



CIVIL ENGINEERING

Site Based Stormwater Management Plan

Riverbend, Jimboomba

PREPARED FOR
Celestino Pty Limited

Ref: NL230370
Rev: B
Date: 03.09.2024

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Table of Contents

Table of Contents	3
Executive Summary	6
1 Introduction	7
1.1 Related Reports and Documents	7
2 Site Context and Existing Characteristics	8
2.1 Site Location	8
2.2 Existing Lawful Point of Discharge	9
3 Proposed Development	11
3.1 Proposed Stormwater Management	11
3.1.1 Proposed Stormwater Conveyance	11
3.1.2 Lawful Point of Discharge	12
4 Stormwater Management Objectives	14
4.1 Development Control Plan Objectives	14
5 Flood Impact Assessment.....	15
5.1 Study Catchment and Proposed Development	15
5.2 Model Parameters	15
5.2.1 Hydrological Model	15
5.2.2 Hydraulic Model	22
5.3 Results	26
5.3.1 Critical Duration	26
5.3.2 Model Validation	26
5.3.3 Flood Behaviour	27
5.3.4 Flood Effects	27
6 Stormwater Quality Management - Construction Phase	28
6.1 Erosion and Sediment Control	28
7 Stormwater Quality Management - Operational Phase	29
7.1 Proposed Stormwater Quality Improvement Devices (SQID's)	29
7.1.1 Bioretention Basin	29
7.1.2 Rainwater Tanks	29
7.2 Stormwater Quality Modelling (MUSIC) Methodology	29
7.3 Modelling Results and Summary	33
8 Conclusion	36
Appendix A – Civil Engineering Plans	
Appendix B – Flood Maps	
Appendix C – Structure Plan by Place Design Group Pty Ltd	

Figures

Figure 2-1 - Site Locality (SOURCE: Nearmap (Aerial dated December 2023))	8
Figure 3-1 - Proposed Development (Place Design Group)	11
Figure 3-2 – Lawful Point of Discharge	13
Figure 5-1 – Hydraulic structures and basins	16
Figure 5-2 – Existing catchment extents	17
Figure 5-3 – Developed catchment extents.....	18
Figure 5-4 - TUFLOW Model Setup – Existing Conditions.....	24
Figure 5-5 - TUFLOW Model Setup – Developed Conditions	25
Figure 7-1 - MUSIC model arrangement	30
Figure 7-2 – Water quality treatment locations.....	35

Tables

Table 1-1 - Property Details.....	7
Table 4-1 - Water Quality Objectives.....	14
Table 5-1 - Study Catchment Characteristics.....	15
Table 5-2 - Existing Sub-Catchments.....	19
Table 5-3 - Developed Case Sub-Catchments.....	20
Table 5-4 - IFD Rainfall Depths	21
Table 5-5 - Median Pre-Burst Rainfall Depths.....	21
Table 5-6 - Loss Parameters	22
Table 5-7 - Proposed Culverts.....	22
Table 5-8 - Proposed Detention Basins.....	23
Table 5-9 - Land Use Roughness (Manning's value)	23
Table 5-10 - Critical Events	26
Table 5-11 - Peak Flow Comparison (XP-RAFTS vs RFFE).....	26
Table 7-1 - Rainfall Runoff Parameters	30
Table 7-2 – MUSIC Fraction Impervious Assumptions	31
Table 7-3 – MUSIC nodes Area Breakdown	31
Table 7-4 - Catchment Source Node Summary	31
Table 7-5 - Water Quality Parameters for MUSIC Source Nodes	32
Table 7-6 - Bioretention Sizing Summary.....	33
Table 7-7 - Bioretention Filter Area	33
Table 7-8 - MUSIC Model Results.....	34

Glossary

Term	Definition
AEP	Annual Exceedance Probability
EDQ	Economic Development Queensland
IECA	International Erosion Control Association
IL/CL	Initial Loss and Continuing Loss Hydrological Model
LCC	Logan City Council
LGA	Local Government Area
ML	Megalitres
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
QUDM	Queensland Urban Drainage Manual
PDA	Priority Development Area
RFFE	Regional Flood Frequency Estimation
SBSMP	Site Based Stormwater Management Plan
SPP	State Planning Policy
SQID	Stormwater Quality Improvement Device
WQO	Water Quality Objective
WSUD	Water Sensitive Urban Design

Executive Summary

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Celestino Pty Ltd to prepare a Site Based Stormwater Management Plan (SBSMP). The proposed site is located within the Riverside endorsed context plan area of the Greater Flagstone Priority Development Area (PDA). The proposed development will deliver a 550ha residential subdivision with associated facilities, transport and servicing infrastructure.

This SBSMP addresses the stormwater management strategy for the proposed development and demonstrates that the proposed development can be constructed and operated in accordance with all stormwater objectives required for the development. The primary outcomes of this SBSMP are to outline the following:

- Lawful point of discharge
- Stormwater Conveyance
- Flood management strategy
- Stormwater Quality management strategy
- Erosion and Sediment Control strategy.

Lawful Point of Discharge

The existing site has numerous site discharge points to the Logan River, existing roads and lots. The developed site will retain the existing site discharge points as the lawful point of discharge, with stormwater management at the downstream point of each catchment prior to site discharge.

Stormwater Conveyance

The subdivision will include a stormwater pit and pipe network to appropriately manage the minor storm events. In major storm events detailed design will ensure any overland flow of stormwater is safe and controlled within the road reserve and any stormwater easements. Stormwater will be safely and effectively conveyed from the upper extent of each catchment to stormwater management facilities downstream prior to site discharge.

Flood Management Strategy

A TUFLOW model with RAFTS inflows has been prepared to assess the flood behaviour across the site. A series of detention basins have been proposed to mitigate flows onto adjoining private property. Where the site adjoins the Logan River, discharge has been released undetained. It was determined there were no significant adverse impacts on private property from the development.

Stormwater Quality management strategy

Stormwater quality infrastructure has been included in the design to achieve the water quality objectives for South East Queensland specified in the State Planning Policy 2017, namely, the removal of gross pollutants, suspended solids, nitrogen and phosphorus. The proposed treatment train was modelled using MUSIC modelling software and includes bioretention basins and rainwater tanks to treat runoff from the site. The proposed development is split into multiple catchments, with each catchment having localised treatment prior to discharge to the downstream watercourse.

Erosion and Sediment Control strategy

Erosion and Sediment Control measures are to be implemented during construction in accordance with the requirements of the International Erosion Control Association (IECA).

1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Celestino Pty Ltd to prepare a Site Based Stormwater Management Plan (SBSMP) in support of the proposed development within the Greater Flagstone Priority Development Area (PDA). This report is intended to be submitted to Economic Development Queensland (EDQ) for approval.

The proposed development extent currently consists of six existing parcels of undeveloped land. The proposed development will deliver a 550ha residential subdivision with associated facilities, transport and servicing infrastructure. Property information for the site is summarised in Table 1-1.

Table 1-1 - Property Details

Category	Description
Lot Title	Lot 800 SP247625
	Lot 101 SP254145
	Lot 102 SP254145
	Lot 104 SP254145
	Lot 105 SP254145
	Lot 106 SP254145
Total Site Area	550 Ha
Proposed Land Use	Urban Residential Centre

This primary objectives of this SBSMP are to define the following:

- Lawful point of discharge
- Stormwater Conveyance
- Stormwater Quantity and Flood management strategy
- Stormwater Quality management strategy
- Erosion and Sediment Control strategy.

1.1 Related Reports and Documents

This report is to be read in conjunction with the following reference documents:

- Civil Design Drawings by Colliers Engineering.
- Flood Impact Assessment for Bulk Earthworks OPW for Riverbend, Jimboomba (prepared by Northrop Engineers, Revision C, dated October 2023).

2 Site Context and Existing Characteristics

2.1 Site Location

The subject site is located South of Teviot Road, Jimboomba, within the Logan City Council (LCC) LGA. The site comprises of six adjacent land parcels to be subdivided into an urban residential development. The site includes the following parcels of land:

- Lot 800 SP247625
- Lot 101 SP254145
- Lot 102 SP254145
- Lot 104 SP254145
- Lot 105 SP254145
- Lot 106 SP254145

The site is currently bound by:

- Teviot Road to the North-West
- Logan River to the East and South
- Residential lots and private properties to the North and South

In its current state the subject site is undeveloped with generally sparse, vegetated land and trees. The site is largely cleared and used as grazing land. Riparian vegetation is located around the existing watercourse. Figure 2-1 below illustrates the site location and existing site characteristics.



Figure 2-1 - Site Locality (SOURCE: Nearmap (Aerial dated December 2023))

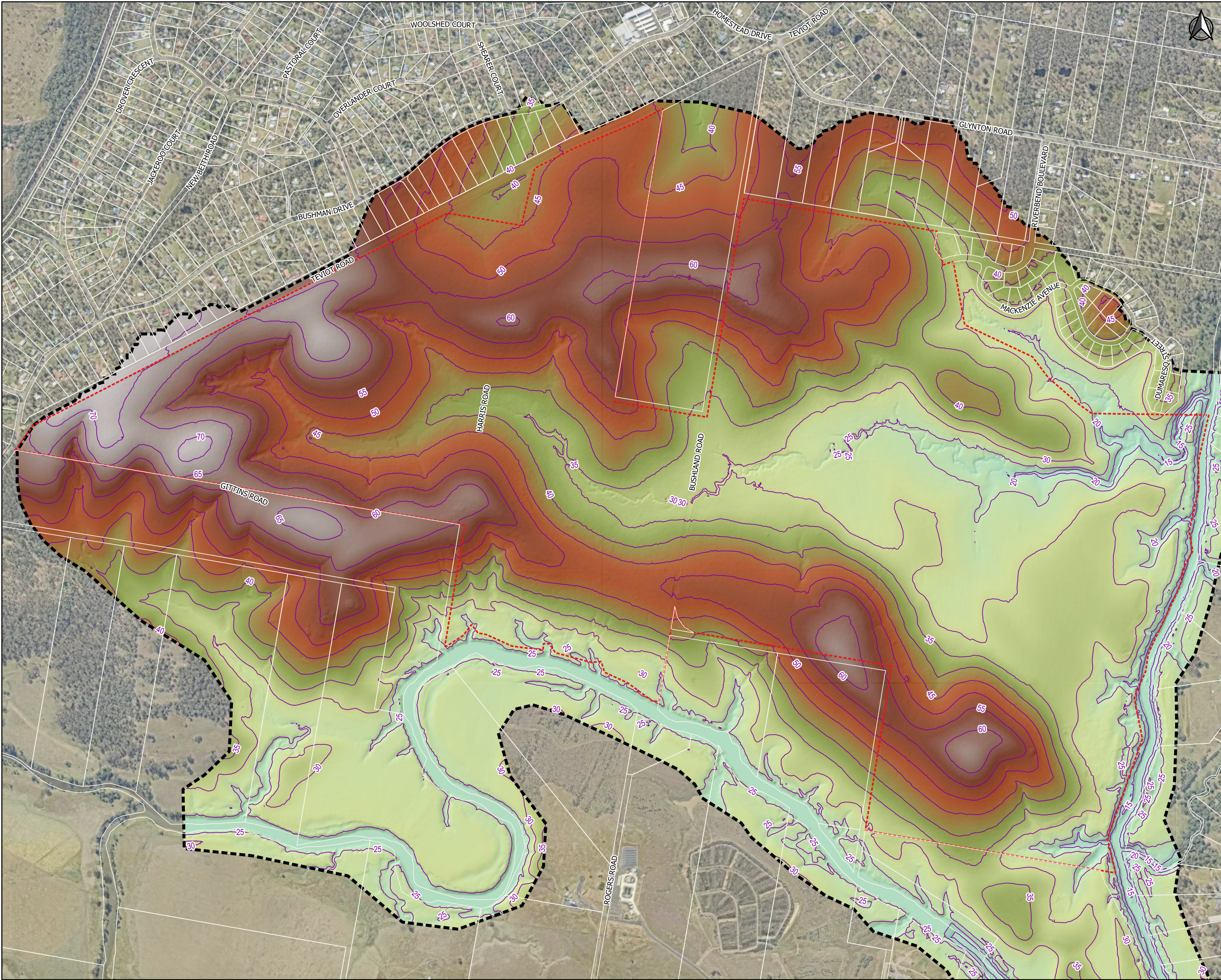
2.2 Existing Lawful Point of Discharge

The site topography results in the site having numerous existing discharge points, generally including the following:

- To Logan River along the south and east
- To Teviot Road
- To existing lots north of the site

Approximately half of the site grades toward an unnamed watercourse running west to east central to the site, which ultimately discharges to Logan River at the edge of the site.

Refer to Figure 2-2 overleaf for topography of the existing site.



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Study Catchment
 - 5m Contours(mAHD)
- Terrain(mAHD)
- Band 1
- 75
 - 20

0 200 400 Metres

1:13,000

Figure 2-2
Existing Terrain

3 Proposed Development

The proposed Riverbend Jimboomba Celestino urban residential development consists of ranging residential densities. The construction will involve the residential subdivision works and associated transport and servicing infrastructure. The development is proposed to be an urban residential centre with recreational areas, sport centres, community and education facilities. The proposed Concept Block Layout outlining the general layout of the development prepared by Place Design Group Pty Ltd is shown below in **Figure 3-1**. The prepared Concept Block Layout is included in Appendix C.

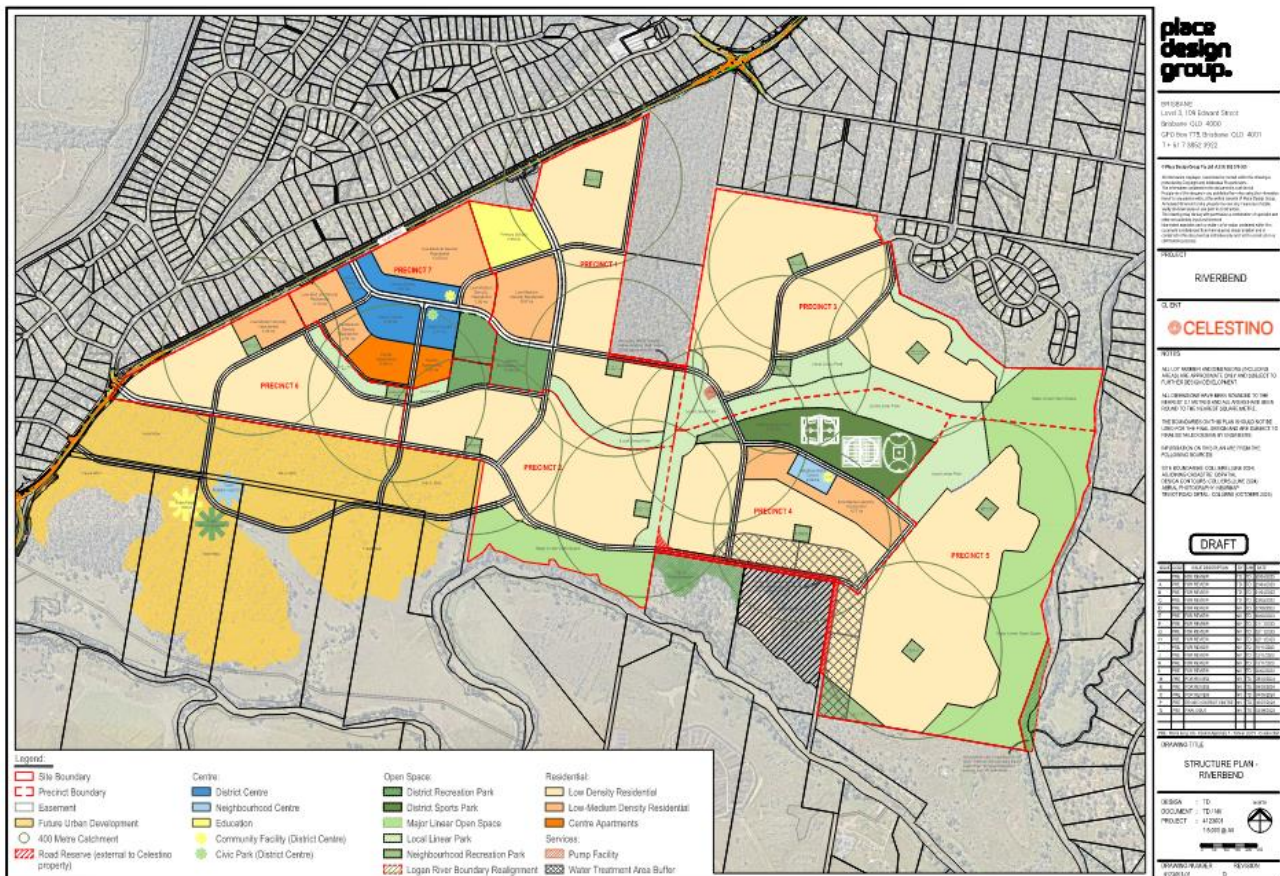


Figure 3-1 - Proposed Development (Place Design Group)

3.1 Proposed Stormwater Management

3.1.1 Proposed Stormwater Conveyance

The subdivision will include a stormwater pit and pipe network which will follow the road alignment. Pit spacing will adhere to Council maximum spacing and pipe size and grades to Council minimum requirements. The stormwater pit and pipe network will be designed with capacity to appropriately manage minor storm events, with adherence to Council requirements including freeboard and flow widths in the minor events.

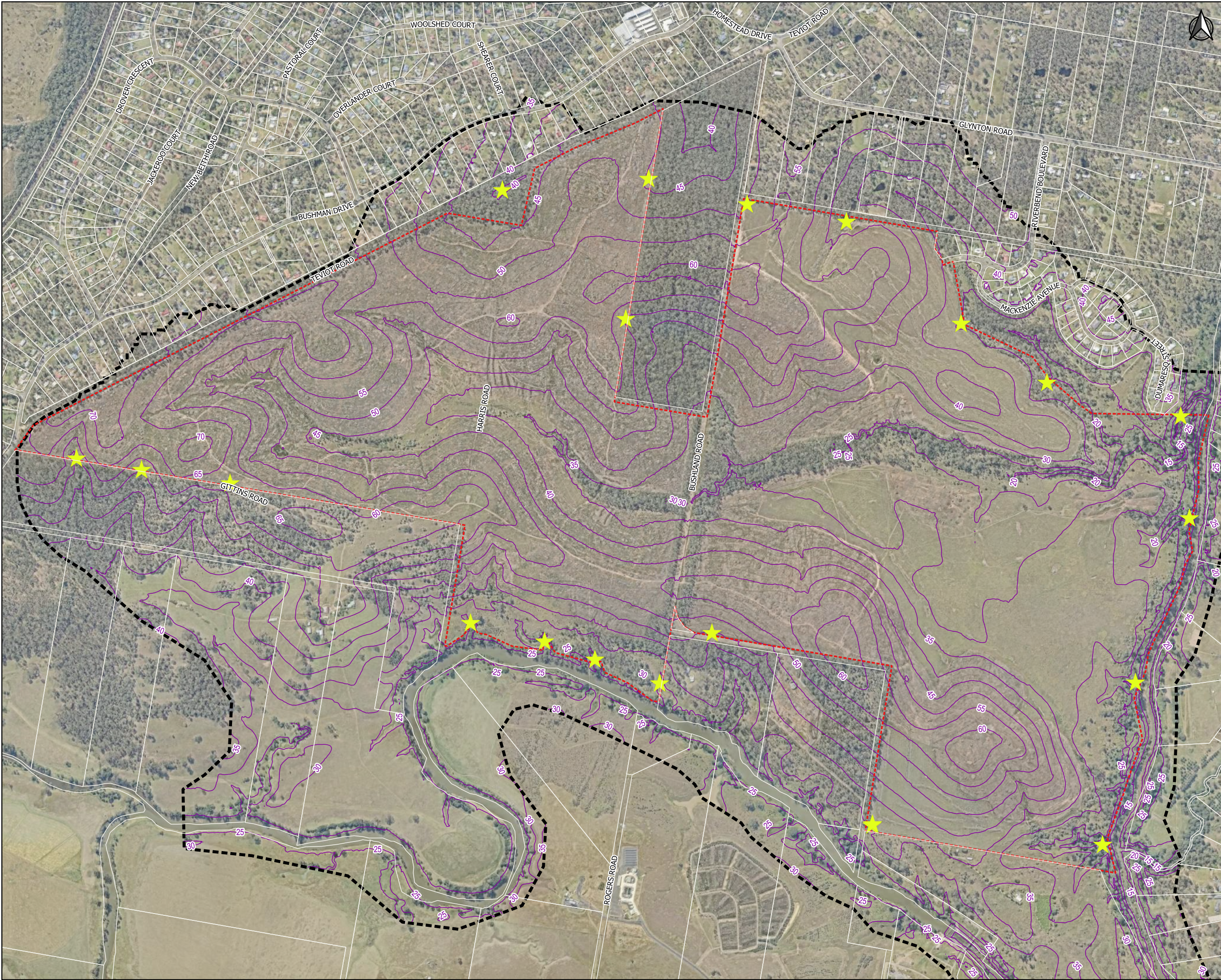
In major storm events detailed design will ensure any overland flow of stormwater is safe and controlled within the road reserve. Easements for drainage of stormwater will be applied where required for appropriate management of stormwater. Maximum velocity x depth (vd) and flow depths will comply to ensure safe conveyance in the street and lots not inundated with stormwater.

Stormwater will be safely and effectively conveyed from the upper extent of each catchment to stormwater management facilities downstream prior to site discharge. Management facilities will treat stormwater to meet the water quality targets outlined in Section 4.

Detailed design and assessment of compliance with these requirements will be undertaken at each stages ROL application.

3.1.2 Lawful Point of Discharge

The development proposes to retain the existing site discharge points as the lawful points of discharge. Proposed site grading will generally work with the natural land formation, such that existing discharge points are utilised. Stormwater management at the downstream point of each catchment prior to site discharge, as described in this report, will minimise adverse impacts downstream of the discharge point. The points of discharge are presented overleaf in **Figure 3-2**.



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Study Catchment
 - 5m Contours(mAHD)
 - Discharge Points

0 200 400 Metres
1:13,000

Figure 3-2
Discharge Locations

4 Stormwater Management Objectives

4.1 Development Control Plan Objectives

Stormwater management for the proposed development has been designed in accordance with the following documents:

- Logan City Council Planning Scheme
- State Planning Policy (SPP), 2017
- Environmental Protection (Water) Policy, 2009
- Queensland Urban Drainage Manual (QUDM) Fourth Edition, 2016
- Water By Design MUSIC Modelling Guidelines, Version 3.0, 2018
- Water by Design - Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands V1.1, 2010
- Australian Rainfall and Runoff Guideline (ARR)

The stormwater management objectives for the development are summarised below:

- Stormwater quality to achieve the minimum design requirements of the State Planning Policy (2017) and achieve water quality objectives in accordance with Environmental Protection (Water) Policy (2009), as follows in Table 4-1 below.

Table 4-1 - Water Quality Objectives

Pollutant	Percent Reduction
Gross Pollutants (>5mm), GP	90%
Total Suspended Solids, TSS	80%
Total Phosphorous, TP	60%
Total Nitrogen, TN	45%

5 Flood Impact Assessment

5.1 Study Catchment and Proposed Development

The study catchment predominantly falls to east and south directly flowing to approximately 6 kilometres long section of Logan River. A major ephemeral watercourse traverses the catchment from the west to the east and a series of minor watercourses and gullies discharging to the south. There are also two minor drainage paths discharging to the north.

Table 5-1 - Study Catchment Characteristics

Characteristics	Value
Total Area (ha)	1050
Average Elevation (m AHD)	25
Highest Elevation (m AHD)	74
Lowest Elevation (m AHD)	11
Average Slope (%)	7
Typical Land Use	Medium to High density bushland, Grassland and Pastures, Shrubs and Trees, Rural Residential, Low-density Residential.

The study catchment, proposed development design landform, lot boundaries, major hydraulic structures and concept detention basins are shown in **Figure 5-1** overleaf.

5.2 Model Parameters

Detailed two-dimensional hydraulic modelling was undertaken using the two-dimensional TUFLOW hydrodynamic modelling software. XP-RAFTS hydrological modelling software has been used to generate inflows for the TUFLOW model. The hydrological and hydraulic model parameters are presented below.

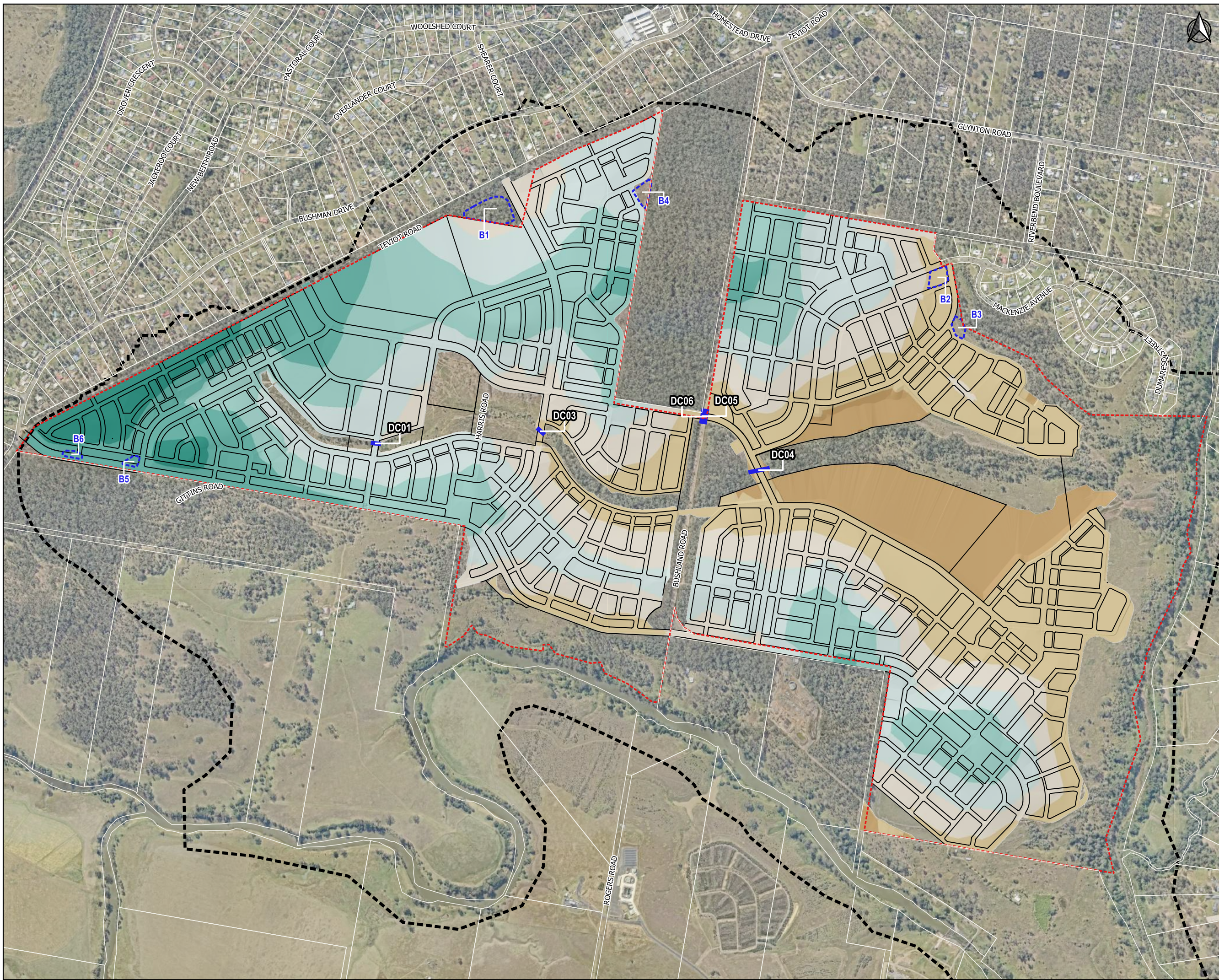
5.2.1 Hydrological Model

The hydrological model used for the analysis was the XP-RAFTS software with Laurenson hydrology. As recommended by the latest Australian Rainfall and Runoff (ARR) 2019 guidelines, the Initial and Continuing Loss (ILCL) model, coupled with median pre-burst rainfall has been adopted in this study. The input data for the XP-RAFTS model used in this study includes sub-catchment data, design rainfall, temporal patterns, pre-burst rainfall and the Initial and Continuing Losses. These are summarised below.

Sub-Catchment Properties

Sub-catchments have been delineated using a combination of LiDAR, aerial imagery, cadastral boundaries, and detailed survey. The following **Table 5-2** presents the existing sub-catchment properties while, the catchment extents are presented in **Figure 5-2** overleaf.

Sub-catchments over the extent of the proposed development have been further refined to capture proposed modifications to the terrain and land use introduced as part of the development. A typical 80% impervious fraction has been adopted over the extent of the proposed development. A summary of the developed catchments is presented in the below **Table 5-3** and are presented in **Figure 5-3** below.



Legend

- Masterplan Stage Boundary
- Existing Lots
- Study Catchment
- Development Layout
- Detention Basins
- Culverts

Design Surface(mAHD)

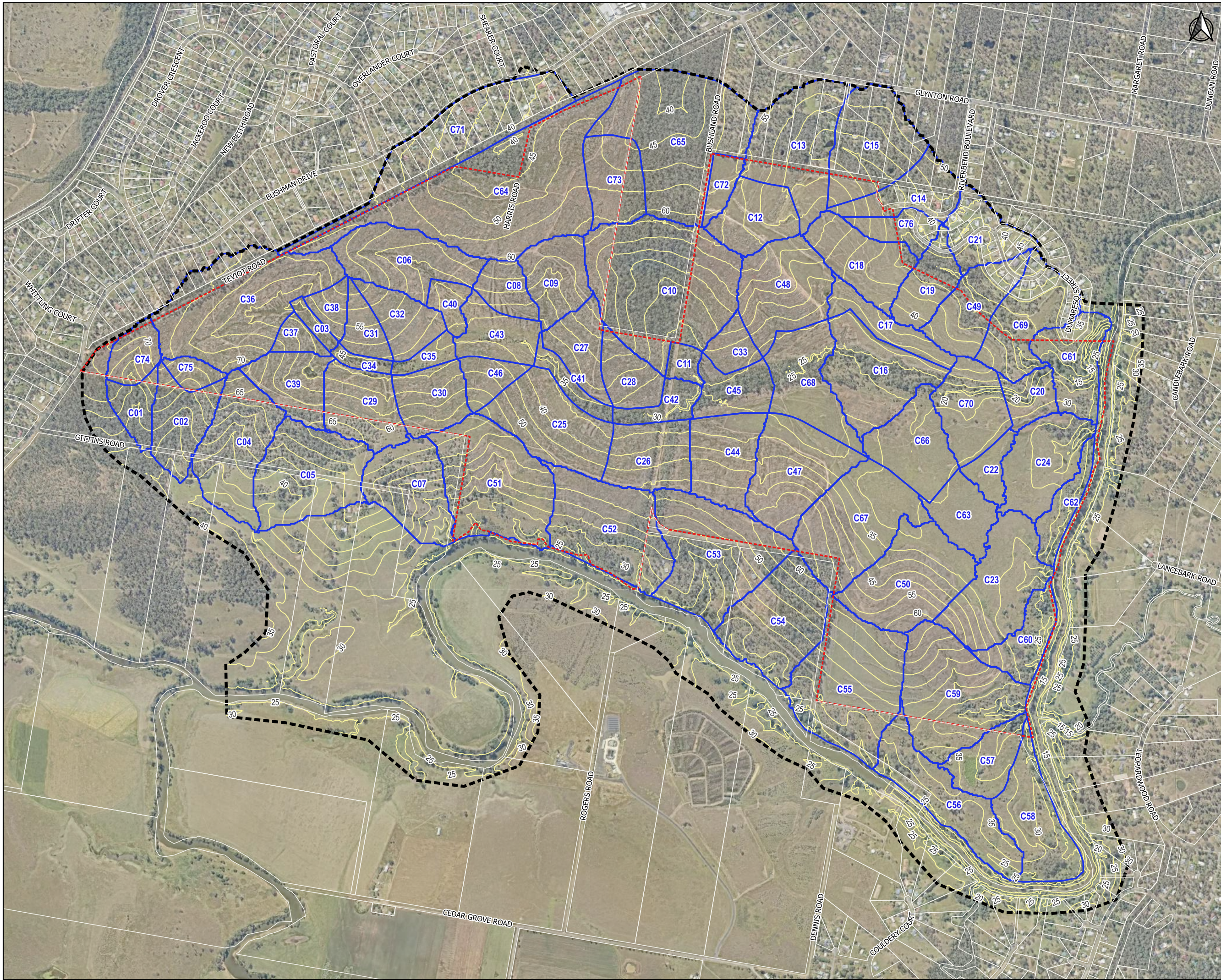
- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

0 200 400 Metres
1:13,000

Figure 5-1
Proposed Development

Riverbend

NORTHROP



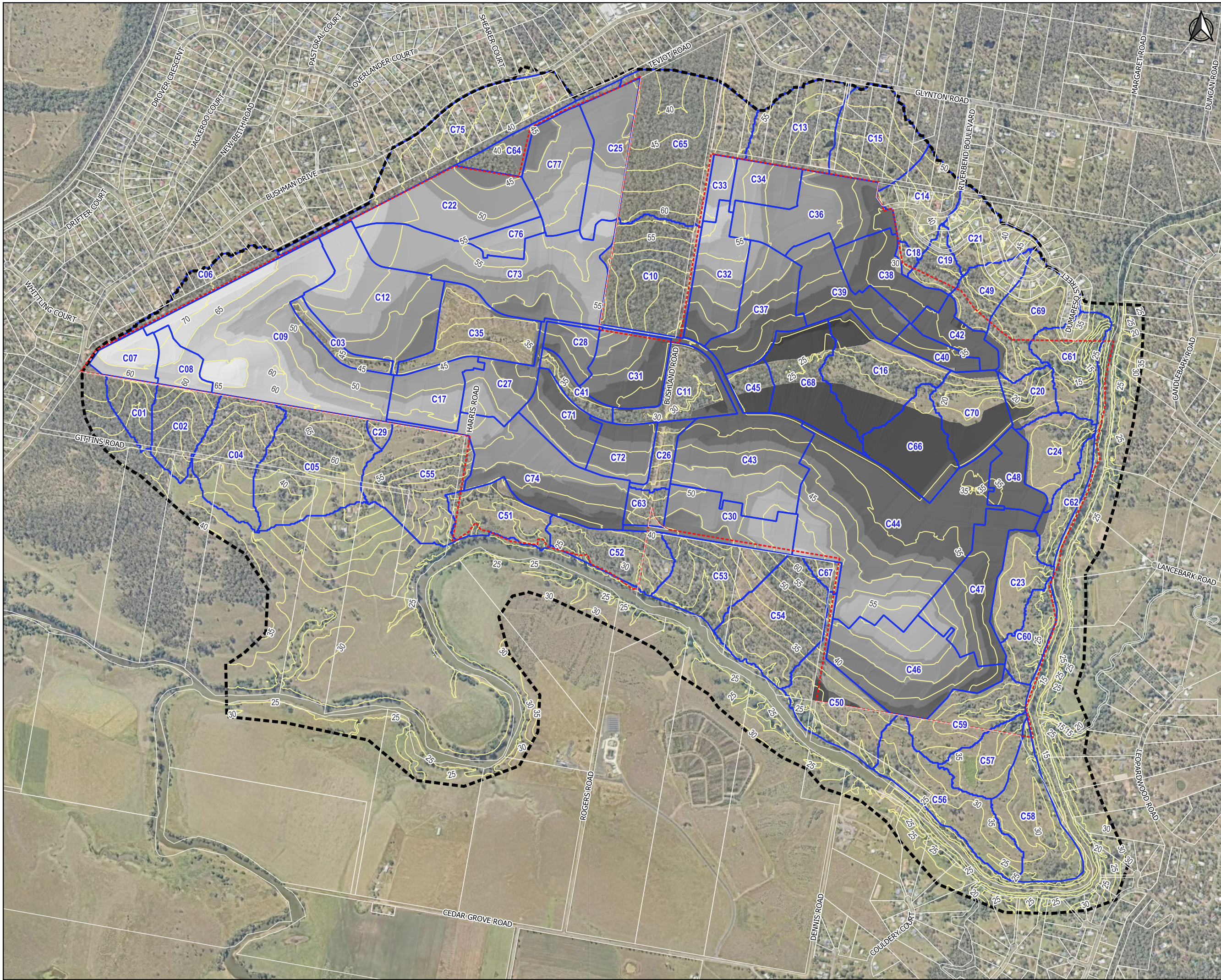
- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Study Area
 - RAFTS Catchments
 - 5m Contours(mAHD)

0 200 400 Metres
1:15,000

Figure 5-2
Hydrologic Model
Catchments
Existing Conditions

Riverbend





Legend

- Masterplan Stage Boundary
- Existing Lots
- Study Area
- RAFTS Catchments
- 5m Contours(mAHd)

Design Surface(mAHd)

<= 30.9
30.9 - 37.8
37.8 - 44.6
44.6 - 51.5
51.5 - 58.3
58.3 - 65.2
> 65.2

0 200 400 Metres
1:15,000

Figure 5-3
Hydrologic Model
Catchments
Developed Conditions

Table 5-2 - Existing Sub-Catchments

Catchment Reference	Area (ha)	Effective Impervious (%)	Vectored Slope (%)	Catchment Reference	Area (ha)	Effective Impervious (%)	Vectored Slope (%)
C01	4.50	0	8.9	C39	8.31	0	7.1
C02	9.21	0	8.4	C40	2.97	0	5.7
C03	1.59	0	7.5	C41	3.25	0	4.5
C04	15.30	0	7.8	C42	4.08	0	2.3
C05	17.21	0	7.8	C43	7.48	0	5.4
C06	13.55	0	6.8	C44	11.02	0	5.9
C07	12.53	0	10.2	C45	6.77	0	2.5
C08	4.86	0	7.9	C46	4.21	0	7.7
C09	8.77	0	6.4	C47	15.60	0	7.2
C10	32.29	0	6.7	C48	14.64	0	7.9
C11	2.17	0	2.4	C49	10.03	2	6.9
C12	8.97	0	4.7	C50	17.48	0	7.5
C13	17.46	0	5.4	C51	21.48	0	9.0
C14	8.36	10	6.8	C52	19.09	0	7.3
C15	15.12	0	6.7	C53	21.90	0	8.5
C16	15.36	0	4.9	C54	16.71	0	8.0
C17	6.09	0	8.1	C55	23.49	0	7.2
C18	10.77	0	5.3	C56	14.41	0	7.5
C19	7.10	2	6.0	C57	7.23	0	5.6
C20	4.56	0	10.5	C58	12.94	0	8.4
C21	8.20	15	6.8	C59	21.15	0	8.7
C22	3.54	0	1.2	C60	6.82	0	8.4
C23	16.04	0	7.0	C61	9.86	0	11.4
C24	12.14	0	5.0	C62	4.96	0	13.2
C25	14.95	0	6.8	C63	7.01	0	1.3
C26	10.20	0	6.3	C64	39.96	0	4.2
C27	7.21	0	6.7	C65	27.91	0	4.2
C28	6.26	0	5.5	C66	11.22	0	2.7
C29	10.28	0	7.2	C67	18.96	0	6.8
C30	8.14	0	7.2	C68	12.14	0	2.2
C31	4.24	0	7.1	C69	12.79	3	7.8
C32	7.00	0	6.5	C70	10.68	0	6.6
C33	3.79	0	5.8	C71	19.86	25	3.0
C34	1.59	0	4.7	C72	3.07	0	4.5
C35	2.50	0	4.2	C73	8.94	0	4.5
C36	26.93	0	6.1	C74	4.71	0	8.9
C37	2.53	0	7.9	C75	2.56	0	8.4
C38	2.99	0	8.9	C76	4.54	10	6.8

Table 5-3 - Developed Case Sub-Catchments

Catchment Reference	Area (ha)	Effective Impervious (%)	Vectored Slope (%)	Catchment Reference	Area (ha)	Effective Impervious (%)	Vectored Slope (%)
C01	4.55	0	9.0	C40	3.32	80	4.1
C02	8.28	10	8.0	C41	2.90	0	4.5
C03	3.18	0	6.2	C42	4.92	80	3.2
C04	13.68	0	7.5	C43	22.53	80	3.3
C05	20.46	0	7.0	C44	45.39	80	3.4
C06	5.69	0	3.8	C45	3.37	0	2.6
C07	4.71	80	5.5	C46	20.27	80	4.3
C08	3.99	80	3.1	C47	14.42	80	3.5
C09	38.22	80	3.6	C48	5.61	80	1.0
C10	18.10	0	6.9	C49	6.20	3	7.1
C11	9.16	0	2.3	C50	13.56	0	6.8
C12	21.94	80	3.5	C51	8.52	0	8.9
C13	12.30	0	5.5	C52	10.02	0	7.7
C14	9.32	15	6.5	C53	12.89	0	9.2
C15	13.07	0	6.5	C54	16.62	0	8.0
C16	15.34	0	4.9	C55	17.09	0	9.0
C17	8.24	80	3.8	C56	14.31	0	7.5
C18	0.85	0	5.3	C57	7.23	0	5.6
C19	3.68	4	6.5	C58	12.94	0	8.4
C20	4.52	0	10.6	C59	10.30	0	8.4
C21	8.2	15	6.8	C60	5.76	0	8.1
C22	15.78	0	4.0	C61	9.86	0	11.4
C23	7.40	0	6.5	C62	4.94	0	13.5
C24	8.08	0	7.1	C63	2.79	0	5.8
C25	10.50	80	2.0	C64	4.42	25	3.0
C26	3.35	0	6.4	C65	27.81	0	4.0
C27	7.70	80	3.8	C66	11.21	0	2.7
C28	4.06	80	3.6	C67	1.47	0	5.9
C29	0.97	0	6.6	C68	12.09	0	2.2
C30	10.67	80	3.5	C69	11.96	3	7.9
C31	10.25	80	3.0	C70	9.90	0	6.6
C32	10.98	80	3.0	C71	7.37	80	3.2
C33	2.50	80	2.2	C72	6.27	80	3.3
C34	5.25	80	2.6	C73	27.77	60	3.2
C35	12.05	0	5.4	C74	19.89	80	4.0
C36	15.17	80	3.0	C75	19.86	25	3.0
C37	12.46	80	3.8	C76	3.14	80	2.5
C38	8.79	80	2.9	C77	12.24	80	3.0
C39	10.61	80	3.6				

Burst Rainfall

The latest ARR 2019 rainfall has been obtained from the Bureau of Meteorology (BoM) while the accompanying rainfall temporal patterns have been obtained by the ARR Data Hub for a location over the study catchment. ARR 2019 recommends the use of the storm ensemble method using 10 temporal patterns for each storm duration. For this investigation, storm durations ranging from the 15, 20, 25, 30, 45-minute, 1, 1.5, 2, 3, 4.5, 6-hour events were assessed in the hydrological model. The following **Table 5-4** presents the rainfall depths used for the investigation.

Table 5-4 - IFD Rainfall Depths

Duration	20% AEP (mm)	10% AEP (mm)	5% AEP (mm)	1% AEP (mm)
15 min	27.1	32.1	37	47.9
20 min	31.4	37.2	42.8	55.6
25 min	34.6	41.1	47.4	61.8
30 min	37.3	44.3	51.1	66.9
45 min	42.9	51.1	59.1	78.3
1 hour	46.7	55.8	64.8	86.5
1.5 hour	52.2	62.5	72.8	98.4
2 hour	56.2	67.5	78.9	107
3 hour	62.7	75.5	88.6	122
4.5 hour	70.7	85.3	100	139
6 hour	77.7	93.8	111	153

Pre-Burst Rainfall

The median (50%-percentile) pre-burst rainfall depths have been adopted for the purposes of the investigation. These were obtained from the ARR Data Hub for a location over the study catchment. Pre-burst rainfall depths were distributed across six timesteps prior to the storm burst. **Table 5-5** presents the median pre-burst rainfall depths used for the assessment.

Table 5-5 - Median Pre-Burst Rainfall Depths

Duration	20% AEP (mm)	10% AEP (mm)	5% AEP (mm)	1% AEP (mm)
15 min	1.7	2.7	3.6	4.3
20 min	1.9	3.1	4.1	5.0
25 min	2.1	3.4	4.6	5.6
30 min	2.3	3.7	4.9	6.0
45 min	2.7	4.2	5.7	7.0
1 hour	2.9	4.6	6.2	7.8
1.5 hour	2.0	3.2	4.5	17.4
2 hour	3.6	6.1	8.4	20.8
3 hour	5.1	8.2	11.2	31.4
4.5 hour	6.4	10.5	14.4	36.2
6 hour	7.8	12.8	17.7	40.3

Infiltration Losses and Catchment Roughness

As mentioned above, the Initial and Continuing Loss (ILCL) model has been used for this study with the latest ARR 2019 storm losses obtained from the ARR Data Hub for a location over the study area. The ILCL method simulates catchment storage as an initial loss in rainfall followed by a constant loss rate (continuing loss). The following **Table 5-6** presents the Initial and Continuing losses used for the analysis.

Table 5-6 - Loss Parameters

Land Use	Initial Loss (mm)	Continuing Loss (mm/hr)
Modelled (ARR data hub) Pervious	24.0	1.6
Modelled Effective Impervious	1.5	0.0

A hydrological roughness of 0.015 has been used for impervious areas which is consistent with concrete surfaces and sealed roads while, roughness value of 0.060 have been adopted for pervious areas which are consistent with predominantly grassed areas expected over rural catchments.

5.2.2 Hydraulic Model

The hydraulic model used for this study is the combined one-dimensional / two-dimensional (1D/2D) TUFLOW hydrodynamic engine. For this study, TUFLOW version 2020-10-AD with HPC GPU solver has been used.

Model Domain

The TUFLOW model extent is presented in **Figure 5-4** and **Figure 5-5** overleaf for both existing and developed conditions. The TUFLOW model terrain was developed using a combination of the latest LiDAR and topographical surveys. A five-meter grid size was adopted in this flood assessment as it was determined to provide a reasonable balance between model run time and the representation of catchment overland flow and flood behaviour through watercourses.

Boundary Conditions

Sub-catchment flows derived by the XP-RAFTS model were applied directly to the two-dimensional grid via a series of inflow polygons. Inflow and outflow boundaries for Logan River and outlet boundaries for the northern sub-catchments of the model are shown in **Figure 5-4** and **Figure 5-5**. The 5% AEP flood levels for Logan River were adopted in this assessment and sourced from the latest Logan River Flood Study. A “HQ” boundary was used for each northern outlets with a “free outflow” tailwater condition and slopes generally consistent with the observed existing terrain grades at the location of the outlet boundaries.

Hydraulic Structures

A summary of proposed major stormwater infrastructure (refer to **Figure 5-1** for locations) is presented in the following **Table 5-7**.

Table 5-7 - Proposed Culverts

Culvert Reference	Type	Size
DC01	RCBC	2 x W 3.0m x H 1.5m
DC03	RCBC	4 x W 3.0m x H 1.5m
DC04	RCBC	5 x W 3.0m x H 1.5m
DC05	RCP	3 x D 0.852m
DC06	RCP	3 x D 0.825m

An overview of proposed detention basin configurations (refer to **Figure 5-1** for locations) is outlined in the following **Table 5-8**.

Table 5-8 - Proposed Detention Basins

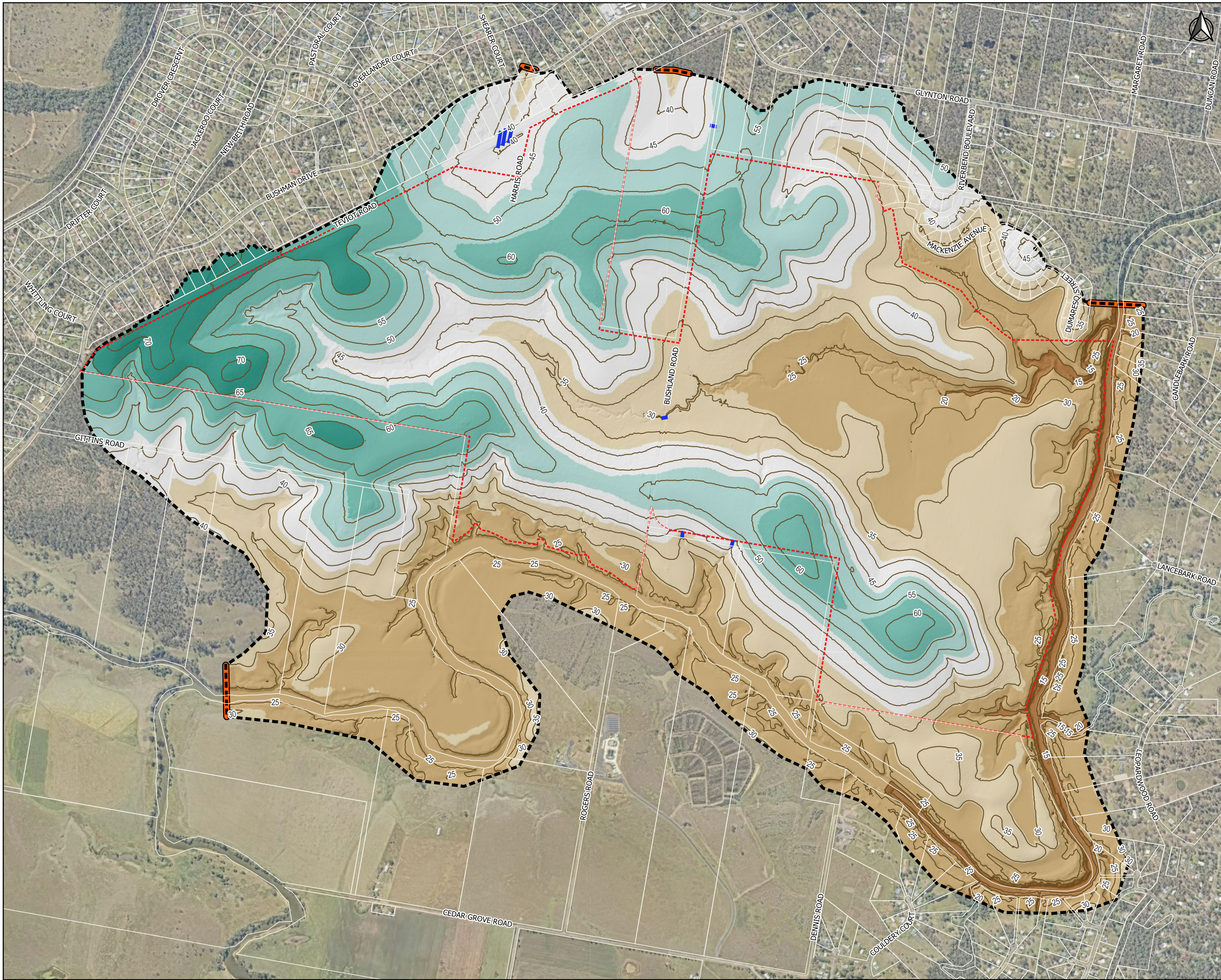
Basin Ref	Embankment	Catchment (ha)	ToW or Road Shoulder Elevation (m AHD)	Outlet	Weir	1% AEP Storage (m ³)
1	Wall	35.58	43.05	RCP 2 x 0.675m, US IL 39.95mAHD, DS IL 39.65mAHD	Base Width 5m, Top Width 8m, IL 42.3mAHD	12,630
2	Wall	10.50	48.20	RCP 2 x 0.45m, US IL 44.6mAHD, DS IL 43.85mAHD	Base Width 5m, Top Width 8m, IL 47.5mAHD	3,170
3	Road	4.71	57.70	RCP 1 x 0.525m, US IL 55.5mAHD, DS IL 55.00mAHD	N/A	1,800
4	Road	4.00	56.50	RCP 1 x 0.6m, US IL 54.5mAHD, DS IL 54.25mAHD	N/A	1,550
5	Road	15.17	34.00	RCP 2 x 0.675m, US IL 31.5mAHD, DS IL 31.15mAHD	N/A	6,500
6	Wall	8.79	32.50	RCP 2 x 0.45m, US IL 29.7mAHD, DS IL 29.2mAHD	Base Width 5m, Top Width 8m, IL 32.0mAHD	3,000

Hydraulic Roughness

The following **Table 5-9** below present the modelled land use and the adopted surface roughness values. The adopted surface roughness values are consistent with the latest flood study for Logan River.

Table 5-9 - Land Use Roughness (Manning's value)

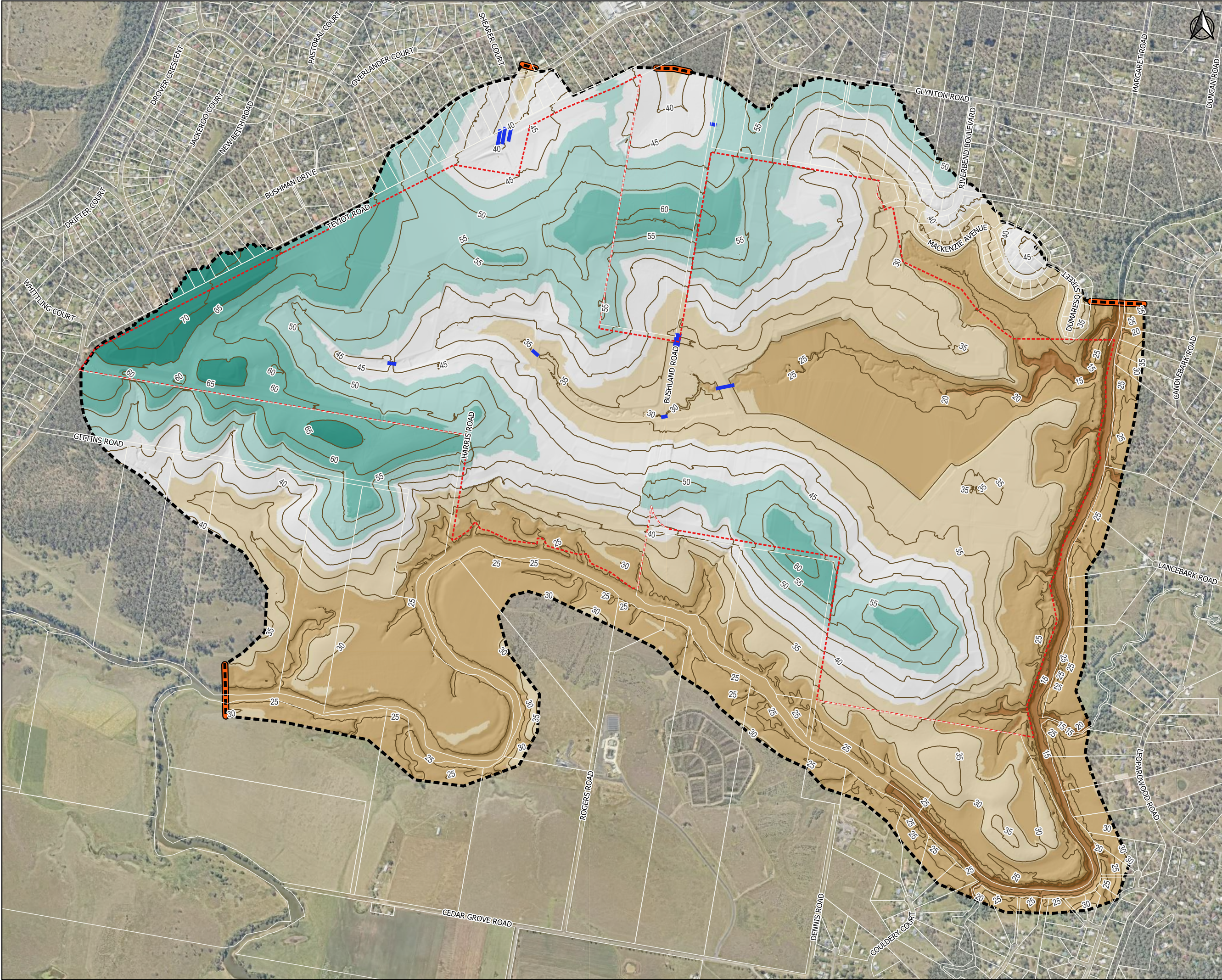
Land Use	Roughness (Manning's)
Dense Vegetation	0.100
Medium Dense Vegetation	0.070
Open Water	0.020
Grassland	0.055
Creeks	0.035
Roads Sealed, Concrete Surfaces	0.018
Unsealed Roads	0.025
Rural Residential	0.065
Logan River Channel	0.035
Old Logging	0.050
New Logging	0.045
Development Lots	0.057



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - TUFLOW Model Extent
 - 5m Contours(mAHD)
 - U/S D/S Boundaries
 - Culverts
- Terrain(mAHD)
- <= 20.5
 - 20.5 - 29.4
 - 29.4 - 38.3
 - 38.3 - 47.1
 - 47.1 - 56.0
 - 56.0 - 64.9
 - > 64.9

0 200 400 Metres
1:15,000

Figure 5-4
TUFLOW Model Setup
Existing Conditions



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - TUFLOW Model Extent
 - 5m Contours(mAHD)
 - U/S D/S Boundaries
 - Culverts

- Terrain(mAHD)
- <= 20.5
 - 20.5 - 29.4
 - 29.4 - 38.3
 - 38.3 - 47.1
 - 47.1 - 56.0
 - 56.0 - 64.9
 - > 64.9

0 200 400 Metres
1:15,000

Figure 5-5
TUFLOW Model Setup
Developed Conditions

Riverbend



5.3 Results

5.3.1 Critical Duration

To determine the critical storm duration for the subject site and vicinity the guidance provided in the latest ARR 2019 guidelines was considered as summarised below:

- Classification of the median value of the ten temporal patterns (TP) for each storm duration.
- Selection of the duration that produces the maximum median value for each return interval.

The flood elevation results were used in this investigation to define the maximum median value.

All ten rainfall patterns for the 15, 20, 25, 30, 45, 60-minute and 1.5, 2, 3, 4.5, and 6-hour durations were entered into the two-dimensional model to determine the critical storm duration for the 20%, 10%, 5% and 1% AEP flood events.

The below **Table 5-10** presents the critical events observed during the Existing and Developed Case scenarios for the 20%, 10%, 5% and 1% AEP design storm events.

Table 5-10 - Critical Events

Event	20% AEP	10% AEP	5% AEP	1% AEP
1	1hr TP4	45min TP4	45min TP3	45min TP2
2	1hr TP7	45min TP5	45min TP5	45min TP3
3	3hr TP1	45min TP7	45min TP6	1.5hr TP2
4	3hr TP3	1hr TP5	45min TP7	1.5hr TP3
5	3hr TP6	2hr TP5	45min TP10	1.5hr TP5
6	4.5hr TP7	2hr TP7	2hr TP5	-
7	-	2hr TP8	2hr TP8	-
8	-	2hr TP10	2hr TP9	-
9	-	3hr TP6	-	-

5.3.2 Model Validation

The peak flows (maximum median values) observed by the XP-RAFTS model at the location of junction with Logan River have been compared to the flows generated using the Regional Flood Frequency Estimation (RFFE) Tool. A summary of the results is presented in the below **Table 5-11**.

Table 5-11 - Peak Flow Comparison (XP-RAFTS vs RFFE)

Flood Event	RFFE (m ³ /s) (Lower – Upper Limits)	XP-RAFTS (m ³ /s)	Difference (m ³ /s)
20% AEP	29.8 (14.4 – 62.2)	30.1	+0.3
10% AEP	43.5 (19.3 – 97.6)	43.3	-0.2
5% AEP	59.8 (23.8 – 150)	54.2	-5.6
1% AEP	111 (33.4 – 358)	85.5	-25.5

The results presented in the above **Table 5-11** shows good alignment between the XP-RAFS and RFFE results during the more frequent events, such as the 20% and 10% AEP. An increase in the difference between the two models is observed for less frequent events such as the 5% and 1% AEP, however the results still fall well within the upper and lower bounds presented by the RFFE.

5.3.3 Flood Behaviour

Maximum modelled flood depth and elevations for the 1%, 5%, 10% and 20% AEP local catchment flood events during the existing case scenario are presented in **Figures B1 to B4 of Appendix B**.

Maximum modelled flood depth and elevations for the 1%, 5%, 10% and 20% AEP local catchment flood events during the developed case scenario are presented in **Figures C1 to C4 of Appendix B**.

5.3.4 Flood Effects

Figures D1 to D4 of Appendix B present the flood impact to flood level for the modelled 1%, 5%, 10% and 20% AEP flood events.

Modelling indicates that flood levels typically decrease in properties adjacent to the development as the proposed detention basins successfully attenuate peak flows during all modelled flood events.

Localised water level increases observed off-site and in areas of downstream of the development are minor in extent and magnitude, not changing the existing flood hazard conditions, and therefore are not expected to create significant adverse impact.

Detailed modelling of basins and outlets will be undertaken as part of each stage ROL submission.

6 Stormwater Quality Management - Construction Phase

6.1 Erosion and Sediment Control

Prior to construction commencing, it is the contractor's responsibility to ensure adequate erosion and sediment control measures are installed around the subject site to minimise disturbance and ensure the quality of runoff discharging from the site is of an acceptable standard.

A detailed Erosion and Sediment Control Plan (ESCP) will be prepared and submitted to Council prior to commencement of works. It is expected that the ESCP will be prepared in accordance with the Best Practice Erosion and Sediment Control Manual prepared by International Erosion Control Association (IECA 2009) based on Type 1 techniques. Erosion and sediment control techniques used for the site will generally include:

- Sediment barriers to be installed on all entrances to stormwater inlet pits
- Construction of entry and exit shakedown areas
- Sediment fences are to be installed on the downstream boundaries of the subject site
- Sediment fences to be installed on the downstream side of any stockpiles
- Construction of temporary bunds at the top of all earthworks batters to ensure runoff is directed away from exposed batters
- Construction of temporary diversion drains to divert water to sediment basins and around any stockpiles
- Construction of temporary diversion drains to divert upstream clean water around disturbed areas
- Stabilisation of all batters upon reaching the finished earthworks levels
- Dust control measures which include covering stockpiles, maintain site fences and watering exposed areas
- Sediment basin in accordance with IECA Best Practice Erosion and Sediment Control

With implementation of erosion and sediment control management in accordance with the IECA, it is expected the site can appropriately manage water quality during the construction phase to have no adverse effect on downstream watercourses.

During construction, maintenance of the control measures will be necessary to ensure they continue to function. A monitoring schedule shall be followed, with repairs or additional controls are to be carried out as identified during monitoring.

7 Stormwater Quality Management - Operational Phase

7.1 Proposed Stormwater Quality Improvement Devices (SQID's)

7.1.1 Bioretention Basin

Bioretention systems are effective at removing suspended pollutants from stormwater. Stormwater ponds on the surface of the bioretention system and slowly filters through the soil media. This filter area retains the pollutants through fine filtration, absorption, and some biological uptake from plant roots. The soil media also allows for the growth of plants.

Treated stormwater is collected at the base of the system via a network of perforated pipes located within the gravel drainage layer which is then discharged into outlet pits. Bioretention basins are proposed prior to each discharge point, with filter media surface areas to suit the catchment as noted in Figure Ref. Filter media depths of 0.5m and extended detention depth of 0.3m have been proposed. Parameters for the bioretention basin were adopted in accordance with the Water By Design MUSIC Modelling Guidelines Version 3.0, 2018.

7.1.2 Rainwater Tanks

Rainwater tanks remove stormwater pollutants from the stormwater drainage network via the retention and reuse of stormwater.

Rainwater have been designed on the assumption that 50% of the roof water from will be connected to the tank, with the remaining 50% of flow from roofs bypassing treatment by the tanks. Each rainwater tank has a 3kL capacity and water is expected to be reused indoors for toilet flushing purposes, based on the rate of 58.8L per day per dwelling. The reuse rate was derived from Water By Design MUSIC Modelling Guidelines Vesion 3.0, 2018, for 2.8-person average occupancy per dwelling as per Table 4.2 and rate of 21L per person per day for residential toilet flushing assuming water saving devices per Table 4.3. Rainwater tanks were modelled based on the number of lots per catchment, from the density of dwellings per ha. Education precincts assumed to have a 50kL rainwater tank.

7.2 Stormwater Quality Modelling (MUSIC) Methodology

Stormwater quality modelling for the site was prepared using 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC) Version 6.3. The model has been built to assess the adequacy of the proposed SQID's and to ensure that the quality of stormwater meets the WQO's for the development. A partial diagrammatic layout of the MUSIC Model is presented in Figure 7-1 below, which is representative of the full model arrangement.

For the analysis of the MUSIC modelling, Meteorological data (average potential evapotranspiration (PET) and Rainfall Station) was based on the recommendations listed for Southeast Queensland and Logan City Council (East) in WBD MUSIC Modelling Guidelines for SEQ, Tables 3.1, A1.1 and A1.2. The rainfall data was obtained from the Bureau of Meteorology for Station No. 40659 at Greenbank Thomas Road. The analysis was undertaken using a 6 min time step for the period 1/1/1980 to 31/12/1989.

The following rainfall and runoff parameters, advised for regions within South-East Queensland by the Water by Design MUSIC Modelling Guidelines (November 2018) shown in Table 7-1 have been utilised.

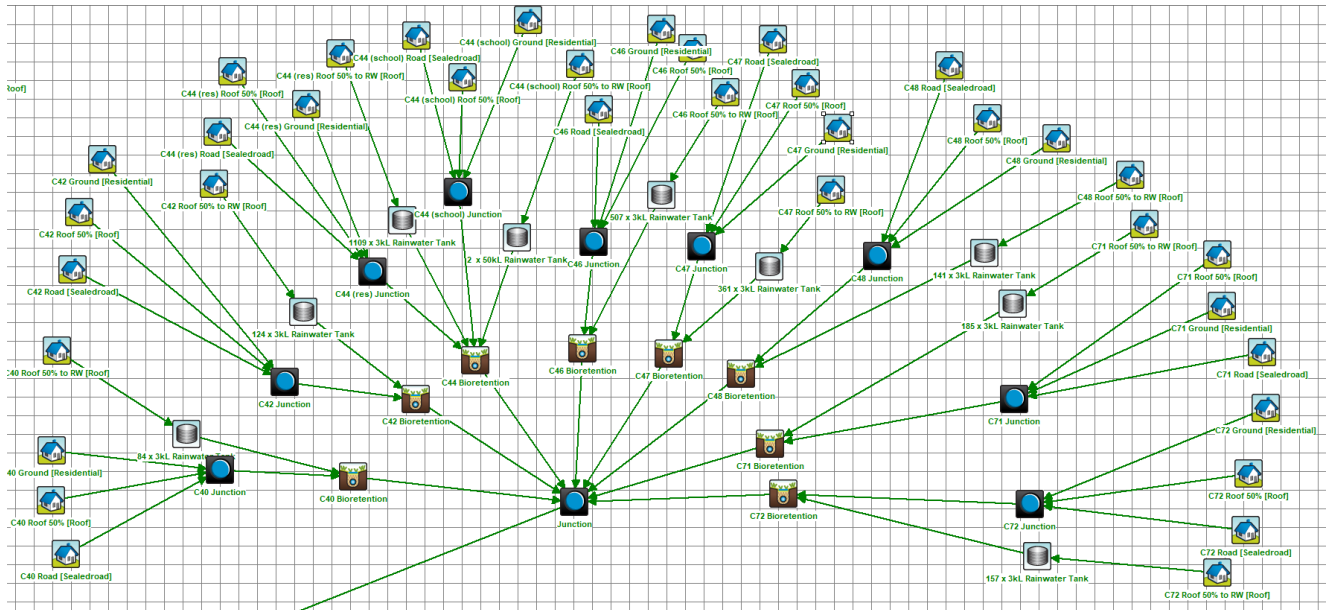


Figure 7-1 - MUSIC model arrangement

Table 7-1 - Rainfall Runoff Parameters

Parameter	Value*
Land Use Category	Urban Residential
Rainfall Threshold (mm/day)	1 mm
Soil Storage Capacity (mm)	500 mm
Initial Storage (% of Capacity)	10 %
Field Capacity (mm)	200 mm
Infiltration Capacity Coefficient – a	211
Infiltration Capacity Exponent – b	5.0
Initial Depth (mm)	50 mm
Daily Recharge Rate (%)	28 %
Daily Base flow Rate (%)	27 %
Daily Deep Seepage Rate (%)	0 %

* Parameter values taken from WBD – MUSIC Modelling Guidelines November 2018, Table A1.2 Recommended Music Rainfall Runoff Parameter SEQ

The catchments used for MUSIC modelling were broken down into land use category to accurately model the pollutant runoff characteristics for all land-use categories. Source nodes used for each category were as follows:

- Road was modelled as source node type 'urban - sealed road'
- Roof was modelled as source node type 'urban – roof'
- Other ground surface was modelled as source node type 'urban – residential'

The fraction impervious assigned for each source node are summarised below in **Table 7-2** and the area breakdown in **Table 7-3**.

Table 7-2 – MUSIC Fraction Impervious Assumptions

Land Use	Road	Roof	Ground
Low Density Residential (25 dwellings / ha)*	70%	100%	24%
School	75%	100%	60%

**Note fraction impervious values were interpolated based on Water By Design Music Modelling Guidelines November 2018, Table 3.4 and 3.6.*

Table 7-3 – MUSIC nodes Area Breakdown

Land Use	Road	Roof	Ground
Low Density Residential (25 dwellings / ha)*	27%	33%	40%
School	26%	35%	41%

The total catchment area and land use type assigned are summarised in **Table 7-4**.

Table 7-4 - Catchment Source Node Summary

Catchment	Total Area (Ha)	Land Use
C07	4.709	Low Density Residential
C08	3.993	Low Density Residential
C09	38.219	Low Density Residential
C12	21.940	Low Density Residential
C17	8.237	Low Density Residential
C22	15.780	School
C25	10.499	Low Density Residential
C27	7.701	Low Density Residential
C28	4.056	Low Density Residential
C30	10.666	Low Density Residential
C31	10.250	Low Density Residential
C32	10.979	Low Density Residential
C33	2.500	Low Density Residential
C34	5.250	Low Density Residential
C36	15.169	Low Density Residential
C37	12.464	Low Density Residential
C38	8.788	Low Density Residential
C39	10.609	Low Density Residential
C40	3.324	Low Density Residential
C42	4.925	Low Density Residential

Catchment	Total Area (Ha)	Land Use
C43	22.529	Low Density Residential
C44	1.054	School
	44.331	Low Density Residential
C46	20.266	Low Density Residential
C47	14.417	Low Density Residential
C48	5.614	Low Density Residential
C63	1.054	Low Density Residential
C71	7.366	Low Density Residential
C72	6.27	Low Density Residential
C74	19.893	Low Density Residential
C76	3.137	Low Density Residential
C77	12.239	Low Density Residential

The pollutant concentration parameters used in the model were based on information provided in Water By Design – MUSIC Modelling Guidelines for South East Queensland V1.0 (2018). The parameters are listed in Table 7-5 below:

Table 7-5 - Water Quality Parameters for MUSIC Source Nodes

Land- Use Category		Log TSS (mg/L)		Log TP (mg/L)		Log TN (mg/L)	
		Storm Flow	Base flow	Storm Flow	Base Flow	Storm Flow	Base Flow
Roof Areas (Urban roof)	Mean	1.30	N/A	-0.89	N/A	0.26	N/A
	Std Dev	0.39	N/A	0.31	N/A	0.23	N/A
Roads (Urban Sealed Road)	Mean	2.43	1.00	-0.30	-0.97	0.26	0.20
	Std Dev	0.39	0.34	0.31	0.31	0.23	0.20
Ground Level (Urban Residential)	Mean	2.18	1.00	-0.47	-0.97	0.26	0.20
	Std Dev	0.39	0.34	0.31	0.31	0.23	0.20

*Parameter values taken from WBD – MUSIC Modelling Guidelines November 2018 Table 3.9.

7.3 Modelling Results and Summary

The bioretention system concept design parameters adopted are summarised below in **Table 7-6** and **Table 7-7**, outlining all design requirements for the system including footprint and filter media specifications. The modelling results shown in **Table 7-8** demonstrates that the treatment train will achieve the water quality targets set out in **Table 4-1**. The indicative water quality basin locations are presented overleaf in Figure 7-2.

Table 7-6 - Bioretention Sizing Summary

Parameter	Basin
Extended Detention Depth (mm)	300
Minimum Filter Media Depth (mm)	400
Saturated Hydraulic Conductivity (mm/hour)	200
TN Filter Media Content (mg/kg)	400
Orthophosphate Filter Media Content (mg/kg)	30.0

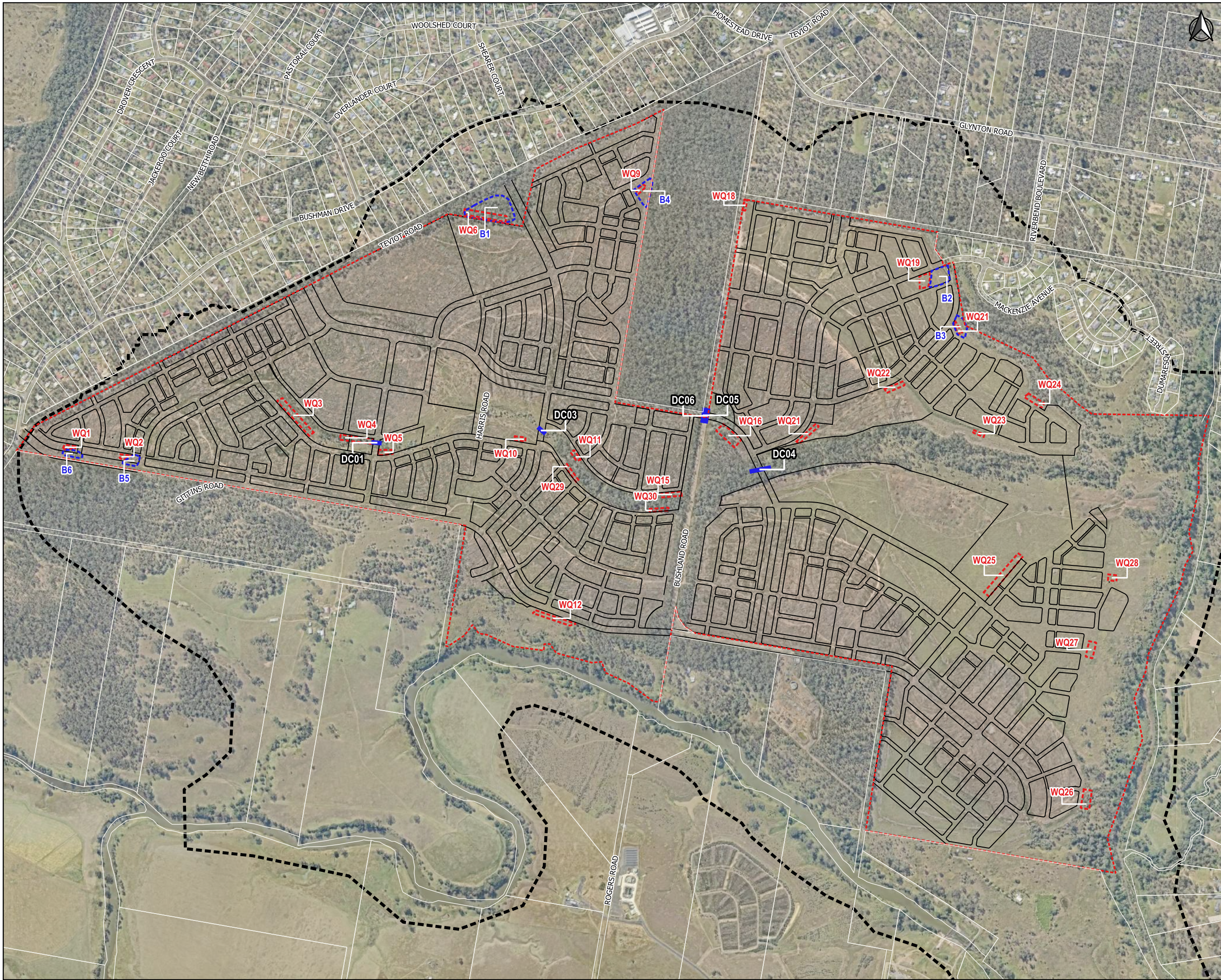
Table 7-7 - Bioretention Filter Area

Plan ID	Contributing Catchments	Bioretention Filter Area (m ²)
WQ1	C07	200
WQ2	C08	200
WQ3	C09	1,800
WQ4	C12	1,100
WQ5	C17	400
WQ6	C22	
WQ7	C76	1,600
WQ8	C77	
WQ9	C25	500
WQ10	C27	400
WQ11	C28	200
WQ12	C30	
WQ13	C63	1,500
WQ14	C74	
WQ15	C31	550
WQ16	C32	
WQ17	C43	1,550
WQ18	C33	150
WQ19	C34	
WQ20	C36	1,000
WQ21	C37	600

Plan ID	Contributing Catchments	Bioretention Filter Area (m ²)
WQ21	C38	450
WQ22	C39	500
WQ23	C40	150
WQ24	C42	250
WQ25	C44 SCHOOL C44 RES	2,100
WQ26	C46	1,000
WQ27	C47	700
WQ28	C48	300
WQ29	C71	350
WQ30	C72	300
TOTAL		17,850

Table 7-8 - MUSIC Model Results

Pollutant	Annual Loads (kg/yr)		% Reduction		Compliant
	Source	Residual	Actual	Target	
TSS	292,000	56,800	80.6	80	Yes
TP	595	163	72.6	60	Yes
TN	3,480	1,640	52.8	45	Yes
GP	46,500	0	100	90	Yes



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Study Catchment
 - Detention Basins
 - Culverts
 - Bioretention Basins

0 200 400 Metres
1:13,000

Figure 7-2
Water Quality Treatment
Devices Location

Riverbend



8 Conclusion

Northrop Consulting Engineers has prepared this SBSMP for the proposed urban residential development South of Teviot Road in the Logan City Council Local Government Area. Based on investigations, analyses and designs, it has been demonstrated that the proposed development can be constructed and operated in accordance with all stormwater objectives listed in Section 4. The primary outcomes of this SBSMP are as follows:

Stormwater Quantity

A flood impact assessment has been prepared for the proposed urban residential development at Riverbend. It is concluded that the proposed development with implemented flood mitigation measures is not expected to create a significant adverse impact to the existing flood behaviour on the subject site and adjacent properties.

Stormwater Quality

Erosion and sediment controls per the International Erosion Control Association will be installed to ensure disturbance of the site during construction is appropriately managed to limit impacts to water quality.

Stormwater quality infrastructure has been included in the design to achieve the water quality objectives for South East Queensland specified in the State Planning Policy 2017. The proposed treatment train was modelled using MUSIC modelling software to confirm the objectives were met and includes bioretention basins and rainwater tanks to treat runoff from the site. Each catchment will have localised treatment prior to discharge to the downstream watercourse.

Lawful Point of Discharge

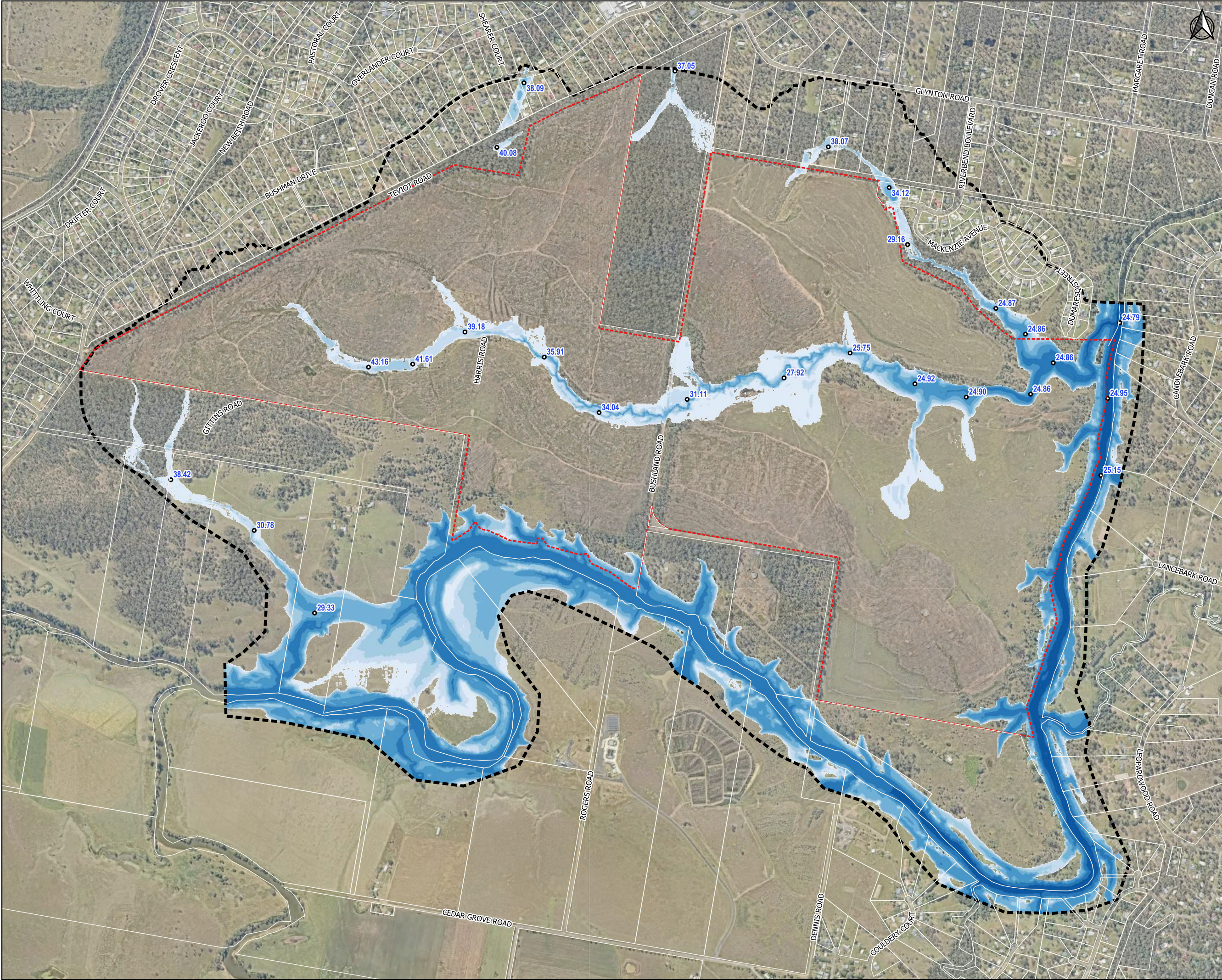
developed site will retain the existing site discharge points as the lawful point of discharge, with stormwater management at the downstream point of each catchment prior to site discharge to ensure no adverse impacts downstream.

Stormwater Conveyance

The subdivision will include a stormwater pit and pipe network to appropriately manage the minor storm events and ensure any overland conveyance is safe and controlled within the road reserve and any stormwater easements to the lawful point of discharge.

Appendix A – Civil Engineering Plans

Appendix B – Flood Maps





Legend

- Masterplan Stage Boundary
- Existing Lots
- TUFLOW Model Extent
- Spot Water Level (mASL)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

Figure B2
5% AEP Flood Depth
and Elevation
Local Catchment
Existing Conditions



Legend

- Masterplan Stage Boundary
- Existing Lots
- TUFLOW Model Extent
- Spot Water Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

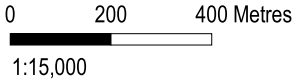


Figure B3
10% AEP Flood Depth
and Elevation
Local Catchment
Existing Conditions

Riverbend





Legend

- Masterplan Stage Boundary
- Existing Lots
- TUFLOW Model Extent
- Spot Water Level (mASL)

Depth(m)

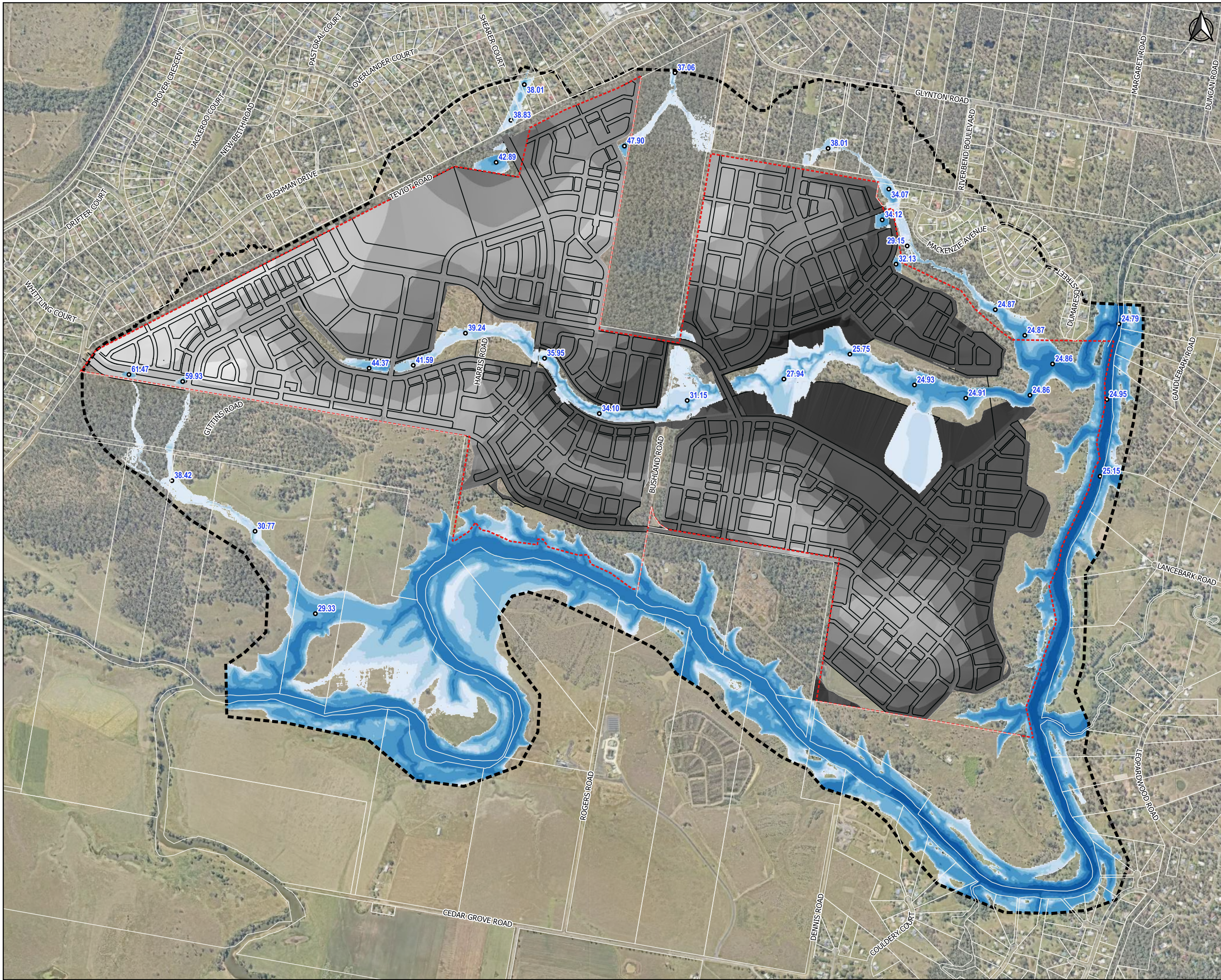
- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

Figure B4
20% AEP Flood Depth
and Elevation
Local Catchment
Existing Conditions

Riverbend





Legend

- Masterplan Stage Boundary
- Existing Lots
- Development Layout
- TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Spot Water Level (mAHD)

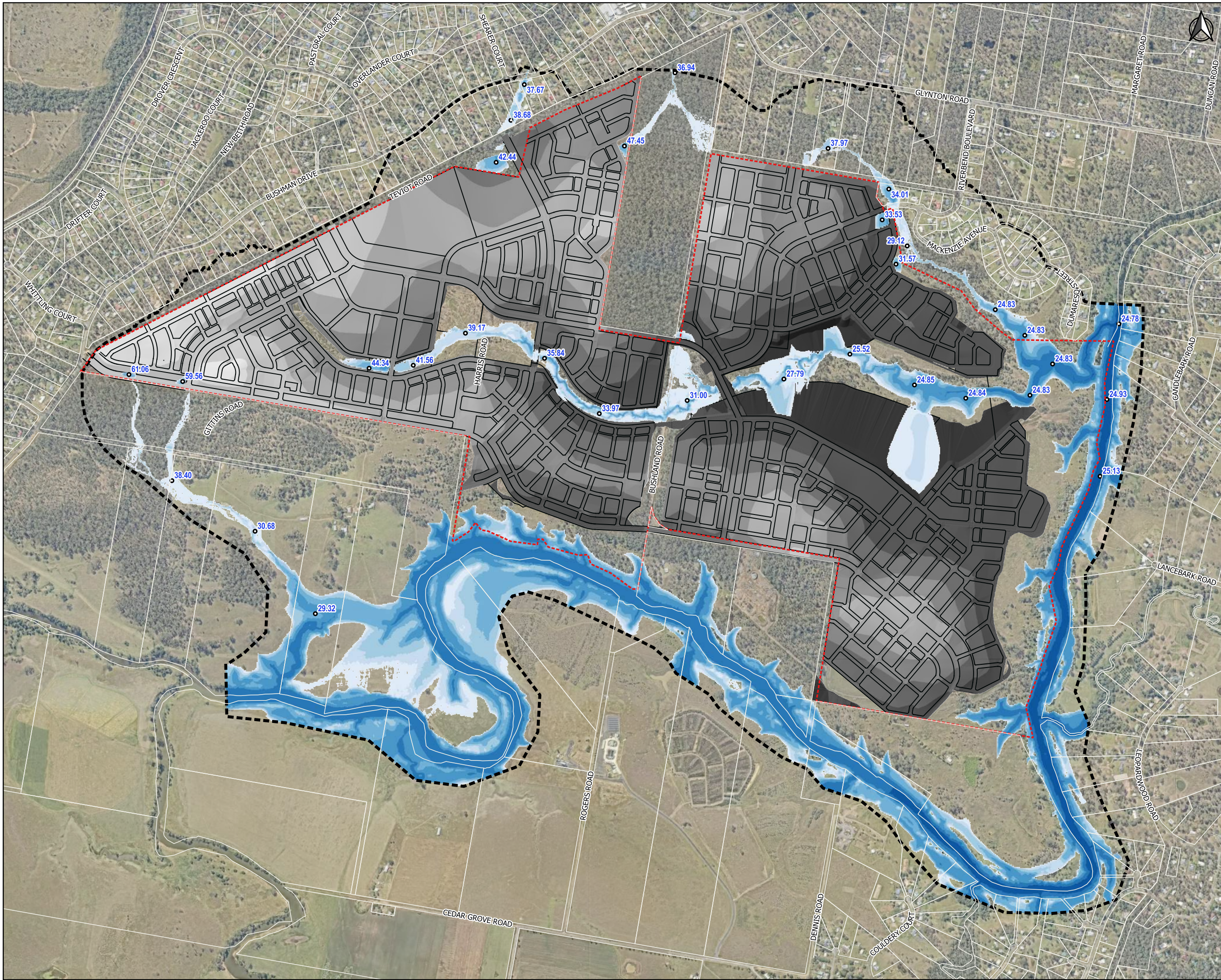
- Spot Water Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

Figure C1
1% AEP Flood Depth
and Elevation
Local Catchment
Developed Conditions



Legend

- Masterplan Stage Boundary
- Existing Lots
- Development Layout
- TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Spot Water Level (mAHD)

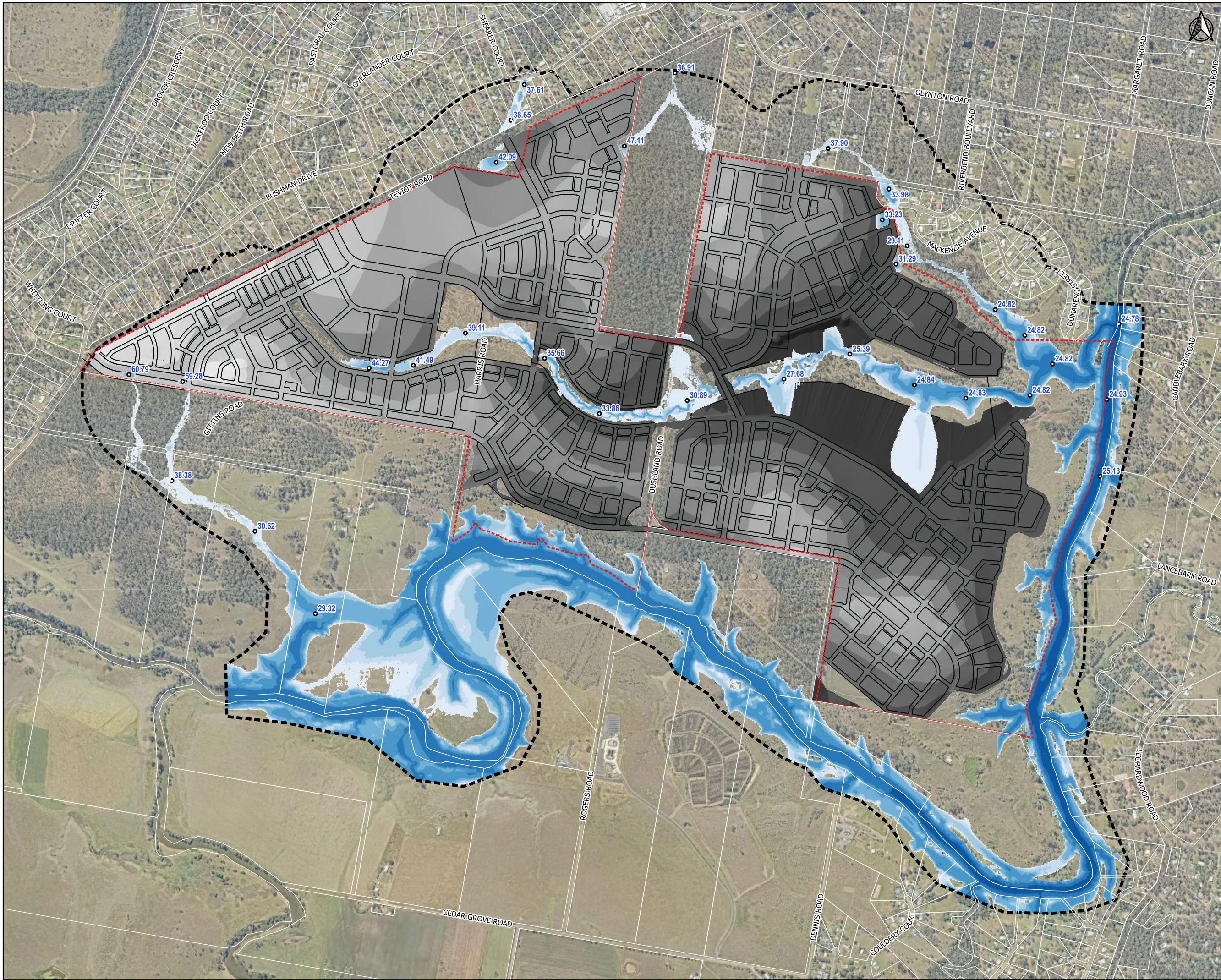
- Spot Water Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

Figure C2
5% AEP Flood Depth
and Elevation
Local Catchment
Developed Conditions



Legend

- Masterplan Stage Boundary
- Existing Lots
- Development Layout
- TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Spot Water Level (mAHD)

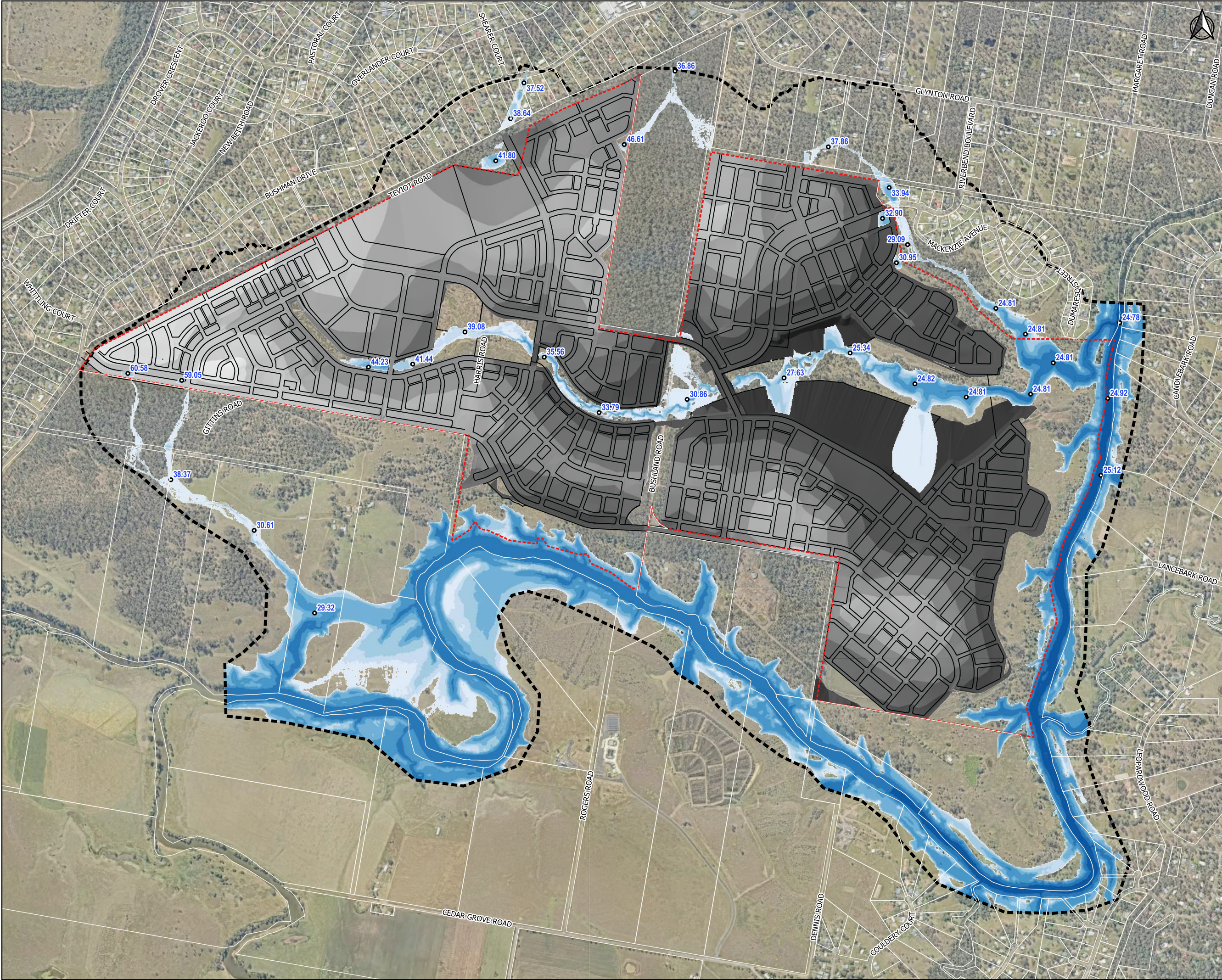
- Spot Water Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

Figure C3
10% AEP Flood Depth
and Elevation
Local Catchment
Developed Conditions



Legend

- Masterplan Stage Boundary
- Existing Lots
- Development Layout
- TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Spot Water Level (mAHD)

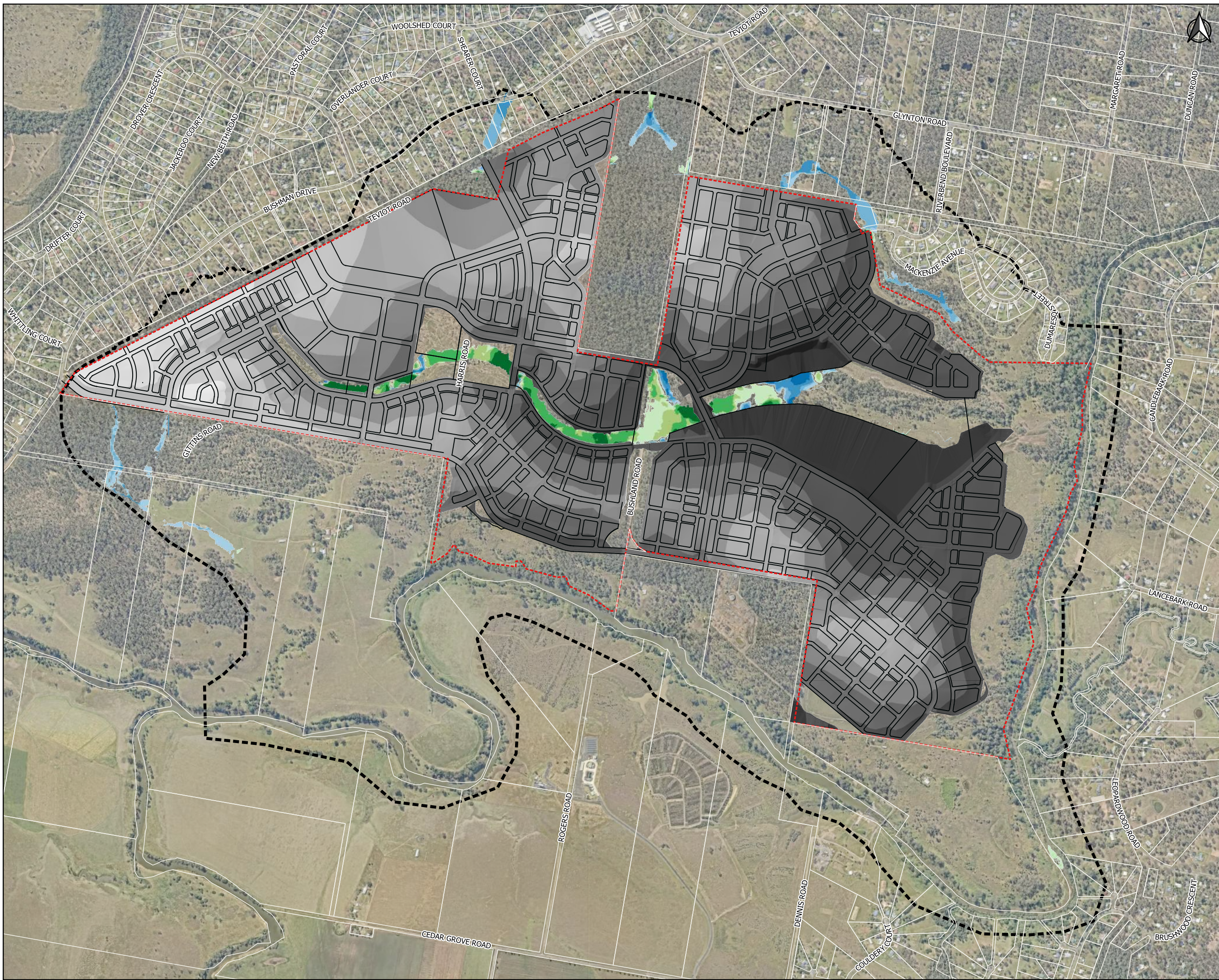
- Spot Water Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 5.00
- 5.00 - 10.00
- 10.00 - 15.00
- > 15.00

0 200 400 Metres
1:15,000

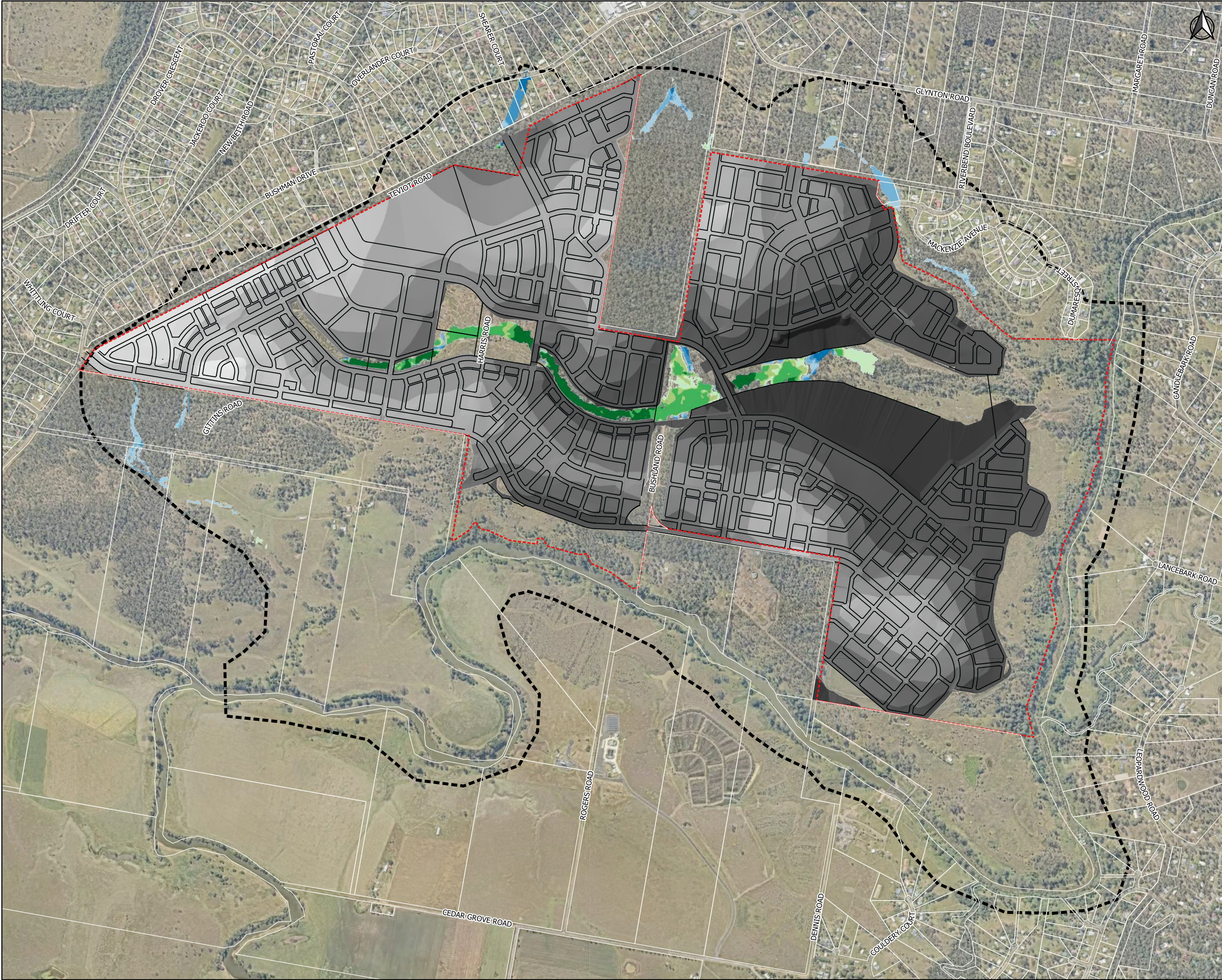
Figure C4
20% AEP Flood Depth
and Elevation
Local Catchment
Developed Conditions



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Development Layout
 - TUFLOW Model Extent
- Design Surface(mAHD)
- <= 30.9
 - 30.9 - 37.8
 - 37.8 - 44.6
 - 44.6 - 51.5
 - 51.5 - 58.3
 - 58.3 - 65.2
 - > 65.2
- Difference(m)
- <-0.10
 - 0.10 - -0.05
 - 0.05 - -0.03
 - 0.03 - -0.01
 - Less than +/-10mm
 - 0.01 - 0.03
 - 0.03 - 0.05
 - 0.05 - 0.10
 - >0.10

0 200 400 Metres
1:15,000

Figure D1
1% AEP Flood Elevation
Difference
Local Catchment
Pre-to-Post Comparison



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Development Layout
 - TUFLOW Model Extent

Design Surface(mAHD)

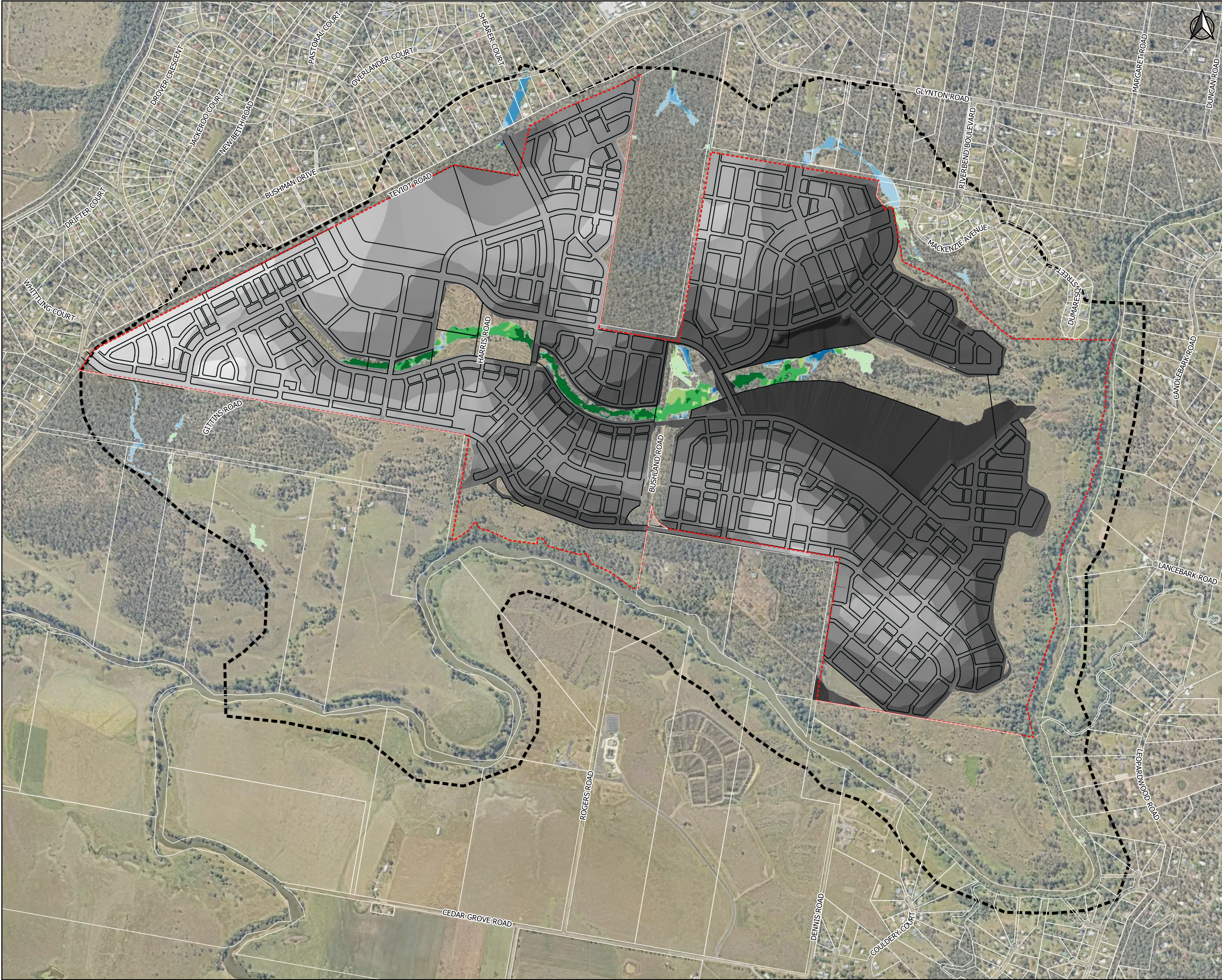
- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Difference(m)

- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 200 400 Metres
1:15,000

Figure D2
5% AEP Flood Elevation
Difference
Local Catchment
Pre-to-Post Comparison



- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Development Layout
 - TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Difference(m)

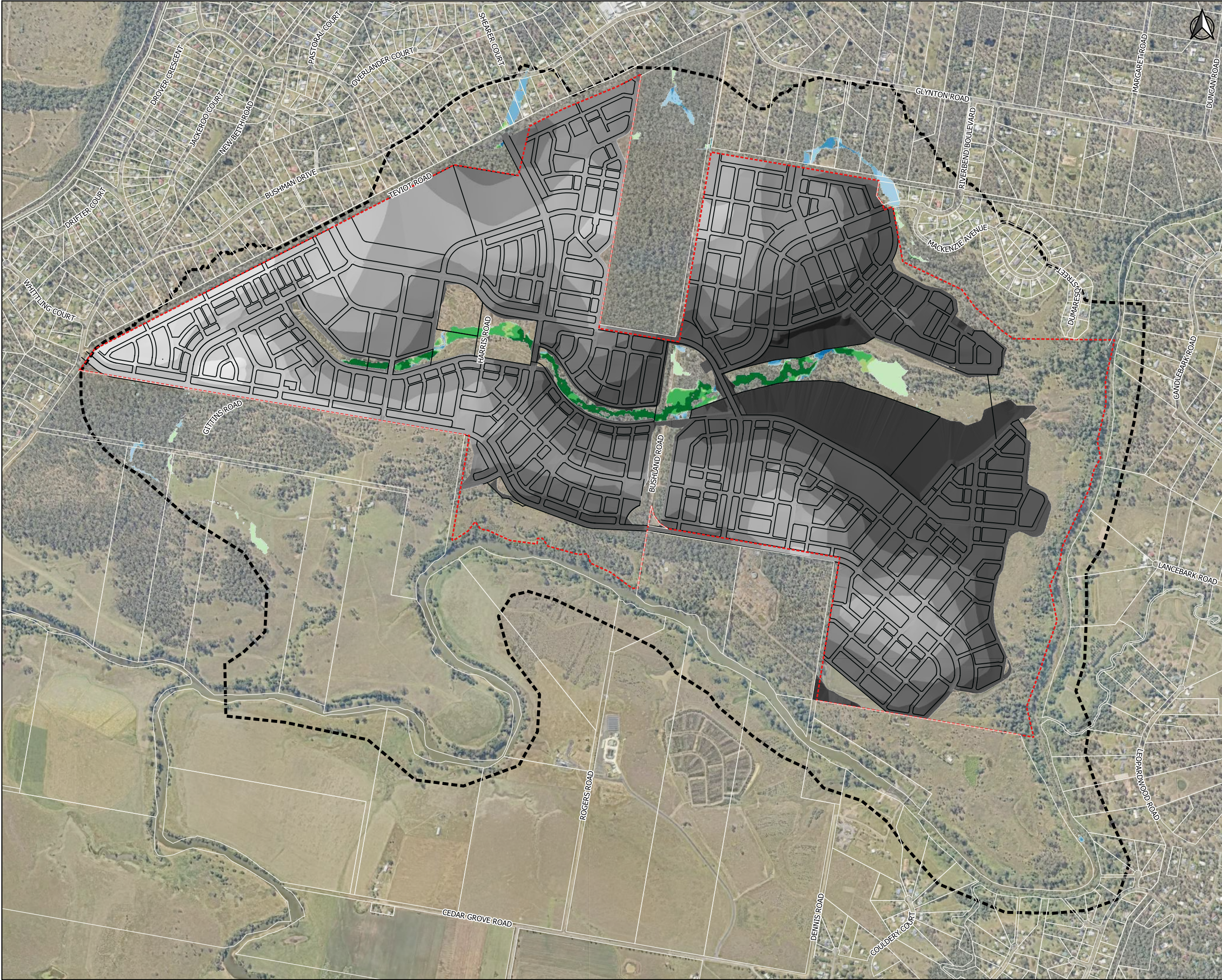
- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 200 400 Metres
1:15,000

Figure D3
10% AEP Flood Elevation
Difference
Local Catchment
Pre-to-Post Comparison

Riverbend





- Legend
- Masterplan Stage Boundary
 - Existing Lots
 - Development Layout
 - TUFLOW Model Extent

Design Surface(mAHD)

- <= 30.9
- 30.9 - 37.8
- 37.8 - 44.6
- 44.6 - 51.5
- 51.5 - 58.3
- 58.3 - 65.2
- > 65.2

Difference(m)

- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 200 400 Metres
1:15,000

Figure D4
20% AEP Flood Elevation
Difference
Local Catchment
Pre-to-Post Comparison

Riverbend



Appendix C – Structure Plan by Place Design Group Pty Ltd

PROJECT

RIVERBEND

CLIENT



NOTES

ALL LOT NUMBER AND DIMENSIONS (INCLUDING AREAS) ARE APPROXIMATE ONLY AND SUBJECT TO FURTHER DESIGN DEVELOPMENT.

ALL DIMENSIONS HAVE BEEN ROUNDED TO THE NEAREST 0.1 METRES AND ALL AREAS HAVE BEEN ROUNDED TO THE NEAREST SQUARE METRE.

THE BOUNDARIES ON THIS PLAN SHOULD NOT BE USED FOR THE FINAL DESIGN AND ARE SUBJECT TO FINAL DETAILED DESIGN BY ENGINEERS.

INFORMATION ON THIS PLAN ARE FROM THE FOLLOWING SOURCES:

SITE BOUNDARIES: COLLIERS (JUNE 2024)
ADJOINING CADASTRE: QSPATIAL
DESIGN CONTOURS: COLLIERS (JUNE 2024)
AERIAL PHOTOGRAPHY: NEARMAP
TEVIOT ROAD DETAIL: COLLIERS (OCTOBER 2023)

DRAFT

ISSUE	CODE	ISSUE DESCRIPTION	BY	CHK	DATE
-	PRE	FOR REVIEW	TD	TD	20/04/2023
A	PRE	FOR REVIEW	TD	TD	21/04/2023
B	PRE	FOR REVIEW	TD	TD	21/04/2023
C	PRE	FOR REVIEW	TD	TD	03/05/2023
D	PRE	FOR REVIEW	NV	TD	07/06/2023
E	PRE	FOR REVIEW	NV	TD	30/08/2023
F	PRE	FOR REVIEW	NV	TD	01/11/2023
G	PRE	FOR REVIEW	NV	TD	02/11/2023
H	PRE	FOR REVIEW	NV	TD	02/11/2023
I	PRE	FOR REVIEW	NV	TD	10/11/2023
J	PRE	FOR REVIEW	NV	TD	13/11/2023
K	PRE	FOR REVIEW	NV	TD	13/11/2023
L	PRE	FOR REVIEW	NV	TD	20/02/2024
M	PRE	FOR REVIEW	NV	TD	28/03/2024
N	PRE	FOR REVIEW	NV	TD	04/03/2024
O	PRE	FOR REVIEW	NV	TD	04/03/2024
P	PRE	REVISED DISTRICT CENTRE	NV	TD	30/07/2024
Q	PRE	FINAL ISSUE	NV	TD	02/08/2024

PRE - Preliminary | CA - Council Approval | T - Tender | CON - Construction

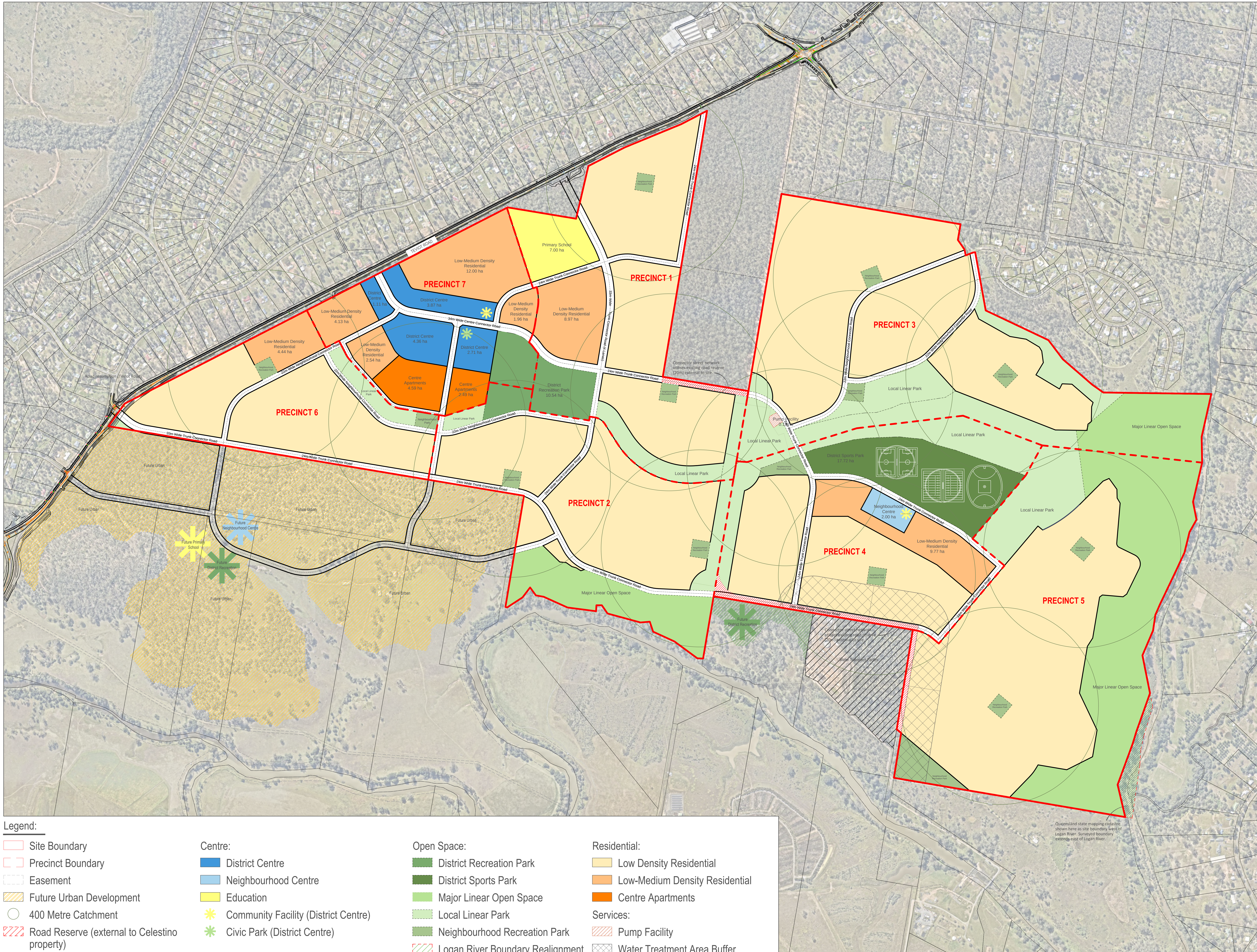
DRAWING TITLE

STRUCTURE PLAN -
RIVERBEND

DESIGN : TD
DOCUMENT : TD / NV
PROJECT : 4123001
1:5,000 @ A0

DRAWING NUMBER
4123001-01

REVISION
Q



Legend:

- Site Boundary

Precinct Boundary

Easement

Future Urban Development

400 Metre Catchment

Road Reserve (external to Celestino property)
- Centre:

District Centre

Neighbourhood Centre

Education

Community Facility (District Centre)

Civic Park (District Centre)
- Open Space:

District Recreation Park

District Sports Park

Major Linear Open Space

Local Linear Park

Neighbourhood Recreation Park

Logan River Boundary Realignment
- Residential:

Low Density Residential

Low-Medium Density Residential

Centre Apartments

Services:

Pump Facility

Water Treatment Area Buffer