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)	2020-2025[2]	2025[2] - 2026[3]	2026[3] - 2031	2032-2041	2041 (ultimate)
P2	1 Bedroom Dwelling	-	-	-	89	89	89
	2 Bedroom Dwelling	-	-	-	89	89	89
	3+ Bedroom Dwelling	-	-	-	20	20	20
P3	1 Bedroom Dwelling	-	-	-	-	292	292
	2 Bedroom Dwelling	-	-	-	-	292	292
	3+ Bedroom Dwelling	-	-	-	-	65	65
P4	Hotel Suite (1/2 Bed)	191	-	-	357	357	357
P5	1 Bedroom Dwelling	-	-	471	471	471	471
	2 Bedroom Dwelling	-	-	471	471	471	471
	3+ Bedroom Dwelling	-	-	105	105	105	105
Total		191	-	1,046	1,601	2,251	2,251

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)	2020-2025[2]	2025[2] - 2026[3]	2026[3] - 2031	2032-2041	2041 (ultimate)
P1	Education/Research	-	-	-	-	82,890	82,890
	Low Impact Industry	475	475	475	475	-	-
P2	Commercial (Office)	948	948	948	11,970	23,939	23,939
P3	Commercial (Office)	35,700	35,700	35,700	35,700	104,567	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	3,043	-	16,362	16,362	16,362
	Entertainment (PMEA)	-	-	-	57,096	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.

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

Legend

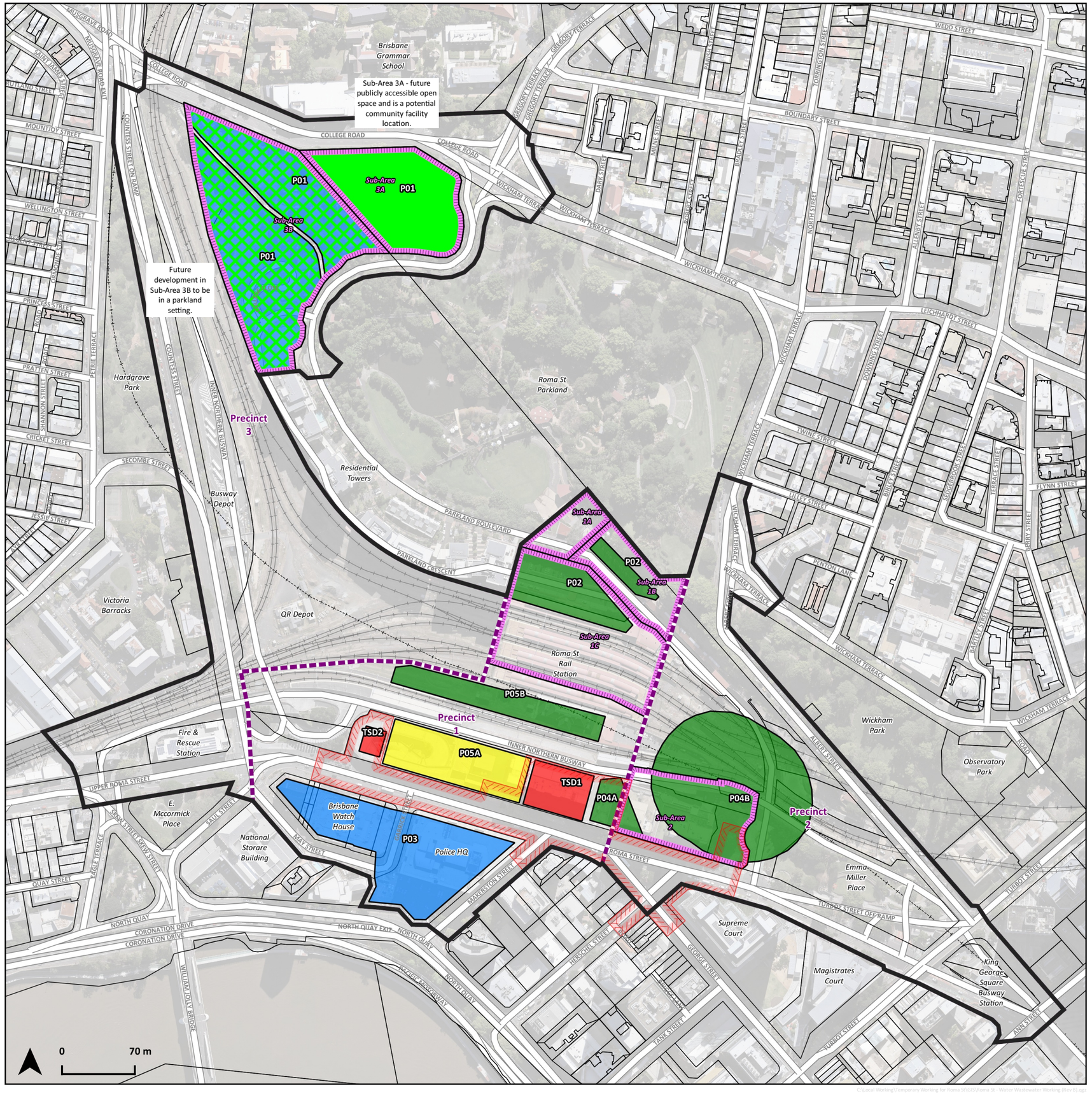
- Existing Rail
- Existing Road
- CRR Alignment
- Base Parcels
- PDA Boundary
- TSD Delivery Area
- PDA Precinct Boundary
- PDA Sub-Area Boundary

Development Sites (by Stage & Year) (Indicative Only)

- Stage 1 (TSD) (2020-2025)
- Stage 2 (2025 - 2026)
- Stage 3 (2026 - 2031)
- Stage 4 (2032 - 2041)

Future Publicly Accessible Open Space

- Parkland Setting Development (inc. Publicly Accessible Open Space)
- Publicly Accessible Open Space (Park)



Version Date & Time: 26/05/2021 08:33

Data Sources
QLD Government 2021, Brisbane City Council 2021

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CROSSRIVERRAIL

C:\Local Working\Temporary Working for Roma St\GIS\Roma St - Water Wastewater Working (Rev B).qgz

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)	2020-2025[2]	2025[2] - 2026[3]	2026[3] - 2031	2032-2041	2041 (ultimate)
Water Supply Network	930	334	1,492	4,881	6,831	6,831
Wastewater Network	930	334	1,492	4,881	6,831	6,831
Stormwater Network	N/A	N/A	N/A	N/A	N/A	N/A
Transport Network	18,163	6,725	23,484	72,034	105,839	105,839
Communities Facility Network	622	137	2,210	5,244	5,244	5,244

[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

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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.

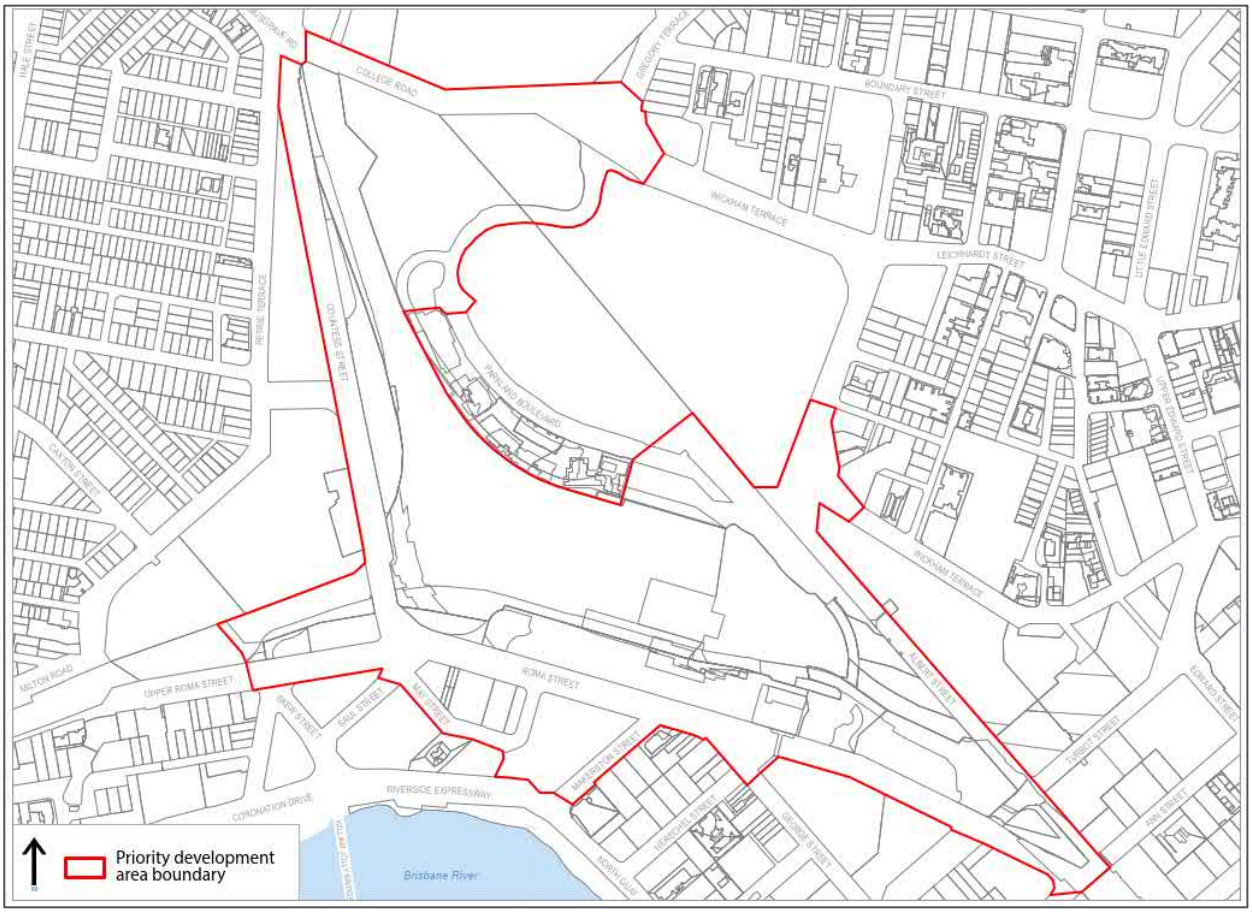


Figure 1-1: Roma Street CRR PDA Boundary (Source: CRRDA Roma Street Interim Land Use Plan Dec 19)

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.

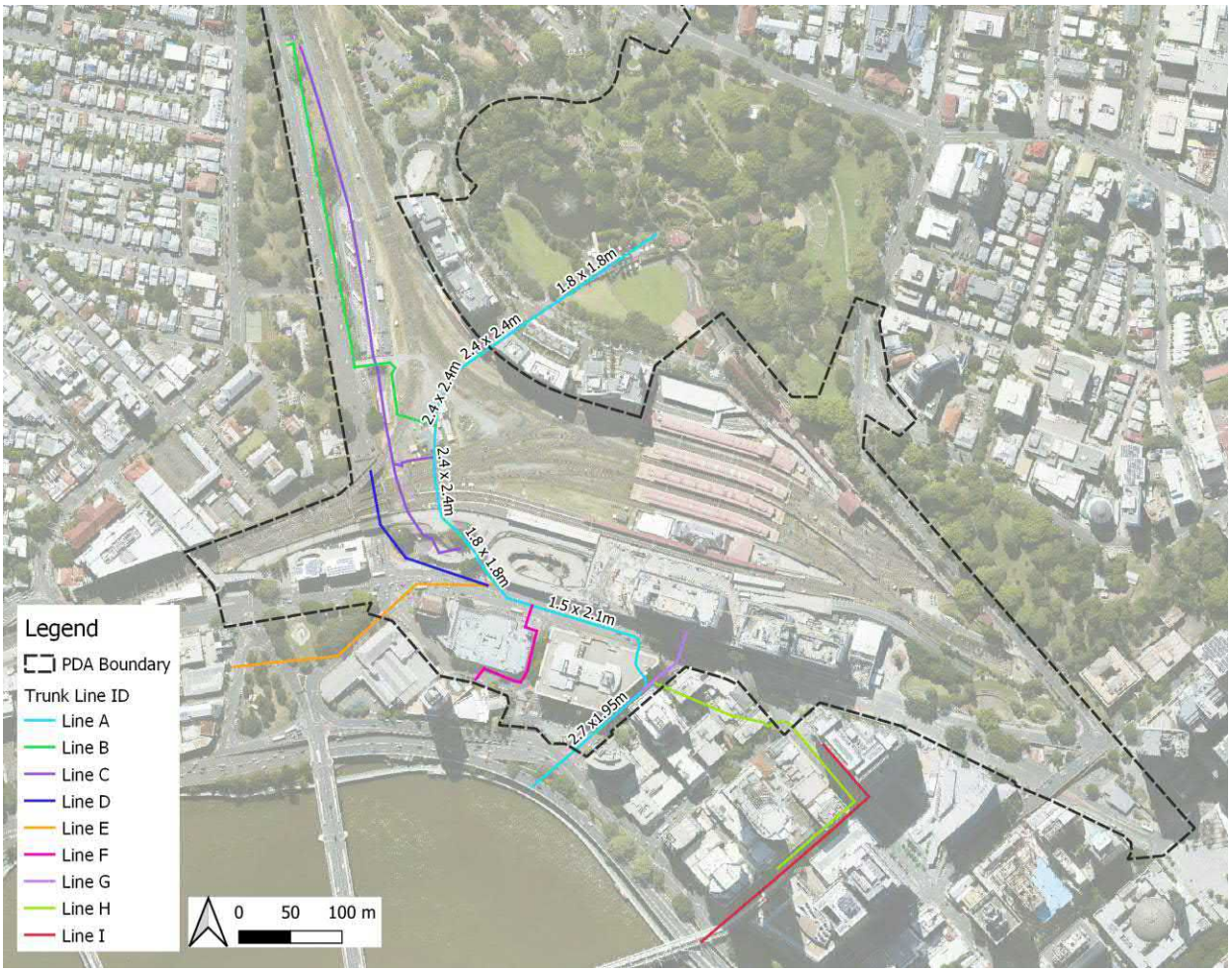


Figure 2-1 - Trunk Network and ID with Line A pipe sizes

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.

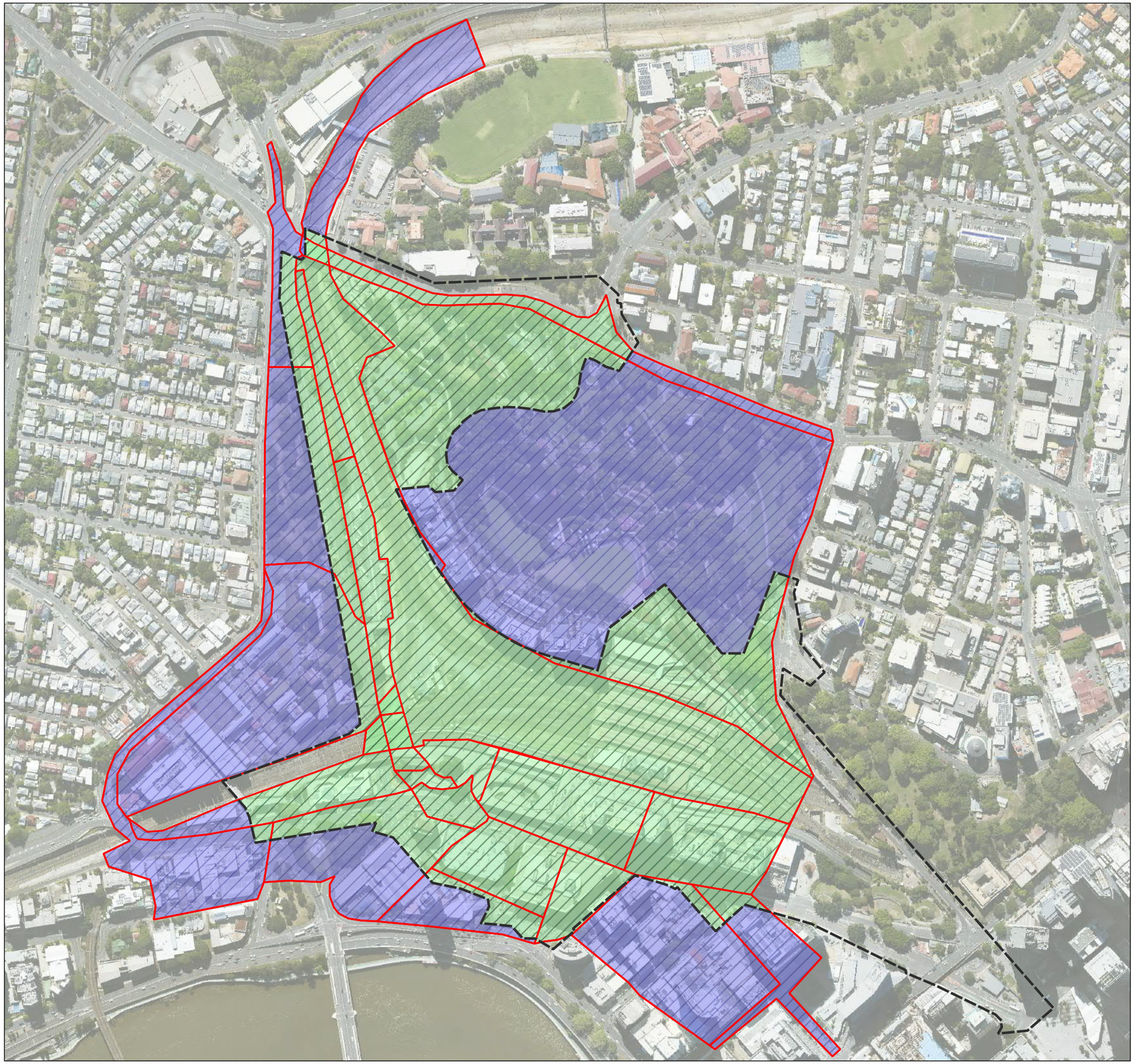
0 25 50 m

Legend

- PDA Boundary
- Existing Case Catchments

Existing Case Catchment Classification

- CRR PDA Catchment
- External Catchment



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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

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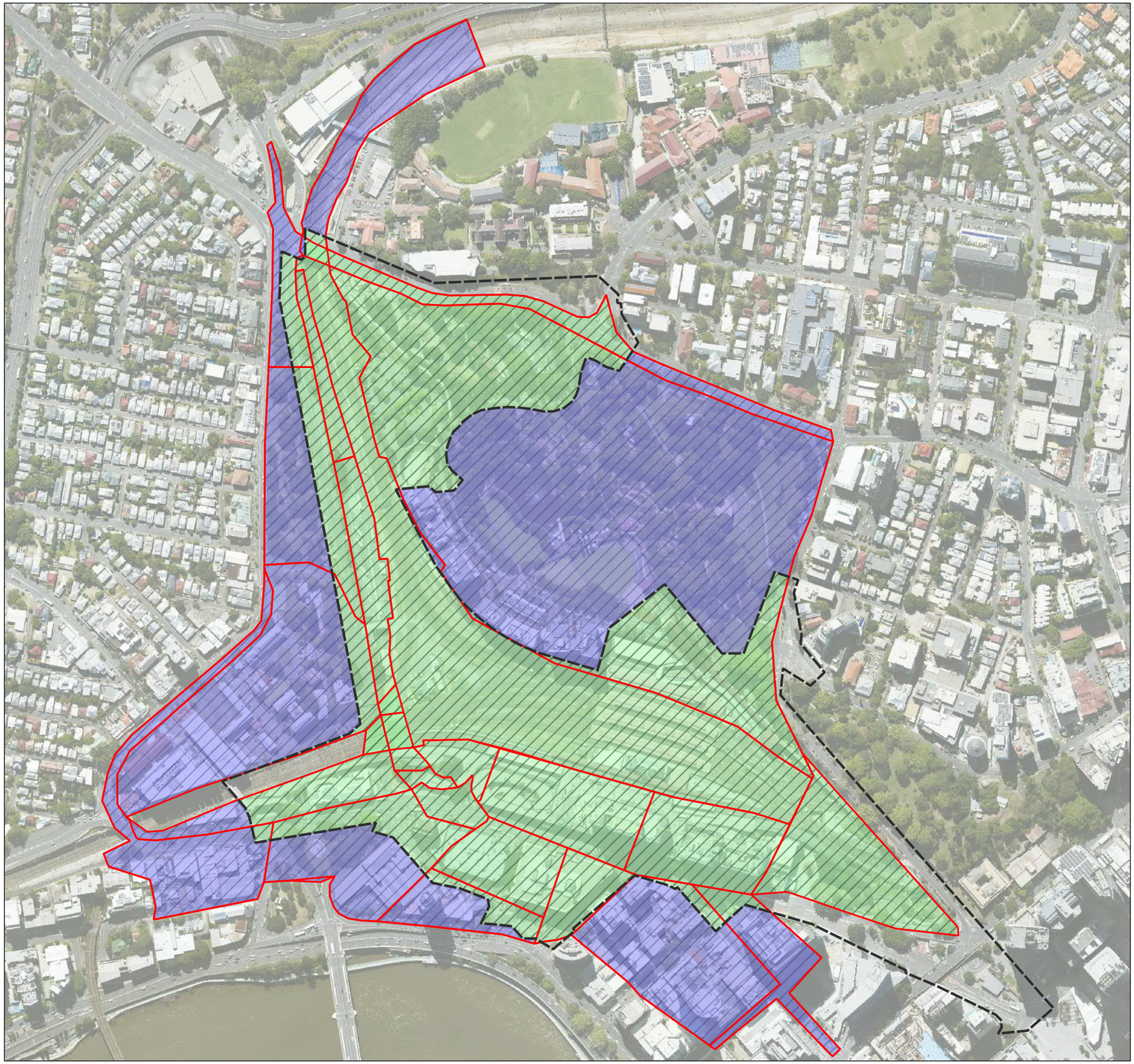
0 25 50 m

Legend

- PDA Boundary
- Design Case Catchments

Design Case Catchment Classification

- CRR PDA Catchment
- External Catchment



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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

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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

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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

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0 25 50 m

Legend

PDA Boundary

Pipe Capcity Existing Case

Pipe Has Capacity

No Pipe Capacity, Not Surcharging

No Pipe Capacity, Surcharging

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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

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0 25 50 m

Legend

PDA Boundary

Trunk Network Proposed Upgrades

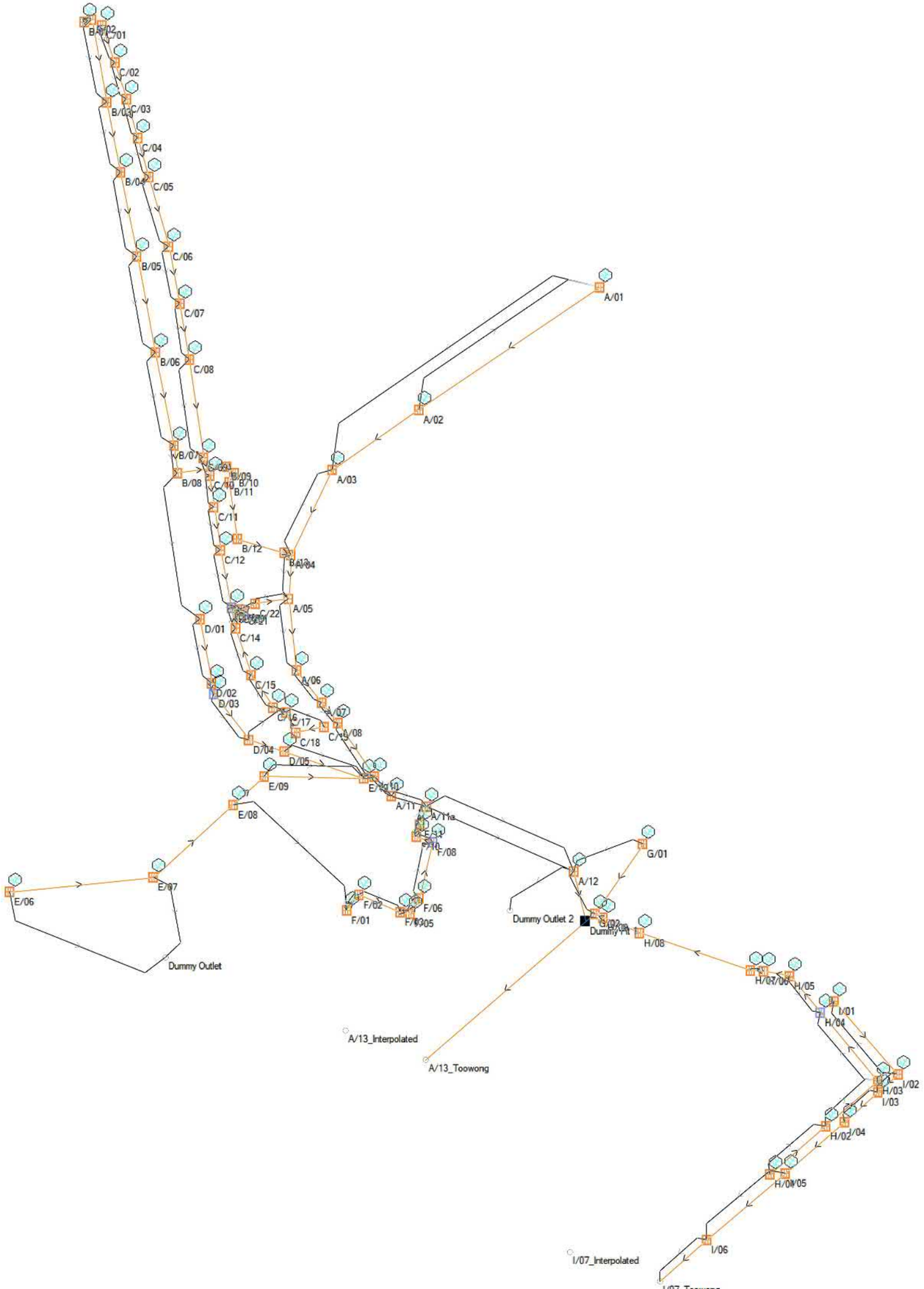
Existing Pipes

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