

ENGINEERING REPORT

FOR THE PROPOSED MIXED USE DEVELOPMENT

LOCATED AT
527 GREGORY TERRACE,
BOWEN HILLS

PREPARED FOR
KINGSFORD DEVELOPMENT AUSTRALIA

BY
BORNHORST & WARD
SEPTEMBER 2016

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2016/759
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Queensland
Government

Bornhorst & Ward Project No. **14313B**

If you have any queries regarding this report please contact Nicholas Rozis.

Revision	Date	Description	Author	Rev.	App.
DRAFT	December 2014	Draft Issue to Client	LP	JT	
A	January 2015	Issue to Client	LP	JT	NR
B	January 2015	Updated architectural plans	LP	JT	NR
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D	September 2016	Updated architectural plans	JV	NR	NR
E	September 2016	Updated architectural plans	JV	NR	NR

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CONTENTS

1. INTRODUCTION	4
2. SITE CHARACTERISTICS	4
2.1 LOCATION	4
2.2 LANDUSE	5
2.2.1 EXISTING	5
2.2.2 PROPOSED	5
2.3 TOPOGRAPHY AND SITE DRAINAGE.....	5
3. EXISTING AND PROPOSED CIVIL WORKS AND INFRASTRUCTURE	6
3.1 STORMWATER.....	6
3.1.1 EXISTING	6
3.1.2 PROPOSED	6
3.2 SEWERAGE	7
3.3 WATER	7
3.4 ROADS.....	8
3.5 EARTHWORKS	8
3.6 TELECOMMUNICATIONS (TELSTRA).....	8
3.7 ELECTRICITY (ENERGEX).....	8
3.8 GAS (APA GROUP)	8
3.9 COMMUNICATIONS.....	9
4. SITE BASED STORMWATER MANAGEMENT PLAN	10
4.1 STORMWATER OBJECTIVES	10
5. STORMWATER QUANTITY	10
5.1 STORMWATER DRAINAGE METHODOLOGY.....	10
5.2 PEAK FLOW CALCULATIONS.....	10
6. STORMWATER QUALITY MANAGEMENT PLAN	12
6.1.1 Pollutants of Concern	12
6.1.2 Modelling/Assessment Approach	12
6.1.3 Meteorological Data	13
6.1.4 Source Nodes	13
6.1.5 Treatment Nodes	14
6.1.6 Proposed Treatment Train.....	14
6.1.7 Results.....	15
7. EROSION AND SEDIMENT CONTROL PLAN (ESCP).....	15
8. SUMMARY	15

LIST OF FIGURES

Figure 1: Aerial Photograph of Site.....	4
Figure 2: Proposed Treatment Train.....	14

LIST OF TABLES

Table 1: Pre & Post Development Peak Flow Calculations (Development Site)	11
Table 2: South East Queensland Stormwater Quality Objectives.....	12
Table 3: Source Node Catchment Details	13
Table 4: Treatment Node Information	14
Table 5: Pollutant Removal Rates Discharge	15

APPENDICES

Appendix A	Architectural and Site Information
Appendix B	Development Drawings
Appendix C	Hydrological Calculations
Appendix D	MUSIC Data
Appendix E	Brisbane City Council Erosion Hazard Assessment Form

1. INTRODUCTION

Bornhorst + Ward has been commissioned to investigate and report on the civil engineering, servicing and stormwater requirements pertaining to the proposed mixed unit commercial and residential development located at 527 Gregory Terrace, Bowen Hills (Lot 22 on RP202547).

The development site is located within the Bowen Hills Priority Development Area (PDA), however all Engineering requirements for this proposal will be in accordance with the Brisbane City Council Design City Plan (2014) and Planning Scheme Policies, the Queensland Urban Drainage Manual (QUDM) (2013), Queensland Urban Utilities design guidelines and the State Planning Policy (2016). This is consistent with other developments within and surrounding the PDA.

This report outlines the proposed design methodology and calculations in support of a Development Application to Economic Development Queensland (EDQ) and should be read in conjunction with other documents issued by the consultant team.

2. SITE CHARACTERISTICS

2.1 LOCATION

The proposed site is located within the south eastern extent of the declared Bowen Hills PDA, and is located to the south of Gregory Terrace and east of Brunswick Street. Commercial and residential development surrounds the site. Refer to Figure 1 below.

Street Address: 527 Gregory Terrace, Bowen Hills 4006

RP Description: Lot 22 on RP202547



Figure 1: Aerial Photograph of Site

2.2 LANDUSE

2.2.1 EXISTING

The 0.70 ha development site is largely occupied by 2 x 4 storey commercial office towers. A large portion of the site is occupied by landscaping and outdoor seating and recreation areas. Driveway access is currently available from Gregory Terrace. Refer to Figure 1 above for further details.

2.2.2 PROPOSED

The development proposal consists of demolishing the existing commercial buildings and associated facilities and constructing 2 x residential towers, with retail and commercial office space at the ground and lower levels.

The development will be delivered across two stages. Stage 1 is located within the northern portion of the site and consists of a 30 storey tower with 4 levels of basement that encompasses the majority of the site. Stage 2 is within the southern portion of the site and consists of the construction of a 25 storey tower over the Stage 1 basement. Access to the development is to remain from the existing location at Gregory Terrace. Public thoroughfare and landscaping is proposed at the podium level as part of the development. Refer to the nra-co-lab Architectural Design Plans in Appendix A for further information.

2.3 TOPOGRAPHY AND SITE DRAINAGE

The majority of the site currently falls south and south east at an approximate average grade of 1 in 11 (9%). Levels range between RL 24m AHD in the sites north eastern boundary to RL 18m AHD in the sites southern boundary. Surface water runoff from the site currently sheet flows south and south east to the road reserves of Brunswick Street and to the southern and eastern adjoining properties. A roof water connection appears to currently service the site and pertains from the eastern adjoining properties. A small amount of surface water runoff is expected to fall north and north-west of the site as overland sheet flow to the road reserves of Gregory Terrace and Brunswick Street.

Underground stormwater infrastructure is currently located within the vicinity of the site. An underground culvert of 1275x2150mm dimensions is located within the intersection of Brunswick Street and Water Street, approximately 80m downstream of the site. A 525mm dia network is also located within Diggles Close, south of the site and continues south within an easement between the southern adjoining properties. Both networks continue east along Water Street, before ultimately discharging to the Brisbane River, approximately 1700m east of the subject site. Please refer the Brisbane City Council Stormwater and Cable Network Plan in Appendix A for further information.

The site is not subject to an upstream external catchment as it is situated within a high topographical location relative to its surrounds.

Furthermore, information obtained from Brisbane City Councils Floodwise Property Report and the Interactive Flood Awareness Map (Appendix A) indicate that the site is not subject to flooding.

3. EXISTING AND PROPOSED CIVIL WORKS AND INFRASTRUCTURE

3.1 STORMWATER

3.1.1 EXISTING

As stated in **Section 2.3**, stormwater infrastructure is located within the vicinity of the site. An underground 1275x2150mm culvert is located within the intersection of Brunswick Street and Water Street, approximately 80m downstream of the site.

A 525mm dia stormwater pipe is located in an easement within the rear property boundary of 50 Anderson Street, and adjacent to the rear property boundary of 62 Brunswick Street, immediately south of the site. This network discharges to the aforementioned infrastructure within Water Street. It is expected that this network has been implemented as part of the infill development at 50 Anderson Street to cater for the ultimate development land use within the catchment upstream, inclusive of the development site. This assumption has been based on the atypically large diameter 525mm dia pipe within the upper catchment extent, with an estimated capacity of approximately 1.05m³/s (at approximately 6% grade). While the upstream catchment pertaining to this network produces a 10% AEP runoff rate estimated conservatively as 0.67m³/s, it is expected that this infrastructure has capacity to service the proposed development.

A roof water connection of unknown diameter appears to service the existing development and pertains from the underground stormwater network within Anderson Street. This roof water connection currently traverses 541 and 555 Gregory terrace and 68 Anderson Street, in a built-over arrangement.

Please refer to the Brisbane City Council Stormwater and Cable Network Plan in Appendix A for further information.

3.1.2 PROPOSED

We are proposing two options for the proposed stormwater management strategies to service the development. Option 1 is the preferred option however; it will await permission from the southern adjoining property owner to implement. The options are summarised below:

- **OPTION 1:** Provide an extension of the existing 525mm dia pipe within the rear property boundary of 50 Anderson Street to the site southern boundary to service the development.
 - o As mentioned, it is expected that this network was implemented to service the ultimate development land use of the catchment upstream, inclusive of the development site. Therefore, our investigation of the existing infrastructure suggests there is adequate capacity to discharge the 10% AEP piped runoff from the site to this network;
 - o The approved development plans for the downstream adjoining site, 62 Brunswick Street, do not indicate an upstream connection has been provided. As the majority of the runoff from the site currently sheet flows south beyond the southern property boundary, some provision for an upstream connection should have been made available to the development site in accordance with Brisbane City Council guidelines;
 - o Permission from the downstream property owner will be required to provide the extension of the 525mm dia network to implement this option; and

- o The development plans included within the Site Based Stormwater Management Plan for 62 Brunswick Street, indicate that adequate clearance is available to provide an easement and stormwater pipe within the downstream site.

Please see the Robert Bird Group Concept Stormwater Management Plan in Appendix B for further information.

OR

- **OPTION 2:** Provide a connection to the site from the 1275x2150mm underground stormwater network within the intersection of Brunswick Street and Water Street, approximately 80m south of the site south western boundary.
 - o This option requires the installation of approximately 80m length of new stormwater pipe within Brunswick Street to the sites frontage;

Furthermore, the existing roof water connection will not be used by the proposed development. It is expected that the aforementioned 525mm dia infrastructure will have adequate capacity to service the developments roof water runoff. Furthermore, it is expected that this main will be made redundant as future and proposed development occurs within the sites it currently traverses and services.

Internal drainage will service the roof, podium and landscaped areas of the development for the 10% AEP storm event. Flows in excess of the piped drainage system are proposed to discharge to the road reserves of Gregory Terrace and Brunswick Street as overland flow.

Please refer to the Bornhorst + Ward Proposed Stormwater Management Plan SK031 in Appendix B for further information.

3.2 SEWERAGE

Sewerage infrastructure is currently located within the vicinity of the site. The site is currently serviced by a sewer main within Brunswick Street, adjacent to the sites western boundary. Please refer to the QUU Sewer Infrastructure Map in Appendix A for further information.

We are proposing to retain the existing sewer connection to the main within Brunswick Street to service the proposed development. Please refer to the Bornhorst + Ward Proposed Sewer and Water Connection Plan SK071 in Appendix B for further information.

A QUU Service Advice Notice (Appendix A) has been obtained for the proposed development and indicates the proposed connection location is acceptable and no external sewer infrastructure upgrades will be required. All proposed Sewer and Water connections will be submitted to QUU for assessment and approval.

3.3 WATER

Potable water infrastructure is currently located within the vicinity of the site. The site is currently serviced by a main within Gregory Terrace, at the sites north eastern boundary. Please refer to the QUU Water Infrastructure Map in Appendix A for further information.

We are proposing to retain the existing connection to the main within Gregory Terrace to service Stage 1 and 2 of the proposed development. Please refer to the Bornhorst + Ward Proposed Sewer and Water Connection Plan SK071 in Appendix B for further information.

A QUU Service Advice Notice (Appendix A) has been obtained for the proposed development and indicates the proposed connection location is acceptable and no external potable water infrastructure upgrades will be required. All proposed Sewer and Water connections will be submitted to QUU for assessment and approval.

3.4 ROADS

Access to the multi-unit development is to be via the existing access from Gregory Terrace. Construction of a new driveway crossover may be required. Any proposed of future road works will be undertaken in accordance with Brisbane City Council guidelines.

A 7m road resumption is also provided by the development along the frontage to Brunswick Street,

3.5 EARTHWORKS

Due to the proposed basement extents, the majority of the development site will be in cut. All earthworks will also be carried out in accordance with Brisbane City Council Guidelines. A detailed earthworks plan will be prepared as a part of the detailed design operational works lodgement.

As the development encroaches a reduced level of less than RL 20m AHD, exposure to Potential and Actual Acid Sulphate soils (ASS) may be encountered. The proposed underground basement however does go beyond a reduced level of less than 5m AHD. An ASS investigation will be undertaken during the detailed design phase of the development.

3.6 TELECOMMUNICATIONS (TELSTRA)

Telstra assets, including cables and service pits are located within the vicinity of the site. Telstra infrastructure currently services the site; however infrastructure will be required to service the proposed development. Telstra is to be contacted during the detailed design phase to confirm the exact location of assets and servicing requirements of the development site.

3.7 ELECTRICITY (ENERGEX)

A Dial Before You Dig (DBYD) enquiry indicates underground low voltage electrical cables are located within and surrounding the site. Multiple low voltage cables are located within the road reserves of Gregory Terrace and Brunswick Street. A cable is also traverses the sites north and appears to pertain from the aforementioned network. Please refer to the Energex DBYD response in Appendix A for further information. All electrical assets and supply to the development should be confirmed during detailed design, with discussions between the Electrical Engineer and Energex.

3.8 GAS (APA GROUP)

Gas infrastructure was not detected from the DBYD investigation. Confirmation of gas services locations within the vicinity of the site will need to be confirmed upon the detailed design phase of the development.

3.9 COMMUNICATIONS

Underground communications infrastructure is located within and surrounding the site. Traffic system cables and fibre optic cables have been identified within Gregory and within the site from a DBYD investigation. Coordination between the relevant services providers will be required upon the detailed design phase of the development. Please refer to Appendix A for the DBYD information.

4. SITE BASED STORMWATER MANAGEMENT PLAN

4.1 STORMWATER OBJECTIVES

Under the Brisbane City Council Infrastructure Design Planning Scheme Policy (2014), several design elements were identified in relation to stormwater management issues. Brisbane City Council must be satisfied that:

- The proposed development can be drained;
- The stormwater management system can follow the features and functions of the natural drainage system;
- The volume, timing, velocity and pollutant load of stormwater has no adverse effect on any surrounding properties or receiving waters; and
- Suitable provision is made in the design layout to accommodate for major drainage.

5. STORMWATER QUANTITY

5.1 STORMWATER DRAINAGE METHODOLOGY

Modelling of stormwater runoff quantity has been considered for the existing case and operational phase of the development. In order to assess the existing and predicted future (operational phase) discharge rates from the development site, calculations have been conducted based on the Rational Method, according to the methods specified in the Queensland Urban Drainage Manual (2013) and Brisbane City Council's Infrastructure Design Planning Scheme Policy (2014).

5.2 PEAK FLOW CALCULATIONS

The Rational Method as outlined in the Queensland Urban Drainage Manual (2008) was used to determine the peak flow rate corresponding to the minor and major storm events for this development.

The Brisbane City Council Infrastructure Design Planning Scheme Policy, Table 7.2.2.3B "Design Standards for Drainage Systems" was used to identify the design storm events for this development as:

Minor -	1 in 10 year ARI
Major (overland flow) -	1 in 50 year ARI
Major -	1 in 100 year ARI

Flow rates were calculated at the point of discharge from the site for the existing and operational phases of the development. The results are summarised in Table 1 following. Detailed calculations can be reviewed in Appendix C.

Table 1: Pre & Post Development Peak Flow Calculations (Development Site)

	Parameter	Existing	Proposed	Difference
Catchment Details	Catchment Area (Ha)	0.700	0.700	-
	Fraction Impervious (FI)	52%	71%	+ 19%
	Coefficient of Runoff (C_{10})	0.80	0.84	+ 0.04
	Time of Concentration (min)	5.0	5.0	-
	10 year Rainfall Intensity (mm/hr)	215	215	-
	50 year Rainfall Intensity (mm/hr)	292	292	-
	100 year Rainfall Intensity (mm/hr)	327	327	-
Discharge	1 in 10 year ARI (m^3/s)	0.334	0.351	+ 0.017
	1 in 50 year ARI (m^3/s)	0.523	0.549	+ 0.026
	1 in 100 year ARI (m^3/s)	0.610	0.635	+ 0.025

As indicated within Table 1 above, the rate of stormwater runoff exiting the site increases by 17l/s and 25l/s as a result of the proposed development for both the minor (10 year) and major (100 year) storm events, respectively. This is due to the increased impervious area, increasing the coefficient of runoff.

The time of concentration for the both the existing and the developed site catchment was calculated using first principles, in accordance with Section 4.06 Time of concentration (Rational Method) in QUDM (2013). The coefficient of runoff (C_{10}) was identified as 0.80 and 0.84 for existing and proposed conditions respectively, based on the fraction impervious calculated for the site and with reference to Table 4.05.3 (a) of the Queensland Urban Drainage Manual. Refer to Appendix C for the detailed hydrological calculations.

As indicated above, the peak discharge from the site will be increased minimally as a result of the development and the effect of the increased discharge on downstream infrastructure is expected to be insignificant. However, due to the existing sensitive nature of the downstream infrastructure and experienced flooding issues within Water Street, quantity mitigation will be provided in site.

We are proposing to provide an onsite detention tank of approximately $13m^3$. Piped runoff from the 10% AEP storm event will be conveyed to the detention tank prior to entering the proposed downstream drainage system.

6. STORMWATER QUALITY MANAGEMENT PLAN

Stormwater Quality for the site has been assessed in accordance with Part E of the Queensland Government State Planning Policy (December 2013) which sets out Interim Development Assessment Requirements. The following extract from the document describes when the policy is applicable:

Receiving waters – a development application for any of the following:

1. *A material change of use for urban purposes that involves a land area greater than 2500 square metres that:*
 - a) *Will result in an impervious area greater than 25 per cent of the net developable area, or*
 - b) *Will result in six or more dwellings, or*
2. *Reconfiguring a lot for urban purposes that involves a land area greater than 2500 square metres and will result in six or more lots, or*
3. *Operational works for urban purposes that involve disturbing more than 2500 square metres of land*

As the development site area is greater than 2500m² and includes the following:

- An impervious area of >25% of the net developable area;
- Six or more dwellings; and
- Require operational works for urban purposes,

the objectives of the State Planning Policy are triggered. As such, the development requires assessment under the State Planning Policy (2013).

6.1.1 Pollutants of Concern

In accordance with Figure 2.5 of the Urban Stormwater Quality Planning Guidelines, the proposed development is located within the South East Queensland region for stormwater quality design objectives. The key pollutants to be targeted and the minimum pollutant concentration removal objectives described in the aforementioned document for the South East Queensland region are outlined in Table 3 below:

Table 2: South East Queensland Stormwater Quality Objectives

Pollutant	Concentration Removal
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

6.1.2 Modelling/Assessment Approach

A quantitative assessment of stormwater runoff quality has been undertaken for the operational phase of the development.

The predicted future (operational phase) reduction in mean annual loads of key pollutants have been evaluated using the “*Model for Urban Stormwater Improvement Conceptualisation (MUSIC)*”. MUSIC is a stormwater quality modelling program that provides estimates of stormwater pollution generation and the performance of stormwater management measures used in series or parallel to form a ‘treatment train’.

Input parameters and required Water Quality Objectives (WQOs) specific to the South East Queensland region were adopted in accordance with the Water by Design MUSIC Modelling Guidelines and the Urban Stormwater Quality Planning Guidelines, respectively.

6.1.3 Meteorological Data

The first step in creating the MUSIC model was to select the appropriate meteorological data set (period and time step) to be used as the basis for the runoff algorithms. Section 3.1 – Meteorological Data and Section 3.2 – Modelling Period and time-step, of the reference material details the Rainfall Data and Time Step process requirements of the model, respectively.

The time step used for the MUSIC modelling process was: Brisbane 6 Minutes.

6.1.4 Source Nodes

The second step taken in creating the MUSIC model was to define ‘Source Nodes’ or Sub-Catchments. Source nodes for modelling the catchments were defined as per the Water By Design MUSIC Modelling Guidelines. The parameters adopted are listed in Appendix D for reference.

The model consisted of two types of source nodes:

- Source nodes representing the commercial ground level areas; and
- Source nodes representing residential roof areas.

Table 3: Source Node Catchment Details

Source	Node Type	Area (Ha)	Fraction Impervious
Ground Level	Commercial Ground Level	0.43	65%
Roof	Residential Roof	0.22	100%
	Total	0.65*	70%

*area does not include dedicated road reserve

6.1.5 Treatment Nodes

A range of Stormwater Quality Best Management Practices (SQBMPs) were considered for inclusion in the development site layout. Each has been reviewed for its suitability for this location. For this particular development the treatment option listed in Table 4 has been chosen for incorporation into the development design.

Table 4: Treatment Node Information

Treatment Device	Discussion
Stormwater360 – EnviroPod Gross Pollutant Traps	A gross pollutant trap is a treatment device designed to capture coarse sediment, trash and vegetation matter in stormwater runoff. Stormwater360 EnviroPod gross pollutant traps will be implemented within drainage inlets in inlets throughout the podium and landscaped area of the proposed development.
Stormwater360 – Storm Filter	The Stormwater360 Storm Filter device is a proprietary stormwater quality treatment device to remove sediments and nutrients from runoff. A 20 x 690mm cartridge system within a 3100mm diameter manhole structure is proposed for the development in conjunction with 6 EnviroPods to be installed within the upstream drainage network.

Refer to the Bornhorst + Ward Proposed Stormwater Management Plan SK031 in Appendix B; and the MUSIC Input Data in Appendix D for further information.

6.1.6 Proposed Treatment Train

The treatment train proposed for the development which consists of a 20 x 690mm cartridge Stormwater360 Stormfilter and 6 x Enviropod system, is illustrated in Figure 2 below.

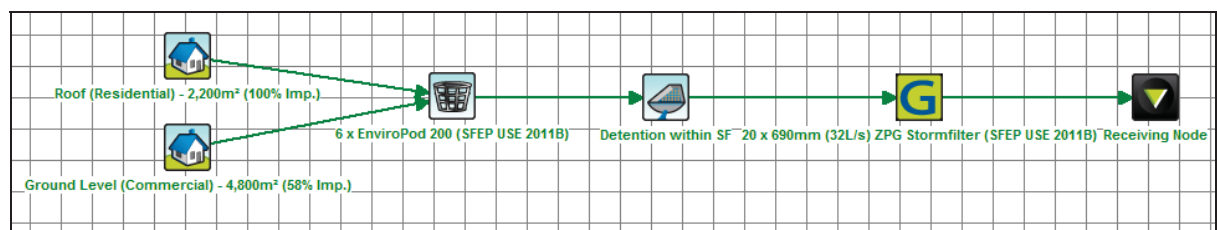


Figure 2: Proposed Treatment Train

6.1.7 Results

The pollutant export removal rates for the developed phase obtained from the MUSIC model and analysis are indicated in Table 5.

Table 5: Pollutant Removal Rates Discharge

Pollutant	TSS (%)	TP (%)	TN (%)	GP (%)
Treatment Train	87.8	64.8	45.4	100.0
WQOs	80.0	60.0	45.0	90.0

Indicated in the table above, the removal rates for the target pollutants; total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and gross pollutants (GP), are all above the water quality objectives stipulated in the Urban Stormwater Quality Planning Guidelines for developments in South East Queensland. On this basis, the treatment train proposed for the development will yield satisfactory pollutant removal to satisfy the requirements of the State Planning Policy (2014) and the Urban Stormwater Quality Planning Guidelines.

7. EROSION AND SEDIMENT CONTROL PLAN (ESCP)

A comprehensive Erosion and Sediment Control Plan including a construction process will be prepared for this development during the detailed design phase. The ESCP designs will be in accordance with the Institution of Engineers reference material and Brisbane City Council's Guidelines.

An Erosion Hazard Assessment Form has also been included in this application (refer to Appendix E).

8. SUMMARY

From the investigations conducted, it has shown that the proposed residential development located at 527 Gregory Terrace, Bowen Hills, can be constructed and serviced in accordance with Brisbane City Council guidelines. The following points summarise the findings and recommendations:

- The site is not subject to flooding;
- Sewer and water services currently service the site. Advice from QUU indicates that the development can be serviced by the existing external infrastructure;
- A connection from the existing 525mm dia network to the site south OR a connection from the existing 1275x2150mm infrastructure within the intersection of Water Street and Brunswick Street, is proposed to service the proposed development;
- Stormwater quantity mitigation will be provided on site;
- Site access is to be provided from the Gregory Terrace as existing;
- Earthworks are required for the construction of the basement levels;
- An Erosion and Sediment Control Plan will be provided during the detailed design phase of the development;
- An Acid Sulphate Soil investigation will be undertaken during the detailed design phase of the development.

APPENDIX A

ARCHITECTURAL AND SITE INFORMATION

Ground Floor







200 000

4

6200

RAM

P

4150

1

1

NG

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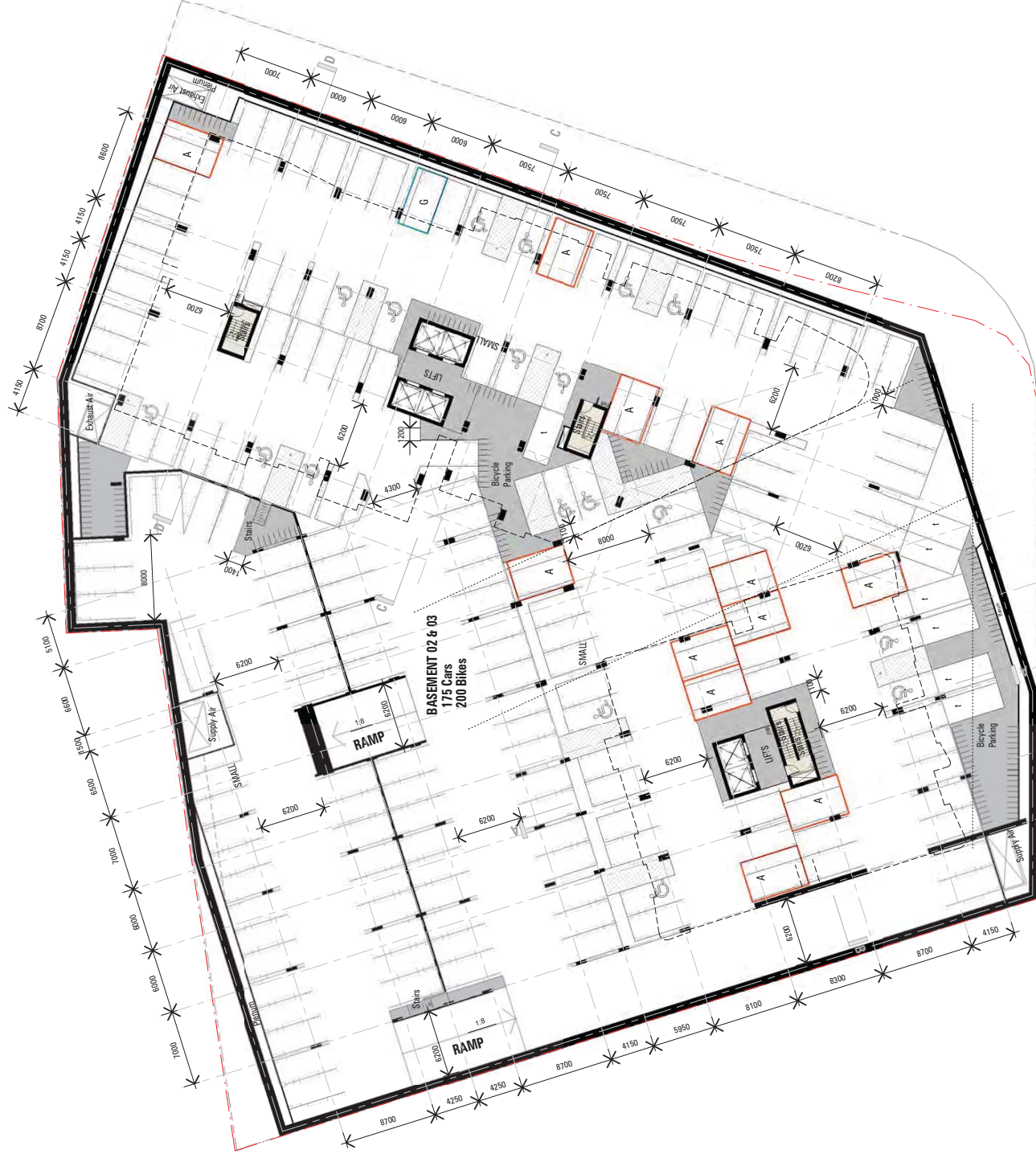
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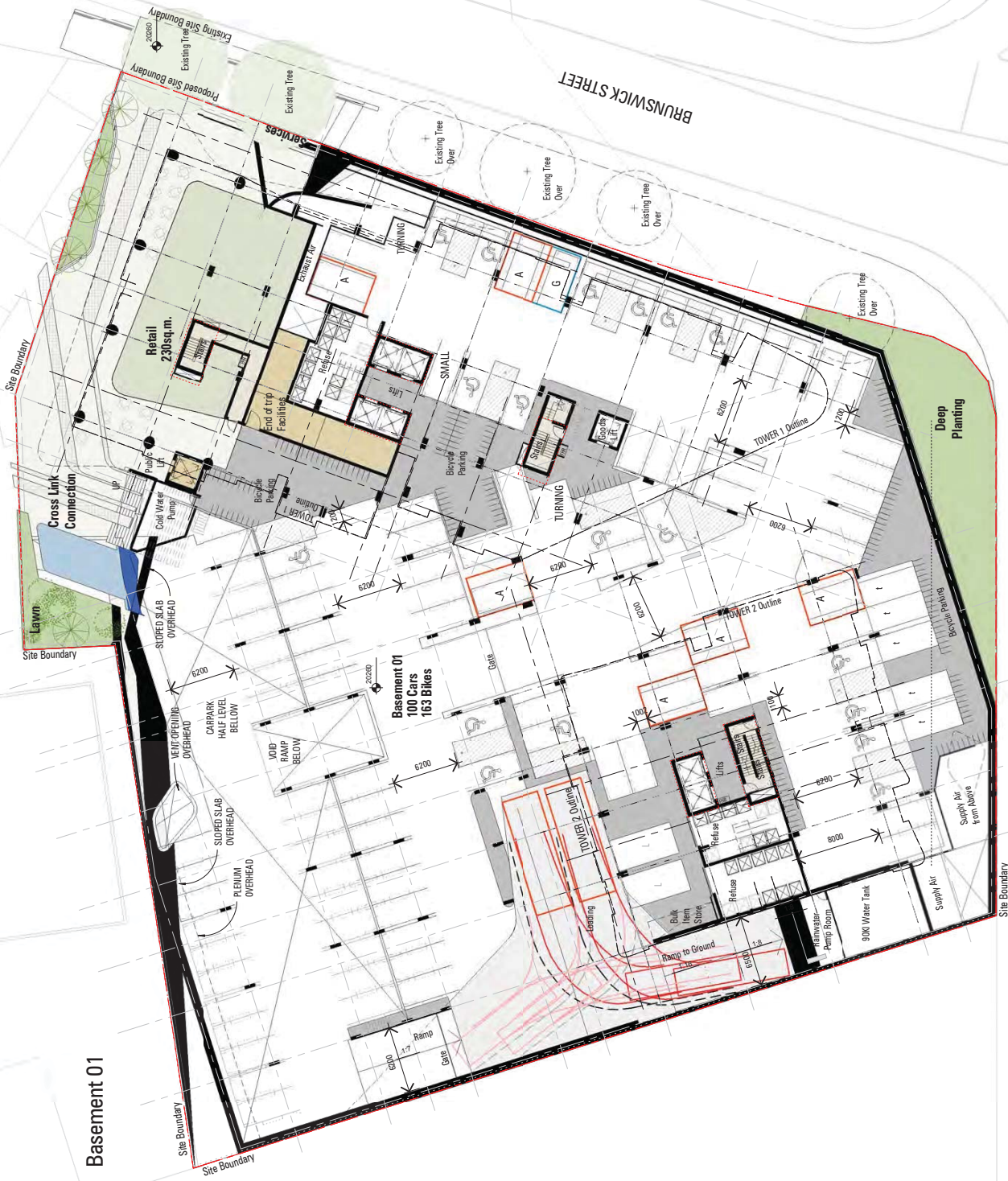


- Carpark Legend
- Code Compliant PMD Carpark
 - A Accessible Carpark - 3.8m x 5.5m
 - G Generous Carpark - 2.8 x 5.5m
 - T Tandem Carpark

Landscape Legend

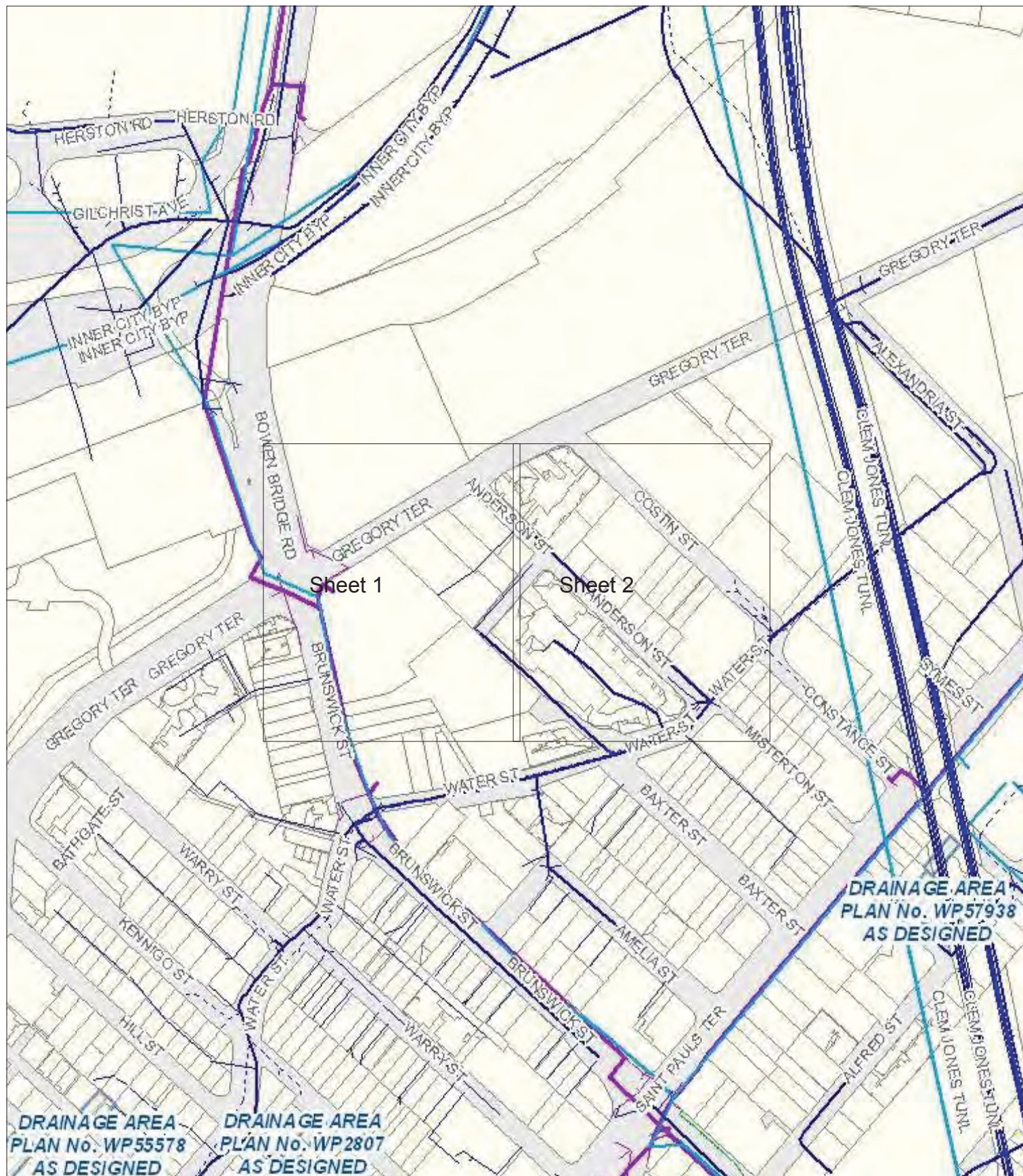
Existing Tree - To Be Retained

New Landscaping



GREGORY TERRACE

PRELIMINARY 13/09/2016



Map Sheet Overview

Sequence Number: 42322088

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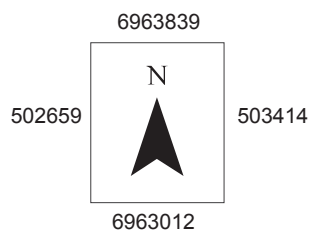
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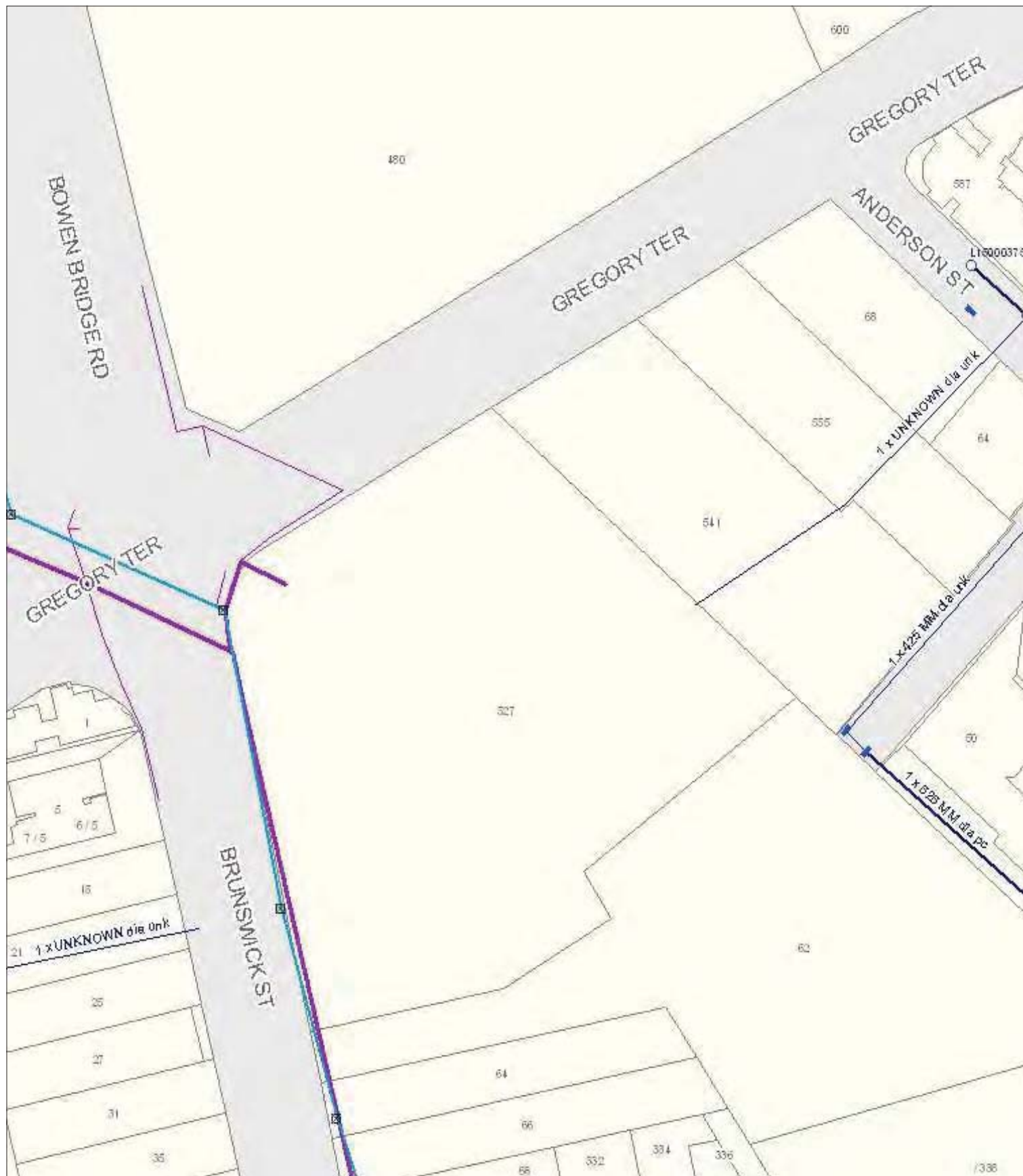
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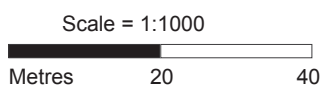
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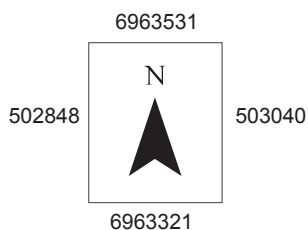
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Location:



Sheet 1



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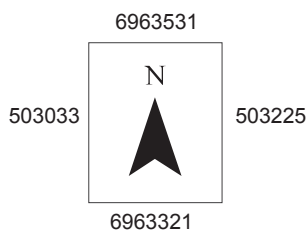
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Scale = 1:1000



Location:



Date: Oct 30, 2014

Sheet 2



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Legend

Stormwater Network

-  Stormwater Drain
-  Stormwater Gully / Roofwater Connection
-  Future Stormwater Drain
-  Stormwater Maintenance Hole
-  Stormwater Roofwater Pit
-  Stormwater Gully Pit

BCC Cable Network

-  Traffic System Cable
-  Traffic Signal Ducting
-  Traffic Light Conduit
-  Fibre Optic Cable Location
-  Flood Telemetry Conduit
-  Fibre Optic Pit Location



Brisbane City Council FloodWise Property Report

Report Reference

3215156

21/11/2014 11:21:00

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

To find out more about how the contents of this report may affect building or development on this property, please visit www.brisbane.qld.gov.au/planning-building. For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit www.brisbane.qld.gov.au/beprepared

PROPERTY DETAILS:

Address: 527 GREGORY TCE, FORTITUDE VALLEY QLD 4006

Lot Details: L.22 RP.202547

This property has no flood levels or flags for building or development purposes

Brisbane City Council has not assigned flood level information for this property for building or development purposes.

For professional advice or a detailed assessment of a property contact a Registered Professional Engineer of Queensland.

For general information about your flood risk and how to prepare your home or business for potential flooding visit www.brisbane.qld.gov.au/beprepared.



Brisbane City Council FloodWise Property Report

Report Reference

3215156

21/11/2014 11:21:00

Dedicated to a better Brisbane

TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit www.brisbane.qld.gov.au/planning-building or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

PROPERTY DETAILS:

Address: 527 GREGORY TCE, FORTITUDE VALLEY QLD 4006

Lot Details: L.22 RP.202547

No Defined Flood Levels (DFL), Residential Flood Level (RFL) or Overland Flow flags for this property

There are no Defined Flood Levels, Residential Flood Level, Overland Flow or other flood related flags associated with this property.

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

There are currently no River, Creek/Waterway, or Overland Flow Flood Planning Areas that apply to this property.

COASTAL HAZARD OVERLAY CODE

There are currently no Coastal Hazard Overlays that apply to this property.

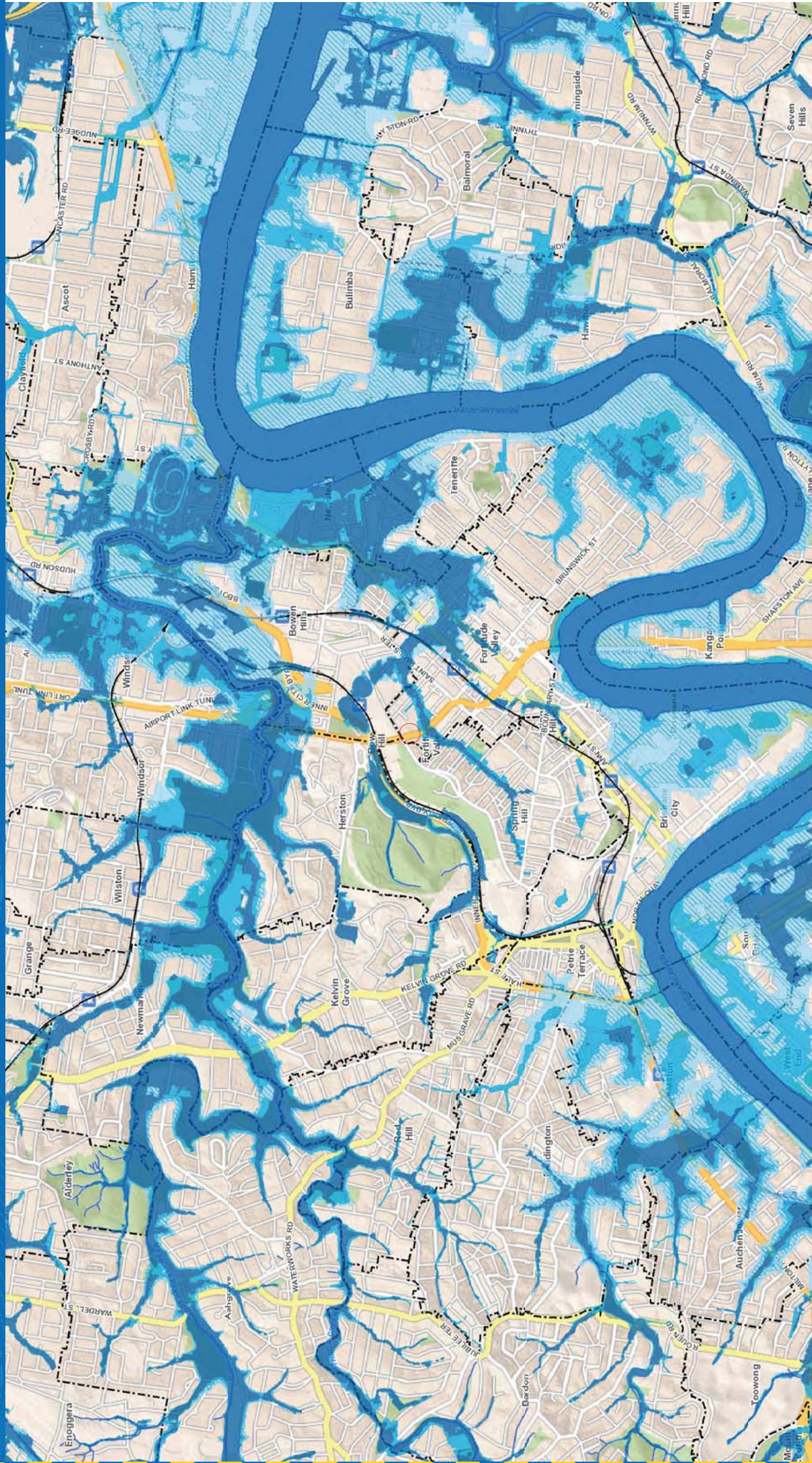


Dedicated to a better Brisbane

Map produced on 15/12/2014 at 7:02 PM

FLOOD AWARENESS MAP 527 GREGORY TCE, FORTITUDE VALLEY (22RP202547)

Be Aware.
Be Prepared.



High Flood Risk
Flood risk is almost certain to occur in a high risk area.
Residents and businesses are strongly advised to learn about the flood risk for their property so they can be prepared to help minimise the impact on their home, business and family.

Medium Flood Risk
Flood risk is likely to occur in a medium risk area.
Residents and businesses are advised to learn about the flood risk for their property so they can be prepared to help minimise the impact on their home, business and family.

Low Flood Risk
A low flood risk area may experience flooding in a rare flood event. Flooding is unlikely in a low flood risk area, but may still occur.
Very Low Flood Risk
A very low flood risk area is unlikely to flood except in a very rare or extreme flood event.
Flooding is very unlikely in a very low flood risk area, but may still occur.

Residents and businesses should consider how flooding may affect their local suburb, area or community.

This map uses data produced via computer modelling. The information is for awareness purposes. Please consider that you may need individual professional advice. Council makes no warranty or representation regarding the accuracy or completeness of a Flood Awareness Map and disclaims all liability to any person arising directly or indirectly from using the Flood Awareness Maps.
For flood information relating to building or renovating visit www.brisbane.qld.gov.au/planning-building

Map Date: 15/12/2014
Map Name: 527 Gregory Tce
Map Scale: 1:5000
Map Projection: UTM
Map Datum: GDA 2011
Map Zone: 56 S
Map Source: Brisbane City Council
Map Author: Brisbane City Council
Map Date: 15/12/2014
Map Name: 527 Gregory Tce
Map Scale: 1:5000
Map Projection: UTM
Map Datum: GDA 2011
Map Zone: 56 S
Map Source: Brisbane City Council
Map Author: Brisbane City Council

How to prepare for flooding

Council is working hard to reduce the impact of flooding but we all have a responsibility to understand our flood risk and how to be better prepared to minimise the impact on our homes and businesses. **Once you have used Council's Flood Awareness Map to identify the flood risk for your property, use the tips in this table to put a plan in place for your home and family.**

Brisbane's weather

Understand Brisbane's climate and weather patterns

- Sign up for Council's Severe Weather Early Warning Alert Service. www.brisbane.qld.gov.au/earlywarning.
- Pay attention to radio, television and online weather updates.
- Visit www.bom.gov.au for the latest weather updates.

Flooding and your property

Understand how water flows in and around your property and street

- Observe where water flows from and to during heavy rain. This will indicate the path of potential floodwaters.
- Consider that properties near a river, creek, gully or tidal waterway are more likely to flood.
- Consider how fast moving flood waters may damage your home and interfere with evacuation plans.
- Consider loss of power, road closures and interruptions to public transport.
- Consider how close your property is to bordering other Flood Awareness Map risk areas.

Building or renovating

Check Brisbane's City Plan

- You must comply with City Plan planning requirements. Visit www.brisbane.qld.gov.au/planning-building.
- Download a FloodWise Property Report for information about building and development for a specific property. Visit www.brisbane.qld.gov.au/planning-building.

Insurance

Make sure you are appropriately insured

- Talk to your insurer about flood insurance and your property.

Have an evacuation plan

Create an emergency plan and emergency kit

- Prepare an emergency kit.
- Have emergency contact phone numbers easily accessible.
- Consider your pets. They may need temporary to long-term alternative shelter away from your home during a flood.
- Plan multiple evacuation routes. Some roads may be cut off by floodwaters.

Personal possessions

Consider how and where to move valuables during a flood event

- Store valuables and possessions (jewellery, passports, financial statements etc) safely during a flood event.
- Consider where you can safely store your vehicle/s.

Your local area

Know your local area and talk with your neighbours

- Consider how potential loss of power, road closures and interruptions to public transport could affect you.
- Talk to your neighbours. Those living in the area for a long time may have experience of previous flood events.
- Consider how you can help your community. The elderly, disabled or families with young children may need your help to evacuate during a flood.

Flooding in Brisbane is natural and part of our environment therefore we need to be prepared for flooding and the impact it can have on our homes and families. Once you have used Council's Flood Awareness Map to identify the flood risk for your property use the tips in this table to put a plan in place. If you need an interpreter contact 131 450.

브리스번에서 홍수는 자연 현상이며 우리 환경의 일원입니다. 따라서 우리는 홍수가 우리 집과 가족에 가져다 줄 수 있는 피해에 대비해야 합니다. 브리스번 시의회의 홍수 경계 지도 (Flood Awareness Map)를 이용하여 여러분의 홍수 위험도를 파악한 후 아래 표에 실려 있는 유용한 정보를 이용하여 계획을 세우십시오. 통역사가 필요하면 131 450번으로 연락하십시오.

Lũ lụt ở Brisbane là hiện tượng tự nhiên và là một phần của môi trường sống chung ta, do đó chúng ta cần được chuẩn bị sẵn sàng ứng phó với lũ lụt và tác động của chúng lên mái ấm và gia đình của bạn. Nếu bạn đã dùng Bản đồ Cảnh báo Lũ lụt của Hội Đồng để xác định nguy cơ lũ lụt ở khu bất động sản của bạn, hãy dùng thông tin trong bảng này để lập kế hoạch ứng phó. Nếu bạn cần thông dịch viên, hãy liên lạc số 131 450.

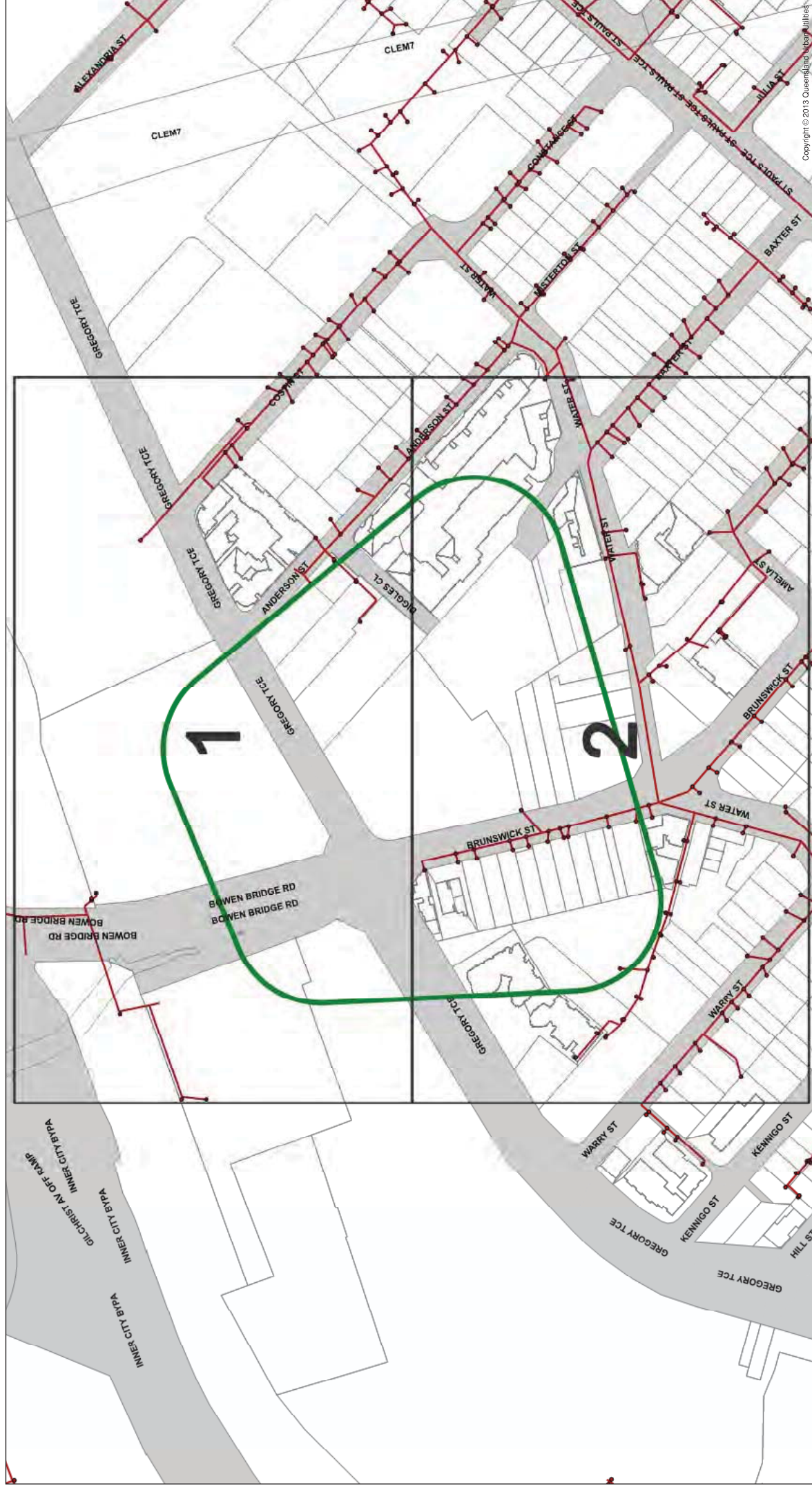
洪水對於布里斯本而言是件正常的事情，是我們環境的一個部分，因此我們需要隨時準備好應對洪水以及其對我們的住宅和家人的影響。您用市政局的防洪意識地圖（Flood Awareness Map）來確定自己房產的洪水風險之後，請用本表中提供的建議制定一個計劃。若您需要傳譯員，請聯絡 131 450。

يحتاج سكان بريزبن الى فهم مخاطر الفيضانات الطبيعية التي تحدث في بيئتنا، لذلك نحتاج ان نكون مستعدين للفيضان ونحضر خطة للتعامل مع الفيضان في حال حدوثه. بعد ان استخدمت خريطة الفيضان التي اعدتها المدينة لتحديد مستوى خطر الفيضان في ممتلكاتك، استخدم النصائح في هذه الجدول لوضع خطة للتعامل مع الفيضان. اذا كنت بحاجة الى مترجم، يرجى الاتصال بـ 131 450.



Dedicated to a better Brisbane

Queensland Urban Utilities - Sewerage and Recycled Water Infrastructure

[illegible]

N

Map Scale
1:2050

Sewerage and Recycled Water Network features

- Infrastructure
- Network Pipelines

Other features

- ▨ Easements
- ▒ Road Casements

DBYD - Queensland Urban Utilities
Sewerage & Recycled Water Infrastructure

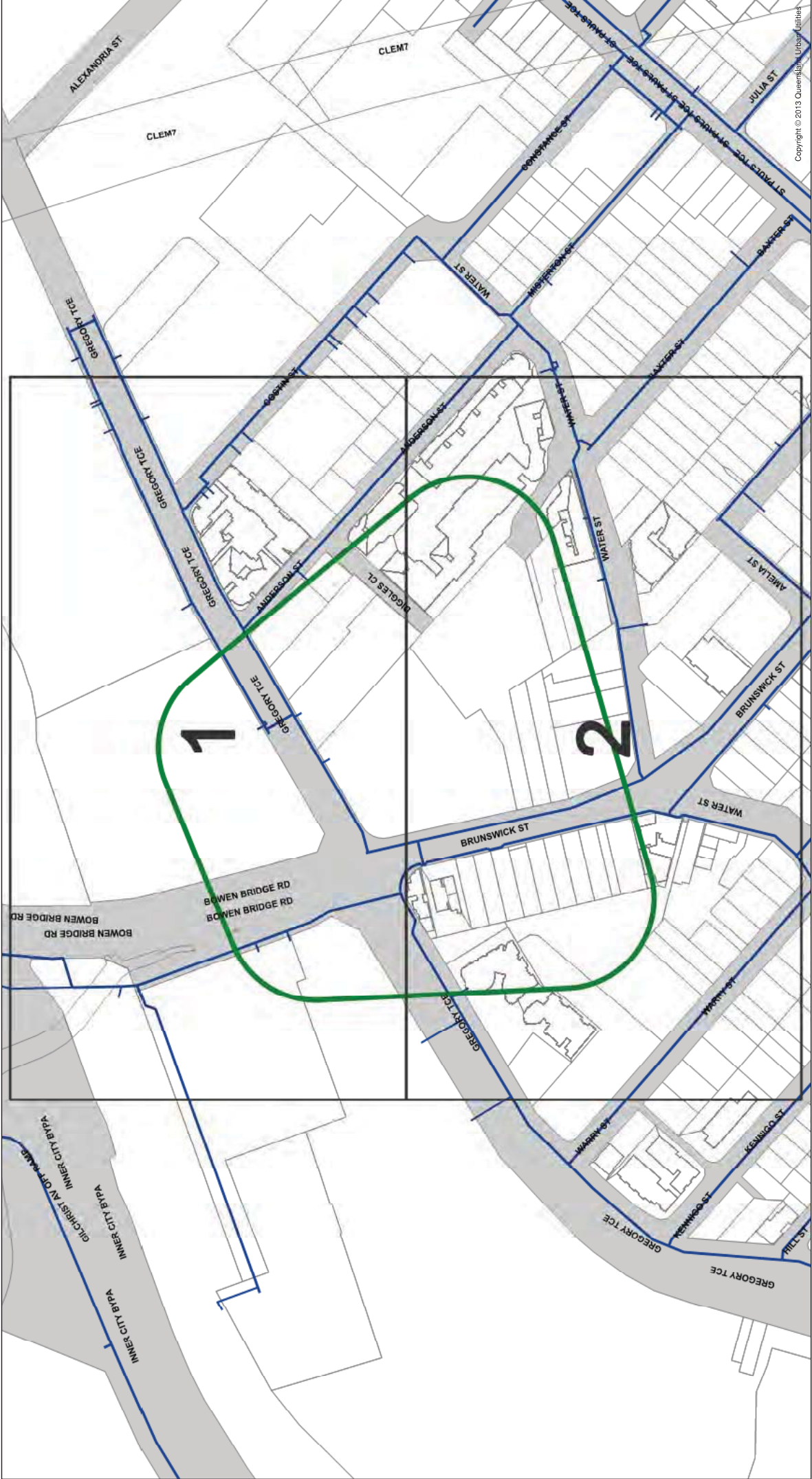
DBYD Reference No: 42322093

Date DBYD Ref Received: 30/10/2014 4:32:00 PM
Date DBYD Job to Commence: 4/11/2014 12:00:00 AM
Date DBYD Map Produced: 30/10/2014

 **GDA**
Produced by: Queensland Urban Utilities



Queensland Urban Utilities - Water Infrastructure





DBYD - Queensland Urban Utilities
Water Infrastructure

DBYD Reference No: 42322093

Date DBYD Ref Received: 30/10/2014 4:32:00 PM

Date DBYD Job to Commence: 4/11/2014 12:00:00 AM

Date DBYD Map Produced: 30/10/2014

Produced By: Queensland Urban Utilities



Water Network features

- Infrastructure
- Network Pipelines

Other Features

- Easements

Network Structures

Proposed Work Area

Road Casements

N



Map Scale

1:2050

The data are indicative and approximate only and provided without warranties of any kind, express or implied, including in relation to accuracy, completeness, currency or fitness for purpose. Users are responsible and accept full liability for any loss, damage, cost or liability that may be incurred by any person acting in reliance on the information provided on this data.

The data should be used as guide only. Any dimensions should be confirmed on site by the relevant authority.

Based on or contain data provided by the State of Queensland (Department of Natural Resources and Environment) and the State of Queensland (Department of Transport and Main Roads) and agree that the data are the property of the State of Queensland and that the data are not to be used for any purpose other than the purpose for which they were provided. The data are provided on the basis of the State of Queensland Department of Natural Resources and Environment (2012).

For further information, please call Queensland Urban Utilities on 13 74 57 (tomb-2pm weekdays), 1300 745 574 (tomb-24/7) or www.queenslandurbanutilities.com.au. A88 86 6/3 835 011

17th December 2014

Mr Nicholas Rozis
Bornhorst + Ward Consulting Engineers
Level 4 67 Astor Terrace
Spring Hill QLD 4000

Via Email: n.rozis@bornhorstward.com.au

Dear Daniel

Queensland Urban Utilities Services Advice Notice

QUU Application Number: 14-SRV-10175
Applicant Name: Mr Nicholas Rozis
Street Address: 527 Gregory Terrace, Fortitude Valley
Real Property Description: Lot 22 on RP202547

Proposed service connection/alteration/disconnection type:

Drinking water	☒
Non-drinking water	☐
Wastewater	☒

Queensland Urban Utilities provides this *Services Advice Notice* in accordance with 99BRAC of the *SEQ Water (Distribution and Retail Restructuring) Act 2009*. This *Services Advice Notice* does not constitute an application for connection, is not an approval to connect to the Queensland Urban Utilities network(s) and does not bind any future Queensland Urban Utilities decision if the applicant applies for a connection.

Queensland Urban Utilities understands that the ultimate proposal is for a mixed used development (Residential - 496 units and Commercial/ Retail – 2904 m²) on the site. Based on your proposal, the following advice is provided:

Queensland Urban Utilities Services Advice

Infrastructure and Design

Water

The site is currently serviced by an existing 225mm diameter water main in Gregory Terrace.

Wastewater

The site is currently serviced by an existing 150mm diameter sewer line in Brunswick Street.

Network Demand and Capacity

Water

An assessment of the water supply available at the site, including computer hydraulic modelling of the network under peak demand and fire flow conditions, has been completed. The assessment indicates the existing water supply infrastructure has adequate capacity to service the proposed development in accordance with the *SEQ Water Supply and Sewerage Design and Construction Code* (SEQ WS&S D&C Code, 2013).

Wastewater

It is assumed the proposed development will connect to the existing 150mm sewer main in Brunswick Street.

A hydraulic assessment of the sewerage network servicing the site under peak wet weather flow conditions has been completed. The assessment indicates that the existing 150mm diameter sewer main in Brunswick Street has adequate capacity to service the proposed development in accordance with the *SEQ WS&S D&C Code* (2013). However downstream 225mm dia. sewer in Water Street has inadequate capacity to service the proposed development in accordance with the *SEQ WS&S D&C Code* (2013) and is surcharging during peak wet weather flow condition.

As the additional discharge expected from the proposed development is relatively minor and will not have a significant impact on sewer levels during wet weather event. It is therefore considered unreasonable to impose augmentation of the sewerage network as a condition of development of the site.

Land and Easements

Water

Easements shall be provided in accordance with the *Water Supply Code of Australia* (2011) and the *SEQ WS&S D&C Code – Amendment to Water Supply Code of Australia* (2013).

Wastewater

Easements shall be provided in accordance with Queensland Urban Utilities requirements and the *SEQ WS&S D&C Code – Amendment to Sewerage Code of Australia* (2013). Further information regarding wastewater easements is available at:

<http://www.urbanutilities.com.au/development-services/help-and-advice/design-and-construction-standards>.

Infrastructure Integration

No infrastructure integration is required in this instance.

Contributed Assets

No contributing asset is required in this instance.

Infrastructure Charges (as at 1 July 2014)

Water

\$3,300 per 1 or 2 bedroom dwelling

\$4,620 per 3 bedroom dwelling

\$12 per m2 GFA commercial

Wastewater

\$6,700 per 1 or 2 bedroom dwelling

\$9,380 per 3 bedroom dwelling

\$24 per m2 GFA commercial

Trade Waste

Based on the information supplied by the applicant no trade waste approval is required for this proposal. Should a trade waste approval be required, further information is available at the following website:

<https://www.urbanutilities.com.au/business/business-services/trade-waste>

Connection Application Process

Based on the information provided, it is expected that the following applications will be required to assess the ability to connect to Queensland Urban Utilities networks;

1. Property Service Connection – Water & Wastewater (Minor Works)

Water & Wastewater (Minor Works)

The Water Approval will require connection works to be undertaken. These works are expected to be available under the Certification Scheme for Minor Works. You will be able to choose a QUU Endorsed Consultant and a contractor to appoint to design and construct the works, including live works in most cases (Permit to Work required) and then maintain the works for a specified period (usually 12 months) in accordance with the conditions stated in your Water Approval (including compliance with the SEQ WS&S D&C Code (2013)). Further information regarding the Certification Scheme for Minor Works is available at: **<http://www.urbanutilities.com.au/development-services/help-and-advice/connections/certification-scheme>**.

Fees and Charges

Likely Queensland Urban Utilities fees and charges associated with these applications are outlined below.

1. Application Phase

Base Application Fee – Property Services Connection \$550 (per connection / disconnection / alteration)

Base Application Fee – Network (1-10 lots) \$550 (per application for each service)

Technical Report Review Fee \$545 (per report)

Works Inspection Fee

Certification Scheme Audit and Compliance Fee \$385/per inspection

Notes:

1. The customer may incur additional fees and charges during the approval and works phase, including but not limited to, fees levied by the RPEQ and construction contractor, fees associated with the provision of maintenance / uncompleted works bond(s), re-checking amended plans fees, re-inspection of works fees and infrastructure agreement preparation fees;
2. The above estimates are indicative only and are subject to review of the detailed application upon lodgement; and

3. Please refer to the QUU *Water Netserv Plan* - for further details / clarifications on Fees and Charges.

Time Frames for Assessment

It is anticipated that the works to connect to Queensland Urban Utilities water network will be available under the Certification Scheme for Minor Works.

Water & Wastewater (Minor Works)

Connection Assessments

To be completed within 20 business days of receipt of Properly Made Connection Application (including payment of the relevant assessment fee), or within a further 20 business days of receipt of requested information (unless extended by agreement).

Design Phase

Typically, for an application which is classified as minor works, no assessment of the design phase is expected to be required from Queensland Urban Utilities.

However, Queensland Urban Utilities may audit a selection of certified designs based on its assessment of the risk of non-compliance.

Other Guidance

Based on the information supplied by the applicant no Build Over Asset (BOA) application is expected to be required for this development.

This *Services Advice Notice* is current for a period of two (2) years from the date of issue. Should you wish to proceed with applying for a service connection please lodge your application via Queensland Urban Utilities Development Services Online Lodgement Portal at <http://www.urbanutilities.com.au/development-services>. Please include your Services Advice reference number in your application.

Queensland Urban Utilities may, at its discretion, provide a reduced fee for a service connection application based on this Services Advice Notice if your application is received within 12 months of the date of issue and is substantially in accordance with the proposal upon which this advice was issued.

If you have any questions in relation to this Service Advice Notice, please do not hesitate to contact your account manager, Sajid Syed on 07 3855 6646 or sajid.syed@urbanutilities.com.au.

Yours sincerely



Richard Sefton

Developer Client Management Leader
Queensland Urban Utilities

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISe DBYD map, then ENERGEX shall be contacted immediately.

For Emergency Situations
Please call 13 19 62



EnerGISe
DBYD

Date: 30 Oct 14 Time: 15:39:14
Requested By: DBYD

NOT TO SCALE

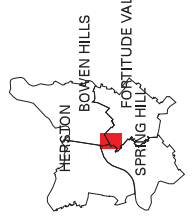


Enquiry No: 42322089
KEY MAP

Enquiry Area



LOCALITY DIAGRAM

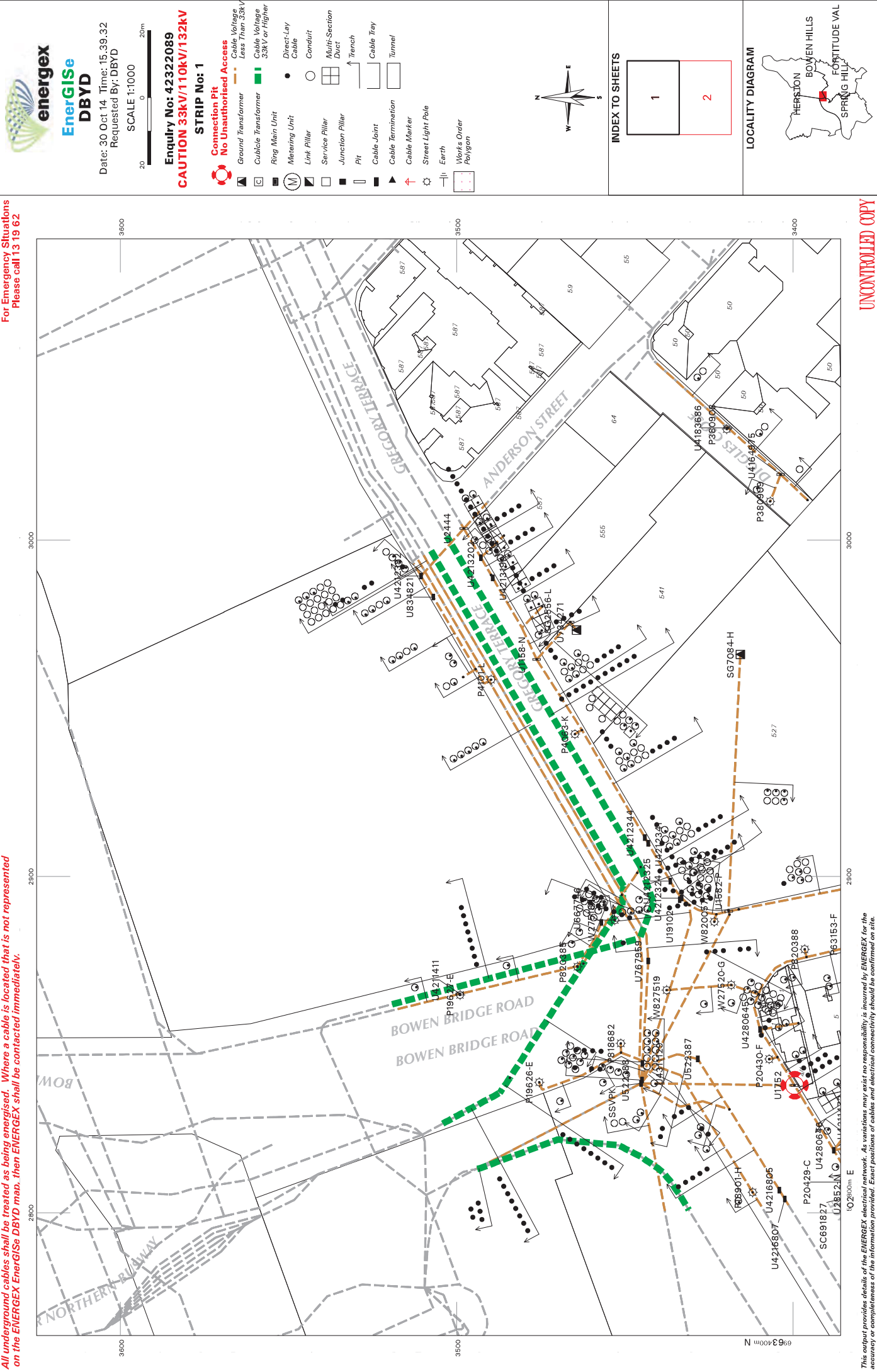


UNCONTROLLED COPY

This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISE DBYD map, then ENERGEX shall be contacted immediately.

**For Emergency Situations
Please call 13 19 62**



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

UNCONTROLLED COPY

energex
EnerGISE
DBYD

Date: 30 Oct 14 Time: 15:39:32
Requested By: DBYD
SCALE 1:1000

Enquiry No: 42322089
CAUTION 33kV/110kV/132kV

STRIP No: 1

Connection Pit
No Unauthorised Access

Ground Transformer
Cable Voltage Less Than 33kV
Cable Voltage 33kV or Higher
Ring Main Unit
Meeting Unit
Link Pillar
Service Pillar
Junction Pillar
Pit
Cable Joint
Cable Termination
Cable Marker
Street Light Pole
Earth
Works Order
Polygon

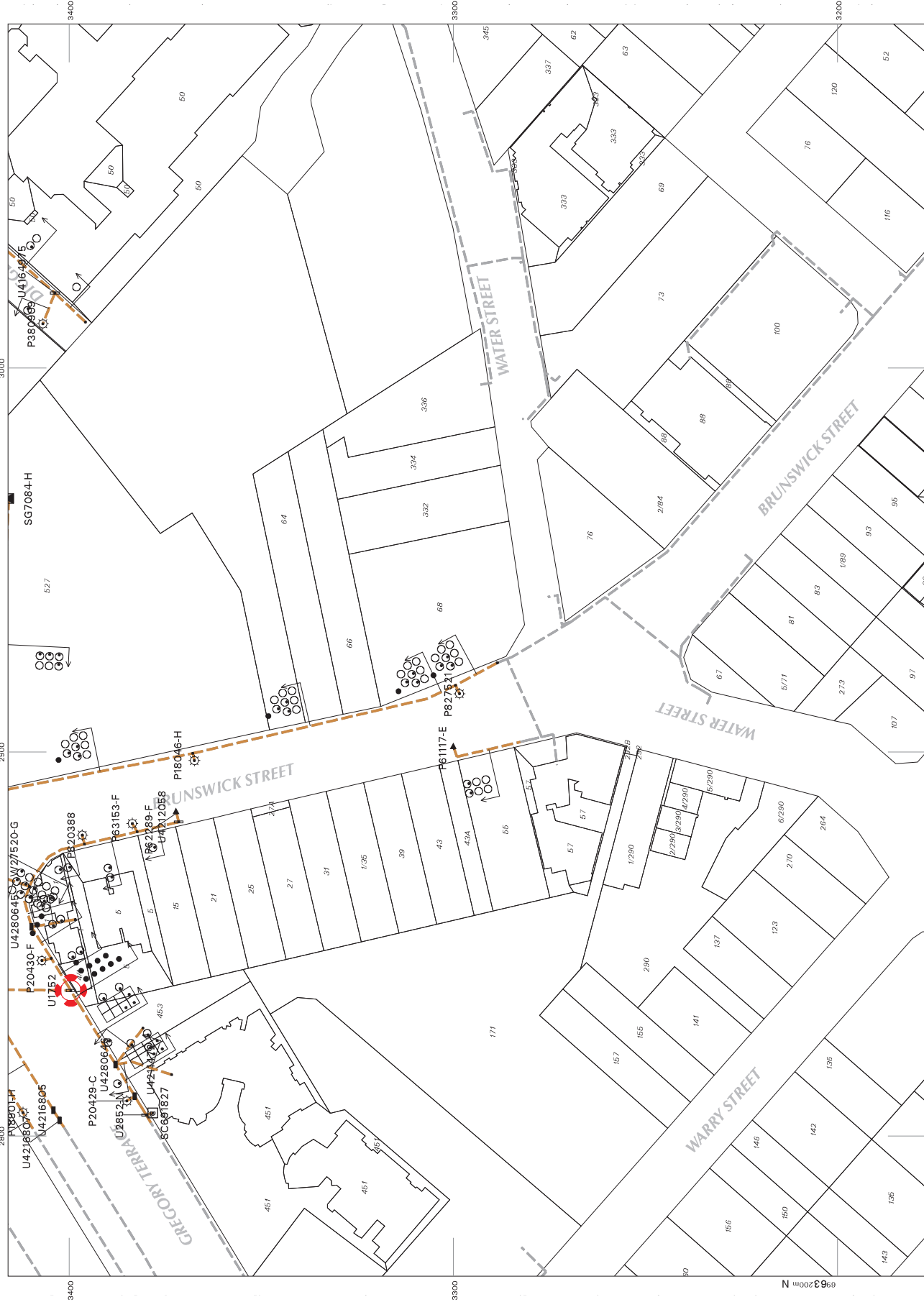
Direct-Lay Cable
Conduit
Multi-Section Duct
Trench
Cable Tray
Tunnel

INDEX TO SHEETS

LOCALITY DIAGRAM

HEPSON BOWEN HILLS
SPRING HILL FORTITUDE VAL

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISE DBYD map, then ENERGEX shall be contacted immediately.



This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

UNCONTROLLED COPY



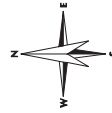
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Requested By: DBYD
SCALE 1:1000



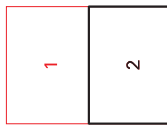
Enquiry No: 4322089

STRIP No: 2

- Connection Pit**
No Unauthorised Access
- Ground Transformer
 - Cable Voltage Less Than 33kV
 - Cable Voltage 33kV or Higher
 - Ring Main Unit
 - Meeting Unit
 - Link Pillar
 - Service Pillar
 - Junction Pillar
 - Pit
 - Cable Joint
 - Cable Termination
 - Cable Marker
 - Street Light Pole
 - Earth
 - Works Order Polygon
 - Conduit
 - Multi-Section Duct
 - Trench
 - Cable Tray
 - Tunnel

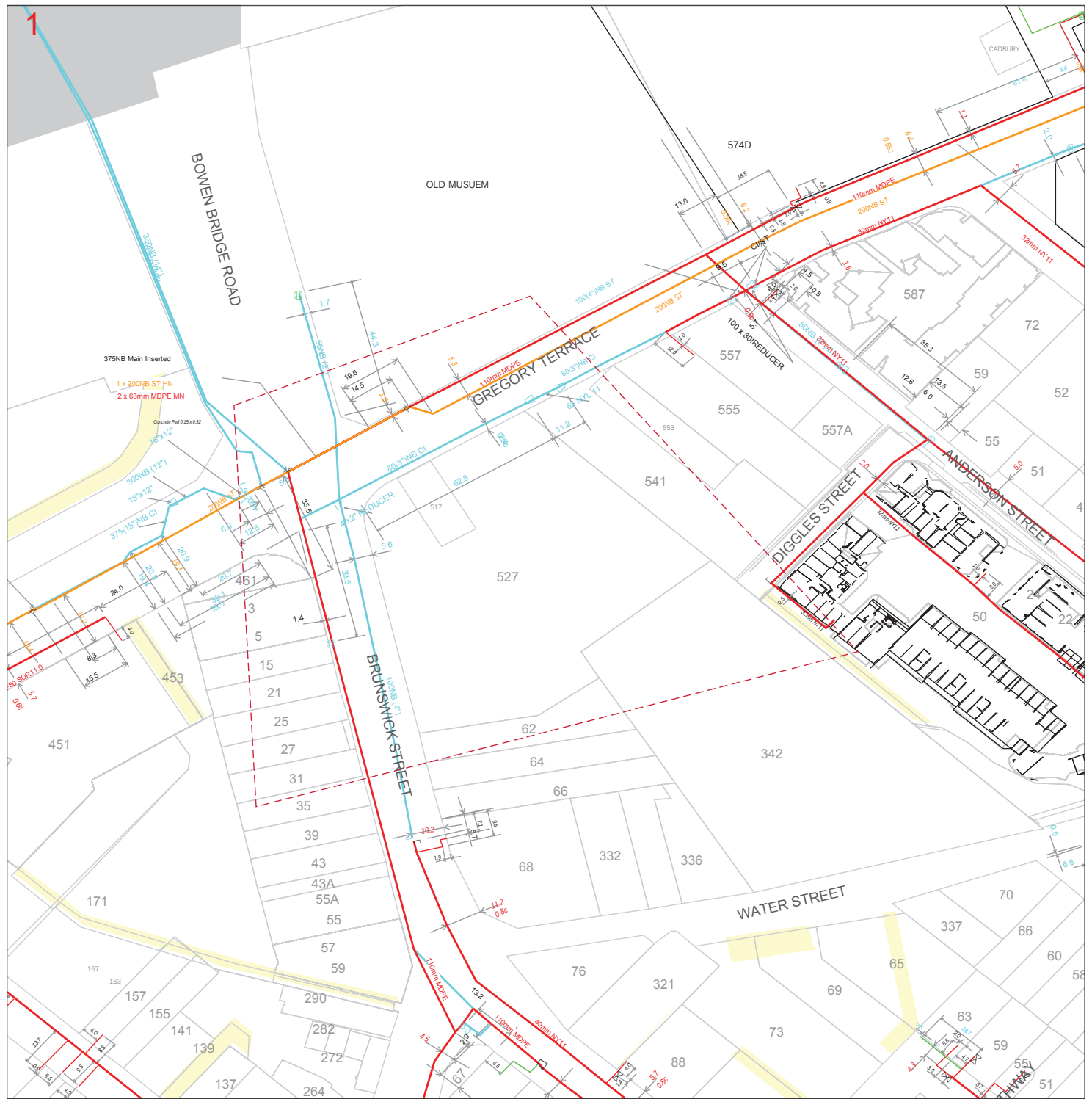


INDEX TO SHEETS



LOCALITY DIAGRAM





42322092 Map Sheet: 1

Papersize: A3 Scale: 1: 1000

0 0.01km



Map Key:

1

Legend

	Transmission Pressure Natural Gas		Sleeve		Sewer Manhole
	High Pressure Natural Gas		Valve		Power Pole
	Medium Pressure Natural Gas		Syphon		Telecom Pit
	Low Pressure Natural Gas		Endcap		Baghole
	LPG Reticulation		Regulator		Reducer
	Domant Main		Pipe Connector		Purge Point
	Proposed Main		Insulated Connection		Warning Sign (Marker)
	Easement		Cathodic Test Point		

--- Line / Polygon Request

Data Source

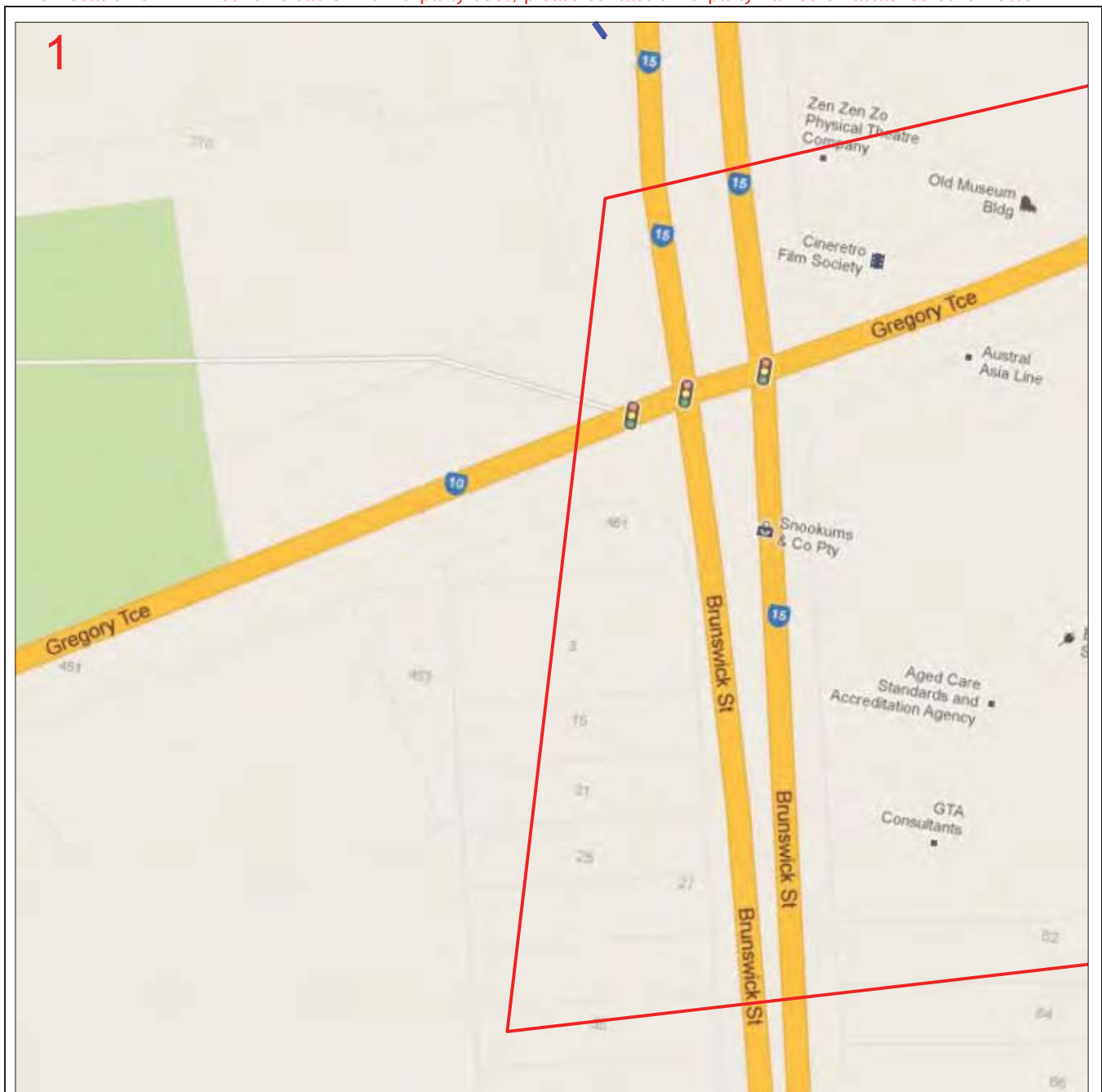
Pipeline Data Copyright APA Envestra Pty Ltd, Property Parcels Copyright QLD Government, UBD Imagery - Copyright Sensis, DBYD Dig Location provided by DBYD.

APA Group

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

Only PIPE Networks' duct displayed.

For location of PIPE Networks cable in third-party duct, please contact third-party named on attached cover letter.



Enquiry Number: 42322087

Map Sheet: 1

Scale: 1:750

0 0.008km

LEGEND

DBYD Request Area Asset

Line

Area

Manhole

Duct

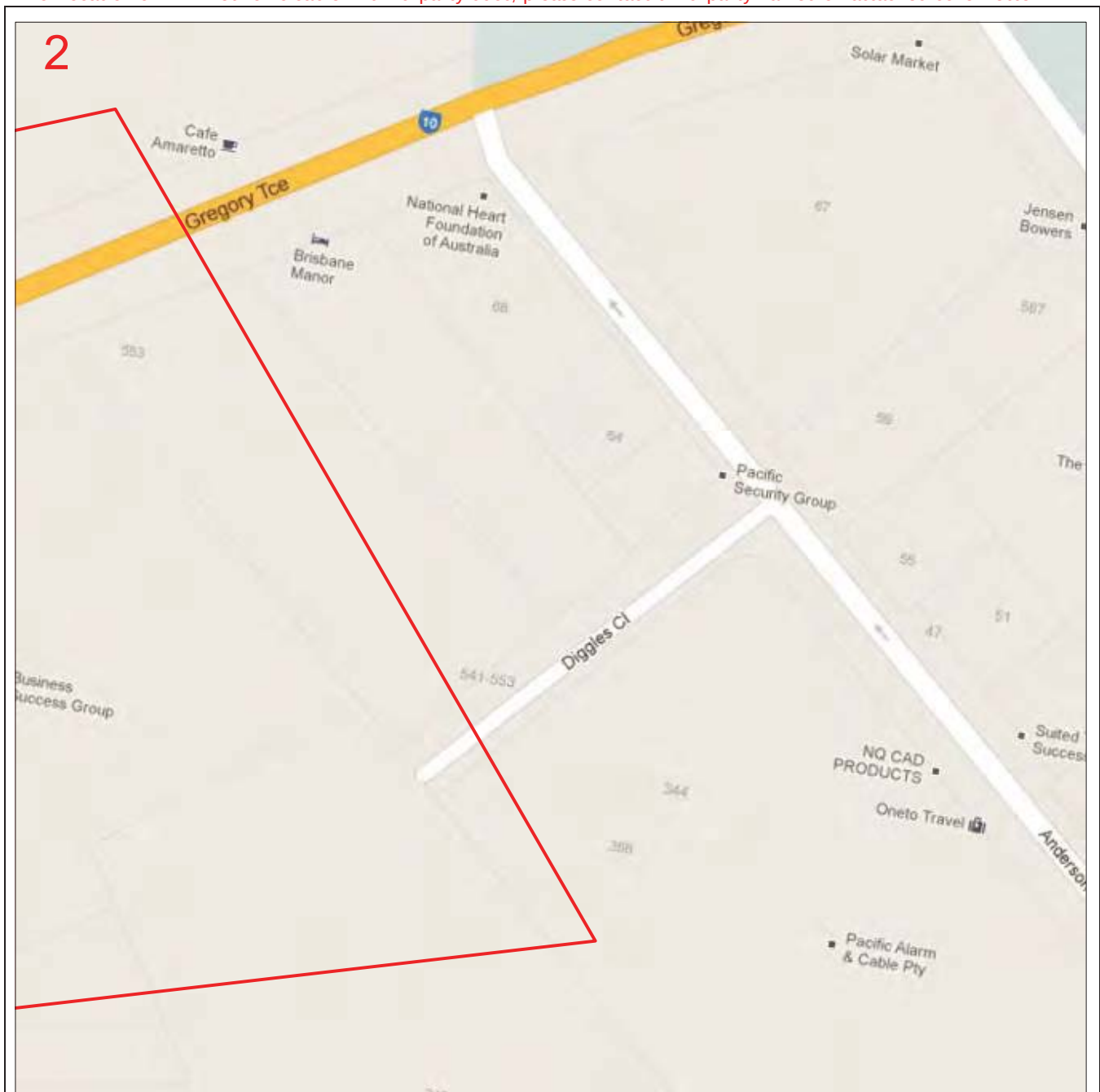


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Note: If the works fall in an area that is adjacent to PIPE Networks infrastructure, a pre-inspection is required prior to commencement of works. Contact PIPE Networks to arrange an inspection time. **NO WORKS TO COMMENCE PRIOR TO INSPECTION.**

Only PIPE Networks' duct displayed.

For location of PIPE Networks cable in third-party duct, please contact third-party named on attached cover letter.



Enquiry Number: 42322087

Map Sheet: 2

Scale: 1:750

0 0.008km

LEGEND

DBYD Request Area Asset

Line

Area

Manhole

Duct



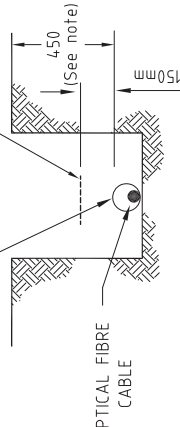
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Note: If the works fall in an area that is adjacent to PIPE Networks infrastructure, a pre-inspection is required prior to commencement of works. Contact PIPE Networks to arrange an inspection time. **NO WORKS TO COMMENCE PRIOR TO INSPECTION.**

LEGEND

- ELECTRICITY POLE
- O/H FIBRE OPTIC CABLE
- CABLE CONDUIT (TRENCHING)
- CABLE CONDUIT (BORE TUNNELLING)
- UE P2 PIT
- UE P5 PIT
- UE P6 PIT
- UE P8 PIT
- UE P9 PIT
- BUILDING LINE
- BOK - BACK OF KERB
- CL - CENTRELINE OF CONDUIT
- TP - TURNING POINT OF CONDUIT
- FENCE LINE, FL
- TELSTRA MANHOLE
- TELSTRA PIT
- ENERGEX MANHOLE
- OPTICAL FIBRE JOINT
- JOINT LOOP (m) - POLE / UNDERGROUND
- CABLE HEAD POLE 10A
- CABLE DEPTH
- YELLOW MARKER TAPE

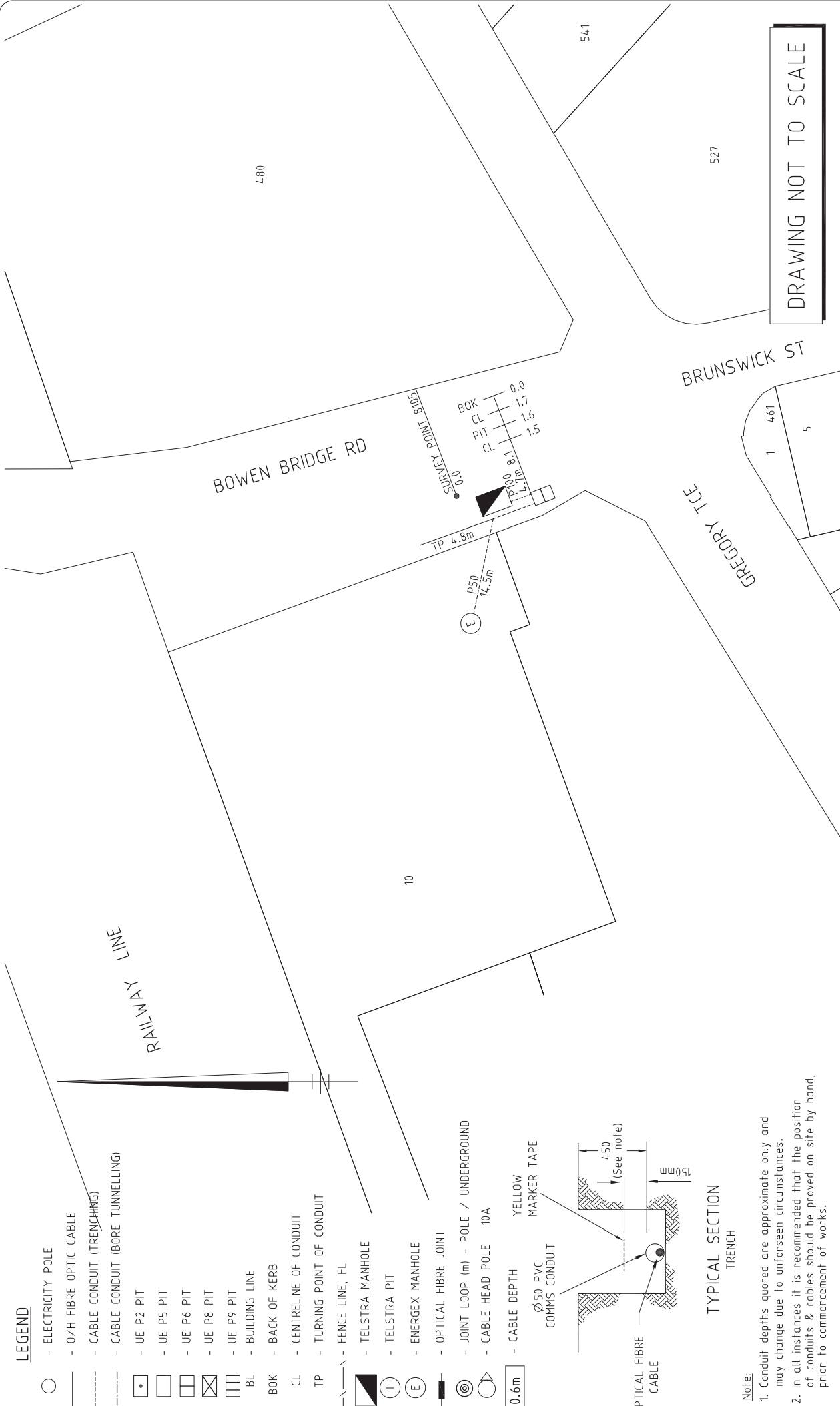
0.6m



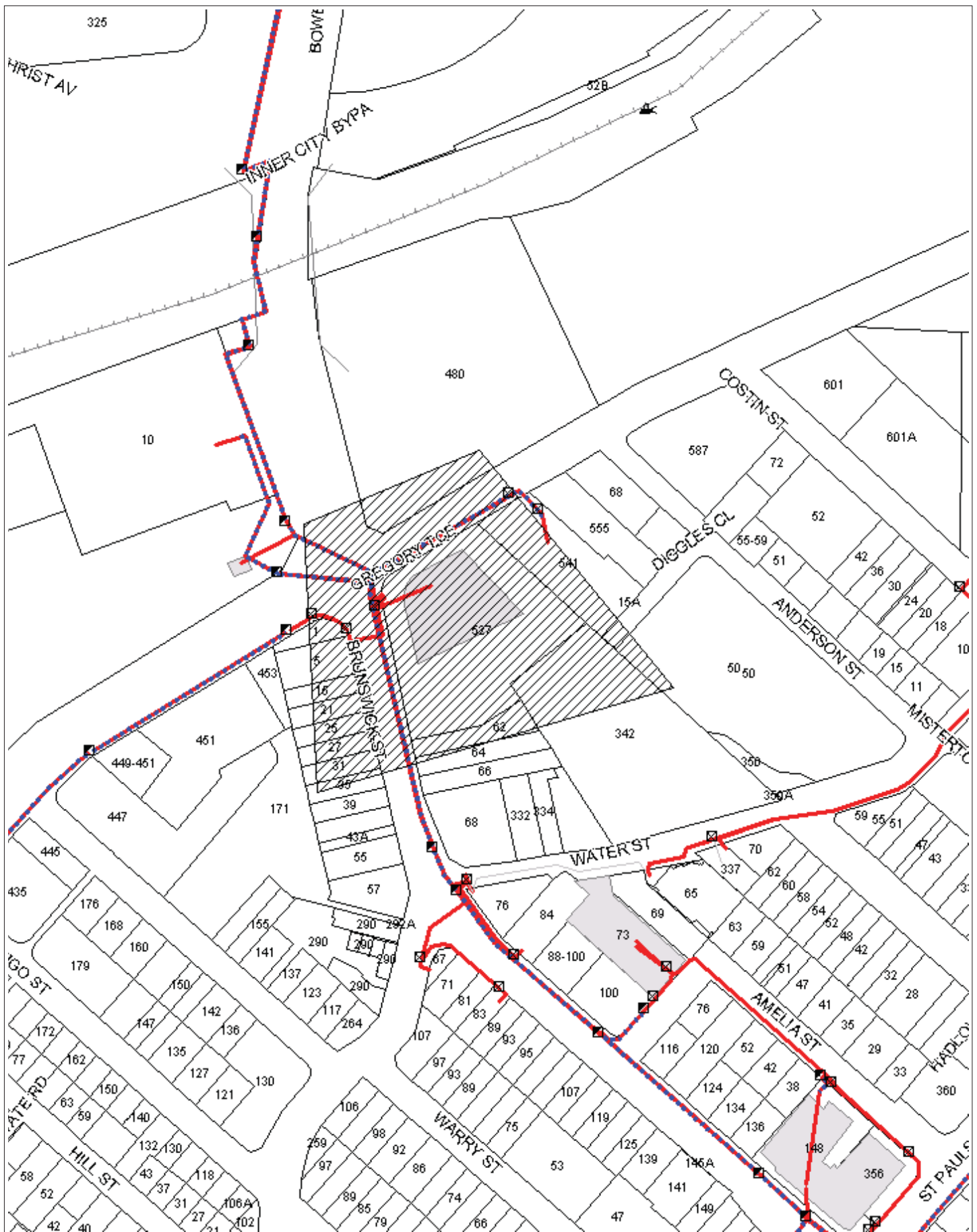
TYPICAL SECTION
TRENCH

Note:

- Conduit depths quoted are approximate only and may change due to unforeseen circumstances.
- In all instances it is recommended that the position of conduits & cables should be proved on site by hand, prior to commencement of works.



REVISION		DATE	REV.	REVISION DESCRIPTION	CHECKED	APP'D.
		CONTACT OFFICER		PH:		
		PROJECT NUMBER		NEXUB-128		
		PLAN No.				
		MELWAY / UBD REF / STREET SMART		'159-Q3		
		DRAWN		26/02/08		
		DESIGN CHECKED		SG		
		APPROVED		26/02/08		
		DRG No.		0FN5/BNE/4371-1		
		U/G OPTICAL FIBRE CABLE RUN		BOWEN BRIDGE ROAD		
				GREGORY TCE & BRUNSWICK ST		
				SPRING HILL QLD 4000		



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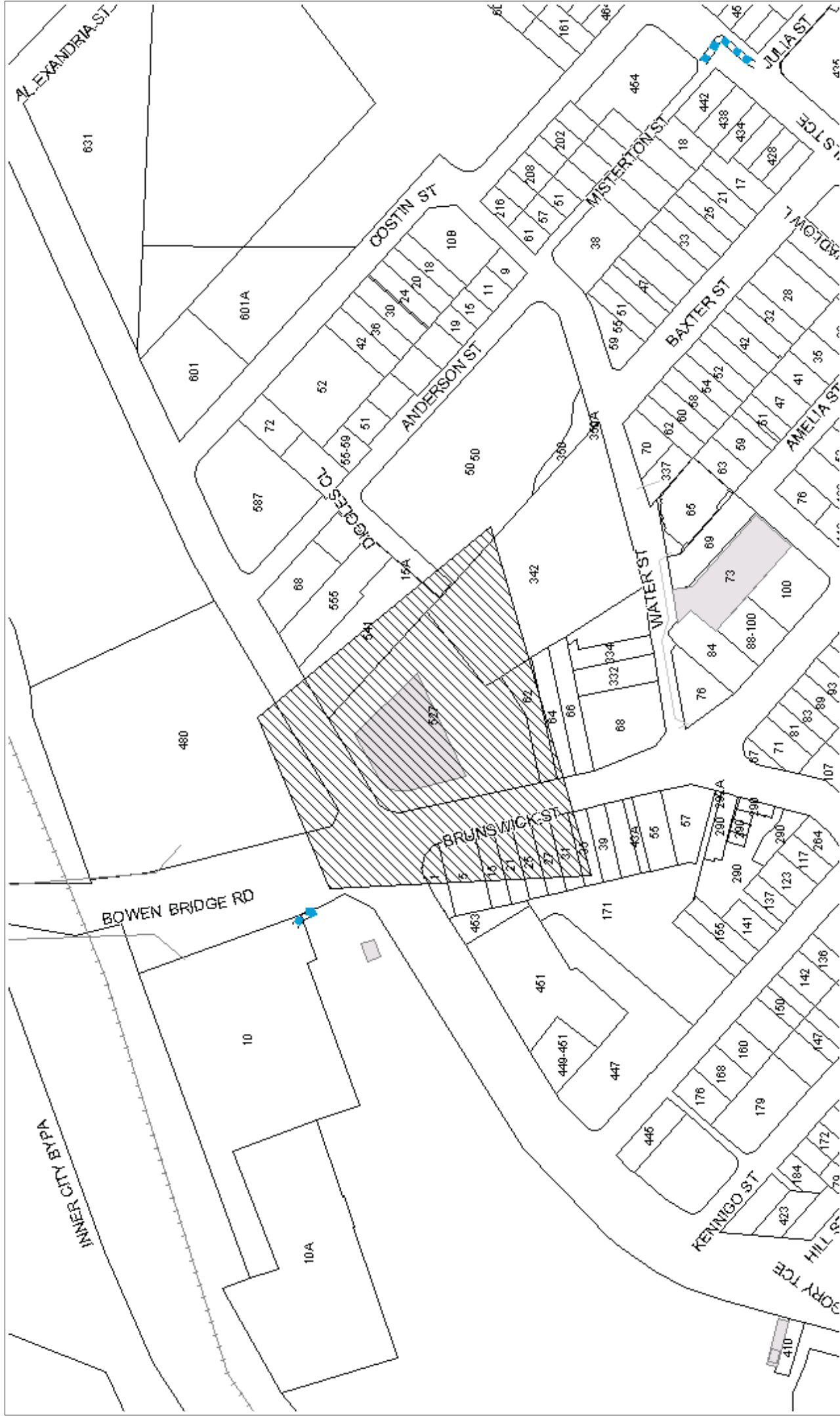
Sequence Number: 42322091

Date Generated: 30/10/2014



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





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Job Location

Line Point Area

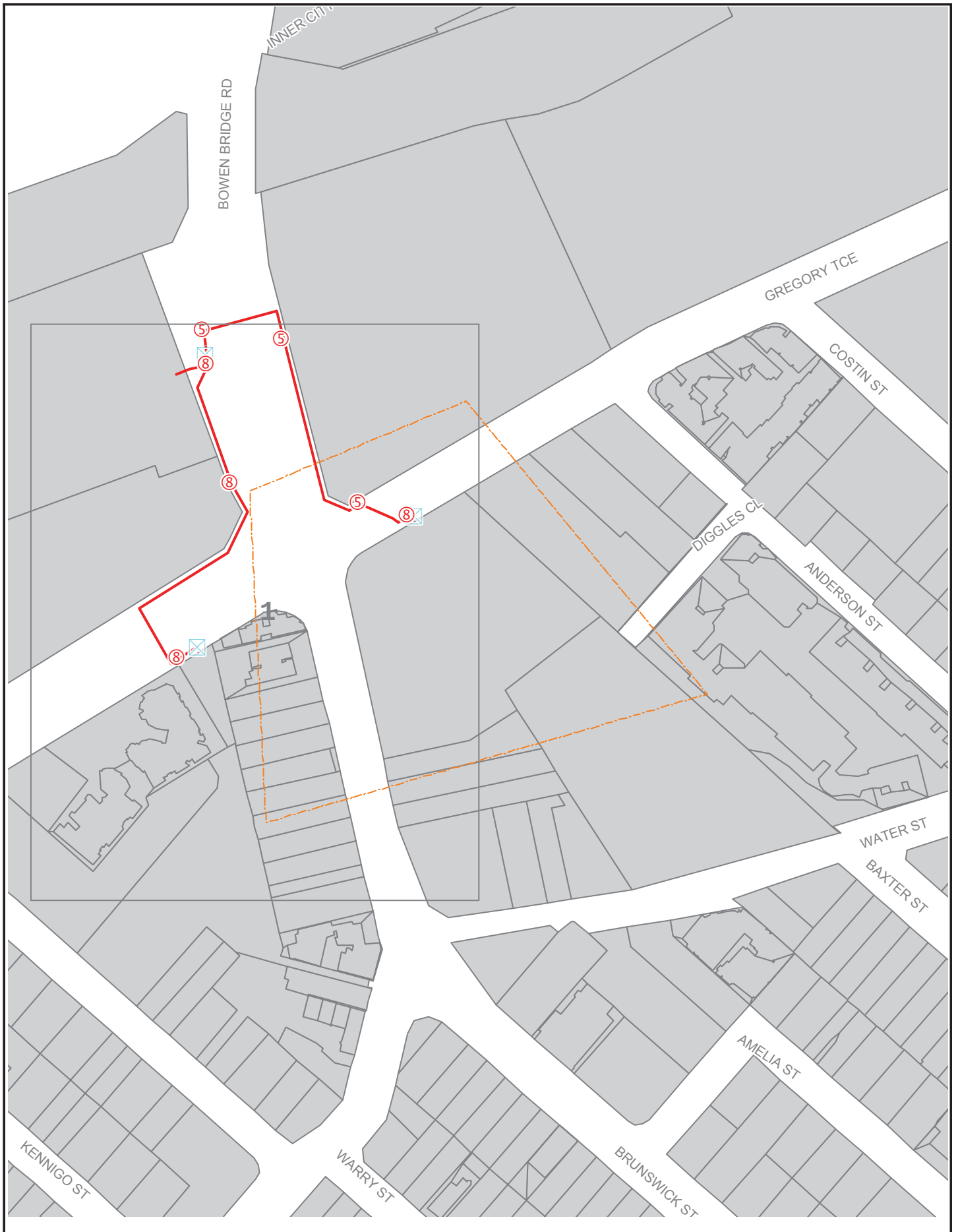
Underground Asset

Uecomm

Uecomm
Cable Uecomm Underground
 Scale: #INSERT MAP SCALE#
 Sequence Number: 42322091
 Location: 527 Gregory Terrace

uocomm™
 Powering Network Convergence

Printed On: 30/10/2014



VOCUS
communications



30/10/2014

QLD

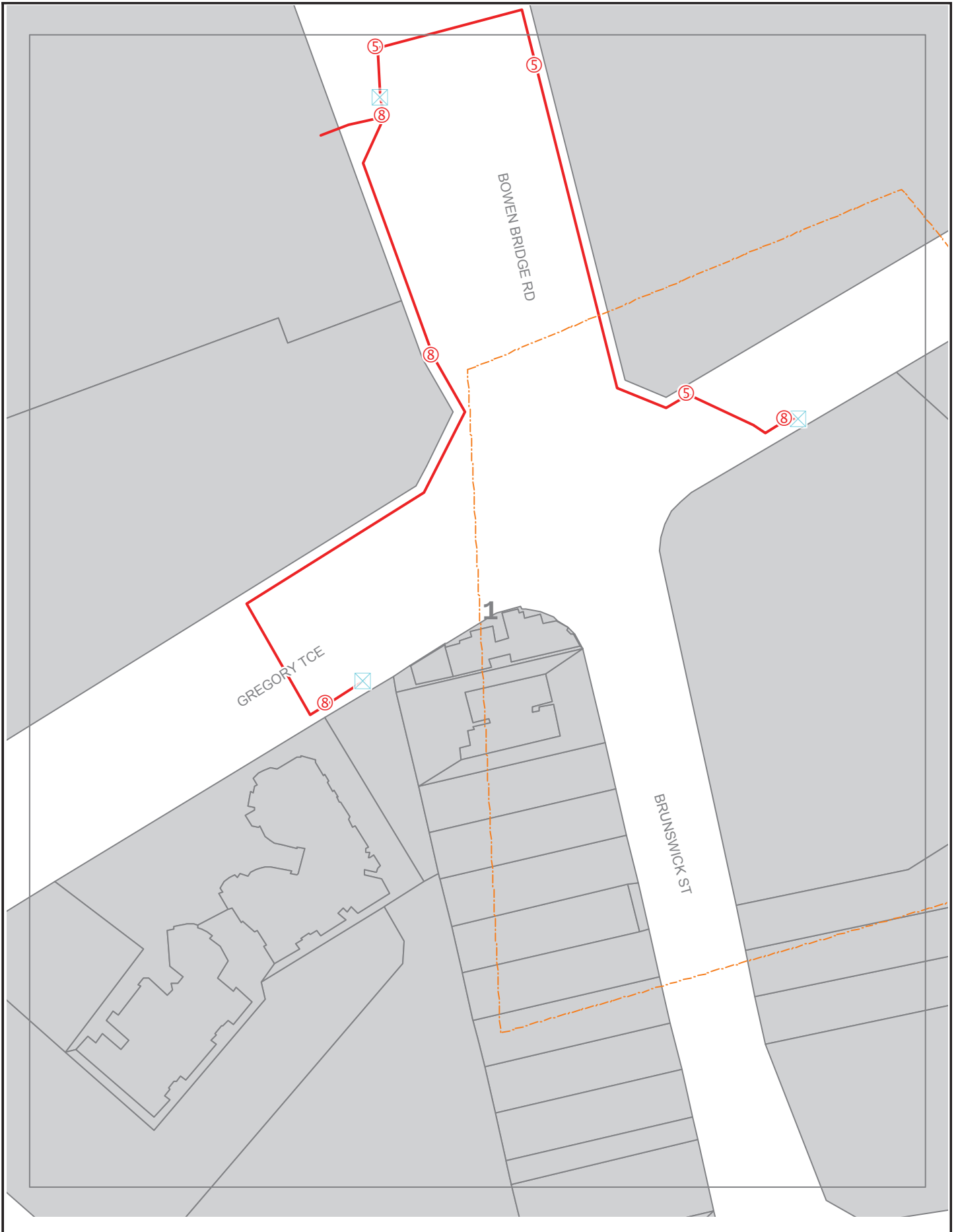
1:1000

DIAL BEFORE YOU DIG RESPONSE

Fibre Assets

Sequence Number: 42322094, DBYD Job No 8490124

- 8 Vocus Pit
- Vocus Asset
- X Telstra Manhole



DIAL BEFORE YOU DIG RESPONSE

Fibre Assets

Sequence Number: 42322094, DBYD Job No 8490124

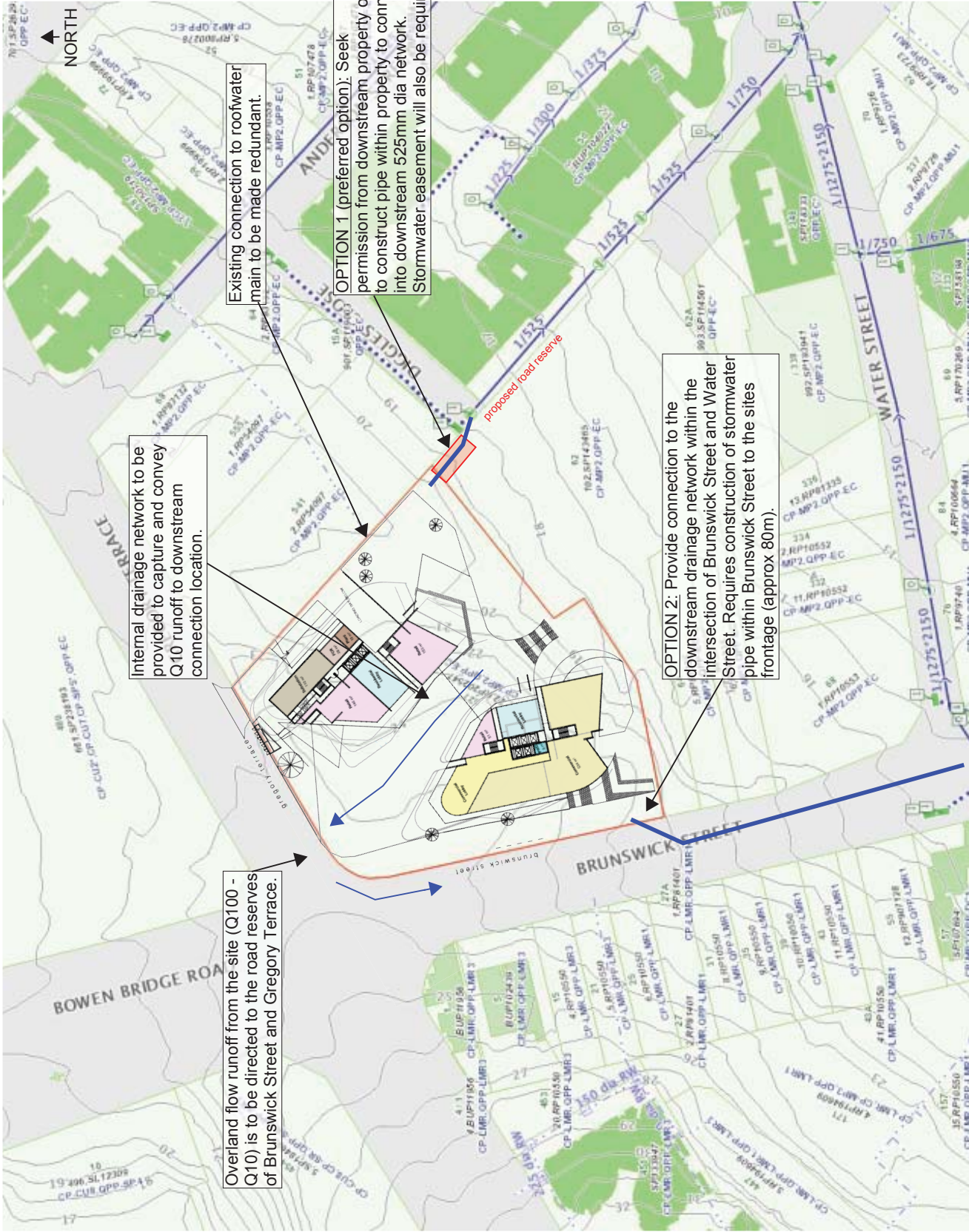
- 8 Vocus Pit
- Vocus Asset
- X Telstra Manhole

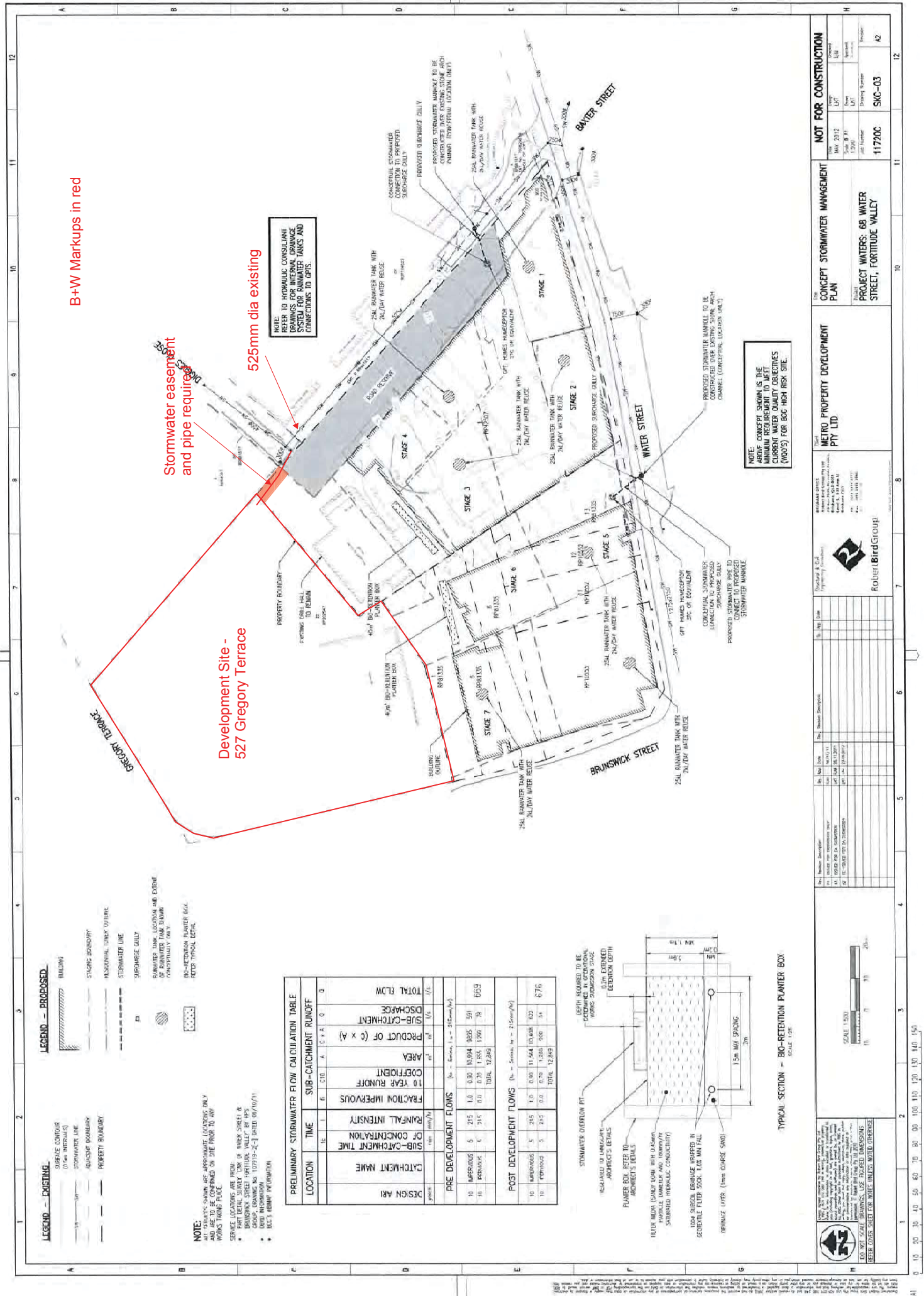
APPENDIX B

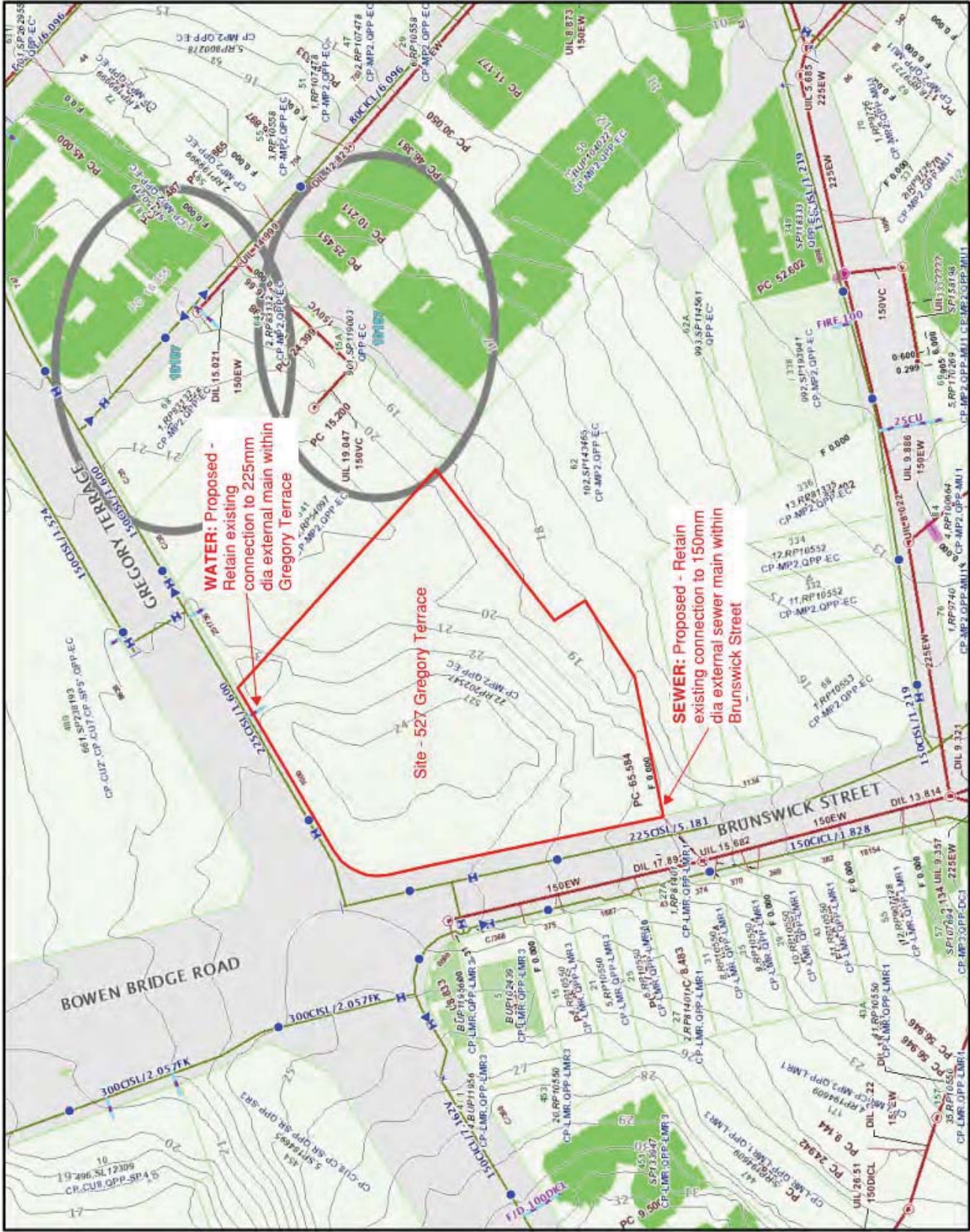
DEVELOPMENT DRAWINGS

INDICATIVE ONLY
- NOT TO SCALE

Option 1 or 2 to be adopted
pending coordination with
downstream property owner







Indicative only - Not to Scale

Background image from BCC
eBimap



BORNHORST + WARD		PROJECT		SUBJECT		PROJECT No.	
CONSULTING ENGINEERS		Oct 14		527 Gregory Terrace, Bowen Hills		14313	
CIVIL AND STRUCTURAL		For Information		SK071 Proposed Sewer and Water Connections Plan		DRAWING No.	
Level 4, 67 Asfor Terrace, Spring Hill, QLD 4000						REVISION	
P. +61 (7) 3013 4699 mail@bomhorstward.com.au						1	

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APPENDIX C

HYDROLOGICAL CALCULATIONS

INITIAL PEAK FLOW CALCULATIONS

Based on QUDM (2008) 4.00 'Catchment Hydrology'
Written by BB 31/10/08

BORNHORST + WARD
CONSULTING ENGINEERS

CIVIL AND STRUCTURAL

Job Number: 14313
Job Name: 527 Gregory Terrace, Bowen Hills

Designed: LP
Checked: JT

IFD Location: Brisbane

TOTAL RUNOFF COEFF.						
	Sub Catchment Area (Ha)		Runoff Coefficients		Calculated C10	
No.	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	0.700	0.700	0.80	0.84		
	0.7	0.7			0.80	0.84

Raw IFD data has been obtained from the Bureau of Meteorology (BOM) website.

EXISTING TIME OF CONCENTRATION			
	Std Inlet Time	5	
SHEET FLOW	Site Slope (%)	0	
	Flow Length (m)	0	
	Horton's "n"	0	
	Travel Time (min)	0.00	
CHANNEL/PIP E FLOW	Travel Length (m)	0	
	Fall (m)	0	
	Travel Time (min)	0	
	Multiplier	0	
	Travel Time (min)	0	
	Total Time (Tc)	5.0	

DEVELOPED TIME OF CONCENTRATION			
	Std Inlet Time	5	
SHEET FLOW	Site Slope (%)	0	
	Flow Length (m)	0	
	Horton's "n"	0	
	Travel Time (min)	0.00	
CHANNEL/PIP E FLOW	Travel Length (m)	0	
	Fall (m)	0	
	Travel Time (min)	0	
	Multiplier	0	
	Travel Time (min)	0	
	Total Time (Tc)	5.0	

PEAK RUNOFF CALCULATIONS						
ARI Event yr	Rainfall Intensity (mm/hr)		Coefficient of Runoff		Peak Runoff Rates (m³3/s)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	116	116	0.64	0.67	0.144	0.151
2	149	149	0.68	0.71	0.197	0.207
5	190	190	0.76	0.80	0.281	0.295
10	215	215	0.80	0.84	0.334	0.351
20	248	248	0.84	0.88	0.405	0.425
50	292	292	0.92	0.97	0.523	0.549
100	327	327	0.96	1.00	0.610	0.635

PEAK FLOWS FOR FREQUENT EVENTS			
ARI Event yr	% of Q1	Peak discharge (m³/s)	
		Existing	Proposed
1mth	25%	0.036	0.038
2mth	40%	0.058	0.060
3mth	50%	0.072	0.076
4mth	60%	0.086	0.091
6mth	75%	0.108	0.113
9mth	90%	0.129	0.136
12mth	100%	0.144	0.151

INITIAL DETENTION SIZING

Based on QUDM (2008) 5.05.1 'Flood-Routing - Initial Sizing'
Written by SC 31/10/94
updated by BB 31/10/08



CIVIL AND STRUCTURAL

Job Number:

14313

Job Name: 527 Gregory Terrace, Bowen Hills
Flow into Development site

Brisbane

Designed: LP

Checked: JT

	Critical Time of Concentration tc min	10 yr ARI Runoff C ^{eff} p307 ARR Cv	Total Catchment Area A ha
Existing	5.00	0.80	0.7
Post-Develop	5.00	0.84	0.7

Flood Event	Volumetric Coeff. of Runoff		Rainfall Intensity		Inflow Volume	Peak outflow capacity or desired peak outflow	Peak Inflow rate by rational method	Reduction ratio	Storage Volume						Time ratio factor 1.25
	Existing Cv	Post-Devel Cv	Existing I mm/hr	Post-Devel I mm/hr	VI m^3	Qo m^3/s	Qi m^3/s	r	CULP m^3	BOYD m^3	CARROL m^3	BASHA m^3	Small Basins m^3	Required Volume m^3	
ARI															
yr															
3mth	0.64	0.67	58	58	30	0.072	0.076							30	
1	0.64	0.67	116	116	60	0.144	0.151	0.05	1	3	1	2	32	4	
2	0.68	0.71	149	149	83	0.197	0.207	0.05	1	4	2	3	43	5	
5	0.76	0.80	190	190	118	0.281	0.295	0.05	2	6	2	4	62	7	
10	0.80	0.84	215	215	140	0.334	0.351	0.05	2	7	3	5	74	8	
20	0.84	0.88	248	248	170	0.405	0.425	0.05	3	8	3	6	89	10	
50	0.92	0.97	292	292	220	0.523	0.549	0.05	4	10	4	7	115	13	
100	0.96	1.00	327	327	254	0.610	0.635	0.04	4	10	4	7	132	13	

assumes $V_i = 4 * Q_i * T_c / 3$ where Q_i is flow from rational method (QUDM 5.05.1)
and T_c is in seconds for this equation only.
ie $C_v = 1.33 * C_r$ which is conservative for SE QLD.

APPENDIX D

MUSIC DATA

MUSIC Data

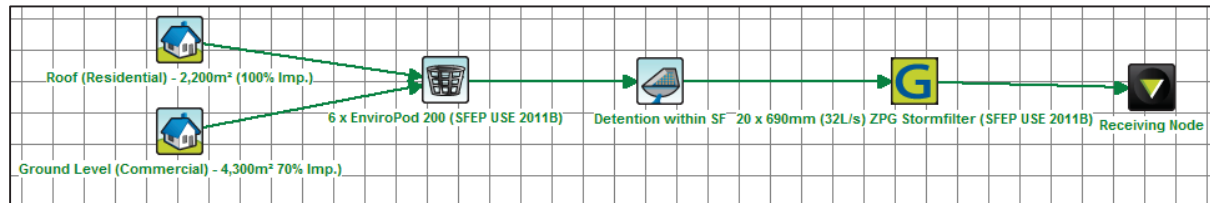


Figure 1 MUSIC Treatment Train

	Sources	Residual Load	% Reduction
Flow (ML/yr)	6.38	6.38	0
Total Suspended Solids (kg/yr)	915	111	87.8
Total Phosphorus (kg/yr)	2.6	0.917	64.8
Total Nitrogen (kg/yr)	17.6	9.62	45.4
Gross Pollutants (kg/yr)	146	0	100

Figure 2 Results

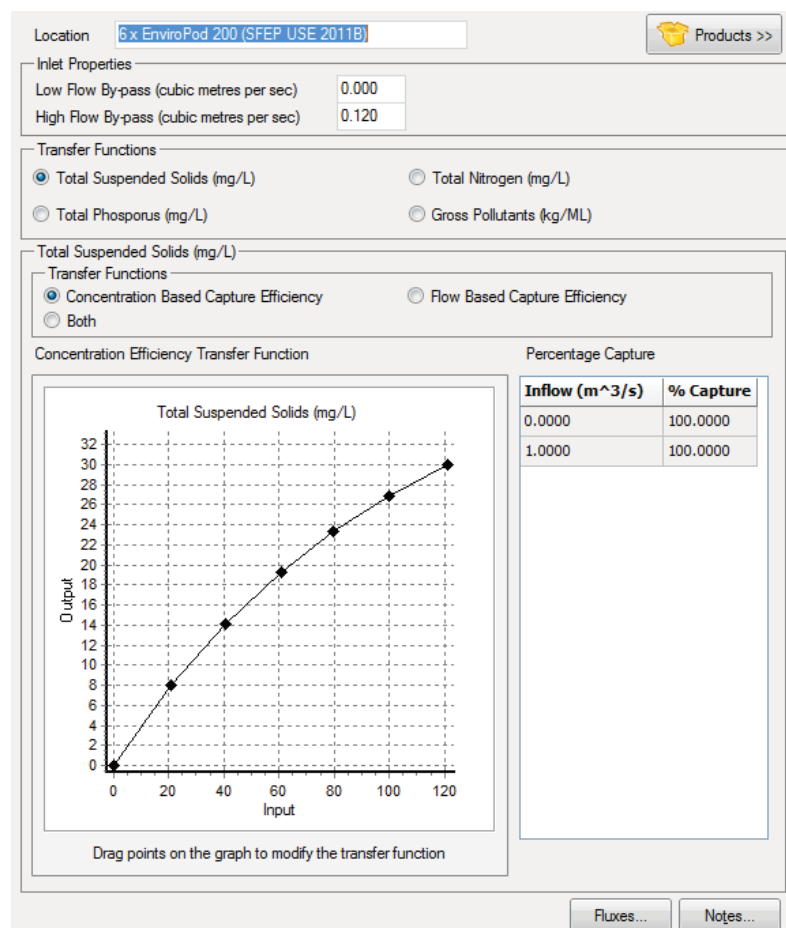


Figure 3 EnviroPod modelling data

Location:

Inlet Properties

Low Flow By-pass (cubic metres per sec):

High Flow By-pass (cubic metres per sec):

Storage Properties

Surface Area (square metres):

Extended Detention Depth (metres):

Permanent Pool Volume (cubic metres):

Initial Volume (cubic metres):

Exfiltration Rate (mm/hr):

Evaporative Loss as % of PET:

Outlet Properties

Equivalent Pipe Diameter (mm):

Overflow Weir Width (metres):

Notional Detention Time (hrs):

☐ Use Custom Outflow and Storage Relationship

Not Defined

Figure 4 Stormfilter (detention) modelling data

Location:

Inlet Properties

Low Flow By-pass (cubic metres per sec):

High Flow By-pass (cubic metres per sec):

Transfer Functions

☒ Flow (cubic metres per sec) ☐ Total Nitrogen (mg/L)

☐ Total Suspended Solids (mg/L) ☐ Gross Pollutants (kg/ML)

☐ Total Phosphorus (mg/L)

Flow (cubic metres per sec)

Transfer Functions

☒ Concentration Based Capture Efficiency ☒ Flow Based Capture Efficiency

☒ Both

Concentration Efficiency Transfer Function

Percentage Capture

Flow (cubic metres per sec)

Output

Input

Drag points on the graph to modify the transfer function

Fluxes... **Notes...**

Figure 5 Stormfilter (20 x 690mm cartridge) modelling data

APPENDIX E

EROSION HAZARD ASSESSMENT FORM



Erosion Hazard Assessment - June 2014

Brisbane City Council (BCC), *Erosion Hazard Assessment* form must be read in conjunction with the *Erosion Hazard Assessment- Supporting Technical Notes* (June 2014 or later version) for explanatory terms and Certification information.

What is an Erosion Hazard Assessment?

Soil erosion and sediment from urban development, particularly during construction activities, is a significant source of sediment pollution in Brisbane's waterways. The Erosion Hazard Assessment determines whether the risk of soil erosion and sediment pollution to the environment is 'low', 'medium' or 'high'.

When is the EHA required?

An *Erosion Hazard Assessment* form must be completed and lodged with BCC for any Development Application (ie MCU or ROL) that will result in soil disturbance OR Operational Works or Compliance Assessment Application for 'Filling' or Excavation.

Failure to submit this form during lodgement of an application may result in assessment delays or refusal of the application.

Privacy Statement

The personal information collected on this form will be used by Brisbane City Council for the purposes of fulfilling your request and undertaking associated Council functions and services. Your personal information will not be disclosed to any third party without your consent, unless this is required or permitted by law.

Assessment Details

1 Please turn over and complete the erosion hazard assessment.

2 Based on the erosion hazard assessment overleaf, is the site:

☐ A 'low' risk site

Best practice erosion and sediment control (ESC) must be implemented but no erosion and sediment control plans need to be submitted with the development application. Factsheets outlining best practice ESC can be found at <http://www.waterbydesign.com.au/factsheets>

☒ A 'medium' risk site

If the development is approved, the applicant will need to engage a Registered Professional Engineer (RPEQ) or Certified Professional in Erosion and Sediment Control (CPESC) to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Infrastructure Design Planning Scheme Policy.

☐ A 'high' risk site

If the development is approved, the applicant will need to engage a RPEQ and CPESC to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Infrastructure Design Planning Scheme Policy. The plans and program will need to be certified by a CPESC.

3 Site Information and Certification

Application number (if known)

Site address

527 GREGORY TERRACE
BOWEN HILLS
Postcode 4006

I certify that:

- ☒ I have made all relevant enquiries and am satisfied no matters of significance have been withheld from the assessment manager.
- ☒ I am a person with suitable qualifications and/or experience in erosion and sediment control.
- ☒ The Erosion Hazard Assessment was completed in accordance with the Erosion Hazard Assessment Supporting Technical Notes and the BCC Infrastructure Design Planning Scheme Policy.
- ☒ The Erosion Hazard Assessment accurately reflects the site's overall risk of soil erosion and sediment pollution to the environment.
- ☒ I acknowledge and accept that the BCC, as assessment manager, relies, in good faith, on this certification as part of its development assessment process and the provision of false or misleading information to the BCC constitutes an offence for which BCC may take punitive steps/ action against me/ enforcement action against me.

Certified by Print name

Nicholas Rozis

Certifier's signature

Date

28/01/2014

Table 1: Low Risk Test

		Yes	No
1.1	is the area of land disturbance > 1000 m ²	☒	☐
1.2	does any land disturbance occur in a BCC mapped waterway corridor	☐	☒
1.3	is there any slope on site (longer than three metres in length) before, during or after construction that is steeper than 5%	☒	☐
1.4	does any land disturbance occur below 5 m AHD	☐	☒
1.5	does development involve endorsement of a staging plan	☒	☒
1.6	is there an upstream catchment passing through the site > 1 hectare	☐	☒

Have you answered 'yes' to any of the questions in Table 1?

Yes	No
☒	☐

If 'No' then site is low risk with respect to erosion and sediment control

If 'Yes' then proceed to Table 2

Table 2: Medium Risk Test

		Yes	No
2.1	is the area of land disturbance > 1 hectare	☐	☒

If 'No' then site is medium risk with respect to erosion and sediment control

If 'Yes' then proceed to Table 3

Table 3: High Risk Test

3.1	is there an upstream catchment passing through the site > 1 hectare	☐	☐
3.2	does any land disturbance occurs in a BCC mapped waterway corridor	☐	☐
3.3	is there any slope on site (longer than three metres in length) before, during or after construction that is steeper than 15%	☐	☐

Have you answered 'yes' to any of the questions in Table 3?

Yes	No
☐	☐

If 'No' then site is medium risk with respect to erosion and sediment control

If 'Yes' then site is high risk with respect to erosion and sediment control