Roma Street

Cross River Rail Priority Development Area

Infrastructure Plan Background Report

February 2021

CROSSRIVERRAIL

Queensland Government

The Department of State Development, Infrastructure, Local Government and Planning improves productivity and quality of life in Queensland by leading economic strategy, industry development, infrastructure and planning, for the benefit of all.

The Queensland Government is committed to providing accessible services to Queenslanders of all cultural and linguistic backgrounds. If you have difficulty understanding this publication and need a translator, please call the Translating and Interpreting Service (TIS National) on 13 14 50 and ask them to contact the Department of State Development, Infrastructure, Local Government and Planning on 07 3452 7100.

Copies of this publication are available on our website at www.dsdmip.qld.gov.au and further copies are available upon request to:

Cross River Rail Delivery Authority

PO Box 15476, Brisbane City East, QLD 4002
Phone: 1800 010 875
Email: info@crossriverrail.qld.gov.au
Web: www.crossriverrail.qld.gov.au

Economic Development Queensland

Department of Department of State Development, Infrastructure, Local Government and Planning
GPO Box 2202, Brisbane Queensland 4002.

1 William Street Brisbane Qld 4000 (Australia)
Phone: 13 QGOV (13 74 68)
Email: edq@dsdmip.qld.gov.au
Web: www.edq.qld.gov.au

Table of Contents

1 Background **1**
1.1 Purpose of Infrastructure Plan Background Report 2
2 Growth projections **3**
2.1 Introduction 3
2.2 Growth projection years 3
2.3 Existing development demand 3
2.4 Potential development capacity 3
2.5 Development constraints 3
2.6 Growth rates 3
2.7 Growth projections summary 4
3 Demand projections **5**
4 Desired standard of service **6**
4.1 Water supply 6
4.2 Wastewater 6
4.3 Stormwater 6
4.4 Transport 6
4.5 Parks and community facilities 6
5 Infrastructure planning **7**
5.1 Purpose 7
5.2 Planning horizon 7
5.3 Water supply 7
5.4 Wastewater 7
5.5 Stormwater 8
5.6 Transport 8
5.7 Parks and community facilities 8
5.8 Infrastructure summary & categories 9
6 Infrastructure costs **12**
6.1 Cost of land 12
6.2 Cost of the works 12
6.2.1 Water **12**
6.2.2 Wastewater **12**
6.2.3 Stormwater **12**
6.2.4 Transport **12**
6.2.5 Parks and community facilities **12**
6.3 On-cost allowances 13
6.4 Contingency allowance 13
7 Development charges **14**
8 Trunk infrastructure cost schedules **15**

Appendices

Appendix A	PDA boundary map
Appendix B	Development yields and reference scheme
Appendix C	Demand generation rates
Appendix D	Demand projections
Appendix E	Technical memorandums / network summary reports / future infrastructure network plans
Appendix F	Future Trunk Infrastructure network plans
Appendix G	Future Trunk Infrastructure cost schedules

List of Tables

Table 2-1: Future residential dwellings and non-residential floor space projections	4
Table 2-2: Future population and employment projections	4
Table 5-1: Infrastructure summary table and categories	9
Table 6-1: On-cost allowance	13
Table 6-2: Contingency allowance	13

List of Figures

Figure 1-1: Roma Street PDA Boundary	2

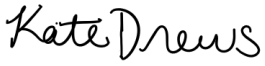
Document Control

Document:	Roma Street Priority Development Area
File Location:	\\aubnfsv006.sjgroup.local\Urban$\Projects\30032260\100 Concept-Feasibility\105 Deliverables\01 Roma St\Infrastructure Plan Background Report\Rev 06
Project Name:	Cross River Rail Delivery Authority Infrastructure Plan Background Report
Project Number:	30032260
Revision Number:	06

Issue Register

DISTRIBUTION LIST	DATE ISSUED	NUMBER OF COPIES
Cross River Rail Delivery Authority	23 Nov 2020	Electronic issue

SMEC Company Details

Approved by:	Kate Drews		
Address:	Level 6, 480 St Pauls Tce, Fortitude Valley, QLD, 4006		
Signature:			
Tel:	07 3324 7813	Fax:	
Email:	Kate.Drews@smec.com	Website:	www.smec.com

1 Background

The Queensland Government's Cross River Rail Precincts Delivery Strategy (the strategy) sets a vision for each Cross River Rail (CRR) Station precinct that is aligned to the Government's policy priorities. The strategy sets out a vision for Roma Street Precinct to be an extension of the Central Business District (CBD) and Brisbane's gateway to jobs, tourism and recreation.

To facilitate the realisation of this potential, the Roma Street precinct focus will be on:

- The key arrival destination for the central CBD, and the western gateway to the City's premier cultural, leisure and entertainment offerings including a Potential Major Entertainment Arena (PMEA).
- Improved public realm and active transport connections to improve pedestrian movement and connections.
- Significant upgrades to State-owned station interchange for CRR, Metro and bus services, including realignment of the Inner Northern Busway.

The strategy sets out a Roma Street Precinct Intent, located at one of Brisbane's most significant city centre arrival points, that has the opportunity to become a key economic and community hub through major redevelopment, reinvigorating heritage places, new public spaces and developing strong connections to nearby major parklands and facilities.

To support the Government's vision for the precinct, the Roma Street CRR Priority Development Area (PDA) was declared on 13 December 2019 and an Interim Land Use Plan (ILUP) given effect. Roma Street is one of the new underground stations with associated PDAs. The PDA was declared to assist with the delivery of the CRR Project's broader objectives.

The Roma Street CRR PDA is approximately 32 hectares and is located on the outer edge of Brisbane's city centre. The PDA includes state-owned land holdings, state transport corridors and roads, and other land in and around the rail station. It is approximately bound by College Road, Parkland Boulevard and Parkland Crescent to the north, Wickham Terrace, Albert Street and Emma Miller Place to the east, Roma Street, North Quay and Upper Roma Street to the south and Countess Street to the west (Refer Figure 1-1 and Appendix A).

The PDA declaration provides the opportunity to reconnect the area with the city centre, Spring Hill and Petrie Terrace, and with the Brisbane River and Kurilpa Bridge. The Roma Street CRR PDA regulates development on land within the Roma Street CRR PDA. The Minister for Economic Development Queensland (MEDQ) has delegated certain functions and powers under the *Economic Development Act 2012* (the ED Act) to the Cross River Rail Delivery Authority (CRRDA) including plan, carry out, promote or coordinate activities to facilitate economic development and development for community purposes.

The Roma Street CRR PDA Development Scheme (the development scheme) is applicable to development on land within the boundaries Roma Street CRR PDA. From the date of approval, the development scheme replaces the Roma Street Cross River Rail PDA ILUP which commenced upon declaration.

The development scheme consists of the following:

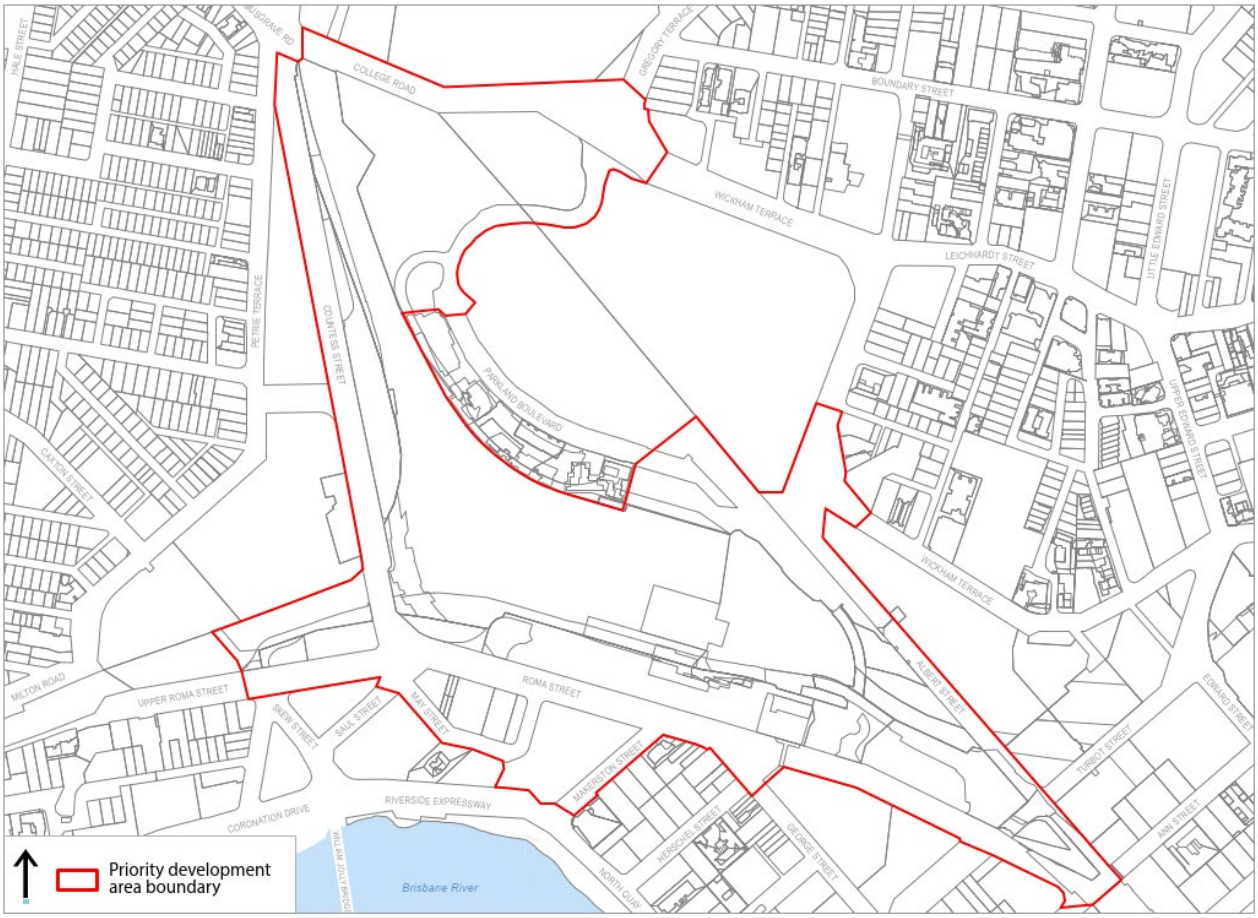
1. a land use plan that regulates development in the PDA (section 2)

2. an infrastructure plan that describes infrastructure required to support achievement of the land use plan (section 3)

3. an implementation strategy that describes objectives and actions that complement the land use plan and infrastructure plan to achieve the main purpose of the ED Act (section 4).

The development scheme was prepared under delegation by the CRRDA in collaboration with Economic Development Queensland, State agencies, and other key stakeholders.

Figure 1-1: Roma Street PDA boundary



(Source: CRRDA Roma Street Interim Land Use Plan Dec 19)

The Roma Street CRR PDA Development Charges and Offset Plan (DCOP) provides a mechanism to facilitate the funding and delivery of trunk infrastructure to service the land uses and development yields assumed to be realised in the PDA, for the water supply, wastewater, stormwater, transport, parks and community facilities networks. The DCOP provides the MEDQ policy guidance to support the development scheme and sets out the development charge rates, schedule of works for trunk infrastructure and mapping which identifies trunk infrastructure upgrades or new trunk infrastructure necessary to be delivered in the PDA to 2036. The DCOP also sets out matters relevant to calculating development charges, credits, offsets and refunds for the provision of trunk infrastructure.

1.1 Purpose of Infrastructure Plan Background Report

This Infrastructure Plan Background Report (IPBR) documents information relevant to preparing the infrastructure plan and DCOP for the Roma Street CRR PDA. The report will assist users of the infrastructure plan within the development scheme and the DCOP to understand how infrastructure planning was undertaken and how development charges were determined.

Additionally, section 4 of this report outlines the Desired Standard of Service (DSS) for infrastructure for the Roma Street CRR PDA. The DSS is a summary of the trunk and non-trunk design standards used to inform the planning of the infrastructure networks in the area. These standards also provide guidance to future development applicants of the form, type and arrangement of infrastructure that is likely to be acceptable to the MEDQ in the Roma Street CRR PDA.

2 Growth projections

2.1 Introduction

The rate of growth projected for the Roma Street CRR PDA is based on the potential residential and non-residential development in the area and forms the basis for the planning of the infrastructure services. The following sections detail the development and associated growth envisaged for the area.

2.2 Growth projection years

The Roma Street PDA growth projections were prepared for the following years:

- The base date 2020 (prior to the demolition of the Brisbane Transit Centre (BTC) and Hotel Jen) and the following projection years:
  - year of opening of the new Roma Street CRR station 2025
  - 2026
  - 2031
  - ultimate development at 2036.

2.3 Existing development demand

The Gross Floor Area (GFA) of existing buildings within the Roma Street CRR PDA were estimated to form a demand on infrastructure at 2020, prior to the demolition of the BTC and Hotel Jen.

2.4 Potential development capacity

The vision for the Roma Street CRR PDA is to facilitate a mix of short term accommodation, residential, commercial, entertainment, community and education land uses in the Precinct. While a development scheme is yet to be finalised for the PDA, a Baseline Potential Development Scenario – reference scheme (the reference scheme) was adopted to forecast future servicing demand. The ultimate potential development capacity that may be achieved on premises within the PDA was calculated based on the type and density of development allowable under the Reference Scheme (the planned density), considering impacting factors such as existing development, land tenure and plot size to determine a likely development outcome.

Following calculation of the potential development yield (in GFA per m^2), these areas were then distributed between various land uses (commercial, retail, industrial and residential), in accordance with the development yields and reference scheme table (Appendix B).

The plot ratios and dwelling size assumptions are averages and they recognise that development may occur in individual circumstances at higher or lower densities. Appendix B states the plot ratios and GFA distribution assumptions assumed for land within each future development site within the PDA.

2.5 Development constraints

The projected growth for the PDA has been calculated taking into consideration known development constraints which may limit the potential yield of land. Absolute constraints (such as flooding, transport infrastructure, parkland, etc.) were addressed as part of the reference scheme.

2.6 Growth rates

The rate of growth for residential and non-residential development in the PDA was determined by the CRRDA having regard to the anticipated timing of government land becoming available for development, the anticipated staging of future development, market analysis and industry engagement.

2.7 Growth projections summary

The growth projections for the PDA are summarised in Table 2-1 and Table 2-2.

Table 2-1: Future residential dwellings and non-residential floor space projections

DEVELOPMENT TYPE	PROJECTIONS BY YEAR					
	2020[1]	2025[2]	2026[3]	2031	2036	Ultimate total
Residential Dwellings	-	-	-	1,601	649	2,250
Non-residential floor space (m^2 GFA)	-	-	193,052	110,354	213,863	517,269

Table 2-2: Future population and employment projections

DEVELOPMENT TYPE	PROJECTIONS BY YEAR					
	2020[1]	2025[2]	2026[3]	2031	2036	Ultimate total
Residents	-	-	-	2,936	1,256	4,192
Employees	-	-	9,241	2,912	7,613	19,766

[1] Prior to demolition of the BTC and Hotel Jen.

[2] Year of completion of the Roma Street Cross River Rail Station, Herschel Street Pocket Park and Station Arrival Plaza.

[3] Assumed commencement of use of the first Future Over Station Development (FOSD) on the former BTC site.

3 Demand projections

Growth projections are converted into demand projections to enable infrastructure planning to be undertaken.

Different infrastructure networks express infrastructure demand using different demand units. The demand units used by each local network in the PDA are as follows:

- for the water supply network, equivalent persons (EP)
- for the wastewater network, equivalent persons (EP)
- for the stormwater quantity network, impervious area expressed in hectares (Imp Ha)
- for the transport network, trips per day (trips)
- for the parks and community facilities network, persons.

The demand generation rates used by each network to convert growth projections into demand are stated in Appendix C.

The demand projections for each network are stated in Appendix D.

4 Desired standard of service

4.1 Water supply

The Desired Standards of Service (DSS) for the water supply network is consistent with:

- the design standards for the water supply network stated in the South East Queensland Design and Construction Code, as may be amended from time to time.

The latest DSS can be accessed on the SEQ Water Supply and Sewerage Design and Construction Code website.

4.2 Wastewater

The DSS for the wastewater network is consistent with:

- the design standards for the wastewater network stated in the South East Queensland Design and Construction Code, as may be amended from time to time.

The latest DSS can be accessed on the SEQ Water Supply and Sewerage Design and Construction Code website.

4.3 Stormwater

The DSS for the stormwater network is consistent with the *Brisbane City Plan 2014*, Schedule 6, Chapter 7 for the trunk infrastructure network and supporting policy, as may be amended from time to time.

The latest DSS can be accessed on the Brisbane City Council (BCC) website.

4.4 Transport

The desired standard of service for the road network is as follows:

- design the road network to comply with the following:
  - the standard road cross-sections in BCC's Infrastructure Design Planning Scheme Policy (IDPSP)
  - transport corridors are planned to cater for 2036 planning horizon.
  - active transport routes must always be publicly accessible, or a suitable alternative route must be provided during the operation of events.

CRRDA have adopted BCC's DSS, as per the Brisbane City Plan 2014 Local Government Infrastructure Plan (LGIP), for all transport networks as outlined in Roma Street Priority Development Area – Transport Report prepared by SMEC, dated 4 November 2020. However, where BCC's DSS conflicts with the following standards, the standards listed below prevail:

- The Department of Transport and Main Roads Technical Note 128 Selection and Design of Cycle Tracks.

The latest DSS can be accessed on the BCC website.

4.5 Parks and community facilities

The DSS for the parks and land for community facilities network is consistent with the BCC LGIP and supporting policy, as may be amended from time to time. Refer to the following sections of the Brisbane City Plan 2014 for the relevant DSS:

- Part 4 (LGIP)
- Public Parks and Land for Community Facilities Network – extrinsic material
- Planning Assumptions – extrinsic material.

The latest DSS can be accessed on the BCC website.

5 Infrastructure planning

5.1 Purpose

As described in section 3.1 of the development scheme, the purpose of the infrastructure plan is to ensure that the PDA vision is achieved through:

1. integrating infrastructure planning with land use planning identified in the development scheme
2. identifying the infrastructure requirements which may be delivered by the relevant infrastructure provider such as state government, BCC, Urban Utilities or applicants
3. providing a basis for imposing conditions on development approvals
4. responding to the increased demand on the relevant infrastructure networks.

This IBPR should be read in conjunction with the development scheme infrastructure plan (Section 3) and the DCOP. Section 3.2 of the development scheme identifies the various infrastructure networks and Section 3.3 describes three PDA infrastructure categories: trunk, non-trunk and other which inform future funding arrangements.

5.2 Planning horizon

The infrastructure plans for the Roma Street CRR PDA have a planning horizon of 2036. This horizon was chosen to align with the anticipated staging of future development and the realisation of ultimate development in the Roma Street CRR PDA. The PDA is assumed to be fully developed by 2036.

5.3 Water supply

The Roma Street PDA Precinct is currently generally well serviced in terms of water supply pressure and flow. Assessment of the existing external water supply infrastructure indicated that no upgrades of the existing water infrastructure will be required to service the future development demands within the PDA.

There is an existing large diameter trunk watermain running through the Parkland. This trunk main will be required to be protected during the works.

Further details relating to the planning of water supply infrastructure for the PDA is documented in Appendix E:

- Water Supply & Wastewater Technical Note – Technical Memo prepared by SMEC, dated 4 November 2020.

Refer to Appendix F and G for planned trunk infrastructure project mapping and cost schedules (where applicable).

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1.

5.4 Wastewater

The Roma Street PDA is generally divided into two main catchments. The south-west catchment of the PDA discharges into the existing wastewater infrastructure located at Roma Street, that continues through Makerston Street and North Quay, before connecting into a large trunk main at Turbot Street. The capacity of this infrastructure is constrained and will require upgrades inside and outside of the Roma Street PDA to adequately service the demand generated by the potential future development. This may involve upgrade works of the wastewater infrastructure in Makerston Street.

Planning of wastewater infrastructure for the PDA is documented in Appendix E:

- Water Supply & Wastewater Technical Note – Technical Memo prepared by SMEC, dated 4 November 2020.

This includes an overall existing and future Wastewater Infrastructure Network Plan identifying non-trunk, trunk and other infrastructure as may be applicable.

Refer to Appendix F – Map 02 Wastewater - Future Trunk Infrastructure Plan and Appendix G for the planned trunk infrastructure project mapping and cost schedules.

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1.

5.5 Stormwater

The stormwater network around the Roma Street area is known to be significantly under capacity and does not currently manage a 10 per cent Annual Exceedance Probability (AEP) storm event flow. The ultimate developed conditions of the Roma Street CRR PDA development do not contribute significant additional flows that would worsen the stormwater performance in the area however, the development does provide the opportunity to address some of the existing drainage issues for the overall catchment and is anticipated to introduce additional land use activities and densities into the precinct.

Modelling indicates that the PDA catchment area is responsible for 57 per cent of the flow for recommended stormwater network upgrade ST01 and 38 per cent of the flow for recommended stormwater network upgrade ST02 (refer Appendices E, F and G for recommended infrastructure network upgrades). In the interests of apportioning the costs of mitigating an existing stormwater issue between existing and future users, government entities and PDA and non-PDA drainage origins, indicative costs have been apportioned accordingly between future PDA development and BCC.

Further details relating to the planning of stormwater infrastructure for the PDA is documented in Appendix E:

Roma Street Precinct Stormwater Management – Technical Memo prepared by SMEC, dated 20 August 2020.

This includes an overall existing and future Stormwater Infrastructure Network Plan identifying non-trunk, trunk and other infrastructure as may be applicable.

Refer to Appendix F – Map 03 Stormwater - Future Trunk Infrastructure Plan and Appendix G for the planned trunk infrastructure project mapping and cost schedules.

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1.

5.6 Transport

Planning of transport infrastructure to service the development within the PDA is documented in Appendix E:

- *Roma Street Priority Development Area – Transport Report* prepared by SMEC, dated 4 November 2020.

This includes overall existing and future Transport Infrastructure Network Plans identifying non-trunk, trunk and other infrastructure as may be applicable.

Refer to Appendix F - Map 04a Transport (Road) - Future Trunk Infrastructure Plan and Map 04b Transport (Active) – Future Trunk Infrastructure Plan and Appendix G for the planned trunk infrastructure project mapping and cost schedules.

Trunk infrastructure is represented by roads and intersections of higher-order road hierarchies, including Motorway, Arterial, Suburban, District roads. These road hierarchies are demonstrated in the Road Hierarchy Overlay contained within the Brisbane City Plan 2014. Within the road corridor, trunk infrastructure includes the formation, carriageway, footpaths, street trees and furniture, cycleways, bridges, in-road drainage and intersections with at least three arms of trunk roads or where the MEDQ considers that the future project is considered on balance to have wider transport network benefits (e.g. car, pedestrian, cycle) and will service multiple future development sites.

Where transport upgrades required for the PDA intersect with other planned trunk infrastructure or development infrastructure (as per BCC's or Urban Utilities' infrastructure planning policies), the transport upgrade is to provide for or accommodate the efficient delivery of all planned infrastructure. This may include the provision of other planned trunk infrastructure or development infrastructure where the delivery of that additional infrastructure is determined to be the most efficient and cost-effective solution.

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1.

5.7 Parks and community facilities

Considering the high levels of quality park and open space areas provided by Roma St Parkland along with BCC's proposed enhancements to Victoria Park and Green Spine, the PMEA project, Emma Miller Place public realm enhancements, and TSD Roma Street Station Plaza and potential expansion, Herschel Street Pocket Park, it is concluded that no further parks investments beyond these are recommended to incorporated into the Roma Street PDA.

Regarding community facilities, it is recommended that the opportunity be provided in the PDA for the inclusion of dedicated space for further community facilities infrastructure. It is recommended that the specific form of community facility be informed by the network planning for the community facilities network being undertaken by BCC. It is further recommended that the facility be centrally located in the PDA, in a visible and highly accessible location with potential site options including the potential redevelopment of the existing Roma Street Parkland Administrative Building (near the Coach Terminal) or re-purposing of the Roma Street Heritage Station Building. The trigger for provision of the facility is residential growth within the PDA of (capacity for) an additional 2,500 residents, which is planned to occur by 2031.

Planning of parks and community facilities infrastructure to service development within the PDA was informed by the following reports in Appendix E:

Roma Street CRR Precinct Community Infrastructure Assessment – Technical Memo prepared by SMEC, dated 4 November 2020.

This includes an overall existing and future Community Infrastructure Network Plan identifying non-trunk, trunk and other infrastructure as may be applicable.

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1.

Refer to Appendix F – Map 05 Parks and Community Facilities - Future Trunk Infrastructure Plan, and Appendix G for the planned trunk infrastructure project mapping and cost schedules.

5.8 Infrastructure summary and categories

A summary of whether the identified infrastructure may be trunk, non-trunk or other infrastructure is provided in Table 5-1. Refer to sections 3.3 and 3.4 of the development scheme infrastructure plan for additional information regarding the relevant infrastructure categories and funding arrangements.

Table 5-1: Infrastructure summary table and categories

INFRASTRUCTURE IDS	INFRASTRUCTURE NETWORKS	INFRASTRUCTURE DETAILS (REFER APPENDIX E, F & G)	INFRASTRUCTURE CATEGORY	POTENTIAL FUNDING
N/A	**Water supply**	Internal servicing mains - various	Non-trunk	Developer
SEW-01A	**Wastewater**	Makerston St Sewer - Gravity Main	Trunk	Development charges
N/A		Gravity Main (inside PDA) - various	Non-trunk	Developer
SEW-01B		North Quay Sewer - Gravity Main (outside PDA)	Trunk	Development charges
N/A		Private pump station - tbd	Non-trunk	Developer
N/A		Alternative treatment - tbd	Non-trunk	Developer
SW 1-12	**Stormwater**	Stormwater pipes / culverts – various under Garrick Street, May Street and Roma Street	Trunk	Partially development charges & Other entity tbd[1]
N/A		Stormwater pipe/culvert - tbd	Non-trunk	Developer
N/A		On-site retention/detention - tbd	Non-trunk	Developer
I01	**Transport**	Garrick Street / Roma Street Intersection	Trunk	Development charges
I06		College Road / Parkland Boulevard Intersection	Trunk	Partially development charges & Other entity tbd[1]
I07		Intersection	Non-trunk	Developer

INFRASTRUCTURE IDS	INFRASTRUCTURE NETWORKS	INFRASTRUCTURE DETAILS (REFER APPENDIX E, F & G)	INFRASTRUCTURE CATEGORY	POTENTIAL FUNDING
I02, I03, I04, I05, I08		Intersections – various (Potential Arena)	Other	Other entity tbd[1]
RD01		Garrick Street intersection works - road corridor	Non-trunk	Developer
RD02		Parkland Blvd road corridor	Non-trunk	Developer
AT01		Pathway - widening Inner Northern Bikeway from College Way to Parkland Crescent	Trunk	Partially development charges & Other entities tbd[1]
AT02		Pathway - widening and public realm enhancements to Parkland entrance from Parkland Kiosk to Albert Street (Potential Arena)	Other	Other entity tbd[1]
AT03		Pathway - New pedestrian / cycle overpass spanning over Roma Street (Potential Arena)	Other	Other entity tbd[1]
AT04		Pathway - New pedestrian / cycle skywalk parallel to Roma Street (Potential Arena)	Other	Other entity tbd[1]
AT05		Pathway - New pedestrian / cycle bridge spanning over Roma Street rail lines	Trunk	Developer charges
AT08		Pathway - New pedestrian / cycle bridge from Roma Street Parkland spanning over Countess Street to Victoria Barracks	Other	Other entity tbd[1]
AT09		Pathway - Upgrade to Courts Precinct path from Roma Street to George Street (Potential Arena)	Other	Other entity tbd[1]
AT10		Pathway - New pedestrian / cycle access connecting Roma Street overpass (AT03) to Albert Street (Potential Arena)	Other	Other entity tbd[1]
AT11		Pathway - New pedestrian skywalk connecting Western Future Over Station Development (FOSD) to existing Barracks pedestrian bridge to Lang Park	Trunk	Partially development charges & Other entities tbd[1]
AT12		Pathway - Parkland Boulevard 'Cycle Street' enhancements - Inner Northern Bikeway Parkland Crescent to Ramp	Trunk	Partially development charges & Other entities tbd[1]
N/A		Pathway/Pathway bridge - tbd	Non-trunk	Developer
N/A		On road facilities - tbd	Tbd	Tbd[1]
PC01		Herschel Street Pocket Park (CRR TSD)	Other	CRR TSD
PC02		Roma Street Station Arrival Plaza (CRR TSD)	Other	CRR TSD
PC03		Emma Miller Place enhancements (Potential Arena)	Trunk	Partially development

INFRASTRUCTURE IDS	INFRASTRUCTURE NETWORKS	INFRASTRUCTURE DETAILS (REFER APPENDIX E, F & G)	INFRASTRUCTURE CATEGORY	POTENTIAL FUNDING
				charges & Other entities tbd[1]
PC04		Multi-purpose community facility (leased floor space) including community meeting rooms	Trunk	Partially development charges & Other entities tbd[1]
PC05		Expanded Roma Street Station Arrival Plaza – Urban Common	Trunk	Partially development charges & Other entities tbd[1]
PC06 (N)	**Parks and community facilities**	Roma Street Streetscape improvements (west)	Non-trunk & Other	Developer & CRR TSD
PC06 (S)		Roma Street Streetscape improvements (west)	Non-trunk	Developer
PC07		Albert Street Green Spine (Potential Arena)	Other	Other entity tbd[1]
PC08		Potential Entertainment Arena	Other	Other entity tbd[1]
PC09		Roma Street Streetscape improvements (east) (Potential Arena)	Other	Other entity tbd[1]
N/A		Public open space (streetscape / public realm) tbd	Non-trunk	Developer

[1] *To be determined (Funding arrangements and potential contributions to be discussed with relevant government entities)*

6 Infrastructure costs

The cost of infrastructure has been determined as follows.

6.1 Cost of land

The assumptions regarding the cost of future infrastructure (land) was determined for each network as follows:

- No additional private land is proposed to be acquired for the infrastructure necessary to support the Roma Street CRR PDA
- If it is identified that a land value is required to provide an offset value for trunk infrastructure land, the value is to be based on the Valuer-General's annual valuation rate (rate per m² basis, in accordance with the land Valuation Act 2010) that is current at the time the offset is granted.

6.2 Cost of the works

The cost of future infrastructure (works) was determined for each network as detailed in the following sections.

6.2.1 Water

No future trunk infrastructure works was identified.

6.2.2 Wastewater

Wastewater cost estimates were prepared by SMEC. These costs are provided as lump sum costs per infrastructure item and are based on a detailed cost calculation adopting industry rates at FY2020/2021. The schedule of works (Appendix G) identifies the specific base cost for each infrastructure item.

6.2.3 Stormwater

Stormwater cost estimates were prepared by SMEC. These costs are provided as lump sum costs per infrastructure item and are based on a detailed cost calculation adopting industry rates at FY2020/2021. The schedule of works (Appendix G) identifies the specific base cost for each infrastructure item.

6.2.4 Transport

Future trunk infrastructure works for the transport network are based on several sources. These include:

- For trunk intersection works – Intersection upgrade costs (including indirect costs, locational factors, and relocation allowance costs) within the BCC LGIP Extrinsic Material documents at FY2016/17
- For trunk pathway and pathway bridge costs:
  - Unit rates for similar projects provided by Rider Levett Bucknall (RLB) at FY2018/219
  - Unit rates for similar projects provided by SMEC at FY2019/20
  - Average unit rates for similar projects (between RLB and SMEC)
  - Nominal unit rates provided by Integran, where necessary.

The schedule of works (Appendix G) identifies the specific base cost for each infrastructure item.

6.2.5 Parks and community facilities

Future trunk infrastructure works for the parks and community facilities networks are based on the following sources:

- Urban common park embellishment:
  - Urban common unit rates within the BCC LGIP Extrinsic Material documents at FY2016/17, calculated as a rate per square metre based on BCC's preferred park size.
- Community facility land:
  - Based on a 20-year lease within Roma Street Heritage building (or other appropriate location) using industry estimates for inner city space, averaged between high and low exposure locations at FY2020/21.

The schedule of works (Appendix G) identifies the specific base cost for each infrastructure item.

6.3 On-cost allowances

On-costs represent the owner's project costs and may include:

- survey for the work
- geotechnical investigations for the work
- strategic planning
- detailed design for the work
- project management, procurement and contract administration
- environmental investigations for the work, and
- portable long service leave payment for a construction contract for the work.

The on-costs allowances that have been applied to infrastructure costs in the PDA are stated in Table 6-1.

Table 6-1: On-cost allowance

NETWORK	ON-COSTS ALLOWANCE
Transport (Road)	13% applied to the Base Cost (inclusive of cost factors)
Transport (Active)	17% applied to the Base Cost (inclusive of cost factors)
All other networks	17% applied to the Base Cost (inclusive of cost factors)

6.4 Contingency allowance

A contingency allowance is included in the cost of future infrastructure works to deal with known risks. The contingency allowance typically reduces in accordance with the level of planning undertaken for the infrastructure item. The level of contingency allowance applied for infrastructure works in each network are stated in Table 6-2.

Table 6-2: Contingency allowance

NETWORK	CONTINGENCY ALLOWANCE
Water	40% applied to the Base Cost (inclusive of on-costs and cost factors)
Sewerage	40% applied to the Base Cost (inclusive of on-costs and cost factors)
Stormwater	40% applied to the Base Cost (inclusive of on-costs and cost factors)
Transport (Road)	40% applied to the Base Cost (inclusive of on-costs and cost factors)
Transport (Active)	20% applied to the Base Cost (inclusive of on-costs and cost factors)
Parks and community facilities	30% applied to the Base Cost (inclusive of on-costs and cost factors)

7 Development charges

Development Charges have been adopted consistent with current Adopted Infrastructure Charges currently levied by BCC and Urban Utilities

8 Trunk infrastructure cost schedules

Detailed cost schedules were prepared for each trunk infrastructure item identified in the DCOP.

Refer to Appendix G for further details.

Queensland
Government

Appendix A PDA Boundary Map

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area

PDA Boundary

Legend

- PDA Boundary
- Roads
- Transit
- Rail (inc CRR)
- Lot Boundary

Data Sources
QLD Government 2020, Brisbane City Council 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

Appendix B Development Yields and Reference Scheme

Table B-1: Existing and Proposed Development Yields - Residential (incl. Short-term Accommodation)

SITES	DEVELOPMENT TYPE	PROJECTIONS BY YEAR				
		2020[1] (base date)	2025[2]	2026[3]	2031	2036 (ultimate)
P2	1 Bedroom Dwelling	-	-	-	89	89
	2 Bedroom Dwelling	-	-	-	89	89
	3+ Bedroom Dwelling	-	-	-	20	20
P3	1 Bedroom Dwelling	-	-	-	-	292
	2 Bedroom Dwelling	-	-	-	-	292
	3+ Bedroom Dwelling	-	-	-	-	65
	Hotel Suite (1/2 Bed)	191	-	-	357	357
P5	1 Bedroom Dwelling	-	-	-	471	471
	2 Bedroom Dwelling	-	-	-	471	471
	3+ Bedroom Dwelling	-	-	-	105	105
Total		191	-	-	1,601	2,250

Note: Presented as cumulative totals

[1] Prior to demolition of the Brisbane Transit Centre (BTC) and Hotel Jen

[2] Year of completion of the Roma Street Cross River Rail Station, Herschel Street Pocket Park and Station Arrival Plaza

[3] Assumed commencement of use of the first Future Over Station Development (FOSD) on the former BTC site.

Table B-2: Existing and Proposed Development Yields – Non-residential GFA (m^2)

SITES	DEVELOPMENT TYPE	PROJECTIONS BY YEAR				
		2020[1] (base date)	2025[2]	2026[3]	2031	2036 (ultimate)
P1	Education/Research	-	-	-	-	109,296
	Low Impact Industry	475	475	475	475-	-
P2	Commercial (Office)	948	948	948	32,854	32,854
P3	Commercial (Office)	35,700	35,700	35,700	35,700	104,567
	Community Purposes	6,300	6,300	6,300	6,300	-
	Emergency Services	5,682	5,682	5,682	5,682	-
	Health Care Service	3,600	3,600	3,600	3,600	-
P4	Commercial (Retail)	-	-	-	4,042	4,042
	Entertainment (Hotel)	3,043	-	-	16,362	16,362
	Entertainment (PMEA)	-	-	-	57,096	57,096
P5	Commercial (Retail)	6,893	-	11,396	11,396	11,396
	Commercial (Office)	36,799	-	181,656	181,656	181,656

Note: Presented as cumulative totals

[1] Prior to demolition of the BTC and Hotel Jen

[2] Year of completion of the Roma Street Cross River Rail Station, Herschel Pocket Park and Station Arrival Plaza

[3] Assumed commencement of use of the first Future Over Station Development (FOSD) on the former BTC site.

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area - Baseline Potential Development Scenario Staging Plan - Reference Scheme

Legend

CRRDA Roma St PDA Boundary

Development Projects (by Stage, Year)

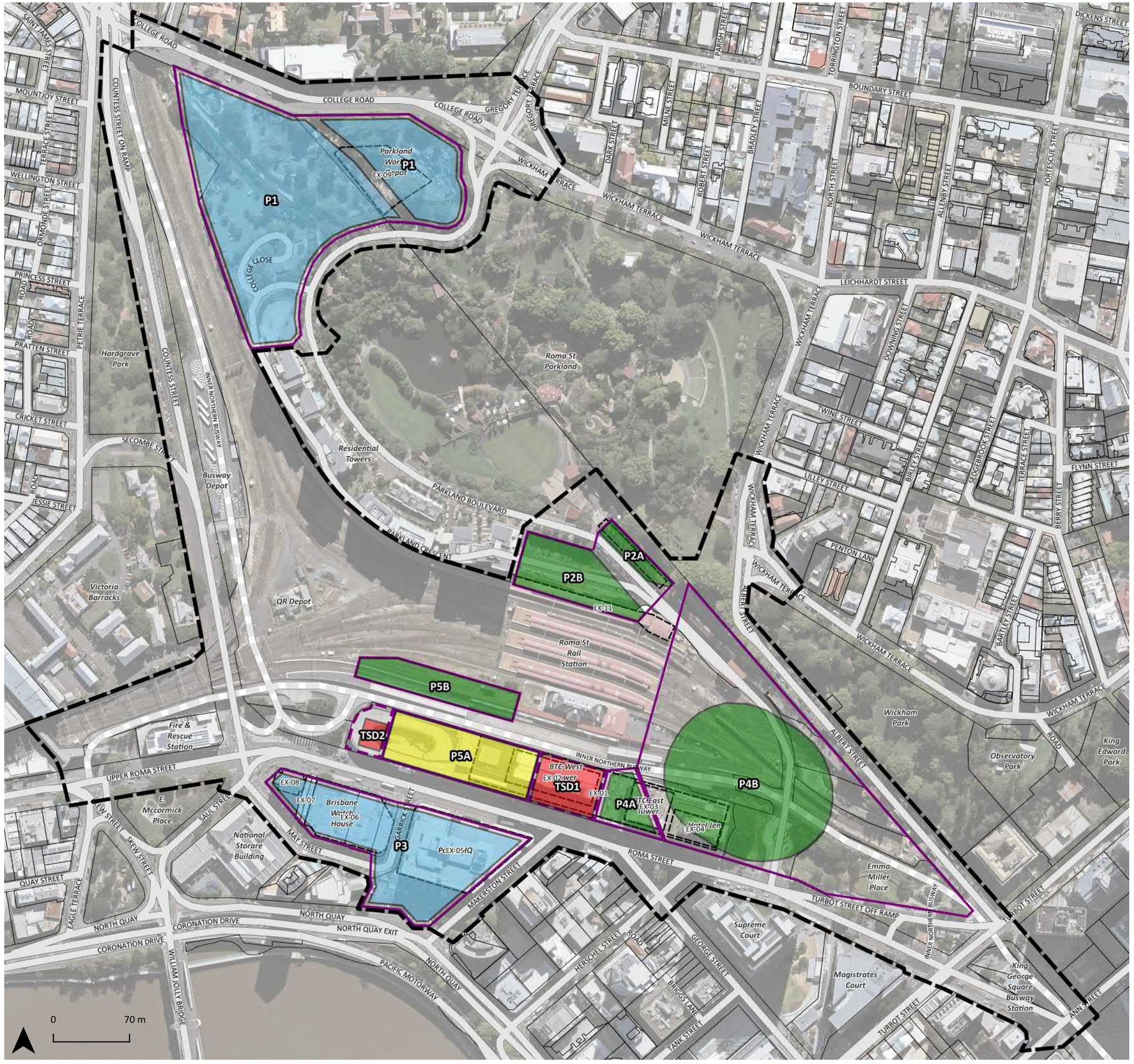
- Stage 1 (2025 TSD)
- Stage 2 (2026)
- Stage 3 (2031)
- Stage 4 (2036)

Development Sites (Lead Party)

- CRRDA Precincts
- Pulse

Roads & Transit

- Road
- Transit
- Lots
- Existing Buildings



Appendix C Demand Generation Rates

DEVELOPMENT CATEGORY	GENERATION RATES				
	Water supply network (EP)	Wastewater network (EP)	Stormwater quantity network (Imp Fr.)	Transport network (trips)	Parks and community facilities network (EP)
Commercial (Retail) (per m² GFA)	0.006	0.006	0.9	0.4	0.00102
Commercial (Office) (per m² GFA)	0.006	0.006	0.9	0.16	0.0037
Entertainment (Hotel) (per m² GFA)	0.006	0.006	0.9	0.4	0.00102
Hotel (per suite)	1.75	1.75	0.9	0.4	1.78
Entertainment (PMEA) (per m² GFA)	0.0024	0.0024	0.9	0.4	0.00102
Low Impact Industry (per m² GFA)	0.0048	0.0048	0.9	0.05	0.00115
Multi-Dwelling (1-2 Bedroom) (per dwelling)	1.75	1.75	0.9	4.2	1.78
Multi-Dwelling (3+ Bedroom) (per dwelling)	1.75	1.75	0.9	4.2	1.78
Community Purposes (per m² GFA)	0.006	0.006	0.9	0.15	0
Source	*SEQ Design and Construction Code (p. 44)*		*BCC LGIP Schedule 3 – SC3.1.3—Planned density and demand generation rate for a trunk infrastructure network (Principal Centre Zone)*	*BCC LGIP - Transport Extrinsic Material - Tables 4.3.1.1 to 4.3.1.3*	*BCC LGIP - Parks Extrinsic Material - Tables 4.3.1.1 to 4.3.1.2 - assumes 1 EP per person*

Appendix D Demand Projections

INFRASTRUCTURE	EXISTING AND PROJECT DEMAND (EP)				
	2020[1] (base date)	2025[2]	2026[3]	2031	2036 (ultimate)
Water Supply Network	930	-	1,158	4,419	6,837
Wastewater Network	930	-	1,158	4,379	6,837
Stormwater Network	N/A	N/A	N/A	N/A	N/A
Transport Network	18,163	-	33,623	75,375	111,226
Communities Facility Network	340	-	1,862	2,850	4,005

[1] Prior to demolition of the BTC and Hotel Jen

[2] Year of completion of the Roma Street Cross River Rail Station, Herschel Pocket Park and Station Arrival Plaza

[3] Assumed commencement of use of the first Future Over Station Development (FOSD) on the former BTC site.

Appendix E Technical Memorandums / Network Summary Reports / Future Infrastructure Network Plans

Member of the Surbana Jurong Group

local people
global experience

Technical Memo

Document No	30032260-W&S-ROMA-IPBR-001	**Date of Issue**	18 November 2020
Subject/Title	Water Supply & Wastewater Technical Note for CRR Roma St Precinct		
Project	30032260 Cross River Rail Delivery Authority Precincts Engineering		
Discipline	Water & Wastewater		
Revision Details	D		
Authors	James Brotherson		
Reviewed by	Adam Cullen, Gavin Flood, Anna West		
Approved by	Gustavo Pereira		
Purpose	Development Scheme IPBR		
Prepared for	Cross River Rail Delivery Authority	**Attention to**	Daniel Gallagher
Attachments	Attachment A Development Yield Maps & Tables Attachment B Netserv Plan Extract		

1 Introduction

1.1 Background

The Queensland Government's Cross River Rail Precincts Delivery Strategy (PDS) sets a vision for each Cross River Rail (CRR) Station precinct that is aligned to the Government's policy priorities. The Strategy sets out a vision for Roma Street Precinct to be an extension of the CBD and Brisbane's gateway to jobs, tourism and recreation.

To facilitate the realisation of this potential, the Roma Street precinct focus will be on:

- The key arrival destination for the central CBD, and the western gateway to the City's premier cultural, leisure and entertainment offerings including a Potential Major Entertainment Arena (PMEA).
- Improved public realm and active transport connections to improve pedestrian movement and connections.
- Significant upgrades to State-owned station interchange for CRR, Metro and bus services, including realignment of the Inner Northern Busway.

The Strategy sets out a Roma Street Precinct Intent, located at one of Brisbane's most significant city centre arrival points, having the opportunity to become a key economic and community hub through major redevelopment, reinvigorating heritage places, new public spaces and developing strong connections to nearby major parklands and facilities.

The Cross River Rail Delivery Authority Act 2016 establishes the Cross River Rail Delivery Authority (CRRDA). The purpose of the CRRDA is to plan, carry out, promote or coordinate activities to facilitate economic development and development for community purposes in a CRR Priority Development Area (PDA). The location of the Roma Street CRR PDA is shown in Figure 1.

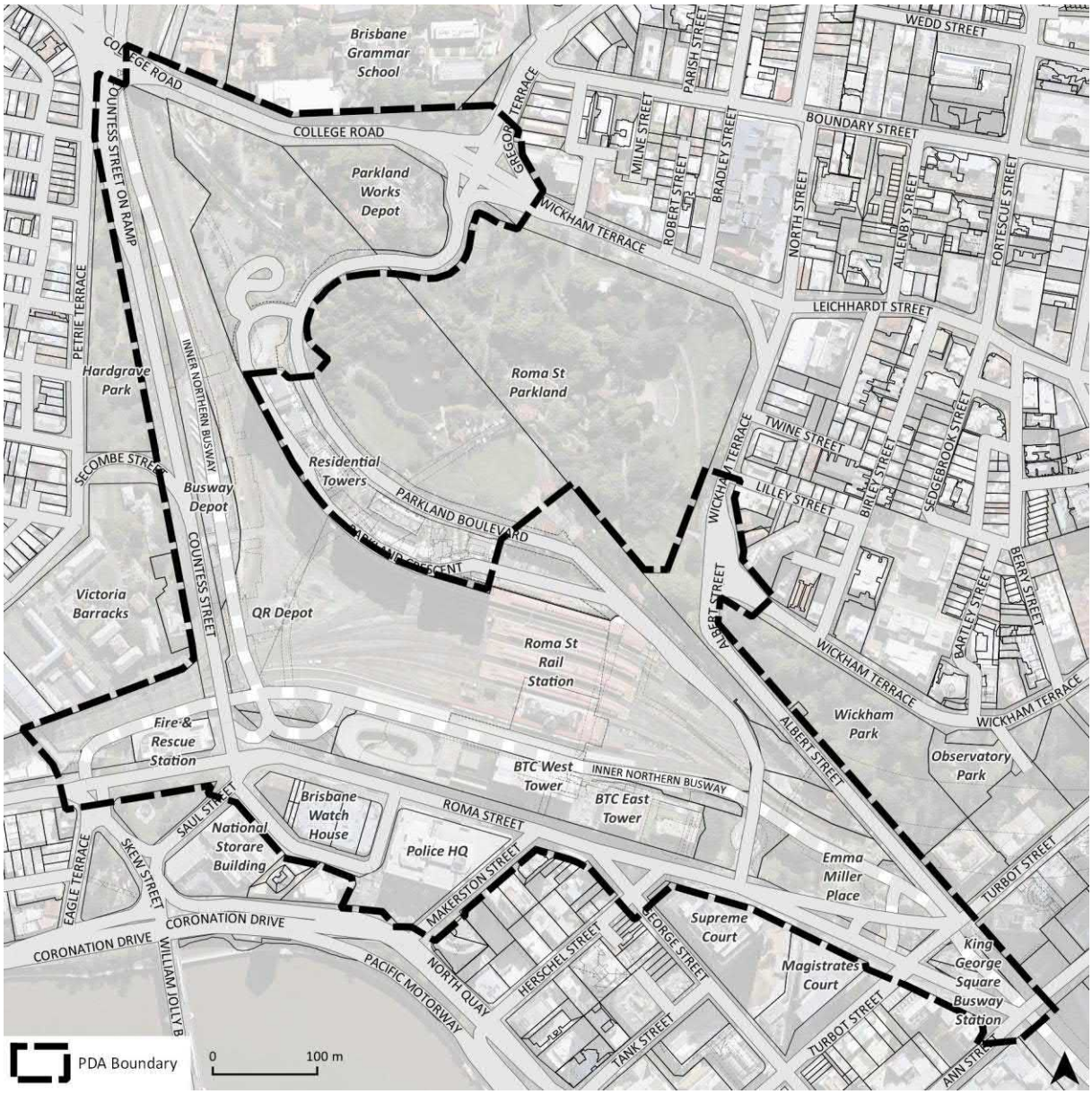


Figure 1 Map of Cross River Rail Roma St PDA Boundary

The CRRDA is preparing a Development Scheme for the Roma Street CRR PDA to support the Government's PDS Vision and to achieve the purposes of the Act.

1.2 Objective

This Technical Memo provides an assessment of the water and wastewater network infrastructure requirements to understand and address the impacts related to the Roma Street Precinct future development opportunities as part of the wider Cross River Rail (CRR) Project. The outcomes will assist in informing infrastructure plans for the PDA Development Scheme and its supporting material, including the Development Charges and Offsets Plan (DCOP).

The external water and wastewater service provider for the PDA is Urban Utilities (UU).

2 Land Use

2.1 Potential Development Opportunity Sites

Potential development opportunity sites in the PDA are shown in Figure 2 and summarised in Table 1.

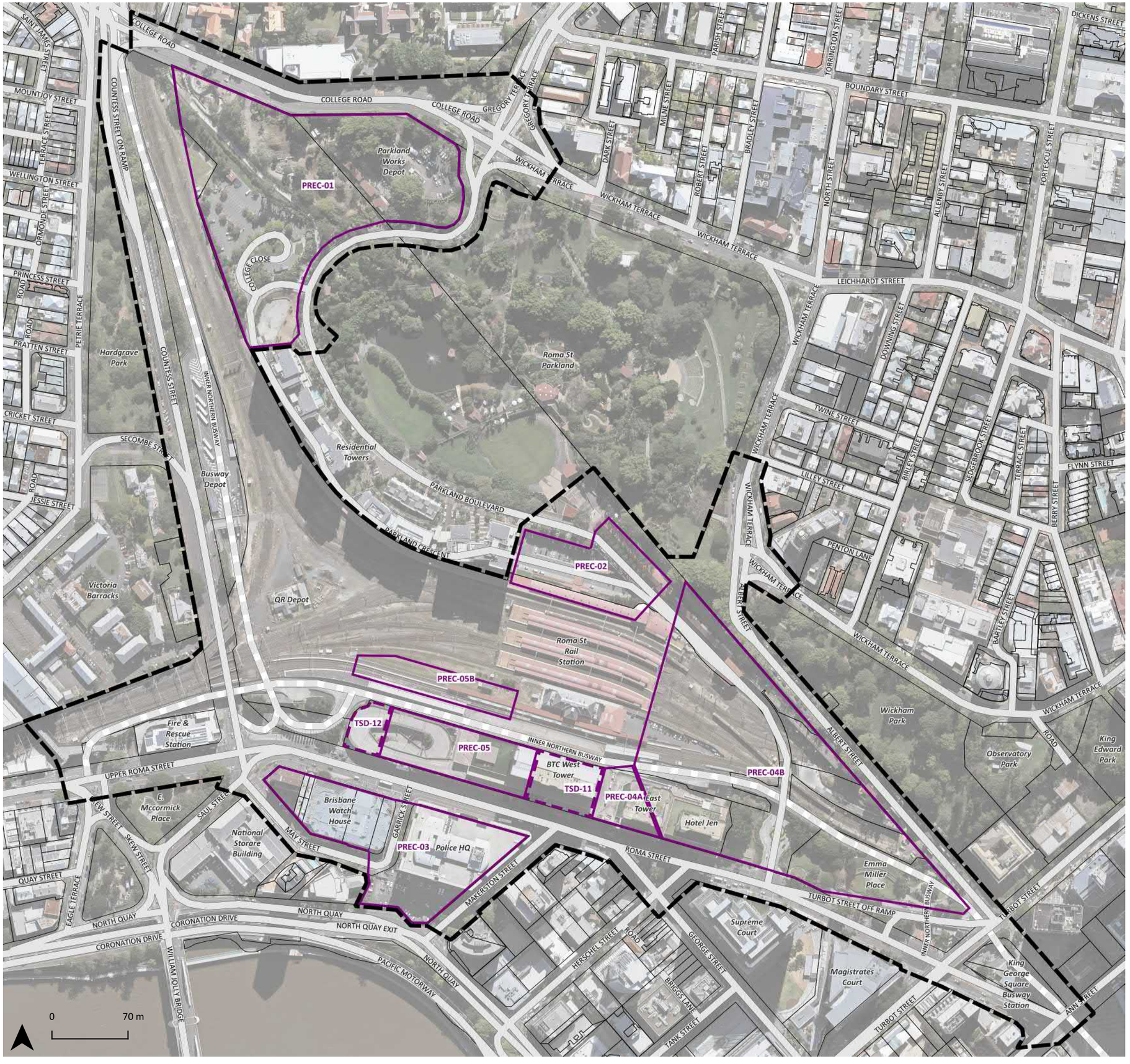
Table 1 Overview of Potential Development Opportunity Sites

Scope Owner	Map Reference / Site No	Approximate Location
CRRDA Precincts Delivery Partner	PREC-01	Existing Roma St Parkland works depot located at the northern end of the PDA
	PREC-02	Existing Roma St Parklands Activity Building and Platform 10. Located on / over Parklands Blvd.
	PREC-03	Split over two (2) blocks encompassing the Police Headquarters, Brisbane Watch House, Biala Building and a two-storey commercial building on Roma St.
	PREC-04A	Within footprint of the former Brisbane Transit Centre (BTC) East Tower, this is referred to as former "Hotel Jen" site. It is part of the Pulse Tunnels, Stations and Development (TSD) construction site that will be handed back to CRRDA for development at the completion of that contract (Future Over Station Development (FOSD-East).
	PREC-04B	Potential Major Entertainment Area (PMEA) site, further development opportunities requiring podium construction over the existing rail corridor and Emma Miller Place.
	PREC-05	Intersects the former BTC bus ramps / station, BTC podium. Part of the Pulse (TSD) construction site that will be handed back to CRRDA for development at the completion of that contract (FOSD - West).
	PREC-05B	Over Roma St Station Platforms 2 and 3
Pulse Consortium (TSD)	TSD-11	Proposed CRR Roma St Station Building
	TSD-12	Proposed CRR Roma St Plant / Services Building

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area
Water & Wastewater Technical Note

Figure 02
Potential Development Opportunity Sites



Legend

- CRRDA Roma St PDA Boundary

Development Sites (by Owner)

- CRRDA Precincts
- Pulse

Roads & Transit

- Road
- Transit
- Lots

Data Sources
QLD Government 2020, Brisbane City Council 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

2.2 Development Scenarios

Potential Development Land Use Scenarios assessed are summarised in Table 2. Maps and yield tables associated with these scenarios are contained in Attachment A Development Yield Maps & Tables.

Table 2 Land Use Scenarios

Scenario	Description
Scenario 1 (Baseline)	"Baseline" scenario that has been the focus of reference design planning, as well as some sensitivity analysis.

2.3 Equivalent Persons Estimate

2.3.1 Methodology

Estimates of Equivalent Persons (EP) unit of demand were developed for the Baseline Potential Development Scenario. The estimates were developed in accordance with the South East Queensland (SEQ) Water and Sewer Design and Construction Code ("the SEQ Code").

The EP estimate is specific to water and wastewater network planning, and it should not be interpreted as representing true future population of development in the PDA.

Totals shown in tables and charts (including EP, water and wastewater demand estimates) are not calculated "as formatted" and often include decimal parts that are not visible due to number formatting.

2.3.2 Existing Scenario / Demand Credits

An Existing Land Use EP estimate was prepared to quantify demand credits associated with the removal of existing buildings / demand sources as potential sites are redeveloped. The analysis found that the existing EP credits equates to approximately 895 EPs.

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area
Water & Wastewater Technical Note

Figure 03
Existing Buildings

Legend

- CRRDA Roma St PDA Boundary
- Existing Buildings

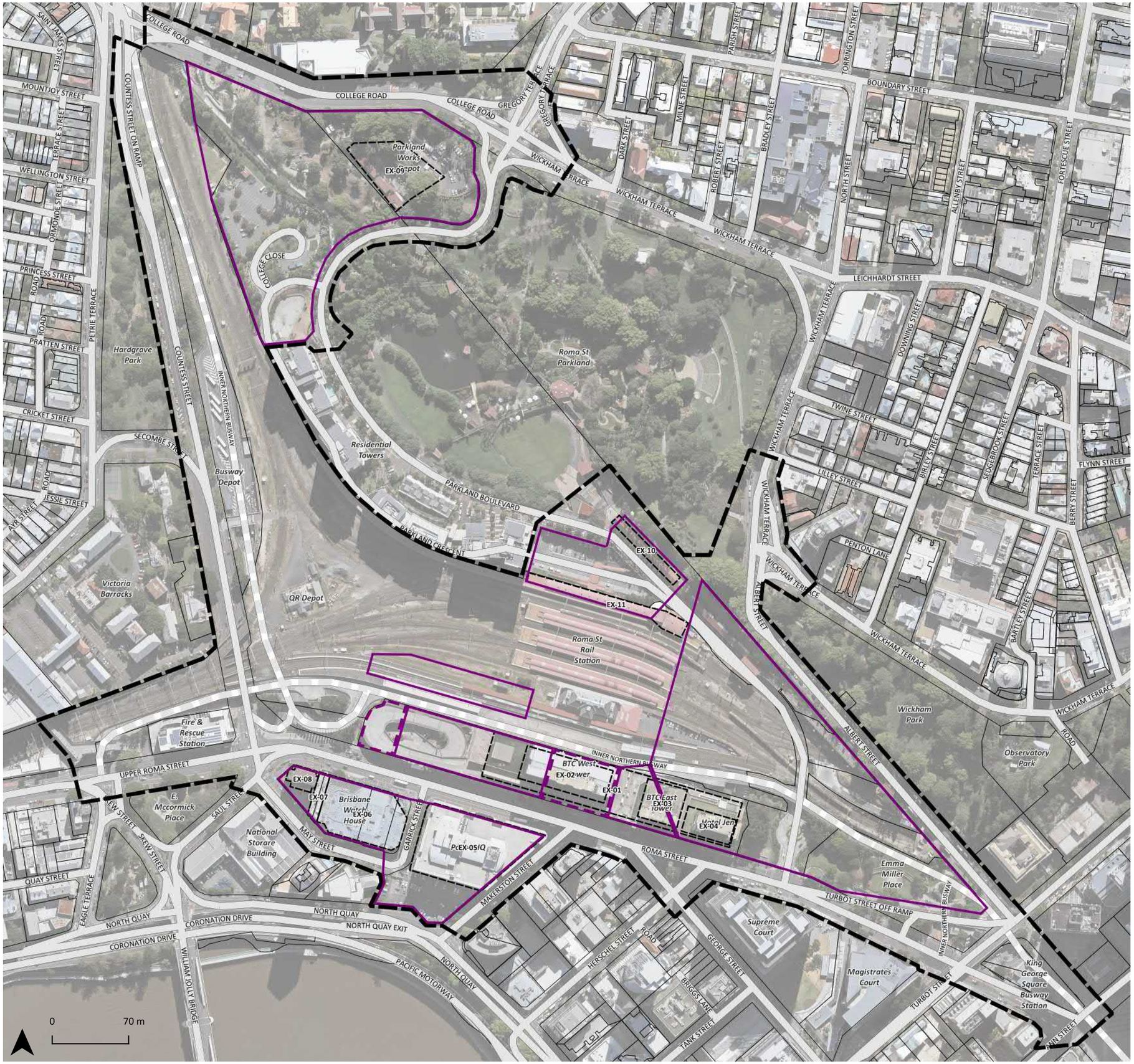
Development Sites (by Owner)

- CRRDA Precincts
- Pulse

Roads & Transit

- Road
- Transit
- Lots

MapRef	Name
EX-01	Existing BTC Podium
EX-02	Existing BTC West Tower
EX-03	Existing BTC East Tower
EX-04	Existing Hotel Jen
EX-05	Existing Police Headquarters / Police Museum Building
EX-06	Existing Brisbane Watch House
EX-07	Existing Private Commercial Building
EX-08	Existing Biala Building
EX-09	Existing Works Depot
EX-10	Existing Activity Building
EX-11	Existing Platform 10



Data Sources
QLD Government 2020, Brisbane City Council 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

Table 3 Summary of Potential EP Credits

Wastewater Catchment	Development Site	Building / Development Name	EP Credit	Equivalent EP in Attached Dwellings (each)	Equivalent EP in Commercial / Retail GFA (m^2)
Catchment 1	**TSD-11**	Existing BTC East Tower	82	47	13,678
		Existing BTC Podium	96	55	15,952
		Existing BTC West Tower	103	59	17,136
		Existing Hotel Jen Tower	334	191	55,708
	TSD-11 Total		**615**	**351**	**102,475**
	PREC-03	Existing Biala Building	20	11	3,332
		Existing Brisbane Watch House Building	38	22	6,326
		Existing Police Headquarters / Police Museum Building	209	120	34,879
		Existing Private Commercial Building	4	3	746
	PREC-03 Total		**272**	**155**	**45,283**
Catchment 1 Total			**887**	**507**	**147,757**
Catchment 2	**PREC-01**	Existing Works Depot	2	1	380
	PREC-01 Total		**2**	**1**	**380**
	PREC-02	Existing Activity Building	4	2	619
		Existing Platform 10 Offices	2	1	329
	PREC-02 Total		**6**	**3**	**948**
Catchment 2 Total			**8**	**5**	**1,328**
Grand Total			**895**	**511**	**149,085**

2.3.3 Development Scenarios

Table 4 and Figure 4 summarises the assumed EP demand credits and future demands associated with the Baseline Development Scenario.

Under this scenario, the demand credits allocated to the former BTC and Hotel Jen will likely be consumed upon the construction of approximately 100,000 m^2 of Commercial / Retail GFA, assumed to be delivered as part of Stage 2 (OSD-W) by 2026.

Table 4 Summary of EP Changes for Development Sites and Stages in Development Scenario

Site	Scenario 1 Potential Future Uses	Stage 1 (TSD)	Stage 2 (2026)	Stage 3 (2031)	Stage 4 (2036)	Total
TSD-11	CRR Station Building	-609				-609
TSD-12	CRR Services Building	+29				+29
PREC-01	Educational / Research				+653	+653
PREC-02	Residential / Commercial			+531		+531
PREC-03	Residential / Commercial				+1,491	+1,491
PREC-04A	Hotel / Retail			+723		+723
PREC-04B	Potential Major Entertainment Arena (PMEA)			+137		+137
PREC-05 (OSD-W)	Commercial / Retail		+1,158			+1,158
PREC-05B	Residential			+1,831		+1,831
Net Total		**-580**	**+1,158**	**+3,221**	**+2,145**	**+5,945**

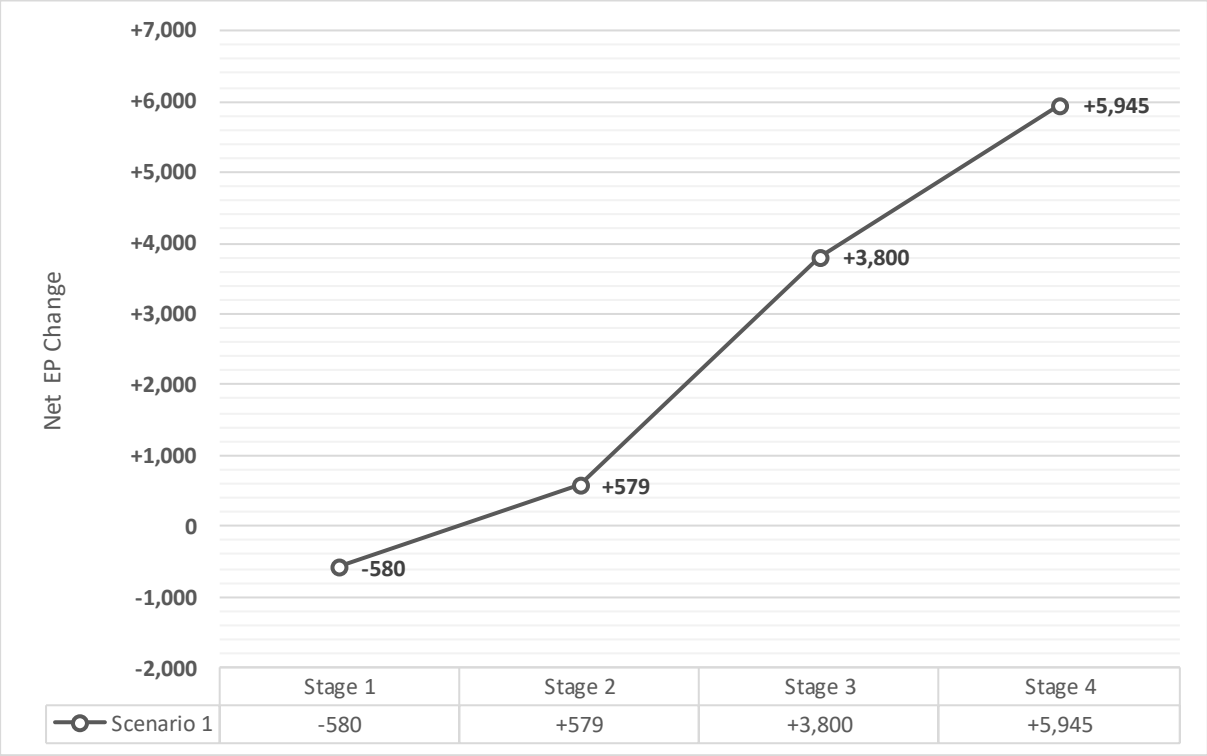


Figure 4 Summary of EP Change for Stages in Development Scenarios

3 Water Supply

3.1 Existing Infrastructure

Service Providers

The primary external water service provider is UU.

There is a network of private water mains within Roma St Parkland which is shown in the UU network dataset as being State Government owned.

Infrastructure

The external water network around the PDA is shown in Figure 5. Notable water infrastructure in the PDA is as follows:

- 910mm diameter Mild Steel (MS) trunk water main that intersects the PDA in a northwest / southeast direction through Roma St Parklands and along the Albert St corridor. This is part of the S002 Bardon to City Trunk Water Main which is an important supply main to the CBD. It was constructed in 1975.
- 300mm diameter reticulation main on north side of Roma St

The PDA falls within the Green Hill Water Supply Zone.

Existing Network Performance

The PDA is well-serviced in terms of existing potable water flow and pressure to accommodate the potential development opportunities identified in the PDA.

Existing Planned Infrastructure

No relevant future UU water infrastructure projects are identified in or around the PDA in UU's Netserv Plan 2020.

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area
Water & Sewerage Technical Note

Figure 05
Existing Water Supply Network

Legend

Development Sites (by Owner)

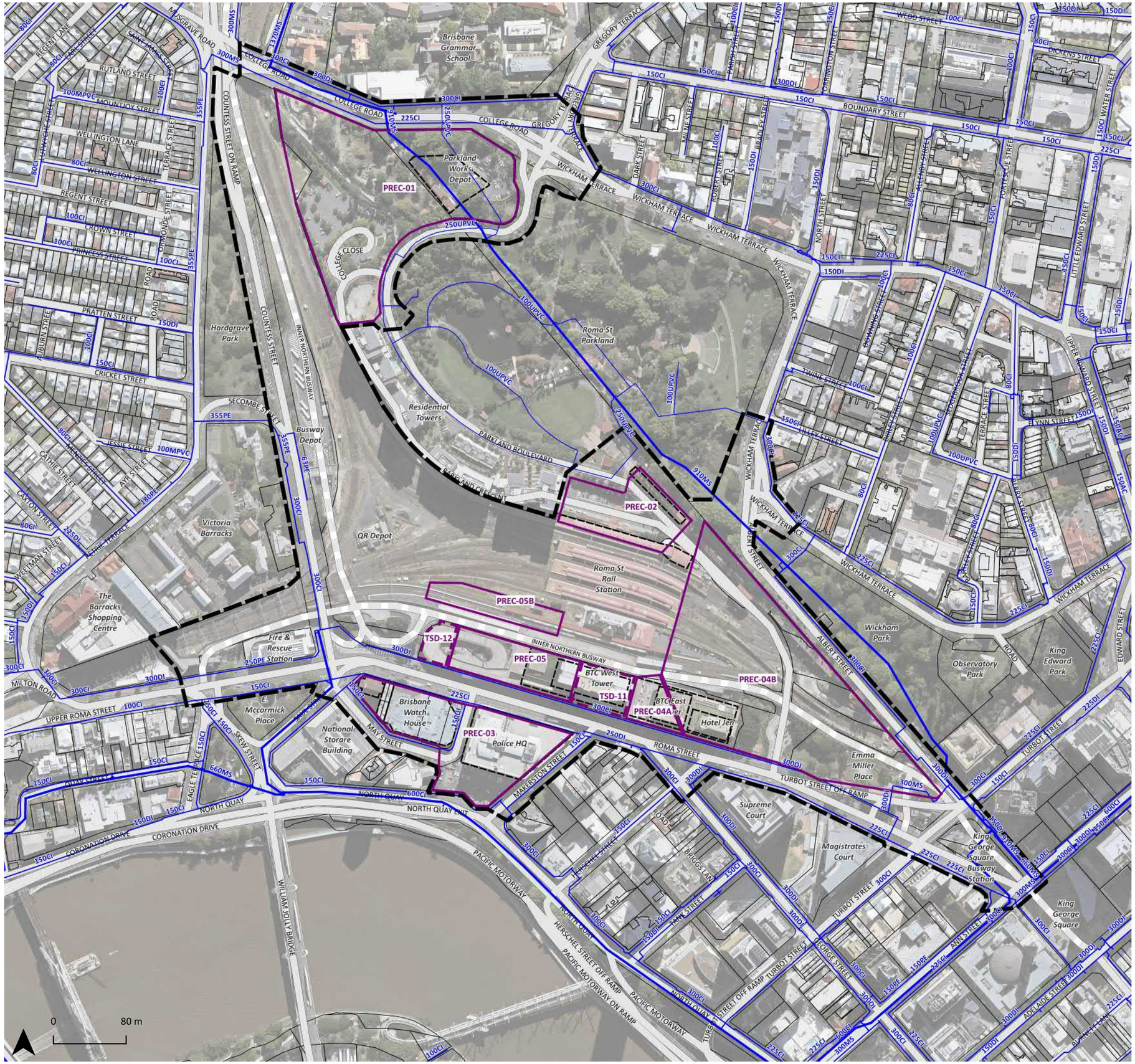
- CRRDA Precincts
- Pulse

Roads & Transit

- Road
- Transit
- Lots

Existing Urban Utilities Water Mains

- Trunk
- Reticulation
- Private Water Mains



3.2 Demand Estimates

Water demands estimates for the Existing and Development Scenarios were developed based on the SEQ Code.

A summary of the demand estimates is shown in Table 5 including Average Day (AD), Peak Day (PD) and Peak Hour (PH).

Table 5 Sumary of Water Demand Estimates

Demand	Stage 1 (TSD)	Stage 2 (2026)	Stage 3 (2031)	Stage 4 (2036)	Total
Scenario 1 (Baseline)					
EP Change	-580	1,158	3,221	2,145	5,945
AD (L/s)	-1.74	3.49	9.69	6.45	17.89
PD (L/s)	-3.29	6.57	18.27	12.16	33.71
PH (L/s)	-5.15	9.04	30.35	18.85	53.09

3.3 Development Risks & Opportunities

The potential water supply risks and opportunities associated with the PDA are summarised in Table 6. These risks and opportunities were identified through service provider engagement, demand estimates and other investigations.

Table 6 Summary of Development Impacts on Water Supply Network

Aspect	Development Considerations
General Network Capacity	• UU advised through the Service Advice Notice (SAN) process that the PDA is well-serviced in terms of potable water supply to support future development opportunities in the PDA
Trunk main in Roma St Parklands	• There is a large diameter, critical water trunk main that runs north-west to south-east through the Parklands and development site PREC-01. • Development in PREC-01 (Works Depot) will need to: - Manage construction risks to avoid comprising the integrity of the main as it is a critical supply link into the City. - Avoid putting buildings / structures within a horizontal clearance each side of the main (10m total, 5m each side of the main CL) - Avoid use of reinforcement for roadways / paths that traverse the main
Protections / Relocations for Individual Developments	• Individual developments within the PDA may require in specific localised upgrades (e.g. at the connection point) or protection / relocations.

3.4 Potential Infrastructure Works

UU advised through the SAN process that there is unlikely to be external infrastructure upgrades associated with the development based on the Development Scenario 1.

4 Wastewater

4.1 Existing Infrastructure

Service Providers

The primary external wastewater service provider is UU.

Internal Catchments & Infrastructure

A map of the existing wastewater network around the PDA is contained in Figure 6. A network diagram of the existing and possible future wastewater network is contained in Figure 7.

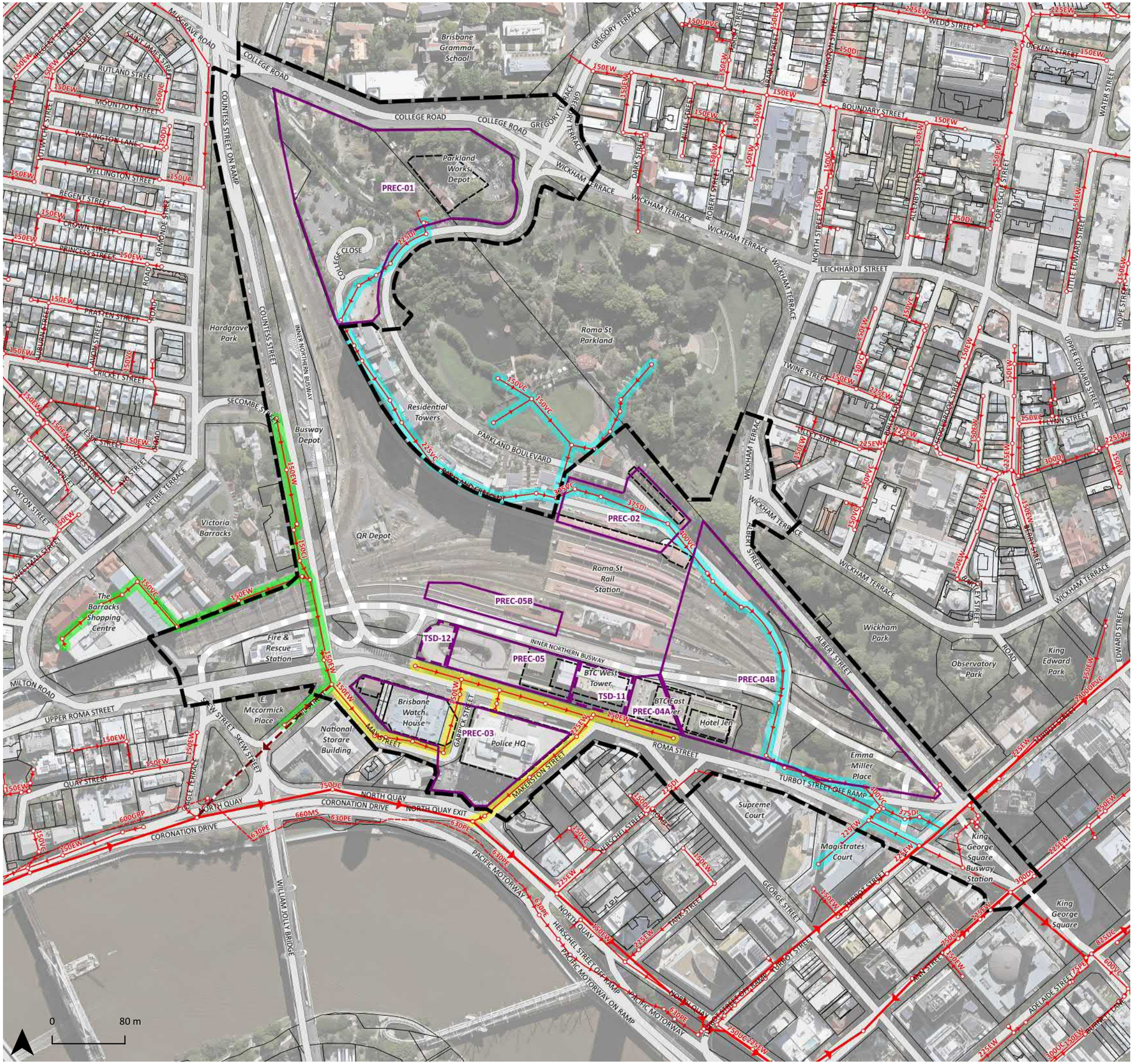
The wastewater network intersecting the PDA is effectively split into two (2) separate catchments. Notable features of the wastewater catchments intersecting the PDA include:

- Catchment 1: Wastewater network upstream of sewer main on Makerston St, divided into two (2) sub-catchments:
  - Catchment 1A:
    - Services existing Roma St Fire / Ambulance Station, Victoria Barracks, The Barracks Shopping Centre, Busway depot, QR Depot
    - Contains the following mains / subnetworks:
      - 150mm diameter Earthenware (EW) sewer servicing The Barracks Shopping Centre
      - 150mm diameter EW / Cast Iron (CI) sewer along Countess St
    - Discharges into Catchment 1B at manhole MH167453 on the intersection of Saul St and May St
    - This sub-network may eventually be diverted away from the PDA as part of the UU project CBD-2016-GM-0016 (identified in 2020 Netserv Plan) Augmentation of May St.
  - Catchment 1B:
    - Services existing BTC, Hotel Gen, Brisbane Watch House / Police Museum, various properties on Saul St, May St, Garrick St and Makerston St
    - Contains following mains / subnetworks:
      - 150mm diameter EW sewer along May St, Garrick St
      - 225mm diameter sewer on Roma St with connections from the Brisbane Transit Centre, Roma St Station and Hotel Jen.
      - 225mm diameter earthenware sewer on Makerston St that discharges into the North Quay sewer.
    - Discharges into the North Quay sewer on the at the intersection of Makerston St and North Quay
- Catchment 2:
  - Services Works Depot (in PDA) and residential towers along Parkland Blvd (outside of PDA)
  - Contains following mains / subnetworks:
    - Small network of 150/255mm diameter VC sewer servicing the Roma St Parklands
    - 225mm diameter Vitrified Clay (VC) sewer servicing
    - 375/400mm diameter Ductile Iron (DI) / VC sewer along Parkland Blvd, under the rail lines and Inner-Northern Busway
  - Discharges into the S1 sewer on Turbot St.

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area
Water & Sewerage Technical Note

Figure 06
Existing Sewerage Network



Legend

Development Sites (by Owner)
- CRRDA Precincts
- Pulse
- Sewerage Manhole

Sewerage Main
- Trunk Sewer
- Reticulation / Other
- Sewerage Rising Main
- Existing Planned UU Sewerage Projects

Internal Sewerage Catchments
- Catchment 1A
- Catchment 1B
- Catchment 2

Roads & Transit
- Road
- Transit
- Lots

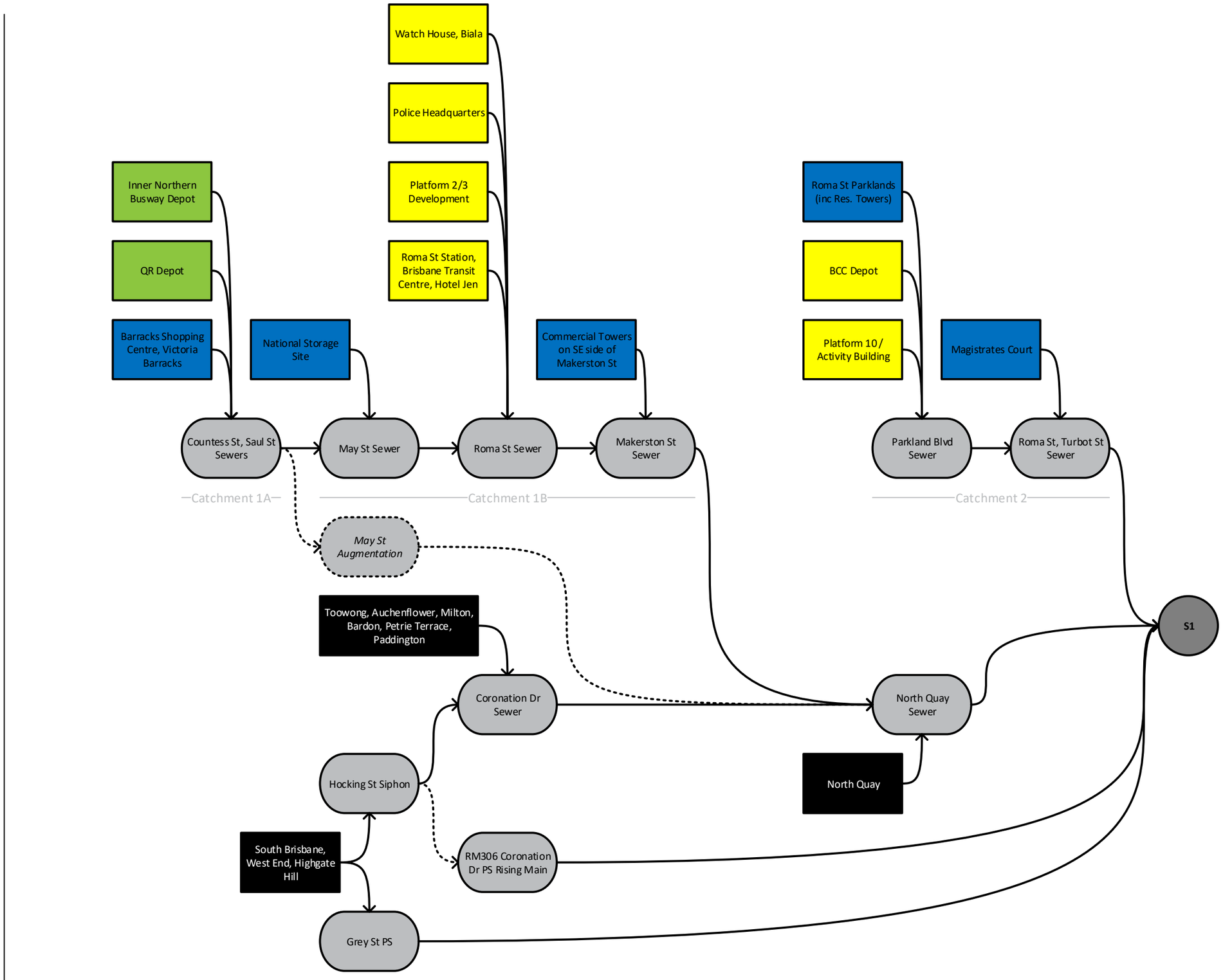
Data Sources
QLD Government 2020, Brisbane City Council 2020, Urban Utilities 2020

Roma St Cross River Rail PDA

Figure 07
Existing Sewerage Network Diagram

Key

- Wastewater Source inside PDA (to be replaced / altered by proposed development)
- Wastewater Source inside PDA (no proposed development)
- Wastewater Source inside PDA (no proposed development)
- Large external catchment
- Existing Sewerage Infrastructure
- Existing Planned Sewerage Infrastructure
- Potential Future PDA Servicing Infrastructure
- Existing Link
- Existing Planned Link



SMEC
Member of the Surbana Jurong Group

External Catchments & Infrastructure

The PDA is within a complex wastewater network where the upstream catchment and flows can change depending on the flow conditions.

Notables features of the wastewater infrastructure outside the PDA are as follows:

- 750mm diameter Unreinforced Concrete (UC) trunk sewer on North Quay (the "North Quay Sewer") which sewer discharges in to the S1 sewer
- 2400mm diameter trunk Sewer on Roma St: this is the S1 trunk sewer, arguably the largest and most significant sewer in the UU network. The sewer generally flows through the CBD and generally along the Brisbane River before terminating at the SP010 Eagle Farm Sewage Pump Station located in Eagle Farm.

The simplified catchment of the North Quay sewer is quite extensive and is shown in Figure 8. It encompasses portions of Toowong, Auchenflower, Bardon, Milton, Paddington, Petrie Terrace and Brisbane City on the northern side of the river, and portions of West End, Highgate Hill and South Brisbane on the southern side of the river.

As shown in Figure 7, the West End / Highgate Hill / South Brisbane catchment discharges into the Coronation Dr sewer via the Hocking St siphon under the Brisbane River. The catchment also discharges into the S1 sewer via the Grey St PS rising main under certain flows conditions.

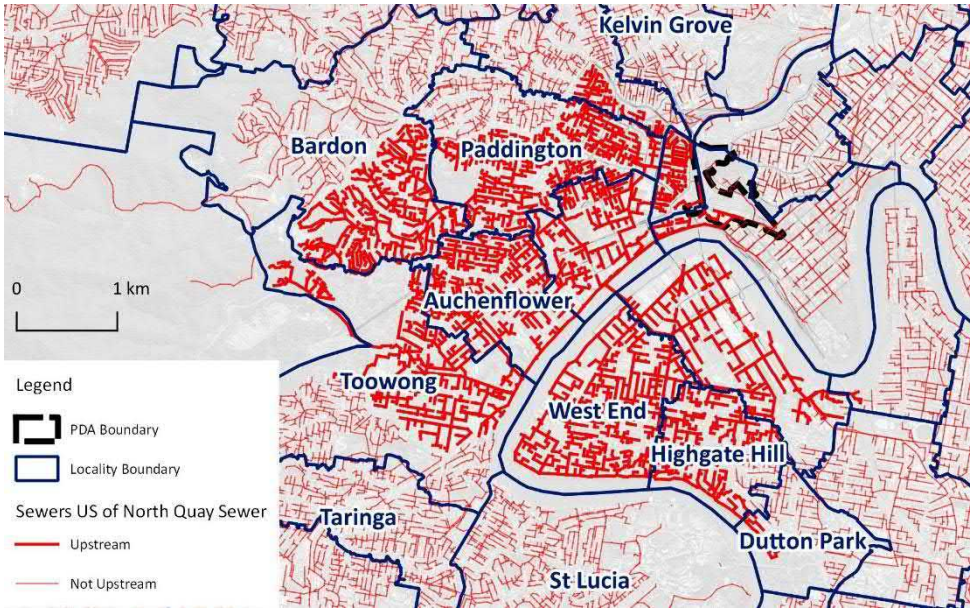


Figure 8 Map of sewer network upstream of North Quay sewer

A spatial analysis was undertaken to quantify the existing and future residential population within the catchment of the North Quay sewer. This was to assist with understanding the proportion of EP discharging into the North Quay sewer relative to the upstream network.

This was performed by extracting the 2016 population of the Australian Bureau of Statistic (ABS) mesh blocks intersected by sewer gravity mains upstream of the sewer. Population growths for the relevant ABS SA2 areas were applied to the mesh blocks to derive the 2041 estimates.

The results of the analysis are shown in Table 7 below. The analysis found that there was an estimated 2016 population of 49,922 located in the approximate catchment of the North Quay sewer, increasing to 89,820 by 2036.

Table 7 Indicative Population of North Quay Sewer Catchment (2016)

Side of River	2016 Population	Growth	2036 Population
North Total	28,242	+27%	35,956
South Total	21,680	+148%	53,865
Total	**49,922**	**+80%**	**89,820**

Existing Network Performance

As advised by UU through SANs and engagement workshops, the network performance of wastewater infrastructure in and around the PDA is summarised as follows:

- Catchment 1:
  - The following sewers are constrained:
    - 150mm diameter mains on May St, Garrick St.
    - 225mm diameter main on Makerston St
- Catchment 2:
  - The Parkland Blvd sewer is not currently constrained and will likely support an increase in flows
- External:
  - 750mm North Quay sewer is constrained, particularly in wet weather flow
  - The S1 sewer and downstream infrastructure, including SP010 Eagle Farm SPS, are constrained.

Existing Planned Infrastructure

UU's latest Water Netserv Plan 2020 was published in March 2020 and enacted on 1 July 2020.

The updated Netserv Plan contains the following Wastewater projects significant to the PDA:

- CBD-2016-GM-0016 Augmentation of May Street Sewers (Estimated timing 2026, Establishment cost $1,217,000): an interceptor sewer to be installed from manhole on May St / Saul St intersection to manhole at the U/S end of the North Quay Sewer. This would divert flows from Catchment 1A away from the PDA. (Note: this project effectively replaces a related UU proposed project in Makerston St that was 2016 BCC LGIP plan and Baseline Report).

This project is shown in Figure 6.

There are also several potential projects planned in the Toowong, South Brisbane and West End area that may reduce flows in the North Quay sewer by diverting wastewater flows to the head of the S1 (D/S of North Quay) or away from the catchment.

Relevant pages of the updated the Netserv Plan are contained in Attachment B Netserv Plan Extract.

4.2 Demand Estimates

Wastewater demand estimates for the Potential Development Scenario was developed based on the SEQ Code guidelines. A summary of the demand estimates is shown in Table 8.

Table 8 Sumary of Wastewater Demand Estimates for Potential Development Scenarios

Row Labels	Stage 1 (TSD)	Stage 2 (2026)	Stage 3 (2031)	Stage 4 (2036)	Total
Scenario 1 (Baseline)					
Catchment 1					
EP Change	-580	1,158	2,553	1,491	4,623
Sewerage ADWF Change (L/s)	-1.4	2.8	6.2	3.6	11.2
Sewerage PDWF Change (L/s)	-5.5	8.5	17.0	8.1	28.2
Sewerage PWWF Change (L/s)	-7.9	13.4	27.7	14.3	47.5
Catchment 2					
EP Change			668	653	1,321
Sewerage ADWF Change (L/s)			1.6	1.6	3.2
Sewerage PDWF Change (L/s)			6.4	4.4	10.8
Sewerage PWWF Change (L/s)			9.2	7.1	16.3
Total EP Change	**-580**	**1,158**	**3,221**	**2,145**	**5,945**
Total Sewerage ADWF Change (L/s)	**-1.4**	**2.8**	**7.8**	**5.2**	**14.4**
Total Sewerage PDWF Change (L/s)	**-5.5**	**8.5**	**23.5**	**12.5**	**39.0**
Total Sewerage PWWF Change (L/s)	**-7.9**	**13.4**	**36.9**	**21.4**	**63.7**

As previously noted, the existing EP credits equates to approximately 895 EPs. These are distributed across the two sewer catchments as follows:

- Catchment 1: 887
- Catchment 2: 8.

4.3 Development Risks & Opportunities

The potential wastewater risks and opportunities associated with the PDA are summarised in Table 9. These risks and opportunities were identified through service provider engagement, demand estimates and other investigations.

Table 9 Summary of Development Risks & Opportunities on Wastewater Network

Aspect	Development Considerations
General Network Performance	• The PDA sits within the S1 catchment, which is generally constrained. • Other existing and future CRR PDA sites (including Gabba, Boggo Rd, Albert St) fall within the S1 catchment.
Existing Network Model	• There are some deficiencies in the current network model due to the age of the inner city network and its complexity. This reduces the accuracy of analysis. A more robust network model will likely be required to accurately model the impact of potential future development on the wastewater network.
Makerston St Sewer is constrained	• UU identified that the Makerston St sewer is unlikely to have sufficient flow capacity to support a significant increase in flow associated with development in PDA • Approximately 615 EP of load will be removed from the Makerston St catchment through the BTC and Hotel Jen demolition.
North Quay sewer is constrained	• UU have advised North Quay St sewer is constrained (it currently flows full under average dry weather conditions) and is unlikely to have sufficient flow capacity to support significant increase in flow associated with PDA development. • North Quay sewer has large upstream external catchment that encompasses a relatively large inner city catchment, including areas of projected high growth.
Parkland Blvd sewer is not constrained	• UU has advised that the Parkland Blvd sewer is not currently constrained and is likely to support a significant increase in flow without triggering an upgrade. • Consideration should be given to transferring flows from Catchment 1 to Catchment 2 via a pumped option (this would need to be private pump station) to reduce flows in Makerston St and North Quay sewers.
Protections / Relocations for Individual Developments	• Individual developments within the PDA may require in specific localised upgrades (eg at the connection point) or protection / relocations.

4.4 Potential Infrastructure Works

Several potential infrastructure projects were identified to service the wastewater demand generated by the PDA development. These potential projects options are described in Table 10.

The projects below are also identified in network diagram in Figure 9 and highlighted in Figure 10.

Table 10 Potential Wastewater Infrastructure Projects

No	Potential Project	Description of Works
SEW-01A	Augmentation of Makerston St Sewer (medium to long term option)	• Driver: Makerston St sewer is constrained • Objective: Increase the capacity of wastewater network along Makerston St to service increased Catchment 1B flows associated with the development in the PDA. • Possible Infrastructure: - dedicated main on Makerston St only servicing the PDA developments, or - replacement of the existing Makerston St sewer with a larger main. • Timing / Trigger: - An appropriate trigger for this project may be when PDA-related EP load discharging into the Makerston St sewer offsets that of the EP removed through the demolition of the Roma St Station / BTC. The estimated residual net EP credit at the completion of Stage 1 (TSD) is 580, which is approximately equivalent to 331 attached residential dwellings / hotel rooms or 96,631m^2 GFA retail / commercial space - This may be deferred or avoided by reducing flows in Catchment 1B through on-site treatment or diversion to Catchment 2 - This may be further deferred by the UU project May St Augmentation, however this would need to be coordinated with UU. • Notes: - This project was proposed by UU as part of the SAN.
SEW-01B	Augmentation of North Quay Sewer (medium to long term option)	• Driver: North Quay Sewer is constrained • Objective: Increase the capacity of wastewater network along North Quay to service increased Catchment 1B flows associated with the development in the PDA. • Possible Infrastructure: - High level relief main adjacent to the existing North Quay sewer (capacity equivalent ultimate EP of PDA generated demands from Catchment 2B) (NB: this solution is contained in DCOP), or - Demand apportioned contribution of funding to UU project to upsize existing North Quay trunk main, subject to UU providing further details of future network planning and demand apportionment • Notes: - This project was proposed by UU through the SAN process - The proportion of existing and future EP in the North Quay sewer associated with the PDA is likely low relatively to that of the existing and future EP in the upstream catchment.

Potential Servicing Strategy

The preferred servicing strategy for the PDA is as follows:

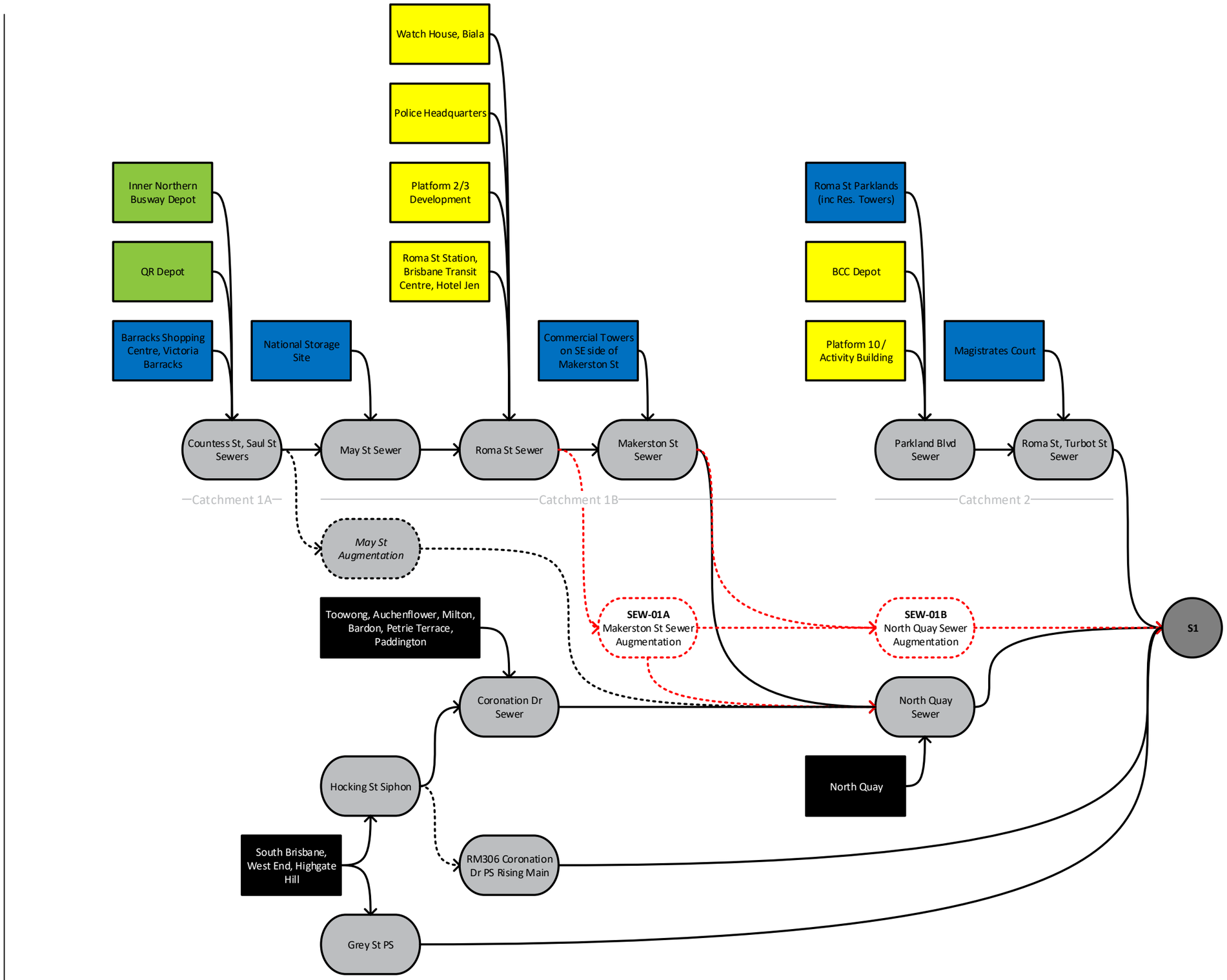
- General Considerations:
  - All delivery years are approximate only. Actual delivery timeframes will be dependent on the final yields and demands at the time of development.
  - Developers should begin engagement with UU early to ensure the early identification and adoption of cost effective and optimised servicing solutions.
  - This strategy will be subject to ongoing review by CRRDA and UU to ensure the lowest cost wastewater solution is provided.
  - All PDA developments to implement integrated water management strategies (including on-site treatment options) to encourage internal reuse and reduce demand on external wastewater network.
- Catchment 1:
  - 2026: Initial FOSD – West demand to consume demand credits in generated through removal of existing demand sources (eg BTC, Hotel Jen)
  - Following consumption of credits (~2027):
    - Delivery of SEW-01A Makerston St sewer augmentation (SEW-01A)
    - Delivery of SEW-01B North Quay sewer augmentation (SEW-01B)
- Catchment 2:
  - Connect PREC-01, PREC-02, PREC-04 developments into Parkland Blvd sewer.

Roma St Cross River Rail PDA

Figure 09
Future Sewerage Network Diagram

Key

- Wastewater Source inside PDA (to be replaced / altered by proposed development)
- Wastewater Source inside PDA (no proposed development)
- Wastewater Source inside PDA (no proposed development)
- Large external catchment
- Existing Sewerage Infrastructure
- Existing Planned Sewerage Infrastructure
- Potential Future PDA Servicing Infrastructure
- Existing Link
- Existing Planned Link

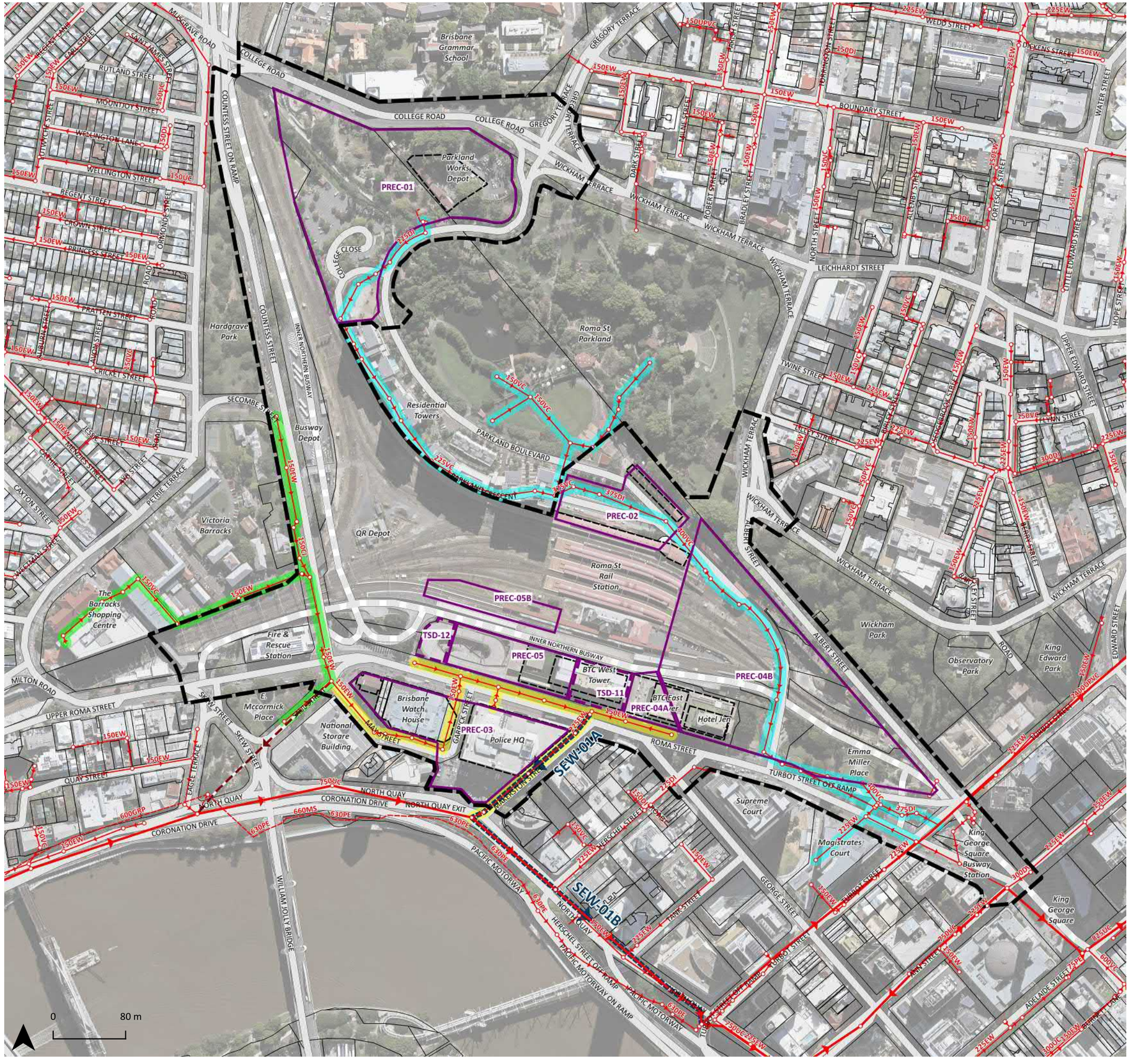


Member of the Surbana Jurong Group

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area
Water & Sewerage Technical Note

Figure 10
Potential Sewerage Projects



Legend

Development Sites (by Owner)

- CRRDA Precincts
- Pulse
- Potential Sewerage Projects

Sewerage Main

- Trunk Sewer
- Reticulation / Other
- Sewerage Manhole
- Sewerage Rising Main
- Existing Planned UU Sewerage Projects

Internal Sewerage Catchments

- Catchment 1A
- Catchment 1B
- Catchment 2

Roads & Transit

- Road
- Transit
- Lots

Data Sources
QLD Government 2020, Brisbane City Council 2020, Urban Utilities 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

5 Summary

Key findings of the Water and Sewerage investigations were as follows:

- UU is the primary water and wastewater service provider for the PDA
- There is likely to be a notable increase in water and wastewater service demand associated with the potential future development opportunities in the PDA
- Water Supply:
  - The Precinct is generally well-serviced in terms of water supply pressure and flow
  - There is unlikely to be a requirement for external water supply infrastructure upgrades to service the future development demands in the PDA
  - The critical, large diameter trunk watermain running through the Parkland will need to be protected
- Wastewater:
  - The PDA is divided into two (2) catchments:
    - Catchment 1:
      - Services the south / west of the PDA
      - Capacity constrained and may require infrastructure upgrades inside and outside of the PDA to adequately service the demand generated by the potential future development opportunities. This may involve sewer upgrade works in Makerston St and North Quay, a private PS to transfer flows to Catchment B
    - Catchment 2:
      - Services north / east of PDA
      - Generally unconstrained and unlikely to require infrastructure upgrades to service potential future development opportunities.

Attachment A Development Yield Maps & Tables

CROSSRIVERRAIL

Roma Street Cross River Rail Priority Development Area Development Stage Plans

Scenario 1

Legend

CRRDA Roma St PDA Boundary

Development Projects (by Stage, Year)

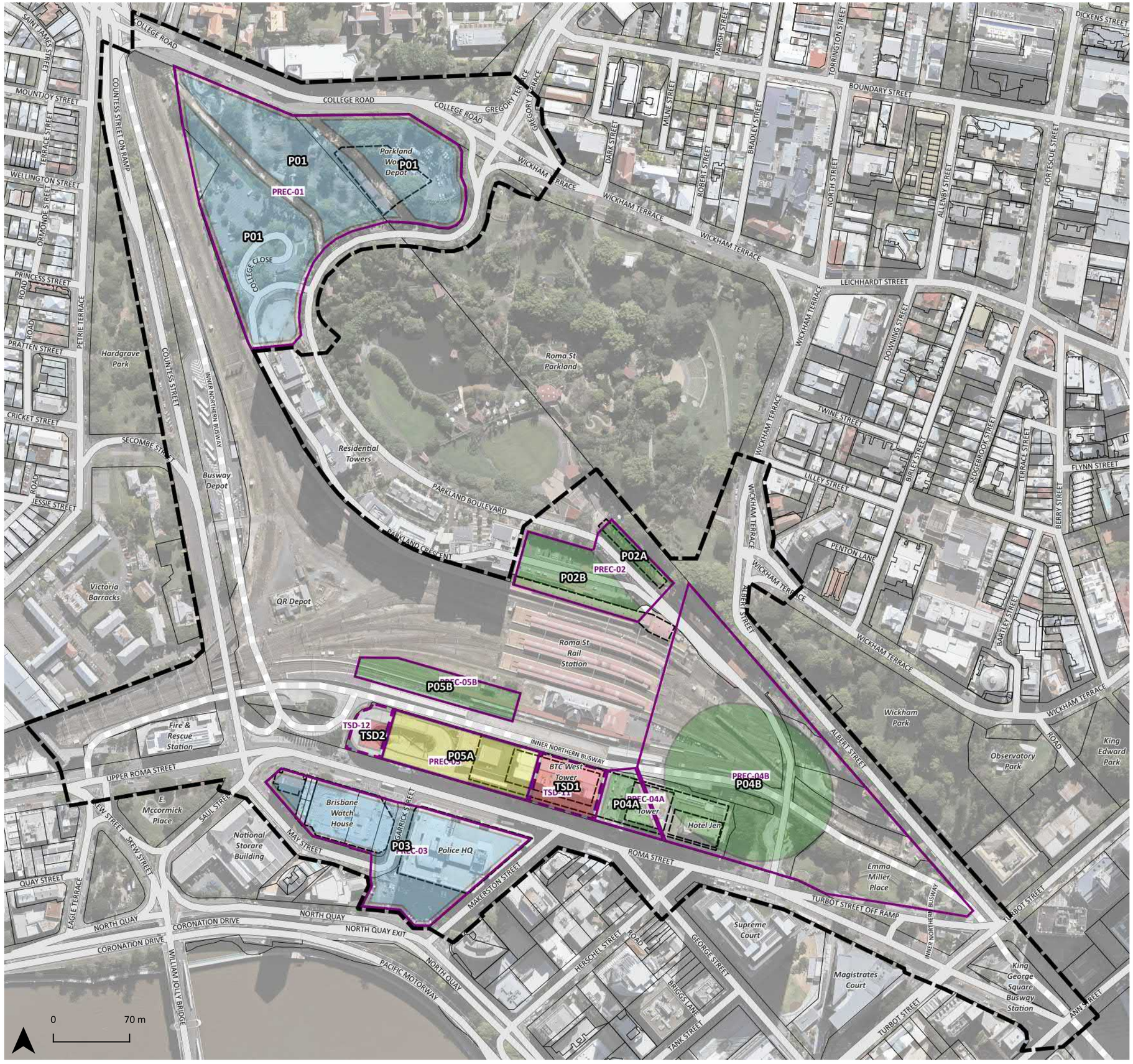
- Stage 1 (2025 TSD)
- Stage 2 (2026)
- Stage 3 (2031)
- Stage 4 (2036)

Development Sites (by Owner)

- CRRDA Precincts
- Pulse

Roads & Transit

- Road
- Transit
- Lots
- Existing Buildings in PDA



Data Sources
QLD Government 2020, Brisbane City Council 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

Development Site	Yield Project Reference	Building / Development Name	Baseline Status	Change Type	EP Rate Source	EP Rate Group	EP Rate Units	Rate	Use Area	Footprint (m2)	Floors	Utilisation Factor	Calculated Area (m2)	Manual Quantity	EP	Attached Dwellings Equivalent	Commercial / Retail GFA (m2) Equivalent	Change Factor	EP Change	Scenario 1 Stage
TSD-11	EX-01	Existing BTC Podium	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	9,970	4	0.40	15,952		96	55	15,952	-1	-96	ST01
TSD-11	EX-02	Existing BTC West Tower	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	2,520	8	0.85	17,136		103	59	17,136	-1	-103	ST01
TSD-11	EX-03	Existing BTC East Tower	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	1,341	12	0.85	13,678		82	47	13,678	-1	-82	ST01
TSD-11	EX-04	Existing Hotel Jen Tower	Existing	Remove	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75		1,076	8	0.85		191	334	191	55,708	-1	-334	ST01
TSD-11	TSD	TSD Station Building	Future	Add	SEQ WS&S D&C Code | QUU | Low Impact Industry	Non-Residential	m2 GFA	0.0048	TRUE	1,257	1	1.00	1,257		6	3	1,006	1	+6	ST01
TSD-12	TSD	TSD Plant Building	Future	Add	SEQ WS&S D&C Code | QUU | Low Impact Industry	Non-Residential	m2 GFA	0.0048	TRUE	3,024	2	1.00	6,048		29	17	4,838	1	+29	ST01
PREC-05	P05A	BTC Redevelopment / Roma West Tower 3 (48 Storey Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						75827.7	455	260	75,828	1	+455	ST02
PREC-05	P05A	BTC Redevelopment / Roma West Tower 4 (42 Storey Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						50884.2	305	174	50,884	1	+305	ST02
PREC-05	P05A	BTC Redevelopment / Roma West Tower 5 (32 Storey Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						66339.9	398	227	66,340	1	+398	ST02
PREC-02	EX-10	Existing Activity Building	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						619	4	2	619	-1	-4	ST03
PREC-02	EX-11	Existing Platform 10 Offices	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						329	2	1	329	-1	-2	ST03
PREC-02	P02A	Activity Building Redevelopment (Commercial Building)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						19102.5	115	65	19,103	1	+115	ST03
PREC-02	P02B	Platform 10 Redevelopment (Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						12568.5	75	43	12,569	1	+75	ST03
PREC-02	P02B	Platform 10 Redevelopment (Residential)	Future	Add	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75						198	347	198	57,750	1	+347	ST03
PREC-04A	P04A	Hotel Jen Redevelopment (Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						10881	65	37	10,881	1	+65	ST03
PREC-04A	P04A	Hotel Jen Redevelopment (Hotel)	Future	Add	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75						357	625	357	104,125	1	+625	ST03
PREC-04A	P04A	Hotel Jen Redevelopment (Retail)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						5481	33	19	5,481	1	+33	ST03
PREC-04B	P04B	Potential Major Entertainment Area	Future	Add	SEQ WS&S D&C Code | QUU | Entertainment and conference centre zone precinct	Non-Residential	ha NDA	36						3.8	137	78	22,800	1	+137	ST03
PREC-05B	P05B	Platform 2/3 Redevelopment Tower 1 (50 Storey Residential)	Future	Add	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75						580	1,015	580	169,167	1	+1,015	ST03
PREC-05B	P05B	Platform 2/3 Redevelopment Tower 2 (40 Storey Residential)	Future	Add	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75						466	816	466	135,917	1	+816	ST03
PREC-03	EX-05	Existing Police Headquarters / Police Museum Building	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	5,862	7	0.85	34,879		209	120	34,879	-1	-209	ST04
PREC-03	EX-06	Existing Brisbane Watch House Building	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	3,721	2	0.85	6,326		38	22	6,326	-1	-38	ST04
PREC-03	EX-07	Existing Private Commercial Building	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	439	2	0.85	746		4	3	746	-1	-4	ST04
PREC-03	EX-08	Existing Biala Building	Existing	Remove	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006	TRUE	490	8	0.85	3,332		20	11	3,332	-1	-20	ST04
PREC-01	EX-09	Existing Works Depot	Existing	Remove	SEQ WS&S D&C Code | QUU | Low Impact Industry	Non-Residential	m2 GFA	0.0048						474.5	2	1	380	-1	-2	ST04
PREC-01	P01	Works Depot Redevelopment (Education Facility)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						109296	656	375	109,296	1	+656	ST04
PREC-03	P03	Police Precinct Redevelopment (Commercial)	Future	Add	SEQ WS&S D&C Code | QUU | Retail, Commercial etc	Non-Residential	m2 GFA	0.006						104567	627	359	104,567	1	+627	ST04
PREC-03	P03	Police Precinct Redevelopment (Residential)	Future	Add	SEQ WS&S D&C Code | QUU | Residential Attached Dwelling	Residential	dwelling	1.75						649	1,136	649	189,292	1	+1,136	ST04
															7,734	4,419	1,288,927		+5,945	

Attachment B Netserv Plan Extract

SCHEDULE 8 SCHEDULE OF WORKS

SC8.1 Water supply network schedule of works

SC8.1.1 Water supply network schedule of works (Brisbane)

Table SC8.1.1 Water supply network schedule of works (Brisbane)

Map Number	Map Reference	Description	Est Timing	Establishment Cost
6	FP-NPA-0005	1,293m of 300dia watermain	2022	$2,510,741
6	FP-NPA-0006	467m of 200dia watermain	2021	$671,475
10	FP-MHS-0001	607m of 300dia watermain	2018	$1,178,669
11	FP-ASP-0002	Between Grant and Sarah Streets, Zillmere Water Trunk Main Railway Crossing	2036	$174,993
12	FP-ASP-0001	1,685m of 450dia watermain	2036	$5,144,261
17	FP-SPH-0002	4m of 300dia watermain	2017	$7,767
17	FP-SPH-0007	103m of 250dia watermain	2021	$170,146
17	FP-SPH-0123	109m of 250dia watermain	2021	$180,058
17	FP-SPH-0124	49m of 250dia watermain	2021	$80,943
17	FP-SPH-0125	72m of 250dia watermain	2021	$118,937
17	FP-SPH-0126	107m of 250dia watermain	2021	$176,754
17	FP-SPH-0204	Hamilton Road from Webster Road to Curwen Terrace Water Trunk Main	2031	$650,000
17	FP-SPH-0206			
17	FP-SPH-0205	Hamilton Road, Curwen Terrace to Farnell Street Water Trunk Main	2036	$950,000
17	FP-SPH-0207			
17	FP-SPH-0212			
17	FP-SPH-0213	10m of 250dia watermain	2021	$16,519
17	FP-SPH-0214	24m of 250dia watermain	2021	$39,646
17	FP-SPH-0358	Stafford Road up to Ogden / Cockle Street to Cutbush Road Water Trunk Main	2036	$542,000
17	FP-SPH-0359			
17	FP-SPH-0360			
17	FP-SPH-0361	352m of 300dia watermain	2036	$683,512
17	FP-SPH-0362	13m of 300dia watermain	2036	$25,243
19	FP-BRH-0002	2,061m of 250dia watermain	2020	$3,404,575
24	FP-MHS-0002	27m of 200dia watermain	2019	$38,822
24	FP-MHS-0003	28m of 200dia watermain	2021	$40,260
24	FP-SPH-0006	9m of 300dia watermain	2017	$17,476
24	FP-SPH-0305	29m of 300dia watermain	2021	$56,312
24	FP-SPH-0307	153m of 300dia watermain	2021	$297,095
24	FP-SPH-0308	Gympie Road, Kuran Street to Kitchener Road Water Trunk Main	2031	$1,340,000
24	FP-SPH-0309	11m of 300dia watermain	2021	$21,360
24	FP-SPH-0310	40m of 300dia watermain	2021	$77,672
24	FP-SPH-0311	13m of 300dia watermain	2021	$25,243
24	FP-SPH-0312	24m of 300dia watermain	2021	$46,603
24	FP-SPH-0313	31m of 300dia watermain	2021	$60,196
24	FP-SPH-0314	13m of 300dia watermain	2021	$25,243
24	FP-SPH-0315	68m of 300dia watermain	2021	$132,042

Map Number	Map Reference	Description	Est Timing	Establishment Cost
24	FP-SPH-0316	5m of 300dia watermain	2021	$9,709
24	FP-SPH-0317	7m of 300dia watermain	2021	$13,593
24	FP-SPH-0319	26m of 300dia watermain	2021	$50,487
24	FP-SPH-0320	78m of 300dia watermain	2021	$151,460
24	FP-SPH-0324	Stafford Road up to Ogden/ Cockle Street Water Trunk Main	2036	$131,000
24	FP-SPH-0325	110m of 300dia watermain	2036	$213,597
24	FP-SPH-0326	Gympie Road, Kuran Street to Kitchener Road Water Trunk Main	2031	$1,340,000
24	FP-SPH-0327	66m of 300dia watermain	2036	$128,158
24	FP-SPH-0328	58m of 300dia watermain	2036	$112,624
24	FP-SPH-0329	193m of 300dia watermain	2036	$374,766
24	FP-SPH-0330	43m of 300dia watermain	2021	$83,497
24	FP-SPH-0331	6m of 300dia watermain	2036	$11,651
24	FP-SPH-0332	9m of 250dia watermain	2021	$14,867
24	FP-SPH-0333	26m of 250dia watermain	2021	$42,950
24	FP-SPH-0334	58m of 250dia watermain	2021	$95,810
24	FP-SPH-0373	Gympie Road, Kuran Street to Kitchener Road Water Trunk Main	2031	$1,340,000
24	FP-SPH-0374			
25	FP-ELH-0023	22m of 300dia watermain	2041	$42,719
25	FP-ELH-0023	172m of 300dia watermain	2041	$333,989
25	FP-ELH-0023	28m of 300dia watermain	2041	$54,370
25	FP-ELH-0023	58m of 300dia watermain	2041	$112,624
25	FP-ELH-0023	100m of 300dia watermain	2041	$194,179
25	FP-ELH-0023	91m of 300dia watermain	2041	$176,703
25	FP-ELH-0023	89m of 300dia watermain	2041	$172,820
25	FP-ELH-0023	48m of 300dia watermain	2041	$93,206
25	FP-ELH-0023	119m of 300dia watermain	2041	$231,074
25	FP-ELH-0023	130m of 300dia watermain	2041	$252,433
25	FP-ELH-0023	36m of 300dia watermain	2041	$69,905
25	FP-ELH-0023	96m of 300dia watermain	2041	$186,412
25	FP-ELH-0023	79m of 300dia watermain	2041	$153,402
25	FP-ELH-0023	90m of 300dia watermain	2041	$174,762
25	FP-SPH-0011	8m of 300dia watermain	2017	$15,534
25	FP-SPH-0020	131m of 200dia watermain	2008	$188,358
25	FP-SPH-0024	21m of 200dia watermain	2008	$30,195
25	FP-SPH-0030	16m of 300dia watermain	2017	$31,069
30	FP-TGP-0003	296m of 300dia watermain	2020	$574,771
32	FP-BOH-0003	673m of 250dia watermain	TBD	$1,111,732
32	FP-BRH-0054	559m of 200dia watermain	2016	$803,758
32	FP-ELH-0001	152m of 300dia watermain	2014	$295,153
32	FP-ELH-0014	14m of 300dia watermain	2014	$27,185
32	FP-ELH-0022	31m of 300dia watermain	2041	$60,196
32	FP-ELH-0022	12m of 300dia watermain	2041	$23,302
32	FP-ELH-0022	73m of 300dia watermain	2041	$141,751
32	FP-ELH-0022	194m of 300dia watermain	2041	$376,708

Map Number	Map Reference	Description	Est Timing	Establishment Cost
32	FP-ELH-0022	92m of 300dia watermain	2041	$178,645
32	FP-ELH-0024	18m of 200dia watermain	2020	$25,881
38	FP-TGP-0004	188m of 450dia watermain	2020	$573,959
40	FP-BOH-0004	135m of 250dia watermain	TBD	$223,007
40	FP-BOH-0005	356m of 250dia watermain	TBD	$588,078
40	FP-BOH-0006	172m of 200dia watermain	TBD	$247,310
41	FP-WLH-0338	7m of 200dia watermain	2022	$10,065
41	FP-WLH-0401	408m of 300dia watermain	2022	$792,252
46	FP-GRH-0192	195m of 200dia watermain	2014	$280,381
46	FP-MCN-0013	64m of 300dia watermain	2018	$124,275
46	FP-TRR-0001	Montague Road Trunk Main Augmentation – Stage 2	2021	$4,630,000
46	FP-TRR-0002			
46	FP-TRR-0122	15m of 200dia watermain	2026	$21,568
47	FP-TRR-0061	21m of 200dia watermain	2021	$30,195
47	FP-TRR-0072	16m of 200dia watermain	2021	$23,006
47	FP-TRR-0112	Augmentation and Replacement mains in Logan Road/Regent Street, Woolloongabba	2027	$139,461
52	FP-FIR-0530-01	603m of 300dia watermain	2021	$1,170,902
53	FP-FIR-0524-01	13m of 200dia watermain	2021	$18,692
53	FP-MCN-0012	281m of 375dia watermain	2018	$676,099
53	FP-MCN-0021	290m of 200dia watermain	2018	$416,976
53	FP-MCN-0022	96m of 200dia watermain	2018	$138,033
53	FP-MCN-0024	5m of 300dia watermain	2018	$9,709
53	FP-MCN-0037	98m of 375dia watermain	2018	$235,792
54	FP-MCN-0001	50m of 200dia watermain	2018	$71,892
55	FP-TRR-0113	Augmentation and Replacement mains in Logan Road/ Regent Street, Woolloongabba	2027	$139,461
55	FP-TRR-0114			
55	FP-TRR-0115			
55	FP-TRR-0116			
55	FP-TRR-0121	49m of 250dia watermain	2041	$80,943
59	FP-MCN-0002	163m of 300dia watermain	2018	$316,513
59	FP-MCN-0006	2m of 300dia watermain	2018	$3,884
59	FP-MCN-0011	192m of 300dia watermain	2018	$372,825
59	FP-MCN-0034	1m of 300dia watermain	2018	$1,942
65	FP-MCN-0025	283m of 450dia watermain	2011	$863,992
65	FP-MCN-0026	441m of 450dia watermain	2016	$1,346,361
65	FP-MCN-0027	11m of 300dia watermain	2018	$21,360
65	FP-MCN-0044	1,009m of 250dia watermain	2021	$1,666,772
65	FP-MCN-0047	399m of 300dia watermain	2018	$774,776
66	FP-MTO-0003	25m of 300dia watermain	2018	$48,545
67	FP-MTO-0021	81m of 250dia watermain	2018	$133,804
70	FP-MGH-0006	58m of 200dia watermain	2021	$83,395
73	FP-MTO-0034	1,585m of 200dia watermain	2018	$2,278,990
73	FP-MTO-0041	1,077m of 200dia watermain	2018	$1,548,563
75	FP-MCS-BW011	17m of 250dia watermain	2019	$28,082
76	FP-ACR-5001	87m of 250dia watermain	2020	$143,716

Map Number	Map Reference	Description	Est Timing	Establishment Cost
76	FP-ACR-5002	116m of 200dia watermain	2020	$166,790
76	FP-ACR-5003	118m of 200dia watermain	2020	$169,666
77	FP-MGH-0005	24m of 300dia watermain	2021	$46,603
80	FP-ACR-0001-04	1,370m of 300dia watermain	2020	$2,660,259
80	FP-ACR-0005-01	16m of 300dia watermain	2036	$31,069
80	FP-ACR-0005-02	410m of 300dia watermain	2036	$796,136
80	FP-ACR-0005-03	327m of 300dia watermain	2036	$634,967
80	FP-ACR-0005-04	224m of 300dia watermain	2036	$434,962
80	FP-ACR-0006	119m of 300dia watermain	2036	$231,074
80	FP-ACR-0008	424m of 200dia watermain	2036	$609,648
81	FP-ACR-0001-01	11m of 300dia watermain	2020	$21,360
81	FP-ACR-0001-02	4m of 300dia watermain	2020	$7,767
81	FP-ACR-0001-03	109m of 300dia watermain	2020	$211,656

SC8.2 Wastewater network schedule of works

SC8.2.1 Wastewater network schedule of works (Brisbane)

Table SC8.2.1 Wastewater supply network schedule of works (Brisbane)

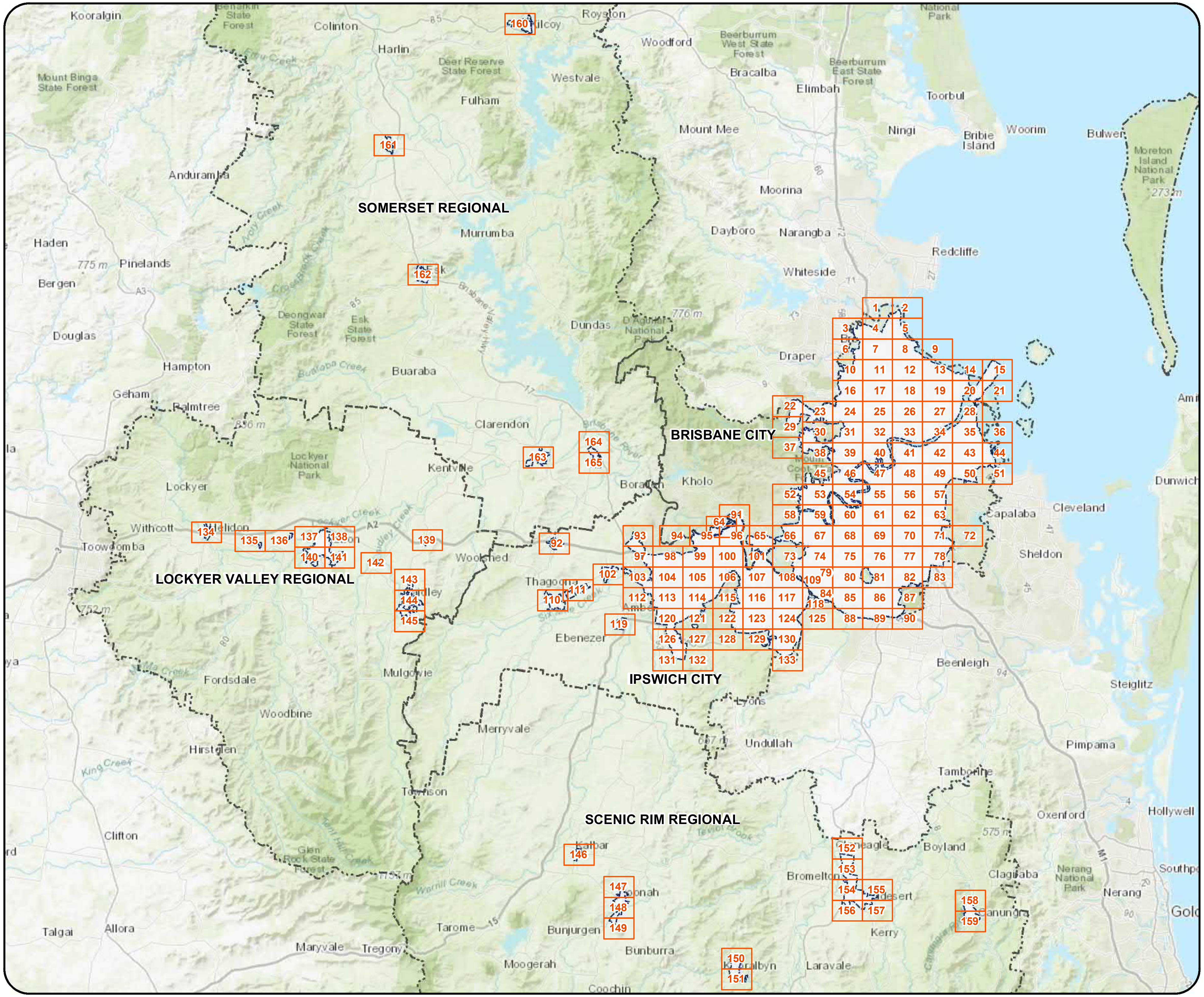
Map Number	Map Reference	Description	Est Timing	Establishment Cost
6	S5-GM-002	SP185 Redirection	2016	$150,194
7	S5-GM15c	Telegraph Road branch off Fitzgibbon-Bracken Ridge	2021	$471,235
7	S5-GM16	New Development area Fitzgibbon	2021	$132,877
7	S5-GM17	U/S Fitzgibbon Sub Main Sec 1 – Roghan Road – Fitzgibbon	2021	$115,732
7	S5-GM20	Branch off Taigum Sub Main – Taigum	2021	$123,447
11	S5-GM-001	Little Cabbage Tree Creek Sub Main Augmentation	2024	$1,195,318
11	S5-GM-003	150mm sewer upstream Gayford Street	2022	$39,469
11	S5-GM-004	SP217 redirection sewers	2026	$246,386
11	S5-GM-005	SP37 Redirection	2021	$420,079
17	S1-2014-FGP-0003	Augmentation with a 375/450mm sewer in Hamilton Road, Chermside	2031	$1,755,503
17	S1-2014-FGP-0004A	Augmentation with a 500mm sewer in Kittyhawk Road, Chermside	2031	$1,599,273
17	S1-2014-FGP-0004B	Augmentation with a 375mm sewer in Thomas/ Kuran Street, Chermside	2031	$1,191,420
17	S1-2014-FGP-0004C	Augmentation with a 375mm sewer in Thomas/ Kuran Street, Chermside	2031	$359,342
17	S1-2014-FGP-0099	Arcola Street Sewer, Aspley	2026	$326,712
18	S1-2014-FGP-0007	Augmentation with a 300mm sewer in Weyba Street, Banyo	2026	$619,098
18	S1-2014-FGP-0009	Virginia Branch Sewer Section 1 Augmentation	2026	$8,293,583
18	S1-2014-FGP-0010	Augmentation of Banyo Sub Main with a 675/600mm sewer in Earnshaw Road, Northgate	2024	$5,986,958
18	S1-2014-FGP-0011A	Virginia Branch Sewer Section 2 Augmentation	2026	$30,437,122
18	S1-2014-FGP-1003	Augmentation with a 300mm sewer in Hurricane Street, Banyo	2035	$202,665
18	S1-2014-FGP-1075	Augmentation with a 300mm sewer in Weyba Street, Banyo	2026	$178,393
23	S1-2014-FGP-0034	Augmentation with a 300mm sewer in Arbor Street, Ferny Grove	2028	$1,193,905
25	S1-2014-FGP-0101	Stage 1 Augmentation of Wooloowin Sub Main with a 300mm sewer	2024	$1,733,219
25	S1-2014-FGP-0101B	Stage 2 Augmentation of Wooloowin Sub Main with a 300mm sewer	2024	$2,389,686
26	S1-2014-FGP-0011B	Virginia Branch Sewer Section 2 Augmentation	2026	$28,961,383
26	S1-2014-FGP-0012	Augmentation with a 300mm sewer in Hedley Avenue, Nundah	2023	$1,287,806
26	S1-2014-FGP-0013	Augmentation of South Kedron Brooke Sewer with a 600mm sewer	2026	$8,766,797

Map Number	Map Reference	Description	Est Timing	Establishment Cost
26	S1-2014-FGP-0014	Augmentation of North Kedron Brooke Sewer with a 1200mm sewer	2022	$42,459,537
26	S1-2014-FGP-0102	375mm South Kedron Brook Sewer cross connection to NKBS	2023	$1,885,548
26	S1-2014-FGP-1014	Augmentation of South Kedron Brooke Sewer with a 600mm sewer	2026	$3,676,788
32	S1-2014-FGP-0015B	S1 Tunnel Extension to Eagle Farm Pump Station, Hamilton – B	2029	$96,000,000
32	S1-2014-FGP-0037	Windsor Sub Main Augmentation with a 375mm sewer	2026	$1,638,893
32	S1-2014-FGP-0037B	Windsor Sub Main Augmentation with a 375mm sewer	2026	$3,800,290
32	S1-2014-FGP-0038	SP23 Edmonstone Street pump station inlet sewer, Newmarket	2022	$2,090,847
32	S1-2014-FGP-0104	Main sewer connection U/S of Edmonstone Pump Station (SP23), Newmarket.	2022	$146,427
32	S1-2014-FGP-1999	Augmentation of Breakfast Creek Main	2023	$10,663,179
33	S1-2014-FGP-0015	S1 Tunnel Extension to Eagle Farm Pump Station, Hamilton – A	2026	$164,871,000
33	S1-2014-FGP-0018	Hamilton Siphon Upgrades	2031	$5,285,000
33	S1-2014-FGP-0021	Sewer Upgrade from Caswell Street SPS to Hamilton Siphon	2023	$93,995,000
34	S3-2016-FRM-0008	Augmented Rising Main for SP49	2017	$1,237,091
35	S4-2019-GM-002	Lower Wynnum Main Sewer Augmentation	2031	$5,050,000
39	CBD-206-GM-0032	Railway Terrace, Milton Sewer Upgrade (Aug Walsh McDougall Street)	2021	$1,936,000
39	S1-2014-FGP-1028	Augmentation of Castlemaine Street and Cribb Street sewers	2024	$6,602,000
39	S1-2014-FGP-1037	Augmentation with a 300mm sewer in Carraway Street, Kelvin Grove	2026	$68,406
40	CBD-2016-GM-0009	Augmentation of Morgan Street sewers	2020	$1,466,000
40	CBD-2016-GM-0011	Augmentation of Bowen Terrace and Brunswick Street sewers	2024	$1,623,000
40	CBD-2016-GM-0012	Augmentation of sewers at intersection of Commercial Road and Ann Street	2024	$1,227,000
40	CBD-2016-GM-0013	Augmentation of Wyandra Street sewers	2024	$1,041,000
40	CBD-2016-GM-0014	Augmentation of Helen Street sewers	2024	$1,082,000
40	CBD-2016-GM-0015	Augmentation of Commercial Road sewers	2024	$1,272,000
40	CBD-2016-GM-0016	Augmentation of May Street sewers	2026	$1,217,000
40	CBD-2016-GM-0017	Augmentation of Queens Street sewers	2026	$758,000
40	CBD-2016-GM-0018	Wickham Street Interceptor Stage 2 – Ballow Street sewer	2021	$1,955,000
40	CBD-2016-GM-0022	Augmentation of Doggett Street sewer	2031	$325,000

Map Number	Map Reference	Description	Est Timing	Establishment Cost
40	CBD-2016-GM-0024	Augmentation of Perry Lane sewers	2036	$1,306,000
40	CBD-2016-GM-0025			
40	CBD-2016-GM-0033	Augmentation of Astor Terrace and Wickham Street sewers	2023	$3,019,000
40	CBD-2016-GM-0035	Wickham Street Interceptor Sewer Stage 1	2021	$9,403,000
40	CBD-2016-GM-0036	Augmentation of Alfred-Constance Street sewers	2021	$2,444,000
40	CBD-2016-GM-0037	Augmentation of Longland Street sewer to S1 main	2021	$2,284,000
40	CBD-2016-GM-0052	Augmentation of Water Street sewers Stage 2	2021	$11,085,000
40	CBD-2016-GM-0053			
40	S1-2014-FGP-0040A	Augmentation of Herston Branch Sewer	2025	$211,956
40	S1-2014-FGP-1000	Augmentation of Breakfast Creek Main	2023	$15,889,723
40	S1-2014-FGP-1009	Augmentation with a 225mm sewer in Bowen Bridge Road Bowen Hills	2031	$633,705
40	S1-2014-FGP-1010	Augmentation with a 225mm sewer in Herston Road	2026	$118,779
40	S1-2014-FGP-1038	Augmentation with a 300mm sewer near Inner City Bypass	2031	$945,619
40	S1-2014-FGP-1039	Augmentation with a 325mm sewer in Gilchrist Avenue, Herston	2026	$672,553
40	S1-2014-FGP-1067	Augmentation with a 450mm sewer in Campbell Street Bowen Hills	2026	$819,352
41	S1-2014-FGP-0020	Perrin Creek Sub Main augmentation with 600mm sewer-Stage 1	2022	$5,310,000
41	S1-2014-FGP-0023	Augmentation of Stewart to Bilyana Street sewer d/s of Barramul Street PS. Morningside.	2024	$1,713,083
41	S1-2014-FGP-0026	Augmentation of Jenolan Avenue Sewer, Hawthorne	2026	$2,502,258
41	S1-2014-FGP-0103	Perrin Creek Sub Main augmentation with 600mm sewer- Stage 2	2024	$6,910,000
41	S1-2014-FGP-1005	Augmentation with a 225mm sewer near Algoori Street, Morningside	2026	$757,830
41	S1-2014-FGP-1042	Augmentation with a 375mm sewer in Beverley Street, Morningside	2035	$1,021,698
41	S1-2014-FGP-1068	Augmentation with a 300mm sewer near Stuart Street, Bulimba	2026	$995,918
42	S3-2016-FGP-0003	Bulimba Creek Trunk Sewer Augmentation (Stage 3)	2036	$78,583,035
42	S3-2016-FGP-0047	Model indicates SP258 is under capacity, replaces with gravity sewer.	2025	$8,121,991
43	S4-2019-GM-001	Upper Wynnum Main Sewer Augmentation	2021	$3,200,000

Map Number	Map Reference	Description	Est Timing	Establishment Cost
46	CBD_2016_ GM_0001	Augmentation of Montague Road and Bank Street sewers	2022	$1,948,000
46	CBD_2016_ GM_0002			
46	CBD_2016_ GM_0003			
46	CBD_2016_ GM_0006	Augmentation of Sylvan Road sewers	2021	$6,038,000
46	CBD-2016-GM-0019	Augmentation of Montague Road sewers	2031	$1,666,000
46	CBD-2016-GM-0021	Augmentation of Ferry Road sewers	2031	$1,353,000
46	CBD-2016-GM-0023	Augmentation of Kurilpa Street sewers	2036	$1,145,000
46	CBD-2016-GM-0031	Extension of DN800 sewers along Lissner and Bennet Streets	2021	$7,390,000
46	CBD-2016-GM-0041	West End Sub-Main Augmentation Stage 1 (Riverside Drive Phase 1)	2022	$7,236,000
46	CBD-2016-GM-0043	Augmentation of Jane Street sewers	2022	$1,028,000
46	S1-2014-FGP-0087	Brisbane Street Sewer upgrade, d/s of SP99, Toowong	2031	$268,392
46	S1-2014-FGP-0091	Augmentation of Inlet sewer u/s of Heroes Avenue SP103, Taringa	2023	$174,521
46	S1-2014-FGP-0117	Augmentation of Patrick Lane sewer	2025	$1,604,000
46	S1-2014-FGP-0119	Brisbane Street Sewer upgrade, d/s of SP99, Toowong	2031	$152,567
46	S1-2014-FGP-1012	Augmentation with a 375mm sewer in Macquarie Street, St Lucia	2025	$1,277,123
46	S1-2014-FGP-1027	Augmentation with a 500mm sewer in Macquarie Street, St Lucia	2025	$30,046
46	S1-2014-FRP-0003	Rising main upgrade from Brisbane Street PS SP99, Toowong.	2031	$218,754
47	CBD_2016_ GM_0004	Augmentation of Boundary Street sewers	2024	$703,000
47	CBD_2016_ GM_0005	Augmentation of Ernest Street sewers	2028	$325,000
47	CBD_2016_ GM_0007			
47	CBD_2016_ GM_0008	Augmentation of Margaret Street sewers	2023	$1,847,000
47	CBD-2016-GM-0020	Augmentation of Hope Street sewers	2031	$866,000
47	CBD-2016-GM-0026	Augmentation of Jurgens Street sewers	2036	$1,874,000
47	CBD-2016-GM-0034	Augmentation of Albert Street sewers via Eliz St diversion sewer	2021	$6,800,000
47	CBD-2016-GM-0039	Augmentation of Rawlins Street sewer	2021	$2,678,000
47	CBD-2016-GM-0040			

Map Number	Map Reference	Description	Est Timing	Establishment Cost
47	CBD-2016-RM-0038	Augmentation of Kangaroo Point Sub-Main	2024	$6,513,000
47	S1-2014-FGP-1026	Augmentation with a 375mm sewer near Gladstone Street, Cooparoo	2023	$2,913,588
47	S1-2014-FGP-1052	Augmentation with a 150mm sewer in Brook Street, South Brisbane	2024	$2,082,000
48	S1-2014-FGP-0028	Augmentation of Ferguson Road Sewer, Seven Hills	2026	$1,124,276
50	S3-2016-FGP-0005	Augmentation U/S of SP258. Planned bypass of SPS.	2025	$1,399,739
54	S1-2014-FGP-0093	Augmentation of Carmody Street Branch, St Lucia	2023	$1,780,000
54	S1-2014-FGP-1001	Augmentation with a 400mm sewer in College Road, St Lucia	2022	$1,458,084
55	S1-2014-FGP-0033	Augmentation with 300mm sewer in Cedar Street, Greenslopes	2024	$1,195,169
55	S1-2014-FGP-0094	Augmentation of Gravity Main leading to SP175, St Lucia	2022	$2,592,594
55	S1-2014-FGP-1020	Augmentation with a 525mm sewer near South East Busway, Greenslopes	2022	$1,010,707
55	S1-2014-FGP-1021	Augmentation with a 600mm sewer near Baron Street, Greenslopes	2031	$2,972,031
55	S1-2014-FGP-1021B	Augmentation with a 600mm sewer near Baron Street, Greenslopes	2031	$1,272,179
55	S1-2014-FGP-1025	Augmentation with a 375mm sewer near Ridge Street, Greenslopes	2028	$2,532,487
57	AL00001-AL00018	Cost based on Bulimba Creek Trunk Sewer Feasibility Study	2016	$82,070,000
65	S6-GM44	Collection main 05 of Church Road PS, Moggill	2018	$159,162
65	S6-GM45	Collection main 06 of Church Road PS, Moggill	2018	$102,417
70	S3-2021-FGP-0012	Sewer Augmentation along Mount Gravatt-Capalaba Road to end of Mascar Street.	2021	$704,352
70	S3-2026-FGP-0014	Montreal St. augmentation. Additional flow from Mt. Gravatt development area.	2026	$80,044
70	S3-2031-FGP-0016	Open space (Malinya Place) Augmentation required due to Mt Gravatt development.	2031	$493,354
70	S3-2031-FGP-0016	Open space (Malinya Place) Augmentation required due to Mt Gravatt development.	2031	$TBA
70	S3-2041-FGP-0017	Montreal St. augmentation between Newnham Road and Geneva Street.	2041	$239,940
78	RDS-NS21	Future Growth driven by Rochedale Development	2021	$635,938
78	RDS-NS22	Future Growth driven by Rochedale Development	2021	$54,420
82	S3-2016-FGP-0002	Sewer Augmentation D/S of SP171 two sections off Beenleigh Road and Alpita Road	2017	$135,356



Legend

- Map index
- Priority infrastructure area
- Local Government Area

0 5 10 15 20 25

Kilometers

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5 Index
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

Basemap Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL,

PROJECT

NETSERV PLAN mapping series

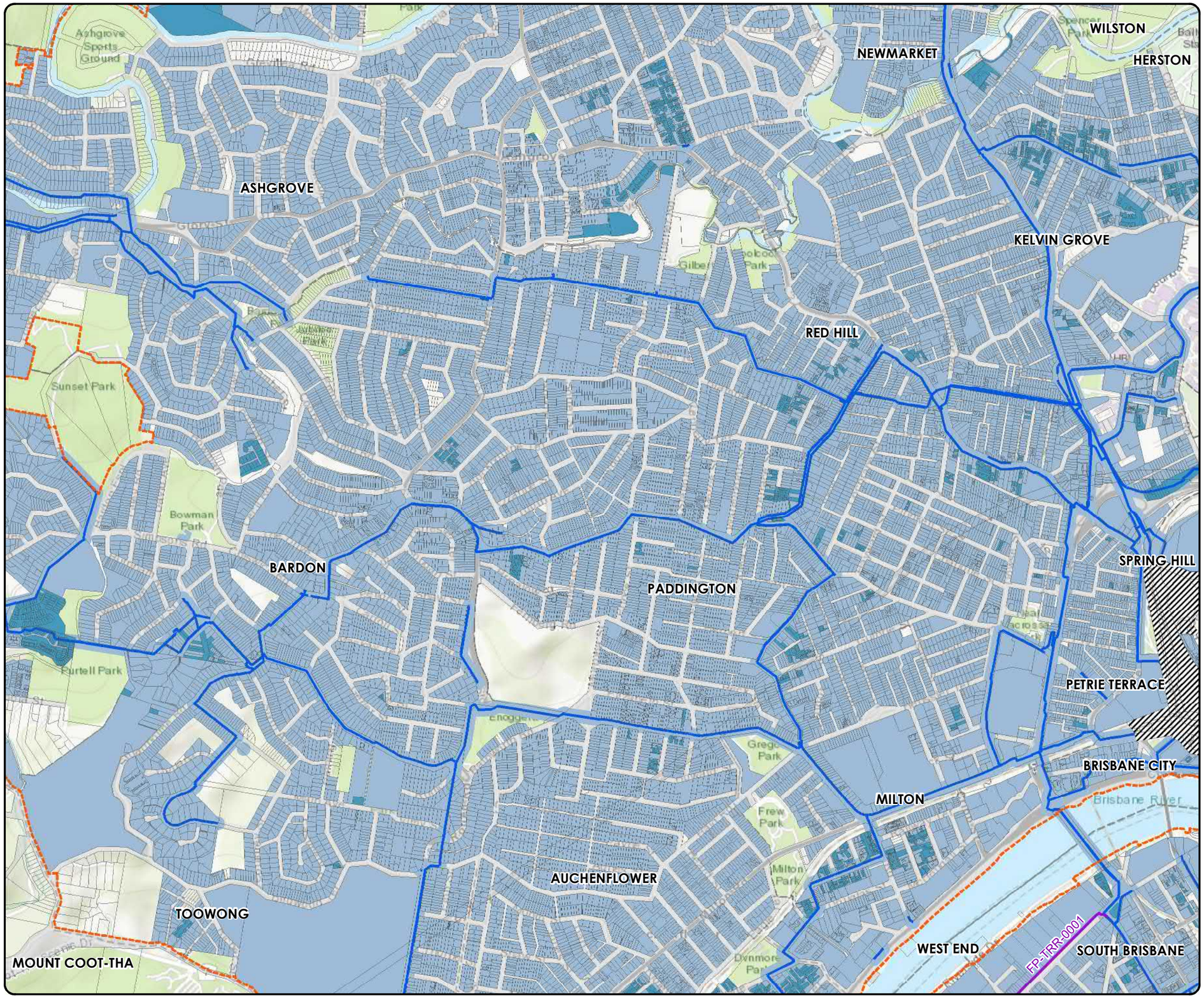
TITLE

Map sheet series index

1 - 165

PRIORITY INFRASTRUCTURE AREA

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Water Trunk Main
- Existing Water Trunk Main
- Water Connection Area
- Water Future Connection Area

UrbanUtilities

0 100 200 300 400 500
Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

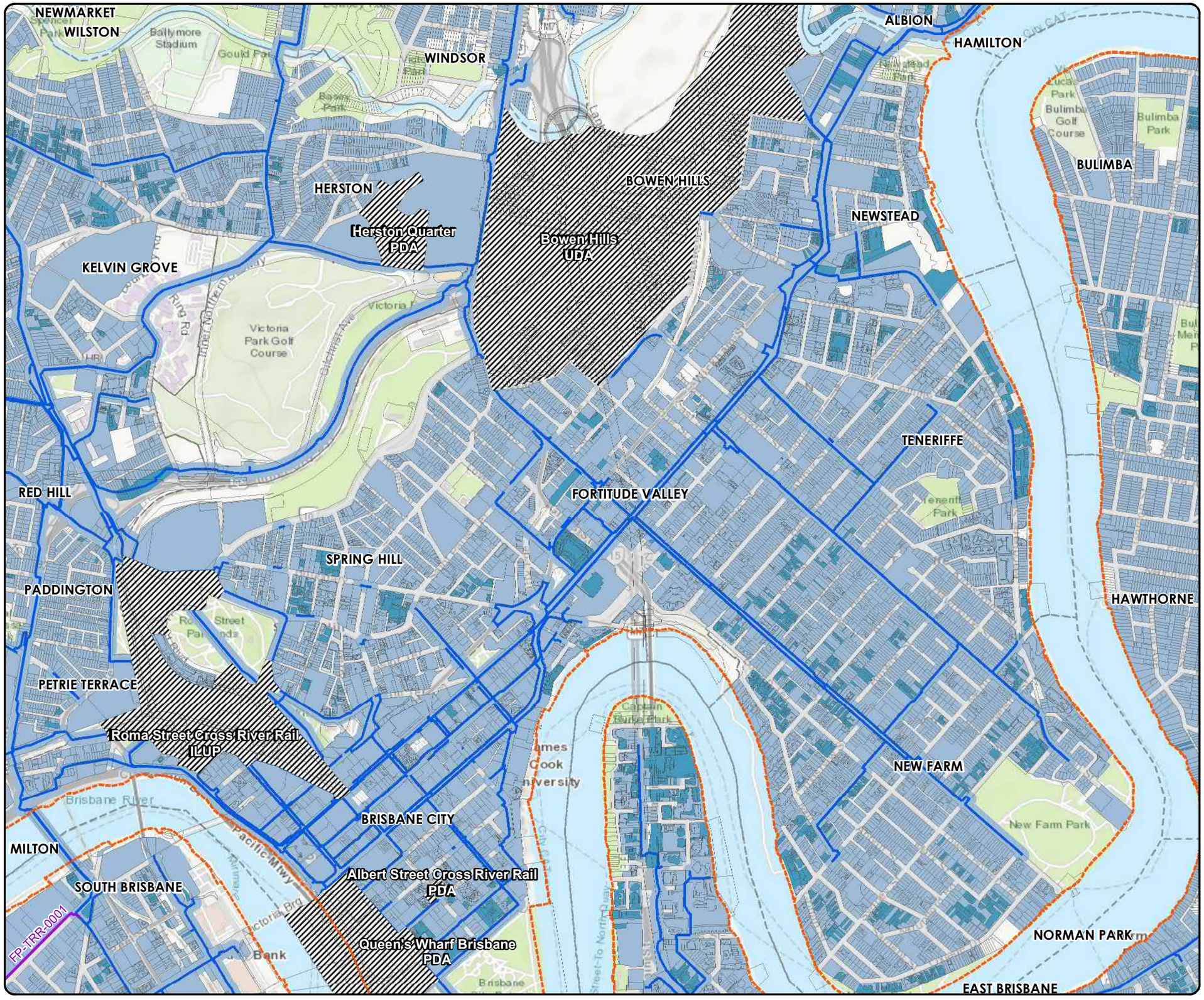
TITLE

Map index number

39

PADDINGTON
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Water Trunk Main
- Existing Water Trunk Main
- Water Connection Area
- Water Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500
Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

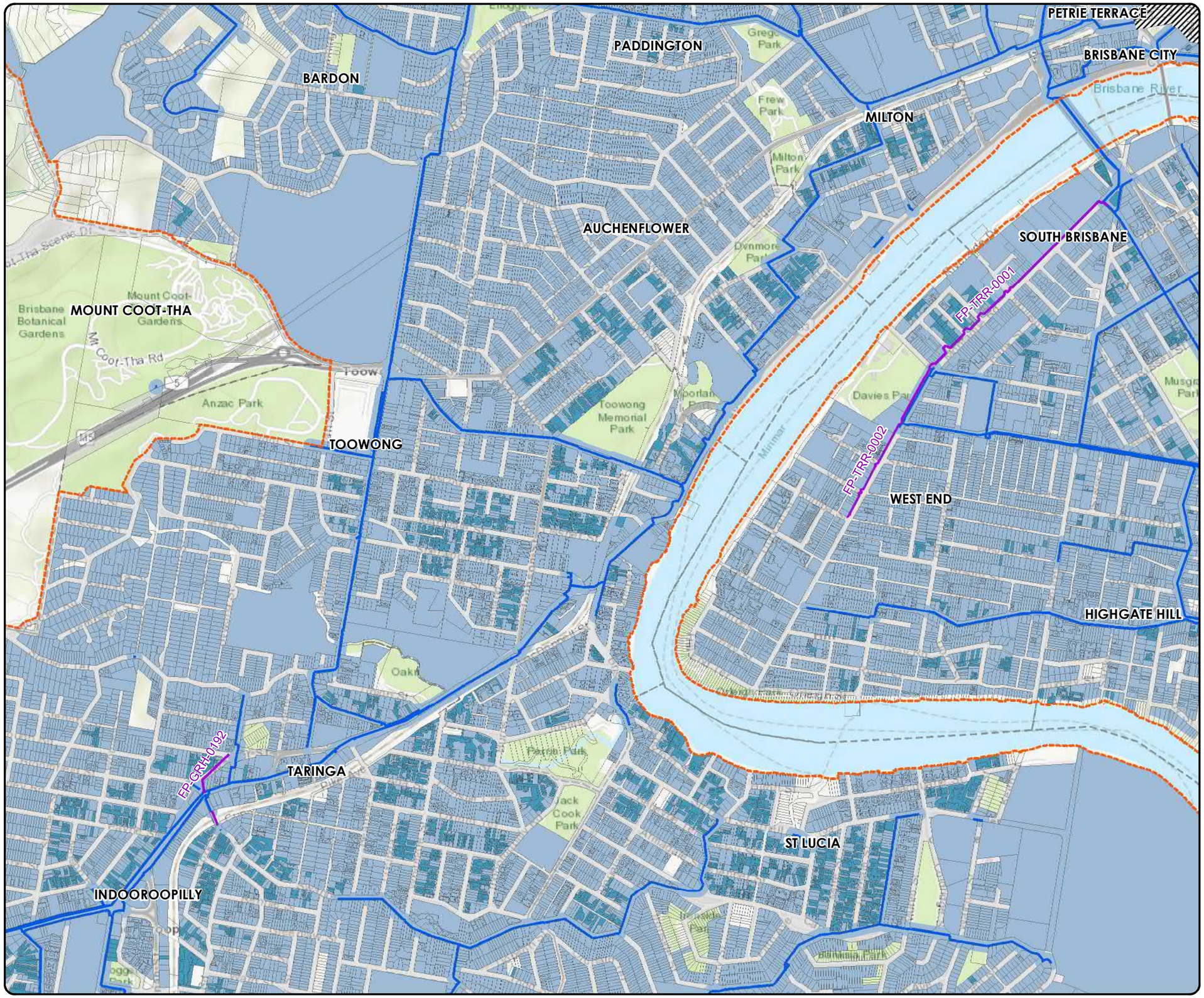
TITLE

Map index number

40

FORTITUDE VALLEY
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Water Trunk Main
- Existing Water Trunk Main
- Water Connection Area
- Water Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500

Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

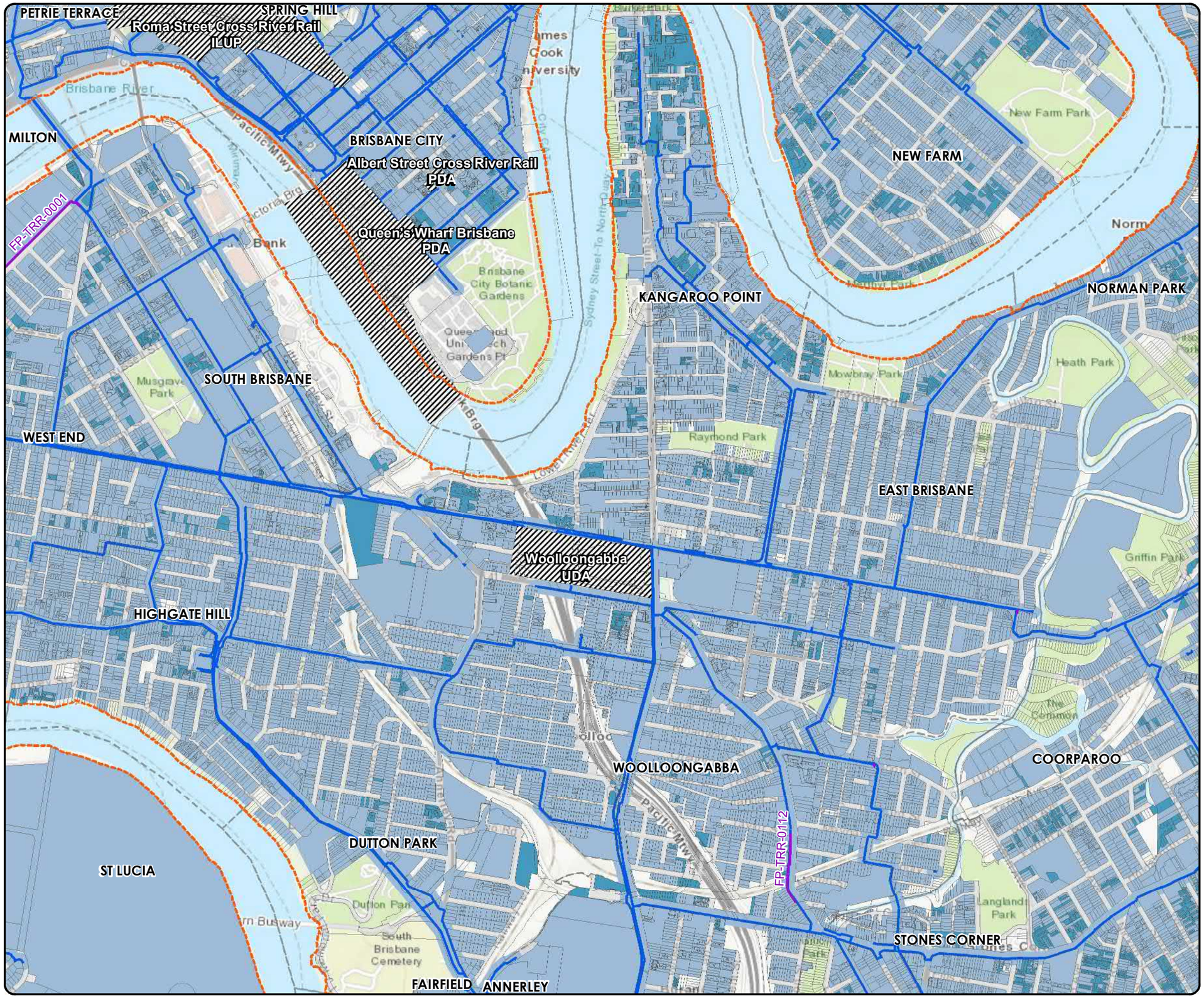
TITLE

Map index number

46

TOOWONG
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Water Trunk Main
- Existing Water Trunk Main
- Water Connection Area
- Water Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500

Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

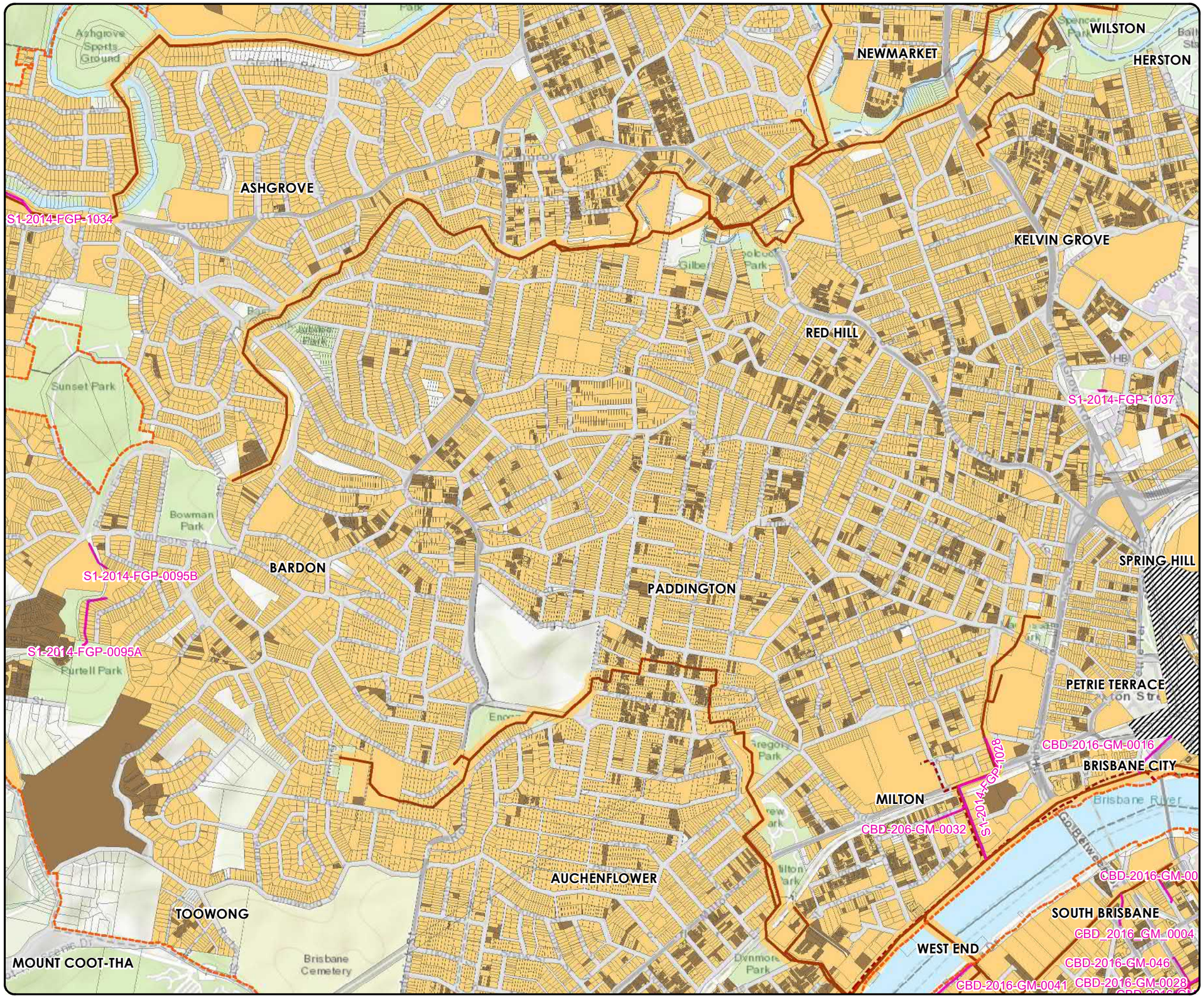
TITLE

Map index number

47

KANGAROO POINT
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Wastewater Trunk Main
- Existing Wastewater Trunk Main
- Existing Wastewater Rising Main
- Wastewater Connection Area
- Wastewater Future Connection Area

UrbanUtilities

0 100 200 300 400 500
Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

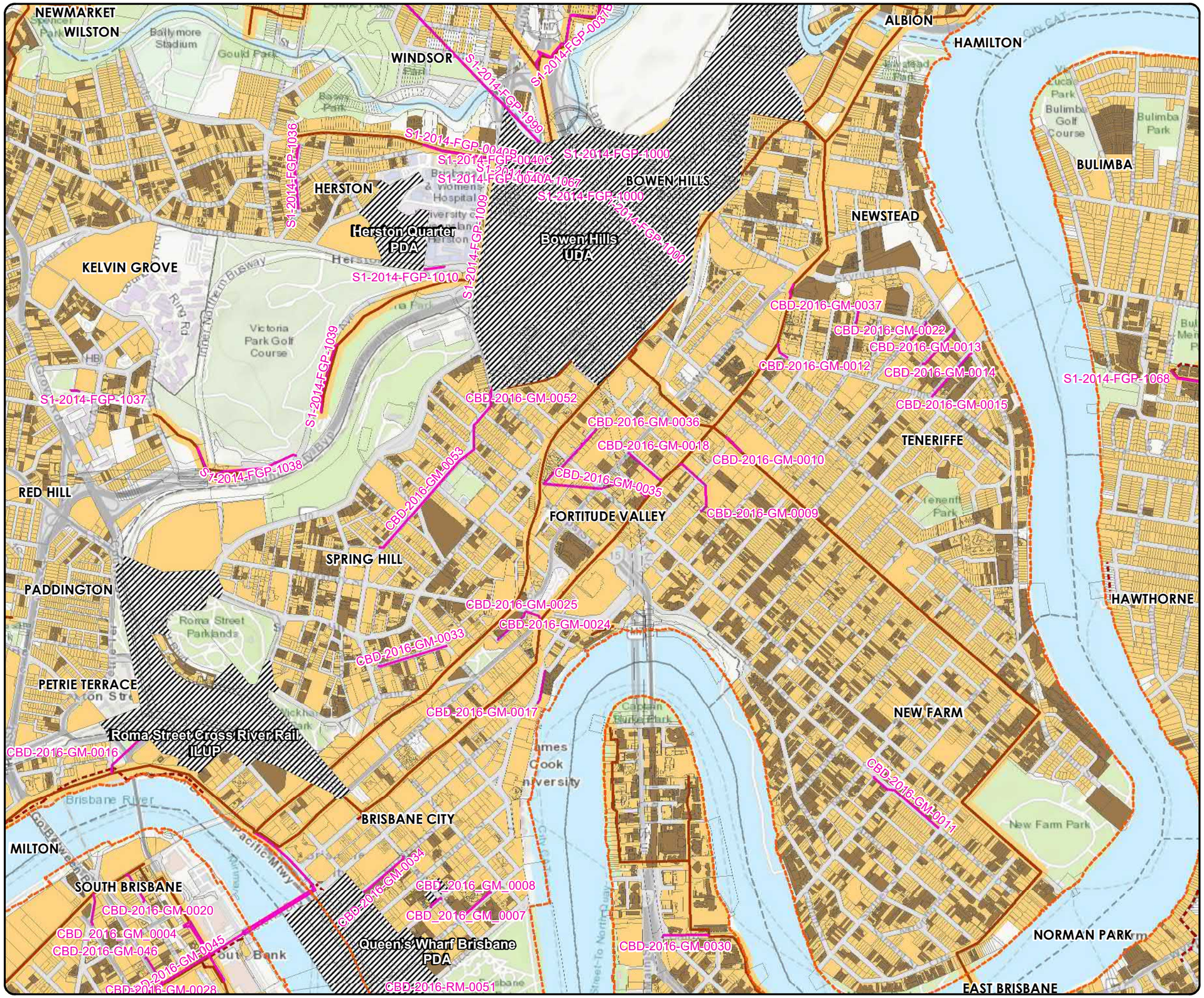
TITLE

Map index number

39

PADDINGTON
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Wastewater Trunk Main
- Existing Wastewater Trunk Main
- Existing Wastewater Rising Main
- Wastewater Connection Area
- Wastewater Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500
Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

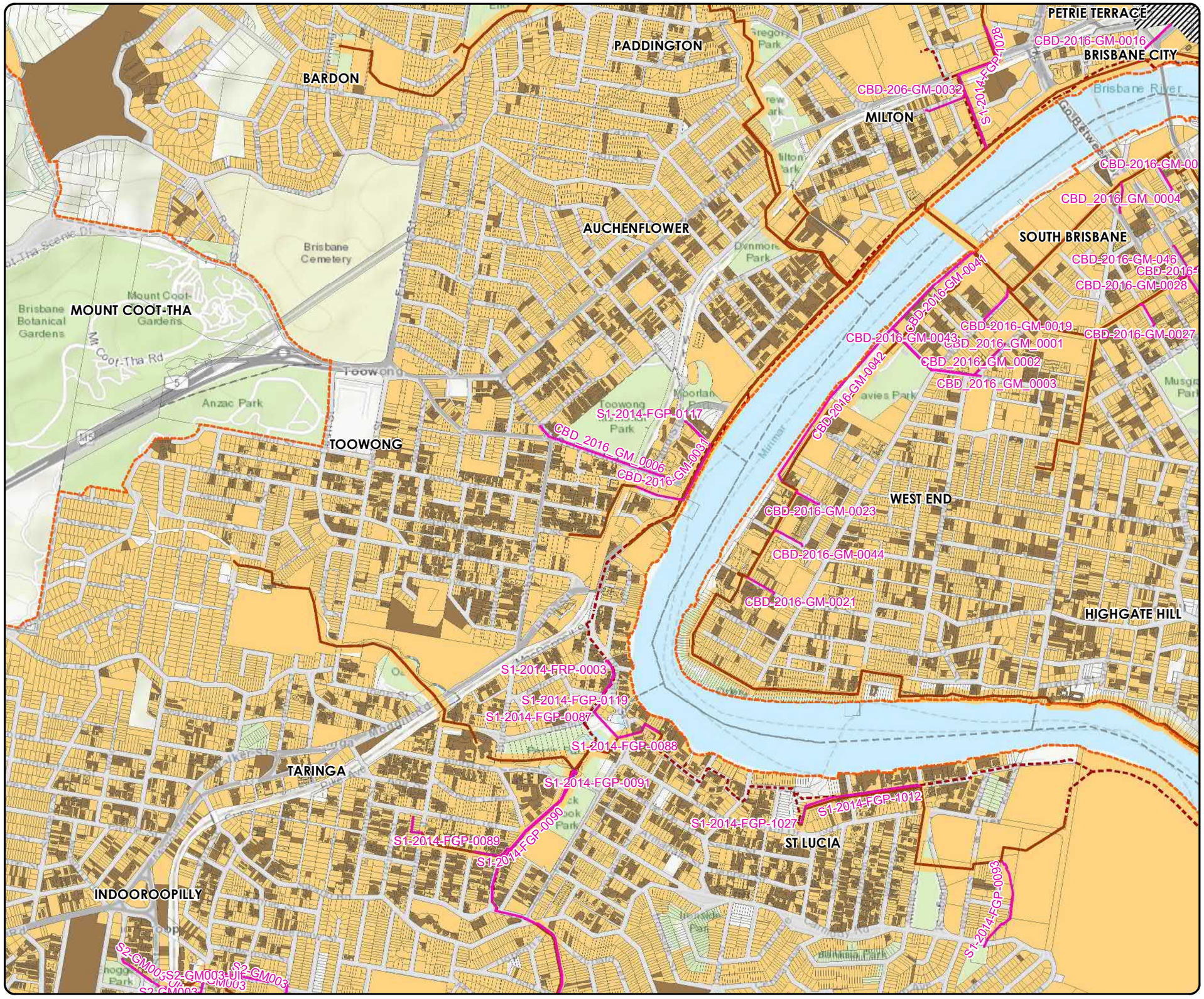
TITLE

Map index number

40

FORTITUDE VALLEY
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Wastewater Trunk Main
- Existing Wastewater Trunk Main
- Existing Wastewater Rising Main
- Wastewater Connection Area
- Wastewater Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500

Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

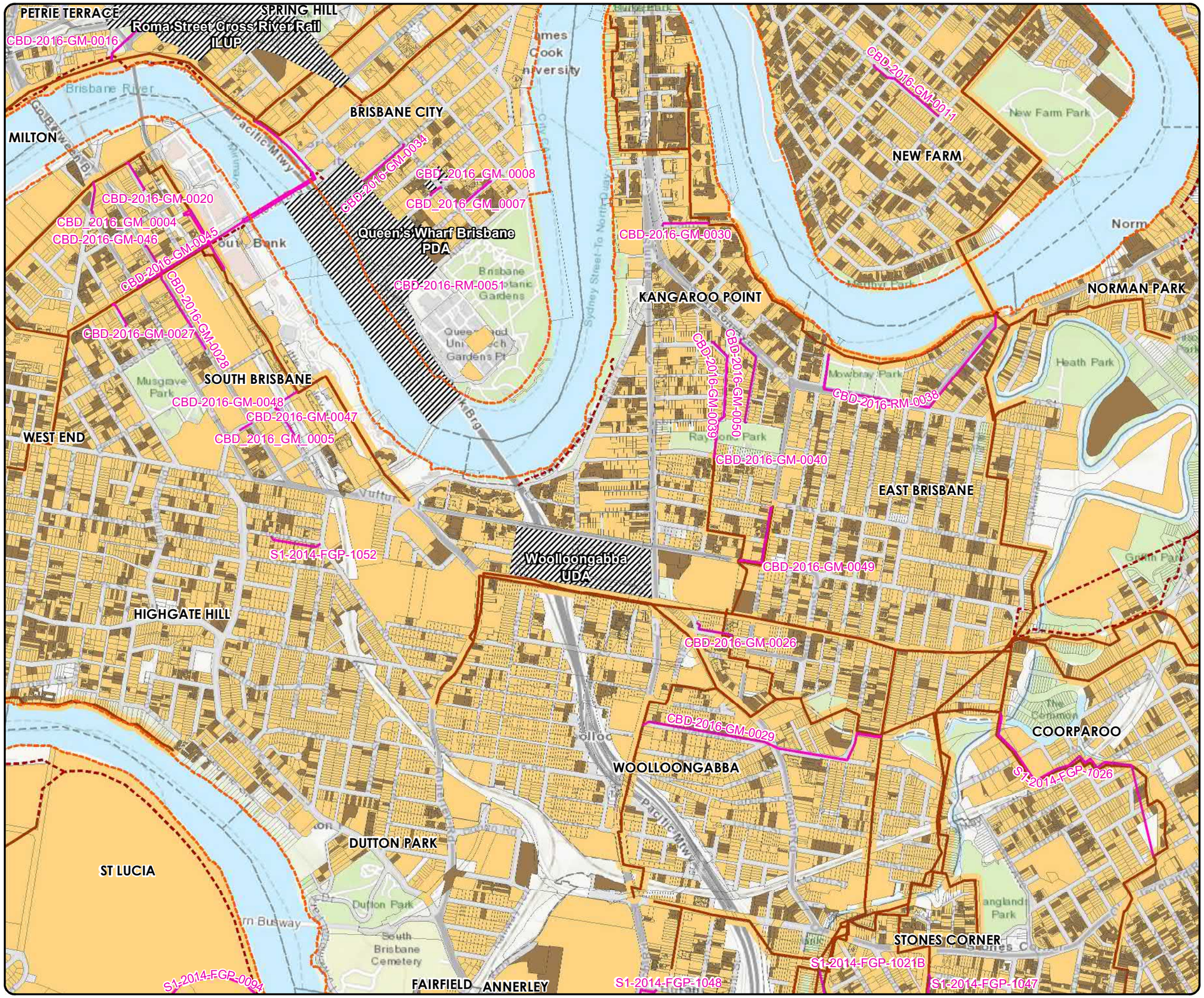
TITLE

Map index number

46

TOOWONG
BRISBANE CITY

netserv@urbanutilities.com.au



Legend

- Priority infrastructure area
- Property Boundary (DCDB)
- Development Area (outside scope)
- Future Wastewater Trunk Main
- Existing Wastewater Trunk Main
- Existing Wastewater Rising Main
- Wastewater Connection Area
- Wastewater Future Connection Area

UrbanUtilities

N

0 100 200 300 400 500

Meters

Production Scale 1:15,000 @A3 1 cm = 150 m

PUBLISHER: PLANNING GROUP
REVISION DATE : Thursday, 18 June 2020
FILENAME : NETSERV PLAN mapping series Version 5
PROJECTION: MAP GRID OF AUSTRALIA, ZONE 56
HORIZONTAL DATUM: GEOCENTRIC DATUM OF AUST 1994

PROJECT

NETSERV PLAN mapping series

TITLE

Map index number

47

KANGAROO POINT
BRISBANE CITY

netserv@urbanutilities.com.au

Member of the Surbana Jurong Group

local people
global experience

Technical Memo

Technical Memo No	30032260-SW-ROMA-IPBR-001	**Date of Issue**	20 August 2020
Subject/Title	Roma Street Precinct Stormwater Management		
Project Name	Cross River Rail	**Project Number**	30032260
Discipline	Stormwater Management		
Document Number	30032260–SW-ROMA-IPBR-001		
Revision Details	01		
Authors	Sheyanne Frisby, Mufrat Noor		
Reviewed by	Martin Kijlstra / Gustavo Pereira		
Approved by	Gustavo Pereira		
Prepared for	Cross River Rail Delivery Authority Purpose: Development Scheme IPBR	**Attention to**	Daniel Gallagher Richard Clarke
Attachments	Appendix A – Catchment Maps Appendix B – Trunk Network Layout and ID Appendix C – Existing Case Proposed Network Solution Appendix D – Existing Case Pipe Capacity Appendix E – DRAINS Model and Results		

1 Introduction

The Cross River Rail Delivery Authority (CRRDA) are preparing a Development Scheme for the Roma Street Cross River Rail Priority Development Area (PDA) to support the Queensland Government's Cross River Rail Precincts Delivery Strategy (PDS) Roma Street Precinct Vision.

The PDA sets out a vision of Roma Street Precinct to be an extension of the CBD and Brisbane's gateway to jobs, tourism and recreation.

To facilitate the realisation of this potential, the Roma Street precinct focus will be on:

- The key arrival destination for the central CBD, and the western gateway to the City's premier cultural, leisure and entertainment offerings including a Potential Major Entertainment Arena (PMEA).
- Improved public realm and active transport connections to improve pedestrian movement and connections.
- Significant upgrades to State-owned station interchange for CRR, Metro and bus services, including realignment of the Inner Northern Busway.

The Strategy sets out a Roma Street Precinct Intent, located at one of Brisbane's most significant city centre arrival points, has the opportunity to become a key economic and community hub through major redevelopment, reinvigorating heritage places, new public spaces and developing strong connections to nearby major Parkland and facilities.

This Technical Memo provides an assessment of the stormwater drainage catchments and infrastructure to address or reduce risks related to future development opportunities within the Roma Street Cross River Rail (CRR) Station Precinct.

The outcomes will assist in informing long term infrastructure plans for the Roma Street CRR Priority Development Area (PDA) Development Scheme and its supporting material. The Cross River Rail Delivery Authority Act 2016 establishes the Cross River Rail Delivery Authority (CRRDA). The purpose of the CRRDA is to plan, carry out, promote or coordinate activities to facilitate economic development and development for community purposes in a CRR PDA. Roma Street is one of the four new underground stations with associated PDAs and was declared in December 2019. It is approximately 32 hectares and is located on the outer edge of Brisbane's city centre as illustrated in Figure 1-1.

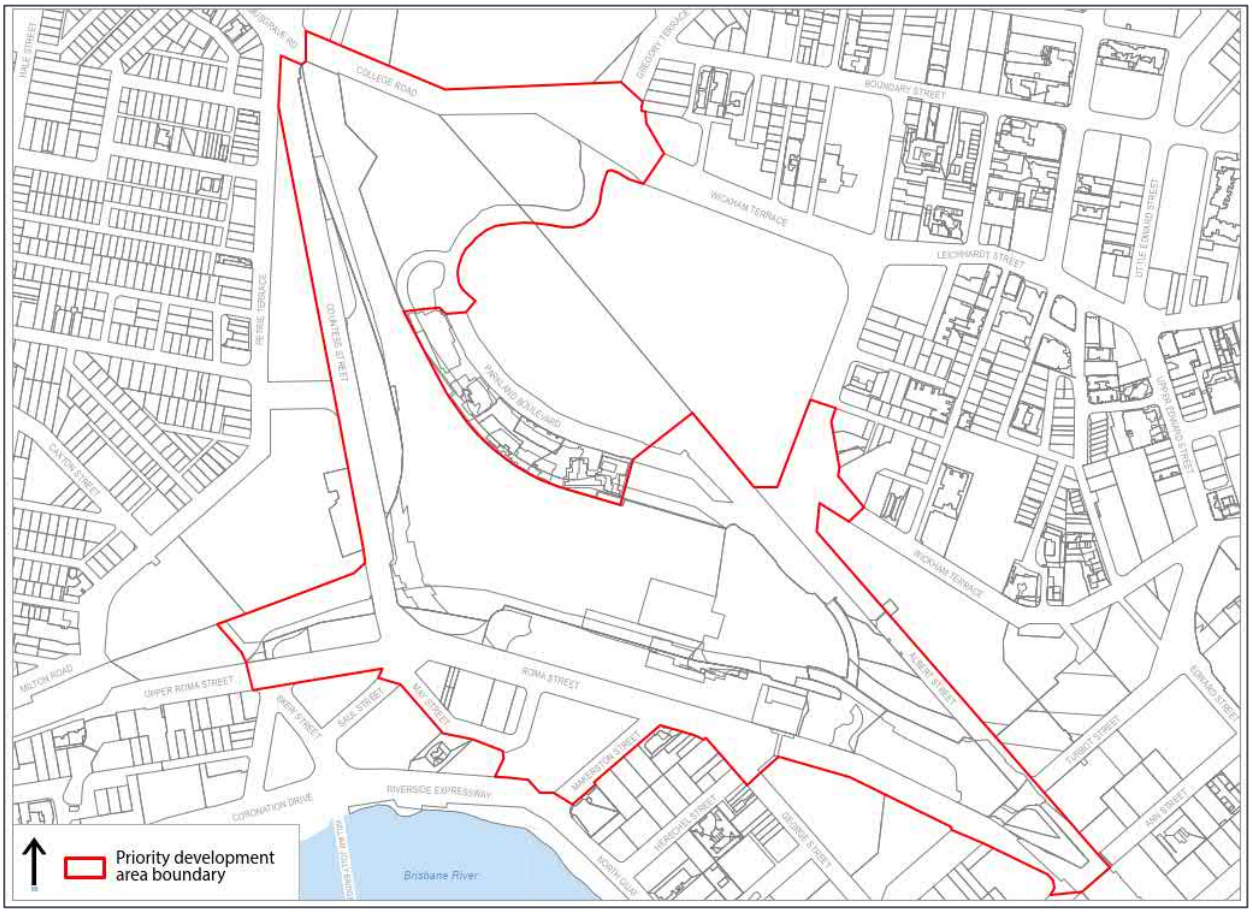


Figure 1-1: Roma Street CRR PDA Boundary (Source: CRRDA Roma Street Interim Land Use Plan Dec 19)

This technical report presents the approach and findings of the stormwater management assessment for the Roma Street Precinct. The assessment has been staged as follows:

- Review the existing stormwater drainage network system, including the Brisbane City Council's (BCC) stormwater assets, as well as those from some non-BCC assets that may contribute to flows into the stormwater drainage system (Refer Table 1-1);
- Identify gaps in available data;
- Determine current constraints within the system; e.g. where the system is unable to drain the minimum desired 10% Annual Exceedance Probability (AEP) design stormwater event (minimum design standard established in BCC's City Plan 2014 - Infrastructure Design Planning Scheme), without impacting the PDA and/or adjacent properties;

- Where pipe size, or level data is not available, undertake a sensitivity analysis to determine if the lack of data is critical;
- Identify network sections or pipe runs where the current stormwater drainage does not perform to current design standards and identify potential upgrades in areas where it directly benefits the Roma Street Precinct development opportunities, Precinct access and other associated benefits (e.g. external properties).
- Update the model to include the CRR Roma Street Precinct development features;
- Determine constrained sections of the stormwater system and associated impacts due to the CRR precinct development;
- Determine options to mitigate the impacts and demonstrate effectiveness of the proposed measures;
- The objective of this staged approach is to identify constraints, impacts and opportunities directly attributed to the proposed Roma Street Precinct development, as well as pre-development constraints.

1.1 Available Data

A summary of the available reference documents and sources of data for the stormwater analysis are presented in Table 1-1.

Table 1-1: Reference Documents and Available Data

Document Name	Date	Prepared By
CRR - Roma Street Precinct - Baseline Infrastructure Report - Appendices	November 2018	SMEC
CRR - Roma Street Precinct - Baseline Infrastructure Report - Rev_C	November 2018	SMEC
Technical Report Cross River Rail Project – Tunnel, Stations and Development Package (TSD)	October 2019	Hatch
Inner Northern Busway Drawings (Ascon and Asbuilt)	2003 – 2008	SKM, Thiess
Brisbane City Council Spatial Data – Stormwater	April 2019	BCC
Brisbane River Catchment Flood Study	2020	BMT
ELVIS LiDAR	2014	ELVIS

2 Existing Stormwater Network

Initially the existing stormwater network was modelled using DRAINS software for the existing precinct infrastructure, to identify existing constraints in the network prior to the CRR Roma Street Precinct future development opportunities being realised.

2.1 Stormwater Catchments

2.1.1 General

The catchment area assessed for this study encompasses 52.5 ha of land bounded by Albert St, Wickham Terrace, Upper Roma Street and North Quay. The catchment discharges to the Brisbane River at two outlet locations under Makerston Street and Tank Street. The catchment is mostly impervious, with the exception of the Roma Street Parkland, Hardgrave park and some small vegetated/grassed areas in the road and rail verges. Appendix A shows the catchments for Roma Street Precinct which were delineated for the purpose of the stormwater assessment. The catchment includes the Roma Street Parkland, part of the Roma Street rail precinct, the Inner Northern Busway (INB), and various commercial building areas in the Brisbane Central Business District (CBD).

2.1.2 External Catchments

For the purpose of this study, external catchments have been defined as any area outside of the PDA which drain to the Roma Street Precinct network. This includes a large portion of the Roma Street Parkland, the Victoria Barracks and Petrie Terrace along with areas in the vicinity of Upper Roma Street, Saul Street, Herschel Street and Tank Street. These external catchments are 26.2ha in size and include the majority of pervious areas within the study extents. Approximately half of the external catchments are classified as pervious land.

2.1.3 PDA Catchments

The PDA catchments are all catchments delineated within the PDA boundary and includes Countess Street, the INB, Roma Street Rail Precinct and the Roma Street road corridor. The PDA catchments make up 26.3ha which is half of the study area. Almost all of the land in this area is considered impervious, with approximately 5% of the area classified as pervious.

2.2 Stormwater Network

The stormwater network information used in this assessment is freely available BCC spatial data (found at https://www.data.brisbane.qld.gov.au/data/group/spatial-data). This information was valuable as it was the most comprehensive data set available for this assessment. The data however, did not include many key attributes which were necessary for understanding how the current network functions. A limited amount of missing network data was able to be extracted from an existing federated Navisworks model of the Roma Street area.

Invert levels (IL) for most of the pipes were unknown and were inferred from the available data. Generally, minimum pipe grades were applied where data was not available, or pipe grades were set so that the known ILs could be achieved.

Surface levels (SL) of pits were generally unknown and where data was not available, SLs were derived from the LiDAR model obtained (2014).

Pipe size information was complete for all pipes. All modelling assumes the information in the BCC spatial data is correct except for two segments of pipe which were changed manually. These pipes were corrected as they showed a significant decrease in pipe size along a large network line and were assumed to be incorrect. A segment of pipe along Roma Street (Line A) was found to be a circular 450mm diameter pipe between an upstream rectangular box culvert of size 1.8x1.8m and downstream rectangular box culvert of size 1.5x2.1m. The 450mm diameter pipe segment was assumed to be incorrect and therefore manually updated on the model to a rectangular 1.8x1.8m box culvert to match the upstream pipe. The second location was along Garrick Street (Line F) where the drainage network discharged into the Roma Street drainage network. At this location the downstream pipe appeared to reduce in size compared to the upstream circular pipe from a 525mm diameter pipe to a 375mm diameter pipe resulting in a contraction. This was once again assumed to be incorrect and therefore the 375mm diameter pipe was upsized in the model to match the upstream pipe segment.

INB drawings were made available, which assisted in confirming network information in that area and assisted to confirm its configuration. Google Street View and high resolution Metromap Imagery also confirmed the location of many pits in the network. To improve the reliability of the modelling information, a detailed survey of the area would be necessary or at minimum, conformation of IL at key locations.

Given the network is currently under capacity (under-sized for the desired level of service and resulting in surcharging), the majority of the trunk network is functioning under pressure and therefore modelling undertaken as part of this assessment wasn't severely impacted by the lack of IL information and would not have impacted HGL results significantly.

2.2.1 Key Trunk Network Pipes

The main pipe conveying flow to the outlet is a large brick arch pipe (Line A) which varies in size along the length of the pipe (see Figure 2-1, or Appendix B for a larger map). It begins in the Roma Street Parkland as a 1.8 x 1.8m brick arch pipe and changes to a 2.4 x 2.4m brick arch pipe under Parkland Boulevard. The pipe continues southwest underneath the Roma Street rail corridor towards the INB where the pipe changes back to a 1.8 x 1.8m brick arch

pipe. The pipe then continues east as a 1.5 x 2.1m brick arch pipe underneath Roma Street towards Makerston Street where it passes underneath the Roma Street Police Station. The pipe continues along Makerston Street as a 2.7 x 1.95m brick arch pipe until the outlet to the Brisbane River underneath the Riverside Expressway (REX).

The pipe network in the INB (Line C) drains to the brick arch pipe while inside the Roma Street rail corridor through a pump system. The INB drains to a sag location underneath the railway line where three pumps lift the stormwater to pipes in the rail corridor, allowing the flow to be discharged into the brick arch pipe. The capacity of the pump is unknown however it is assumed that it is effective in conveying peak flows from the INB system.

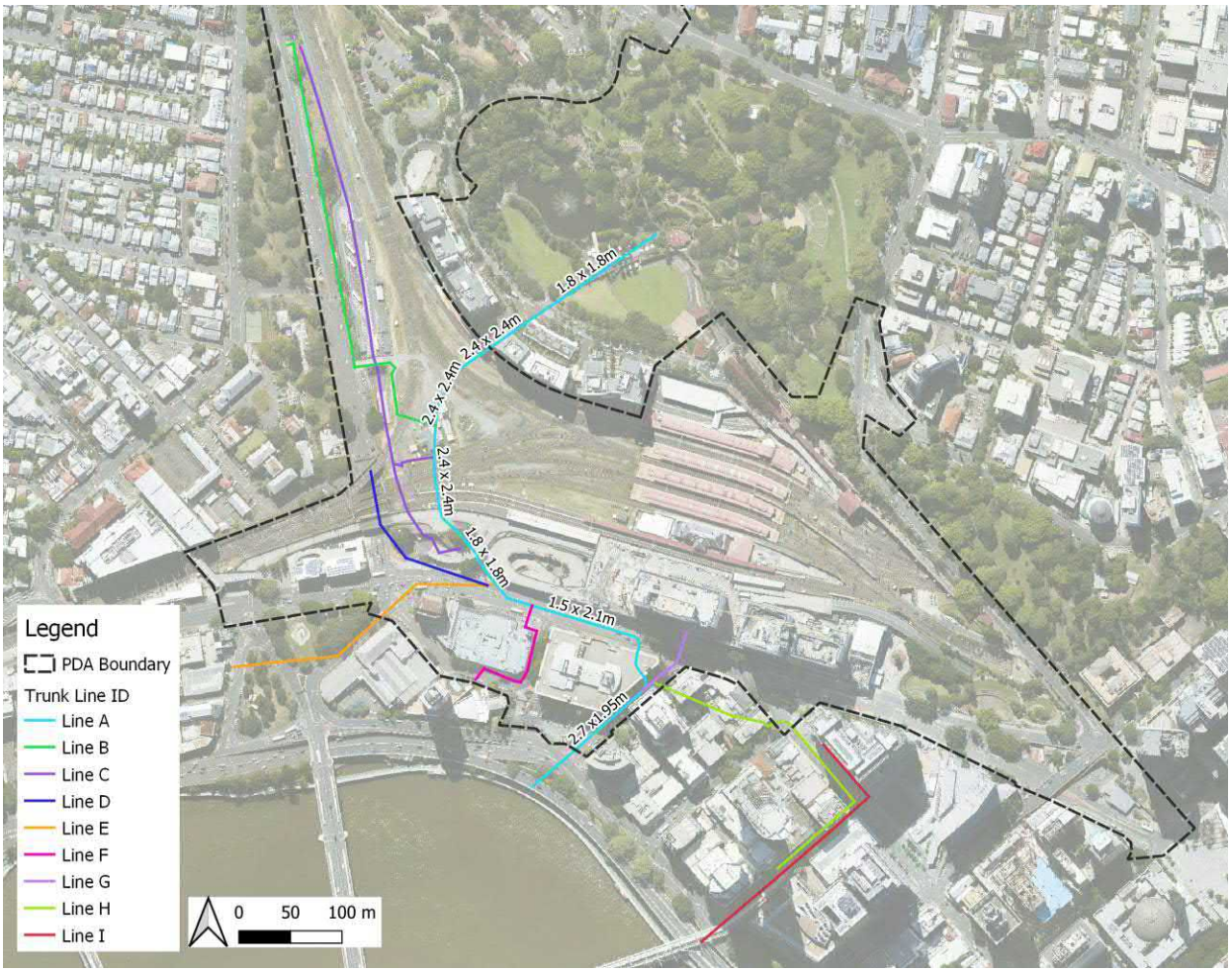


Figure 2-1 - Trunk Network and ID with Line A pipe sizes

2.3 Tailwater

Tailwater levels at the outlet were derived from the *Detailed Model Amendment v803* technical memorandum (BMT, 2020) which is part of the Brisbane River Catchment Flood Study publication set available on the Queensland Government website. Appendix A from this technical memorandum indicates the height of the Brisbane River at various reporting locations along the river. Modelling of the Roma Street network has adopted river heights at Toowong as the tailwater level for both outlets (see Table 2-1 and Figure 2-2).

Tailwater levels were interpolated at the location of the pipe outlets and were determined to be slightly lower than the levels at Toowong. Noting that the river constricts at the location of the outlets, the Toowong river heights were determined to be the most appropriate to adopt as the tailwater levels.

Table 2-1 - Tailwater Level

Location	Tailwater Level (mAHD) at Toowong	
	10% AEP	1% AEP
Outlet 1 (Makerston Street)	2.08	6.74
Outlet 2 (Tank Street)	2.08	6.74

Figure 2-2 - Location of Outlets

2.4 Limitations of the Model

Due to the limited availability of reliable data, the model contains some assumptions including:

- Model data was adopted from the BCC Spatial Data with any missing information interpolated as previously discussed. Data used in the modelling included the pipe network and all pit or stormwater device layers available from BCC. Attributes from this data included spatial location, IL, SL pipe size and pipe type;
- Modelling concrete pipes as class FRC Class 3 with a Manning's *n* value of 0.013;
- Modelling the brick arch pipe as a Box Culvert with a Manning's *n* value of 0.015;
- The brick arch and egg-shaped stormwater conduits have been modelled as box culverts in the existing case. An area assessment can be undertaken in detailed design to determine their actual area. The pipe areas are

likely smaller than those modelled in this exercise, meaning that the impact of the existing case is likely larger than what has been currently assessed.

- Assuming the tailwater level to be uniform across all outlets based on BRCFS (2020);
- Surface Levels at pits were derived from LiDAR (2014) where data was unavailable;
- The model was prepared to assess the capacity of the existing pipe network and does not assess the inlet capacity of the system. Based on imagery and pit spacing it was assumed that pit capacity was not an issue for the network;
- The current modelling is not to be used in any detailed design or detailed assessments. It is a high-level assessment looking at the pipe capacity of the network only for the purpose of assisting in informing infrastructure plans for the Roma Street CRR PDA;
- Impervious areas were determined based on areal imagery;
- Time of concentrations were assumed based on fraction impervious area and land use;
- When sizing the upgrade to the brick arch pipe, all additional pipes or box culverts were increased to a size that would allow 100% of the catchment runoff to enter the network to ensure that the upgraded pipes could carry the capacity of the entire network.

2.5 Existing Constraints

The stormwater network around the Roma Street area is known to be significantly under capacity and cannot convey a 10% AEP storm event flow. Further, a previous study undertaken by Hatch found that pipe capacities in Countess Street, Upper Roma Street, Saul Street and Garrick Street are exceeded even during a 63% AEP event, causing the network to surcharge and pond on and along the streets including Roma Street, at unsafe depths. Appendix C shows a map of the existing case pipe network capacity, depicting pipes with spare capacity, pipes with no spare capacity but not surcharging and pipes with no spare capacity and surcharging.

2.6 Proposed Constraint Resolutions

Due to the busy CBD location of Roma Street, any potential constraint resolutions are severely affected by the disruption that upgrades may cause to pedestrian and vehicular traffic in the area. Therefore, proposed solutions consider both the stormwater network and the impact of the constructions works required to complete the upgrades.

A series of proposed solutions were modelled for the existing case to determine where the most effective upgrades can be undertaken. It was found that upgrades along a section of the Line A brick arch pipe (Refer Appendix D) which runs from the Roma Street Parkland, along Roma Street and Makerston Street to an outlet under the REX, was the most efficient solution to improve the capacity of the trunk main. Upgrading this section of pipe would resolve the main capacity issue within the trunk network and would also allow for a portion of the pipe to be redirected away from under the Roma Street Police Station building, if this site is re-developed in the future, facilitating ease of future maintenance for that section of the trunk main.

As discussed above, the model assumes the drainage network discharging into the trunk main would have adequate capacity to convey the 10% AEP for their respective local catchments (lines B, C, D, E, F, G, H and I). This however is not the case, with all lines currently performing well under the necessary network capacity, resulting in excessive surcharge from those lines being directed to Roma Street. All these lines drain stormwater runoff generated from catchments outside the PDA area and resolutions for those lines were not addressed as part of this study.

The exception is Line F (Garrick Street), which drains the PDA area located to the south of Roma Street. Further, it is recommended that the stormwater pipe in Garrick Street be upgraded concurrently with any future redevelopment of the Roma Street Police Headquarters site (nominally assumed to occur in 2036 in the CRR Roma Street Precinct Baseline Staging Assumptions) as this line is significantly under capacity and also contributes to flooding along Roma Street. This line also receives surcharge flows from line E, outside the PDA area. The recommended augmentation of Line F takes into consideration the extra flows received from Line E. Table 2-2 below shows the

proposed pipe upgrades and Appendix D shows a map of the upgrade area and the proposed PDA pipe upgrade segments. It is noted that the proposed upgrades alone will not be sufficient to resolve the flooding issues within the Roma Street stormwater drainage network catchment. Additional upgrades would be required to be undertaken for the remaining drainage network outside the PDA. The proposed works however would considerably improve the current situation and reduce the flooding within Roma Street road corridor. Refer Appendix E for the flow comparison (pipe flow and overland flow) for the catchment.

Table 2-2 - Proposed Pipe Upgrades

Pipe	Pipe reference	Infrastructure Type	Current Size (m)	New Size (m)	Length (m)
SW1	1	Stormwater	0.675	1.8 x 1.8	5.5
SW1	2	Stormwater	1.8 x 1.8	2.4 x 2.4	13.5
SW1	3	Stormwater	1.5 x 2.1	2.4 x 2.4	25
SW1	4	Stormwater	1.5 x 1.05	2.4 x 2.4	210
SW2	5	Stormwater	0.100	525	13.59
SW2	6	Stormwater	0.100	525	31.396
SW2	7	Stormwater	0.375	525	2.18
SW2	8	Stormwater	0.375	600	7.812
SW2	9	Stormwater	0.450	600	40.161
SW2	10	Stormwater	0.525	600	11.732
SW2	11	Stormwater	0.525	600	8.895
SW2	12	Stormwater	0.525	600	13.43

It is noted that the modelling assumed no-worsening of drainage impacts from future development sites within the PDA, with on-site detention proposed to be incorporated into future developments. The Roma Street road corridor flood impacts proposed to be mitigated are an existing issue. It is noted that the future development opportunities within the PDA are assumed to introduce more residents and workers into the Precinct, therefore mitigating the existing flooding issue is considered warranted.

The results from the modelling indicates that the existing runoff from land within the PDA is responsible for approximately 60% of the flows into the trunk main (Line A) and approximately 35% of the flows into Line F (Garrick Street). The remaining flows (approximately 40% of the flows into the trunk main and approximately 65% of the flows into Garrick Street) are generated from catchments outside the PDA.

3 Roma Street Precinct Developed Network

Once the existing constraints were understood, the stormwater network was modelled with the proposed Roma Street Precinct infrastructure, and compounding constraints analysed.

3.1 Changes to catchments

Three proposed future PDA development scenario was assessed for its impacts to the current layout allowing for the proposed pipe upgrades mentioned in Section 2. Based on the PDA area, the existing case sub catchments were altered to suit. Refer to Appendix A for the design case catchment plans.

3.1.1 Changes to External Catchments

In the design scenario, no changes were made to external catchments. It is understood that the Victoria Barracks may be subject to re-development in the long term however it was assumed that there will be no changes to the imperviousness of the area, or any increase in flow generation will be mitigated by a detention system to be constructed as part of its long-term re-development.

3.1.2 Changes to PDA Catchments

In the design scenario, changes were made to the PDA catchment area to account for the larger extents of development. In the design scenario, the CRR Project P04B (PMEA) area was included in the model extending outside of the base case catchment areas resulting in a slight increase in catchment area. The fraction imperious in the design scenario changes slightly as a limited section of the Roma Street Parkland existing Depot site is assumed to be utilised for a redevelopment opportunity.

3.2 Developed Stormwater Constraints and Proposed Responses

The assumed ultimate re-development in the PDA area has very little to negligible impact on the stormwater network performance in the Roma Street road corridor, once the proposed upgrades are adopted.

3.2.1 Impacts Due to External Catchments

It has been assumed that there are no additional impacts contributing to the network as a result of external catchments. As discussed, no changes have been considered, however there is the possibility of a redevelopment at the Victoria Barracks. Given the network downstream is significantly under capacity (resulting in surcharge), the future re-development of the Barracks site presents an opportunity to utilise detention of stormwater on-site to avoid increased flows in the downstream network.

3.2.2 Impacts due to PDA Catchments

While there are assumed changes (future development) to the catchment area in the long term that have been analysed within the PDA area, there are no significant impacts to the flows into pipe network. Given the limitations of the existing drainage network, it is recommended that the future development of the PMEA, Activity Building area, Parkland Depot site and Future Over Station Development (FOSD) on Roma Street frontage include on-site detention measures to reduce the pressure on the existing network.

3.3 Summary and Conclusion

The existing stormwater network for the Roma Street PDA is generally undersized, causing surcharging and localised flooding, particularly in Countess Street, the INB and Roma Street road corridor.

By upgrading the existing stormwater system in Roma Street, Garrick Street and a section of Makerston street, surcharging and overland flows in Roma Street road corridor can be reduced and some spare capacity in the trunk main could be provided for potential future upgrades of stormwater systems in the upper catchments of the system, particularly, Countess Street, the INB and catchment area to the west.

The Roma Street PDA future development sites does not contribute significant flows that would worsen the stormwater performance in the area. However, future development within the PDA does provide the opportunity to address some of the existing drainage issues for the overall catchment.

Appendix A: Roma Street Catchment Maps

Existing Case Catchment Map

Cross River Rail Roma St Precinct
Master Drainage Study

Figure 01
Existing Case Catchment Plan

Data Sources
QLD Government 2019, Brisbane City Council 2020, Metromap 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

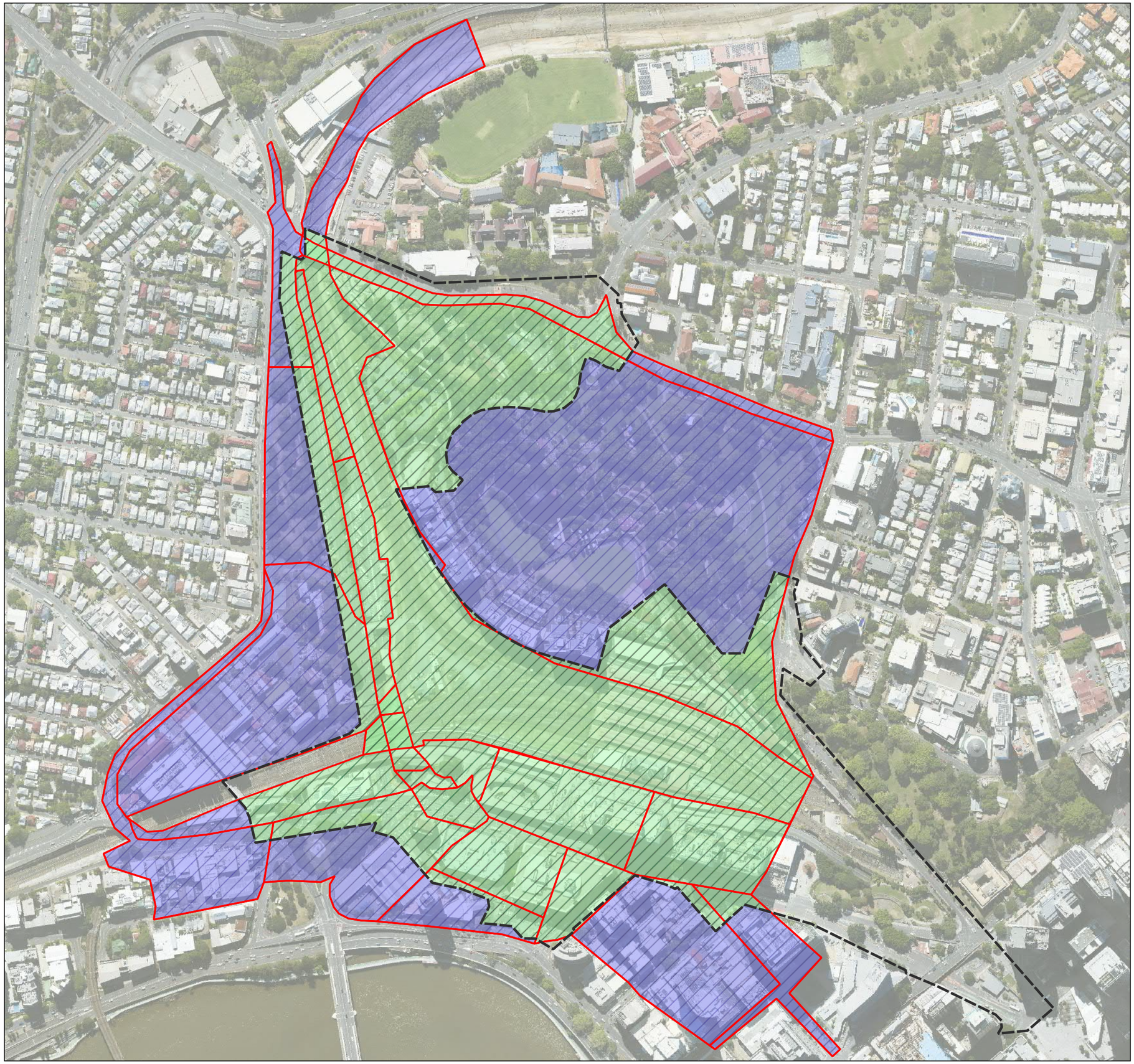
0 25 50 m

Legend

- PDA Boundary
- Existing Case Catchments

Existing Case Catchment Classification

- CRR PDA Catchment
- External Catchment



SURBANA JURONG SMEC

Design Case PDA Catchment Map

Cross River Rail Roma St Precinct
Master Drainage Study

Figure 02
Design Case Catchment Plan
PDA Design Scenario

Data Sources
QLD Government 2019, Brisbane City Council 2020, Metromap 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

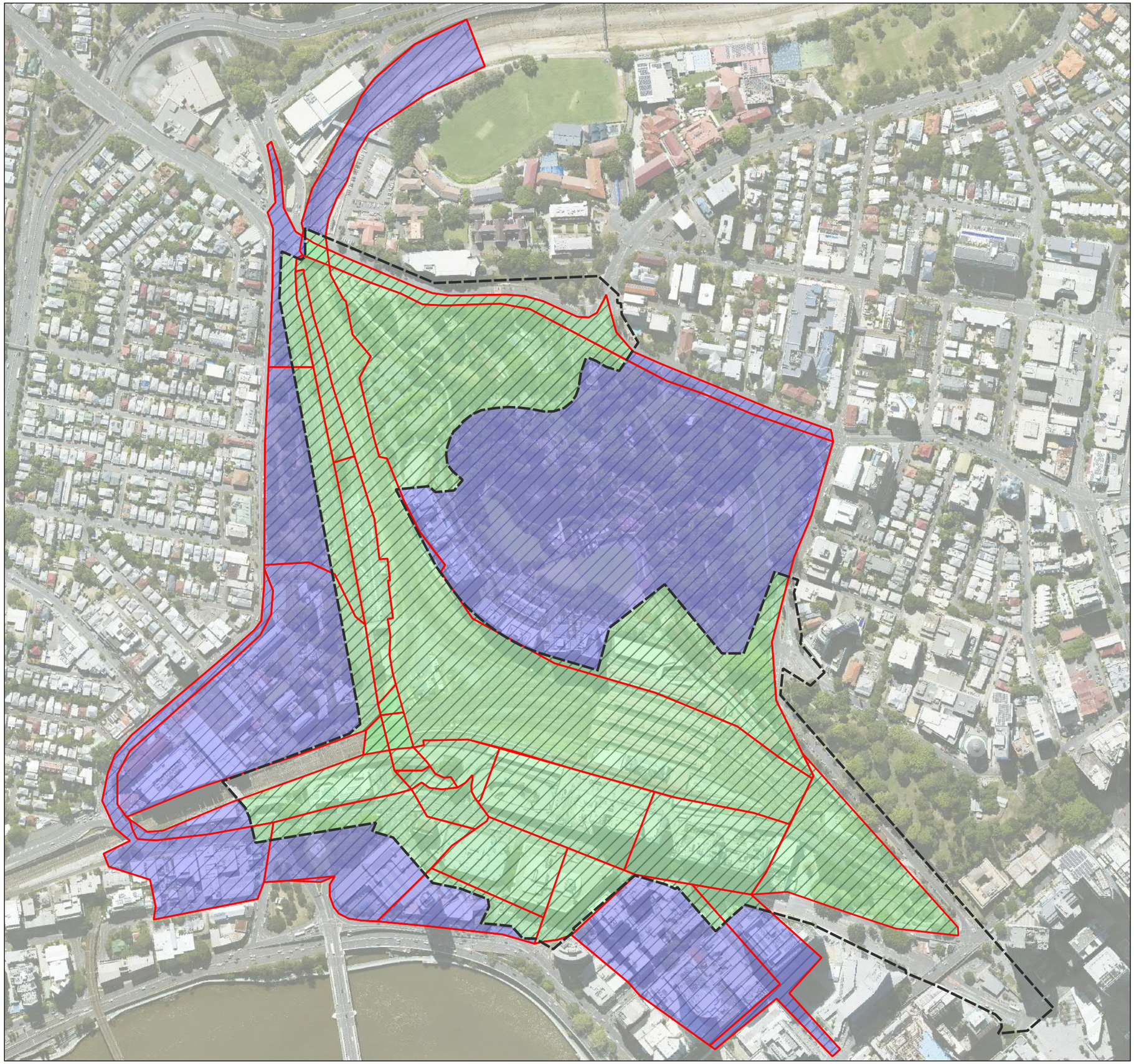
0 25 50 m

Legend

- PDA Boundary
- Design Case Catchments

Design Case Catchment Classification

- CRR PDA Catchment
- External Catchment



SURBANA JURONG SMEC

Appendix B Trunk Network Layout and ID

Cross River Rail Roma St Precinct
Master Drainage Study

Figure 06
Trunk Network Identification and Main Trunk Pipe Size

Data Sources
QLD Government 2019, Brisbane City Council 2020, Metromap 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

0 25 50 m

Legend

- PDA Boundary

Trunk Line ID

- Line A
- Line B
- Line C
- Line D
- Line E
- Line F
- Line G
- Line H
- Line I

SURBANA JURONG SMEC

Appendix C Existing Case Pipe Capacity

Cross River Rail Roma St Precinct
Master Drainage Study

Figure 05
Existing Case Pipe Capacity

Data Sources
QLD Government 2019, Brisbane City Council 2020, Metromap 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

0 25 50 m

Legend

PDA Boundary

Pipe Capcity Existing Case

Pipe Has Capacity

No Pipe Capacity, Not Surcharging

No Pipe Capacity, Surcharging

SURBANA JURONG SMEC

Appendix D Existing Case Proposed Network Solution

Cross River Rail Roma St Precinct
Master Drainage Study

Figure 04
Trunk Network Proposed Upgrades

Data Sources
QLD Government 2019, Brisbane City Council 2020, Metromap 2020

Disclaimer
While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document.

0 25 50 m

Legend

PDA Boundary

Trunk Network Proposed Upgrades

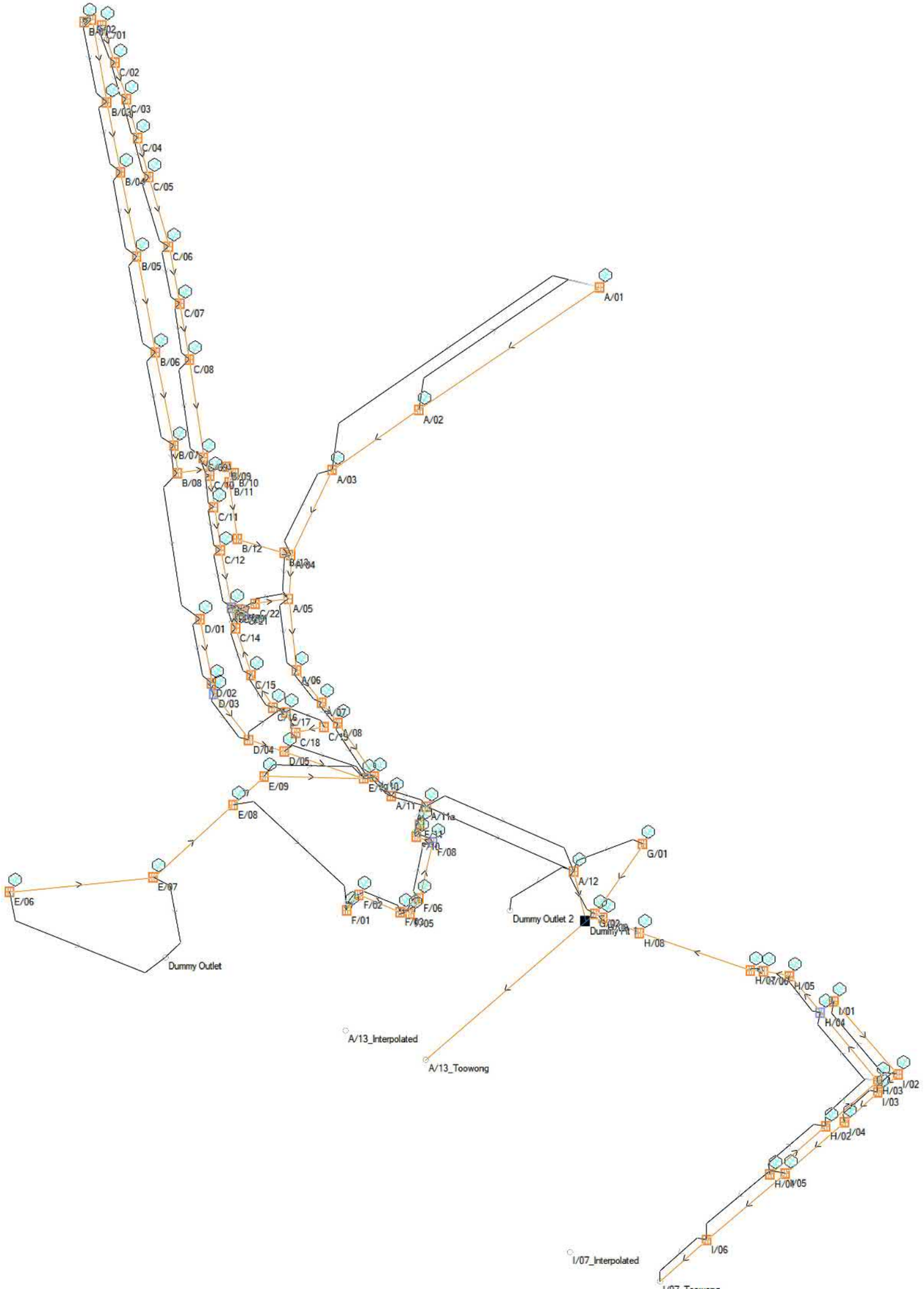
Existing Pipes

Proposed Upgrades

Pipe	Infrastructure Type	New Size (m)	Length (m)	Estimated Timing
1	Stormwater	1.8x1.8	5.5	2031
2	Stormwater	2.4x2.4	13.5	2031
3	Stormwater	2.4x2.4	25	2031
4	Stormwater	2.4x2.4	210	2031
5	Stormwater	0.525	13.59	2031
6	Stormwater	0.525	31.396	2031
7	Stormwater	0.525	2.18	2031
8	Stormwater	0.600	7.812	2031
9	Stormwater	0.601	40.161	2031
10	Stormwater	0.602	11.732	2031
11	Stormwater	0.603	8.895	2031
12	Stormwater	0.604	13.43	2031

Appendix E DRAINS Model and Results

DRAINS Model Layout



TITLE BLOCK LINE 1
TITLE BLOCK LINE 2
TITLE BLOCK LINE 3

Discharge Summary

Pipe	Discharge (m3/s)		
	Existing Case	Existing Case Solved	PDA Design Scenario
P A/01	3.003	3.078	3.08
P A/02	5.442	5.565	5.624
P A/03	9.878	9.949	9.946
P A/04	10.567	10.786	10.996
P A/05	14.887	15.313	15.578
P A/06	14.226	14.486	14.75
P A/07	13.84	14.142	14.381
P A/08	13.942	14.333	14.511
P A/10	10.309	16.024	16.457
P A/11	11.496	15.978	16.422
P A/11a	13.498	17.067	17.427
P A/12	14.912	17.091	17.526
P G/02	14.619	18.391	19.398
P B/01	0.249	0.249	0.249
P B/02	0.335	0.335	0.335
P B/03	0.32	0.32	0.32
P B/04	0.366	0.365	0.365
P B/05	0.359	0.359	0.359
P B/06	0.644	0.644	0.644
P B/07	0.642	0.643	0.643
P B/08	0.659	0.66	0.659
P B/09	0.657	0.657	0.657
P B/10	0.657	0.657	0.657
P B/11	0.681	0.681	0.681
P B/12	0.657	0.657	0.657

Pipe	Discharge (m3/s)		
	Existing Case	Existing Case Solved	PDA Design Scenario
P B/13	0.657	0.657	0.657
P C/01	0.037	0.037	0.037
P C/02	0.074	0.074	0.074
P C/03	0.111	0.111	0.111
P C/04	0.148	0.148	0.148
P C/05	0.185	0.185	0.185
P C/06	0.237	0.237	0.237
P C/07	0.295	0.295	0.295
P C/08	0.352	0.352	0.352
P C/09	0.409	0.409	0.409
P C/10	0.468	0.467	0.467
P C/11	0.531	0.533	0.532
P C/12	0.581	0.581	0.581
P Dummy	1.945	1.947	1.946
P C/19	0.076	0.07	0.07
P C/18	0.102	0.105	0.102
P C/17	0.253	0.253	0.254
P C/16	0.298	0.298	0.298
P C/15	0.352	0.352	0.352
P C/14	0.782	0.778	0.778
P C/20	0.798	0.797	0.798
P C/21	0.854	0.855	0.854
P C/22	1.253	1.253	1.253
P D/01	0.565	0.59	0.59
P D/02	0.6	0.677	0.677
P D/03	0.777	0.789	0.789

Pipe	Discharge (m3/s)		
	Existing Case	Existing Case Solved	PDA Design Scenario
P D/04	0.81	0.921	0.919
P D/05	0.842	0.936	0.919
P E/10	1.511	1.773	1.585
P E/06	0.441	0.441	0.441
P E/07	0.384	0.406	0.395
P E/08	0.435	0.47	0.447
P E/09	0.603	0.667	0.605
P F/01	0.204	0.416	0.425
P F/02	0.228	0.435	0.457
P F/03	0.257	0.482	0.483
P F/05	0.293	0.543	0.541
P F/06	0.403	0.624	0.625
P F/08	0.521	0.708	0.726
P F/10	0.649	0.867	0.909
P F/11	1.017	1.254	1.297
P G/01	0.769	0.77	1.769
P G/01a	1.856	1.834	2.79
P H/01	0.087	0.088	0.088
P H/02	0.185	0.188	0.188
P H/03	0.126	0.118	0.117
P H/04	0.337	0.307	0.3
P H/05	0.435	0.395	0.386
P H/06	0.584	0.584	0.573
P H/07	0.824	0.823	0.814
P H/08	1.103	1.103	1.092
P H/09	1.206	1.205	1.193

Pipe	Discharge (m3/s)		
	Existing Case	Existing Case Solved	PDA Design Scenario
P I/01	0.156	0.154	0.155
P I/02	0.305	0.311	0.309
P I/03	0.378	0.378	0.379
P I/04	0.458	0.461	0.461
P I/05	0.472	0.472	0.472
P I/06	0.471	0.471	0.471