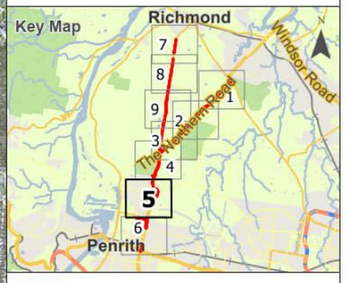

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PROJECT NO:	30013443
FIGURE NO:	Figure 3 (5 of 9)
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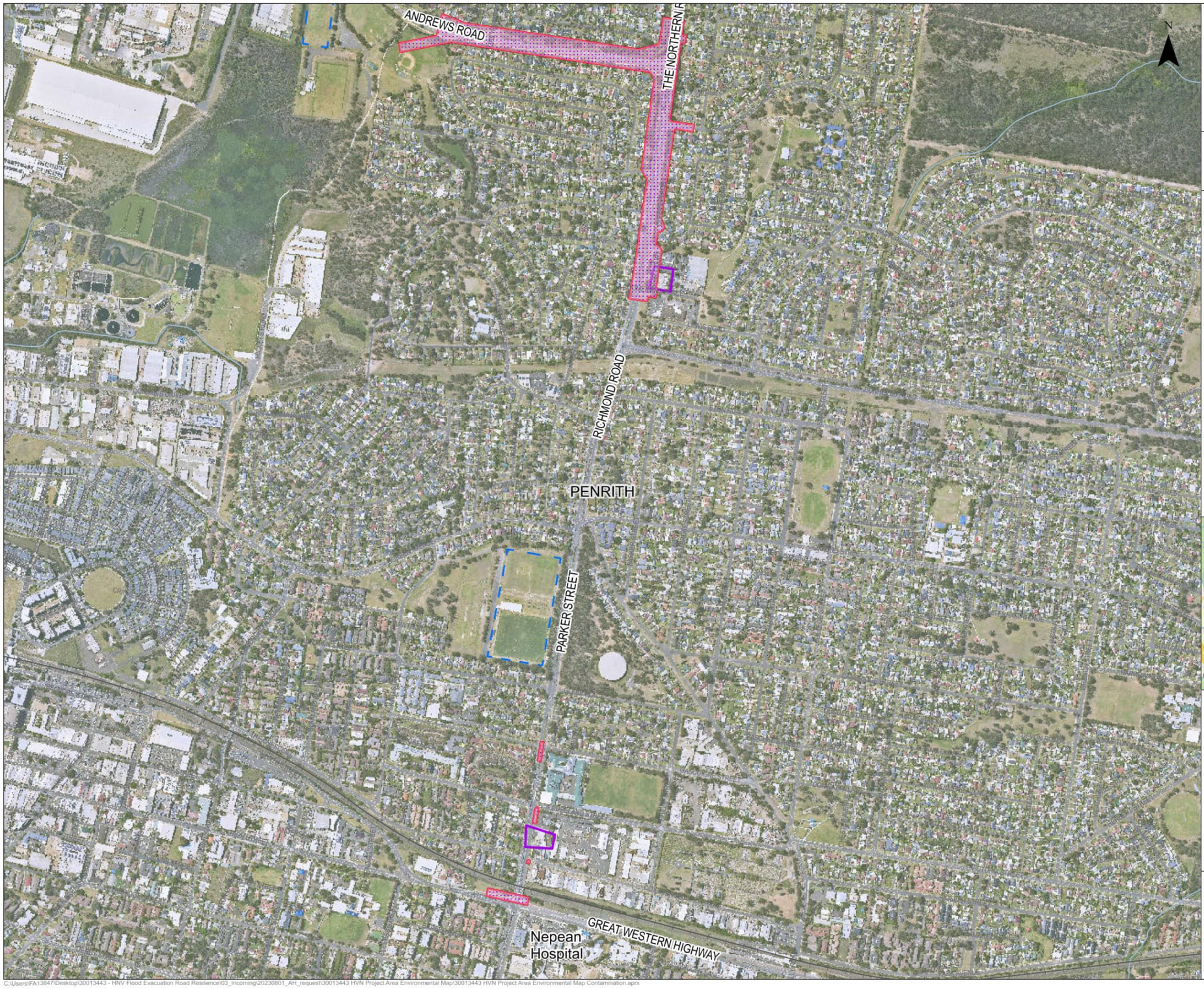

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LEGEND
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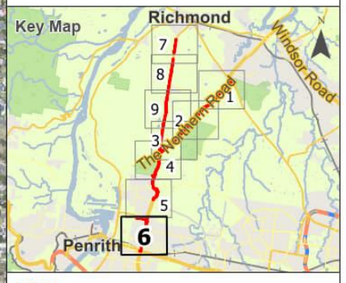

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FIGURE NO:	Figure 3 (6 of 9)
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Chainage

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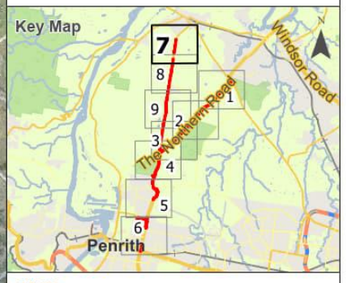

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FIGURE NO:	Figure 3 (7 of 9)
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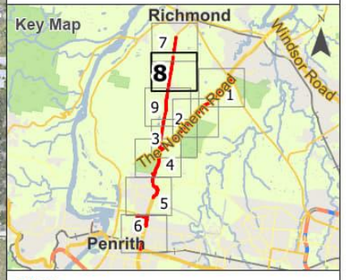

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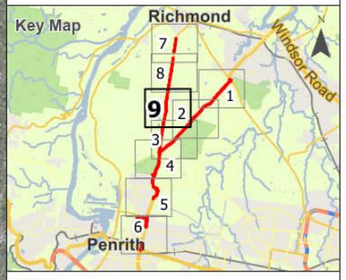

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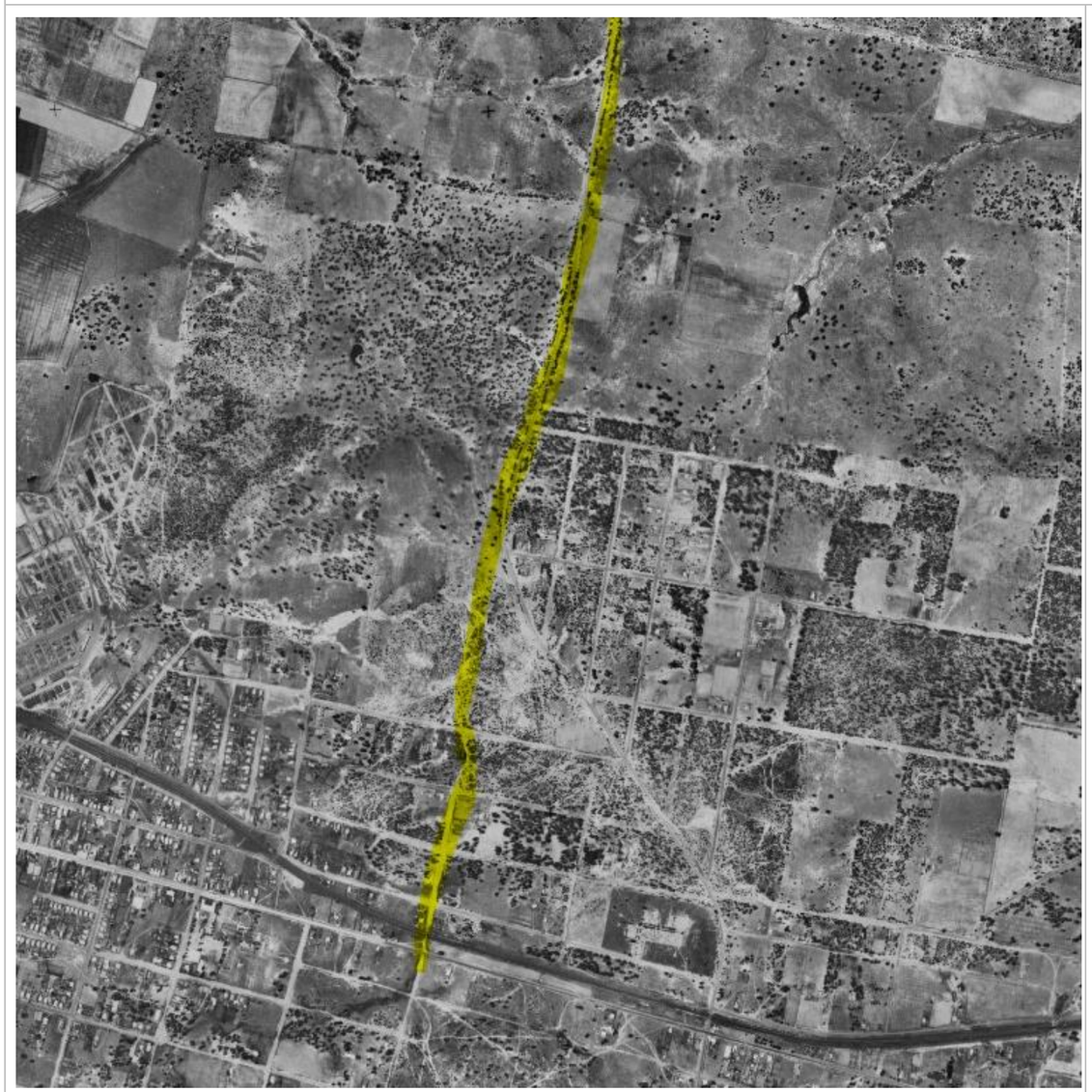
Appendix B

Historical Aerial Photos

Notes: Yellow highlighted areas on the historic aerials are only indicative and not an exact representation of the study area.

Parker Street and The Northern Road (approx. between Great Western Highway/southern boundary of the Site and Dunheved Road)



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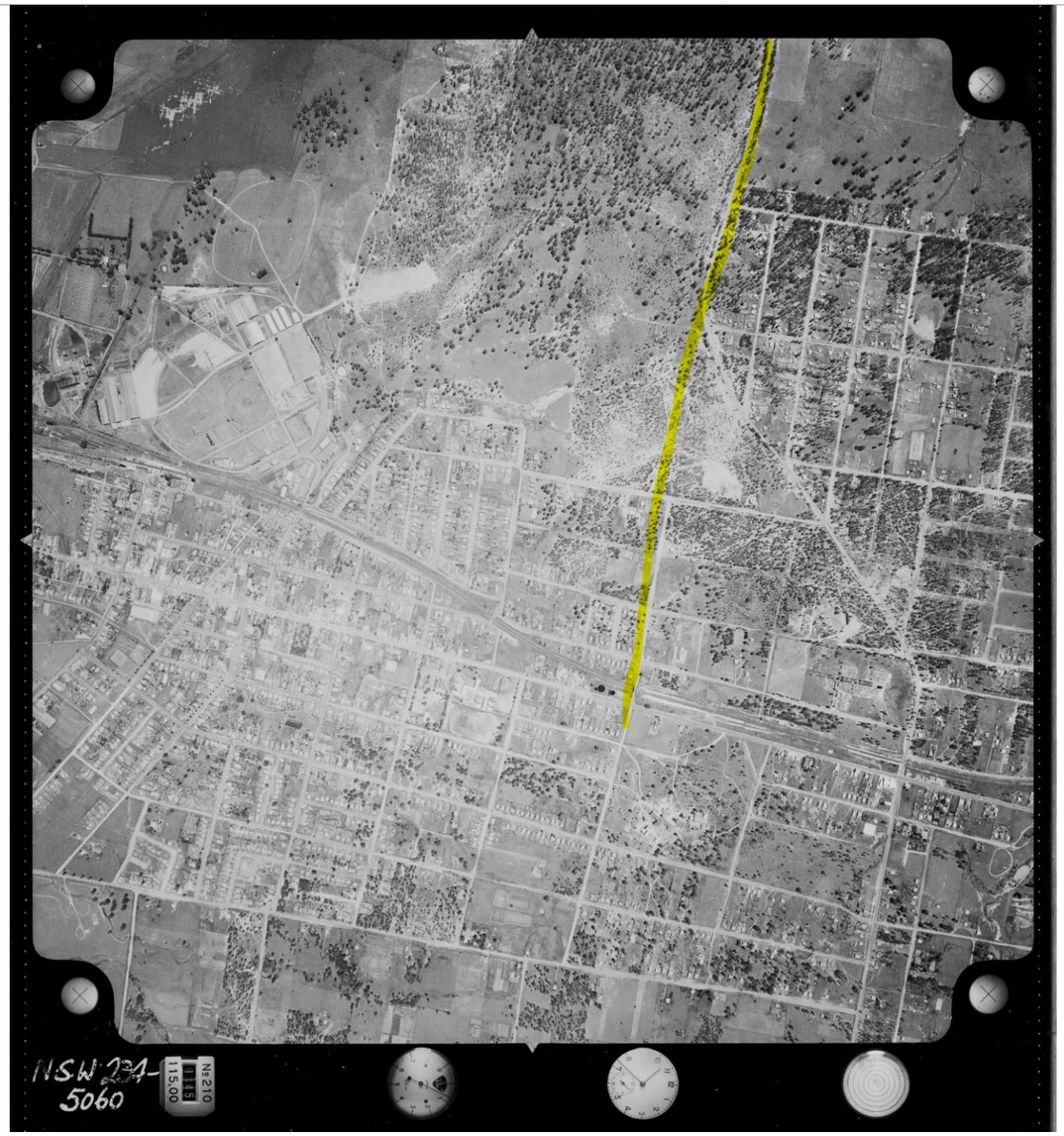

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1961

1970

1978

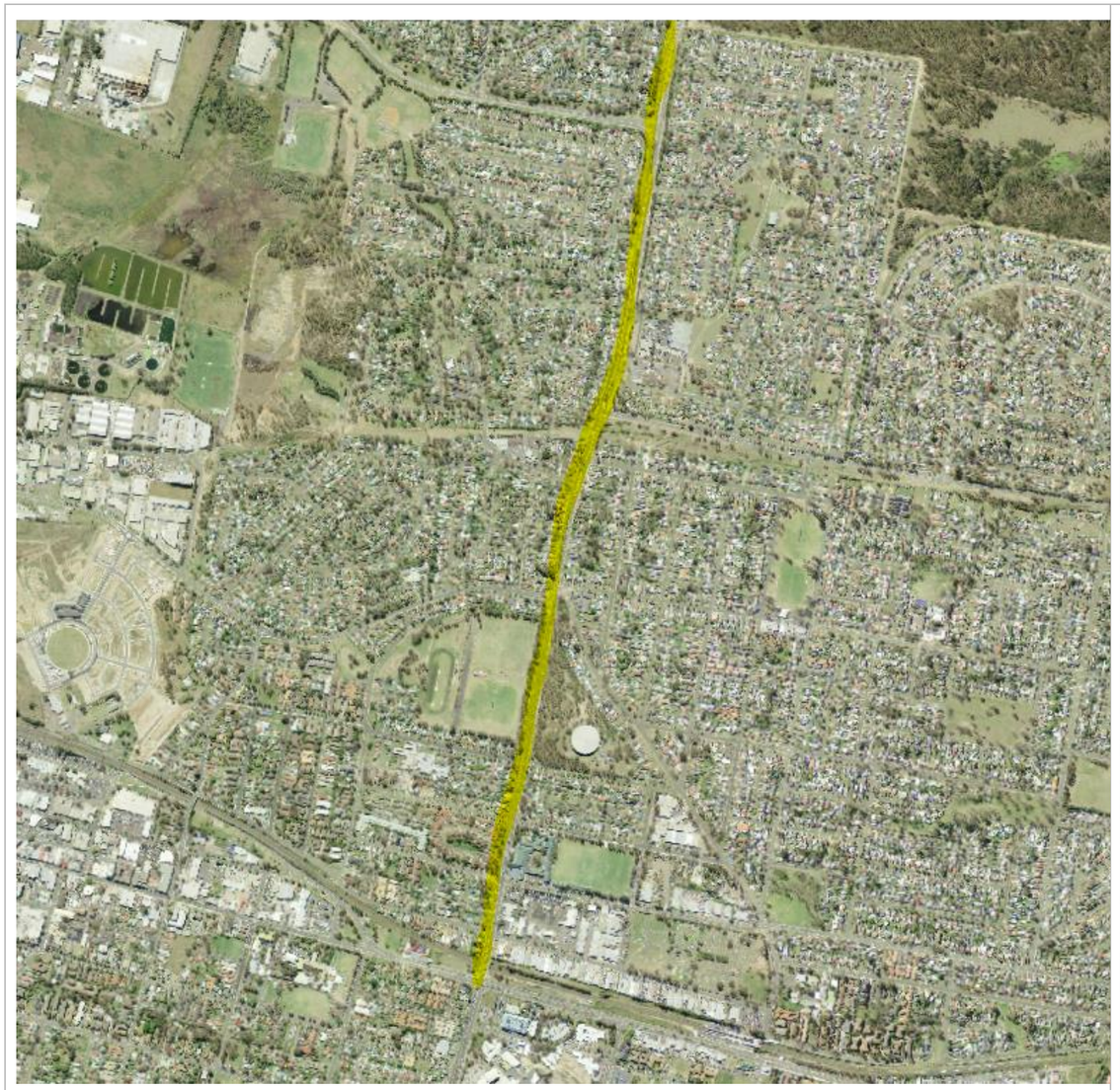
1986

1991

1998

2004

2005



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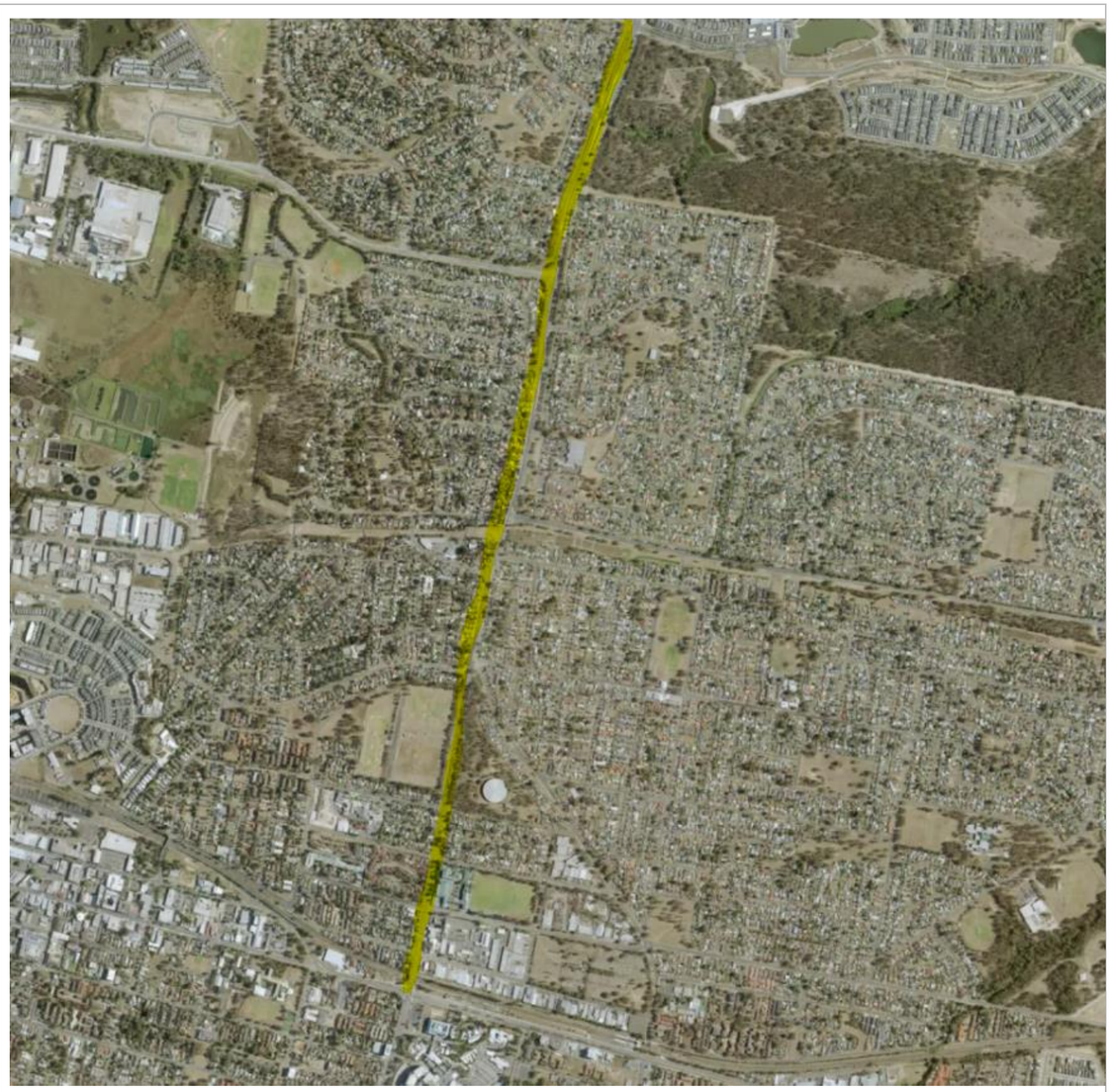

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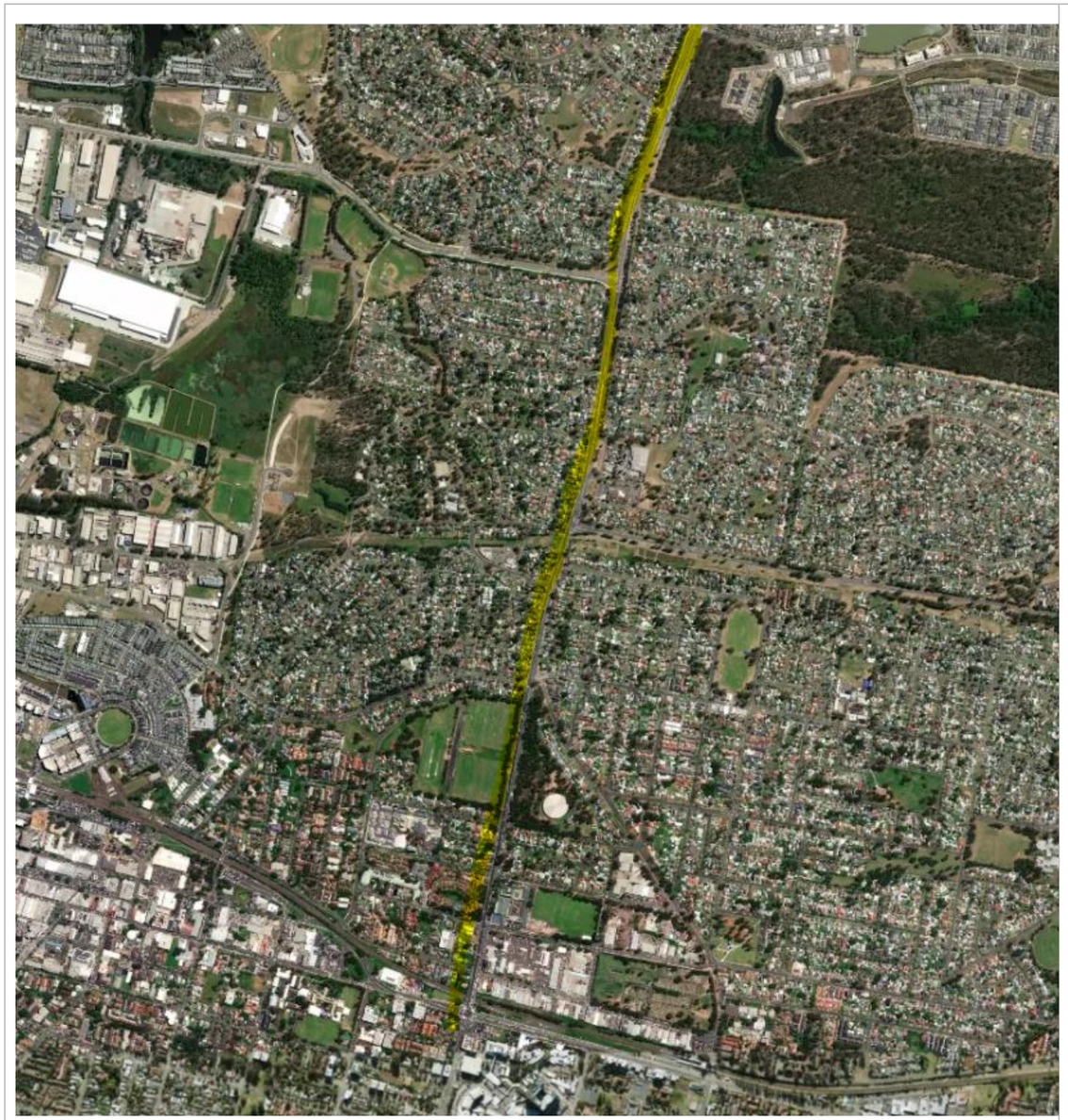
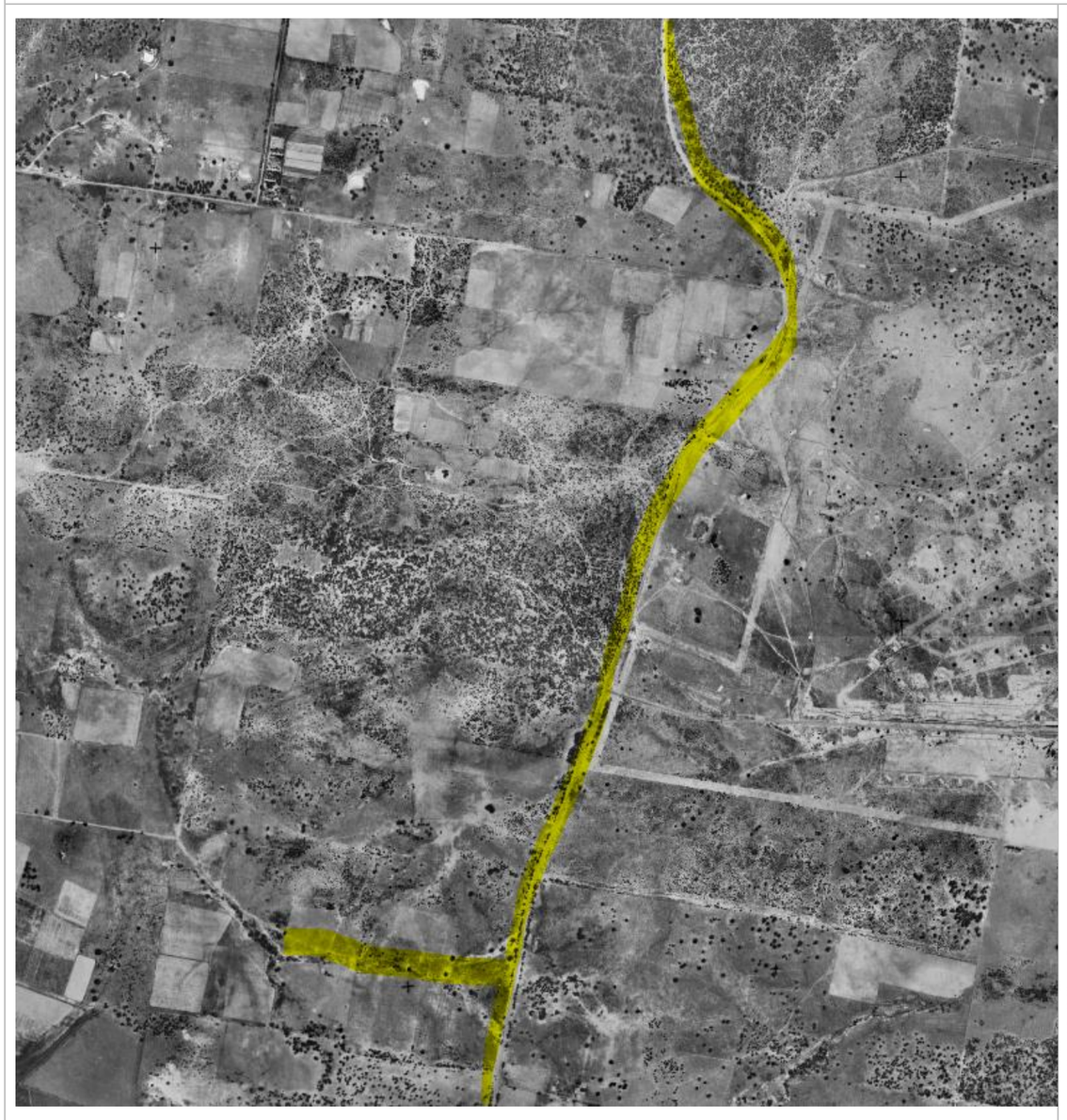


2021

2023

The Northern Road (approx. between Great Western Highway and Borrowdale Way)



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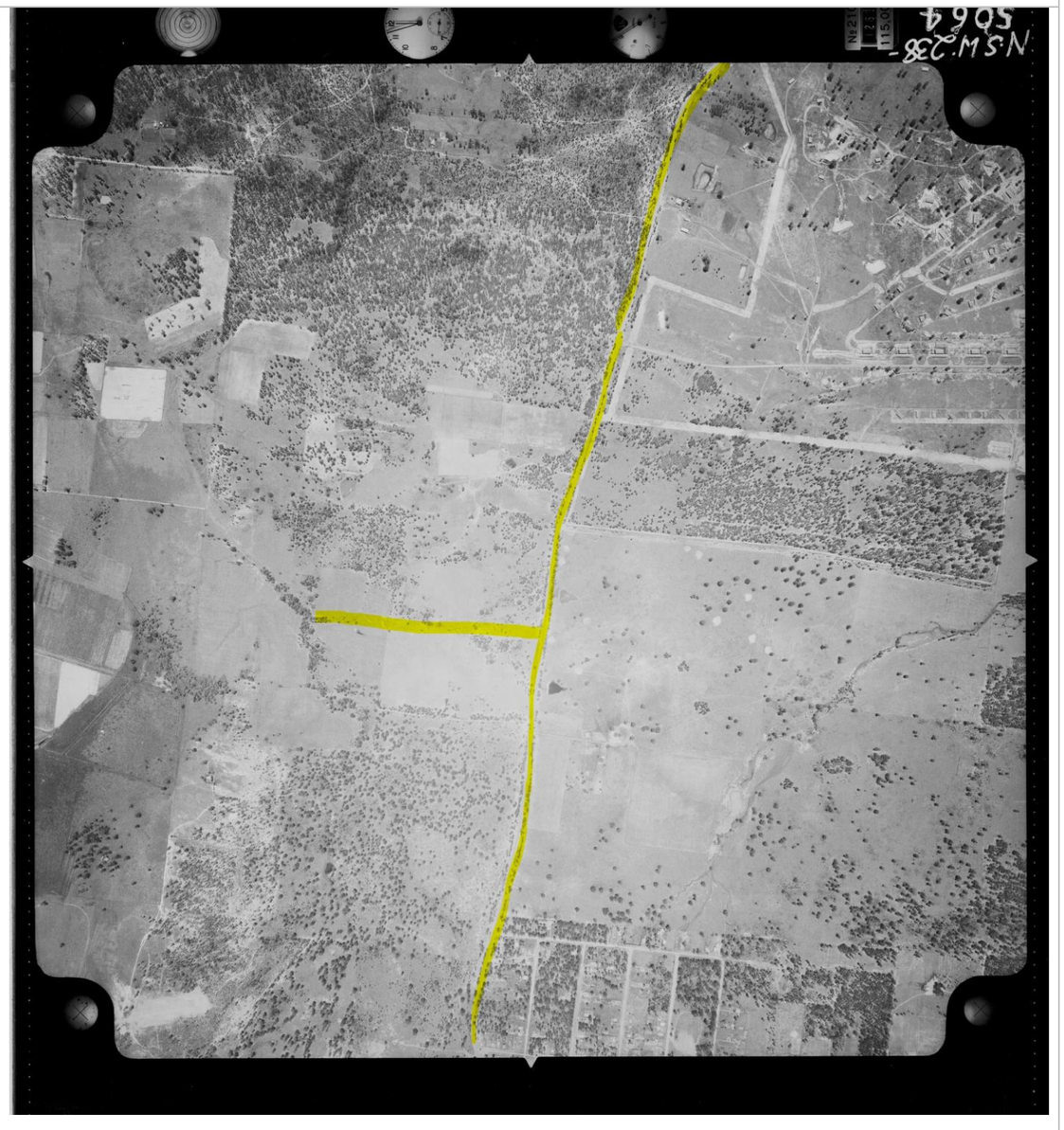

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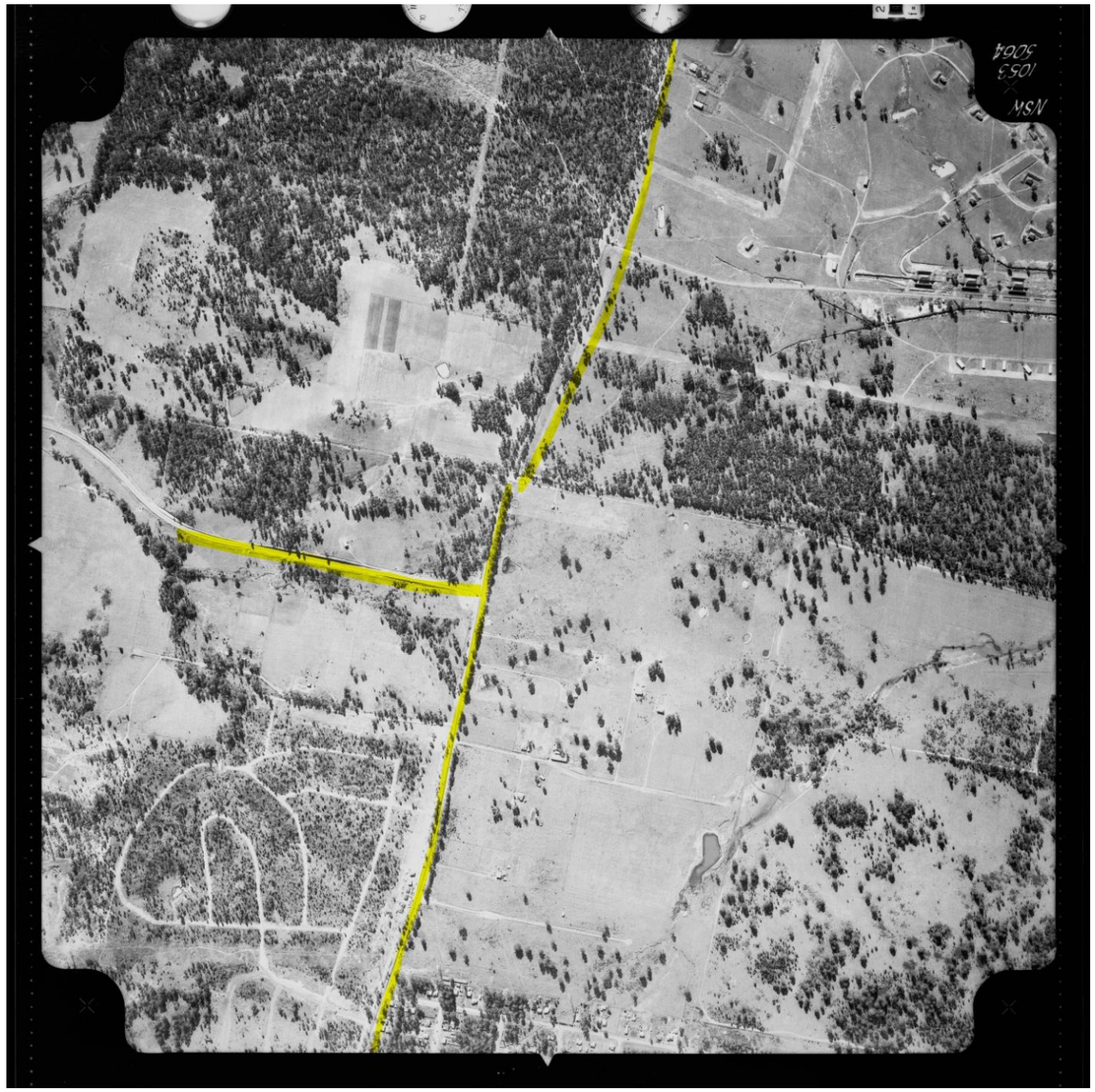

1961

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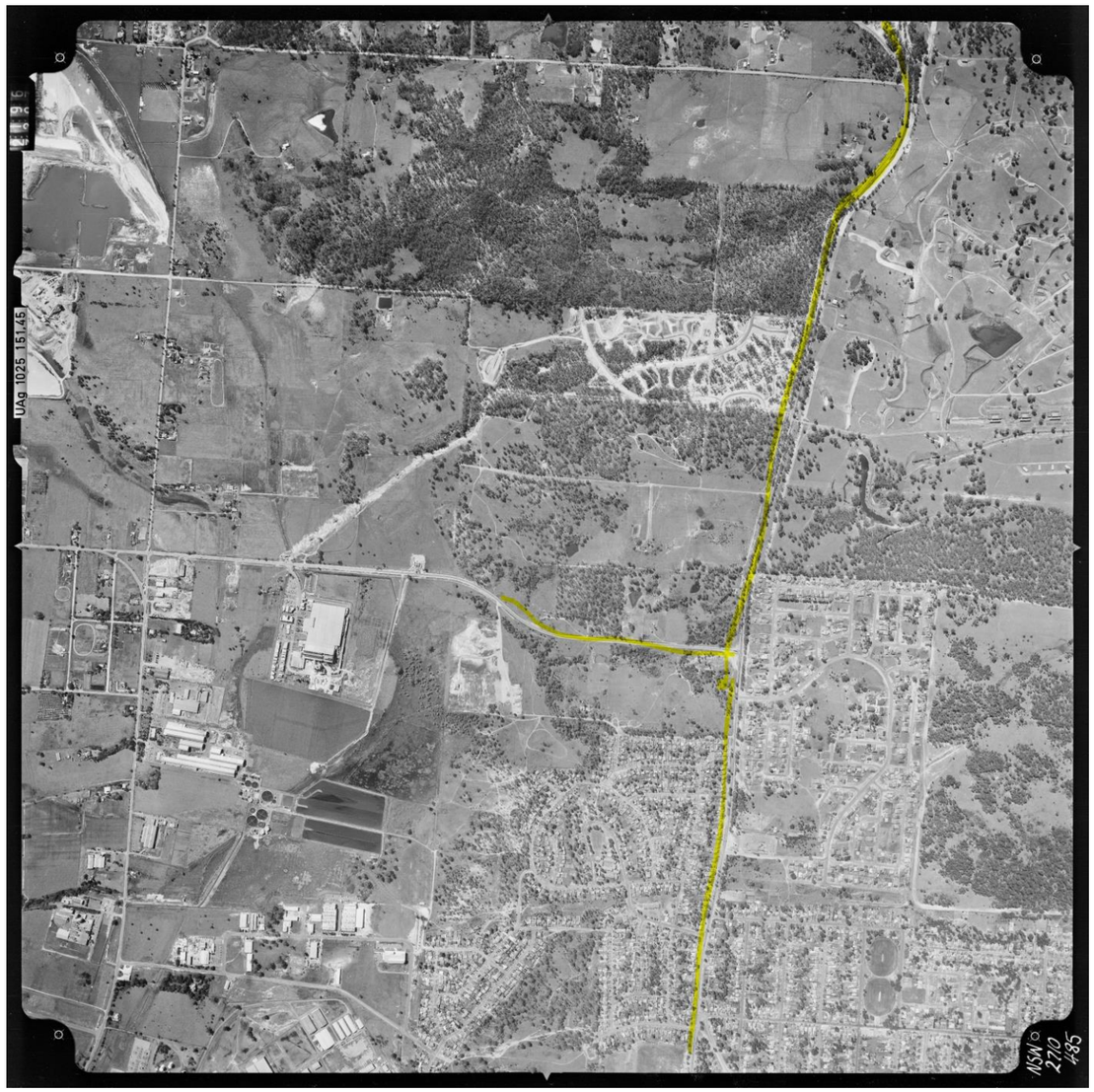

1978

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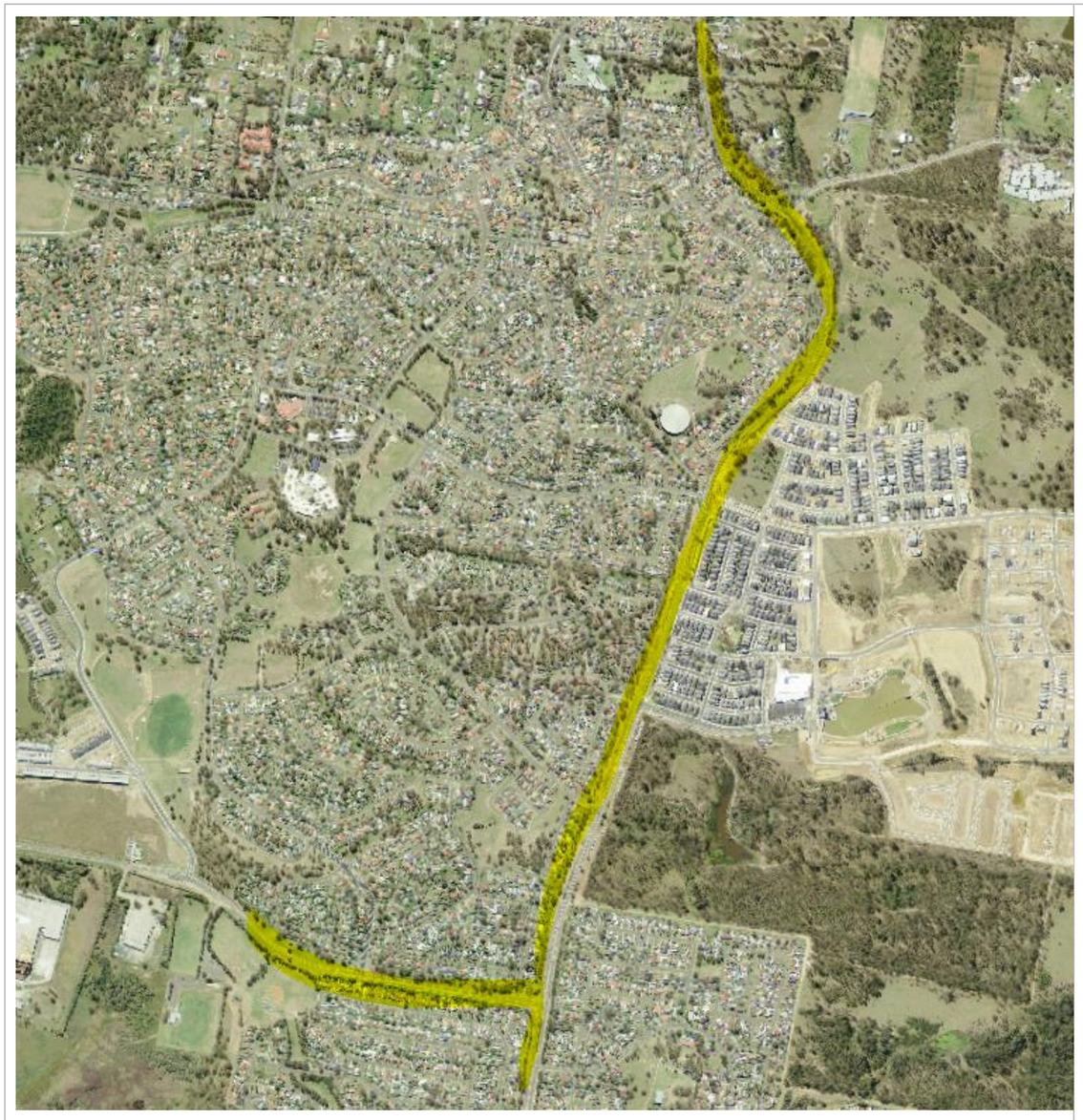
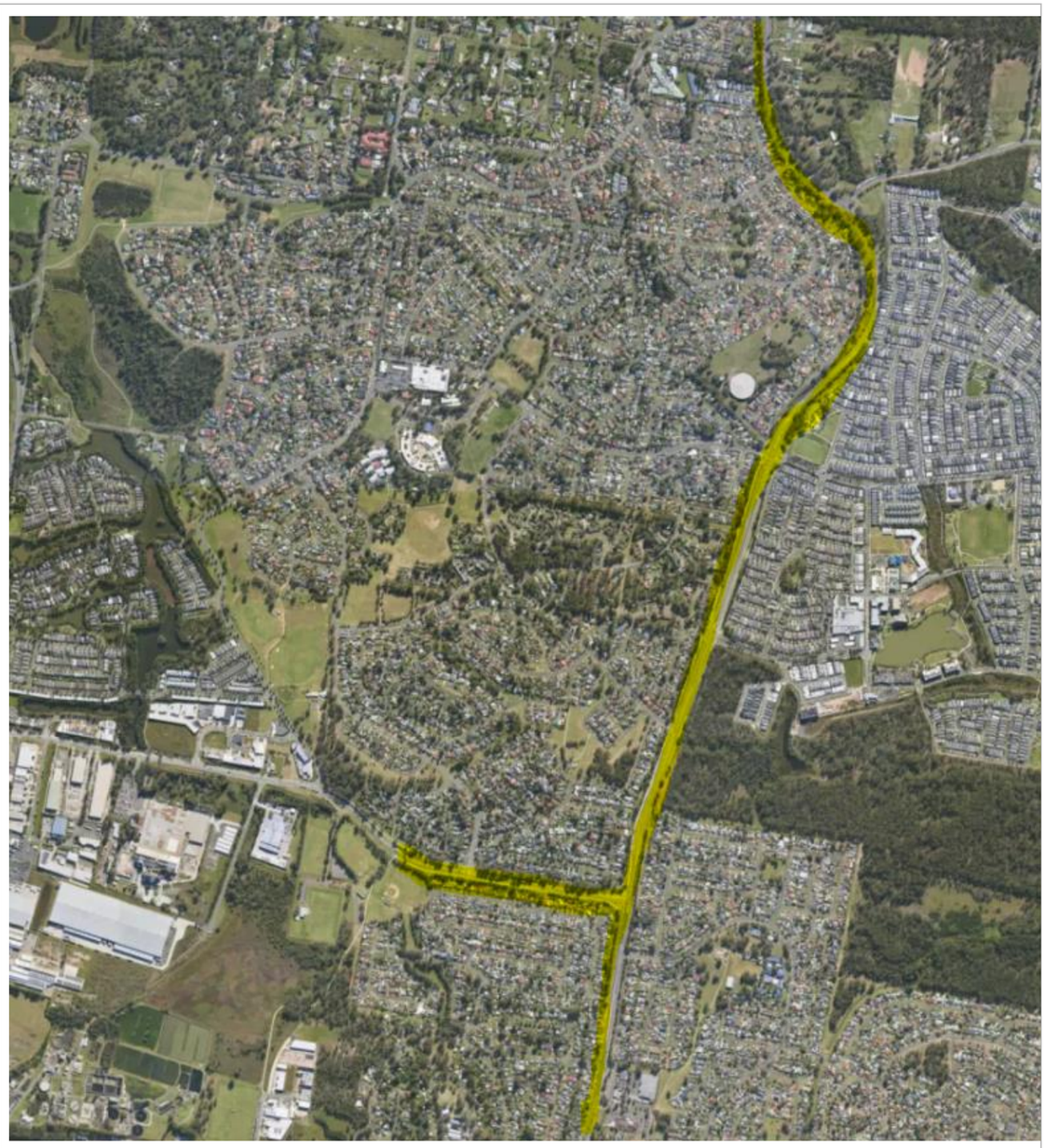


2013

2018

2021



2023

The Northern Road (approx. between Borrowdale Way and Seventh Avenue)

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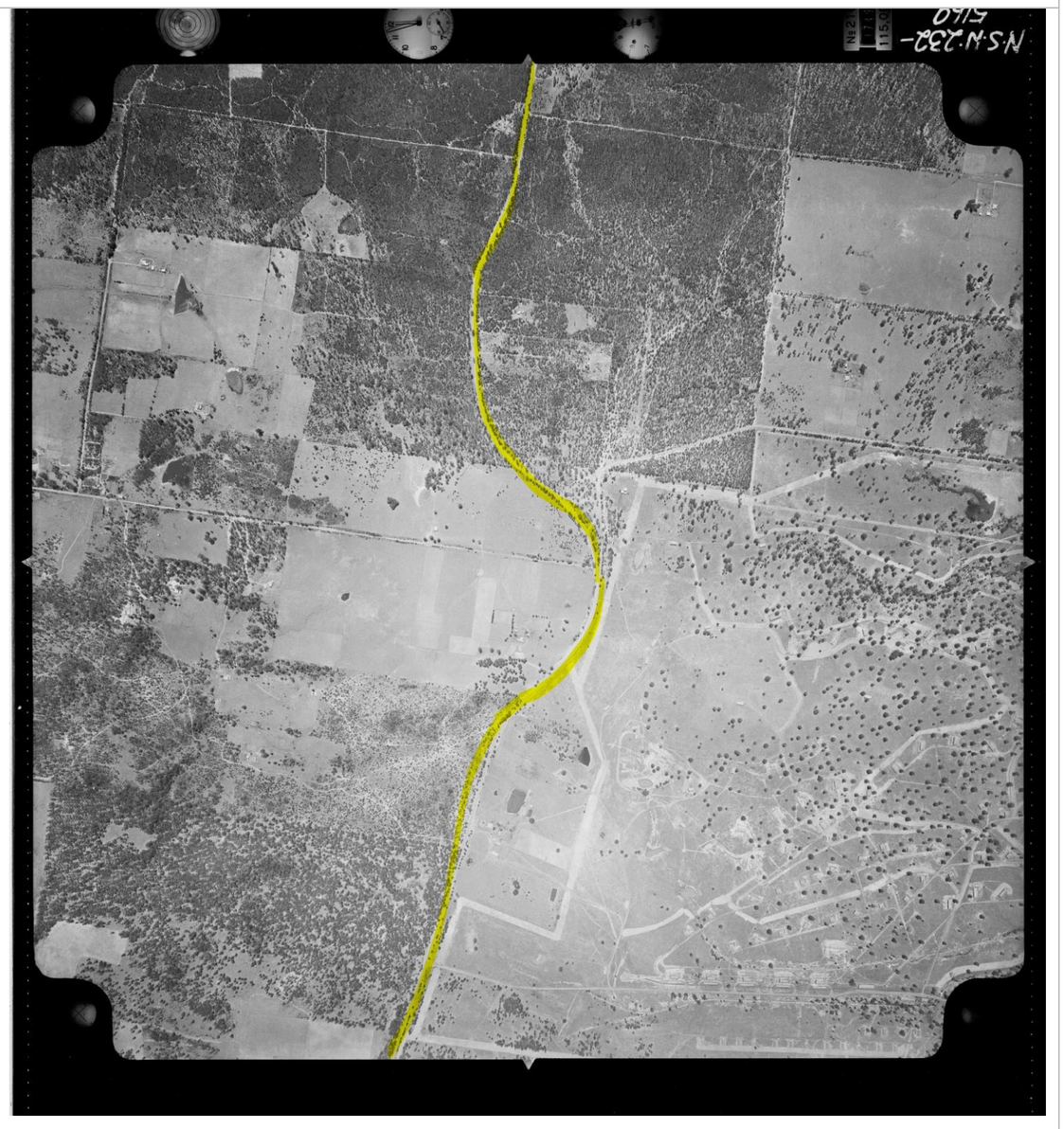

1955

1961

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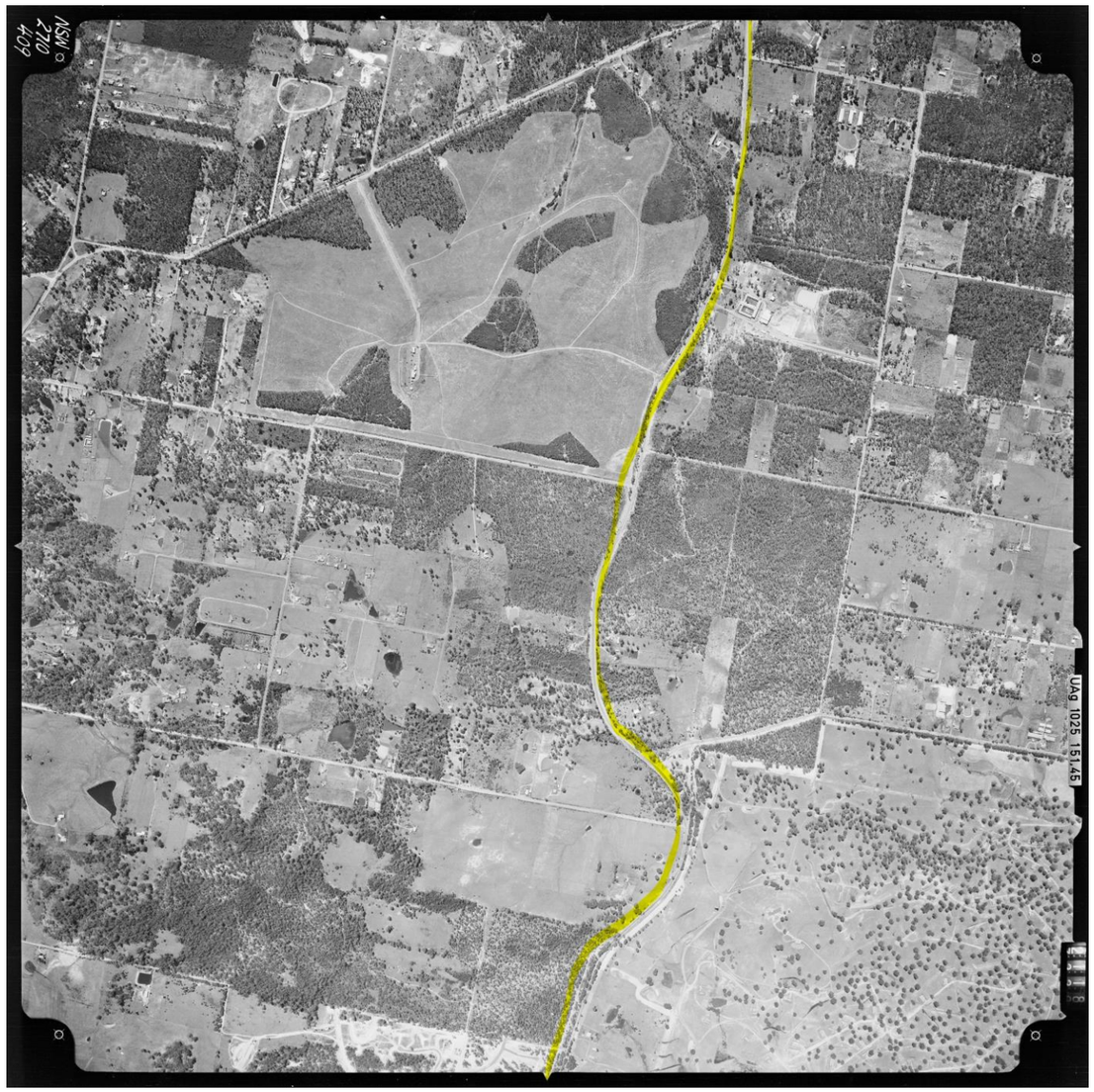

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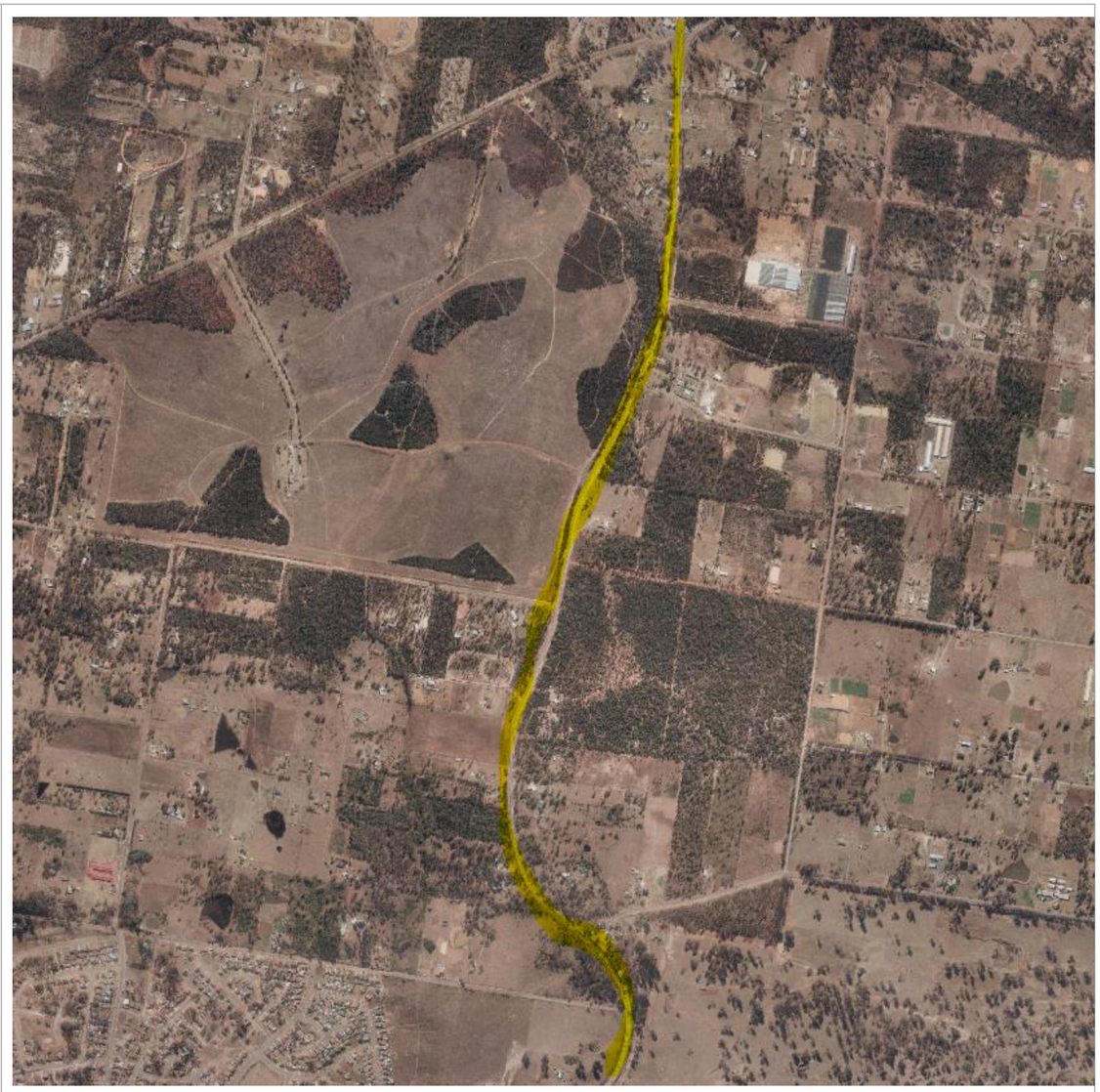
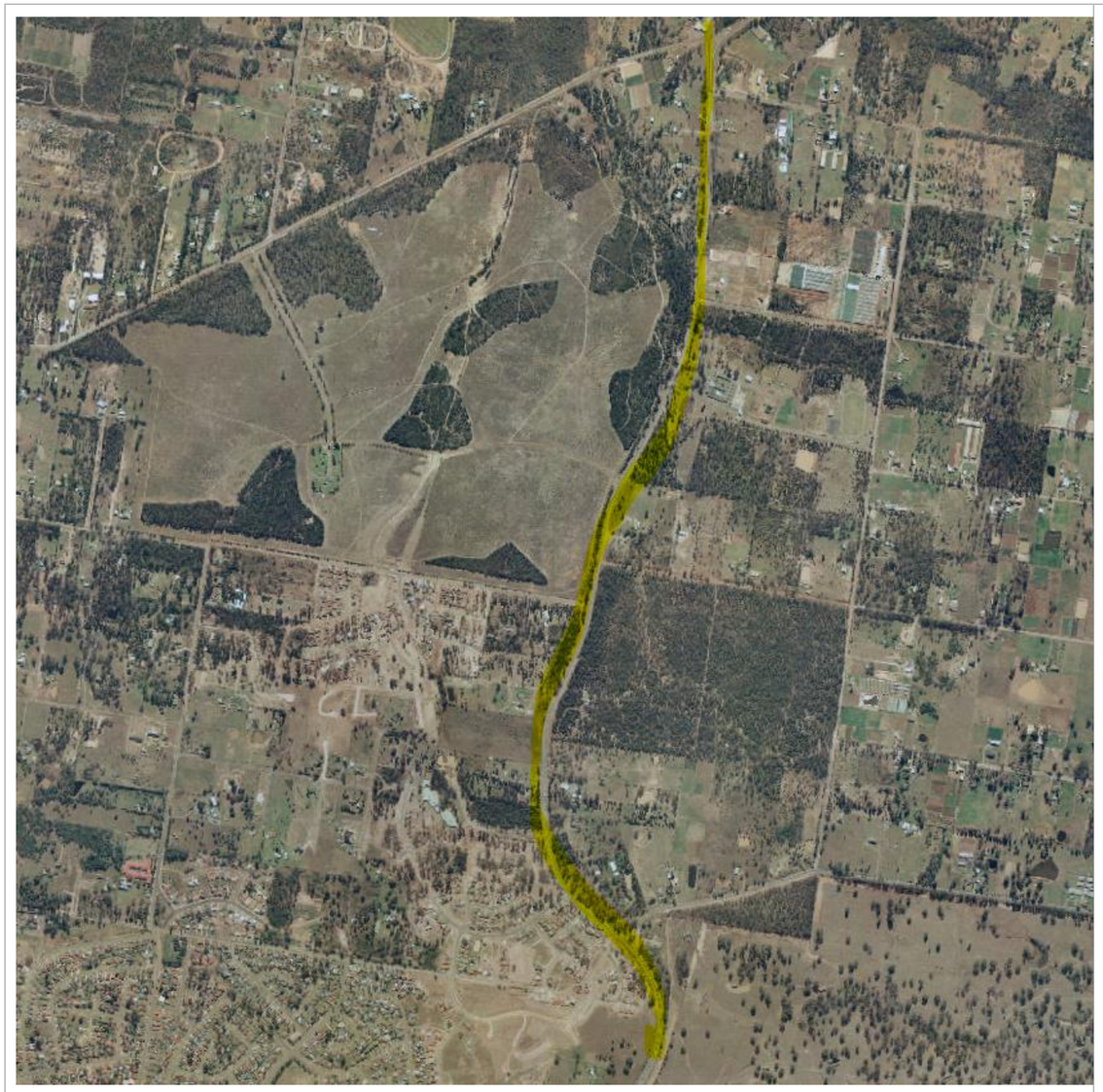


1986



1991

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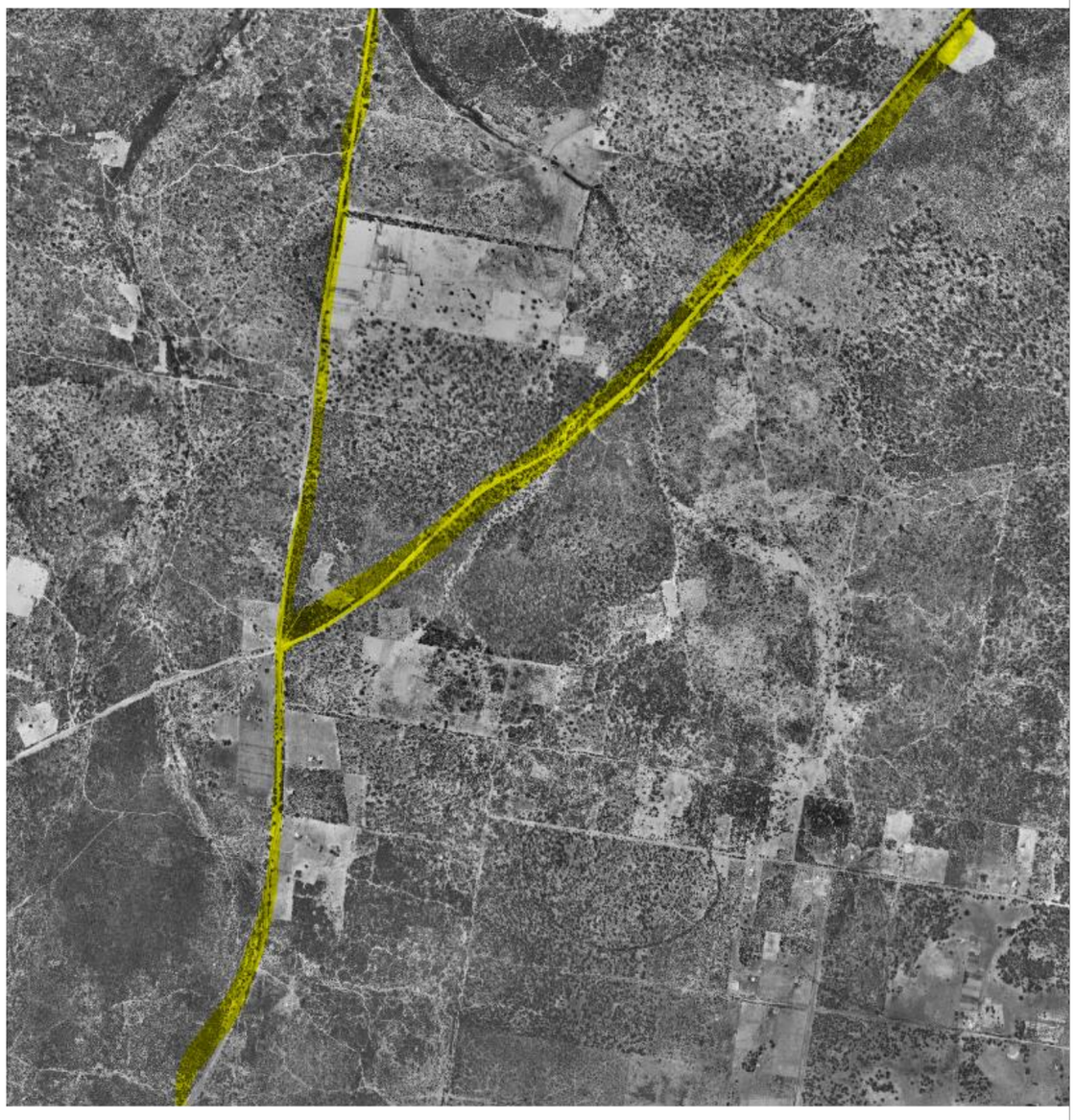
2023

Junction of The Northern Road and Londonderry Road



1947

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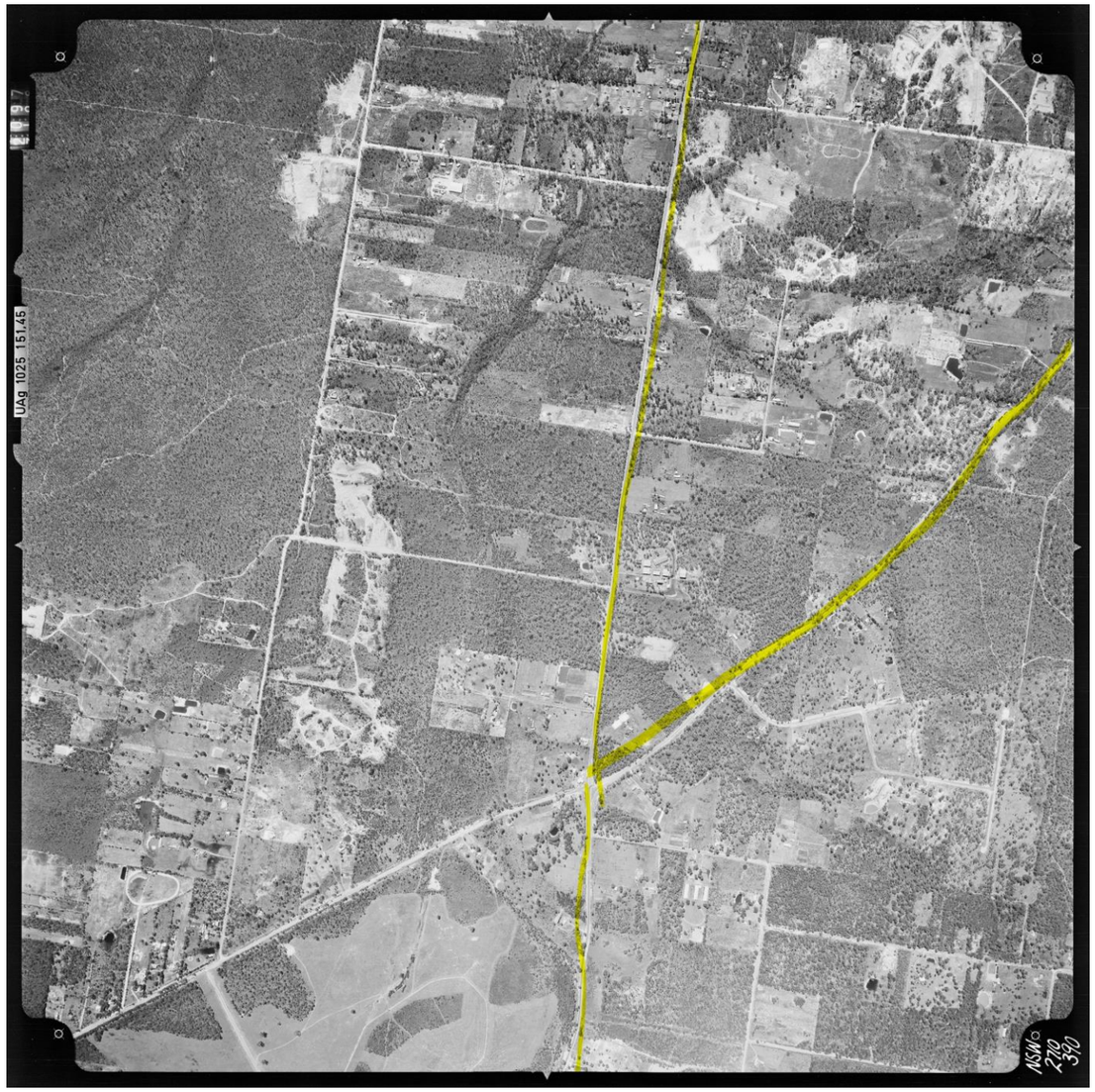

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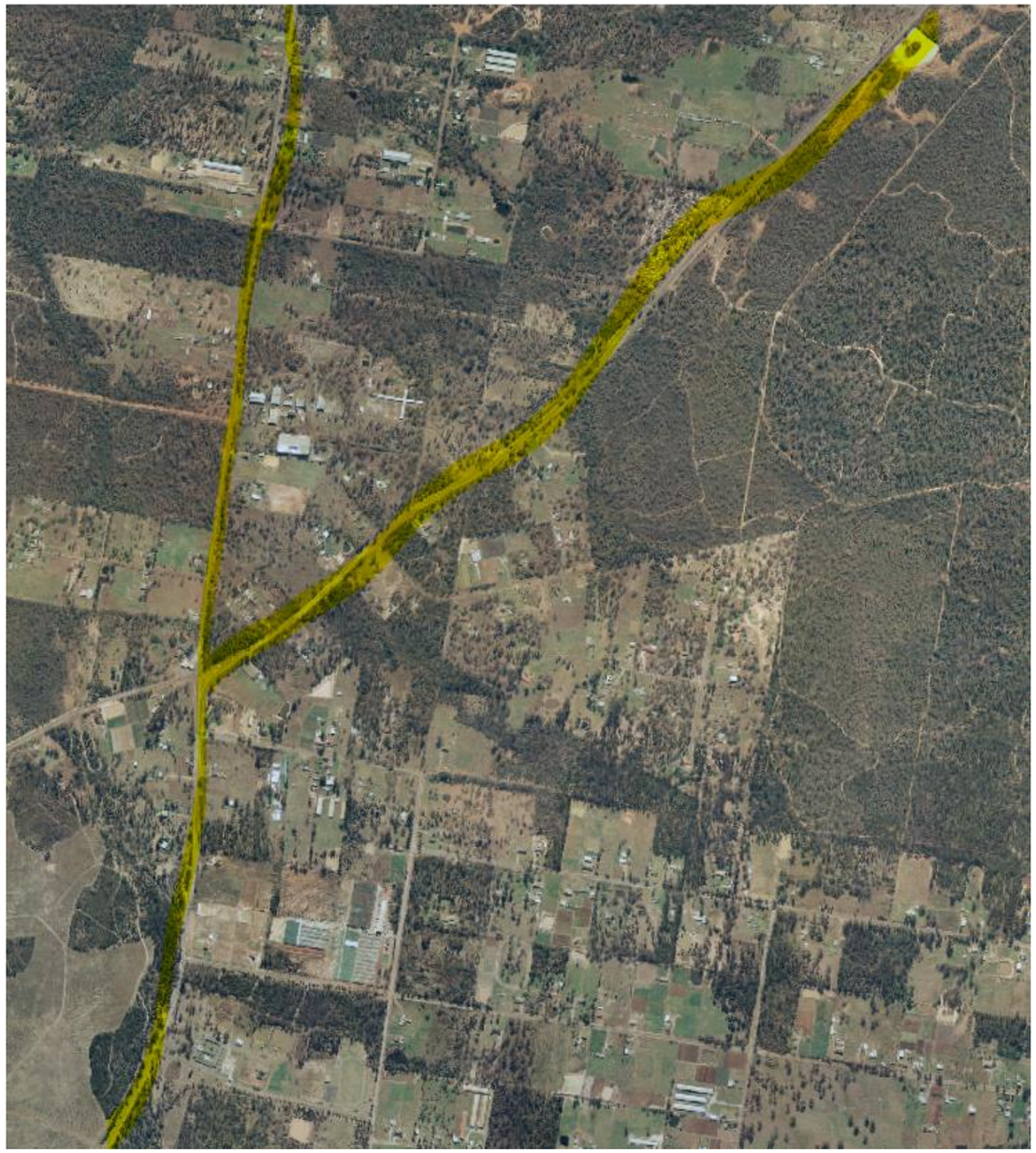

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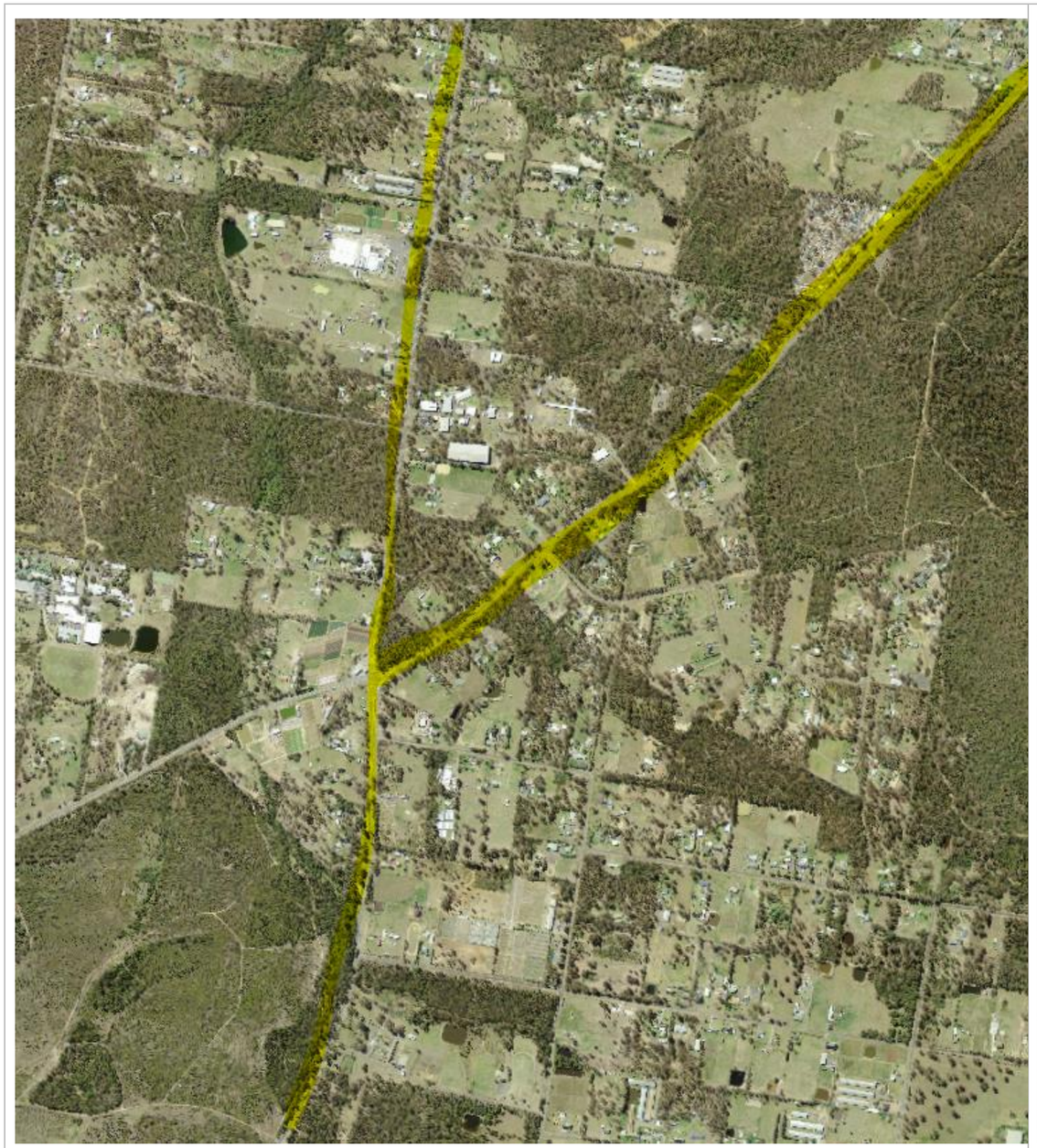

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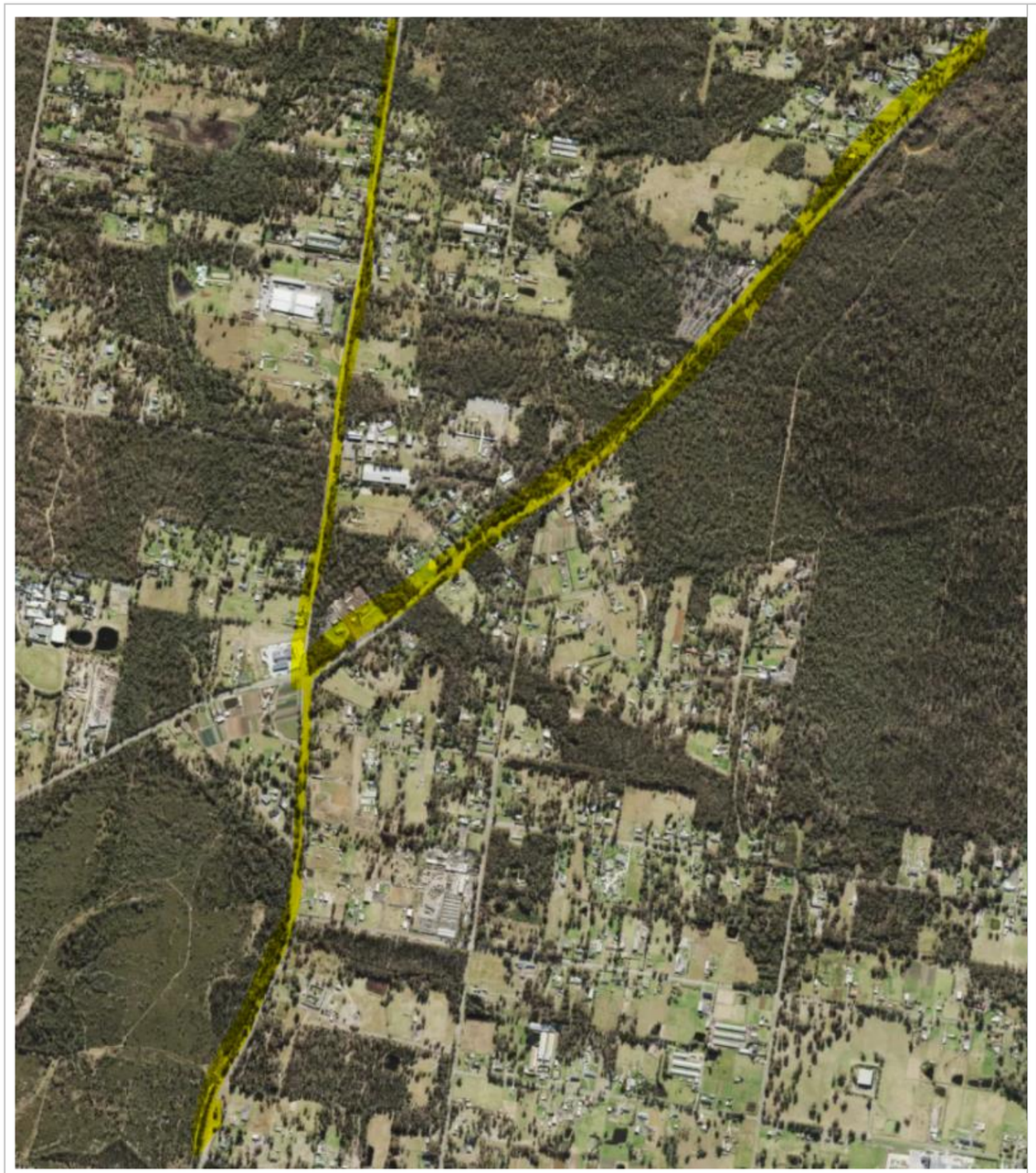
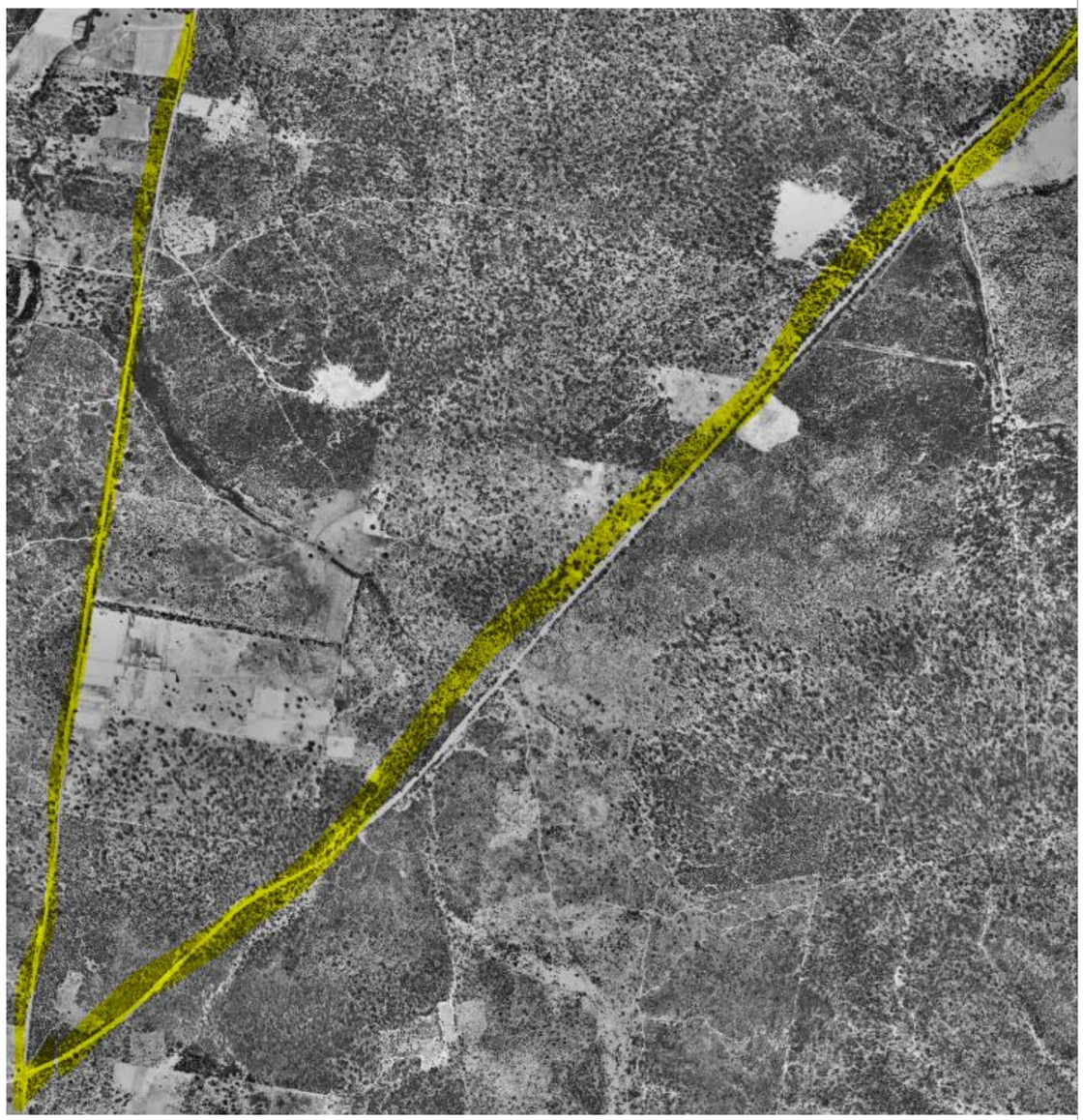


2021

2023

The Northern Road (approx. between junction of Northern Road/Londonderry Road and Carrington Road)



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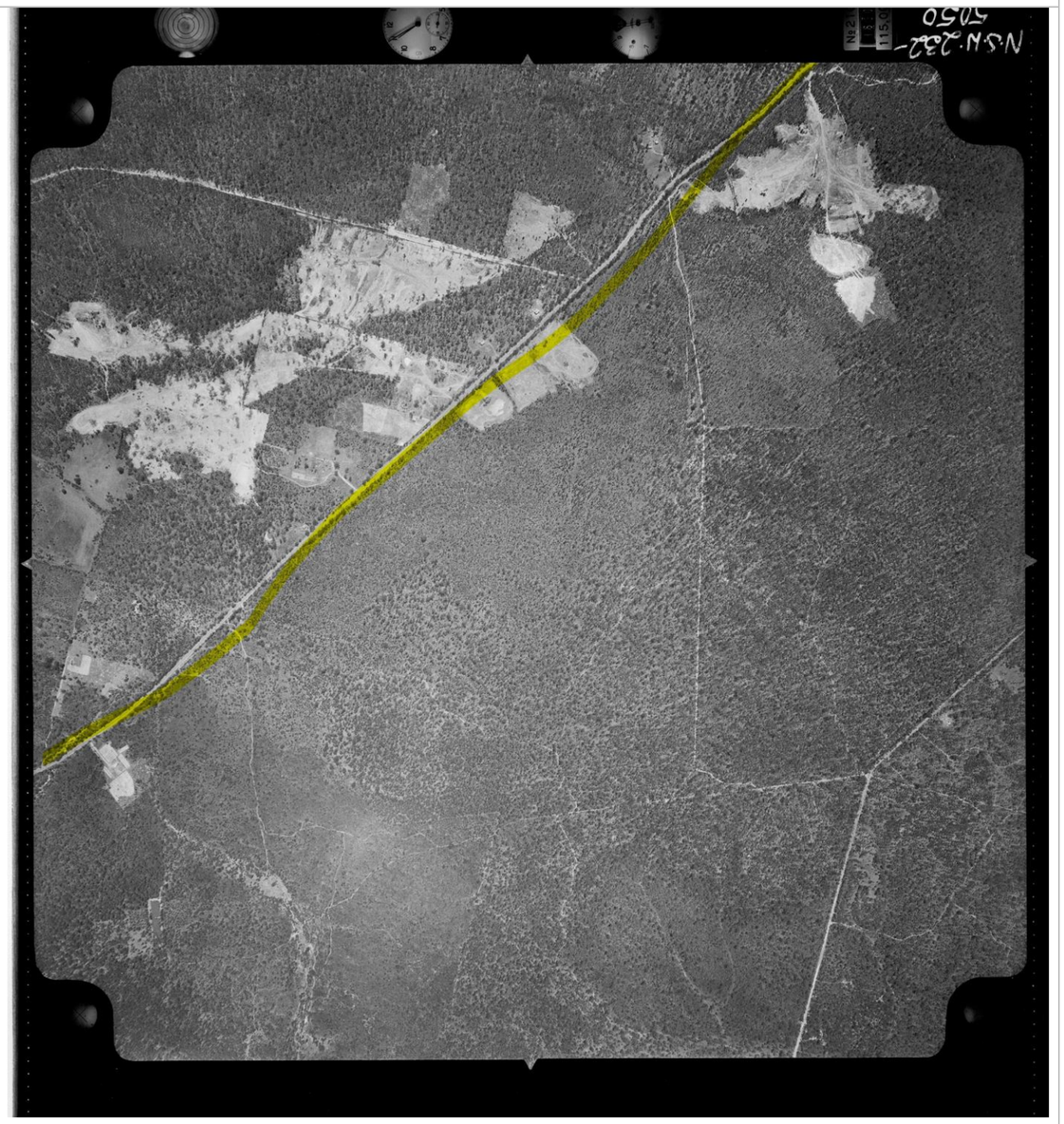

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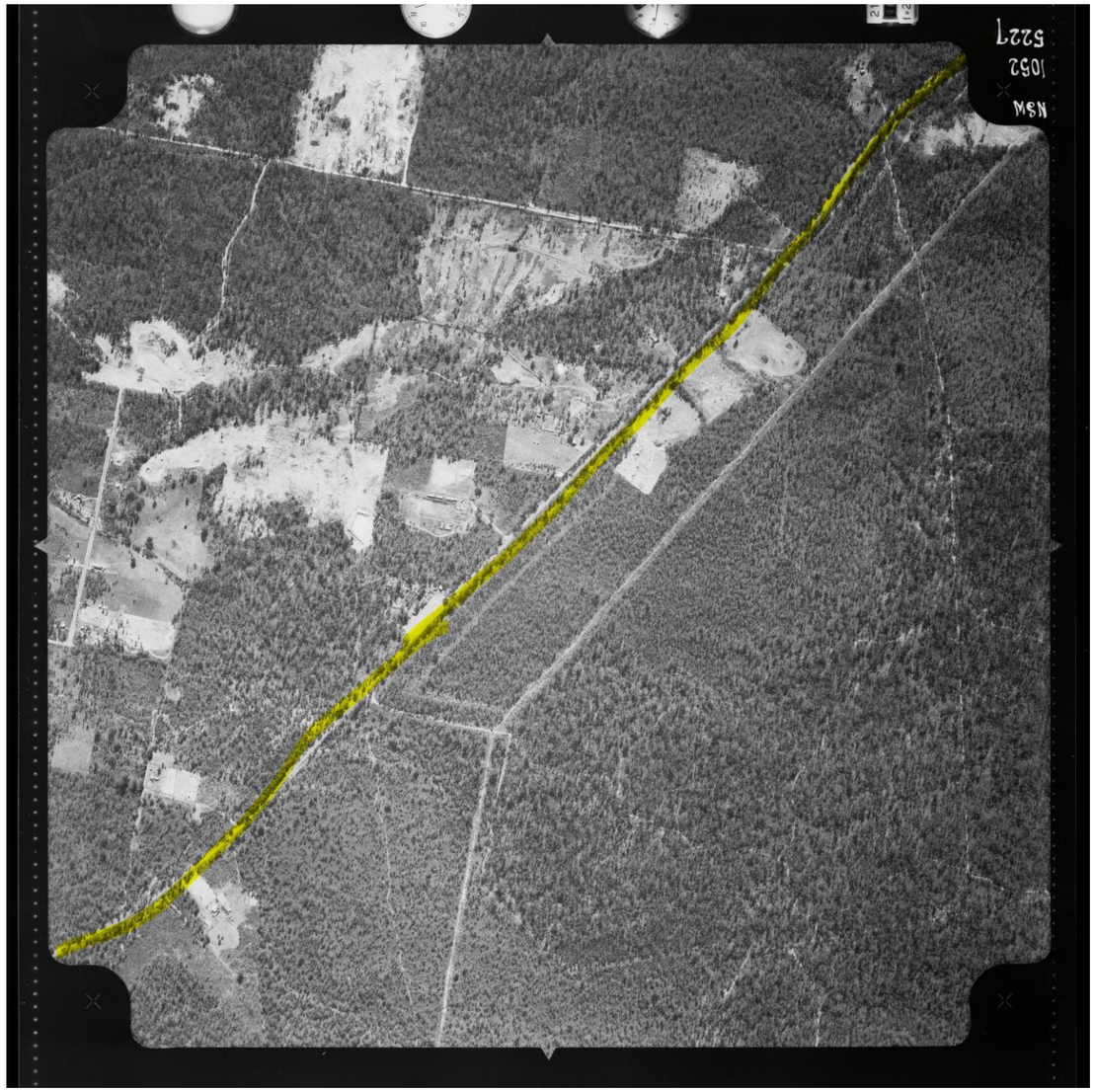

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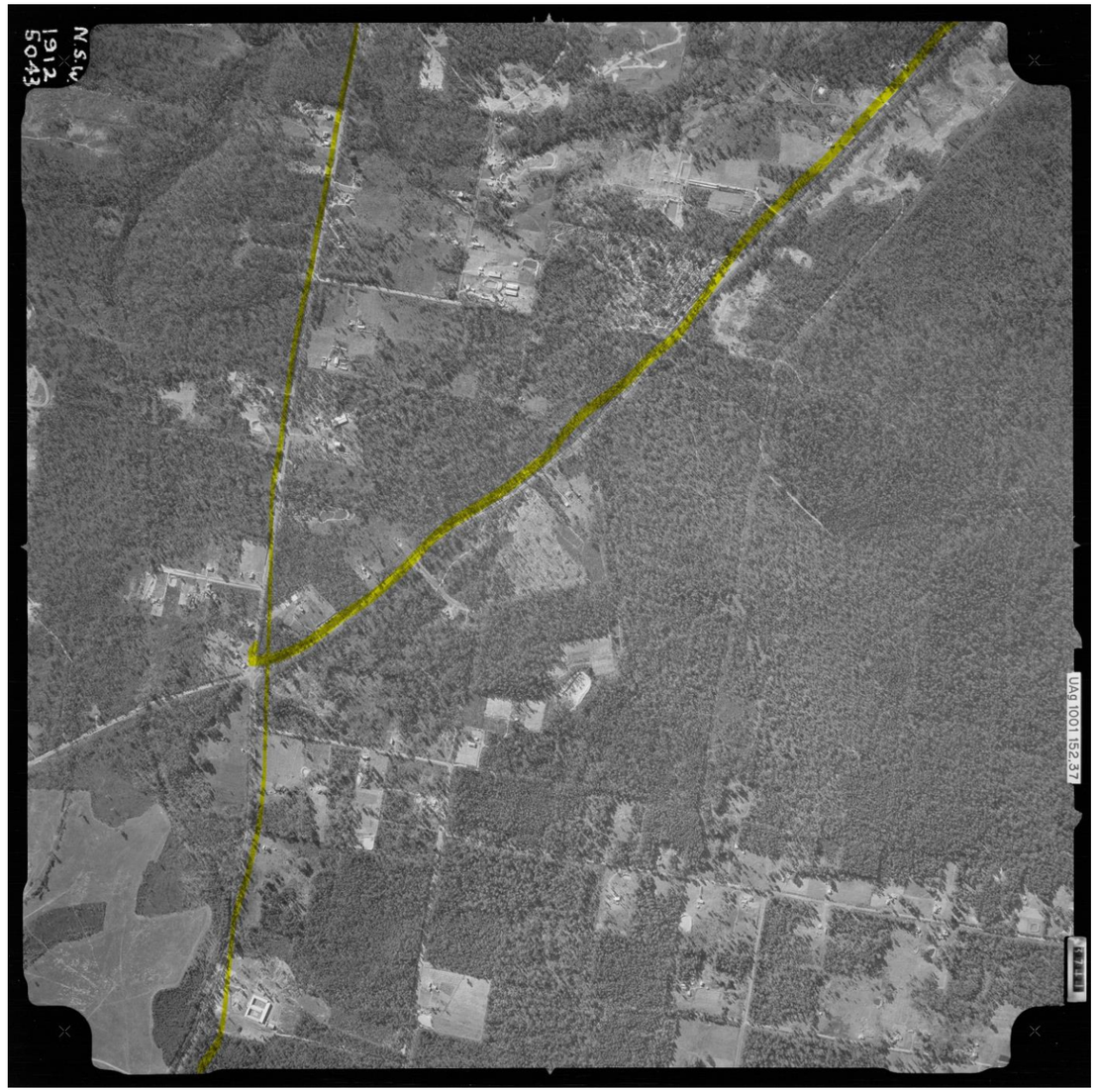

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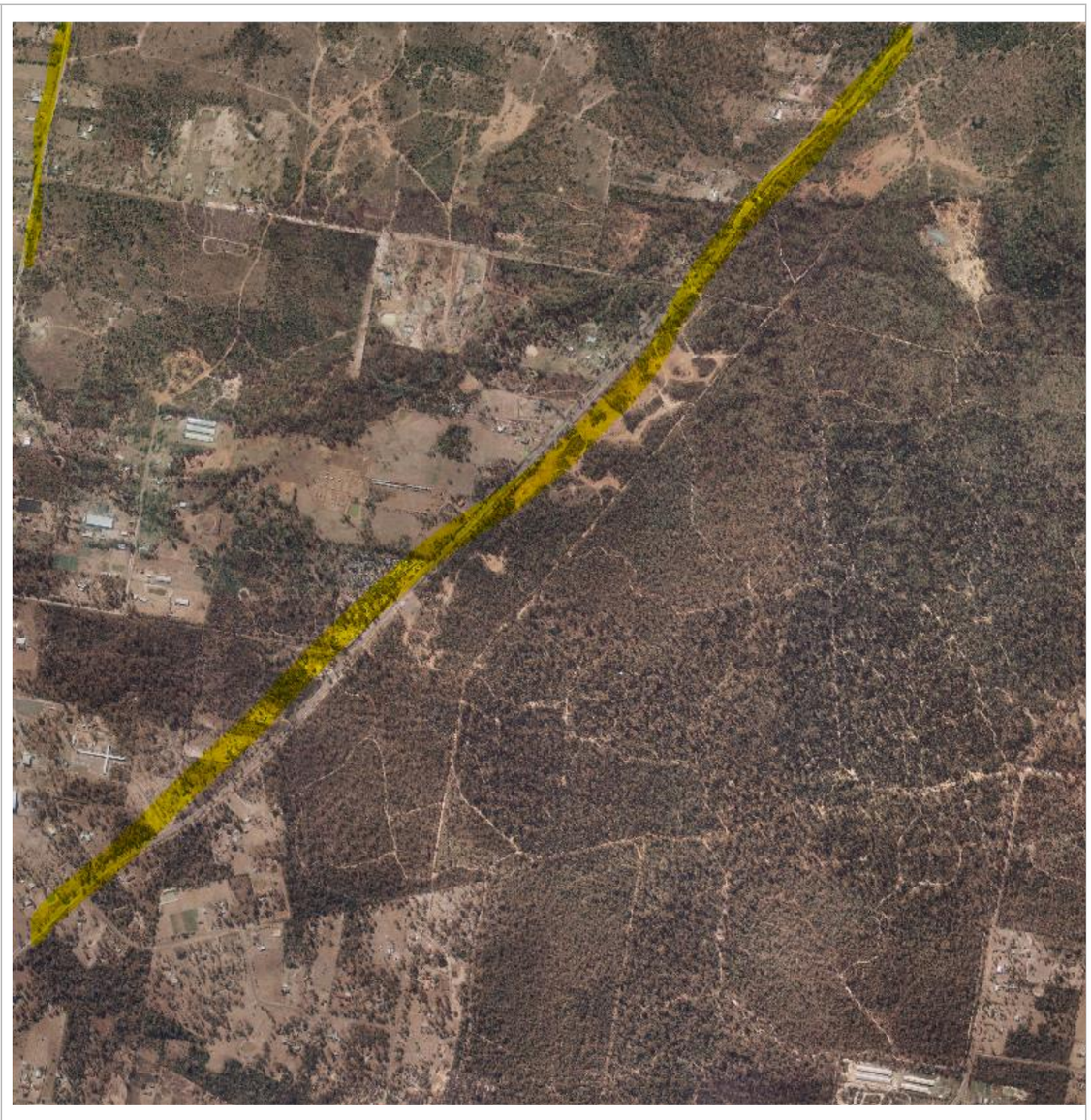
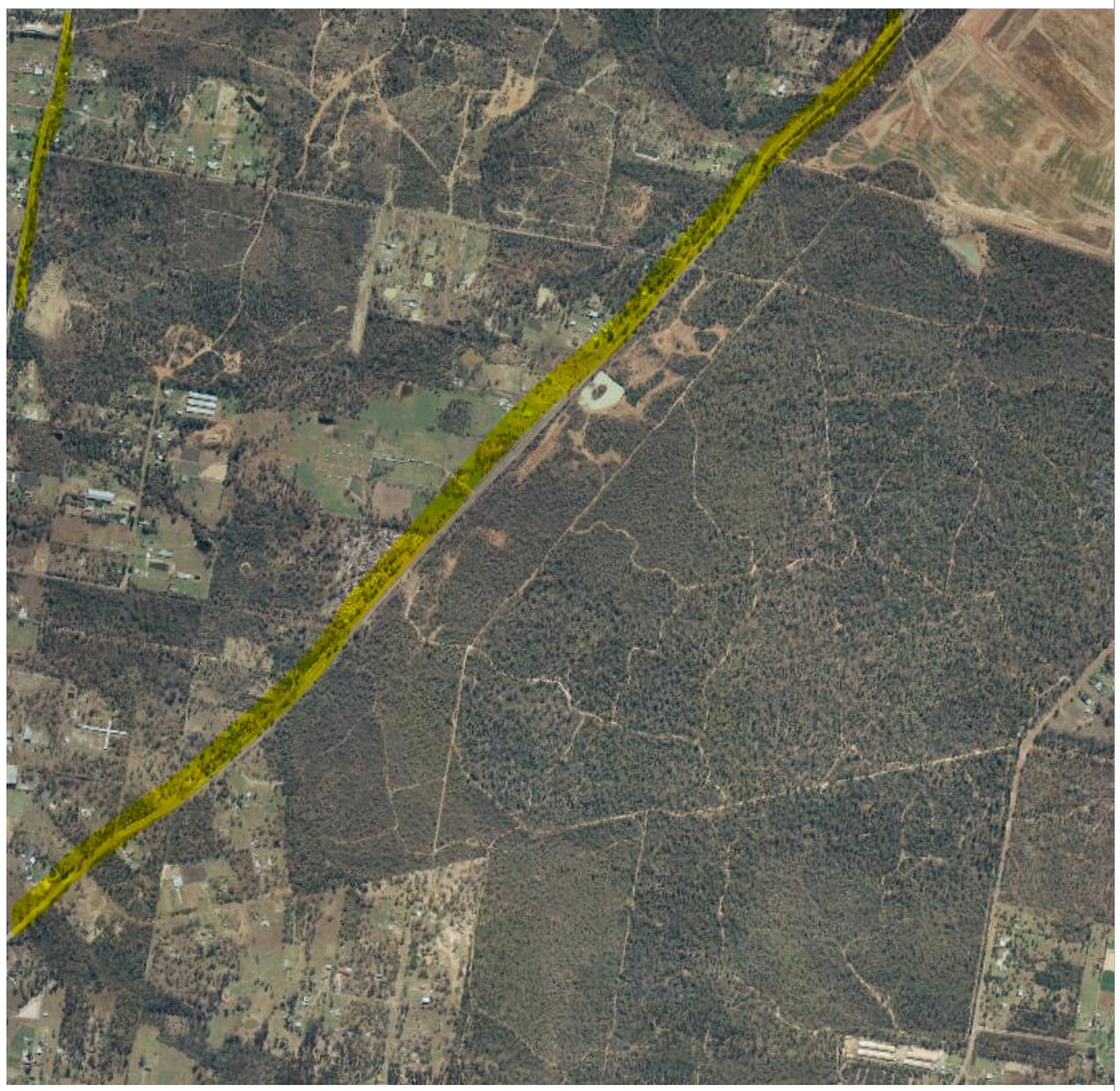


1986

S



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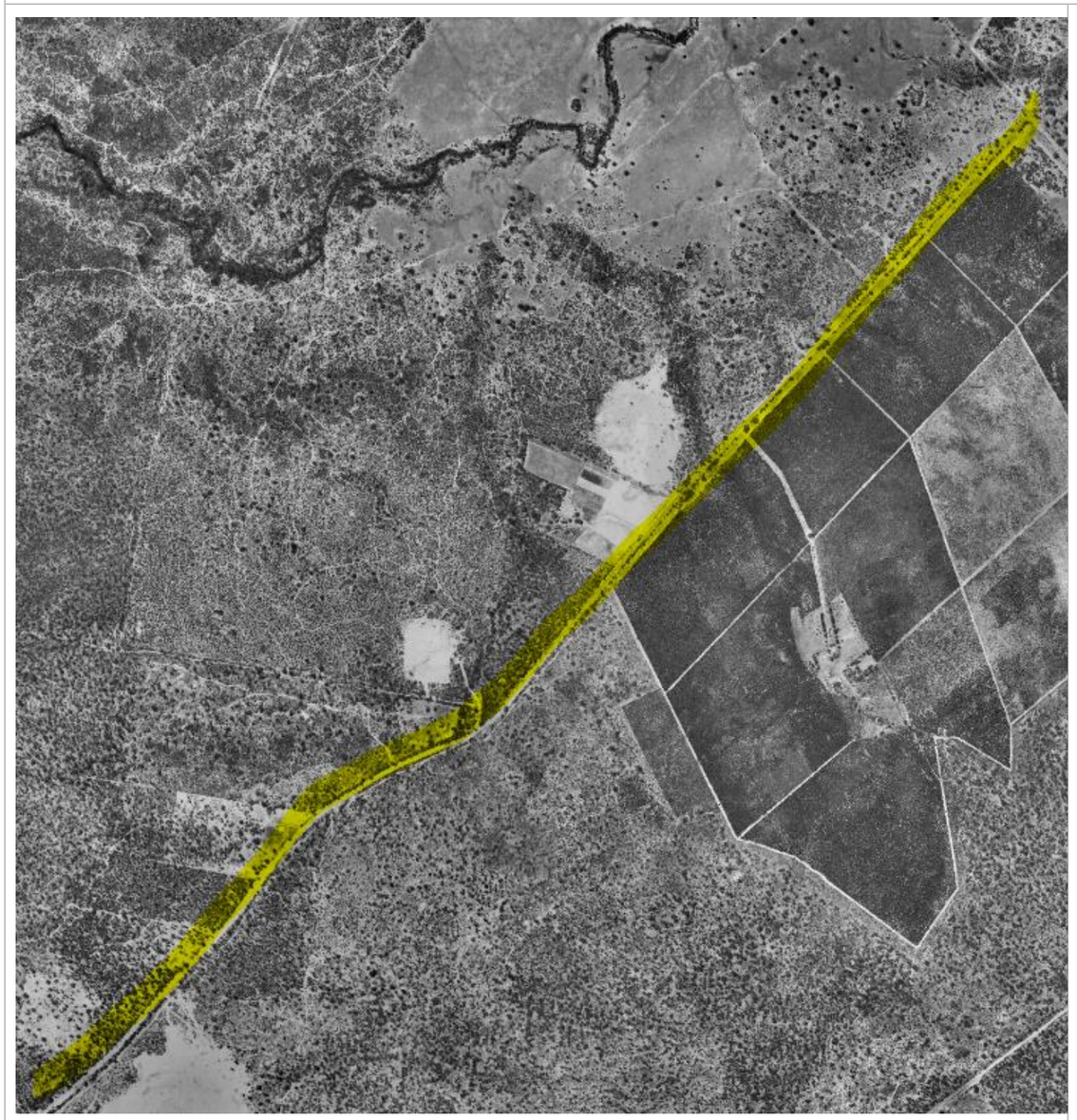
The Northern Road (approx. between Carrington Road and Richmond Road/north-eastern boundary of the Site)



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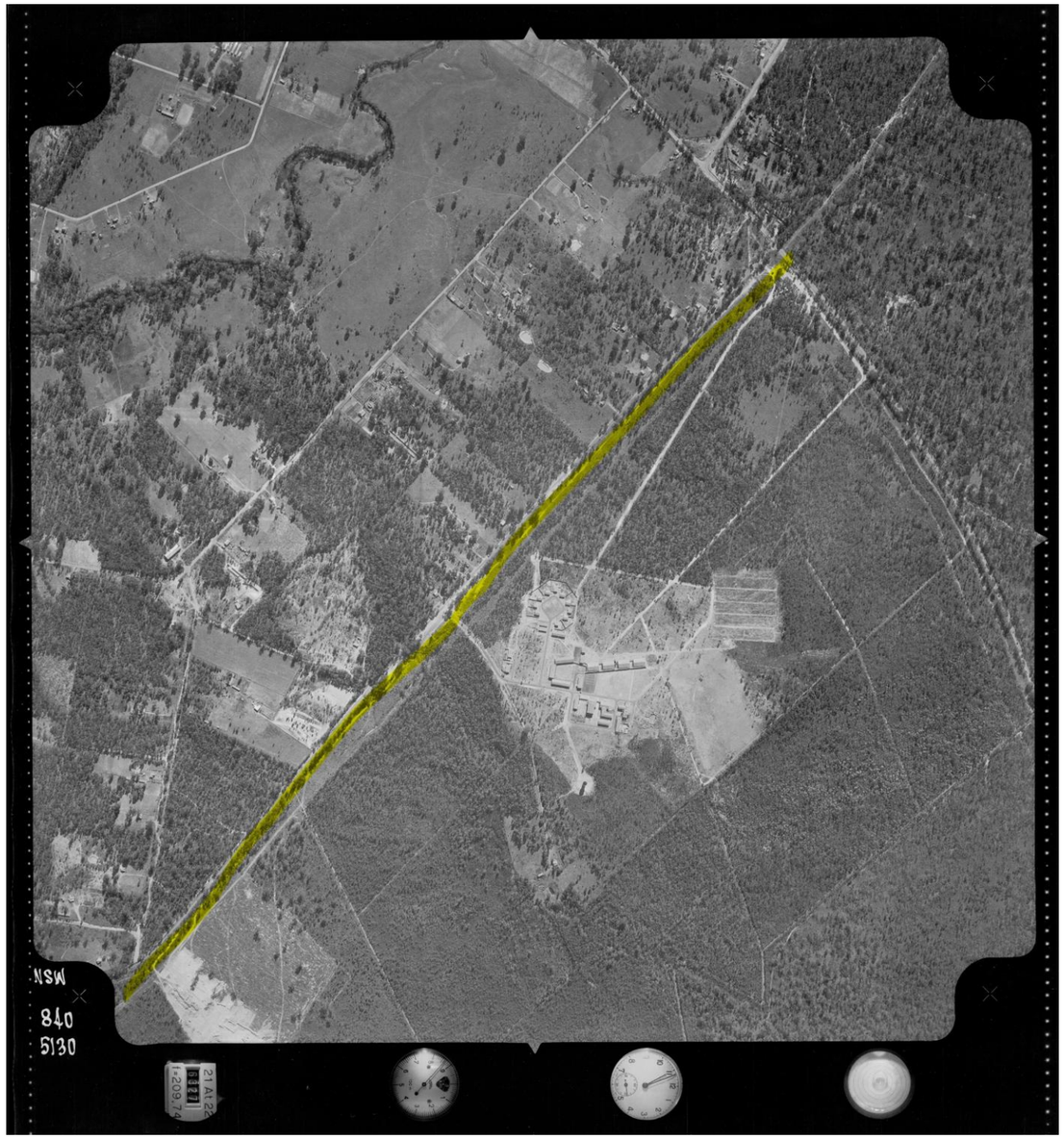

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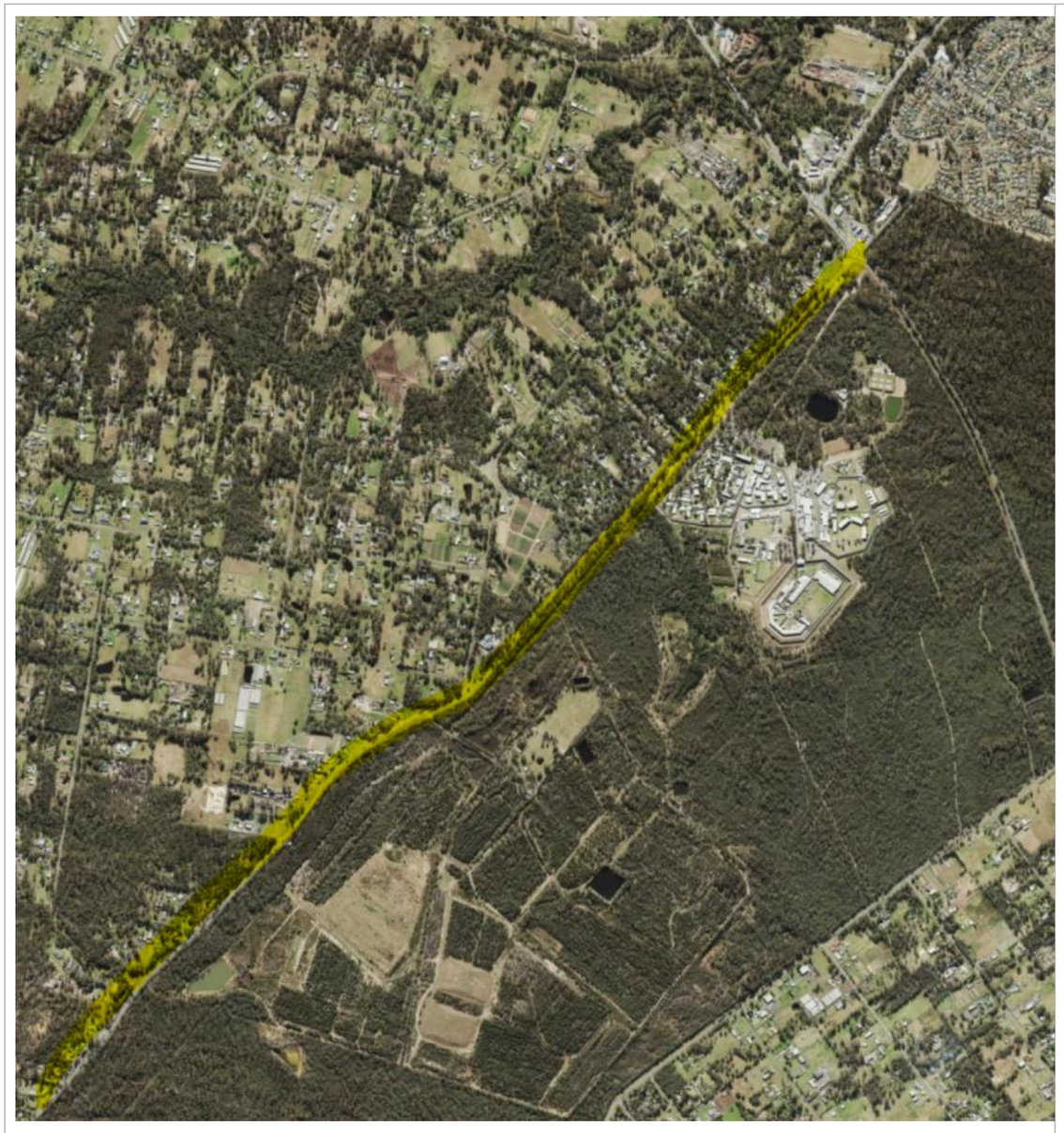

2021

2023

Londonderry Road (approx. between junction of Northern Road/Londonderry Road and Carrington Road)

1947

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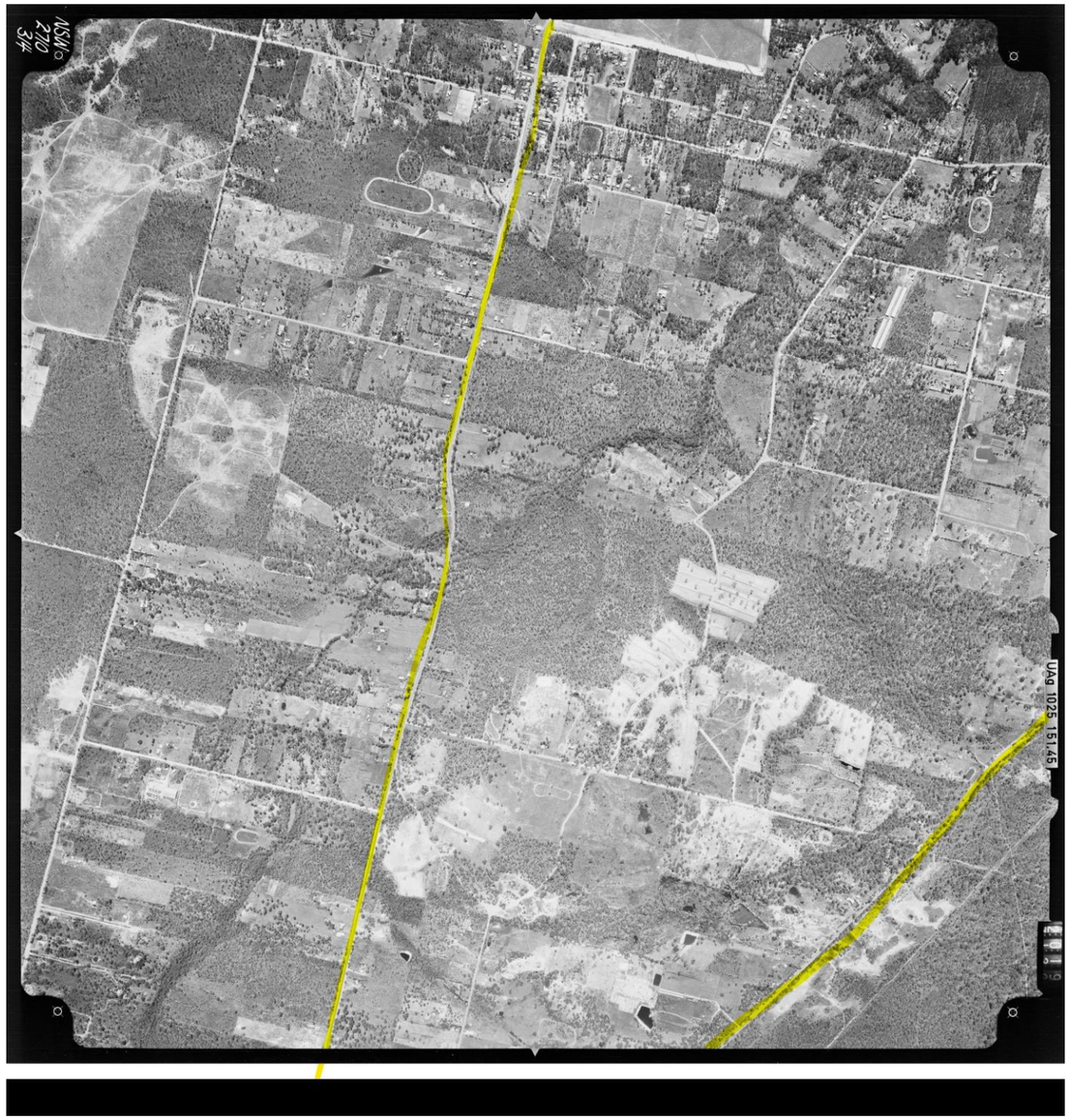

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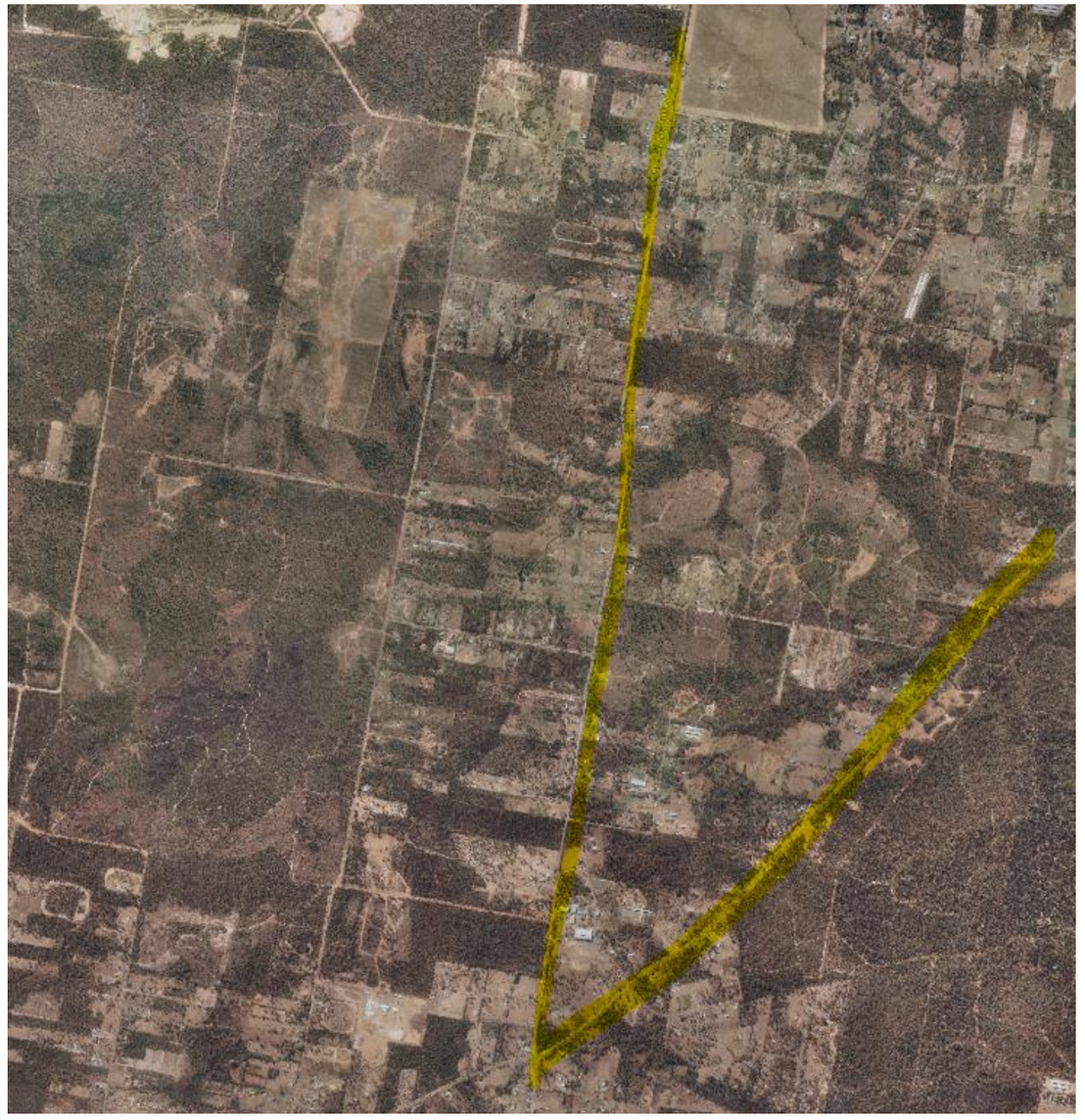

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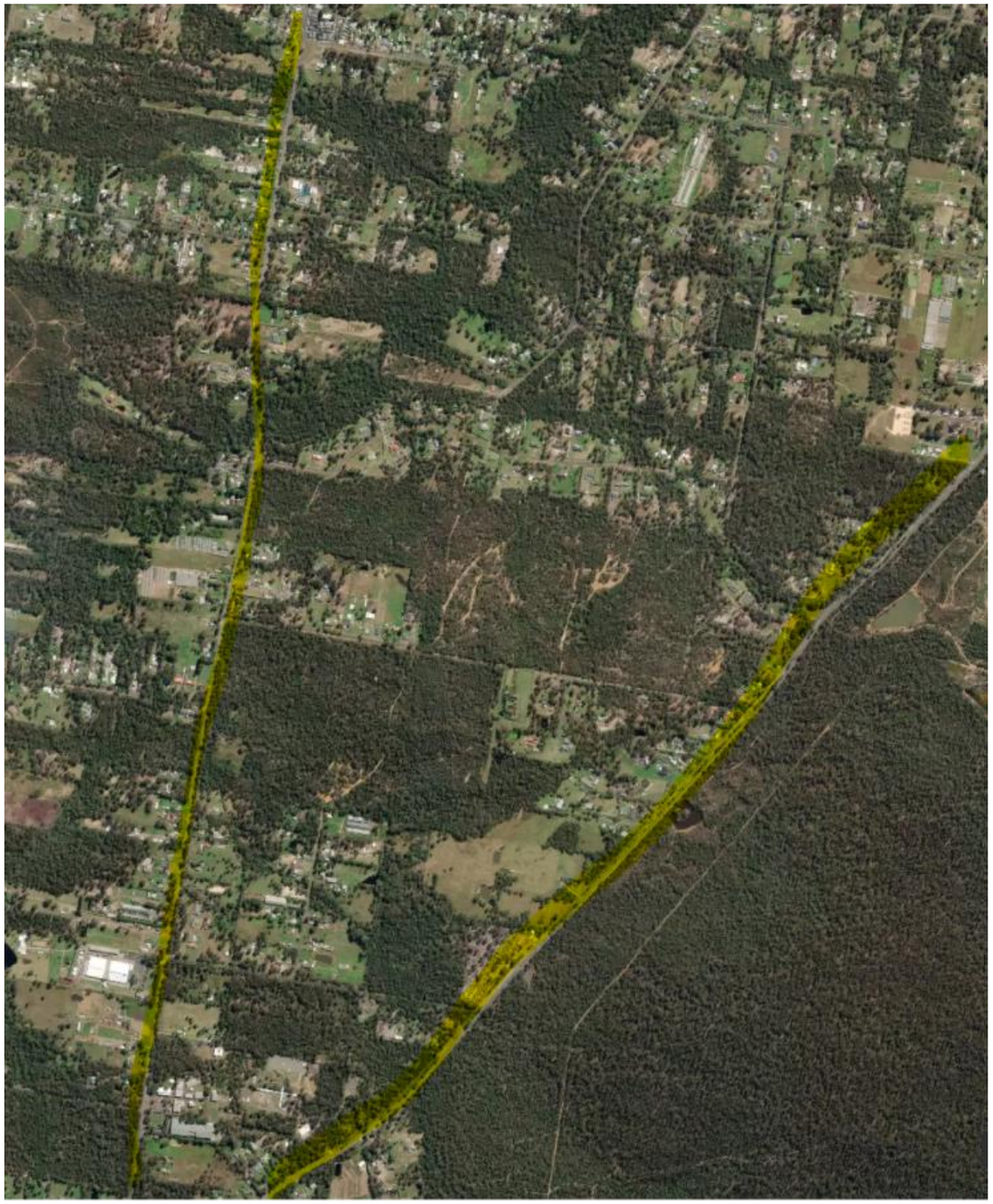

2018

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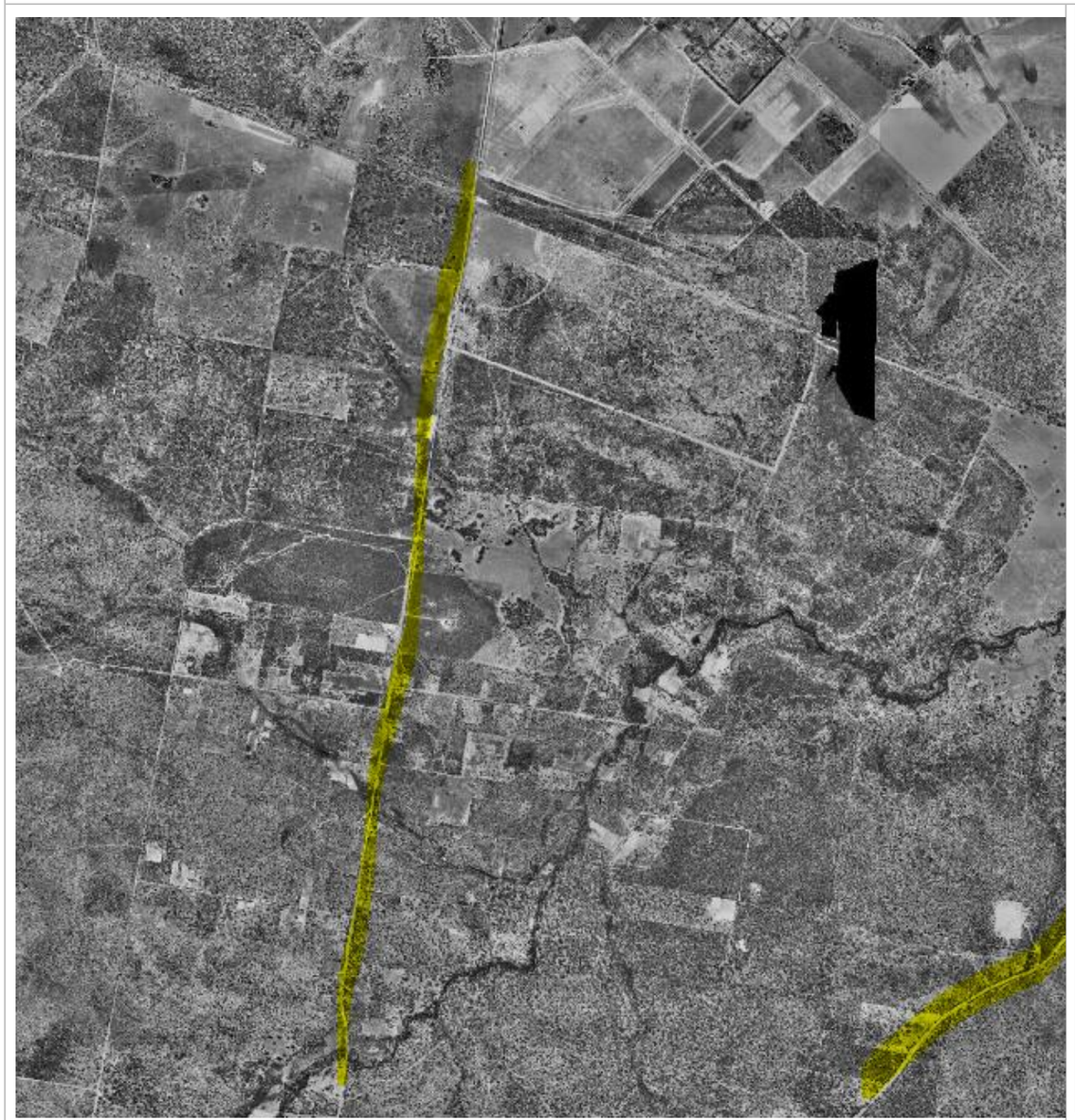
2023

Londonderry Road (approx. between Carrington Road and The Driftway/north-western boundary of the Site)



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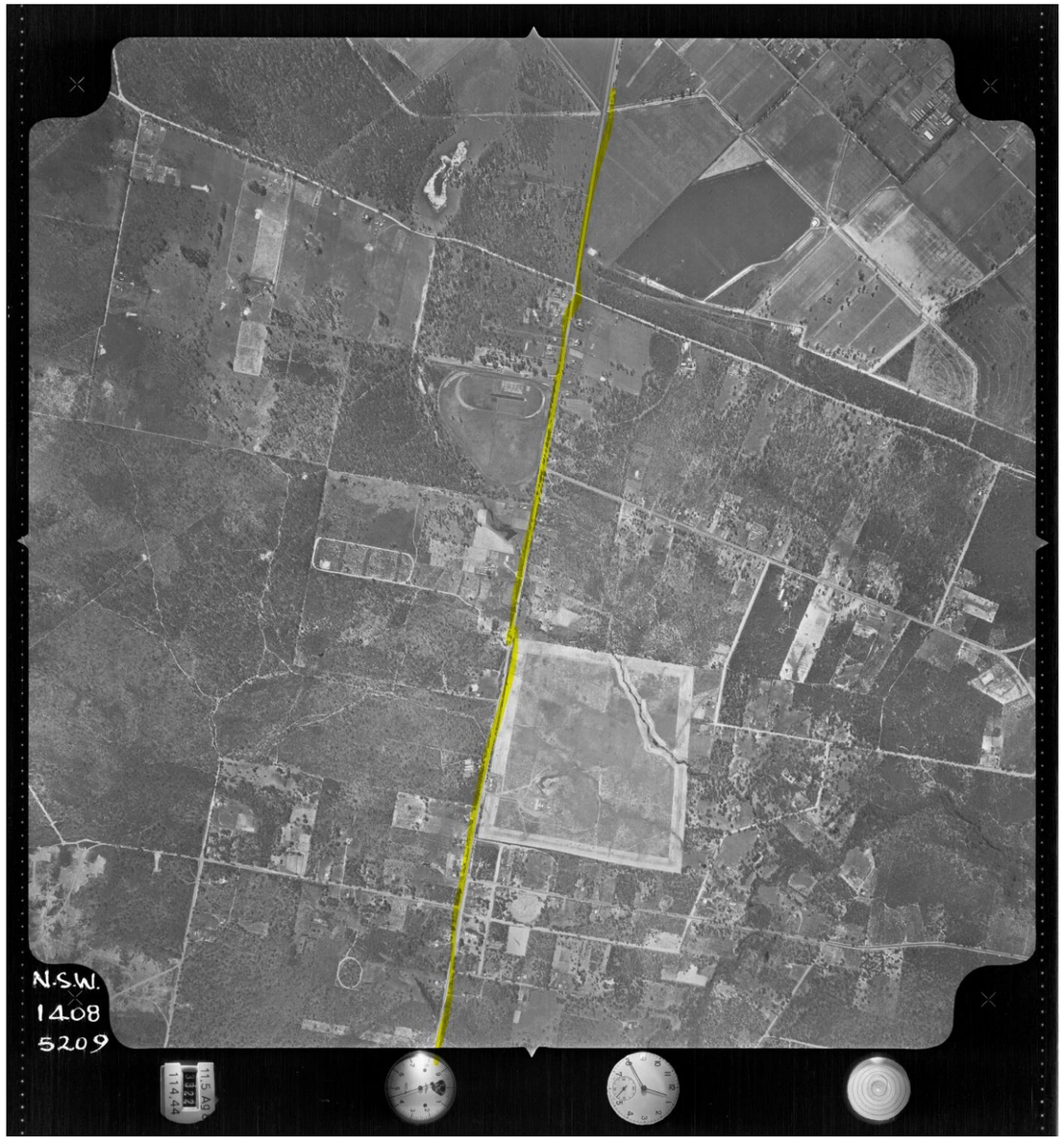
1955



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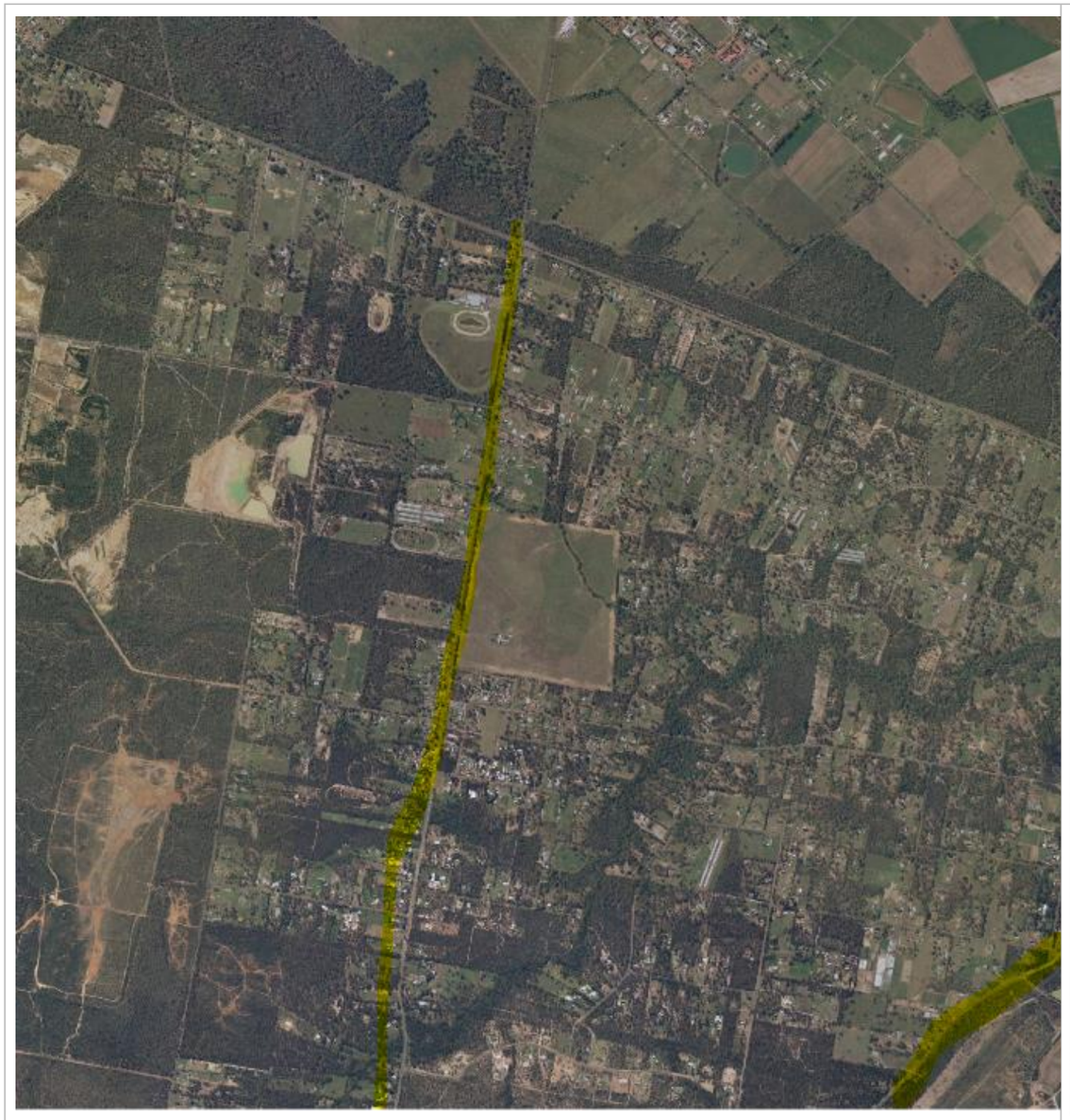

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Appendix C

Photo Logs

Photo 1 – Example of the stormwater drain on the site of road corridor

Photo 2 – Service station and car wash were located between Cox Avenue and Copeland Street

Photo 3 – Petrol station located adjacent to Boomerang Place and Star Crescent, east of the Site

Photo 4 – Water Tank observed west of the road corridor, north of Borrowdale Way

Photo 5 – Example of livestock observed

Photo 6 – Heavily treed reserve observed

Photo 7 – Petrol station at the junction between Londonderry Road and the Northern Road.

Photo 8 – Tanks with “hazard” sinage observed

Photo 9 – Bags of unknown waste observed approximately midway between Spencer Road and Cherry brook Chase

Photo 10 – Service station located south of Carrington Road, east of the Site

Photo 11 – Petrol station located west of the Site, opposite to the RAAF Base Londonderry

Photo 12 – Londonderry RAAF Base, located east of the Site

Photo 13 – “Climate Change Research” area, west of the Site

Photo 14 – Tanks observed within the “Climate Change Research” area

Photo 15 –John Morony Correctional Facility, east of the Site

Photo 16 – RFS training area (TestSafe)

Photo 17 – Heavily treed Castlereagh Nature Reserve

Photo 18 – Wrecker located west of the Site

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