

Toowoomba Griffiths Street

Corridor Planning Study Report

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Prepared for
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Contact Information

Cardno (Qld) Pty Ltd
 ABN 57 051 074 992

Level 11 Green Square North Tower
 515 St Paul's Terrace
 Locked Bag 4006
 Fortitude Valley Qld 4006

Telephone: 07 3369 9822
 Facsimile: 07 3369 9722
 International: +61 7 3369 9822

transportqld@cardno.com.au
 www.cardno.com.au

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Executive Summary

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Toowoomba Regional Council (TRC) to prepare a planning study to assist in infrastructure planning for Griffiths Street. This study has been triggered by the upcoming provision of the Toowoomba Second Range Crossing (TSRC) which is anticipated to significantly impact travel patterns in the Toowoomba region.

The focus of this planning study has been to identify interim (for immediate implementation, prior to opening of the TSRC) and ultimate (suitable to satisfy 2031 traffic demands) solutions for the length of Griffiths Street, including intersections with Mort Street and the New England Highway.

Key issues and associated recommendations from this planning study are outlined following. These recommendations have been discussed and agreed with the project's Project Leadership Team (PLT), comprising Council and TMR representatives.

Traffic Demands

With the TSRC, Griffiths Street will carry additional traffic, as it provides the most convenient connection between the TSRC and the New England Highway. Strategic transport modelling undertaken by Council (and used to inform these investigations) suggests that around 1,500vpd is likely to undertake this movement (two way) at 2031.

Existing and Future traffic volumes are summarised in Table 1-1 below.

Griffiths Street Existing and Future Traffic Volumes

Scenario	East of Mort Street (vpd)	West of New England Highway (vpd)
2016 Traffic Counts	9,000	9,600
2031 Forecast, consisting of:-	10,300 -- 12,300*	14,700 -- 16,900*
To/from the TSRC	1,600 -- 3,100*	1,500

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Existing heavy vehicle volumes are at around 6.5% on Griffiths Street (approx. 500 - 600vpd). Movements associated with the TSRC are likely to be at a higher rate than this, and an allowance for 50% (750vpd approx.) has been made for TSRC related movements on Griffiths Street at 2031.

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In planning for the interim arrangement, consideration has been given to the need to achieve this from a safety and operational perspective. AUSTRROADS recommends provision of channelised right turn bays at locations with more than five vehicles turning right from the main carriageway, at locations with traffic volumes at the existing peak hour levels recorded on Griffiths Street (850 – 1,000vph two way, approximately). Available crash records show three rear end crashes and one side swipe crash in the vicinity of the existing property

accesses (all occurred between 2006 and 2010, all requiring medical treatment). Noting that the available road reserve and existing verge profiles limit the ability for turn lanes to the existing properties, it is recommended that property access be restricted to left in/left out in the interim design as well. Consultation is required with affected stakeholders as part of the next stages of design in order to confirm this from a community and stakeholder perspective.

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Mort Street Intersection

It is recommended that Council and TMR proceed with current planning and design being undertaken by GHD for the Mort Street intersection. This involves signalling the intersection, and upgrading the rail level crossing to incorporate its operation into the overall signal operation.

As an alternative to the signalised intersection, Cardno investigated two signalised roundabout options to facilitate U-turn provision for B-Double vehicles. Whilst these had operational benefits from a traffic carrying capacity perspective, the resulting earthwork requirements and concern regarding driver observance/acceptance of a signalised roundabout arrangement led to the recommendation of the signalised intersection.

New England Highway Intersection

Transport modelling and intersection capacity analysis has been undertaken to investigate the future requirements for the New England Highway intersection.

In the interim, with extension of turn lanes on both the north and west approaches to the intersection, it is estimated that the intersection can operate within capacity for around the next 5 years. This is based on assumptions related to TSRC traffic volumes, and other background growth. Should such assumptions prove conservative, the life of the interim upgrade may be longer.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

B-Double Movement

At the commencement of this study, Griffiths Street had B-Double access permitted for access to business in Griffiths Street only. With the introduction of the TSRC, it was recommended to convert this to full access (ie to allow through movements) and upgrade/manage Griffiths Street accordingly.

Review of maps published by TMR on March 7 2017 suggests this change has now been made and Griffiths Street is approved for use by 23m and 25m B-Double vehicles.

Gowrie Creek

The existing Gowrie Creek bridge structure was constructed in the 1980's. Cardno has undertaken a review of the existing structure's structural capacity. Due to incomplete records held by Council regarding the structural detail, this review was not able to be fully completed.

Council has since commissioned a separate review of the structure by Instrada. That review should be referenced for conclusions regarding the existing structure's load capacity and remaining life.

Interim Concept Design and Estimate

A concept design and cost estimate have been prepared for an interim design solution (i.e. pre-opening of the TSRC). Table 1-2 outlines the proposed configuration.

Griffiths Street Recommended Form - Interim

Section	Recommended Form
Mort Street Intersection	Signals – as per GHD Design
Rail Level Crossing	Upgraded level crossing, geometry to suit Mort St intersection requirements
Gowrie Creek Bridge	Existing bridge retained
Creek to Crest	Existing (with minor pavement width/quality improvements) – includes pavement rehabilitation in necessary places, and full pavement overlay. Left in/Left out property access (subject to stakeholder consultation)
Crest to Goombungee Rd	Existing (with minor pavement width/quality improvements) – includes pavement rehabilitation in necessary places, crossfall correction and full pavement overlay. Left in/Left out property access (subject to stakeholder consultation)
Goombungee Road Intersection	Roundabout (unsignalised, single lane form in interim)
Goombungee Rd to NEH	Existing (with minor pavement width/quality improvements) Left in/Left out property access (subject to stakeholder consultation)
NEH Intersection	Minor upgrade to queue storage lengths on turn lanes (north and west)

It is estimated that the design and construction of the Interim form will cost in the order of \$7.3 million, including contingency and cost escalation. This however excludes upgrades to the Mort Street intersection and the Rail Level Crossing, which are part of the Mort Street upgrade works.

It is noted that street lighting to Category V3 provision has been allowed for in the above estimate.

It is understood that the available budget for upgrades to Griffiths Street is \$10.1 million. Taking the above interim design into account, around \$2.4 million would be available for contribution to the Mort Street intersection upgrade.

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1 Introduction

1.1 Context

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Toowoomba Regional Council (TRC) to prepare a planning study to assist in infrastructure planning for Griffiths Street. This study has been triggered by the upcoming provision of the Toowoomba Second Range Crossing (TSRC) which is anticipated to significantly impact travel patterns in the Toowoomba region.

1.2 Project Background

The TSRC is a planned bypass route to the north of Toowoomba, which is to be implemented as an alternative to the Warrego Highway connection which runs through the Toowoomba City Centre. The TSRC will connect to Toowoomba via a new interchange at Mort Street, north of the Mort Street/Hogg Street/Griffiths Street intersection.

It is anticipated that the provision of the TSRC will increase the traffic load on Mort Street as the primary northern connection into Toowoomba, and Griffiths Street which will function as a primary connection to the New England Highway.

The study also assesses the high level impacts on the study area road network, extending between the TSRC to the north and Bridge Street to the south.

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1.3 Objectives

The project objective is to provide a planning study report on the Griffiths Street corridor, between and including Mort Street and the New England Highway, which identifies work needed to upgrade the corridor to carry anticipated future traffic while maintaining the safety of all road users and the surrounding community.

The planning study includes development of concept options and priorities for input into future planning works of both TMR and Council. The study has been undertaken by a multidisciplinary team to ensure that all relevant infrastructure, amenity, cost, project risk and planning implications are appropriately assessed.

1.4 Project Governance

The Griffiths Street Planning Study is overseen by Toowoomba Regional Council (as the commissioning authority) and the Department of Transport and Main Roads (TMR). This is administered via monthly Project Leadership Team meetings involving Council, TMR and Cardno (when invited).

Significant decisions made by the PLT in the direction of this study are noted herein where relevant.

2 Study Methodology

The study methodology and specific tasks have been developed by Cardno and refined in ongoing consultation with Council to ensure that the planning study considers all relevant areas of assessment and can adequately address Council objectives and requirements. The study methodology is outlined in Table 2-1.

Table 2-1 Study Task List

Work Element	Team Tasks
Project start up and Review	<ul style="list-style-type: none"> ▪ Start-up Meeting ▪ Develop Project Management Plan ▪ Obtain updated traffic environmental and planning data from Council ▪ Review previous studies and confirm objectives ▪ Site Inspection
Project Management	<ul style="list-style-type: none"> ▪ Update Delivery program & status reports ▪ Monthly meeting Council ▪ Stakeholder meetings as required ▪ Identify / rank /address issues along Griffiths St ▪ Determine integration with TSRC and other related projects ▪ Identify impacts associated with the identified opportunities and constraints add to risk register
Traffic & Transport	<ul style="list-style-type: none"> ▪ Collection of intersection turning movement volumes (9 key sturdy intersections) ▪ Review historic crash data (as per HIG report) ▪ Identify public transport and active transport requirements ▪ Consult with Queensland Rail re train frequencies and timing requirements for the traffic model ▪ Undertake Road Safety Review ▪ Obtain CUBE strategic model data from Council ▪ Develop local network AM and PM peak hour model using SATURN for 2016 (calibrated against counts) and 2031 for 2 network options. Model area bounded by and including Ruthven St, Bridge St, Mort Street, TSRC) ▪ Develop Paramics microsimulation model for AM and PM peak hours at Mort Street/Griffiths Street intersection (including level crossing) for 2016 (calibrated to counts and queue length observations) and 2031 for two network options ▪ Identify daily and peak hour volumes on Griffiths Street and at intersections with Mort Street and Old Goombungee Road ▪ Provide options analysis and recommend mid-block cross section for a staged upgrade of Griffiths Street ▪ Provide options analysis and recommend intersection form at the Mort Street/Hog Street/Griffiths Street intersection (including level crossing) at 2031 (based on microsimulation modelling). ▪ Provide options analysis and recommend intersection form at the Goombungee Road/Griffiths Street intersection at 2031 for 2 network options (analysed using SIDRA). ▪ Document significant findings from the investigations
Environment	<ul style="list-style-type: none"> ▪ A desktop and limited field assessment the environmental aspects applicable to the project ▪ Identification of the environmental features of the site and adjacent area ▪ Identification of potential environmental impacts and opportunities associated with the concept design ▪ Identification additional studies required to support detailed design and construction and/or to support required approval processes.
Planning	<p>Assessment of current and future land use patterns for land holdings adjacent the Griffiths Street corridor with particular reference to:</p> <ul style="list-style-type: none"> ▪ Working knowledge of current site-specific and master-planned developments adjacent the corridor;

Work Element	Team Tasks
	<ul style="list-style-type: none"> State and Local Government land use planning regulations and planning instruments including associated mapping; and Consultation with relevant State Agencies e.g. Department of Infrastructure, Local Government and Planning and; Toowoomba Regional Council's Strategic Planning Branch.
Public Utility Plant and street lighting	<ul style="list-style-type: none"> PUP – obtain updated Dial Before You Dig (DBYD) information Insert DBYD into CAD to assist with constraints mapping Develop PUP Strategy & identify areas for adjusted / relocated assets Indicative street lighting design for costing purposes
Structures	<ul style="list-style-type: none"> Obtain bridge design details from Council and TMR Calculate a theoretical load capacity of the existing structure
Flooding & Drainage	<ul style="list-style-type: none"> Review flooding model provided by Council Refine the models to ensure representation of the existing drainage characteristics are suitably represented. Provide existing flood inundation extents and bridge/road immunity for the full range of flood events to inform the bridge design Assess the impacts on flooding resulting from improving the immunity of the bridge and approaches
Road Design	<ul style="list-style-type: none"> Review and agree design assumptions and standards with Council and TMR Setup base mapping and CAD standards Establish Design Standards Confirm form and function of corridor Review horizontal and vertical geometry of current alignment Update opportunities risk and constraints mapping in GIS layers for all design constraints Review local flooding and geology impacts Consider typical cross-sections
Develop Options	<ul style="list-style-type: none"> Brainstorm options in meeting with Council Develop conceptual 2D sketches of options Select the Base Case and 2 other options for development in Options workshop Assess impacts and opportunities for each of the options Comparative cost estimate for each option
MCA Workshop	<ul style="list-style-type: none"> MCA Workshop to select Preferred Option Option Report
Refinement and Concept Design	<ul style="list-style-type: none"> Refine SIDRA assessment to suit concept design Undertake 3D design with concept plans, long section and cross sections produced in 12d Value Engineering workshop Identify & document construction staging Identify any additional land requirements Category 3 cost estimate Basis of Estimate
Reporting	<ul style="list-style-type: none"> Prioritised list of works for long term funding plans (draft & final) Planning Study Report (draft and final)

3 Background Information Review

3.1 Toowoomba Second Range Crossing Overview

The current major road network provides connection to and around Toowoomba via the Warrego Highway and Gore Highway. The existing road network facilitates travel to and through Toowoomba via links running through the Toowoomba City Centre.

The TSRC will bypass the city centre and provides a northern connection between the eastern and western sections of the Warrego Highway with continuation to the Gore Highway to the west of Toowoomba.

This link will provide commercial vehicles with an alternative crossing of the Toowoomba Range to improve freight efficiency and driver safety, relieve pressure on roads in Toowoomba and the Lockyer Valley, and enhance liveability for the region's residents.

The TSRC will form part of the National Land Transport Network and is due to be completed and be operational by late 2018.

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3.3 GHD Investigations of Mort Street

Toowoomba City Council has also engaged GHD to undertake a study for the Mort Street corridor. This report considers the GHD signalised layout at the Griffiths Street/Hogg Street/Mort Street intersection. The proposed intersection form is included at Appendix A.

3.4 B-Double Routes

The study area includes a number of B-Double routes. 23m and 25m B-Doubles are permitted on New England Highway (Ruthven Street), Griffiths Street and Mort Street.

At the commencement of this study, Griffiths Street had B-Double access permitted for access to business in Griffiths Street only. With the introduction of the TSRC, it was recommended to convert this to full access (ie to allow through movements) and upgrade/manage Griffiths Street accordingly.

Review of maps published by TMR on March 7 2017 suggests this change has now been made and Griffiths Street is approved for use by 23m and 25m B-Double vehicles.

The existing B-Double routes in Toowoomba, as of 14 June 2016, are illustrated on the “Multi-combination Routes in Queensland” map produced by the Queensland Government. This map has been included for reference at Appendix B. Additionally, the current map (showing Griffiths Street for unrestricted B-double use) is uncluded.

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4 Constraints Analysis

4.1 Survey

The survey data was collected in August 2016 and is in MGA Zone 56 coordinates. Comparison of the details in this file to the current images show that the information was reasonably accurate. A full topographical survey will be required to progress this design.

4.2 Rail Line

Griffiths Street crosses the existing rail line approximately 40m east of the intersection with Mort Street. This at-grade level crossing is under boom gate control, with a single lane in each direction of travel.

Figure 4-1 Shows a schematic of the Western System rail line, which is crossed by Griffiths Street at the subject site. As can be seen, the Western System (magenta) and the Qld Rail Western System (light blue) lines rely on this section of line for connection to and from the south and east. It is noted that the South Western System adjoins the network in the Toowoomba CBD, and that trains between that line and Brisbane do not use the section of rail line at Griffiths Street.

Figure 4-1 Existing Rail Network



Source: Queensland Competition Authority website.

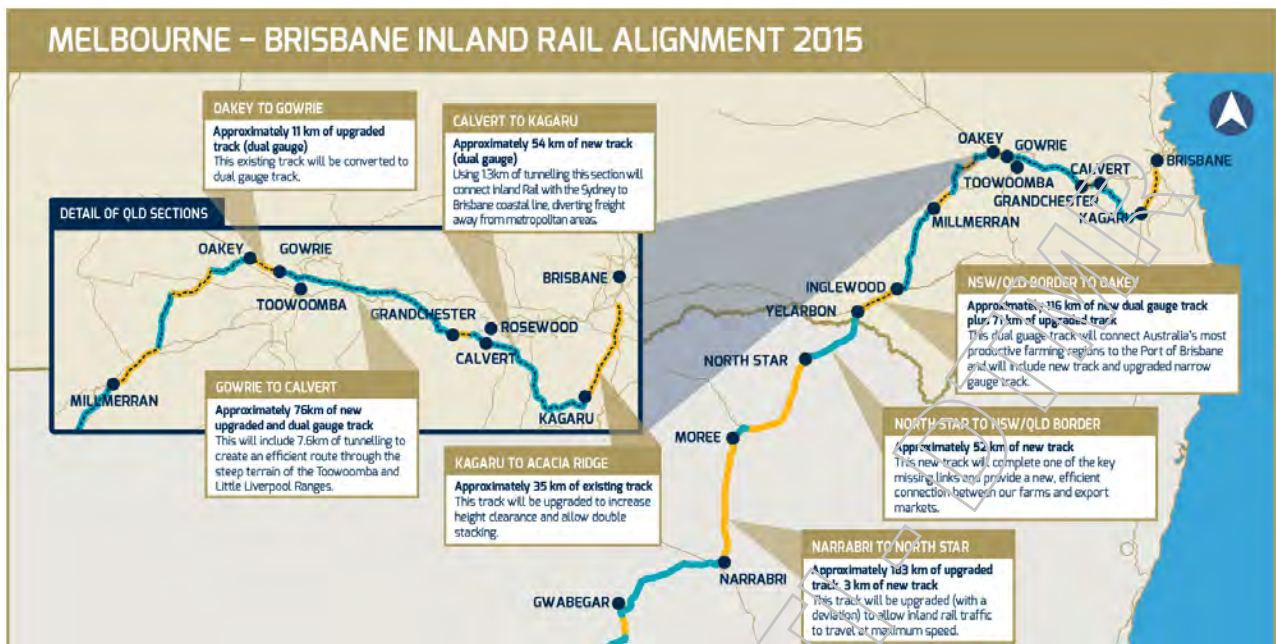
Discussions with Queensland Rail (QR) show that use of the Western System currently comprise 20-30 rail movements per day, with one movement scheduled in each of the peak periods. Daily variations may occur as trains run late or with seasonal variation to services. The traffic video surveys taken as part of this study indicate two to three movements in the peak periods.

It is noted that future plans exist for an Inland Rail network. The "Inland Rail Information Sheet" published by the Australian Government in 2015 states that:

"Inland Rail will provide a direct, high performance freight rail corridor between Melbourne and Brisbane and connect south-east Queensland by rail with Adelaide and Perth. Its construction over ten years will have flow on benefits for local industries and regional communities, create thousands of jobs and provide infrastructure that will serve Australia for the next century and beyond"

Figure 4-2 shows the proposed alignment in the vicinity of Toowoomba.

Figure 4-2 Inland Rail Alignment



Source: Inland Rail Information Sheet, Australian Government, 2015

When constructed, it is likely that Inland Rail would result in less use of the subject section of rail line at Griffiths Street. However, given the uncertainty of timing, form and actual use, the existing usage of the existing line will be assumed to continue in this assessment.

Response from QR confirms that the observed rail movements are reasonably representative of the typical weekday operation and the anticipated 2031 design year movements including anticipated future growth.

The duration of boom gate closures varies depending on the train length and type. The traffic surveys recorded closure times ranging from just over one minute to over three minutes. The traffic model representation of the existing and future year movements is detailed in the "Traffic Modelling and Analysis Report".

4.3 Public Utility Plant

A Dial Before You Dig (DBYD) search was conducted along Griffiths Street, and the Mort Street intersection (Refer to Appendix C). A brief summary of the infrastructure identified on the DBYD search includes but is not limited to:

- Water
 - From Hogg St, crosses Mort St and continues along the majority of the south side of Griffith St and crosses to the north side between chainage 1000 to 1050, continues to Old Goombungee Road and crosses towards Dwyer Street; and
 - Runs along the north side of Griffith St from approximately chainage 325, crosses to the south side between chainage 900 to 950, crosses back to the north side between chainage 1000 to 1050, continues to Old Goombungee Road and crosses towards Dwyer Street;
 - Runs along the north side of Griffith St from approximately chainage 360 to Old Goombungee Road;
 - Crosses Griffiths St at chainage 1110;
 - On the north side of Griffiths St from Doyle St to New England Highway; and
 - North through the New England Highway intersection.
- Stormwater
 - From Hogg St, crosses Mort St and continues along the majority of the south side of Griffiths St heading towards Eagle St on the eastern side of the rail line;
 - From Doyle St to New England Highway along the north side of Griffiths St
- Sewer

- From the south side of Hogg St, crosses Mort St, then crosses Griffiths St to the north side, then crosses the rail line and continues along the northern side of Griffiths St until it diverts through “Lattice Designs” property at 103 Griffiths St
- Cross Griffiths St on the south west side of the Goombungee Rd intersection.
- Gas
 - Along the eastern side of Mort St
 - Along the entire length of Griffiths St on the southern side from Mort St to Goombungee Rd
 - Along the western side of Goombungee Rd to the southern side of Griffiths St;
 - On the north side of Griffiths St from Doyle St to New England Highway.
- Electrical
 - There is a combination of high voltage and low voltage electrical along the entire length of all of the roads within the study area.
- NBN
 - On the north side of Griffiths St from Doyle St to New England Highway; and
 - Along the south side Griffiths St from approximate chainage 550 to 1150, crossing north to the east side of Goombungee Rd
 - Along the eastern side of the Goombungee intersection.
- Optus
 - There were no Optus assets identified in the study area from Mort St to Goombungee Rd.
- Telstra
 - Along the southern side of Hogg St
 - Along the north eastern side of Mort St, then crosses Griffiths St and the rail line diagonally to the south west
 - Along the northern side of Griffiths St from chainage 310 to 750, and then crosses to the southern side;
 - Along the southern side of Griffiths St from chainage 550 to the approximately 1150, then crossing at the eastern side of Goombungee Rd towards Dwyer St; and
 - On the north side of Griffiths St from Doyle St to New England Highway.

4.4 Environment and Heritage

This section summarises the results of a high level review of the major local government planning scheme considerations and the mapped State development assessment interests affecting the route alignment and options for the Griffiths Street corridor study (‘the corridor’). The source for the information summarised herein is:

- Toowoomba Regional Planning Scheme 2012
(<https://maps.toowoombarc.qld.gov.au/flex/PlanningScheme/>)
- Department of Infrastructure, Local Government and Planning (DILGP) State Assessment and Referral Agency (SARA) ‘DA mapping system’
(<http://dams.dsdip.esriaustraliaonline.com.au/damappingsystem/>)
- DILGP State Planning Policy (SPP) ‘DA mapping system’
(<http://spp.dsdip.esriaustraliaonline.com.au/geoviewer/map/da>).

4.4.1 Land Use Planning Context

Griffiths Street is in the locality of Harlaxton in the northern suburbs of the city of Toowoomba, in the Toowoomba Regional Council (TRC) local government area. The Toowoomba Second Range Crossing and bypass will be constructed on an alignment that runs approximately one kilometre to the north of Griffiths Street.

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Hence the area of interest for the purposes of this report is the land broadly between the second range crossing and the CBD, and between Mort Street and Ruthven Street. This report does not address the second range crossing alignment itself.

Griffiths Street runs between Ruthven Street (New England Highway) in the east and Mort Street in the west, with the road alignment extending west of Mort Street as Hogg Street. Ruthven Street crosses the Main Line

railway (Brisbane – Toowoomba) just south of the Griffiths Street intersection, with the railway paralleling Griffiths Street for a short distance at the eastern end of the street. Griffiths Street crosses the Western Line railway at grade, just south of Willowburn Station and east of its intersection with Mort Street. Just east of this point it also bridges Gowrie Creek.

The Willowburn railway marshalling yards serving the Western line is located to the south of Griffiths Street. Other significant features in the vicinity of Griffiths Street include the Baillie Henderson Hospital to the north-west, the JJ Richards waste management facility on the south side of Griffiths Street, Downlands College on Ruthven Street to the south-east and the former KR Darling Downs bacon factory on Mort Street to the north (now vacant but still zoned 'High impact industry').

4.4.2 Regulatory considerations

The planning scheme zoning and overlay categorisations have implications for individual development proposals for land in the study area under the *Sustainable Planning Act 2009* ('SPA') and the planning scheme. However, under the *Sustainable Planning Regulation 2009* (SP Reg) Schedule 4, Table 5, item 7, all aspects of development for State roads cannot be regulated by a local government planning scheme.

Local government roads are not mentioned in the SP Reg except in the particular case of works on a road that forms part of a route used for a public passenger service. The SARA DA mapping does not identify any roads as road used for a public passenger service in the area between the second range crossing and the Toowoomba CBD (although it does show the alignment of a 'Future public passenger transport corridor' between Weale Street and Hermitage Road, in the vicinity of but on a different alignment to the second range crossing).

The TRC planning scheme establishes that (except in particular circumstances that are unlikely to apply to the corridor project), operational work for local government roadworks is exempt development under the planning scheme (Table 5.8:1 of the planning scheme).

4.4.3 Planning Scheme Zoning and Overlays

Development of land in the area of interest for this project is primarily regulated by the Toowoomba Regional Planning Scheme 2012 ('the planning scheme').

As noted above, the land adjoining Griffiths Street to the north is predominantly rural land included in the 'Emerging community zone' for future urban residential development under the planning scheme, with land to the south predominantly included in the 'Medium impact industry zone' and developed and used for those purposes. Extracts from the planning scheme zoning and overlay maps, as well as the Strategic Framework map which provides a graphical expression of the high-level land use planning strategy for the area, are reproduced at Appendix D. For this matter, the Strategic Framework map does not add anything not otherwise communicated by the zoning and overlay maps.

In addition to the local government planning schemes, development is also potentially subject to referral to the State government for assessment against the State Development Assessment Provisions (SDAP). The SARA development assessment (DA) mapping system assists to determine whether land is in a location or contains attributes that trigger referral. The SARA DA mapping is reproduced in Appendix D.

Further, until the State Planning Policy (SPP) is determined to be appropriately incorporated into a local government planning scheme, the interim development assessment provisions of Part E of the SPP apply to development. This remains the case in the TRC area. The SPP DA mapping system assists to determine whether land is in a location or contains attributes that trigger assessment against Part E of the SPP. The SPP DA mapping is reproduced in Appendix D.

The following sections of this report deal with the planning scheme.

4.4.3.1 Zoning

The land adjoining Griffiths Street to the north is predominantly rural land included in the 'Emerging community zone' for future urban residential development under the Toowoomba Regional Planning Scheme 2012 ('the planning scheme'), with land to the south predominantly included in the 'Medium impact industry zone' and developed and used for those purposes.

Land at the eastern end of Griffiths Street comprises predominantly low density residential development with a hard rock quarry further to the east, and a rifle range beyond the quarry. Land across Mort Street at the western end of Griffiths Street (other than the previously noted hospital) comprises predominantly residential development at a range of densities.

Further afield, land to the north is zoned for a mixture of residential, rural residential and rural purposes, as well as road and railway purposes. Land to the south between Mort Street and Ruthven Street is predominantly zoned and developed for industrial and railway purposes through to North Street, with a mixture of light industry and residential zoning and development taking over south of there to Bridge Street, and fringe commercial and railway uses predominating from Bridge Street to the CBD. In this area the Toowoomba Railway Parklands Priority Development Area ('PDA') development scheme was declared by the State government, to develop as an active, high quality mixed density urban village adjoining the Toowoomba CBD core area. The zoning map extract in Attachment 1 shows the location of the PDA at the foot of the image.

4.4.4 Overlays

The following material summarises the main elements of the planning scheme overlays applying to land in the area of interest. The following notes should be read in conjunction with the overlay map extract in Appendix D.

4.4.4.1 Griffiths Street and Immediate Environs

The overlays directly affecting Griffiths Street and its immediate environs are:

- the Ecological Significance Overlay, with Gowrie Creek mapped in the 'Waterways and Wetlands Buffer' categories. The 'Waterways and Wetlands Buffer' category extends a small distance north of Griffiths Street and south to the CBD and beyond.
 - The purpose of the Environmental Significance Overlay Code is *"to avoid or minimise the impacts of development on the biodiversity values of ecosystems, ecological processes, areas of ecological significance and biodiversity corridors and on the ecological, hydrological and water quality values of natural waterways and wetlands"* (section 8.5.1 of the planning scheme).
 - The purpose is to be achieved through overall outcomes which are as follows:
 - "(a) impacts on biodiversity values of ecosystems, areas of ecological significance and biodiversity corridors are avoided, or where they cannot be avoided impacts are minimised and impacts on biodiversity values are offset consistent with the Queensland Government Environmental Offsets Policy and other applicable biodiversity/environmental offsets policies;*
 - (b) ecological processes and the ecosystem services provided by areas of ecological significance are maintained;*
 - (c) habitat areas are connected by viable biodiversity corridors;*
 - (d) degraded ecosystems, habitats and corridors are restored;*
 - (e) ecological values and processes of waterways and wetlands are protected;*
 - (f) the hydrological regime of wetlands and waterways is protected and rehabilitated to its natural state; and*
 - (g) water quality is maintained or improved."*
 - While the Environmental Significance Overlay Code would, technically, not apply to the project (as is summarised above under the heading **Regulatory considerations**), compliance with the code would entail keeping works outside the mapped waterway and buffer and avoiding changes to (or re-establishing) the naturally occurring hydrological regime.
- The Flood Hazard Overlay Code, with Gowrie Creek mapped in the 'High Flood Hazard' category. This category extends north and south along the length of Gowrie Creek, but its lateral extent is not substantial.
 - The purpose of the Flood Hazard Overlay Code is *"to ensure development in identified flood hazard areas protects the safety of people and property and does not adversely affect floodplain functions"* (section 8.2.3 of the planning scheme).
 - The purpose of the code will be achieved through the following overall outcomes:
 - "(a) development provides acceptable levels of safety for people and property; and*
 - (b) the adverse impacts of flooding are not increased within or external to a development site."*

- The code seeks to keep development out of identified High Hazard areas and to avoid works diminishing the flood storage and conveyance capacity of the floodplain.

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4.4.4.2 Griffiths Street Wider Environs

Other overlay mapping of note in the vicinity of Griffiths Street includes:

- Heritage Place Overlay (Heritage Place category) over the Baillie Henderson Hospital grounds, to the north-west, and over various sites on the eastern side of Ruthven Street in the vicinity of the eastern end of Griffiths Street;
- Landslide Hazard Overlay (High Risk category) and Bushfire Hazard Overlay (Medium Fire Risk) over areas of land running along Mort Street and Gowrie Creek to the south-west;
- Airport Environs Overlay (land within Obstacle Limitation Surface (OLS) Extent; 8km Bird and Bat Strike Zone; and 6km Dangerous Light Boundary) for the Toowoomba Airport (NB: These overlay categories affect all land in the area of interest and do not represent a significant issue for road corridor planning purposes).
- Various categories of the Environmental Significance Overlay, Bushfire Hazard Overlay, Landslide Hazard Overlay and Extractive Resources Overlay over various sites on the eastern side of Ruthven Street to the east of Griffiths Street.

4.4.4.3 Southwards to Toowoomba CBD

South of the Griffiths Street environs, there are no significant overlay features affecting the area of interest (other than the flooding and waterway buffer overlays along Gowrie Creek and two areas of Heritage Overlay over Downlands College on Ruthven Street and the Toowoomba Maltings Malthouse on Mort Street) until Jellicoe Street, North Toowoomba, at which point the Neighbourhood Character Overlay commences and extends southwards to the CBD (together with various other Heritage Overlay sites).

- The purpose of the Heritage Overlay Code is “to conserve and enhance heritage places, those elements that contribute to the place’s significance and ensure that development on or adjoining a heritage place (as identified in Planning Scheme Policy No. 6 - Heritage Places) protects its cultural heritage significance” (section 8.3.1 of the planning scheme).
 - The purpose is to be achieved through overall outcomes which are as follows:
 - “(a) development does not result in the demolition or removal of the heritage place as identified in the Heritage Overlay Maps Planning Scheme Policy (PSP) No. 6 - Heritage Places
 - (b) development retains and does not detract from the materials or setting of the heritage place identified in Schedule 6 PSP No. 6 - Heritage Places
 - (c) development is compatible with the cultural heritage significance of the place as identified in Schedule 6 PSP No. 6 - Heritage Places
 - (d) the adaptive reuse of buildings is encouraged so that the heritage values are retained.”
 - Of note for this project, the performance criteria supporting the overall outcomes include performance outcome PO6 and acceptable outcomes AO6.1 and AO6.2, as follows:
 - “PO6 Elements within the road reserve that make a positive contribution to the setting of the heritage place are retained.
 - In partial compliance with the performance outcome:
 - > AO6.1 Existing bluestone kerbing and channelling is retained.
 - > AO6.2 Existing street trees and street furniture are retained and are not adversely affected.”
- The purpose of the Neighbourhood Character Overlay Code is “conserve and enhance buildings and streetscapes which contribute to the character of the local area and to ensure new development is sympathetic to the nature and character of those areas” (section 8.3.2 of the planning scheme).
 - The purpose is to be achieved through the following overall outcomes:
 - *“(a) buildings and features which contribute to the local streetscape are retained*
 - *“(b) other characteristics which contribute to the local character are protected*
 - *“(c) the character, appearance, location, height and bulk of new development is compatible with those aspects of existing premises on the site or in the local streetscape*
 - *“(d) extensions or modifications to existing buildings do not detract from the particular character values of the premises or the local streetscape”*
 - Again of note for this project, the performance criteria supporting the overall outcomes include performance outcome PO8 and acceptable outcomes AO8.1 and AO8.2, as follows:
 - > *“AO8 Elements within the road reserve that make a positive contribution to the local streetscape are retained.*
 - > *In partial compliance with the performance outcome:*

- > AO8.1 Existing bluestone kerbing and channelling is retained.
- > AO8.2 Existing street trees and street furniture are retained and are not adversely affected.”
- The Heritage Overlay Code and the Neighbourhood Character Overlay are supported by Planning Scheme Policies (PSP) No.6 – Heritage Places and No.7 – Neighbourhood Character Places. PSP No.6 includes a table that identifies local heritage places and State heritage places. PSP No.7 contains a similar but much larger list of neighbourhood character places. As a starting position, in advance of heritage and/or character impact assessment, it should be assumed that the buildings, fencing, landscaping and other improvements, and the adjoining street frontage treatment (footpaths, trees, street furniture and kerbing) of these properties, should not be damaged or modified by project works.
- The heritage properties of potential relevance are the following:
 - Baillie Henderson Hospital, 1-59 Hogg Street, Cranley
 - 254-272 Ruthven Street/New England Highway, Harlaxton
 - Downlands College, 64-72 Ruthven Street, Harlaxton (State and local heritage place)
 - The Toowoomba Maltings site, 11 Mort Street, Newtown (State and local heritage place)
 - 2-14 Fanny Street (corner of West Street), Newtown
 - Various properties on both sides of Bridge Street, between West Street and Ruthven Street
 - Various properties on both sides of Norwood, Campbell, Taylor and Russell Streets, between West Street and Mort Street
 - Western side of Ruthven Street, between Bridge Street and Chalk Street.
- The neighbourhood character places of relevance occupy the following areas:
 - Effectively, all properties in the area bounded by West Street, Mort Street and Russell Street, including both sides of West Street
 - All properties on the eastern side of Ruthven Street, adjoining and south of the intersection of Ruthven Street and Jellicoe Street, south to Delacey Street.

4.4.5 Toowoomba Railway Parklands Priority Development Area ('PDA')

The Toowoomba Railway Parklands Priority Development Area ('PDA') was declared on 12 December 2014 at the request of Toowoomba Regional Council. The PDA covers land centred on and around the Toowoomba Railyards which extends north to Bridge Street and south to Russell Street, and is bounded by Mort Street to the west and Ruthven - Neil Streets to the east. The PDA surrounds a central parkland on an operational railyard site and Gowrie Creek, surrounded by a mixture of commercial, industrial, retail and residential land uses. It also incorporates a number of places of state and local heritage significance, as noted above. The PDA is planned to develop as an active, high quality mixed density urban village adjoining the Toowoomba CBD core area. The draft development scheme for the PDA is understood to be undergoing review by the State government prior to taking effect.

The structure plan below is reproduced from the draft development scheme. The structure plan identifies the fringing streets of Ruthven Street and Russell Street, as well as parts of Campbell Street, Chalk Drive and Mort Street as 'Activity Streets'. Activity Streets are described in section 3.4 of the draft development scheme as "*streets where development activates the street at ground floor level through land uses and building design that create activity in the street*". While this is not necessarily incompatible with a through traffic function, it appears that the street environment is intended to be conducive to relatively slow moving local traffic movements supporting adjoining commercial, community, cultural and related activities.

Map 4: Structural elements plan



Legend

— PDA boundary

Compact mixed land use

Low to medium density residential

Cultural hub

City frame

Main street

Activity Streets

Urban parkland network

Central parkland

Local park

Community use

Central parklands gateway

Place making

Gowrie Creek

East Creek

Integrated movement network

Outer Circulating Road

Primary access road

Secondary access road
(Internal circulation roads)

Proposed pedestrian / cycle link

Principal cycle network

Railway line and safety edges

Key crossing

Bridge Street and the majority of Mort Street are identified as 'Primary access roads'. Primary access roads are described in section 3.4.4 of the draft development scheme as "roads that provide high level connections to the PDA from the surrounding road network. These roads are in place and no new primary access roads are proposed". While this appears to suggest compatibility with a though traffic function, the draft development scheme also seeks to "preserve and enhance the tree lined streetscape of Mort Street through streetscape works, built form setbacks and the preservation of significant landscape trees" (Section 3.6.4, Preferred outcome c for Precinct 4 – Mort Street).

4.4.6 State Planning Interests

4.4.6.1 State Assessment & Referral Agency Development Assessment (SARA DA) Mapping

The SARA DA mapping is reproduced at **Attachment 2**. The following State interests for development assessment are mapped in the vicinity of the area of interest:

- Regional Plan:
 - South East Queensland Regional Plan 2009 – 2031 Urban Footprint
- Priority development areas:
 - Toowoomba Railway Parklands Priority Development Area (addressed above)
- Fish habitat areas:
 - Queensland waterways for waterway barrier works: Level 2 Moderate waterway (Gowrie Creek) and Level 1 Low waterway tributaries of Gowrie Creek
- Water resources:
 - Water resource planning area boundary
 - Great Artesian water resource plan area
- Future public passenger transport corridor
- Vegetation management regional ecosystem and remnant map:
 - Category A or B area containing endangered regional ecosystems
 - Category A or B area containing of concern regional ecosystems
 - Category A or B area that is a least concern regional ecosystem
 - Non remnant vegetation;
- State controlled roads:
 - State controlled roads (Ruthven Street/New England Highway)
 - Area within 25m of State controlled roads
 - Limited access roads
 - Future State controlled roads (second range crossing)
 - Future State controlled transport tunnel
 - Area within 50m of a future State controlled transport tunnel;
- Railway:
 - Railway
 - Area within 25m of existing railway
- Heritage:
 - Queensland Heritage places (addressed above with planning scheme)
- Electricity infrastructure:
 - Ergon electricity substation (corner of Ruthven Street and North Street)
 - Ergon electricity substation 100m buffer.

Except as addressed separately elsewhere in this report (e.g. with regard to heritage considerations and the PDA), based on our understanding of the mapped distribution of the above factors (as shown in Appendix D) and the corresponding codes in the State Development Assessment Provisions (SDAP), the above factors are not likely to have a significant influence on the selection or high level conceptual design of the corridor.

4.4.6.2 State Planning Policy (SPP) DA Mapping

The SPP DA mapping is reproduced at Appendix D. As noted earlier in this report, Part E of the SPP remains relevant to development assessment in the TRC area. The following SPP State interests are mapped in the vicinity of the area of interest:

- Biodiversity
 - Matters of State Environmental Significance (MSES) - Regulated vegetation
 - MSES - Regulated vegetation (intersecting a watercourse) (Gowrie Creek)
- Water quality
 - Climatic regions - stormwater management design objectives
- Natural hazards risk and resilience
 - Flood hazard area - Level 1 - Local government flood mapping area
 - Bushfire hazard area (Very High, High and Medium Potential Bushfire Intensity and Potential Impact Buffer)

- Strategic airport and aviation facilities
 - 6km lighting area buffer
 - Zone C and D light restriction zone
 - 8km wildlife hazard buffer zone
 - Obstacle limitation surface contours
- Resources (extractive)
 - Key Resource Area - Resource/processing area, Separation area, Transport route and Transport route separation area
- Emissions and hazardous activities
 - Hazard Management Area.

Again, based on our understanding of the mapped distribution of the above factors (as shown in Appendix D) and the corresponding provisions of Part E of the SPP, the above factors are not likely to have a significant influence on the selection or high level conceptual design of the corridor.

4.4.7 Preliminary Land Use Planning Considerations

Broadly, the local government planning scheme zoning and overlay categorisations reflect the existing scale, nature and distribution of land uses, infrastructure and natural features in the study area and its surrounds.

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4.4.8 Heritage Value of Existing Structures

In considering options for the upgrade of the existing New England Highway/Griffiths Street intersection, the potential that aspects of the existing bridge crossings over the rail line (immediately south of Griffiths Street) may be on a relevant heritage register.

TMR has investigated this in detail and has confirmed that there are no relevant heritage restrictions registered.

4.5 Gowrie Creek Bridge Structure

4.5.1 Structural Capacity Review

The below structural capacity review considers the following:

- available design information
- design vehicle
- braking loads
- barrier loads
- design for fatigue
- durability requirements
- shear reinforcement
- design review.

4.5.2 Design Vehicle

The bridge is assumed to have been designed for two lanes of T44 truck loading in accordance with NAASRA (1976). NAASRA also has provision for a standard Abnormal Vehicle loading to be applied if required by the road authority. However, after considering the road grades either side of the bridge, it is believed unlikely that such a heavy vehicle loading would have been considered in the design of this bridge.

Griffiths Street is an existing B-Double route, specifically for access to nearby industrial sites. Following the opening of the Toowoomba Second Range Crossing, it is expected that its role in carrying heavy vehicles will increase. Accordingly, the bridge has also been reviewed for two HML B-Double vehicles as nominated by the Department of Transport and Main Roads (TMR).

Finally, the bridge has been reviewed for the current M1600 design vehicle loading specified by AS5100. The AS5100 also has provision for a Heavy Platform Load. For the same reasons as listed above, the Heavy Platform Load is not considered relevant at this location.

4.5.3 Braking Loads

NAASRA specifies a braking load equal to 10% of the T44 lane loading, including the concentrated load for moment, within the range 70kN to 270kN. For the Gowrie Creek bridge the minimum braking load of 70kN per lane (140kN total for the bridge) governs.

AS5100 requires 45% of a M1600 vehicle load over the length under consideration within the range 200kN to 720kN. For the 11m bridge span, 2 x 360kN axle groups can fit onto the bridge. Hence design braking load would be 354kN for a single lane. For multiple lane braking, the design braking load is 212kN. Hence the design braking load is 354kN acting over the width of the bridge.

Based on the assumed design being in accordance with NAASRA, the bridge is not expected to be capable to accommodate the higher braking load requirements of a M1600 vehicle in accordance with AS5100.

4.5.4 Barrier Loads

NAASRA Clause 2.6.1 requires that kerbs be able to withstand a lateral load of 7.5kN per metre applied at the top of the kerb whilst Clause 2.6.3 requires that for traffic barriers, both rail and post members be designed for transverse load of 45kN.

AS5100 Part 1 Clause 10 nominates a regular performance level barrier as being applicable for a new bridge in this current location. AS5100 Part 2 requires such a barrier to be designed for an ultimate load of 250kN acting transversely outward at 800mm above the road surface.

It is noted that AS5100.1 Clause 10.5 leaves it to the discretion of the relevant authority to determine whether it would be necessary or appropriate to require the existing traffic barriers to be upgraded. However, since it is unlikely that the existing deck has not been designed for such a significant lateral load, it would be impractical to substantially upgrade the barrier capacity with the bridge deck in its present form.

Based on the assumed design being in accordance with NAASRA, the bridge is not expected to be capable to accommodate the barrier load requirements in accordance with AS5100.

4.5.5 Design for Fatigue

NAASRA Clause 6.3.6 "*Repetitive Loads (Fatigue)*" states that fatigue need only be considered where tendons are unbonded if the bridge design specification is otherwise satisfied, particularly in regard to maximum flexural stress and minimum reinforcement.

As the bridge design specification is satisfied in regard to maximum flexural stress and minimum shear reinforcement, and the tendons are fully bonded, design for fatigue is deemed to be satisfied under the NAASRA provisions.

4.5.6 Stream Loading

NAASRA Clause 2.9 "*Forces due to Stream Flow*" provides for lateral loads from stream flow pressure, debris and log impact on piers only and does not require loads be applied to the superstructure. It is noted that whilst the original 100-year design flood level of RL 556.62 (used in the 1989 bridge design) lies 260mm above the superstructure soffit, it is suspected that the existing structure was not designed for lateral loads from water flow.

AS5100 part 2 Clause 15 "*Forces resulting from water flows*" specifies the forces on piers and superstructures due to water flow and forces on piers and superstructures resulting from debris and log impact.

It is noted that the 100-year flood level, obtained from the recent flood study prepared by AECOM for Toowoomba Regional Council, is some 0.9m above the top surface of the deck units and stream flow is of the order of 4.6 metres per second. Hence AS5100 applies significant lateral loads to the bridge deck that would have unlikely been accounted for in the original design.

It is likely that the lateral loads from stream flow pressure, debris and log impact have not been included in the original design. Design flood levels have increased in height since the original design, with the bridge superstructure now expected to be fully submerged during events greater than and including the 1 in 20 year ARI. Consequently, there is increased risk going forward for potential bridge failure under stream loadings.

4.5.7 Durability Requirements

NAASRA Section 5 "*Reinforced concrete design*" and Section 6 "*Prestressed concrete design*" provide a number of requirements regarding materials, characteristic concrete strength, concrete cover to reinforcement and crack control. When these requirements are fulfilled, the durability requirements for reinforced and prestressed concrete are satisfied.

NAASRA specifies a maximum characteristic concrete strength of 30MPa for reinforced members and a minimum characteristic strength of 35MPa for pre-tensioned members. With 30MPa concrete nominated for abutments and 45MPa concrete specified for deck units, this requirement should be satisfied.

NAASRA specifies a minimum concrete cover to reinforcement of 30mm (45mm where cast against ground) for reinforced members and a minimum cover of 30mm for pre-tensioned members. With 50mm concrete cover nominated for abutments and 30mm cover specified for deck units, this requirement is satisfied.

NAASRA Section 5 specifies maximum allowable stressed for concrete in compression and steel in tension, with additional requirements for crack control provided in Clause 5.9.2. Section 6 limits tensile stresses in concrete to not more than the characteristic flexural tensile strength of the concrete.

AS5100 Part 1 Clause 6.2 "*Design life*" specifies the design life of structures designed in accordance with the code to be 100 years.

For concrete structures, AS5100 specifies Exposure Classification A for all bridge components except surfaces in contact with the ground which are Category B1. Hence reinforced elements (abutments) require a minimum concrete characteristic strength of 32MPa and minimum concrete cover of 45mm whilst the prestressed concrete deck units require a minimum concrete characteristic strength of 25MPa and a minimum concrete cover of 25mm.

The NAASRA Bridge Design Specification drawings indicates that for reinforced concrete, 30MPa concrete with 50mm cover has been specified and for prestressed concrete members, 45MPa concrete with 30mm cover has been specified. **Hence the concrete components of the Griffiths Street Bridge would likely satisfy the AS5100 requirements for durability.**

However, it should be noted that TMR generally require a minimum Exposure Classification B2 be applied to all concrete members of new bridges under their control. This would require 40MPa concrete with 55mm cover for the abutments and 40MPa concrete with 45mm cover for the deck units. **As such, the bridge does not satisfy the current TMR durability requirements and this may become an issue for Council should control of the current Gowrie Creek Bridge ultimately be transferred to TMR.**

4.5.8 Shear Reinforcement

NAASRA Clause 6.6.5.3 (e) (iii) requires a minimum shear reinforcement $A_v \geq 0.5b_w.s/f_{sy}$ except in those regions of a member where the ultimate shear force is less than $0.5V_{uc}$ where V_{uc} is the ultimate shear force carried by the concrete. NAASRA therefore allows the provision of no or partial shear reinforcement in the bridge deck.

AS5100.5 Clause 8.2.8 "*Minimum Shear reinforcement*" requires a minimum shear reinforcement $A_{sv} \geq 0.35b_w.s/f_{sy}$ throughout the beam.

For all new bridges designed to AS5100 the deck units are required to be provided with minimum shear reinforcement throughout the length of the member. **Based on the assumed design being in accordance with NAASRA, the bridge is not expected to have been designed to accommodate the shear reinforcement requirements in accordance with AS5100.**

4.5.9 Design Loading Review

A design review of the bridge structure has indicated it can likely satisfactorily carry the loads for which it was designed, namely two T44 design vehicles, on the assumption it was designed in accordance with the provisions of NAASRA.

The design review has also shown that the structure is also likely adequate to support two B-Double vehicles, again on the assumption that the design was in accordance with NAASRA.

Our review of the provisions of the Main Roads standard design drawings has indicated that the bridge superstructure has approximately 25% reserve capacity above the T44 vehicle loading when compared to the NAASRA requirements. However, our review also revealed that the abutments, and particularly the piles, are the limiting factor being at their design capacity with the T44 loading applied.

4.5.10 Findings

The findings of the structural assessment are summarised in Table 4-1.

Table 4-1 Structural Capacity Review

Design Provision	NAASRA (1976)	AS5100 (2004)	TMR
Applicable Design Vehicle	T44	M1600	HML B-Double
Braking Loads	Satisfied	Not Satisfied	Not reviewed
Barrier Loads	Satisfied	Not Satisfied	Not reviewed
Design for Fatigue	Satisfied	Not reviewed	Not reviewed
Stream Loading	Satisfied based on the flow depth adopted for the design in 1989	Not Satisfied	Not reviewed
Durability Requirements	Satisfied	Satisfied	Not reviewed
Shear Reinforcement	Satisfied	Not Satisfied	Not reviewed
Design Loading Review	Satisfied	Not Satisfied	Satisfied

Based on the structural assessment, it is recommended that:

1. A Registered Professional Engineer Queensland would not be able to certify that the existing bridge complies with the current AS5100 design standards. However, the design review indicates that the structure is able to accommodate the likely loadings under Semi-Trailer and B-Double vehicles, as it is currently used (subject to the noted disclaimers regarding available information and corresponding assumptions made herein).

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4.5.11 Further Investigations by Others

Based on the above findings, the Griffiths Street Project Leadership Team has commissioned a third party review of the existing structure to accommodate B-Double loads, potentially including load testing of the structure to confirm structural capacity.

The findings of this work are not reported herein.

4.6 Gowrie Creek Flooding

4.6.1 Flood Immunity

The overall Gowrie Creek flood model has recently been updated by AECOM, 2015 as detailed in 'Gowrie Creek 2015 Base Case Flood Model' prepared for Toowoomba Regional Council dated 17 April 2015. This report indicates that the Griffiths Street Bridge only has a 1 in 10-year Average Recurrence Interval (ARI) flood immunity.

Table 4-2 outlines the ARI flood levels upstream of the bridge and the flood depth over Gowrie Creek bridge deck (RL = 557m) as detailed in the 'Gowrie Creek 2015 Base Case Flood Model' (AECOM, 2015).

Table 4-2 ARI Flood Level

ARI (years)	Upstream Flood Level (m AHD)	Flood depth over Gowrie Creek Bridge (m)*	Flood speed over Gowrie Creek Bridge (m/s)**	Flood hazard over Gowrie Creek Bridge (m ² /s)**
5	556.6	-	-	-
10	556.9	-	-	-
20	557.1	0.1	3.6	0.4
50	557.5	0.5	4.2	2.1
100	557.9	0.9	4.6	4.1
500	558.6	1.6	5.6	10.1
PMF	565.4	8.4	9.9	83.2

*deck level modelled in MikeFlood at 557.0m AHD.

**extracted from MikeFlood received results

The 2015 flood modelling identifies that the existing structure would be overtopped by storm events exceeding the 1 in 10 year ARI. It is anticipated that if constructed today, a 1 in 100 year ARI immune bridge would likely consist of a multi-span bridge, with a larger waterway opening. The soffit of such a bridge would likely be at or above 557.9m AHD (the 1 in 100-year flood level reported by AECOM, 2015), though this criteria would need to be determined by Council.

Increasing the waterway opening of the bridge may result in a reduction in flood levels upstream of the bridge and an increase in flood levels downstream. Consequently, it is recommended that a more detailed, site specific flood study be conducted incorporating calibrated structure losses for the bridge in order to determine the impacts of changing the bridge structure.

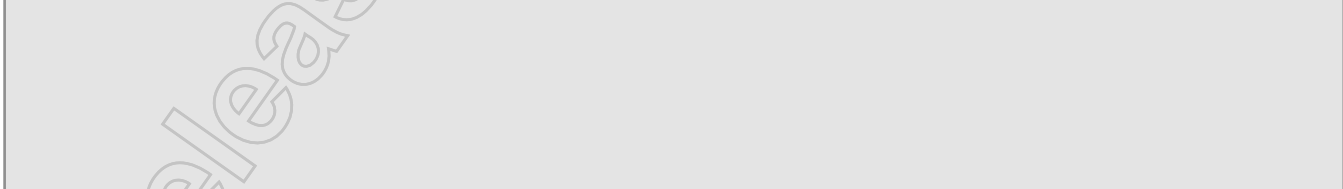
4.6.2 Findings

The recent flood modelling ARI levels have increased in height since the original design, with the bridge superstructure now expected to be fully submerged during events greater than 1 in 20 year ARI. Lateral loads from stream flow pressure, debris and log impact do not appear to have been included in the original design. Hence, there is increased risk of stream loading impacts with the higher flood level expectations. While this is a risk (in particular for asset life), the potential risk to the community is likely low, given it would be unlikely that vehicles or people would be on the bridge during flood events. This risk could potentially be further mitigated by the provision of appropriate warning signage. Clearly if the structure did wash away, there would be a period where Griffiths Street would not be available to traffic movements in the network, which would lead to traffic diversions to other parts of the network (Jellicoe, North and Bridge Streets, none of which are B-double routes).

4.6.3 Recommendations

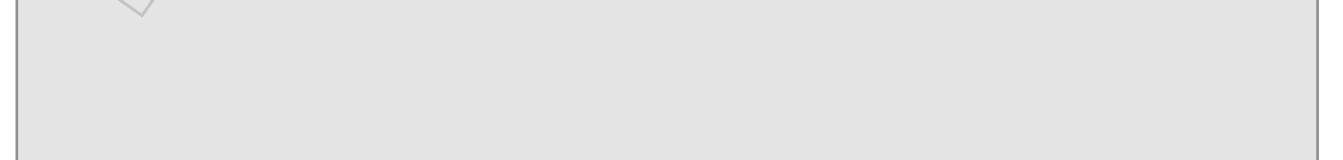
Based on the flood study findings it is recommended that:

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government



- A site specific flood study be conducted incorporating calibrated structure losses for the bridge(s) in order to determine the impacts downstream and upstream of any change in the structure(s) and waterway across Gowrie Creek.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government



Road Safety Review A Road Safety review has been conducted for Griffiths Street to identify relevant safety deficiencies to be addressed in the development of options for the corridor.

This report is included at Appendix E.

4.6.4 Crash Data Analysis – Mort Street to Doyle Street

The initial crash review considered the section of Griffiths Street between Mort Street and Doyle Street. The following observations are made from the review of recorded crashes from 2001 to 2011:

- No fatal crashes occurred in that time period
- Seven serious injury crashes occurred, three of which were intersection crashes involving adjacent or opposing vehicles, and three were a result of vehicles leaving the carriageway on curves or on straight sections.

Of all recorded crashes:

- 21% involve leaving the carriageway or loss of control (13% on curves and 8% on straight sections) which could indicate that speed or perception of the road alignment may be a determining factor
- 26% are rear end crashes
- 41% are intersection crashes involving adjacent or opposing vehicles. The high percentage of intersection crashes indicates that drivers are not judging safe gaps in opposing traffic lanes which could be determined by driver error combined with road/intersection design inadequacies
- 5% are head on crashes.

Figure 5-3 Below summarises the crash locations by severity (excluding the New England Highway intersection). It shows a clustering of crashes at and near the Mort Street intersection and the Gowrie Creek bridge. Additionally, crashes are noted in the vicinity of industrial property accesses on Griffiths Street, and at the Old Goombungee Road intersection. The report provides further discussion on these including contributing causes. At the New England Highway intersection, a total of 17 crashes were recorded over the data period. The severity of these crashes is summarised as follows:-

- There were no recorded fatalities from crashes over the data collection period
- 6% of all crashes at the intersection over the data collection period resulted in a hospitalisation and 24% required medical treatment (30% combined), while 59% of crashes resulted in property damage only;
- The total number of crashes was insufficient to accurately analyse trends across individual years.

In regard to crash types, the following summarises the observed trends:-

- 41% are intersection crashes involving adjacent or opposing vehicles. The high percentage of intersection crashes indicates that drivers are not judging safe gaps in opposing traffic lanes which could be determined by driver error combined with road/intersection design inadequacies or the signal phasing (filtered right turn)
- 41% are rear end crashes. The high percentage of rear end crashes indicate drivers are not judging the distance to the vehicle in front which could be determined by driver error combined with road/intersection design inadequacies
- 1 crash involved a pedestrian
- 1 crash was a left carriageway and hit object
- 1 crash was a side swipe.

Figure 4-3 Crash Location and Severity (excluding NEH Intersection)



4.6.5 Crash Data Analysis – New England Highway/Griffiths Street

In addition to the above analysis, a review of crash data provided by TMR for the Griffiths Street/New England Highway intersection has been undertaken as part of the corridor planning study. The review indicates that:

- There were no recorded fatalities from crashes over the data collection period
- 6% of all crashes at the intersection over the data collection period resulted in a hospitalisation and 24% required medical treatment (30% combined), while 59% of crashes resulted in property damage only
- The total number of crashes was insufficient to accurately analyse trends across individual years.

The Definitions for Coding Accidents (DCA) category of all severity crashes reported between 2001 and 2011 (Table 2-7), the data revealed:

- 41% are intersection crashes involving adjacent or opposing vehicles. The high percentage of intersection crashes indicates that drivers are not judging safe gaps in opposing traffic lanes which could be determined by driver error combined with road/intersection design inadequacies or the signal phasing (filtered right turn)
- 41% are rear end crashes. The high percentage of rear end crashes indicate drivers are not judging the distance to the vehicle in front which could be determined by driver error combined with road/intersection design inadequacies
- 6% involved a pedestrian
- 6% are left carriageway and hit object
- 6% are side swipe.

4.6.6 Road Safety Review Issues

The review included an on-site audit (similar to AUSTRROADS road safety audit processes) which identified a range of issues related to the existing general form, and condition of Griffiths Street. These relate to:

- Mort Street intersection (grades, alignments, sight distances)
- Rail level crossing
- Geometry of approaches to the Gowrie Creek bridge
- Width, and barrier configurations for Gowrie Creek bridge
- Inadequate pavement width (no shoulders)
- Poor pavement condition
- Poor condition of existing line marking, signage and guideposts
- Trees and street furniture in the roadside environment
- Property access by large vehicles on steep grade – inadequate left turn lane lengths, non-existent right turn entry provision, and concerns with exiting vehicles
- Lack of street lighting
- Roadside culvert headwalls (unprotected)
- Intersection sight distances under existing posted speed limit.
- A distinct lack of facilities for pedestrians and cyclists, other than through use of the road pavement. This is of significant risk for pedestrians crossing Gowrie Creek
- Adverse superelevation on a horizontal curve.

Whilst the ultimate and some of the interim solutions proposed for the corridor in this study will address some of these issues, it is recommended that general maintenance issues be considered by Council as a matter of priority for the corridor, prior to the larger capital works items being completed.

Detailed findings and recommendations for site specific issues are detailed in the Road Safety review report at Appendix E.

4.7 Property Access and Consultation

Numerous industrial properties gain vehicular access from Griffiths Street. Each of these existing businesses have been consulted regarding existing operations.

Relevant aspects from this consultation are outlined in Table 4-3 below.

Table 4-3 Consultation Outcomes

Business	Contact Person	Existing Vehicle Movements	Other Comments
JJ Richards & Sons Pty Ltd	Part Refuse Sch.4 Part 4 s.6 Personal information	Up to 200 heavy vehicles per day <ul style="list-style-type: none"> ▪ 35 trade waste ▪ 60 skip trucks ▪ 30 front lift industrial ▪ 16 roll on/roll off ▪ 7 B-Doubles ▪ balance domestic general, recycle and green waste vehicles. 	All B-Double movements currently to and from Brisbane via Ruthven Street. Majority of other movements to and from Mort Street.
Toowoomba Concrete Recyclers (Beutel Oughtred & Sons)	Part Refuse Sch.4 Part 4 s.6 Personal information	Up to 100 heavy vehicles per day. Vehicle size up to Truck and Dog.	Even split in movements between east and west of Griffiths Street. Safety concerns with right turns to and from driveway.
Orgro (shared access with Toowoomba Concrete Recyclers)	Part Refuse Sch.4 Part 4 s.6 Personal information	Up to 10 trucks per day, up to B-double	B-doubles infrequent – one per month.
Adbri Masonry	Part Refuse Sch.4 Part 4 s.6 Personal information	2 trucks per day, up to B-double.	B-doubles to and from manufacturing facility at Stapylton (Gold Coast).

Business	Contact Person	Existing Vehicle Movements	Other Comments
Ultimate Self Storage	Part Refuse Sch.4 Part 4 s.6 Personal information	Infrequent, minor in comparison to others in Griffiths Street.	Could come from any direction. Safety concerns with right turns to and from driveway.

East of Goombungee Road, Griffiths Street provides frontage access to the following properties on the northern side:

- 4 detached residential dwellings;
- Neighbourhood Centre, on the corner with the New England Highway.

Direct consultation has not been held with these property owners. The PLT has nominated that this will occur as part of broader community consultation activities subsequent to this study.

4.8 Constraints Mapping

Constraints mapping was undertaken as part of the Griffiths Street corridor study, and are shown on drawings CEB06818-CI-1005 and 1006 (refer to Appendix F). Further to the mapped constraints, Table 4-4 and Table 4-5 summarise some of the geometrical constraints

Table 4-4 Existing Intersection Geometrical Constraints

Aspect	Hogg St	Mort St (North)	Mort St (South)	Griffiths St
Grades (max)	14.9%	3%	2%	11.6%
Corridor width (min)	20m	21m	26.25m	20.65m
Pavement Width (min)	7.2m	7.2m	7.25m	7.72m

Table 4-5 Existing Griffiths Street Geometrical Constraints

Aspect	Griffiths St
Grades (max)	9.55%
Corridor width (min)	20.1m
Pavement Width (min)	7.1m

5 Corridor Options Development

5.1 Overview

The overall corridor has been divided into eight sections for the purposes of this assessment and report. The location nodes for each of the sections are as follows (noting that corridor chainages run generally from east to west):

- A. Mort Street Intersection
- B. Gowrie Creek Bridge
- C. Crest
- D. Old Goombungee Road
- E. New England Highway.

Between each of these location nodes, up to five options have been identified and assessed. In each case, the existing corridor alignment is adopted as the base corridor, to which the alternatives are compared. Table 5-1 details these options.

Table 5-1 Corridor Alignment Options

Section	Options	Description of Options
A	A1	Existing Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
A to B	AB1	Existing level crossing and alignment Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
B	B1	Existing bridge retained Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
B to C	BC1	Existing (with minor pavement width/quality improvements) Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
C to D	CD1	Existing (with minor pavement width/quality improvements) Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
D	D1	Existing (with minor pavement width/quality improvements) Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
D to E	DE1	Existing (with minor pavement width/quality improvements) Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government
E	E1	Existing intersection, at existing location Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Refer to Drawing SK-001 in Appendix G for the location nodes above.

All options have been evaluated against the preferred design criteria in Table 5-2. Table 5-3 describes the proposed design vehicles.

Table 5-2 Preferred Design Criteria

Criteria	Desirable	Minimum
Design Speed - Operating/ Signposted (km/h)	70/80	60/70
Lanes width (m)	3.5m	3.25m
Outside Shoulder (m)	2.5m	2.0m
On-Street cycle lane	* in shoulder above	* in shoulder above
Footway including utilities corridor	6.5m	3.5m
Flood Immunity (AEP) at Gowrie Creek	1%	2%
Capacity of other Cross Drainage	1%	2%
Longitudinal Drainage	5%	10%
Maximum Flooding impact - Reserves & other vegetated land with habitable structures before construction of the proposed infrastructure	200mm Maximum	N/A
Maximum Flooding impact - Residential and commercial properties with NO habitable floor inundation before construction of the proposed infrastructure	100mm Maximum	N/A
Maximum Flooding impact - Residential and commercial properties with habitable floor inundation before construction of the proposed infrastructure	50mm Maximum	N/A
Stormwater retention / detention /water quality	N/A	Nil
Intersection Performance (DoS) at 2031	As per minimum, with addition of operations to return to "normal conditions" within 5 minutes following rail level crossing closure.	90% Maximum across peak hours
Intersection Queue Storage	95 th percentile queue lengths stored safely across intra-peak hour periods (ie rail level crossing closure)	95 th percentile queue lengths stored safely across peak hour
Bridge Structures – Design Life	N/A	100 years
Pavement – Design Life	N/A	20 years
Widening	Any widening of road reserve is to the north	N/A

Table 5-3 Proposed Design Vehicles

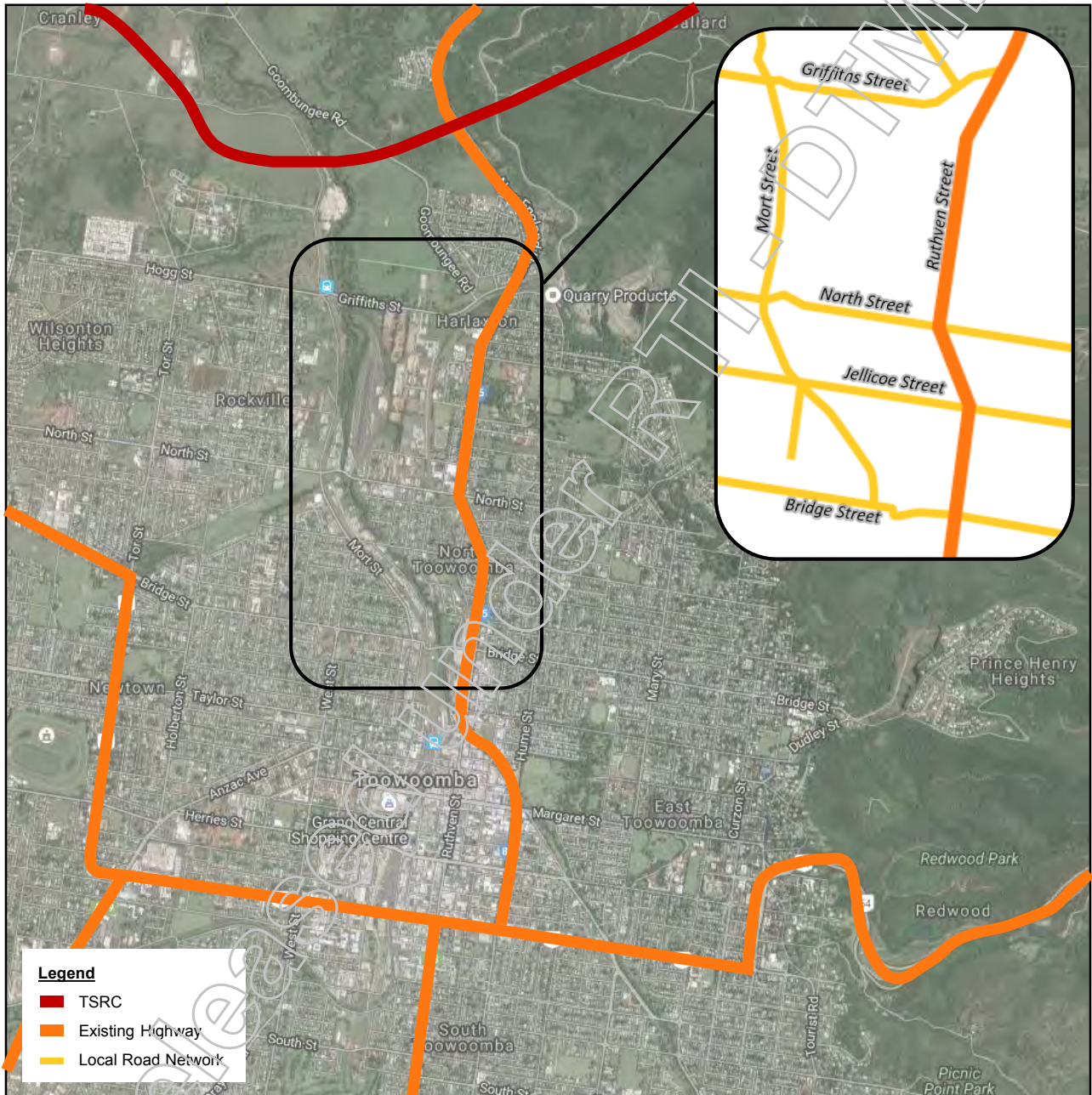
Location / Application	Design Vehicle
Griffiths St corridor Griffiths St / Mort St intersection Griffiths St / New England Highway intersection Access to Commercial properties (JJ Richards)	26m B Double, 19m semi-trailer; and 12.5m rigid bus.
Access to Commercial properties (other than JJ Richards)	19m semi-trailer; and 12.5m rigid bus.
Residential Properties	Car, refuse collection servicing.

6 Road Network Assessment

6.1 Existing and Future Road Hierarchy

The study area is bounded by and including the TSRC to the north, Bridge Street to the south, New England Highway/Ruthven Street to the east and Mort Street to the west. Figure 6-1 illustrates the location of key links.

Figure 6-1 Key Links



The existing capacity, road environment, traffic volume and traffic capacity of the key links are discussed in the following sections.

6.1.2 Mort Street

Mort Street is a regional arterial classified road that runs north-south parallel to the New England Highway. With the provision of the TSRC the link is anticipated to have a higher order function and traffic volume, particularly in the section north of Griffiths Street.

6.1.3 New England Highway/Ruthven Street

New England Highway/Ruthven Street forms part of the TMR's state controlled highway network and facilitates long distance travel from Hexham at Newcastle, New South Wales at its southern end to Yarraman north of Toowoomba, Queensland at its northern end. The TSRC and Mort Street connection is provided to relieve some of the traffic load on this link in future years.

6.1.4 Griffiths Street

Griffiths Street is classified as a distributor road in the Toowoomba Regional Planning Scheme, and is a two lane, two-way road, connecting the New England Highway to Mort Street, running in an east-west direction. The provision of the TSRC is anticipated to increase the significance and traffic volume load of this road as it provides the first direct connection between Mort Street and New England Highway.

Development along Griffiths Street is generally limited to low density, large lot industrial land uses, allowing a higher traffic carrying capacity (around 15,000vpd) based on the surrounding land uses. Current traffic volumes are in the order of 9,000vpd, indicating spare capacity for future growth in a two lane form. It is however noted that grade and access considerations will also need to be considered.

6.1.5 North Street

North Street is designated as a distributor road in the Toowoomba Region Planning Scheme. It is a two lane, two-way road, and has a posted speed limit of 60km/h. Adjacent land uses are industrial in nature.

Current traffic volumes (around 7,000vpd) indicates mid-block capacity for further growth.

6.1.6 Jellicoe Street

Jellicoe Street is a distributor road in the Toowoomba Region Planning Scheme. It is a two lane, two-way street, connecting Ruthven Street and Mort Street. Development on Jellicoe Street is characterised by low-medium density residential development. Existing traffic volumes are in the order of 6,000vpd. Jellicoe Street also provides an alternative east-west connection to Griffiths Street, although the nature of the link and surrounding land uses makes it less suitable to cater for increased traffic volumes.

6.1.7 Bridge Street

Bridge Street is classified as a distributor in the Toowoomba Region Planning Scheme and has a posted speed limit of 60km/h. It is a two lane, two-way road running east-west between Mort Street and Ruthven Street. The link has limited access and is not constrained by amenity issues. Heavy vehicle traffic height restrictions (3.7m) exists at the rail underpass, making it unsuitable for use by larger vehicles. This underpass also restricts the road width to two lanes. Existing traffic volumes are around 13,000vehicles per day which is nearing the upper end capacity of a two lane road, particularly with the geometric constraints which exist.

6.1.8 Desirable Maximum Traffic Volume Thresholds

The above considerations have been used to identify the desirable maximum volume thresholds for each link. Table 6-1 summarises key characteristics of the above links.

Table 6-1 Key Links

Link	Road Classification	Posted Speed	Form	Existing Daily Traffic Volume	Desirable Maximum Traffic Volume
Mort Street	Regional Arterial	50-70km/h	Two lanes, two way	3,000-10,000vpd	15,000vpd
New England Highway/Ruthven Street	Highway	60km/h	Four lanes, two way	20,000-24,000vpd	30,000vpd
Griffiths Street	Distributor	60-70km/h	Two lanes, two way	9,000-10,000vpd	15,000vpd*
North Street	Distributor	60km/h	Two lanes, two way	7,000vpd	15,000vpd

Link	Road Classification	Posted Speed	Form	Existing Daily Traffic Volume	Desirable Maximum Traffic Volume
Jellicoe Street	Distributor	60km/h	Two lanes, two way	6,000vpd	6,000vpd
Bridge Street	Distributor	60km/h	Two lanes, two way	13,000vpd	15,000vpd

*Impacted/reduced by grade and property access

The extraction of daily traffic volumes is detailed in the “*Traffic Modelling and Analysis Report*”.

6.2 Transport Modelling Process

6.2.1 Saturn Modelling

Mesoscopic level SATURN modelling has been completed to determine the future operation of the study network. This analysis considers the mid-block traffic volume carrying capacity of the study links. This assessment has been completed on a high level to determine infrastructure that operates and continues to operate acceptably and infrastructure with existing or future deficiencies outside of the Griffiths Street corridor. The latter will not be assessed as part of this report, only identified for further investigation.

The SATURN model process is detailed in the “*Traffic Modelling and Analysis Report*”. This document is included at Appendix H for further reference. The following sections gives an overview of the modelling process and documents the model results and implications.

6.2.2 Network Scenarios

The SATURN assessment considers the land use and network determined through consultation with Council. Consideration has been given to the base year operation, 2016, to identify existing deficiencies and to the future design year operation, 2031, to identify long term network deficiencies.

Initial consideration was given to ten network options and timeframes, as identified in a Workshop with Council and other stakeholders. These scenarios were narrowed down to three after initial viability assessment undertaken in consultation with Council.

Consequently, SATURN models has been prepared for three network scenarios, including:

- 2016 Base Year

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

6.2.3 Matrix Development

Strategic model data from Toowoomba Regional Transport Model (CUBE) was used as an input into SATURN to determine the 2016 base year and 2031 future year traffic volumes.

Council has provided the traffic volume and origin destination data from a sub area matrix from its 2011 base year and 2031 future year CUBE model. The CUBE data is available for a single 24hr period and has been further refined to establish peak hour traffic flows for more detailed assessment.

The 2011 base year data was calibrated to the intersection turning count volumes surveyed on Wednesday 17 August 2016. 2031 future year traffic models were guided by the daily CUBE sub area matrix traffic flows, with 2016 surveyed directional flow patterns. This data was calibrated against the 2031 full model data for the overall network.

The matric development process is detailed in the *Traffic Modelling and Analysis Report*”, included at Appendix H.

6.3 Link Performance

The midblock link performance has been assessed by comparison of the existing and estimated traffic volumes compared to the desirable design threshold as identified in Section 7.1.

It is noted that SATURN converts all traffic to equivalent private car units (pcus). The SATURN traffic volumes were converted from pcus to vehicles by the application of a 96% conversion factor. This factor was established from traffic count data and has been adopted generally across the network for link volumes. Detailed intersection analysis uses a conversion factor specific to each intersection. That analysis further discussed in section 8.

The daily traffic volumes and desirable maximum thresholds are summarised for key links in Table 7-2.

Table 6-2 Daily Link Volumes

Link	Location	Desirable Maximum Traffic Volume (vpd)	2016 Traffic Count (vpd)
Mort Street	North of Griffiths Street	15,000	2,600
	South of Griffiths Street	15,000	6,800
	South of North Street	15,000	9,800
	South of Jellicoe Street	15,000	5,200
New England Highway/ Ruthven Street	North of Griffiths Street	30,000	24,100
	South of Griffiths Street	30,000	22,000
	South of North Street	30,000	19,100
	South of Jellicoe Street	30,000	17,400
	South of Bridge Street	30,000	19,800
Griffiths Street	East of Mort Street	15,000*	9,000
	West of New England Highway	15,000	9,600
Goombungee Road	North of Griffiths Street	15,000	4,000
North Street	West of New England Highway	15,000	7,400
Jellicoe Street	West of New England Highway	6,000	5,600
Bridge Street	West of New England Highway	15,000	13,400

*Impacted/reduced by grade and property access

Part Refuse Sch.4 Part 4 s.4(1)(a)
Opinion/advice/recommendation for deliberative
processes of government

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Released under
Official Information Act

Pages 43 through 44 redacted for the following reasons:

Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Released under RTI - DTMR

7 Intersection Operations Assessment

7.1 Transport Modelling Process

Detailed intersection analysis has been completed for intersections along Griffiths Street, including SIDRA and Paramics analysis. A Paramics model has been prepared to assess the operation of a single study intersection, the Griffiths Street/Mort Street/Hogg Street intersection. This intersection is affected by the operation of an at grade rail crossing which cannot easily be represented by other, more simplistic tools, such as SIDRA. The Paramics model assessment is detailed in Section 8.4 of this report.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Intersection analysis has also been completed for the Griffiths Street/New England Highway intersection. The SIDRA model process is outlined in Section 8.6 of this report.

This section provides an overview of the intersection analysis and results. The Paramics network build, Paramics model limitations, SIDRA intersection analysis and matrix development process is detailed in the *Traffic Modelling and Analysis Report*, included at Appendix H.

7.2 Network Options

The scope of assessment includes the build of a calibrated base model to simulate the network operation under existing conditions. Options tests have then been completed for the design year 2031, to test alternative intersection layouts and their relative performance against a “Do Nothing” scenario.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

7.3 Traffic Volumes

The Paramics matrix is a simple four by four matrix, with each zone representing one intersection leg. 2016 base model volumes are simply extracted from the surveyed intersection movements.

2031 future year matrices are based on the SATURN intersection turn volumes. These have been converted from equivalent private car units (pcus) to vehicles based on the 2016 traffic survey proportions at the Griffiths Street/Mort Street/Hogg Street.

7.4 Mort Street/Hogg Street/Griffiths Street Intersection

7.4.1 Paramics Model Scope

A Paramics model has been prepared to assess the operation of a single study intersection, the Griffiths Street/Mort Street/Hogg Street intersection. The existing intersection is illustrated on Figure 7-1.

Figure 7-1 Griffiths Street/Mort Street/Hogg Street Intersection



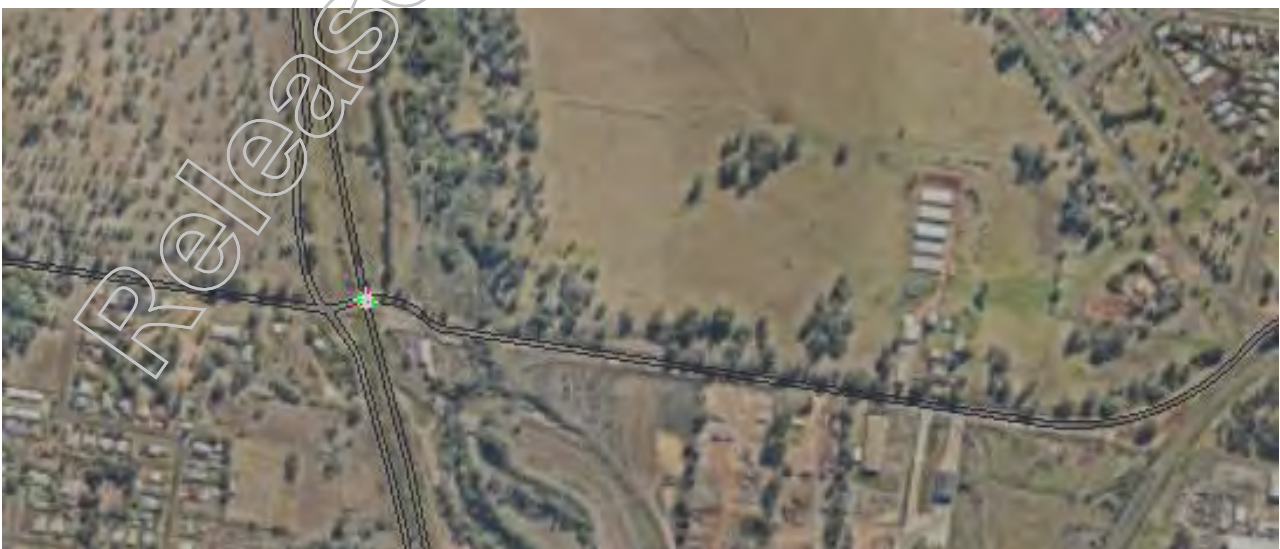
An at grade rail crossing is located approximately 40m east of the Griffiths Street/Mort Street/Hogg Street Intersection. The rail line has relatively infrequently rail movements, with around 10-20 movements per day, however the slow moving freight trains results in long boom gate closures which have significant follow on impacts on the operation of the study intersection.

7.4.2 Network Build

The Paramics model scope includes the Griffiths Street/Mort Street/Hogg Street intersection and the adjacent rail-crossing. No other major intersections or other infrastructure is located in close proximity to the subject intersection and the Paramics network has been extended as far as practical to include queue storage on the intersection approaches.

The Paramics model network extents, for the base model, are as illustrated on Figure 7-2.

Figure 7-2 Network Extent

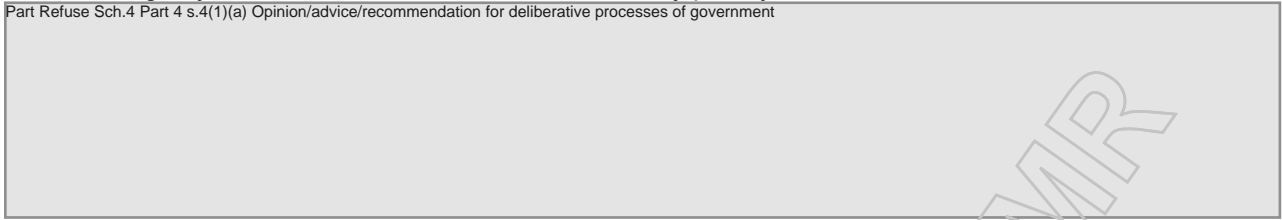


7.4.3 Layout Options

Alternative layouts tested at the Griffiths Street/Mort Street/Hogg Street intersection include:

- Existing Layout full assessment of four way priority intersection

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government



All options were included in a series of preliminary tests to give an indication of the operation and to identify options to be included in further investigations. Section 8.4.4 describes the intersection operation in each of the above configurations. The scenarios ruled out during the initial investigations are not reported in detail.

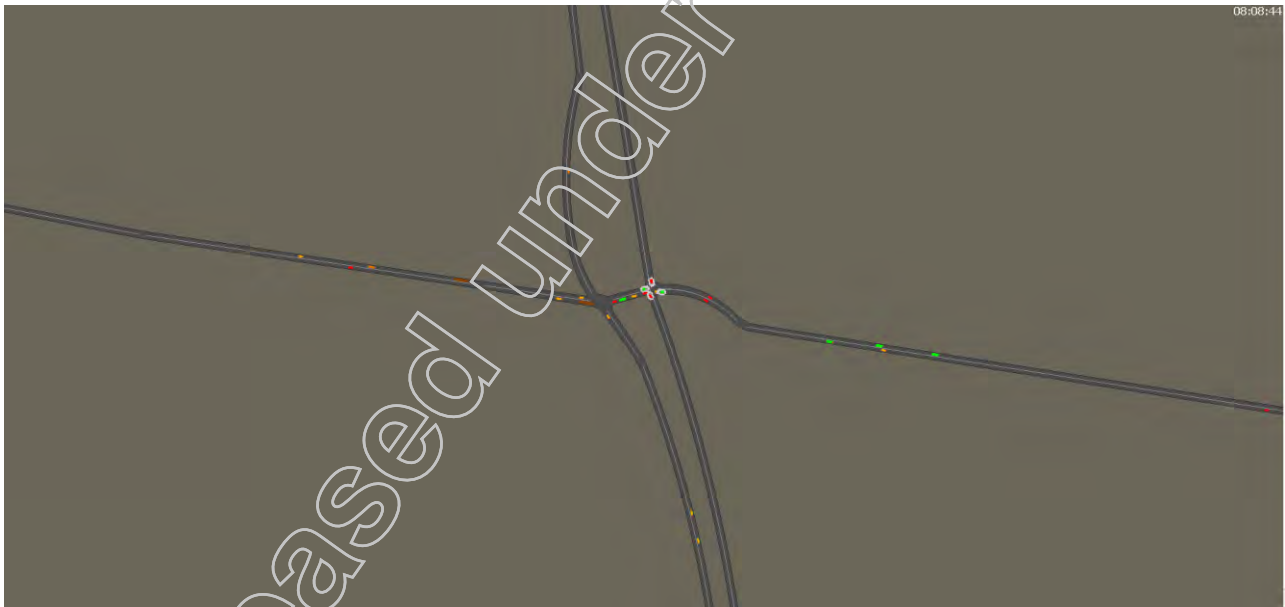
The Paramics models include functional layouts based on concept drawings of the above options. These concept designs are included and described in detail in Section 9.

7.4.4 Intersection Performance

The intersection operation in various layouts is described below. The *Traffic Modelling and Analysis Report* provides additional information of the model build, operation and limitations. That report is included at Appendix H for reference.

In the base case, the existing intersection operates well with limited delay outside of rail operations. Figure 7-3 shows the typical operation when unaffected by rail movements.

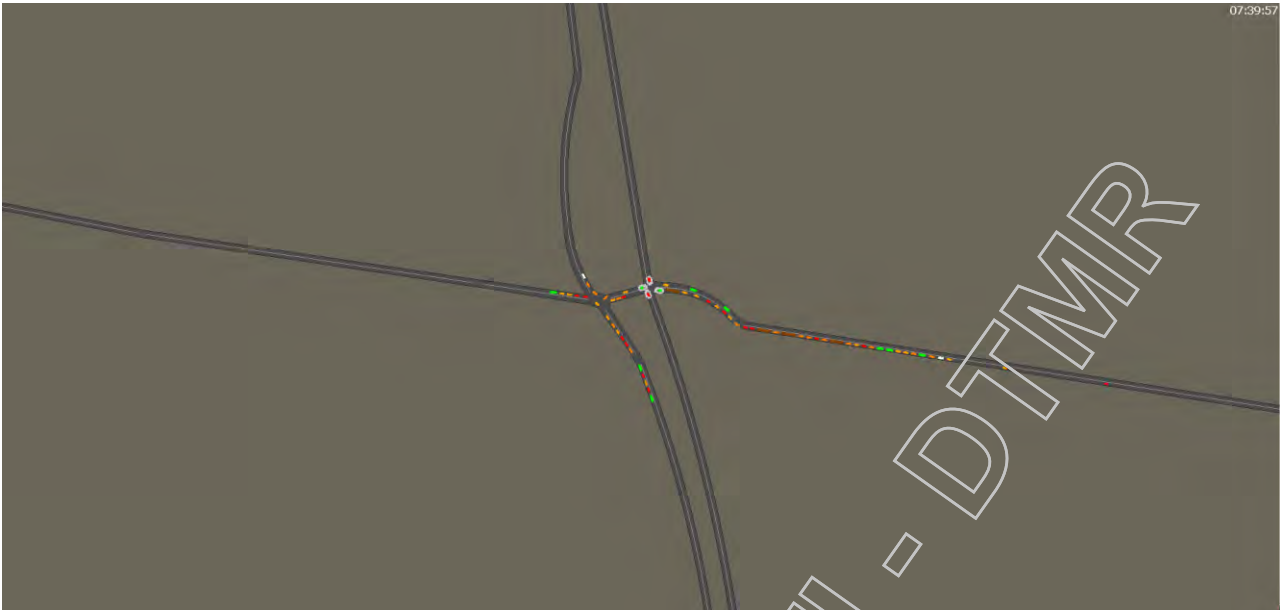
Figure 7-3 2016 AM Peak Operation– Existing Layout (Typical Operation)



The lengthy closure of boom gates creates significant delay during peak hour operation. At these times intersection queues are excessive. The build up of traffic creates residual delays post boom gate closure.

In the AM peak the queues are most significant on the eastern approach with queues over 30 vehicles on Griffiths Street. Video surveys indicate that these queues take around 20 minutes to clear. Figure 7-4 indicates the peak queuing patterns just after the boom gate opening.

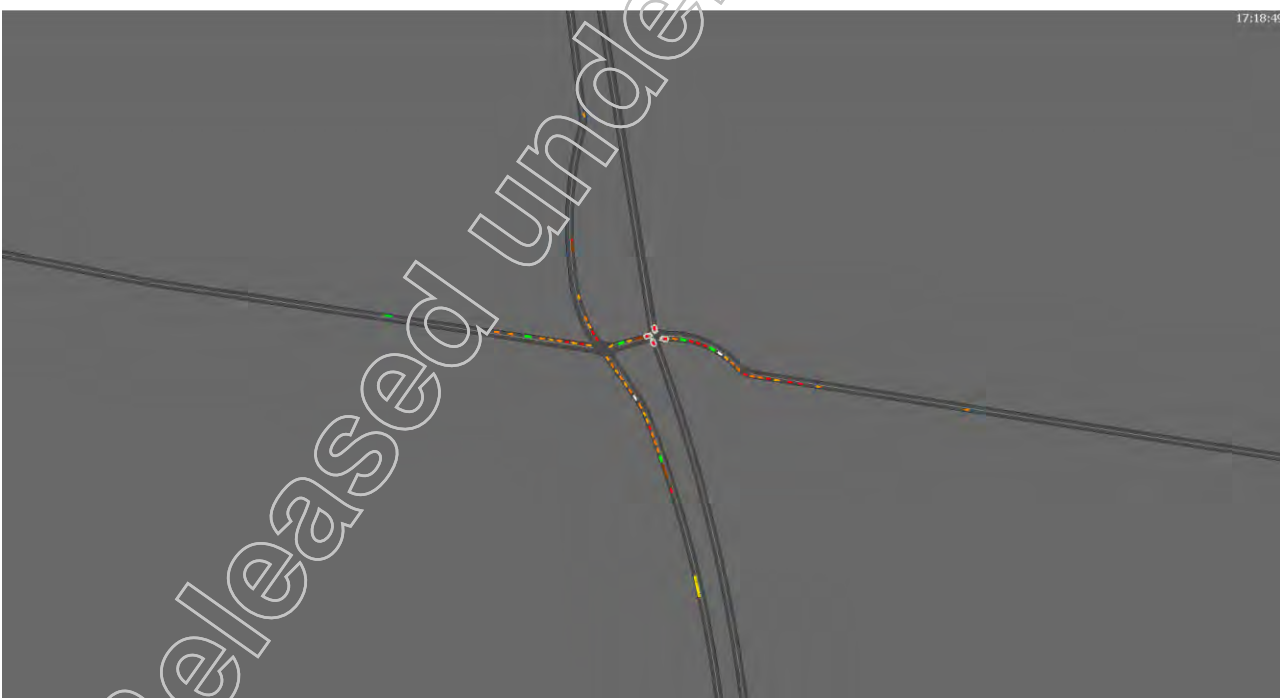
Figure 7-4 2016 AM Peak Operation– Existing Layout (Rail Impacted)



It should be noted that the AM peak model was determined to overstate the capacity of the existing intersection to some degree during the time of the boom gate closure.

Queues in the PM peak are most significant on the southern and eastern approaches. The recorded delay in the PM peak is around 10 minutes following a boom gate closure. Figure 7-5 shows the queuing patterns in the PM peak during a rail crossing closure.

Figure 7-5 2016 PM Peak Operation– Existing Layout (Rail Impacted)



It should be noted that the PM peak model was determined to understate the capacity of the existing intersection to some degree during the time of the boom gate closure.

The future year assessment indicates that the existing priority layout will have insufficient capacity to accommodate future year traffic volumes with the TSRC in place. The increase in through movements reduces the ability for give way moments to find adequate gaps in traffic and queues are significant.

Pages 49 through 52 redacted for the following reasons:

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7.4.5 Intersection Recommendations

Table 7-1 summarises the options analysis and intersection operation in the various configurations.

Table 7-1 Griffiths Street/Hogg Street/Mort Street Intersection Operation – Summary

Layout	Operation
Existing	<ul style="list-style-type: none">▪ Base case 2016 assessment suggest that intersection is currently operating well with limited delay outside of rail operations▪ Boom gate closures affects intersection operation for an extended period after the boom gate opening (up to 20minutes in the existing situation).▪ At the design horizon the intersection is expected to operate over capacity with significant delay and queueing during and following rail operations (over one hour to return to normal conditions)



7.5 Goombungee Road/Griffiths Street Intersection

7.5.1 Assessment Approach

Detailed intersection analysis has been completed for the Goombungee Road/Griffiths Street intersection, which is located midblock on Griffiths Street. This intersection operation has been assessed to determine if there are any existing deficiencies and the future year impact of traffic from the TSRC and planned development. The intersection has been assessed using SIDRA to identify potential future intersection layouts and staging of works.

7.5.2 Existing Situation

Goombungee Road/Griffiths Street is currently provided as an unsignalised T intersection with priority on Griffiths Street (east-west). The existing intersection is illustrated on Figure 7-15.

Figure 7-15 Goombungee Road/Griffiths Street Intersection



7.5.3 Layout Options

Alternative layouts tested at the Goombungee Road/Griffiths Street intersection include:

- Existing Layout three way priority intersection

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7.6 New England Highway/Griffiths Street Intersection

7.6.1 Assessment Approach

Detailed intersection analysis has been completed for the New England Highway/Griffiths Street intersection, using SIDRA, to identify potential future intersection layouts and staging of works.

7.6.2 Existing Situation

The existing layout is shown on Figure 8-16. The intersection footprint is constrained by a rail line overpass which comprised two separate bridge structures, as well as existing development on the north western corner.

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Figure 7-16 New England Highway/Griffiths Street Intersection



It should be noted that the intersection provides a channelised right turn from Griffiths Street into a commercial development on the northern side. This access located immediately west of the intersection and Griffiths Street therefore provides two departure lanes in the westbound direction. As the central lane is provided for access purposes, and does not provide additional capacity for other movements, it has not been included in the SIDRA analysis.

Part Refuse Sch.4 Part 4 s.4(1)(b) Consultation/deliberation for deliberative processes of government

7.6.4 Traffic Volumes

Intersection analysis has been based on traffic count volumes for the base year. Design traffic volumes (at the 2031 future year) were identified using a SATURN model. Analysis of future traffic volume growth in the area shows two major contributors, the TSRC and proposed development the area north and west of existing residential development on Goombungee Road. Interim analysis has been completed for the New England Highway/Griffiths Street intersection to assess a short term scenario which considers the former (TSRC) only, plus an allowance for background growth.

Part Refuse Sch.4 Part 4 s.4(1)(c) Opinion/advice/recommendation for deliberative processes of government

Pages 59 through 60 redacted for the following reasons:

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8 Corridor Options Assessment

8.1 Assessment Criteria

The list of assessment criteria is tabulated below. It is noted that only criterion that are able to provide a differentiator for the options were adopted in the final assessment.

Table 8-1 Assessment Criteria

Criteria	Considerations
Traffic Carrying Capacity	<ul style="list-style-type: none"> Intersection Performance (where appropriate) Link Capacity (where appropriate)
Road Geometry	<ul style="list-style-type: none"> Ability to meet technical standards of each option (horizontal & vertical alignment, design speed).
Road Safety	<ul style="list-style-type: none"> Management of vehicle interactions (speeds, angles of incidents) Management of heavy vehicles (turning, climbing)
Active Transport Provisions	<ul style="list-style-type: none"> Amenity of each option for cycles and pedestrians
Environment & Heritage Impacts	<ul style="list-style-type: none"> Impact on the local Cultural heritage Impact on local environment including flora and fauna
Property Access Impacts	<ul style="list-style-type: none"> Impact on current land uses (access) Impact on future development strategies
Property Resumption Impacts	<ul style="list-style-type: none"> Extent of property acquisition required to achieve option
Gowrie Creek Flood Immunity	<ul style="list-style-type: none"> Immunity from flooding in major flood events ability to provide access for the community during major flood events Bridge lengths
Local Drainage Provision	<ul style="list-style-type: none"> Ability to provide for local drainage requirements
Public Utility Plant	<ul style="list-style-type: none"> Impact on the existing major assets for power, telecommunications, water, sewer, gas;
Capital Cost	<ul style="list-style-type: none"> Relative order of cost of the options based on a length/area of corridor basis
Existing Asset Design Life	<ul style="list-style-type: none"> use of existing assets for the duration of their useful life

8.2 Assessment Methodology

Each option was initially assessed by the project team for relative merit against the current corridor, using the following assessment methodology.

Table 8-2 Assessment Methodology

Outcome	Comment	Colour Coding
Preferred	The option provides a more desirable / better outcome for this criteria compared to the current corridor (as per Positive ranking below). This Outcome selected if there more than one option identified as Positive, but there is a clear preferred option.	*
Positive	The option provides a more desirable / better outcome for this criteria compared to the current corridor	
Neutral	The option provides a similar outcome for this criteria compared to the current corridor	
Negative	The option provides a less desirable outcome for this criteria compared to the current corridor	

A MCA workshop will be held on Thursday 20th of October with relevant Council and TMR stakeholders to present the options and the initial assessment for each of the options.

Pages 62 through 97 redacted for the following reasons:

Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

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Table 10-2 Recommended Griffiths Street Interim Form

Section	Options	Description of Options
A Mort Street Intersection	A1	Existing
	A2	Signals
	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
A to B Rail Level Crossing	AB1	Existing level crossing and alignment
	AB2	Upgraded level crossing, geometry to suit bridge and Mort St requirements
	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
B Gowrie Creek Bridge	B1	Existing bridge retained
	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
	BC1	Existing (with minor pavement width/quality improvements)
B to C Creek to Crest	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
	CD1	Existing (with minor pavement width/quality improvements)
C to D Crest to Goombungee Rd	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
	D3	Roundabout (unsignalised, single lane form in interim)
D Goombungee Rd intersection	DE1	Existing (with minor pavement width/quality improvements)
	Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government	
	E	Minor upgrade to queue storage lengths on turn lanes (north and west)
E NEH Intersection		

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Table 10-3 Section B to C Interim Configuration

Feature	Recommended Configuration	Reason
General Arrangement	1 lane up the hill	Cost, existing road reserve ability to provide additional lanes in the short term
	1 lane down the hill	One lane sufficient for interim
Access Arrangements	improve and extend left turn auxiliary lane servicing southern driveways	safety (noting existing lane terminates at Adbri Masonry)
	left in/left out access to all properties	Safety for all road users*
	future northern frontage development access via Bacon Street or similar	Allow for future access restrictions

* See discussion below

Discussion was held at the PLT level regarding the appropriate strategy for management of property accesses on Griffiths Street. At the timing of authoring this report, it was agreed by the PLT that in the interests of safety for all road users in Griffiths Street, existing property access should be restricted to left in/left out movements. This would be achieved through a double white line marking treatment and suitable signage.

To alleviate the access impact this will have for right turns into properties on the southern side of Griffiths Street, the provision of a roundabout at the Goombungee Road intersection (single lane form in interim) will provide the ability for vehicles up to B-Double size to travel east to Goombungee Road and u-turn to head back to the southern properties and turn left into these sites.

Any alternative treatment (turn lanes, climbing lanes etc), would require additional road reserve, for which there is inadequate time to acquire the necessary land for the implementation of the interim scheme.

It is noted that Council and TMR are yet to conduct a community consultation exercise regarding the overall scheme. This aspect will be considered and discussed with affected property owners as part of that consultation.

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11 Concept Design Investigations

11.1 Concept Design Principles

The design principles used for Griffiths Street concept design have been based on referencing the latest design manuals, standards, standard drawings and policies from Council and TMR, noting that the design brief has been to adopt TMR requirements wherever appropriate.

Several key issues were identified, including the following, which have been addressed in detail in this section:

- Design vehicle type
- Cross sectional elements
- Pavement crossfalls
- Auxiliary lane widths
- Entry deflection
- Stormwater drainage
- Sight distances from conflict points.

The extents of both the Interim and Ultimate design for Griffiths Street is from chainage 150 (ie east of the Mort Street intersection) to the New England Highway intersection. The Mort Street intersection and up to chainage 150 on Griffiths Street is being designed under a separate scope of works by GHD.

11.1.1 Concept Design Method

The preferred option was designed using AutoCAD to determine location of control lines, kerb and channel, roundabout, and interchanges. 3D modelling for the concept design was undertaken using 12D Model. The 3D design was required to refine geometry, identify potential service clashes, and increase confidence in the concept.

A key issue identified was the impact the proposed road modifications would have on existing services. The 3D design would aim to avoid impacts where possible and the high cost associated with service relocations.

11.1.2 Constraints

The following constraints were taken into consideration throughout the concept design phase:

- Existing Corridor width (DTMR, TRC, QR)
- Current design standards vs. the existing corridor
- Regional Flooding extents (Gowrie Creek)
- Topography along the corridor
- Existing road network connectivity
- Existing culverts
- Future road network connectivity
- Environmental impacts (local significant trees)
- Gowrie Creek
- Tying into the existing GHD design at chainage 150
- Existing property accesses
- Existing services.

11.1.3 Design Assumptions/Decisions

Part Refuse Scn.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

The following design assumptions have been adopted for the Griffiths Street concept design:

- Intersecting side roads maintained existing horizontal alignment were possible
- Q100 flood immunity where practicable
- Cut batters at 1:4 and fill batters at 1:6

- Design speed of 80km/hr for both horizontal, vertical and super elevation
- Cross fall 3% on straights
- Min 0.5% longitudinal grade on all roads
- Maximum desirable height of 5.5m for retaining walls
- Ultimate concept design pavement depth of 355mm assumed for the length of Griffiths Street (Based on the GHD intersection design)
- Draft Preliminary Interim Design pavement depth is as per section 11.1.6 of this report, both 10 year and 20 year pavement designs have been completed with 20 year granular pavement designs adopted
- 5m aerial contours have been used for areas outside of the surveyed corridor.

11.1.4 Design Standards

The following latest design manuals, standards, standard drawings and policies have been referenced for the conceptual design for the road and associated TMR and Local Government roads:

- Austroads Guide to Road Design
- DTMR Road Planning and Design Manual (RPDM)
- DTMR Road Drainage Manual (RDM)
- Toowoomba Regional Council (TRC)
- Austroads Geometric Design for Trucks – When, Where and How?
- DTMR Standard Drawings for Roads
- DTMR Standard Specifications for Roads
- Manual for Uniform Traffic Control Devices (MUTCD)
- Queensland Urban Design Manual (QUDM);
- DTMR Design Criteria for Bridges and Other Structure (current edition – August 2014)

The design and posted speeds are summarised in Table 11-1.

Table 11-1 Design and Posted Speeds

Road Section	Target (Design) Speed	Posted Speed
Griffiths Street	80 km/h	70 km/h
Intersections (Turning speeds)	50 km/h	40 km/h

11.1.4.2 Typical Cross Sections

Refer to drawing CEB06818-DG-TC-1101, 1102 and CEB06818-CI-9201 for the typical cross sections.

11.1.4.3 Design Vehicle

The design vehicle for the proposed corridor road geometry is a 26m B-double (Figure 11-1 **Error! Reference source not found.**) and a 19.0m semi-trailer for the service roads (Figure 11-2 **Error! Reference source not found.**).

Figure 11-1 26m B-double

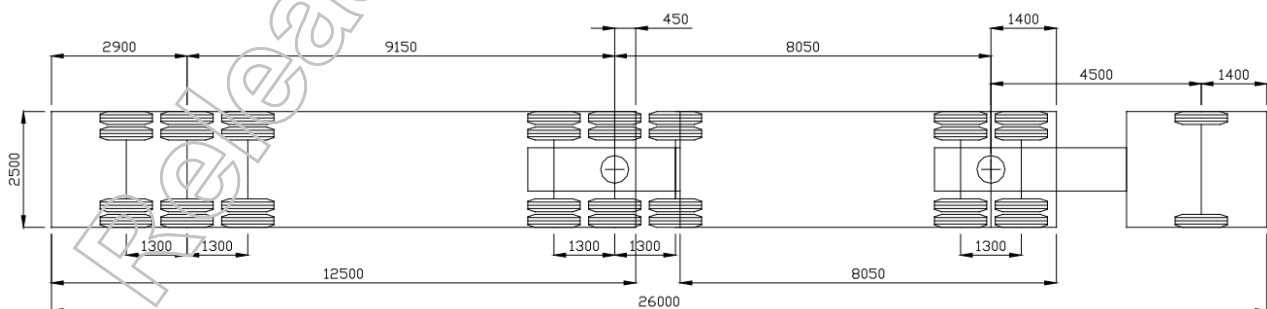
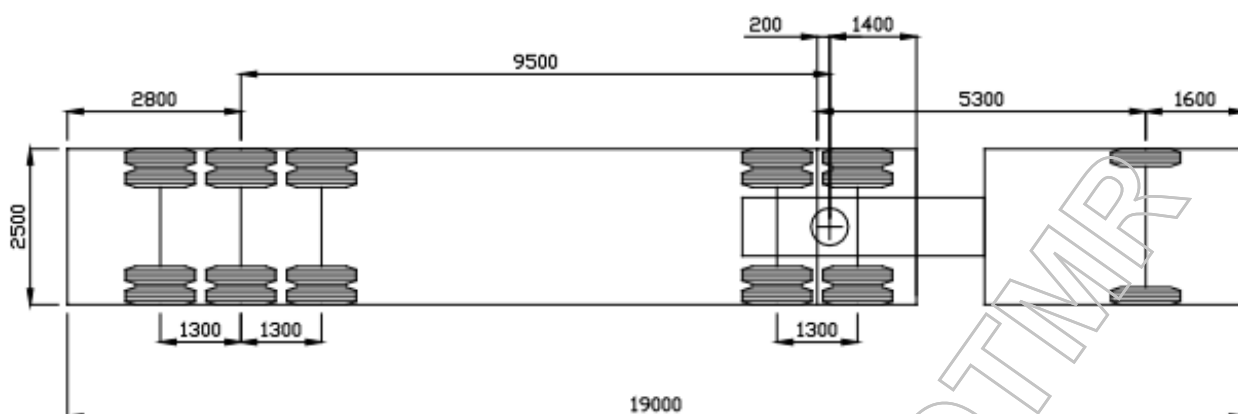


Figure 11-2 1 19.0m Semi-trailer



11.1.4.4 Sight Distance

Sight distances were designed in accordance with Austroads: Guide to Road Design; Part 3: Geometric Design (2016), Clause 5. The sight distance parameters are summarised below in Table 11-2 and Table 11-3.

Table 11-2 Stopping Sight Distance Parameters – Main Alignment – 80km/hr Design Speed

Item	Car	Truck	Source
Eye Height (m)	1.1	2.4	Austroads Part 3, Pg. 122, Table 5.1
Object Height (m)	0.2	0.2	Austroads Part 3, Pg. 122, Table 5.1
Stopping Sight Distance Parameters: (Design Speed = 80km/hr)			
Coefficient of deceleration "d"	0.36	0.29	Austroads Part 3, Pg. 125, Table 5.3
Reaction time "Rt (s)"	2.5	2.5	Austroads Part 3, Pg. 124, Table 5.2
Stopping Sight Distance (m)	126	142	Austroads Part 3, Pg. 128, Table 5.5 & Pg. 131, Table 5.6
Horizontal position of eye and object from edge of outside lane (m)	1.75	1.75	Austroads Part 3, Pg. 133, Clause 5.4

Table 11-3 Stopping Sight Distance Parameters – Intersection Turning Movements

Item	Car	Truck	Source
Eye Height (m)	1.1	2.4	Austroads Part 3, Pg. 122, Table 5.1
Object Height (m)	0.2	0.2	Austroads Part 3, Pg. 122, Table 5.1
Stopping Sight Distance Parameters: (Design Speed = 50km/hr)			
Coefficient of deceleration "d"	0.36	0.29	Austroads Part 3, Pg. 125, Table 5.3
Reaction time "Rt (s)"	2.5	2.5	Austroads Part 3, Pg. 124, Table 5.2
Stopping Sight Distance (m)	62	69	Austroads Part 3, Pg. 128, Table 5.5 & Pg. 131, Table 5.6
Horizontal position of eye and object from edge of outside lane (m)	1.75	1.75	Austroads Part 3, Pg. 133, Clause 5.4

11.1.4.5 Crossfall

Crossfalls were designed in accordance with Austroads: Guide to Road Design; Part 3: Geometric Design, Clause 4.2.2, at 3.0%.

Superelevation of various horizontal curves were designed in accordance with Austroads: Guide to Road Design; Part 3: Geometric Design, Clause 7.7, and as per Table 7.8. Super elevation doesn't exceed 3%.

The adverse crossfall between chainage 830 to 1090 will be corrected to provide positive superelevation.

11.1.4.6 Longitudinal Grades

The below tables summarise the existing and proposed maximum grades along Griffiths Street.

Table 11-4 Existing Longitudinal Grades on Griffiths Street

Chainage	150-1050	1050-1300	1300-NEH
Grades (max)	11.8%	4.7%	9.5%

Table 11-5 Proposed Longitudinal Grades on Griffiths Street

Chainage	150-1050	1050-1300	1300-NEH
	Grades (max)	Grades (max)	Grades (max)
Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government			
Interim	11.4%	5.2%	5.0%

Following further design review of the New England Highway approach on Griffiths Street, it has been identified the existing longitudinal grade of 9.5% is greater than the maximum of 5%. This has been considered in both the interim and ultimate design cases. For the interim, it is not considered practical to correct this grade at this time due to the scale of work required, which would then be sacrificial to a degree when construction of the Ultimate works is undertaken.

Consideration on this element has been reviewed in accordance with current design standards on the approach to an intersection refer "Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections" Section 2.2.2 Vertical Alignment.

11.1.4.7 Intersections

The intersection formations are designed as per the traffic assessment reported in this document, with design based on *Austroads: Guide to Road Design; Part 4*.

11.1.4.8 Retaining Walls

Due to the corridor width constraints, retaining walls will be required to reduce additional land requirement impacts along the corridor.

During the detailed design phase, the retaining walls will need to be designed by a suitably qualified RPEQ engineer, and to TMR satisfaction with consideration given to the location of retaining wall footings within boundaries. The design may potentially have carriageways and verges modified to optimise the retaining wall requirements.

11.1.5 Stormwater Drainage

11.1.5.1 Cross Drainage

A high level analysis was undertaken for the proposed cross drainage culvert, the Rational Method was used to estimate the 100 year Average Recurrence Interval (ARI) discharge from the contributing catchment. Based on these flow estimates, an assessment on the size of each cross drainage culvert was carried out. The culverts were assumed to be at grades of 0.5% to reduce the velocity at the outlet of the culverts and hence, reduce the potential for scour to occur.

The existing culvert is at chainage 1100 just west of the Goombungee intersection, and is a 1200x450 RCBC approximately 16m long. The culvert will need to be extended, and its size may need to be increased which will be determined during detailed design.

11.1.5.2 Longitudinal Drainage

The concept catchment areas for the longitudinal drainage are based on the typical cross section widths and the intersection spacing. An allowance is made for of pipes running along both sides of the road with standard gully pits at nominal intervals. The inlet flows were based on average grades between on 0.5% to 10.0%.

The existing external catchment to the northern side of Griffiths Street will require a trunk pipe drainage system to collect and convey the major flows as they intersect Griffiths Street. This system will need convey the major

flows to the downstream side of the new bridge over Gowrie Creek.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Further detailed

design will refine the layout and capacity requirements of the trunk longitudinal drainage system.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government



11.1.7 Pavement Design – Interim Design Concept

Cardno has undertaken a concept pavement design for the Interim Concept Design and Cost Estimate. This involved determining a pavement rehabilitation plan, and concept pavement design for the proposed minor road widening sections. The proposed pavement construction will be a granular pavement formation.

The existing geotechnical conditions are summarised in Table 11-7 and Table 11-8 below.

Table 11-7 Test Pit Geotechnical Log Summary

Material Description	TP1	TP2	TP3	TP4
Seal	10mm	-	10mm	-
Asphalt	-	50mm	-	120mm
Quarry manufactured basalt Gravel	160mm	100mm	150mm	200mm
Brown grey gravel	-	150mm	300mm	-
Red brown orange Clay & Old Seal	160mm	-	-	-
Red brown lateritic Clay	-	-	-	200mm
Subgrade	Mottled Orange brown grey Clay	Brown Clay	Mottled red grey silty Clay	Red find lateritic gravel

Table 11-8 Pavement Subgrade CBR

Test Pit	Test Location (Approx. chainage)	Laboratory soaked CBR
TP1	350	4.0
TP2	550	2.5
TP3	850	10
TP4	1200	8.5

The data in Section 7 has been used for the purposes of calculating design traffic loadings for this site. The TRC Planning Scheme Policy notes that for higher order roads (Distributor's and above) the design life is to be 40 years. However, as part of this project, TRC has requested options only for a 20 year design life. A granular pavement design was completed based on the TRC Planning Scheme Policy Schedule 6, section SC6.2.3.

Table 11-9 Pavement Gravel Properties

Parameter	Value	Comment
Road Classification	Distributor	
Design Period	20 years	As advised by Council and TMR.
Design ESAs	2.16 x 10 ⁷	

Based on the above design parameters and geotechnical tests, the proposed pavement design is shown in Table 11-10.

Table 11-10 Granular Pavement Design

Pavement Layer	Material	Subgrade CBR			
		2.5	4	8.5	10
Surfacing	AC DG14	50	50	50	50
Prime	AMC00	10	10	10	10
Base	Type 2.1 CBR 80	150	150	150	150
Sub-Base	Type 2.3 CBR 45	150	150	150	150
Lower Sub-Base	Type 2.5 CBR 15	575	375	175	125
Total Pavement Thickness (including prime)		935	735	535	485

This pavement design has been incorporated into pavement rehabilitation and widening works for the Interim Concept design and cost estimate reported herein.

It is noted that this has not been incorporated into the ultimate design or cost estimates as part of this package of works. As noted in Section 11.1.6 it is recommended that at the time of detailed design for the Ultimate Concept, the necessary pavement design be reviewed.

11.1.8 Safety in Design

Under the Queensland Workplace Health and Safety Act 2011, the Workplace Health and Safety Regulation and other legislation and guidelines, the Principal Contractor has specific obligations in relation to the safe operation of the work site. To assist the Principal Contractor in complying with these obligations, the project designers have identified the following potential hazards may arise:

- Working under traffic control conditions
- Design vehicle turning paths
- Sight distance
- Vehicle rollovers / accidents

- Existing services – Trunk
- Existing services - Reticulation
- Entry deflections
- Existing crossfalls
- Steep batter slopes
- Retaining walls
- Flooding
- Deep excavations
- Working at waterways

The approach to risk within safe design was to adopt the so far as is reasonably practicable (SFAIRP) to eliminate risks before further mitigating them. What can be done should be done, in proportion with the risk, unless it's reasonable in the circumstances to do something less. The SFAIRP framework has three (3) broad categories as follows:

- Unacceptable Risk - The risk cannot be justified and would only be contemplated in extraordinary circumstances
- Undesirable Risk – The risk is tolerable if further risk reduction is not practicable or the cost is grossly disproportionate to the improvement gained and the broader community desires the benefit of the activity given the associated risk
- Acceptable Risk – The residual risk is regarded as negligible / remote and further measures to reduce the risk are grossly disproportionate to the subject risk. These risks are generally small in comparison to the everyday risks the community experiences.

Cardno prepared a Risk Management Plan in accordance with the DTMR Corporate Form M4213 – Risk Assessment, which can be found in Appendix J.

11.1.9 Risk Register

A risk register for the project was prepared and updated throughout the project to identify particular courses of action to minimise, transfer or negate either the occurrence or impact of the identified risk factors. The following items were addressed:

- When is the risk situation likely to occur
- Who is the risk situation manager
- What is the risk rating before treatment
- Possible treatment strategies
- What the risk rating after treatment is
- What the possible costs of the risk before and after treatment are
- What other factors are attributing to the risk
- The status of the risk
- Develop a schedule for monitoring and control of each risk factor.

Cardno has prepared a Risk Management Plan in accordance with the DTMR Corporate Form M4213 – Risk Assessment, which can be found in Appendix J.

11.2 Basis of Cost Estimates

11.2.1 Methodology

A cost estimate has been prepared using recent contract rates for jobs in South East Queensland, and current industry estimating benchmark rates. The construction estimates were prepared by Cardno. The PUP rates for the ultimate design were adopted from the GHD intersection estimates.

The estimate has been split into several sections to assist with costing the staging of works. Construction costs as rates in the estimate generally allow for contractor's direct costs, on-site overheads, off-site overheads and margin.

his Interim Design estimate was based on a preliminary design 20 year design life granular pavement.

The Interim Design estimate had the rates reviewed by TRC and a third party Quantity Surveyor, WT Partnership. The Ultimate design cost estimate was not reviewed by any third party.

11.2.2 Source of Information

The estimate is based on the following information:

- Cardno concept designs in CAD and 12D formats
- GHD 12D design
- GHD Cost estimate
- 12D volume reports.

11.2.3 Project Scope

The scope of work within the package is mainly:

- Bulk earthworks
- Retaining walls
- Drainage
- Pavement construction
- Subgrade improvements
- Road furniture (line marking, guard rails, medians etc)
- Intersections
- Street lighting
- Structures (bridges).

11.2.4 Constructability

Key constructability issues for this project are:

- Traffic management associated with connecting to existing road roads
- Construction under traffic
- Potential resumption of business's land
- Bulk earthworks – locations to export/import, and haul routes along potential large distances
- Retaining wall construction
- Public Utilities requiring relocation
- Commercial access to be maintained during construction
- Bridge construction over the Gowrie Creek
- Bridge works at New England Highway intersection

11.2.5 Construction Program

No construction program has been prepared.

11.2.6 Assumptions

The main assumptions that the estimates are based on include:

- Construction rates are adopted from recent contracts in South East Queensland, and current industry benchmarked rates
- The rates adopted include contractor's overhead costs and margin, where different contractors will have separate calculations and are assumed to be spread similarly over all items
- PUP costs are based on the existing costs provided in the GHD estimates

- Pavement costs for the Draft Preliminary Interim Design estimate are based on a 20 year granular pavement design
- Cross drainage was based on a high level analysis and assumed alignments

- Street lighting for the Draft Preliminary Interim Design option is assumed to be provided every 35m for to one side of the road

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- There is an allowance made for subgrade treatment based on percentage of area. Actual areas of subgrade improvement likely to be required will need to be confirmed after geotechnical investigations.

11.2.7 Limitations

- The estimates are based on a delivery by construction only method (TIC-CO), without allowances for other forms of project delivery i.e. Design and Construct (TIC-D&C)

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

11.2.8 Principal's Cost Estimate

The Principal's costs have been included as the following percentage values of the construction values:

Item	Interim
Pre-construction	6%
Construction & Post-construction	11%

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

The Ultimate percentages are generally in accordance with other DTMR projects Cardno has undertaken in recent time. The Interim Design percentages were advised by WT Partnership.

11.2.8.1 Cost to Date

A cost to date amount was not provided by DTMR.

11.2.8.2 Principal Supplied Materials

It is assumed there are no separate costs for materials to be supplied.

11.2.8.3 Risks and Opportunity Costs

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

The Interim Design estimate has a contingency of 20% applied, which is due to the greater level of detail requested from TRC.

11.2.8.4 Escalation

A cost escalation of 5% has been applied both the Ultimate and Interim estimates, with the assumption that the project may be tendered within a 12 month period.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

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11.5 Interim Design Concept

The following list of drawings in Table 11-13 form the concept set for the Interim Design which is located in Appendix L:

Table 11-13 Interim Concept Design Drawing Schedule Summary

Job No	Drawing Start	Drawing End	Drawing Type
CEB06818-	CI-9001	to 9002	Cover Sheet, Locality Plan, Schedule & Notes
CEB06818-	CI-9101	to 9102	Overall Plan
CEB06818-	CI-9103	to 9105	Details
CEB06818-	CI-9201	to 9202	Typical Sections
CEB06818-	CI-9401	to 9403	Public Utility Plant
CEB06818-	CI-9501	to 9503	Pavement Details
CEB06818-	CI-9903	to 9905	Turning Paths – New England Highway

11.6 Interim Design Cost Estimate

A concept design and cost estimate have been prepared for an interim design solution (i.e. pre-opening of the TSRC). Table 11-14 outlines the proposed configuration.

Table 11-14 Griffiths Street Recommended Form - Interim

Section	Recommended Form
Mort Street Intersection	Signals – as per GHD Design
Rail Level Crossing	Upgraded level crossing, geometry to suit Mort St intersection requirements
Gowrie Creek Bridge	Existing bridge retained
Creek to Crest	Existing (with minor pavement width/quality improvements) – includes pavement rehabilitation in necessary places, and full pavement overlay. Left in/Left out property access (subject to stakeholder consultation)
Crest to Goombungee Rd	Existing (with minor pavement width/quality improvements) – includes pavement rehabilitation in necessary places, crossfall correction and full pavement overlay. Left in/Left out property access (subject to stakeholder consultation)
Goombungee Road Intersection	Roundabout (unsignalised, single lane form in interim)
Goombungee Rd to NEH	Existing (with minor pavement width/quality improvements) Left in/Left out property access (subject to stakeholder consultation)
NEH Intersection	Minor upgrade to queue storage lengths on turn lanes (north and west)

It is estimated that the design and construction of the Interim form will cost in the order of \$7.3 million, including contingency and cost escalation. This however excludes upgrades to the Mort Street intersection and the Rail Level Crossing, which are part of the Mort Street upgrade works.

It is noted that street lighting to Category V3 provision has been allowed for in the above estimate.

It is understood that the available budget for upgrades to Griffiths Street is \$10.1 million. Taking the above interim design into account, around \$2.4 million would be available for contribution to the Mort Street intersection upgrade.

Part Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Released under
Official Information Act

Page 111 redacted for the following reason:

Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Released under RTI - DTMR

APPENDIX A
GHD MORT STREET CONCEPT

Released under RTI - DTMR

Pages 113 through 115 redacted for the following reasons:

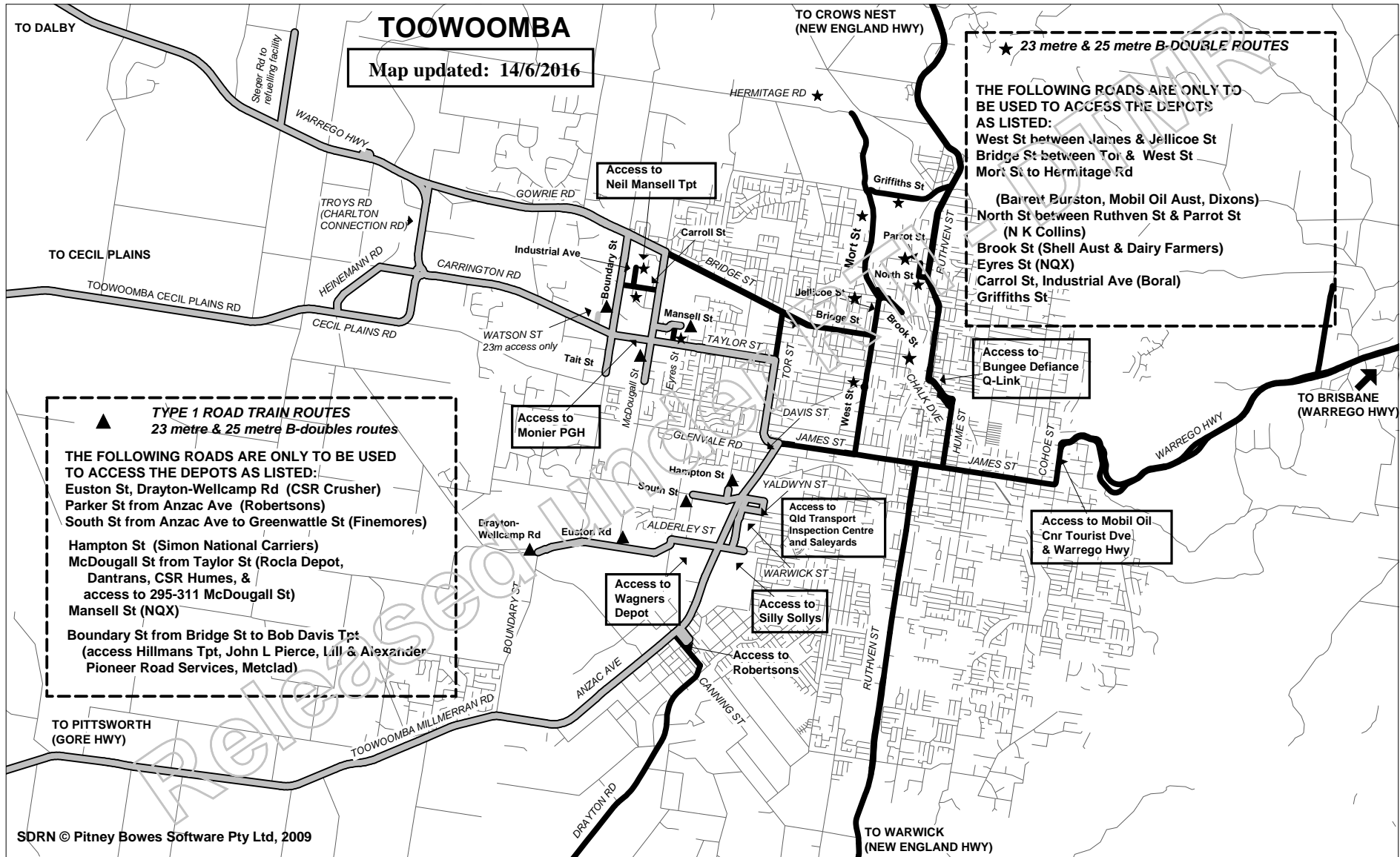
Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

Released under RTI - DTMR



APPENDIX B
B-DOUBLE ROUTE MAP


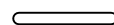
Released under RTI - DTMR

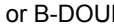
MULTI-COMBINATION ROUTES IN QUEENSLAND



SDRN © Pitney Bowes Software Pty Ltd, 2009

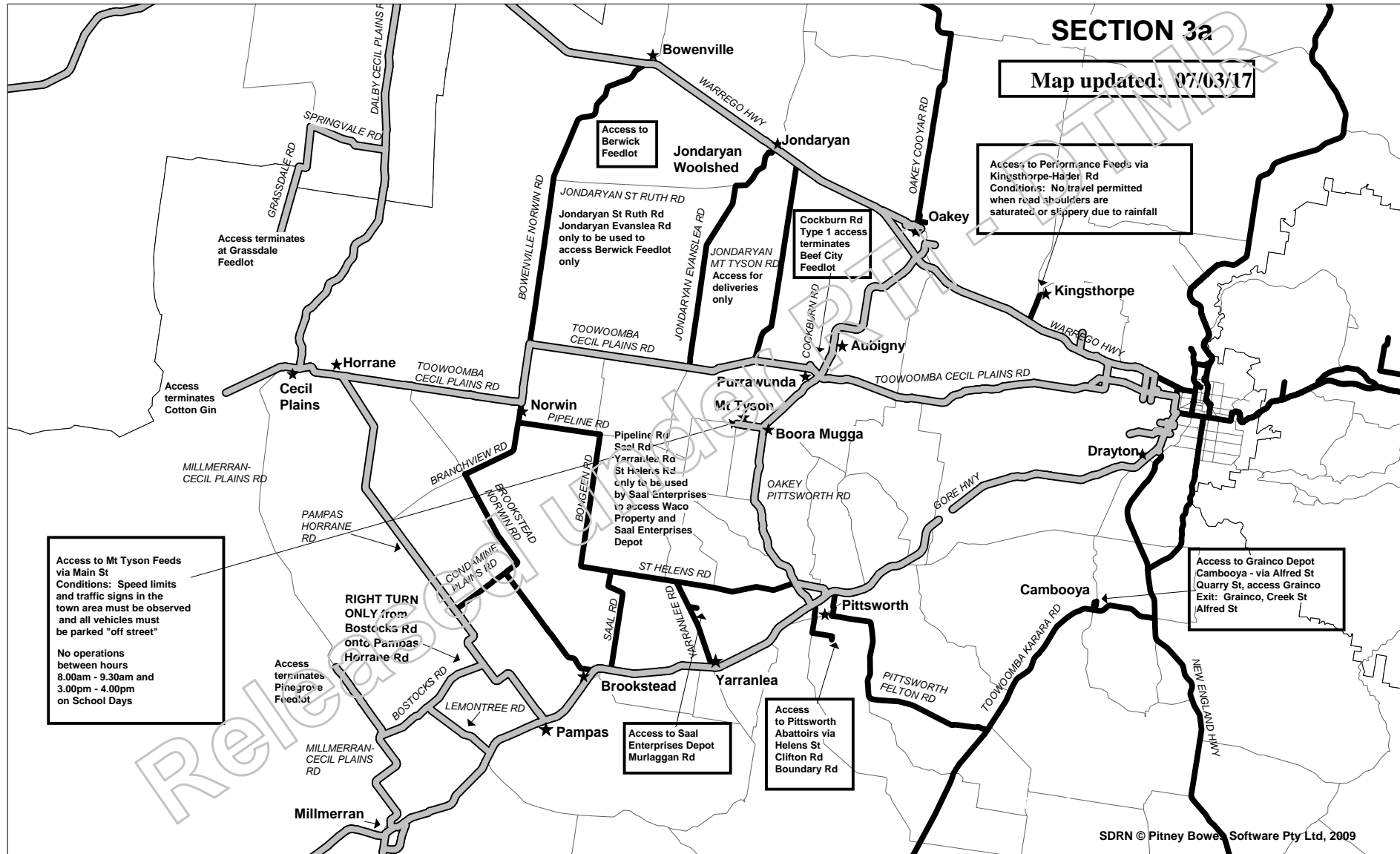
B-DOUBLES	
	23 metre routes
	23 & 25 metre routes

ROAD TRAINS	
	Type 1 routes
	Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES	
	

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS
 Note: 23 & 25 metre B-doubles can access Type 1 & 2 road train routes

MULTI-COMBINATION ROUTES IN QUEENSLAND



B-DOUBLES
 23 metre routes
 23 & 25 metre routes

ROAD TRAINS
 Type 1 routes
 Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES

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 Note: 23 & 25 metre B-doubles can access Type 1 & 2 road train routes

APPENDIX C
DIAL BEFORE YOU DIG INFORMATION

Released under RTI - DTMR



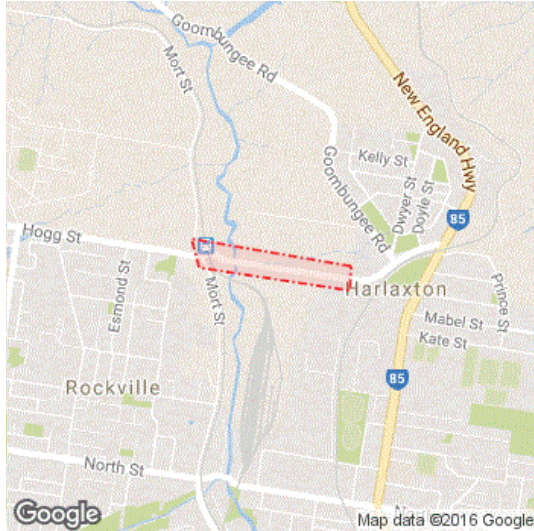
Caller Details

Contact: Part Refuse Sch.4 Part 4 s.6 Personal information
Company: Cardno
Address: Level 11 Green Square North Tower, 515 St P
Fortitude Valley QLD 4006

Caller Id: 1488325
Mobile: Not Supplied
Email: Part Refuse Sch.4 Part 4 s.6 Personal information @cardno.com.au
Phone: Part Refuse Sch.4 Part 4 s.6 Personal information
Fax: Not Supplied

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Other
Enquiry Date: 09/08/2016 Start Date: 12/08/2016 End Date: 31/08/2016
Address: Griffiths Street, Harlaxton QLD 4350
Job Purpose: Excavation
Onsite Activity: Manual Excavation
Location of Workplace: Both
Location in Road: CarriageWay, Footpath, Nature Strip

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works: Not Supplied

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is your responsibility to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is your responsibility to identify and contact any asset owners not listed here directly.
** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.
Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
54817596	APA Group (Allgas) Networks, Qld	0881154500	NOTIFIED
54817594	Ergon Energy, Toowoomba	131046	NOTIFIED
54817597	NBN Co, Qld	1800626762	NOTIFIED
54817595	Telstra QLD, Regional	1800653935	NOTIFIED
54817593	Toowoomba Regional Council	131872	NOTIFIED

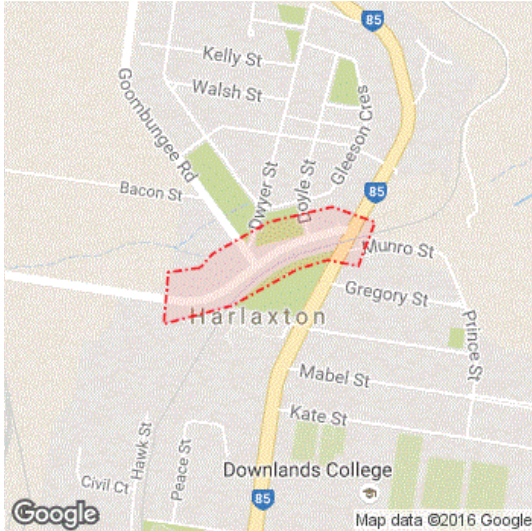
END OF UTILITIES LIST

Caller Details

Contact: Part Refuse Sch.4 Part 4 s.6 Personal information
Company: Cardno
Address: Level 11 Green Square North Tower, 515 St P; Fortitude Valley QLD 4006
Caller Id: 1488325
Mobile: Not Supplied
Email: Part Refuse Sch.4 Part 4 s.6 Personal information @cardno.com.au
Phone: Part Refuse Sch.4 Part 4 s.6 Personal information
Fax: Not Supplied

Dig Site and Enquiry Details

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Location in Road: CarriageWay, Footpath, Nature Strip

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- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:

- CONTINUED FROM JOB: 11073873 -

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- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
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Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
54817642	APA Group (Allgas) Networks, Qld	0881154500	NOTIFIED
54817639	Ergon Energy, Toowoomba	131046	NOTIFIED
54817643	NBN Co, Qld	1800626762	NOTIFIED
54817641	Optus and/or Ucomm, Qld	1800505777	NOTIFIED
54817640	Telstra QLD, Regional	1800653935	NOTIFIED
54817638	Toowoomba Regional Council	131872	NOTIFIED

END OF UTILITIES LIST

DIAL BEFORE YOU DIG DISCLAIMER

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Assets

Toowoomba Regional Council's Underground Assets include:

- Sewerage Pipes and Access Chambers
- Drainage Pipes, Drainage Inlet Structures, Access Chambers
- Water Pipes and Fittings
- Electrical and communication cables In CBD and at intersections, not stored digitally please call 131 TRC for plans. Cost may apply.

Toowoomba Regional Council does not own or control the location of other underground infrastructure including but not limited to Telstra, Ergon and Energex.

Map

The enclosed map highlights Toowoomba Regional Council's underground assets in the vicinity of proposed works. If this map does not cover the full extent of the area of proposed works please contact us 131 TRC and request a revised map or further information.

HCP (Housing Connection Plan) for internal sewer drainage must be obtained from the plumbing section of the Toowoomba Regional Council. Cost Applies. Location details of water pipe connections from water meters to the house are not available.

Disclaimer

While every care is taken in preparing these maps and information, Toowoomba Regional Council will not take responsibility for any errors or omissions in the information supplied. This information will remain valid for a period of (3) months from date of issue It is the responsibility of the applicant to take all necessary measures to protect Council Infrastructure from any damage due to the proposed works.

Duty of Care

The enclosed map should be used as a guide only. It indicates the presence of Assets in the general vicinity. It is **the applicant's** responsibility to ensure that precise location of assets is determined. All assets in the vicinity of the works must be located prior to the commencement of work.

Location of Assets

1. Toowoomba Regional Council may provide either remote over the phone or on-site surface location of Toowoomba Regional Assets, including how to visually locate and protect assets when excavating.
2. If you are unable to locate Toowoomba Regional Assets you should arrange for an on-site surface location.
3. A plan search for a more detailed location of infrastructure is available. Phone 131 TRC (*cost applies*)
4. In the event of insufficient records relating to the location of assets, the exact location of assets likely to be affected shall be confirmed by use of an electronic cable locator, These services shall be provided at Toowoomba Regional Council's discretion:

Your Responsibility

1. Visually locate Toowoomba Regional Council Assets by hand digging where construction activities may damage or interfere with Toowoomba Regional Council Assets.
2. On receipt of plans and before commencing works in the vicinity of Toowoomba Regional Council Assets, carefully locate these assets by using the abovementioned method.
3. Council Parks and Recreation Branch should be contacted on 131 TRC to make arrangements to minimize damage to tree roots.
4. Other relevant authorities should be contacted for locating their services.
5. Notification should be given to residents affected by work before commencement.
6. If an electronic cable locator is used hand excavation to the depth of asset must be done in advance to excavators.

Conditions of Supply of Information

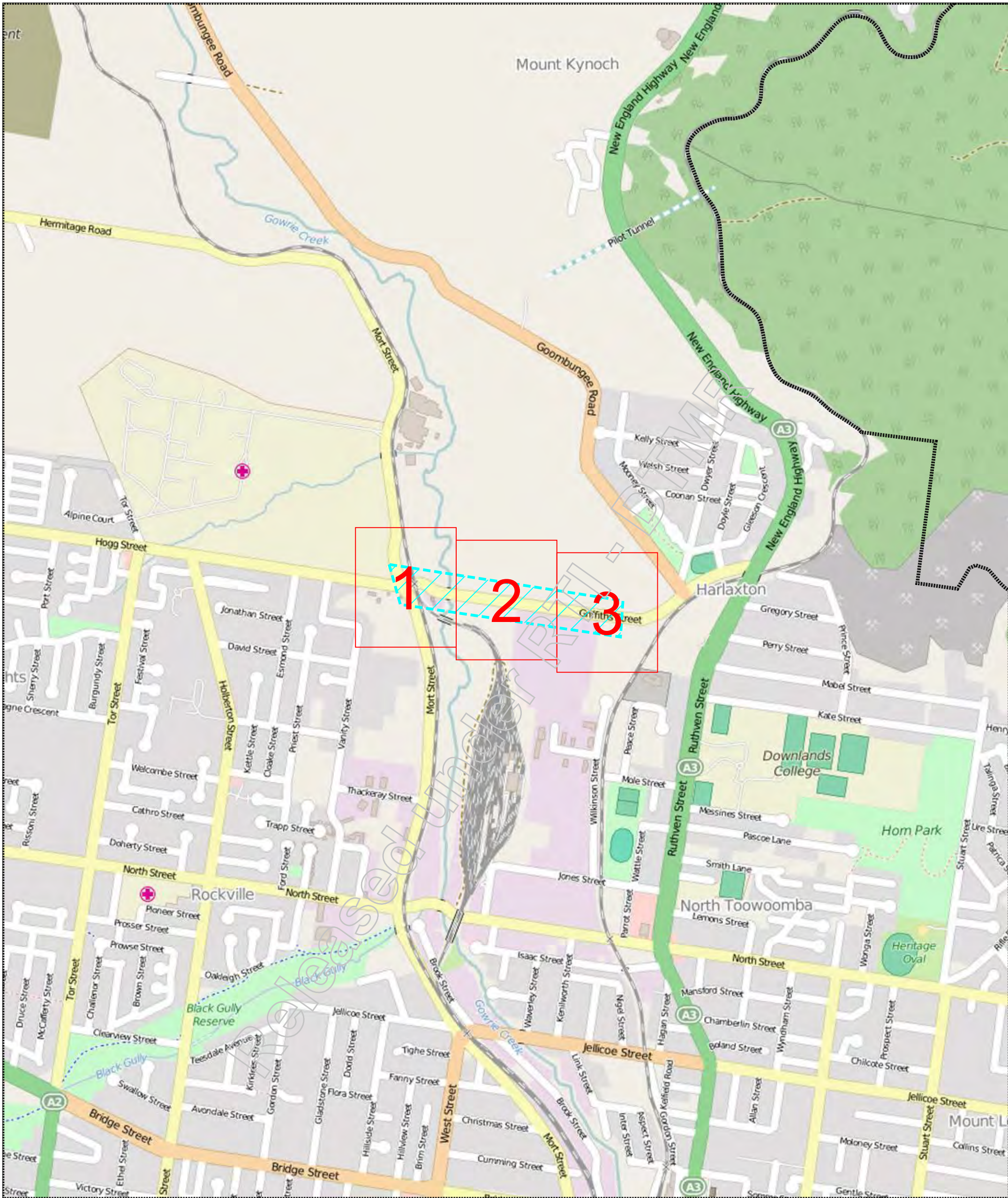
1. Toowoomba Regional Council and its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, by its servants and agents. The applicant shall agree to indemnify Toowoomba Regional Council against any claim or demand for any such loss or damage to the applicant, its servants, or agents or to any third party.
2. Any damage to Council assets must be promptly reported to Toowoomba Regional Council by contacting the Construction and Maintenance Branch 07)4688 6552.
3. Any damage to council assets shall be repaired or reinstated by Toowoomba Regional Council at the applicants cost to the appropriate Council Standard.
4. Toowoomba Regional Council may elect to carry out rectification/reinstatement works itself because of public safety, continuity of service or other reason. In such circumstances, the cost of such repairs will be recovered from the applicant.
5. For all work within 2.5m of nominal location, you are required to hand dig (pothole) and expose the asset, hence proving its exact location before work can commence.

Road and Footpath Openings


1. All Road and Footpath openings shall be in accordance with TRC Auspec Volume 2 Section 306.1 "Road Openings and Restorations By Utility Authorities."
2. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads.

Where works impact on road users, a traffic control plan shall be submitted to Council for consideration, prior to works commencing. Depending on the impact of such works, certain conditions may be imposed, i.e. Day/time of works.

For more information including inverts and size queries please refer to our Toowoomba Regional Council online mapping service ["E-view"](#)



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by telephoning 131 TRC
 2. Council Parks and Recreation Branch should be contacted on 131 TRC to make arrangements to minimise damage to tree roots.
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 4. Notification should be given to residents affected by the work before commencement.
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 7. HCP (house connection plans) for sewer stub locations must be obtained from the plumbing section of the Toowoomba Regional Council. (COST APPLIES). Water pipe connections from Water meter to house Not Known.
 8. For a more detailed location of services, an infrastructure search is available (COST APPLIES).
 9. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads. And a copy of the traffic control plan for the works to be submitted to and approved by Council prior to the commencement of works.
- For Work on Road Reserves please contact: Councils Road and Traffic Branch 131 TRC

LEGEND
 DBYD Enquiry

N
 1:10000
 (A3 Size)



Whilst all due care has been taken in the preparation of this plan, the accuracy of provided information can not be guaranteed. All information MUST be verified on site. Please refer any discrepancies to Toowoomba Regional Council - Infrastructure Asset Management Department. No part of this plan is to be reproduced without Infrastructure Asset Management Department permission.

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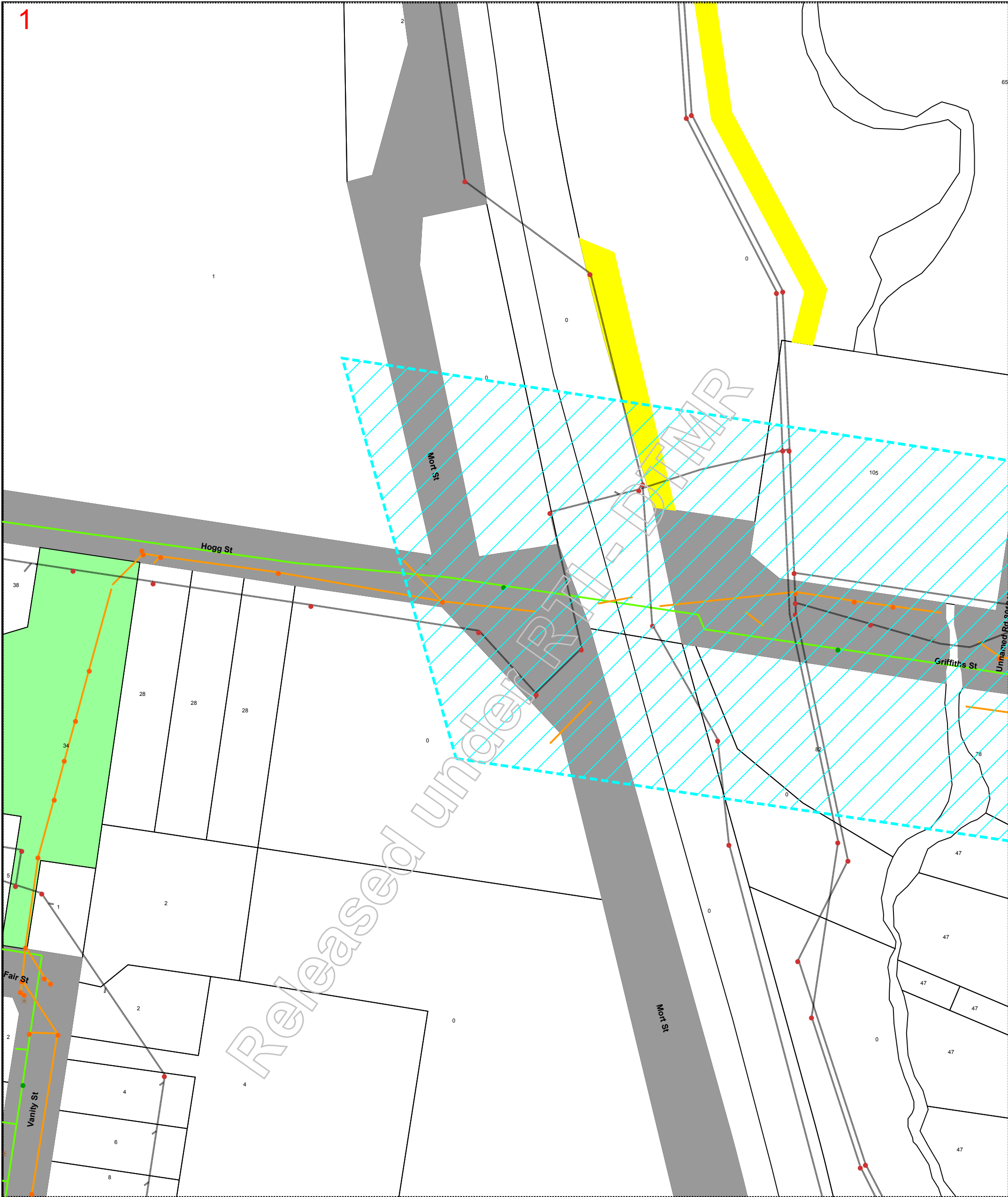
DIAL BEFORE YOU DIG RESPONSE

Overview Map

DBYD Ref: 54817593

Date: 09/08/2016

For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by 131TRC
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LEGEND

- Communication Fittings
- Communication Lines
- Sewer Fittings
- Sewer Pipes
- Stormwater Fittings
- Stormwater Pipes
- Water Fittings
- Water Pipes
- Park Infrastructure
- Permanent Survey Mark
- Dam
- Easement
- DBYD Enquiry

DIAL BEFORE YOU DIG RESPONSE

Map 1

DBYD Ref: 54817593

Date: 09/08/2016

For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by 131TRC
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N
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 (A3 Size)



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LEGEND

- Communication Fittings
- Communication Lines
- Sewer Fittings
- Sewer Pipes
- Stormwater Fittings
- Stormwater Pipes
- Water Fittings
- Water Pipes
- Park Infrastructure
- Permanent Survey Mark
- Dam
- Easement
- DBYD Enquiry

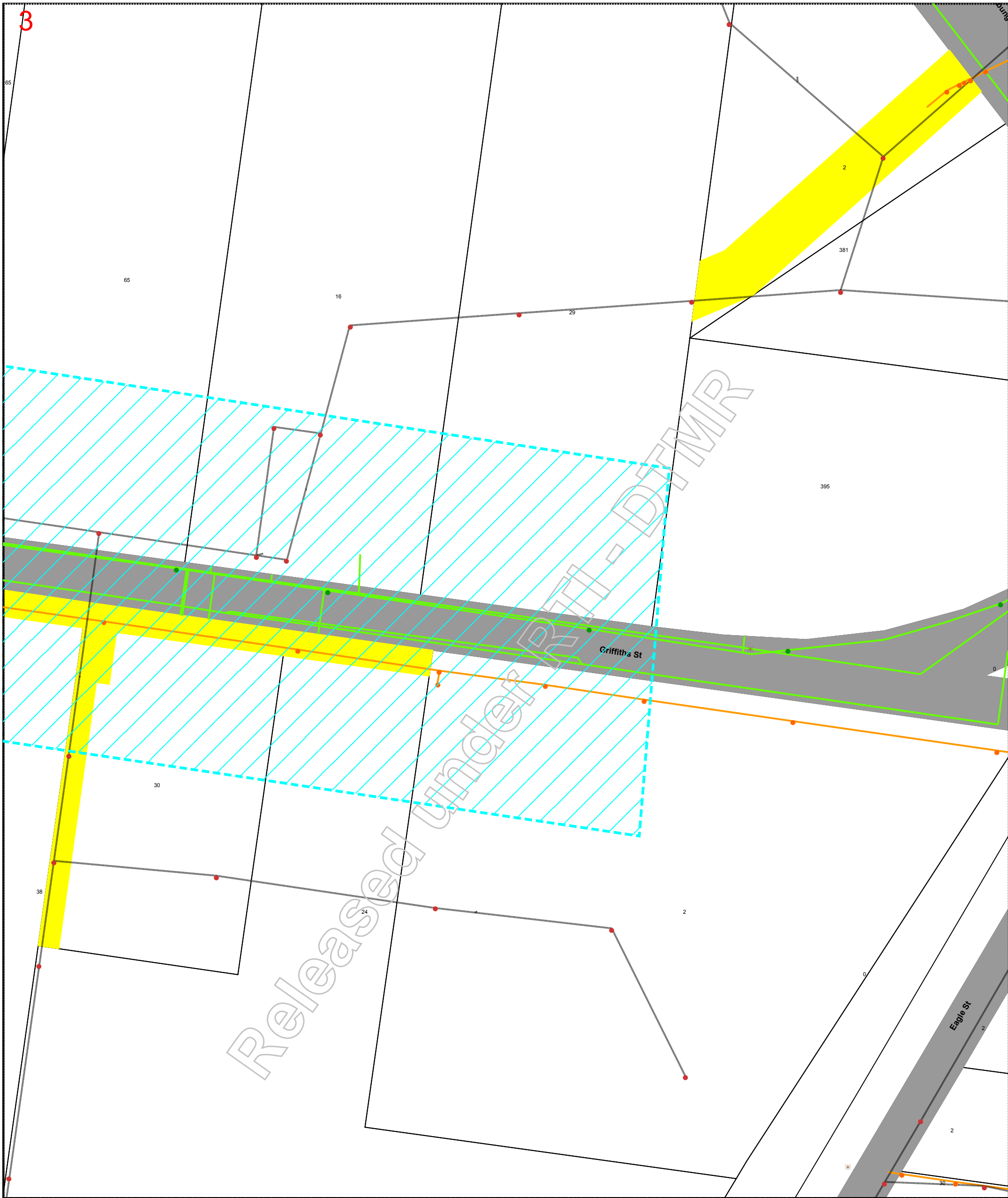
DIAL BEFORE YOU DIG RESPONSE

Map 2

DBYD Ref: 54817593

Date: 09/08/2016

For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>



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LEGEND

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- Communication Lines
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- Sewer Pipes
- Stormwater Fittings
- Stormwater Pipes
- Water Fittings
- Water Pipes
- Park Infrastructure
- Permanent Survey Mark
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DIAL BEFORE YOU DIG RESPONSE

Map 3

DBYD Ref: 54817593

Date: 09/08/2016

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6. If an electronic cable locator is used hand excavation to the depth of asset must be done in advance to excavators.

Conditions of Supply of Information

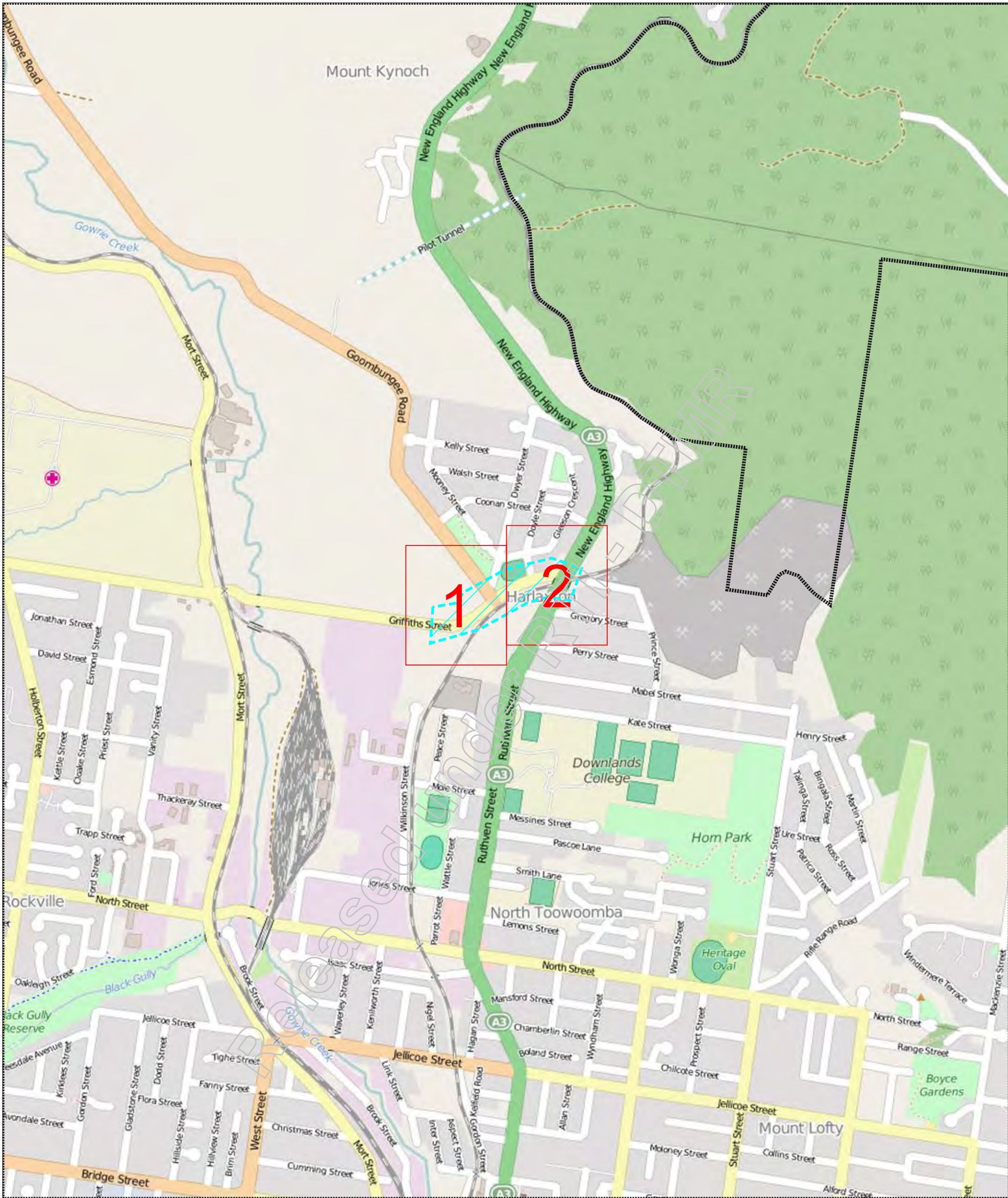
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5. For all work within 2.5m of nominal location, you are required to hand dig (pothole) and expose the asset, hence proving its exact location before work can commence.

Road and Footpath Openings


1. All Road and Footpath openings shall be in accordance with TRC Auspec Volume 2 Section 306.1 "Road Openings and Restorations By Utility Authorities."
2. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads.

Where works impact on road users, a traffic control plan shall be submitted to Council for consideration, prior to works commencing. Depending on the impact of such works, certain conditions may be imposed, i.e. Day/time of works.

For more information including inverts and size queries please refer to our Toowoomba Regional Council online mapping service ["E-view"](#)



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by telephoning 131 TRC
 2. Council Parks and Recreation Branch should be contacted on 131 TRC to make arrangements to minimise damage to tree roots.
 3. Other relevant authorities should be contacted for locating their services.
 4. Notification should be given to residents affected by the work before commencement.
 5. Any damage to Council assets shall be repaired or reinstated at the applicant's cost to the appropriate Council standards.
 6. All Road and Footpath openings shall be in accordance with ToC Auspec Volume 2 Section 306.1 "Road Openings And Restorations by Utility Authorities."
 7. HCP (house connection plans) for sewer stub locations must be obtained from the plumbing section of the Toowoomba Regional Council. (COST APPLIES). Water pipe connections from Water meter to house Not Known.
 8. For a more detailed location of services, an infrastructure search is available (COST APPLIES).
 9. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads. And a copy of the traffic control plan for the works to be submitted to and approved by Council prior to the commencement of works.
- For Work on Road Reserves please contact: Councils Road and Traffic Branch 131 TRC

LEGEND
 DBYD Enquiry

N
 1:10000
 (A3 Size)



DIAL BEFORE YOU DIG RESPONSE

Overview Map

DBYD Ref: 54817638

Date: 09/08/2016

Whilst all due care has been taken in the preparation of this plan, the accuracy of provided information can not be guaranteed. All information MUST be verified on site. Please refer any discrepancies to Toowoomba Regional Council - Infrastructure Asset Management Department. No part of this plan is to be reproduced without Infrastructure Asset Management Department permission.

NOTE:
 This response is generated to answer a Dial Before You Dig enquiry. It is NOT a council approval to carry out works. You may still need to contact the appropriate Toowoomba Regional Council department to obtain approval for works.

For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by 131TRC
2. Council Parks and Recreation Branch should be contacted on 131 TRC to make arrangements to minimise damage to tree roots.
3. Other relevant authorities should be contacted for locating their services.
4. Notification should be given to residents affected by the work before commencement.
5. Any damage to Council assets shall be repaired or reinstated at the applicant's cost to the appropriate Council standards.
6. All Road and Footpath openings shall be in accordance with Tcc Auspec Volume 2 Section 306.1 "Road Openings And Restorations by Utility Authorities".
7. HCP (house connection plans) for sewer stub locations must be obtained from the plumbing section of the Toowoomba Regional Council. (COST APPLIES). Water pipe connections from Water meter to house Not Known.
8. For a more detailed location of services, an infrastructure search is available (COST APPLIES).
9. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads. And a copy of the traffic control plan for the works to be submitted to and approved by Council prior to the commencement of works. For Work on Road Reserves please contact: Councils Road and Traffic Branch 131 TRC

N

 1:1000
 (A3 Size)



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NOTE:

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LEGEND

- Communication Fittings
- Communication Lines
- Sewer Fittings
- Sewer Pipes
- Stormwater Fittings
- Stormwater Pipes
- Water Fittings
- Water Pipes
- Park Infrastructure
- Permanent Survey Mark
- Dam
- Easement
- DBYD Enquiry

DIAL BEFORE YOU DIG RESPONSE

Map 1

DBYD Ref: 54817638

Date: 09/08/2016

For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>



1. On site locations are required before commencement of work in the vicinity of Toowoomba Regional Council services by 131TRC
2. Council Parks and Recreation Branch should be contacted on 131 TRC to make arrangements to minimise damage to tree roots.
3. Other relevant authorities should be contacted for locating their services.
4. Notification should be given to residents affected by the work before commencement.
5. Any damage to Council assets shall be repaired or reinstated at the applicant's cost to the appropriate Council standards.
6. All Road and Footpath openings shall be in accordance with Tcc Auspec Volume 2 Section 306.1 "Road Openings And Restorations by Utility Authorities."
7. HCP (house connection plans) for sewer stub locations must be obtained from the plumbing section of the Toowoomba Regional Council. (COST APPLIES). Water pipe connections from Water meter to house Not Known.
8. For a more detailed location of services, an infrastructure search is available (COST APPLIES).
9. All traffic management/control to be carried out strictly in accordance with the Main Roads Manual of Uniform Traffic Control Devices, Part 3, Works on Roads. And a copy of the traffic control plan for the works to be submitted to and approved by Council prior to the commencement of works. For Work on Road Reserves please contact: Councils Road and Traffic Branch 131 TRC


 1:1000
 (A3 Size)
















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NOTE:

This response is generated to answer a Dial Before You Dig enquiry. It is NOT a council approval to carry out works. You may still need to contact the appropriate Toowoomba Regional Council department to obtain approval for works.

LEGEND

-  Communication Fittings
-  Communication Lines
-  Sewer Fittings
-  Sewer Pipes
-  Stormwater Fittings
-  Stormwater Pipes
-  Water Fittings
-  Water Pipes
-  Park Infrastructure
-  Permanent Survey Mark
-  Dam
-  Easement
-  DBYD Enquiry

**DIAL BEFORE
YOU DIG
RESPONSE**

Map 2

DBYD Ref: 54817638

Date: 09/08/2016

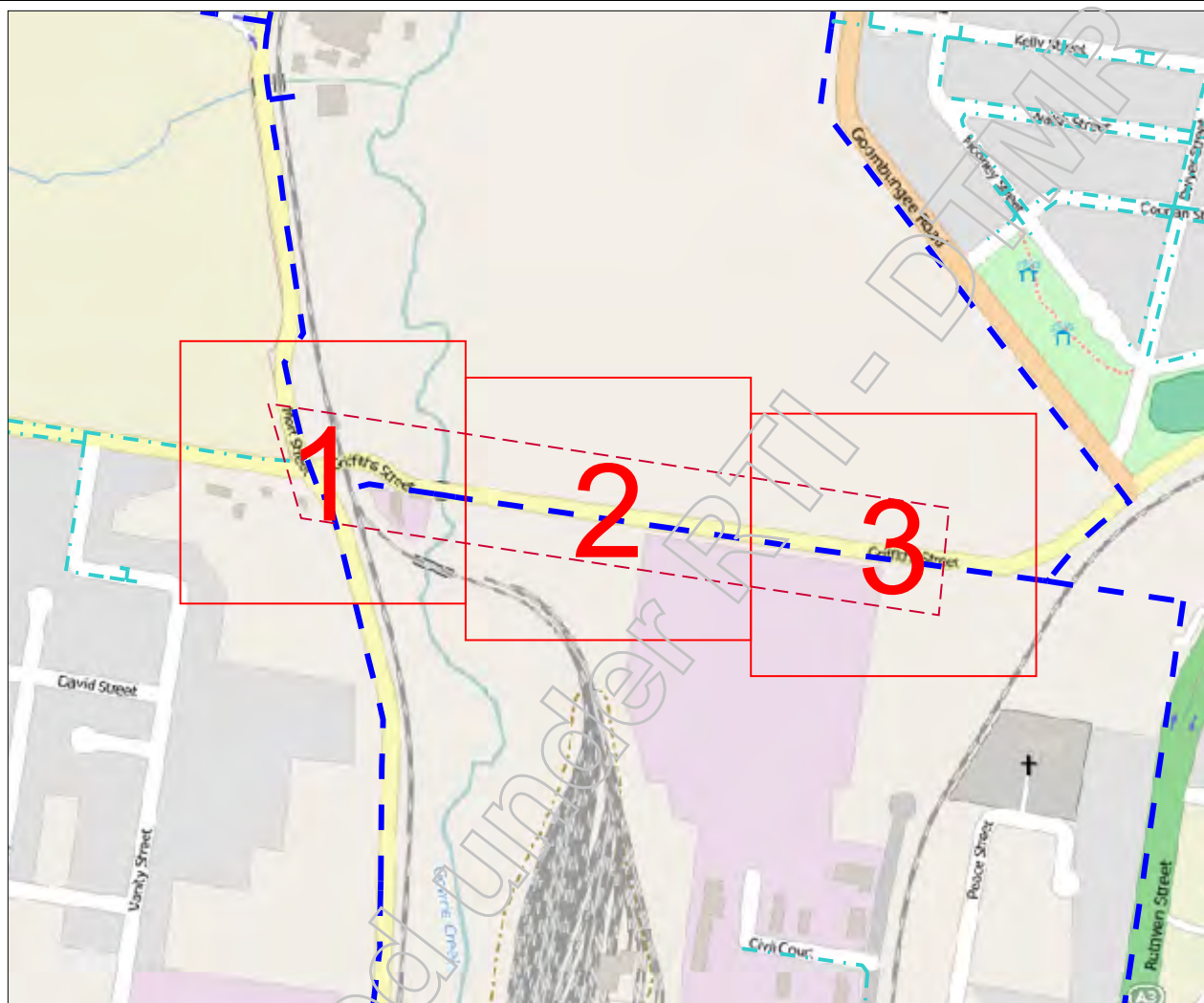
For more information including inverts and size queries please go to <https://maps.toowoombarc.qld.gov.au/flex/TRMAPSassets/>

09/08/2016

SCALE: DO NOT SCALE

REF NO: 54817596

As work on APA underground plant is ongoing any drawing with an issue date of more than 30 days previous can no longer be considered valid. All persons planning civil works on any site are advised to contact APA to confirm location. All underground gas pipelines are the property of APA & are not to be accessed by unauthorised persons. All care is taken with preparation of the drawings & no responsibility is accepted for errors or omissions



Enquiry: 54817596

Papersize: A4 Scale: 1:7000

0 0.08km


























Data Source

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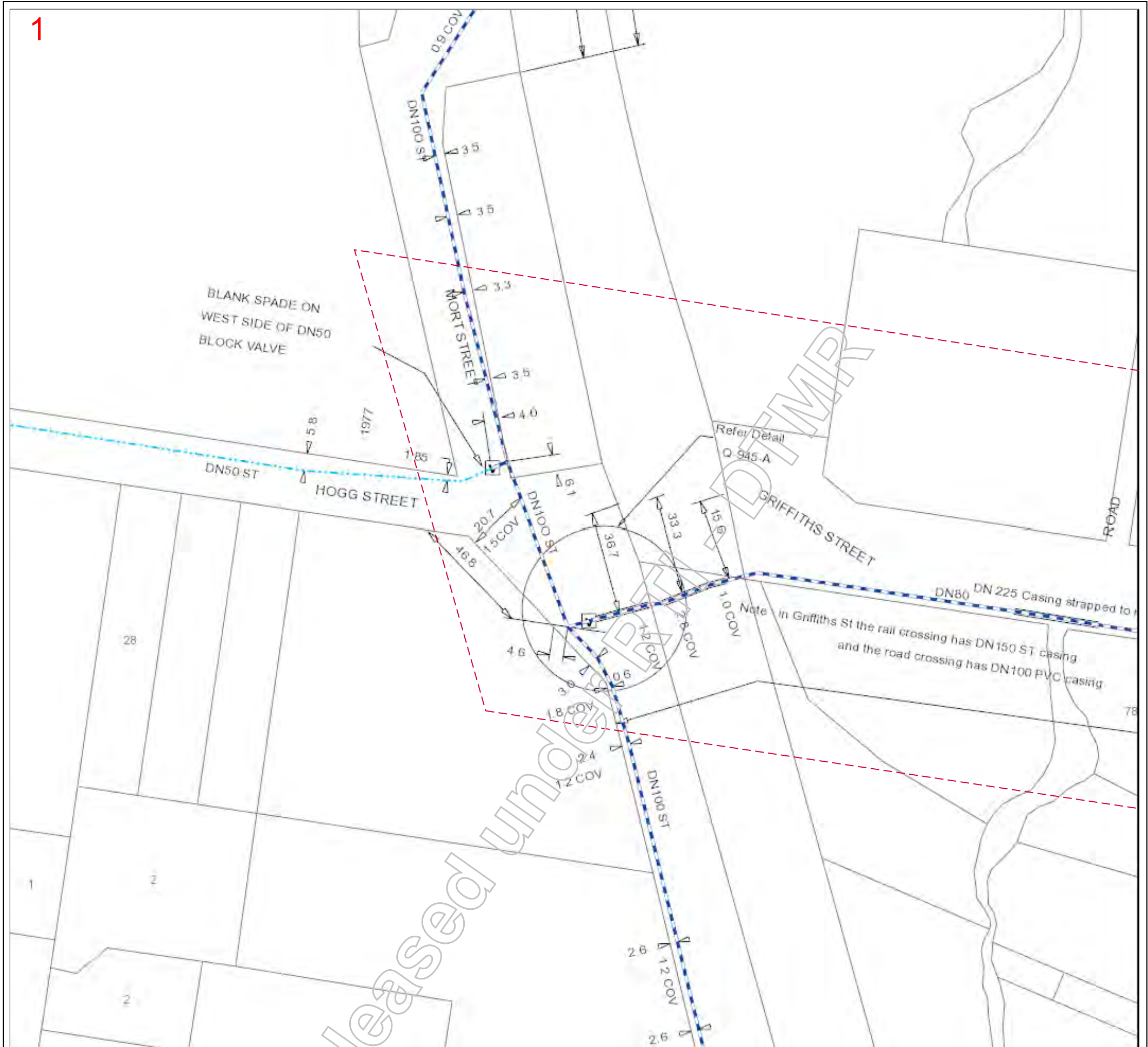
operated by



Legend

	Anode		Proposed/Under Construction		Idle Gas Pipe
	Pipeline Marker		Class 600 Steel		Sleeve
	Regulator		Class 300 Steel		Undefined Pressure
	Syphon		Class 150 Steel		Easement
	Test Point		High Pressure Steel		
	Block Valve		High Pressure PE 700kPa		
	Isolation Valve		High		
	Trace Wire Point		Medium		
			Medium Nylon Pipes		
			Low		
			Line / Polygon Request		

This maps is created in colour and shall be printed in colour



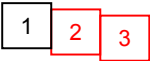
54817596 Map Sheet: 1

Papersize: A3 Scale: 1: 1000

0 0.01km



Map Key:



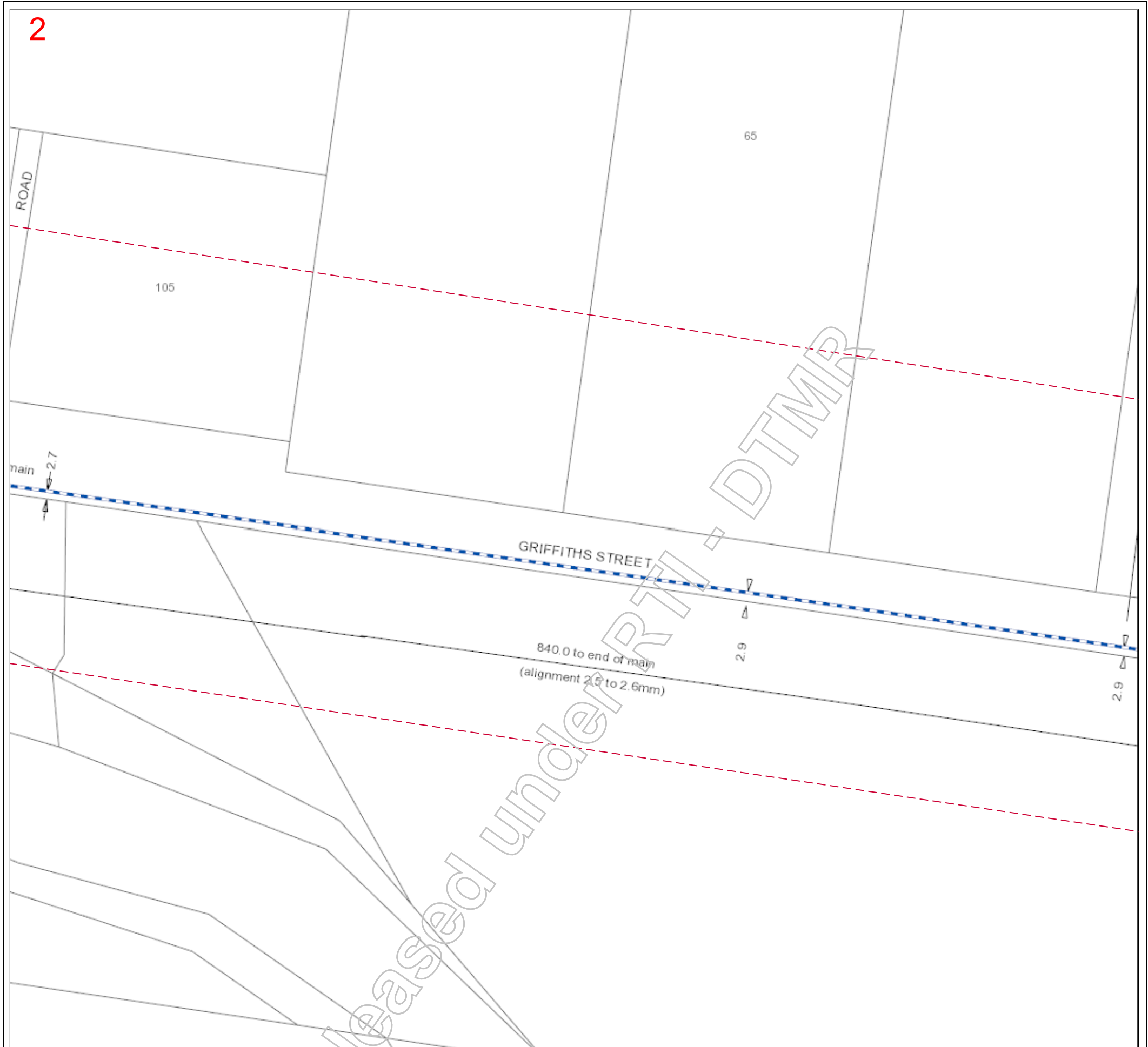
Legend

- Anode
- Pipeline Marker
- Regulator
- Syphon
- Test Point
- Block Valve
- Isolation Valve
- Trace Wire Point
- Proposed/Under Construction
- Class 600 Steel
- Class 300 Steel
- Class 150 Steel
- High Pressure Steel
- High Pressure PE 700kPa
- High
- Medium
- Medium Nylon Pipes
- Low
- Idle Gas Pipe
- Sleeve
- Undefined Pressure
- Easement
- Line / Polygon Request

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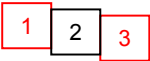
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Papersize: A3 Scale: 1: 1000

0 0.01km



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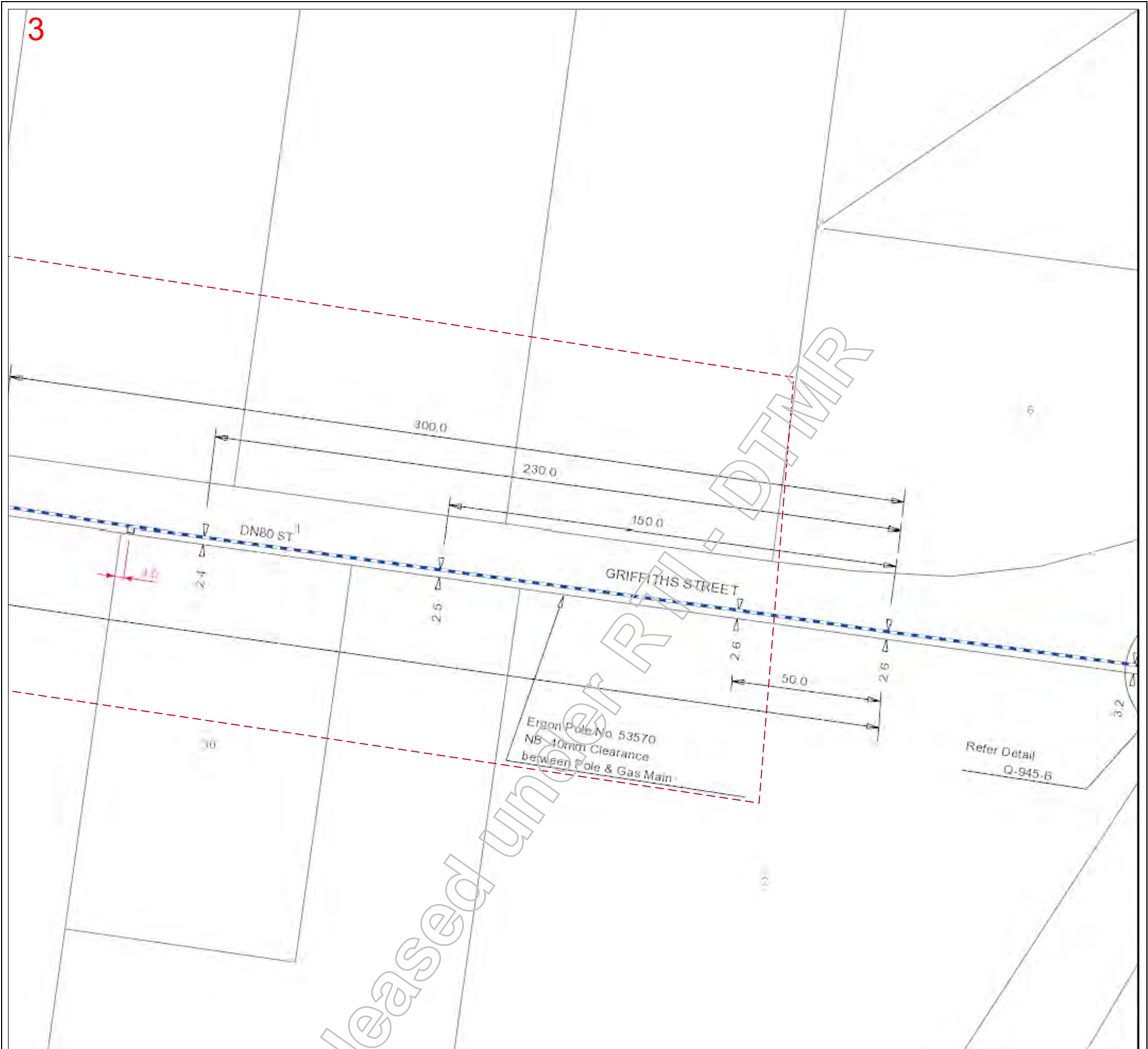
Legend

- | | | |
|--------------------|-----------------------------|--------------------|
| ⬢ Anode | Proposed/Under Construction | Idle Gas Pipe |
| Ⓜ Pipeline Marker | Class 600 Steel | Sleeve |
| Ⓡ Regulator | Class 300 Steel | Undefined Pressure |
| Ⓢ Syphon | Class 150 Steel | Easement |
| Ⓣ Test Point | High Pressure Steel | |
| Ⓥ Block Valve | High Pressure PE 700kPa | |
| Ⓦ Isolation Valve | High | |
| Ⓦ Trace Wire Point | Medium | |
| | Medium Nylon Pipes | |
| | Low | |
| | Line / Polygon Request | |

Data Source

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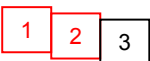
54817596 Map Sheet: 3

Papersize: A3 Scale: 1: 1000

0 0.01km



Map Key:



Legend

- | | | |
|--------------------|---------------------------------|----------------------|
| ⬢ Anode | --- Proposed/Under Construction | — Idle Gas Pipe |
| Ⓜ Pipeline Marker | - - - Class 600 Steel | — Sleeve |
| Ⓡ Regulator | - - - Class 300 Steel | — Undefined Pressure |
| Ⓢ Syphon | - - - Class 150 Steel | — Easement |
| Ⓣ Test Point | - - - High Pressure Steel | |
| Ⓥ Block Valve | - - - High Pressure PE 700kPa | |
| Ⓥ Isolation Valve | - - - High | |
| Ⓦ Trace Wire Point | - - - Medium | |
| | - - - Medium Nylon Pipes | |
| | - - - Low | |
| | - - - Line / Polygon Request | |

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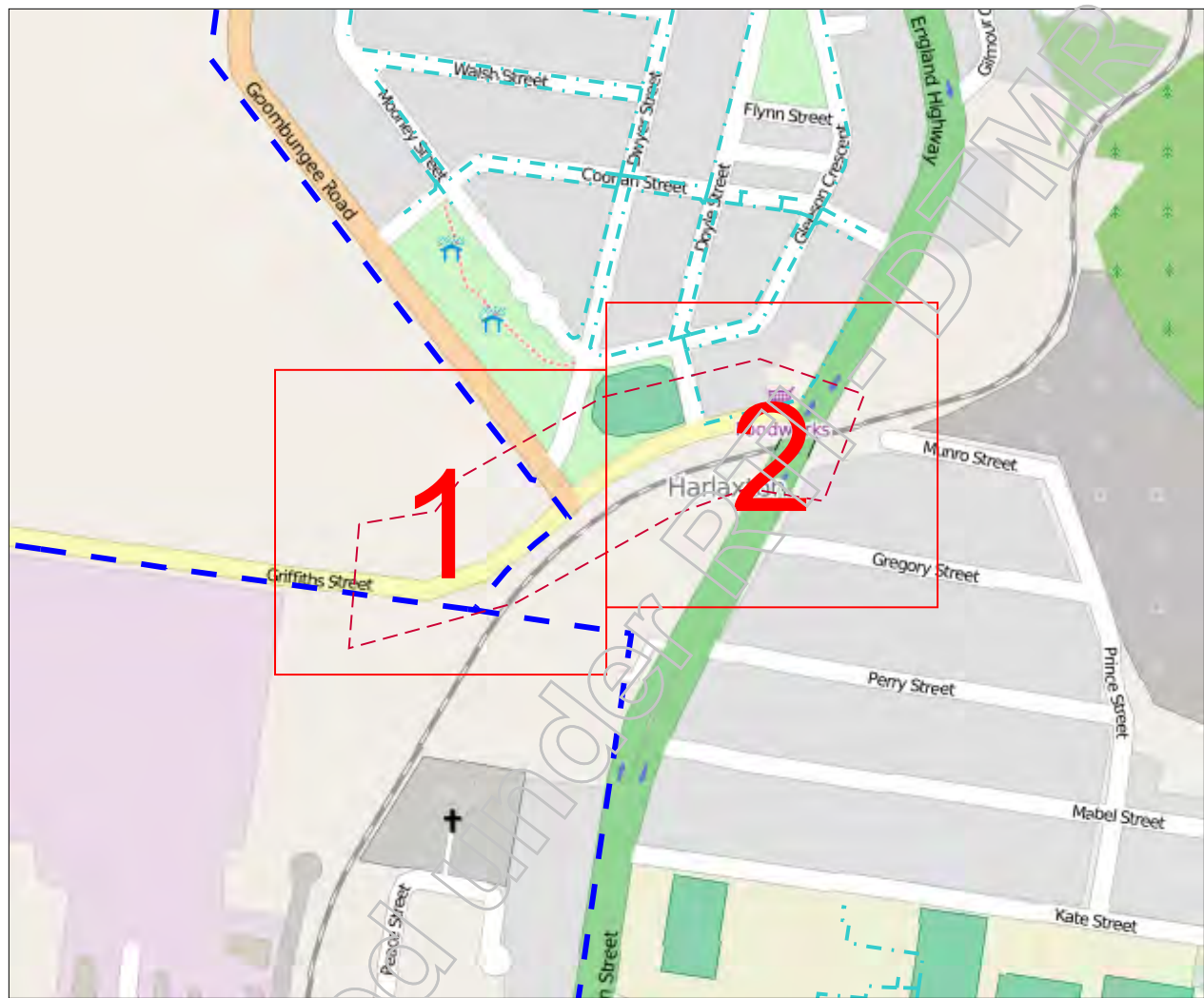
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09/08/2016

SCALE: DO NOT SCALE

REF NO: 54817642

As work on APA underground plant is ongoing any drawing with an issue date of more than 30 days previous can no longer be considered valid. All persons planning civil works on any site are advised to contact APA to confirm location. All underground gas pipelines are the property of APA & are not to be accessed by unauthorised persons. All care is taken with preparation of the drawings & no responsibility is accepted for errors or omissions



Enquiry: 54817642

Papersize: A4 Scale: 1:6000

0 0.07km



Data Source

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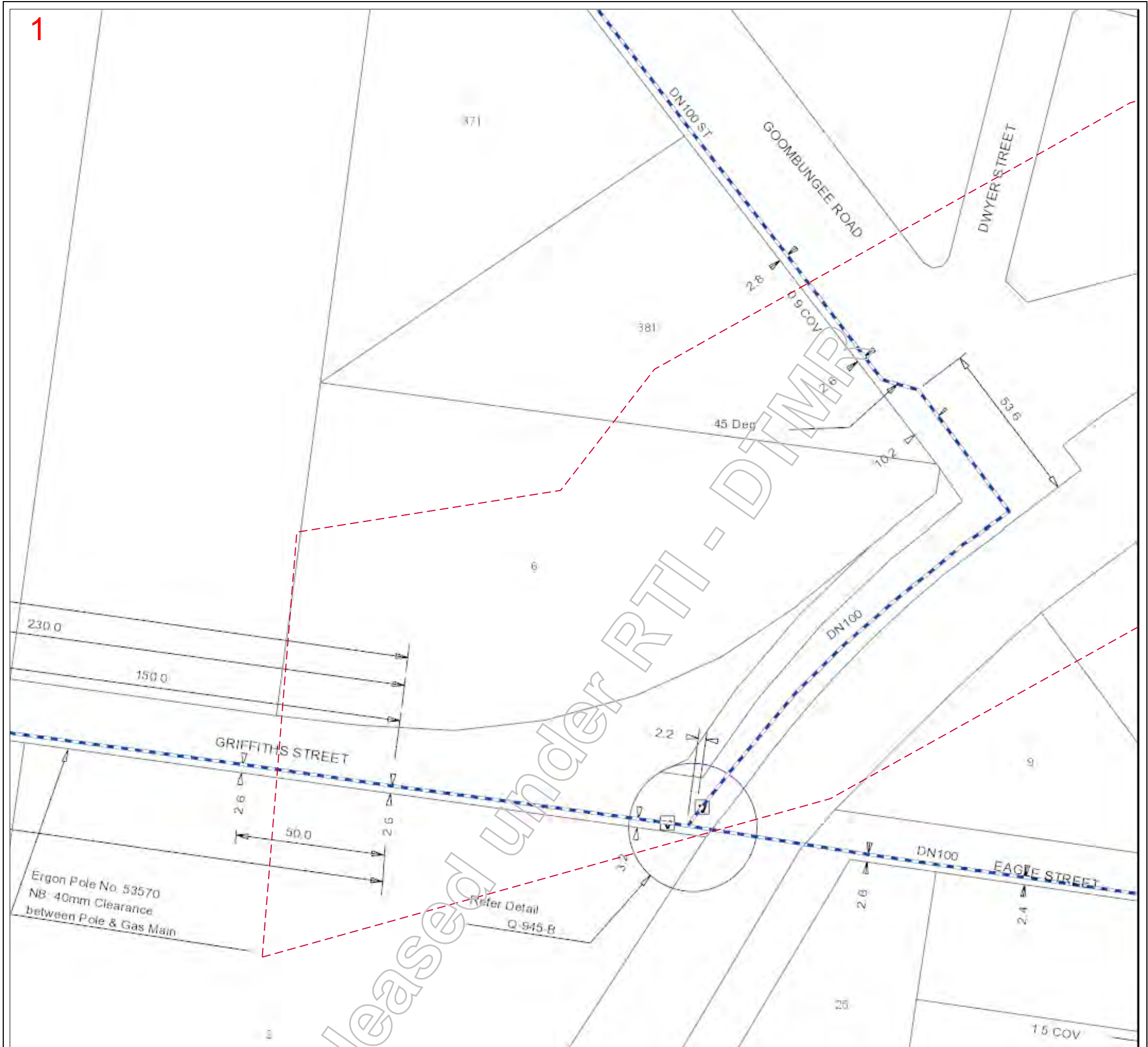


Legend

- | | | |
|--------------------|-------------------------------|----------------------|
| ◆ Anode | — Proposed/Under Construction | — Idle Gas Pipe |
| Ⓜ Pipeline Marker | — Class 600 Steel | — Sleeve |
| Ⓡ Regulator | — Class 300 Steel | — Undefined Pressure |
| Ⓢ Syphon | — Class 150 Steel | — Easement |
| Ⓣ Test Point | — High Pressure Steel | |
| Ⓥ Block Valve | — High Pressure PE 700kPa | |
| Ⓦ Isolation Valve | — High | |
| Ⓧ Trace Wire Point | — Medium | |
| | — Medium Nylon Pipes | |
| | — Low | |
| | — Line / Polygon Request | |

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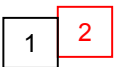
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Papersize: A3 Scale: 1: 1000

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Map Key:



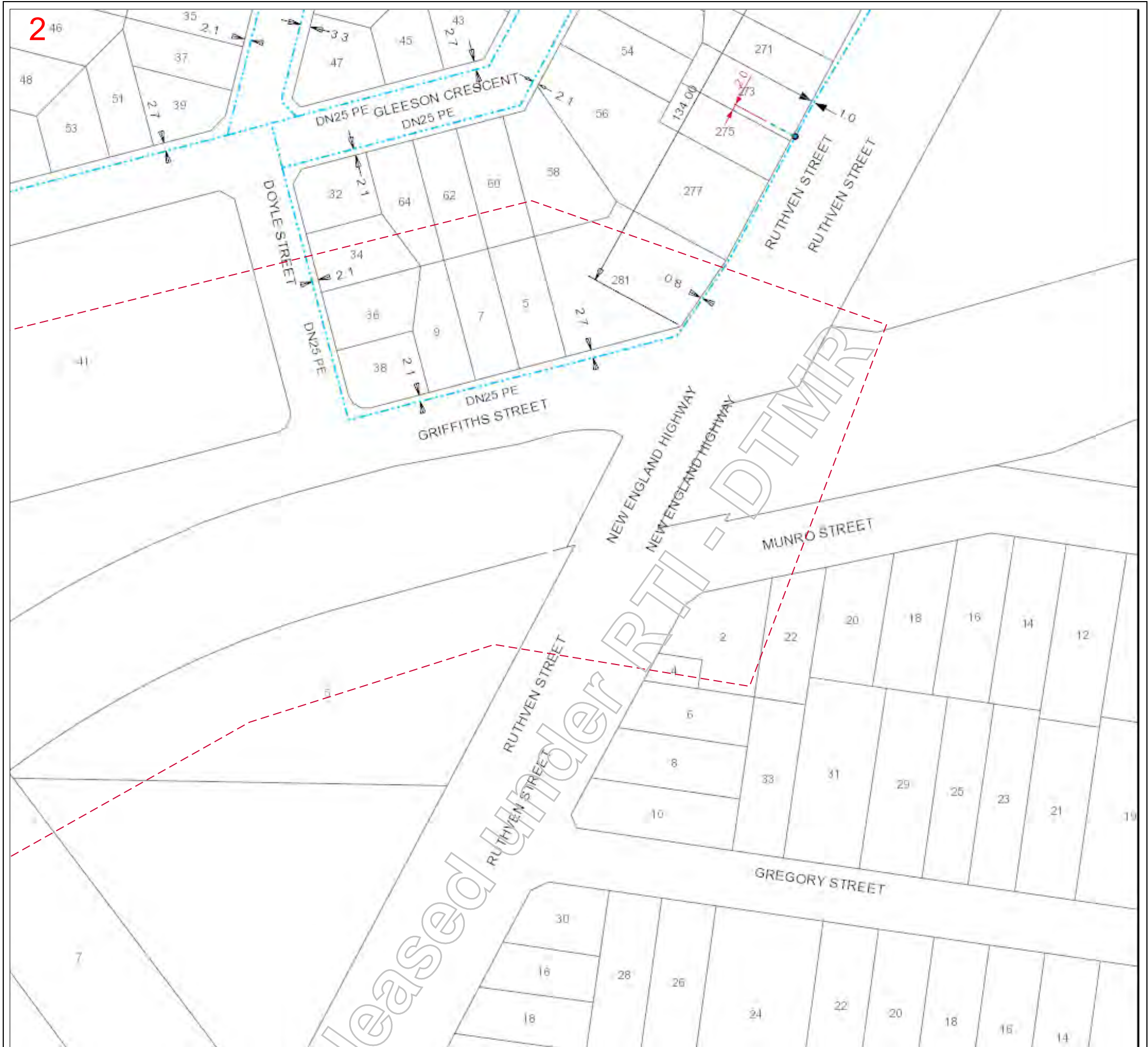
Legend

- | | | |
|--------------------|-----------------------------|--------------------|
| ⬠ Anode | Proposed/Under Construction | Idle Gas Pipe |
| Ⓜ Pipeline Marker | Class 600 Steel | Sleeve |
| Ⓡ Regulator | Class 300 Steel | Undefined Pressure |
| Ⓢ Syphon | Class 150 Steel | Easement |
| Ⓣ Test Point | High Pressure Steel | |
| Ⓥ Block Valve | High Pressure PE 700kPa | |
| Ⓦ Isolation Valve | High | |
| Ⓦ Trace Wire Point | Medium | |
| | Medium Nylon Pipes | |
| | Low | |
| | Line / Polygon Request | |

Data Source

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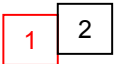
54817642 Map Sheet: 2

Papersize: A3 Scale: 1: 1000

0 0.01km



Map Key:



Legend

- Anode
- Pipeline Marker
- Regulator
- Syphon
- Test Point
- Block Valve
- Isolation Valve
- Trace Wire Point
- Proposed/Under Construction
- Class 600 Steel
- Class 300 Steel
- Class 150 Steel
- High Pressure Steel
- High Pressure PE 700kPa
- High
- Medium
- Medium Nylon Pipes
- Low
- Idle Gas Pipe
- Sleeve
- Undefined Pressure
- Easement
- Line / Polygon Request

Data Source

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54817594-11073873

Sheet: Index Layer: All Layers

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Created date: 09/08/2016 12:44:54


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Large

 Land Parcel Large (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

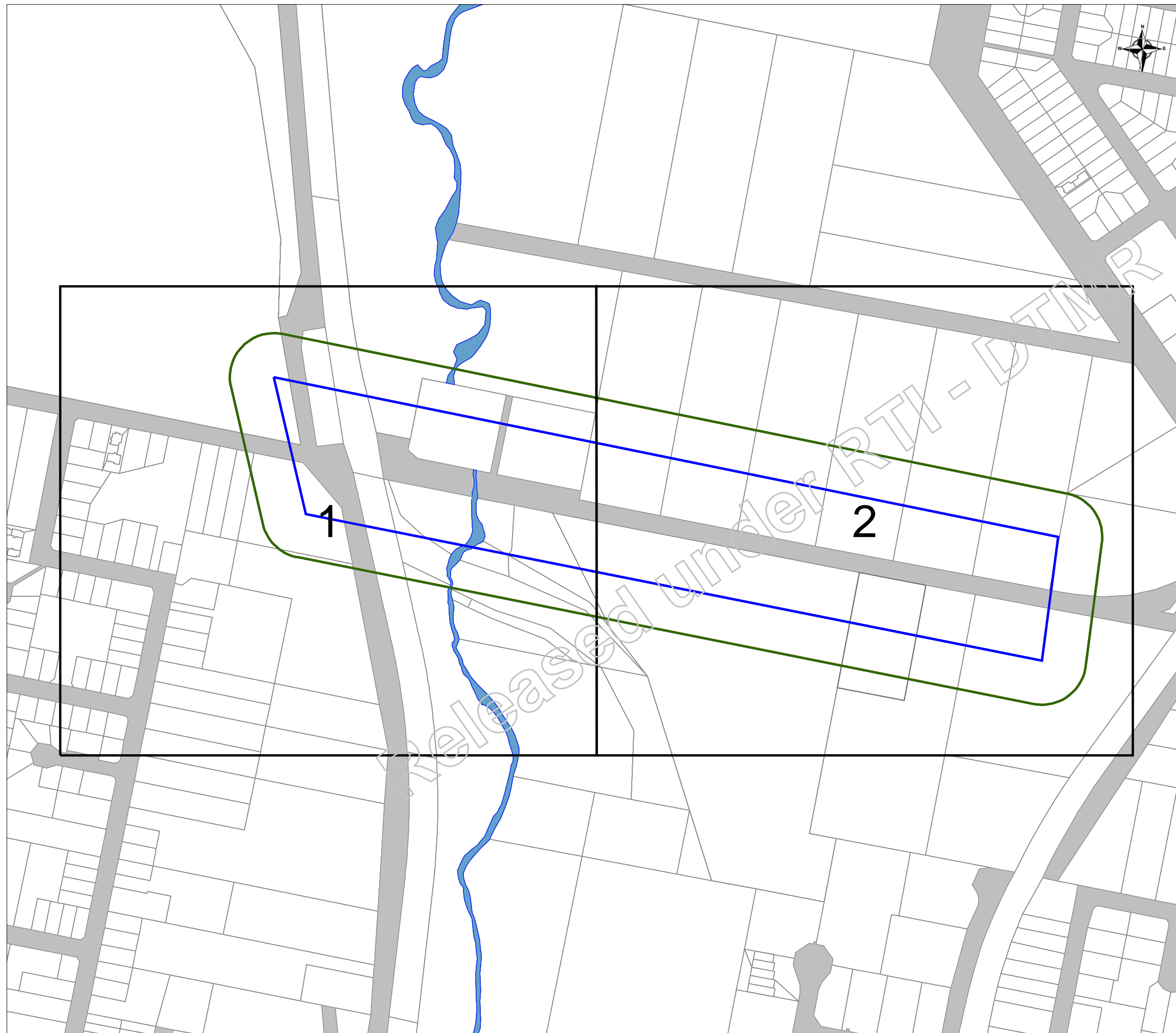
Water Coverage

 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817594-11073873

Sheet: 1 Layer: All Layers

Created by: DBYD Autoplot

Created date: 09/08/2016 12:45:01

Scale: 1:2000



LEGEND

Electricity

Earth - as constructed
Pillar

Pole - HV
Pole - Bollard
Pole - HV/LV
Pole - LV

Substation - Pole

Low Voltage

LV Cable - as constructed (240v)
LV Cable - as constructed (415v)

DBYD

DBYD Request

DBYD Request (Area)
DBYD Request (Ergon Search Area)

Network_other

Planned Asset

Planned Asset - earth
Planned Asset - pole

DCDB

Land Parcel

Land Parcel (Area Geom)

Land Parcel Large

Land Parcel Large (Area Geom)

Land Parcel Medium

Land Parcel Medium (Area Geom)

Easement

Easement (Area Geom)

Road Coverage

Road Coverage (Area Geom)

Water Coverage

Water Coverage (Area Geom)



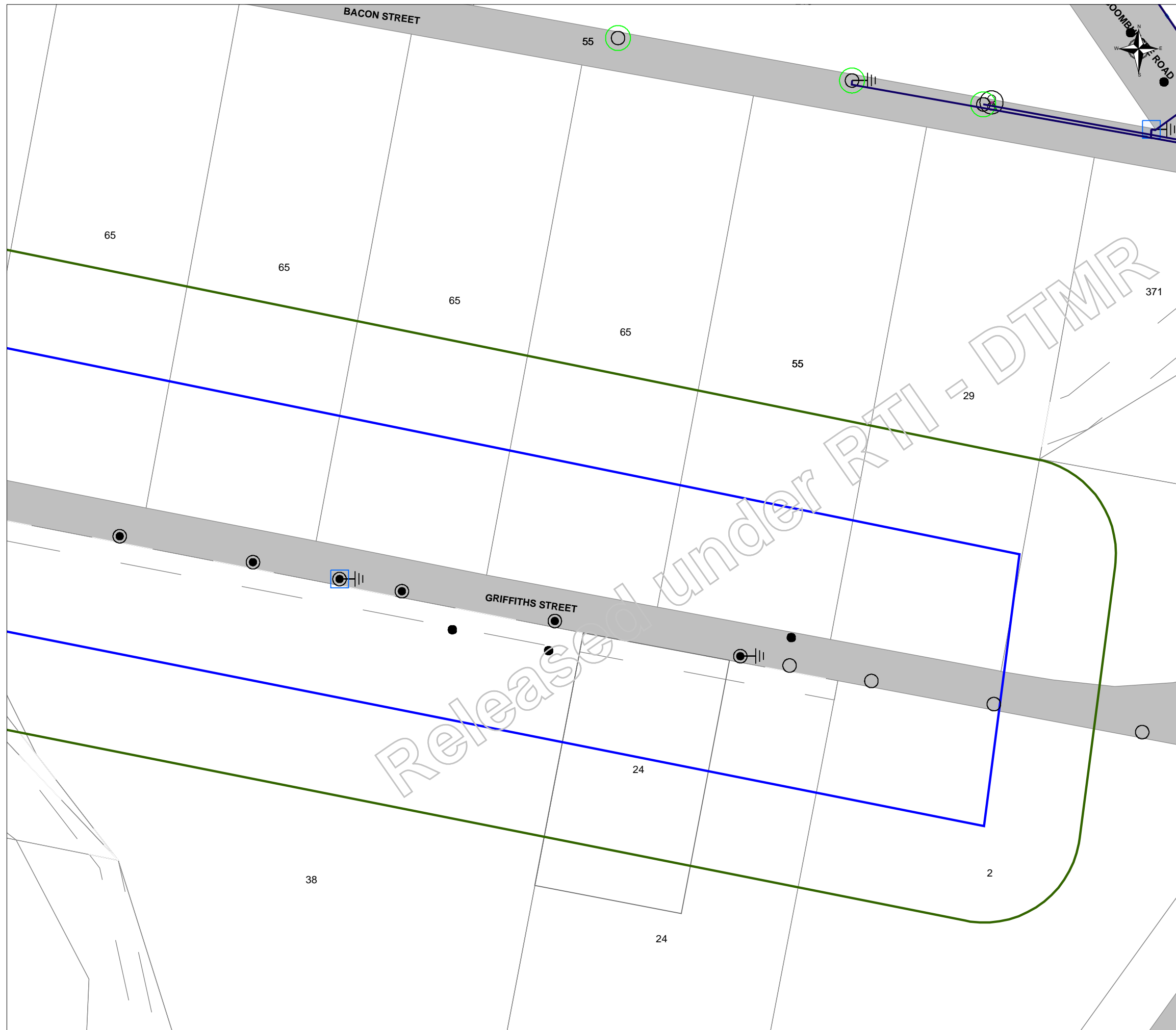
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Created date: 09/08/2016 12:45:05

Scale: 1:2000



LEGEND

Electricity

- Duct - as constructed
- Earth - as constructed

- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV

- Substation - Pole
- Substation - RDU/RMU

High Voltage

- HV Cable - as constructed (11kv)
- HV Cable Joint - as constructed (11Kv)

Communications

- Communications Cable - as constructed
- Communications Joint - as constructed
- Communications Pit - as constructed

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Unregistered Plan

- URP Lot
- URP Lot (Geometry)



54817594-11073873

Sheet: Index Layer: Planned Assets

Created by: DBYD Autoplot

Created date: 09/08/2016 12:45:20


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Large

 Land Parcel Large (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

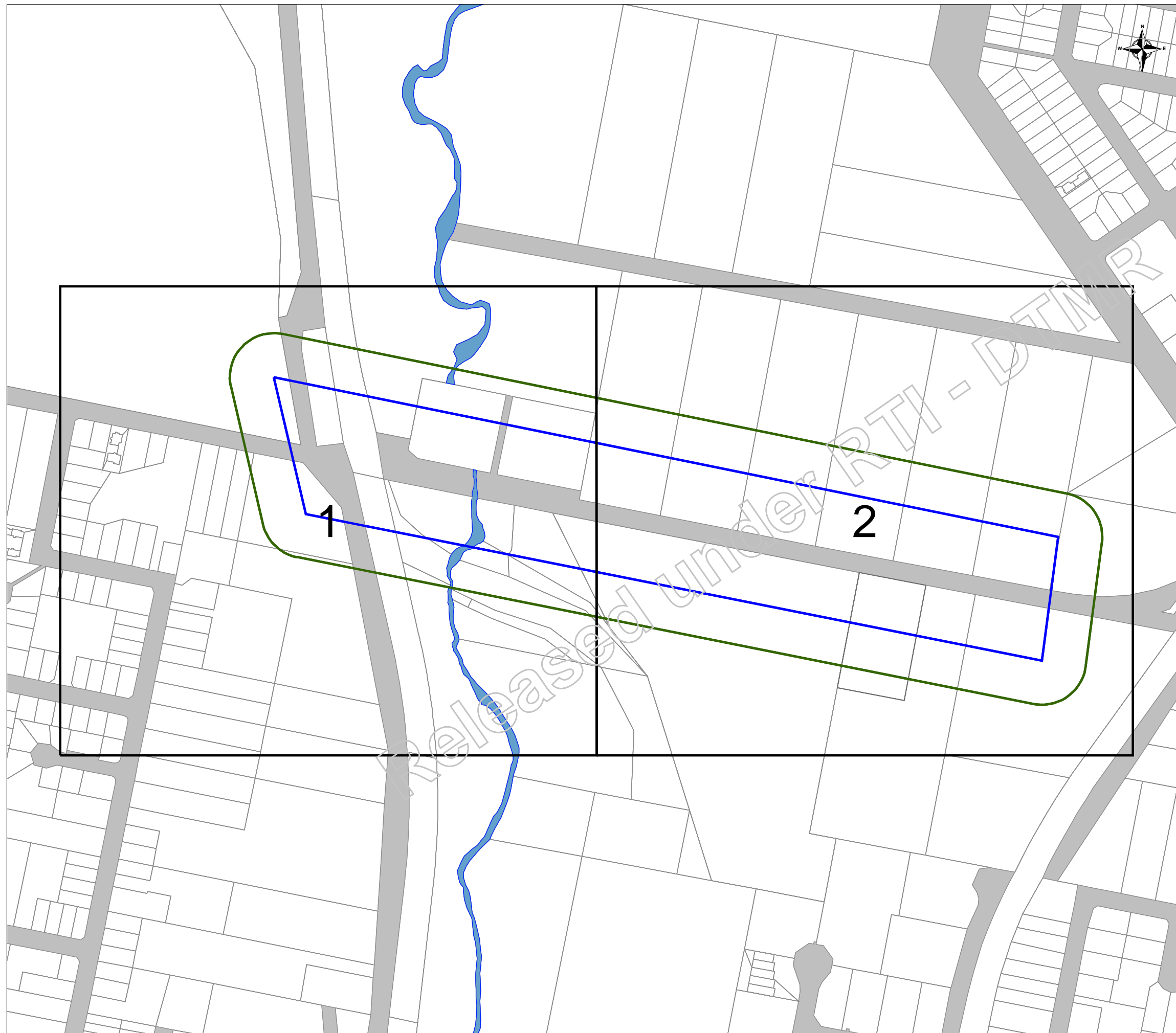
Water Coverage

 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817594-11073873

Sheet: 1 Layer: Planned Assets

Created by: DBYD Autoplot

Created date: 09/08/2016 12:45:24

Scale: 1:2000



LEGEND

Electricity

- Earth - as constructed
- Pillar

- Pole - HV
- Pole - Bollard
- Pole - HV/LV
- Pole - LV

- Substation - Pole

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

Network_other

Planned Asset

- Planned Asset - earth
- Planned Asset - pole

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Large

- Land Parcel Large (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

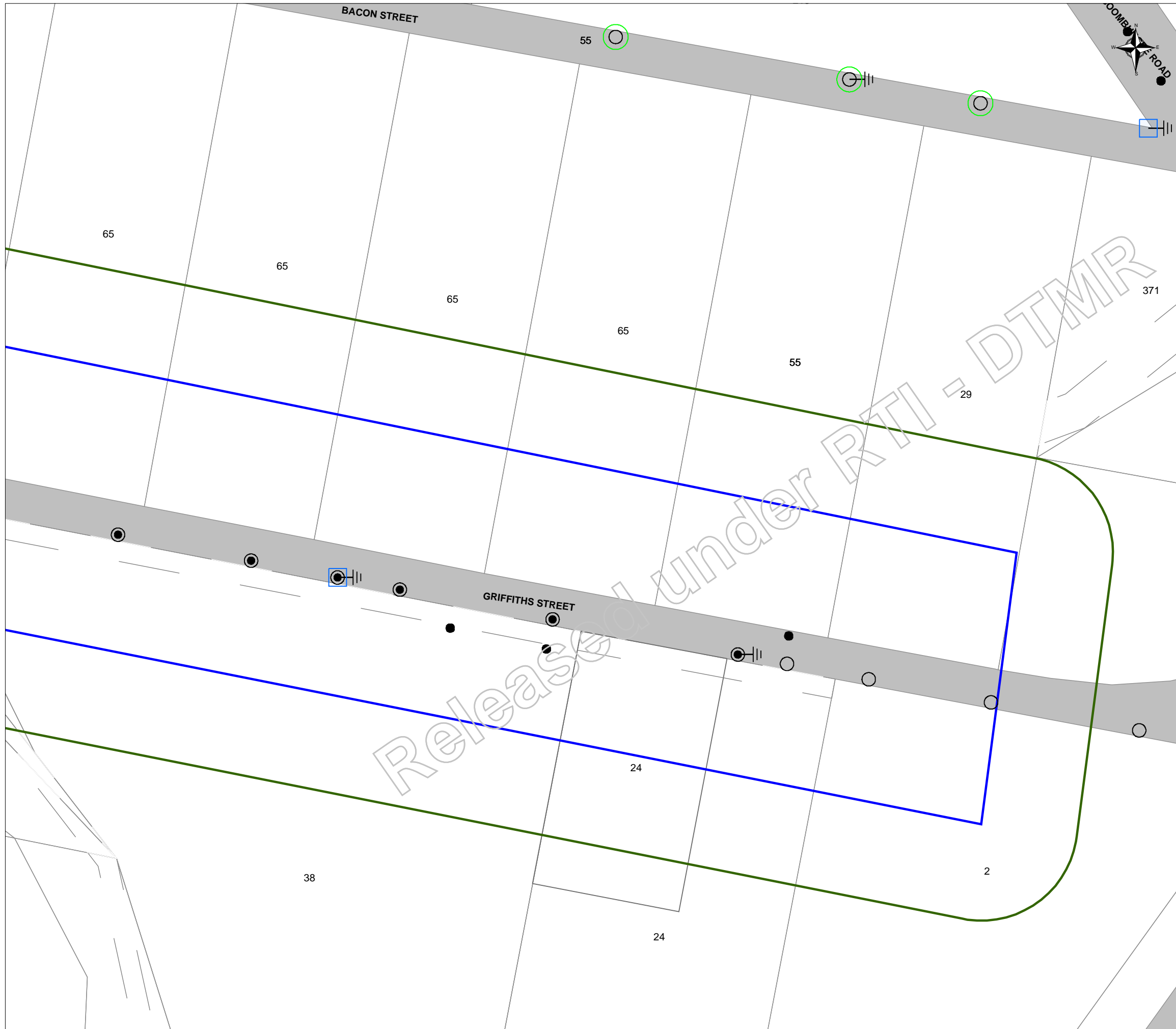
- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Water Coverage

- Water Coverage (Area Geom)



54817594-11073873

Sheet: 2 Layer: Planned Assets

Created by: DBYD Autoplot

Created date: 09/08/2016 12:45:29

Scale: 1:2000

LEGEND

Electricity

- ||— Earth - as constructed
- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV

- Substation - Pole
- Substation - RDU/RMU

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Unregistered Plan

- URP Lot
- URP Lot (Geometry)



54817639-11073883

Sheet: Index Layer: All Layers

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:17


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

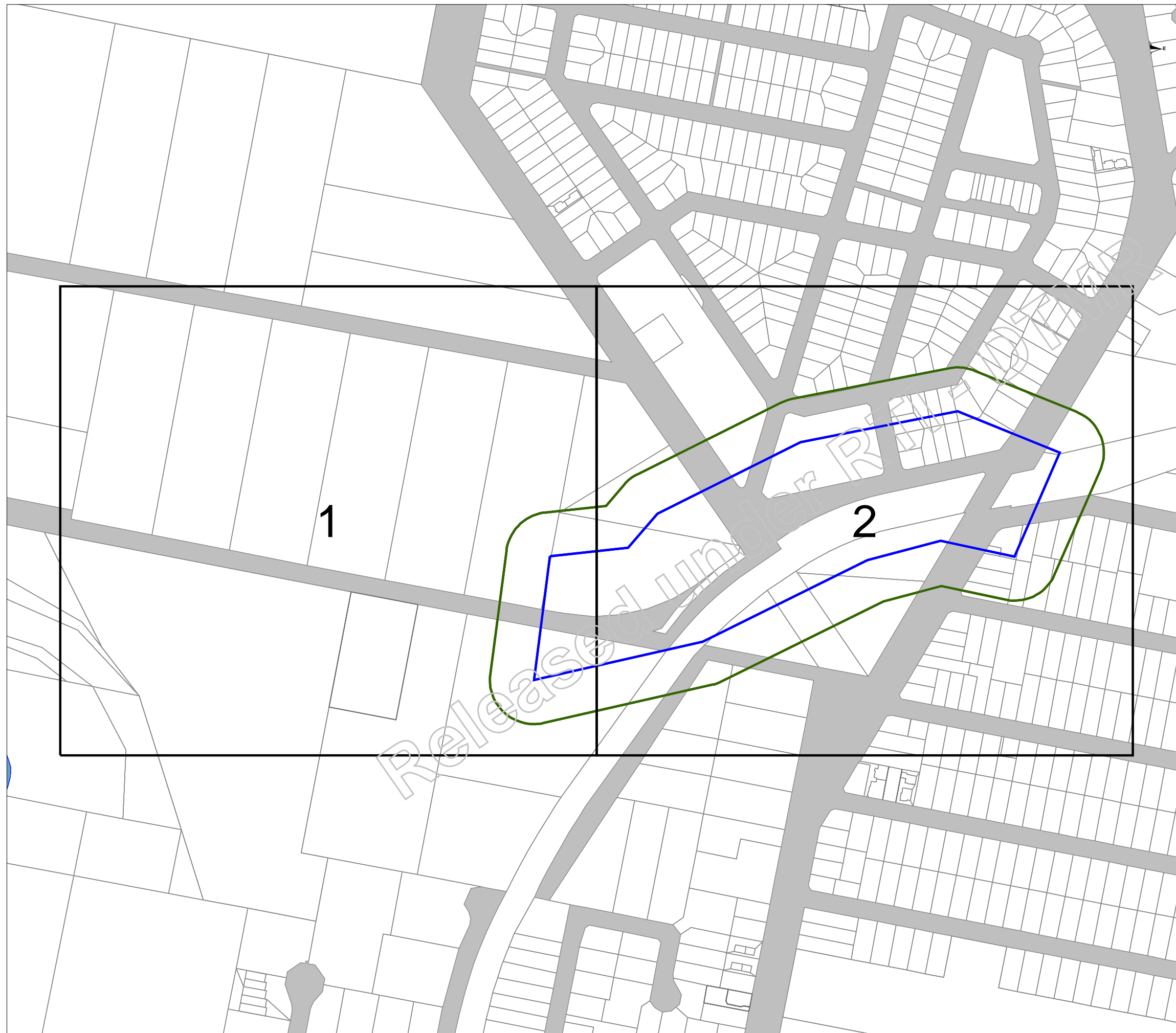
Water Coverage

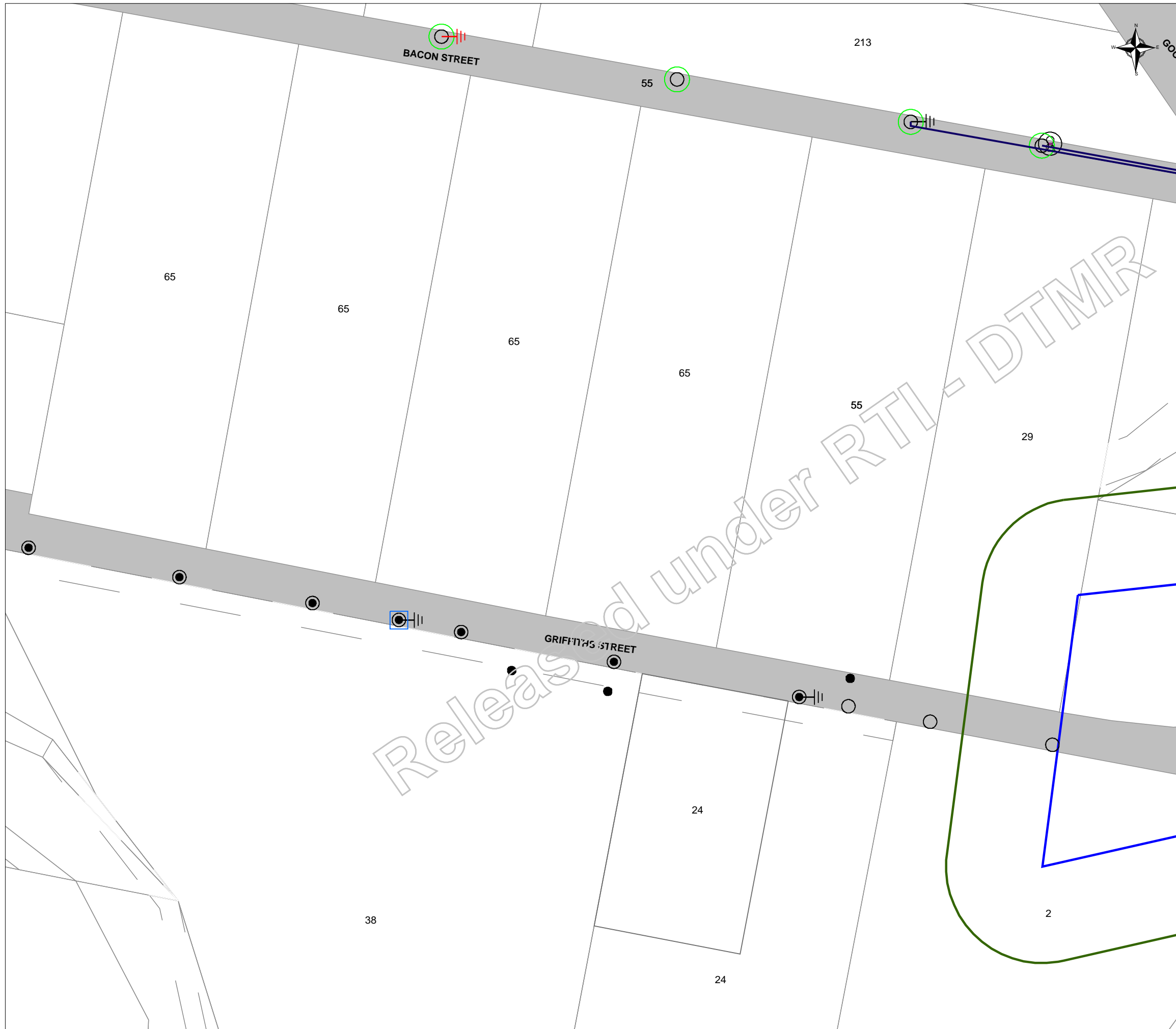
 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817639-11073883

Sheet: 1 Layer: All Layers

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:21

Scale: 1:2000

LEGEND

Electricity

- Duct - as constructed
- Earth - as constructed

- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV

- Substation - Pole

High Voltage

- HV Cable - as constructed (11kv)

Communications

- Communications Cable - as constructed
- Communications Joint - as constructed
- ⊗ Communications Pit - as constructed

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

Network_other

Planned Asset

- Planned Asset - earth

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Unregistered Plan

- URP Lot (Geometry)



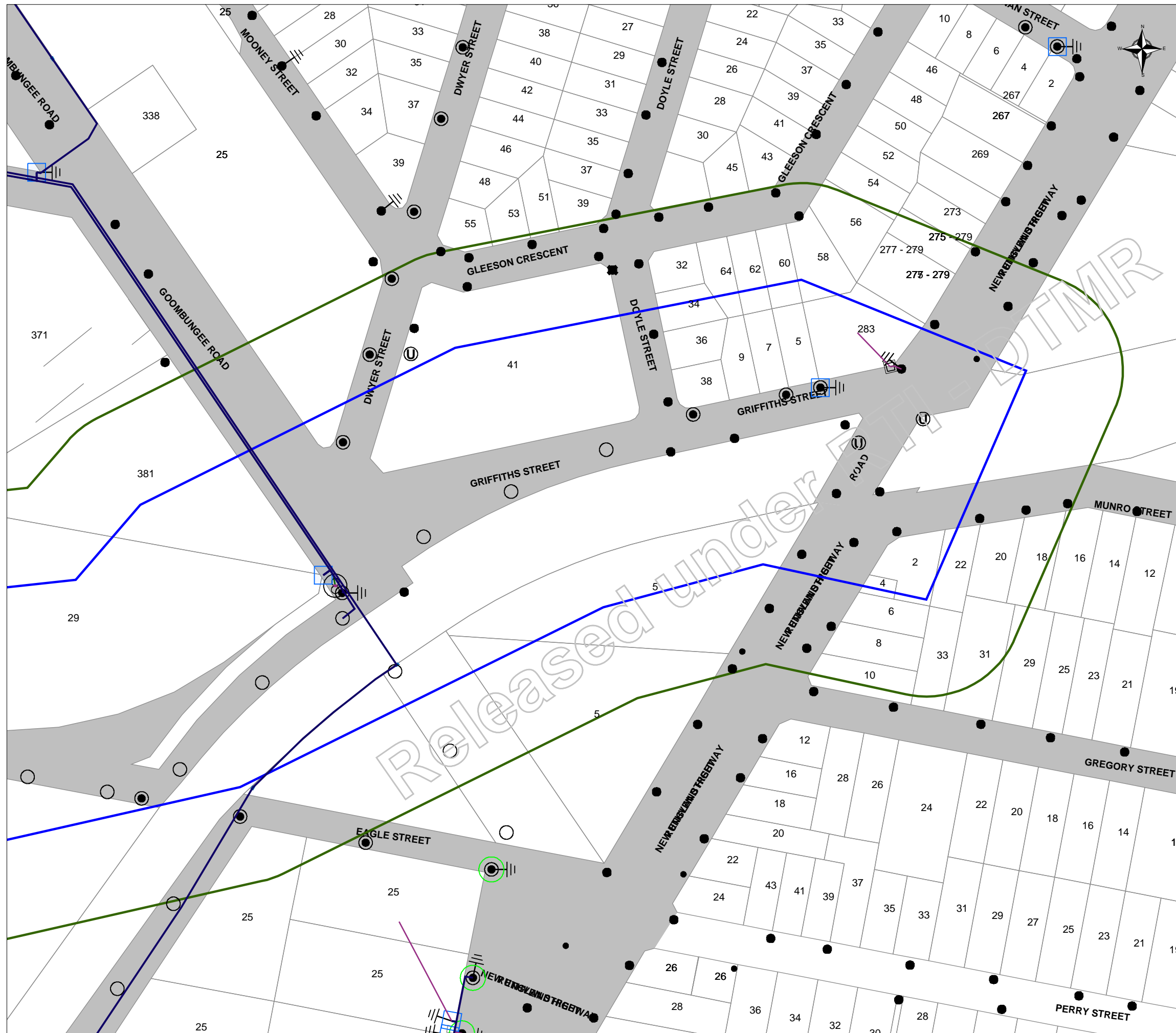
54817639-11073883

Sheet: 2 Layer: All Layers

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:28

Scale: 1:2000



LEGEND

Electricity

- Duct - as constructed
- Earth - as constructed
- Pillar - Cross Road Pillar

- Pole - HV/LV
- Pole - HV
- Pole - HV/LV/Comms
- Pole - SL
- Pole - Unknown
- Pole - Bollard
- Pole - LV
- Pole - LV/Comms

- Substation - Pole
- Substation -
- Substation - RDU/RMU

Low Voltage

- LV Cable - as constructed (240v)
- LV Cable - as constructed (415v)

High Voltage

- HV Cable - as constructed (11kv)
- HV Cable Joint - as constructed (11Kv)

Communications

- Communications Cable - as constructed
- Communications Joint - as constructed
- Communications Pit - as constructed

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

To:	Part Refuse Sch.4 Part 4 s.6 Personal information	DBYD Inquiry/Referral No: 54817639
Company:	Cardno	Date: 9/08/2016 12:23:00 PM
Address:	Level 11 Green Square North Tower, 515 St Pauls Fortitude Valley QLD 4006	From: Ergon Energy Region: Ergon SW
Fax No:	Not Supplied	Telephone: 13 10 46 or 13 2296 (Fault Calls)

THIS RESPONSE IS APPLICABLE ONLY FOR ERGON ENERGY ELECTRICITY

Our search has revealed there is existing Ergon Energy underground electrical equipment within the defined search area. Please see attached plan.

It is Important that you note:

- 1. That in addition to underground cables marked on attached plan there maybe underground Substation earth conductors, M.E.N. Conductors, S.W.E.R. Substation Earth Conductors, ABS Earth Mats, or Consumers Mains in the vicinity.**
- 2. This advice does not identify the presence of private underground cables that may run from Ergon Energy mains to consumer's premises**

Further Comments:

In response to your application, Ergon Energy provides the attached copy of existing records showing the approximate location of known Ergon Energy underground electrical equipment within the vicinity of:

Location address: Griffiths Street
Private/Road/Both: B
Activity Code: 28

Suburb/Town: Harlaxton QLD 4350
UBD Map/Ref: R101_B5,R101_C5
Start Date: 12/08/2016 12:00:00 AM

Terms and Conditions

Responsibilities When Working in the Vicinity of Ergon Energy Underground Electrical Equipment

Extreme care must be taken during non-mechanical or mechanical excavation as damage to Ergon Energy underground electrical equipment can lead to injury or death of workers or members of the public.

Everyone has a legal "Duty of Care" to ensure safety which must be observed, particularly when working in the vicinity of underground electrical equipment. Underground electrical equipment includes underground cables, conduits and other associated underground equipment. When discharging this "Duty of Care" in relation to Ergon Energy underground electrical equipment, the following points must be considered:

- 1. It is the responsibility of the architect, consulting engineer, developer, and principal contractor in the project planning stages to design for minimal impact and protection of Ergon Energy underground electrical equipment.**

Ergon Energy will provide free plans showing the presence of the underground electrical equipment to assist at this design stage.

2. It is the constructor's responsibility to:
 - a. Obtain DBYD plans of Ergon Energy underground electrical equipment for a particular location at a reasonable time before civil work begins.
 - b. Visually locate Ergon Energy underground electrical equipment by non-mechanical excavation (potholing) when civil work activities may damage or interfere with Ergon Energy underground electrical equipment.
 - c. If Ergon Energy underground electrical equipment is wholly or partly affected by planned civil work activities, contact Ergon Energy on 13 10 46 and request Safety Advice.A constructor may include but not limited to designer, project manager, installer, contractor, civil contractor.
3. The alignments and boundaries contained within Ergon Energy plans and maps will sometimes differ from present alignments and boundaries "on the ground". Accordingly, in every case where it appears that alignments and boundaries have shifted, or new road ways have been added, the constructor should obtain confirmation of the actual position of Ergon Energy cables and pipelines. In no case should the constructor rely on statements of third parties in relation to the position of Ergon Energy cables and pipelines.

Conditions of Supply of Information

- Plans and details provided by Ergon Energy are current for 4 weeks from the date of dispatch and should be disposed of by shredding or any other secure disposal methods after use.
- Ergon Energy agrees to provide free plans if an Ergon Energy underground electrical equipment location request is made to Freecall "1100" (Dial Before You Dig - DBYD) only on the basis that at least 2 business days' notice is given and the DBYD applicant agrees to the terms of this agreement. Ergon Energy does not provide information on private underground installations.
- Ergon Energy retains copyright of all plans and details provided in connection to your request.
- Ergon Energy plans or other details are provided for the use of the DBYD applicant, its servants, or agents, for the sole purpose of the applicant's responsibilities in relation to Ergon Energy underground electrical equipment and shall not be used for any other purpose.
- Ergon Energy plans are circuit diagrams only and indicate the presence of underground electrical equipment in the general vicinity of the geographical area shown. It is important to note that exact ground cover and alignments cannot be given with any certainty as such levels can change over time. The plans do not pinpoint the exact location of cables.
- On receipt of DBYD plans and before commencing excavation work or similar activities near Ergon Energy's underground electrical equipment, check to see that it relates to the area you have requested and carefully locate this underground electrical equipment first to avoid damage. If you are unclear about any information contained on the plan, please contact Ergon Energy on 13 10 46 for further advice.
- Ergon Energy, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and of details so supplied to the DBYD applicant, its servants or agents, and the DBYD applicant agrees to indemnify Ergon Energy against any claim or demand for any such loss or damage to the DBYD applicant, its servants, or agents or to any third party.
- The constructor is responsible for all underground electrical equipment damaged when works commence prior to obtaining Ergon Energy plans, or at any time after that for failure to follow agreed instructions contained in this document or any other advice provided by Ergon Energy.
- By undertaking any work, you acknowledge that Ergon Energy reserves all rights to recover compensation for loss or damage to Ergon Energy caused by interference or damage, including consequential loss and damage to its cable network, or other property.
- Be aware that some underground conduits may contain asbestos. Refer to "Code of Practice for the Management and Control of Asbestos in Workplace [NOHSC;2018 (2005)]" for guidance.

When working in the vicinity of Ergon Energy underground electrical equipment, you must observe the following conditions:

Records

The first step before any excavation commences is to obtain records of Ergon Energy underground electrical equipment in the vicinity of the work (from DBYD). For new work, records should be obtained during the planning and design stage. The records provided by Ergon Energy must be made available to all relevant work groups on site. Where Ergon Energy underground electrical equipment information is transferred to plans for the proposed work, care must be exercised that important detail is not lost in the process.

Location of Cables

Examining the records is not sufficient, as reference points may change from the time of installation. Records must also be physically proven when working in close proximity to them. The exact location of underground electrical equipment likely to be affected shall be confirmed by use of an electronic cable locator followed by careful non mechanical excavation to the level of concrete slabs or conduits. Non mechanical excavation (potholing) must be used in advance of excavators. In any case, where doubt exists with respect to interpretation of cable records, contact Ergon Energy on 13 10 46 for further advice.

- If during excavation, cables or conduits are damaged:
 - Call Ergon Energy Fault Call on 13 22 96 to report damaged cables or conduits.
 - Treat cables as if alive, post a person to keep all others clear of the excavation until Ergon Energy crew attend to make safe.
- If **unknown** cables or conduits (i.e. not shown on issued DBYD plans) are located during excavation:
 - Call Ergon Energy Fault Call on 13 22 96 to report
 - Treat cables as if alive, post a person to keep all others clear of the excavation until Ergon Energy crew attend to make safe.
- If the constructor is unable to locate Ergon Energy underground assets within 2.5 metres of nominal plan locations, they should contact the Ergon Energy on 13 10 46 for further advice.

Released under RTI - DTMR



54817639-11073883

Sheet: Index Layer: Communications Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:49:14


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

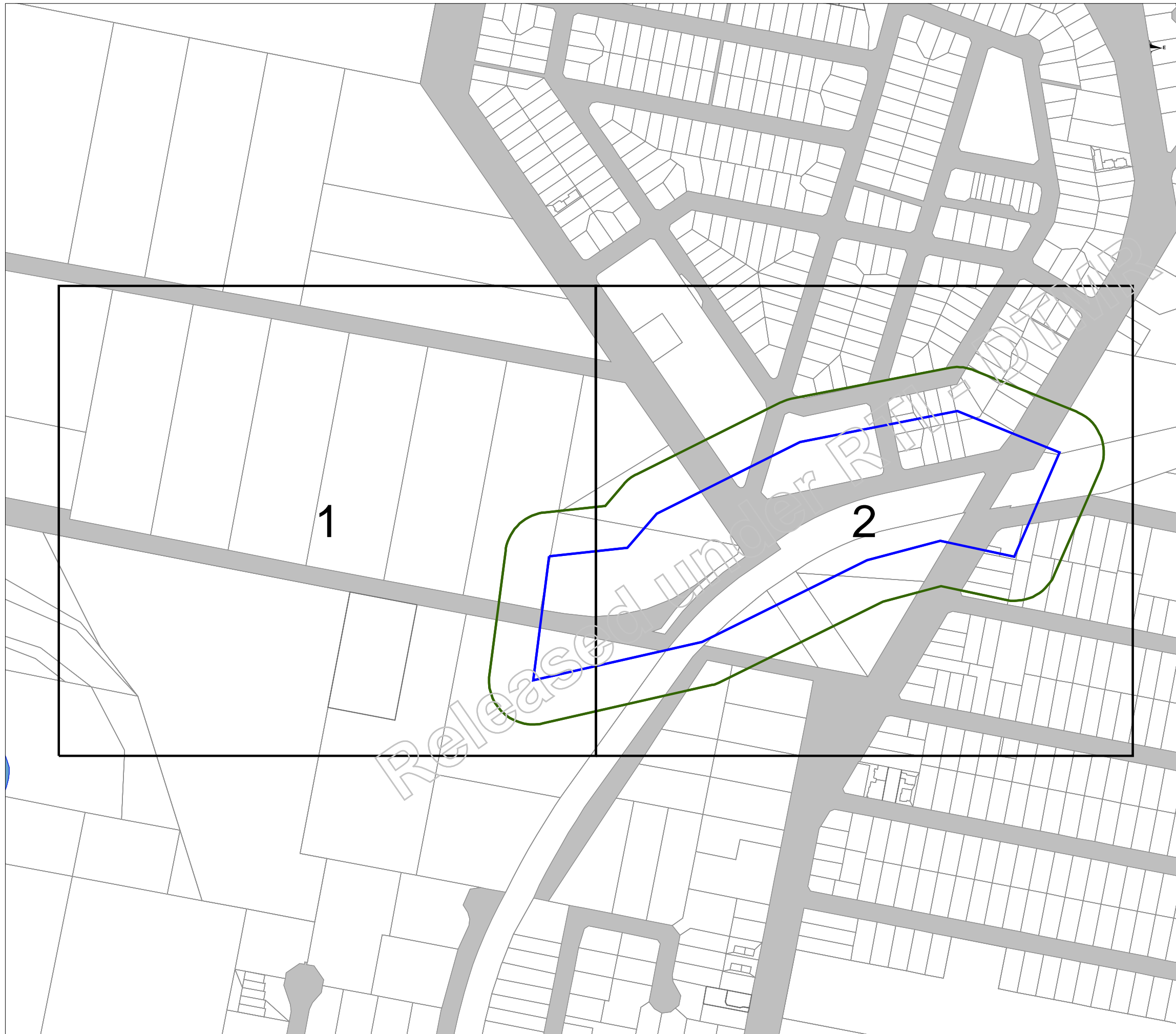
Water Coverage

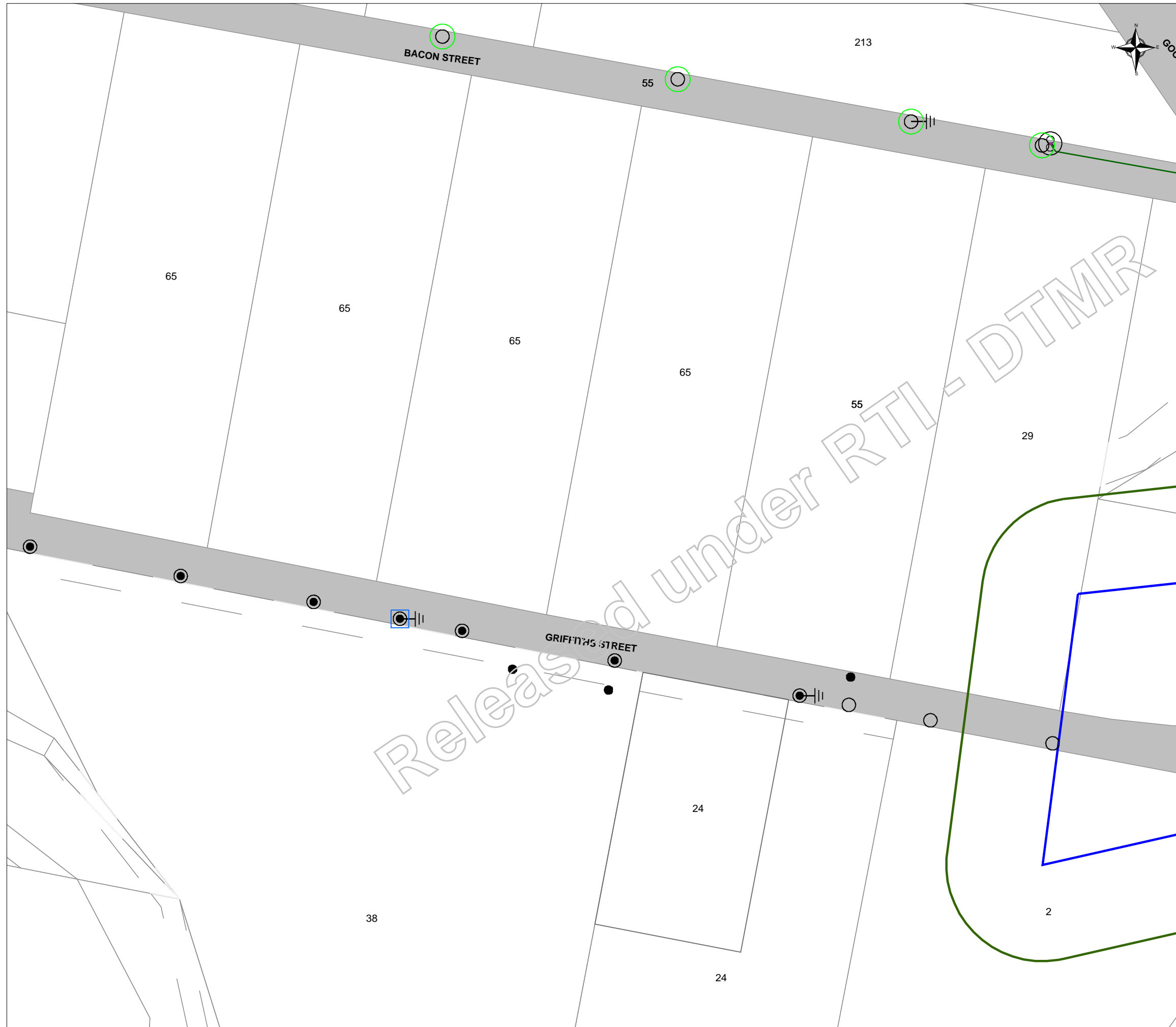
 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817639-11073883

Sheet: 1 Layer: Communications Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:49:18

Scale: 1:2000

LEGEND

Electricity

—||— Earth - as constructed

○ Pole - HV

○ Pole - HV/Comms

● Pole - HV/LV

● Pole - LV

□ Substation - Pole

Communications

— Communications Cable

■ Communications Joint - as constructed

⊗ Communications Pit - as constructed

DBYD

DBYD Request

□ DBYD Request (Area)

□ DBYD Request (Ergon Search Area)

DCDB

Land Parcel

□ Land Parcel (Area Geom)

Land Parcel Medium

□ Land Parcel Medium (Area Geom)

Easement

□ Easement (Area Geom)

Road Coverage

■ Road Coverage (Area Geom)

Unregistered Plan

URP Lot

— URP Lot (Geometry)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot



54817639-11073883

Sheet: 2 Layer: Communications Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:49:21

Scale: 1:2000

LEGEND

Electricity

- ||— Earth - as constructed
- Pillar - Cross Road Pillar
- Pole - HV/LV
- Pole - HV
- Pole - HV/LV/Comms
- Pole - SL
- ⊕ Pole - Unknown
- Pole - Bollard
- Pole - LV
- Pole - LV/Comms
- Substation - Pole
- Substation -
- Substation - RDU/RMU

Communications

- Communications Cable
- Communications Joint - as constructed
- ⊗ Communications Pit - as constructed

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

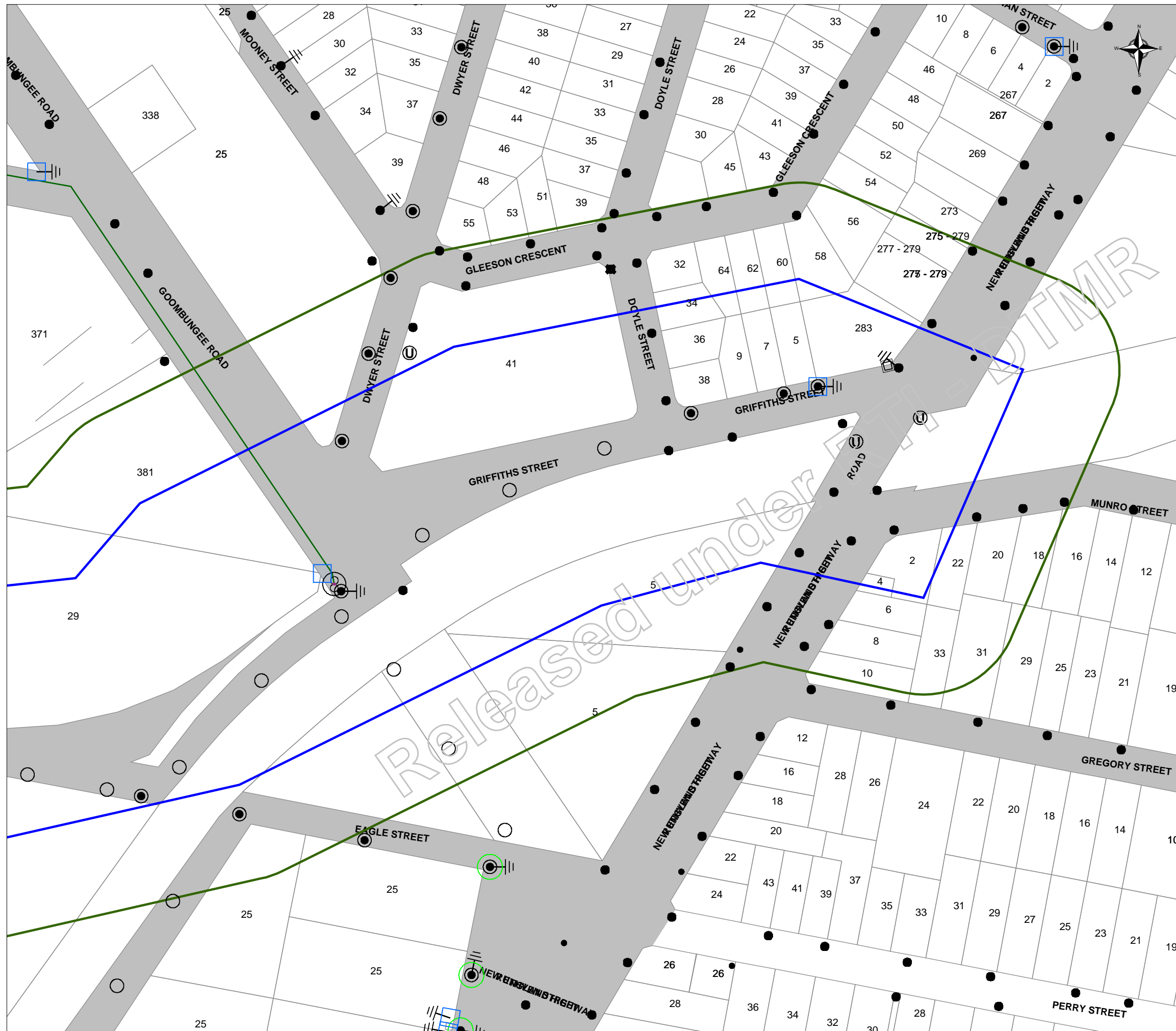
Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot





54817639-11073883

Sheet: Index Layer: Ducts

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:45


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

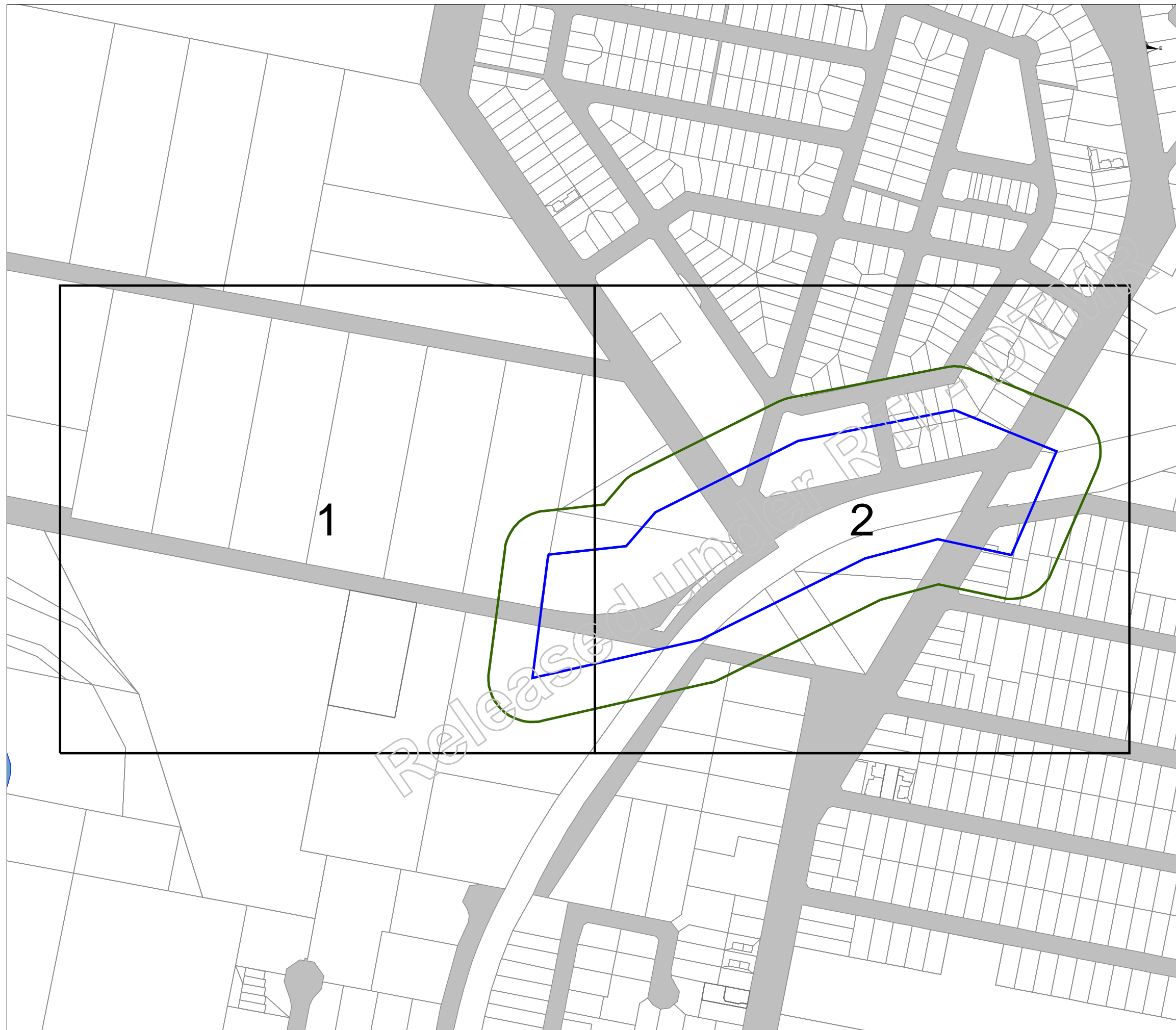
Water Coverage

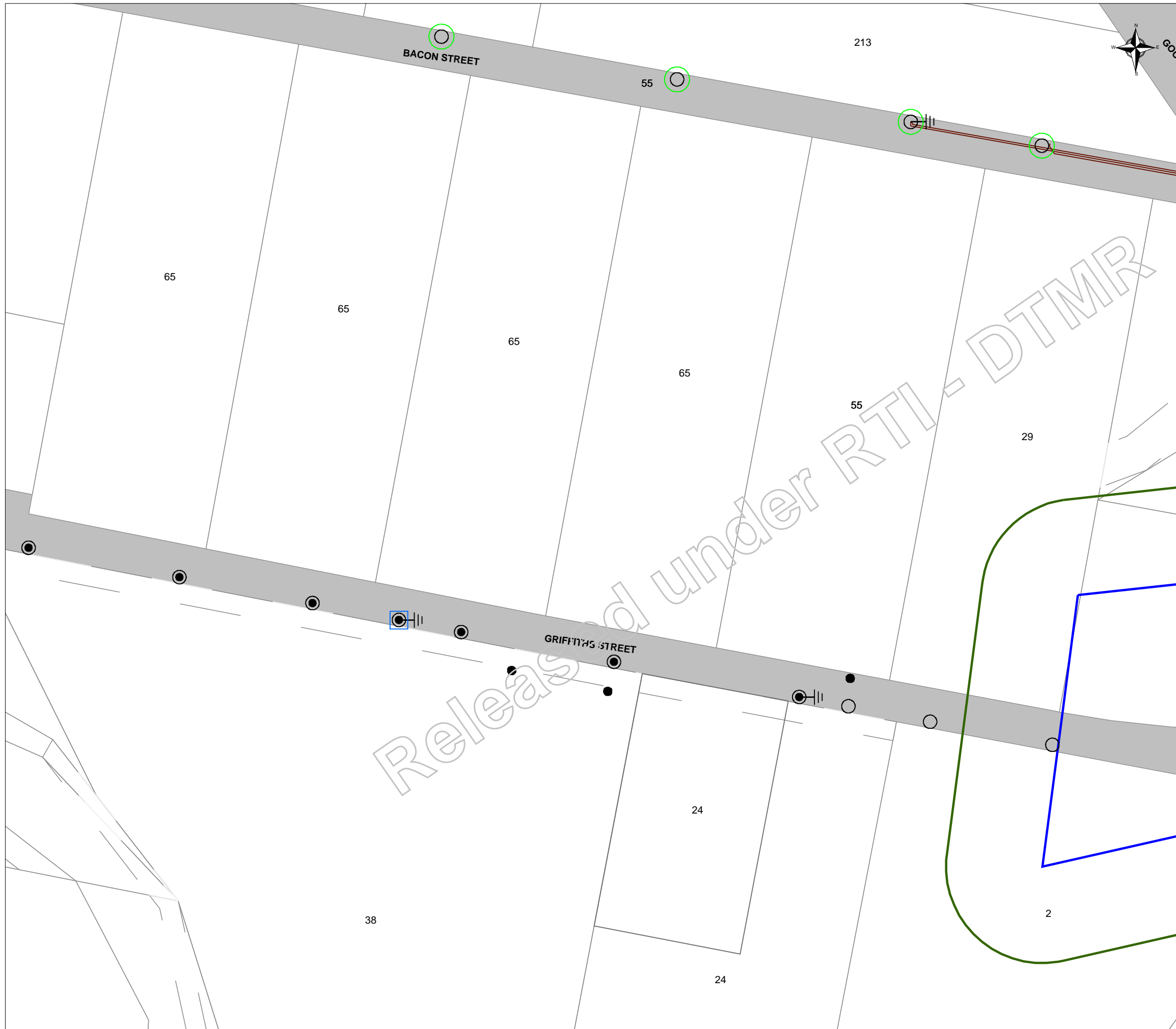
 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817639-11073883

Sheet: 1 Layer: Ducts

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:49

Scale: 1:2000

LEGEND

Electricity

- Duct
- Earth - as constructed

- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV

- Substation - Pole

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Unregistered Plan

- URP Lot**
- URP Lot (Geometry)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot



54817639-11073883

Sheet: 2 Layer: Ducts

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:53

Scale: 1:2000

LEGEND

Electricity

- Duct
- Earth - as constructed
- Pillar - Cross Road Pillar
- Pole - HV/LV
- Pole - HV
- Pole - HV/LV/Comms
- Pole - SL
- Pole - Unknown
- Pole - Bollard
- Pole - LV
- Pole - LV/Comms
- Substation - Pole
- Substation -
- Substation - RDU/RMU

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

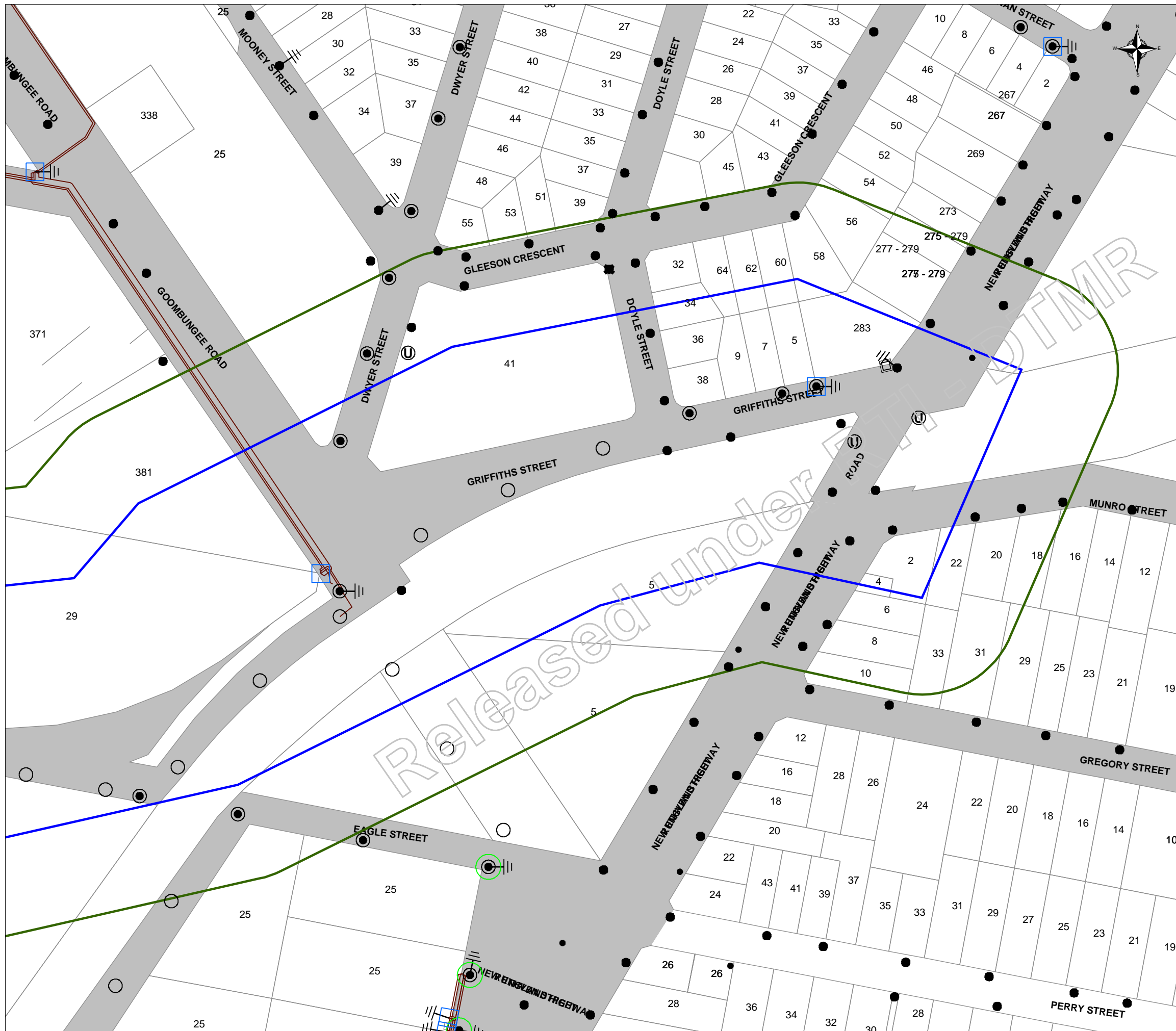
Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot





54817639-11073883

Sheet: Index Layer: Hv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:48


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

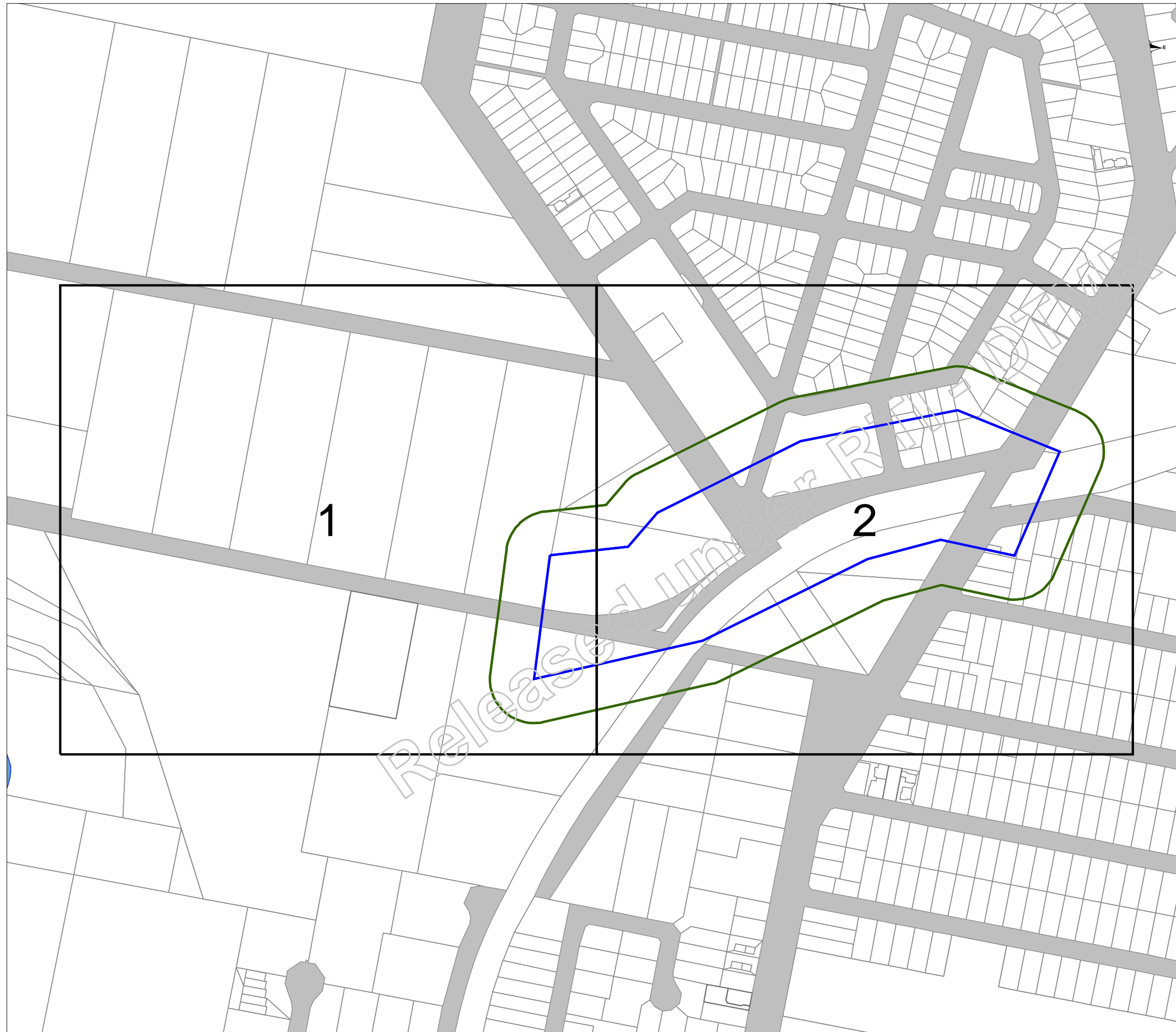
Water Coverage

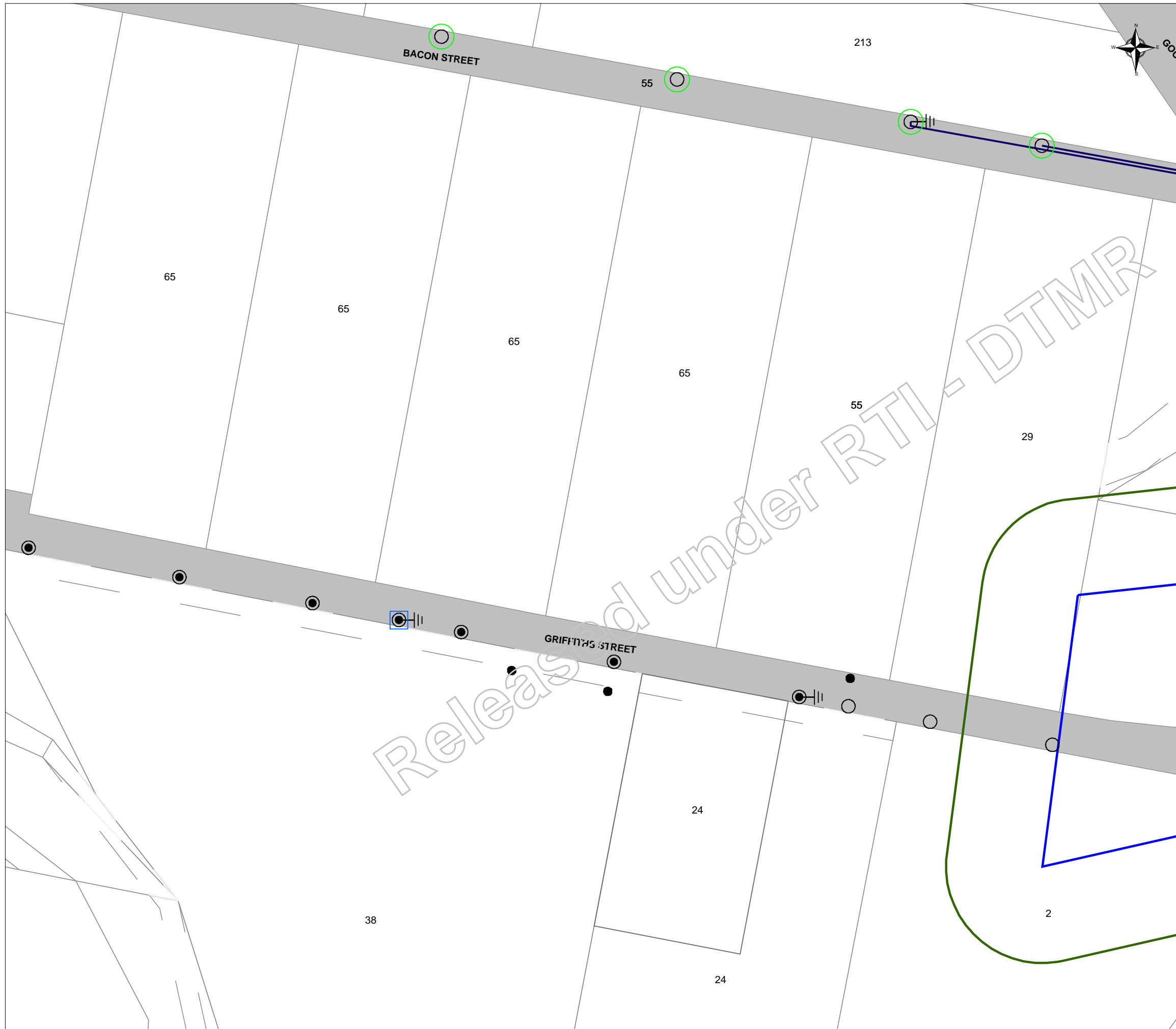
 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817639-11073883

Sheet: 1 Layer: Hv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:53

Scale: 1:2000

LEGEND

Electricity

—||— Earth - as constructed

- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV

□ Substation - Pole

High Voltage

— HV Cable (11kv)

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

□ Land Parcel (Area Geom)

Land Parcel Medium

□ Land Parcel Medium (Area Geom)

Easement

□ Easement (Area Geom)

Road Coverage

■ Road Coverage (Area Geom)

Unregistered Plan

— URP Lot (Geometry)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot



54817639-11073883

Sheet: 2 Layer: Hv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:47:57

Scale: 1:2000

LEGEND

Electricity

- Earth - as constructed
- Pillar - Cross Road Pillar

- Pole - HV/LV
- Pole - HV
- Pole - HV/LV/Comms
- Pole - SL
- Pole - Unknown
- Pole - Bollard
- Pole - LV
- Pole - LV/Comms

- Substation - Pole
- Substation -
- Substation - RDU/RMU

High Voltage

- HV Cable (11kv)
- HV Cable Joint - as constructed (11Kv)

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

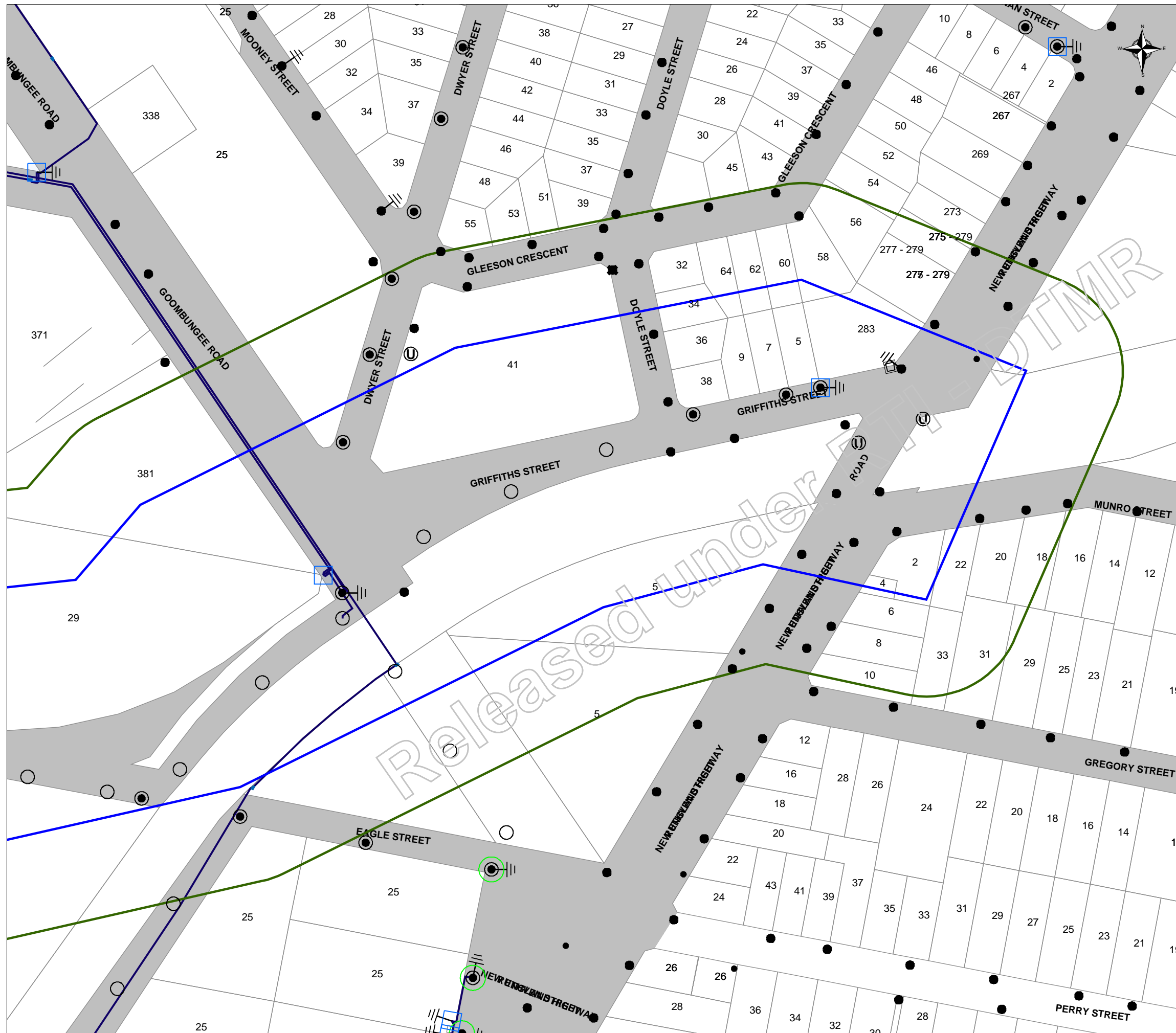
Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot





54817639-11073883

Sheet: Index Layer: Lv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:16


Scale: 1:4400

LEGEND

DBYD

DBYD Request

 DBYD Request (Area)

 DBYD Request (Ergon Search Area)

DCDB

Land Parcel

 Land Parcel (Area Geom)

Land Parcel Medium

 Land Parcel Medium (Area Geom)

Road Coverage

 Road Coverage (Area Geom)

Water Boundary

 Water Boundary (Line Geom)

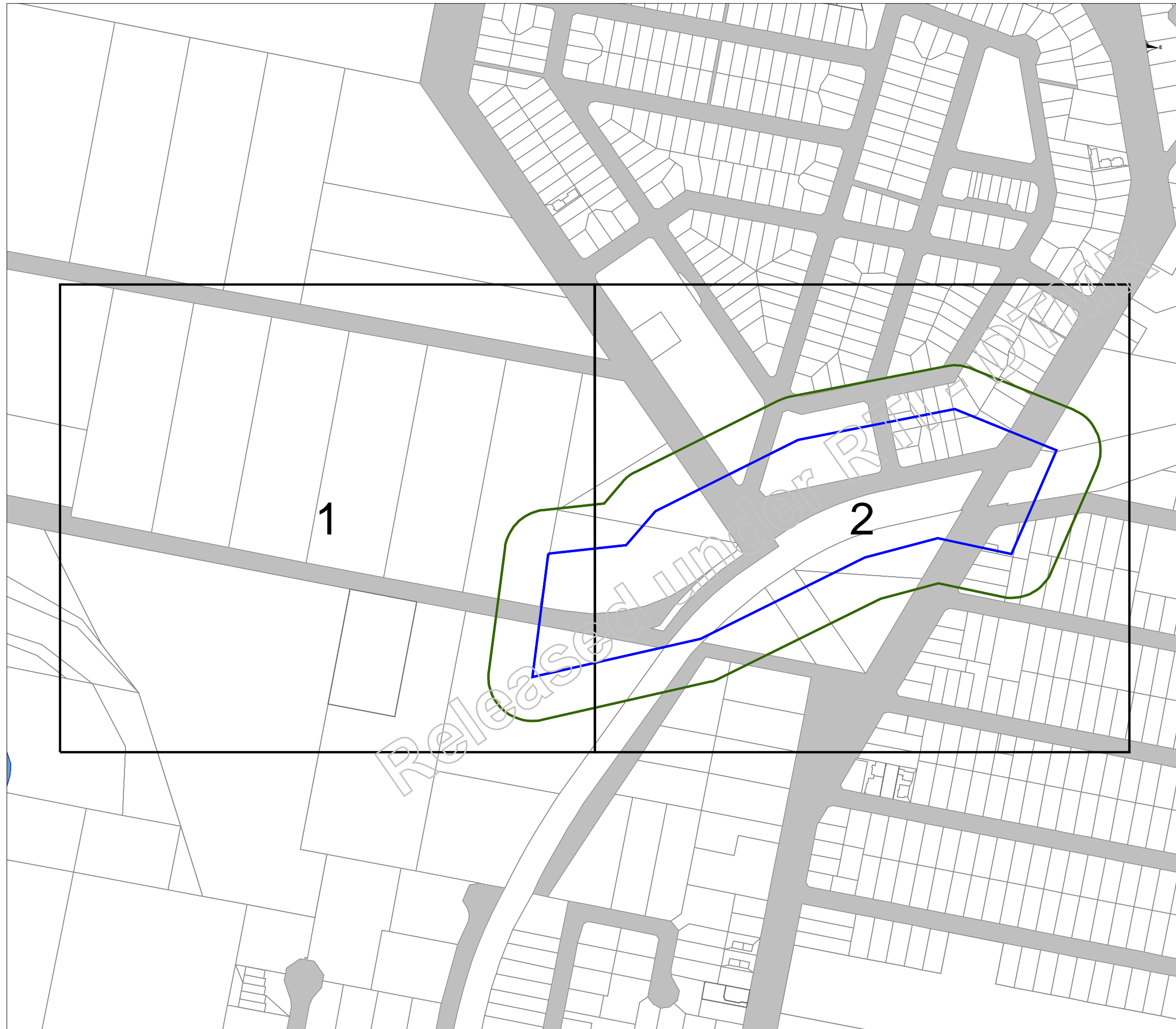
Water Coverage

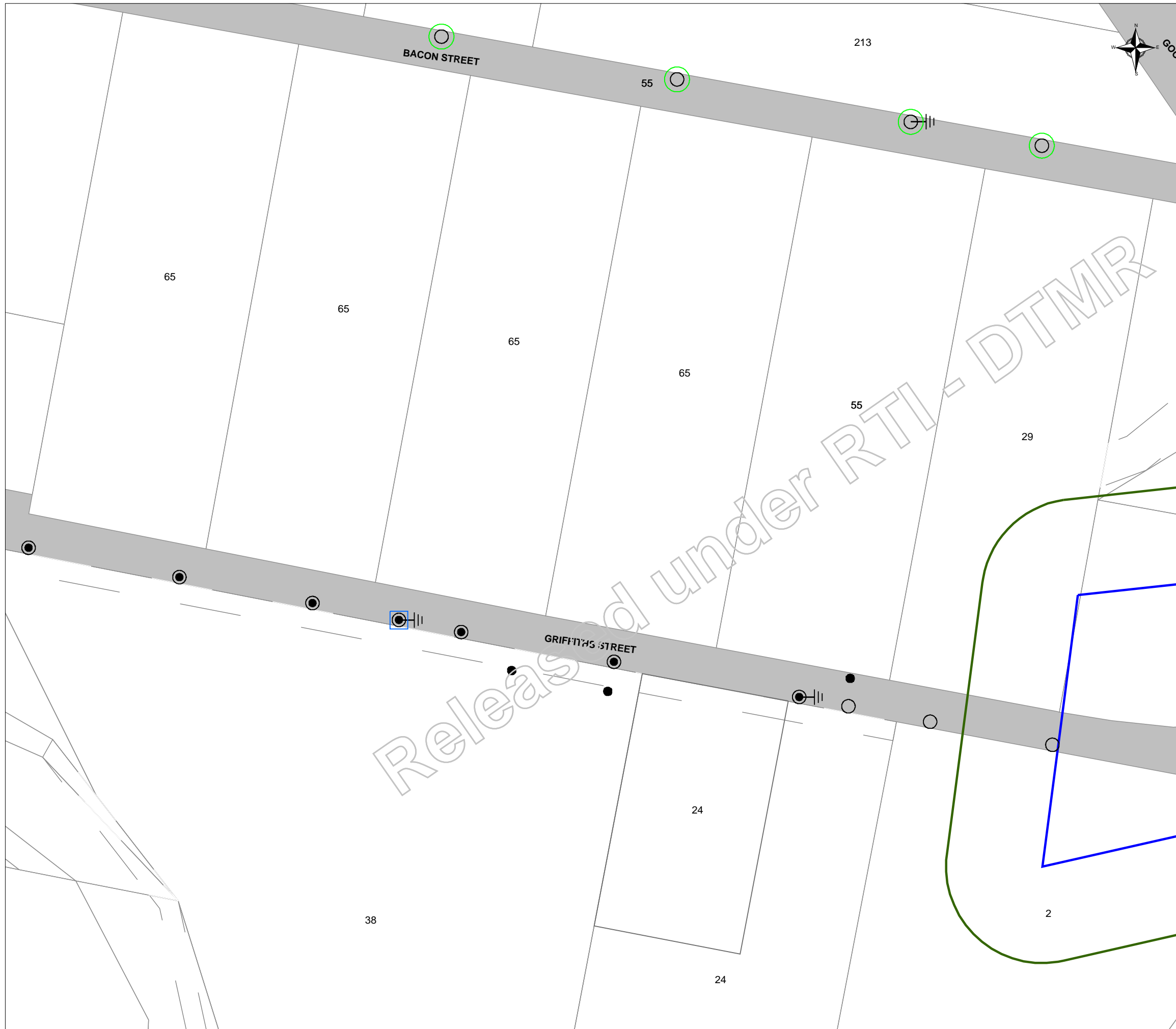
 Water Coverage (Area Geom)

Unregistered Plan

URP Lot

 URP Lot (Geometry)





54817639-11073883

Sheet: 1 Layer: Lv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:20

Scale: 1:2000

LEGEND

Electricity

- ||— Earth - as constructed
- Pole - HV
- Pole - HV/Comms
- Pole - HV/LV
- Pole - LV
- Substation - Pole

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Land Parcel Medium

- Land Parcel Medium (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

Unregistered Plan

- URP Lot (Geometry)

NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot



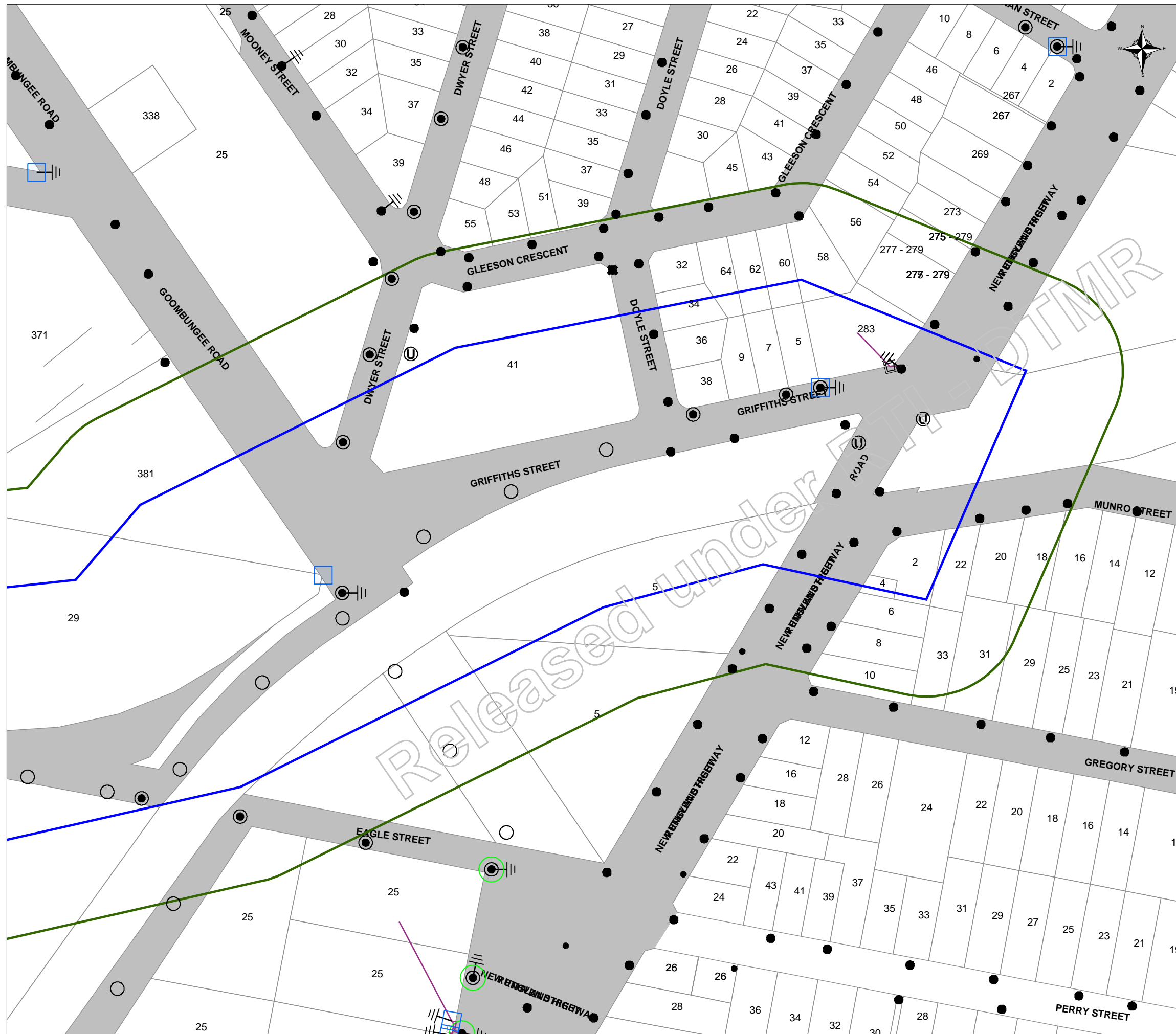
54817639-11073883

Sheet: 2 Layer: Lv Cables

Created by: DBYD Autoplot

Created date: 09/08/2016 12:48:25

Scale: 1:2000



LEGEND

Electricity

- Earth - as constructed
- Pillar - Cross Road Pillar
- Pole - HV/LV
- Pole - HV
- Pole - HV/LV/Comms
- Pole - SL
- Pole - Unknown
- Pole - Bollard
- Pole - LV
- Pole - LV/Comms
- Substation - Pole
- Substation -
- Substation - RDU/RMU

Low Voltage

- LV Cable (240v)
- LV Cable (415v)

DBYD

DBYD Request

- DBYD Request (Area)
- DBYD Request (Ergon Search Area)

DCDB

Land Parcel

- Land Parcel (Area Geom)

Easement

- Easement (Area Geom)

Road Coverage

- Road Coverage (Area Geom)

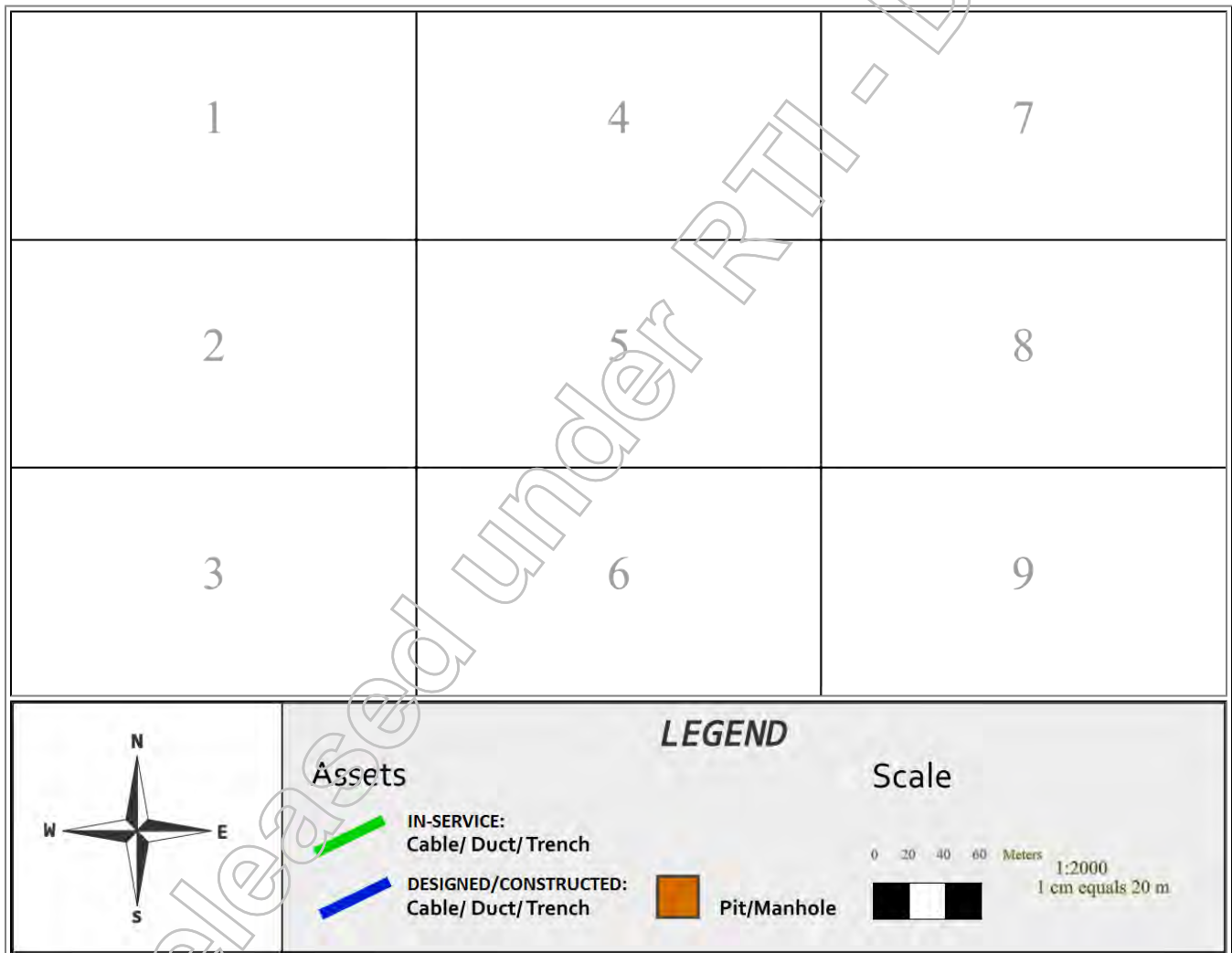
NOTE : Cable/Ducts overlaying one another are displayed as geographically separated in the plot

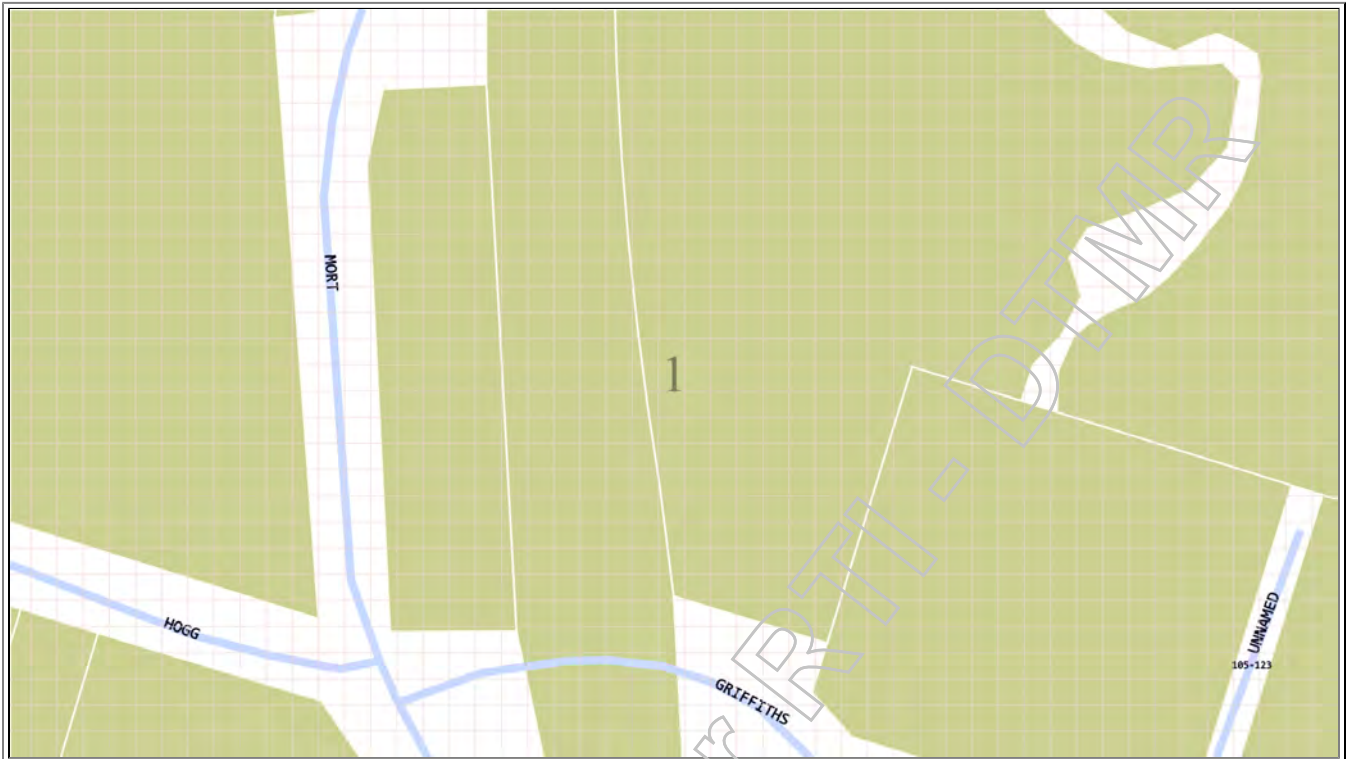







Notes:

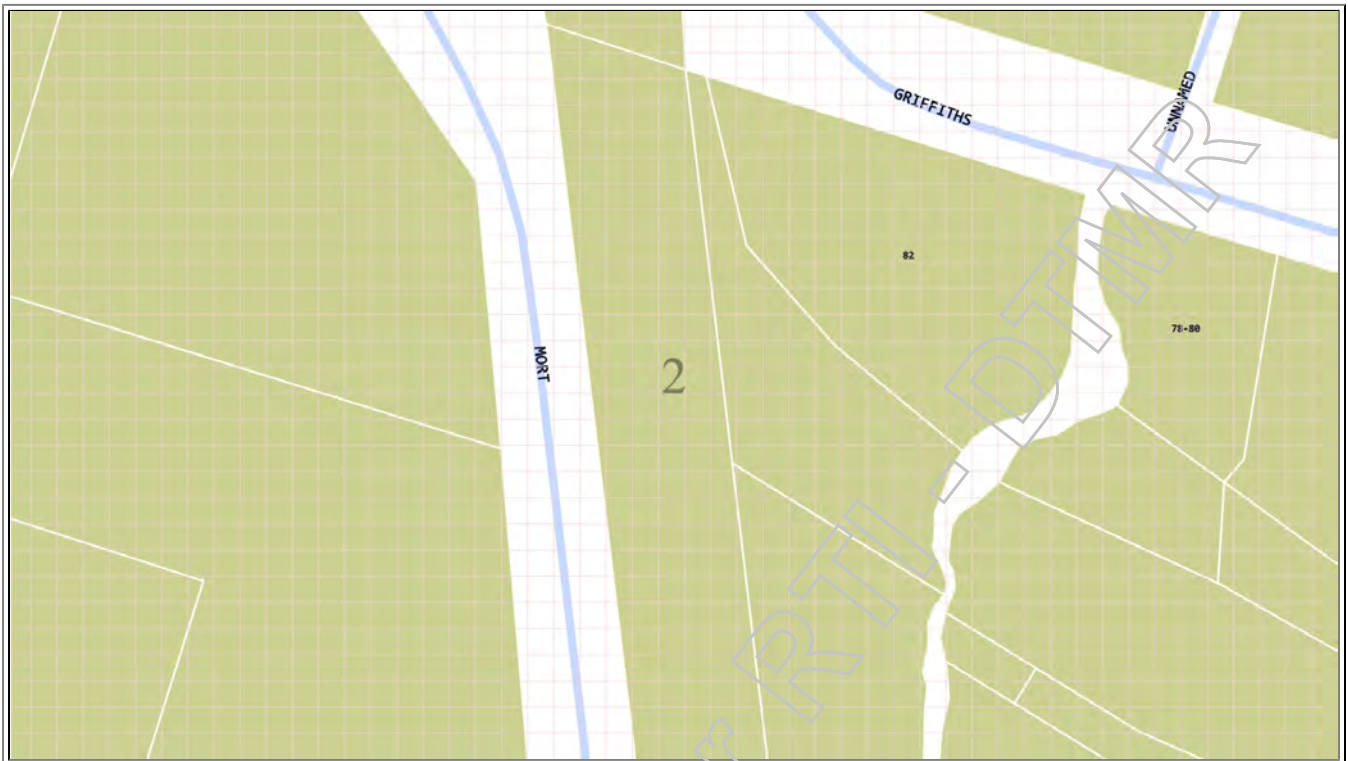
1. You are now aware that there are items of telecommunications and/or power facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (Cth) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.






Indicative Plans



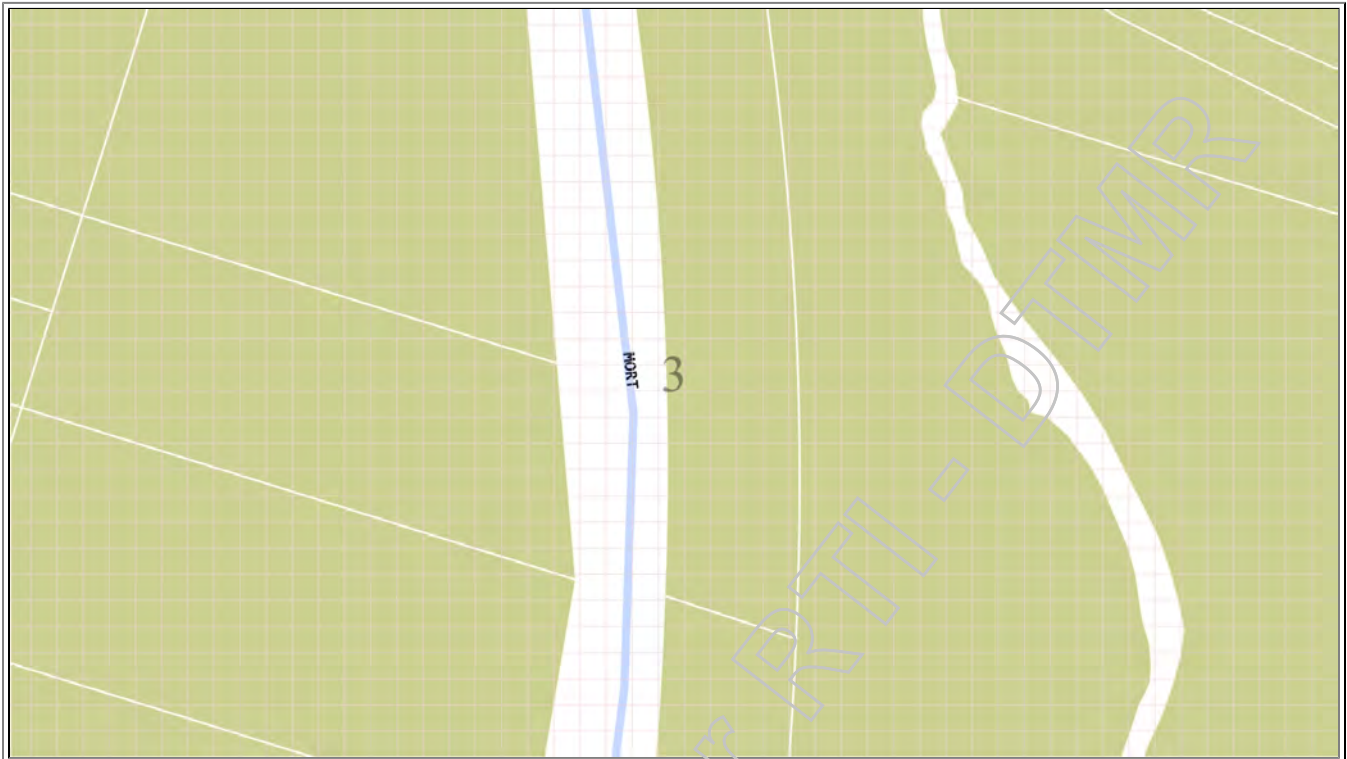







Assets		Scale	
	IN-SERVICE: Cable/ Duct/ Trench		Pit/Manhole
	DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench		Scale
		0 20 40 60 Meters 1:2000 1 cm equals 20 m	



LEGEND	
	<p>Assets</p> <p> IN-SERVICE: Cable/ Duct/ Trench</p> <p> DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench</p>
	<p> Pit/Manhole</p>
<p>Scale</p> <p>0 20 40 60 Meters</p> <p>1:2000 1 cm equals 20 m</p> 	






Released under RTI



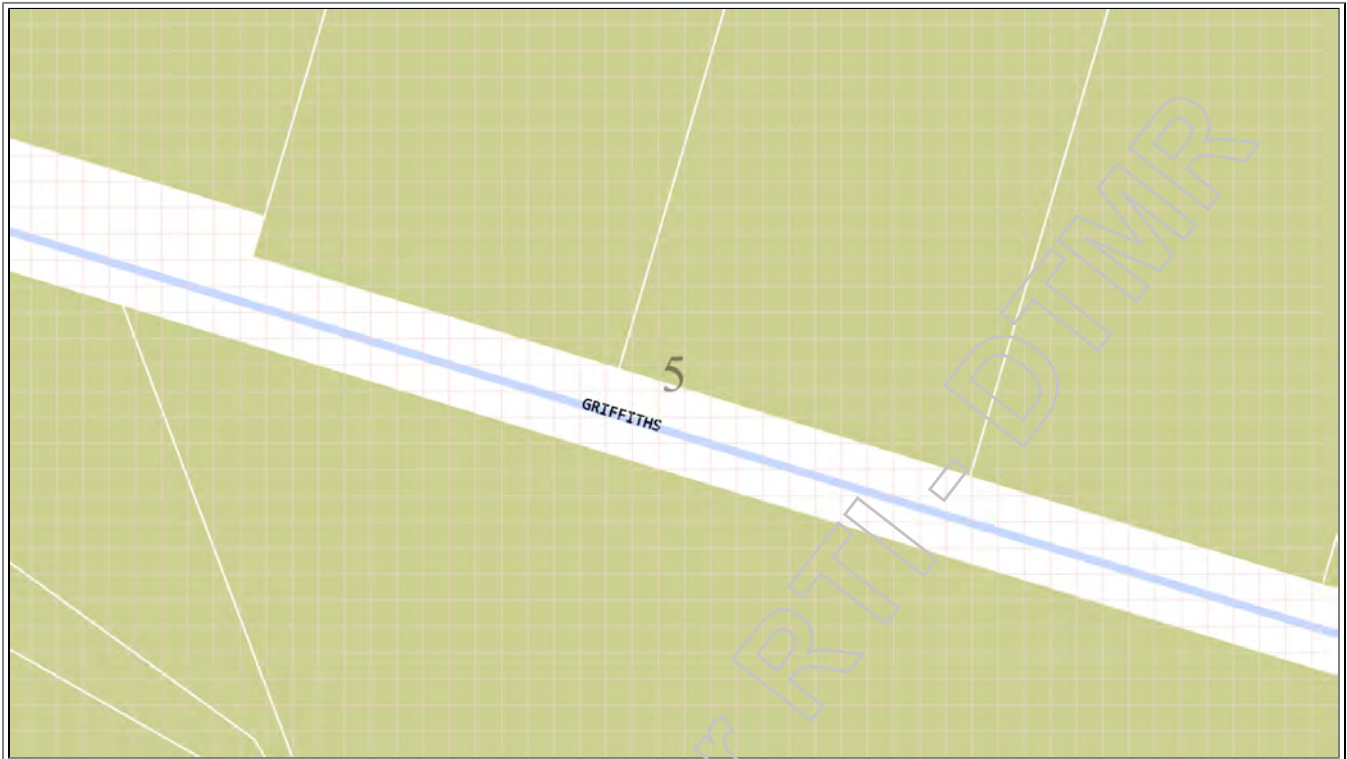
LEGEND		
	Assets  IN-SERVICE: Cable/ Duct/ Trench	Scale  0 20 40 60 Meters 1:2000 1 cm equals 20 m
	 DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench  Pit/Manhole	





Released under RTI - DTMR



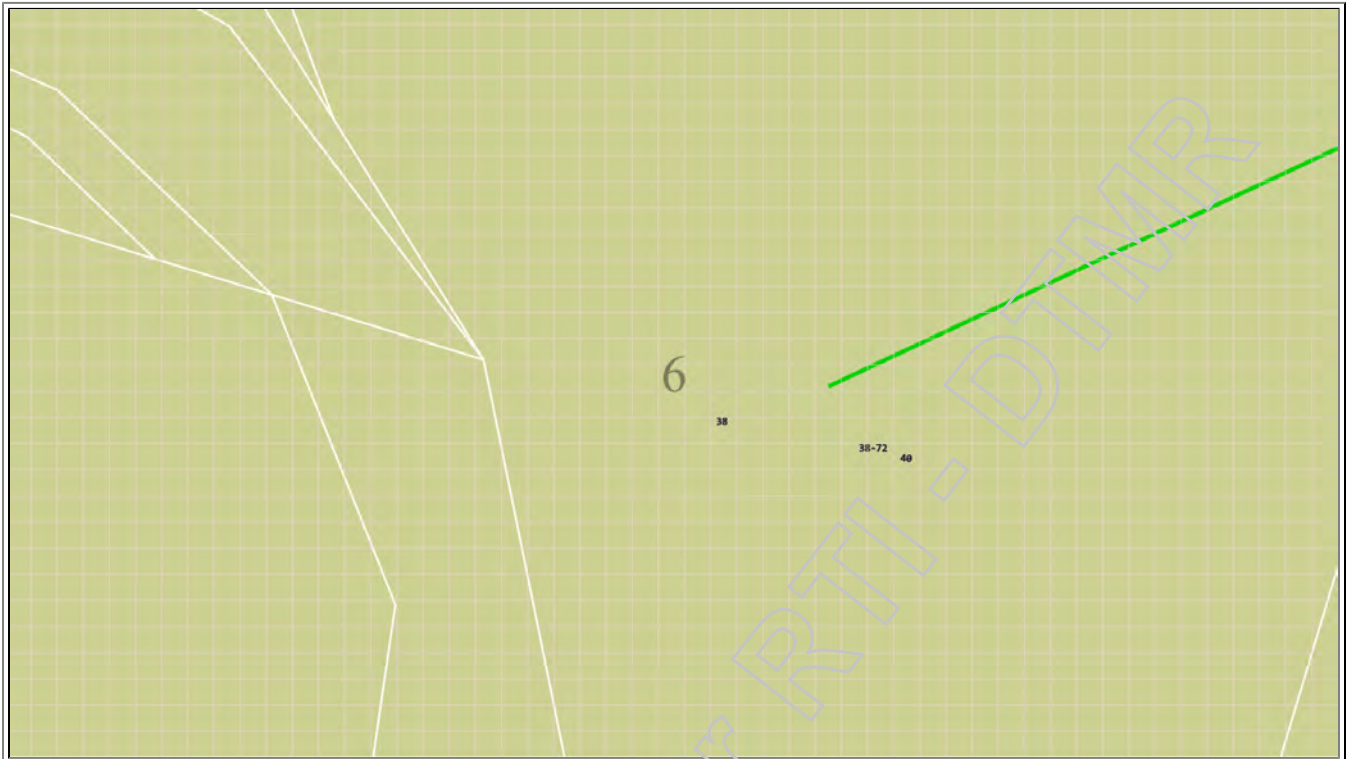
LEGEND		
	Assets  IN-SERVICE: Cable/ Duct/ Trench	Scale  0 20 40 60 Meters 1:2000 1 cm equals 20 m
	 DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench  Pit/Manhole	






Released under RTI - DTMR



LEGEND	
	<p>Assets</p> <p> IN-SERVICE: Cable/ Duct/ Trench</p> <p> DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench</p>
	<p> Pit/Manhole</p>
<p>Scale</p> <p>0 20 40 60 Meters</p> <p>1:2000 1 cm equals 20 m</p>	

Released under RTI/DTMR



LEGEND		
	Assets  IN-SERVICE: Cable/ Duct/ Trench  DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench	Scale  0 20 40 60 Meters 1:2000 1 cm equals 20 m  Pit/Manhole

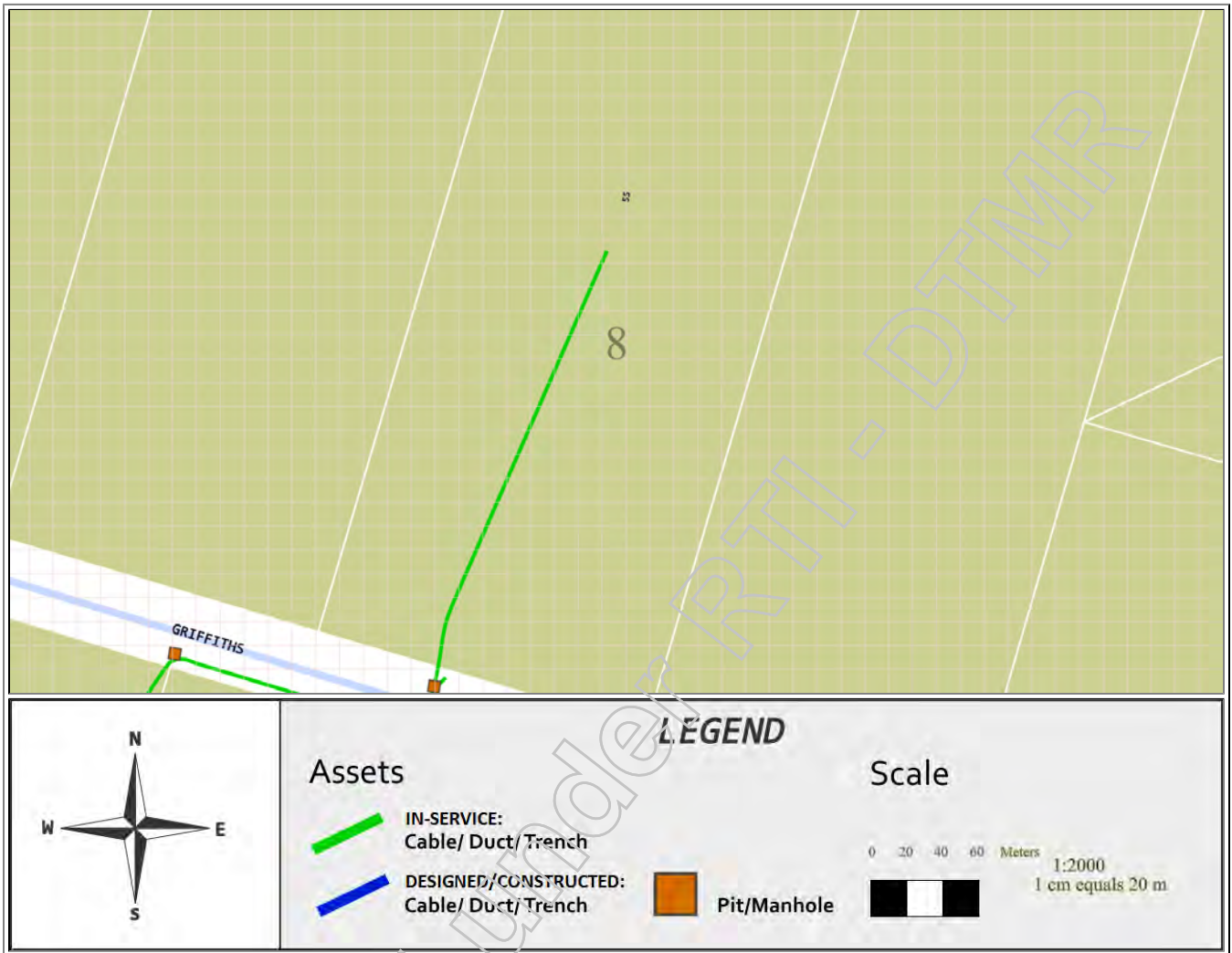
Released Under RTI - DMR

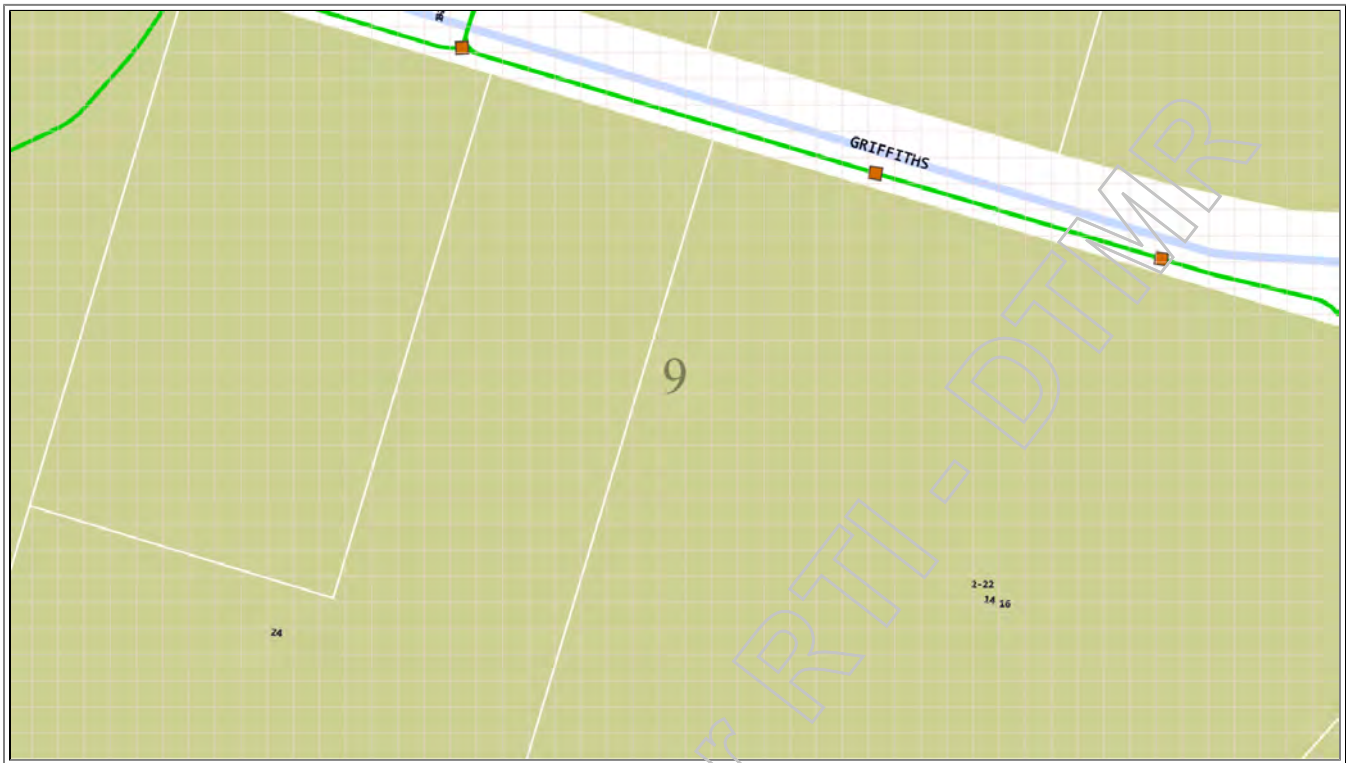


LEGEND

	Assets		Scale
	IN-SERVICE: Cable/ Duct/ Trench	Pit/Manhole	
	DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench		

Released under RTI - DTMR





Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By receiving, accepting or relying upon the plans (including the Indicative Plans), you are agreeing to these conditions. These conditions are in addition to (and not in replacement of) any duties and obligations you have under applicable law.

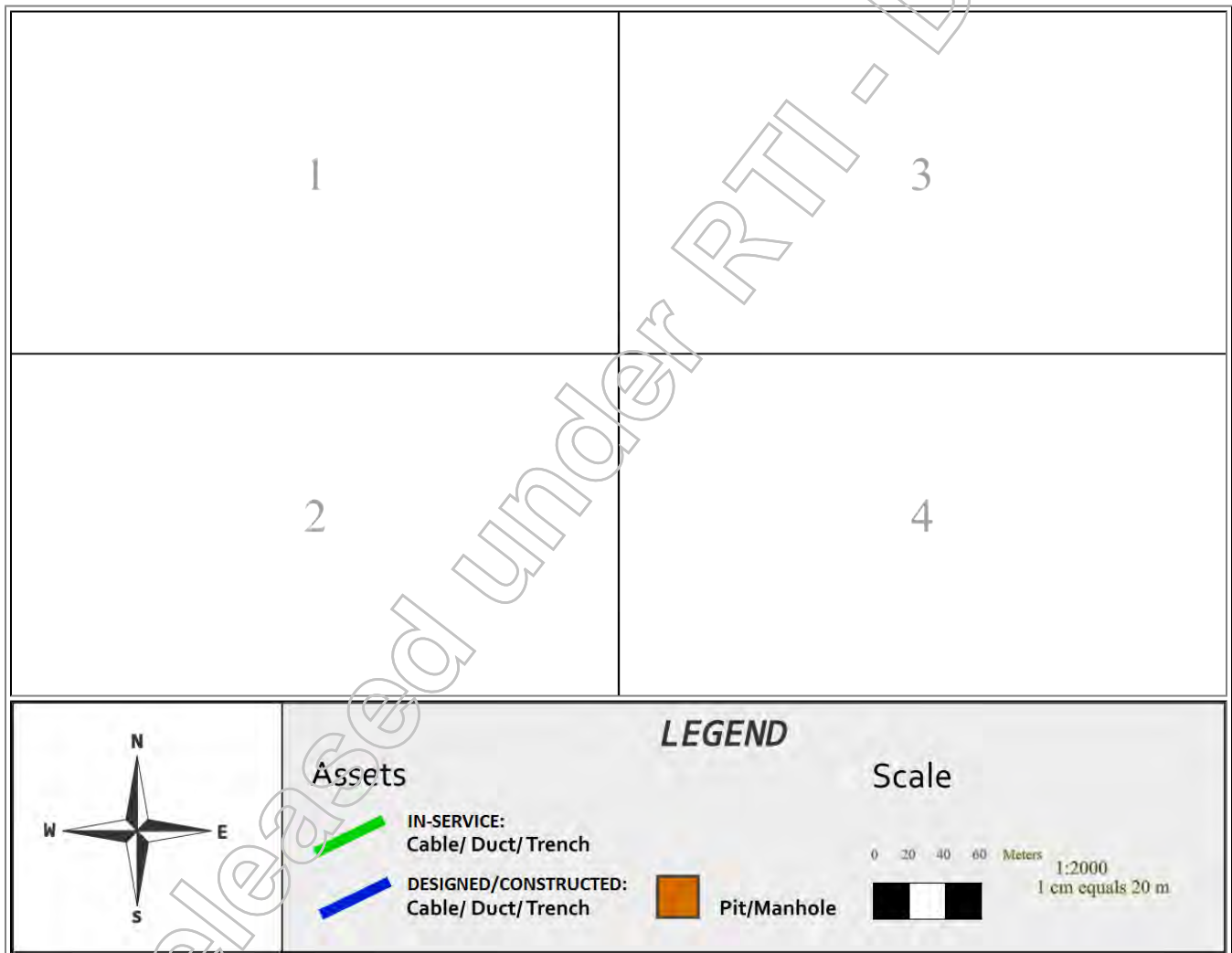
1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate **nbn** telecommunications facilities during any activities you carry out on site).
2. You should not assume that **nbn** cables and assets follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
3. In carrying out any works in the vicinity of **nbn** facilities, you must maintain the following minimum clearances:
 - 300mm when laying assets inline, horizontally or vertically
 - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates;and
 - 1000mm when operating mechanical excavators.
 - Adherence to clearances as directed by other asset owner's instructions
4. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn** fibre optic,copper and coaxial cables, to **nbn** assets).Damage to underground electric cables may result in:

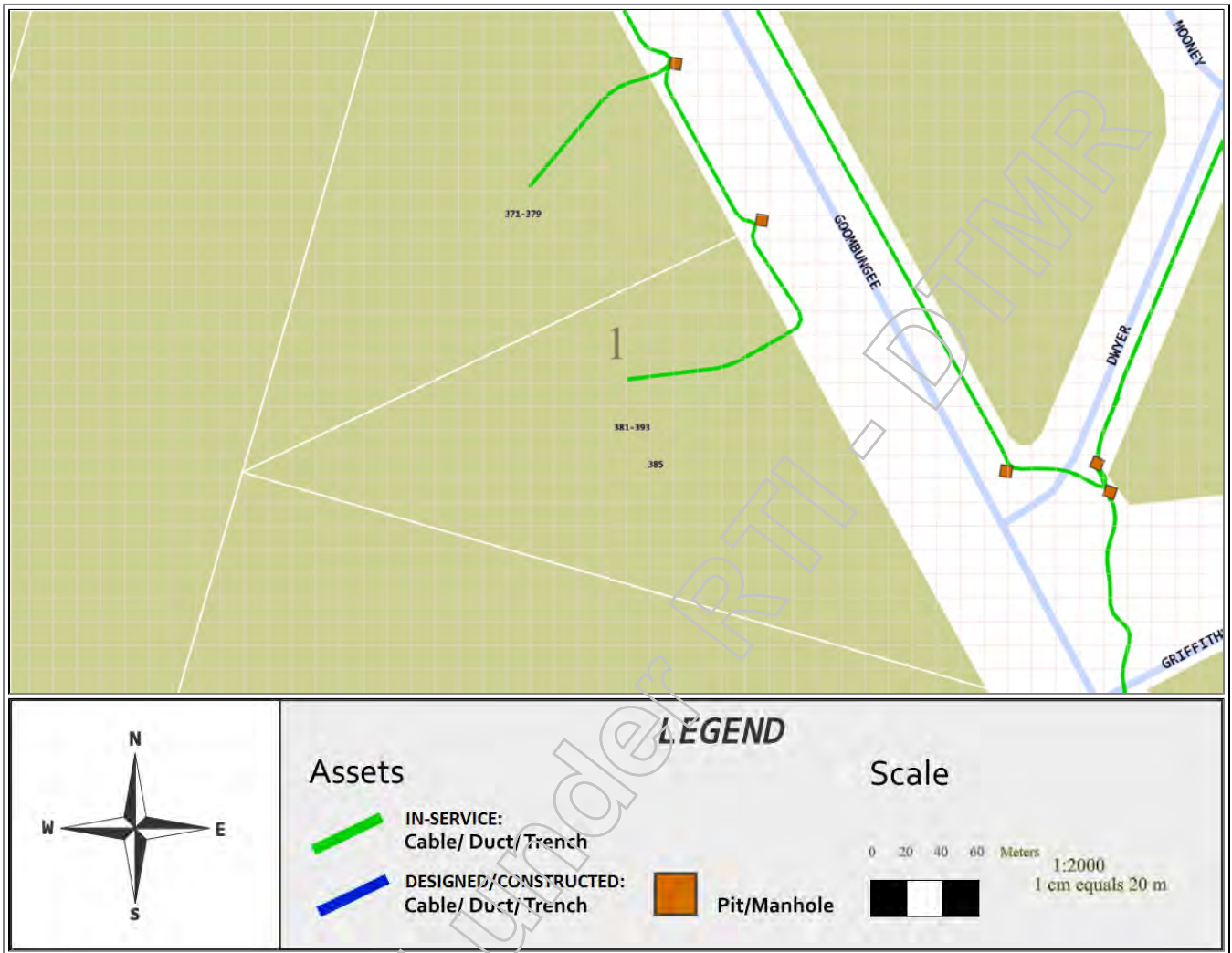


Notes:

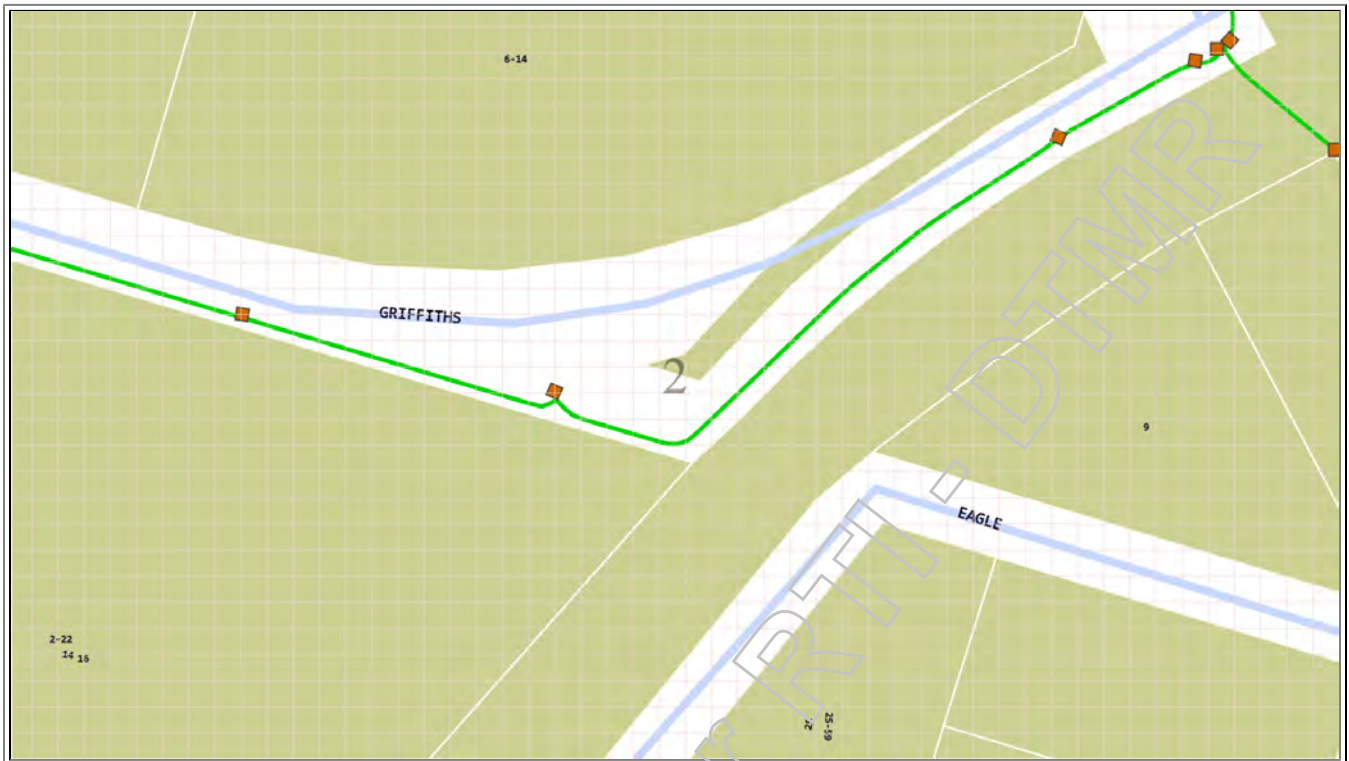
1. You are now aware that there are items of telecommunications and/or power facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (Cth) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.





Indicative Plans





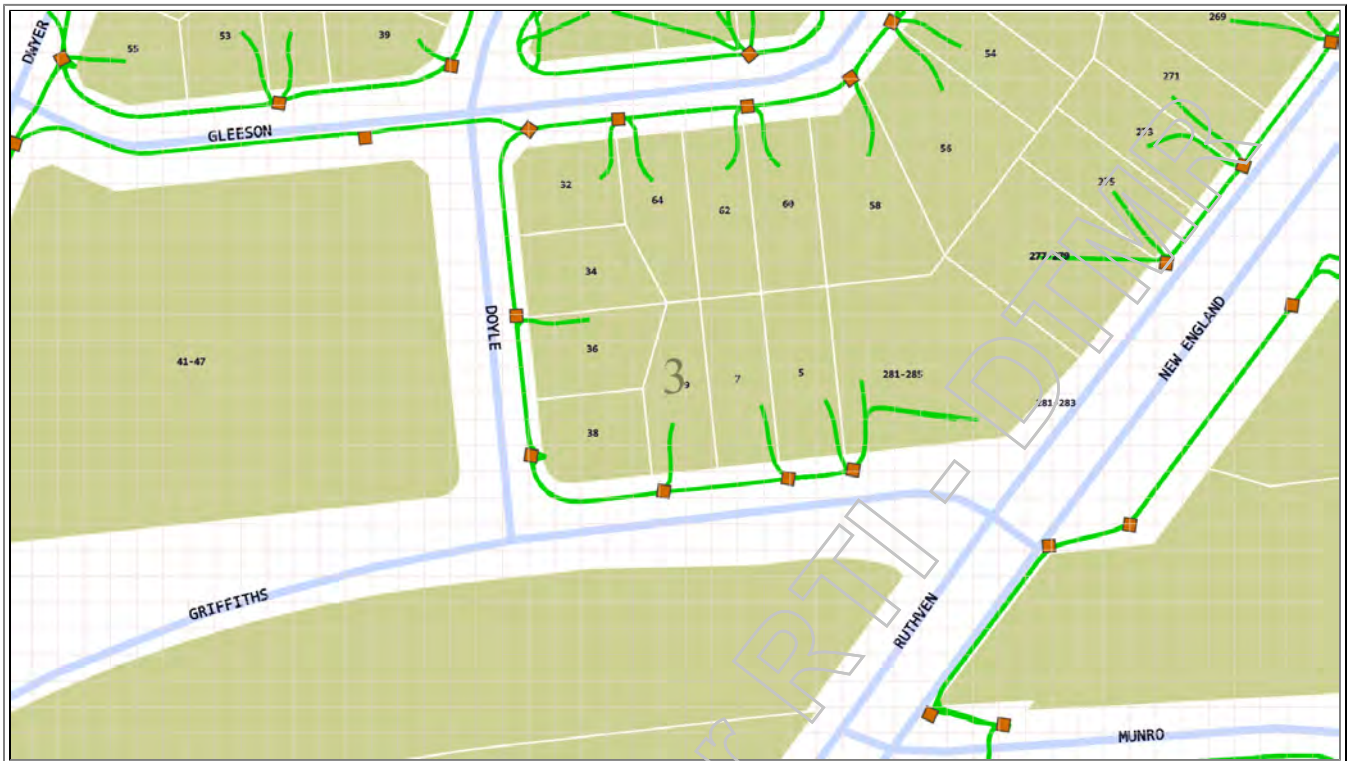
Released under RTI







Assets		Scale	
	IN-SERVICE: Cable/ Duct/ Trench		Pit/Manhole
	DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench		0 20 40 60 Meters
		1:2000 1 cm equals 20 m	

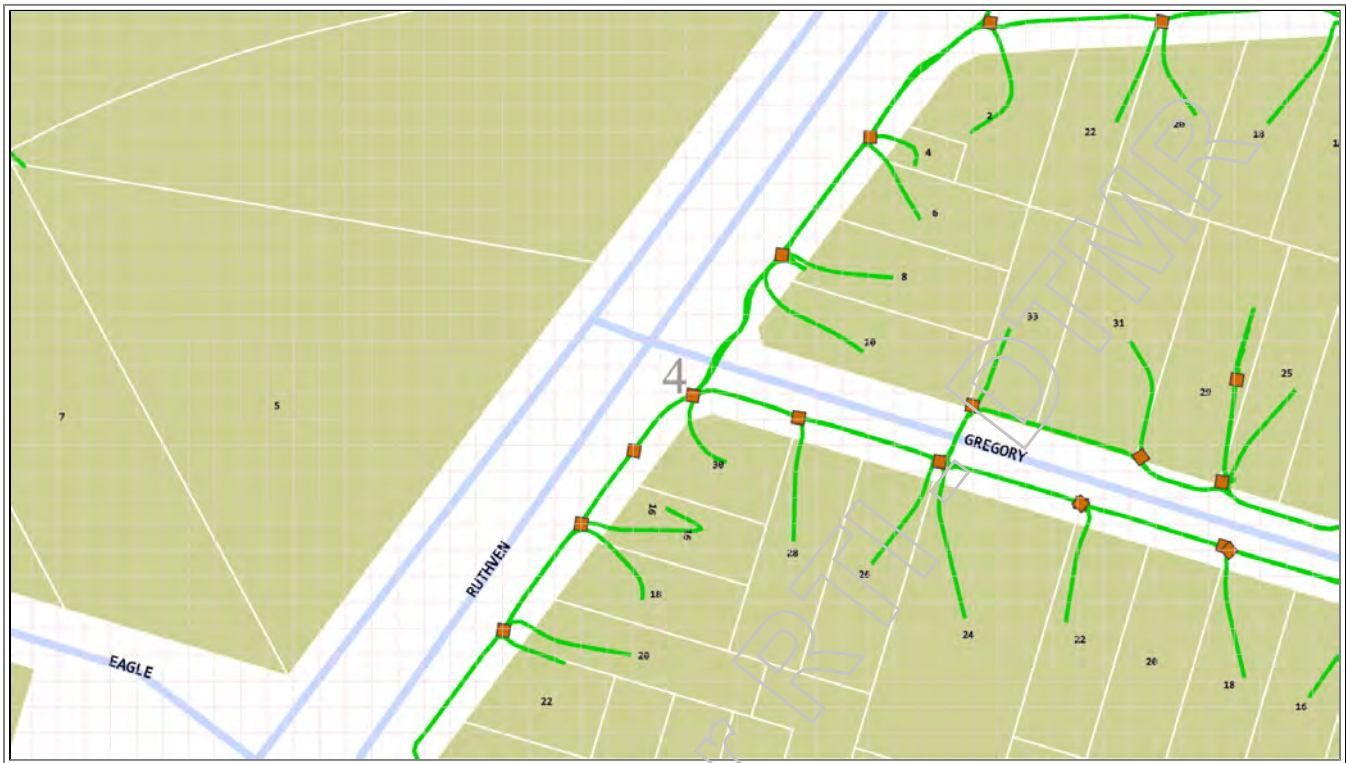


Released under RTI



Assets		Scale	
	IN-SERVICE: Cable/ Duct/ Trench		Pit/Manhole
	DESIGNED/CONSTRUCTED: Cable/ Duct/ Trench		0 20 40 60 Meters
		1:2000 1 cm equals 20 m	

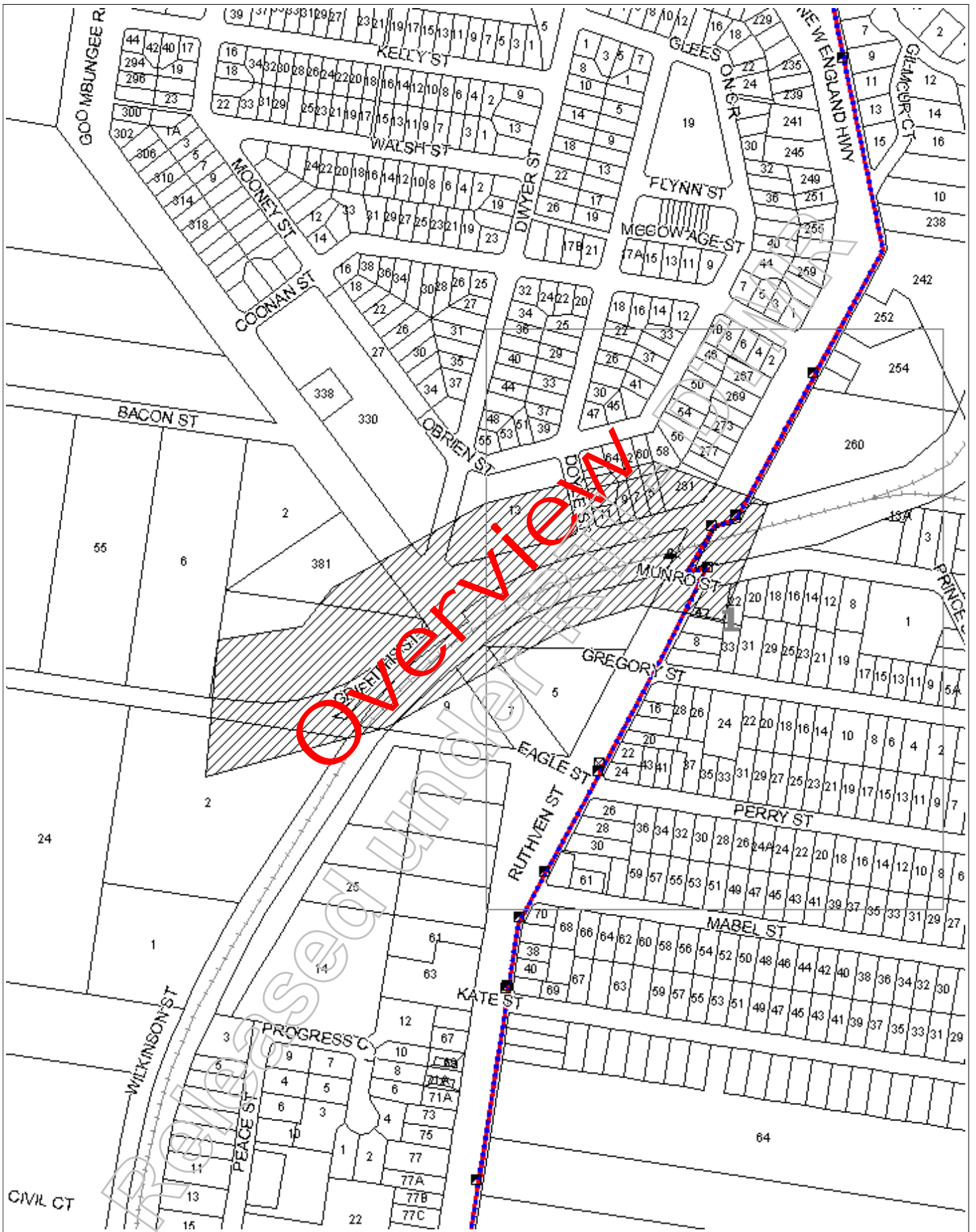
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Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By receiving, accepting or relying upon the plans (including the Indicative Plans), you are agreeing to these conditions. These conditions are in addition to (and not in replacement of) any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate **nbn** telecommunications facilities during any activities you carry out on site).
2. You should not assume that **nbn** cables and assets follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
3. In carrying out any works in the vicinity of **nbn** facilities, you must maintain the following minimum clearances:
 - 300mm when laying assets inline, horizontally or vertically
 - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates;and
 - 1000mm when operating mechanical excavators.
 - Adherence to clearances as directed by other asset owner's instructions
4. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn** fibre optic,copper and coaxial cables, to **nbn** assets).Damage to underground electric cables may result in:



WARNING: This document is confidential and may also be privileged. Confidentiality nor privilege is not waived or destroyed by virtue of it being transmitted to an incorrect addressee. Unauthorised use of the contents is therefore strictly prohibited. Any information contained in this document that has been extracted from our records is believed to be accurate, but no responsibility is assumed for any error or omission. Optus Plans and information supplied are valid for 30 days from the date of issue. If this timeline has elapsed please raise a new enquiry.

Sequence Number: 54817641

Date Generated: 09/08/2016



For all Optus DBYD plan enquiries –
 Email: Fibre.Locations@optus.net.au
 For urgent onsite assistance contact 1800 505 777
 Optus Limited ACN 052 833 208





WARNING: This document is confidential and may also be privileged. Confidentiality nor privilege is not waived or destroyed by virtue of it being transmitted to an incorrect addressee. Unauthorised use of the contents is therefore strictly prohibited. Any information contained in this document that has been extracted from our records is believed to be accurate, but no responsibility is assumed for any error or omission. Optus Plans and information supplied are valid for 30 days from the date of issue. If this timeline has elapsed please raise a new enquiry.

Sequence Number: 54817641

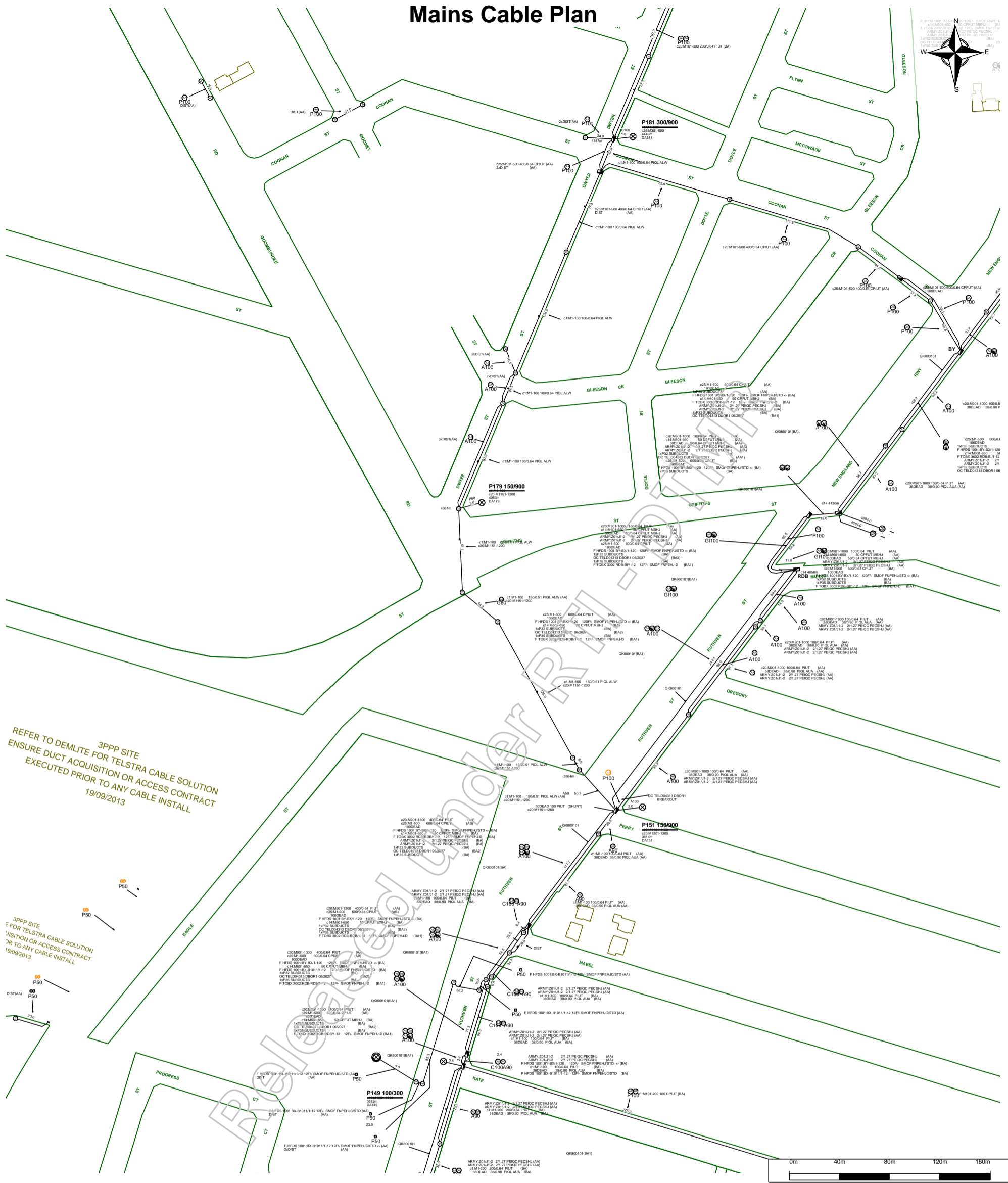
Date Generated: 09/08/2016



For all Optus DBYD plan enquiries –
 Email: Fibre.Locations@optus.net.au
 For urgent onsite assistance contact 1800 505 777
 Optus Limited ACN 052 833 208



Mains Cable Plan



3PPP SITE
FOR TELSTRA CABLE SOLUTION
ENSURE DUCT ACQUISITION OR ACCESS CONTRACT
EXECUTED PRIOR TO ANY CABLE INSTALL
19/09/2013

3PPP SITE
FOR TELSTRA CABLE SOLUTION
ENSURE DUCT ACQUISITION OR ACCESS CONTRACT
EXECUTED PRIOR TO ANY CABLE INSTALL
19/09/2013



For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

Sequence Number: 54817640
CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

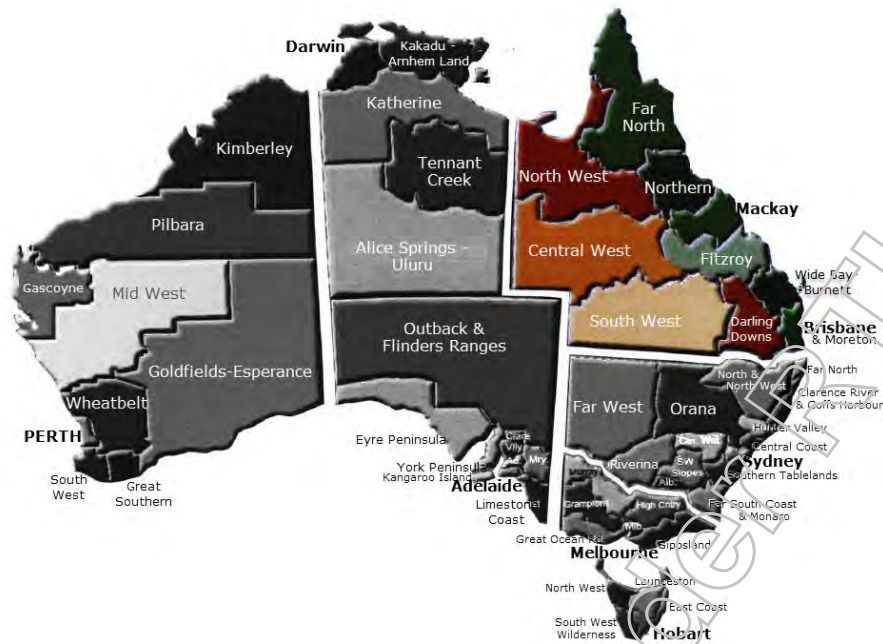
Generated On 09/08/2016 12:27:32

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.



TELSTRA ACCREDITED PLANT LOCATORS – QUEENSLAND. ALL REGIONS

Regions – Far North, North, Central, South

Telstra plans are intended to be indicative only. A plant location service (Telstra accredited) is required to identify the exact location of the plant and ensure that the asset is protected during construction work. It is your responsibility as part of your “Duty of Care” to engage an Accredited Plant Locator.

***Optic fibre cable locations** must be performed by a locator with Telstra optic fibre location accreditation.


Locators with Telstra optic fibre cable location accreditation are indicated by either a ‘yes’ in the ‘Fibre’ column or the DBYD Certified Locator Symbol.



Please contact a Telstra accredited locator from the pages following (fees apply).

FAR NORTH QLD



Company Name & service areas	*Fibre	Contact	
Atherton Location Services Pty Ltd Atherton Tablelands and surrounding areas, Innisfail, Mareeba, Karumba, Cape York	NO	07 4091 3239 Not relevant 07 4092 3239 Part Refuse Sch.4 Part 4 s.6 Personal Information @bigpond.com	Phone Mobile Fax Email Web
Aussie Drill Kings Pty Ltd Cairns and Remote Areas	NO	07 4037 0604 Not relevant 07 4037 0634 accounts@ozdrill.com	Phone Mobile Fax Email Web
Cable and Pipe Locators NQ Cairns to Townsville	YES	Not relevant cablennq@gmail.com	Phone Mobile Fax Email Web
Cairns Cable Locators Cairns	YES	Not relevant @cclocators.com.au	Phone Mobile Fax Email Web
Chris Page Pipe & Cable Townsville, Ingham, Cardwell, Ayr, Charters Towers, Bowen, Home Hill and surrounding areas	YES	07 4788 8976 Not relevant 07 4788 8398 Part Refuse Sch.4 Part 4 s.6 Personal Information @westnet.com.au	Phone Mobile Fax Email Web
Courtsea Pty Ltd All of NT, top of WA and North Queensland	YES	08 8983 1404 Not relevant 08 8983 1404 courtsea@bigpond.com	Phone Mobile Fax Email Web
CUSL Pty Ltd Cairns, Cardwell to Cape York	NO	Not relevant 07 4054 4797 Part Refuse Sch.4 Part 4 s.6 Personal Information @cusl.com.au	Phone Mobile Fax Email Web
Hannahbull Locations Thuringowa – Townsville and all areas in Qld.	YES	07 4751 8931 Personal Information admin@hannahbull.com.au	Phone Mobile Fax Email Web
Hydro-Vac Excavations FNQ Cairns and surrounding districts, Atherton Tablelands, Cape York, Cassowary Coast, Mt Isa, Gulf Country	YES	07 4057 6300 Not relevant 07 4057 6300 Part Refuse Sch.4 Part 4 s.6 Personal Information @hvfqnq.com	Phone Mobile Fax Email Web
iFind Pipes 'N' Cables Pty Ltd All of NT, top of WA and Kimberley region, and Northern Qld.		Not relevant info@ifindnt.com www.ifindnt.com	Phone Mobile Fax Email Web
JR & LM Trackson Pty Ltd Ayr, Townsville, Innisfail, Tablelands, Cairns and Cape York areas	YES	07 4063 0300 Not relevant 07 4063 0307 Part Refuse Sch.4 Part 4 s.6 Personal Information @tracavoid.com.au	Phone Mobile Fax Email Web
Lostpipe.com	NO	Not relevant @lostpipe.com	Phone Mobile Fax Email Web
Online Communications	YES	07 4095 3399 Not relevant 07 4095 2200 Personal Information onlineco@bigpond.net.au	Phone Mobile Fax Email Web

Orbital Underground Service Location		1300 672 482 Not relevant 07 5497 8384 locators@orbital.com.au	Phone Mobile Fax Email Web
Outback Vac Western Queensland	YES	Part Refuse Sch.4 Part 4 s.6 Personal information 07 4658 0013 Not relevant 07 4658 1003 @longreachhardware.com.au	Phone Mobile Fax Email
Rex Petersens Bobcat Hire Mareeba	NO	Part Refuse Sch.4 Part 4 s.6 Personal information 07 4092 2659 Not relevant 07 4092 7659 @activ3.net.au	Phone Mobile Fax Email Web
Samark North Queensland Pty Ltd	NO	07 4054 6511 07 4054 6533 info@samark.com.au	Phone Mobile Fax Email Web
Scan Man Pty Ltd All of Queensland	NO	1800 SCANMAN Not relevant info@scanman.com.au www.scanman.com.au	Phone Mobile Fax Email Web
Shamrock Civil	NO	Not relevant 07 3879 4100 shamrock@shamrockcivil.com.au	Phone Mobile Fax Email Web
Utility I.D. All areas Queensland and New South Wales	YES	Not relevant info@utilityid.com.au www.utilityid.com.au	Phone Mobile Fax Email Web




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NORTH QLD

Company Name & service areas	*Fibre	Contact	
A One Locations & Consulting Pty Ltd Townsville, Thuringowa, Ingham, Burdekin, Bowen, Charters Towers and their surrounding Districts	YES	074778 1413 Not relevant 07 4778 1461 Part Refuse Sch.4 Part 4 s.6 Personal information @bigpond.com	Phone Mobile Fax Email Web
Aussie Drill Kings Pty Ltd Cairns and Remote Areas	NO	07 4037 0604 Not relevant 07 4037 0634 accounts@ozdrill.com	Phone Mobile Fax Email Web
A.U.S Locators Pty Ltd All of QLD	YES	Not relevant auslocat@gmail.com	Phone Mobile Fax Email Web
Cable and Pipe Locators NQ Cairns to Townsville	YES	Not relevant cableng@gmail.com	Phone Mobile Fax Email Web
Chris Page Pipe & Cable Townsville, Ingham, Cardwell, Ayr, Charters Towers, Bowen, Home Hill and surrounding areas	YES	07 4788 8976 Not relevant 07 4788 8398 Part Refuse Sch.4 Part 4 s.6 Personal information @westnet.com.au	Phone Mobile Fax Email Web
Courtsea Pty Ltd All of NT, top of WA and North Queensland	YES	08 8983 1404 Not relevant 08 8983 1404 courtsea@bigpond.com	Phone Mobile Fax Email Web
Hannahbull Locations Thuringowa – Townsville and all areas in Qld.	YES	07 4751 8931 admin@hannahbull.com.au	Phone Mobile Fax Email Web
Hydro-Vac Excavations FNQ Cairns and surrounding districts, Atherton Tablelands, Cape York, Cassowary Coast, Mt Isa, Gulf Country	YES	07 4057 6300 Not relevant 07 4057 6300 Part Refuse Sch.4 Part 4 s.6 Personal information @hvefnq.com	Phone Mobile Fax Email Web
iFind Pipes 'N' Cables Pty Ltd All of NT, top of WA and Kimberley region, and Northern Qld.		Not relevant info@ifindnt.com www.ifindnt.com.au	Phone Mobile Fax Email Web
Jackos Back-O Mackay, Western Regions, Bowen, St Laurence, Whitsundays and all of Central and Far Western Queensland regions	NO	07 4954 0760 Not relevant ijlm@bigpond.com	Phone Mobile Fax Email Web
JR & LM Trackson Pty Ltd Ayr, Townsville, Innisfail, Tablelands, Cairns and Cape York areas	YES	07 4063 0300 Not relevant 07 4063 0307 Part Refuse Sch.4 Part 4 s.6 Personal information @tracavoid.com.au	Phone Mobile Fax Email Web
Lostpipe.com	NO	Not relevant @lostpipe.com	Phone Mobile Fax Email Web
National Locating Service Available all QLD areas	YES	07 4124 7757 Not relevant nls@contractor.net	Phone Mobile Fax Email Web

Orbital Underground Service Location		1300 672 482 Not relevant 07 5497 8384 locators@orbital.com.au	Phone Mobile Fax Email Web
Outback Vac Western Queensland	YES	07 4658 0013 Not relevant 07 4658 1003 Part Refuse Sch.4 Part 4 s.6 Personal information @longreachhardware.com.au	Phone Mobile Fax Email
QDP Directional Boring	NO	07 4728 5589 Not relevant 07 4728 6999 Part Refuse Sch.4 Part 4 s.6 Personal information @bigpond.com	Phone Mobile Fax Email Web
Samark North Queensland Pty Ltd	NO	07 4054 6511 07 4054 6533 info@samark.com.au	Phone Mobile Fax Email Web
Sarajaw Pty Ltd t/as HAVAC Solutions Townsville, Ingham, Charters Towers, Bowen, Cardwell, Ayr and surrounding areas	NO	Not relevant 07 4779 9638 admin@havacsolutions.com.au	Phone Mobile Fax Email Web
Scan Man Pty Ltd All of Queensland	NO	1800 SCANMAN Not relevant info@scanman.com.au www.scanman.com.au	Phone Mobile Fax Email Web
Shamrock Civil	NO	Not relevant 07 3879 4100 shamrock@shamrockcivil.com.au	Phone Mobile Fax Email
Subsite Locators Bowen Basin Mines		07 4955 7572 Not relevant 07 4955 7072 subsitelocators@bigpond.com	Phone Mobile Fax Email Web
Terrascan Central Qld	NO	07 4969 5337 Not relevant 07 4969 5337 Part Refuse Sch.4 Part 4 s.6 Personal information @terrascan.com.au	Phone Mobile Fax Email Web
Utility I.D. All areas Queensland and New South Wales	YES	Not relevant info@utilityid.com.au www.utilityid.com.au	Phone Mobile Fax Email Web

CENTRAL QLD

Company Name & service areas	*Fibre	Contact	
1300 Locate		07 5499 3350 Not relevant 07 5499 3353 admin@1300locate.com.au www.1300locate.com.au	Phone Mobile Fax Email Web
ABC Locators Pty Ltd Darling Downs, Southern Downs, Burnett, Lockyer Valley, Brisbane Valley, South East Qld, Southern Qld, Northern NSW	YES	07 4632 3499 Not relevant @bigpond.com	Phone Mobile Fax Email Web
Abletech Underground South East Qld, Northern NSW, Rockhampton, Gladstone, Roma, Goondiwindi, Toowoomba, Charleville, Cunnamulla	YES	Not relevant abletech@bigpond.net	Phone Mobile Fax Email Web
Accredited Cable Locating Central Queensland – all areas including Mines area	NO	07 4939 5615 Not relevant 07 4939 1852 @bigpond.com	Phone Mobile Fax Email Web
Alpha Plant Locations Queensland – South-East, South-West, Central & Central-West areas. NSW – North-East & North-West areas. Available to travel further if required.		Not relevant 07 3818 6595 @bigpond.com	Phone Mobile Fax Email Web
A.U.S Locators Pty Ltd All of QLD	YES	Not relevant auslocat@gmail.com	Phone Mobile Fax Email Web
Capvac Pty Ltd Rockhampton, Yeppoon	NO	Not relevant 07 4927 9544 @capvac.com.au www.capvac.com.au	Phone Mobile Fax Email Web
Central Qld Cable & Pipe Locators Bundaberg to Mackay, West to Longreach		07 4978 5571 Not relevant 07 4978 7571 cqccablelocator.com.au	Phone Mobile Fax Email Web
Copp & Co Plant Hire Bowen, Mackay, Central Highlands, Whitsundays.	YES	07 4945 3169 Not relevant 07 4945 4783 @coppandco.com	Phone Mobile Fax Email Web
Geoff Hall Projects Pty Ltd Bundaberg, Gympie, Childers, Gin Gin and surrounding districts. Also S.E. & Central Queensland regions	YES	07 4151 5166 Not relevant 07 4153 1317 info@ghpelect.com.au www.ghpelect.com.au	Phone Mobile Fax Email Web
Georadar Australia Pty Ltd Alpha, Anakie, Barcaldine, Blackwater, Bluff, Capella, Clermont, Comet, Dingo, Dysart, Emerald, Gem Fields, Hail Creek, Middlemount, Moranbah, Nebo, Oakey Creek, Rolleston, Roma, Rubyvale, Springsure, Tambo, Tieri	YES	Not relevant @georadar.net.au www.georadar.net.au	Phone Mobile Fax Email Web
Hannahbull Locations Thuringowa – Townsville and all areas in Qld.	YES	07 4751 8931 admin@hannahbull.com.au	Phone Mobile Fax Email Web
IRT Plumbing & Locating Pty Ltd	YES	07 5497 6345 Not relevant 07 5497 6345 @bigpond.com www.irtplumbing.com.au	Phone Mobile Fax Email Web

Jackos Back-O Mackay, Western Regions, Bowen, St Laurence, Whitsundays and all of Central and Far Western Queensland regions	NO	07 4954 0760 Not relevant Part Refuse Sch.4 Part 4 s.6 @bigpond.com	Phone Mobile Fax Email Web
Jai-Cor Communication Solutions Eimeo and surrounding Central Qld districts		07 4954 9905 Not relevant Personal information 07 4954 9844 Jai-cor@bigpond.com	Phone Mobile Fax Email Web
Lostpipe.com	NO	Not relevant Part Refuse Sch.4 Part 4 s.6 @lostpipe.com	Phone Mobile Fax Email Web
National Locating Service Available all QLD areas	YES	07 4124 7757 Not relevant Personal information nls@contractor.net	Phone Mobile Fax Email Web
Orbital Underground Service Location		1300 672 482 Not relevant 07 5497 8384 locators@orbital.com.au	Phone Mobile Fax Email Web
Outback Vac Western Queensland	YES	07 4658 0013 Not relevant Part Refuse Sch.4 Part 4 s.6 Personal information 07 4658 1003 longreachhardware.com.au	Phone Mobile Fax Email
RPS Australia East Pty Ltd Brisbane and Ipswich	YES	07 3237 8899 Not relevant Part Refuse Sch.4 Part 4 s.6 Personal information @rpsgroup.com.au	Phone Mobile Fax Email Web
Safe Dig Vacuum Excavation Pty Ltd	NO	07 3376 0856 Not relevant 07 3376 1258 admin@safedig.com.au	Phone Mobile Fax Email Web
Scan Man Pty Ltd All of Queensland	NO	1800 SCANMAN Not relevant info@scanman.com.au www.scanman.com.au	Phone Mobile Fax Email Web
Shamrock Civil	NO	Not relevant 07 3879 4100 shamrock@shamrockcivil.com.au	Phone Mobile Fax Email
Speciality Services Pty Ltd	YES	07 4668 9909 Not relevant 07 4662 7355 ops@specialityservicesqld.com.au	Phone Mobile Fax Email
Subsite Locators Bowen Basin Mines		07 4955 7572 Not relevant 07 4955 7072 subsitelocators@bigpond.com	Phone Mobile Fax Email Web
Terrascan Central Qld	NO	07 4969 5337 Not relevant Part Refuse Sch.4 Part 4 s.6 Personal information @terrascan.com.au	Phone Mobile Fax Email Web
Utility I.D. All areas Queensland and New South Wales	YES	Not relevant info@utilityid.com.au www.utilityid.com.au	Phone Mobile Fax Email Web

Vac Group Operations Pty Ltd t/as Earthspy






1300 822 834
Not relevant





Phone
Mobile
Fax
Email
Web



www.vacgroup.com.au






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SOUTHERN QLD

Company Name & service areas	*Fibre	Contact	
1 Find Cables Brisbane, Ipswich, Gold Coast & Northern NSW – and surrounding areas	YES	1300 734 772 Not relevant 07 3041 6471 @provac.net.au www.provac.net.au	Phone Mobile Fax Email Web
1300 Locate		07 5499 3350 Not relevant 07 5499 3353 admin@1300locate.com.au www.1300locate.com.au	Phone Mobile Fax Email Web
AAA Locating Toowoomba area		Not relevant info@uul.com.au www.uul.com.au	Phone Mobile Fax Email Web
ABC Locators Pty Ltd Darling Downs, Southern Downs, Burnett, Lockyer Valley, Brisbane Valley, South East Qld, Southern Qld, Northern NSW	YES	07 4632 3499 Not relevant @bigpond.com	Phone Mobile Fax Email Web
Abletech Underground South East Qld, Northern NSW, Rockhampton, Gladstone, Roma, Goondiwindi, Toowoomba, Charleville, Cunnamulla	YES	Not relevant abletech@bigpond.net	Phone Mobile Fax Email Web
Accurate Service Locators	NO	07 5498 5020 Not relevant 07 5498 5402 locators@asloc.com.au	Phone Mobile Fax Email Web
Ace Cable Locations Maryborough, Hervey Bay, Childers, Biggenden & Wide Bay-Burnett	YES	Not relevant 07 4122 4428 @bigpond.com	Phone Mobile Fax Email Web
All Underground Pipe & Cable Location Pty Ltd Sunshine Coast, Chinchilla & Kilcoy areas	YES	Not relevant info@undergroundplocation.com.au	Phone Mobile Fax Email
Alpha Plant Locations Queensland – South-East, South-West, Central & Central-West areas. NSW – North-East & North-West areas. Available to travel further if required.		Not relevant 07 3818 6595 @bigpond.com	Phone Mobile Fax Email Web
Anton Seng Plumbing Pty Ltd Toowoomba, the Downs regions	YES	07 4634 2427 Not relevant 07 4634 2011 anton_seng@bigpond.com	Phone Mobile Fax Email Web
ATTAIN Solutions South East Queensland. Brisbane, Gold Coast, Sunshine Coast, Noosa, Ipswich and surrounding areas	YES	1300 294 969 Not relevant attain.com.au www.attain.com.au	Phone Mobile Fax Email Web
Auscom Qld Pty Ltd Palmwoods, Nambour and surrounding districts	NO	07 5446 6962 Not relevant auscom.qld@bigpond.com www.auscomqld.com	Phone Mobile Fax Email Web
Aussie Hydrovac Services South East Qld areas	NO	07 3287 7818 Not relevant 07 3287 7819 info@aussiehydrovac.com.au www.aussiehydrovac.com.au	Phone Mobile Fax Email Web

A.U.S. Locators Pty Ltd All of Qld	YES	Not relevant auslocat@gmail.com	Phone Mobile Fax Email Web
Bsure Locations Bundaberg and surrounding areas	NO	Not relevant 07 4154 2753 admin@bsurelocations.com.au	Phone Mobile Fax Email Web
C Locate South-East Queensland areas		Not relevant clocate@bigpond.com	Phone Mobile Fax Email Web
Cardno Brisbane, Ipswich, Toowoomba region, Gold Coast, Sunshine Coast, Mackay and Northern New South Wales	YES	1300 224 664 07 3806 5711 cardnoaus@cardno.com.au	Phone Mobile Fax Email Web
Collingwood Services Pty Ltd Brisbane, Gold Coast, Sunshine Coast to Kilcoy, Yarraman, Esk, Gympie, Rainbow Beach, Fraser Island.	YES	07 5445 9291 Not relevant scollingwood@bigpond.com	Phone Mobile Fax Email Web
DC Locators Ipswich, Brisbane, Lockyer Valley, Logan, Beaudesert, Scenic Rim, Somerset & Southern Downs area		07 3389 2313 Not relevant dcloc@powerup.com.au	Phone Mobile Mobile Email Web
Dynamic Excavations Brisbane, Gold Coast, Toowoomba, Sunshine Coast, Northern NSW, Ballina, Sydney and surrounding districts		07 5564 8142 Not relevant Part Refuse Sch.4 Part 4 s.6 Personal information dynamicexcavations.com.au www.dynamicexcavations.com.au	Phone Mobile Email Web
Expert Service Locating Pty Ltd Sunshine Coast, South East Qld, Brisbane, Gold Coast and Northern NSW		Not relevant info@expertservicelocating.com.au www.expertservicelocating.com.au	Mobile Email Web
Eye Spy Cable & Pipe Pty Ltd South East Qld, Sunshine Coast, Brisbane, Gold Coast and Northern NSW	NO	Not relevant 07 3818 2764 eyespy.location@optusnet.com.au	Phone Mobile Fax Email
Farmer Enterprises & Co Pty Ltd	YES	07 4671 2443 Not relevant 07 4671 2443 digalot1@bigpond.com	Phone Mobile Fax Email Web
Geoff Hall Projects Pty Ltd Bundaberg, Gympie, Childers, Gin Gin and surrounding districts. Also S.E. & Central Queensland regions	YES	07 4151 5166 Not relevant 07 4153 1317 info@ghpelect.com.au www.ghpelect.com.au	Phone Mobile Fax Email Web
Hannahbull Locations Thuringowa – Townsville and all areas in Qld.	YES	07 4751 8931 admin@hannahbull.com.au	Phone Mobile Fax Email Web
How Deep Water Leaks Runaway Bay, Gold Coast, Brisbane, The Tweed, Northern Rivers, Murwillumbah, Far North NSW	YES	Not relevant @howdeeplocations.com.au www.howdeeplocations.com.au	Phone Mobile Fax Email Web
Hydro Digga All of NSW, ACT & South East Qld		Part 4 s.6 Personal information Not relevant locator@hydrodigga.com	Phone Mobile Fax Email Web

Hydrovac Excavations (Aust) Pty Ltd	NO	07 5433 1811 07 5433 1911 enquiries@hydrovac.com.au	Phone Mobile Fax Email Web
Integra Contracting Pty Ltd Nerang and surrounding districts	NO	Not relevant 07 5500 4415 07 5500 4416 admin@integracontracting.com.au	Phone Mobile Fax Email
IRT Plumbing & Locating Pty Ltd Bribie Island and surrounding areas	YES	Not relevant 07 5497 6345 07 5497 6345 @bigpond.com www.irtplumbing.com.au	Phone Mobile Fax Email Web
JNC Group Australia Pty Ltd Armidale and North West	NO	Not relevant 02 6772 9980 02 6772 0781 @bigpond.com	Phone Mobile Fax Email Web
Katacole Pty Limited	NO	Not relevant 07 3297 6090 07 3297 7068 @bigpond.com	Phone Mobile Fax Email Web
Lambert Locations South East Queensland, Northern NSW		Not relevant 1300 150 035 admin@lambertlocations.com.au www.lambertlocations.com.au	Phone Mobile Email Web
Leaktech Australia Caloundra and surrounding areas	YES	07 5438 2111 0421 624 794 07 5437 2146 info@leaklocations.com.au	Phone Mobile Fax Email Web
Lee's Liquid Waste Services Brisbane area	YES	07 3206 4844 lees@liquidwaste.com.au www.cleanmyseptic.com.au	Phone Mobile Fax Email Web
Locate And Detection Specialists Pty Ltd (LADS) Gold Coast, Brisbane, Sunshine Coast, Toowoomba. Northern NSW and surrounding regions.		Not relevant admin@ladsqld.com.au www.ladsqld.com.au	Phone Mobile Fax Email Web
Locom Locations Brisbane, Sunshine Coast, Gympie areas	NO	Not relevant 07 5441 1671 Locom.locations@bigpond.com	Phone Mobile Fax Email Web
Lostpipe.com	NO	Not relevant @bigpond.com lostpipe.com	Phone Mobile Fax Email Web
National Locating Service Available all QLD areas	YES	Not relevant 07 4124 7757 nls@contractor.net	Phone Mobile Fax Email Web
Network Protection Specialists Tweed Heads, Brisbane, Gold Coast, Northern Rivers	YES	Not relevant nps@gmail.com	Phone Mobile Fax Email Web
NTS Group Pty Ltd	YES	Not relevant 07 5564 7788 07 5564 9931 info@ntsgroup.com	Phone Mobile Fax Email Web

Orbital Underground Service Location		1300 672 482 Not relevant 07 5497 8384 locators@orbital.com.au	Phone Mobile Fax Email Web
P & A Communications North & South Burnett and surrounding areas	YES	07 4168 1586 Not relevant 07 4168 1586 Pacomm1@bigpond.com	Phone Mobile Fax Email Web
Protec Cable Locations Nambour, Sunshine Coast & Hinterland, Mary Valley, Gympie	YES	Not relevant 07 5441 7048 proteccable@bigpond.com	Phone Mobile Fax Email Web
RPS Australia East Pty Ltd Brisbane and Ipswich	YES	07 3237 8899 Not relevant Part Refuse Sch.4 Part 4 s.6 Personal information @rpsgroup.com.au	Phone Mobile Fax Email Web
Safe Dig Vacuum Excavation Pty Ltd	NO	07 3376 0856 Not relevant 07 3376 1258 admin@safedig.com.au	Phone Mobile Fax Email Web
Scan Man Pty Ltd All of Queensland	NO	1800 SCANMAN Not relevant info@scanman.com.au www.scanman.com.au	Phone Mobile Fax Email Web
Service Locate Pty Ltd Brisbane & Gold Coast areas. And Northern Rivers		Not relevant admin@servicelocate.com.au www.servicelocate.com.au	Phone Mobile Fax Email Web
Shamrock Civil	NO	Not relevant 07 3879 4100 shamrock@shamrockcivil.com.au	Phone Mobile Fax Email
Speciality Services Pty Ltd	YES	07 4668 9909 Not relevant 07 4662 7355 ops@specialityservicesqld.com.au	Phone Mobile Fax Email
Subsite Locators Bowen Basin Mines		07 4955 7572 Not relevant 07 4955 7072 subsitelocators@bigpond.com	Phone Mobile Fax Email Web
SureSearch South-East Queensland area – Sunshine Coast to Gold Coast, including Brisbane, Toowoomba and surrounding districts		1300 884 520 Not relevant info@suresearch.com.au www.suresearch.com.au	Phone Mobile Fax Email Web
Test Line Pty Ltd Thornlands, Brisbane and surrounding Districts		Not relevant @testline.com.au www.testline.com.au	Phone Mobile Fax Email Web
Trakida Pty Ltd Qld	YES	Part Refuse Sch.4 Part 4 s.6 Personal information 07 5514 6373 Not relevant trakida@bigpond.net.au	Phone Mobile Fax Email Web
Trikileaks Leak Detection Brisbane and surrounding areas	NO	Not relevant info@trikileaks.com.au	Phone Mobile Fax Email Web

TVE Pty Ltd All Brisbane, Gold Coast, Sunshine Coast, Darling Downs, Lockyer Valley & surrounding areas	YES	0708 855 617 07 3297 0009 tve@live.com.au	Phone Mobile Fax Email Web
Utility I.D. All areas Queensland and New South Wales	YES	Not relevant info@utilityid.com.au www.utilityid.com.au	Phone Mobile Fax Email Web
Utility Location Services Brisbane, Gold Coast, Sunshine Coast, Lismore, Coffs Harbour		07 3907 3552 Not relevant 07 3807 9899 utilitylocationservices@bigpond.com	Phone Mobile Fax Email
Utility Mapping (Aust) Pty Ltd Brisbane and surrounding areas	YES	1300 MAPPING Not relevant brisbane@utilitymapping.com.au www.utilitymapping.com.au	Phone Mobile Fax Email Web
Vac Group Operations Pty Ltd t/as Earthspy		1300 822 834 Not relevant www.vacgroup.com.au	Phone Mobile Fax Email Web

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DUTY OF CARE

TELSTRA CORPORATON ACN 051 775 556

IMPORTANT:

When working in the vicinity of telecommunications plant you have a "Duty of Care" that must be observed. Please read and understand all the information and disclaimers provided below.

Telstra network is complex and requires expert knowledge to interpret information, to identify and locate components, to pothole underground assets for validation and to safely work around assets without causing damage. If you are not an expert and/or qualified in these areas then you should not be attempting these activities. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

The 4 essential steps that must be undertaken to prevent damage to Telstra assets are listed below. Construction activities must not commence without first undertaking these steps.

(The following pages contain more detail on each step below and the contact details to seek further advice. AS5488-2013 is the Australian Standard for the Classification of Subsurface Utility Information.)

1 Dial Before You Dig -Telstra Plans :

- *The essential **first** step in preventing damage.*

You must have current Telstra plans via the DBYD process. Telstra advises that the accuracy of the information provided by Telstra conforms to Quality Level D as defined in AS5488-2013. This means the information is indicative only, not a precise location. **The actual location may differ substantially from that shown on the plans** - refer to steps 2 & 3 to determine actual location prior to commencing construction.

2 Telstra Accredited Plant Locator :

- *The essential **second** step in preventing damage.*

To be able to trace and identify individual subsurface cables and ducts requires access to Telstra pits and manholes. Only a Telstra Accredited Plant Locator (TAPL) is authorised to access Telstra network for locating purposes. A TAPL can interpret plans, validate visible assets and access pits and manholes to undertake electronic detection of underground assets prior to further validation. All Telstra assets must be located, validated and protected prior to commencing construction. If you are not authorised to do so by Telstra, you should not be accessing Telstra network or locating Telstra network.

3 Validation :

- *The essential **third** step in preventing damage.*

All Telstra assets must be positively identified (i.e. validated), by physically sighting them. For underground assets this can be done by potholing by hand or using non-destructive vacuum extraction methods (Refer to 'validation' as defined in AS5488-2013 QL-A). **Underground assets located by electronic detection alone (step 2), are not deemed to be 'validated' and should not be used for construction purposes.** Some TAPL's can assist with non-destructive potholing for validation purposes. **If you cannot validate the Telstra network you should not proceed with construction.** Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

4 Protection :

- *The essential **fourth** step in preventing damage.*

Telstra assets must be protected to avoid damage from construction activities. Minimum working distances around Telstra network must be maintained. These distances are provided in this document. Telstra can also provide advice and assistance in regards to protection – refer to the following pages.

STEP 1 – Dial Before You Dig -Telstra Plans:

The actual location of Telstra assets may differ substantially from that shown on the plans. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for the accuracy shown on the plans. Steps 2 and 3 must be undertaken to determine actual location of network.

- Telstra DBYD plans are not suitable for displaying Telstra network within a Telstra exchange site. For advice on Telstra network within a Telstra exchange site contact Telstra Plan Services.
- Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose.
- Telstra plans or other details are provided only for the use of the applicant, its servants, agents or Telstra Accredited Plant Locators. The applicant may not give the plans or details to any parties other than these, and may not generate profit from commercialising the plans or details.
- Please contact Telstra Plan Services immediately should you locate Telstra assets not indicated on these plans.
- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
- Please ensure Telstra plans and information provided remains on-site at all times throughout the inspection, location and construction phase of any works.
- Telstra plans are valid for 60 days after issue and should be replaced if required after the 60 days.
- **Emergency situations - receiving Telstra plans** Telstra's automated mapping system (TAMS) will provide a fast response for emergency situations (faster than an operator can provide manually via a phone call - see below for fast response requirements). Automated responses are normally available 24/7.

To receive a fast automated response from Telstra your request must -

- Be a web request lodged at DBYD (www.1100.com.au). The request will be then forwarded to Telstra.
- Contain your current email address so you can receive the automated email response.
- Be for the purposes of 'mechanical excavation' or other ground breaking DBYD activity. (Requests with activity types such as conveyancing, planning & design or other non-digging activities may not be responded to until the next business day).
- Be for an area less than 350 metres in size to obtain a PDF map (over 350 metres will default to DWF due to size) this does not include congested CBD areas where only DWF may be supplied.
- Be for an area less than 2500 metres in size to obtain a DWF map (CBD's less)
- **Data Extraction Fees.** In some instances a data extraction fee may be applicable for the supply of Telstra information. Typically a data extraction fee may apply to large projects or requests to be supplied in non-standard formats. For further details contact Telstra Plan Services.
- **Electronic plans - PDF and DWF maps** If you have received Telstra maps via email you will have received the maps as either a PDF file (for smaller areas) or DWF file (for larger area requests). All requests over approximately *350m or in congested CBD areas can only be supplied in DWF format. There are size limits on what can be provided. (*actual size depends on geographic location of requested area). If you are unable to launch any one of the softcopy files for viewing and printing, you may need to download and install one or more of the free viewing and printing products such as Adobe Acrobat Reader (for PDF files) or Autodesk Design Review (for DWF files) available from the internet
 - **Pdf files** - PDF is the default softcopy format for all requests for areas up to approx *350m in length. (*depends on geographic location of request). The PDF file is nominally formatted to A3 portrait sheet however it can be printed on any size sheet that your printer supports, e.g. either as the full sheet or selected areas to suit needs and legibility. (to print a selected area zoom up and print 'current view') If there are multiple layers of Telstra network you may receive up to 2 sheets in the single PDF file attachment supplied. There are three types or layers of network normally recorded - local network, mains cables or a combined layer of local and mains (usually displayed for rural or semi-rural areas). If mains cable network is present in addition to local cables (i.e. as separate layer in a particular area), the mains will be shown on a separate sheet. The mains cable information should be read in conjunction with the local cable information.
 - **DWF files** – DWF is the default softcopy format for all requests for areas that are over 350m in length. Maximum length for a DWF automated response is approx 2500m - depending on geographic

location of request (manually-processed plans may provide larger coverage). The DWF files differ from PDF in that DWF are vector files made up of layers that can be turned on or off and are not formatted to a specific sheet size. This makes them ideal for larger areas and for transmitting electronically.

- **How to view Telstra DWF files –**
Telstra DWF files come with all layers turned on. You may need to turn individual layers on or off for viewing and printing clarity. Individual layer names are CC (main cable/conduit), DA (distribution area network) and sometimes a combined layer - CAC. Layer details can be viewed by either picking off the side menu or by selecting 'window' then 'layers' off the top menu bar. Use 'layers' to turn individual layers off or on (double click or right click on layer icon).
- **How to print Telstra DWF files –**
DWF files can be printed on any size sheet – either their entirety or by selected areas of interest. Some DWF coverage areas are large and are not suited to printing legibly on a single A4 sheet - you may need several prints if you only have an A4 printer. Alternatively, an A3, A1 or larger printer could be used. To print, zoom in or out and then, by changing the 'print range' settings, you can print what is displayed on your screen to suit your paper size. If you only have a small printer, e.g. A4, you may need to zoom until the text is legible for printing (which is why you may need several prints). To print what is displayed on your screen the 'view' setting should be changed from 'full page' to 'current view'. The 'current sheet' setting should also be selected. You may need to print layers separately for clarity and legibility. (Details above on how to turn layers on or off)
- **How to change the background colour from white to black (when viewing) Telstra DWF files –**
If using Autodesk Design Review the background colour can be changed by selecting 'Tools' then 'options' then 'sheet'. Tick the box 'override published paper colours' and select the colour required using the tab provided.

STEP 2 - Telstra Accredited Plant Locator (TAPL):

Utilising a TAPL is an essential part of the process to identify network and to trace subsurface network prior to validating. A TAPL can provide plan interpretation, identification and electronic detection. This will assist in determining the position of subsurface assets prior to potholing (validating). Some TAPL's can also assist in validating underground detected network. Electronic detection is only an indication of the existence of underground network and can be subject to interference from other services and local conditions. Electronic detection should not be used solely to determine location for construction purposes. The electronic (indicative) subsurface measurements must be proven by physically sighting the asset (see step 3 - Validation).

- All TAPL's locating Telstra network must be able to produce a current photo ID card issued by Telstra. A list of TAPL's is provided with the Telstra Dial Before You Dig plans.
- Telstra does not permit external parties (non-Telstra) to access or conduct work on our network. Only Telstra staff, Telstra contractors or locators whom are correctly accredited are authorised to work on or access our manholes, pits, ducts, cables etc. This is for safety as well as for legal reasons.

It is a criminal offence under the *Criminal Code Act 1995 (Cth)* to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

- Optic fibre cable locations must be performed by a locator with Telstra optic fibre cable location accreditation. The locators with optic fibre cable location accreditation are indicated by a 'yes' in the column headed 'Fibre' in the lists of locators that are published with the Telstra DBYD plans. Telstra Accredited Plant Locators that are DBYD Certified Locators are also fibre accredited. Inspection of photo ID cards will confirm whether locators are just copper accredited or copper + fibre accredited.
- The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the Telstra Accredited Plant Locator engaged. Telstra is not a party to any contract entered into between you and a Telstra Accredited Plant Locator.
- Payment for the site assistance will be your responsibility and payment details should be agreed before the engagement is confirmed.

- Telstra does not accept any liability or responsibility for the performance of or advice given by a Telstra Accredited Plant Locator. Accreditation is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.
- Neither the Telstra Accredited Plant Locator nor any of its employees are an employee or agent for Telstra. Telstra is not liable for any damage or loss caused by the Telstra Accredited Plant Locator or its employees.

• **Electronically derived subsurface measurements (e.g. depths/alignments by locating devices)**

All locator provided measurements for Telstra assets must have the AS5488-2013 quality level specified - (e.g. QL-A, B, C or D). These quality levels define the accuracy of subsurface information and are critical for determining how the information is later used – for example if suitable for excavation purposes.

1) **An example of a subsurface measurement with no quality level specified – (i.e. not to be used)**

Telstra cover - **0.9m**

*The measurement above has no AS5488-2013 quality level specified and **should not** be provided by a locator or used for design or construction. This is because it is not known whether the measurement is actual or derived (where 'actual' means validated and 'derived' means assumed and not validated, e.g. electronic or other). Typically damages occur by constructors incorrectly using unvalidated measurements as actual measurements.*

2) **An example of a subsurface measurement with quality level B specified –**

Telstra cover - **0.9m (QL-B)**

Where (QL-B) complies with AS5488-2013 QL-B (for example an electronic location that complies with QL-B)

(Note QL-B means it has not been validated and should not be used for construction purposes around Telstra network, however it would assist further investigation to determine the actual location)

3) **An example of a subsurface measurement with the quality level A specified –**

Telstra cover - **0.6m (QL-A)**

Where (QL-A) complies with AS5488-2013 QL-A (and is deemed suitable for excavation purposes). In this example the asset has been electronically located first, (QL-B) and then physically exposed (QL-A).

Note -Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers if unvalidated subsurface measurements are used for construction and subsequently result in damage to Telstra assets. Only measurements conforming to AS5488-2013 (QL-A) are deemed by Telstra to be validated measurements.

- **Rural landowners** Where Telstra-owned cable crosses agricultural land, Telstra may provide on-site assistance with cable location. **You must contact Telstra Plan Services to determine eligibility and to request the service.**

Please note the following –

- If eligible, the location assistance must be approved and organised by Telstra. Telstra will not pay for a location that has not been approved and facilitated by Telstra (Telstra is not responsible for payment assistance when a customer engages a locator directly).
- The exact location, including depth of cables, must be validated by potholing, which may not be covered by this service.
- This service is nominally only available to assist private rural land owners.
- This service nominally covers one hour on-site only. Any time required in addition to Telstra-funded time can be purchased directly from the assigned Telstra Accredited Plant Locator.
- This service does not apply to previously located network at the same location (i.e. it is a once off).
- This service does not apply to other carriers' cables (marked as 'OC' on Telstra plans).

STEP 3 – *Validation:

After utilising a Telstra Accredited Plant Locator and prior to commencing construction, any electronically detected underground network must be positively identified (validated) by physically sighting it. This can be done by careful hand digging or using non-destructive water jet methods to expose the network.

*Validation as defined in AS5488-2013 (QL-A).

Manual potholing needs to be undertaken with extreme care and by employing techniques least likely to damage cables. For example, align shovel blades and trowels parallel to the cable rather than digging across the cable. Some Telstra Accredited Plant Locators are able to provide or assist with non-destructive potholing methods to enable validation of underground cables and ducts.

If you cannot validate the underground network then you should not proceed with construction. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Important note: The construction of Telstra's network dates back over many years. Some of Telstra's pits and ducts were manufactured from asbestos-containing cement. You must take care in conducting any works in the vicinity of Telstra's pits and ducts. You must refrain from in any way disturbing or damaging Telstra's network infrastructure when conducting your works. We recommend that before you conduct any works in the vicinity of Telstra infrastructure that you ensure your processes and procedures eliminate any possibility of disturbing, damaging or interfering in any way with Telstra's infrastructure. Your processes and procedures should incorporate appropriate measures having regard to the nature of this risk. For further information -

<http://ucm.in.telstra.com.au/about/media/emergencies-incidents/asbestos/index.htm?ssSourceSiteId=consumer-advice>

STEP 4 – Protection:

You must maintain the following minimum clearance distances between construction activity and the validated position of Telstra plant.

Jackhammers/Pneumatic Breakers	<i>Not within 1.0m of actual validated location.</i>
Vibrating Plate or Wacker Packer Compactor	<i>Not within 0.5m of actual validated location of Telstra ducts. 300mm compact clearance cover before compactor can be used across Telstra ducts.</i>
Boring Equipment (in-line, horizontal and vertical)	<i>Not within 2.0m of actual validated location. Constructor to hand dig or use non-destructive water jet method (pothole) and expose plant.</i>
Heavy Vehicle Traffic (over 3 tonnes)	<i>Not to be driven across Telstra ducts (or plant) with less than 600mm cover. Constructor to check actual depth via hand digging.</i>
Mechanical Excavators, Farm ploughing and Tree Removal	<i>Not within 1.0m of actual validated location. Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.</i>

- For blasting or controlled fire burning please contact Telstra Plan Services for advice.
- If conducting roadworks all existing Telstra pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.
- All Telstra conduit should have the following minimum depth of cover after the completion of ground work:-
 - **Footway 450mm**

- **Roadway 450mm at drain invert and 600mm at road centre crown**

- For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact Telstra Plan Services.
- If Telstra plant is situated wholly or partly where you plan to work (i.e. in conflict), then Telstra's Network Integrity Group must be contacted to discuss possible engineering solutions. Please phone **1800 810 443** or email NetworkIntegrity@team.telstra.com
- You are not permitted to relocate or alter or repair any Telstra assets or network under any circumstances.

It is a criminal offence under the *Criminal Code Act 1995 (Cth)* to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

Only Telstra and its contractors may access and conduct works on Telstra's network (including its plant and assets). This requirement is to ensure that Telstra can protect the integrity of its network, avoid disruption to services and ensure that the relocation meets Telstra's requirements.

- If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer, constructor or person for whom the work is performed. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works. Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com
Further information - <https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets>

Damage to Telstra's network must be reported immediately -

<https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment>

- You will be held responsible for all plant damage that occurs or any impacts to Telstra's network as a result of your construction activities. This includes interfering with plant, conducting unauthorised modification works and interfering with Telstra's assets in a way that prevents Telstra from accessing or using its assets in the future.
- Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

FURTHER INFORMATION:

NATURAL DISASTERS

Natural Disasters include (amongst other things) earthquakes, cyclones, floods and tsunamis. In the case of such events, urgent requests for plans or information relating to the location of Telstra network can be made directly to Telstra Network Integrity Team Managers as follows:

NSW -	Part Refuse Sch.4 Part 4 s.6 Personal information	Not relevant
QLD -	Part Refuse Sch.4 Part 4 s.6 Personal information	Not relevant
VIC/TAS	Part Refuse Sch.4 Part 4 s.6 Personal information	Not relevant
SA/NT -	Part Refuse Sch.4 Part 4 s.6 Personal information	Not relevant
WA -	Part Refuse Sch.4 Part 4 s.6 Personal information	Not relevant

TELSTRA PLAN SERVICES - for all Telstra Dial Before You Dig related enquiries

Email - Telstra.Plans@team.telstra.com

Phone - 1800 653 935 (general enquiries, business hours only)

*Telstra DBYD plan information -	Part Refuse Sch.4 Part 4 s.6 Personal Information	07 3455 2997 07 3455 2365
Advice on preventing damage -		07 3455 1011 07 3455 3132
Accredited plant locator enquiries -	Not relevant	
Road closures -		07 3455 0834 07 3455 3132
Telstra easements -		07 3455 1011

**Please note - to make a Telstra plan enquiry the plans must be current (within 60 days of issue). If your plans have expired you will need to submit a new request via DBYD prior to contacting Telstra Plan Services.*

Information for new developments (developers, builders, home owners)

Telstra Smart Communities - <https://www.telstra.com.au/smart-community>

Asset relocations

Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com

<https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets>

Telstra offers free Cable Awareness Presentations, if you believe you or your company would benefit from this offer please contact Network Integrity on 1800 810 443 or

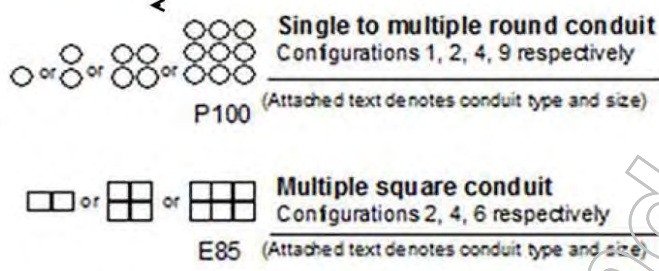
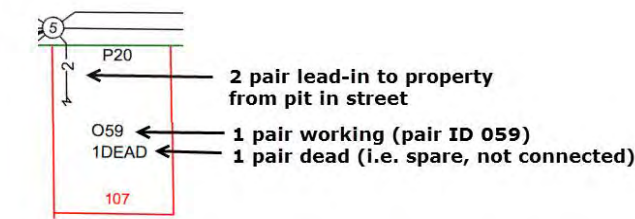
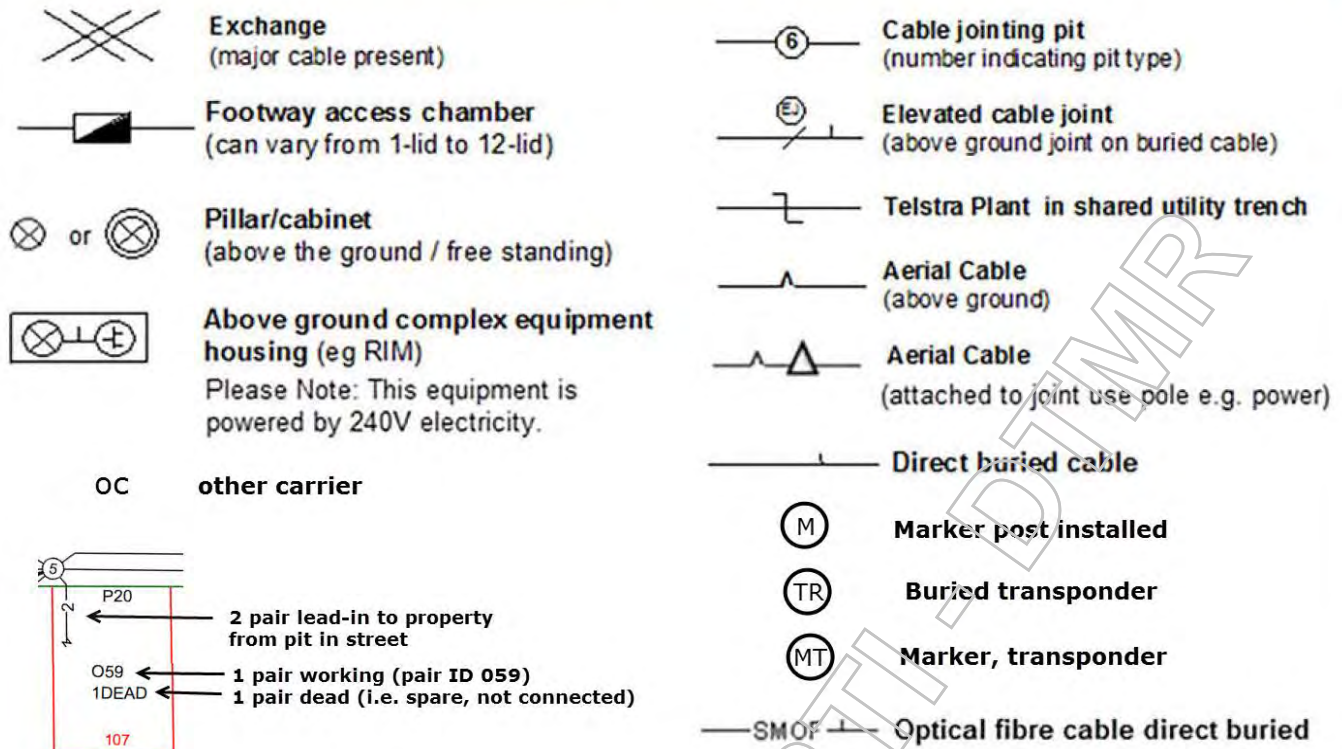
NetworkIntegrity@team.telstra.com

PRIVACY NOTE

Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps your information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy



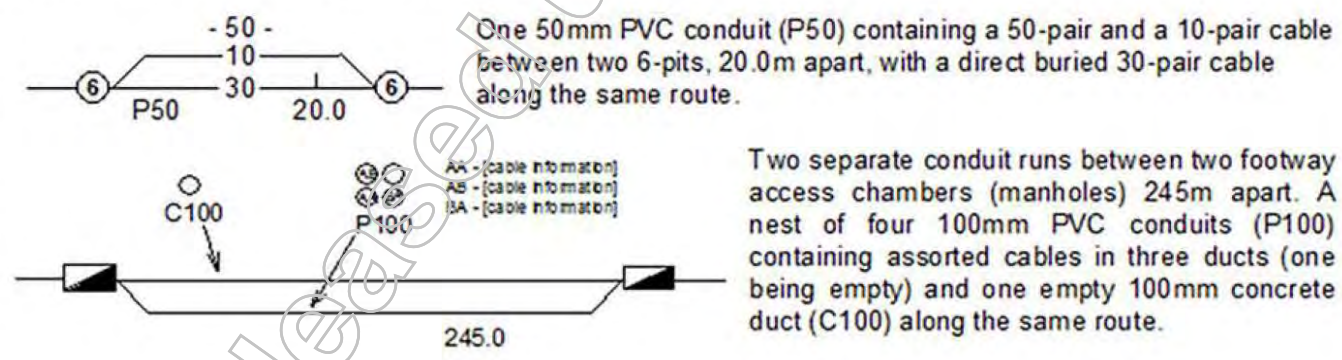
For more info contact a Telstra Accredited Locator or Telstra Plan Services 1800 653 935



Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

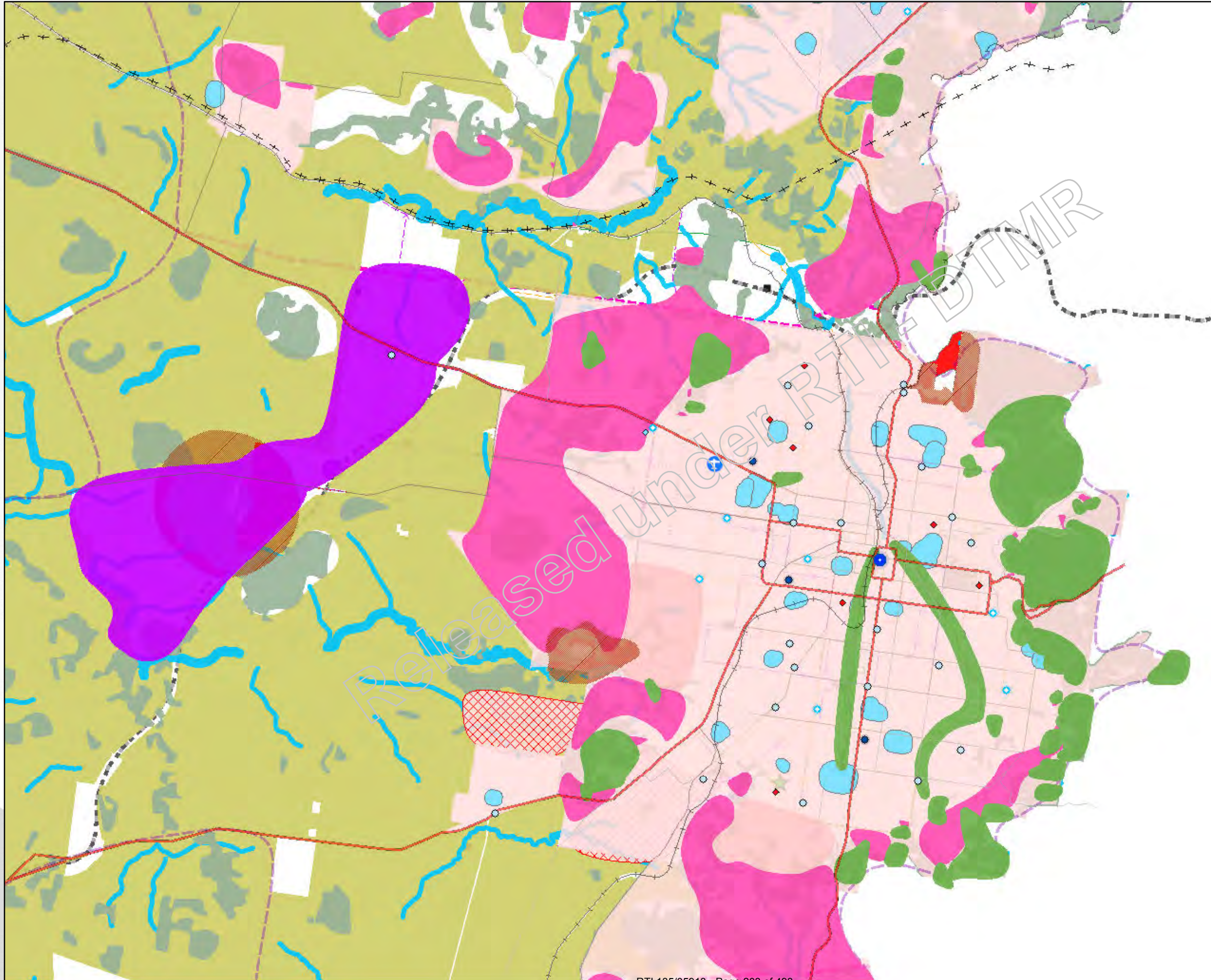
Some examples of how to read Telstra plans:



WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. **FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK.** A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

APPENDIX D
LAND USE PLANNING MAPPING

Released under RTI - DTMR



© Toowoomba Regional Council 2010
 DCDB © Department of Environment and
 Resource Management Queensland
 Geocentric Datum of Australia 1994 (GDA94) Zone 56

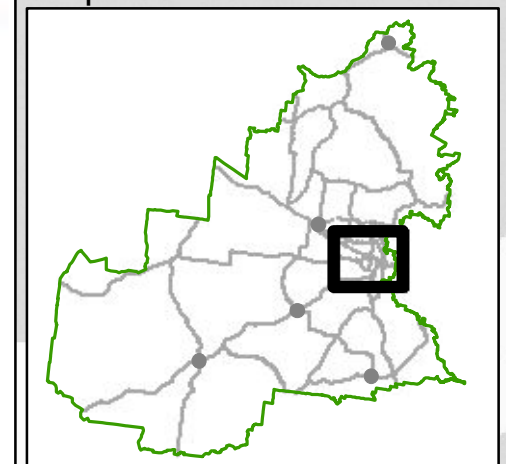
DISCLAIMER: The Plan Information is provided as
 a guide and should not be relied upon in anyway
 whatsoever.

Toowoomba Regional Council takes no responsibility
 for inaccuracies in the Plan Information and is
 not liable under any circumstances for any loss or
 damage whatsoever or howsoever caused arising
 directly or indirectly in connection with its use.
 The recipient must verify the Plan Information on
 site. Please refer any discrepancies to Toowoomba
 Regional Council Strategic Land Use Planning
 Branch.

No part of the Plan information should be
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 Regional Council.

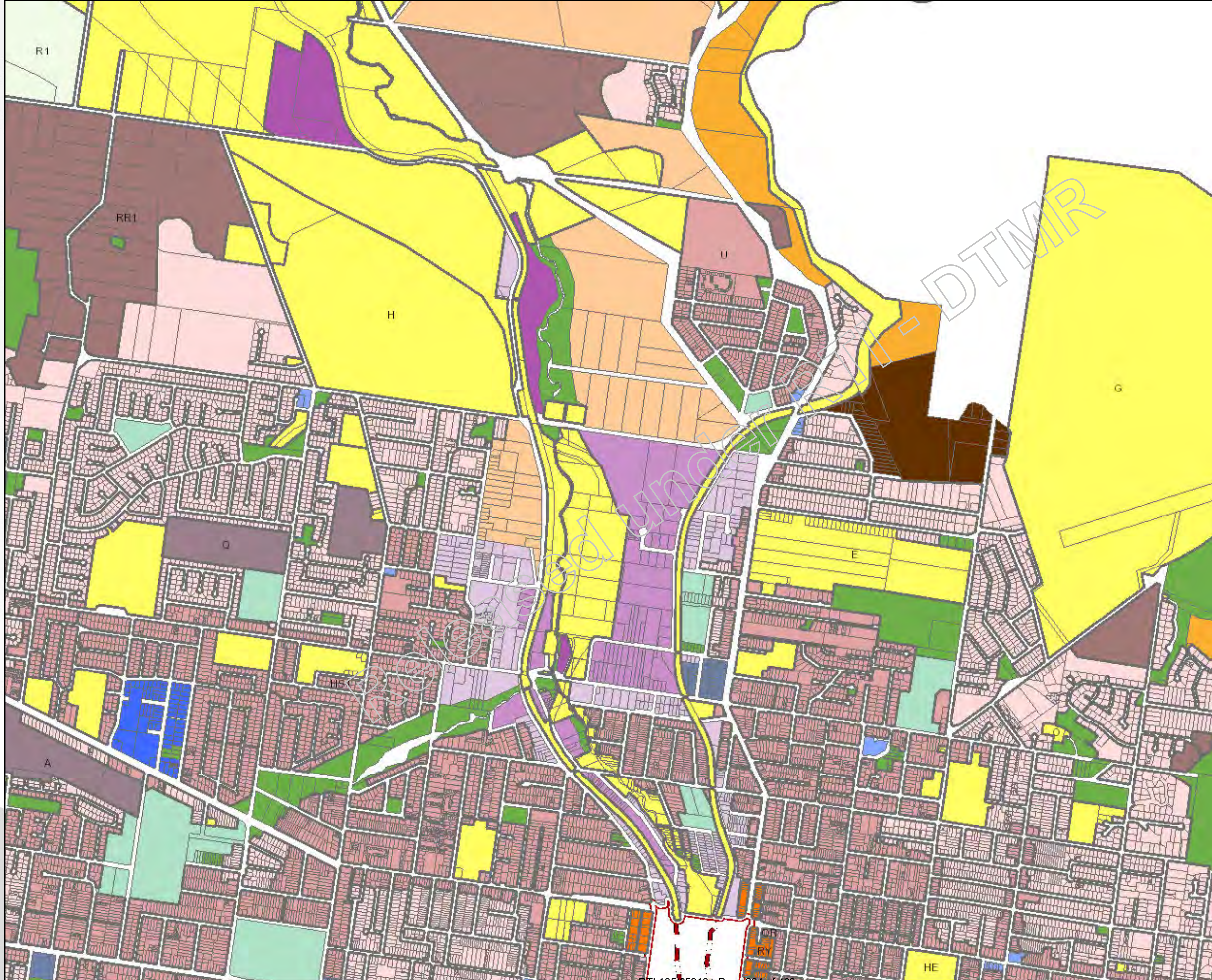
Warning: This data will not contain amendments
 made since the date it was created.

Map Sheet Index



Final map sheet boundaries to be confirmed.





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DCDB © Department of Environment and
Resource Management Queensland
Geocentric Datum of Australia 1994 (GDA94) Zone 56

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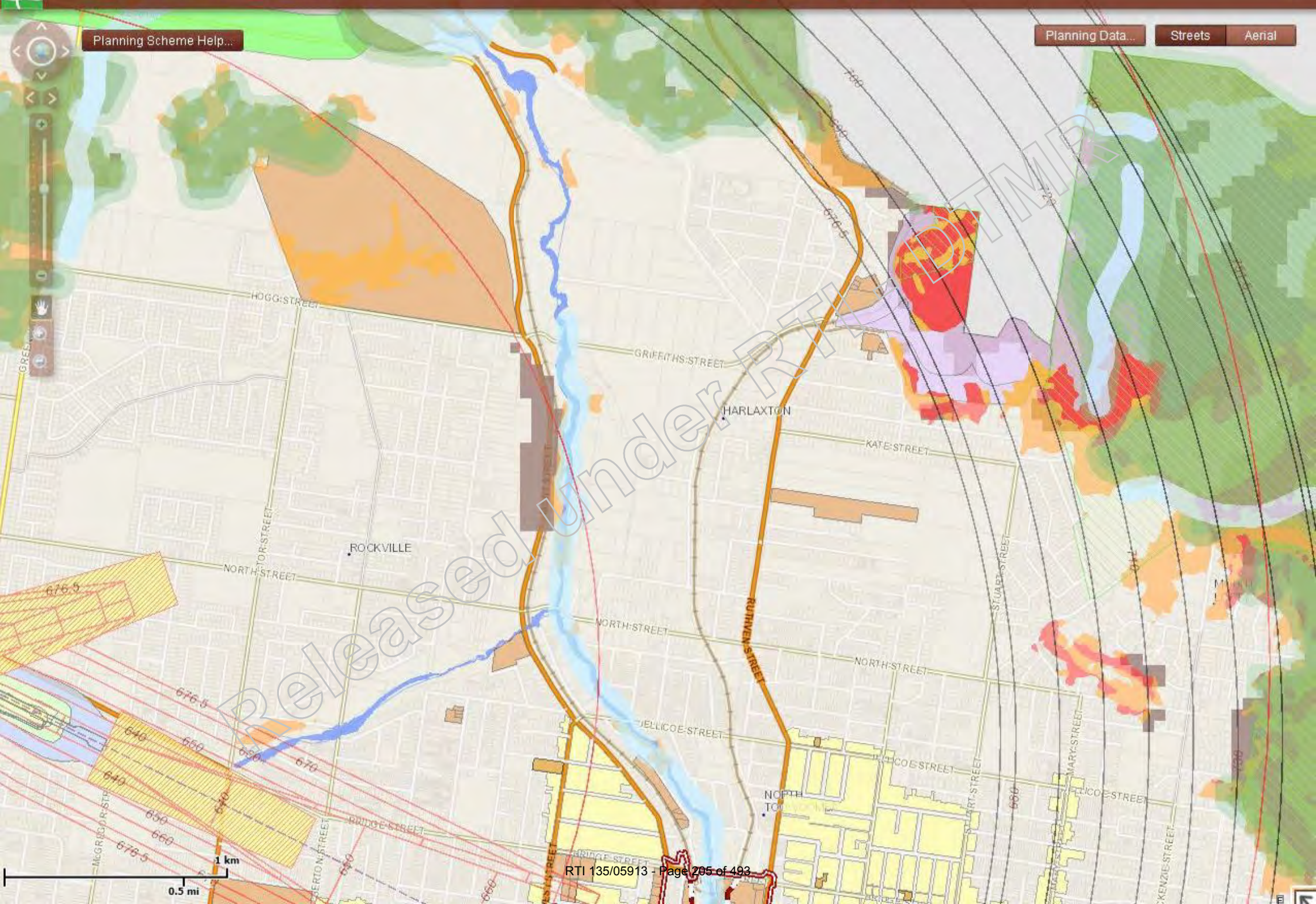


Planning Scheme Help...

Planning Data...

Streets

Aerial



Toowoomba Regional Planning Scheme - Legend

Land Use

Land Use Zones	
Zone, Precinct	
O	Community Facilities, Other Community Purposes
E	Community Facilities, Education
G	Community Facilities, Government
HE	Community Facilities, Higher Education
H	Community Facilities, Hospital
P	Mixed Use, Parkland Living
CS	Mixed Use, City South
W	Mixed Use, West Creek
RY	Mixed Use, Railyards
HS2	Mixed Use, Health Support
PC	Principal Centre
MC	Major Centre
HC	Major Centre, Highfields Town Centre Core
F	Major Centre, Highfields Town Centre Frame
M	Major Centre, Medium Density Residential
DC	District Centre
LC	Local Centre
CC	Local Centre, Commercial / Centre
EC	Emerging Community
LI	Low Impact Industry
WLI	Low Impact Industry - Welcamp Low Impact Industry
MI	Medium Impact Industry
IM	Medium Impact Industry, Intermodal Facility
W	Medium Impact Industry, Transport & Warehousing
GI	Medium Impact Industry, General Industry
HI	High Impact Industry
HI	High Impact Industry, Heavy Industry
QP	High Impact Industry, Quarry
EI	Extractive Industry
LDC	Limited Development (Constrained Land)
OS	Open Space
C	Open Space, Conservation
CF	Open Space, State Govt Conservation and Forestry
SR	Sport and Recreation
LR	Low Density Residential, General
PR	Low Density Residential, Park Residential
S	Low Density Residential, Clifford Park Stables
HW	Low Density Residential, Highway
REG	Low-Medium Density Residential, Regional Residential
HS1	Low-Medium Density Residential, Hospital Support
U	Low-Medium Density Residential, Urban Residential
UC	Low-Medium Density Residential, Urban Consolidation
OR	Low-Medium Density Residential, Office Residential
Q	Specialised Centre, Qld Govt Research Facility
A	Specialised Centre, Toowoomba Airport
D	Specialised Centre, Defence Facilities
R	Specialised Centre, Specialist Retail Centre
RR1	Rural Residential, 4000m ²
RR2	Rural Residential, 1 ha
RR3	Rural Residential, 2 ha
H	Rural Residential, Highway
T	Township
R1	Rural, 100 ha
R2	Rural, 200 ha
H	Rural, Heinemann Road Transport
LA	Local Plan Areas

Overlays

Airport Environs Overlay Runway Approach and Departure Limitation Surface Runway Centreline Conical Limitation Surface Bird and Bat Strike Zone 3 km 8 km 13 Km CASA Dangerous Light Boundary (6km) Obstacle Height Restriction Zones (Oakey) Height Zone Area A - 0m Area B - 7.5m Area C - 15m Area D - 45m Area E - 90m Defence Owned Land Airport Public Safety Runway Public Safety Area ANEF Contour ANF>40 ANF>35 ANF>30 ANF>25 ANF>20	Bushfire Hazard Overlay High Fire Risk Medium Fire Risk Extractive Resources Overlay Haulage Route Extractive Resource Separation Area Regional Infrastructure Corridors and Substations Overlay Crows Nest Army Signals Base Buffer Petroleum / Natural Gas Pipeline Agricultural Land Overlay Good Quality Agricultural Land Heritage Overlay Heritage Place Neighbourhood Character Overlay Neighbourhood Character Place Landslide Hazard Overlay High Risk Flood Hazard Overlay High Flood Hazard Medium Flood Hazard Scenic Amenity Overlay Scenic Amenity Water Resources Overlay Water Resource Catchment Dam High Water Level
Ecological Significance Overlay Waterways and Wetlands Category 2 Wetland Category 3 Stream Waterways and Wetlands Buffer Biodiversity Corridors Areas of Ecological Significance Areas of Ecological Significance Buffer	Strategic Framework Settlement Pattern Cabralah Defence Facility District Centre Local Centre Major Centre Oakey Airbase Principal Centre Specialised Activity Centre Specialist Urban Retail Centre Toowoomba Airport Future Railway Railway Highway Major Road Other Road Bushland and Corridors Charlton Welcamp Enterprise Area Dam High Water Level Extractive Industry Nature Conservation and Open Spaces Rural Residential SEQRP Sport and Recreation Urban Extent Future Urban Area New Urban Area

Natural Environment Ecological Corridor Areas of Ecological Significance Dam High Water Level Plantation Waterways and Wetlands	Infrastructure and Services Electricity Generation Electricity Substations Waste Management Site Waste Water Treatment Plant Water Treatment Plant Bulk Water Lines Electricity Corridor Gas Pipeline Corridor Petroleum Pipeline Corridor Toowoomba Bypass Water Supply Catchment Water Supply Dams
Natural Resources Agricultural Land Key Resource Areas Stock Routes Water Supply Catchment	Economic Development Charlton Welcamp Enterprise Area District Centres Local Centres Major Centres Principal Centres University of Southern Queensland
Natural Resources - Mining Tenements Petroleum Pipeline (Operational) Mineral Development Licence (Granted) Mining Lease (Granted)	Access and Mobility Future Major Road Heavy Vehicle Route Other Cycle and Pedestrian Paths Principle Cycle Network

Priority Infrastructure Plan

Water Future Trunk Water Infrastructure Pump Station Reservoir Spillway Upgrade Water Treatment Plant Future Trunk Water Infrastructure (mains) Water Main Wastewater Future Trunk Wastewater Infrastructure Sewage Pump Station Water Reclamation Facility Future Trunk Wastewater Infrastructure (Mains) Gravity Sewer Pressure Main	Transport Future Intersection Upgrades Proposed Intersection Works Intersection Works Priority Roundabout Signals Future Transport Schedule Of Works Project Description Future Paths Future Road
Stormwater Future Trunk Stormwater Infrastructure Detention Basin (location not confirmed) Gross Pollutant Trap Stormwater Harvesting Tank Stormwater Pipe Future Stormwater Schedule Of Works Asset Type Detention Basin (Land Identified) Retention Basin Formed Channel Lake Revegetation Major Stabilisation Minor Stabilisation Wetland	Priority Infrastructure Area Priority Infrastructure Area

Road Hierarchy

Road Hierarchy Description	
	Collector
	Collector, Proposed
	Distributor
	Distributor, Investigation
	Distributor, Proposed
	Highway
	Highway Proposed
	Highway, Proposed Upgrade
	Highway, Proposed Upgrade from Distributor
	Local
	Proposed Upgrade from Distributor
	Regional Arterial
	Regional Arterial, Proposed
	Regional Arterial, Proposed Downgrade
	Sub-Arterial
	Sub-Arterial, Investigation
	Sub-Arterial

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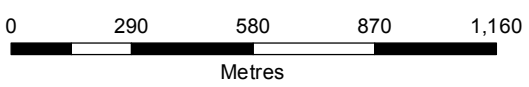
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Department of
Infrastructure, Local
Government and Planning

DA Mapping System – Print Screen




Date: 03/08/2016

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Legend

Cadastre (25k)


 Cadastre (25k)


Priority development areas


 Assessment Manager LGA


 Assessment Manager DILGP

Qld waterways for waterway barrier works


 1 - Low

 2 - Moderate


 3 - High

 4 - Major


Water resource planning area boundaries

 Water resource planning area boundaries


Great artesian water resource plan area

 Great artesian water resource plan area


Queensland heritage place

 Queensland heritage place


Future public passenger transport corridor

 Future public passenger transport corridor


Area within 25m of existing railway

 Area within 25m of existing railway


Area within 25m of State controlled roads

 Area within 25m of State controlled roads


Future State controlled transport tunnel

 Future State controlled transport tunnel


Area within 50m of a future State controlled transport tunnel

 Area within 50m of a future State controlled transport tunnel

State-controlled roads

 State-controlled roads


Future State-controlled roads

 Future State-controlled roads

Railway

 Railway


Ergon electricity substation 100m buffer (referral to Ergon - outside SARA)

 Ergon electricity substation 100m buffer (referral to Ergon - outside SARA)


Ergon electricity substation


 Ergon electricity substation


Limited access roads (SDAP information layer)


 Limited access roads (SDAP information layer)

Vegetation management regional ecosystem and remnant map

 Category A or B area containing endangered regional ecosystems

 Category A or B area containing of concern regional ecosystems

 Category A or B area that is a least concern regional ecosystem

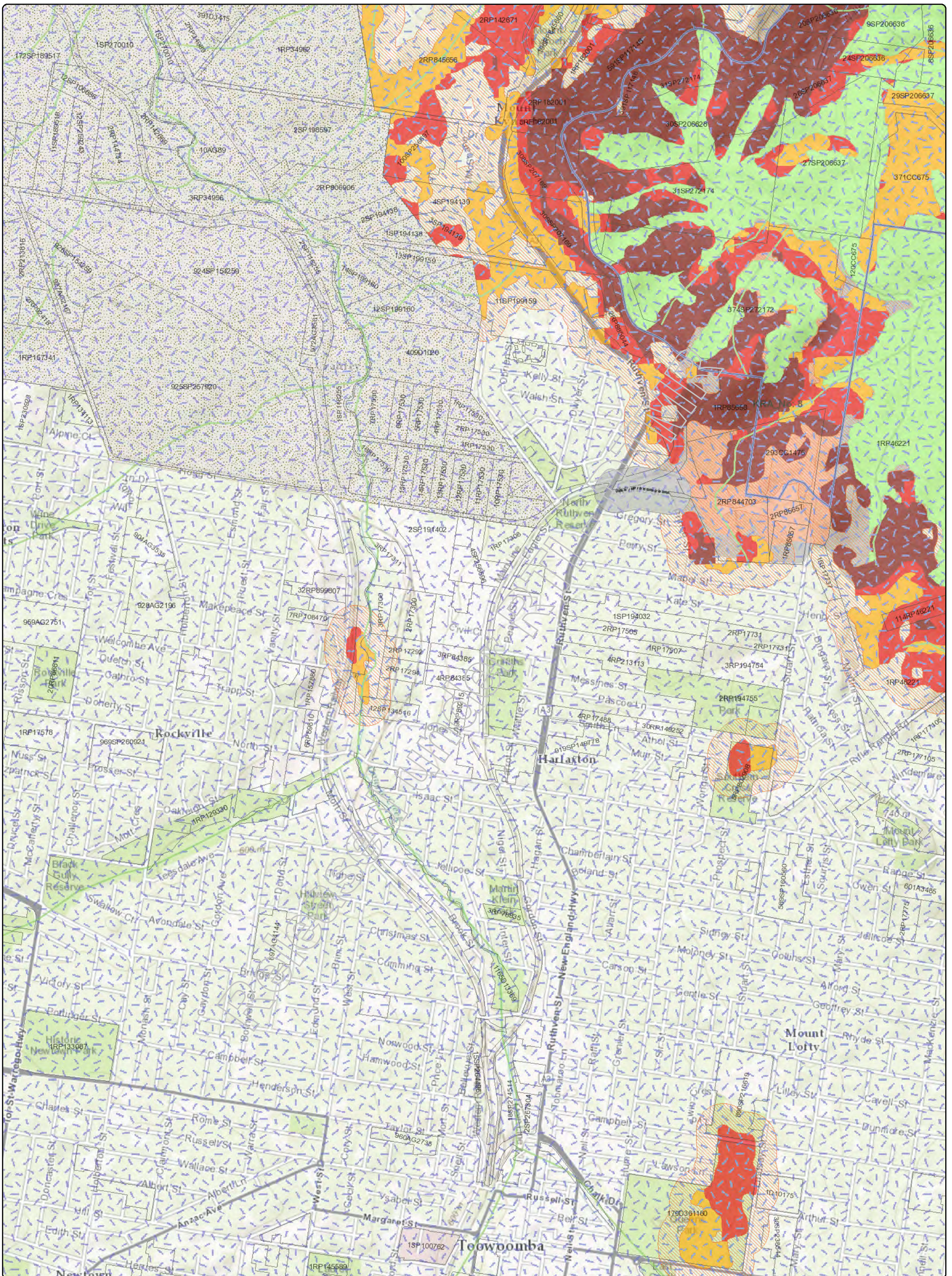
 Category A or B area that is remnant vegetation (no regional ecosystem mapping available)

Non remnant

 Water

Released under RTI - DTMR



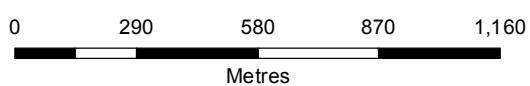


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Government and Planning

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State Planning Policy

Local government development assessment




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Date: 09/08/2016


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Legend


Cadastre (25k)

 Cadastre (25k)


KRA - Transport route

 KRA - Transport route


Climatic regions - stormwater management design objectives

 Climatic regions - stormwater management design objectives


MSES - Regulated vegetation (intersecting a watercourse)

 MSES - Regulated vegetation (intersecting a watercourse)

KRA - Transport route separation area

 KRA - Transport route separation area


Management area


 Management area


MSES - Regulated vegetation


 MSES - Regulated vegetation

Bushfire hazard area (Bushfire prone area)


 Very High Potential Bushfire Intensity

 High Potential Bushfire Intensity


 Medium Potential Bushfire Intensity

 Potential Impact Buffer

KRA - Resource / processing area

 KRA - Resource / processing area

KRA - Separation area

 KRA - Separation area

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APPENDIX E
ROAD SAFETY REVIEW REPORT

Released under RTI - DTMR

Road Safety Review

Griffiths Street, Toowoomba

CEB06818

Prepared for
Toowoomba Regional Council

26 April 2017



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Contact Information

Cardno (Qld) Pty Ltd
 ABN 57 051 074 992

Level 11 Green Square North Tower
 515 St Paul's Terrace
 Locked Bag 4006
 Fortitude Valley Qld 4006

Telephone: 07 3369 9822
 Facsimile: 07 3369 9722
 International: +61 7 3369 9822

transportqld@cardno.com.au
 www.cardno.com.au

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Version	Reason for Issue / Stage of Deliverable	Approver Initials	Approved Signature	Approved Release Date
A	Issued for Design Team Input			14/09/2016
B	Issued for Design Team Input			26/4/2017

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Appendices

Appendix A	Review Inventory & Checklist
Appendix B	Crash Data Analysis

1 Introduction

1.1 Context

Cardno (QLD) Pty Ltd has been commissioned by the Toowoomba Regional Council to undertake a road safety review of Griffiths Street, Toowoomba between the Griffiths Street/ New England Highway intersection and Griffiths Street/ Mort Street intersection. The road safety review forms part of the corridor planning study of Griffiths Street for which Cardno has also been engaged to provide multi-disciplinary engineering services.

This road safety review has been undertaken to inform Toowoomba City Council and the design team of the higher level road safety issues associated with future upgrade of the road corridor. The road safety review is of the existing road form (not the proposed or planned upgrade design).

1.2 Scope

Figure 1-1 indicates the geographical scope of the review. Griffiths Street is highlighted in blue.

Figure 1-1 Scope of Road Safety Review



Source – Near Map

The road safety review has been undertaken in line with Austroads' *Guide to Road Safety Part 6: Road Safety Audit*. The following sections identify the review findings and recommendations.

1.3 Statement by Road Safety Auditor

The road safety review was carried out by the Part Refuse Sch.4 Part 4 s.6 Personal information Accredited Senior Road Safety Auditor on Thursday August 11th 2016. The road safety review site investigations was undertaken during the day. In respect of independence and non-bias, it must be recognised that the Cardno Road Safety Auditor is not part of the team responsible for delivery of the corridor planning study.

Part Refuse Sch.4 Part 4 s.6 Personal information

Part Refuse Sch.4 Part 4 s.6 Personal information

Accredited Senior Road Safety Auditor, (Cardno)

2 Crash Data Analysis

2.1 Crash Data Analysis - between the Griffiths Street/ Doyle Street intersection and Griffiths Street/ Mort Street intersection

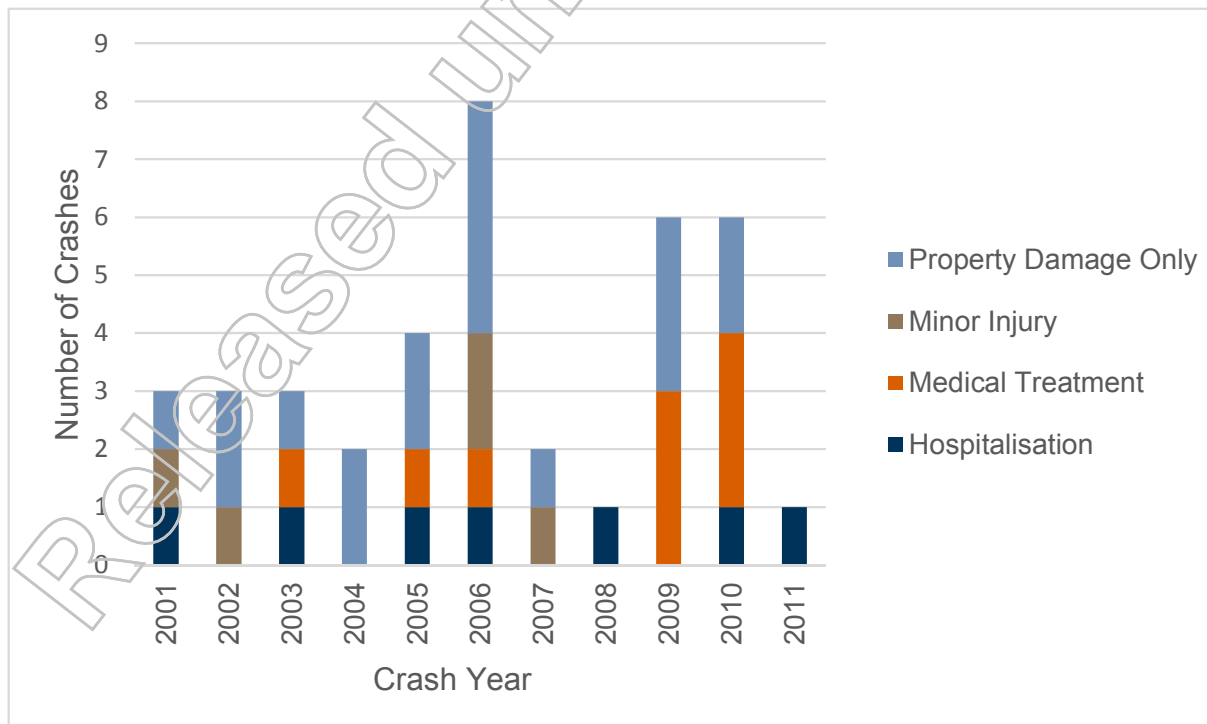
A review of crash data provided by TMR for Griffiths Street between the Griffiths Street/ Doyle Street intersection and Griffiths Street/ Mort Street intersection has been undertaken as part of the corridor planning study. The crash data can be found in Appendix B.

Table 2-1 Crash Summary by Severity Griffiths St, Toowoomba

Crash Year	Total	Fatal	Hospitalisation	Medical Treatment	Minor injury	Property Damage Only
2001	3	0	1	0	1	1
2002	3	0	0	0	1	2
2003	3	0	1	1	0	1
2004	2	0	0	0	0	2
2005	4	0	1	1	0	2
2006	8	0	1	1	2	4
2007	2	0	0	0	1	1
2008	1	0	1	0	0	0
2009	6	0	0	3	0	3
2010	6	0	1	3	0	2
2011	1	0	1	0	0	0
Total	39	0	7	9	5	18

*. Property Damage only crashes are no longer reported by the Queensland Government beyond 2010

Figure 2-1 Crash Summary by Severity Griffiths Street



The crash data as set out in Table 2-1 and Figure 2-1 revealed that:

- > There were no recorded fatalities from crashes over the data collection period
- > 18% of all crashes in the corridor over the data collection period resulted in a hospitalisation and 23% required medical treatment (41% combined), while 46% of crashes resulted in property damage only
- > This shows a somewhat similar proportion of crashes that resulted in some form of injury requiring medical treatment, and those that resulted in property damage only
- > The total number of crashes was insufficient to accurately analyse trends across individual years.

Figure 2-2 Crash Location by Severity



Table 2-2 Crash Summary by DCA Code – All Injury Severities – Griffiths Street

Crash Year	Total	Off Carriageway on Curve + Hit Object / Out of Control of Curve	Rear End	Intersection from Adjacent Approaches / Opposing Vehicles Turning	Head on	Off carriageway on Straight	Lane Changes	Other
2001	3	2	1	0	0	0	0	0
2002	4	1	1	1	0	0	0	0
2003	3	0	0	2	1	0	0	0
2004	2	0	1	1	0	0	0	0
2005	4	0	1	2	0	1	0	0
2006	8	2	3	3	0	0	0	0
2007	2	0	0	1	0	0	0	1
2008	1	0	0	1	0	0	0	0
2009	6	0	3	2	1	0	0	0
2010	7	0	0	3	0	2	1	0
2011	1	0	0	0	0	0	0	1
Total	39	5	10	16	2	3	1	2

The Definitions for Coding Accidents (DCA) category of all severity crashes reported between 2001 and 2011 (Table 2-2), the data revealed:

- > 21% involve leaving the carriageway or loss of control (13% on curves and 8% on straight sections), which could indicate that speed or perception of the road alignment may be a determining factor
- > 26% are rear end crashes
- > 41% are intersection crashes involving adjacent or opposing vehicles. The high percentage of intersection crashes indicates that drivers are not judging safe gaps in opposing traffic lanes which could be determined by driver error combined with road/intersection design inadequacies
- > 5% are head on crashes.

Table 2-3 Crash Summary by DCA Code – FSI Crashes Only – Griffiths Street

Crash Year	Total	Off Carriageway on Curve + Hit Object / Out of Control of Curve	Rear End	Intersection from Adjacent Approaches / Opposing Vehicles Turning	Head on	Off carriageway on Straight	Lane Changes	Other
2001	1	1	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0
2003	1	0	0	1	0	0	0	0
2004	0	0	0	0	0	0	0	0
2005	1	0	0	0	0	1	0	0
2006	1	0	0	1	0	0	0	0
2007	0	0	0	0	0	0	0	0
2008	1	0	0	1	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	1	0	0	0	0	1	0	0
2011	1	0	0	0	0	0	0	1
Total	7	1	0	3	0	2	0	1

The Fatal/Serious Injury (FSI) crashes (data reported between 2001 and 2011) by DCA code (Table 2-3) revealed:

- > There were no crashes resulting in fatalities between 2001 and 2011
- > The data is insufficient for rigorous statistical analysis, however it is noted that:
 - 3 of 7 crashes were a result of intersection crashes involving adjacent or opposing vehicles
 - 3 of 7 crashes were a result of vehicles leaving the carriageway on curves or on straight sections

Figure 2-3 Crash Location by DCA Code Grouping



Figure 2-4 Crash Summary by Day of Week and Severity – Griffiths Street

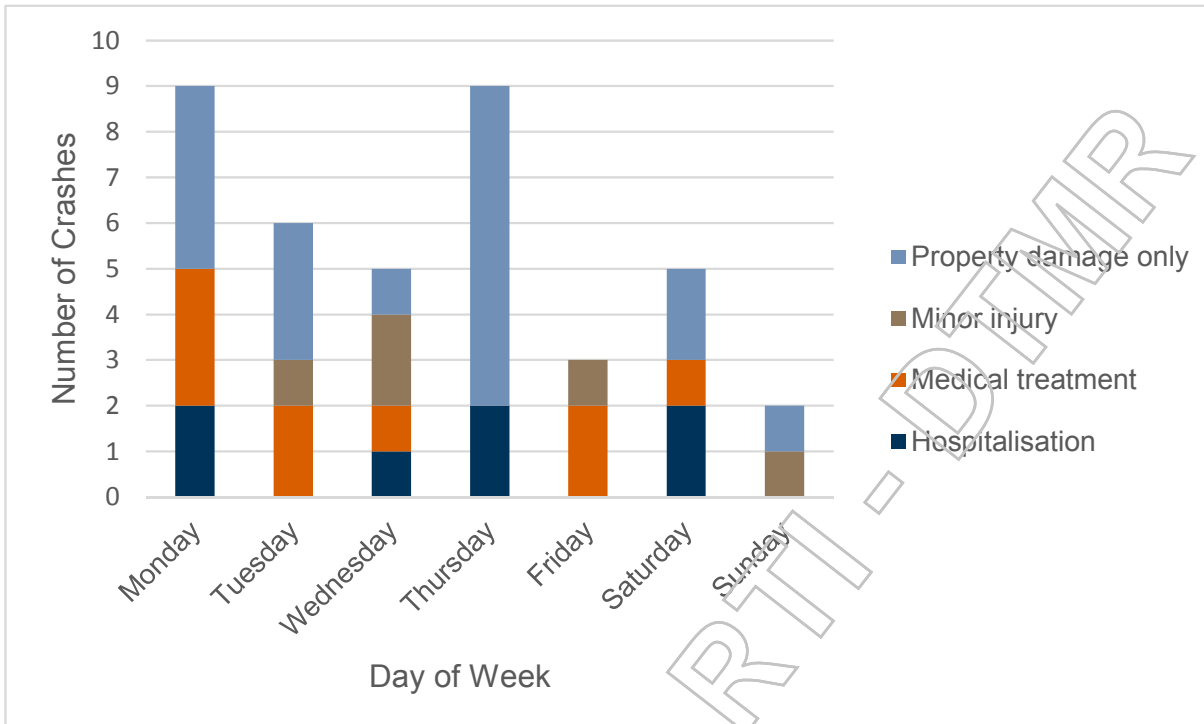
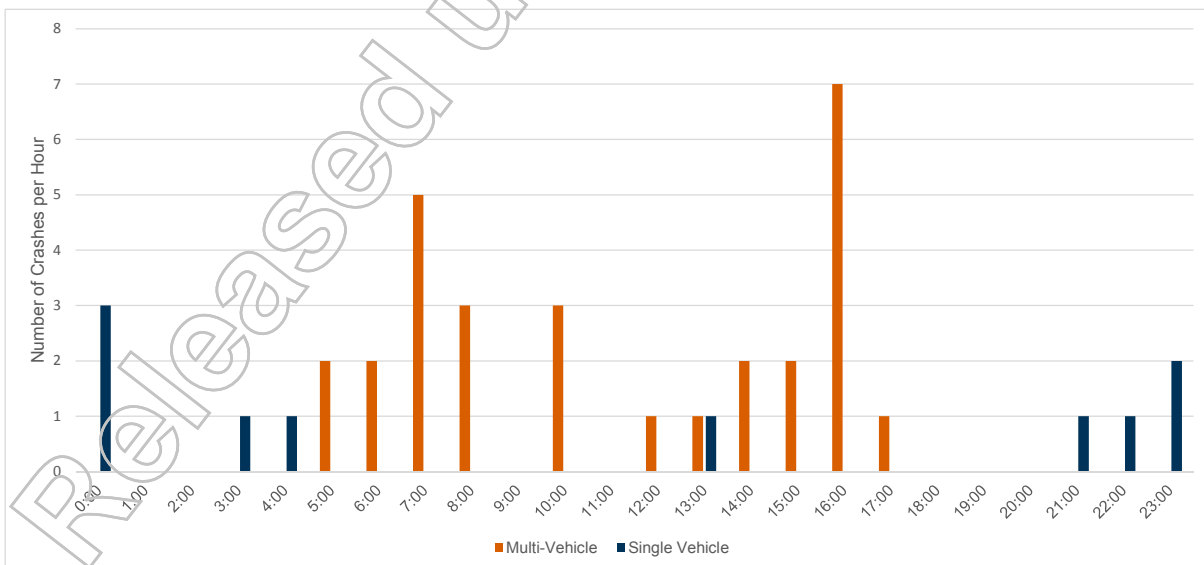


Figure 2-4 shows crash data by day of the week and severity. The data suggests that:

- > Generally, the incidence of crashes is higher on weekdays than on weekends. This may be a result of decreased volumes of traffic along Griffiths St during peak hours on weekends, and the different patterns of behaviour of road users over the weekend days compared to during the week (as discussed below)
- > There was a significant increase in crashes resulting in property damage on Thursdays compared to other days of the week. This may not be statistically significant.

Figure 2-5 Crash Summary by Hour of Day and Vehicles Involved – Griffiths Street



On the time of day and number of involved vehicles attributes of crashes reported between 2001 and 2011 (Figure 2-5):

- > The trend as shown in Figure 2-5 suggests that multiple vehicle crashes tend to occur during the day time, with significant increases around commuter peaks (7:00am to 9:00am and 3:00pm to 6:00pm). Multi-Vehicle crashes accounted for 96% of all daytime crashes.
- > The data suggests that single vehicle crashes are more likely to occur during the night and in the early morning. Single vehicle crashes accounted for 82% of all early morning and night time crashes.
- > These single vehicle crashes may be a result of fatigue or driving under the influence, commonly associated with night and early morning
- > Multi-Vehicle crashes may be more likely to occur during the day (and especially at peak times) as the volume of traffic on the roads at these times is generally higher.

Table 2-4 Griffith Street Crash Summary by Surface Condition

Crash Period	Dry Surface Crashes		Wet Surface Crashes		Total Crashes
2001 – 2011	26	67%	13	33%	39
2005 – 2011	21	75%	7	25%	28
2009 – 2011	9	69%	4	31%	13

Table 2-5 Griffith Street Crash Summary by Lighting Condition

Crash Period	Daytime Lighting Crashes		Nighttime and Dusk/Dawn Crashes		Total Crashes
2001 – 2011	26	67%	13	33%	39
2005 – 2011	21	75%	7	25%	28
2009 – 2011	11	85%	2	15%	13

Analysis of Table 2-4 and Table 2-5 suggests that the majority of crashes occurred during 'good' road surface, atmospheric and daylight periods (dry roads, no rain, and in daylight hours). Conversely, up to 33% of crashes occurred on wet surfaces and up to 33% of crashes occurred at night time or dusk/dawn (where low lighting may have been a contributing factor).

Analysis of the absolute numbers of crashes points to trends in when crashes are more likely to occur and under what conditions. Figures 2-6 and 2-7 below illustrate how different road, atmospheric and daylight conditions influences *where* crashes occur along the Griffiths Street corridor. Crashes tend to occur at similar locations regardless of changes in conditions, with the exception of a significant increase in the number of crashes at the Griffiths Street and Goombungee Road intersection during 'poor' conditions (wet road surface, rain or foggy atmospheric conditions and low light periods such as early morning or night time). There is a possibility that some element of road/intersection design may be inadequate and contributing to the increase in crashes at the Griffiths Street and Goombungee Road intersection during poor weather conditions.

The following figures compare crashes by occurrence during 'Normal Conditions' (Dry road surface, daylight, clear atmospheric conditions) with crashes that occurred during 'Poor Conditions' (Wet road surface, dawn/dusk or darkness, raining or foggy conditions).

Figure 2-6 Location of crashes under 'normal' operational conditions

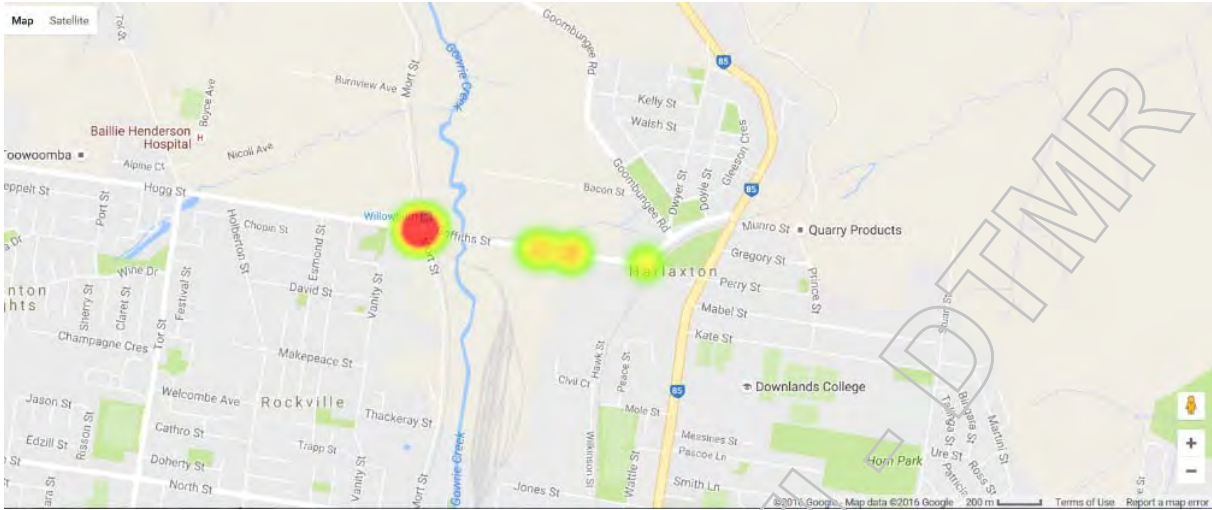
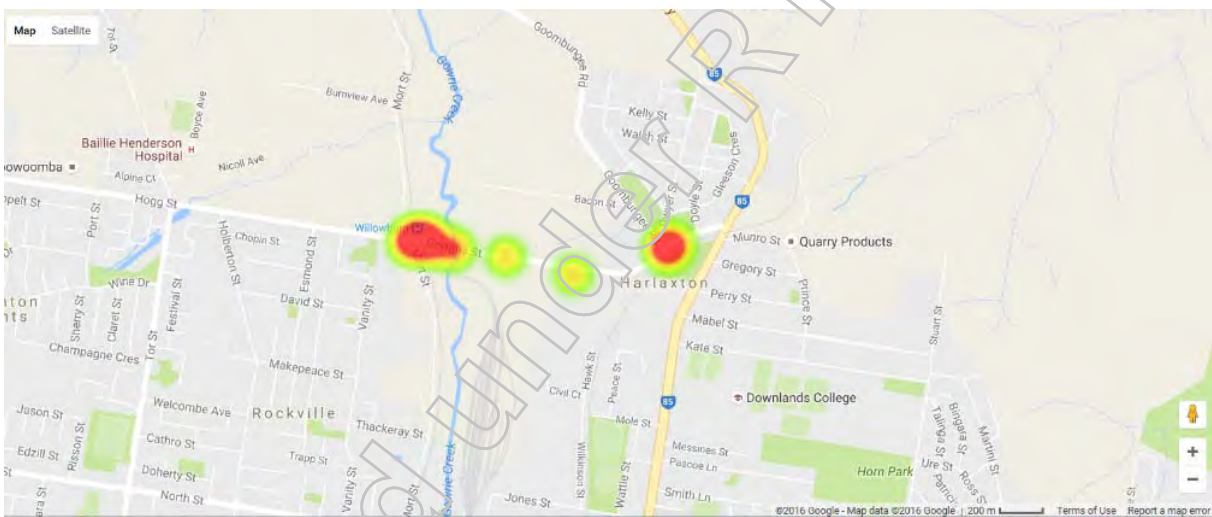


Figure 2-7 Location of crashes under 'poor' operational conditions



2.2 Crash Data Analysis – New England Highway/Griffiths Street

A review of crash data provided by TMR for the Griffiths Street/ New England Highway intersection has been undertaken as part of the corridor planning study. The crash data can be found in Appendix B.

Table 2-6 Crash Summary by Severity - Griffiths Street/ New England Highway intersection

Crash Year	Total	Fatal	Hospitalisation	Medical Treatment	Minor Injury	Property Damage Only
2001	1	0	0	0	0	1
2002	2	0	0	1	0	1
2003	0	0	0	0	0	0
2004	2	0	0	1	1	0
2005	4	0	0	1	1	2
2006	0	0	0	0	0	0
2007	2	0	0	0	0	2
2008	1	0	0	0	0	1
2009	3	0	1	0	0	2
2010	1	0	0	0	0	1
2011	1	0	0	1	0	0
Total	17	0	1	4	2	10

*. Property Damage only crashes are no longer reported by the Queensland Government beyond 2010

The crash data as set out in Table 2-6 that:

- > There were no recorded fatalities from crashes over the data collection period
- > 6% of all crashes at the intersection over the data collection period resulted in a hospitalisation and 24% required medical treatment (30% combined), while 59% of crashes resulted in property damage only
- > The total number of crashes was insufficient to accurately analyse trends across individual years.

Table 2-7 Crash Summary by DCA Code – All Injury Severities – Griffiths Street/ New England Highway intersection

Crash Year	Total	Pedestrian	Intersection from Adjacent Approaches / Opposing Vehicles Turning	Rear End	Left Turn Side Swipe	Off Carriageway on Straight hit Object
2001	1	0	0	1	0	0
2002	2	0	2	0	0	0
2003	0	0	0	0	0	0
2004	2	0	0	2	0	0
2005	4	0	3	1	0	0
2006	0	0	0	0	0	0
2007	2	0	1	1	0	0
2008	1	0	0	0	1	0
2009	3	1	0	1	0	1
2010	1	0	0	1	0	0
2011	1	0	1	0	0	0
Total	17	1	7	7	1	1

The Definitions for Coding Accidents (DCA) category of all severity crashes reported between 2001 and 2011 (Table 2-7), the data revealed:

- > 41% are intersection crashes involving adjacent or opposing vehicles. The high percentage of intersection crashes indicates that drivers are not judging safe gaps in opposing traffic lanes which could be determined by driver error combined with road/intersection design inadequacies or the signal phasing (filtered right turn)
- > 41% are rear end crashes. The high percentage of rear end crashes indicate drivers are not judging the distance to the vehicle in front which could be determined by driver error combined with road/intersection design inadequacies
- > 6% involved a pedestrian
- > 6% are left carriageway and hit object
- > 6% are side swipe.

3 Road Safety Review Findings

3.1 Road Safety Review

The Road Safety Review findings have been documented by identified issue. In order to address these existing issues, recommendations for potential remedial treatments have been identified for each issue.

The following sections identify the review findings and recommendations. The risk associated with these issues has been classified as:

- > High – any safety issue that is considered to be of sufficient hazard to warrant immediate attention for redesign, reconstruction, removal, protection or warning
- > Medium – any safety issue which is considered to have potential to increase crash risk or increase the severity of a crash
- > Low – any issue which is not identified as being of high or medium priority, but which still requires consideration. This does not imply that the issue is not important.

3.2 Review referencing

Locations of the issues identified are approximate locations/ intersections along Griffiths Street, with the road safety review starting at the Griffiths Street/ New England Highway intersection and finishing at the Griffiths Street/Mort Street intersection. It should be noted that road safety issues have been identified road safety for Griffiths Street only and any issues for the New England Highway and Mort Street have been excluded from the study.

An inventory and the Austroads Part 6 Existing Roads Checklist completed as part of the road safety review site visit are included at Appendix A, showing numbering to reference the issues reported below.

3.3 Location Specific Issues

The findings of the road safety review and subsequent recommendations are presented below.

3.3.1 Issue 1

Location	Griffiths Street (full length)
Deficiency	Trees and street furniture (power poles and street lighting columns) located in clear zone along the full length of Griffiths Street
Risk	Potential hazard for errant vehicles
Recommendation	Remove tree and relocate street furniture or protect with the installation of safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture
Priority	High



3.3.2 Issue 2

Location	Griffiths Street (full length to both sides)
Deficiency	No shoulders or minimum width of sealed /unsealed shoulders
Risk	Insufficient shoulder width to allow drivers to regain control of errant vehicle
Recommendation	Provide sealed shoulders to both sides of Griffiths Street in accordance with RPDM and Toowoomba Regional Council's Design Guide
Priority	Medium



3.3.3 Issue 3

Location	Griffiths Street (full length of corridor)
Deficiency	Damaged RRPMS, faded line markings and signage in poor condition
Risk	Risk to all road users
Recommendation	Review adequacies and re-install road markings and signage in accordance with MUTCD.
Priority	Medium



3.3.4 Issue 4

Location	Griffiths Street (several locations along full length of corridor)
Deficiency	Pavement is worn and cracking
Risk	Potential for vehicles to lose control on damaged surface
Recommendation	Repair pavement
Priority	Medium



3.3.5 Issue 5

Location	Griffiths Street (several locations along full length of corridor)
Deficiency	Damaged Guide Posts
Risk	The damaged guide posts reduces the readability of the road to drivers, especially at bends during hours of darkness
Recommendation	Install guide posts in accordance with MUTCD
Priority	High



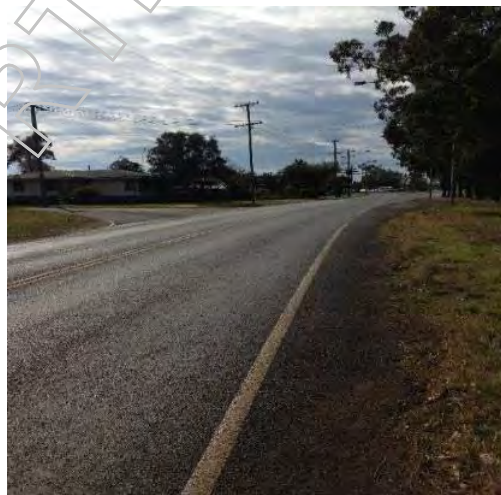
3.3.6 Issue 6

Location	Griffiths Street (along full length of corridor)
Deficiency	No pedestrian or cycle facilities
Risk	Potential risk to vulnerable road users
Recommendation	Provide pedestrian and cycle facilities. Due to the high volume of trucks consider segregated shared facilities
Priority	High



3.3.7 Issue 7

Location	Griffiths Street (From Goombungee Road to Mort Street)
Deficiency	No Street Lighting
Risk	Risk to all road users
Recommendation	Provide street lighting in accordance with RPDM Volume 6 Lighting
Priority	High



3.3.8 Issue 8

Location	Griffiths Street/ New England Highway intersection
Deficiency	Right turn filter at from New England Highway / Griffiths Street signalised intersection
Risk	The crash data indicates that a number of incidents occur between right turning traffic with the through movement. It is considered that the filtered right movement creates conflict issues
Recommendation	Review signal phasing to remove potential conflict between right turning vehicles and through traffic
Priority	High



3.3.9 Issue 9

Location	Griffiths Street/ New England Highway intersection
Deficiency	Pedestrian crossing distance on Griffiths Street
Risk	Pedestrians crossing Griffiths Street are required to cross a long distance (approximately 36m).
Recommendation	It is recommended that the Design Team consider the introduction of a staged pedestrian crossing
Priority	Medium



3.3.10 Issue 10

Location	Griffiths Street/ New England Highway intersection
Deficiency	The intersection has a low angle alignment, which creates potential issues for left turning vehicles, especially larger vehicles.
Risk	The crash data indicates that a number of incidents of rear end crashes which could be attributed to the intersection geometry.
Recommendation	It is recommended that the Design Team consider the geometry of the intersection and realign the intersection to improve vehicle manoeuvrability.
Priority	High



3.3.11 Issue 11

Location	Griffiths Street/ New England Highway intersection
Deficiency	The right turn facility into the commercial driveway is very short (approx. 18m)
Risk	A queue of more than two vehicles or a service vehicle propped to turn right into the commercial car park affects the operation and safety of the Griffiths Street/ New England Highway intersection.
Recommendation	It is recommended that the right turn facility into the commercial driveway is prohibited and access is limited to a Left In/Left Out arrangement
Priority	High



3.3.12 Issue 12

Location	Griffiths Street
Deficiency	A number of private driveways are located between the New England Highway intersection and Doyle Street intersection, that creates potential rear end incidents
Risk	Whilst the current road marking is a solid white line to deter drivers from undertaking the right turn manoeuvre, the current arrangement could lead to potential rear end incidents.
Recommendation	It is recommended that physical measures are introduced to ensure a Left In/Left Out arrangement for the private driveways
Priority	Medium



3.3.13 Issue 13

Location	Griffiths Street/ Doyle Street intersection
Deficiency	No Give Way road markings
Risk	The lack of road markings makes it difficult for drivers to identify the side road especially during hours of darkness.
Recommendation	Install Give Way road markings and associated signage in accordance with MUTCD Provide right turn facilities at the Griffiths Street/ Doyle Street intersection or change intersection form to Left In/Left Out arrangement
Priority	High



3.3.14 Issue 14

Location	Griffiths Street/ Goombungee Road intersection
Deficiency	It appears that the intersection sight distance at the intersection is substandard for the posted 70km/h speed limit
Risk	Potential risk for drivers exiting the side road
Recommendation	Ensure safe intersection sight distance (SISD) is provided in accordance with Austroads Guide to Road Design Part 4A Unsignalised and Signalised Intersections.
Priority	High



3.3.15 Issue 15

Location	Griffiths Street (westbound) approximately 50m west of Goombungee Road
Deficiency	The posted speed limit changes from 60km/h to 70km/h prior to the sweeping bend.
Risk	Potential risk to drivers increasing their speed on sweeping bend and change in gradient.
Recommendation	Undertake a Speed Limit Review to establish appropriate speed limit for whole length of Griffiths Street.
Priority	High



3.3.16 Issue 16

Location	Griffiths Street (westbound) approximately 45m west of Goombungee Road
Deficiency	Culvert is in clear zone and unprotected
Risk	Potential for errant vehicles to impact at high speed
Recommendation	Locate culvert out of the clear zone or install safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture.
Priority	High



3.3.17 Issue 17

Location	Griffiths Street (sweeping bend)
Deficiency	Large trees located within clear zone on the outside of the sweeping bend
Risk	Potential for hazard for errant vehicles.
Recommendation	Remove tree and relocate street furniture or protect with the installation of safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture
Priority	High



3.3.18 Issue 18

Location	Griffiths Street (sweeping bend)
Deficiency	No advanced warning of bend in both directions
Risk	Potential for loss of control crashes due to inappropriate speeds at bend.
Recommendation	Install 'Bend Ahead' and advisory speed signage in accordance with MUTCD in both directions
Priority	High



3.3.19 Issue 19

Location	Griffiths Street westbound (sweeping bend)
Deficiency	Existing Chevron Alignment Markers (CAMs) are erected at a low level and the third CAM is located beyond the crest and not visible to westbound drivers
Risk	Potential for loss of control crashes due to inappropriate speeds at bend.
Recommendation	Erect CAMs at appropriate height in accordance with MUTCD in both directions. Install Guide Posts to delineate bend.
Priority	Medium



3.3.20 Issue 20

Location	Griffiths Street eastbound (sweeping bend)
Deficiency	No delineation of sweeping bend. The alignment of the existing power poles suggest that the road alignment is straight and increases the potential risks to drivers not familiar with the road geometry.
Risk	Potential for loss of control crashes due to inappropriate speeds at bend.
Recommendation	Install CAMs at appropriate height in accordance with MUTCD in both directions. Install Guide Posts and advance 'Bend Ahead' signage to delineate bend.
Priority	High



3.3.21 Issue 21

Location	Griffiths Street (Gravel rest area)
Deficiency	A gravel rest area is located on the outside of the sweeping bend which is utilised by HGVs. The rest area is accessed by two informal entrances. The sight distance to the left appears to be substandard due to the steep gradient of Griffiths Street. To maximise the sight distance it was observed that drivers exit the rest area over the grass verge away from the crest.
Risk	Potential for crashes due to the lack of sight distance.
Recommendation	Remove rest area or provide access driveways with safe intersection sight distance (SISD) in accordance with Austroads Guide to Road Design Part 4A Unsignalised and Signalised Intersections.
Priority	Medium



3.3.22 Issue 22

Location	Griffiths Street westbound (sweeping bend)
Deficiency	The westbound lane around the sweeping bend is constructed as a centre line camber, which provides an adverse camber for vehicles travelling in the westbound direction.
Risk	Potential for vehicles to lose control on bend
Recommendation	Install 'Bend Ahead' and advisory speed signage in accordance with MUTCD. For future Griffiths Street long term upgrades, provide super-elevated camber on bend.
Priority	Medium



3.3.23 Issue 23

Location	Griffiths Street westbound
Deficiency	The AUL serving industrial units appears to be too short for the 70km/h speed limit and road gradient
Risk	Potential for loss of control of vehicles undertaking left turn manoeuvres
Recommendation	Provide full length AUL in accordance with Austroads Guide to Road Design Part 4A Unsignalised and Signalised Intersections.
Priority	Medium



3.3.24 Issue 24

Location	Griffiths Street westbound
Deficiency	HGV utilise the through lane to negotiate the left turn manoeuvre into the industrial units on Griffiths Street
Risk	Potential rear end collisions
Recommendation	Construct driveways with appropriate corner radii.
Priority	Medium



3.3.25 Issue 25

Location	Griffiths Street westbound
Deficiency	'Left Turn' arrow road markings are provided as part of the AUL facility. The first driveway is exit only and is confusing to drivers.
Risk	Potential head on collisions
Recommendation	Remove 'Left Turn' arrow road markings prior to first driveway and install 'No Entry' road markings at driveway in accordance with the MUTCD.
Priority	High



3.3.26 Issue 26

Location	Griffiths Street westbound
Deficiency	Power poles are located in clear zone and in close proximity to driveways
Risk	Potential hazard for errant vehicles
Recommendation	Relocate power poles or protect with the installation of safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture
Priority	High



3.3.27 Issue 27

Location	Griffiths Street / Driveway
Deficiency	The sight distance to the right out of the industrial driveway appears to be substandard due to the crest.
Risk	Potential for crashes due to the lack of sight distance.
Recommendation	Provide safe intersection sight distance (SISD) in accordance with Austroads Guide to Road Design Part 4A Unsignalised and Signalised Intersections.
Priority	Medium



3.3.28 Issue 28

Location	Griffiths Street eastbound
Deficiency	No right turn facilities provided into industrial driveways. It was noted that some vehicles travel on the unsealed and sealed shoulders to pass a right turning vehicle
Risk	Potential for rear end collisions and loss of control crashes for vehicles travelling off the sealed lane
Recommendation	Provide full length CHR in accordance with Austroads Guide to Road Design Part 4A Unsignalised and Signalised intersections
Priority	High




3.3.29 Issue 29

Location	Griffiths Street eastbound
Deficiency	The existing grade of Griffiths Street results in slow truck speeds especially as heavy trucks (B-Doubles) enter the traffic stream on the up-grade from the industrial driveways located on Griffiths Street.
Risk	Potential for rear end collisions and head on collisions if drivers attempt to overtake a slow moving truck. Potential for through traffic to collide with slow turning (right) vehicle.
Recommendation	Provide climbing lane or additional traffic lane for through traffic on Griffiths Street. Prohibit right turn manoeuvres out of industrial driveways and install left in/left out arrangement at all driveways.




	See Section 4 for further discussion and potential design team mitigation considerations.	
Priority	High	

3.3.30 Issue 30

Location	Griffiths Street eastbound	
Deficiency	Private driveways located close to traffic lane and drivers have limited sight distance in both directions	
Risk	Drivers exiting the driveway may enter the traffic lane to improve visibility resulting in potential collision with through traffic	
Recommendation	Consider private driveways and provide appropriate provision	
Priority	Medium	

3.3.31 Issue 31

Location	Griffiths Street westbound approximately 80m west of Toowoomba Concrete Recycles driveway	
Deficiency	Culvert is in clear zone and unprotected	
Risk	Potential for errant vehicles to impact at high speed	
Recommendation	Provide sloped headwalls or install safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture.	
Priority	High	

3.3.32 Issue 32

Location	Griffiths Street westbound approximately 50m east of the Gowrie Creek bridge
Deficiency	Culvert is in clear zone and unprotected
Risk	Potential for errant vehicles to impact at high speed
Recommendation	Provide sloped headwalls or install safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture.
Priority	High



3.3.33 Issue 33

Location	Griffiths Street (Gowrie Creek bridge)
Deficiency	The road width at Gowrie Creek bridge is approximately 7.6m wide with minimal shoulders and no pedestrian/cycle facilities
Risk	Potential risk to vulnerable road users
Recommendation	Provide 'Pedestrian Ahead' and 'Bicycle Ahead' warning signs on both approaches to bridge. For future Griffiths Street long term upgrades, provide segregated pedestrian and cycle facilities.
Priority	High



3.3.34 Issue 34

Location	Griffiths Street (Gowrie Creek bridge)
Deficiency	The crash barrier end treatment chevron sticker is damaged
Risk	Potential for drivers to not recognise the location of the crash barrier system especially in the hours of darkness
Recommendation	Re-install chevron striped signage and install reflectors to crash barriers
Priority	Low



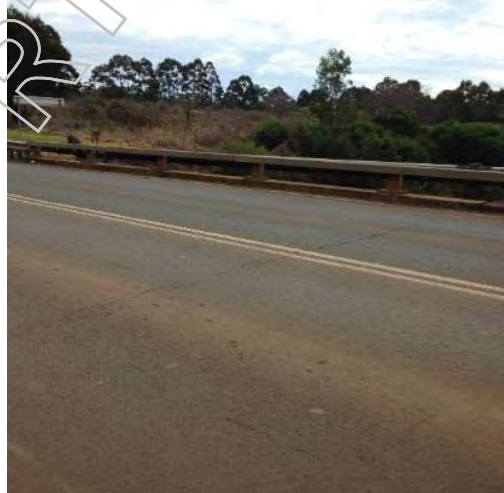
3.3.35 Issue 35

Location	Griffiths Street (Gowrie Creek bridge)
Deficiency	The existing crash barrier system on the approaches to the bridge is a 'W' semi-rigid steel beam.
Risk	Due to the volume of HGVs on Griffiths Road, the type of crash barrier system is deemed inappropriate.
Recommendation	Replace 'W' beam crash barrier with a THRIE semi-rigid steel beam crash barrier system
Priority	High



3.3.36 Issue 36

Location	Griffiths Street (Gowrie Creek bridge)
Deficiency	Bridge guard rail on bridge (both sides) is approximately 0.6m high and is not to current standards
Risk	Potential for errant vehicles, pedestrians and cyclists to fall over the edge
Recommendation	Install guard railing in accordance with the RPDM Safety Barriers and Roadside Furniture
Priority	High



3.3.37 Issue 37

Location	Griffiths Street westbound
Deficiency	Power Pole located in clear zone on bend
Risk	Potential hazard for errant vehicles
Recommendation	Relocate power pole or protect with the installation of safety barriers in accordance with the RPDM Safety Barriers and Roadside Furniture
Priority	High



3.3.38 Issue 38

Location	Griffiths Street eastbound
Deficiency	Manhole is located within the traffic lane
Risk	Potential risk to workers during maintenance periods.
Recommendation	Consider public utilities and relocate to safe accessible location
Priority	Medium



3.3.39 Issue 39

Location	Griffiths Street eastbound
Deficiency	'70' Speed limit sign located on bend approaching Gowrie Creek bridge
Risk	The location of the speed limit sign may be interpreted as an appropriate speed to negotiate the bend and result in loss of control crashes
Recommendation	Relocate the speed limit sign after the bridge and refer to Issue 10 (Undertake Speed Limit Review to establish appropriate speed limit for whole length of Griffiths Street)
Priority	High



3.3.40 Issue 40

Location	Griffiths Street eastbound
Deficiency	No advanced warning of 'S' bend in both directions
Risk	Potential for loss of control crashes due to inappropriate speeds at bend.
Recommendation	Install 'S Bend Ahead' and advisory speed signage in accordance with MUTCD in both directions
Priority	High



3.3.41 Issue 41


Location	Griffiths Street / Rail line crossing
Deficiency	At-grade rail line crossing close to Griffiths Street/ Mort Street intersection leads to significant queues on all legs when the boom gates are operated for a train
Risk	Potential rear end type crashes
Recommendation	Consider proximity of the at-grade rail line crossing to the Griffiths Street/ Mort Street intersection to reduce impact on queues when the boom gates are triggered
Priority	Medium



3.3.42 Issue 42

Location	Griffiths Street/ Mort Street/ Hogg Street intersection
Deficiency	<p>Several deficiencies have been identified:</p> <ul style="list-style-type: none"> • General geometry of Griffiths Street and Hogg Street is off-set which leads to awkward manoeuvres whilst looking for a safe gap in two streams of traffic • Griffiths Street leg meets Mort Street at a steep upgrade leading to slow starts for drivers at the give way line and potential for vehicles to roll back • Griffiths Street leg - It appears the sight distance to the right and left are substandard due to the bends • Hogg Street - It appears the sight distance to the right is substandard due to the bend • Hogg Street – vehicles turning left from Mort Street into Hogg street obscure vehicles travelling north on Mort Street • No right turn facilities. It was observed that drivers travelling north utilise the short AUL to Hogg Street to pass the stationary vehicle and right turn vehicles cut the corner and travel in the opposite lane • Mort Street (northbound) – No intersection warning signs. Intersection is obscured by bend which raises potential rear end crashes especially due to the high number of right turn manoeuvres into Griffiths Street • Mort Street (northbound) – intersection approach sight distance is obscured by bend which raises potential rear end crashes especially due to the high



	<p>number of right turn manoeuvres into Griffiths Street</p> <ul style="list-style-type: none">• Power poles are located in clear zone and in close proximity to traffic lanes• Culvert is in clear zone and unprotected• No pedestrian or cyclist facilities	
Risk	Potential risk for all road users	
Recommendation	Consider changing the form of intersection and redesigning the intersection geometric design in the horizontal and vertical planes.	
Priority	High	

4 Industrial Driveways on Griffiths Street

Issue 24 of the Road Safety Review, identified that the existing grade of Griffiths Street results in slow truck speeds in the eastbound direction, especially as heavy trucks (B-Doubles) enter the traffic stream on the up-grade from the industrial driveways located on Griffiths Street. This deficiency raises the potential for rear end collisions and head on collisions if drivers attempt to overtake a slow moving truck and the possibility of through traffic colliding with a truck undertaking the right turn manoeuvre.

Table 4-1 details the design considerations required to address the deficiency.

Table 4-1 Design Considerations for Industrial Driveways

Potential Treatment	Road Safety Risk	Possible Design Solution/ Constraints
Right turn manoeuvres permitted from industrial driveways	Risk maintained Right turn manoeuvres are still permitted and required design solution to mitigate identified risks.	Seagull treatment to allow a right side merge into through lane or dedicated climbing lane. Potential risk still remains as truck is trying to merge into faster moving vehicles. Proximity of driveways may restrict seagull treatment for all access locations.
Prohibit right turn manoeuvres out of industrial driveways and install left in/left out arrangement at all driveways.	Risk removed	It is assumed that the majority of B-Doubles are travelling to the Warrego Highway and will access the new Range Crossing by turning right at the Griffiths Street/ Mort Street intersection and will not be required to turn right out. For vehicles wanting to travel toward the New England Highway, it is recommended that a 'U' Turn facility is constructed or traffic is directed to utilize the multi-combination routes via West Street, James Street and Hulme Street. Potential 'U' Turn facility such as a Jug Handle design could be located off Griffiths Street beyond the industrial lots or Mort Street (within proposed Mort Street road widening)

5 Conclusion

Cardno (QLD) Pty Ltd has been commissioned by the Toowoomba Regional Council to undertake a road safety review of Griffiths Street, Toowoomba between the Griffiths Street/ New England Highway intersection and Griffiths Street/ Mort Street intersection. The road safety review forms part of the corridor planning study of Griffiths Street for which Cardno has also been engaged to provide multi-disciplinary engineering services.

This road safety review has been undertaken to inform Toowoomba City Council and the design team of the higher level road safety issues associated with future upgrade of the road corridor. The road safety review is of the existing road form (not the proposed or planned upgrade design).

Griffiths Street, Toowoomba

APPENDIX A
REVIEW INVENTORY & CHECKLIST

Released under RTI - DTMR

Date: Fri, 13 May 2016

Notes:



Griffiths Street RSR - Appendix A (EB06818)

Date: Fri, 13 May 2016

Notes:

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Date: Fri, 13 May 2016 Notes:



Date: Fri, 13 May 2016 Notes:



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Date: Fri, 13 May 2016

Notes:



CHECKLIST 6: EXISTING ROADS: ROAD SAFETY AUDIT

Issue	Yes	No	Comment
6.1 Road alignment and cross-section			
6.1.1 Visibility; sight distance			
Is sight distance adequate for the speed of traffic using the route?		No	Griffiths St – Crest obscures advanced sight distance
Is adequate sight distance provided for intersections and crossings? (for example, pedestrian, cyclist, cattle, railway)		No	Griffiths Street/Mort St/Hogg St – Griffiths St - substandard to left and right (bends) Hogg St - substandard to right (bend) and left turn vehicles
Is adequate sight distance provided at all private driveways and property entrances?			Rest area - substandard to left due to crest
6.1.2 Design speed			
Is the horizontal and vertical alignment suitable for the (85th percentile) traffic speed?		No	70 km/h posted speed limit does not seem appropriate – undertake Speed Limit Review
If not: <ul style="list-style-type: none"> • are warning signs installed? • are advisory speed signs installed? 		No No	No warning signs provided No advisory speed signs just speed limit signs
Are the posted advisory speeds for curves appropriate?		No	No advisory speed signs for bends
6.1.3 Speed limit/speed zoning			
Is the speed limit compatible with the function, road geometry, land use and sight distance?		No	70 km/h posted speed limit does not seem appropriate – undertake Speed Limit Review
6.1.4 Overtaking			
Are safe overtaking opportunities provided?		No	None provided
6.1.5 Readability by drivers			

<p>Is the road free of elements that may cause confusion? For example:</p> <ul style="list-style-type: none"> - is alignment of the roadway clearly defined? - has disused pavement (if any) been removed or treated? - have old pavement markings been removed properly? - do tree lines follow the road alignment? - does the line of street lights or the poles follow the road alignment? 	<p>No</p> <p>Yes</p> <p>No</p>	<p>No bend warning, damaged guide posts, damaged RRPMS and worn road markings</p> <p>N/A</p> <p>Generally the trees follow the alignment</p> <p>No power poles go straight instead of following the sweeping bend</p>
<p>Is the road free of misleading curves or combinations of curves?</p>	<p>No</p>	<p>No</p>
<p>6.1.6 Widths</p>		
<p>Are medians and islands of adequate width for the likely users?</p>		<p>N/A</p>
<p>Are traffic lane and carriageway widths adequate for the traffic volume and mix?</p>	<p>No</p>	<p>No – high volume of HGVs</p>
<p>Are bridge widths adequate?</p>	<p>No</p>	<p>No approximately 7.6m wide, no sealed shoulders or pedestrian/cycle facilities</p>
<p>6.1.7 Shoulders</p>		
<p>Are shoulders wide enough to allow drivers to regain control of errant vehicles?</p>	<p>No</p>	<p>No shoulders in some locations and minimal in other locations</p>
<p>Are shoulders wide enough for broken-down or emergency vehicles to stop safely?</p>	<p>No</p>	<p>No shoulders in some locations and minimal in other locations</p>
<p>Are shoulders sealed?</p>		<p>Minimal sealed and gravel shoulders</p>
<p>Are shoulders traffickable for all vehicles and road users? (i.e. are shoulders in good condition)</p>	<p>No</p>	<p>Poor condition</p>
<p>Is the transition from road to shoulder safe? (no drop-offs)</p>	<p>Yes</p>	<p>Reasonable – no issues</p>
<p>6.1.8 Crossfalls</p>		
<p>Is appropriate superelevation provided on curves?</p>	<p>No</p>	<p>Camber on sweeping bend</p>
<p>Is any adverse crossfall safely managed (for cars, trucks, etc.)?</p>	<p>No</p>	<p>Potential for loss of control at speed</p>
<p>Do crossfalls (carriageway and shoulder) provide adequate drainage?</p>	<p>Yes</p>	<p>No issues</p>
<p>6.1.9 Batter slopes</p>		

Are batter slopes traversable by cars and trucks that run off the road?			N/A
6.1.10 Drains			
Are roadside drains and culvert end walls traversable?		No	No in clear zone and not traversable
6.2 Auxiliary lanes			
6.2.1 Tapers			
Are starting and finishing tapers located and aligned correctly?		No	Short AUL to industrial driveways
Is there sufficient sight distance to the end of the auxiliary lane?	Yes		
6.2.2 Shoulders			
Are appropriate shoulder widths provided at merges?		No	
Have shoulder widths been maintained beside the auxiliary lane?		No	

Issue	Yes	No	Comment
6.2.3 Signs and markings			
Have all signs been installed in accordance with the appropriate guidelines?	Yes		
Are all signs conspicuous and clear?		No	Poor condition
Does all linemarking conform with these guidelines?		No	Poor condition, worn, missing RRPMs
Is there advance warning of approaching auxiliary lanes?		No	No advanced signage or road markings
6.2.4 Turning traffic			
Have right turns from the through lane been avoided?		No	No right turn facilities
Is there advance warning of turn lanes?			N/A
6.3 Intersections			
6.3.1 Location			
Are all intersections located safely with respect to the horizontal and vertical alignment?		No	Griffiths St/Mort St/Hogg St – has very poor geometry in both horizontal and vertical alignment
Where intersections occur at the end of high-speed environments (for example, at approaches to towns), are there traffic control devices to alert drivers?			N/A
6.3.2 Visibility; sight distance			
Is the presence of each intersection obvious to all road users?		No	

Is the sight distance appropriate for all movements and all road users?	No	Griffiths St/Mort St/Hogg St – has very poor visibility
Is there stopping sight distance to the rear of any queue or slow-moving turning vehicles?	No	Griffiths St/Mort St/Hogg St – restricted due to bends
Has the appropriate sight distance been provided for entering and leaving vehicles?	No	
6.3.3 Controls and delineation		
Are pavement markings and intersection control signs satisfactory?	No	Griffiths St/Mort St/Hogg St – consider change of intersection form
Are vehicle paths through intersections delineated satisfactorily?		Reasonable
Are all lanes properly marked (including any arrows)?		Reasonable
6.3.4 Layout		
Are all conflict points between vehicles safely managed?	No	Griffiths St/Mort St/Hogg St – poor geometry consider change of intersection form
Is the intersection layout obvious to all road users?	No	Griffiths St/Mort St/Hogg St – poor geometry consider change of intersection form

Issue	Yes	No	Comment
Is the alignment of kerbs obvious and appropriate?			N/A – No kerb and channel for majority of subject corridor
Is the alignment of traffic islands obvious and appropriate?			N/A
Is the alignment of medians obvious and appropriate?			N/A
Can all likely vehicle types be accommodated?			No - Griffiths St/Mort St/Hogg St – poor geometry so larger vehicles stray out of lanes
Are merge tapers long enough?			N/A
Is the intersection free of capacity problems that may produce safety problems?		No	Close proximity of at-grade level rail crossing creates queuing through Griffiths St/Mort St/Hogg St intersection when triggered
6.3.5 Miscellaneous			
Particularly at rural sites, are all intersections free of loose gravel?		No	Toowoomba Concrete Recycles driveway has reasonable amount of loose gravel

6.4 Signs and lighting			
6.4.1 Lighting			
Has lighting been adequately provided where required?			RSA not undertaken in hours of darkness but minimal street lighting provided along corridor
Is the road free of features that interrupt illumination? (for example, trees or overbridges)			N/A
Is the road free of lighting poles that are a fixed roadside hazard?		No	Lighting poles in clear zone
Are frangible or slip-base poles provided?	Yes		
Ambient lighting: if it creates special lighting needs, have these been satisfied?			N/A
Is the lighting scheme free of confusing or misleading effects on signals or signs?			N/A
Is the scheme free of any lighting black patches?			N/A
6.4.2 General signs issues			
Are all necessary regulatory, warning and direction signs in place? Are they conspicuous and clear?		No	Damaged and in poor condition
Are the correct signs used for each situation, and is each sign necessary?		No	No bend warning signs, no advisory speed sign on bends. CAMS too low
Are all signs effective for all likely conditions? (for example, day, night, rain, fog, rising or setting sun, oncoming headlights, poor lighting)			No - signs in poor condition
If restrictions apply for any class of vehicle, are drivers adequately advised?			N/A
If restrictions apply for any class of vehicle, are drivers advised of alternative routes?			N/A

Issue	Yes	No	Comment
6.4.3 Sign legibility			
In daylight and darkness, are signs satisfactory regarding visibility and: <ul style="list-style-type: none"> clarity of message? readability/legibility at the required distance? 		No	Signs in poor condition
Is sign retroreflectivity or illumination satisfactory?		No	
Are signs able to be seen without being hidden by their background or adjacent distractions?	Yes		
Is driver confusion due to too many signs avoided?		No	
6.4.4 Sign supports			

Are sign supports out of the clear zone?		No	
If not, are they:	Yes		
- frangible?		No	
- shielded by barriers (for example, guard fence, crash cushions)?			
6.5 Markings and delineation			
6.5.1 General issues			
Is the line marking and delineation:	Yes		Reasonable but poorly maintained
- appropriate for the function of the road?	Yes		
- consistent along the route?	Yes		
- likely to be effective under all expected conditions? (day, night, wet, dry, fog, rising and setting sun position, oncoming headlights, etc.)			
Is the pavement free of excessive markings? (for example, unnecessary turn arrows, unnecessary barrier lines, etc.)		No	Arrows in AUL are confusing
6.5.2 Centrelines, edgelines, lane lines			
Are centrelines, edgelines, lane lines provided? If not, do drivers have adequate guidance?			Poorly maintained and some edge lining missing due to damaged shoulders
Have RRPMS been installed where required?	Yes		RRPMs missing or damaged
If RRPMS are installed, are they correctly placed, correct colours, in good condition?		No	RRPMs missing or damaged
Are profiled (audible) edgelines provided where required?		No	
Is the linemarking in good condition?		No	Poorly maintained
Is there sufficient contrast between linemarking and pavement colour?		No	Poorly maintained

Issue	Yes	No	Comment
6.5.3 Guideposts and reflectors			
Are guideposts appropriately installed?		No	Broken or missing
Are delineators clearly visible?			None provided
Are the correct colours used for the delineators?			None provided
Are the delineators on guard fences, crash barriers and bridge railings consistent with those on guideposts?		No	None provided
6.5.4 Curve warning and delineation			
Are curve warning signs and advisory speed signs installed where required?		No	None provided
Are advisory speed signs consistent along the route?		No	None provided
Are the signs correctly located in relation to the curve? (i.e. not too far in advance)		No	None provided

Are the signs large enough?			N/A
Are chevron alignment markers (CAMs) installed where required?		No	CAMs provided in one direction and too low
Is the positioning of CAMs satisfactory to provide guidance around the curve?		No	Third CAM is obscured by crest
Are the CAMs the correct size?	Yes		
Are CAMs confined to curves? (not used to delineate islands, etc)	Yes		
6.6 Crash barriers and clear zones			
6.6.1 Clear zones			
Is the clear zone width traversable? (i.e. drivable)		No	Trees/Power poles in clear zone
Is the clear zone width free of rigid fixtures? (if not, can all of these rigid fixtures be removed or shielded?)		No	Power poles in clear zone
Are all power poles, trees, etc., at a safe distance from the traffic paths?		No	Power poles in clear zone
Is the appropriate treatment or protection provided for any objects within the clear zone?		No	None provided
6.6.2 Crash barriers			
Are crash barriers installed where necessary?	Yes		Bridge & S Bend – Bridge could be THRIE beam
Are crash barriers installed at all necessary locations in accordance with the relevant guidelines?	Yes		
Are the barrier systems suitable for the purpose?		No	High number of HGVs
Are the crash barriers correctly installed?	Yes		Chevron sticker damaged
Is the length of crash barrier at each installation adequate?	Yes		

Issue	Yes	No	Comment
Is the guard fence attached correctly to bridge railings?	Yes		
Is there sufficient width between the barrier and the edge line to contain a broken-down vehicle?		No	No shoulder
6.6.3 End treatments			
Are end treatments constructed correctly?	Yes		
Is there a safe run-off area behind breakaway terminals?	Yes		
6.6.4 Fences			
Are pedestrian fences frangible?			N/A – Barrier is approximately 0.6m high and too low – potential risk

Are vehicles safe from being speared by horizontal fence railings located within the clear zone?	Yes		
6.6.5 Visibility of barriers and fences			
Is there adequate delineation and visibility of crash barriers and fences at night?			N/A
6.7 Traffic signals			
6.7.1 Operations			
Are traffic signals operating correctly?	No		New England Highway - potential filter issue
Are the number, location and type of signal displays appropriate for the traffic mix and traffic environment?			
Where necessary, are there provisions for visually impaired pedestrians? (for example, audio-tactile push buttons, tactile markings)			
Where necessary, are there provisions for elderly or disabled pedestrians? (for example, extended green or clearance phase)	No		Long walk distance across Griffiths Street
Is the controller located in a safe position? (i.e. where it is unlikely to be hit, but maintenance access is safe)			
Is the condition (especially skid resistance) of the road surface on the approaches satisfactory?			
6.7.2 Visibility			
Are traffic signals clearly visible to approaching motorists?			
Is there adequate stopping sight distance to the ends of possible vehicle queues?			
Have any visibility problems that could be caused by the rising or setting sun been addressed?			
Are signal displays shielded so that they can be seen only by the motorists for whom they are intended?			

Issue	Yes	No	Comment
Where signal displays are not visible from an adequate distance, are signal warning signs and/or flashing lights installed?			
Where signals are mounted high for visibility over crests, is there adequate stopping sight distance to the ends of traffic queues?			
Is the primary signal free from obstructions on the nearside footway to approaching drivers? (trees, light poles, signs, bus stops, etc.)			

6.8 Pedestrians and cyclists			
6.8.1 General issues			
Are there appropriate travel paths and crossing points for pedestrians and cyclists?	No		No facilities
Is a safety fence installed where necessary to guide pedestrians and cyclists to crossings or overpasses?			N/A
Is a safety barrier installed where necessary to separate vehicle, pedestrian and cyclist flows?	No		
Are pedestrian and bicycle facilities suitable for night use?	No		No facilities
6.8.2 Pedestrians			
Is there adequate separation distance between vehicular traffic and pedestrians on footways?	No		No facilities
Is there an adequate number of pedestrian crossings along the route?	No		No facilities
At crossing points is fencing oriented so pedestrians face oncoming traffic?	No		No facilities
Is there adequate provision for the elderly, the disabled, children, wheelchairs and baby carriages? (for example, holding rails, kerb and median crossings, ramps)	No		No facilities
Are adequate hand rails provided where necessary? (for example, on bridges, ramps)	No		No facilities
Is signing about pedestrians near schools adequate and effective?			N/A
Is signing about pedestrians near any hospital adequate and effective?	Yes		
Is the distance from the stop line to a cross walk sufficient for truck drivers to see pedestrians?			N/A

Issue	Yes	No	Comment
6.8.3 Cyclists			
Is the pavement width adequate for the number of cyclists using the route?		No	No facilities
Is the bicycle route continuous? (i.e. free of squeeze points or gaps)		No	No facilities and no shoulders on bridge create pinch point
Are drainage pit grates bicycle safe?	Yes		
6.8.4 Public transport			
Are bus stops safely located with adequate visibility and clearance to the traffic lane?			N/A
Are bus stops in rural areas signposted in advance?			N/A
Are shelters and seats located safely to ensure that sight lines are not impeded? Is clearance to the road adequate?			N/A

Is the height and shape of the kerb at bus stops suitable for pedestrians and bus drivers?			N/A
6.9 Bridges and culverts			
6.9.1 Design features			
Are bridges and culverts the full formation width?		No	No shoulders on bridge
Are bridge and culvert carriageway widths consistent with approach conditions?	Yes		
Is the approach alignment compatible with the 85th percentile travel speed?		No	S Bend approach
Have warning signs been erected if either of the above two conditions (i.e. width and speed) are not met?		No	No warning signs or advisory speed signs
6.9.2 Crash barriers			
Are there suitable traffic barriers on bridges and culverts and their approaches to protect errant vehicles?		No	Barrier is approximately 0.6m high and too low – potential risk
Is the connection between barrier and bridge safe?	Yes		
Is the bridge free of kerbing that would reduce the effectiveness of barriers or rails?	Yes		
6.9.3 Miscellaneous			
Are pedestrian facilities on the bridge appropriate and safe?		No	No facilities
Is fishing from the bridge prohibited? If not, has provision been made for safe fishing?			N/A
Does delineation continue over the bridge?	Yes		

Issue	Yes	No	Comment
6.10 Pavement			
6.10.1 Pavement defects			
Is the condition of the pavement edges satisfactory?		No	Very poor condition
Is the transition from pavement to shoulder free of dangerous edge drop offs?	Yes		Reasonable
Is the pavement free of defects (for example, excessive roughness or rutting, potholes, loose material, etc.) that could result in safety problems (for example, loss of steering control)?		No	Very poor condition
6.10.2 Skid resistance			
Does the pavement appear to have adequate skid resistance, particularly on curves, steep grades and approaches to intersections?		No	Poor condition
Has skid resistance testing been carried out where necessary?			N/A

6.10.3 Ponding			
Is the pavement free of areas where ponding or sheet flow of water could contribute to safety problems?			Unsure – dry weather
6.10.4 Loose stones/material		Yes	Toowoomba Concrete Recycles driveway has reasonable amount of loose gravel
Is the pavement free of loose stones and other material?	Yes		Generally
6.11 Parking			
6.11.1 General issues			
Are the provisions for, or restrictions on, parking satisfactory in relation to traffic safety?		No	No Shoulders
Is the frequency of parking turnover compatible with the safety of the route?	Yes		
Is there sufficient parking for delivery vehicles so that safety problems due to double parking do not occur?			N/A
Are parking manoeuvres along the route possible without causing safety problems? (for example, angle parking)			N/A
Is the sight distance at intersections and along the route, unaffected by parked vehicles?			N/A
6.12 Provision for heavy vehicles			
6.12.1 Design issues			
Are overtaking opportunities available for heavy vehicles where volumes are high?		No	No turning facilities, steep gradient results in slow HGVs (no climbing lane). Substandard AUL into HGV driveway

Issue	Yes	No	Comment
Does the route generally cater for the size of vehicle likely to use it?		No	Narrow lanes/no shoulders
Is there adequate manoeuvring room for large vehicles along the route, at intersections, roundabouts, etc.?		No	Poor geometric design, HGVs use through and turn lanes to undertake manoeuvres
Is access to rest areas and truck parking areas adequate for the size of vehicle expected? (consider acceleration, deceleration, shoulder widths, etc.)			N/A
6.12.2 Pavement/shoulder quality			
Are shoulders sealed at bends to provide additional pavement for long vehicles?		No	Minimum shoulder width in poor condition
Is the pavement width adequate for heavy vehicles?	Yes		

In general, is the pavement quality sufficient for the safe travel of heavy and oversized vehicles?	No	Poor condition
On truck routes, are reflective devices appropriate for truck drivers' eye heights?	No	Poor condition
6.13 Floodways and causeways		
6.13.1 Ponding, flooding		
Are all sections of the route free from ponding or flow across the road during wet weather?		Potentially
If there is ponding or flow across the road during wet weather, is there appropriate signposting?		No signage
Are floodways and causeways correctly signposted?		N/A
6.13.2 Safety of devices		
Are all culverts or drainage structures located outside the clear roadside recovery area?	No	In clear zone
If not, are they shielded from the possibility of vehicle collision?	No	No barriers provided
6.14 Miscellaneous		
6.14.1 Landscaping		
Is landscaping in accordance with guidelines? (for example, clearances, sight distance)		N/A
Will existing clearances and sight distances be maintained following future plant growth?		N/A
Does the landscaping at roundabouts avoid visibility problems?		N/A

Issue	Yes	No	Comment
6.14.2 Temporary works			
Are all locations free of construction or maintenance equipment that is no longer required?			N/A
Are all locations free of signs or temporary traffic control devices that are no longer required?			N/A
6.14.3 Headlight glare			
Have any problems that could be caused by headlight glare been addressed? (for example, a two-way service road close to main traffic lanes, the use of glare fencing or screening)			N/A
6.14.4 Roadside activities			

Are the road boundaries free of any activities that are likely to distract drivers?		No	
Are all advertising signs installed so that they do not constitute a hazard?			N/A
6.14.5 Errant vehicles			
Is the roadside furniture on the verges and footways free of damage from errant vehicles that could indicate a possible problem, hazard or conflict at the site?		No	Culvert/ drainage damaged
6.14.6 Other safety issues			
Is the embankment stability safe?			N/A
Is the route free of unsafe overhanging branches?	Yes		
Is the route free of visibility obstructions caused by long grass?	Yes		
Are any high-wind areas safely dealt with?	Yes		
If back-to-back median kerbing is used is it: <ul style="list-style-type: none"> - adequately delineated? - obvious where it starts? - obvious at intersections? - unlikely to be a hazard to pedestrians? 			N/A
6.14.7 Rest areas			
Is the location of rest areas and truck parking areas along the route appropriate?	Yes		
Is there adequate sight distance to the exit and entry points from rest areas and truck parking areas at all times of the day?		No	Sight distance to left is substandard due to crest

Issue	Yes	No	Comment
6.14.8 Animals			
Is the route free from large numbers of animals? (for example, cattle, sheep, kangaroos, koalas, wombats, etc.)	Yes		
If not, is it protected by animal-proof fencing?			N/A
6.14.9 Safety aspects for heavy vehicles not already covered			
Have all other matters which may have a bearing on safety for heavy vehicles been addressed?		No	No right turn facilities into industrial driveways

Griffiths Street, Toowoomba

APPENDIX B
CRASH DATA ANALYSIS

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Griffiths Street/New England Highway

Crash_Ref_Number	Crash_Severity	Crash_Year	Crash_Hour	Crash_Nature	Crash_Road_Surface_Condition	Crash_Atmospheric_Condition	Crash_Lighting_Condition	Crash_DCA_Code	Crash_DCA_Description	Crash_DCA_Group_Description
197560	Hospitalisation	2009	10	Hit pedestrian	Sealed - Dry	Clear	Daylight	3	Ped'N: Far Side Vehicle Hit From Left	Pedestrian
107677	Property damage only	2005	6	Angle	Sealed - Dry	Clear	Dawn/Dusk	102	Veh'S Adjacent Approach: Right-Thru	Intersection from adjacent approaches
30188	Property damage only	2002	11	Angle	Sealed - Dry	Clear	Daylight	104	Veh'S Adjacent Approach: Thru-Right	Intersection from adjacent approaches
35606	Medical treatment	2002	12	Angle	Sealed - Dry	Clear	Daylight	104	Veh'S Adjacent Approach: Thru-Right	Intersection from adjacent approaches
101919	Minor injury	2005	16	Angle	Sealed - Dry	Clear	Daylight	104	Veh'S Adjacent Approach: Thru-Right	Intersection from adjacent approaches
105922	Medical treatment	2005	15	Angle	Sealed - Dry	Clear	Daylight	104	Veh'S Adjacent Approach: Thru-Right	Intersection from adjacent approaches
238259	Medical treatment	2011	19	Angle	Sealed - Dry	Clear	Darkness - Lighted	104	Veh'S Adjacent Approach: Thru-Right	Intersection from adjacent approaches
158166	Property damage only	2007	16	Angle	Sealed - Dry	Clear	Daylight	202	Veh'S Opposite Approach: Thru-Right	Opposing vehicles turning
135389	Property damage only	2007	21	Rear-end	Sealed - Dry	Clear	Darkness - Lighted	301	Veh'S Same Direction: Rear End	Rear-end
217751	Property damage only	2010	18	Rear-end	Sealed - Dry	Clear	Darkness - Lighted	301	Veh'S Same Direction: Rear End	Rear-end
13951	Property damage only	2001	10	Rear-end	Sealed - Dry	Clear	Daylight	302	Veh'S Same Direction: Left Rear	Rear-end
82802	Medical treatment	2004	16	Rear-end	Sealed - Dry	Clear	Daylight	302	Veh'S Same Direction: Left Rear	Rear-end
90038	Minor injury	2004	11	Rear-end	Sealed - Dry	Clear	Daylight	302	Veh'S Same Direction: Left Rear	Rear-end
96579	Property damage only	2005	15	Rear-end	Sealed - Dry	Clear	Daylight	302	Veh'S Same Direction: Left Rear	Rear-end
181074	Property damage only	2009	22	Rear-end	Sealed - Dry	Clear	Darkness - Lighted	302	Veh'S Same Direction: Left Rear	Rear-end
173546	Property damage only	2008	14	Angle	Sealed - Dry	Clear	Daylight	309	Veh'S Same Direction: Left Turn S/Swipe	Parallel lanes turning
195428	Property damage only	2009	11	Hit object	Sealed - Dry	Clear	Daylight	703	Off Path-Straight: Left Off Cway Hit Obj	Off carriageway on straight hit object

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APPENDIX F
CORRIDOR CONSTRAINTS MAP

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APPENDIX G
CORRIDOR OPTIONS

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APPENDIX H
TRAFFIC MODELLING AND ANALYSIS
REPORT

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Toowoomba Griffiths Street Corridor Planning Study

Traffic Modelling and Analysis Report

CEB06818

Prepared for
Toowoomba Regional Council

3 May 2017



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Contact Information

Cardno (Qld) Pty Ltd
 ABN 57 051 074 992

Level 11 Green Square North Tower
 515 St Paul's Terrace
 Locked Bag 4006
 Fortitude Valley Qld 4006

Telephone: 07 3369 9822
 Facsimile: 07 3369 9722
 International: +61 7 3369 9822

transportqld@cardno.com.au
 www.cardno.com.au

Document Control

Version	Date	Description of Revision	Author Initials	Author Signature	Reviewer Initials	Reviewed Signature
V.1	15/12/16	Draft Report	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information
V.2	03/05/16	Revised Draft Report	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information

Version	Reason for Issue	Stage of Deliverable	Approver Initials	Approved Signature	Approved Release Date
V.1	Draft report for client review		Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	15/12/2016
V.2	Amended Draft Report including Further Studies		Part Refuse Sch.4 Part 4 s.6 Personal information	Part Refuse Sch.4 Part 4 s.6 Personal information	03/05/2017

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Executive Summary

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Toowoomba Regional Council (Council) to provide a transport modelling assessment of the impact of the Toowoomba Second Range Crossing (TSRC) on the local Toowoomba road network, in particular the Griffiths Street corridor, to assist Council's planning for this link.

The traffic assessment considers the operation of the transport network based on input from a variety of transport model with sequential increase in the level of detail for the study. Broder area road network planning and land use growth is based on the strategic model data from the Toowoomba Regional Transport Model (CUBE).

Mesoscopic analysis using a SATURN model developed for the purpose of this planning study considers the high level network operation for the overall study area, including the TSRC to the north, Bridge Street to the south, Ruthven Street (New England Highway) to the east and Mort Street to the west.

Detailed intersection analysis has been completed the Griffiths Street/Mort Street/Hogg Street intersection using the Paramics model platform and for the Goombungee Road/Griffiths Street and the New England Highway/Griffiths Street intersections using SIDRA to identify potential future intersection layouts and staging of works.

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1 Project Scope

1.1 Project Overview

Cardno (Qld) Pty Ltd (Cardno) has been commissioned by Toowoomba Regional Council (Council) to provide a transport modelling assessment of the impact of the Toowoomba Second Range Crossing (TSRC) on the local Toowoomba road network, in particular the Griffiths Street corridor.

The TSRC is a planned bypass route to the north of Toowoomba, which is to be implemented as an alternative to the Warrego Highway connection which runs through the Toowoomba City Centre. The TSRC will connect to Toowoomba via a new interchange at Mort Street, north of the Mort Street/Hogg Street/Griffiths Street intersection.

It is anticipated that the provision of the TSRC will increase the traffic load on Mort Street as the primary northern connection into Toowoomba and Griffiths Street which will function as a primary connection to the New England Highway.

This report has been prepared on behalf of Council to assist the future planning to upgrade Griffiths Street to its future function in the road network.

The report documents the accurate verification, calibration and validation of model parameters to confirm that the base models reflect current traffic conditions and can be utilised to provide accurate forecasts of future performance. This report further documents the future year model development and options assessment results. The report should be read in conjunction with the overall Griffiths Street Planning Study Report which provides a multidisciplinary investigation of the safety, structural, flooding and design matters for the corridor.

The NSW Roads & Maritime Services (RMS) Traffic Modelling Guidelines has informed this report as a reference document.

1.2 Traffic Modelling Overview

The traffic assessment considers the operation of the transport network based on input from a variety of transport models with sequential increase in the level of detail for the study is based on the limitations and purpose of the model platform.

Strategic model data from the Toowoomba Regional Transport Model determines the broader distribution of traffic for the greater area. This model has been prepared to guide Council's high level transport network planning for the region. Council has provided the traffic volume and origin destination data from the 2011 base year and 2031 future year CUBE model. This data is available for a single 24hr period and has been further refined to establish peak hour traffic flows for more detailed assessment.

A SATURN model has been developed to provide a more detailed model for the local area. This model includes the TSRC to the north, Bridge Street to the south, Ruthven Street (New England Highway) to the east and Mort Street to the west. The SATURN model process is detailed in Section 2 of this report.

The SATURN model has been used to identify the future year link volumes and high level operations of the transport network in the study area. The assessment considers existing and planned land uses and road networks as directed by Council to identify the higher level traffic impacts for the Griffiths Street corridor, and on the key links within the study area.

Detailed intersection analysis has been completed for intersections along Griffiths Street, including SIDRA and Paramics analysis. A Paramics model has been prepared to assess the operation of a single study intersection, the Griffiths Street/Mort Street/Hogg Street intersection. This intersection is affected by the operation of an at grade rail crossing which cannot easily be represented by other, more simplistic tools, such as SIDRA. The Paramics modelling process is detailed in Section 3 of this report.

The Goombungee Road/Griffiths Street and the New England Highway/Griffiths Street intersections are anticipated to be significantly affected by traffic from the TSRC and from future development in areas to the north of Griffiths Street. These intersections have been assessed using SIDRA to identify potential future intersection layouts and staging of works. The SIDRA modelling process is outlined in Section 4 of this report.

The type of traffic modelling software utilised, study extents and general modelling assumptions were agreed at a meeting with Council representatives on 11 August 2016.

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2 Saturn Modelling

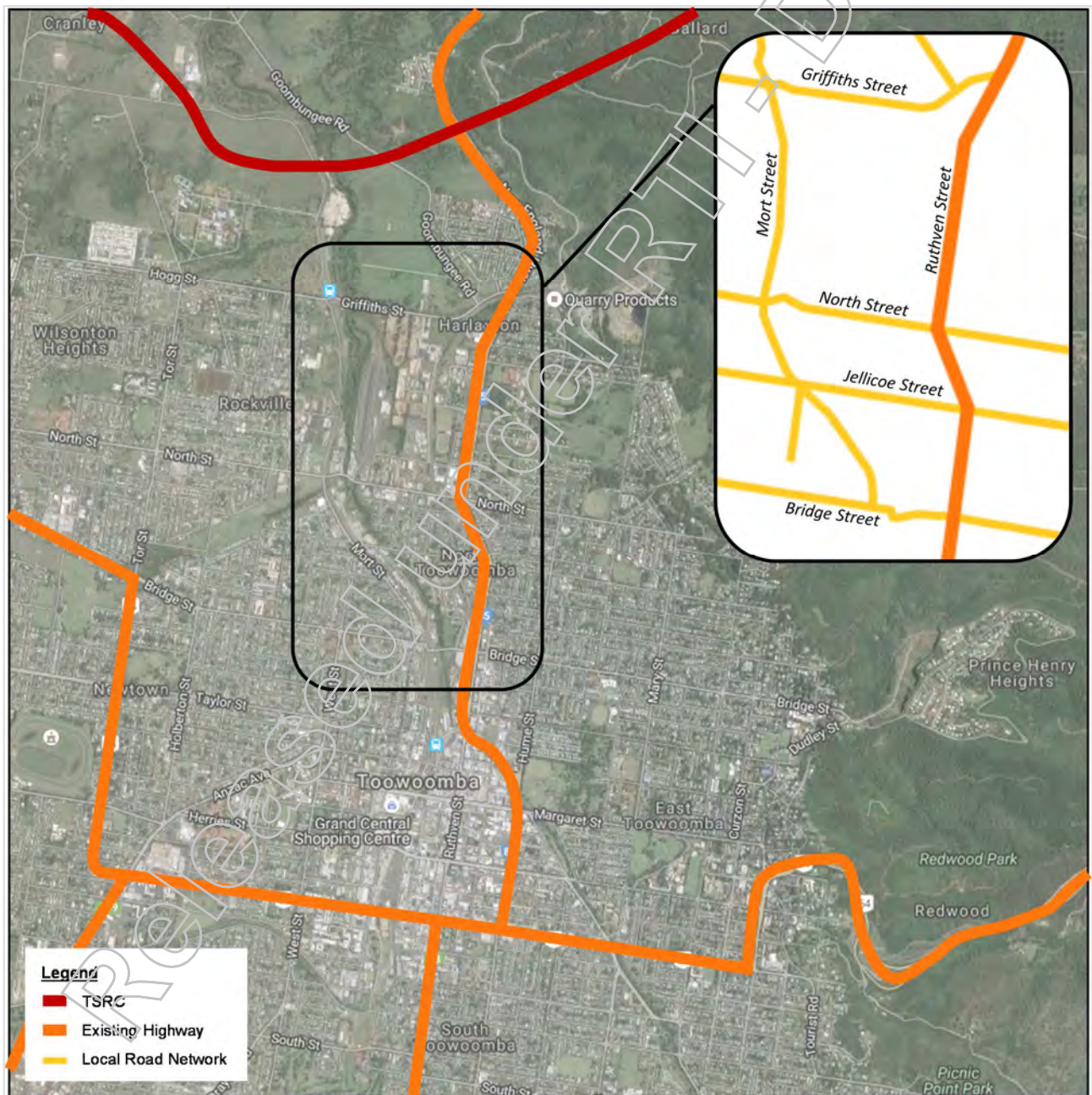
The SATURN model suite was used to develop a mesoscopic model for the local area to identify the future year link volumes and high level impacts on the transport operation in the study area. The assessment considers the land use and network as directed by Council's future planning to identify the detailed longer term road and intersection requirements for the Griffiths Street corridor, and on a higher level on the key links within the study area.

Assessment has been completed using SATURN Version 11.3.12F+UPDATE 1.

2.1 Network Development

2.1.1 Network Extent

Figure 2-1 Study Area

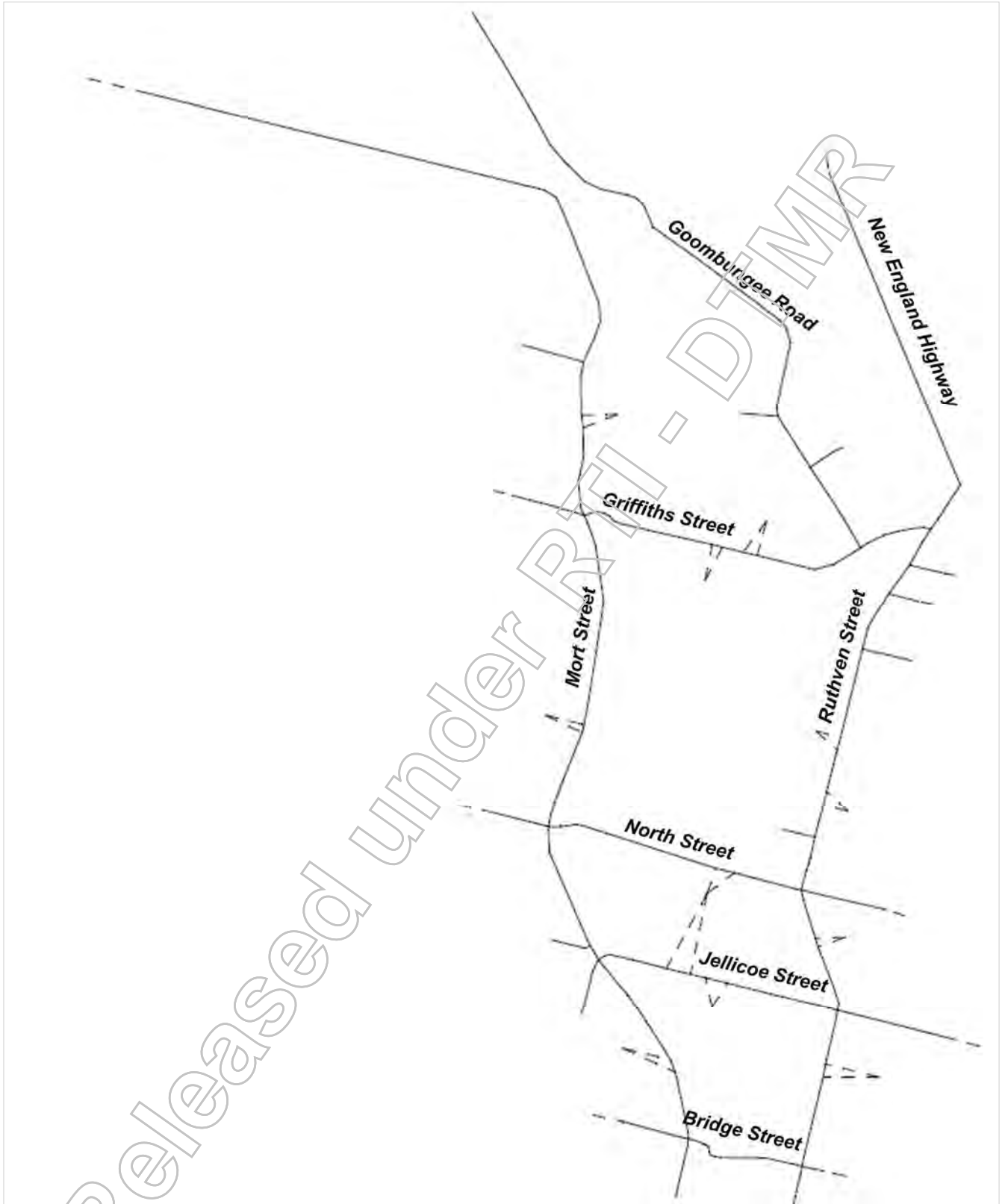


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Figure 2-2 2016 Base Year Scenario



2.2 Network Build

This section of the report details the model network development, initial coding and input development.

The original network coding was completed according to Nearmap, consistent with aerials dated 21 August 2016, was used to input all physical parameters including link alignment, lane configuration, tuning lane lengths, speed and intersection control.

2.2.1 Intersections

The key intersections that will be assessed as part of this corridor study are identified on Figure 2-5, with the level of assessment outlined in Table 2-1.

Figure 2-3 Key Intersections



Table 2-1 Key Intersections

Intersection Location	Level of Assessment	Authority
Mort Street/Griffiths Street	Assessed intersection (Paramics)	Toowoomba Regional Council
Griffiths Street/Goombungee Road	Assessed intersection (SIDRA)	Toowoomba Regional Council
New England Hwy/Griffiths Street	Assessed intersection (SIDRA)	Department of Transport and Main Roads
Mort Street/North Street	Modelled in SATURN	Toowoomba Regional Council
Ruthven Street/North Street	Modelled in SATURN	Department of Transport and Main Roads
Mort Street/Jellicoe Street	Modelled in SATURN	Toowoomba Regional Council
Ruthven Street/Jellicoe Street	Modelled in SATURN	Department of Transport and Main Roads
Mort Street/Bridge Street	Modelled in SATURN	Toowoomba Regional Council
Ruthven Street/Bridge Street	Modelled in SATURN	Department of Transport and Main Roads

Key intersections have been detailed in the base model consistent with the current layout, signal phasing and timing, as per recent aerial imagery and signal data provided by Council and TMR. The data was utilised to code signal groups, phasing and cycle times based on average data for the signalised intersections within the network extents. Each intersection was closely observed to report anomalies within model vehicle behaviour and no adjustments to the signal coding were found necessary. This data has been retained in the future year analysis.

Minor intersections and property access are included as either zone connectors or amalgamated links. The model has been reviewed to ensure that there are no significant or unexpected delays outside of the key intersections.

2.2.2 Links

The 2016 base model SATURN network has been developed to align with the existing road hierarchy, speed and lane configurations, as outlined for key links in Table 2-2.

Table 2-2 Existing Road Network – Classification and Form

Road Name	Road Classification	Posted Speed	Form
Mort Street (north of North St)	Regional Arterial	70km/h	Two lanes two way
Mort Street (between North St and Jellicoe St)	Regional Arterial	60km/h	Two lanes two way
Mort Street (south of Jellicoe St)	Regional Arterial	50km/h	Two lanes two way
Ruthven Street	Highway (proposed downgrade)	60km/h	Four lanes two way
Griffiths Street (east of Old Goombungee Rd)	Distributor	60km/h	Two lanes two way
Griffiths Street (west of Old Goombungee Rd)	Distributor	70km/h	Two lanes two way
North Street	Distributor	60km/h	Two lanes two way
Jellicoe Street	Distributor	60km/h	Two lanes two way
Bridge Street	Distributor	60km/h	Two lanes two way

In SATURN this translates to a saturation flow input for each lane. The saturation flow is generally consistent with the Draft TMR SATURN Modelling Guidelines & Criteria for Queensland prepared by Metis Consulting (dated 26 February 2013). The adopted baseline saturation flows are detailed in Table 2-3.

Table 2-3 Saturation Flows

Road Classification	Intersection Type	Lane Form	Adopted Saturation Flow (pcus)
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Left (Shared)	1,600
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Left	1,770
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Ahead	1,900
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Right	1,820
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Right (shared)	1,650
Regional Arterial (Divided)	Signal or Priority (Major Arm)	Right (opposed)	1,500
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Left (Shared)	1,400
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Left	1,570
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Ahead	1,700
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Right	1,620
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Right (shared)	1,450
Regional Arterial (Undivided)	Signal or Priority (Major Arm)	Right (opposed)	1,300
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Left (Shared)	900
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Left	1,000
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Ahead	900
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Right	800
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Right (shared)	700
Regional Arterial (Undivided)	Priority Give Way (Minor Arm)	Right (opposed)	-
Distributor	Signal or Priority (Major Arm)	Left (Shared)	1,200
Distributor	Signal or Priority (Major Arm)	Left	1,370
Distributor	Signal or Priority (Major Arm)	Ahead	1,500
Distributor	Signal or Priority (Major Arm)	Right	1,420
Distributor	Signal or Priority (Major Arm)	Right (shared)	1,250
Distributor	Signal or Priority (Major Arm)	Right (opposed)	1,100
Distributor	Priority Give Way (Minor Arm)	Left (Shared)	900
Distributor	Priority Give Way (Minor Arm)	Left	1,000
Distributor	Priority Give Way (Minor Arm)	Ahead	900
Distributor	Priority Give Way (Minor Arm)	Right	800
Distributor	Priority Give Way (Minor Arm)	Right (shared)	700
Distributor	Priority Give Way (Minor Arm)	Right (opposed)	-
Local	Signal or Priority (Major Arm)	Left (Shared)	800
Local	Signal or Priority (Major Arm)	Left	870
Local	Signal or Priority (Major Arm)	Right	920
Local	Signal or Priority (Major Arm)	Right (shared)	750
Local	Signal or Priority (Major Arm)	Right (opposed)	700
Local	Priority Give Way (Minor Arm)	Left (Shared)	900
Local	Priority Give Way (Minor Arm)	Left	1,000
Local	Priority Give Way (Minor Arm)	Right	800
Local	Priority Give Way (Minor Arm)	Right (shared)	700
Local	Priority Give Way (Minor Arm)	Right (opposed)	-

The default position is to adopt the posted speed limits as the free flow speed.

2.2.3 SATURN Parameters

The non-default SATURN parameters were used to replicate the observed behaviour are included in Table 2-4. The logical parameters have been changed to reflect Australian driving conditions, the Integer parameters have been changed to allow a higher number of model assignment iterations and the Real parameters have slight changes to gap acceptance parameters.

Table 2-4 SATURN Build Parameters

Logical Parameters	Integer Parameters	Real Parameters
BUSKER = T	LRTP=60	AK_MIN=0.2
DUTCH = T	LTP = 60	ALEX=6.00
FOZZY = T	MASL = 100	GAP = 2
FREDDY = T	MASL_M=3	GAPM = 1.5
FREEXY = T	MAXLSF=2100	GAPR = 2
LEFTDR = T	MAXZN = 2120	PCNEAR=1
RAGS = T	MINRED = 5	RSTOP=98.0
REFFUB = T	NITA=25	STPGAP = 0.15
SIM111 = T	NITS_M = 10	
SPEEDS = T	NITA_S=100	
	NITS=40	
	NOPMAX=5	
	NOTUK=1	
	NOMADS = 1	

Note: The gap acceptance parameters are slightly lower than TMR default values, however the differences have undergone sensitivity testing and results in very small changes to the Griffiths Street volumes in the peak periods.

Changes to road network default values are outlined in Table 2-5.

Table 2-5 Road Network Changes

Item	Node	Default	Adopted	Comment
Griffiths Street	1000-1100	Posted speed 70km/h	Free flow speed 50km/h	Reduced free flow speed to reflect uphill grade

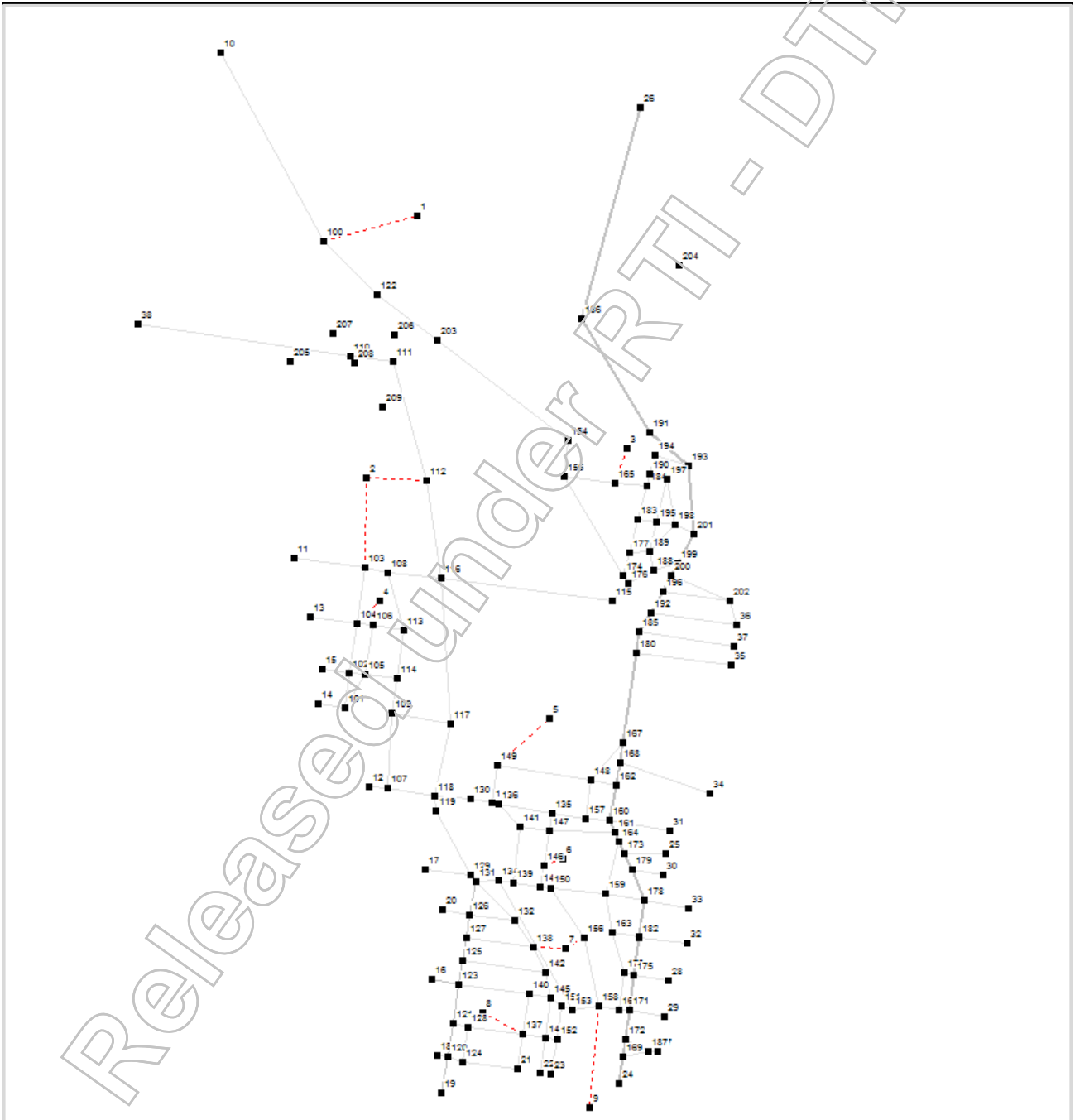
2.3 Matrix Development

Council has provided traffic volume and origin destination information from its 2011 base year and 2031 future year CUBE models. This data is available for a single 24hr period and has been further refined using spreadsheet analysis and the SATURN matrix estimation feature to establish peak hour traffic flows for more detailed assessment.

2.3.1 2016 Base Year Matrix

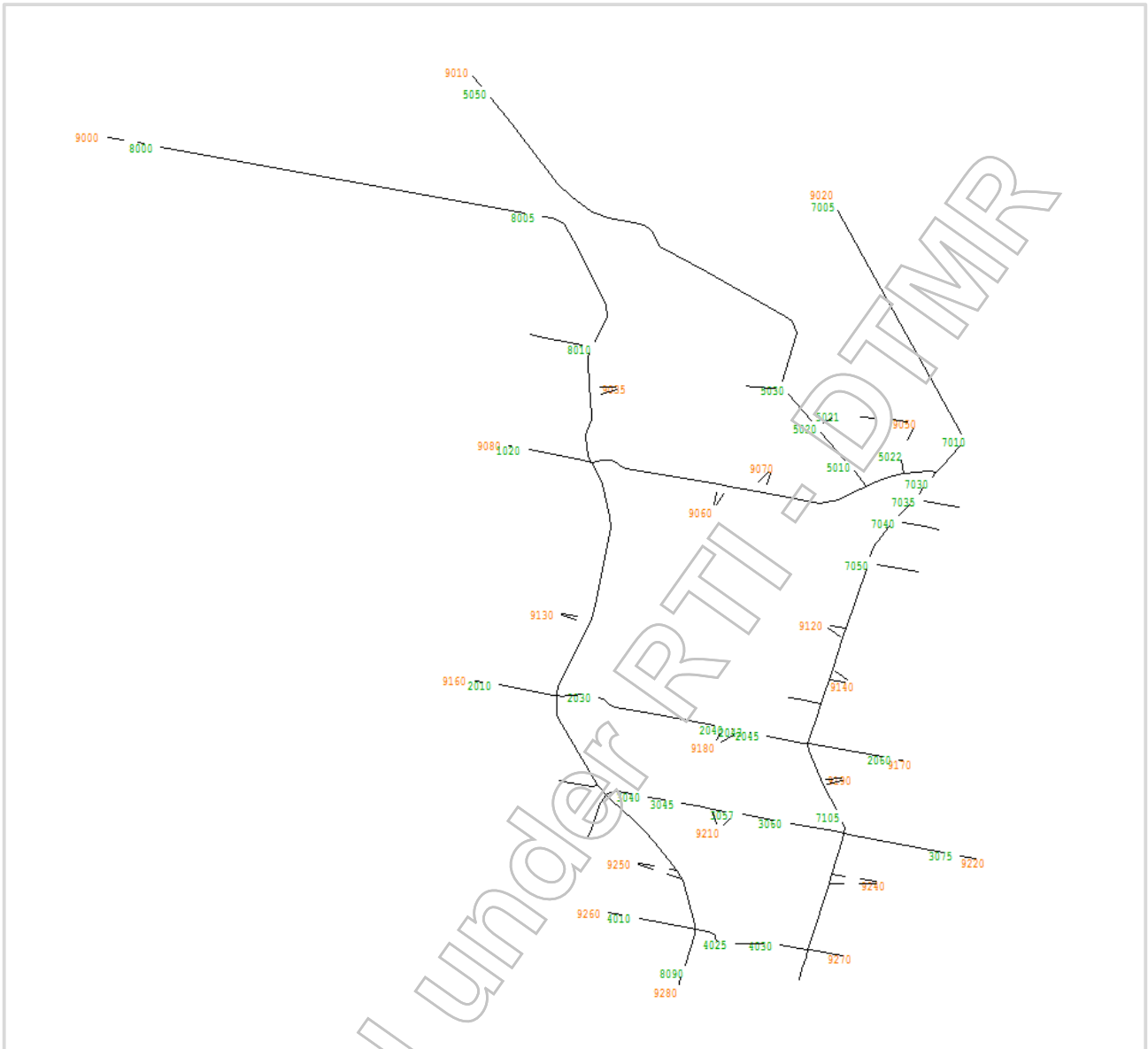
The 2011 CUBE data was provided as a single submatrix extracted from the full model. The network extent and zone structure is illustrated on Figure 2- 6 below. The first 38 nodes represent traffic generating zones.

Figure 2-4 CUBE 2011 Zone Structure



The 2016 Base SATURN model has a similar structure, as illustrated on Figure 2-7.

Figure 2-5 2016 SATURN Zone Structure



A total of 31 traffic generating zones are included in the SATURN model. These are represented in orange and have the prefix 9 (9000-9290 range). The CUBE zone network was translated into SATURN equivalents as described in Table 2-6.

Table 2-6 SATURN Zone Equivalents

CUBE Zone	% of Total	SATURN Zone
1	100%	9010
2	20%	9030
2	80%	9080
3	5%	9020
3	95%	9050
4	75%	9080
4	25%	9130
5	50%	9120
5	50%	9150
5	0%	9180

CUBE Zone	% of Total	SATURN Zone
6	50%	9180
6	50%	9210
7	100%	9210
8	100%	9260
9	100%	9210
10	100%	9010
11	75%	9080
11	25%	9130
12	100%	9160
13	75%	9080
13	25%	9130
14	75%	9080
14	25%	9130
15	75%	9080
15	25%	9130
16	100%	9260
17	100%	9200
18	100%	9260
19	100%	9260
20	80%	9230
20	20%	9250
21	100%	9280
22	100%	9280
23	100%	9280
24	100%	9290
25	100%	9190
26	100%	9020
27	100%	9290
28	100%	9240
29	100%	9270
30	100%	9190
31	100%	9170
32	100%	9240
33	100%	9220
34	100%	9140
35	100%	9110
36	100%	9090
37	100%	9100
38	100%	9000

The equivalent table was used to identify a 24hr pattern matrix correlating to the SATURN zone network.

To create AM and PM peak prior matrices, peak hour traffic was represented by an initial estimation of the TO/FROM flows relevant for each zone, based on the following process:

- Traffic count data adopted for zones captured wholly or partially by the traffic surveys
- 10% peak to daily factor adopted for non-residential zones or mixed use
- 10% peak to daily factor adopted for residential zones with typical TO/FROM distribution

Traffic count data was collected on Wednesday 17 August 2016 at the following locations:

- Griffiths Street/Hogg Street/Mort Street intersection
- North Street/Mort Street intersection
- Jellicoe Street/Mort Street intersection
- Bridge Street/Mort Street intersection
- Griffiths Street/Goombungee Road intersection
- Griffiths Street/New England Highway intersection
- North Street/Ruthven Street intersection
- Jellicoe Street/Ruthven Street intersection
- Bridge Street/Ruthven Street intersection

The pattern matrix and peak hour TO/FROM flows were input into the SATURN matrix estimation process to develop AM and PM peak prior matrices. These prior matrices were processed in SATURN against the available traffic count data to calibrate to 2016 traffic counts.

It is noted that SATURN converts all traffic to equivalent passenger car units (pcus). The traffic count data was therefore applied in this format with conversion factors as follows:

- light vehicle 1.0 pcu
- heavy vehicles 2.5 pcus

To allow a balance of counts between intersections, the traffic count data was included for the network peak, not the individual intersection peaks. The modelled time period will be a one-hour network peak, as follows:

- AM Peak: 7:45am to 8:45am
- PM Peak: 4:30pm to 5:30pm

The calibration to counts is further detailed in Section 2.4.

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2.4 Model Calibration

2.4.1 Calibration Criteria

The model has been calibrated to the intersection turning count volumes surveyed on Wednesday 17 August 2016.

The model calibration compares the modelled flows versus observed counts with the resulting GEH statistics documented. For traffic modelling work, in a baseline scenario, a GEH tolerance of 5 is considered a good match between modelled and observed traffic volumes. GEH values between 5 and 10 have been identified and accepted at non-essential locations.

The GEH calculations is documented on Figure 2-8.

Figure 2-6 GEH Calculation

$$GEH = \sqrt{\frac{(F_{mod} - F_{obs})^2}{0.5(F_{mod} + F_{obs})}}$$

Where: F_{mod} = Modelled Flow
 F_{obs} = Observed Flow

Table 2-9 provides the relevant criteria from the RMS Guide to Microsimulation Modelling to demonstrate the accuracy of the SATURN model.

Table 2-9 RMS Calibration Criteria

Traffic Volumes	
Flows	<ul style="list-style-type: none"> < 99 – to be within 10 vehicles of observed value 100 to 999 – to be within 10 per cent of observed value 1000 to 1999 – to be within 100 vehicles of observed value > 2000 – to be within 5 per cent of observed value
100 per cent of observations to be within tolerance limits	
Saturation Flows	
Stop line saturation flow	Modelled saturation flows should be within 10 per cent of the recorded on-site survey data.
Highway assignment modelling link and turn target calibration criteria	
GEH Statistic	Tolerance limits for network-wide area: 95 per cent of individual link volumes to have a GEH ≤ 5.0 85 per cent of individual turn volumes to have a GEH ≤ 5.0 All individual link and turn volumes should have GEH ≤ 10

2.4.2 Calibration Statistics and Results

The Model was calibrated against the intersection turning count volumes surveyed on Wednesday 17th August 2016. The RMS Guide to Microsimulation Modelling was used to set the calibration criteria as detailed above.

Appendix A provides volume plots of the all observed volumes (traffic surveys) and modelled traffic volumes for both the AM and PM peak periods in passenger car units (pcu's). Appendix B provides GEH plots based on the data presented in Appendix A.

Within the AM peak all traffic flows are within the flow tolerance limits and all GEH statistical values are under 5.0. Within the PM peak, the following flows around West Street exceed the flow tolerance allowed in Table 2-9 (< 99 to be within 10 vehicles observed):

- Right turn from West Street to Mort Street (south) modelled flow 25 pcu above observed
- Left turn from Mort Street (south) to West Street modelled flow 7 pcu above observed

The PM peak has one GEH above 5, which is the right turn from West Street to Mort Street (south) equal to 5.78.

Both the AM and PM peak period calibration and GEH plots demonstrates that the model is well calibrated to the survey data. Table 2-10 provides a summary of the GEH metrics of the modelled volumes versus observed flows.

Table 2-10 Peak Hour Modelled Versus Observed Flow Comparisons

Time Period	Base Case Model		
	Within 5 GEH	Within 10 GEH	Exceeds 10 GEH
AM Peak	100%	100%	0%
PM Peak	99%	100%	0%

The model convergence statistics are provided in Appendix C. The statistics show that the model converges within 5 and 6 iterations and has a simulation convergence value of 0.0010 and 0.0061 for the 2016 AM and PM peak periods respectively.

The results presented in Table 2-10 and Appendices A, B and C confirm that the Base Case Model calibrates well with the observed traffic volumes.

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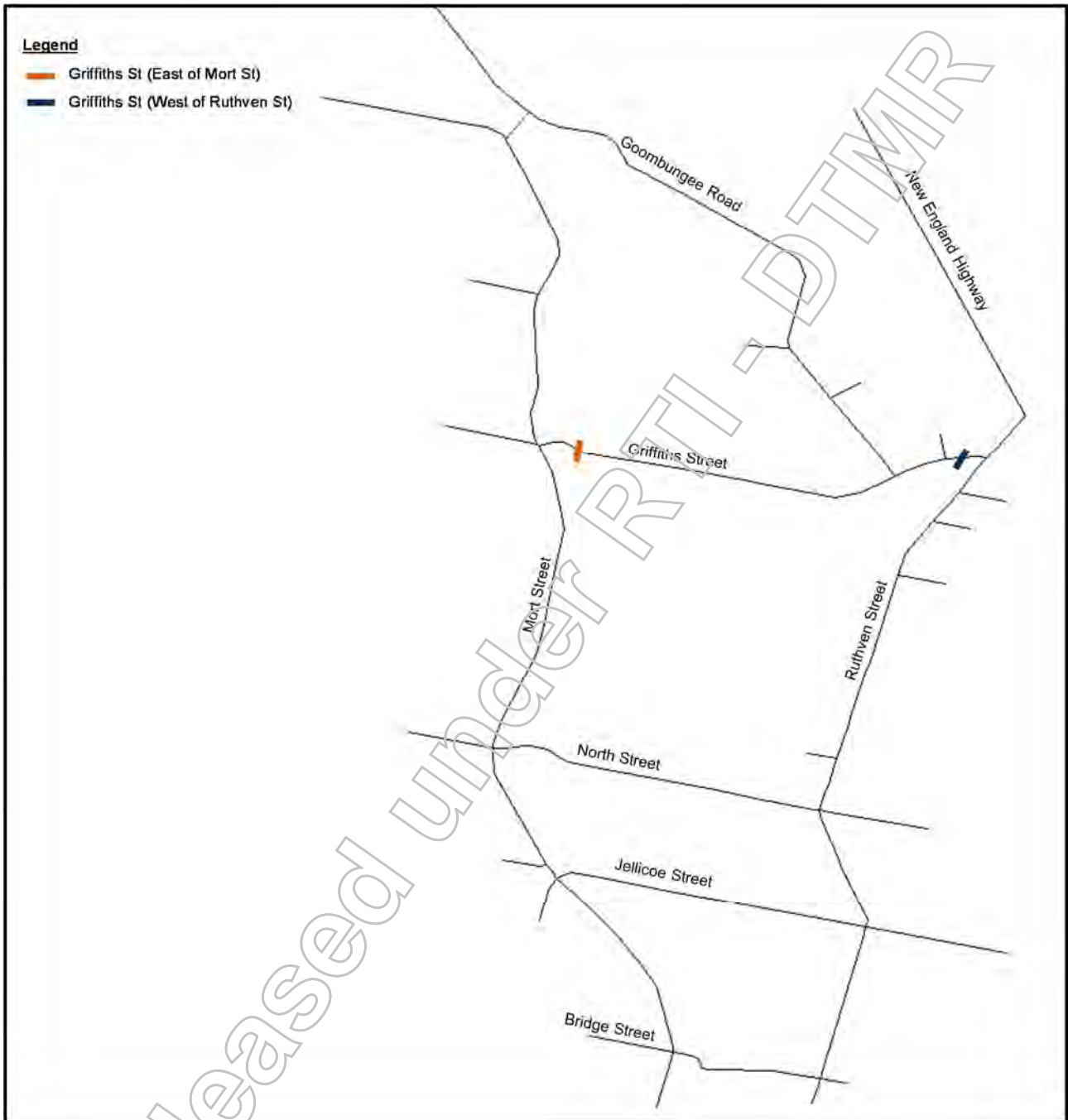
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2.5.2 Select Links

To assess the volumes along Griffiths Street, select link analysis has been completed at the two sites along Griffiths Street as shown below in Figure 2-10. Figures 2-11 and 2-12 provide select link analysis plots.

Figure 2-10 Select Link Locations



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3 Microsimulation Modelling

3.1 Network Development

3.1.1 Network Extent

A Paramics model has been prepared to assess the operation of a single study intersection, the Griffiths Street/Mort Street/Hogg Street intersection. The existing intersection is illustrated on Figure 3-1.

Figure 3-1 Griffiths Street/Mort Street/Hogg Street Intersection



An at grade rail crossing is located approximately 40m east of the Griffiths Street/Mort Street/Hogg Street intersection. The rail line has relatively infrequently rail movements, with around 10-20 movements per day, however the slow moving freight trains results in long boom gate closures which have significant follow on impacts on the operation of the study intersection.

The Paramics model scope therefore includes the Griffiths Street/Mort Street/Hogg Street intersection and the adjacent rail-crossing. No other major intersections or other infrastructure is located in close proximity to the subject intersection and the Paramics network has been extended as far as practical to include queue storage on the intersection approaches.

The Paramics model network extents, for the base model, are as illustrated on Figure 3-2.

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3.2.1 Road Network

The original network coding was completed according to Nearmap, consistent with aerials dated 21 August 2016, to reflect baseline physical parameters such as alignment and stop line placement. Link data has been provided consistent with the categories files outlined in the RTA's "Paramics Microsimulation Modelling RTA Manual", in consideration of the existing link speed and road hierarchy.

3.2.2 Vehicles

Vehicle data has been provided consistent with the vehicle files outlined in the RTA's "Paramics Microsimulation Modelling RTA Manual", with modifications to match observed heavy and light vehicle proportions.

3.2.3 Rail Operations

The rail line is included as a high speed highway, with rail movements represented by scheduled public transport consistent with the timing identified from video capture of the intersection. Trains are visually represented by a custom built vehicle. It is however noted that the operation of the rail line and its impact on the subject intersection is controlled by the observed duration of boom gate closures not the physical passing of the vehicle. The existing intersection and rail crossing closures are described by some relatively simplistic coding and the rail closure for the 2016 base year scenario is described by the average closure time for a northbound and a southbound train movement. The more complex models are modelled with trains running in a single direction to allow coordination with the adjacent signals (to eliminate a coding issued that arose in the software). This is also adopted for the 2031 existing layout to allow direct comparison of the intersection operation.

The modelled boom gate closure times have been based on the average of the observed boom gate closure times as summarised in Table 3-1.

Table 3-1 Rail Movements

Time of Train	North/South	Observed Boom Gate Closure Time (seconds)	Adopted 2016 Boom Gate Closure Time (seconds)	Adopted 2031 Boom Gate Closure Time (seconds)
7:35	Southbound	150	150	180*
7:41	Northbound	210	210	
16:26	Southbound	140	160	125*
17:11	Southbound	75	75	
17:15	No train	160	160	

*30s has been added to signalised options

It should be noted that the boom gate closure has been extended for the traffic signal options to account for a delay in the signal phase change over when the boom gate is triggered. This occurs as result of limitation within the Paramics coding which allows the intersection signal cycle to finish before the traffic signal reacts to the boom gate closure (i.e. all phases will run for a minimum time before the all red time at the boom gate closure). As a result, vehicular traffic at the Griffiths Street/Mort Street/Hogg Street intersection has reduced wait time as traffic will be continuing until the signal cycle runs through the last phase.

As a countermeasure, the boom gate time is extended. The required extension of the boom gate time varies depending on when in the signal cycle the boom gate is triggered. Base on visual review, and the average phase times, a 30s extension is considered reasonable.

It is further noted that intersection movements not crossing the rail line would be permitted when the boom gate is closed. The traffic signal set up in the Paramics model has not reliably allowed these movements and it is noted that the intersection operation during rail movements overstate the delay to some movements.

3.3 Configuration

An AM and a PM peak model has been prepared for each traffic volume scenario. Each model is configured with a three hour duration, including a one hour pre-load and post-load, as detailed in Table 3-2:

Table 3-2 Configuration

Period	AM Peak	PM Peak
Pre Load	6:45 - 7:45am	3:30 – 4:30pm
Peak Period	7:45 - 8:45am	4:30 – 5:30pm
Post Load	8:45 - 9:45am	5:30 – 6:30pm

The relevant peak hour periods have been identified from 2016 traffic counts.

3.3.2 Profile

The PARAMICS profile was identified from the recent intersection counts which identified vehicle proportions as outlined in Table 3-3.

Table 3-3 Profile

Model Period	Demand Factor (% of peak hour)	Period Profile
7:00 AM		0%
7:00 AM		0%
7:15 AM	36%	50%
7:30 AM		50%
7:45 AM		28%
8:00 AM		24%
8:15 AM	100%	26%
8:30 AM		23%
8:45 AM		60%
9:00 AM		40%
9:15 AM	30%	0%
9:30 AM		0%
3:45 PM		0%
4:00 PM		0%
4:15 PM	50%	51%
4:30 PM		49%
4:45 PM		26%
5:00 PM		24%
5:15 PM	100%	23%
5:30 PM		28%
5:45 PM		49%
6:00 PM		51%
6:15 PM	39%	0%
6:30 PM		0%

The preload and postload profile represent the traffic volume in the half an hour period immediately adjacent to the peak hour.

3.4 Matrix Development

The Paramics matrix is a simple four by four matrix, with each zone representing one intersection leg. 2016 base model volumes are simply extracted from the surveyed intersection movements.

2031 future year matrices are based on the SATURN intersection turn volumes. These have been converted from equivalent private car units (pcus) to vehicles based on the 2016 traffic survey proportions at the Griffiths Street/Mort Street/Hogg Street.

3.5 Model Calibration

The input volumes exactly match the observed traffic volumes so there is no need to complete calibration to traffic counts in the base year model. The modelled intersection queue behaviour has been compared to video surveys of the existing intersection to ensure that the base model accurately reflects the current operation. The queue data and model data is detailed in Table 3-4.

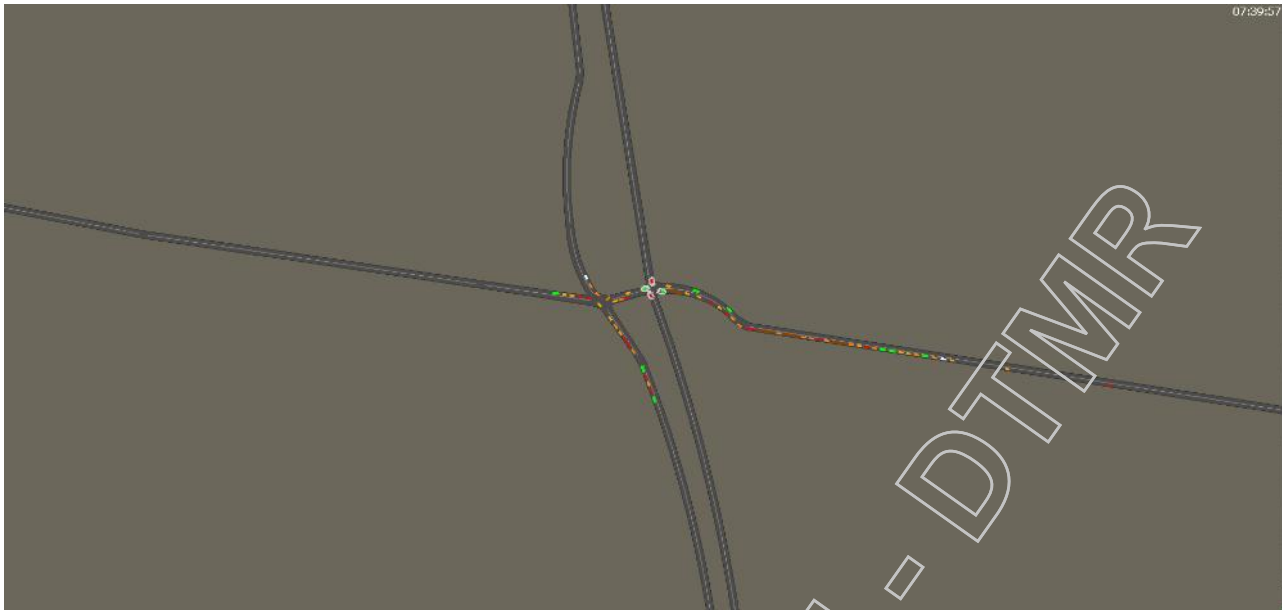
Table 3-4 2016 Base Year Paramics Model Calibration - Queues & Delay

Scenario	Period	Max Queue (vehicles)				Rail Operation and Delay
		Mort Street	Griffiths Street	Mort Street	Hogg Street	
		North	East	South	West	
2016 AM Traffic Survey	7:30 - 7:45	5	30+	4	10	▪ Boom gate closure at 7:35
	7:45 - 8:00	0	30+	0	1	▪ Intersection does not clear between boom gate closures
	8:00 - 8:15	0	6	0	1	▪ Boom gate closure at 7:41
	8:15 - 8:30	0	6	1	1	▪ Intersection clearing at 8:03
	8:30 - 8:45	0	8	1	1	
	8:45 - 9:00	0	8	0	1	
2016 PM Traffic Survey	16:15 - 16:30	0	15	7	7	▪ Boom gate closure at 16:26
	16:30 - 16:45	0	4	1	5	▪ Intersection clearing at 16:30
	16:45 - 17:00	0	5	0	4	▪ Boom gate closure at 17:11
	17:00 - 17:15	0	11	6	6	▪ Intersection clearing at 17:14
	17:15 - 17:30	0	20	50	20	▪ Boom gate closure at 17:15
	17:30 - 17:45	0	7	0	2	▪ Intersection clearing at 17:20
2016 AM Base Case	7:30 - 7:45	3	40	13	5	▪ Boom gate closure at 7:36
	7:45 - 8:00	0	30	0	2	▪ Intersection does not clear between boom gate closures
	8:00 - 8:15	0	4	1	2	▪ Boom gate closure at 7:42
	8:15 - 8:30	0	7	2	1	▪ Intersection clearing at 7:52
	8:30 - 8:45	0	3	0	2	
	8:45 - 9:00	0	7	0	1	
2016 PM Base Case	16:15 - 16:30	0	9	17	10	▪ Boom gate closure at 16:26
	16:30 - 16:45	0	19	5	11	▪ Intersection clearing at 16:33
	16:45 - 17:00	0	2	3	4	▪ Boom gate closure at 17:11
	17:00 - 17:15	0	5	8	4	▪ Intersection does not clear between boom gate closures
	17:15 - 17:30	5	19	18	10	▪ Boom gate closure at 17:15
	17:30 - 17:45	0	2	3	2	▪ Intersection clearing at 17:25

At 2016, the existing intersection operates well with limited delay outside of rail operations. The lengthy closure of boom gates creates significant delay during peak hour operation. At these times intersection queues are excessive. The build up of traffic creates residual delays post boom gate closure.

In the AM peak the queues are most significant on the eastern approach with queues over 30 vehicles long on Griffiths Street. These queues take around 20 minutes to clear. The base case model operation replicates the queue build up accurately, however the intersection clears in a shorter time (around 10 minutes) and the model overestimates the capacity of the existing intersection to some degree. Figure 3-3 indicates the peak queuing patterns just after the boom gate opening.

Figure 3-3 2016 AM Peak Operation– Existing Layout (Rail Impacted)



Conversely, in the PM peak, the model underestimates the intersection capacity to some extent. Queues in this time period are most significant on the southern and eastern approaches. The model shows a similar queueing pattern however queues are somewhat shorter than observed. In contrast, the intersection clears in a shorter time than the traffic survey observation. The recorded delay in the PM peak is around 10minutes, compared to the modelled 15minutes. Figure 3-4 shows the queueing patterns in the PM peak during a rail crossing closure.

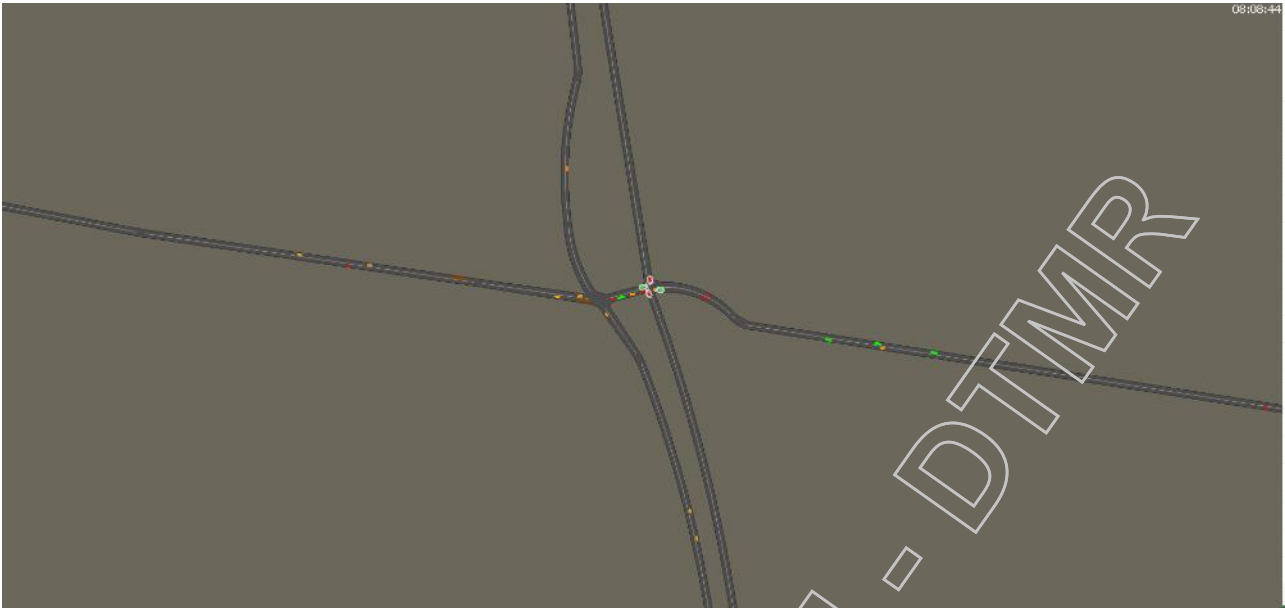
Figure 3-4 2016 PM Peak Operation– Existing Layout (Rail Impacted)



The model is considered to reasonably replicate the intersection operations and queueing patterns when operations across the AM and PM peaks are considered. The variations appear to relate to driver behaviour and gap acceptance parameters during times of heavy congestion. From experience, models often show some variation when replicating over-capacity conditions where driver behaviour is less predictable. The above variations are therefore considered reasonable but will be considered in the assessment of intersection operation.

The model closely replicates the intersection operation for the majority of the peak period and queues and delay outside of rail operations are a very good fit to the video survey observations. Figure 3-5 shows the typical operation when unaffected by rail movements.

Figure 3-5 2016 AM Peak Operation– Existing Layout (Typical Operation)



3.6 Network Operational Assessment

3.6.1 Existing Layout

As detailed in the model calibration section above, the existing priority intersection operates well when unaffected by rail movements. However, the traffic build-up takes a long time to clear after the boom gates opening following a closure. The most affected movements are the lower priority movements that operate in a give way arrangement. With increasing traffic in future years, it is anticipated that natural gaps in traffic will be shorter resulting in longer delays and more extensive queues.

The model has been used to test the future year operation of the existing intersection to identify a baseline “Do Nothing” scenario. The 2031 design year intersection operation is detailed in Table 3-5.

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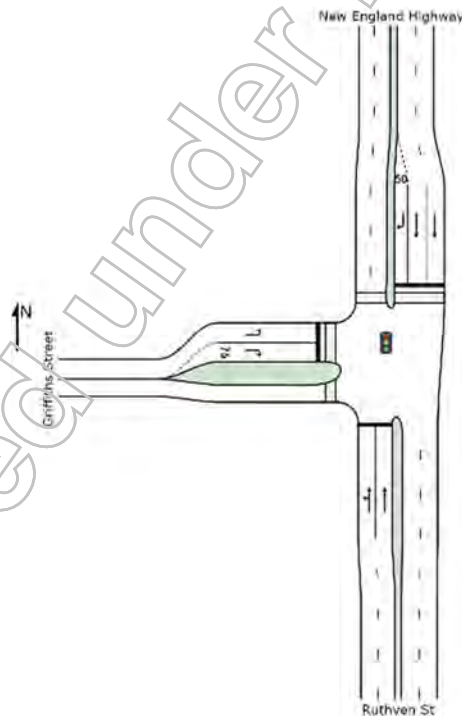
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4.6.2 Existing Layout

The existing layout is shown on Figure 4-7. The intersection footprint is constrained by a rail line overpass which comprised two separate bridge structures, as well as existing development on the north western corner. It should be noted that the intersection provides a channalised right turn from Griffiths Street into a commercial development on the northern side. This access located immediately west of the intersection and Griffiths Street therefore provides two departure lanes in the westbound direction. As the central lane is provided for access purposes, and does not provide additional capacity for other movements, it has not been included in the SIDRA analysis.

Figure 4-7 New England Highway/Griffith Street (Existing Layout) – SIDRA Layout



In terms of DOS, the existing intersection layout has a maximum capacity at 0.90. The SIDRA analysis results are summarised in Table 4-7. Detailed results are included at Appendix F for reference.

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APPENDIX A
2031 MODELLED AND OBSERVED
VOLUMES

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APPENDIX B
2031 GEH PLOTS

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APPENDIX C
CALIBRATION STATISTICS

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2016 AM Base Model (Griffiths_V11B_AM_V5B.UFS)

Summary of the Main Convergence Statistics

Number of Ass-Sim Loops 5
 Assignment Delta (%) 0.00000
 # of (Final) Ass Iterations 1
 Total # of FW Ass Iterations 1
 Simulation Convergence 0.0010
 Number of Sim Iterations 6

% of OK Flows < 1.00% 100.00
 ... and previous 3 loops: 100.00
 100.00
 100.00

Mean GEH Flow Statistic 0.00000
 Mean Abs Flow Difference % 0.000
 Rel Mean Abs Flow Diff. % 0.000
 Rel Mean Standard Dev. % 0.000
 % of OK Turn Delays 100.00
 Mean Abs Diff in Ass/Sim Del 0.000
 Relative to mean delay:(%) 0.00

Convergence Gap (%) 0.00000
 Variational Inequality (%) 0.000

Change in ASS-HRS (%) 0.000
 Loop n - 1 0.000
 Loop n - 2 -0.001
 Loop n - 3 0.000

Change in PCU-KMS (%) 0.000
 Loop n - 1 0.000
 Loop n - 2 0.000
 Loop n - 3 -0.001

No of calls to MAXQCT 0
 No of calls to MAXDTP 0
 Delta (%) on the .UFC file 0.00000

Total CPU time (seconds) 0.6

Network File: 2016_AM_Base\Griffiths_V11B_AM_V5B.UFS

ASSIGNMENT/SIMULATION LOOP SUMMARY STATISTICS

Table 1: Convergence Statistics by Sub-Model and Loops

Ass. - DELTA FUNCTION (%) / NUMBER OF ITERATIONS
 Sim. - FINAL AVER ABS CHANGE IN OUT CFP (PCU/HR) / NUMBER OF ITERATIONS
 A/S Step - Step Length used on Ass/Sim Loop / Simulation Iterations
 %FLOWS - LINK FLOWS DIFFERING BY < 1% BETWEEN ASS-SIM LOOPS
 %DELAYS - TURN DELAYS DIFFERING BY < 1% BETWEEN ASSIGNMENT & SIMULATION
 %V.I. - VARIATIONAL INEQUALITY - SHOULD BE > 0
 %GAP - WARDROP EQUILIBRIUM GAP FUNCTION POST SIMULATION

LOOP	Ass.	Sim.	A/S Step	%FLOWS	%DELAYS	%V.I.	%GAP
1	0.0000/ 1	0.002/12	1.000/ 1	53.1	0.00000		
2	0.0000/ 1	0.001/ 6	1.000/ 1	100.0	100.0	0.00000	0.00000
3	0.0000/ 1	0.001/ 7	1.000/ 1	100.0	100.0	0.00000	0.00000
4	0.0000/ 1	0.001/ 7	1.000/ 1	100.0	100.0	0.00000	0.00000
5	0.0000/ 1	0.001/ 6	1.000/ 1	100.0	100.0	0.00000	0.00000

LOOP	Ass.	Sim.	A/S Step	%FLOWS	%DELAYS	%V.I.	%GAP
------	------	------	----------	--------	---------	-------	------

Table 2: Extended Convergence Statistics

ASS-HRS - TOTAL DEMAND*TIME PCU-HR/HR FROM THE BUFFER+SIMULATION NETWORKS
CHANGE - % CHANGE IN ASS-HRS FROM THE PREVIOUS LOOP
SIM-HRS - TOTAL TIME PCU-HR/HR FROM THE SIMULATION (WITHIN TIME PERIOD ONLY)
SIM-KMS - TOTAL DISTANCE PCU-KM/HR FROM THE SIMULATION (WITHIN TIME PERIOD ONLY)
GEHBAR - MEAN GEH STATISTIC, LINK DEMAND FLOWS
AAD - AVERAGE ABSOLUTE DIFFERENCE IN LINK FLOWS PCU/HR
RAAD - % RELATIVE AVERAGE ABSOLUTE DIFFERENCE IN LINK FLOWS
XMSD - % RELATIVE STANDARD DEVIATION IN LINK FLOWS
SAD - MEAN ABS. DIFF. IN ASS/SIM DELAYS (SECONDS)
RSAD - % RELATIVE MEAN ABS. DIFF. IN ASS/SIM DELAYS

LOOP	ASS-HRS	CHANGE	SIM-HRS	SIM-KMS	GEHBAR	AAD	RAAD	XMSD	SAD	RSAD
1	670.6	638.7	19822.8		18.2	71.5				
2	670.6	0.000	638.7	19822.6	0.000	0.00	0.00	0.000	0.00	0.00
3	670.6	-0.001	638.7	19822.5	0.000	0.00	0.00	0.000	0.00	0.00
4	670.6	0.000	638.7	19822.4	0.000	0.00	0.00	0.000	0.00	0.00
5	670.6	0.000	638.7	19822.4	0.000	0.00	0.00	0.000	0.00	0.00

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2016 PM Base Model (Griffiths_V11B_PM_V5B.UFS)

Summary of the Main Convergence Statistics

Number of Ass-Sim Loops	5
Assignment Delta (%)	0.00000
# of (Final) Ass Iterations	1
Total # of FW Ass Iterations	1
Simulation Convergence	0.0061
Number of Sim Iterations	5
% of OK Flows < 1.00%	100.00
... and previous 3 loops:	100.00
	100.00
	100.00
Mean GEH Flow Statistic	0.00000
Mean Abs Flow Difference %	0.000
Rel Mean Abs Flow Diff. %	0.000
Rel Mean Standard Dev. %	0.000
% of OK Turn Delays	100.00
Mean Abs Diff in Ass/Sim Del	0.000
Relative to mean delay:(%)	0.00
Convergence Gap (%)	0.00000
Variational Inequality (%)	0.000
Change in ASS-HRS (%)	0.000
Loop n - 1	0.000
Loop n - 2	-0.001
Loop n - 3	0.000
Change in PCU-KMS (%)	0.000
Loop n - 1	0.000
Loop n - 2	0.000
Loop n - 3	-0.001
No of calls to MAXQCT	0
No of calls to MAXDTP	0
Delta (%) on the .UFC file	0.00000
Total CPU time (seconds)	0.6

Network File: 2016_PM\Griffiths_V11B_PM_V5B.UFS

ASSIGNMENT/SIMULATION LOOP SUMMARY STATISTICS

Table 1: Convergence Statistics by Sub-Model and Loops

Ass. - DELTA FUNCTION (%) / NUMBER OF ITERATIONS
 Sim. - FINAL AVER ABS CHANGE IN OUT CFP (PCU/HR) / NUMBER OF ITERATIONS
 A/S Step - Step Length used on Ass/Sim Loop / Simulation Iterations
 %FLOWS - LINK FLOWS DIFFERING BY < 1% BETWEEN ASS-SIM LOOPS
 %DELAYS - TURN DELAYS DIFFERING BY < 1% BETWEEN ASSIGNMENT & SIMULATION
 %V.I. - VARIATIONAL INEQUALITY - SHOULD BE > 0
 %GAP - WARDROP EQUILIBRIUM GAP FUNCTION POST SIMULATION

LOOP	Ass.	Sim.	A/S Step	%FLOWS	%DELAYS	%V.I.	%GAP
1	0.0000/ 1	0.007/12	1.000/ 1		52.4	0.00000	
2	0.0000/ 1	0.006/ 6	1.000/ 1	100.0	100.0	0.00000	0.00000
3	0.0000/ 1	0.006/ 7	1.000/ 1	100.0	100.0	0.00000	0.00000
4	0.0000/ 1	0.006/ 7	1.000/ 1	100.0	100.0	0.00000	0.00000
5	0.0000/ 1	0.006/ 5	1.000/ 1	100.0	100.0	0.00000	0.00000

LOOP	Ass.	Sim.	A/S Step	%FLOWS	%DELAYS	%V.I.	%GAP
------	------	------	----------	--------	---------	-------	------

Table 2: Extended Convergence Statistics

ASS-HRS - TOTAL DEMAND*TIME PCU-HR/HR FROM THE BUFFER+SIMULATION NETWORKS
CHANGE - % CHANGE IN ASS-HRS FROM THE PREVIOUS LOOP
SIM-HRS - TOTAL TIME PCU-HR/HR FROM THE SIMULATION (WITHIN TIME PERIOD ONLY)
SIM-KMS - TOTAL DISTANCE PCU-KM/HR FROM THE SIMULATION (WITHIN TIME PERIOD ONLY)
GEHBAR - MEAN GEH STATISTIC, LINK DEMAND FLOWS
AAD - AVERAGE ABSOLUTE DIFFERENCE IN LINK FLOWS PCU/HR
RAAD - % RELATIVE AVERAGE ABSOLUTE DIFFERENCE IN LINK FLOWS
XMSD - % RELATIVE STANDARD DEVIATION IN LINK FLOWS
SAD - MEAN ABS. DIFF. IN ASS/SIM DELAYS (SECONDS)
RSAD - % RELATIVE MEAN ABS. DIFF. IN ASS/SIM DELAYS

LOOP	ASS-HRS	CHANGE	SIM-HRS	SIM-KMS	GEHBAR	AAD	RAAD	XMSD	SAD	RSAD
1	600.7	550.4	17230.2		14.5	63.7				
2	600.7	0.000	550.4	17230.1	0.000	0.00	0.000	0.00	0.00	0.00
3	600.7	-0.001	550.4	17230.0	0.000	0.00	0.000	0.00	0.00	0.00
4	600.7	0.000	550.4	17229.9	0.000	0.00	0.000	0.00	0.00	0.00
5	600.7	0.000	550.4	17229.9	0.000	0.00	0.000	0.00	0.00	0.00

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APPENDIX D
SNAP SHOTS

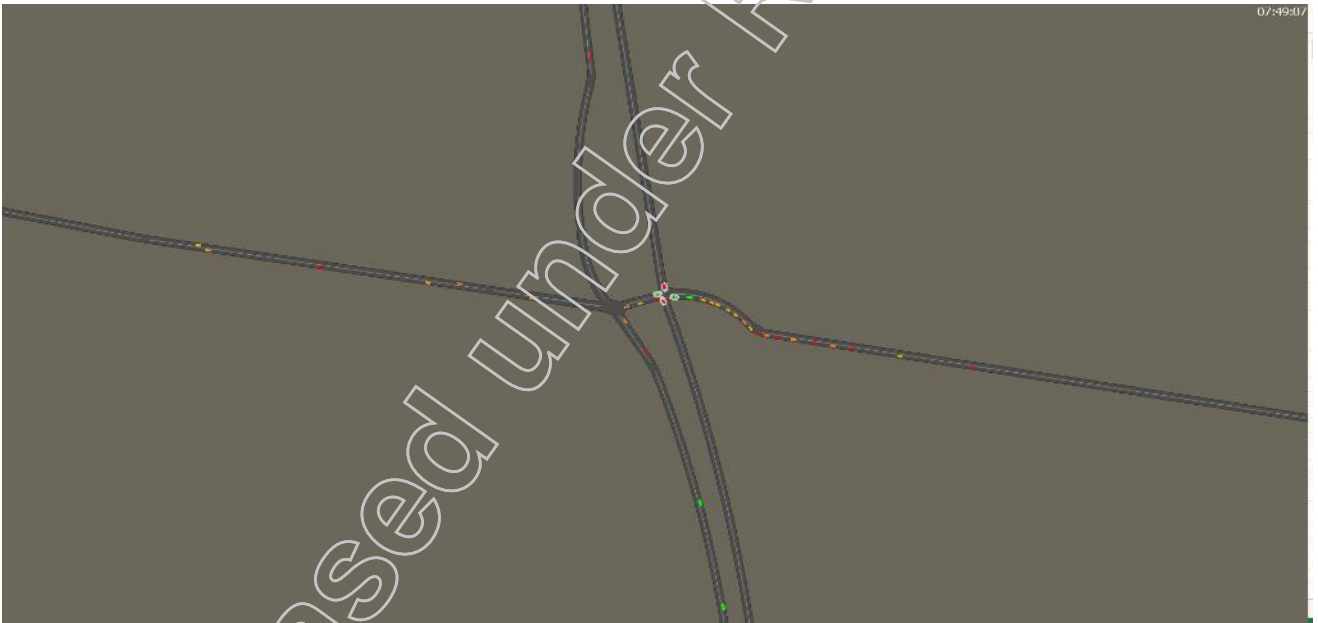
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2016 Base Case – Existing Layout

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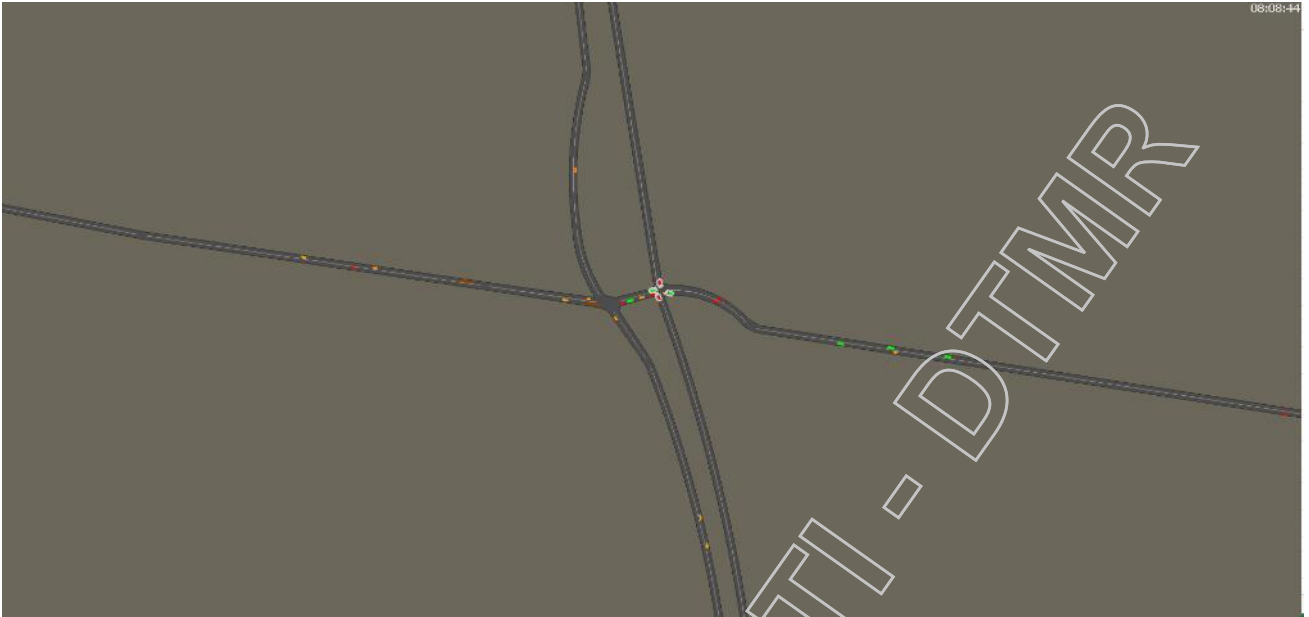


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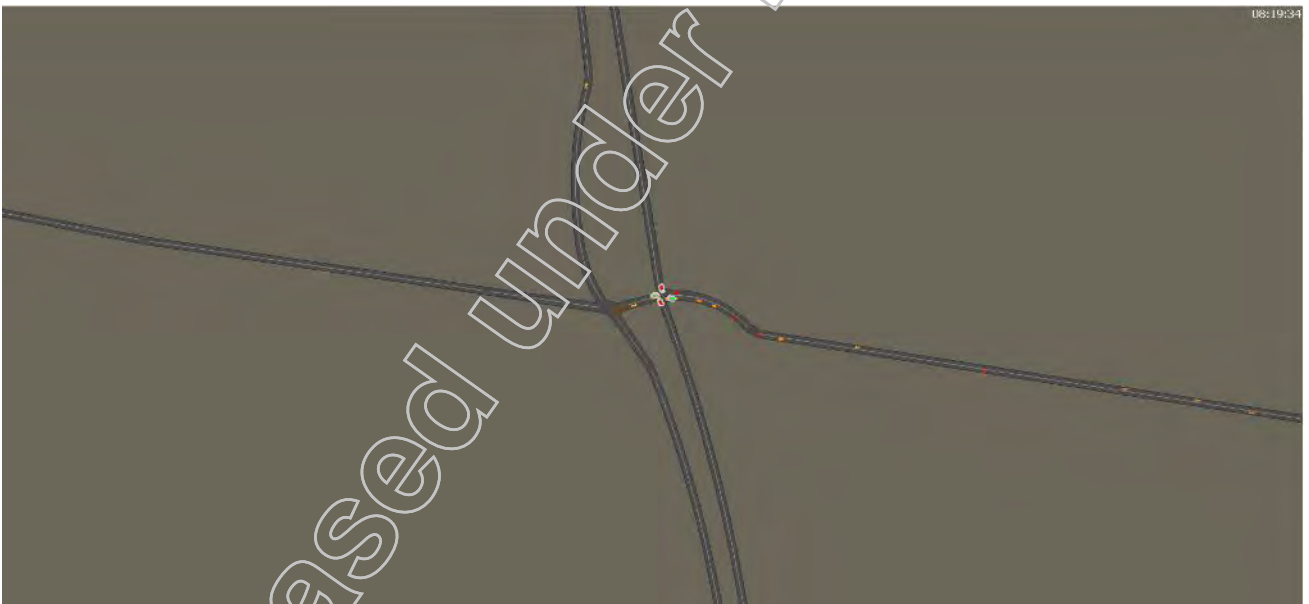


2016 Base Case – Existing Layout

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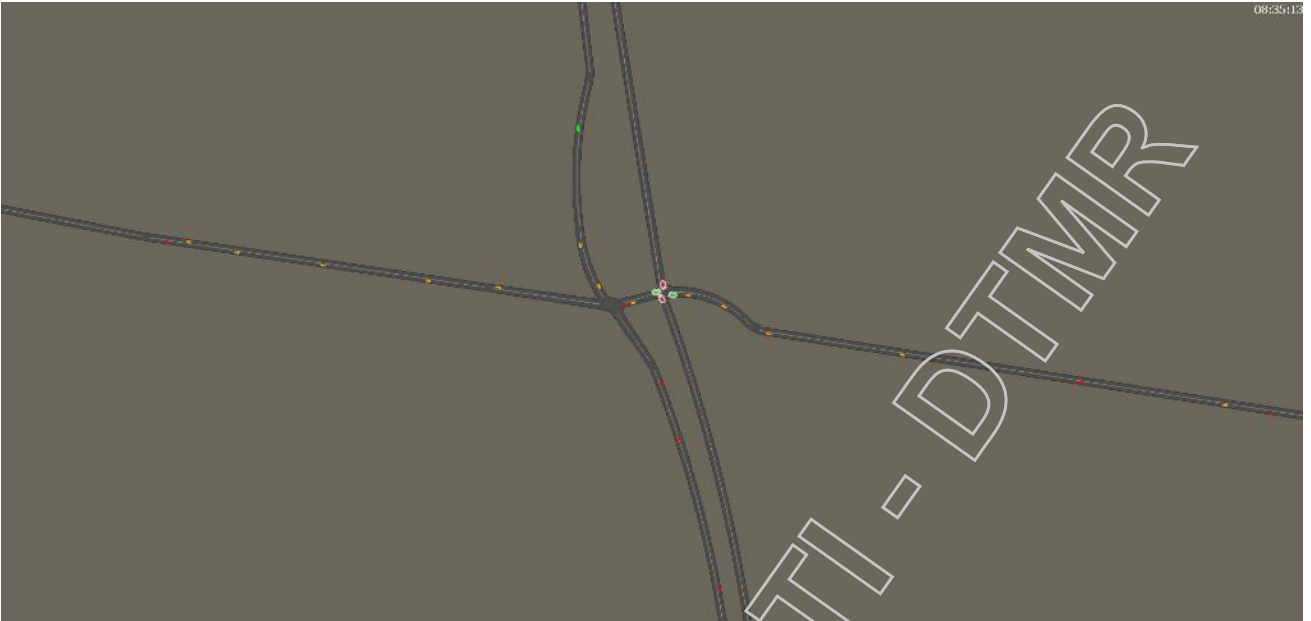


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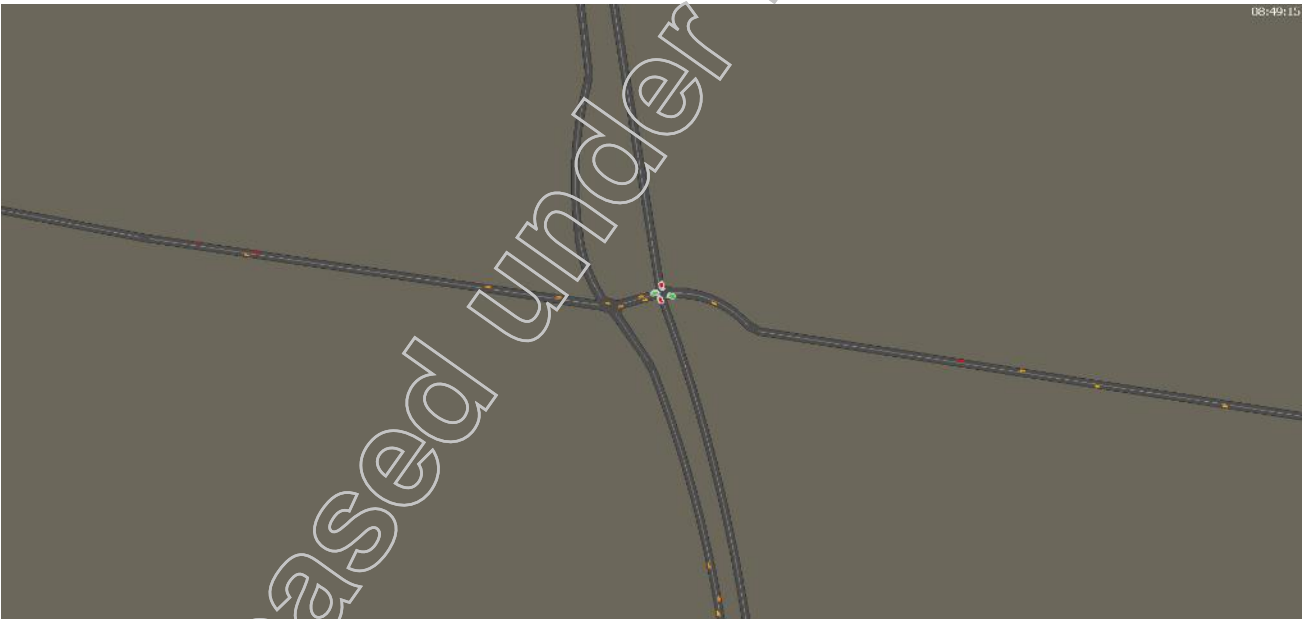


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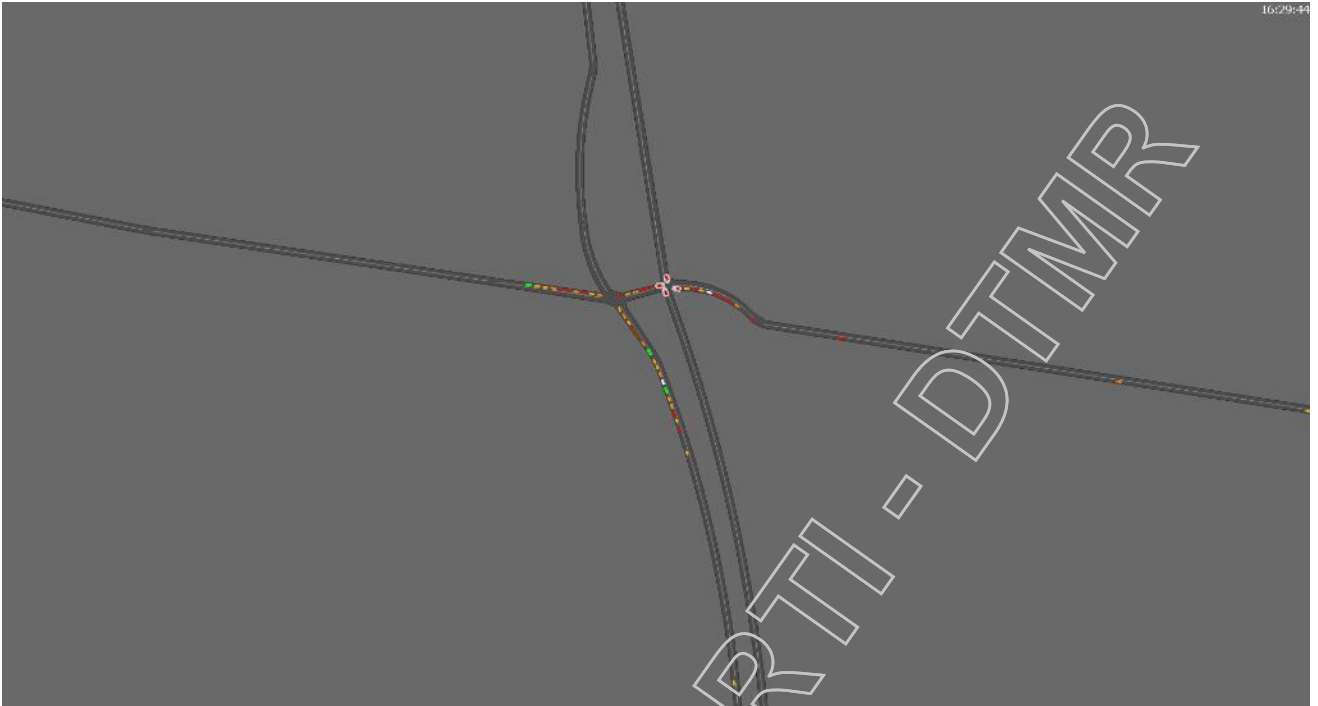


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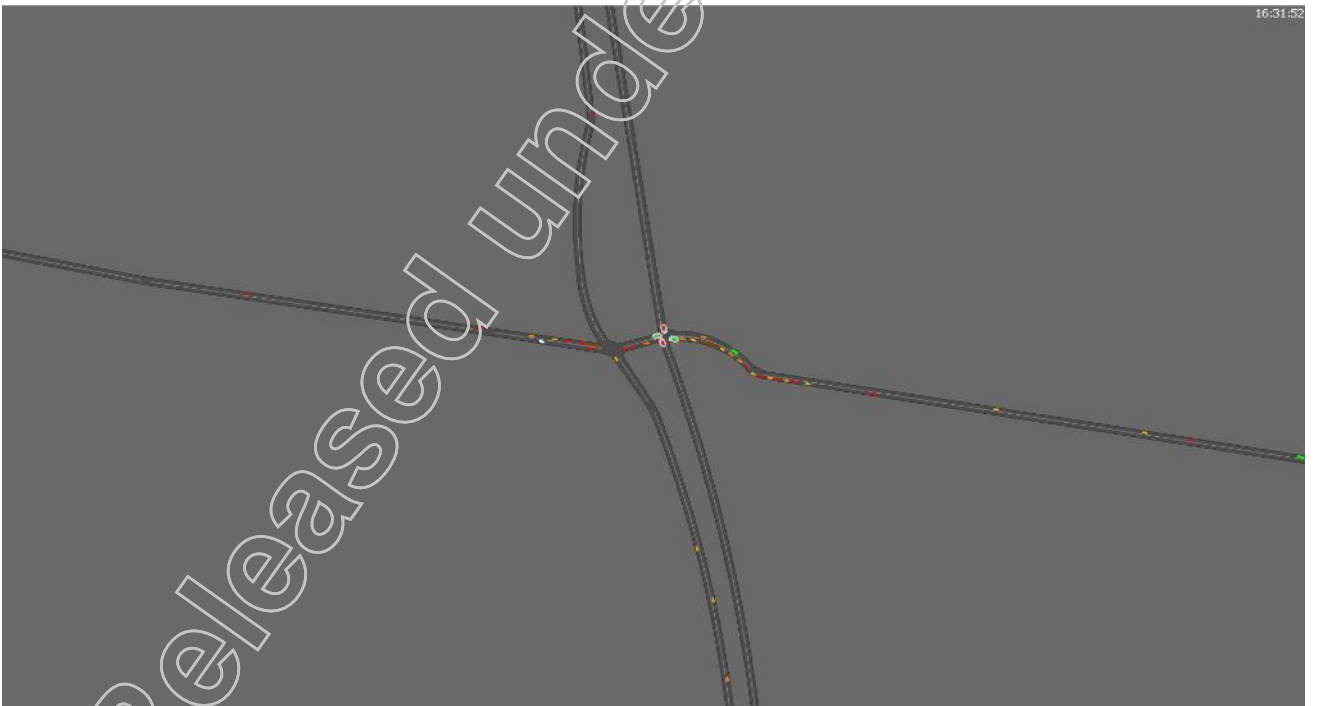


2016 Base Case – Existing Layout

16:15 – 16:30



16:30 – 16:45



2016 Base Case – Existing Layout

16:45 - 17:00



17:00 – 17:15

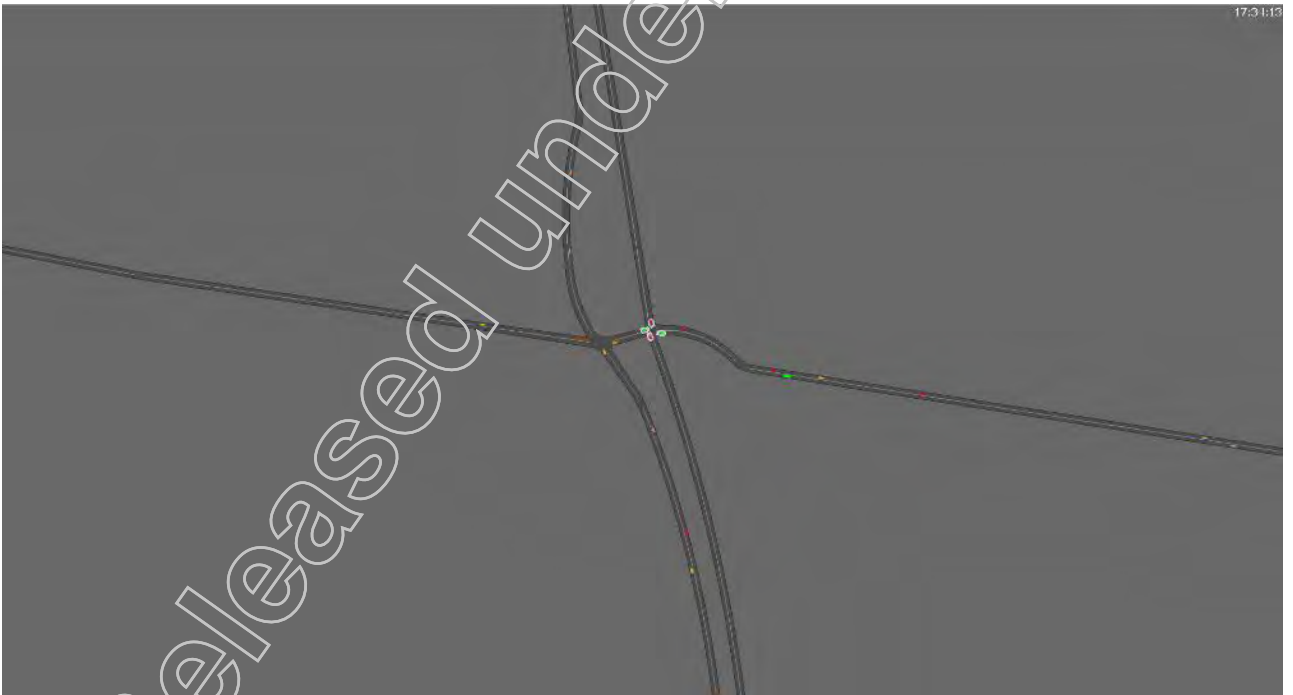


2016 Base Case – Existing Layout

17:15 – 17:30



17:30 – 17:45



Pages 378 through 413 redacted for the following reasons:

Refuse Sch.4 Part 4 s.4(1)(a) Opinion/advice/recommendation for deliberative processes of government

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APPENDIX E
INTERSECTION LAYOUT

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APPENDIX F
SIDRA RESULTS

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APPENDIX I
MORT STREET ROUNDABOUT
PRELIMINARY CONCEPTS

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APPENDIX J
RISK MANAGEMENT PLAN & SAFETY
IN DESIGN REGISTER

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APPENDIX K
COST ESTIMATE SUMMARY

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APPENDIX L

CONCEPT DESIGN DRAWINGS

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Level 6, Springfield Tower, 145 Sinnathamby Boulevard

Springfield Central QLD 4300

Tel: 07 3381 0111 Fax: 07 3470 1241

Web: www.cardno.com.au

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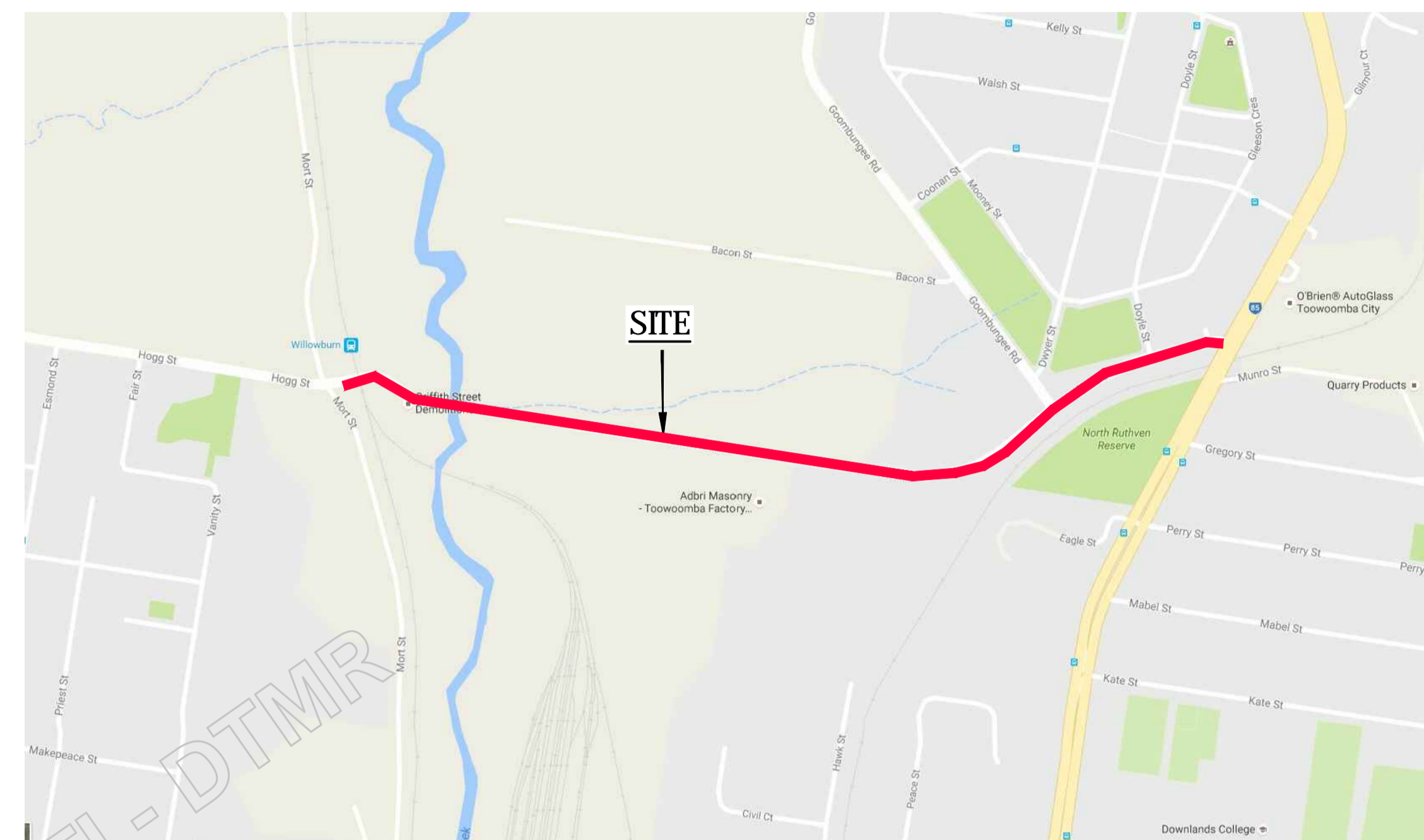
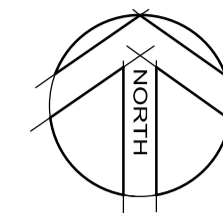
TOOWOOMBA REGIONAL COUNCIL

GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN

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SCHEDULE OF DRAWINGS	
DRAWING No.	DESCRIPTION
CEB06818-CI-9001	COVER SHEET
CEB06818-CI-9002	LOCALITY PLAN GENERAL NOTES AND SCHEDULE OF DRAWINGS
CEB06818-CI-9101	INTERIM DESIGN - OVERALL PLAN SHEET 1
CEB06818-CI-9102	INTERIM DESIGN - OVERALL PLAN SHEET 2
CEB06818-CI-9103	INTERIM DESIGN - DETAIL SHEET 1
CEB06818-CI-9104	INTERIM DESIGN - DETAIL SHEET 2
CEB06818-CI-9105	INTERIM DESIGN - DETAIL SHEET 3
CEB06818-CI-9201	TYPICAL SECTIONS
CEB06818-CI-9202	TYPICAL SECTIONS - INTERIM
CEB06818-CI-9301	LONGITUDINAL SECTIONS SHEET 1
CEB06818-CI-9302	LONGITUDINAL SECTIONS SHEET 1
CEB06818-CI-9401	PUBLIC UTILITY PLAN SHEET 1
CEB06818-CI-9402	PUBLIC UTILITY PLAN SHEET 2
CEB06818-CI-9403	PUBLIC UTILITY PLAN SHEET 3
CEB06818-CI-9501	PAVEMENT DETAILS SHEET 1
CEB06818-CI-9502	PAVEMENT DETAILS SHEET 2
CEB06818-CI-9503	PAVEMENT DETAILS SHEET 3
CEB06818-CI-9903	TURNING PATHS LAYOUT PLAN INTERIM INTERSECTION B-DOUBLE
CEB06818-CI-9904	TURNING PATHS LAYOUT PLAN INTERIM INTERSECTION 19m SEMI
CEB06818-CI-9905	TURNING PATHS LAYOUT PLAN NEW ENGLAND HIGHWAY CAR U-TURN



LOCALITY PLAN
NOT TO SCALE
UBD MAP REF: 256 R:8

ABBREVIATIONS TABLE	
DESCRIPTION	ABBREVIATION
PROPOSED	PR
EXISTING	EX
ELECTRICITY	ELEC
STORMWATER	SWD
WATER	WAT
SEWER	SEW
TELSTRA	TEL
NON DRINKING WATER	NDW
COMMUNICATION	COMMS
STANDARD	STD.
DRAWING	DWG.
TOOWOOMBA REGIONAL COUNCIL	T.R.C
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND	IP.W.E.A.Q.
PROPERTY	RP
BOUNDARY	BDY
DEPARTMENT OF TRANSPORT AND MAIN ROADS	D.T.M.R.
QUEENSLAND URBAN UTILITIES	Q.U.U.

GENERAL NOTES:

- SHOULD SITE WORKS EXPOSE ANY ARCHAEOLOGICAL OR CULTURAL MATERIAL ALL WORKS SHALL CEASE AND OFFICIALS OF THE NATIONAL PARKS AND WILDLIFE, ABORIGINAL LAND COUNCIL AND TOOWOOMBA REGIONAL COUNCIL ARE TO BE NOTIFIED.
- THE CONTRACTOR SHALL ADHERE TO ALL REQUIREMENTS OF THE DEPARTMENT OF ENVIRONMENT AND HERITAGE PROTECTION (D.E.H.P.)
- WHERE IN THIS SET OF DRAWINGS REFERENCE IS MADE TO THE ENGINEER, CONSULTING ENGINEER AND OR COUNCIL ENGINEER IT SHALL MEAN THE SUPERINTENDENT UNDER THE CONTRACT FOR THE WORKS.
- WHERE A DISCREPANCY AND / OR CONFLICT EXISTS BETWEEN THE DRAWING PREPARED BY CARDNO AND ANY STANDARD DRAWING OF THE LOCAL GOVERNMENT AUTHORITY AND / OR GOVERNMENT ORGANISATION THE DETAILS AND / OR INFORMATION ON THE CARDNO DRAWINGS SHALL TAKE PRECEDENCE. ADVISE THE SUPERINTENDENT IMMEDIATELY OF THE DETAILS OF ANY AND ALL CONFLICTS FOUND.
- PRIOR TO COMMENCEMENT OF WORK, FENCE OFF AND CLEARLY DELINEATE ALL AREAS WHERE WORK CANNOT BE CARRIED OUT.
- THE CONTRACTOR IS TO VERIFY LOCATION AND LEVELS OF ALL SERVICES AND TO LIAISE WITH THE LOCAL AND SERVICE AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
- ELECTRICAL AND TELECOMMUNICATION SERVICES CONTRACTOR TO CONFIRM LOCATIONS OF ALL EXISTING SERVICES ON SITE, INCLUDING LIAISON WITH RELEVANT AUTHORITIES.
- THE CONTRACTOR IS TO INFORM TOOWOOMBA REGIONAL COUNCIL AND THE ENGINEER PRIOR TO COMMENCEMENT OF WORK.
- PRIOR TO COMMENCEMENT OF WORK, A SIGN DETAILING THE PROJECT AND CONTAINING THE NAMES AND CONTACT NAMES OF THE DEVELOPER, CONTRACTOR AND PRINCIPAL CONSULTANT SHALL BE ERECTED AND MAINTAINED IN A PROMINENT POSITION AT THE SITE TO THE SATISFACTION OF TOOWOOMBA REGIONAL COUNCIL. THE SIGN SHALL REMAIN IN PLACE UNTIL COMPLETION OF THE CONTRACT.
- LEVELS SHOWN AT ALL INTERFACES ARE TO BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
- ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE APPROVED CONDITIONS OF CONSENT.
- THESE DRAWING ARE TO BE READ IN CONJUNCTION WITH CARDNO ELECTRICAL, LANDSCAPING A TRAFFIC SIGNAL DESIGN PLANS. COMMUNICATIONS WORKS ARE NOT DETAILED AS PART OF THIS PACKAGE AND ARE SHOWN INDICATIVELY..
- ALL DWG.'S LISTED ON DWG. CEB06818-001-CI-1001 ARE TO BE READ AS A WHOLE AND NOT IN ISOLATION.
- ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ABBREVIATION TABLE SHOWN.
- ALL DRAWINGS TO BE READ IN CONJUNCTION WITH PROJECT SPECIFICATION.
- THE CONTRACTOR IS TO ENSURE THAT ALL SURFACE GRADES TO BE A MINIMUM OF 0.5%.
- IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE REPAIR OR REPLACE EXISTING SERVICES DAMAGED DURING THE WORKS.

Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION		HW	NL JJ
1	26/04/2017	ISSUED FOR INFORMATION			

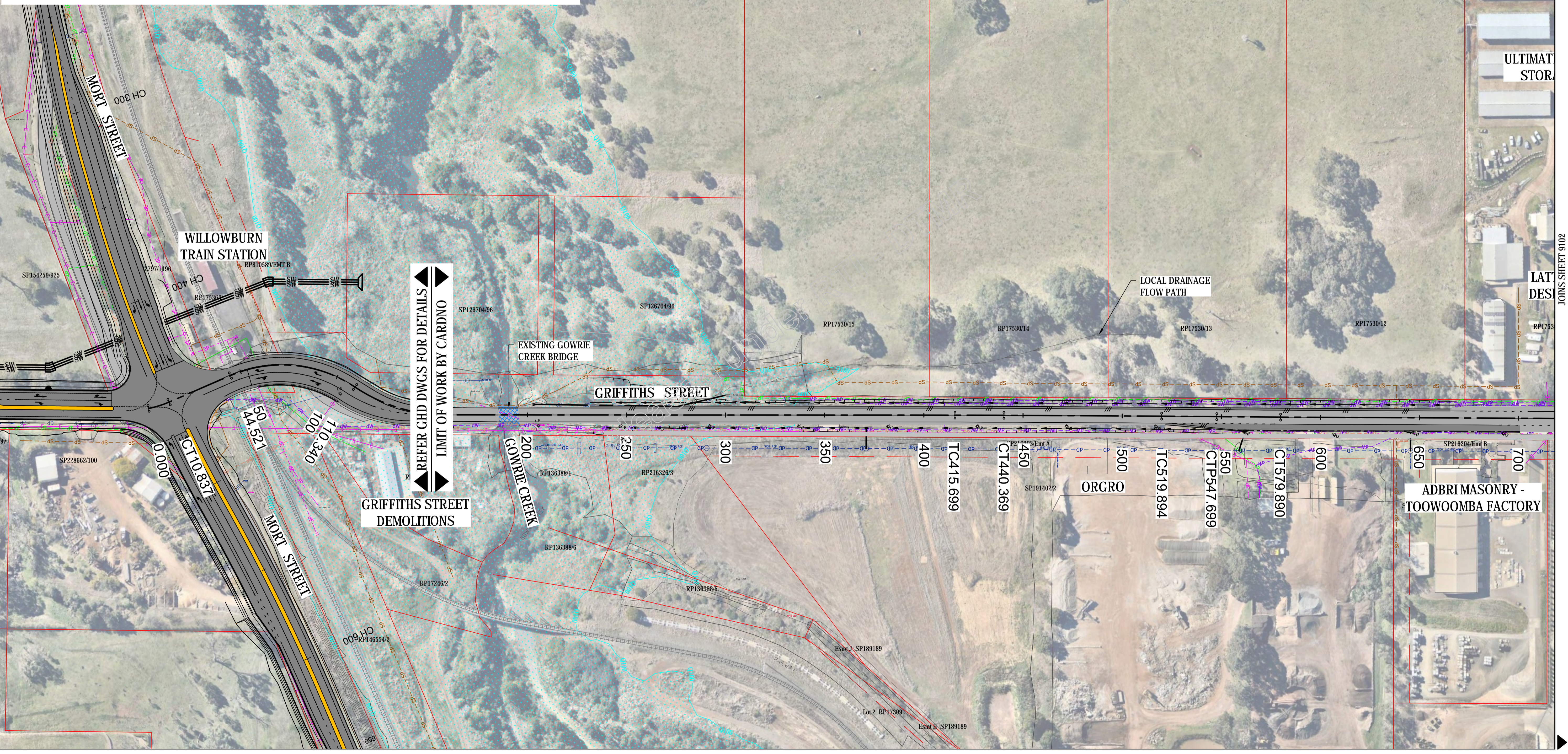
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Springfield Central QLD 4300
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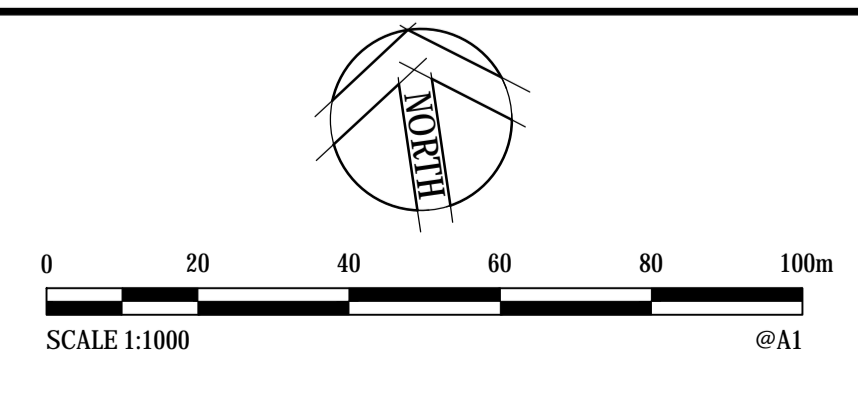
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Date	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Date	8/05/2017	Title	LOCALITY PLAN GENERAL NOTES AND SCHEDULE OF DRAWINGS
Date	21/06/2017		

Status	FOR INFORMATION ONLY			
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Datum	GRID	Scale	Size	
AHD		AS SHOWN	A1	
Drawing Number	CEB06818-CI-9002			Revision
				2

EXISTING LEGEND	PROPOSED LEGEND
EXISTING PROPERTY BOUNDARY	ROAD PAVEMENT
EXISTING EASEMENT BOUNDARY	MEDIAN
EXISTING BOTTOM OF BATTER	SHARED PATH
EXISTING TABLE DRAIN	RESUMPTION BOUNDARY
EXISTING RAILWAY	Q100 FLOOD LEVEL
ELECTRICAL	STORMWATER (GHD)
ELECTRICITY (DBYD)	
TELECOMMUNICATIONS (DBYD)	
STORMWATER DRAINAGE (DBYD)	
WATER MAIN (DBYD)	
GAS (DBYD)	
SEWER (DBYD)	



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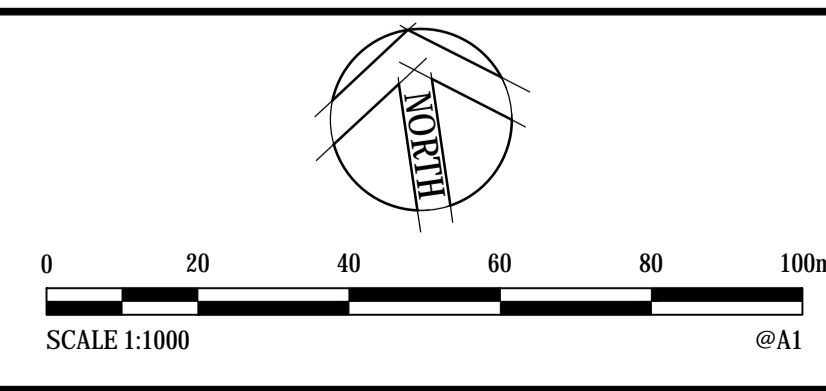
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8/05/2017	TOOWOOMBA REGIONAL COUNCIL
8/05/2017	Project GRIFFITHS STREET PLANNING STUDY
8/05/2017	INTERIM CONCEPT DESIGN
21/06/2017	Title INTERIM DESIGN - OVERALL PLAN
21/06/2017	SHEET 1

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NOTE:
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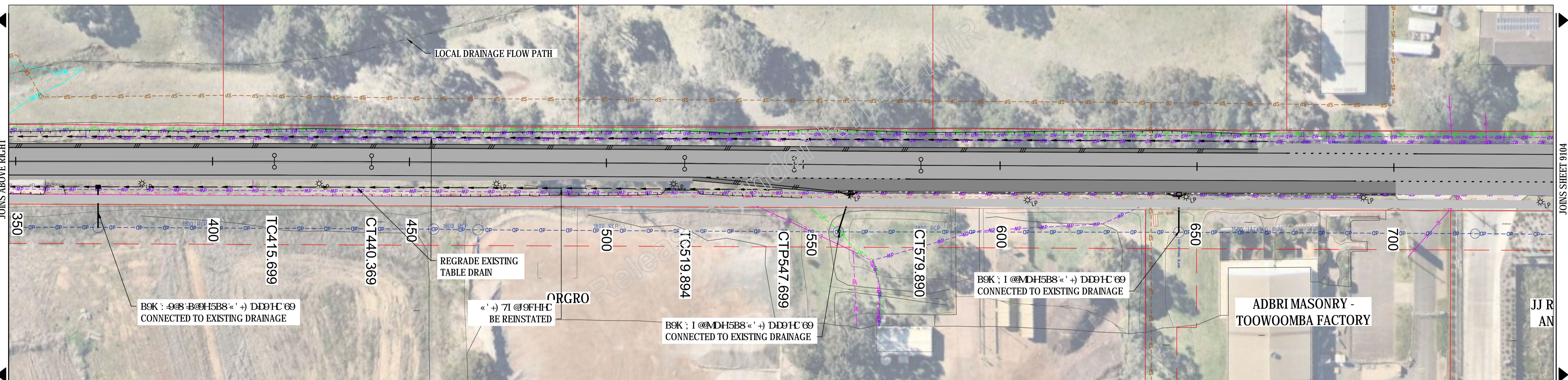
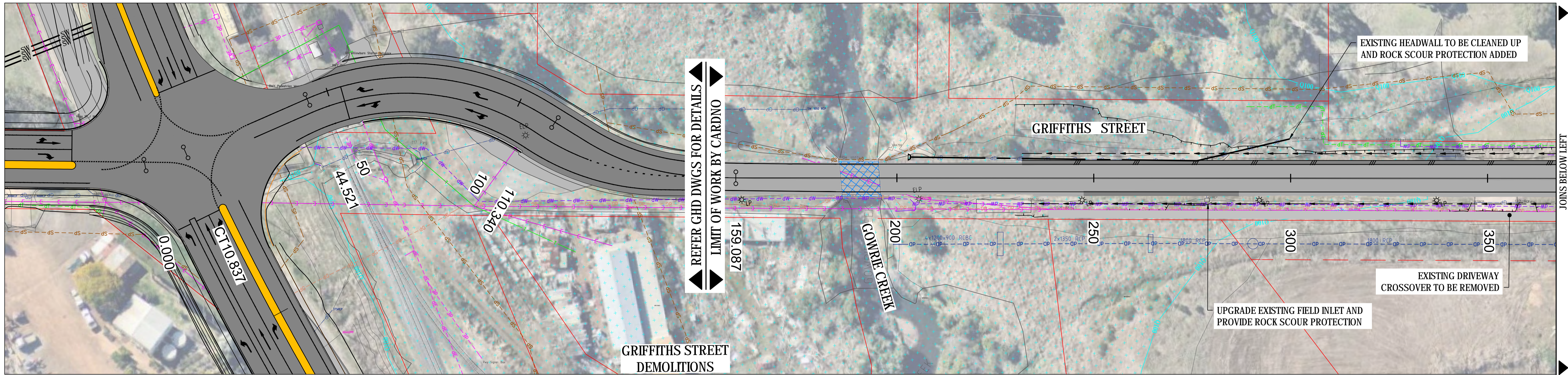
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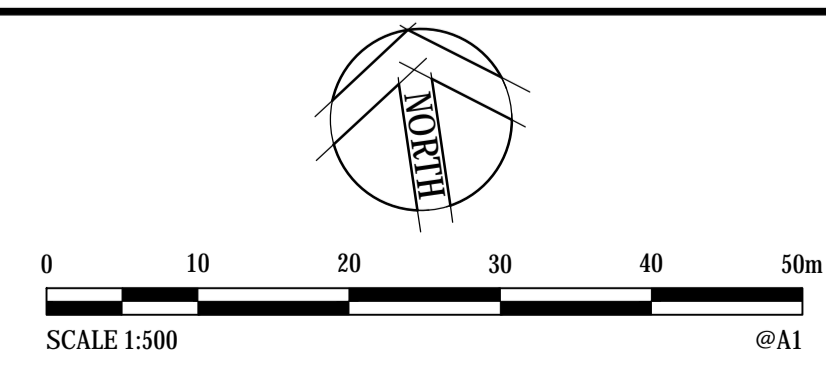
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8/05/2017	GRIFFITHS STREET PLANNING STUDY
Date	Interim Concept Design
8/05/2017	
Date	Title
21/06/2017	INTERIM DESIGN - OVERALL PLAN
	SHEET 2

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CEB06818-CI-9102				2

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EXISTING LEGEND		PROPOSED LEGEND	
EXISTING PROPERTY BOUNDARY		NEW PAVEMENT	
EXISTING EASEMENT BOUNDARY		MEDIAN	
EXISTING BOTTOM OF BATTER		SHARED PATH	
EXISTING TABLE DRAIN		RESUMPTION BOUNDARY	
EXISTING RAILWAY		Q100 FLOOD LEVEL	
ELECTRICAL		STORMWATER (GHD)	
ELECTRICITY (DBYD)			
TELECOMMUNICATIONS (DBYD)			
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WATER MAIN (DBYD)			
GAS (DBYD)			
SEWER (DBYD)			



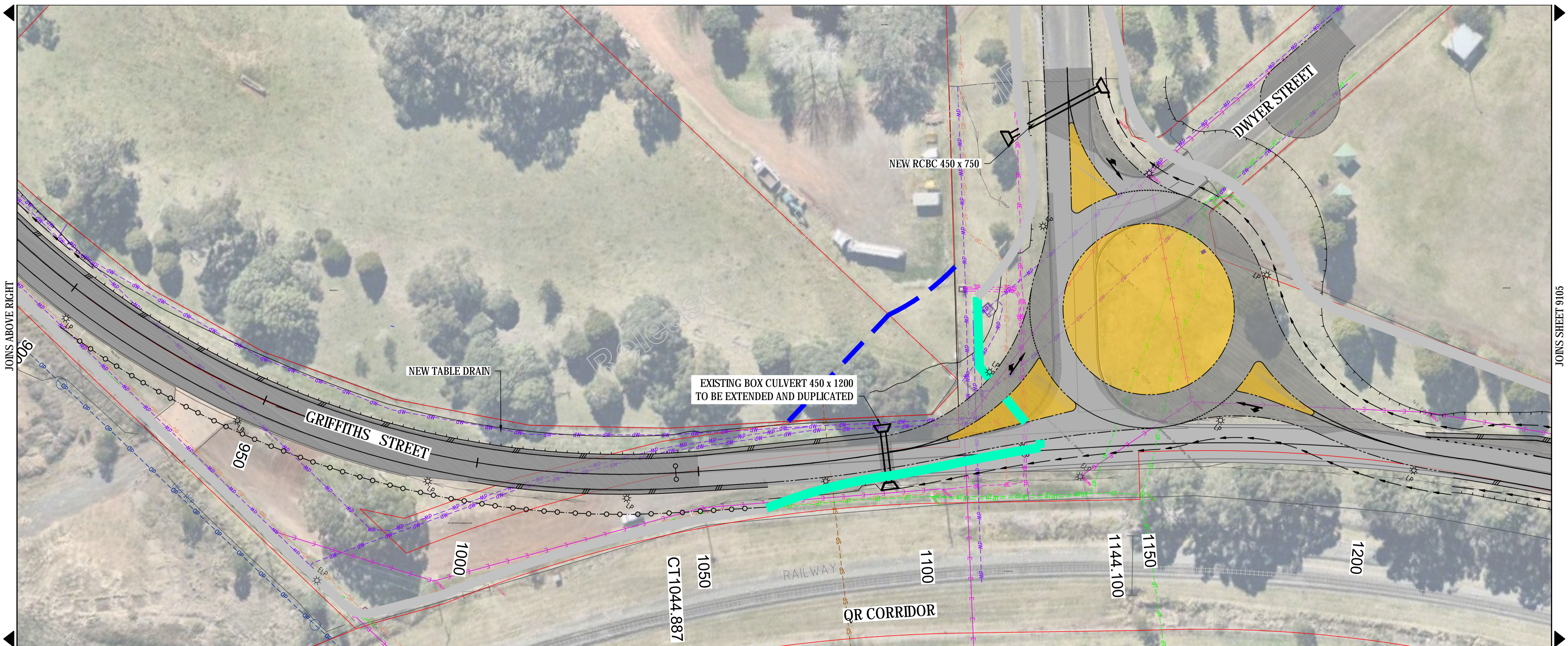
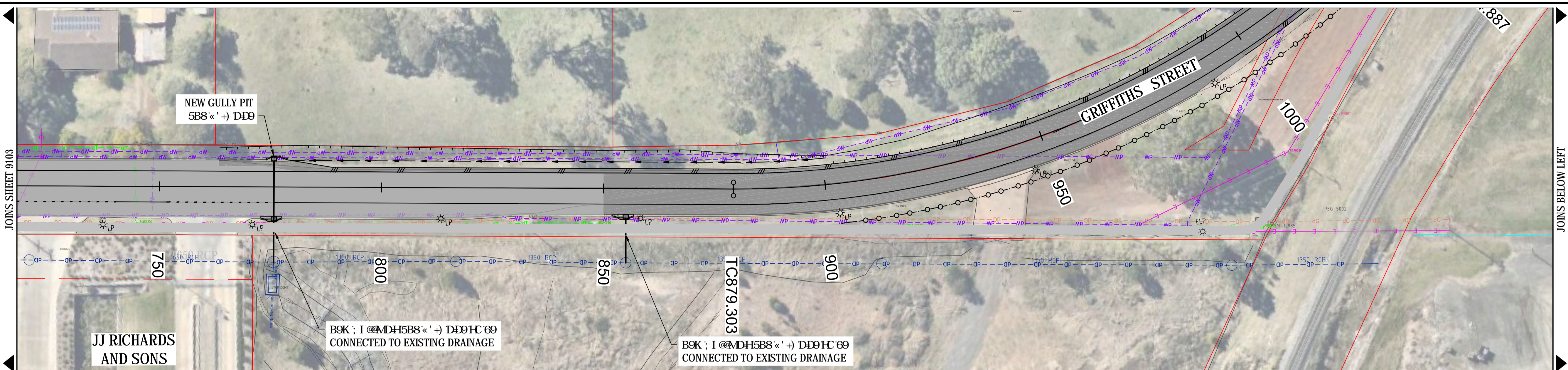
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Approved	Part Release Sch 4 Part 4 s/c

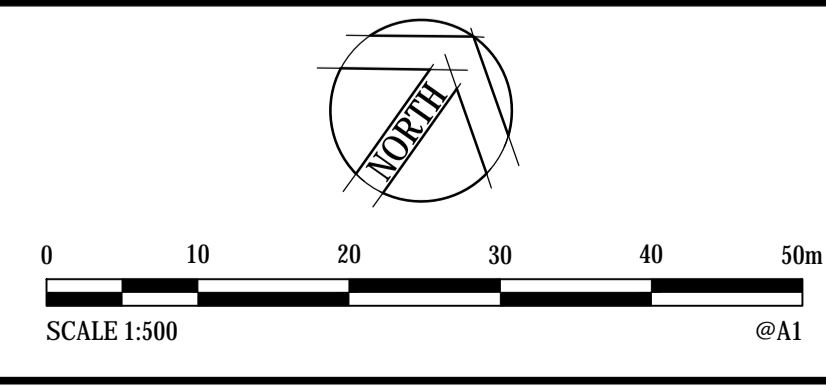
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Date	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY
Date	8/05/2017		INTERIM CONCEPT DESIGN
Date	21/06/2017	Title	INTERIM DESIGN - DETAIL
Date	21/06/2017		SHEET 1

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NOTE:
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2	21/06/2017	ISSUED FOR INFORMATION		HW	NL JJ
1	26/04/2017	ISSUED FOR INFORMATION			



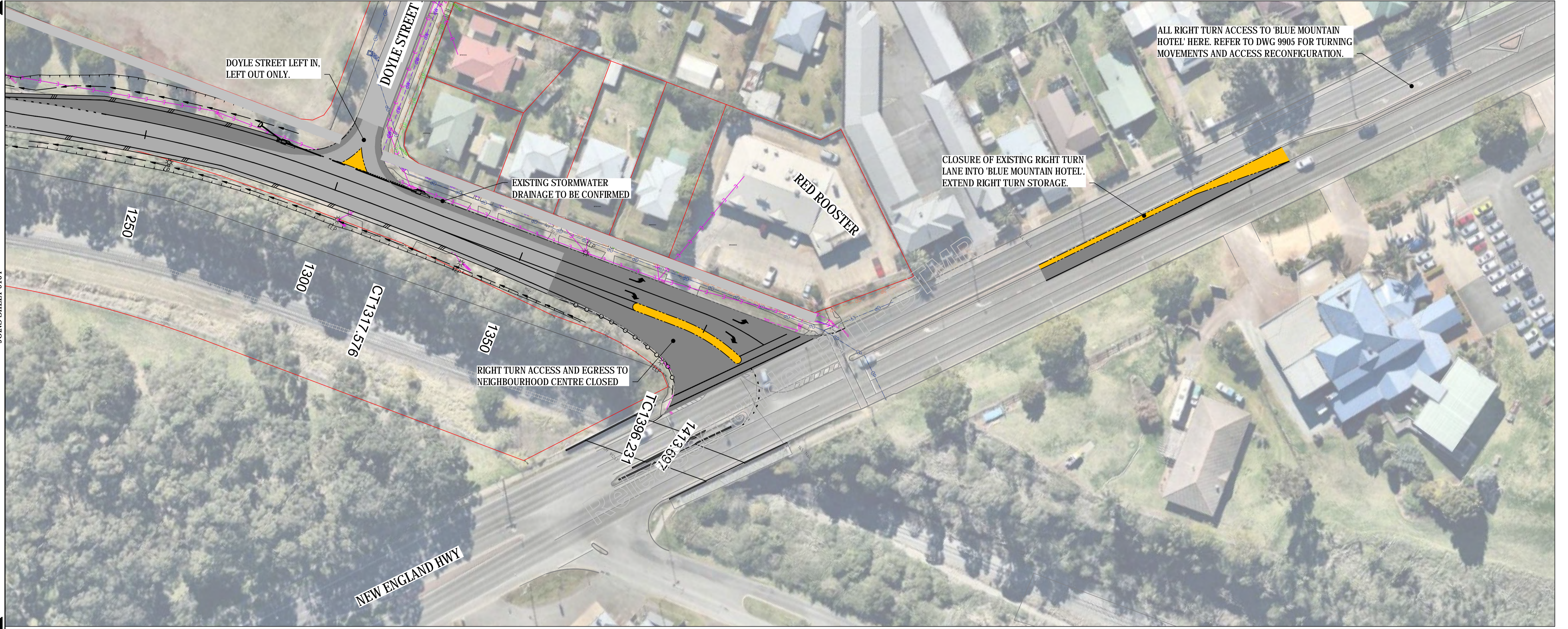
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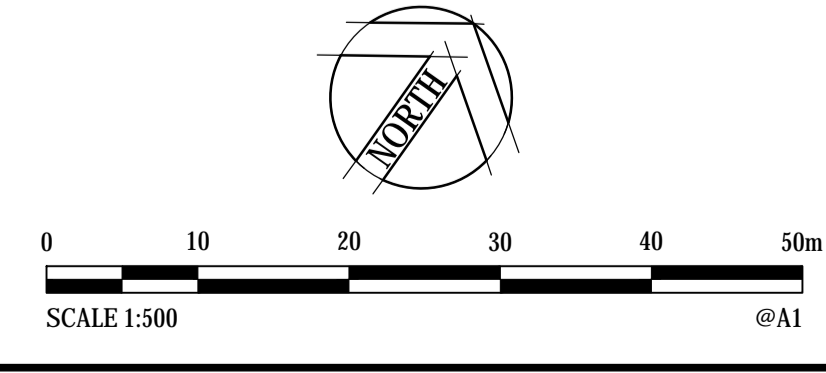
Drawn	Date	Client
Part Release Sch 4 Part 4 & 6 Personal Information	8/05/2017	TOOWOOMBA REGIONAL COUNCIL
Checked	Date	Project
Part Release Sch 4 Part 4 & 6 Personal Information	8/05/2017	GRIFFITHS STREET PLANNING STUDY
Designed	Date	Interim Concept Design
Part Release Sch 4 Part 4 & 6 Personal Information	8/05/2017	
Verified	Date	Title
Part Release Sch 4 Part 4 & 6 Personal Information	21/06/2017	INTERIM DESIGN - DETAIL
Approved	Date	SHEET 2
Part Release Sch 4 Part 4 & 6 Personal Information	21/06/2017	

Datum	GRID	Scale	Size
AHD		AS SHOWN	A1
Drawing Number	Revision		
CEB06818-CI-9104	2		



NOTE:
 • REFER PD-9103 FOR LEGEND

Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION			

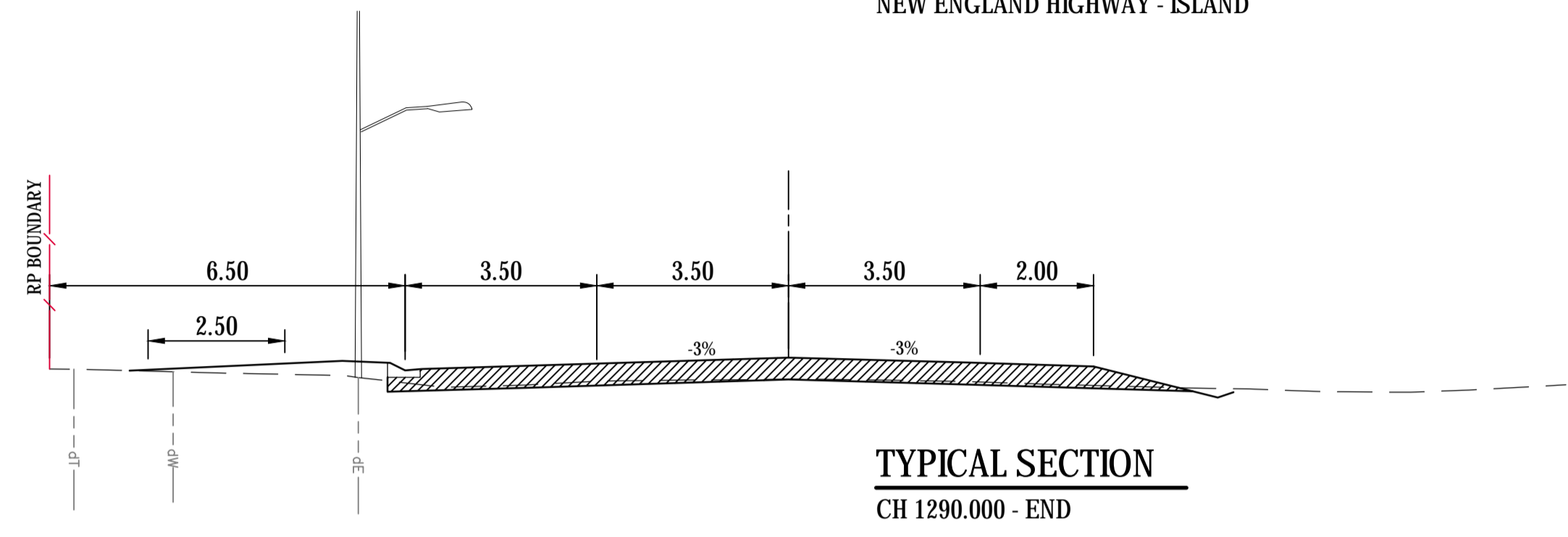
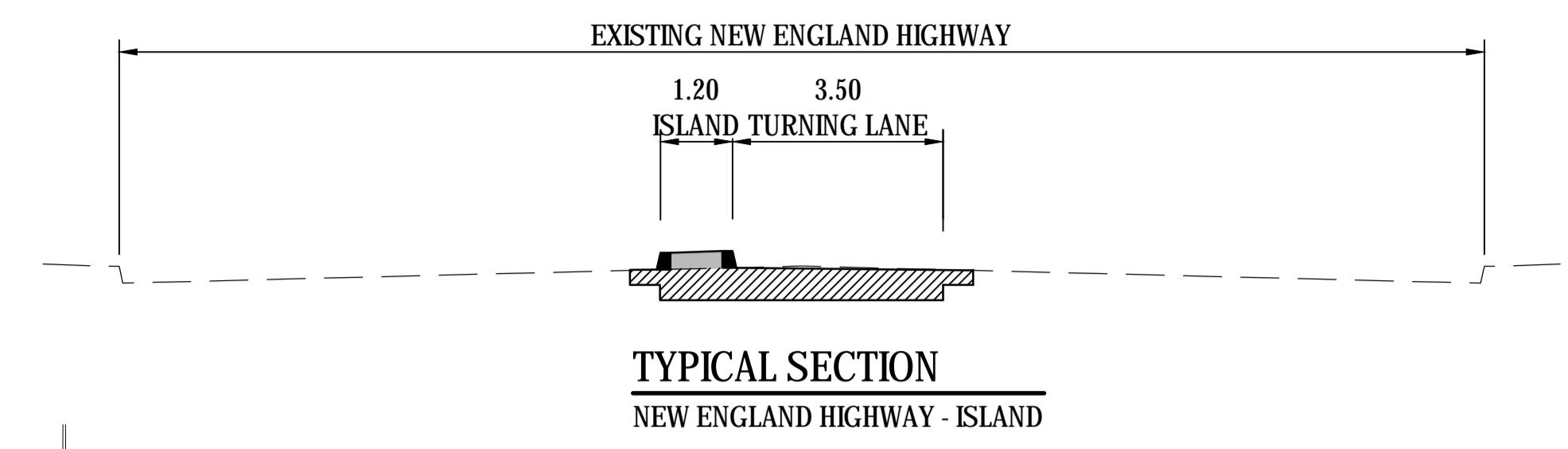
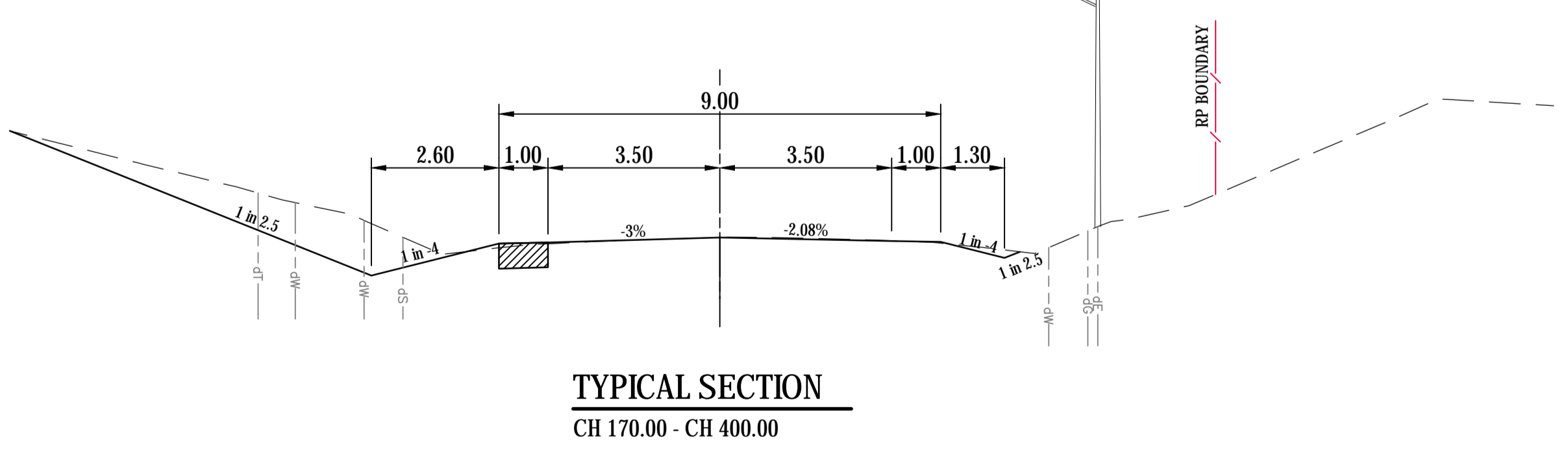
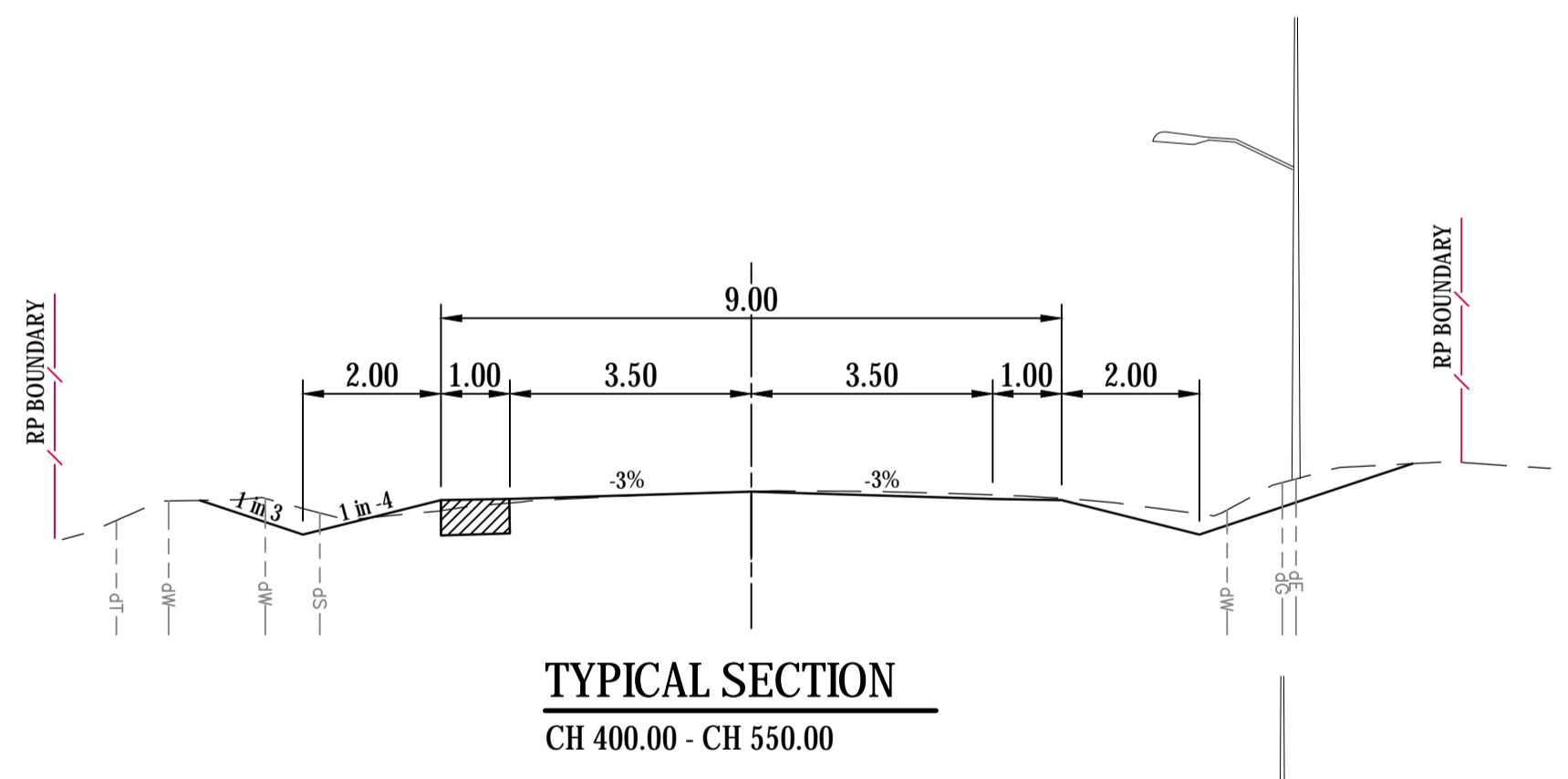
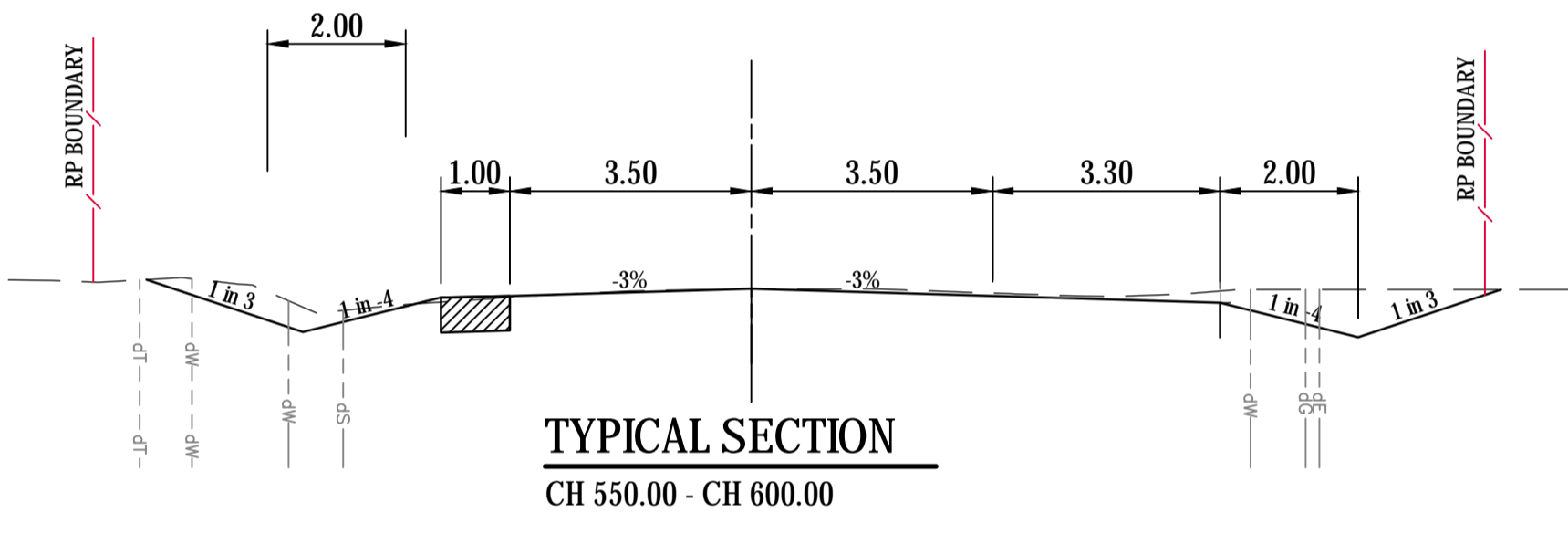
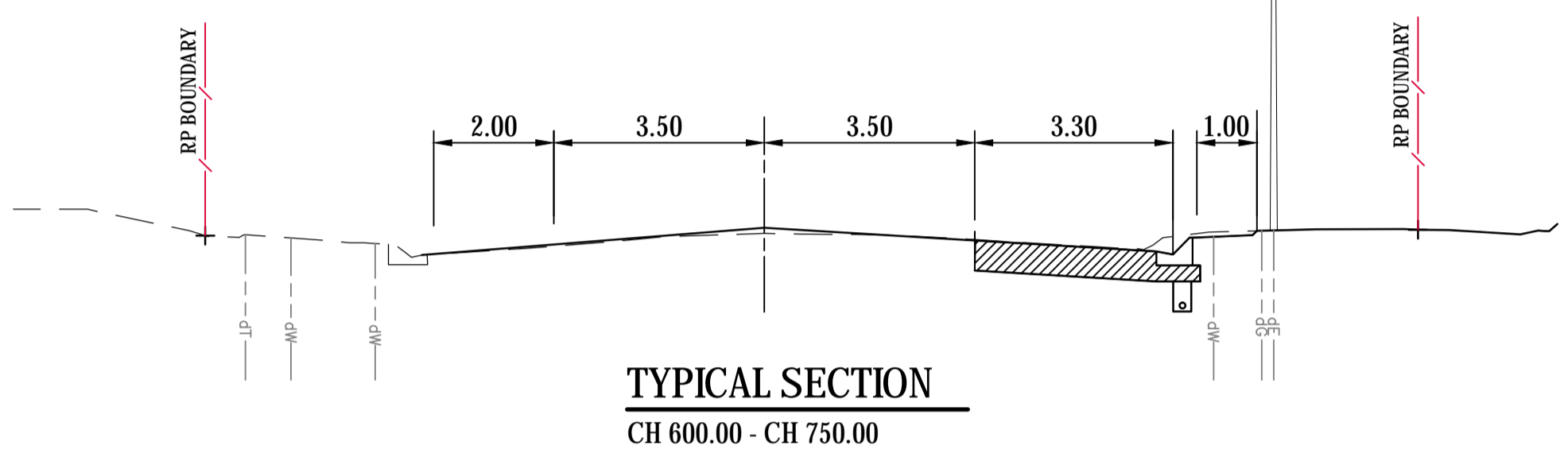
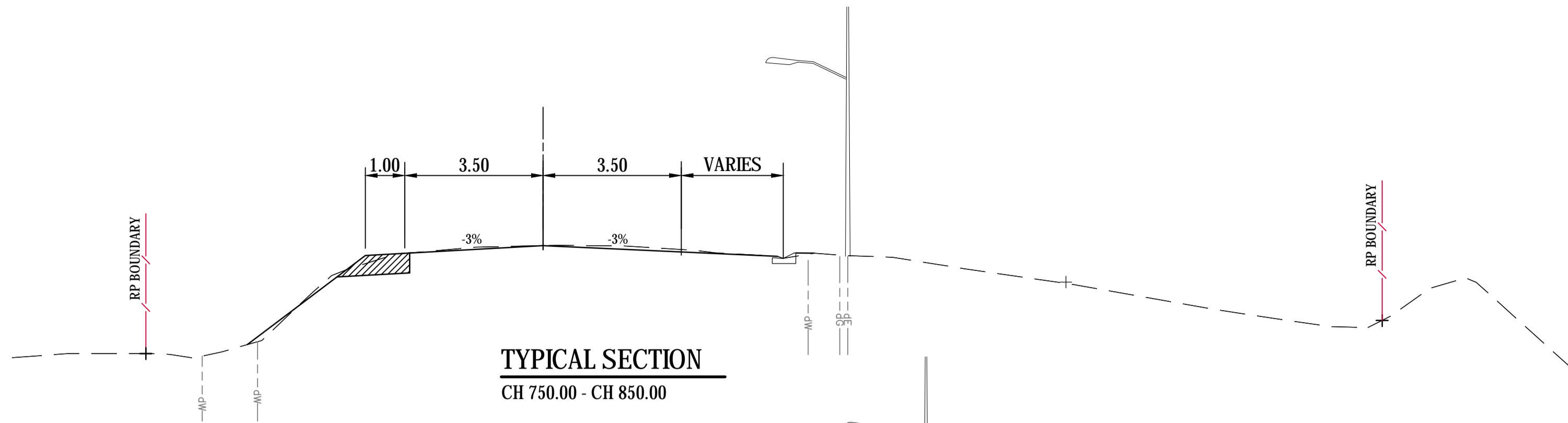


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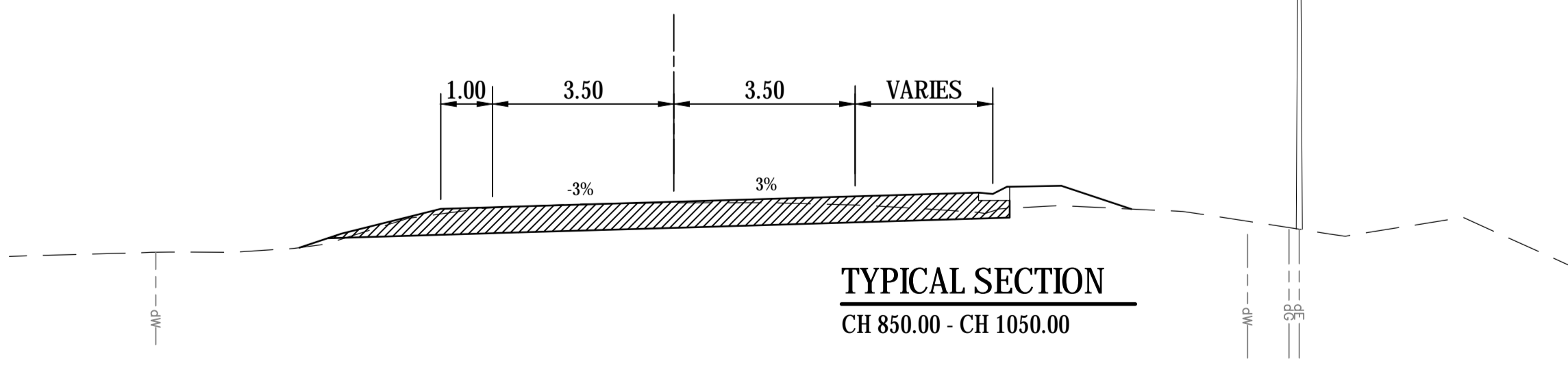
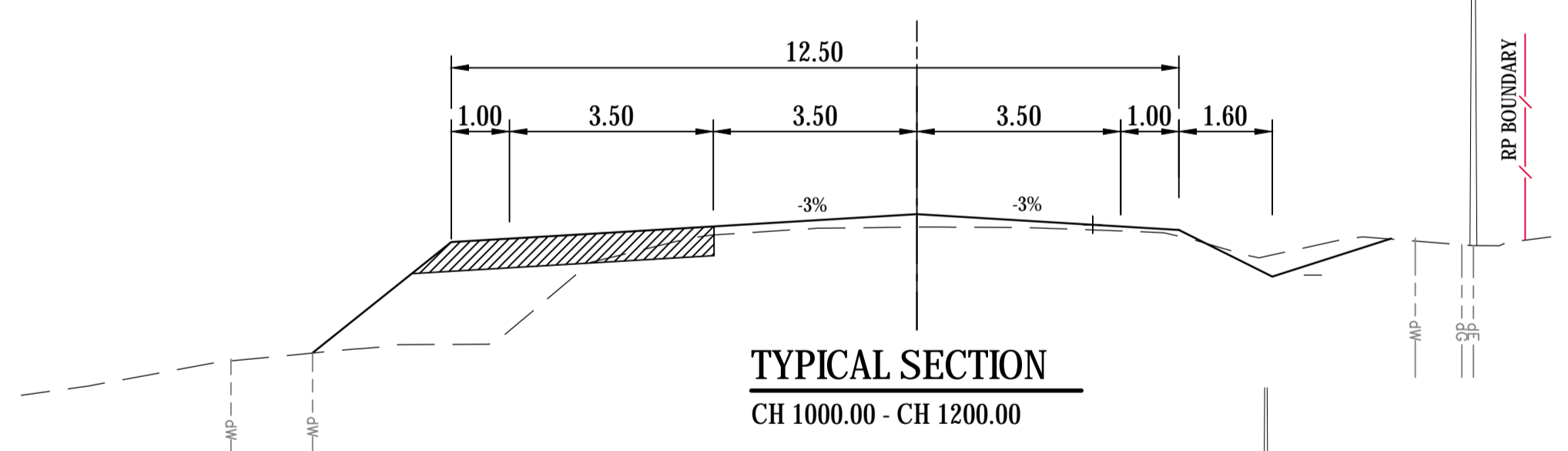
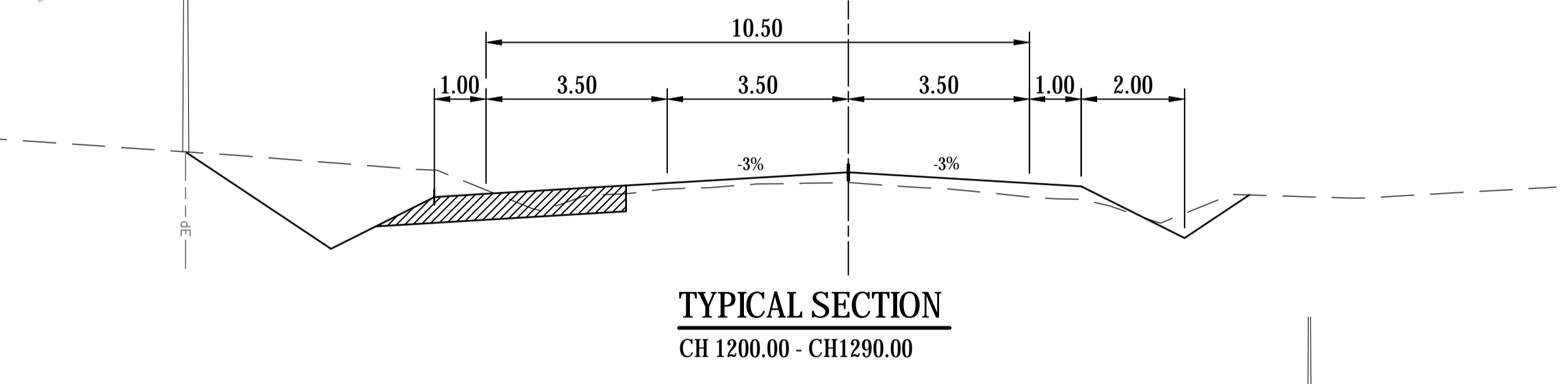
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Part Release Sch 4 Part 4.6	8/05/2017	TOOWOOMBA REGIONAL COUNCIL
Checked	Date	Project
Part Release Sch 4 Part 4.6	8/05/2017	GRIFFITHS STREET PLANNING STUDY
Designed	Date	Interim Concept Design
Part Release Sch 4 Part 4.6	8/05/2017	
Verified	Date	Title
Part Release Sch 4 Part 4.6	21/06/2017	INTERIM DESIGN - DETAIL
Approved	Date	SHEET 3
Part Release Sch 4 Part 4.6	21/06/2017	

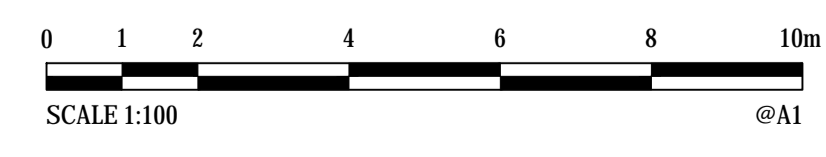
Status	FOR INFORMATION ONLY			
	NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Datum	GRID	Scale	Size	
AHD		AS SHOWN	A1	
Drawing Number				Revision
CEB06818-CI-9105				2



Released under RTI - DTMR



Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION		HW	NL JJ
1	26/04/2017	ISSUED FOR INFORMATION			



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Drawn Part Release Sch.4 s.6 Personal Information	Date 8/05/2017	Client TOOWOOMBA REGIONAL COUNCIL
Checked Part Release Sch.4 Part 4 s.6 Personal Information	Date 8/05/2017	Project GRIFFITHS STREET PLANNING STUDY
Designed Part Release Sch.4 Part 4 s.6 Personal Information	Date 8/05/2017	INTERIM CONCEPT DESIGN
Verified Part Release Sch.4 Part 4 s.6 Personal Information	Date 21/06/2017	Title TYPICAL SECTIONS - INTERIM
Approved Part Release Sch.4 Part 4 s.6 Personal Information	Date 21/06/2017	

Status FOR INFORMATION ONLY	Scale AS SHOWN	Size A1
Datum AHD	Revision 2	
Drawing Number CEB06818-CI-9201		

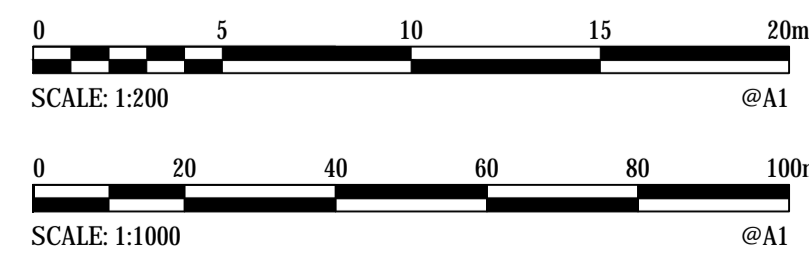
MORT STREET

VERT. CURVE LENGTH (m)
 VERT. CURVE RADIUS (m)
 VERT. GEOMETRY GRADE (%)
 VERT. GEOMETRY LENGTH(m)
 DATUM RL 530.000

HORZ. CURVE LENGTH (m)	HORZ. CURVE RADIUS (m)	EXISTING SURFACE LEVELS ROAD CENTRELINE	CONTROL LINE DESIGN LEVEL	CONTROL LINE CHAINAGE ROAD CENTRELINE
230.000		558.329	558.317	230.000
240.000		559.001	558.949	240.000
260.000		560.343	560.248	260.000
265.000		560.679	560.579	265.000
280.000		561.685	561.595	280.000
300.000		563.135	563.012	300.000
320.000		564.837	564.748	320.000
340.000		566.581	566.473	340.000
360.000		567.871	567.785	360.000
380.000		568.984	568.868	380.000
400.000		570.096	569.980	400.000
415.699		570.959	570.853	415.699
420.000		571.181	571.093	420.000
440.000		572.121	572.026	440.000
440.369		572.137	572.040	440.369
460.000		572.909	572.823	460.000
480.000		573.627	573.526	480.000
500.000		574.313	574.213	500.000
500.399		574.327	574.227	500.399
519.894		575.069	574.976	519.894
520.000		575.073	574.979	520.000
540.000		575.835	575.728	540.000
547.699		576.119	576.028	547.699
560.000		576.500	576.387	560.000
579.890		577.315	577.172	579.890
580.000		577.320	577.177	580.000
596.091		577.990	577.890	596.091
600.000		578.179	578.082	600.000
619.077		579.102	579.052	619.077
620.000		579.153	579.102	620.000
640.000		580.261	580.126	640.000
660.000		581.370	581.250	660.000
680.000		582.676	582.622	680.000
700.000		584.337	584.302	700.000
716.274		585.817	585.767	716.274
720.000		586.165	586.105	720.000
740.000		588.030	587.991	740.000
747.217		588.702	588.652	747.217
760.000		589.883	589.812	760.000
780.000		591.730	591.657	780.000
800.000		593.623	593.534	800.000
820.000		595.684	595.508	820.000
840.000		597.916	597.739	840.000
860.000		600.055	600.002	860.000
879.303		601.840	601.800	879.303
880.000		601.899	601.861	880.000
900.000		603.447	603.405	900.000
910.000		604.111	604.068	910.000

GRIFFITHS STREET
 SCALE: H 1:1000
 V 1:200

Rev.	Date	Description	Des.	Verf.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION			



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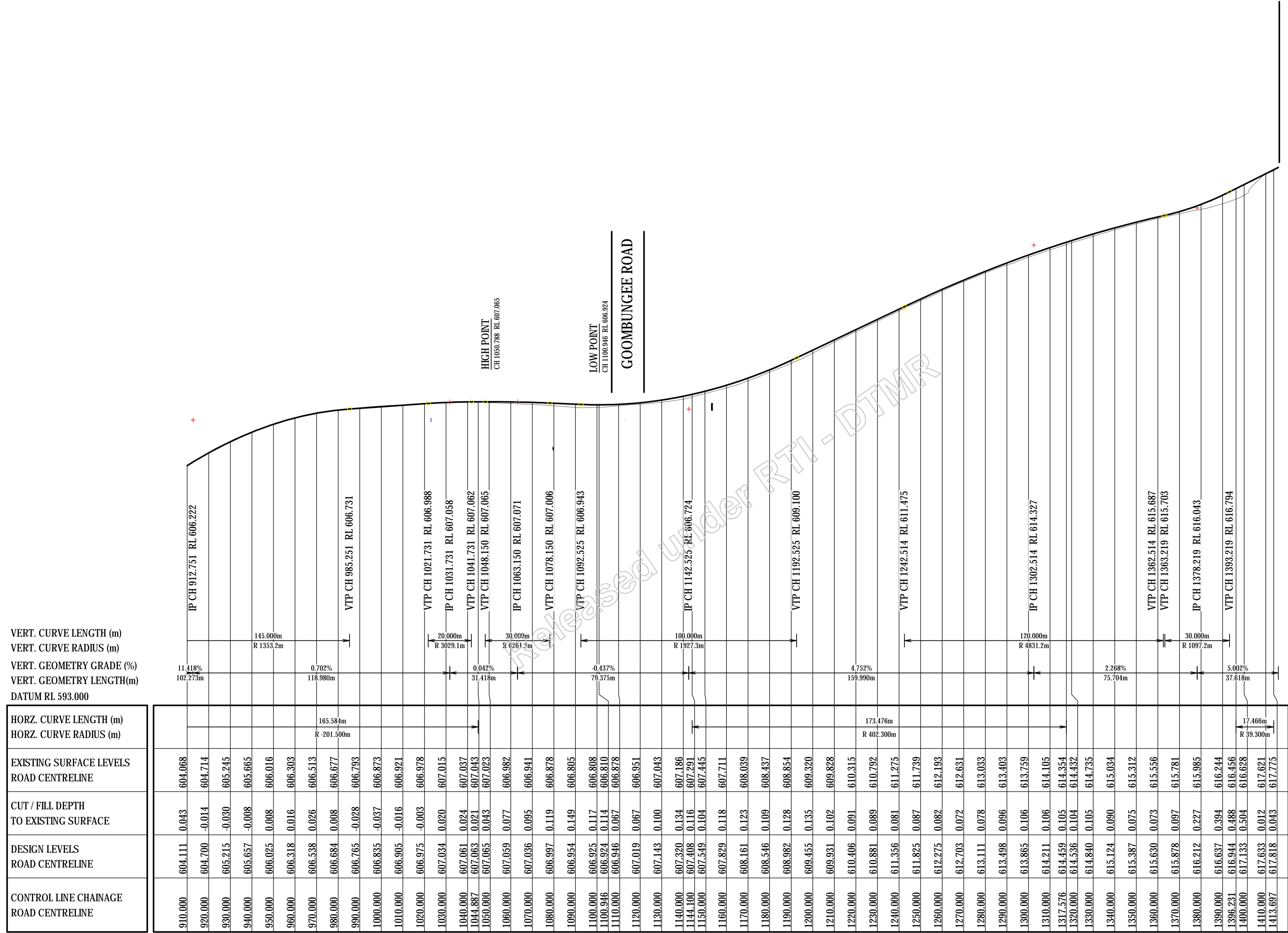


Drawn	8/05/2017
Checked	8/05/2017
Designed	8/05/2017
Verified	21/06/2017
Approved	21/06/2017

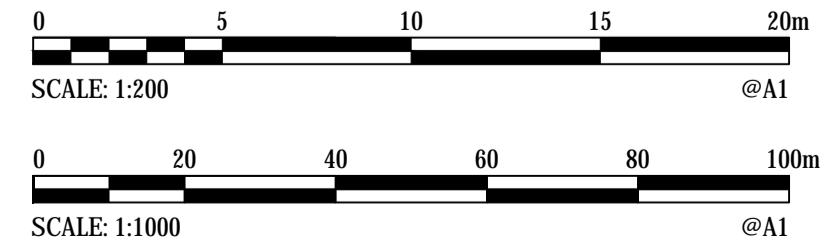
Client	TOOWOOMBA REGIONAL COUNCIL
Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Title	LONGITUDINAL SECTIONS SHEET 1

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Datum	AHD
Scale	AS SHOWN
Size	A1
Drawing Number	CEB06818-CI-9301
Revision	2

CONTINUED DWG PD-9402



CEN
 SCALE: H 1:1000
 V 1:100



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 Checked: Part Release Sch 4 Part 4 s/o Personal Information
 Designed: Part Release Sch 4 Part 4 s/o Personal Information
 Verified: Part Release Sch 4 Part 4 s/o Personal Information
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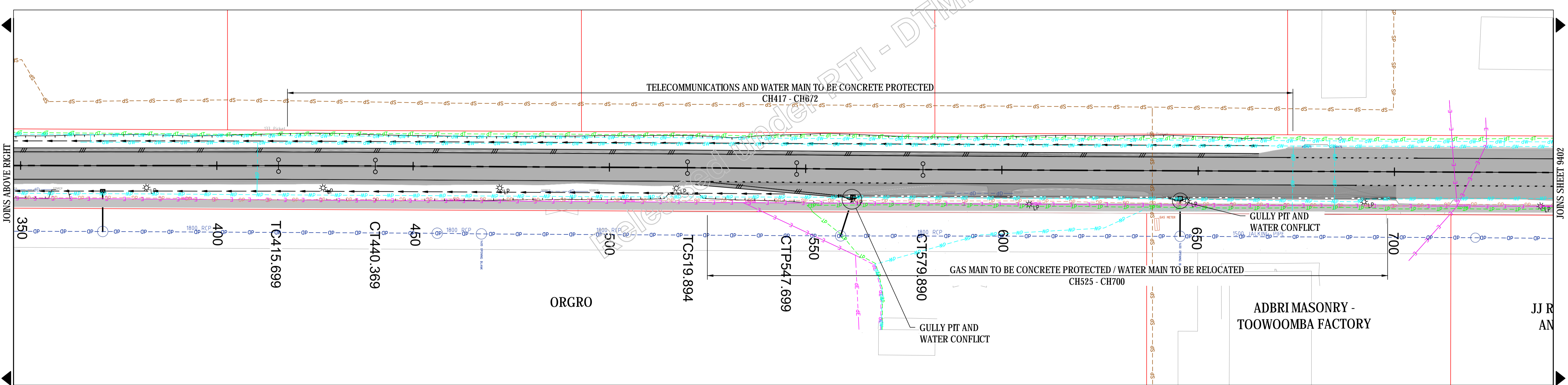
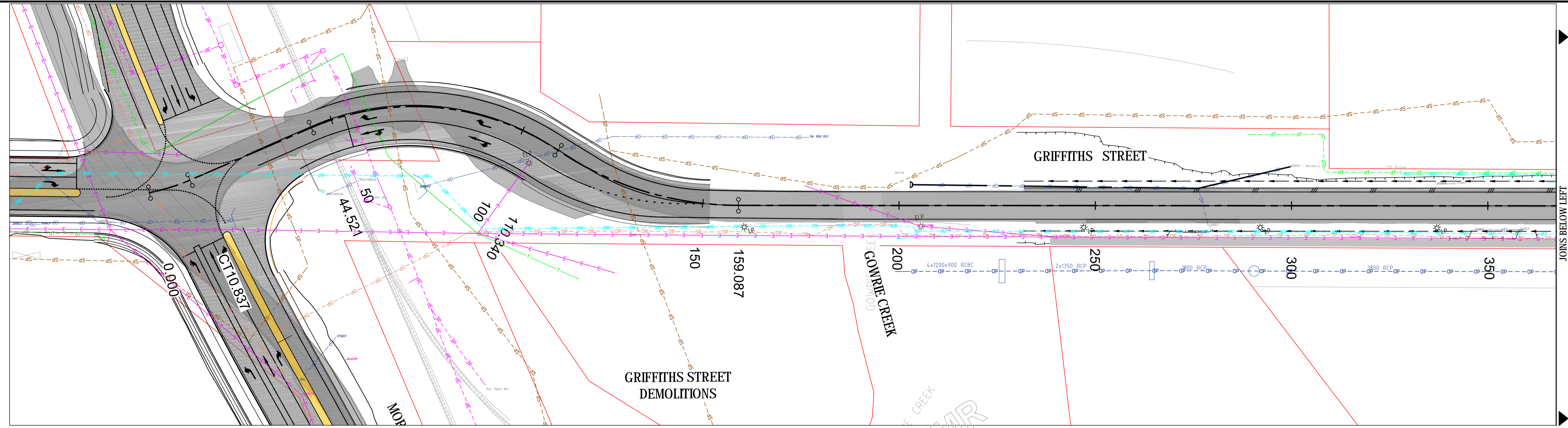
Date: 8/05/2017
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 Date: 8/05/2017
 Project: **GRIFFITHS STREET PLANNING STUDY**
 Date: 8/05/2017
 Title: **INTERIM CONCEPT DESIGN**
 Date: 21/06/2017
 Title: **LONGITUDINAL SECTIONS SHEET 2**

Status: **FOR INFORMATION ONLY**
 NOT TO BE USED FOR CONSTRUCTION PURPOSES
 Datum: AHD
 Grid: AS SHOWN
 Scale: AS SHOWN
 Size: A1
 Drawing Number: **CEB06818-CI-9302**
 Revision: **2**

NEW ENGLAND HWY

GOOMBUNGEE ROAD

DATE PLOTTED: 22 June 2017 9:39 AM BY: JEREMY PARSONS
 XREFS: XR - DBYD, XR - SURVEY, XR - EX - CH - XR - LOCALITIES, XR - DESIGN, XR - ULTIMATE, XR - AERIAL, XR - CONCEPT - DESIGN - INTERIM OPT 1, XR - PRELIM - DESIGN - INTERIM OPT 1, XR - EXISTING FEATURES, XR - DESIGN CHANGES, XR - DESIGN CHANGES, PLOT - PDF, SGC - verified
 CAD File: L:\CEB06818\0003 - DESIGN PHASE, Drawings\CEB06818-CI-9401-9403.dwg



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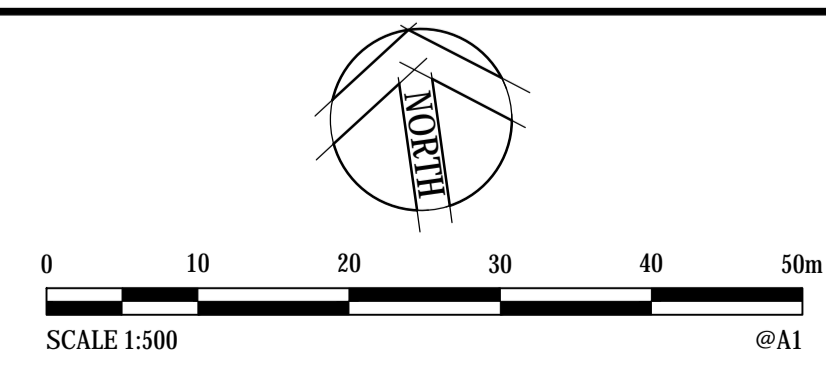
WARNING
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EXISTING FEATURES
 SCALE 1:500

LEGEND

- EXISTING PROPERTY BOUNDARY —
- EXISTING EASEMENT BOUNDARY ---
- EXISTING BOTTOM OF BATTER ---
- EXISTING TABLE DRAIN ---
- ELECTRICITY (UNDERGROUND DBYD) ---
- ELECTRICITY (OVERHEAD) ---
- TELECOMMUNICATIONS (DBYD) ---
- TELECOMMUNICATIONS RELOCATED ---
- STORMWATER DRAINAGE (DBYD) ---
- WATER MAIN (DBYD) ---
- WATER MAIN RELOCATED ---
- GAS (DBYD) ---
- SEWER (DBYD) ---
- SEWER RELOCATED ---
- PROPOSED RP BOUNDARY ---

Rev.	Date	Description	Des.	Verf.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION			

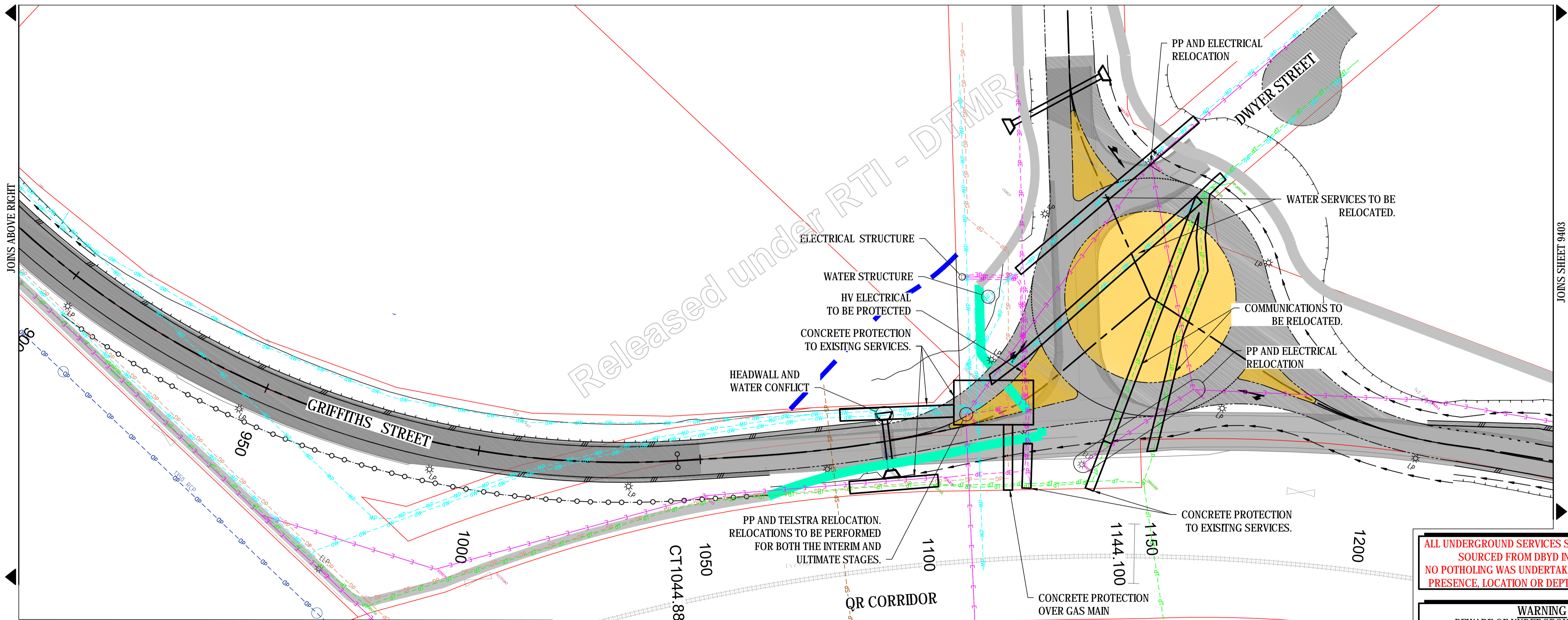
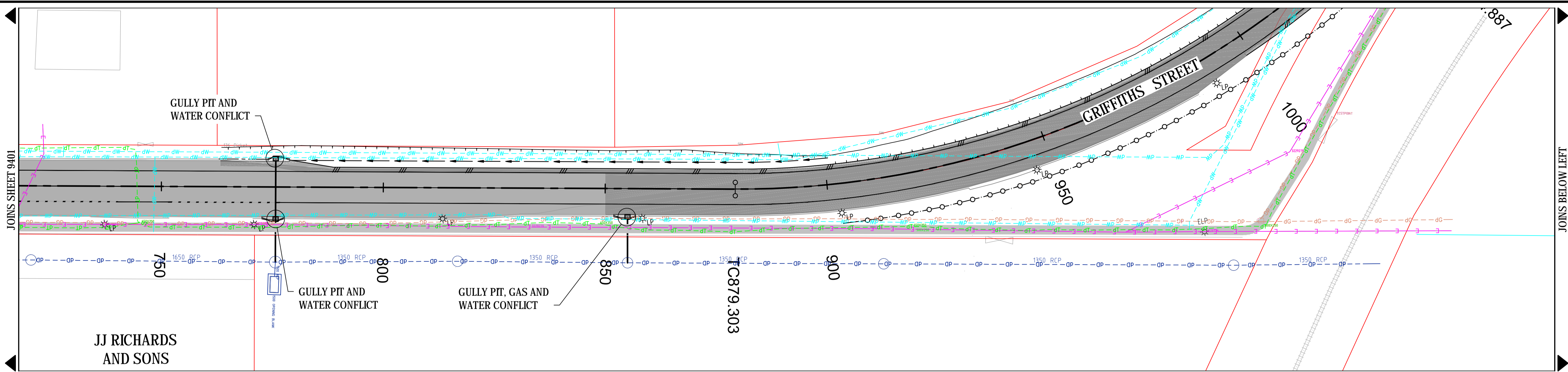


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Client	TOOWOOMBA REGIONAL COUNCIL
Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Date	21/06/2017
Title	PUBLIC UTILITY PLAN SHEET 1

Status	FOR INFORMATION ONLY			
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Datum	GRID	Scale	Size	Revision
AHD		AS SHOWN	A1	
Drawing Number	CEB06818-CI-9401			2



LEGEND

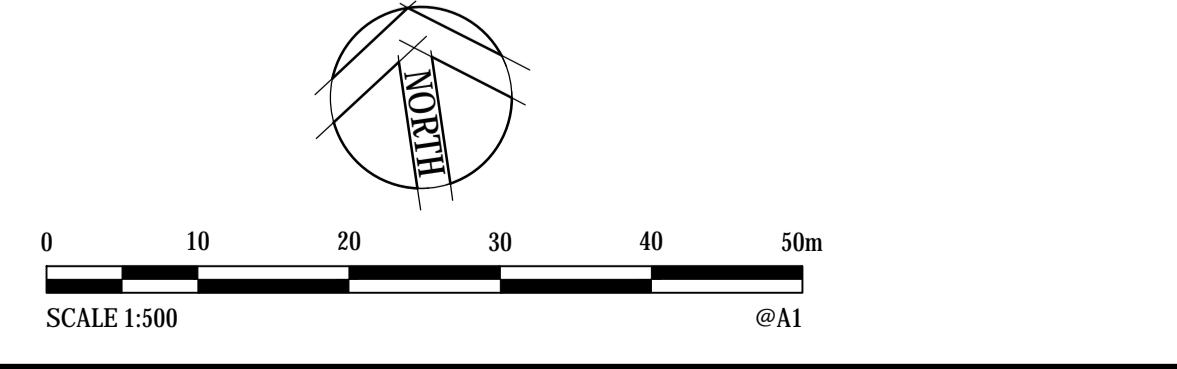
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EXISTING EASEMENT BOUNDARY	— · — · — · — · — · —	STORMWATER DRAINAGE (DBYD)	— dD — dD — dD — dD —
EXISTING BOTTOM OF BATTER	— — — — —	WATER MAIN (DBYD)	— dW — dW — dW — dW —
EXISTING TABLE DRAIN	— — — — —	WATER MAIN RELOCATED	— W — W — W — W —
ELECTRICITY (UNDERGROUND DBYD)	— dE — dE — dE — dE —	GAS (DBYD)	— dG — dG — dG — dG —
ELECTRICITY (OVERHEAD)	— E — E — E — E —	SEWER (DBYD)	— dS — dS — dS — dS —
TELECOMMUNICATIONS (DBYD)	— dT — dT — dT — dT —	SEWER RELOCATED	— S — S — S — S —

EXISTING FEATURES
SCALE 1:500

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Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION		HW	NL JJ
1	26/04/2017	ISSUED FOR INFORMATION			



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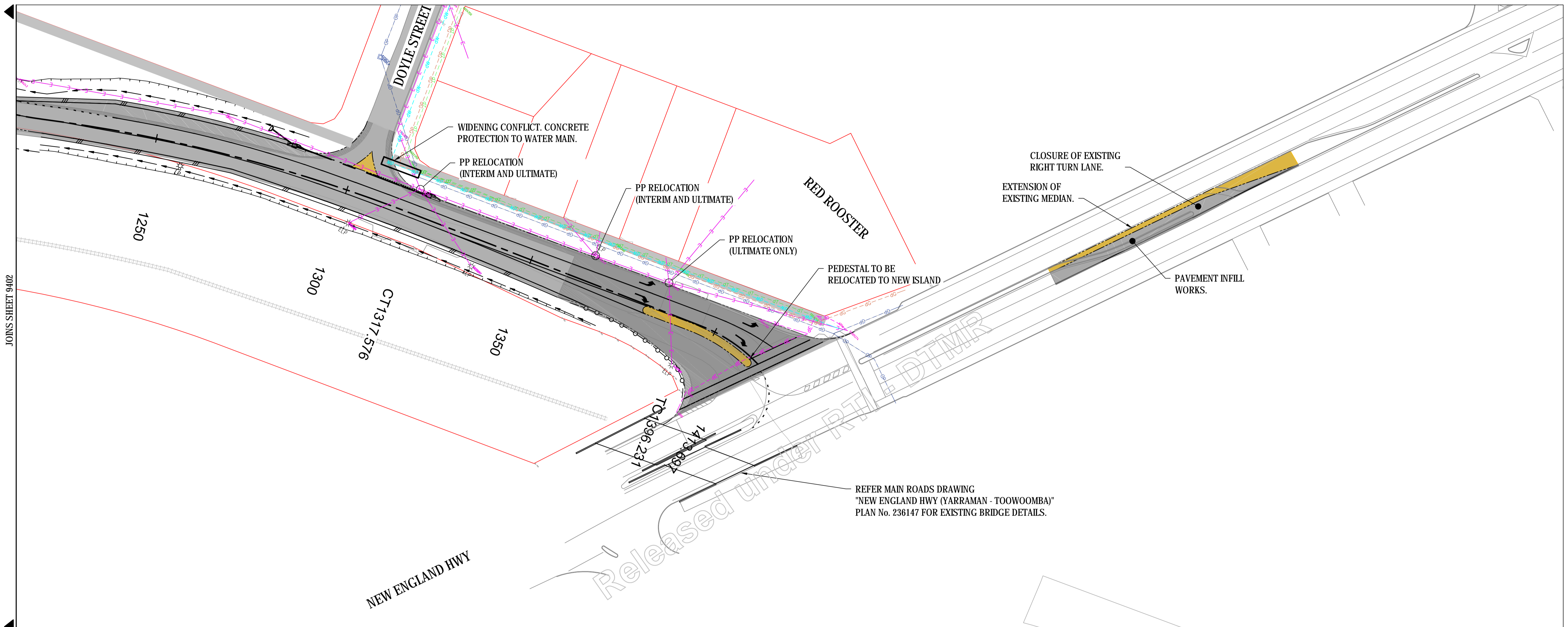
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Checked	Date	8/05/2017
Part Release Sch 4 Part 4 s.6 Personal Information	Date	8/05/2017
Designed	Date	8/05/2017
Part Release Sch 2 Part 4 s.6 Personal Information	Date	21/06/2017
Verified	Date	21/06/2017
Part Release Sch 3 Part 4 s.6 Personal Information	Date	21/06/2017
Approved	Date	21/06/2017
Part Release Sch 3 Part 4 s.6 Personal Information	Date	21/06/2017

Client	TOOWOOMBA REGIONAL COUNCIL
Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Title	PUBLIC UTILITY PLAN SHEET 2

Status	FOR INFORMATION ONLY			
NOT TO BE USED FOR CONSTRUCTION PURPOSES				
Datum	GRID	Scale	Size	Revision
AHD		AS SHOWN	A1	
Drawing Number	CEB06818-CI-9402			Revision
				2

DATE PLOTTED: 22 June 2017 9:39 AM BY: JEREMY PARSONS



JOINS SHEET 9402

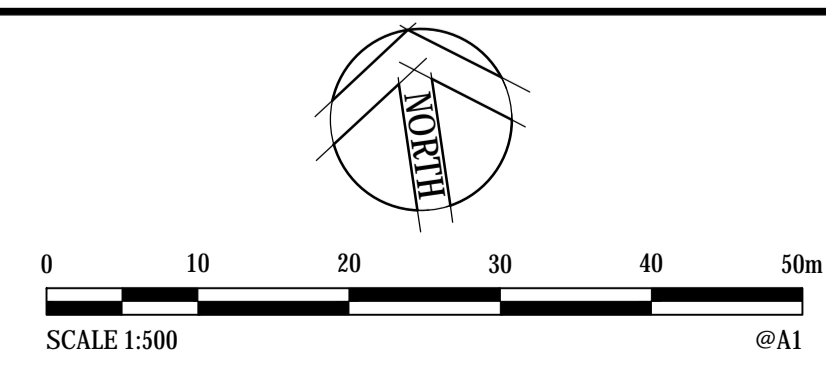
EXISTING FEATURES
SCALE 1:500

WARNING
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LEGEND	
EXISTING PROPERTY BOUNDARY	---
EXISTING EASEMENT BOUNDARY	---
EXISTING BOTTOM OF BATTER	---
EXISTING TABLE DRAIN	---
ELECTRICITY (UNDERGROUND DBYD)	-dE - - - -dE
ELECTRICITY (OVERHEAD)	-E - - - -E
TELECOMMUNICATIONS (DBYD)	-dT - - - -dT
TELECOMMUNICATIONS RELOCATED	-T - - - -T
STORMWATER DRAINAGE (DBYD)	-dD - - - -dD
WATER MAIN (DBYD)	-dW - - - -dW
WATER MAIN RELOCATED	-W - - - -W
GAS (DBYD)	-dG - - - -dG
SEWER (DBYD)	-dS - - - -dS
SEWER RELOCATED	-S - - - -S

Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION			



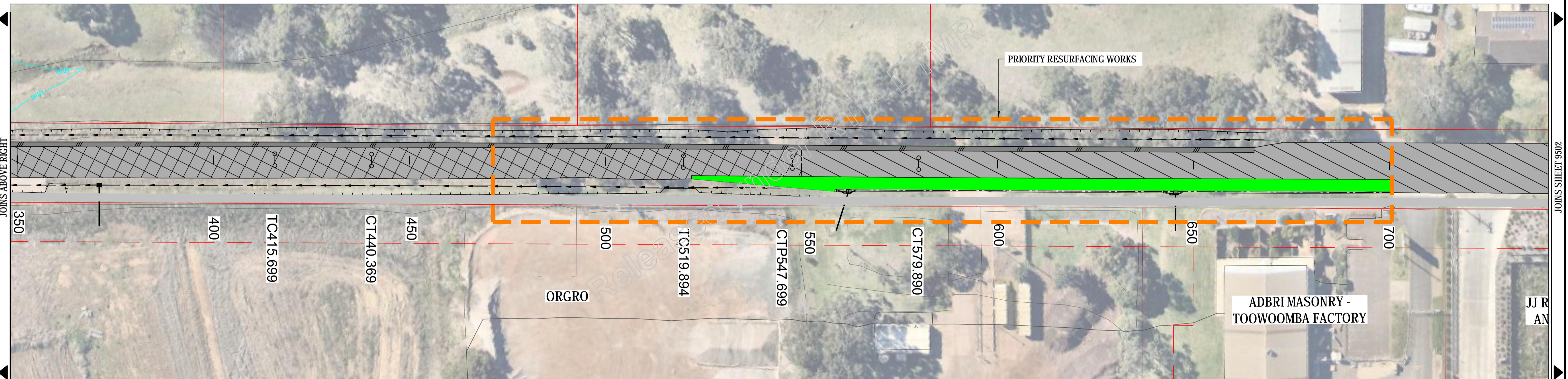
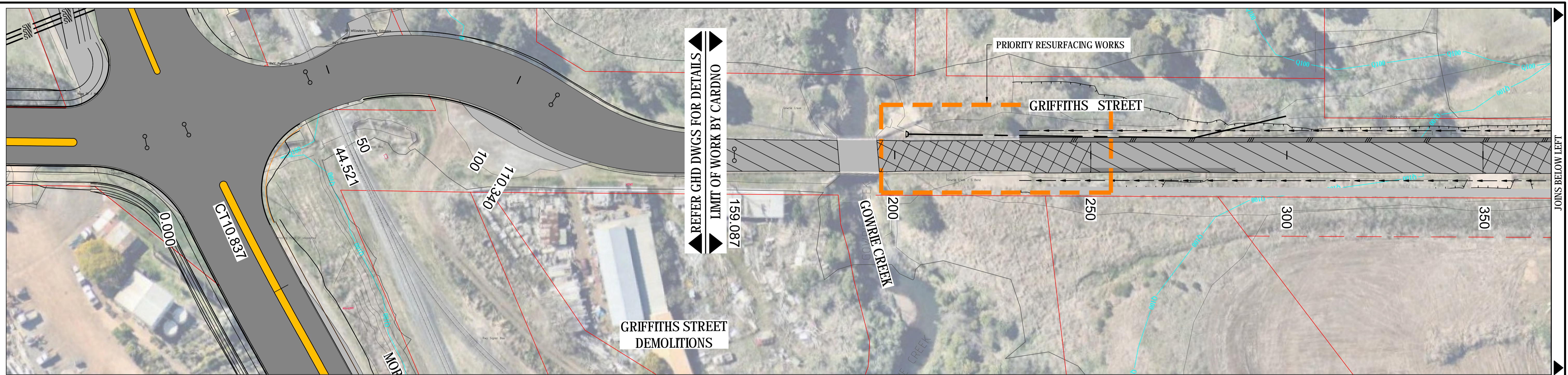
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Drawn	Part Release Sch 4, Part 4.6.6 Personal Information
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Designed	Part Release Sch 4, Part 4.6.6 Personal Information
Approved	Part Release Sch 4, Part 4.6.6 Personal Information

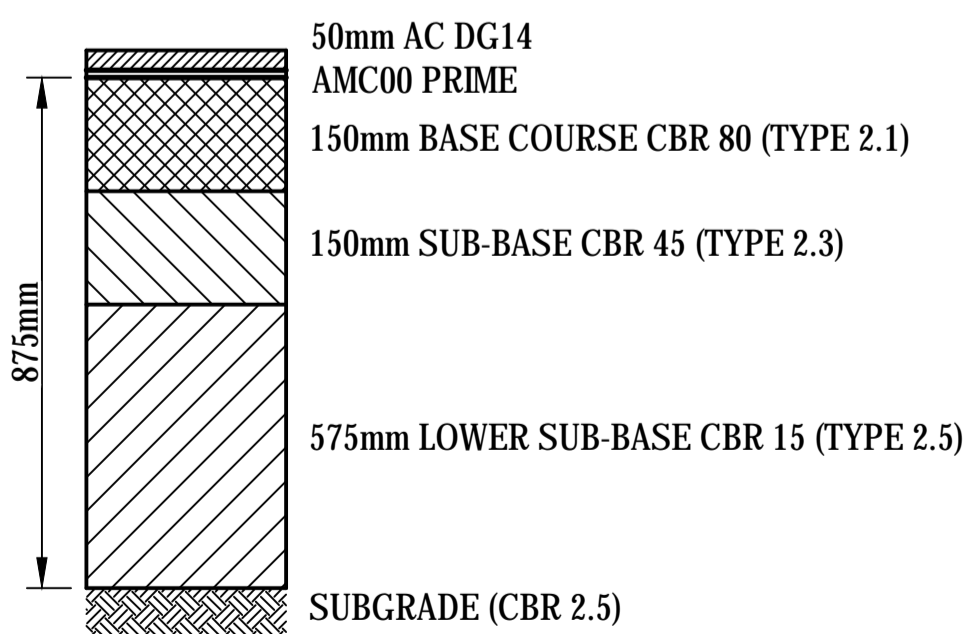
Date	8/05/2017	Client	TOowoomba REGIONAL COUNCIL
Date	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY
Date	8/05/2017		INTERIM CONCEPT DESIGN
Date	21/06/2017	Title	PUBLIC UTILITY PLAN
Date	21/06/2017		SHEET 3

Status	FOR INFORMATION ONLY			
NOT TO BE USED FOR CONSTRUCTION PURPOSES				
Datum	GRID	Scale	Size	
AHD		AS SHOWN	A1	
Drawing Number			Revision	
CEB06818-CI-9403			2	



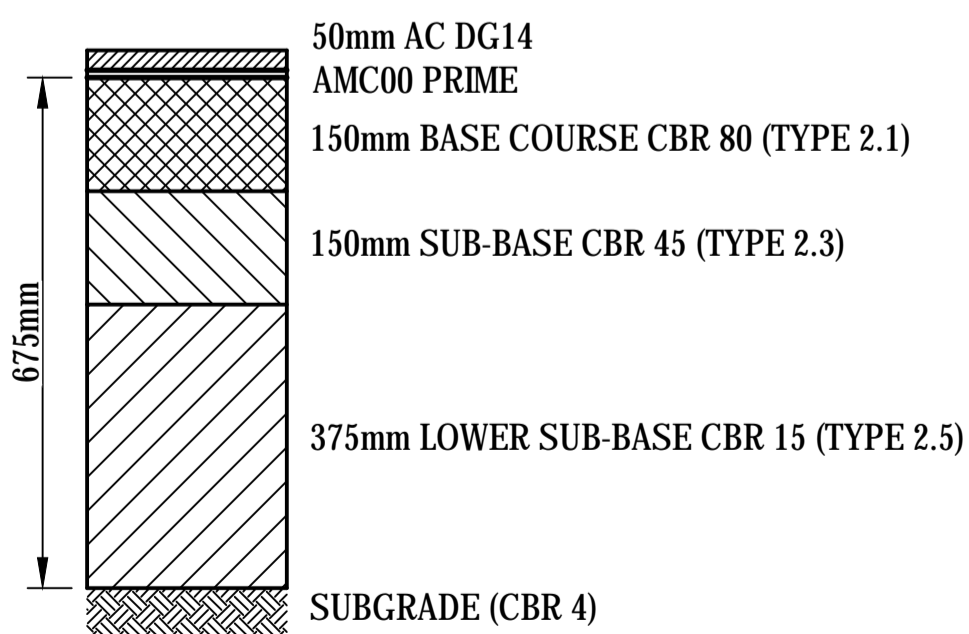
20 YEAR WIDENING (CBR2.5)

TYPE G2



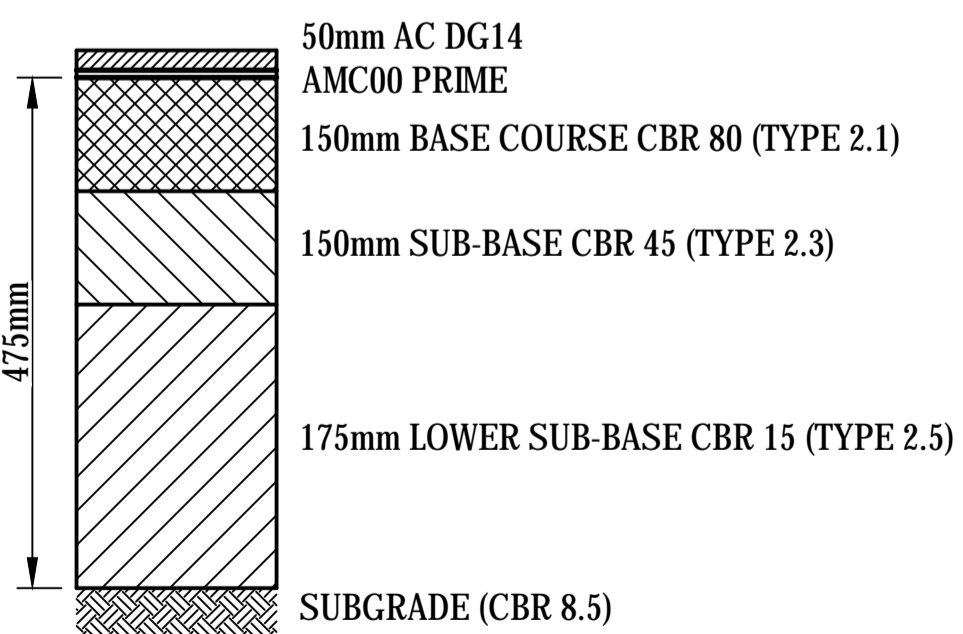
20 YEAR WIDENING (CBR4)

TYPE G2



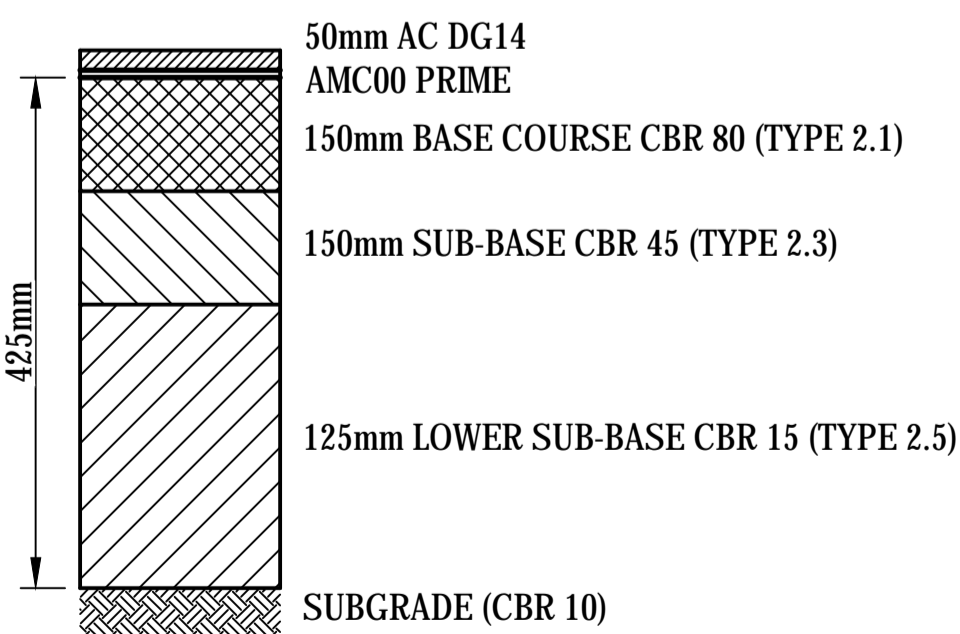
20 YEAR WIDENING (CBR8.5)

TYPE G2



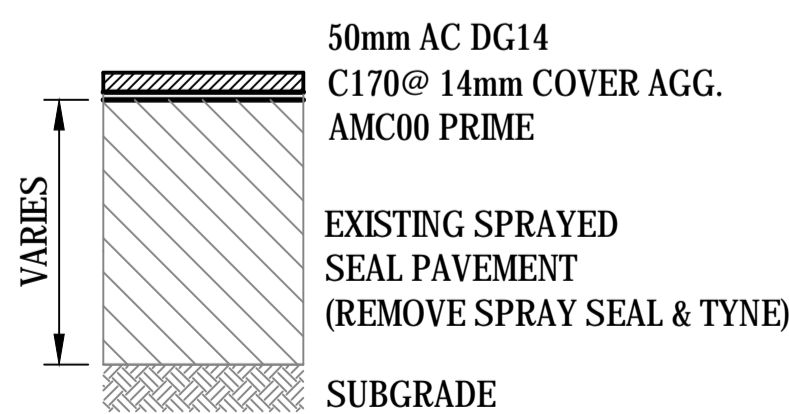
20 YEAR WIDENING (CBR10)

TYPE G2



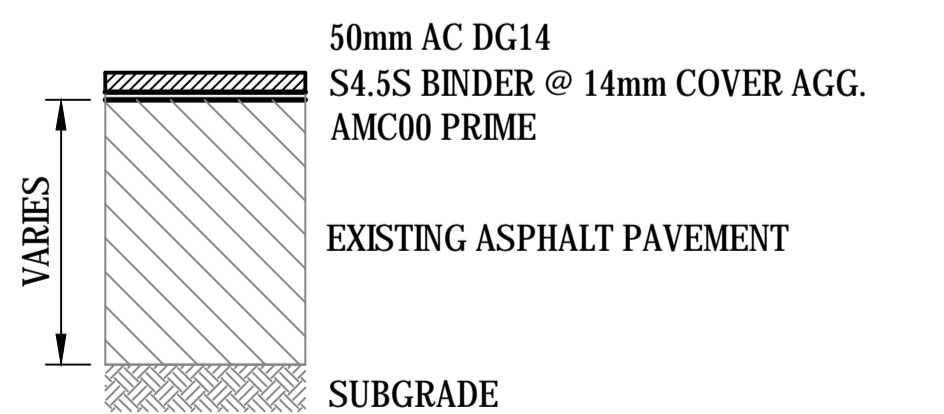
10-20 YEAR ASPHALT OVERLAY

TYPE A5

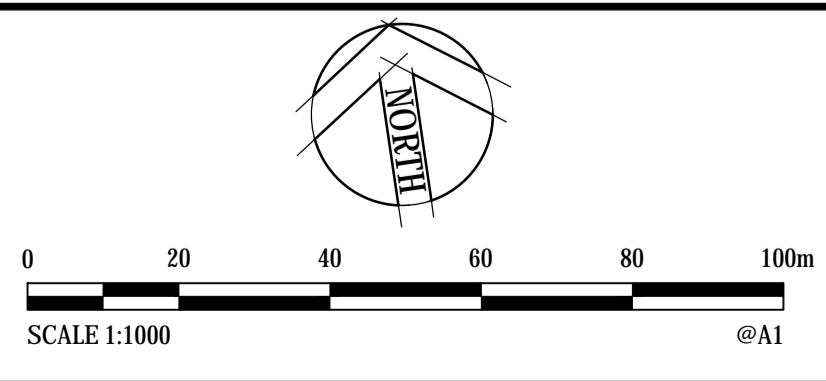


10-20 YEAR ASPHALT OVERLAY

TYPE A6



Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION	HW	NL	JJ



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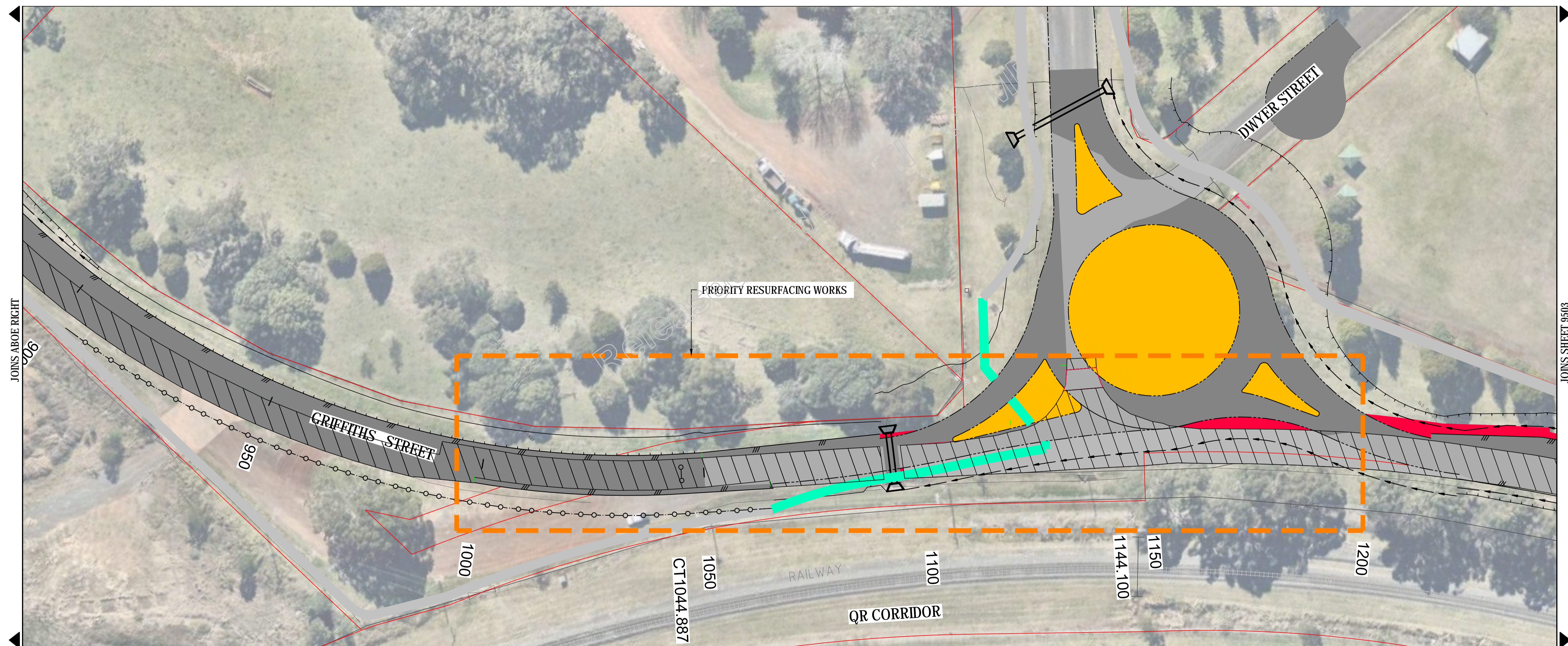
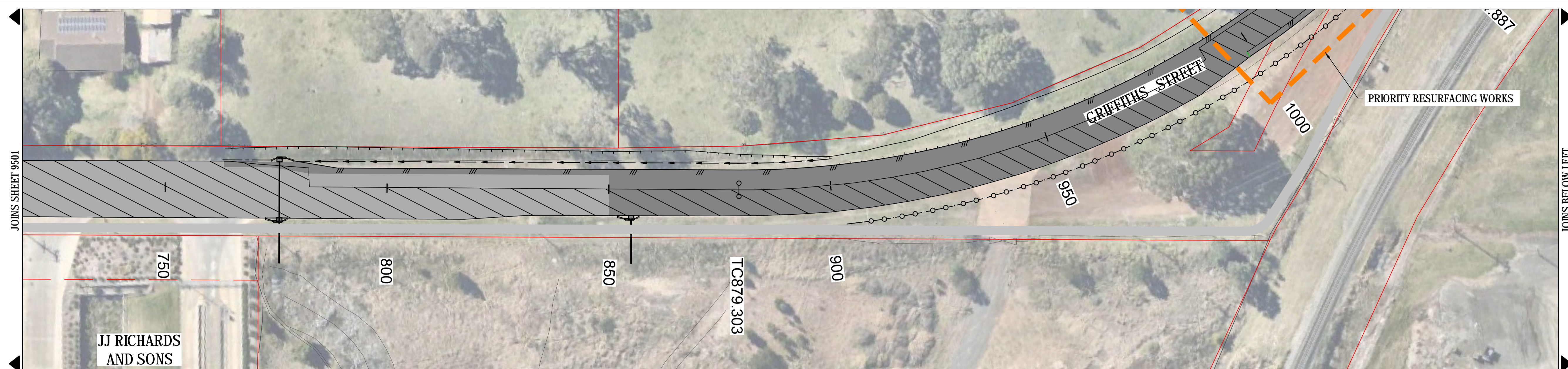
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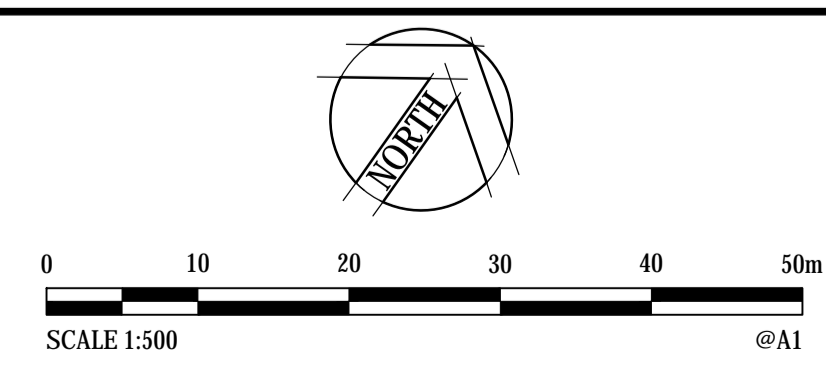
Date	8/05/2017	Client	TOOWOOMBA REGIONAL COUNCIL
Date	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY
Date	8/05/2017		INTERIM CONCEPT DESIGN
Date	21/06/2017	Title	PAVEMENT DETAILS
Date	21/06/2017		SHEET 1

Status	FOR INFORMATION ONLY		
	NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Datum	GRID	Scale	Size
AHD		AS SHOWN	A1
Drawing Number	CEB06818-CI-9501		Revision
			2



NOTE:
 • REFER PD-9501 FOR LEGEND AND PAVEMENT PROFILES

Rev.	Date	Description	Des.	Verif.	Appd.
2	21/06/2017	ISSUED FOR INFORMATION			
1	26/04/2017	ISSUED FOR INFORMATION	HW	NL	JJ



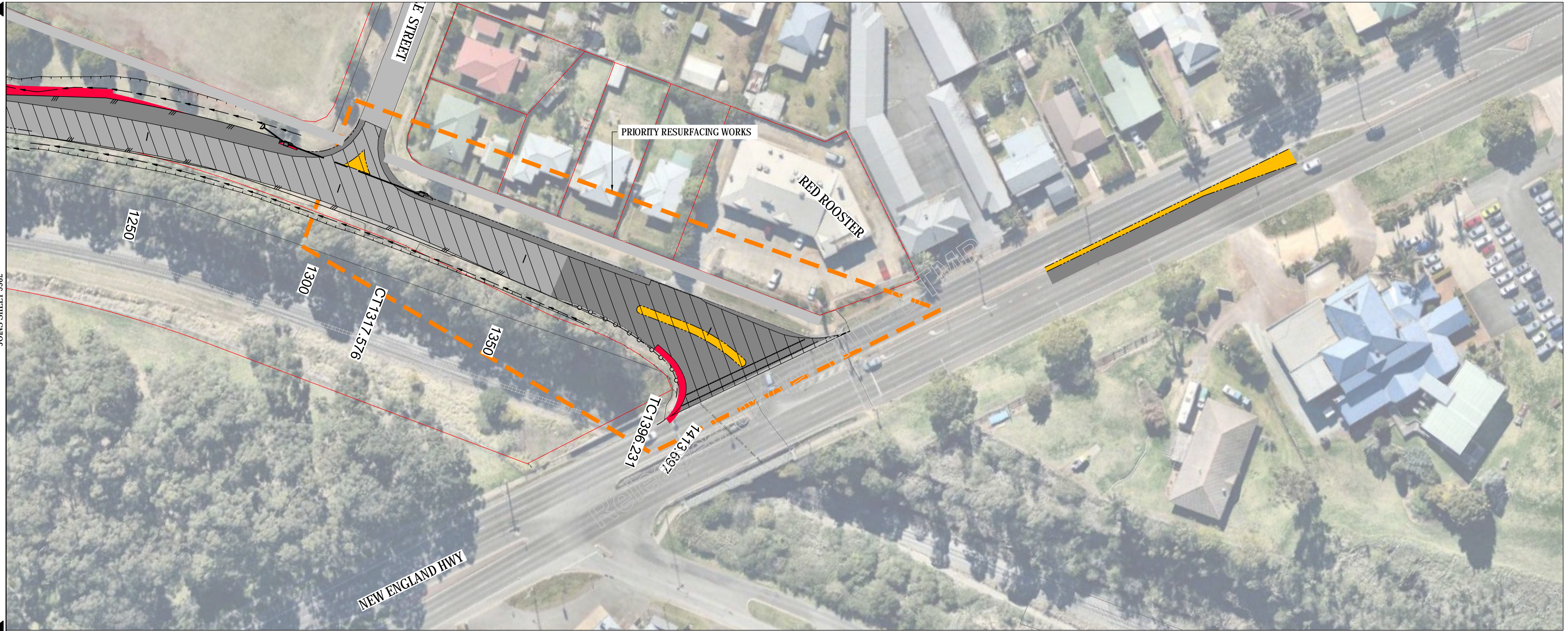
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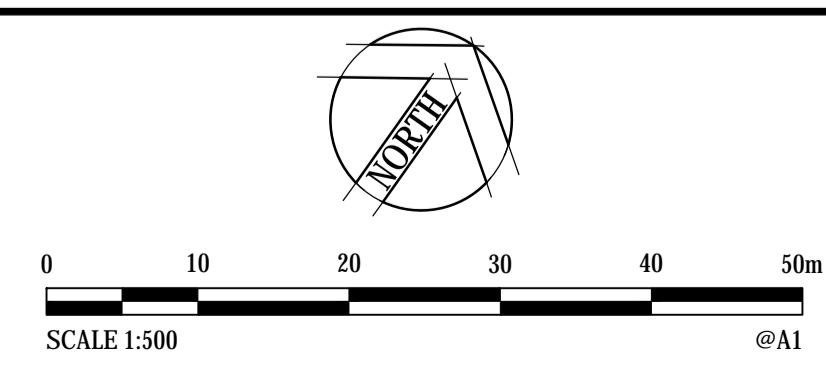
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Date	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY
Date	8/05/2017		INTERIM CONCEPT DESIGN
Date	21/06/2017	Title	PAVEMENT DETAILS
Date	21/06/2017		SHEET 2

Status	FOR INFORMATION ONLY			
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Datum	GRID	Scale	Size	
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Drawing Number	CEB06818-CI-9502			Revision
				2



NOTE:
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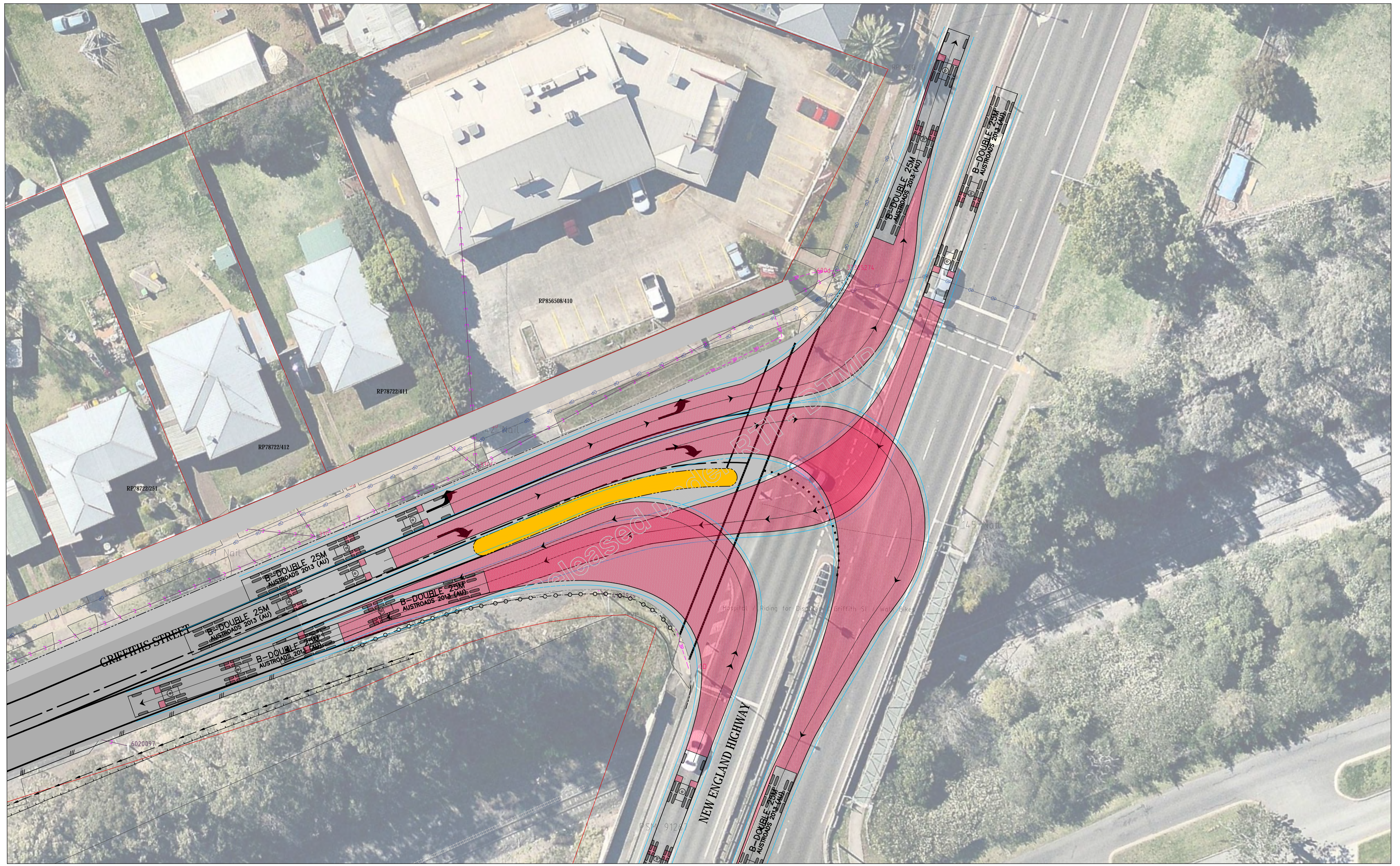
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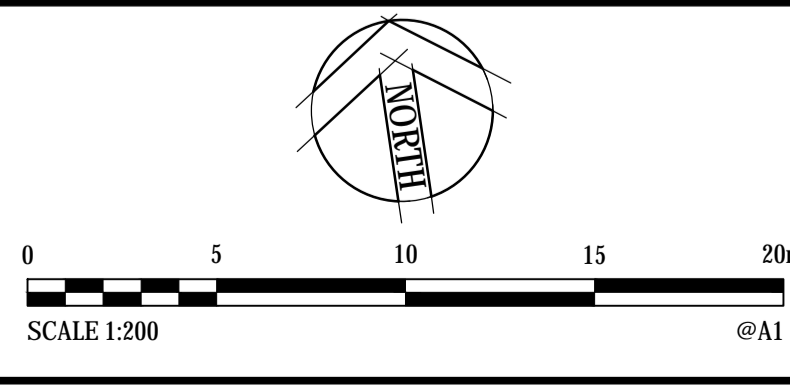
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Checked	8/05/2017	Project	GRIFFITHS STREET PLANNING STUDY
Designed	8/05/2017	Interim	INTERIM CONCEPT DESIGN
Verified	21/06/2017	Title	PAVEMENT DETAILS
Approved	21/06/2017	Sheet	SHEET 3

Datum	GRID	Scale	Size
AHD		AS SHOWN	A1
Drawing Number			Revision
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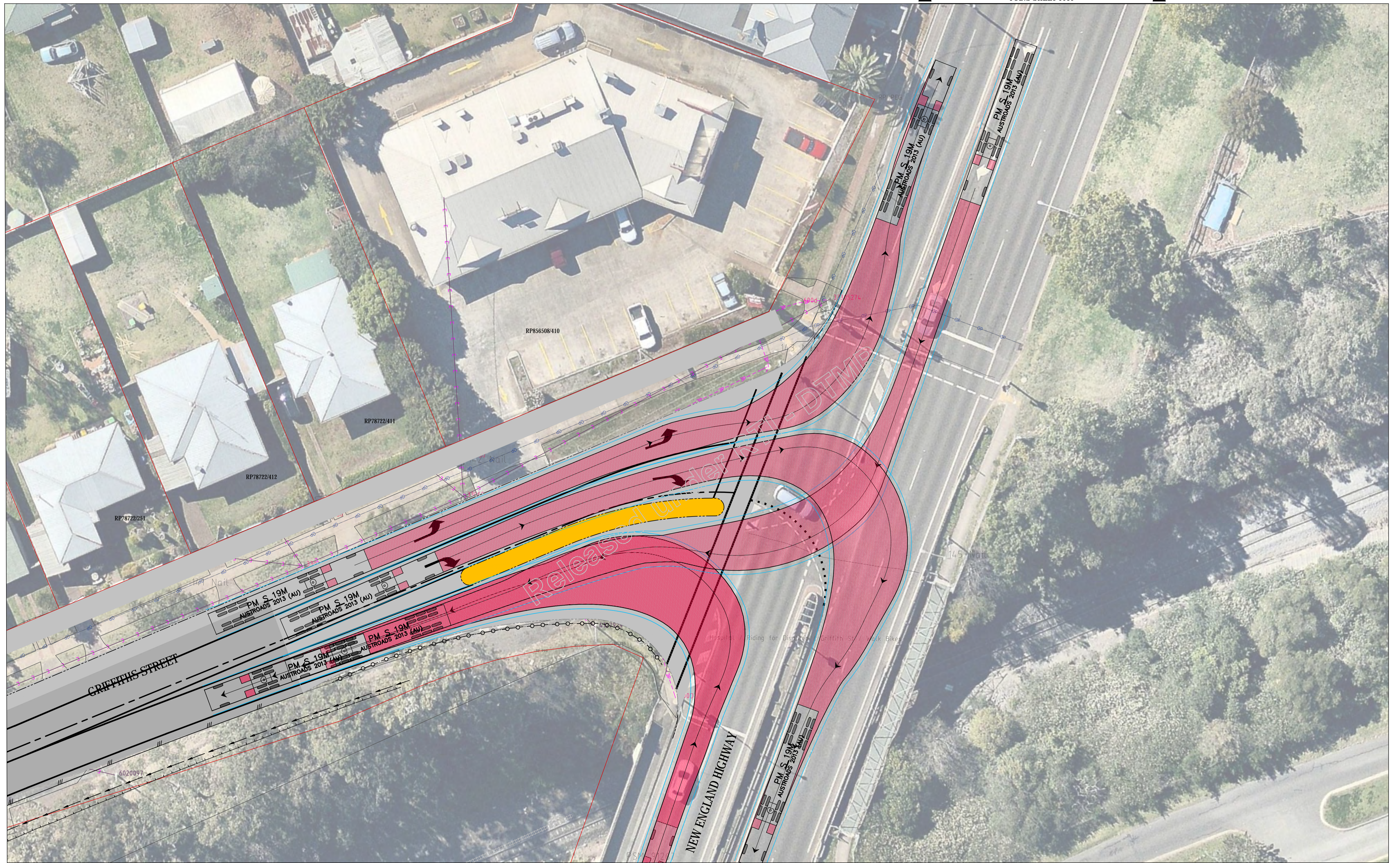
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Approved	Part Refuse Sch 4 Part 4 s.6 Personal Information

Date	8/05/2017
Date	8/05/2017
Date	8/05/2017
Date	21/06/2017

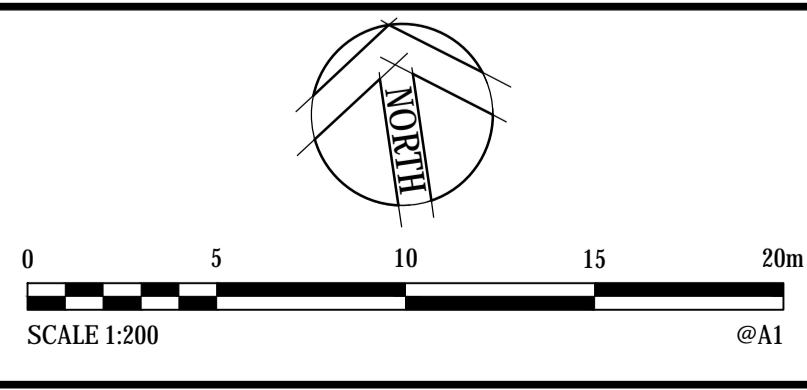
Client	TOOWOOMBA REGIONAL COUNCIL
Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Title	TURNING PATHS LAYOUT PLAN INTERIM INTERSECTION B-DOUBLE

Status	FOR INFORMATION ONLY			
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Datum	GRID	Scale	Size	A1
AHD		AS SHOWN		
Drawing Number	CEB06818-CI-9903			Revision
				2



XREFS: XR - DBVT - XR - LOCALITIES - XR - SURVEY - XR - AERIAL - XR - CONCEPT - DESIGN - INTERIM OPT 1 - XR - AERIAL - 20170206 - XR - PRELIM - DESIGN - INTERIM 2 - PLOT PDF - SGC - minibk - PLOT PDF - SGC - verified
 CAD File: L:\CEB06818\9905 - design phase\drawings\CEB06818-CI-9901-9905.dwg

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1	26/04/2017	ISSUED FOR INFORMATION			HW



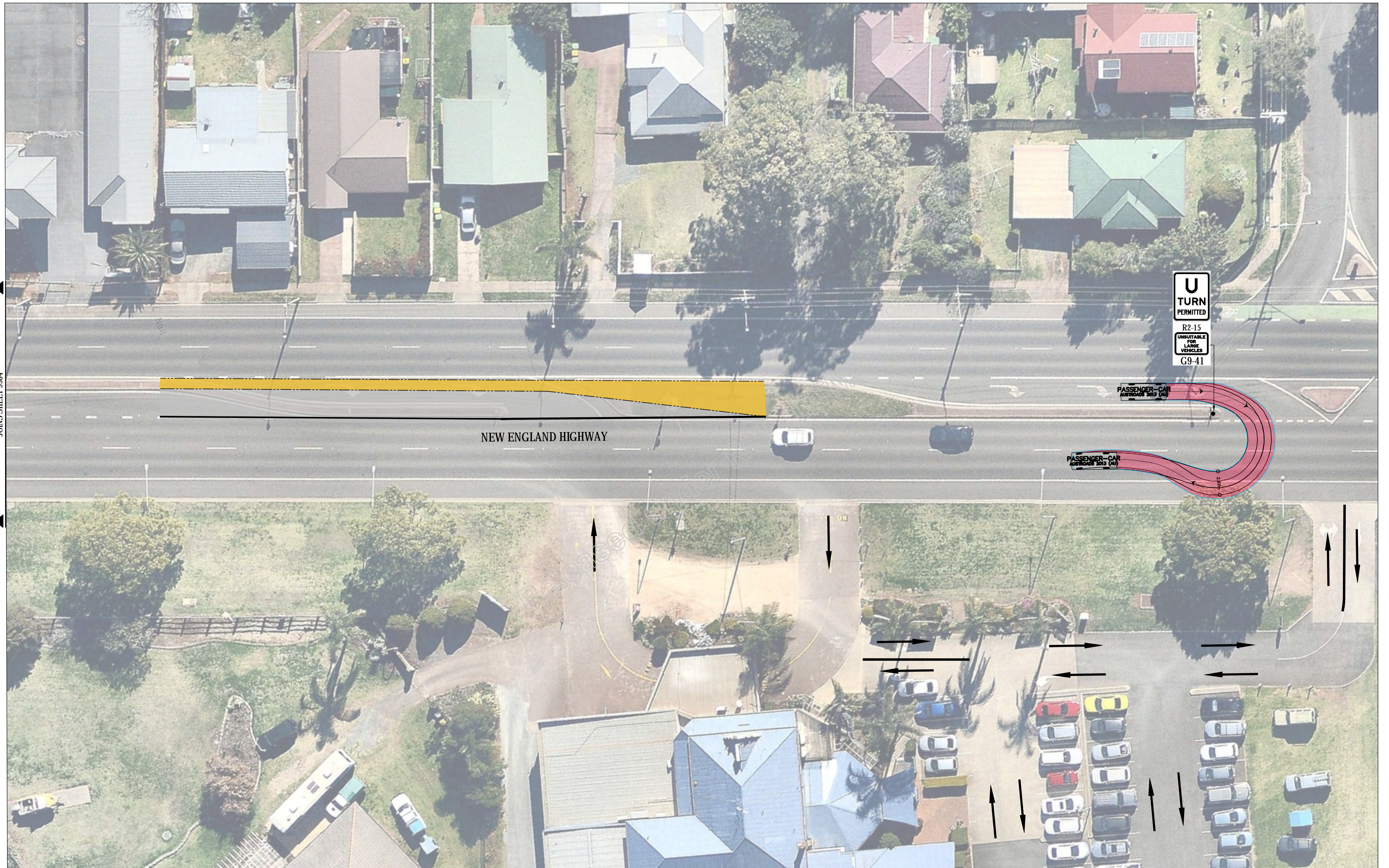
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Designed	Part Release Sch 4 Part 4 s.6 Personal Information	Date	8/05/2017
Verified	Part Release Sch 4 Part 4 s.6 Personal Information	Date	21/06/2017
Approved	Part Release Sch 4 Part 4 s.6 Personal Information	Date	21/06/2017

Client	TOOWOOMBA REGIONAL COUNCIL
Project	GRIFFITHS STREET PLANNING STUDY INTERIM CONCEPT DESIGN
Title	TURNING PATHS LAYOUT PLAN INTERIM INTERSECTION 19m SEMI

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Datum	GRID	Scale	Size	
AHD		AS SHOWN	A1	
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Project	GRIFFITHS STREET PLANNING STUDY
Interim Concept Design	
Title	TURNING PATHS LAYOUT PLAN
	NEW ENGLAND HIGHWAY
	CAR U-TURN

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AHD		AS SHOWN	A1
Drawing Number	Revision		
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TOOWOOMBA REGIONAL COUNCIL

GRIFFITHS STREET PLANNING STUDY ULTIMATE CONCEPT DESIGN

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