

SITE BASED STORMWATER MANAGEMENT PLAN

FOR THE PROPOSED GREENBANK SHOPPING CENTRE STAGE 2

LOCATED AT
15 & 19-69 PUB LANE, GREENBANK

PREPARED FOR REGION GROUP

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2019/1087/11

Date: 25/03/2026



**BORNHORST
+ WARD**

Bornhorst & Ward Pty Ltd

A.B.N. 78 010 151 354

A.C.N. 010 151 354

Level 14, 133 Mary Street

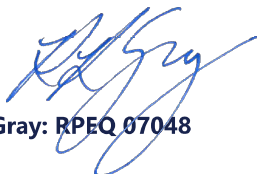
Brisbane Qld 4000

Phone: (07) 3013 4699

E-mail: mail@bornhorstward.com.au

Bornhorst and Ward Project No: **21282**If you have any queries regarding this proposal, then please contact: **Robert Gray**

Revision	Date	Description	Author	Rev.	App.
A	Dec 2021	Draft for consultant team review for DA submission	RG	RG	
B	Dec 2021	Update on staging and associated calculations and wording	STIO		
C	Apr 2023	Issue to Client	ST	RG	RG
D	Aug 2023	Response to RFI	ST	RG	RG
E	Oct 2023	Response to Further Issues	ST	RG	RG
F	Aug 2025	Updated Stage 2 Masterplan	AM	MN/WU	NR
G	Sep 2025	Updated locality plan & DA drawings & added flood report	MN	MN	NR
H	Dec-2025	Revised architectural staging			RG


Rob Gray: RPEQ 07048

COPYRIGHT: This document is and shall remain the property of Bornhorst & Ward Pty Ltd and shall not be copied in whole or part. Unauthorized use of this document in any form is prohibited.

File Name: J:\2021\21282_B\07_REPORTS\DESIGNREPORTS\RPT_SWMP(H).docx

CONTENTS

1. INTRODUCTION.....	1
2. SITE CHARACTERISTICS.....	1
2.1 LOCATION AND EXISTING FEATURES	1
2.2 PROPOSED DEVELOPMENT.....	2
2.2.1 Staging.....	2
2.3 TOPOGRAPHY AND CATCHMENT CHARACTERISTICS	3
2.4 EXISTING FLOODING CONDITIONS	4
3. EXISTING AND PROPOSED STORMWATER INFRASTRUCTURE.....	5
3.1 EXISTING INFRASTRUCTURE	5
3.2 PROPOSED STORMWATER DRAINAGE	5
4. STORMWATER QUANTITY ANALYSIS	6
4.1 DETAILED HYDRAULIC MODELLING – XPSTORM	6
4.1.1 Existing Scenario Model.....	6
4.1.2 Results for Existing Scenario	7
4.1.3 XP Storm and Rational Method Comparison	7
4.1.4 Detention Basin Design	8
4.1.5 Results for Developed Scenario	9
4.1.6 Hydraulic Impacts on Downstream Waterway Corridor.....	9
5. STORMWATER QUALITY	10
5.1 CONSTRUCTION PHASE	10
5.2 OPERATIONAL PHASE.....	10
5.2.1 Pollutants of Concern	10
5.2.2 Modelling/Assessment Approach.....	11
5.2.3 Meteorological Data	11
5.2.4 Source Nodes.....	11
5.2.5 Treatment Nodes	12
5.2.6 Proposed Treatment Train	13
5.2.7 Results.....	14
6. LOGAN CITY COUNCIL CODES.....	14
7. SUMMARY	14

LIST OF FIGURES

Figure 1: Site Locality Plan	2
Figure 2: Logan City Council Interactive Flood Map.....	4
Figure 3: Proposed Treatment Train.....	13

LIST OF TABLES

Table 1: XP Storm Existing Model Parameters	6
Table 2: XP Storm Existing Peak Flow Results – Catchment A (m ³ /sec)	7
Table 3: Comparison of Rational Method & XP Storm Existing Peak Flows (m ³ /sec)	7
Table 4: XP Storm Developed Model Hydraulic Routing – Basin 1	8
Table 5: XP Storm Developed Mitigated Peak Flow Results – Catchment A (m ³ /sec).....	9
Table 6: XP Storm Existing and Developed Mitigated Peak Discharge Comparison – Catchment A (m ³ /sec).....	9
Table 7: South East Queensland Water Quality Objectives	10
Table 8: Source Node Information.....	11
Table 9: Selected Stormwater Quality Treatment Devices	12
Table 10: Pollutant Removal Rates Discharge	14

APPENDICES

Appendix A	DEVELOPMENT DRAWINGS
Appendix B	ENGINEERING DRAWINGS
Appendix C	EXISTING STORMWATER AND CONTOUR INFORMATION
Appendix D	RATIONAL METHOD CALCULATIONS
Appendix E	XPSTORM OUTPUTS
Appendix F	MUSIC DATA
Appendix G	COUNCIL CODES

1. INTRODUCTION

Bornhorst and Ward has been commissioned to investigate and report on the stormwater requirements pertaining to the proposed Stage 2 extension to the Greenbank Shopping Centre located on the corner of Teviot Road and Pub Lane, Greenbank (Lots 1 & 7 on SP214051). The proposal consists of constructing new tenancies, associated carparking and landscaping, and a new access to Pub Lane. Plans of the proposed development can be seen in Appendix A.

This document reports on the existing and proposed civil works and stormwater infrastructure required as part of the proposed development as well as the stormwater quantity and quality management required for the site. The engineering requirements for this proposal shall be in accordance with Engineering Best Management Practices, Logan City Council Planning Scheme 2015, the Queensland Urban Drainage Manual (QUDM 2017) and the State Planning Policy 2017.

This report outlines the preliminary design methodology and calculations in support of a Development Application and should be read in conjunction with other documents issued by the consultant team.

2. SITE CHARACTERISTICS

2.1 LOCATION AND EXISTING FEATURES

The development site, located at 15 & 19-69 Pub Lane, Greenbank has the following existing characteristics:

- The site is bound by low density residential to the north; the existing Greenbank Shopping Centre to the east; Pub Lane to the south; and undeveloped land to the west.
- The existing site is undeveloped and consists of grass and tree cover;
- The total area of the site is 14.100 ha;
- Existing access to the Greenbank Shopping Centre site is achieved via Pub Lane and Teviot Road;
- There are two easements located within the site extents (A & B on SP214051) for drainage;
- The site is located within the Greater Flagstone Priority Development Area.

Refer to Figure 1 for locality details.



Figure 1: Site Locality Plan

2.2 PROPOSED DEVELOPMENT

The following points outline the extent of works for the proposed development:

- It is proposed to construct new tenancies for the Greenbank Shopping Centre, associated carparking and landscaping, and a new access to Pub Lane.

Refer to the development drawings in Appendix A for further details of the proposed development.

2.2.1 Staging

Stage 2A will require the expansion of the existing detention basin, along with provision of a temporary bund or swale to direct runoff from Stage 2A and portions of Stage 1 to the rear detention basin. Expansion of the detention basin also requires the reconfiguration of the outlet pipes and discharge channel as indicated on DA-C030. Direct-to-Boot (DTB) expansion will utilise existing Stage 1 stormwater systems and discharges to the expanded detention system

2.3 TOPOGRAPHY AND CATCHMENT CHARACTERISTICS

The topography and catchment characteristics are as follows:

- The high point of the existing Stage 2 site is approximately RL 69.50m AHD located towards the south-eastern corner of stage 2;
- The development falls to the northwest at an average grade of 2.3% to a low point of approximately RL 63.5m AHD near the railway corridor;
- A Drainage easement along the north boundary accepts flow from the existing Greenbank Shopping Centre. This flow is directed into an existing detention basin before discharging into the Railway Corridor.
- Rainfall on the site will sheet flow towards the east. Once in the railway corridor the stormwater will travel to the north where it connects the drainage easement along the north boundary.
- A culvert under the railway allows stormwater to flow into the neighbouring Power Corridor. This conveys flow from 13.115 ha of the site. Marked as EX CATCH A, in the attached plans. Runoff from the current centre is captured in roof water and stormwater systems before being directed to an open channel along the northern boundary. A detention basin exists within the Stage 2 development site to service the existing development.
- A small portion of the site. 0.74 ha marked as EX CATCH B is conveyed to the south, under Pub Lane.
- There are no external catchments associated with the development site;

See the survey plan in Appendix C for more information.

2.4 EXISTING FLOODING CONDITIONS

A Logan City Council Flood Report has been obtained for the site and states the following:

- No flood levels or flags for building development purposes exist for the development site.
- The interactive mapping system within Logan PD Hub confirms that the development site is not affected by flooding.
- It is expected that the site is at a low risk of flood inundation.

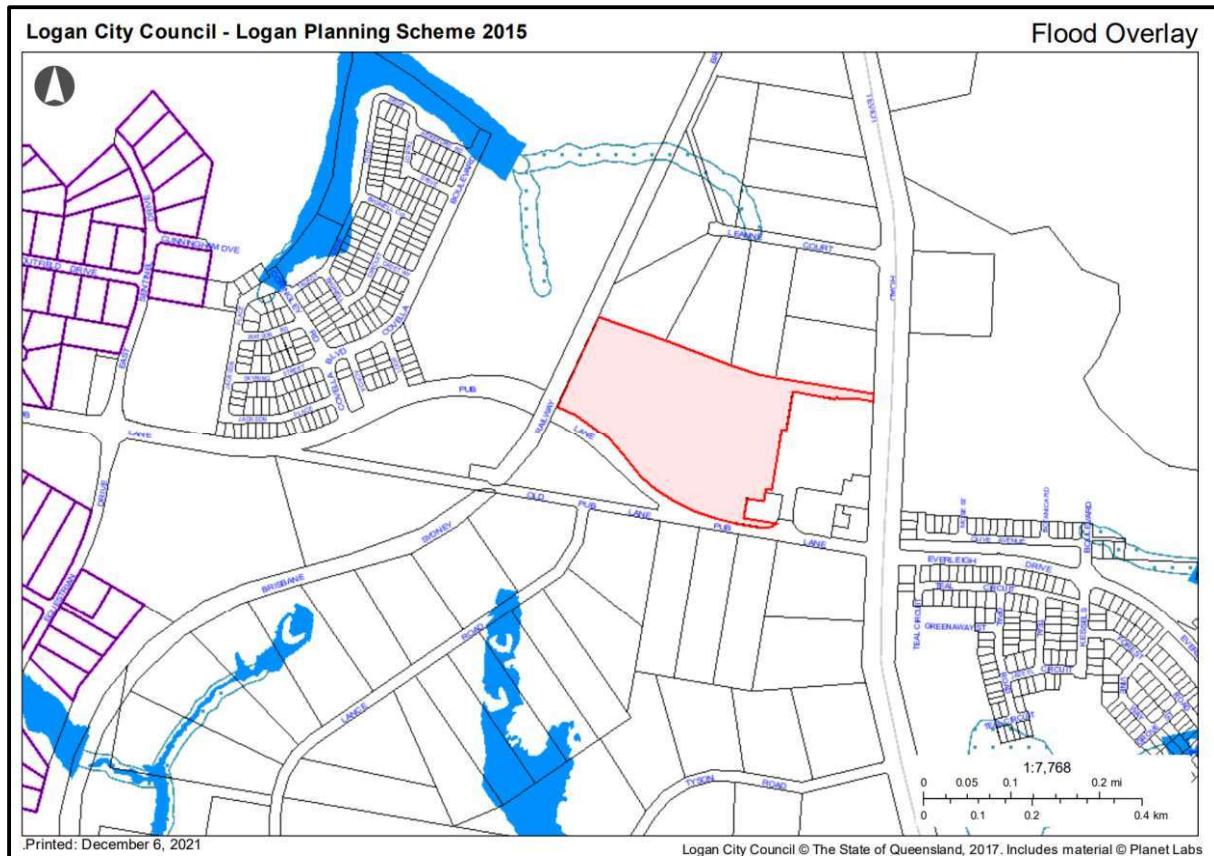


Figure 2: Logan City Council Interactive Flood Map

3. EXISTING AND PROPOSED STORMWATER INFRASTRUCTURE

3.1 EXISTING INFRASTRUCTURE

A Dial Before You Dig Investigation has been completed of the site and its surrounding area. The following stormwater infrastructure was noted:

- There are 3 x 450mm dia. stormwater pipes flowing south from the development site across Pub Lane; This takes a small portion of the site, 0.74 ha to the south. This is marked as Catchment B in the appendix.
- A large grassed open channel along the northern boundary, drains the development towards the west, into a detention basin. Discharge from Stage 1 of the shopping centre enters this drain from 2 locations, each with a Gross Pollutant Trap (GPT) immediately prior to discharge.

Council Asset Plans of the existing stormwater infrastructure can be found in Appendix C of this report.

3.2 PROPOSED STORMWATER DRAINAGE

The following points outline the proposed stormwater infrastructure for the development site:

- As there will be an increase to the impervious area as a result of the development, there will be an increase to peak stormwater flow from the site. Based on this, stormwater detention is required.
- Considering the development area is greater than 2500m², stormwater quality improvement will be required for the site. It is noted that alternate and equivalent SQID may be selected following detailed building hydraulic design.
- The internal piped stormwater network will be designed for the 10% AEP event. Stormwater will be directed into the northern drainage easement and treated either through Proprietary Stormwater Improvement devices or/and Bio retention basins. Refer to section 5.2.5 of this report for details.
- For larger events, the carparking and other hardstand areas will be graded to direct the excess flow to the proposed detention basin.
- The proposed detention basin will discharge into the channel along the north boundary. This channel will convey flows east towards the railway corridor.
- The proposed development for stage 2 will require the removal of the existing detention basin sized for stage 1. As such, the proposed detention basin for stage 2 will be sized to accommodate for both stage 1 and stage 2 flows.

Refer to the engineering drawings in Appendix B for further information.

4. STORMWATER QUANTITY ANALYSIS

4.1 DETAILED HYDRAULIC MODELLING – XPSTORM

A detailed hydrologic and hydraulic analysis using XPStorm software has been undertaken to model the stormwater flow characteristics of the site.

XP Storm is a hydraulic modelling package that allows many different storm events to be run, each with differing rainfall intensity and duration. Hydrographs used in our analysis of the site were calculated using the Laurenson Method for runoff routing in conjunction with the Uniform Loss model for determining soil infiltration. XPStorm has been used to size the detention basin such that the flow rates in the developed site do not exceed that of the existing site.

Refer to Appendix B for existing and developed catchment plans.

4.1.1 Existing Scenario Model

The existing scenario was constructed to assess the predevelopment flow rates through the railway corridor, (Existing Catchment A). This predevelopment scenario was based on the site properties prior to the construction of the existing Greenbank Shopping Centre. The values used in for this existing catchment are provided in Table 1.

Table 1: XP Storm Existing Model Parameters

Parameter	Catchment A	
	Pervious Data	Impervious Data
Area (ha)	13.115	-
Slope (%)	0.02	-
Mannings 'n'	0.05	-
Initial Loss (mm)	5	-
Continuing Loss (mm/hr)	1.1	-
Laurenson 'n'	-0.285	-

4.1.2 Results for Existing Scenario

Table 2 indicates the existing total peak discharge rate for Catchment A as calculated by XPStorm. The critical storm duration for the existing catchment was determined by simulating the storm events shown in Table 2. The flow rates from the critical duration storm are provided below. For 63% and 39% AEP storms, the critical duration is 90 mins long. For the storms greater than this, the time of concentration reduces to 60 min.

Table 2: XP Storm Existing Peak Flow Results – Catchment A (m³/sec)

Storm Duration (min)	AEP (%)						
	63	39	20	10	5	2	1
20	0.364	0.464	0.788	1.046	1.328	1.681	1.988
25	0.424	0.532	0.928	1.228	1.528	1.969	2.327
30	0.479	0.598	1.038	1.371	1.731	2.205	2.598
45	0.597	0.743	1.262	1.637	2.014	2.548	2.982
60	0.654	0.798	1.326	1.721	2.128	2.666	3.112
90	0.664	0.806	1.304	1.691	2.100	2.561	2.982
120	0.646	0.785	1.258	1.610	1.988	2.371	2.771
180	0.596	0.717	1.132	1.456	1.791	2.092	2.453
Critical	0.664	0.806	1.326	1.721	2.128	2.666	3.112

Discharge hydrographs for the existing model have been included in Appendix E.

4.1.3 XP Storm and Rational Method Comparison

Before utilising data from XP Storm, Logan City Council require a comparison of results from XP Storm and the Rational Method. This was undertaken to ensure that the XP Storm model was functioning correctly. Peak discharge rates from the site in the existing case were compared ("Catchment A" defined in Table 1). The comparison is outlined in Table 3. Detailed Rational Method calculations can be reviewed in Appendix D.

Table 3: Comparison of Rational Method & XP Storm Existing Peak Flows (m³/sec)

ARI (Years)	Rational Method Result	XP Storm Result
1	0.712	0.664
2	0.866	0.806
5	1.350	1.326
10	1.692	1.721
20	2.054	2.128
50	2.651	2.666
100	3.085	3.112

As indicated, the XP Storm peak discharge results are of the same magnitude as the results initially estimated using the Rational Method. It was therefore concluded that the existing XP Storm model was functioning correctly.

4.1.4 Detention Basin Design

For the developed mitigated scenario, a storage node representing the proposed detention basin was included in the model.

The civil design software 12d Model was used to create a detention basin suitable for the development and output the depth to storage volume relationship. This was used by XPStorm to provide realistic flow and detention characteristics. See Table 6 depth to volume relationship used in the XPStorm model.

Table 4: XP Storm Developed Model Hydraulic Routing – Basin 1

Depth (m)	Area (m2)	Approximate Volume (m3)
0.00	0	0
0.05	382	18
0.10	609	42
0.15	899	80
0.20	1216	133
0.25	1557	202
0.30	1929	289
0.35	2304	395
0.40	2612	518
0.45	2855	655
0.50	3026	802
0.55	3136	957
0.60	3188	1115
0.65	3237	1275
0.70	3286	1439
0.75	3335	1604
0.80	3384	1772
0.85	3433	1942
0.90	3482	2115
0.95	3531	2291
1.00	3581	2469
1.05	3630	2649
1.10	3679	2831
1.15	3728	3017
1.20	3778	3204

Using this information, the basic outlet configuration for the basin was determined. Though an iterative process it was found that the following outlet configuration is able to prevent an increase in peak flow rate from the site.

Outlets to Basin 1:

- Low flow: 300mm dia. Orifice at +0.05m depth.
- Mid flow 1: 450mm dia. Orifice at +0.50m depth.
- Mid flow 2: 450mm dia. Orifice at +0.50m depth.
- High flow: 450mm dia. Orifice at +0.80m depth.
- High flow weir: 13m long weir with crest at 1.2m depth.

See drawing DA-C030 in Appendix B for more information.

4.1.5 Results for Developed Scenario

Table 5 shows the developed peak flow rate discharged through the railway corridor. To determine the critical storm event for the developed site, including the effect of the detention basin, the 1 to 100 year ARI storm events for 20, 25, 30, 45, 60, 90, 120 and 180 minute durations were simulated in the model, similar to what was done for the existing scenario. This shows that the 60 min storm is the critical storm for the proposed developed site.

Table 5: XP Storm Developed Mitigated Peak Flow Results – Catchment A (m³/sec)

Storm Duration (min)	AEP (%)						
	63	63	63	63	63	63	63
20	0.219	0.312	0.645	0.876	1.075	1.376	1.620
25	0.270	0.371	0.736	0.952	1.189	1.490	2.015
30	0.304	0.413	0.794	1.020	1.269	1.600	2.469
45	0.376	0.499	0.901	1.169	1.427	1.984	2.609
60	0.398	0.526	0.951	1.225	1.515	2.114	2.879
90	0.394	0.521	0.948	1.225	1.515	2.001	2.582
120	0.380	0.499	0.904	1.182	1.454	1.795	2.296
180	0.356	0.463	0.835	1.081	1.346	1.591	1.955
Critical	0.398	0.526	0.951	1.225	1.515	2.114	2.879

Further details of the outputs for the critical events have been located within Appendix E.

4.1.6 Hydraulic Impacts on Downstream Waterway Corridor

A comparison of critical peak flows for the existing and developed scenarios have been included in Table 6. The hydraulic modelling undertaken has demonstrated that the proposed development will not cause a worsening impact downstream of the site in the Q1-Q100 storm events and that the basins have been adequately sized. **Therefore, the required detention volume for the site in the 1% AEP storm event is approximately 3,200m³.** Though some finetuning can be done in the detailed design to get closer to the predevelopment flow rates

Discharge hydrographs, stage/water elevations for the detention basin and associated XP Storm outputs have been included in Appendix E of this report to demonstrate the performance of the proposed detention system.

Table 6: XP Storm Existing and Developed Mitigated Peak Discharge Comparison – Catchment A (m³/sec)

ARI (Years)	Existing Critical Discharge	Developed Critical Discharge	Discharge Difference
1	0.664	0.398	-0.266
2	0.806	0.526	-0.280
5	1.326	0.951	-0.375
10	1.721	1.225	-0.496
20	2.128	1.515	-0.613
50	2.666	2.114	-0.552
100	3.112	2.879	-0.233

5. STORMWATER QUALITY

5.1 CONSTRUCTION PHASE

As a result of the proposed development, contaminants will be generated during the construction phase. A comprehensive Erosion and Sediment Control Plan accounting for the construction process will be prepared during detailed design. This is to be kept on site during the construction phase and will be in accordance with the State Planning Policy 2017 and Logan City Council Planning Scheme.

5.2 OPERATIONAL PHASE

The following is an extract from the Logan Planning Scheme 2015, Schedule 6, PSP 5 – Infrastructure Version 5.1, Section 3.6.1.4 – Stormwater Quality:

Stormwater quality, waterway stability and frequent flow infrastructure is provided to achieve the stormwater management design objectives where the development site is a:

- 1) *Material change of use for urban purposes where:*
 - a) *the size of the premises is greater than 2,500 m²; or*
 - b) *it results in the creation of six or more additional dwellings; or*
 - c) *located in the Loganholme local plan area; or*
 - d) *included in the Highway business precinct of the Specialised Centre Zone and located between the Pacific Highway and the southern boundary of the Loganholme local plan area; or*
- 2) *Reconfiguration of a lot for urban purposes where:*
 - a) *the size of the subject premises is greater than 2,500m² and results in an increased number of non-residential lots (e.g. industrial, commercial, etc.); or*
 - b) *it results in the creation of six or more residential lots; or*
 - c) *located in the Loganholme local plan area and results in a total of four or more lots; or*
 - d) *where included in the Highway business precinct of the Specialised Centre Zone and located between the Pacific Highway and the southern boundary of the Loganholme local plan area and results in a total of four or more lots.*

As the proposed development is for a material of use that involves greater than 2,500m² of land, the State Planning Policy requirements for water quality are applicable to the proposed development.

5.2.1 Pollutants of Concern

The key pollutants to be targeted and the minimum reductions in mean annual loads described in the State Planning Policy for the South East Queensland Region area outlined in Table 7.

Table 7: South East Queensland Water Quality Objectives

Pollutant	Reduction in Mean Annual Load
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants (GP)	90%

5.2.2 Modelling/Assessment Approach

A quantitative assessment of stormwater runoff quality was considered for the catchments ultimate developed scenario.

The predicted reductions in mean annual loads of key pollutants have been identified using the “Model for Urban Stormwater Improvement Conceptualisation” (MUSIC), Version 6 (6.3.0). MUSIC is a stormwater quality modelling program that provides estimates of stormwater pollution generation and the performance of stormwater management measures.

5.2.3 Meteorological Data

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

The time step used for the MUSIC modelling process was the Logan, 6 Minutes data set

5.2.4 Source Nodes

The second step taken in creating the MUSIC models was to define ‘Source Nodes’ or Sub-Catchments. Source nodes for modelling these catchments were based on the Water by Design reference material: Music Modelling Guidelines. The MUSIC model uses the split catchment approach and consists of commercial source nodes. Catchment areas are outlined below.

Table 8: Source Node Information

Node type	Catchment	Area (ha)	Fraction Impervious
Commercial Sealed Road	C1 Carpark	0.239	100%
	C2 Carpark	0.244	100%
	C3 Carpark	0.302	100%
	C4 Carpark	0.150	100%
	C5 Carpark	0.161	100%
	C6 Carpark	0.237	100%
	C7 Carpark	0.289	100%
	C8 Carpark	0.867	100%
	Truck Service Road	0.148	100%
	Truck Turnaround	0.150	100%
Commercial Roof	Roof	1.600	100%

5.2.5 Treatment Nodes

The MUSIC model consisted of 11 treatment nodes as detailed in Table 9. Treatment node input parameters were based on the MUSIC Modelling Guidelines and sourced from the product supplier

Table 9: Selected Stormwater Quality Treatment Devices

Treatment Device	Discussion
Bio-Retention Systems	A bio-retention system is a combination of vegetation and filter substrate that provides treatment of stormwater through filtration, extended detention and some biological uptake. Proposed Bio-retention C1 Area (as modelled): - Filter Area = 71.70m² - Surface Area = 71.70m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C2 Area (as modelled): - Filter Area = 73.26m² - Surface Area = 73.26m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C3 Area (as modelled): - Filter Area = 90.96m² - Surface Area = 90.96m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C4 Area (as modelled): - Filter Area = 45.03m² - Surface Area = 45.03m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C5 Area (as modelled): - Filter Area = 48.42m² - Surface Area = 48.42m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C6 Area (as modelled): - Filter Area = 71.16m² - Surface Area = 71.16m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m Proposed Bio-retention C7 Area (as modelled): - Filter Area = 86.88m² - Surface Area = 86.88m² - Filter Depth = 0.50m - Extended Detention Depth = 0.20m

Tertiary Treatment Device ATLANFilter (or approved equivalent)	The AtlanFilter is a proprietary device containing cartridge filtration designed to remove nutrients and sediments from stormwater runoff. It is noted an oil management device is proposed in the loading dock area upstream of the proposed cartridge filtration. Proposed 20 x ATLANFilters (as modelled): High flow bypass (total) = 56.8 L/s
Gross Pollutant Trap Atlan StormSack (or approved equivalent)	A gross pollutant trap is a stormwater treatment device that aims to capture large, non-biodegradable waste such as litter, plastics, microplastics, and coarse sediment. They are typically installed at the inlet of a stormwater drain to prevent these pollutants from entering the stormwater system. 4x Atlan StormSacks have been proposed to treat the C8 carpark area, and another 4x have been proposed to treat the truck service road, truck turnaround and roof flows. Proposed 8x Atlan StormSacks (as modelled): High flow bypass (total) = 44 L/s
Detention Device Atlan Vault	While a detention tank does not actively treat stormwater flows, they are required to house the proposed AtlanVaults and is required to be included in MUSIC modelling as treatment node. The proposed AtlanVault has been modelled with 52m² surface area, with enough room to house the proposed AtlanFilters.

Refer to the MUSIC information attached in Appendix F for further details.

5.2.6 Proposed Treatment Train

A 'Treatment Train' was developed to target each of the pollutants of concern to be incorporated into the development site layout. This treatment train is illustrated in Figure 3.

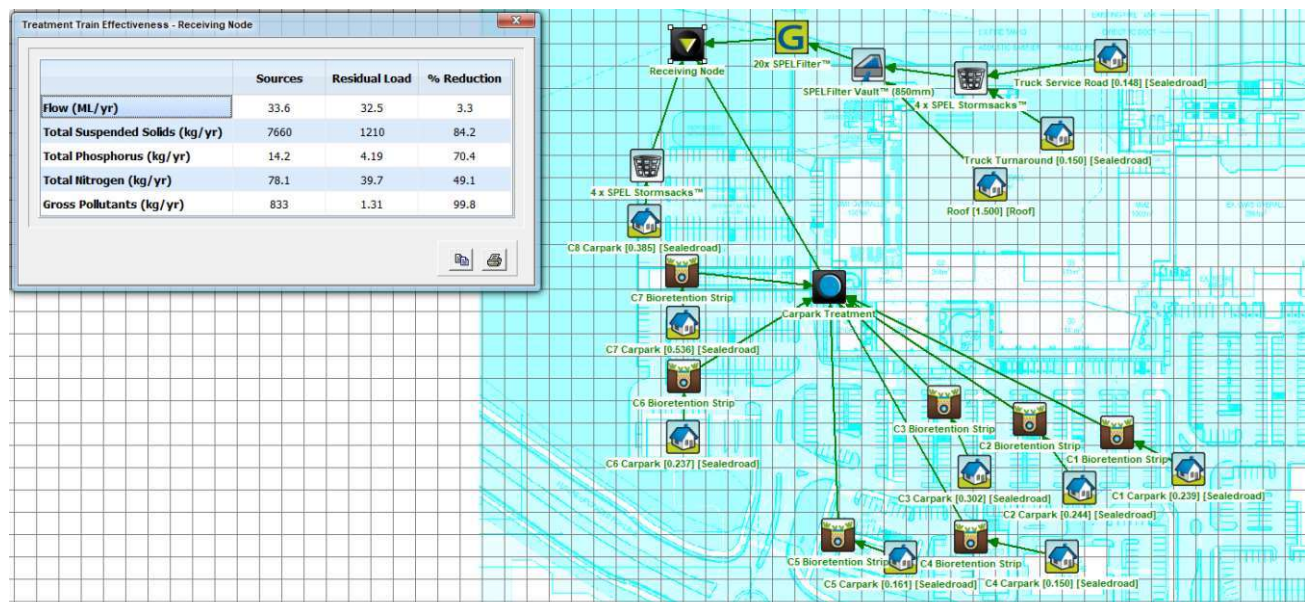


Figure 3: Proposed Treatment Train

5.2.7 Results

The pollutant reductions for the ultimate developed phase of the site, with the inclusion of the detailed treatment train, as obtained from the MUSIC model and analysis are summarised in Table 10.

Table 10: Pollutant Removal Rates Discharge

Pollutant	TSS (%)	TP (%)	TN (%)	GP (%)
Treatment Train Effectiveness	84.1	70.5	49.1	99.8
WQOs	80.0	60.0	45.0	90.0

As indicated in the table above, the removal rates for the target pollutants; total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and gross pollutants (GP) are all above the water quality objectives stipulated in the State Planning Policy. Therefore, the proposed treatment for the site satisfies the requirement for stormwater quality improvement.

6. LOGAN CITY COUNCIL CODES

The relevant Logan City Council Codes with respect to engineering aspects for assessment of the Development Application have been addressed. The codes will assist in assessing operational works requirements. The codes addressed in this report include: -

- Filling and Excavation Code;
- Infrastructure Code.

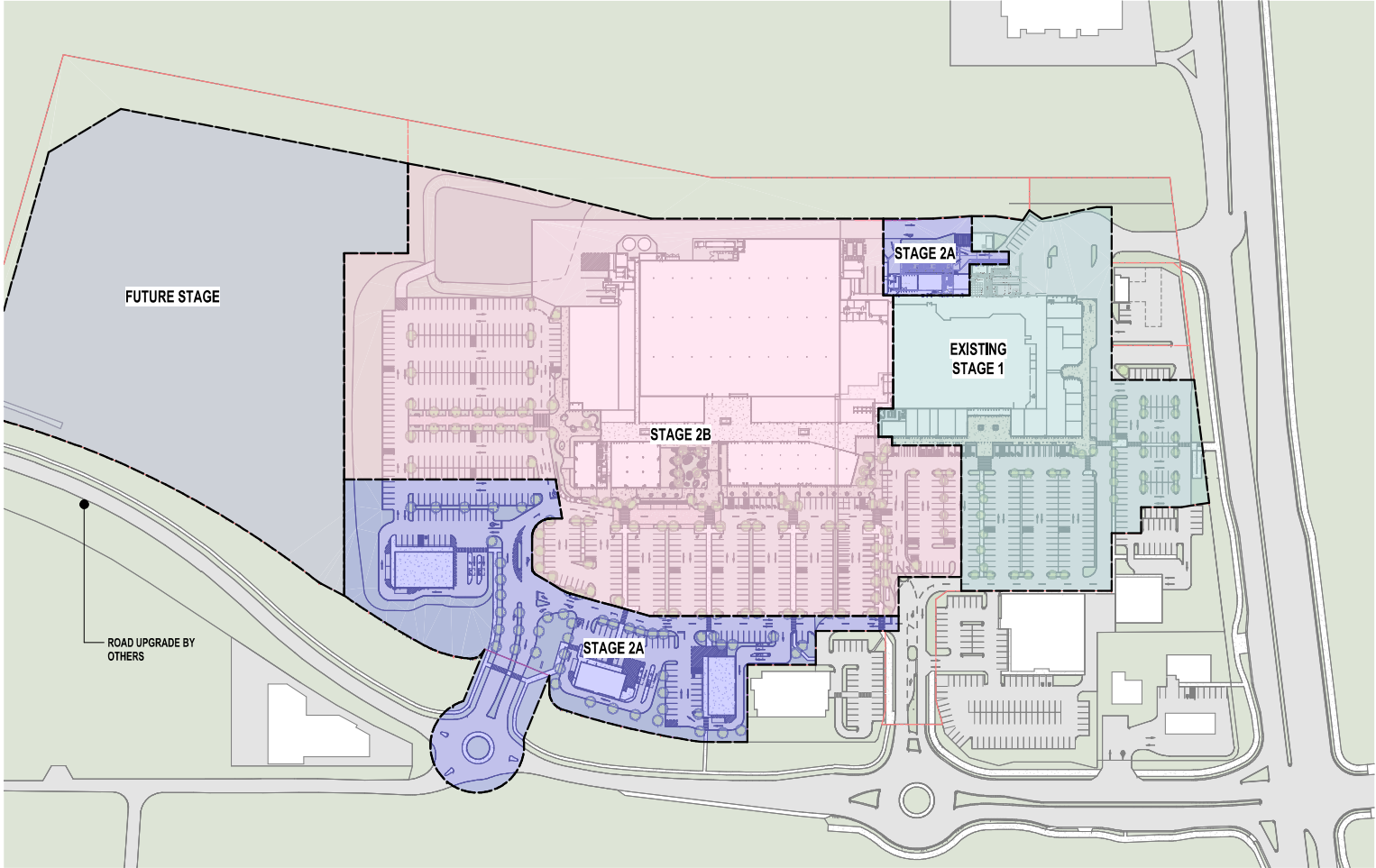
The completed codes can be found attached in Appendix G of this Report.

7. SUMMARY

This Engineering Report has demonstrated that the proposed development located at 15 & 19-69 Pub Lane, Greenbank, can be developed in accordance with Engineering Best Management Practice, Logan City Council guidelines, QUDM 2017 and the State Planning Policy 2017. The following points summarise the findings and recommendations:

- The development site is expected to be at low risk of flooding.
- It is proposed that stormwater is discharged to the drainage easement to the north. Minor flows will be conveyed through the internal drainage system, while major flows will be conveyed via overland flow;
- There will be an increase in peak stormwater runoff as a result of the development, therefore detention is required to mitigate the additional flow rate. Initial sizing has the basin at 3200 m³, though can be reduced in detailed design;
- During construction the development is considered as a risk with regards to the pollutants generated onsite. A detailed Erosion Sediment Control Plan will be submitted during the detailed design phase;
- Stormwater runoff is to be treated via bio-retention systems and stormwater quality improvement devices (SQID) before being directed to the drainage easement to the north of the site.

APPENDIX A
DEVELOPMENT DRAWINGS



COTTEEPARKER Φ

BRISBANE
T 07 3 2666 1222
COTTEEPARKER@COTTEEPARKER.COM.AU
COTTEEPARKER.COM.AU



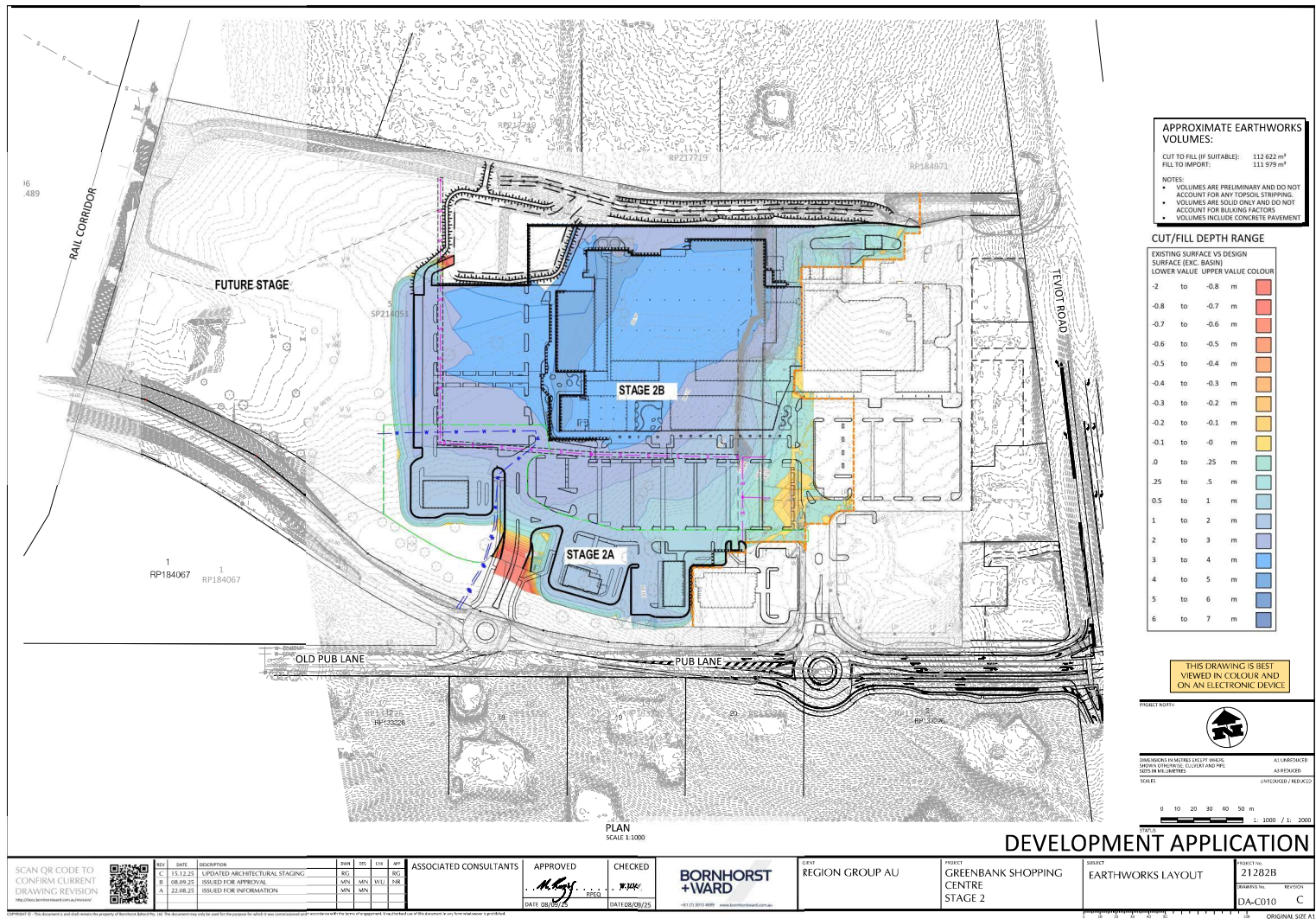
GENERAL NOTES
1. Quantity and the description of 'change' in the schedule is for guidance only and may not correspond to the drawing or the site plan.
2. Other notes are provided for all works requiring the drawing, intended for review, approval or other relevant information.

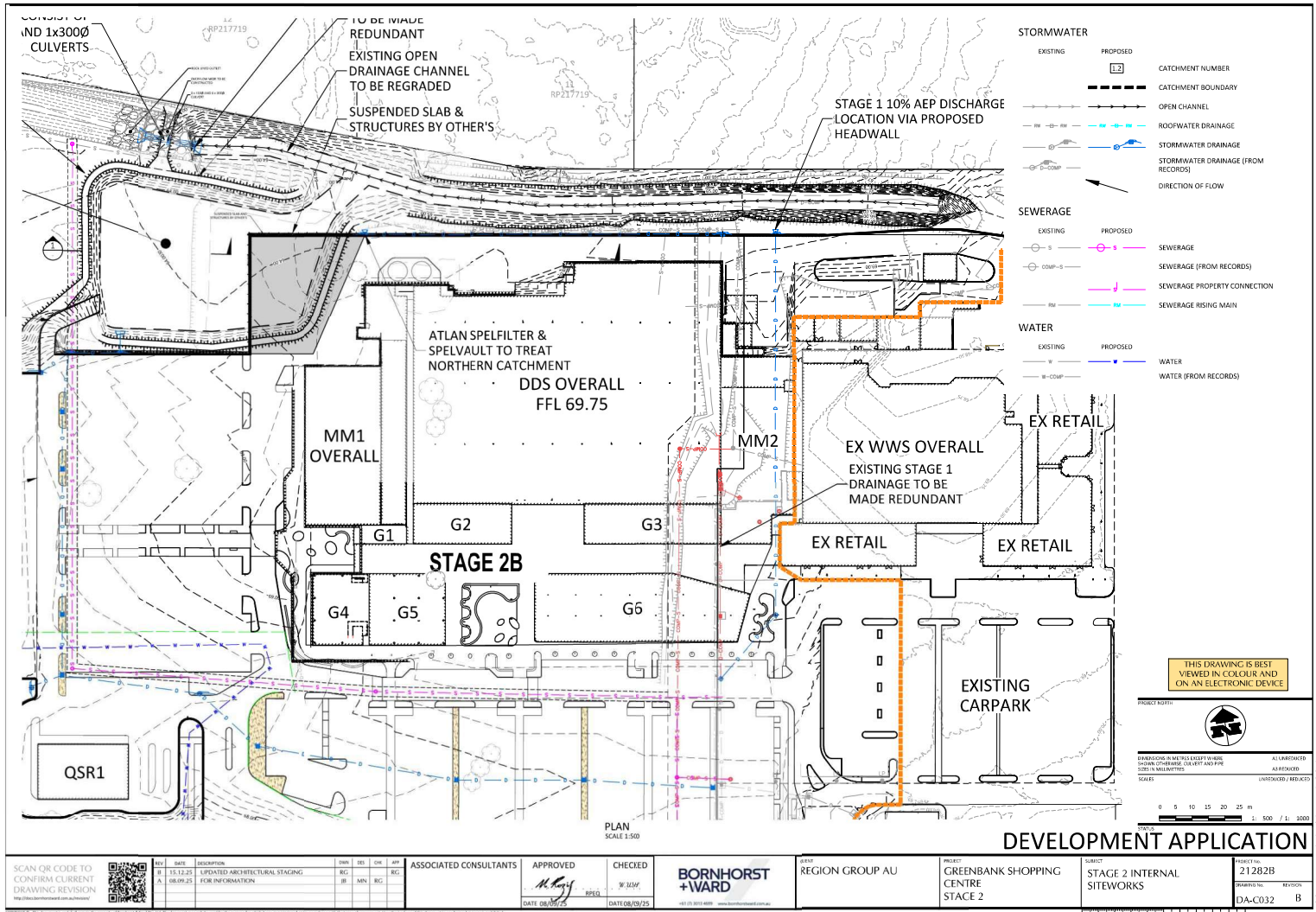
F	10/10/2024	10/10/2024	CPA	CPA
G	10/10/2024	10/10/2024	CPA	CPA
H	10/10/2024	10/10/2024	CPA	CPA
I	10/10/2024	10/10/2024	CPA	CPA
J	10/10/2024	10/10/2024	CPA	CPA
K	10/10/2024	10/10/2024	CPA	CPA
L	10/10/2024	10/10/2024	CPA	CPA
M	10/10/2024	10/10/2024	CPA	CPA
N	10/10/2024	10/10/2024	CPA	CPA
O	10/10/2024	10/10/2024	CPA	CPA
P	10/10/2024	10/10/2024	CPA	CPA
Q	10/10/2024	10/10/2024	CPA	CPA
R	10/10/2024	10/10/2024	CPA	CPA
S	10/10/2024	10/10/2024	CPA	CPA
T	10/10/2024	10/10/2024	CPA	CPA
U	10/10/2024	10/10/2024	CPA	CPA
V	10/10/2024	10/10/2024	CPA	CPA
W	10/10/2024	10/10/2024	CPA	CPA
X	10/10/2024	10/10/2024	CPA	CPA
Y	10/10/2024	10/10/2024	CPA	CPA
Z	10/10/2024	10/10/2024	CPA	CPA

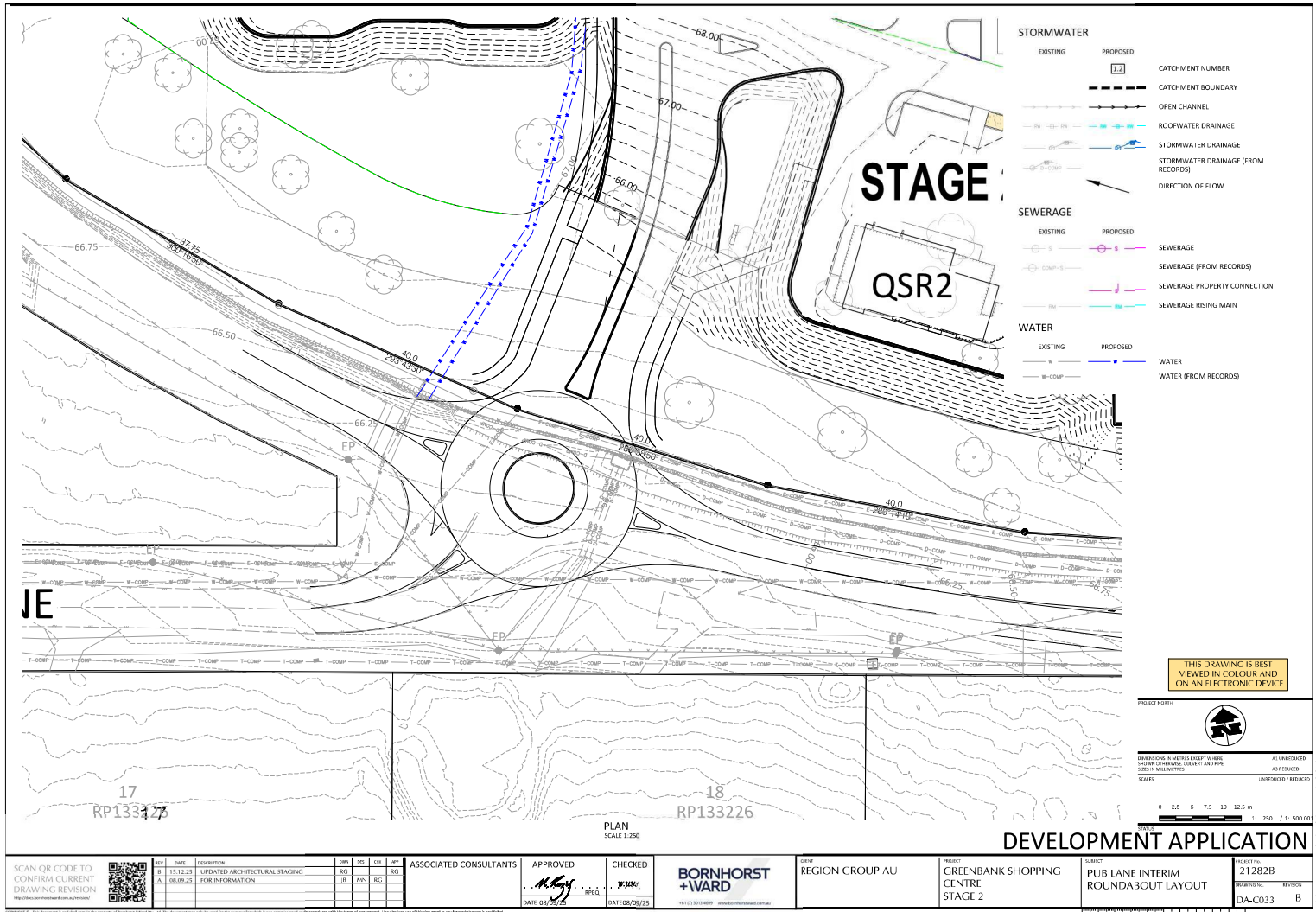
GREENBANK SC EXPANSION

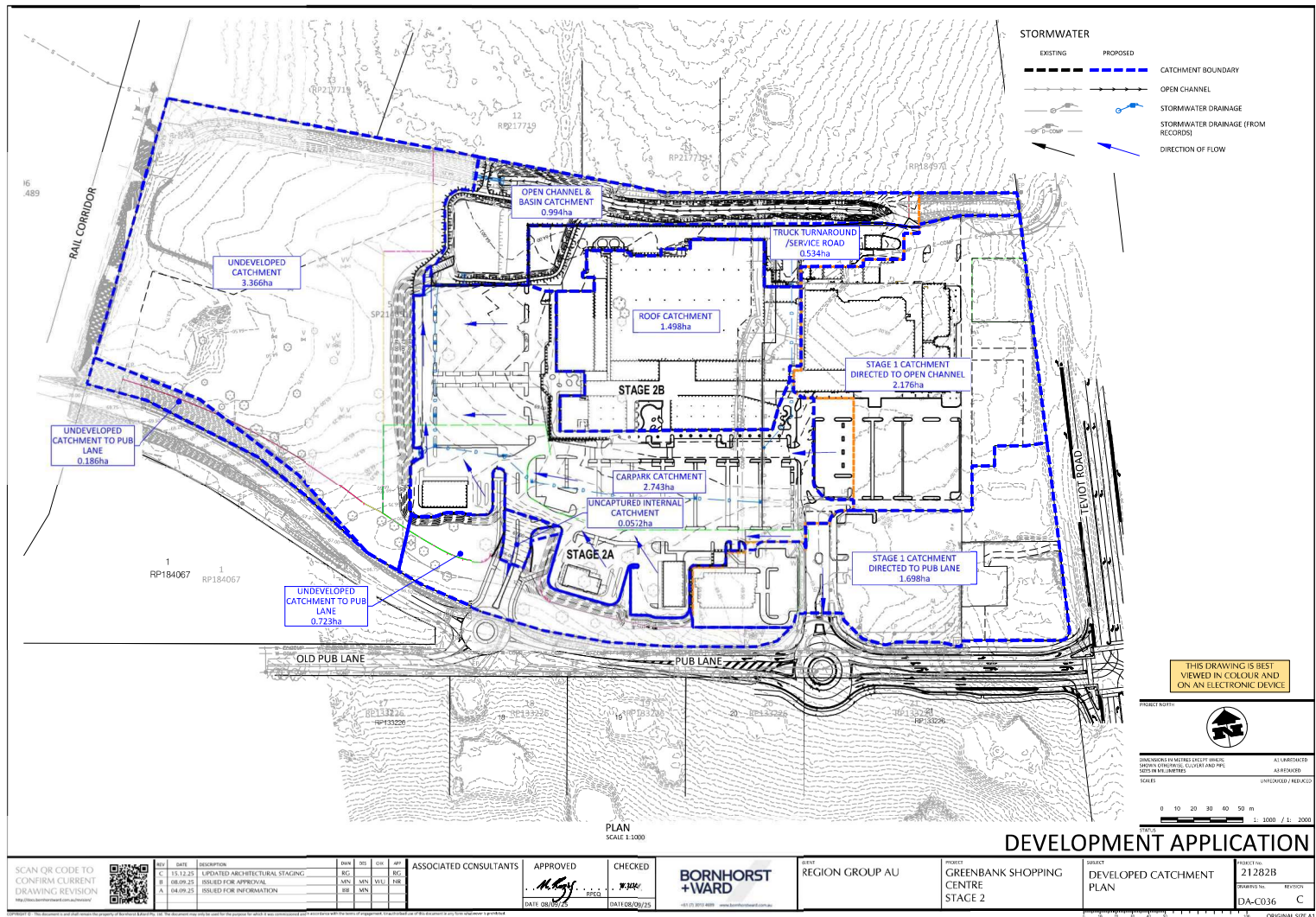
220 RIVER ROAD, GREENBANK
CLIENT - REGION GROUP
DRAWING TITLE
STAGING PLAN
27007748 SD 1002 F

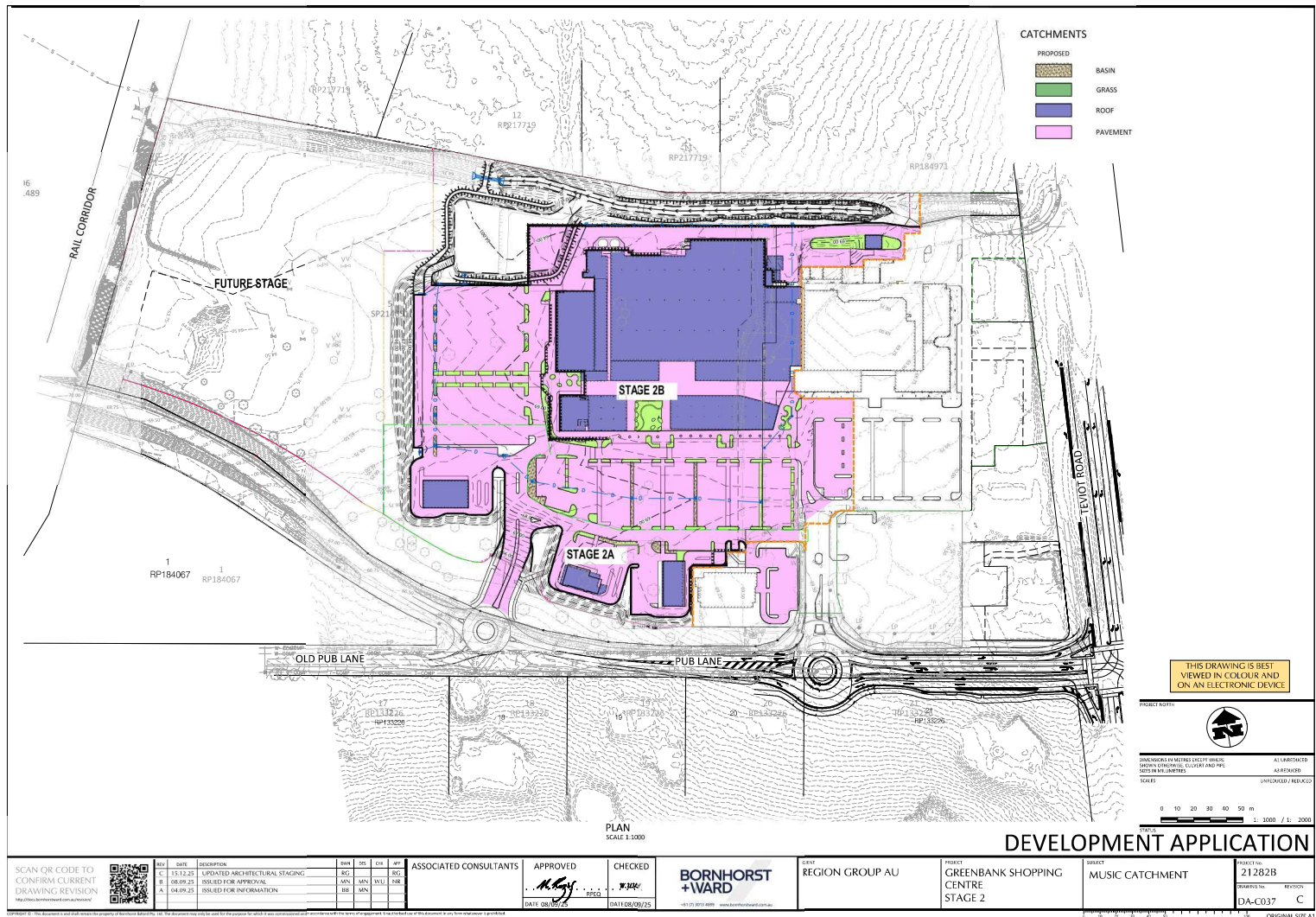
APPENDIX B
ENGINEERING DRAWINGS











APPENDIX C

EXISTING STORMWATER AND CONTOUR INFORMATION

Flood Report



During a flood or other emergency event, please visit Logan's [Disaster Dashboard](#) for the latest information.

This Flood Report provides information from Logan's planning scheme and any updated information Council has accepted from more recent flood studies.

Property Details

Address: 19-67 Pub Lane GREENBANK QLD 4124
Lot/Plan: Lot 5 SP 214051
Property Size: 99,640 m² (survey plan area)
Zone and precinct: Priority Development Area - No Precinct

Property Key: 314242
Division: 11

Flood hazard overlay in Logan Planning Scheme 2015	NO	This property is not mapped on the Flood hazard overlay map in the Logan Planning Scheme 2015. If more recent information about the flood hazard is available, it should be used to inform development decisions. This is to ensure risks associated with flood hazard are avoided or mitigated to protect people and property. See further details below.
Flood Level Information	NO	There is no flood level information for this property included in this report. This does not mean the property is not potentially impacted by floods. Please see further details below or contact Council's River and Catchment Engineering Program using the details in the Further Information section below.
Updated flood mapping based on more recent flood studies	NO	There is no updated flood mapping for this property at this time. This may change in future. Please contact Council's River and Catchment Engineering Program using the details in the Further Information section below or check this report in future.

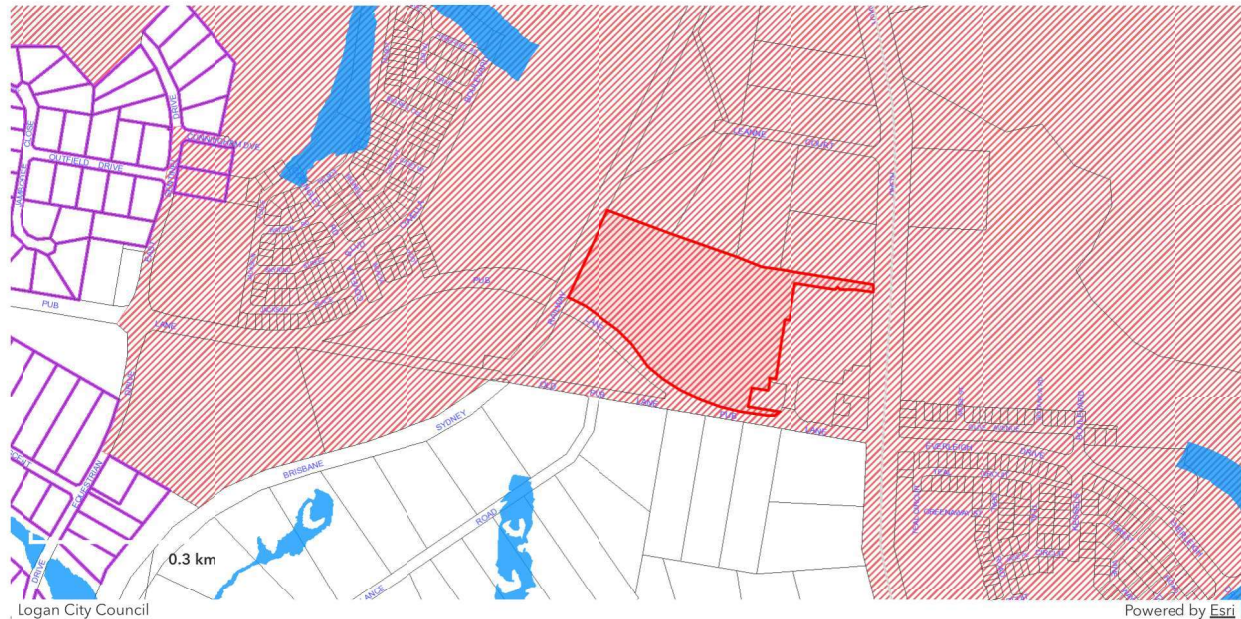
Planning Scheme Flood hazard overlay map

The selected property is shown on the extract below of the Flood hazard overlay map in the Logan Planning Scheme 2015.

Various provisions of the [Logan Planning Scheme 2015](#) which refer to premises affected by the 'flood hazard overlay' apply to the part(s) of the property affected by the Flood hazard overlay map. The map may not reflect the most recent information about flood hazard.

If more recent information is available about the flood hazard for this property, that should be used to inform development decisions to ensure risks associated with flood hazard are avoided or mitigated to protect people and property. Please refer to the Updated flood mapping section below.

Note: this property is in a Priority Development Area. The Logan Planning Scheme does not apply and the extract below is for information only. Please contact Economic Development Queensland for advice on planning and development decisions.



Further Information

Please refer to the [Flood Risk Fact Sheet](#) or contact Council using the details below.

Planning and development enquiries	Contact Council on 07 3412 5269 or email development@logan.qld.gov.au Before lodging a development application, pre-lodgement advice is recommended.
Building information	Contact Council on 07 3412 3412 or email council@logan.qld.gov.au . You can also contact a private building certifier .
Flood studies and modelling information	Contact Council on 07 3412 3412 or email council@logan.qld.gov.au . Flood studies are available from the Flood page on Council's website.
Properties in Priority Development areas	Contact Economic Development Queensland .

Please note:

1. This report can be used for the purposes of development assessment but should **not** be relied upon as part of a property transaction.
2. This report does not represent the highest possible flood level that might affect the property, as floods are highly unpredictable and variable.
3. A property may also be affected by other sources of potential inundation.
4. The flood levels are sourced from Council's accepted flood studies and flood modelling and are measured in metres Australian Height Datum (AHD), where mean sea level is approximately zero (0) metres AHD. Ground level information for the property is provided as context for the flood levels.
5. The flood mapping and levels in this report are based on data that was obtained through flood studies undertaken at a particular time and date and which are subject to change. For example, if the method for calculating flood levels is updated, industry guidelines are amended, or more recent information becomes available, this may result in changes to the information in this report.
6. If flood level information is not available (shown as 'N/A'), you will need to contact Council using the details in the table above.
7. This report provides limited information for development assessment purposes and is not a substitute for independent professional advice. You should engage the services of a Registered Professional Engineer of Queensland (RPEQ) to obtain site specific information regarding the flood risk to your property and any the implications for any proposed building or development.
8. Although Logan City Council takes reasonable care in producing this report, it does not guarantee the information is accurate, complete, or current. Logan City Council does not accept any responsibility for any loss or damage (however it was caused) in connection with the use of or reliance on the information in this report.

Logan City Council

PO Box 3226 Logan Central QLD 4114

Generated: Tuesday, 25 April 2023 8:23 PM

Phone: (07) 3412 5269

Email: council@logan.qld.gov.au

Web: logan.qld.gov.au

Before You Dig Australia (BYDA)

Asset Location Response



PO Box 3226 Logan City DC QLD 4114 • 150 Wembley Road, Logan Central
p (07) 3412 3412 • e council@logan.qld.gov.au • www.logan.qld.gov.au • ABN 21-627-796 435



Ayden Montgomerie
133 Mary Street
Brisbane City QLD 4000
a.montgomerie@bornhorstward.com.au

Logan City Council has been advised that you have placed an enquiry through the Before You Dig Australia service. Our records indicate the enquiry with the following details are affecting Logan City Council asset(s).

Enquiry Details	
Sequence Number	258536869
Enquiry Date	25/07/2025 15:52
Response	AFFECTED
Address	235-255 Teviot Road Greenbank
Location in Road	
Activity	Planning and Design

Please review plans attached and contact Logan City Council prior to commencing works:

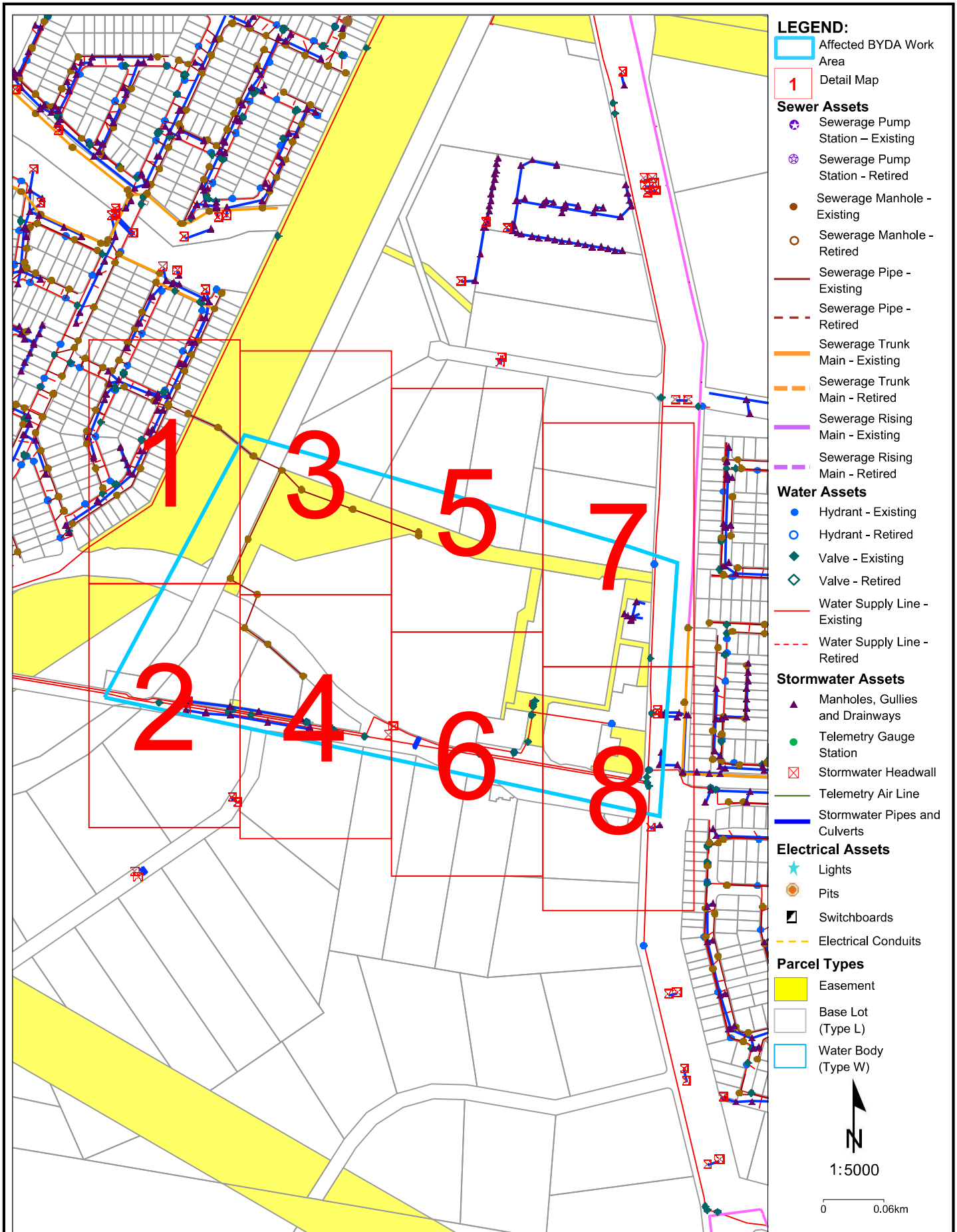
Logan City Council now provides a limited amount of As-Constructed and Drainage Plans on-line, click on the [Logan City As-Constructed Plans](#) link and type in the property address you are seeking. Unfortunately, not all properties will have plan records accessible on-line. The following options are available to customers should a record not be available:

- For **As Constructed Private Sewer/Roofwater (Inside Properties)**
Contact *Development Assessment, Building & Plumbing*
p: (07) 3412 5269
Alternatively visit our Website Link to the relevant PS1 or PS2 forms:
[Logan City As-Constructed Plans](#)
- For **As Constructed Private Sewer/Water/Stormwater (Outside Properties)**
Contact *Road Infrastructure Planning*
p: (07) 3412 5282
Alternatively visit our Website Link for PS3 forms:
[Logan City As-Constructed Plans](#)

If you need more assistance please call us on 07 3412 3412 or email us at council@logan.qld.gov.au.

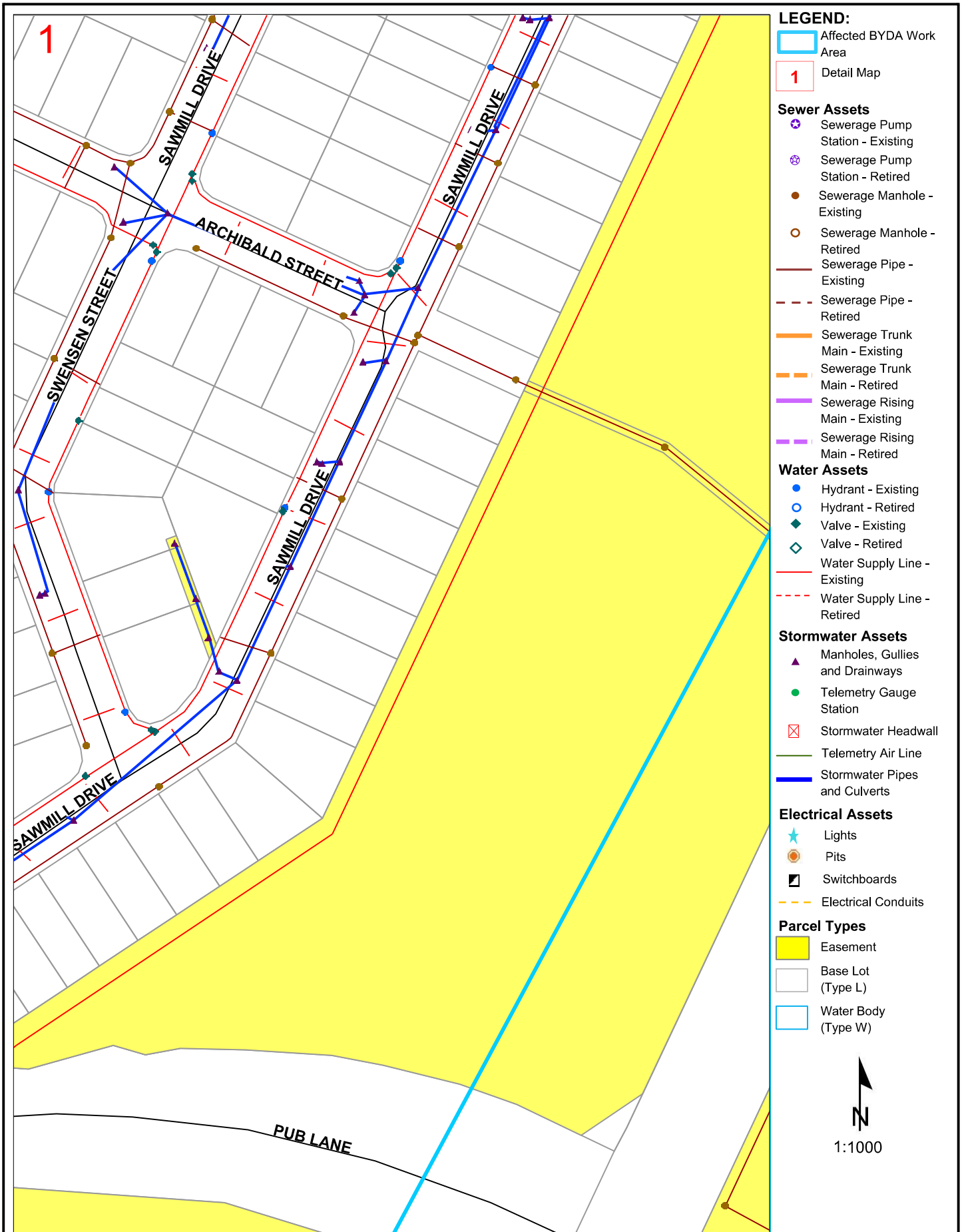
Disclaimer: This document is confidential to the addressee and may also be privileged, and neither confidentiality nor privilege is waived, lost or destroyed by virtue of it being transmitted to an incorrect addressee. Unauthorised use of the contents is therefore strictly prohibited. Any information contained in this document that has been extracted from Council's records is believed to be accurate, but no responsibility is assumed for any error or omission. Council will only accept responsibility for information contained under official letterhead and duly signed by, or on behalf of, Chief Executive Officer.

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



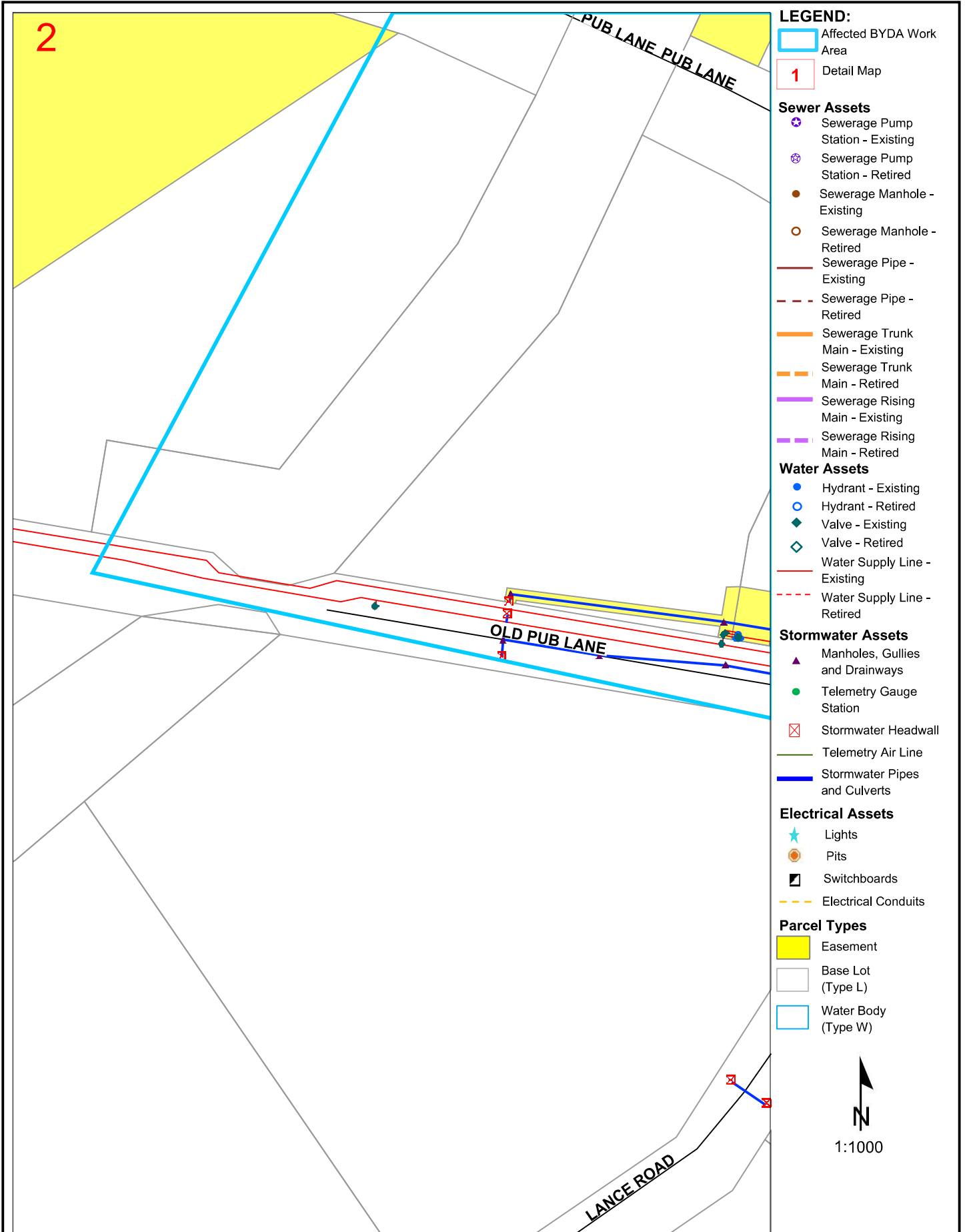
Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



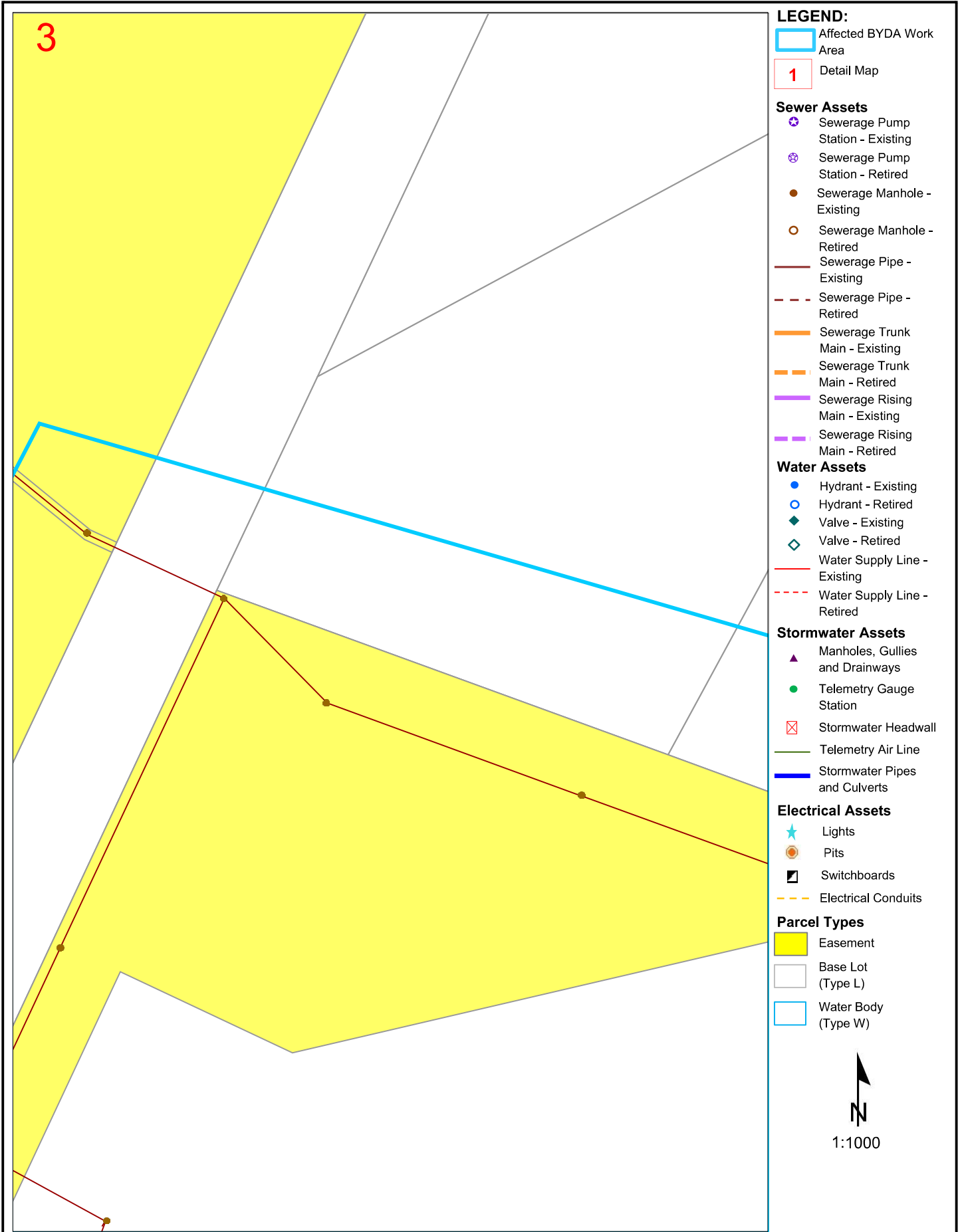
Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



LEGEND:

 Affected BYDA Work Area

 Detail Map

Sewer Assets

-  Sewerage Pump Station - Existing
-  Sewerage Pump Station - Retired
-  Sewerage Manhole - Existing
-  Sewerage Manhole - Retired
-  Sewerage Pipe - Existing
-  Sewerage Pipe - Retired
-  Sewerage Trunk Main - Existing
-  Sewerage Trunk Main - Retired
-  Sewerage Rising Main - Existing
-  Sewerage Rising Main - Retired

Water Assets

-  Hydrant - Existing
-  Hydrant - Retired
-  Valve - Existing
-  Valve - Retired
-  Water Supply Line - Existing
-  Water Supply Line - Retired

Stormwater Assets

-  Manholes, Gullies and Drainways
-  Telemetry Gauge Station
-  Stormwater Headwall
-  Telemetry Air Line
-  Stormwater Pipes and Culverts

Electrical Assets

-  Lights
-  Pits
-  Switchboards
-  Electrical Conduits

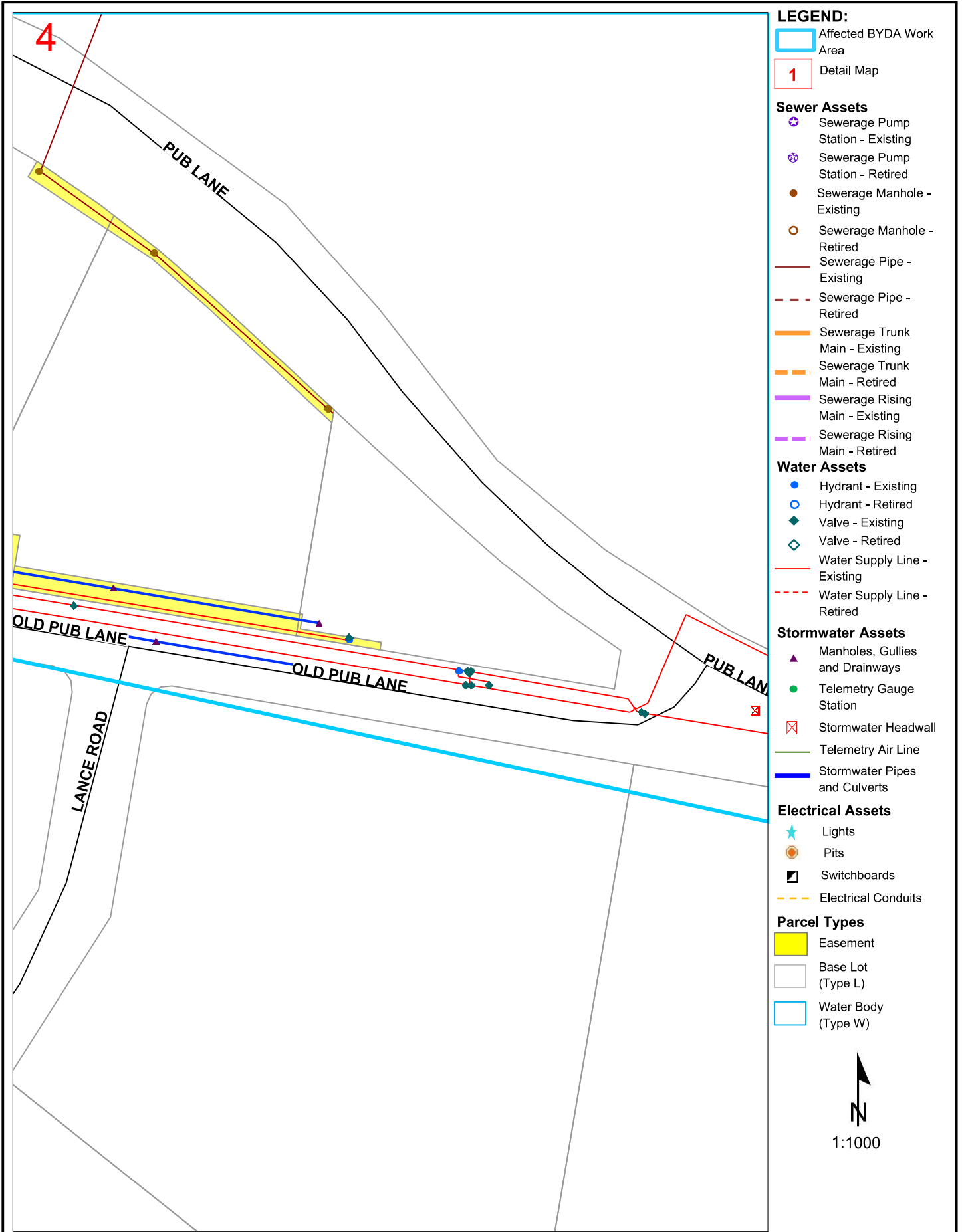
Parcel Types

-  Easement
-  Base Lot (Type L)
-  Water Body (Type W)


1:1000

Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



1:1000

Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".

5

LEGEND:

 Affected BYDA Work Area

 Detail Map

Sewer Assets

-  Sewerage Pump Station - Existing
-  Sewerage Pump Station - Retired
-  Sewerage Manhole - Existing
-  Sewerage Manhole - Retired
-  Sewerage Pipe - Existing
-  Sewerage Pipe - Retired
-  Sewerage Trunk Main - Existing
-  Sewerage Trunk Main - Retired
-  Sewerage Rising Main - Existing
-  Sewerage Rising Main - Retired

Water Assets

-  Hydrant - Existing
-  Hydrant - Retired
-  Valve - Existing
-  Valve - Retired
-  Water Supply Line - Existing
-  Water Supply Line - Retired

Stormwater Assets

-  Manholes, Gullies and Drainways
-  Telemetry Gauge Station
-  Stormwater Headwall
-  Telemetry Air Line
-  Stormwater Pipes and Culverts

Electrical Assets

-  Lights
-  Pits
-  Switchboards
-  Electrical Conduits

Parcel Types

-  Easement
-  Base Lot (Type L)
-  Water Body (Type W)



1:1000

Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".

6

LEGEND:

 Affected BYDA Work Area

 Detail Map

Sewer Assets

-  Sewerage Pump Station - Existing
-  Sewerage Pump Station - Retired
-  Sewerage Manhole - Existing
-  Sewerage Manhole - Retired
-  Sewerage Pipe - Existing
-  Sewerage Pipe - Retired
-  Sewerage Trunk Main - Existing
-  Sewerage Trunk Main - Retired
-  Sewerage Rising Main - Existing
-  Sewerage Rising Main - Retired

Water Assets

-  Hydrant - Existing
-  Hydrant - Retired
-  Valve - Existing
-  Valve - Retired
-  Water Supply Line - Existing
-  Water Supply Line - Retired

Stormwater Assets

-  Manholes, Gullies and Drainways
-  Telemetry Gauge Station
-  Stormwater Headwall
-  Telemetry Air Line
-  Stormwater Pipes and Culverts

Electrical Assets

-  Lights
-  Pits
-  Switchboards
-  Electrical Conduits

Parcel Types

-  Easement
-  Base Lot (Type L)
-  Water Body (Type W)



1:1000

Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".

7

LEGEND:

 Affected BYDA Work Area

 Detail Map

Sewer Assets

-  Sewerage Pump Station - Existing
-  Sewerage Pump Station - Retired
-  Sewerage Manhole - Existing
-  Sewerage Manhole - Retired
-  Sewerage Pipe - Existing
-  Sewerage Pipe - Retired
-  Sewerage Trunk Main - Existing
-  Sewerage Trunk Main - Retired
-  Sewerage Rising Main - Existing
-  Sewerage Rising Main - Retired

Water Assets

-  Hydrant - Existing
-  Hydrant - Retired
-  Valve - Existing
-  Valve - Retired
-  Water Supply Line - Existing
-  Water Supply Line - Retired

Stormwater Assets

-  Manholes, Gullies and Drainways
-  Telemetry Gauge Station
-  Stormwater Headwall
-  Telemetry Air Line
-  Stormwater Pipes and Culverts

Electrical Assets

-  Lights
-  Pits
-  Switchboards
-  Electrical Conduits

Parcel Types

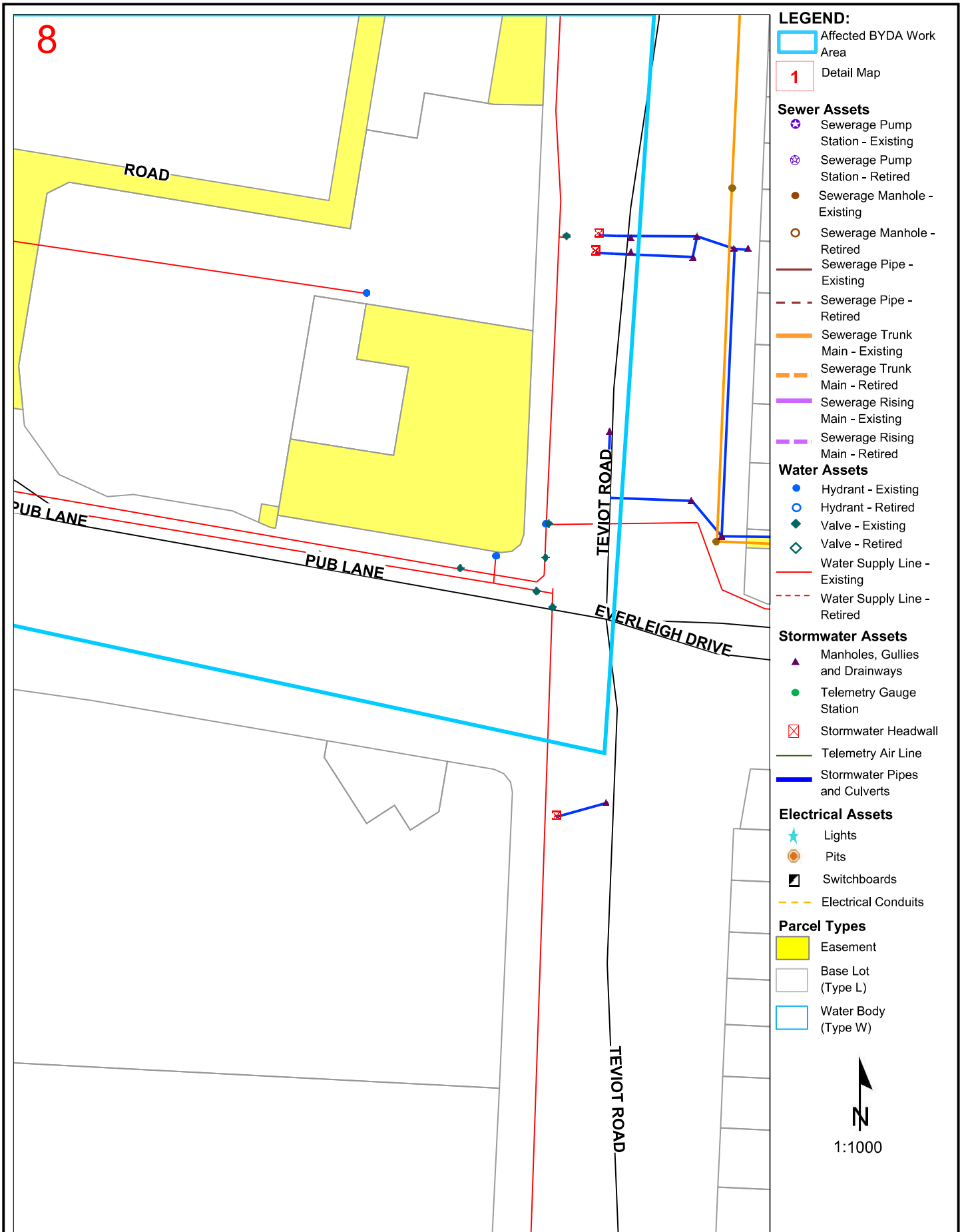
-  Easement
-  Base Lot (Type L)
-  Water Body (Type W)



1:1000

Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



Disclaimer: The plans are indicative only and while all reasonable care has been taken in producing this information, Logan City Council does not warrant the accuracy, completeness or currency of this information and accepts no responsibility for, or in connection with any loss or damage suffered as a result of any inaccuracies, errors or omissions or your reliance on this information. Base material reproduced with permission of the Director-General, Department of Natural Resources and Mines. The State of Queensland (Department of Natural Resources and Mines).

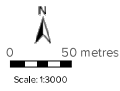
Logan City Council's infrastructure dates back over many years and may include manufactured materials containing asbestos. You are solely responsible for ensuring that appropriate care is taken at all times and that you comply with all mandatory requirements relating to such matters, including but not limited to "workplace health and safety".



A product of
Queensland Globe



Legend located on next page



Printed at: A3
Print date: 4/9/2025
Not suitable for accurate measurement.
Projection: Web Mercator EPSG 102100 (3857)
For more information, visit <https://dsglobe.information.qld.gov.au/help-info/Contact-us.html>

Includes material © State of Queensland 2025. You are responsible for ensuring that the map is suitable for your purposes. The State of Queensland makes no representation or warranties in relation to the map contents and disclaims all liability.
If imagery is displayed, imagery includes material © CNES reproduced under license from Airbus DS, all rights reserved © 21AT © Earth+, all rights reserved, © Planet Labs PBC, 2023



Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development

Contour SRTM 10m

- Index Contour
- Intermediate Contour

Contour LiDAR 5m

- Index Contour
- Intermediate Contour

Contour LiDAR 1m

- Index Contour
- Intermediate Contour

Land parcel

- Parcel

Land parcel - gt 1 ha

- Parcel

Land parcel - gt 10 ha

- Parcel

Land parcel - gt 1000 ha

- Parcel

Green bridges

-

Bridges

-

Tunnels

-

Railway stations

-

Railways

-

Roads and tracks

- Motorway
- Highway
- Secondary
- Connector
- Local
- Restricted Access Road
- Mall
- Busway
- Bikeway
- Restricted Access
- Bikeway
- Walkway
- Restricted Access
- Walkway
- Non-vehicular Track
- Track
- Restricted Access Track
- Ferry
- Proposed Thoroughfare

Includes material © State of Queensland (Department of Resources); © Commonwealth of Australia (Geoscience Australia); © 21AT, © Earth-i, all rights reserved, 2025.

© State of Queensland (Department of Resources) 2023

© State of Queensland (Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development) 2025

© State of Queensland (Department of Resources) 2024

© State of Queensland (Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development) 2024

APPENDIX D

RATIONAL METHOD CALCULATIONS

INITIAL PEAK FLOW ESTIMATE

Written by BB 31/10/08
Updated by DJK 25/05/20



Job Number: 21282
Job Name: Greenbank Shopping Centre 2025

Designed: MN
Checked: RG
IFD Location: Greenbank
27.7375 (S) 152.9875 (E)

TOTAL RUNOFF COEFF.			Stage 1 Excl. 4.1138 ha					
Sub Catchment Area (Ha)			Fraction Impervious		Runoff Coefficients		Calculated C10	
No.	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
1	10.063	5.829	0%	0%	0.70	0.70		
2	0.000	4.234	0%	100%	0.00	0.80		
3	0.000	0.000	0%	100%	0.00	0.80		
4	0.000	0.000	0%	0%	0.00	0.00		
5	0.000	0.000	0%	0%	0.00	0.00		
10.063		10.063					0.70	0.78

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

EXISTING TIME OF CONCENTRATION	
SHEET FLOW	Std Inlet Time
	0.00
	Site Slope (%)
	1.27
	Flow Length (m)
CHANNEL/PIP E FLOW	283
	Horton's "n"
	0.85
	Travel Time (min)
	32.68
CHANNEL/PIP E FLOW	Travel Length (m)
	0
	Fall (m)
	0
	Travel Time (min)
CHANNEL/PIP E FLOW	0
	Multiplier
	1
	Travel Time (min)
	0
Total Time (Tc)	
32.7	

DEVELOPED TIME OF CONCENTRATION	
SHEET FLOW	Std Inlet Time
	10
	Site Slope (%)
	0
	Flow Length (m)
CHANNEL/PIP E FLOW	0
	Horton's "n"
	0
	Travel Time (min)
	0.00
CHANNEL/PIP E FLOW	Travel Length (m)
	0
	Fall (m)
	0
	Travel Time (min)
CHANNEL/PIP E FLOW	0
	Multiplier
	1
	Travel Time (min)
	0
Total Time (Tc)	
10.0	

PEAK RUNOFF CALCULATIONS							
AEP Event %	ARI Event yr	Rainfall Intensity (mm/hr)		Coefficient of Runoff		Peak Runoff Rates (m³/s)	
		Existing	Proposed	Existing	Proposed	Existing	Proposed
63%	1	46	83	0.66	0.63	0.712	1.457
39%	2	52	95	0.60	0.67	0.866	1.769
19%	5	73	132	0.47	0.74	1.350	2.742
10%	10	86	156	0.78	0.78	1.692	3.423
5%	20	100	180	0.74	0.82	2.054	4.134
2%	50	118	210	0.81	0.90	2.651	5.298
1%	100	131	233	0.84	0.94	3.085	6.134

PEAK FLOWS FOR FREQUENT EVENTS			
ARI Event yr	% of Q1	Peak discharge (m³/s)	
		Existing	Proposed
1mth	25%	0.178	0.364
2mth	40%	0.285	0.583
3mth	50%	0.356	0.728
4mth	60%	0.427	0.874
6mth	75%	0.534	1.092
9mth	90%	0.641	1.311
12mth	100%	0.712	1.457

INITIAL DETENTION SIZING ESTIMATE

Written by SC 31/10/94
updated by BB 31/10/08



Job Number: 21282
Job Name: Greenbank Shopping Centre 2025
Flow into Development site

Designed: MN
Checked: RG

	Critical Time of Concentration t _c min	10 yr ARR Runoff Cv p507 ARR Cv	Total Catchment Area A ha
Existing	32.68	0.70	10.063
Post-Develop	10.00	0.75	10.063

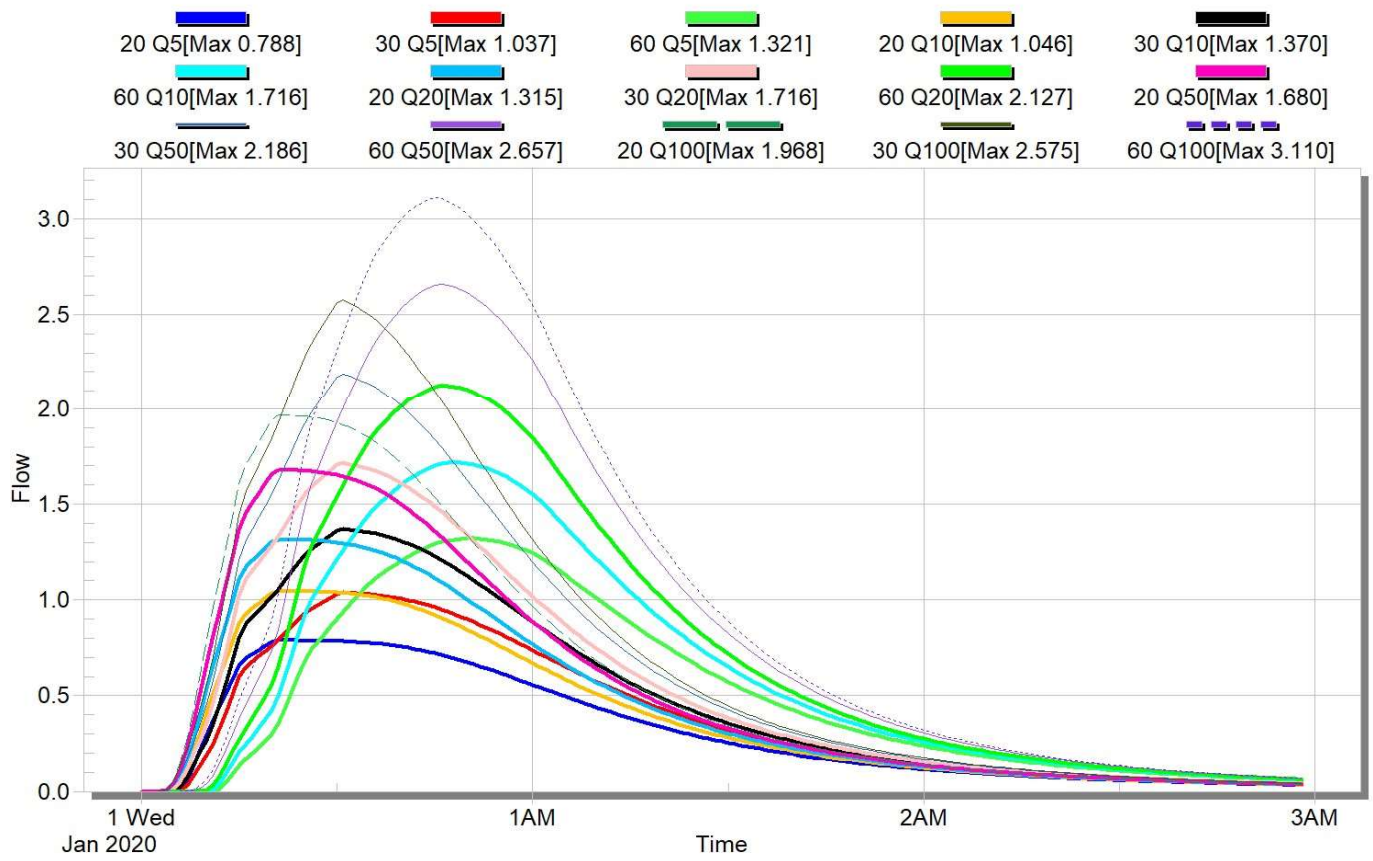
Flood Event ARI yr	Volumetric Coeff. of Runoff		Rainfall Intensity		Inflow Volume	Peak outflow capacity or desired peak outflow	Peak Inflow rate by rational method	Reduction ratio	Storage Volume						Time ratio factor 1.82
	Existing Cv	Post-Devel Cv	Existing I mm/hr	Post-Devel I mm/hr	VI m³	Qo m³/s	Qi m³/s	r	V _s						Required Volume m³
									CULP m³	BOVD m³	CARROL m³	BASNA m³	Small Basins m³		
3mth	0.56	0.63	23	42	583	0.356	0.728								583
1	0.56	0.63	45	83	1165	0.712	1.457	0.51	401	595	413	498	880		1082
2	0.60	0.67	52	95	1416	0.886	1.769	0.51	487	723	502	605	1069		1313
5	0.67	0.74	73	132	2194	1.350	2.742	0.51	748	1114	771	931	1654		2024
10	0.70	0.78	88	158	2758	1.692	3.423	0.51	928	1384	957	1158	2061		2515
20	0.74	0.82	106	189	3387	2.054	4.134	0.50	1112	1683	1147	1398	2485		3022
50	0.81	0.90	118	210	4236	2.651	5.295	0.50	1411	2118	1456	1765	3175		3848
100	0.84	0.94	131	233	4908	3.085	6.134	0.50	1622	2440	1673	2031	3674		4433

assumes $V_i = 4 \cdot Q_i \cdot T_c / 3$ where Q_i is flow from rational method (QUDM 5.05.1)
and T_c is in seconds for this equation only.
ie $C_v = 1.33 \cdot C_r$ which is conservative for SE QLD.
Required Volume is the maximum volume estimated by the 4 different methods, with a Time Ratio factor applied.
Time Ratio Factor is a allowance for additional volume based upon detail sizing calculations for previous projects.

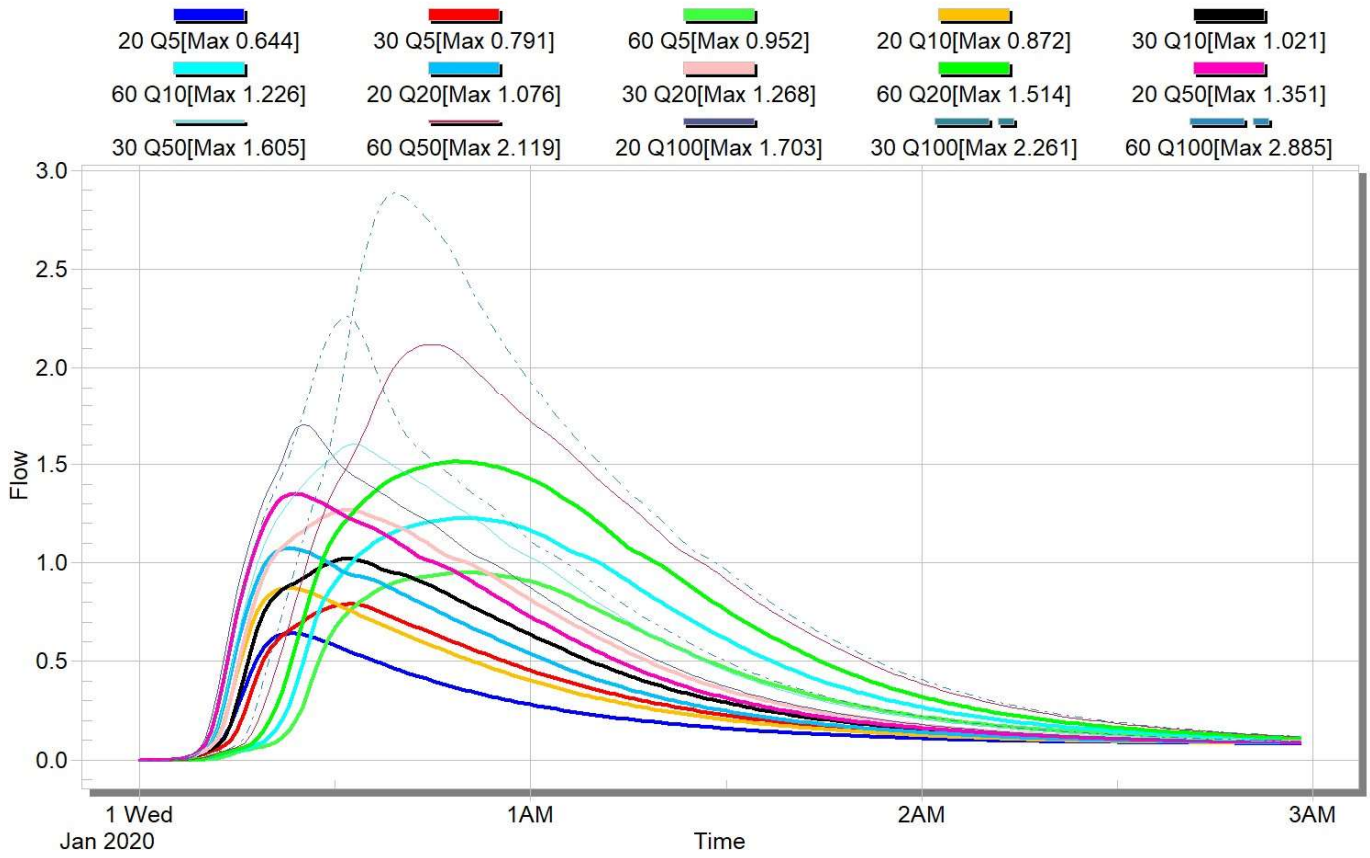
APPENDIX E

XPSTORM OUTPUTS

Conduit Existing from Existing Catchment A to Node9.1



Conduit Developed from Node4 to Node9



APPENDIX F

MUSIC DATA

Table 1: Pollutants Typically Generated During the Construction Phase

Pollutant	Source
Litter	Paper, construction packaging, food packaging, cement bags, cut-offs
Sediment	Unprotected exposed soils and stockpiles during earthworks and buildings
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic Materials	Cement slurry, asphalt prime, solvents, cleaning agents, wash waters (e.g. from tile works)
pH Altering Substances	Acid sulphate soils, cement slurry and wash waters

Table 2: Recommended MUSIC Rainfall-Runoff Generation Parameters

Parameter	Urban
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	18
Initial Storage (% capacity)	10
Field Capacity (mm)	80
Infiltration Capacity Coefficient a	243
Infiltration Capacity Exponent b	0.60
Initial Depth (mm)	50
Daily Recharge Rate (%)	0
Daily Baseflow Rate (%)	31
Daily Deep Seepage Rate (%)	0

Table 3: MUSIC Base and Storm Flow Concentration Parameters for Urban Catchments

Land Use Type	Parameter	TSS (log10mg/L)		TP (log10mg/L)		TN (log10mg/L)	
		Base Flow	Storm Flow	Base Flow	Storm Flow	Base Flow	Storm Flow
Urban Roof	Mean	N/A	1.30	N/A	-0.89	N/A	0.37
	Std Dev	N/A	0.38	N/A	0.34	N/A	0.34
Urban Road	Mean	0.78	2.43	-0.60	0.30	0.32	0.37
	Std Dev	0.39	0.38	0.50	0.34	0.30	0.34
Urban Ground	Mean	0.78	2.16	-0.60	-0.39	0.32	0.37
	Std Dev	0.39	0.38	0.50	0.34	0.30	0.34

APPENDIX G

COUNCIL CODES

9.4.2

Filling and excavation code

9.4.2.1

Application

1. This code applies to:
- a. material change of use:

i. that is accepted development (subject to requirements) or code assessable and for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use in Part 5 - Tables of assessment;

ii. that is made impact assessment in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use or section 5.9 - Categories of development and assessment - local plans in Part 5 - Tables of assessment;

b. reconfiguring a lot:

i. that is code assessable and for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;

ii. that is impact assessable in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;

c. operational work that is accepted development (subject to requirements) and code assessable operational work - filling or excavation for which the Filling and excavation code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.8.1 - Operational work.
2. When using this code, reference should be made to section 5.3.2 - Determining the category of development and category of assessment and, where applicable, section 5.3.3 - Determining the 'assessment benchmarks for assessable development and requirements for accepted development' located in Part 5 - Tables of assessment.

9.4.2.2

Purpose

1. The purpose of the code is to protect premises, people and natural processes from adverse impacts associated with filling or excavation.
2. The purpose of the code will be achieved through the following overall outcomes:
- a. development protects:

i. natural physical processes and ecosystems;

ii. existing and planned infrastructure;

Solution: ✓ = Acceptable Solution

N/A = Not Applicable

AS = Alternative Solution

- iii. personal health and safety and premises;
- iv. visual amenity.

9.4.2.3 Assessment benchmarks for assessable development and requirements for accepted development

Part A - Requirements for accepted development (subject to requirements) and assessment benchmarks for assessable development

Table 9.4.2.3.1 - Filling and excavation code: accepted development (subject to requirements) and assessable development

Performance outcomes	Acceptable outcomes	Solution	Comments	Council Use Only
For accepted development (subject to requirements) and assessable development				
Protection of natural processes and ecosystems				
PO1 The discharge of sediments and pollutants from filling or excavation does not adversely affect a waterway or the stormwater network.	AO1 The discharge of sediments and pollutants to a waterway or stormwater network complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	✓	Erosion and sediment control will be utilized to minimize impacts on the downstream waterways. The discharge of sediments and pollutants to a waterway or stormwater network will comply with part 3.3 – Filling and excavation standards in planning scheme policy 5 – Infrastructure.	
PO2 Topsoil and spoil stockpiled on the premises do not adversely affect natural processes and ecosystems.	AO2 Topsoil and spoil is stockpiled to comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	✓	Topsoil and spoil stockpiles on the development site will not adversely impact the natural processes and ecosystems and will comply with the filling and	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

			excavation standards set in planning scheme policy 5 – Infrastructure.	
PO3 Filling is carried out using stable, solid and clean earth, free of organic and putrescible waste, rubbish and refuse material.	AO3 Filling complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	✓	Cut and fill earthworks are required onsite. Fill material used will be inspected to ensure compliance with the standards set in the planning scheme policy 5 – Infrastructure.	
Protection of existing and planned infrastructure				
PO4 Filling or excavation works do not adversely affect infrastructure, including any services.	AO4 Filling or excavation works comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	✓	Filling or excavation works will not adversely affect any existing infrastructure or services and will comply with part 3.3 – Filling and excavation standards in planning scheme 5 – Infrastructure.	
Protection and enhancement of personal health and safety and premises				
PO5 Filling or excavation works do not adversely affect personal health and safety.	AO5 Filling or excavation works comply with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	✓	Filling or excavation works will not adversely affect personal health and safety and the filling or excavation works will comply with part 3.3 – Filling and excavation standards in planning scheme 5 – Infrastructure.	
Surface water flow				
PO6	AO6	✓	Surface water will not cause: - ponding	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

Surface water drainage does not cause any of the following: a. ponding on any premises; or b. a hazard or adversely affect personal health and safety and premises; or c. diversion or concentration of flow from or onto adjoining premises or infrastructure.	Surface water drainage complies with part 3.3 - Filling or excavation standards in Planning scheme policy 5 - Infrastructure.		- a hazard or adversely affect personal health and safety and premises - divert or concentrate flow from or onto an adjoining premises or infrastructure. Surface water drainage will comply with part 3.3 Filling or excavation standards in planning scheme policy 5 – Infrastructure.	
Batters				
PO7 A batter: a. does not adversely affect the natural physical processes and ecosystems; b. protects existing and planned infrastructure; c. is safe, stable and easily maintained; d. is landscaped to enhance visual amenity.	AO7 A batter is designed and constructed to comply with the standards specified in 3.3.6 - Batters and retaining walls in Planning scheme policy 5 - Infrastructure.	✓	Batters will be required as part of the development. Batters will: - Not adversely affect the natural physical processes and ecosystems. - Be safe, stable and easily maintained. - Be landscaped to enhance visual amenity.	
Retaining walls				
PO8 A retaining wall: a. is not constructed of timber and is not located on existing or proposed	AO8 A retaining wall is designed and constructed to comply with the standards specified in section 3.3.6.2 - Retaining walls in Planning	✓	Retaining walls will be required as a part of the development. Any retaining walls will be designed and constructed to comply with	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

lot boundaries, or movement networks; b. does not adversely affect the natural physical processes and ecosystems; c. is located to avoid conflict with adjoining premises; d. is located such that existing and planned infrastructure is not adversely affected; e. protects the visual amenity of adjoining premises or a public open space; f. is located within the premises that is being filled; g. is located within the premises that is cut and is designed to take any surcharge loading allowable on the uphill lot; h. is safe and stable; i. enables easy access for maintenance.	scheme policy 5 - Infrastructure.		the standards specified in section 3.3.6.2 – Retaining walls in planning scheme policy 5 – Infrastructure.	
Filling of a dam				
PO9 The filling of a dam: a. does not adversely affect the natural physical processes and ecosystems; b. creates a safe and stable surface; c. is integrated into the landscape.	AO9 The filling of a dam complies with part 3.3 - Filling and excavation standards in Planning scheme policy 5 - Infrastructure.	N/A	No dams are proposed as a part of this development proposal.	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

9.4.3

Infrastructure code

9.4.3.1

Application

1. This code applies to:
- a. material change of use:

i. that is accepted development (subject to requirements) or code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use in Part 5 - Tables of assessment;

ii. that is made impact assessment in a table of assessment in section 5.5 - Categories of development and assessment - Material change of use or section 5.9 - Categories of development and assessment - Local plans in Part 5 - Tables of assessment;

b. reconfiguring a lot:

i. that is code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;

ii. made impact assessment in Table 5.6.1 - Reconfiguring a lot in Part 5 - Tables of assessment;

c. operational work that is infrastructure work:

i. that is accepted development (subject to requirements) or code assessable and for which the Infrastructure code is identified in the 'assessment benchmarks for assessable development and requirements for accepted development' column Table 5.8.1 - Operational work in Part 5 - Tables of assessment.

2. When using this code, reference should be made to section 5.3.2 - Determining the category of development and category of assessment and, where applicable, section 5.3.3 - Determining the 'assessment benchmarks for assessable development and requirements for accepted development' located in Part 5 - Tables of assessment.
- 9.4.3.2

Purpose
1. The purpose of the code is to ensure that infrastructure is provided to service development.

2. The purpose of the code will be achieved through the following overall outcomes:

a. development protects the existing infrastructure and planned infrastructure networks being the:

i. movement network;
- Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

- ii. park network;
- iii. water network;
- iv. sewerage network;
- v. stormwater network;
- vi. other networks including electricity, gas and telecommunications;
- vii. land for community facilities network;
- b. development other than operational work provides infrastructure that is necessary to service the development, including elements of:
 - i. a safe, efficient and legible road network;
 - ii. a safe, efficient and legible public transport network;
 - iii. a safe, efficient and legible cycle network;
 - iv. a safe, efficient and legible pedestrian network;
 - v. a safe, efficient and legible parks network;
 - vi. a safe and efficient water network;
 - vii. a safe and efficient sewerage network;
 - viii. a safe and efficient stormwater network;
 - ix. safe and efficient other networks including electricity, gas and telecommunications;
 - x. a safe and efficient road lighting network;
 - xi. land for a community facilities network;
- c. development integrates with existing and planned infrastructure networks;
- d. infrastructure is designed and constructed to deliver a standard of service that is efficient and equitable;
- e. the cost to the community for the life of the infrastructure is minimised by providing for a suitable design life, ease of maintenance and ease of replacement;
- f. development appropriately manages refuse and recycling storage and collection;
- g. infrastructure protects personal health and safety and premises;
- h. infrastructure protects environmental values.

9.4.3.3 **Assessment benchmarks for assessable development and requirements for accepted development**

Part A - Requirements for accepted development (subject to requirements) and assessment benchmarks for assessable development

Table 9.4.3.3.1 - Infrastructure code: accepted development (subject to requirements) and assessable development

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

Performance outcomes	Acceptable outcomes	Solutions	Comments	Council Use Only
For accepted development (subject to requirements) and assessable development				
Provision, design, construction and location of infrastructure				
PO1 Development is demonstrated to be capable of being serviced by necessary infrastructure.	AO1 Reports, plans and drawings are provided in accordance with part 2 of Planning scheme policy 5 - Infrastructure.	✓	The development is capable of being serviced by the necessary infrastructure in accordance with part 2 of the planning scheme policy 5 – infrastructure. Refer to the Bornhorst + Ward Serviceability Report for service connection plans.	
PO2 Development: a. provides necessary infrastructure to service the development; b. provides that the design, construction and location of necessary infrastructure: i. protects existing and planned infrastructure networks; ii. services proposed development; iii. integrates with existing and planned infrastructure networks; iv. delivers a standard of service that is efficient and	AO2 Development: a. in a water supply service area connects to the water network in accordance with the SEQ Water Supply and Sewerage Design and Construction Code; b. not in a water supply service area provides a tank with a minimum storage capacity of 45,000 litres; c. in a sewerage supply service area connects to the waste water network in accordance with the SEQ Water Supply and Sewerage Design and Construction Code; d. not in a sewerage supply service	✓	The development is in a water and sewerage supply service area and is capable of being serviced by the necessary infrastructure in accordance with part 2 of the planning scheme policy 5 – Infrastructure and the SEQ water supply and sewerage design and construction code. Refer to the Bornhorst and Ward serviceability report for service connection locations. The development provides stormwater infrastructure in accordance with part 3.6 of planning scheme policy 5 –	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

equitable; v. minimises the cost to the community for the life of the infrastructure by providing a suitable design life, ease of maintenance and ease of replacement; vi. protects personal health, safety and premises; vii. protects environmental values.	area complies with part 1 of the Queensland Plumbing and Wastewater Code; e. provides stormwater infrastructure in accordance with part 3.6 of Planning scheme policy 5 - Infrastructure; f. provides a movement network infrastructure in accordance with part 3.4 of Planning scheme policy 5 - Infrastructure; g. provides parks in accordance with part 3.12 of Planning scheme policy 5 - Infrastructure; h. provides road lighting in accordance with part 3.5 of Planning scheme policy 5 - Infrastructure; i. provides electricity reticulation in accordance with part 3.8 of Planning scheme policy 5 - Infrastructure; j. provides gas and telecommunications reticulation in accordance with part 3.9 of Planning scheme policy 5 - Infrastructure. k. is consistent with the general planning layouts in part 7.2 of Planning scheme policy 5 - Infrastructure. Editor's note - The delivery of any part of a network identified in the plans for trunk		Infrastructure. Refer to the Bornhorst and Ward stormwater management plan for further information. The development provides movement network infrastructure in accordance with part 3.4 of planning scheme policy 5 – Infrastructure. Refer to Bornhorst and Ward serviceability report.	
---	---	--	---	--

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

	infrastructure is governed by Part 4 - Local government infrastructure plan.			
Location of development				
PO3 Development is located to protect trunk infrastructure networks.	AO3 Development is located outside a network identified in Local government infrastructure plan map LGIP-03.00 to 08.00 Plans for trunk infrastructure in Schedule 3 - Local government infrastructure plan mapping and tables.	✓	Development is located outside a network identified in Local government infrastructure plan map LGI-03.00 to 08.00 Plans for trunk infrastructure in Schedule 3 – Local government infrastructure plan mapping and tables.	
Fire fighting				
PO4 Development in a water service area accessed by common private title provides: a. fire hydrant infrastructure; b. unimpeded access for emergency services vehicles. Editor's note - The term common private title refers to areas such as access roads in community title developments or strata title unit access, which are private and under group or body corporate control.	AO4 Development in a water service area involving a material change of use or reconfiguring a lot where, or to be, accessed by common private title ensures that fire hydrant placement and technical requirements for streets and access ways are in accordance with: a. Australian Standard (AS) 2419.1 - 2005 <i>Fire hydrant installations</i> ; b. QFES: <i>Fire Hydrant and vehicle access guidelines for residential, commercial and industrial lots</i> .	A/S	Water reticulation with required fire hydrants will be provided as part of the development.	
PO5 Development not in a water service area provides sufficient water storage with adequate pressure, volume and flow to service development for fire fighting	AO5 Development: a. is connected to a reticulated water supply scheme that has sufficient flow and pressure	N/A	The development lies within a water service area.	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

purposes.	characteristics for fire fighting purposes at all times with a minimum pressure and flow of 10 litres per second at 200kPa; or b. has on-site water storage in accordance with Table 9.4.3.3.2 - Water storage for fire fighting, dedicated or retained for fire fighting purposes that is made of fire resistant materials and is: i. a separate tank; or ii. a reserve section in the bottom part of the main water supply tankwater tank. Editor's note - The requirement in AO5 is: - in addition to the requirement for potable water supply/storage in AO2 in Table 9.4.3.3.1 - Infrastructure code: accepted development (subject to requirements) and assessable development; - reflected in AO5 in Table 8.2.3.3.1 - Bushfire hazard overlay code: accepted development (subject to requirements) and assessable development.			
Waste management				
PO6 Development provides refuse and recycling collection and storage facilities that are located and managed so that adverse impacts on building occupants, neighbouring properties and the public realm are minimised.	AO6.1 Development provides refuse and recycling collection and storage facilities in accordance with Planning scheme policy 9 - Waste management. AO6.2	N/A		

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

	Development ensures that the location and design of refuse and recycling collection and storage facilities does not have any adverse impact including odour, noise or visual impacts on the amenity of land uses within or adjoining the development. Note - Planning scheme policy 9 - Waste management provides guidance on how to achieve this outcome.			
Disposal of trade waste				
PO7 The disposal of trade waste in a sewerage supply service area does not adversely affect the sewerage network.	AO7 The disposal of trade waste in a sewerage supply service area complies with the sewer admission standards in section 3.2.6 - Sewer admission standards in Planning scheme policy 3 - Environmental management.	N/A		
Roof water drainage and surface water drainage				
PO8 Development provides stormwater infrastructure for the drainage of the premises so as not to cause any of the following: a. ponding of stormwater on the premises; b. a hazard to personal health and safety; c. damage to premises; d. an increased risk of flooding to	AO8 Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	✓	Stormwater infrastructure proposed for the development will be sized to capture the minor storm in underground drainage, and safely transfer up to the major storm as overland flow. Refer to the Bornhorst and Ward stormwater management plan for further information. The development complies with the standards for stormwater	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

premises within the catchment.			infrastructure specified in part 3.6 of planning scheme policy 5 – Infrastructure.	
Natural flow of surface water				
PO9 Development provides that the natural flow of surface water is: a. not altered so as to cause a risk to personal health and safety or damage to property; b. not increased in intensity, velocity or frequency; c. not concentrated onto adjoining premises.	AO9 Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	✓	Overland flows will be maintained as per existing site conditions. Refer to the Bornhorst and Ward stormwater management plan for further information. The development complies with the standards for stormwater infrastructure specified in part 3.6 of planning scheme policy 5 – Infrastructure.	
Water sensitive urban design				
PO10 Development which provides stormwater infrastructure incorporates water sensitive urban design principles having regard to: a. protecting existing natural features and ecological processes; b. protecting the natural hydrologic behaviour of catchments; c. protecting the existing natural flow and water quality regimes of waterways; d. protecting water quality of surface	AO10 Development complies with the standards for stormwater infrastructure specified in part 3.6 of Planning scheme policy 5 - Infrastructure.	✓	The development complies with the standards for stormwater infrastructure specified in part 3.6 of planning scheme policy 5 – Infrastructure.	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

and ground waters; e. minimising demand on the water network; f. minimising sewage discharges to the natural environment; g. integrating water into the landscape to enhance visual and ecological values.				
Movement network				
PO11 The projected traffic levels for a use do not adversely affect the planned standards of service for a road or intersection.	AO11 Development does not cause or contribute to projected traffic levels: a. exceeding the maximum vehicle trips per day in Table 3.4.1.4.2 in Planning scheme policy 5 - Infrastructure; or b. exceeding the maximum control delays through intersections in peak periods in Table 3.4.1.4.3 in Planning scheme policy 5 - Infrastructure.	N/A	Refer to traffic impact assessment for further information.	
Integrated movement concept report				
PO12 Development which generates more than 3,000 vehicle trips per average weekday is designed to integrate the movement network to minimise the transportation costs required to service the use.	AO12 Development which generates more than 3,000 vehicle trips per average weekday provides an integrated movement concept report which integrates the planning of the movement network in accordance with part 2 and 3 of Planning scheme policy 5 - Infrastructure.	N/A	Refer to traffic impact assessment for further information.	

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

For assessable development only				
Land use and transport integration				
PO13 Development within 400 metres of existing or future public passenger transport facilities where the total site area is 5,000m ² or more: a. supports a road hierarchy which facilitates efficient, safe and accessible bus services connecting to existing and future public passenger transport facilities; b. enhances connectivity between existing and future public passenger transport facilities and other transport modes; c. optimises the walkable catchment to existing and future public passenger transport facilities; d. provides for direct and safe access to and use of existing or future public passenger transport facilities. Note - SPP code: Land use and transport integration in Appendix 4 of the state planning policy provides guidance to achieve this outcome.	AO13 No acceptable outcome provided.	N/A	Refer to traffic impact assessment for further information.	

Table 9.4.3.3.2 - Water storage for fire fighting

Column 1	Column 2
----------	----------

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution

Lot size / use type	Water requirement
For each residential lot:	
a. less than 1,000m ²	5,000 litres
b. between 1,000m ² and less than 1 hectare	10,000 litres
c. greater than 1 hectare	20,000 litres
Multiple dwelling	5,000 litres per dwelling up to a maximum of 20,000 litres
A use other than Multiple dwelling	5,000 litres or the prevailing rural fire brigade standard

Solution: ✓ = Acceptable Solution
N/A = Not Applicable
AS = Alternative Solution