NORTHROP

CIVIL ENGINEERING

Site Based Stormwater Management Plan

Riverbend, Jimboomba

PREPARED FOR
Celestino Pty Limited

Ref: NL230370
Rev: C
Date: 20/03/2025

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2016/811/7

Date: 27 May 2025

Queensland Government

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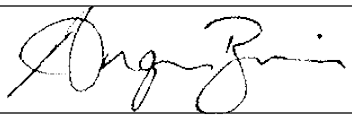
Approver Signature:	

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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
- Waterway stability assessment

All discharge regimes must comply with the Lawful Point of Discharge (LPD) criteria as per QUDM requirements. Any changes to the current discharge arrangements in particular onto private properties will not be supported unless accompanied by the landowner consent.
The post-development run-off regime at the LPD must be equal or less than the corresponding pre-developement run-off regime for all events up to 1% AEP storms.

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).

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25
Queensland Government

Waterway Stability

A waterway stability assessment has determined that no additional mitigation measures are required to limit flows in discharging directly to the Logan River. Minor increases in velocity are predicted at several of the other discharge locations and we do not believe this will result in a significant erosion risk to due to the vegetated nature of the receiving corridors. Additional mitigation measures such as stage discharge configurations on detention basins and augmented bioretention basin capacity will be further investigated at future ROL stages.

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
- Waterway Stability Assessment

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 included in **Appendix A**.
- 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-Wes
- 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))

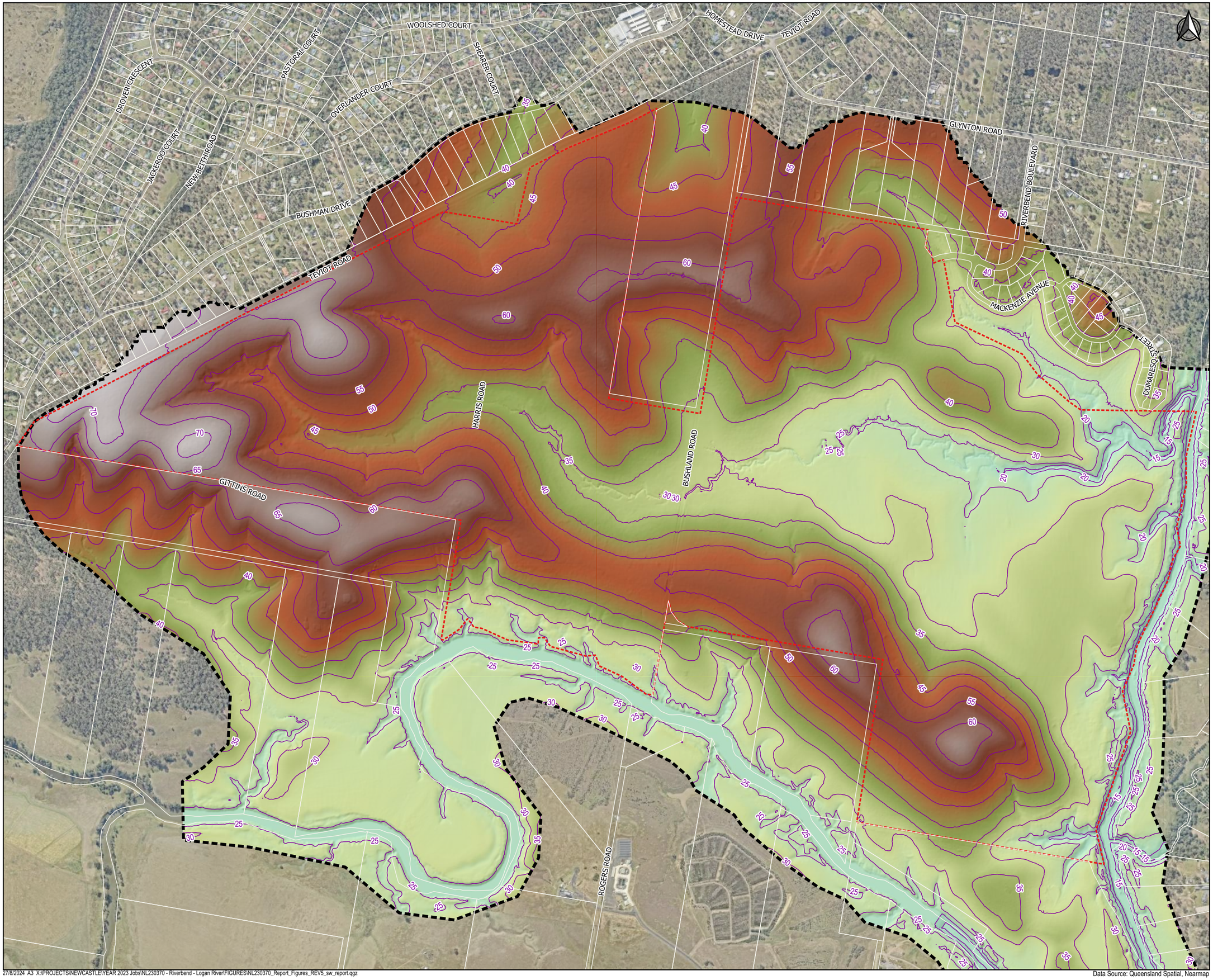
2.2 Existing Lawful Point of Discharge

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

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Refer the approved Context Plan as amended in red.

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 B.**

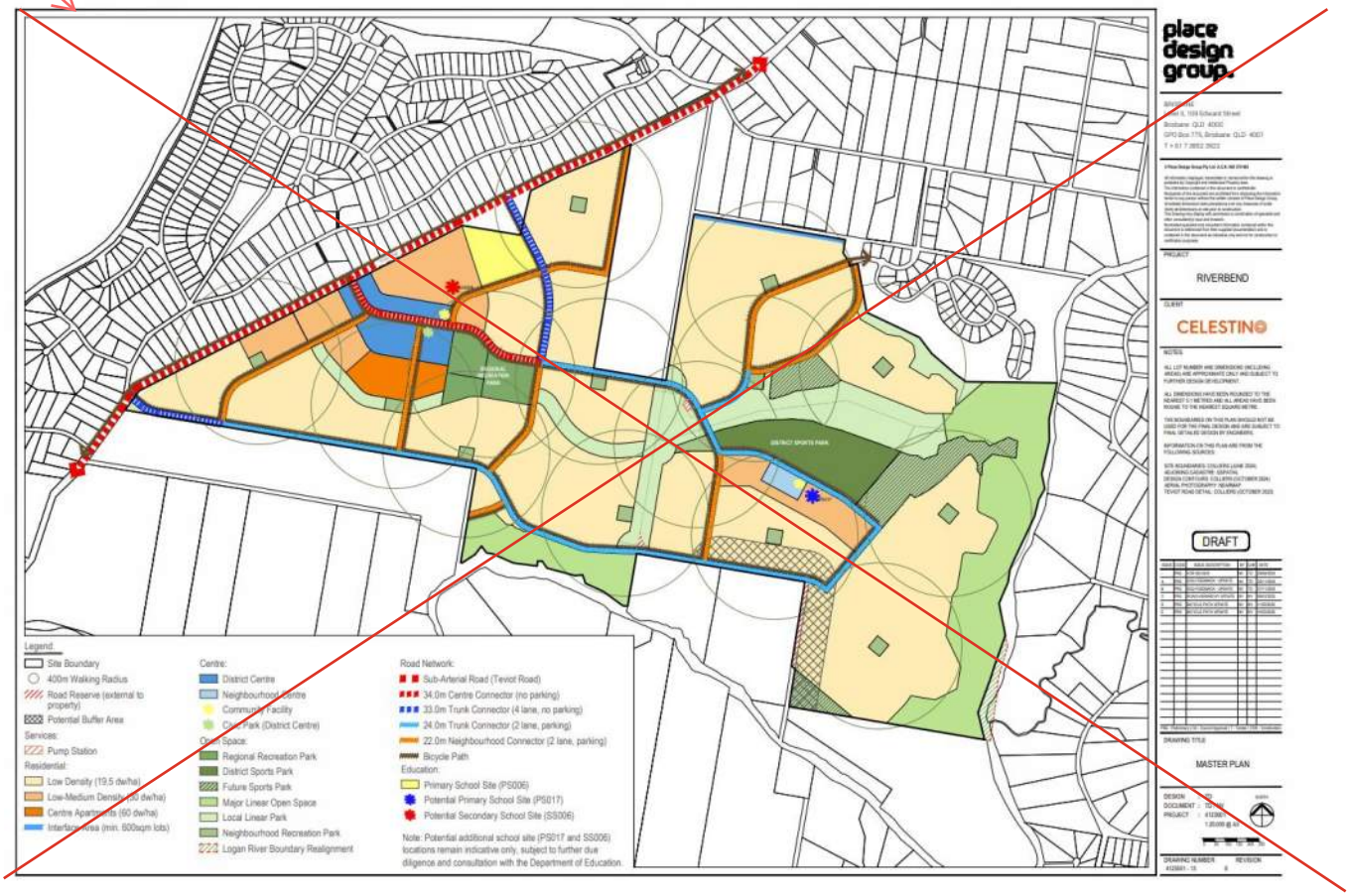


Figure 3-1 - Proposed Development (Place Design Group)

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**.

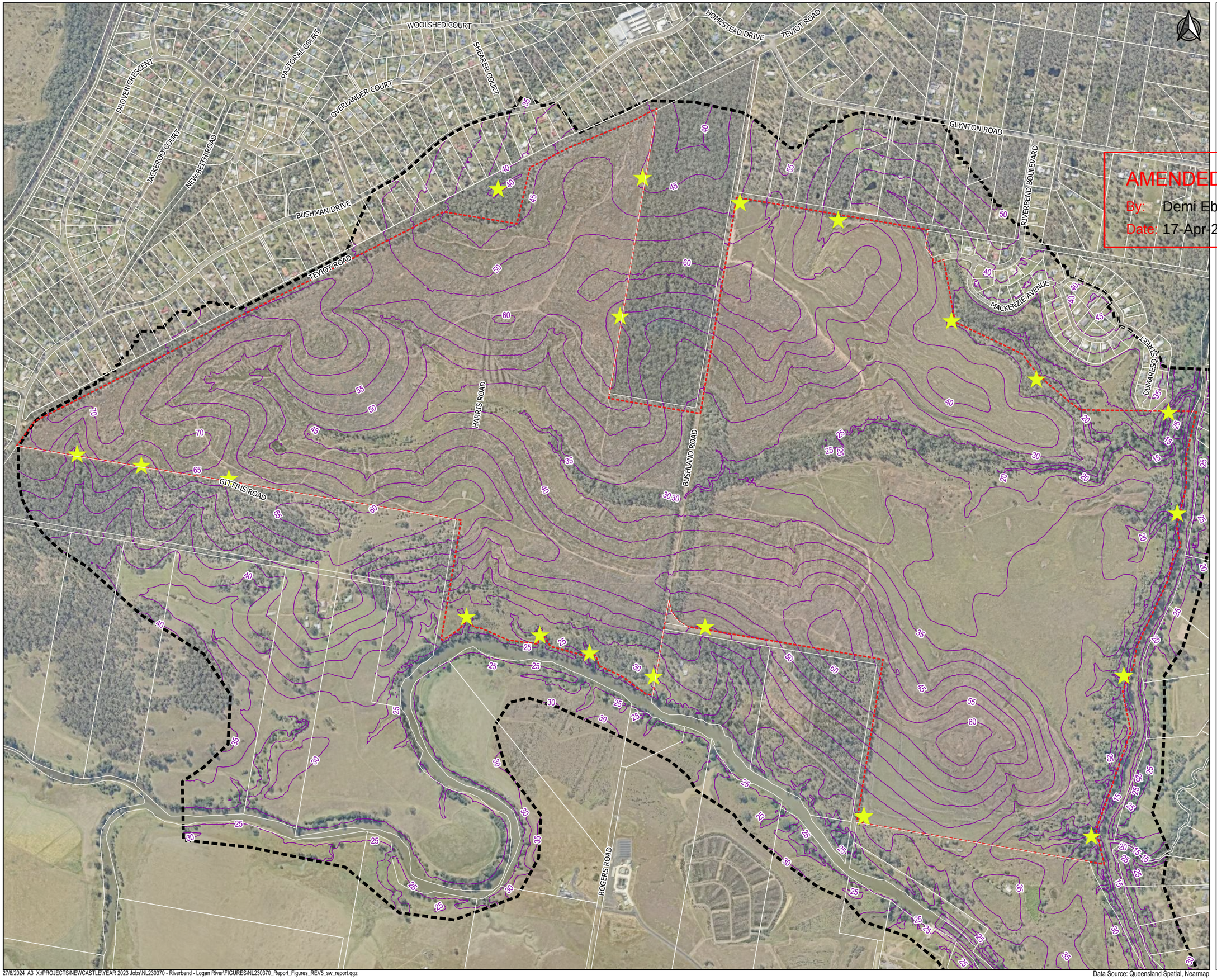
Detailed design and assessment of compliance with these requirements will be undertaken at each stages ROL application.

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**.

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25
Queensland Government

All discharge regimes must comply with the Lawful Point of Discharge (LPD) criteria as per QUDM requirements. Any changes to the current discharge arrangements in particular onto private properties will not be supported unless accompanied by the landowner consent.
The post-development run-off regime at the LPD must be equal or less than the corresponding pre-developement run-off regime for all events up to 1% AEP storms.



Legend

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

AMENDED

By: Demi Ebrahimi

Date: 17-Apr-25

Queensland Government

All discharge regimes must comply with the Lawful Point of Discharge (LPD) criteria as per QUDM requirements. Any changes to the current discharge arrangements in particular onto private properties will not be supported unless accompanied by the landowner consent.
The post-development run-off regime at the LPD must be equal or less than the corresponding pre-developement run-off regime for all events up to 1% AEP storms.

0 200 400 Metres

1:13,000

Figure 3-2

Discharge Locations

Riverbend

NORTHROP

27/8/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV5_sw_report.qgz

Data Source: Queensland Spatial, Nearmap

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 Regional Flood Impact Assessment

A regional flood assessment was prepared as part of DEV2023/1434. Refer to *NL230370 – Flood Impact Assessment for Bulk Earthworks OPW for Riverbend, Jimboomba (Revision C dated 25 October 2023)* for details on model setup, validation, and discussion.

The model used in this assessment was rerun with the revised topography and culvert arrangement and the results are presented in **Appendix C**.

5.2 Local Study Catchment and Proposed Development

The local 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.

5.3 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.

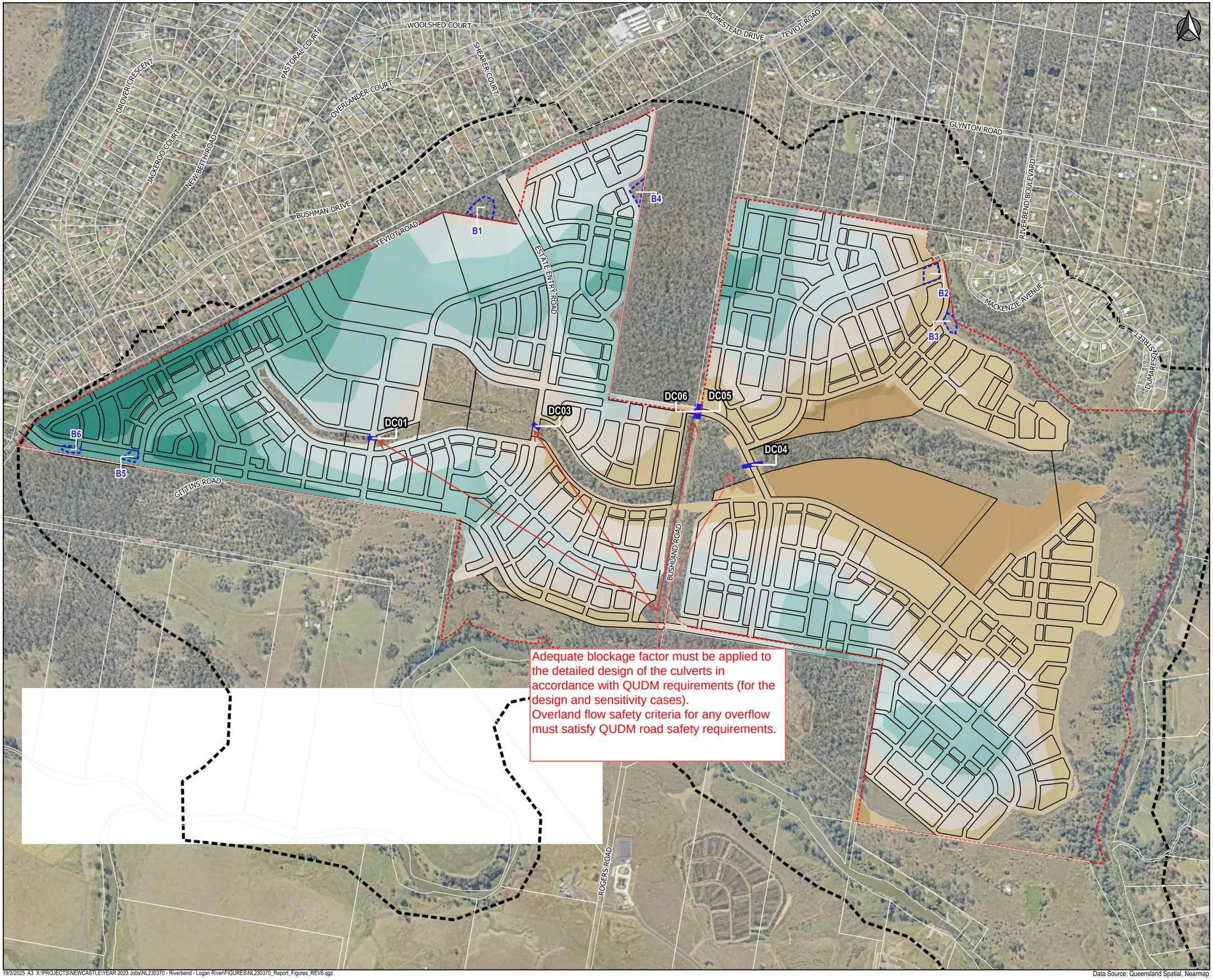
5.3.1 Hydrological Model

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
- 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

Adequate blockage factor must

0 200 400 Metres

1:13,000

Figure 5-1

Proposed Development

Riverbend

NORTHROP

19/3/2025 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV6.qgz

Data Source: Queensland Spatial, Nearmap

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

NORTHROP

27/8/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV5_sw_report.qgz

Data Source: Queensland Spatial, Nearmap

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

Riverbend

NORTHROP

19/3/2025 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV6.qgz

Data Source: Queensland Spatial, Nearmap

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.

5.3.2 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**.

Adequate blockage factor must be applied to the detailed design of the culverts in accordance with QUDM requirements (for the design and sensitivity cases).
Overland flow safety criteria for any overflow must satisfy QUDM road safety requirements.

Table 5-7 - Proposed Culverts

Culvert Reference	Type	Size	Blockage For Off-Site Impacts	Blockage Sensitivity Assessment
DC01	RCBC	2 x W 3.0m x H 1.5m	0%	25%
DC03	RCBC	4 x W 3.0m x H 1.5m	0%	25%
DC04	RCBC	5 x W 3.0m x H 1.5m	0%	25%
DC05	RCP	3 x D 0.852m	0%	25%
DC06	RCP	3 x D 0.825m	0%	25%

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

Adequate blockage factor must be applied to the detailed design of the culverts in accordance with QUDM requirements (for the design and sensitivity cases). Overland flow safety criteria for any overflow must satisfy QUDM road safety requirements.

0 200 400 Metres

1:15,000

Figure 5-4

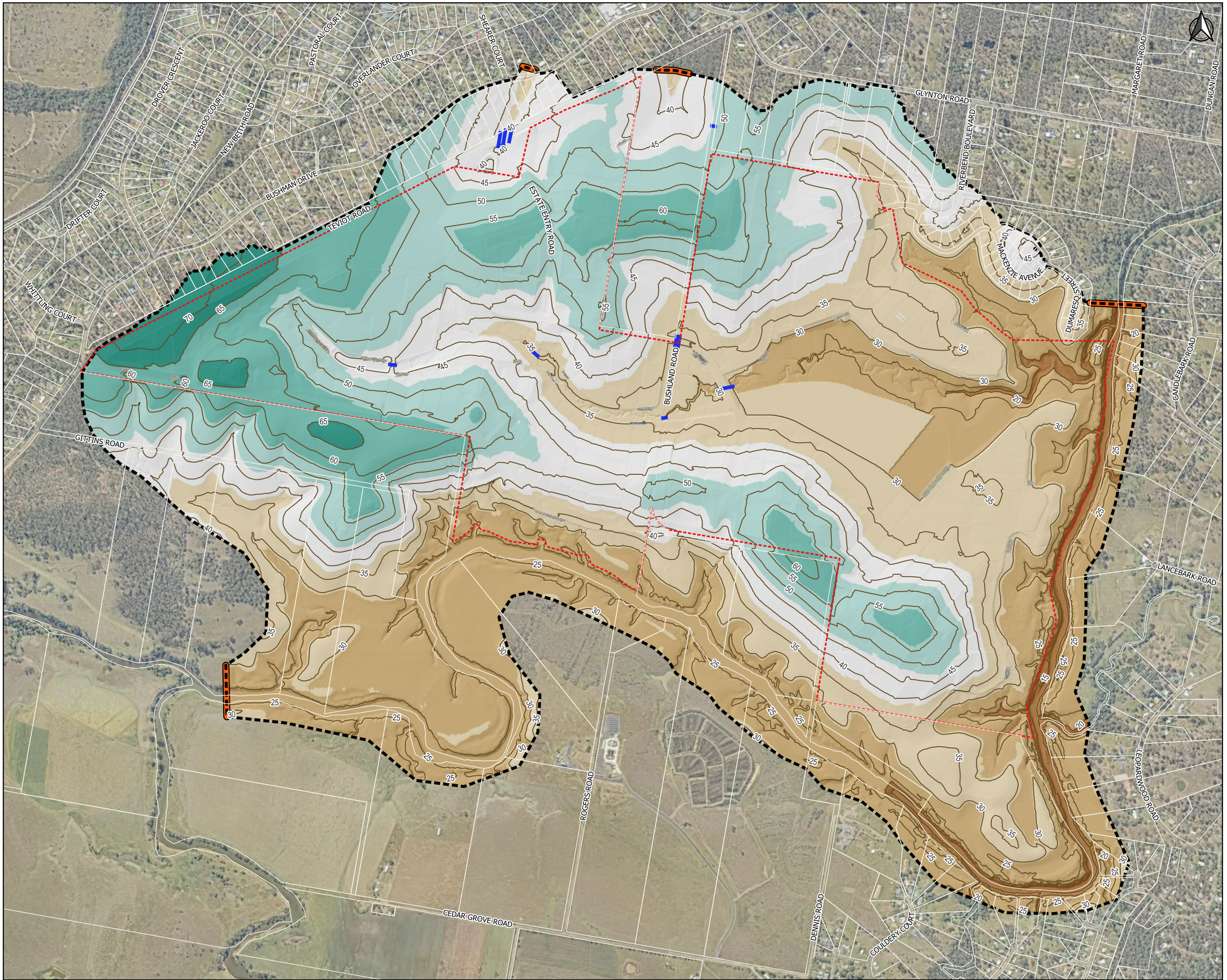
TUFLOW Model Setup
Existing Conditions

Riverbend

NORTHROP

27/8/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV5_sw_report.qgz

Data Source: Queensland Spatial, Nearmap



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

Adequate blockage factor must be applied to the detailed design of the culverts in accordance with QUDM requirements (for the design and sensitivity cases). Overland flow safety criteria for any overflow must satisfy QUDM road safety requirements.

0 200 400 Metres

1:15,000

Figure 5-5

TUFLOW Model Setup Developed Conditions

Riverbend

NORTHROP

19/3/2025 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV6.qgz

Data Source: Queensland Spatial, Nearmap

5.4 Results

5.4.1 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	-	-

5.4.2 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

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

The results presented in the above **Table 5-11** shows good alignment between the XP-RAFTS 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.

5.4.3 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 D**.

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 C**4** of **Appendix D**.

5.4.4 Flood Effects

Figures D1 to **D4** of **Appendix D** 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.

As part of future ROL applications, the following must be demonstrated:

- Confirmation that the basin design complies with the bio-retention technical requirements specified in the Water by Design guidelines.
- Flood immunity of the water quality basins is achieved in accordance with the QUDM or other applicable standards.
- The basins are situated outside the main flow paths
- All roads are designed to comply with the relevant flood immunity criteria
- For the purpose of this approval, existing flood plain storage is defined as the volume of storage following bulk earthworks associated with PDA Development Approval DEV2023/1434.
- The development does not cause any hydraulic impacts external to the site other than what is already approved pursuant to PDA Development Approval DEV2023/1434.

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 7-2**. 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 (herein referred to as "Water by Design guidelines").

We note the basins are indicative in location and shape at this stage, and appropriate levels of flood immunity and compliance with the technical requirements of the Water By Design guidelines will be considered at subsequent ROL stages.

7.1.2 Rainwater Tanks

Rainwater tanks remove pollutants from the stormwater drainage network via the retention and reuse of stormwater. Rainwater tanks have been designed on the assumption that 50% of the roof water will be connected to the tank, with the remaining 50% of roof water bypassing the tanks. Each tank is to be fitted with a proprietary first flush device, which capture the first portion of runoff from the roof, to effectively remove sediment and attached pollutants. Rainwater tanks were modelled for each land use type as follows:

- **Residential areas** (Low Density and Low-Medium Density): roof runoff from residential areas (excluding the Centre Apartments) is proposed to be directed to 3kL rainwater tanks. Each rainwater tank has been modelled with an internal reuse rate of 58.8L per day for toilet flushing. This reuse rate was based on a 2.8 person household, with a rate of 21L per person per day for toilet flushing assuming water saving devices (in accordance with Table 4.2 and 4.3 of the Water By Design guidelines). Rainwater tanks were modelled based on the area's density i.e. number of dwellings per hectare. No rainwater tanks were modelled for the Centre Apartments (as per Water By Design guidelines).
- **Commercial Areas** (District and Neighbourhood Centres): roof runoff from commercial areas is proposed to be directed to 5kL rainwater tanks. Rainwater tank volumes were estimated assuming 1.5kL per 50m² of roof. Each rainwater tank was modelled with an internal reuse rate per day for toilet flushing. Daily reuse rates were based on 0.3kL per 1000m^2 of roof.
- **Education Precinct** (Primary School Site PS006): roof runoff from the school is proposed to be directed to 50kL rainwater tanks. Rainwater tank volumes were estimated assuming 1.5kL per 50m² of roof. Each rainwater tank was modelled with an internal reuse rate per day for toilet flushing and an external reuse rate per year for irrigation. Daily reuse rates were based on 0.5kL per 1000m^2 of roof. Annual reuse rates were based on an irrigation rate of 548mm in accordance with the Water By Design guidelines.

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 prepared to assess the effectiveness of the proposed water quality control measures against 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 the Water By Design 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.

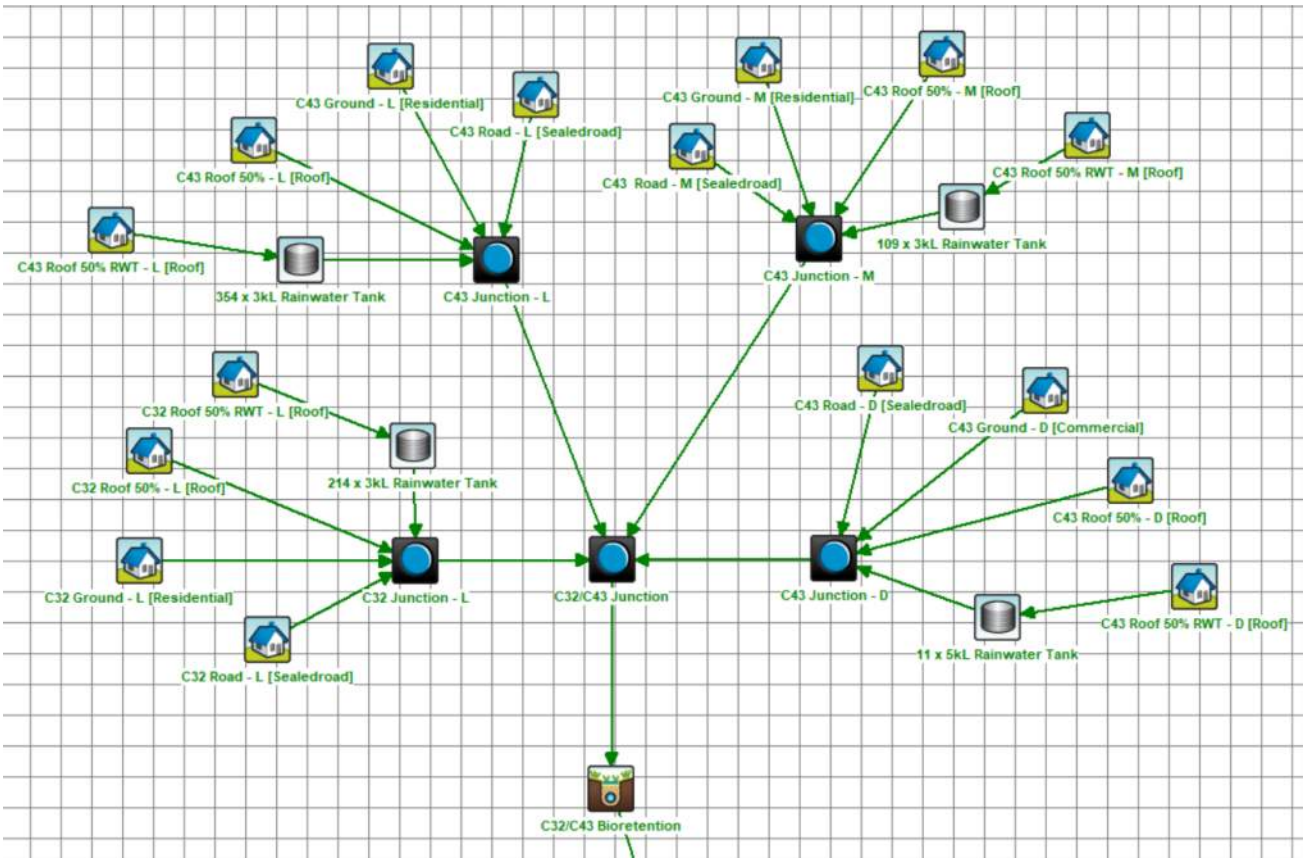


Figure 7-1 - MUSIC Model Arrangement

The catchments modelled in MUSIC were broken down into specific land use categories to accurately model the rainfall runoff parameters and pollutant concentration parameters for each category. Source nodes used for each category were as follows:

- All roads were modelled as 'urban - sealed road'.
- All roofs were modelled as 'urban – roof'.
- Ground surfaces in all residential areas (i.e. low density, low-medium density and apartments) were modelled as 'urban – residential'. The ground surface for the school catchment was also modelled as 'urban – residential' (as outlined in the Water By Design guidelines, Table 3.1).
- Ground surfaces in the district and neighbourhood centres were modelled as source node type 'urban – commercial' (as outlined in the Water By Design guidelines, Table 3.1).

Rainfall-runoff parameters have been adopted in accordance with Table A1.2 in the Water By Design guidelines. Refer to Table 7-1 for the rainfall-runoff parameters for residential source nodes (including low density, low-medium density, apartments and schools) and commercial source nodes (district and neighbourhood centres).

Table 7-1 – Rainfall-Runoff Parameters for Source Nodes

Parameter	Value	
Land Use Category	Urban Residential	Urban Commercial
Rainfall Threshold (mm/day)	1	1
Soil Storage Capacity (mm)	500	18
Initial Storage (% of Capacity)	10	10
Field Capacity (mm)	200	80
Infiltration Capacity Coefficient – a	211	243
Infiltration Capacity Exponent – b	5.0	0.6
Initial Depth (mm)	50	50
Daily Recharge Rate (%)	28	0
Daily Base flow Rate (%)	27	31
Daily Deep Seepage Rate (%)	0	0

** Parameter based on Water By Design guidelines, Table A1.2*

The pollutant concentration parameters adopted in the model were based on those outlined in the Water By Design guidelines. The parameters are listed in **Table 7-2**.

Table 7-2 – Pollutant Concentration Parameters for 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 (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
Roof (Urban Commercial)	Mean	1.30	N/A	-0.89	N/A	0.37	N/A
	Std Dev	0.38	N/A	0.34	N/A	0.34	N/A
Roads (Urban Commercial)	Mean	2.43	0.78	-0.30	-0.60	0.37	0.32
	Std Dev	0.38	0.39	0.34	0.50	0.34	0.30
Ground (Urban Commercial)	Mean	2.16	0.78	-0.39	-0.60	0.37	0.32
	Std Dev	0.38	0.39	0.34	0.50	0.34	0.3

**Parameters based taken from Water by Design guidelines Table 3.9.*

The impervious percentage assigned for each source node is summarised below in **Table 7-3**. The area breakdown for each catchment (road, roof or ground) is shown in **Table 7-4**.

Table 7-3 – MUSIC Fraction Impervious Assumptions

Land Use	Road	Roof	Ground
Low Density Residential (19.5 dwellings / ha)	62%	100%	22%
Low-Medium Density Residential (30 dwellings / ha)	66%	100%	26%
Apartments Residential (60 dwellings / ha)	75%	100%	40%
District/ Neighbourhood Centres	75%	100%	60%
School	75%	100%	60%

**Note fraction impervious values were interpolated based on Water By Design guidelines, Table 3.6.*

Table 7-4 – MUSIC Nodes Area Breakdown

Land Use	Road	Roof	Ground
Low Density Residential (19.5 dwellings / ha)	26%	33%	41%
Low-Medium Density Residential (30 dwellings / ha)	29%	34%	37%
Apartments Residential (60 dwellings / ha)	31%	35%	34%
District/ Neighbourhood Centres	30%	50%	20%
School	26%	35%	41%

**Note areas were interpolated based on Water By Design guidelines, Table 3.4.*

The catchment areas and their associated land use types are summarised in **Table 7-5**.

Table 7-5 - Catchment Source Node Summary

Catchment	Total Area (Ha)	Land Use
C07	4.709	Low Density Residential
C08	3.993	Low Density Residential
C09	29.508 8.711	Low Density Residential Low-Medium Density Residential
C12	2.947 7.859 11.133	Low- Medium Density Residential Apartments District/ Neighbourhood Centre
C17	8.237	Low Density Residential
C22	6.046 6.792	Low- Medium Density Residential School
C25	8.134	Low Density Residential
C27	7.701	Low Density Residential
C28	4.056	Low Density Residential

Catchment	Total Area (Ha)	Land Use
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
C43	18.139 3.640 0.750	Low Density Residential Low- Medium Density Residential District/ Neighbourhood Centre
C44	37.859 6.263 1.263	Low Density Residential Low- Medium Density Residential District/ Neighbourhood Centre
C46	20.266	Low Density Residential
C47	14.417	Low Density Residential
C48	5.614	Low Density Residential
C71	7.366	Low Density Residential
C72	6.270	Low Density Residential
C73	22.512 9.097 3.210	Low Density Residential Low- Medium Density Residential District/ Neighbourhood Centre
C74	19.893	Low Density Residential
C77	14.120	Low Density Residential

7.3 Modelling Results and Summary

Design parameters adopted for the bioretention systems are summarised below in **Table 7-6**. Contributing catchments to each bioretention system, as well as filter areas are outlined **Table 7-7**. Results from the MUSIC model shown in **Table 7-8** demonstrate that the treatment train should achieve the water quality targets outlined in **Table 4-1**. Indicative water quality basin locations are presented in **Figure 7-2.**

Table 7-6 - Bioretention Parameters

Parameter	Value
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

Table 7-7 - Bioretention System Areas

Plan ID	Contributing Catchments	Bioretention Filter Area (m²)
WQ1	C07 C08	400
WQ3	C09	1800
WQ4	C12	1100
WQ5	C17	400
WQ6	C22 C77	1600
WQ8	C73	2000
WQ9	C25	500
WQ10	C27	400
WQ11	C28	200
WQ12	C30 C74	1500
WQ15	C31	550
WQ16	C32 C43	1550
WQ18	C33	150
WQ19	C34 C36	1000
WQ20	C37	600
WQ21	C38	450
WQ22	C39	500
WQ23	C40	150
WQ24	C42	250

Construction of detention basin B1 and Water Quality basin WQ6 is subject to obtaining landowner and road manager's consent. Should these consents not be obtained, the stormwater management devices need to be relocated within the site extent.

All basin design must comply with `QUDM' and `Bioretention Technical Design Guidelines' prepared by `Water by Design' and achieves no worsening to upstream and downstream properties.

AMENDED IN RED
By: Demi Ebrahimi
Date: 22-Apr-25

Queensland Government

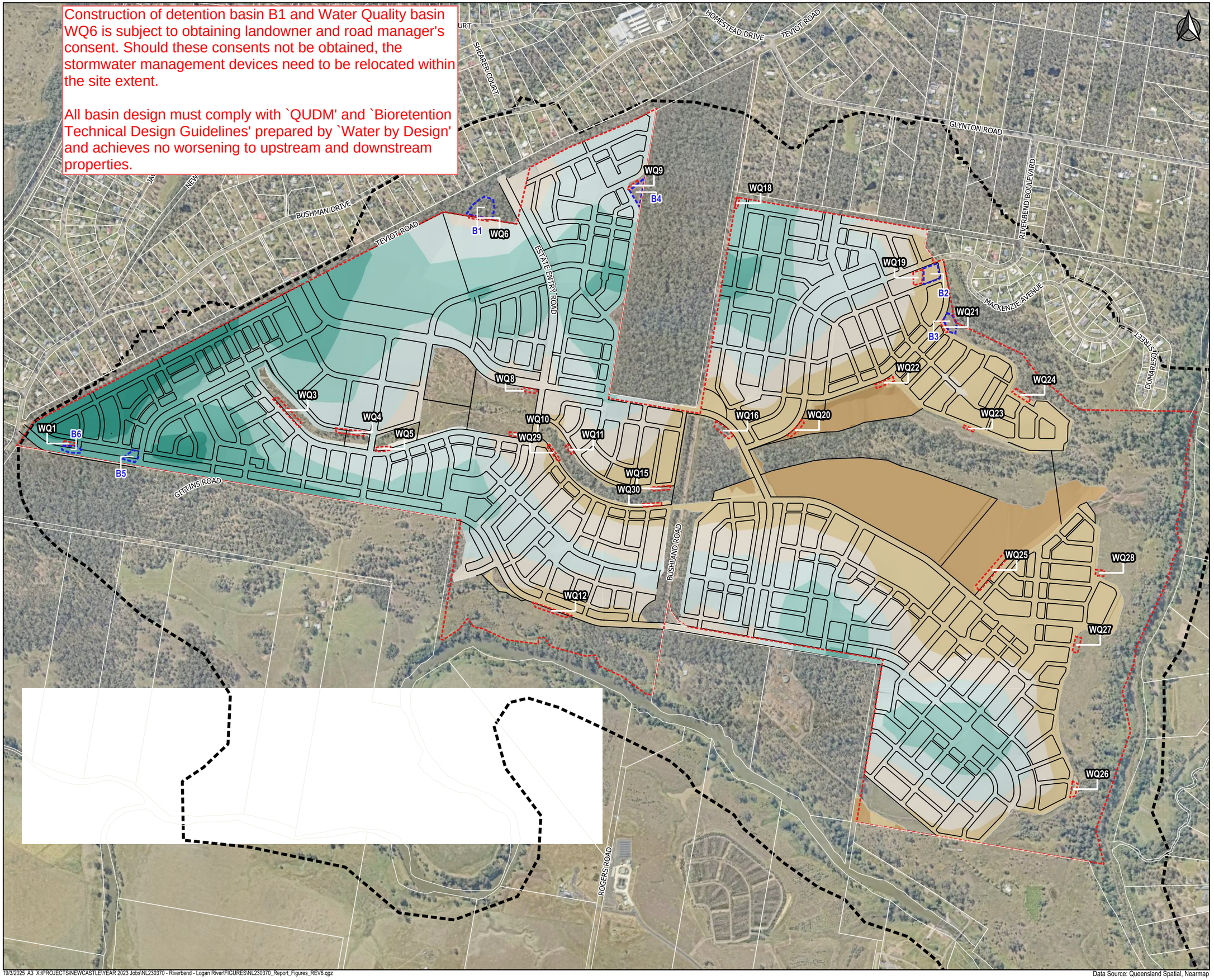
Plan ID	Contributing Catchments	Bioretention Filter Area (m²)
WQ25	C44	2100
WQ26	C46	1000
WQ27	C47	700
WQ28	C48	300
WQ29	C71	350
WQ30	C72	300
	TOTAL	19,850

Table 7-8 - MUSIC Model Results

Pollutant	Annual Loads (kg/yr)		% Reduction		Compliant
	Source	Residual	Actual	Target	
TSS	291,000	52,200	82	80	Yes
TP	607	157	74.2	60	Yes
TN	3,760	1,730	54.1	45	Yes
GP	48,700	279	99.4	90	Yes

Construction of detention basin B1 and Water Quality basin WQ6 is subject to obtaining landowner and road manager's consent. Should these consents not be obtained, the stormwater management devices need to be relocated within the site extent.

All basin design must comply with `QUDM' and `Bioretention Technical Design Guidelines' prepared by `Water by Design' and achieves no worsening to upstream and downstream properties.



Legend

- Masterplan Stage Boundary
- Existing Lots
- Development Layout
- Detention Basins
- Bioretention Basins

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 7-2

Water Quality Treatment Device Location

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

8 Waterway Stability Assessment

This section addresses the waterway stability management required under the SPP (2017). This requires development to limit the 63% AEP (1-year ARI) event discharge within the receiving waterway to the pre-development peak.

The TUFLOW model described above in Section 5 has been used to estimate the 63% AEP flood behaviour in the existing and developed cases. Results are presented in **Appendix E.**

Consideration has been given to the various discharge points as outlined below.

8.1 Discharge to the Logan River

Modelling presented in **Figure D5-2** of **Appendix E** shows no increases in velocity pre to post for the 63% AEP in the Logan River. This is as demonstrated in the previous report and is due to the timing of the regional peak occurring well after the local peak.

Mitigation measure will be provided at site outlets as required and may include energy dissipaters and scour protection to reduce the potential for scour. This will be investigated and addressed at future ROL stages.

8.2 Discharge to Teviot Road

Modelling presented in **Figure D5-2** of **Appendix E** shows no increases in velocity pre to post for the 63% AEP downstream of Teviot Road. This is the location of detention Basin 1 and conceptual design, and further modelling of this basin will be undertaken in subsequent ROL stages.

8.3 Discharge to Drainage Reserve Behind Mackenzie Avenue

Modelling presented in **Figure D5-2** of **Appendix E** shows minor increases in velocity pre to post for the 63% AEP in this location. We do not believe there is significant potential for erosion in this event due to absolute velocities being generally less than 1.5m/s and the vegetated nature of the corridor, as presented in **Figure C5-2** of **Appendix E**.

Detention basins 2 and 3 are located at these discharge locations, and the combination of stage discharge control and augmentation of the detention function of the associated bioretention basins will be investigated at future ROL stages.

8.4 Discharge to Northern Lot

Modelling presented in **Figure D5-2** of **Appendix E** shows minor increases in velocity pre to post for the 63% AEP in this location. We do not believe there is significant potential for erosion in this event due to absolute velocities being generally less than 1.0m/s and the vegetated nature of the corridor, as presented in **Figure C5-2** of **Appendix E**.

Detention basin 4 is located at this discharge location, and the combination of stage discharge control and augmentation of the detention function of the associated bioretention basin will be investigated at future ROL stages.

8.5 Discharge to Main Riparian Corridor

Modelling presented in **Figure D5-2** of **Appendix E** shows minor increases in velocity pre to post for the 63% AEP in this location.

Mitigation measures including augmenting the bioretention basin detention storage, passive detention behind culvert crossings, scour protection, pool and riffle design, and riparian corridor planting will be investigated at future ROL stages.

8.6 Discharge to South

Modelling presented in **Figure D5-2** of **Appendix E** shows minor increases in velocity pre to post for the 63% AEP in this location. We do not believe there is significant potential for erosion in this event due to absolute velocities being generally less than 1.5m/s and the vegetated nature of the corridor, as presented in **Figure C5-2** of **Appendix E**.

Detention basin 5 is located at this discharge location, and the combination of stage discharge control and augmentation of the detention function of the associated bioretention basin will be investigated at future ROL stages.

Future ROL applications must demonstrate appropriate waterway stability assessment is carried out and all relevant mitigation measures are provided to protect waterways and address associated erosion risks and impacts external to the site.
All discharge regimes must comply with the Lawful Point of Discharge (LPD) criteria as per QUDM requirements.
Any changes to the current discharge arrangements in particular onto private properties will not be supported unless accompanied by the landowner consent.
The post-development run-off regime at the LPD must be equal or less than the corresponding pre-developement run-off regime for all events up to 1% AEP storms.

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

9 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.

Waterway Stability

A waterway stability assessment has determined that no additional mitigation measures are required to limit flows in discharging directly to the Logan River. Minor increases in velocity are predicted at several of the other discharge locations and we do not believe this will result in a significant erosion risk to due to the vegetated nature of the receiving corridors. Additional mitigation measures such as stage discharge configurations on detention basins and augmented bioretention basin capacity will be further investigated at future ROL stages.

Appendix A – Civil Engineering Plans

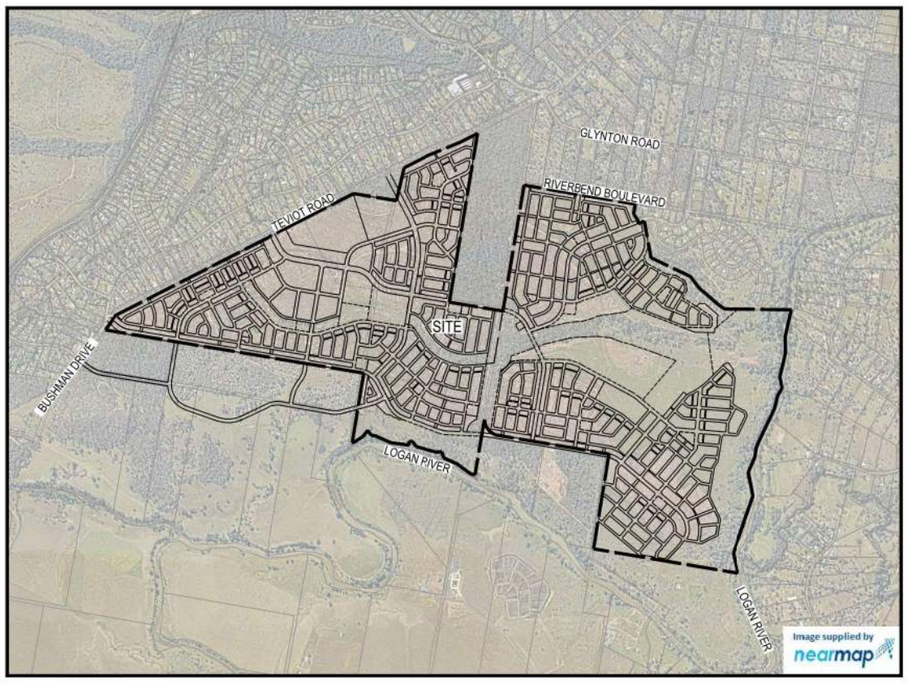
PROPOSED RESIDENTIAL DEVELOPMENT

CONCEPT EARTHWORKS MASTER PLAN
RIVERBEND, JIMBOOMBA
FOR 'CELESTINO DEVELOPMENTS PTY LTD'

DRAWING LIST

CONCEPT EARTHWORKS MASTER PLAN

20-0190-P100	COVER PLAN
20-0190-P101	OVERALL LAYOUT PLAN
20-0190-P102	DEPTH OF CUT/FILL PLAN
20-0190-P103	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 1 OF 7
20-0190-P104	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 2 OF 7
20-0190-P105	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 3 OF 7
20-0190-P106	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 4 OF 7
20-0190-P107	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 5 OF 7
20-0190-P108	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 6 OF 7
20-0190-P109	CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 7 OF 7
20-0190-P110	CONCEPT BULK EARTHWORKS SECTIONS SHEET 1 OF 5
20-0190-P111	CONCEPT BULK EARTHWORKS SECTIONS SHEET 2 OF 5
20-0190-P112	CONCEPT BULK EARTHWORKS SECTIONS SHEET 3 OF 5
20-0190-P113	CONCEPT BULK EARTHWORKS SECTIONS SHEET 4 OF 5
20-0190-P114	CONCEPT BULK EARTHWORKS SECTIONS SHEET 5 OF 5
20-0190-P115	OVERALL EROSION AND SEDIMENT CONTROL PLAN



LOCALITY PLAN
SCALE 1:20000 (A1)
SCALE 1:40000 (A3)

N

PROJECT INFORMATION SUMMARY:
No. OF LOTS = N/A
AREA OF SITE = ~~394.66~~ 550
RP DESCRIPTION LOT 102 ON SP 254145 LOT 104 ON SP 254145 LOT 800 ON SP 247625
DATUM LEVEL AND LOCATION PM172605 RL 43.030 AHD LOCATED RIVERBEND BOULEVAED JIMBOOMBA
LOCAL AUTHORITY: LOGAN CITY COUNCIL
COUNCIL REFERENCE NUMBER:

Notes:
1) Earthworks within Teviot Road road reserve is subject to future assessment.
2) Flood model outputs included within the endorsed Stormwater IMP are to be used for the earthworks and road design.
3) As part of future ROL applications, the following must be demonstrated:

- Confirmation that the basin design complies with the bio-retention technical requirements specified in the Water by Design guidelines.
- Flood immunity of the water quality basins is achieved in accordance with the QUDM or other applicable standards.
- The basins are situated outside the main flow paths
- All roads are designed to comply with the relevant flood immunity criteria
- **For the purpose of this approval, existing flood plain storage is defined as the volume of storage following bulk earthworks associated with PDA Development Approval DEV2023/1434.**
- **The development does not cause any hydraulic impacts external to the site other than what is already approved pursuant to PDA Development Approval DEV2023/1434.**

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.08.24	ML	BA	PLANS UPDATED

DRAWN
DESIGN
STATUS: NOT FOR CONSTRUCTION
APPROVED: DANIEL COLLINS RPEQ 18631 DATE 17.03.25
FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
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1:40000 A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD
ASSOCIATED CONSULTANT:
PROJECT NAME: RIVERBEND
RIVERBEND JIMBOOMBA
DRAWING TITLE: COVER PLAN
PROJECT No. 20-0190
DRAWING No. P100
REVISION D

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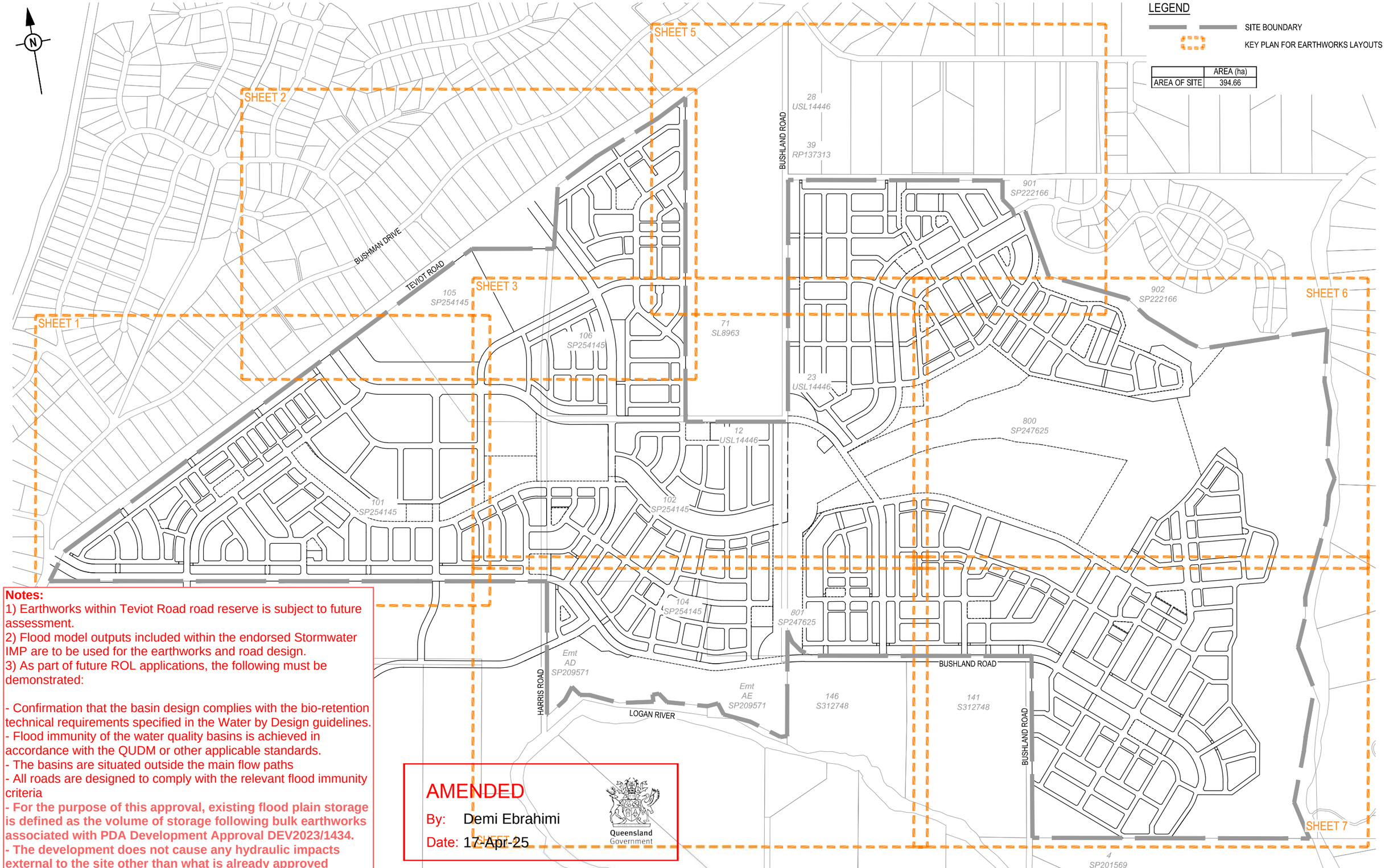

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AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

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D	12.08.24	ML	BA	PLANS UPDATED

DRAWN
DESIGN

STATUS: NOT FOR CONSTRUCTION

APPROVED: DANIEL COLLINS RPEQ 18631 DATE 12.08.24

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
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1:12000 A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

PROJECT NAME: RIVERBEND
RIVERBEND
JIMBOOMBA

DRAWING TITLE: OVERALL LAYOUT PLAN

PROJECT No.	DRAWING No.	REVISION
20-0190	P101	D

PLOT - 18 Mar 2025 03:09 PM LOCATION - H:\20\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-02 [OVERALL LAYOUT PLAN].dwg

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-2	to	-1	m	
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5	to	6	m	
6	to	7	m	
7	to	8	m	
8	to	9	m	
9	to	999	m	

LEGEND

- SITE BOUNDARY
- Q100 FLOOD LINE EXTENT
- EPBC EXTENT

N

BUSHMAN DRIVE
TEVIOT ROAD
BUSHLAND ROAD
HARRIS ROAD
LOGAN RIVER
28 USL14446
39 RP137313
105 SP254145
71 SL8963
901 SP222166
902 SP222166
23 USL14446
800 SP247625
146 S312748
141 S312748
Emt AD SP209571
Emt AE SP209571
4 SP201569

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By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

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D	12.08.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN
DESIGN
STATUS: NOT FOR CONSTRUCTION
APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25
FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
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1:12000 A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD
ASSOCIATED CONSULTANT:

PROJECT NAME: RIVERBEND
RIVERBEND JIMBOOMBA

DRAWING TITLE: DEPTH OF CUT/FILL PLAN

PROJECT No.	DRAWING No.	REVISION
20-0190	P102	E

PLOT - 18 Mar 2025 03:10 PM LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [REV] PLAN.dwg

LEGEND

- SITE BOUNDARY
- 24.0 PROPOSED SURFACE CONTOUR
- 24.0 EXISTING SURFACE CONTOUR

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-8	to	-7	m	
-7	to	-6	m	
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9	to	999	m	

KEYPLAN
NOT TO SCALE

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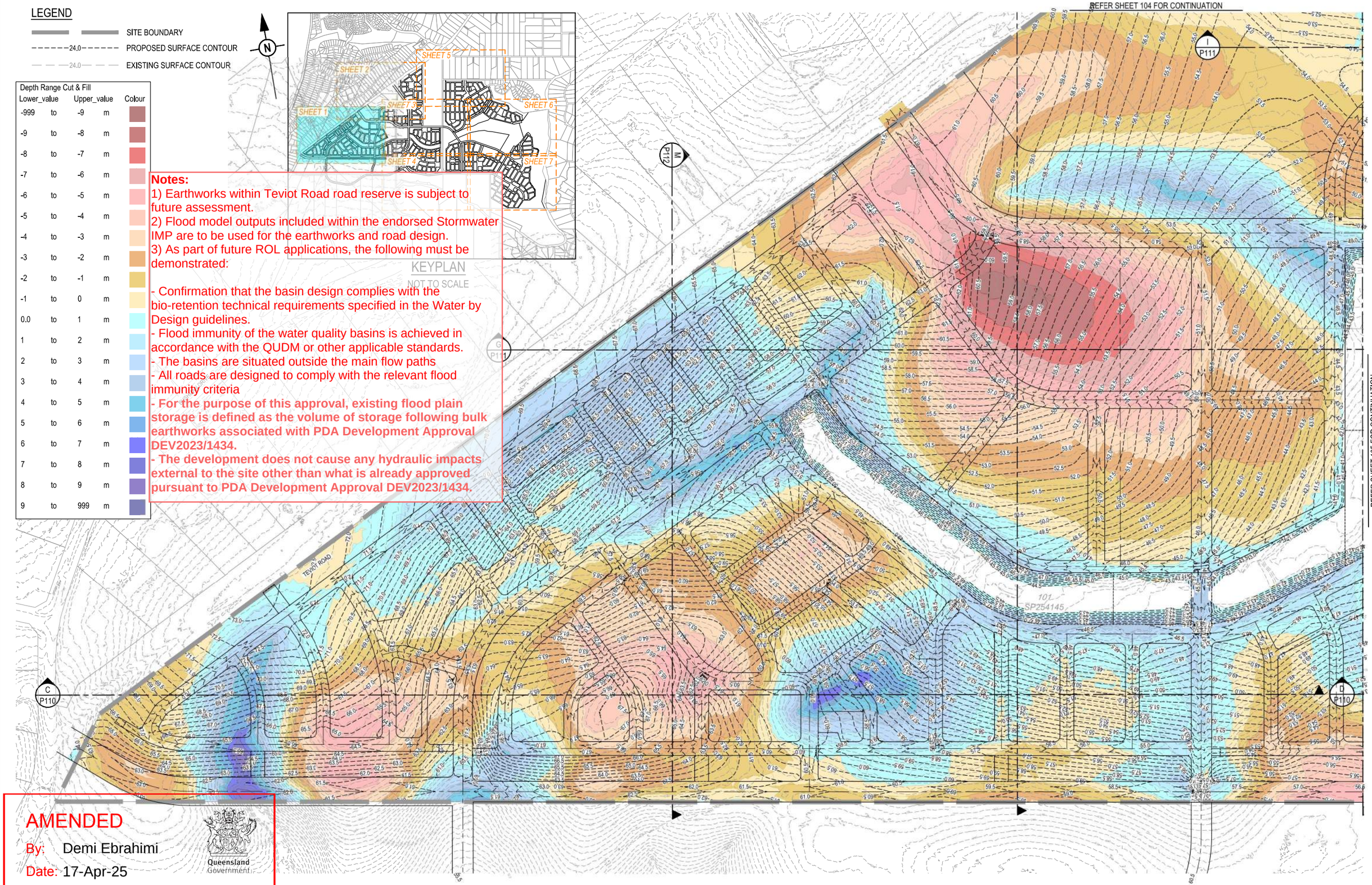

AMENDED

By: Demi Ebrahimi

Date: 17-Apr-25

Queensland Government

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.08.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN

DESIGN

STATUS: NOT FOR CONSTRUCTION

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE: 1:2000 / 1:4000 — 20 0 20 40 60 80 100 — A1 / A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

DRAWING TITLE: CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 1 OF 7

PROJECT No.	DRAWING No.	REVISION
20-0190	P103	E

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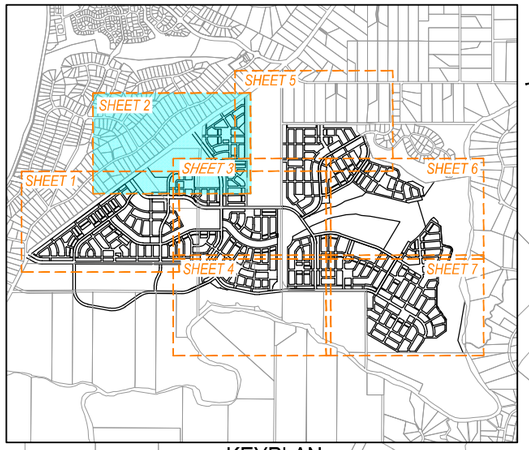

KEYPLAN

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AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

REFER SHEET 107 FOR CONTINUATION
REFER SHEET 103 FOR CONTINUATION
REFER SHEET 105 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.08.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN

DESIGN

STATUS: NOT FOR CONSTRUCTION

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE: 1:2000 / 1:4000 — 20 0 20 40 60 80 100 — A1 / A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

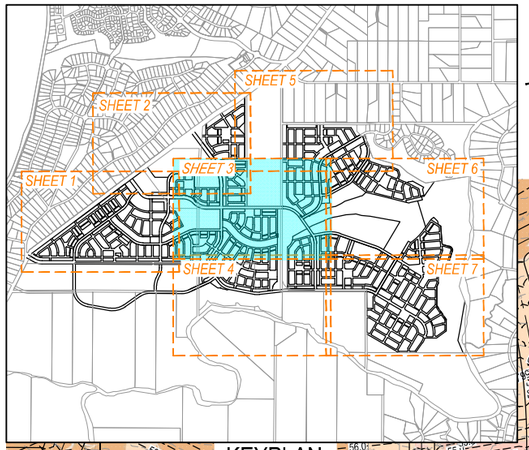
DRAWING TITLE: CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 2 OF 7

PROJECT No.	DRAWING No.	REVISION
20-0190	P104	E

PLOT - 18 Mar 2025 03:10 PM LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [REV1] PLAN.dwg

REFER SHEET 104 FOR CONTINUATION

REFER SHEET 107 FOR CONTINUATION



KEYPLAN
NOT TO SCALE

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AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

BUSHLAND ROAD

PROPOSED CULVERT CROSSING
5x 3.0mWx1.5mH RCBC

IL26.45

IL26.86

REFER SHEET 103 FOR CONTINUATION

REFER SHEET 108 FOR CONTINUATION

REFER SHEET 106 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.06.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN
DESIGN

STATUS: **NOT FOR CONSTRUCTION**

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
1:2000 20 0 20 40 60 80 100 A1
1:4000 A3

CLIENT: **CELESTINO DEVELOPMENTS PTY LTD**

ASSOCIATED CONSULTANT

PROJECT NAME: **RIVERBEND**

RIVERBEND
JIMBOOMBA

DRAWING TITLE: **CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 3 OF 7**

PROJECT No.	DRAWING No.	REVISION
20-0190	P105	E

PLOT - 18 Mar 2025 03:11 PM LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [BEN] PLAN.dwg

REFER SHEET 105 FOR CONTINUATION

REFER SHEET 103 FOR CONTINUATION

REFER SHEET 109 FOR CONTINUATION

HARRIS ROAD

LOGAN RIVER

Emt AD
SP209571

104
SP254145

Emt AE
SP209571

146
SS12748

A
P110

Notes:

1) Earthworks within Teviot Road road reserve is subject to future assessment.
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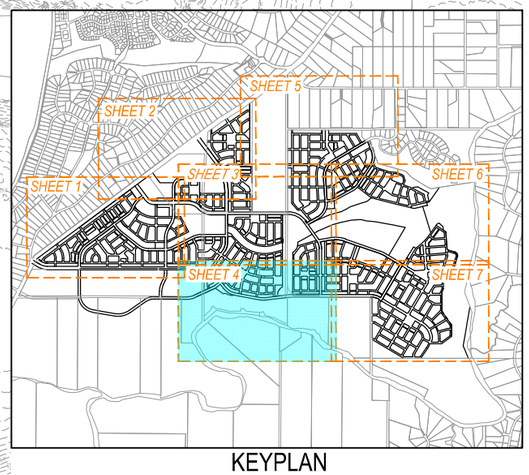
AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government



KEYPLAN
NOT TO SCALE

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.08.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN
DESIGN

STATUS: **NOT FOR CONSTRUCTION**

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25
FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
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1:4000 A3

CLIENT: **CELESTINO DEVELOPMENTS PTY LTD**

ASSOCIATED CONSULTANT

PROJECT NAME: **RIVERBEND**
RIVERBEND
JIMBOOMBA

DRAWING TITLE: **CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 4 OF 7**

PROJECT No.	DRAWING No.	REVISION
20-0190	P106	E

P:\OT - 18 Mar 2025 03:11 PM - LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [BEV] P-LAN.dwg

Notes:

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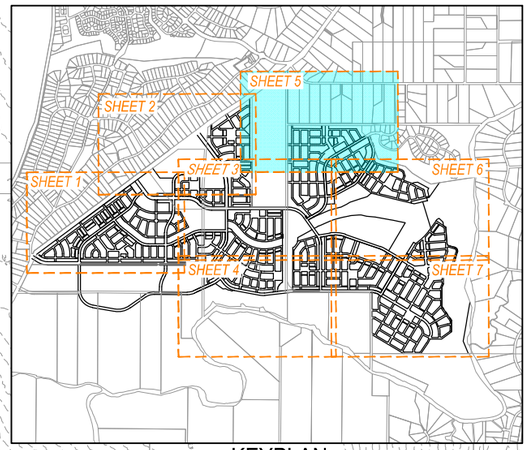
AMENDED

By: Demi Ebrahimi

Date: 17-Apr-25

Queensland Government



KEYPLAN

NOT TO SCALE

28 USL14446

39 RP137313

901 SP222166

RIVERBEND BOULEVARD

BUSHLAND ROAD

P113 S

P113 U

P114 W

P112 L

REFER SHEET 104 FOR CONTINUATION

REFER SHEET 105 FOR CONTINUATION

REFER SHEET 108 FOR CONTINUATION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
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FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

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CLIENT: **CELESTINO DEVELOPMENTS PTY LTD**

ASSOCIATED CONSULTANT

PROJECT NAME: **RIVERBEND**

RIVERBEND JIMBOOMBA

DRAWING TITLE: **CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 5 OF 7**

PROJECT No.	DRAWING No.	REVISION
20-0190	P107	E

PLOT - 18 Mar 2025 03:12 PM - LOCATION - H:\2020\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [BEV] PLAN.dwg

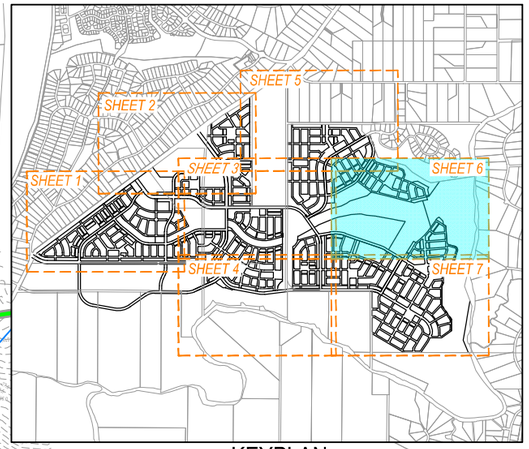
REFER SHEET 106 FOR CONTINUATION

REFER SHEET 105 FOR CONTINUATION

REFER SHEET 109 FOR CONTINUATION

902
SP222166

800
SP247625



KEYPLAN
NOT TO SCALE

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

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APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE: 1:2000 / 1:4000 — 20 0 20 40 60 80 100 — A1 / A3

CLIENT: **CELESTINO DEVELOPMENTS PTY LTD**

ASSOCIATED CONSULTANT

PROJECT NAME: **RIVERBEND**

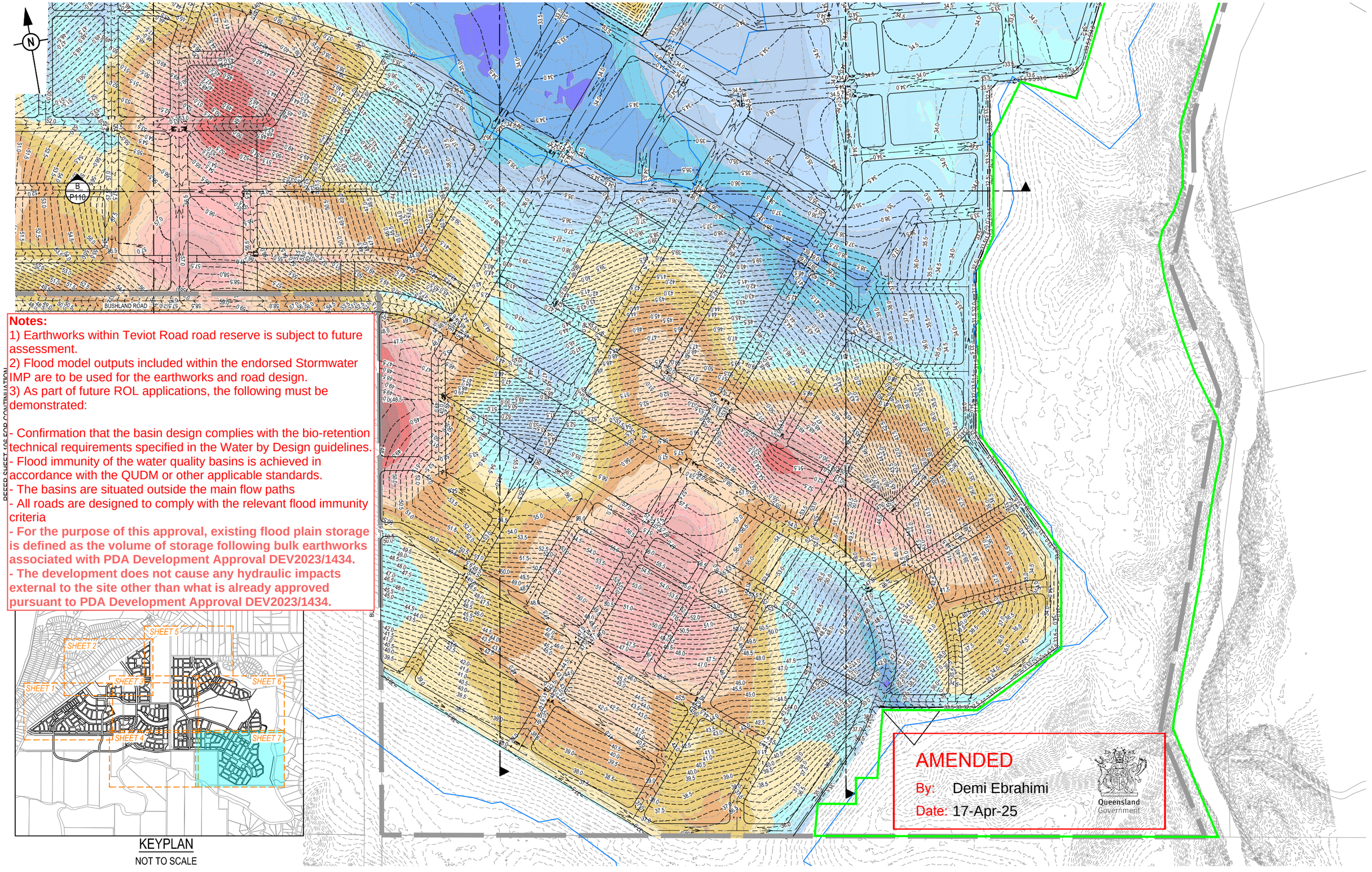
RIVERBEND
JIMBOOMBA

DRAWING TITLE: **CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 6 OF 7**

PROJECT No.	DRAWING No.	REVISION
20-0190	P108	E

PLOT - 18 Mar 2025 03:13 PM - LOCATION - H:\2020\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-00 [BR-V] PLAN.dwg

REFER SHEET 108 FOR CONTINUATION



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KEYPLAN

NOT TO SCALE

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

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Colliers

SCALE
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CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

DRAWING TITLE: CONCEPT BULK EARTHWORKS LAYOUT PLAN SHEET 7 OF 7

PROJECT No.	DRAWING No.	REVISION
20-0190	P109	E

PLOT - 18 Mar 2025 03:13 PM - LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-03 [BE(1)] PLAN.dwg

LEGEND

EXISTING SURFACE

DESIGN SURFACE

Q100 FLOOD LEVEL

Notes:

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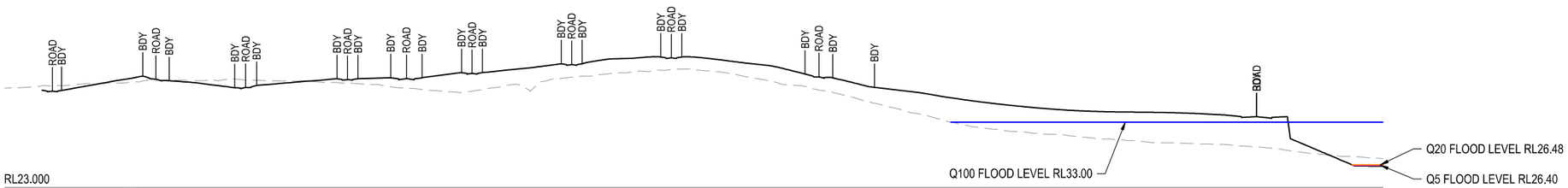
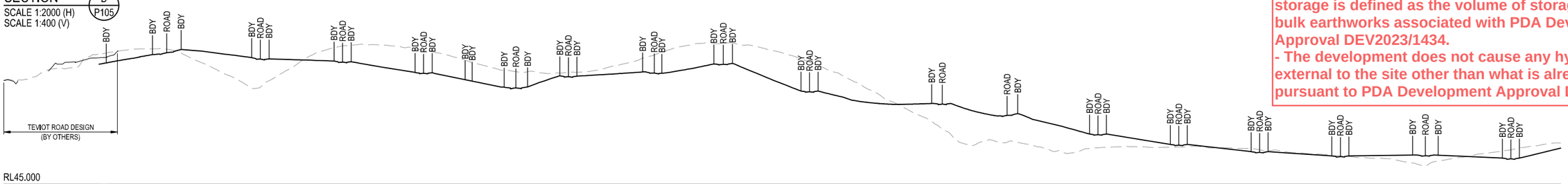


RL23.000

SECTION E P105
SCALE 1:2000 (H)
SCALE 1:400 (V)

RL30.000

SECTION D P105
SCALE 1:2000 (H)
SCALE 1:400 (V)



RL45.000

SECTION C P103
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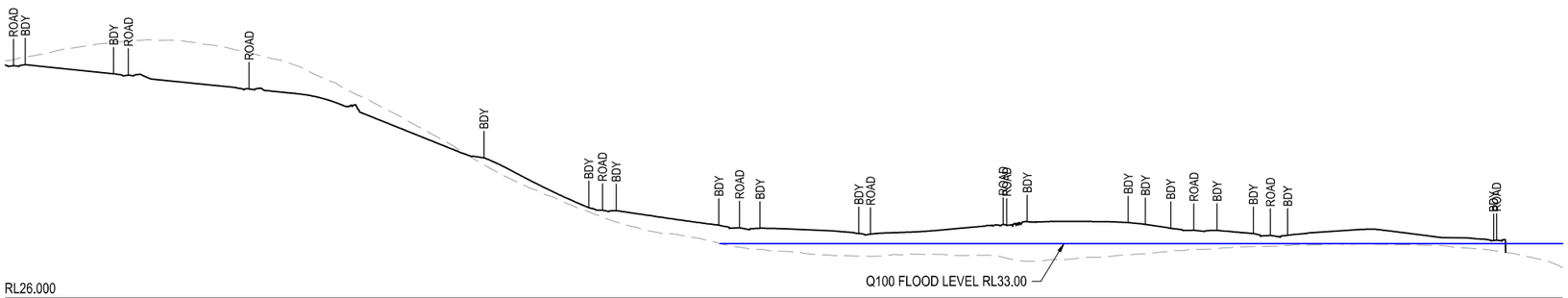

RL26.000

SECTION B P109
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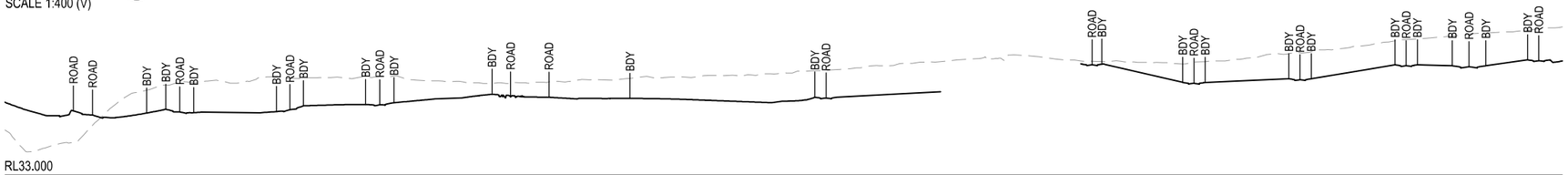
SCALE 1:400 (V)



RL33.000

SECTION A P106
SCALE 1:2000 (H)
SCALE 1:400 (V)

AMENDED

By: Demi Ebrahimi

Date: 17-Apr-25

Queensland Government

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
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DRAWN

DESIGN

STATUS: NOT FOR CONSTRUCTION

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 12.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE

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HORIZONTAL

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1:800 A3
VERTICAL

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

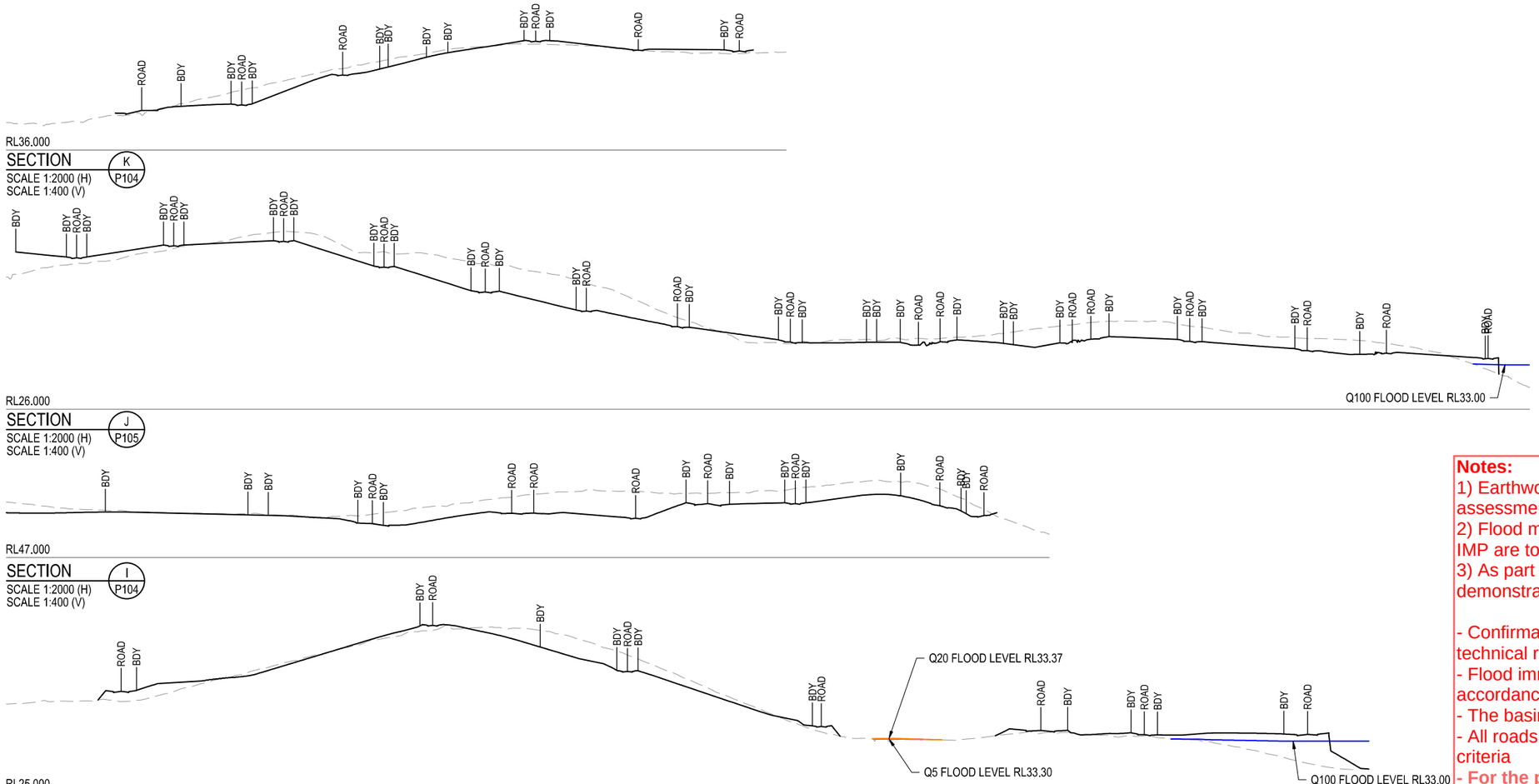
PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

DRAWING TITLE: CONCEPT BULK EARTHWORKS SECTIONS SHEET 1 OF 5

PROJECT No.	DRAWING No.	REVISION
20-0190	P110	E

PLOT - 18 Mar 2025 03:13 PM LOCATION - H:\20\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-04 [REV] SECTIONS.dwg



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Colliers

SCALE

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HORIZONTAL

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1:800 A3
VERTICAL

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

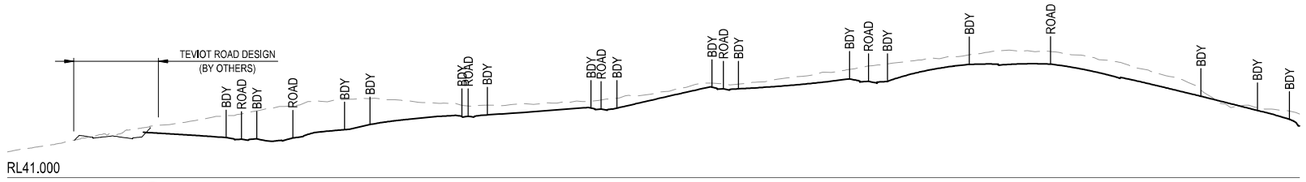
PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

DRAWING TITLE: CONCEPT BULK EARTHWORKS SECTIONS SHEET 2 OF 5

PROJECT No.	DRAWING No.	REVISION
20-0190	P111	E

PLOT - 18 Mar 2025 03:13 PM LOCATION - H:\20\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-04 [REV] SECTIONS.dwg



RL41.000

SECTION P P104

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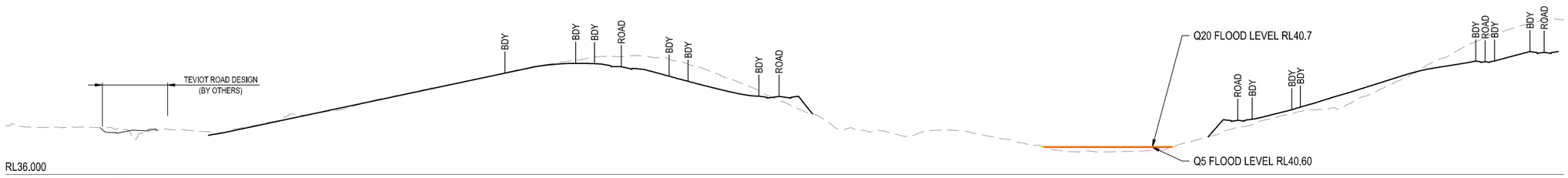

RL36.000

SECTION O P104

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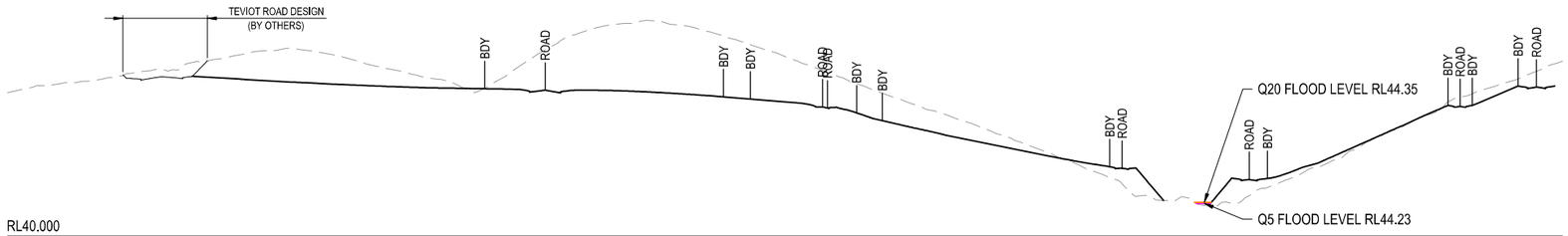

RL40.000

SECTION N P103

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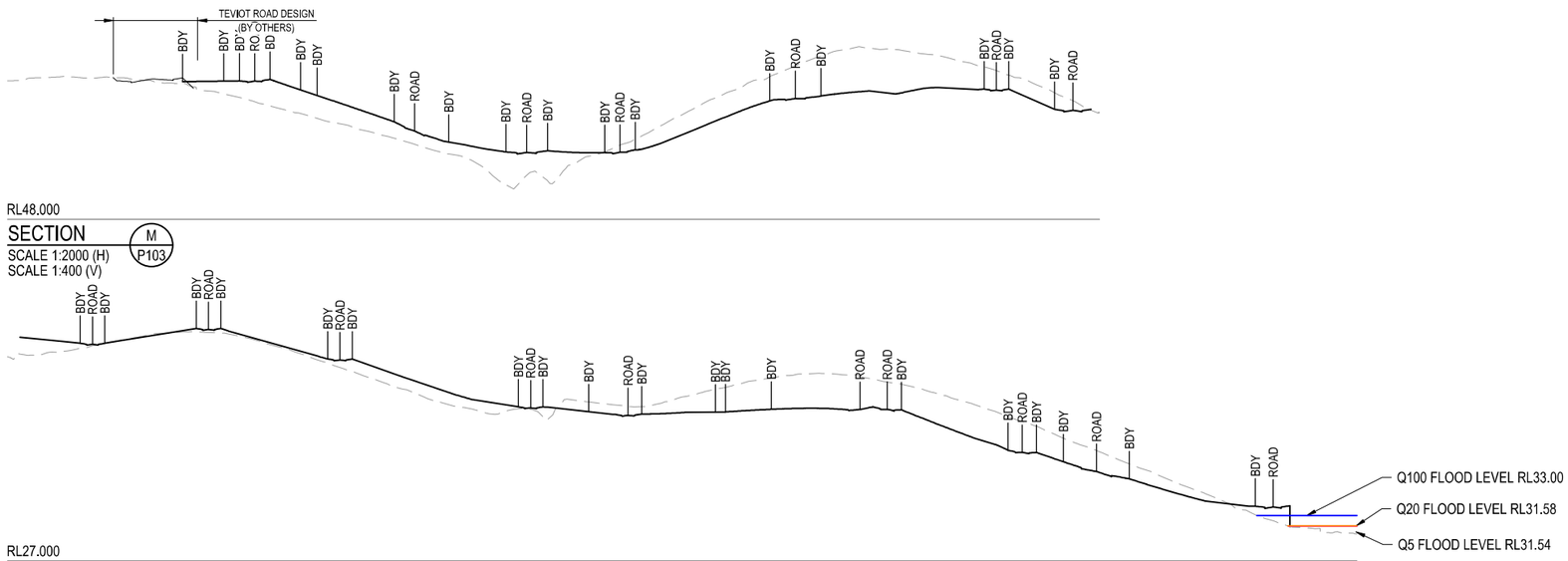
TEVIOT ROAD DESIGN
(BY OTHERS)
BDY
BDY
BDY
RO
BD
BDY
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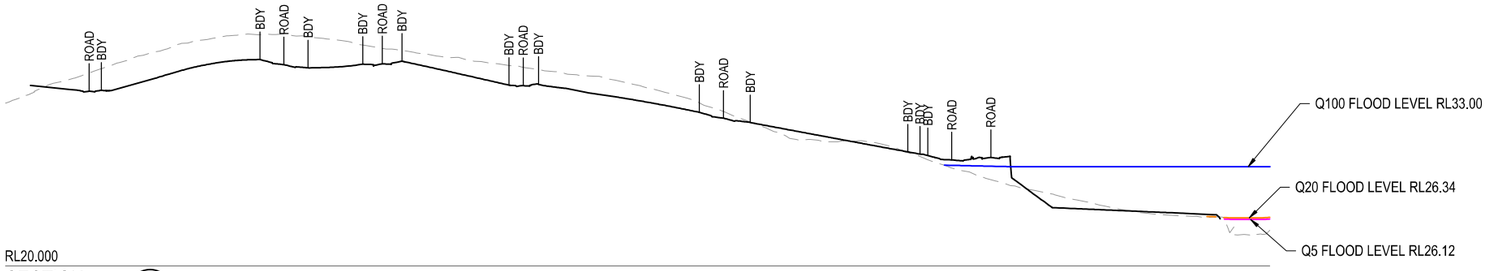

RL20.000

SECTION U
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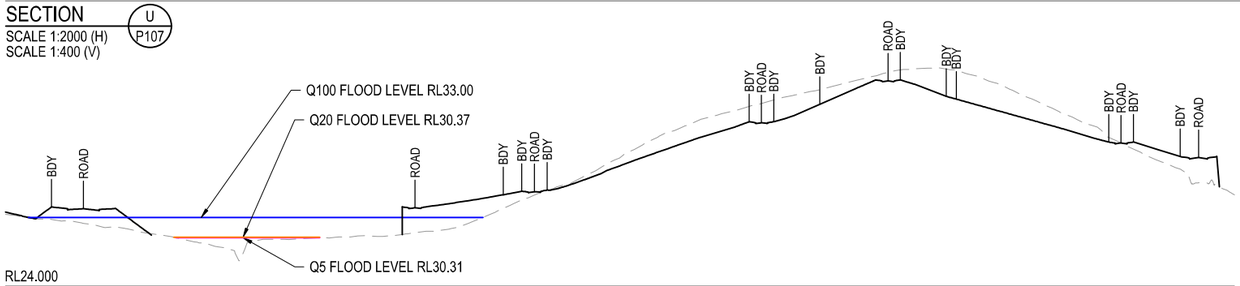
SCALE 1:400 (V)
P107



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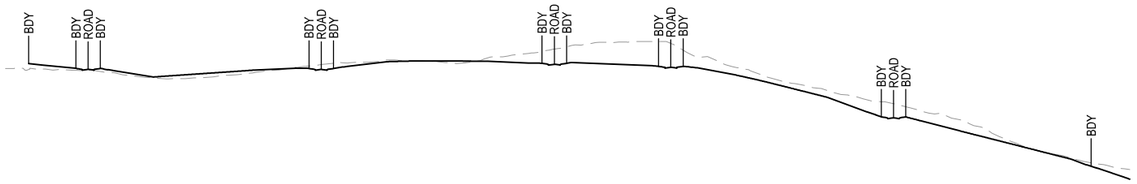

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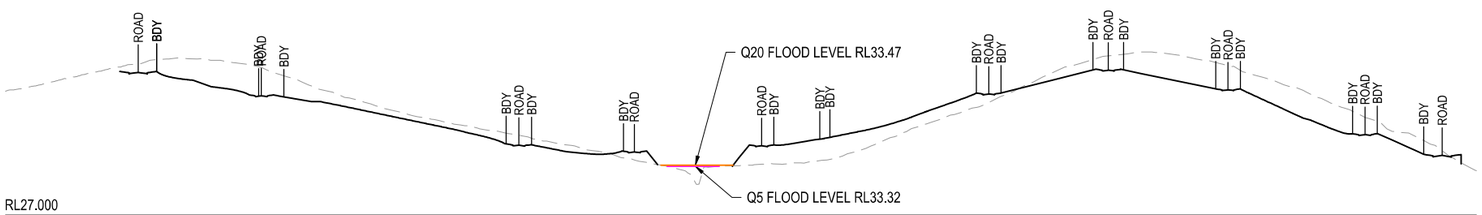
P107



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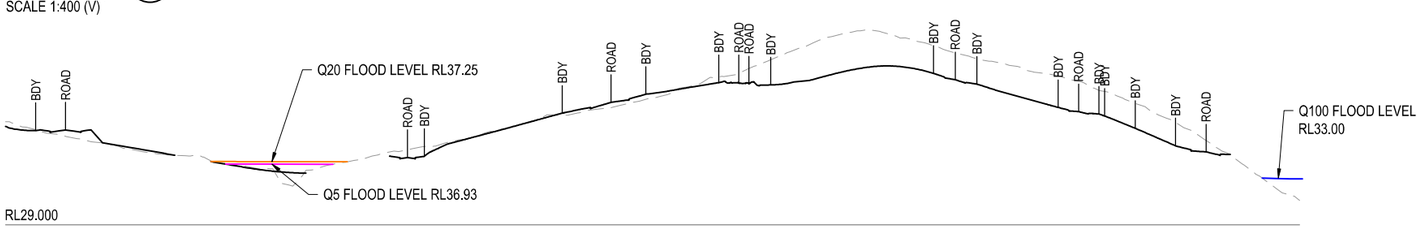
P105



RL29.000

Notes:
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AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

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DESIGN

STATUS: NOT FOR CONSTRUCTION
APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 12.03.25
FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
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HORIZONTAL
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VERTICAL

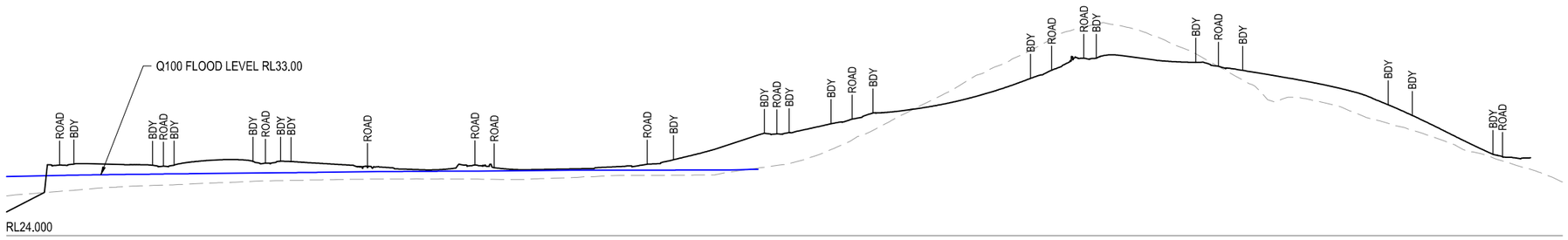
CLIENT: CELESTINO DEVELOPMENTS PTY LTD
ASSOCIATED CONSULTANT:

PROJECT NAME: RIVERBEND
RIVERBEND
JIMBOOMBA

DRAWING TITLE: CONCEPT BULK EARTHWORKS SECTIONS SHEET 4 OF 5

PROJECT No.	DRAWING No.	REVISION
20-0190	P113	E

P:\OT - 18 Mar 2025 03:14 PM - LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-04 [BE=1] SECTIONS.dwg



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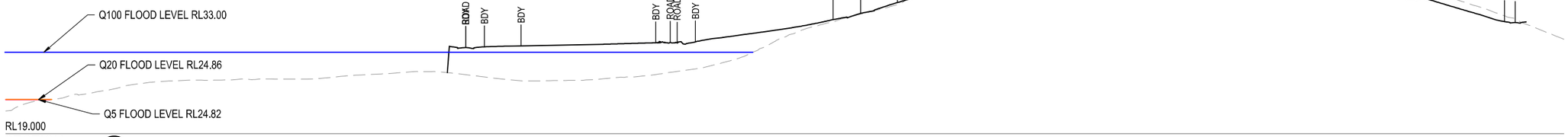
SCALE 1:400 (V)
P108



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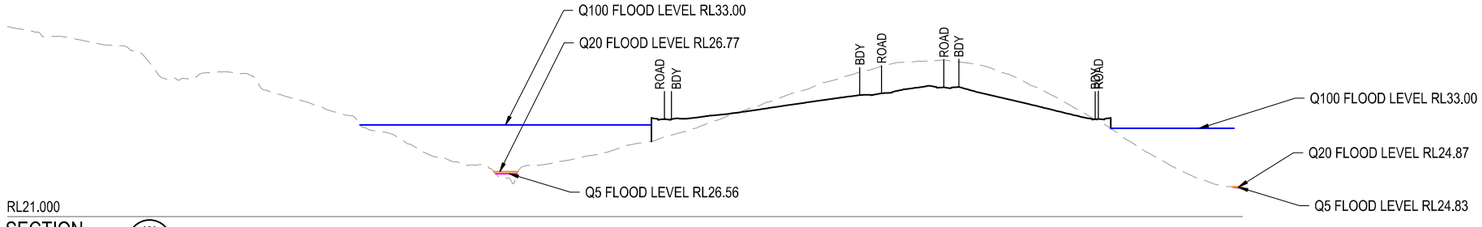

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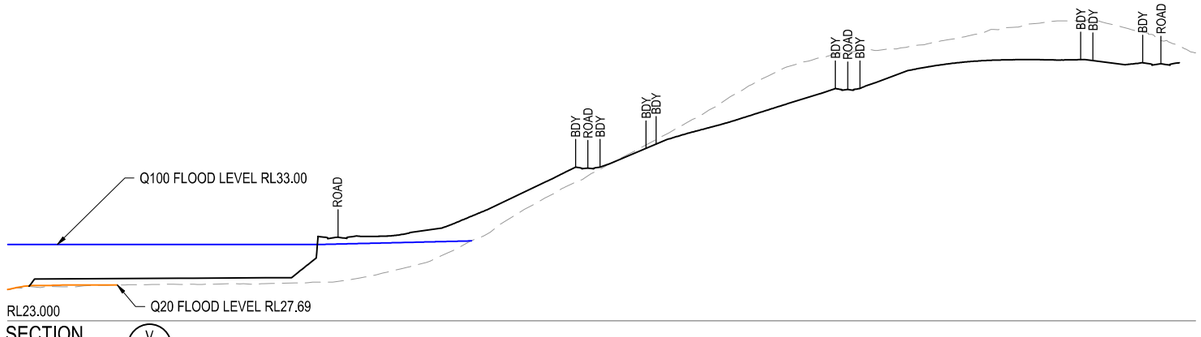

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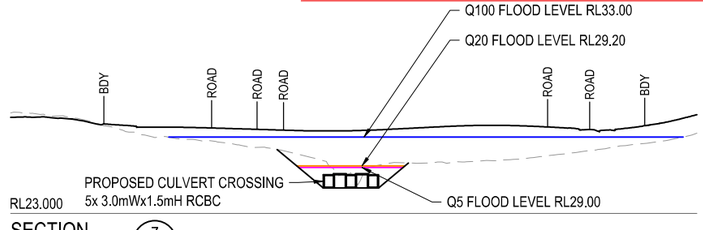
P108



SECTION Z
SCALE 1:2000 (H)
SCALE 1:400 (V)
P108

AMENDED
By: Demi Ebrahimi
Date: 17-Apr-25

Queensland Government

Notes:
1) Earthworks within Teviot Road road reserve is subject to future assessment.
2) Flood model outputs included within the endorsed Stormwater IMP are to be used for the earthworks and road design.
3) As part of future ROL applications, the following must be demonstrated:

- Confirmation that the basin design complies with the bio-retention technical requirements specified in the Water by Design guidelines.
- Flood immunity of the water quality basins is achieved in accordance with the QUDM or other applicable standards.
- The basins are situated outside the main flow paths
- All roads are designed to comply with the relevant flood immunity criteria
- **For the purpose of this approval, existing flood plain storage is defined as the volume of storage following bulk earthworks associated with PDA Development Approval DEV2023/1434.**
- **The development does not cause any hydraulic impacts external to the site other than what is already approved pursuant to PDA Development Approval DEV2023/1434.**

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	07.05.24	ML	BA	ORIGINAL ISSUE
B	31.05.24	ML	ML	AMENDED ROADS
C	07.06.24	ML	ML	PLANS AMENDED
D	12.06.24	ML	BA	PLANS UPDATED
E	12.03.25	LM	LM	RESPONSE TO EDQ RFI DATED 14.02.2025

DRAWN
DESIGN

STATUS: **NOT FOR CONSTRUCTION**

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 12.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE
1:2000 20 0 20 60 100 A1
1:4000 HORIZONTAL A3
1:400 4 0 4 12 20 A1
1:800 VERTICAL A3

CLIENT: **CELESTINO DEVELOPMENTS PTY LTD**

ASSOCIATED CONSULTANT

PROJECT NAME: **RIVERBEND**
RIVERBEND
JIMBOOMBA

DRAWING TITLE: **CONCEPT BULK EARTHWORKS SECTIONS SHEET 5 OF 5**

PROJECT No.	DRAWING No.	REVISION
20-0190	P114	E

PLOT - 18 Mar 2025 03:14 PM LOCATION - H:\2020\0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-04 [REV] SECTIONS.dwg

Construction of detention basin B1 and Water Quality basin WQ6 is subject to obtaining landowner and road manager's consent. Should these consents not be obtained, the stormwater management devices need to be relocated within the site extent.

All basin design must comply with `QUDM' and `Bioretention Technical Design Guidelines' prepared by `Water by Design' and achieves no worsening to upstream and downstream properties.

AMENDED

By: Demi Ebrahimi

Date: 17-Apr-25

Queensland Government

LEGEND

- SITE BOUNDARY
- INDICATIVE SEDIMENT BASIN LOCATION
- INDICATIVE CUT OFF DRAIN
- INDICATIVE CATCHMENT
- EXISTING CONTOURS

NOTE:

THIS IS AN INDICATIVE OVERALL SITE EROSION AND SEDIMENT CONTROL PLAN
DETAILED EROSION AND SEDIMENT CONTROL PLAN WILL BE UPDATED WITH RELEVANT OPERATIONAL WORKS PACKAGES IN DUE COURSE

BUSHMAN DRIVE
TEVIOT ROAD
BUSHLAND ROAD
HARRIS ROAD
LOGAN RIVER
105 SP254145
103 SP254145
28 USL14446
39 RP137313
71 SL8963
23 USL14446
12 USL14446
901 SP222166
902 SP222166
800 SP247625
80 SP247625
Emt AD SP209571
Emt AE SP209571
146 S312748
141 S312748
SP201569

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
A	17.03.25	ML	LM	ORIGINAL ISSUE

DRAWN

DESIGN

STATUS: NOT FOR CONSTRUCTION

APPROVED: DANIEL COLLINS RPEQ 18631 DATE: 17.03.25

FOR AND ON BEHALF OF COLLIERS INTERNATIONAL ENGINEERING & DESIGN PTY LTD

Colliers

SCALE: 1:6000 120 0 120 240 A1; 1:12000 A3

CLIENT: CELESTINO DEVELOPMENTS PTY LTD

ASSOCIATED CONSULTANT

PROJECT NAME: RIVERBEND

RIVERBEND
JIMBOOMBA

DRAWING TITLE: OVERALL EROSION AND SEDIMENT CONTROL PLAN

PROJECT No.	DRAWING No.	REVISION
20-0190	P115	A

PLOT - 18 Mar 2025 03:14 PM LOCATION - H:\20\20-0190 Riverbend\Design\Acad\DA Master Plan\20-0190-100-05 [ESC] PLAN.dwg

Appendix B – Structure Plan

AMENDED IN RED

By: Matthew Buchanan

Date: 28 April 2025

Queensland Government

Note: All boundaries between land use designations are to be treated as a shifting boundaries with final layout to be determined at reconfiguring a lot stage. This is particularly important where in proximity to major open space and potential school sites SS006 and PS017. Final road layout to be finalised at reconfiguring a lot stage.

Pump Station and all associated infrastructure (e.g. piping) do not jepordise the vegetation retention and rehabilitation areas identified unless otherwise approved or endorsed.

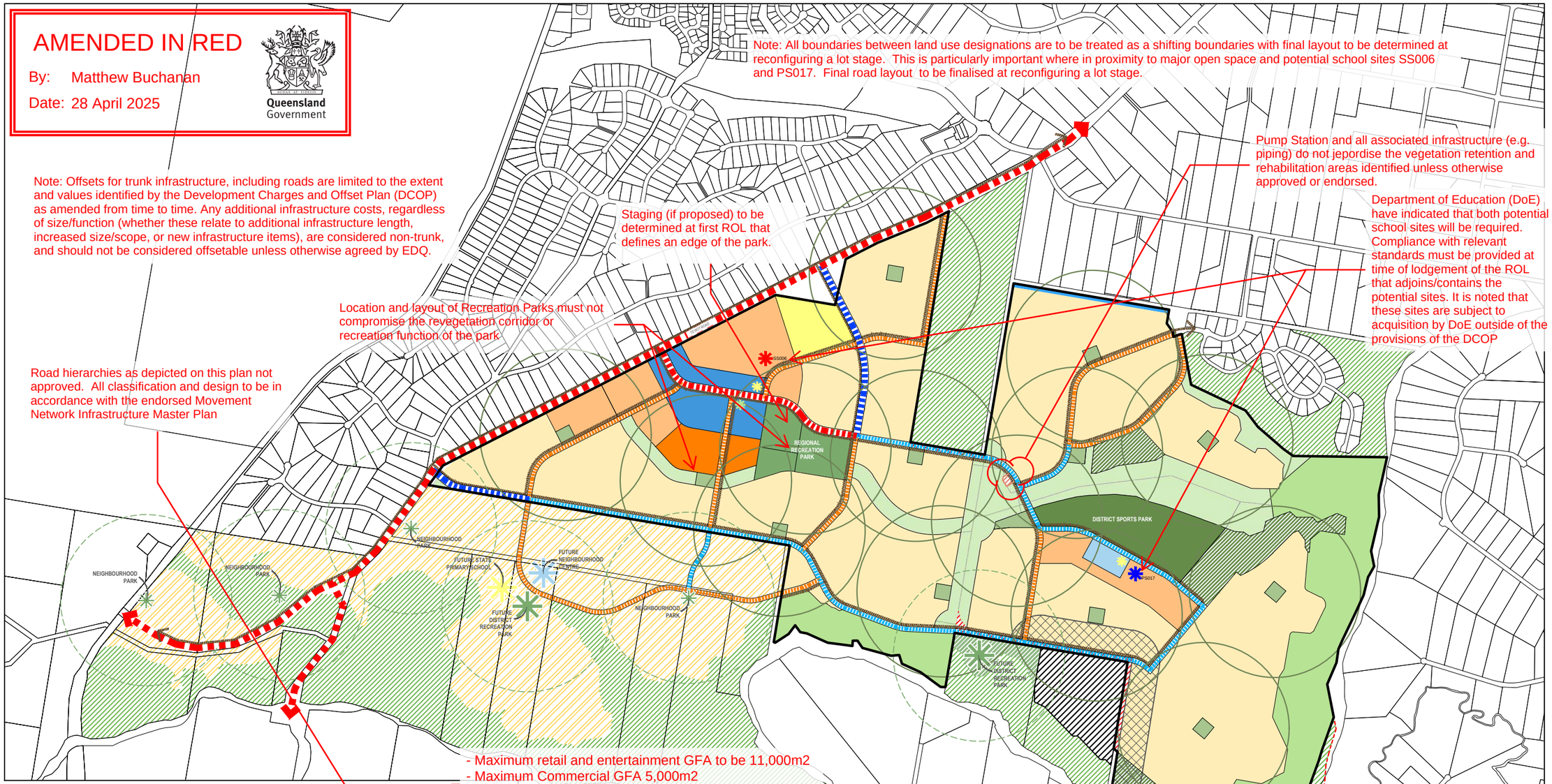
Department of Education (DoE) have indicated that both potential school sites will be required. Compliance with relevant standards must be provided at time of lodgement of the ROL that adjoins/contains the potential sites. It is noted that these sites are subject to acquisition by DoE outside of the provisions of the DCOP

Note: Offsets for trunk infrastructure, including roads are limited to the extent and values identified by the Development Charges and Offset Plan (DCOP) as amended from time to time. Any additional infrastructure costs, regardless of size/function (whether these relate to additional infrastructure length, increased size/scope, or new infrastructure items), are considered non-trunk, and should not be considered offsetable unless otherwise agreed by EDQ.

Staging (if proposed) to be determined at first ROL that defines an edge of the park.

Location and layout of Recreation Parks must not compromise the revegetation corridor or recreation function of the park

Road hierarchies as depicted on this plan not approved. All classification and design to be in accordance with the endorsed Movement Network Infrastructure Master Plan



Legend:

- Site Boundary
- Future Urban Development
- Future Open Space *
- 400m Walking Radius
- Road Reserve (external to property)
- Potential Buffer Area

Services:

- Pump Station
- Special Use - Infrastructure

Open Space:

- Regional Recreation Park*
- District Sports Park*
- Future Sports Park*
- Major Linear Open Space*
- Local Linear Park*
- Neighbourhood Recreation Park*
- Logan River Boundary Realignment

Centre:

- District Centre
- Neighbourhood Centre
- Community Facility
- Civic Park (District Centre)*

Residential:

- Low Density ~~(19.5 dw/ha)~~
- Low-Medium Density (30 dw/ha)^
- Centre Apartments (60 dw/ha)^
- Interface Area (min. 600sqm lots)

Education:

- Primary School Site (PS006)
- Additional ~~Potential~~ Primary School Site (PS017)
- Additional ~~Potential~~ Secondary School Site (SS006)

Note: ~~Potential~~ additional school site (PS017 and SS006) locations remain indicative only, subject to further due diligence ~~and consultation with the Department of Education.~~

- Maximum retail and entertainment GFA to be 11,000m2
- Maximum Commercial GFA 5,000m2
- Maximum height: 5 storeys

- Maximum retail and entertainment GFA to be 4,000m2
- Maximum Commercial GFA 1,000m2
- Maximum height: 3 storeys

Minimum net residential density: 15dw/ha
Maximum height: 2 storteys

Maximum height:
- District Centre: 5 storey
- Neighbourhood Centre: 3 storey

^ Minimum net residential density required to achieve minimum Centre Densities. Can be offset by density delivered in Centre Zones proper.

Road Network:

- Sub-Arterial Road (Teviot Road)
- 34.0m Centre Connector (no parking)
- 33.0m Trunk Connector (4 lane, no parking)
- 24.0m Trunk Connector (2 lane, parking)
- 22.0m Neighbourhood Connector (2 lane, parking)
- Bicycle Path

, consultation and acquisition by DoE outside of the provisions of the DCOP

All reporting provided in support of this context plan is based on ~20,000 residents. Should it be determined that the population will exceed this or alternately fall below the estimates, additional reporting may be required at lodgement of the relevant application. Population to be calculated using number of lots delivered to date multiplied by the equavalent persons per dwelling for the most recent Local Government Area data available.

*Community Greenspace to be delivered in accordance with the requirements of the Community Greenscape Infrastructure Master Plan (IMP) condition and any IMP endorsed in the future pursuant to the same condition.

place design group.

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Nominated specialist and consultant information contained within this document is referenced from their supplied documentation and is contained in this document as indicative only and not for construction or certification purposes.

PROJECT

RIVERBEND

CLIENT

CELESTINO

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 ROUND 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 (OCTOBER 2024)
AERIAL PHOTOGRAPHY: NEARMAP
TEVIOT ROAD DETAIL: COLLIERS (OCTOBER 2023)

DRAFT

ISSUE	CODE	ISSUE DESCRIPTION	BY	CHK	DATE
-	PRE	FOR REVIEW	NV	TD	29/08/2024
A	PRE	EDQ FEEDBACK - UPDATE	NV	TD	25/11/2024
B	PRE	EDQ FEEDBACK - UPDATE	NV	TD	27/11/2024
C	PRE	ROAD HIERARCHY UPDATE	NV	NV	05/03/2025
D	PRE	BICYCLE PATH UPDATE	NV	NV	11/03/2025
E	PRE	BICYCLE PATH UPDATE	NV	NV	14/03/2025

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

DRAWING TITLE

CONTEXT PLAN

DESIGN : TD
DOCUMENT : TD / NV
PROJECT : 4123001
1:20,000 @ A3

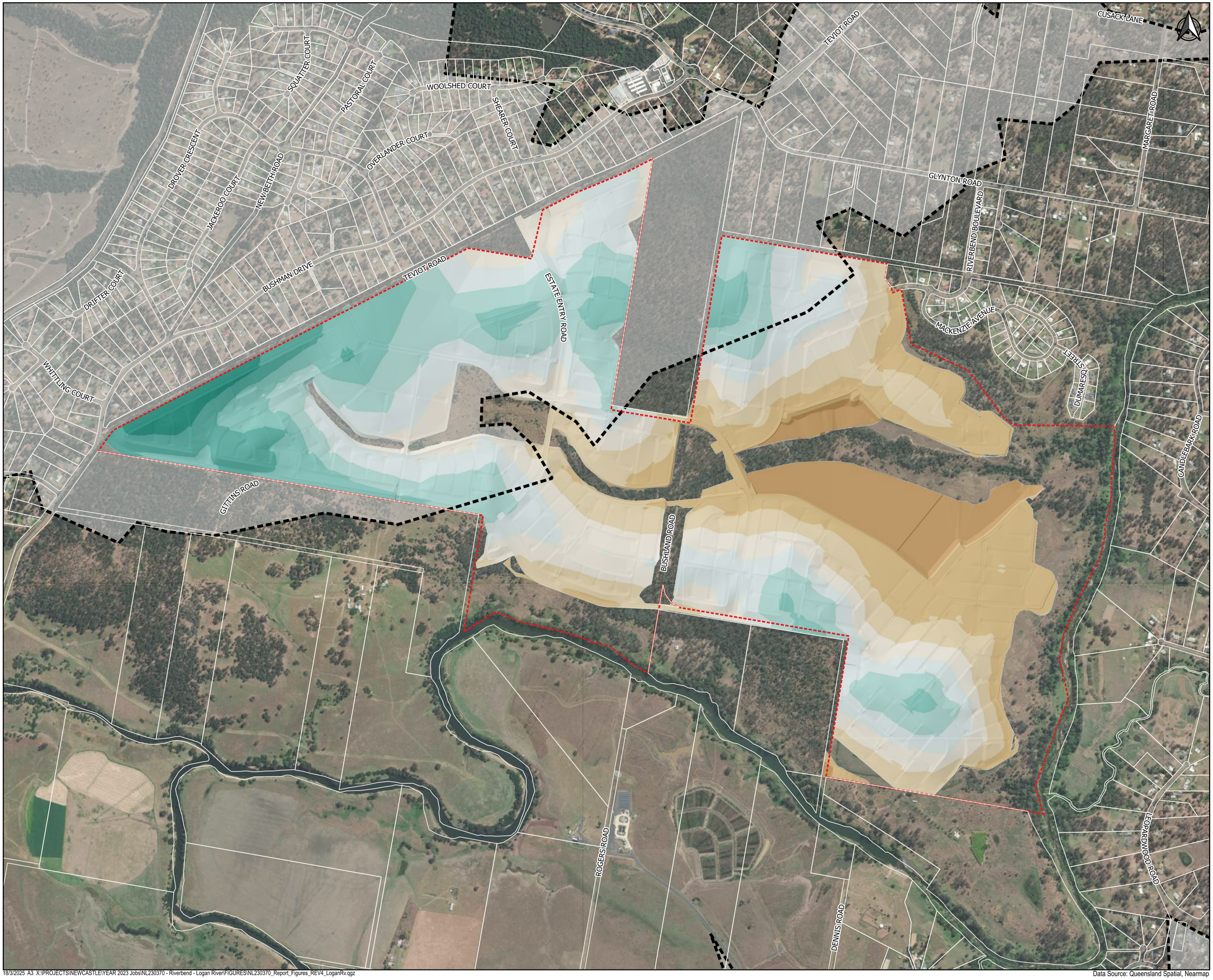
NORTH

0 50 100 150 200 250

DRAWING NUMBER 4123001 - 12

REVISION E

Appendix C – Flood Figures Regional Catchment



Legend

- Existing Lots
- Masterplan Plan
- Boundary
- TUFLOW Model Extent

Design Surface (mAHD)

- <= 30.0
- 30.0 - 35.4
- 35.4 - 40.8
- 40.8 - 46.2
- 46.2 - 51.6
- 51.6 - 57.0
- 57.0 - 62.4
- 62.4 - 67.8
- > 67.8

0 200 400 Metres

1:15,000

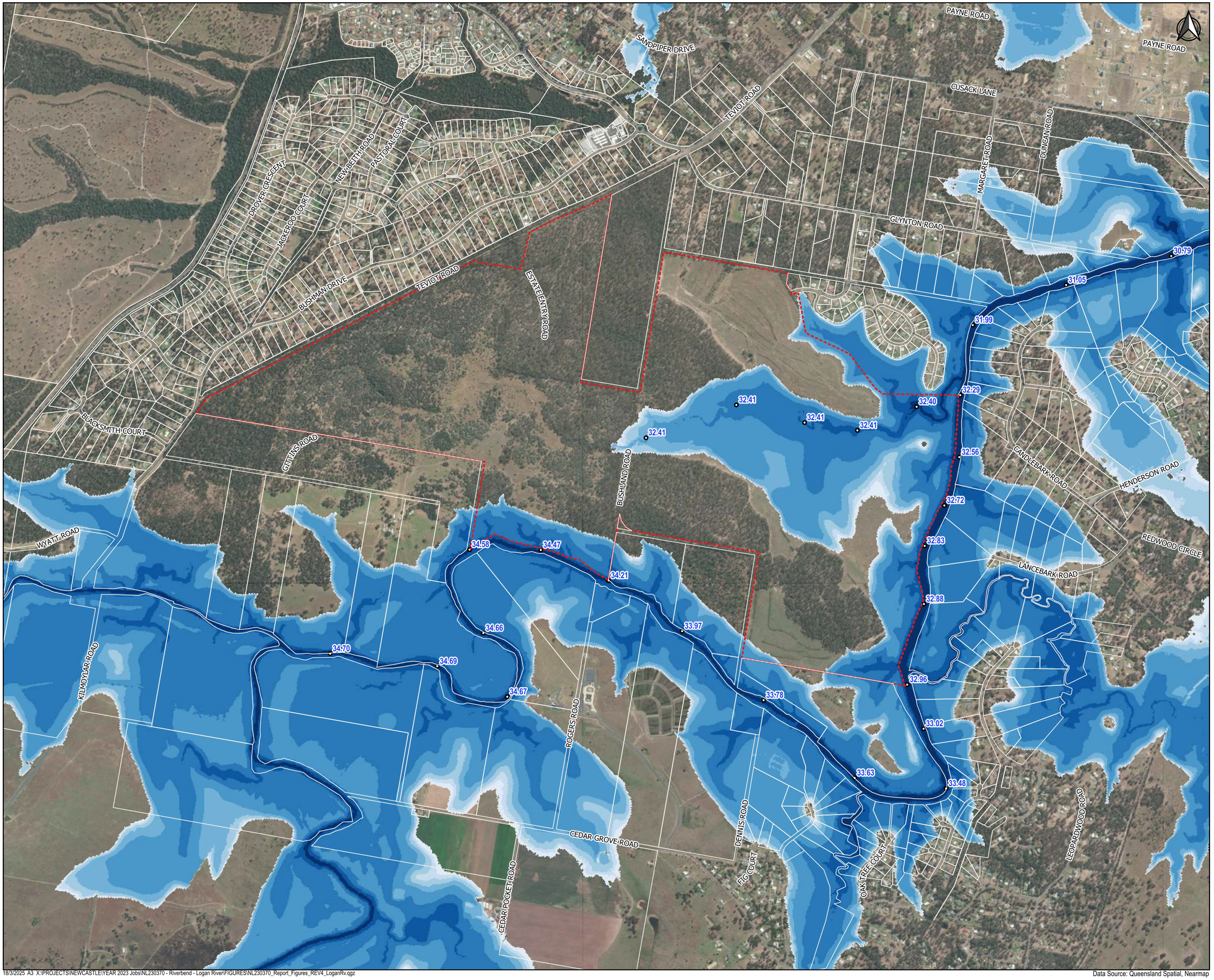
Figure 2

Proposed Earthworks

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

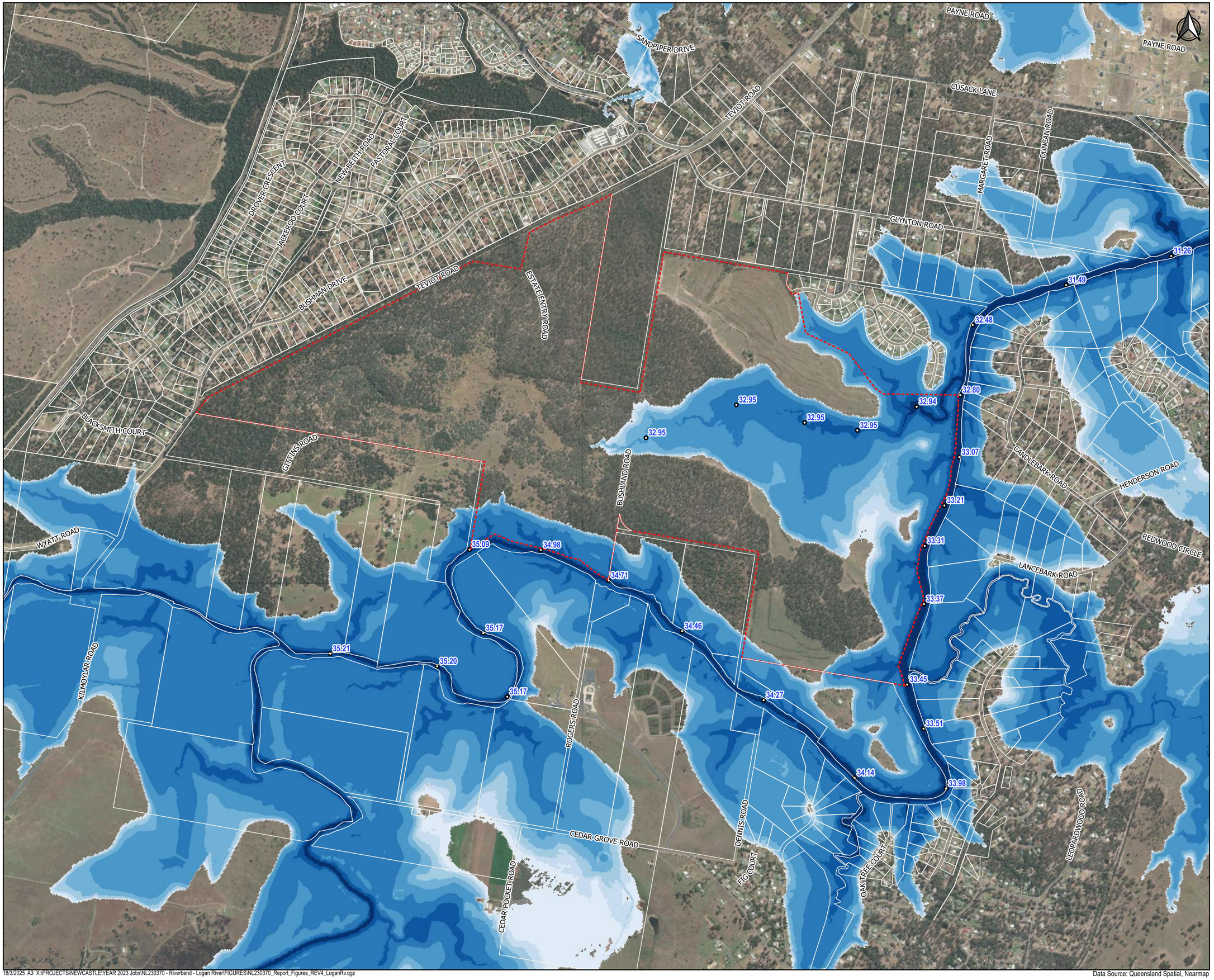
Figure B1

1% AEP Flood Depth and Elevation Logan River Flooding Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

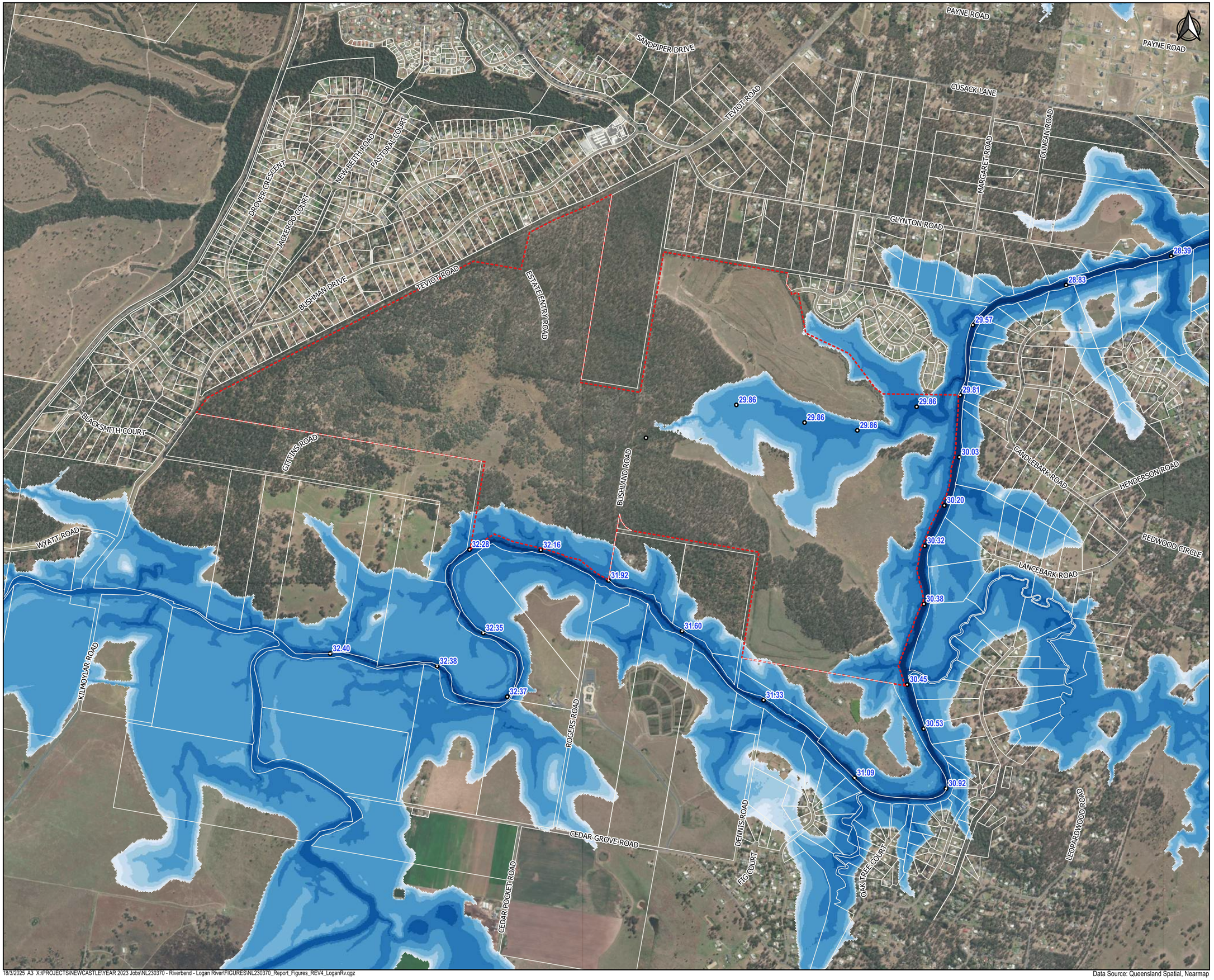
Figure B2

1% AEP Flood Depth and Elevation
Climate Change RCP 6.5 Scenario
Logan River Flooding
Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

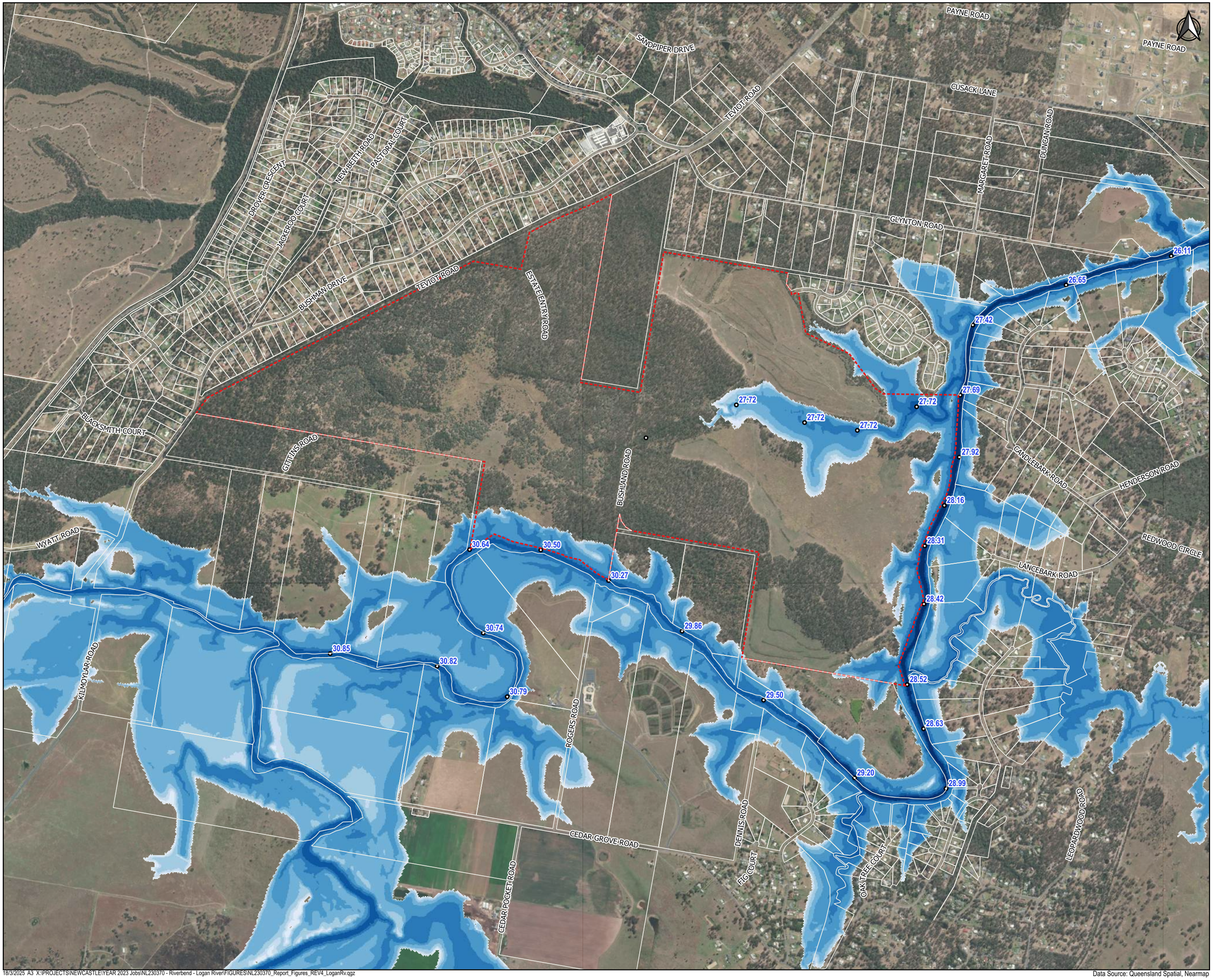
Figure B3

5% AEP Flood Depth and Elevation
Logan River Flooding
Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

Figure B4

10% AEP Flood Depth and Elevation
Logan River Flooding
Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

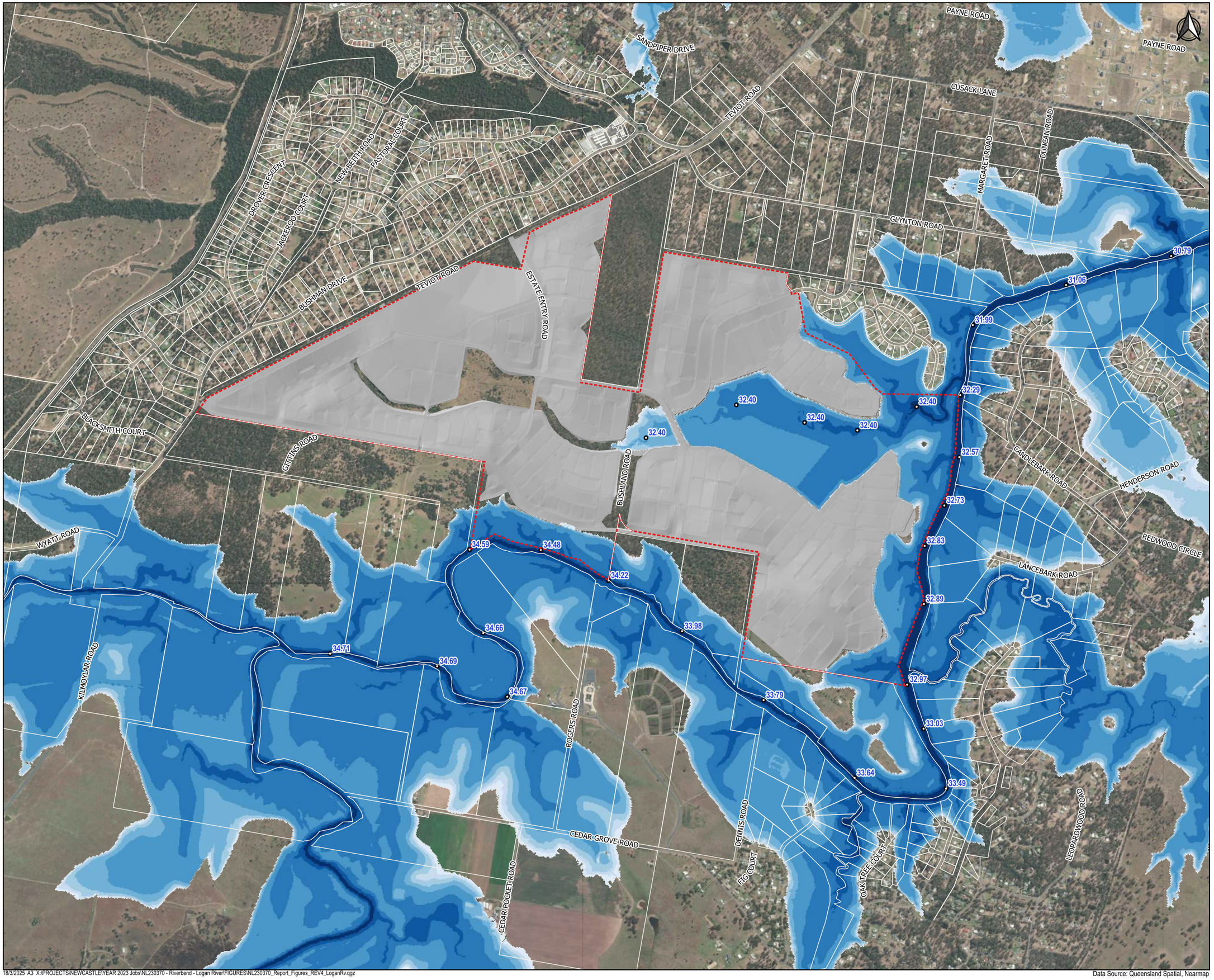
Figure B5

20% AEP Flood Depth and Elevation
Logan River Flooding
Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

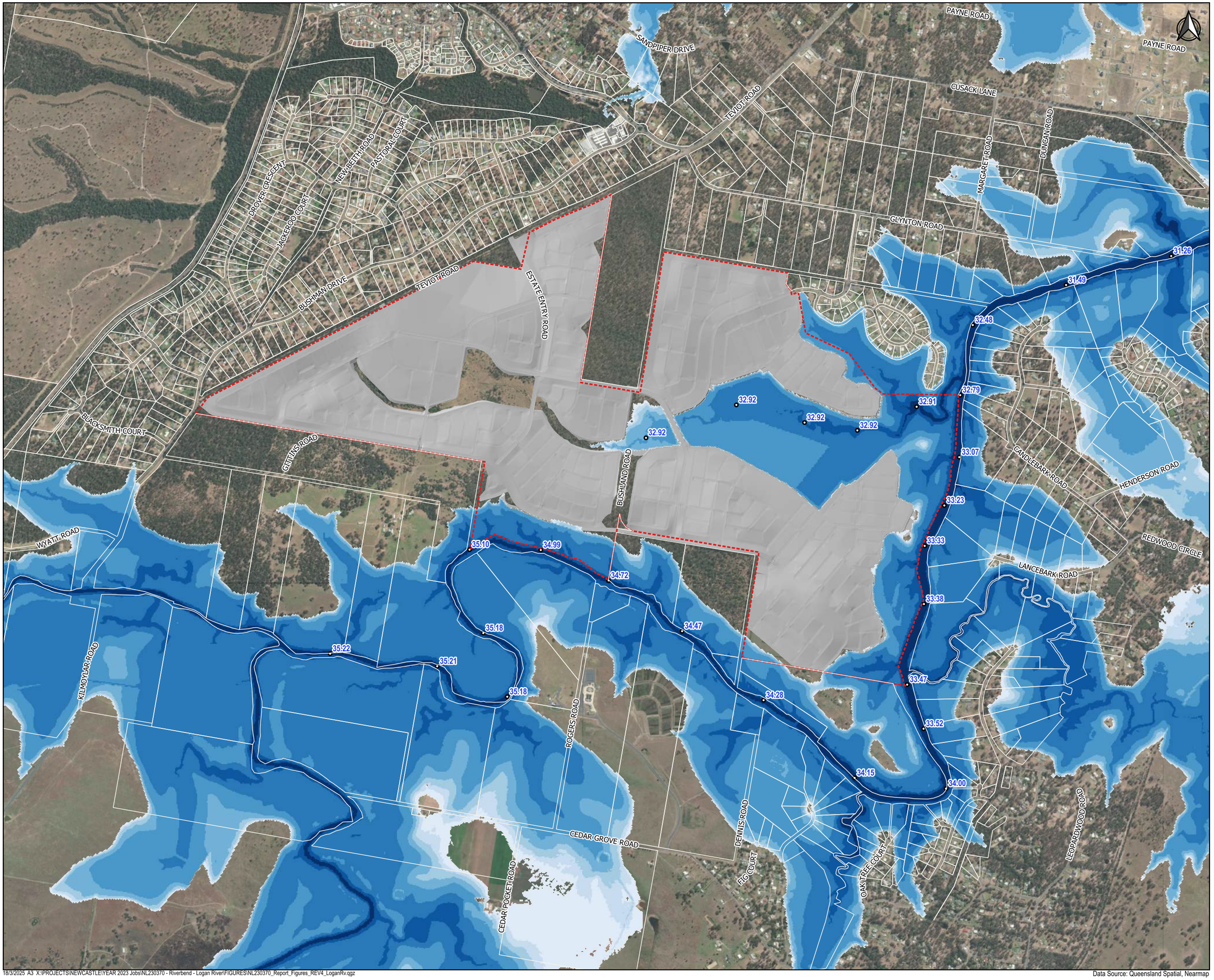
Figure C1

1% AEP Flood Depth and Elevation
Logan River Flooding
Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

Figure C2

1% AEP Flood Depth and Elevation
Climate Change RCP 6.5 Scenario
Logan River Flooding
Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

PAYNE ROAD
SANDPIPER DRIVE
TEVIOT ROAD
CUSACK LANE
MARGARET ROAD
DUNCAN ROAD
GLYNTON ROAD
PROVER CRESCENT
JACKEROO COURT
NEWBEITH ROAD
PASTORAL COURT
BUSHMAN DRIVE
ESTATE ENTRY ROAD
BLACKSMITH COURT
GITTINS ROAD
BUSHLAND ROAD
CANDLEBARK ROAD
HENDERSON ROAD
WYATT ROAD
REDWOOD CIRCLE
LANCEBARK ROAD
KILMOYLAR ROAD
ROGERS ROAD
CEDAR GROVE ROAD
CEDAR POCKET ROAD
DENNIS ROAD
FIG COURT
OAK TREE COURT
LEOPARDWOOD ROAD

28.40
28.83
29.57
29.81
29.86
29.86
29.86
29.86
30.03
30.21
30.32
30.39
30.45
30.53
30.93
31.10
31.33
31.61
31.92
32.16
32.28
32.36
32.38
32.40

Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

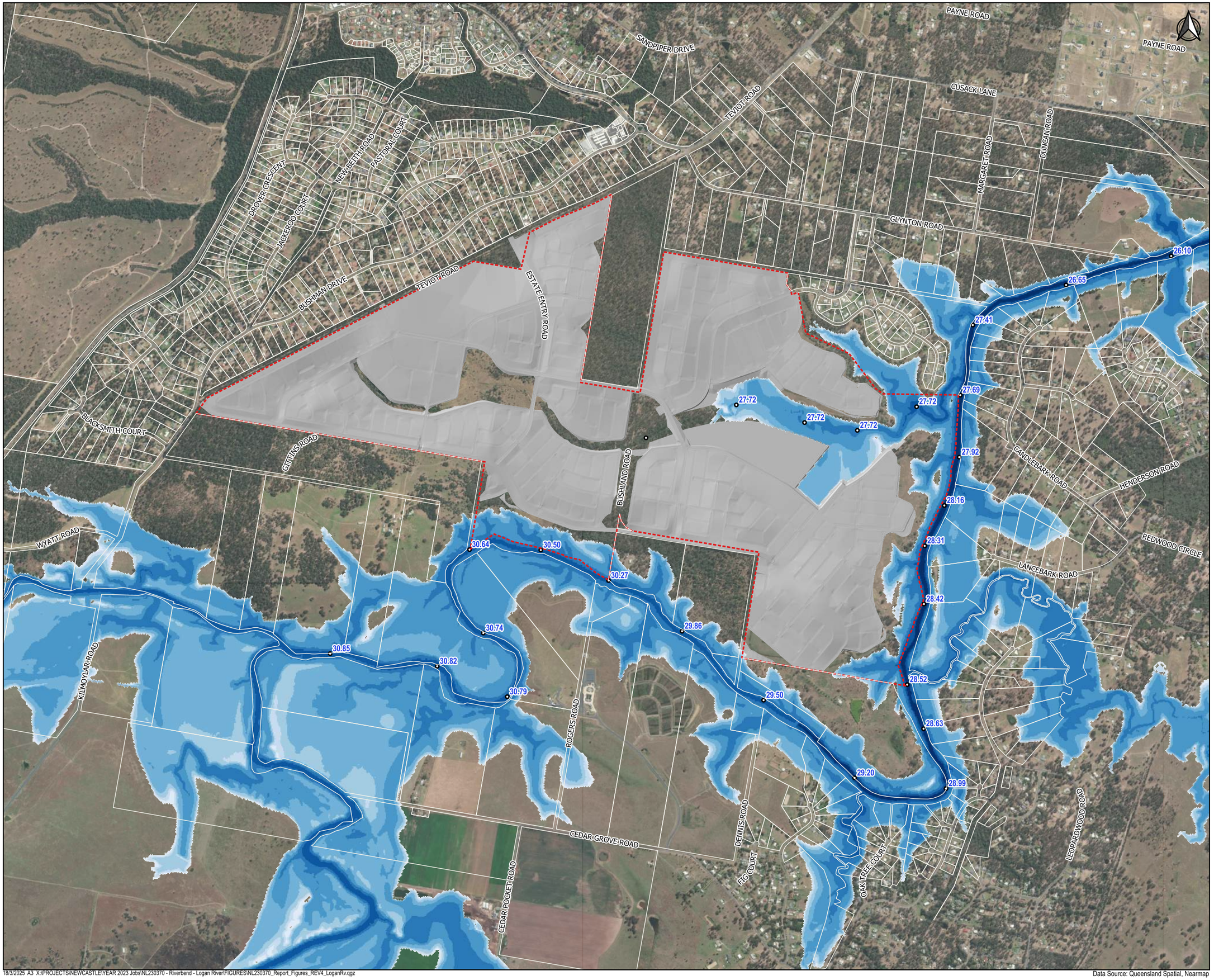
Figure C3

5% AEP Flood Depth and Elevation Logan River Flooding Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

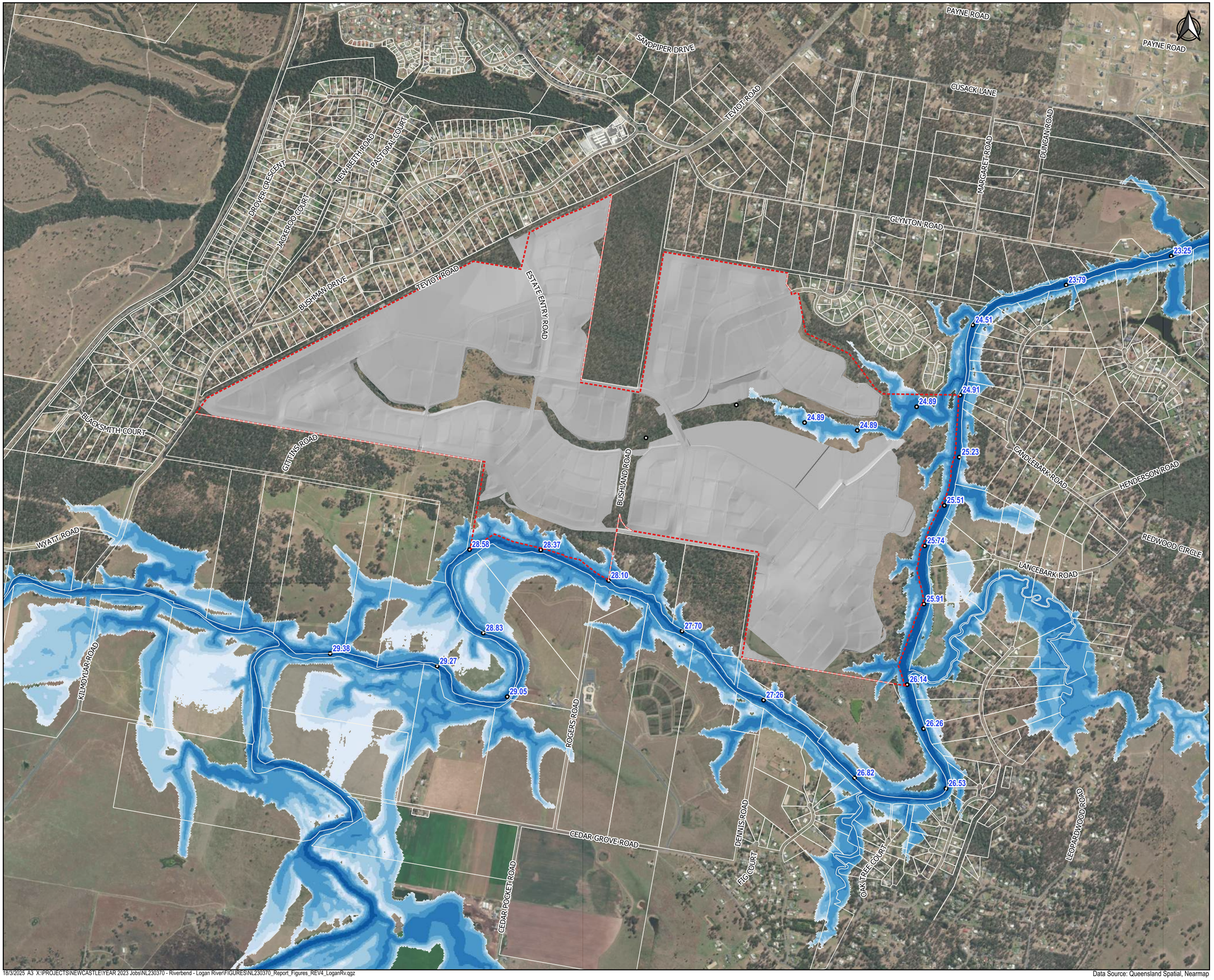
Figure C4

10% AEP Flood Depth and Elevation Logan River Flooding Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots
- 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

0 300 600 Metres

1:20,000

Figure C5

20% AEP Flood Depth and Elevation Logan River Flooding Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Legend

- Masterplan Boundary
- Existing Lots

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

0 300 600 Metres

1:20,000

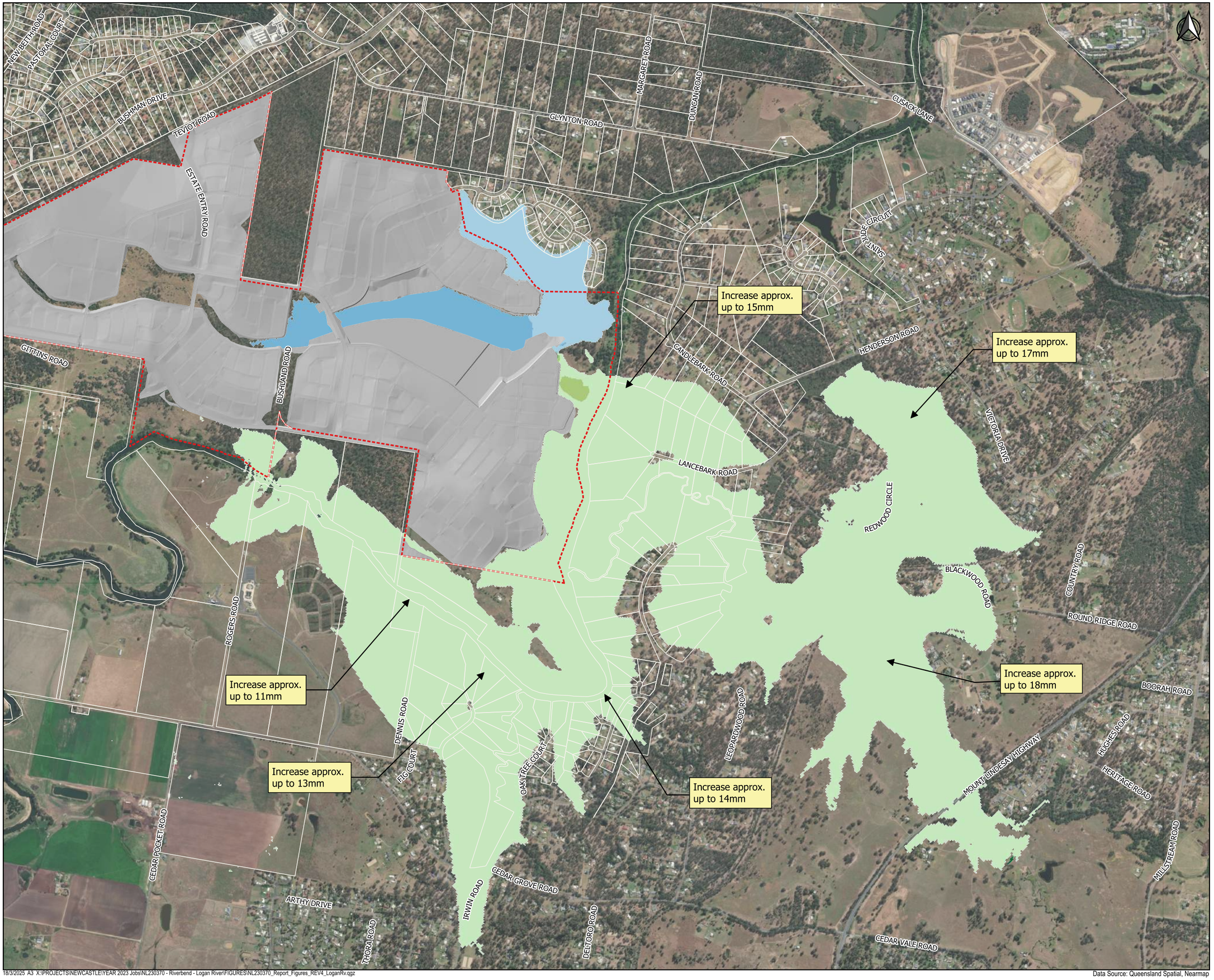
Figure D1

1% AEP Flood Elevation Difference
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

- Masterplan Boundary
- Existing Lots

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

0 300 600 Metres

1:20,000

Figure D2

1% AEP Flood Elevation Difference
Climate Change RCP 6.5 Scenario
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

PAYNE ROAD
SANDPIPER DRIVE
TEVIOT ROAD
CUSACK LANE
MARGARET ROAD
DUNCAN ROAD
GLYNTON ROAD
DROVER CRESCENT
JACKEROO COURT
NEWBERTH ROAD
PASTORAL COURT
BUSHMAN DRIVE
ESTATE ENTRY ROAD
Change within +/- 4mm
BLACKSMITH COURT
GITTINS ROAD
BUSHLAND ROAD
CANDLEBARK ROAD
HENDERSON ROAD
WYATT ROAD
REDWOOD CIRCLE
LANGEBARK ROAD
KILMOYLAR ROAD
ROGERS ROAD
CEDAR GROVE ROAD
DENNIS ROAD
FIG COURT
OAK TREE COURT
LEOPARDWOOD ROAD
CEDAR POCKET ROAD

Legend

- Masterplan Boundary
- Existing Lots

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

0 300 600 Metres

1:20,000

Figure D3

5% AEP Flood Elevation Difference
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

PAYNE ROAD
SANDPIPER DRIVE
TEVIOT ROAD
CUSACK LANE
MARGARET ROAD
DUNCAN ROAD
GLYNTON ROAD
DROVER CRESCENT
JACKEROO COURT
NEWBERTH ROAD
PASTORAL COURT
BUSHMAN DRIVE
ESTATE ENTRY ROAD
Change within +/- 2mm
BLACKSMITH COURT
GITTINS ROAD
BUSHLAND ROAD
CANDLEBARK ROAD
HENDERSON ROAD
WYATT ROAD
LANGEBARK ROAD
REDWOOD CIRCLE
KILMOYLAR ROAD
ROGERS ROAD
CEDAR GROVE ROAD
DENNIS ROAD
FIG COURT
OAK TREE COURT
LEOPARDWOOD ROAD
CEDAR POCKET ROAD

Legend

- Masterplan Boundary
- Existing Lots

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

0 300 600 Metres

1:20,000

Figure D4

10% AEP Flood Elevation Difference
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Legend

- Masterplan Boundary
- Existing Lots

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

0 300 600 Metres

1:20,000

Figure D5

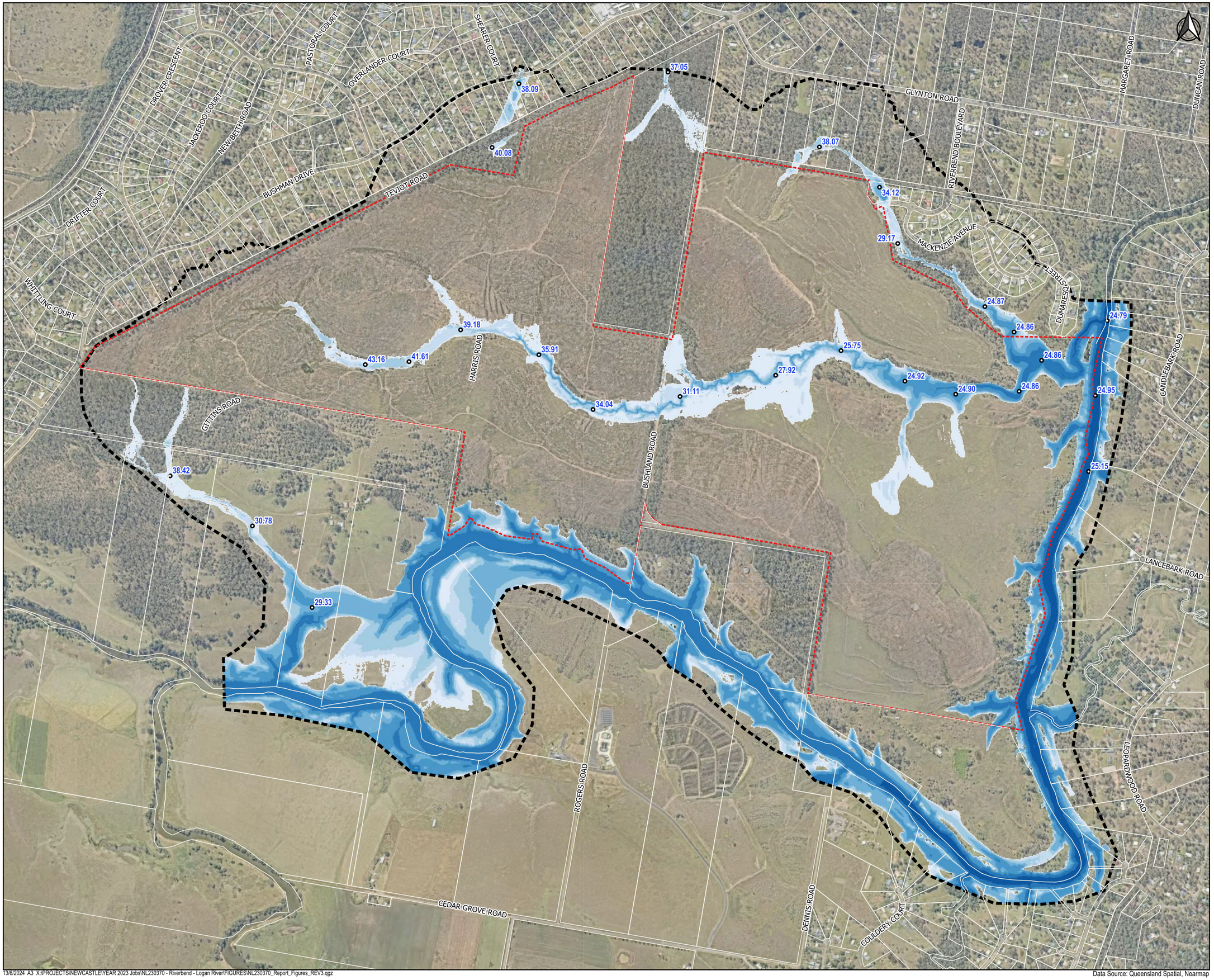
20% AEP Flood Elevation Difference
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Appendix D – Flood Figures Local Catchment



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

0 200 400 Metres

1:15,000

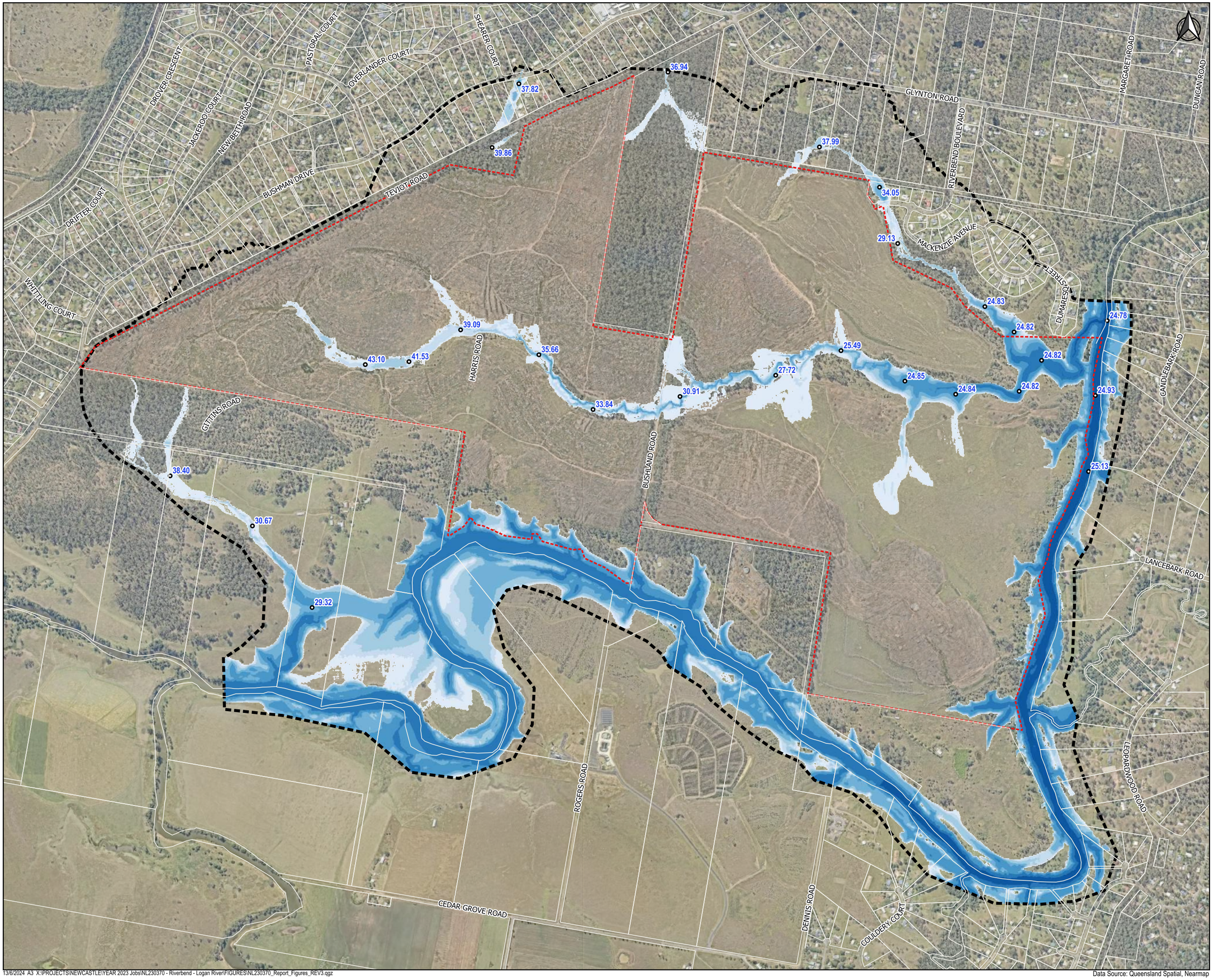
Figure B1

1% AEP Flood Depth and Elevation Local Catchment Existing Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

0 200 400 Metres

1:15,000

Figure B2

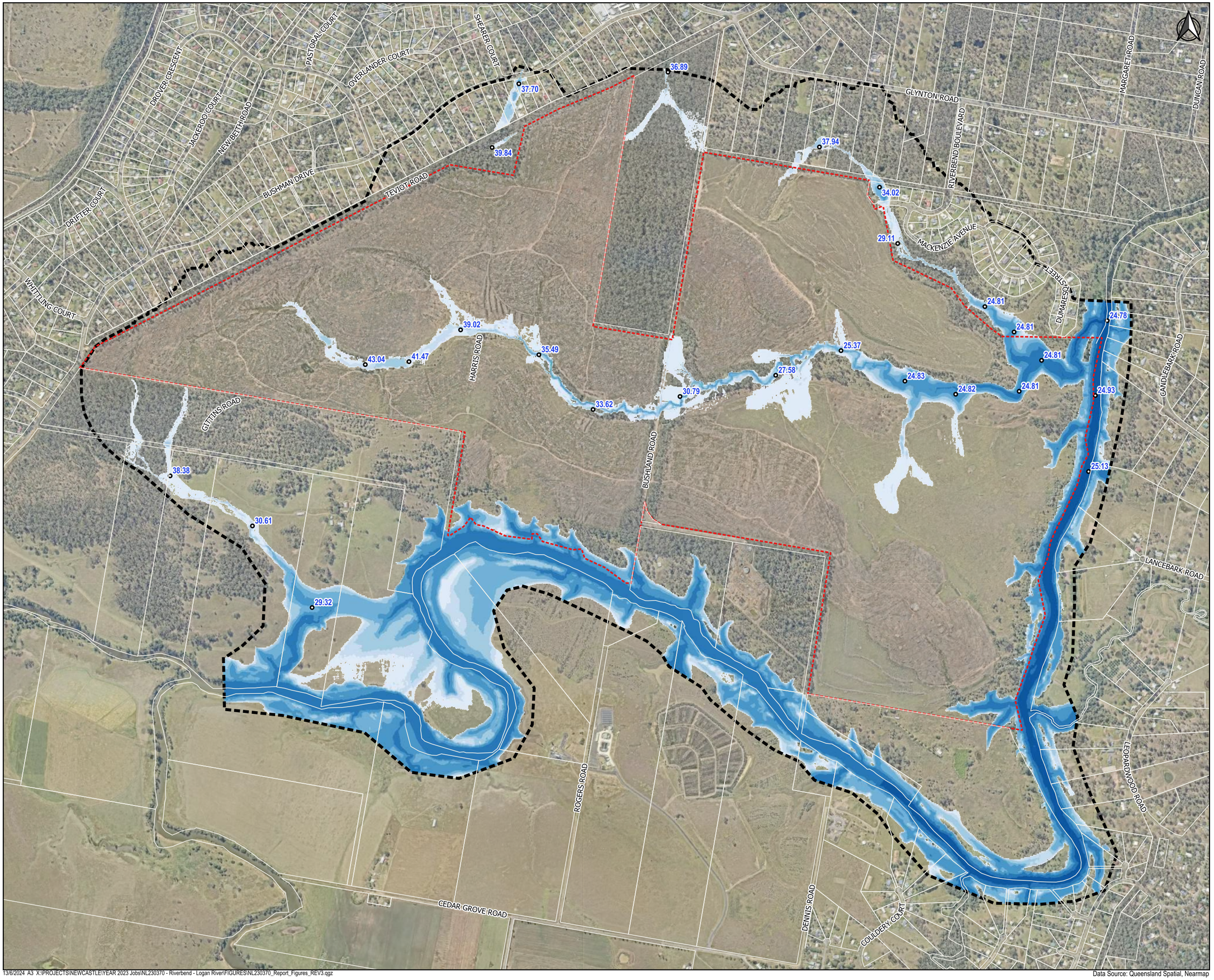
5% AEP Flood Depth and Elevation Local Catchment Existing Conditions

Riverbend

NORTHROP

13/6/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV3.qgz

Data Source: Queensland Spatial, Nearmap



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

0 200 400 Metres

1:15,000

Figure B3

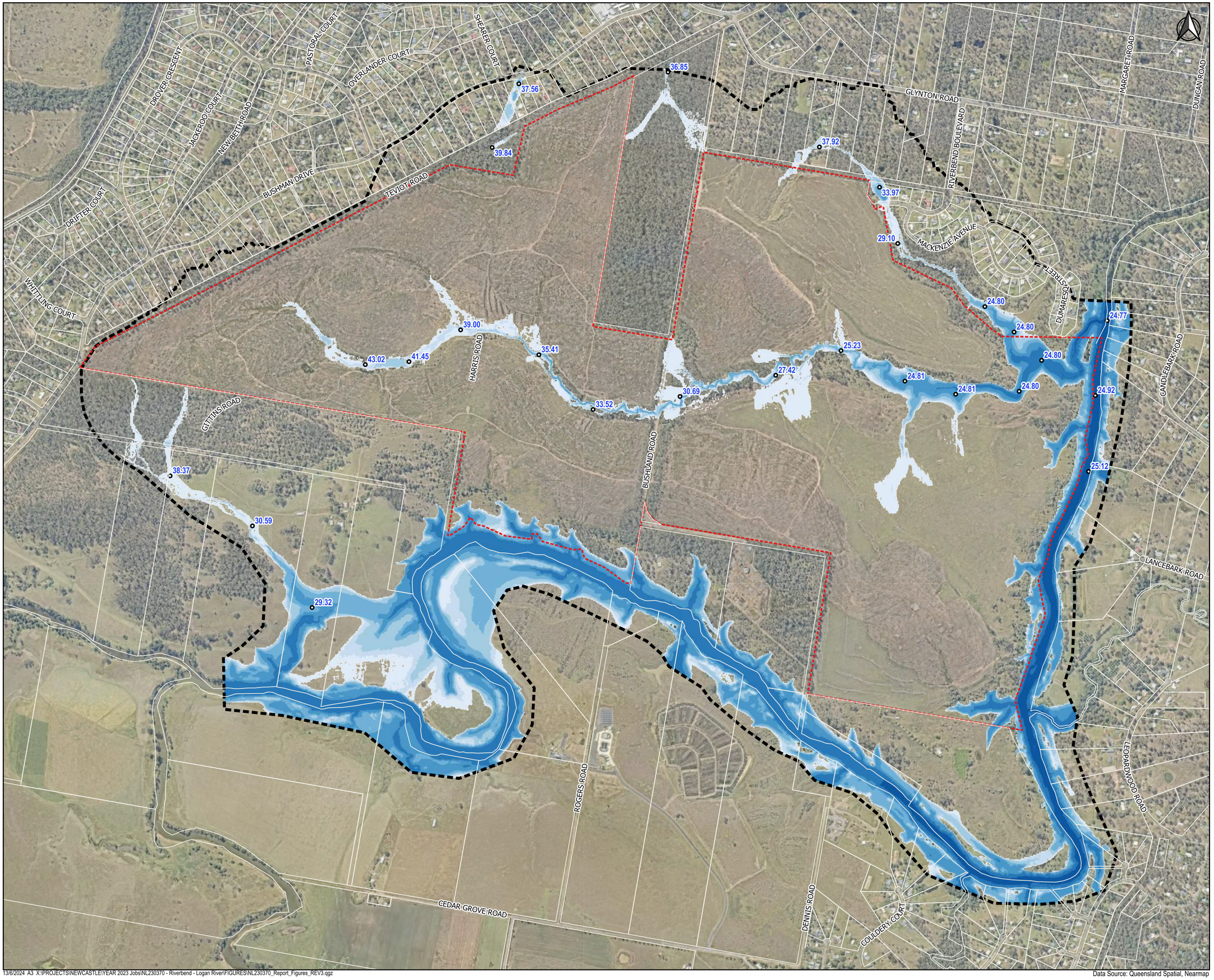
10% AEP Flood Depth and Elevation Local Catchment Existing Conditions

Riverbend

NORTHROP

13/6/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV3.qgz

Data Source: Queensland Spatial, Nearmap



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

0 200 400 Metres

1:15,000

Figure B4

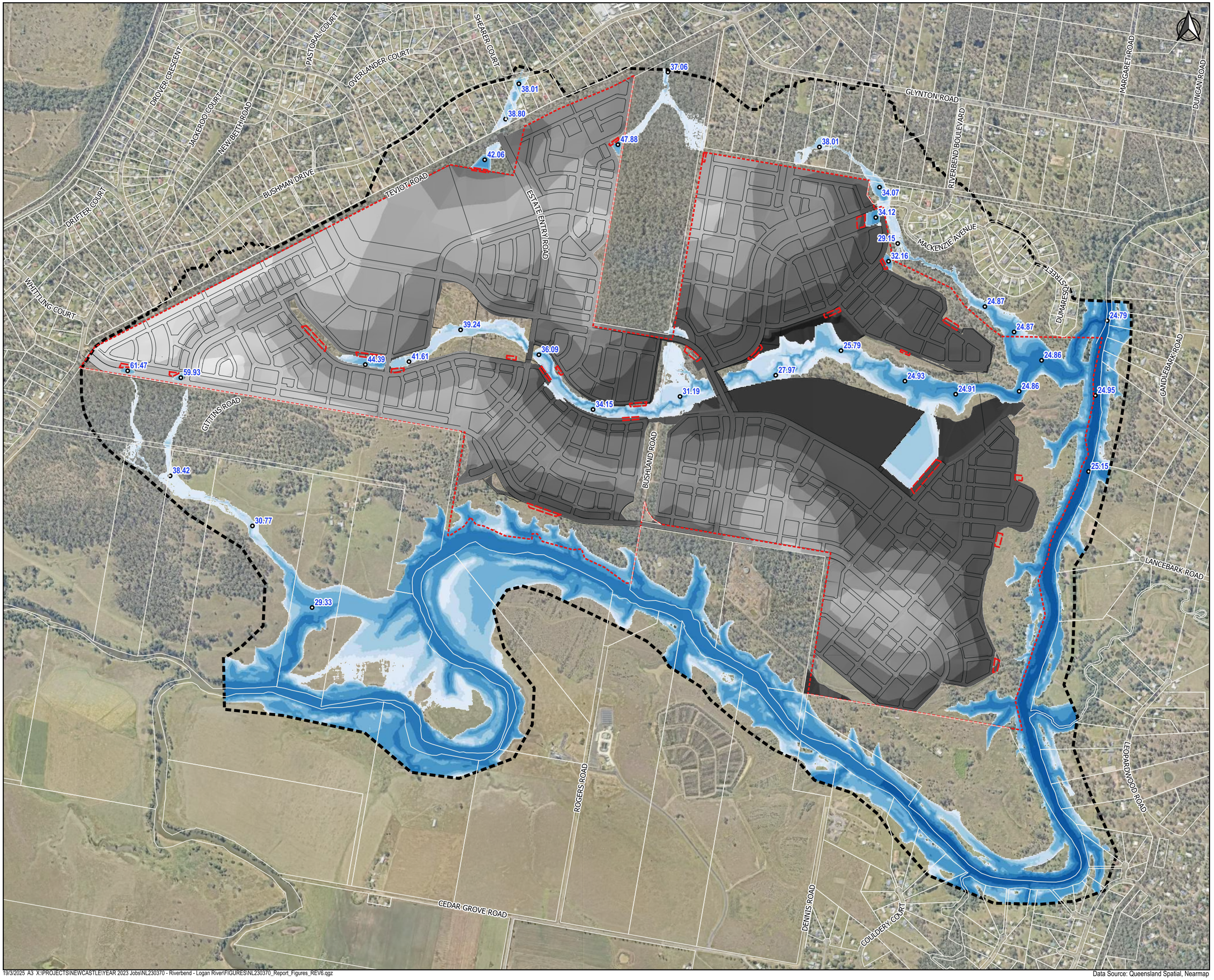
20% AEP Flood Depth and Elevation Local Catchment Existing Conditions

Riverbend

NORTHROP

13/6/2024 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV3.qgz

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

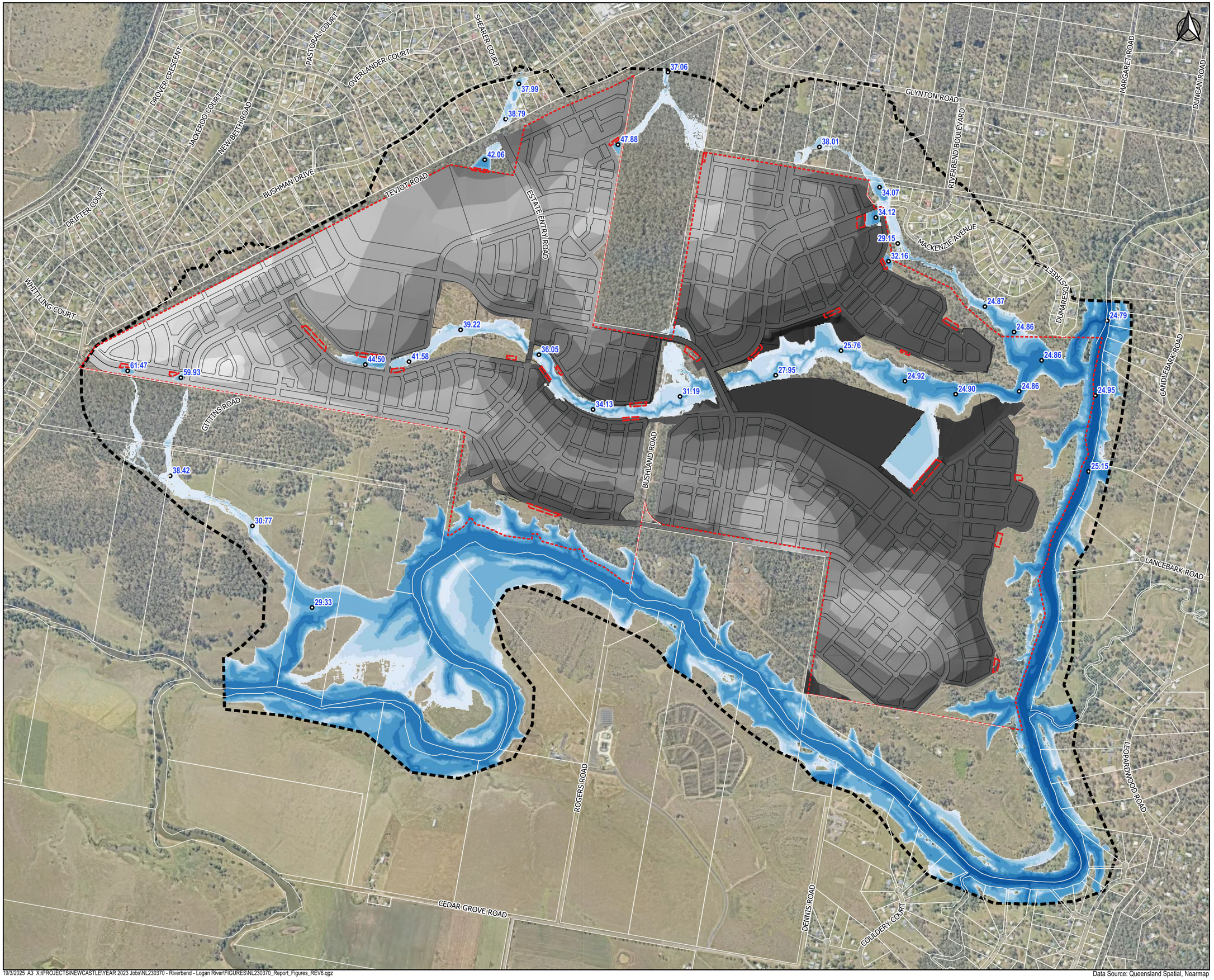
Figure C1

1% AEP Flood Depth and Elevation Local Catchment Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

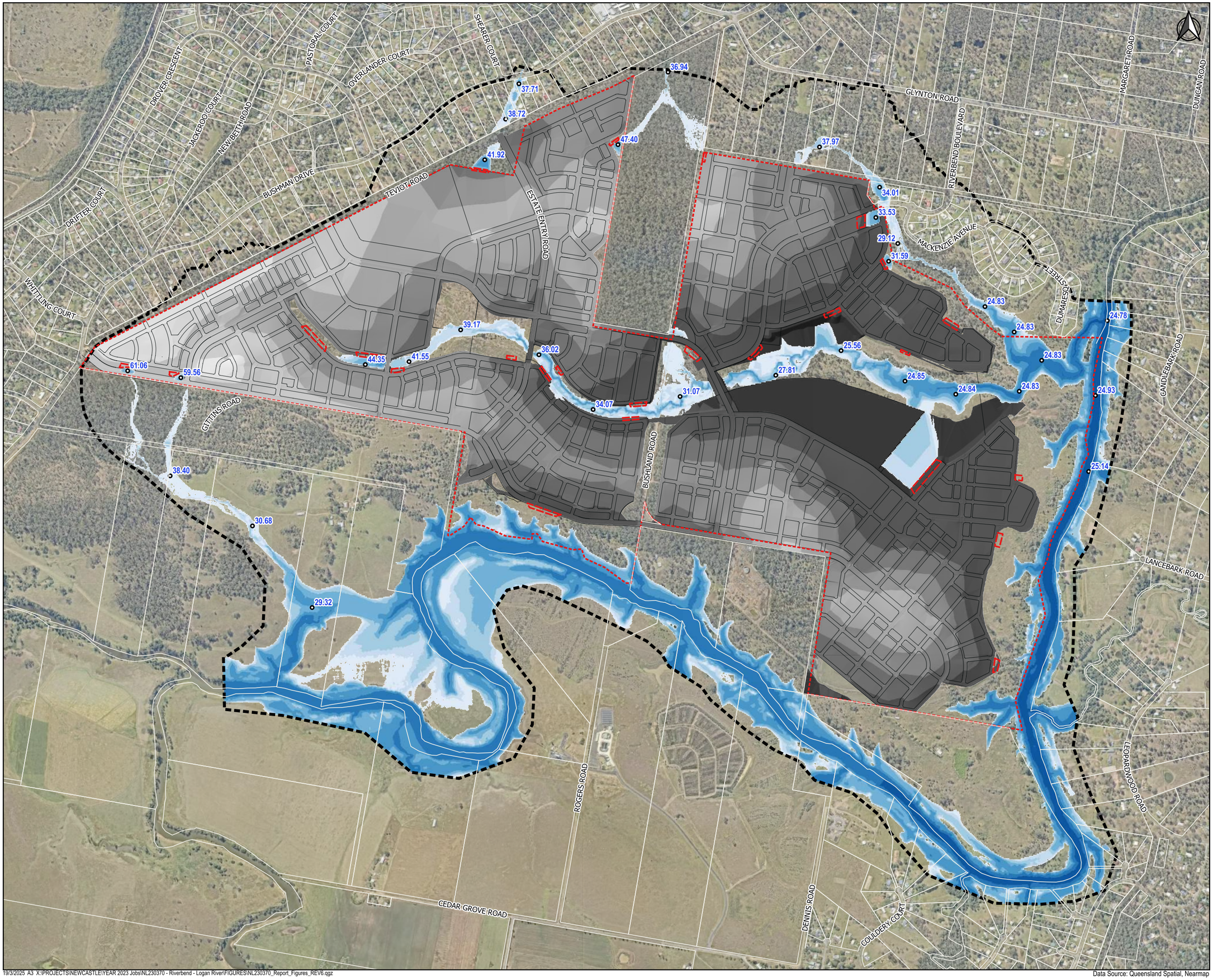
Figure C1-BL

1% AEP Flood Depth and Elevation
Local Catchment
Developed Conditions
25% Culvert Blockage

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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)

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

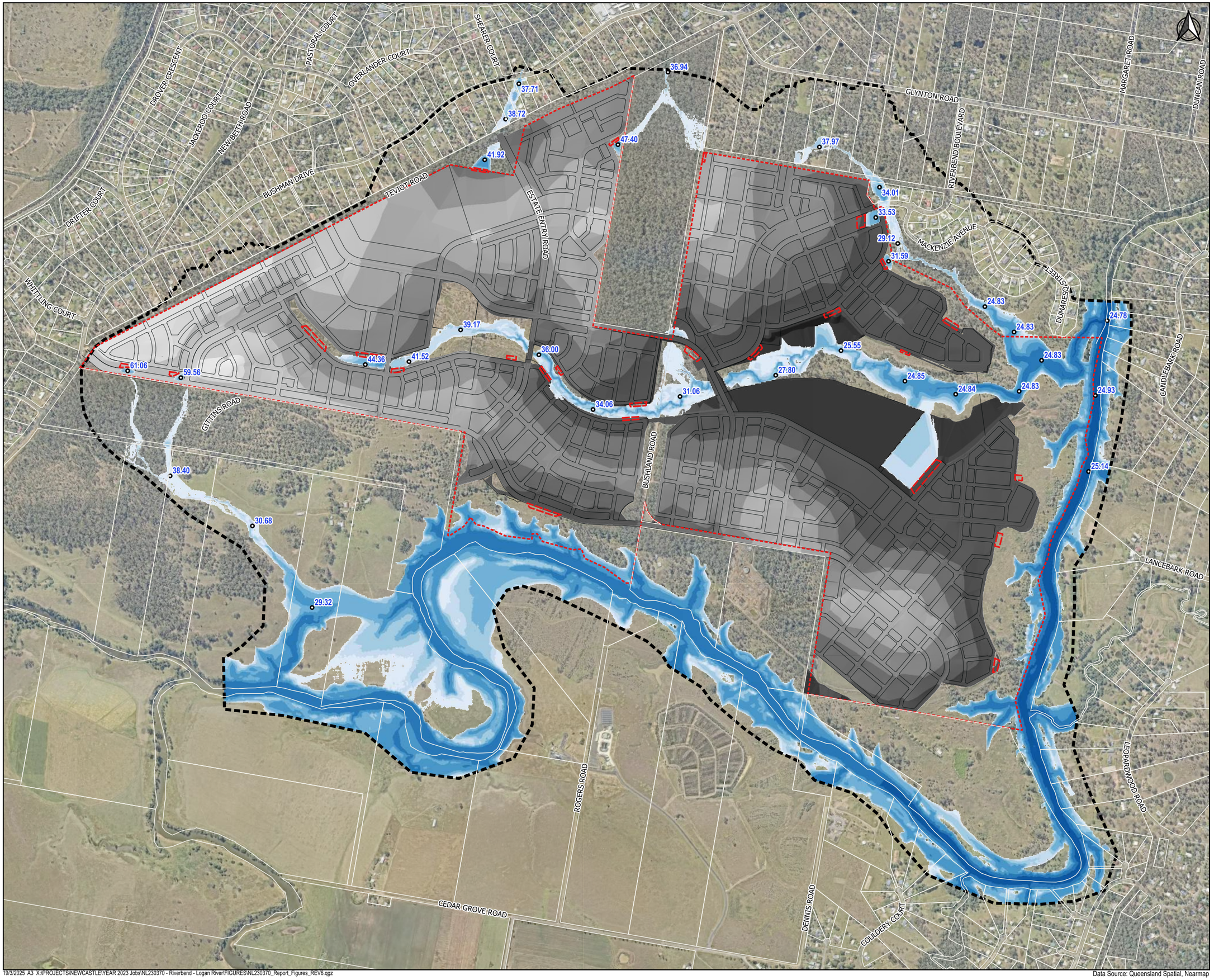
Figure C2

5% AEP Flood Depth and Elevation Local Catchment Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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)

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

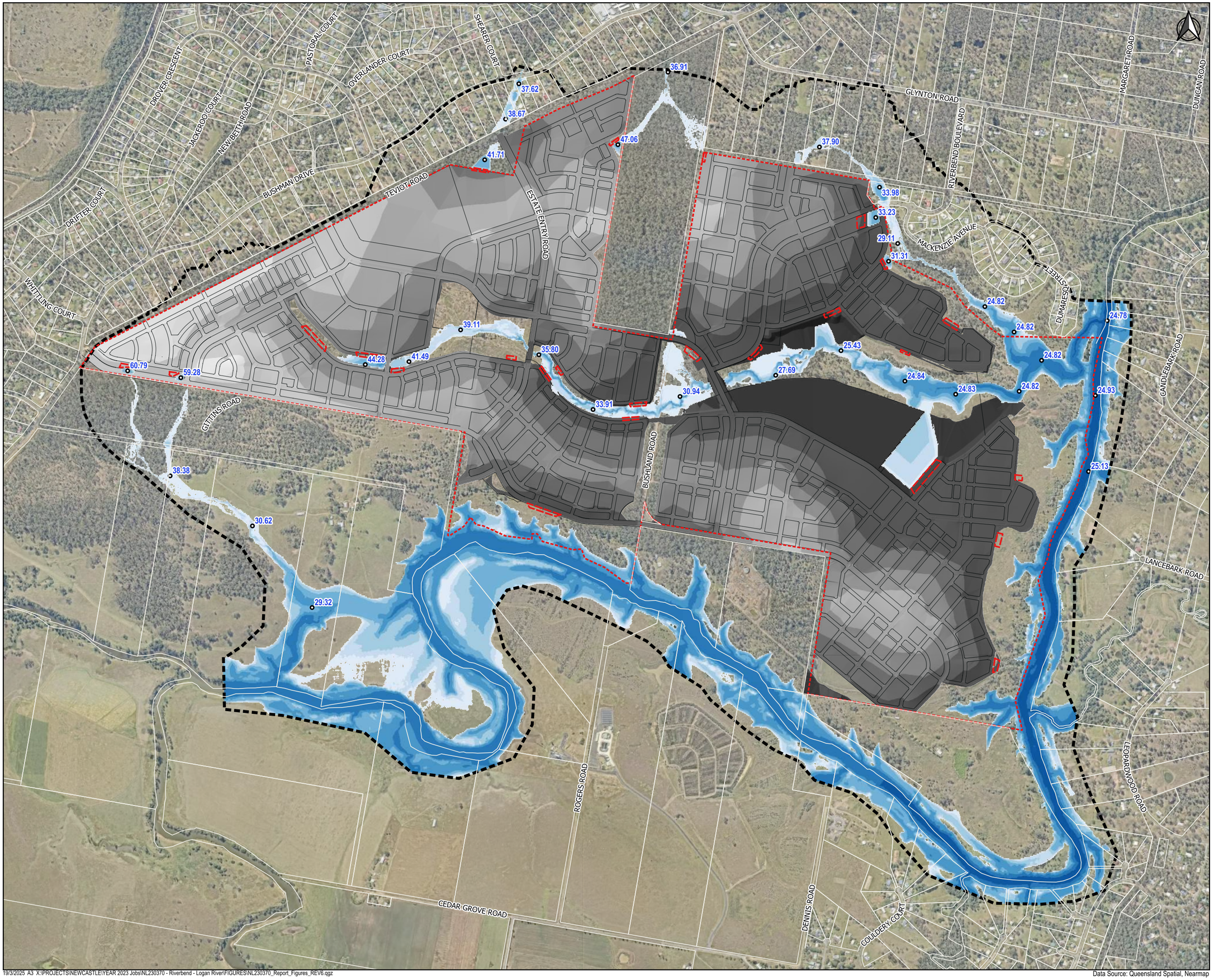
Figure C2-BL

5% AEP Flood Depth and Elevation
Local Catchment
Developed Conditions
25% Culvert Blockage

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

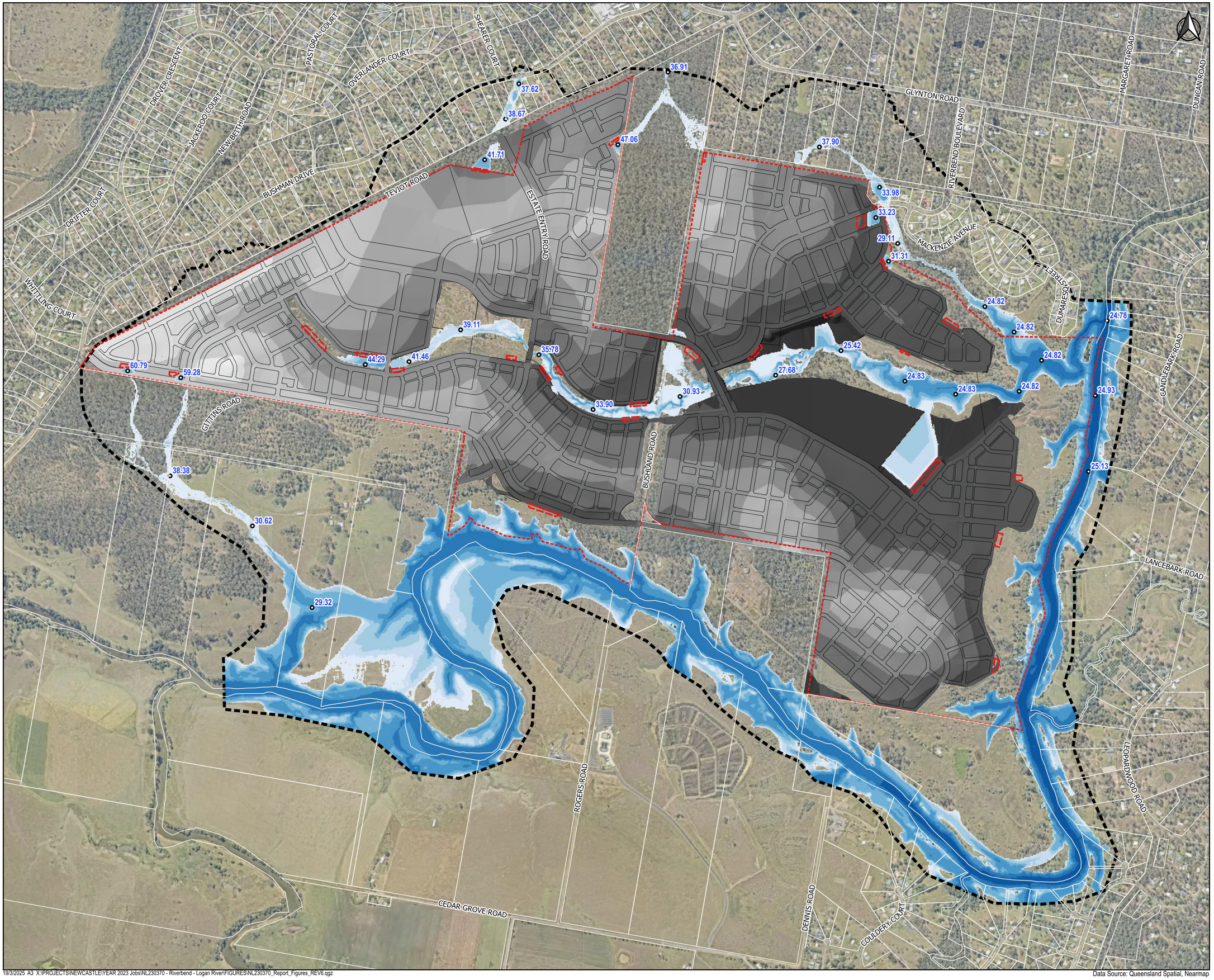
Figure C3

10% AEP Flood Depth and Elevation Local Catchment Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

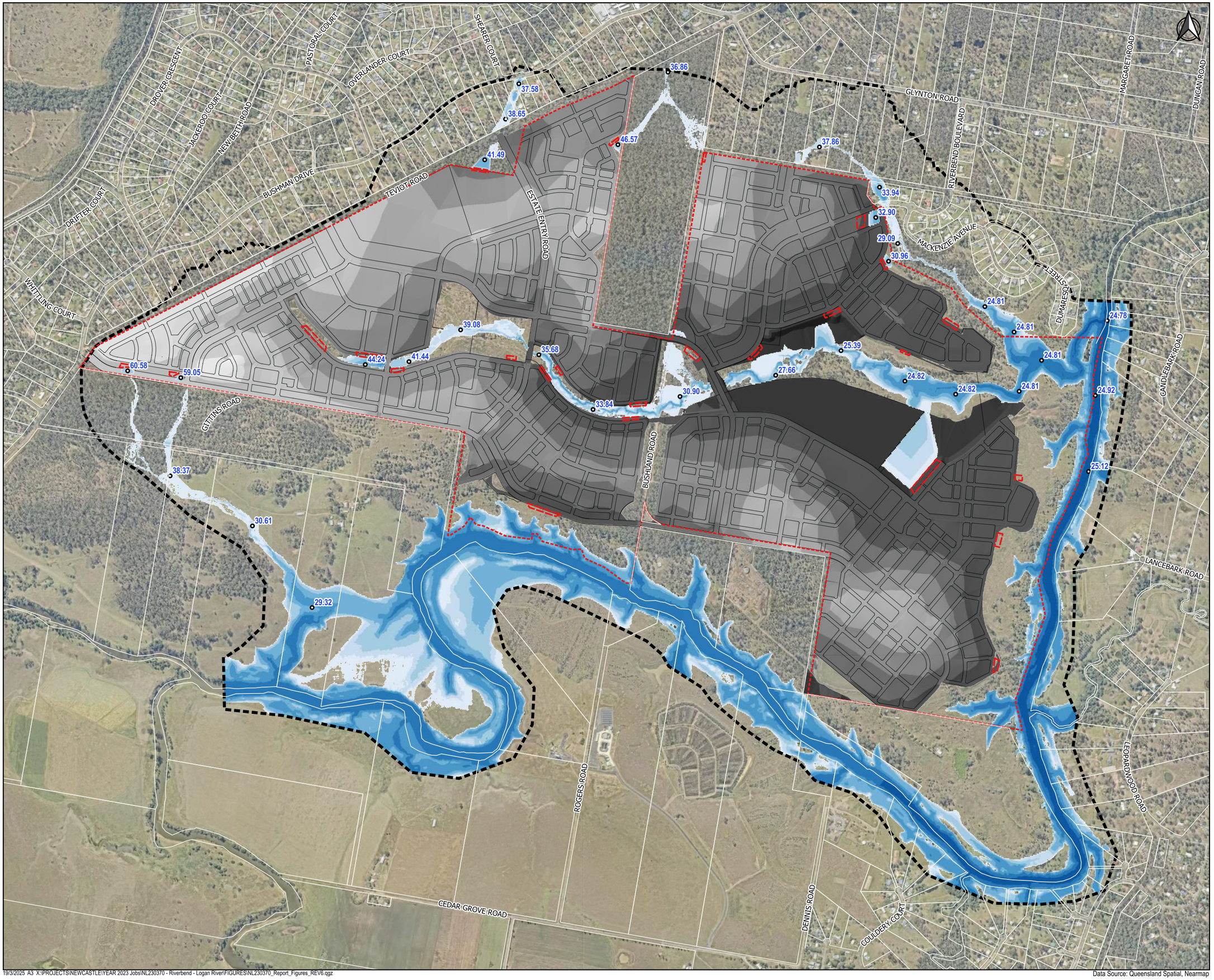
Figure C3-BL

10% AEP Flood Depth and Elevation
Local Catchment
Developed Conditions
25% Culvert Blockage

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

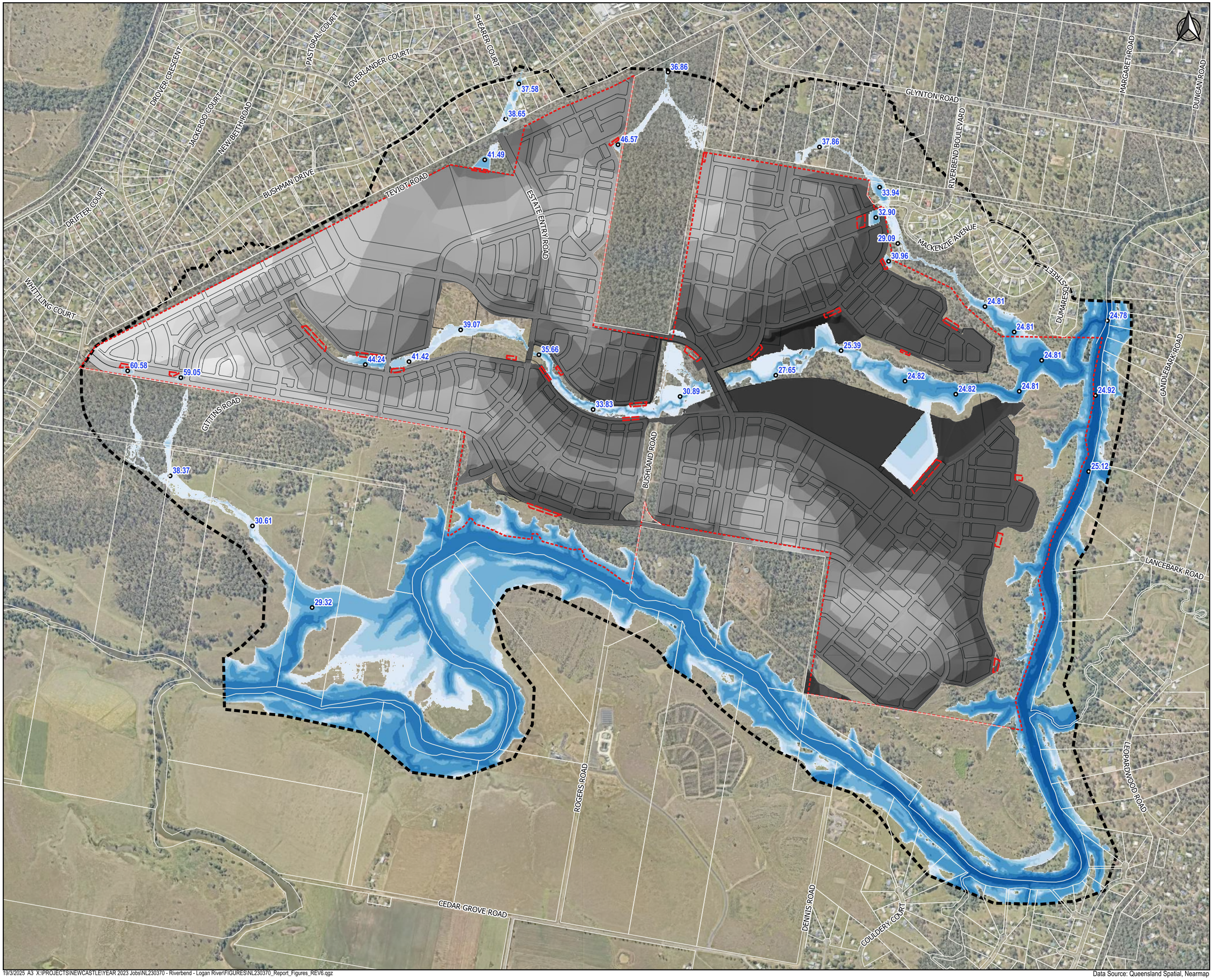
Figure C4

20% AEP Flood Depth and Elevation Local Catchment Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



Legend

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

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)

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

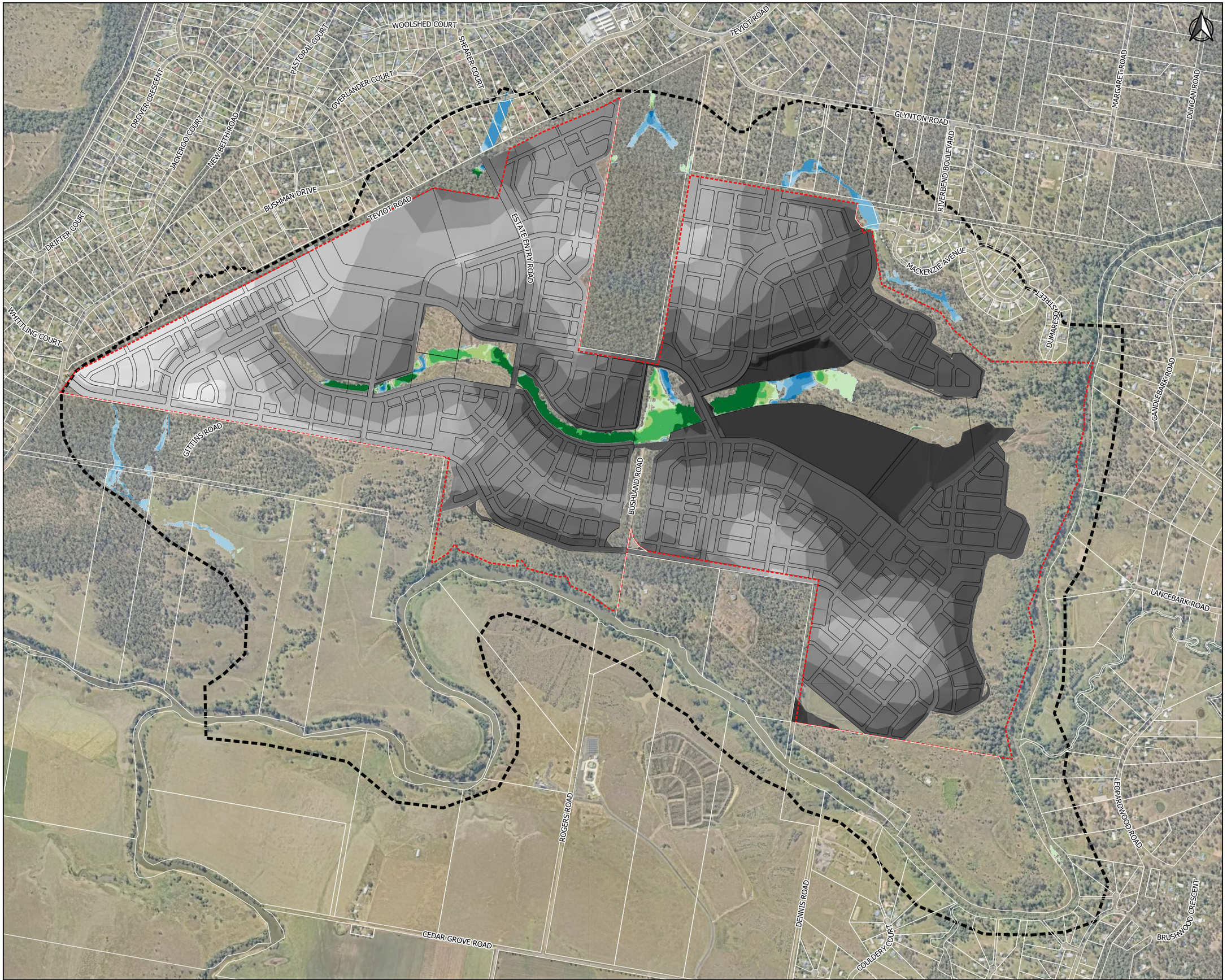
Figure C4-BL

20% AEP Flood Depth and Elevation
Local Catchment
Developed Conditions
25% Culvert Blockage

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

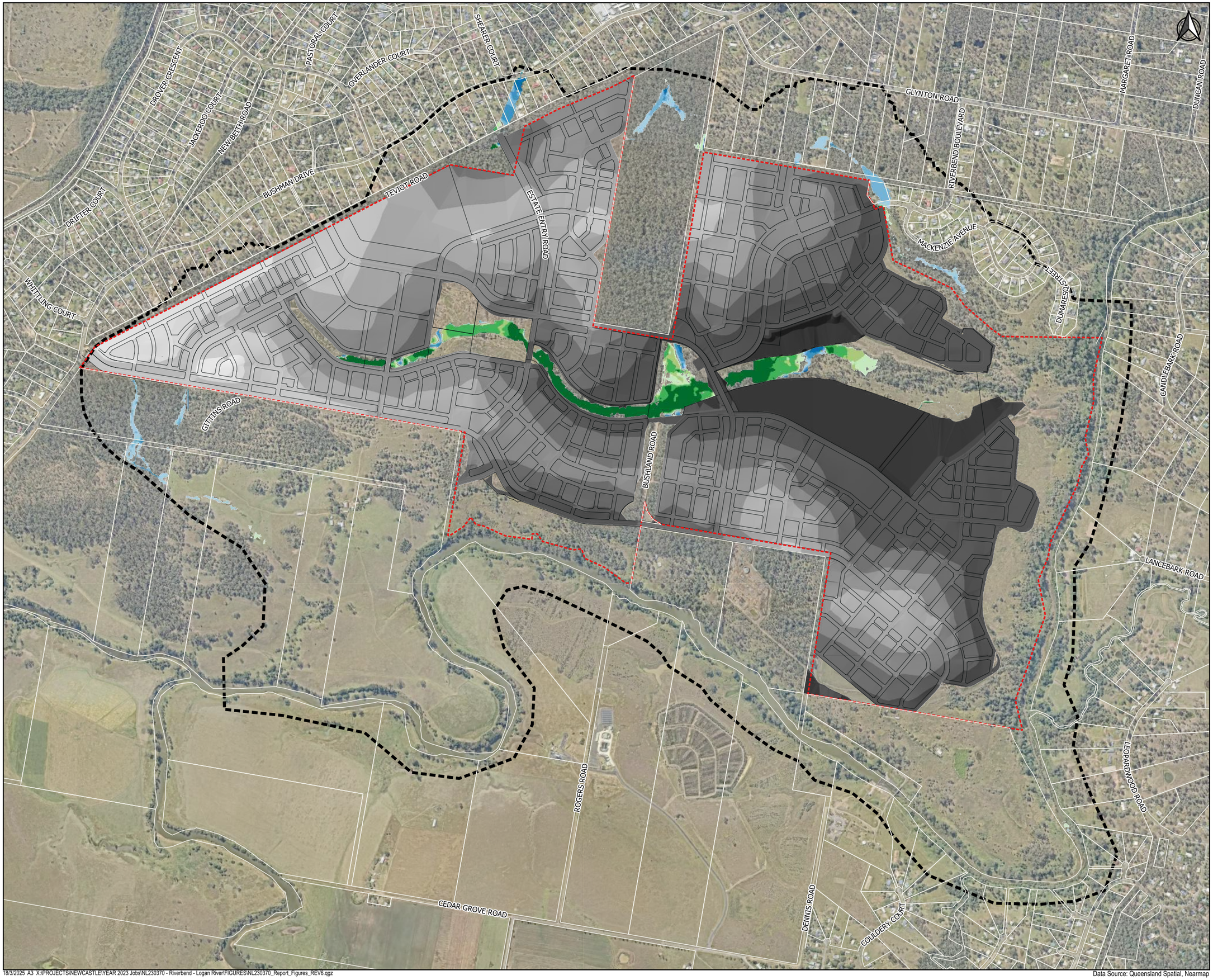
Figure D1

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

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

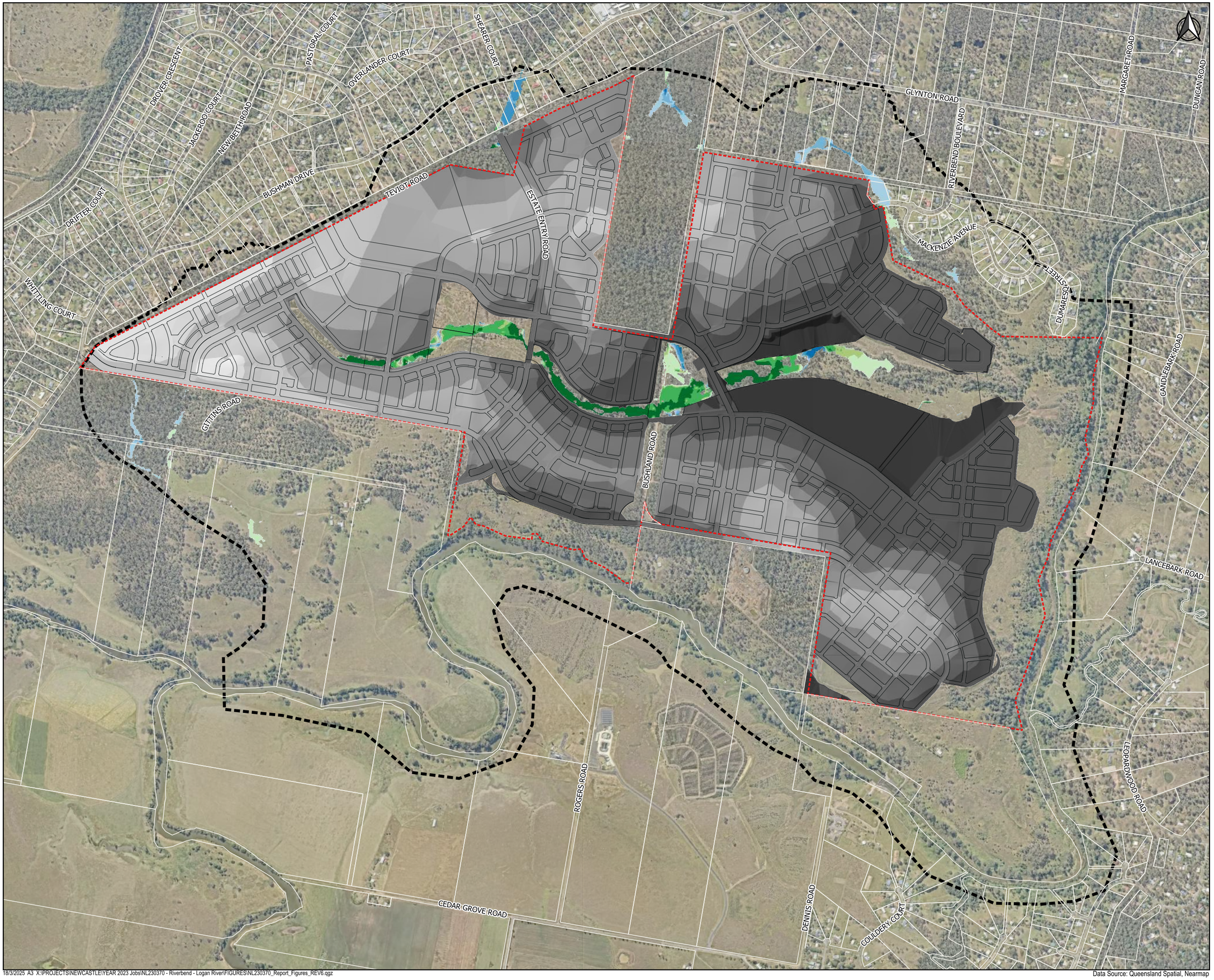
Figure D2

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

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

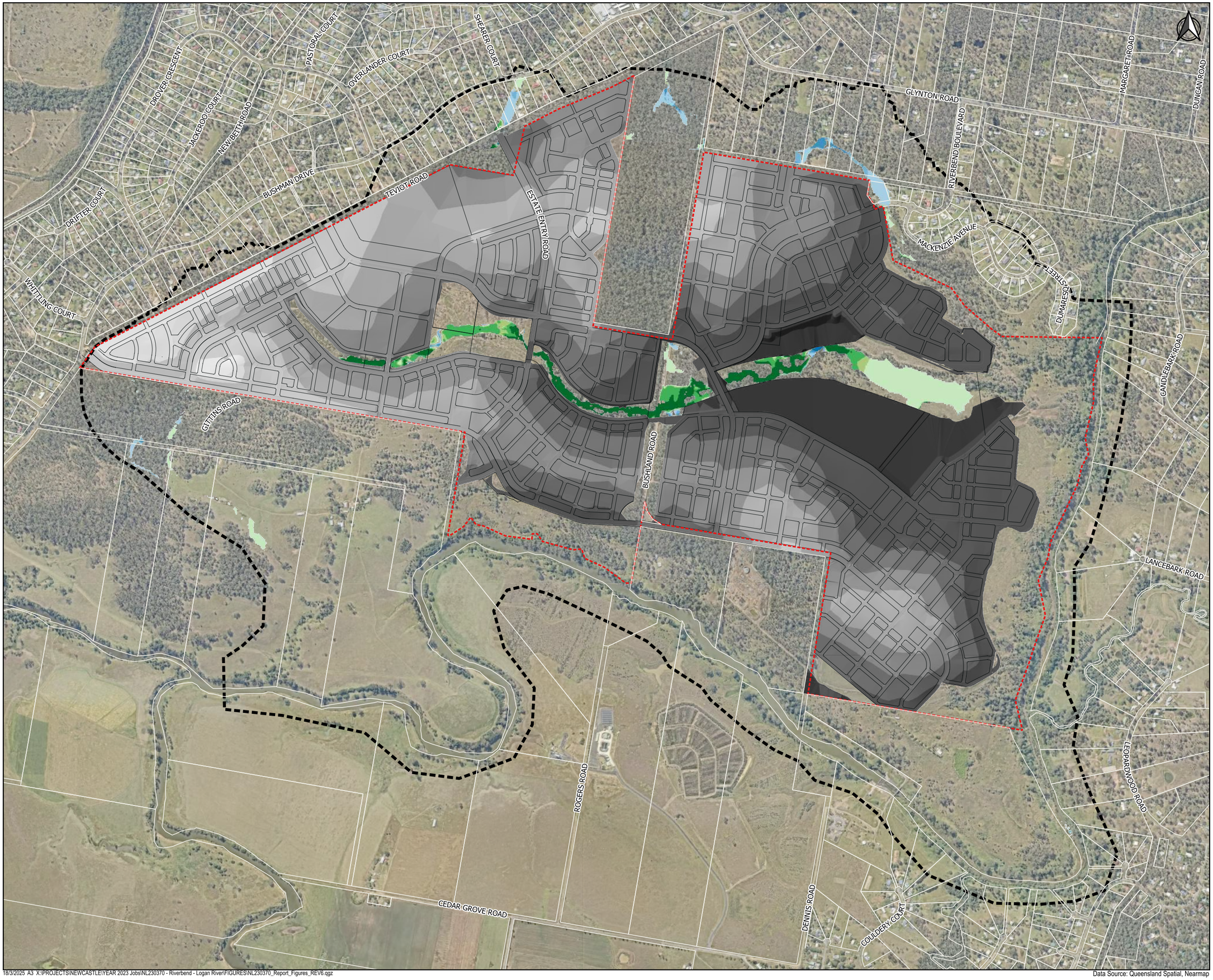
Figure D3

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

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

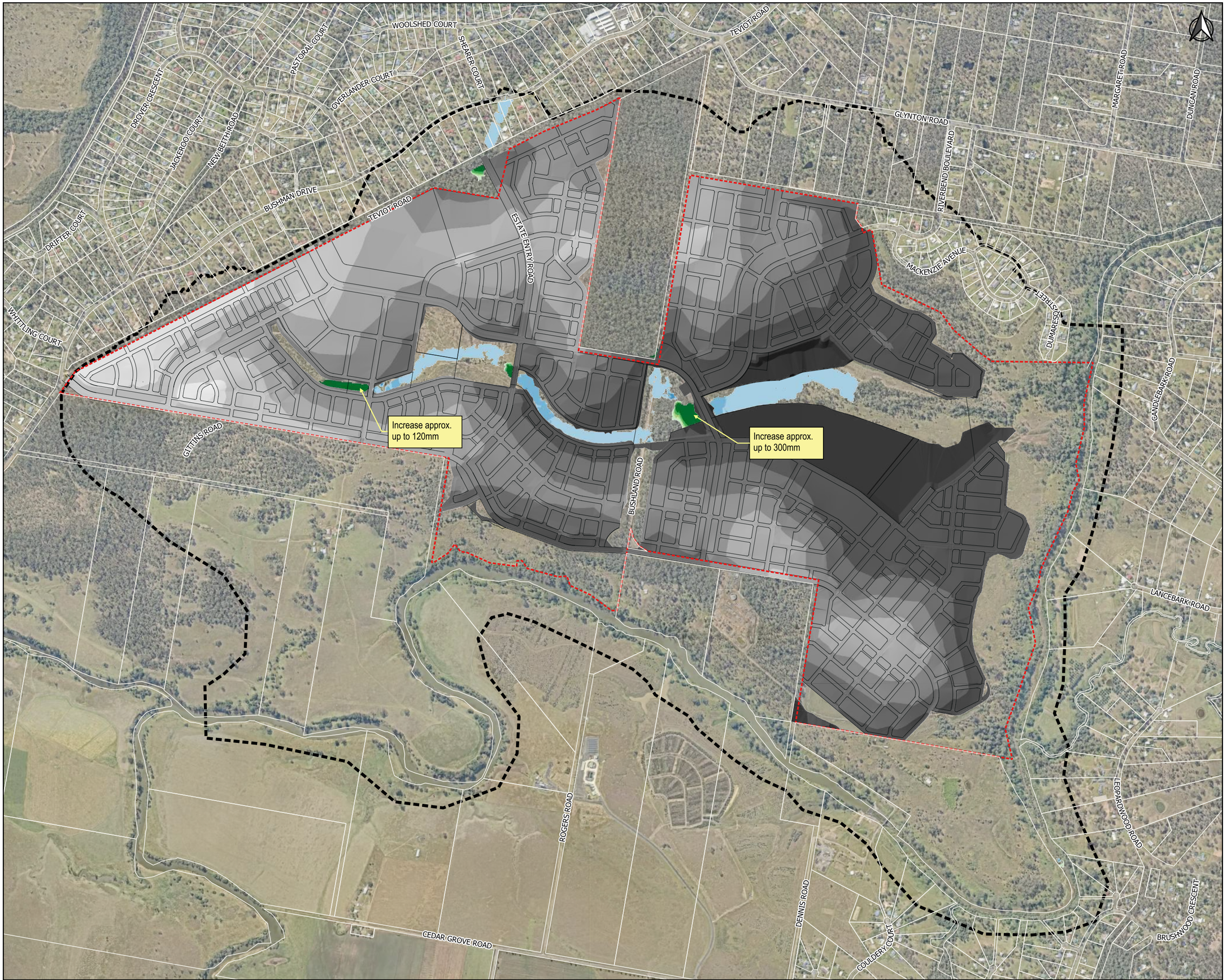
Figure D4

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

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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

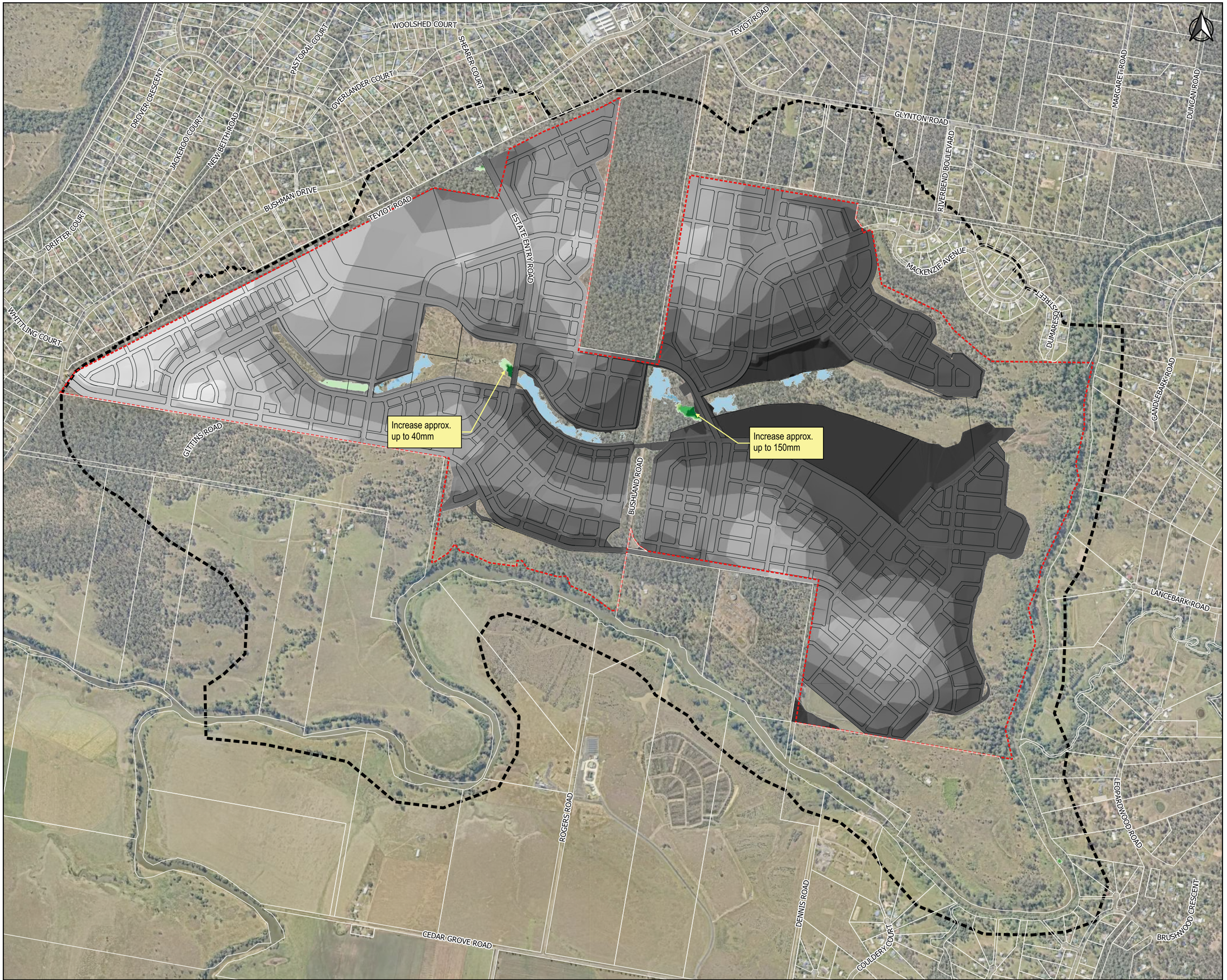
Figure E1

1% AEP Flood Elevation Difference
Local Catchment
Blocked minus Unblocked

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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 E2

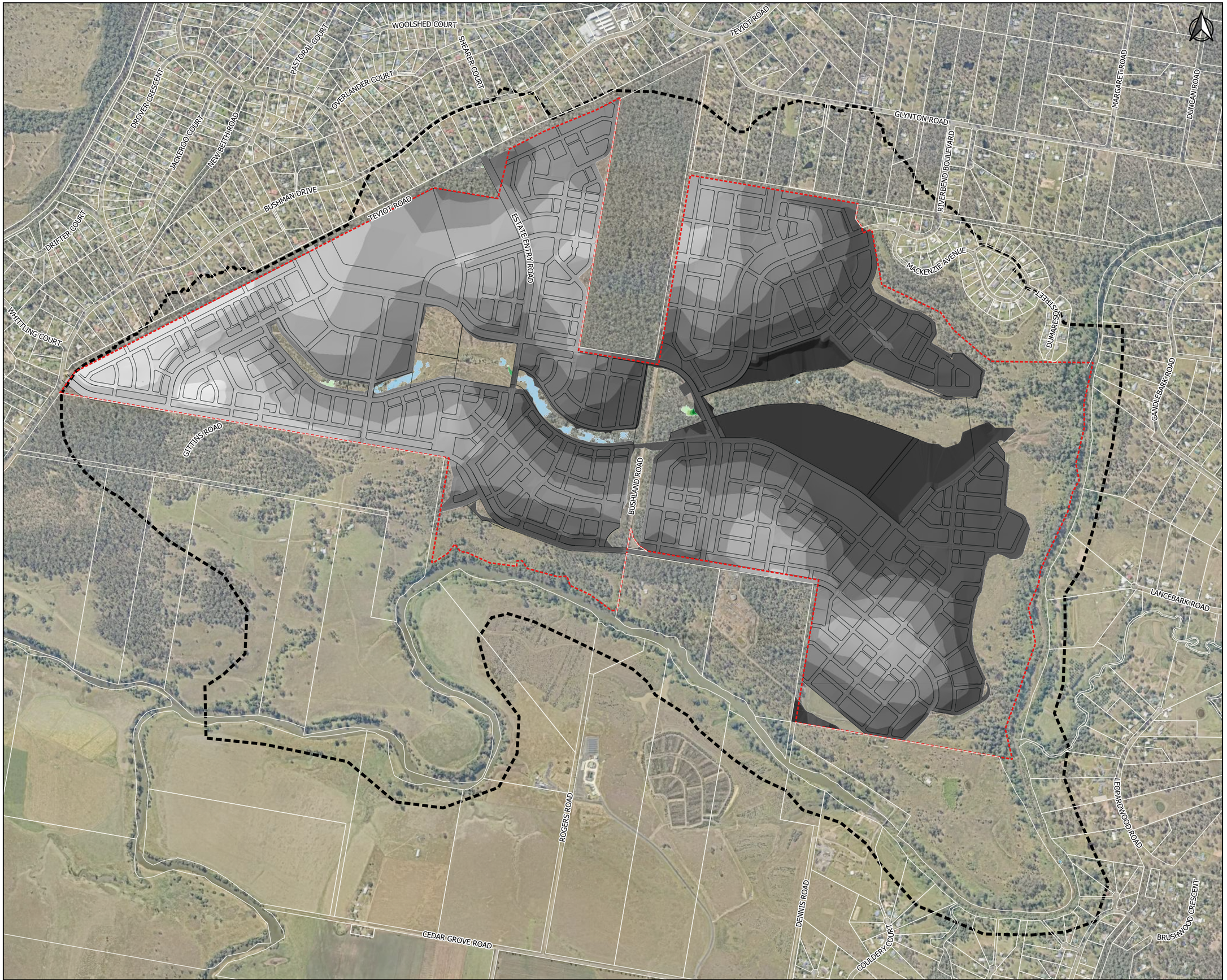
5% AEP Flood Elevation Difference
Local Catchment
Blocked minus Unblocked

Riverbend

NORTHROP

18/3/2025 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV6.qgz

Data Source: Queensland Spatial, Nearmap



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

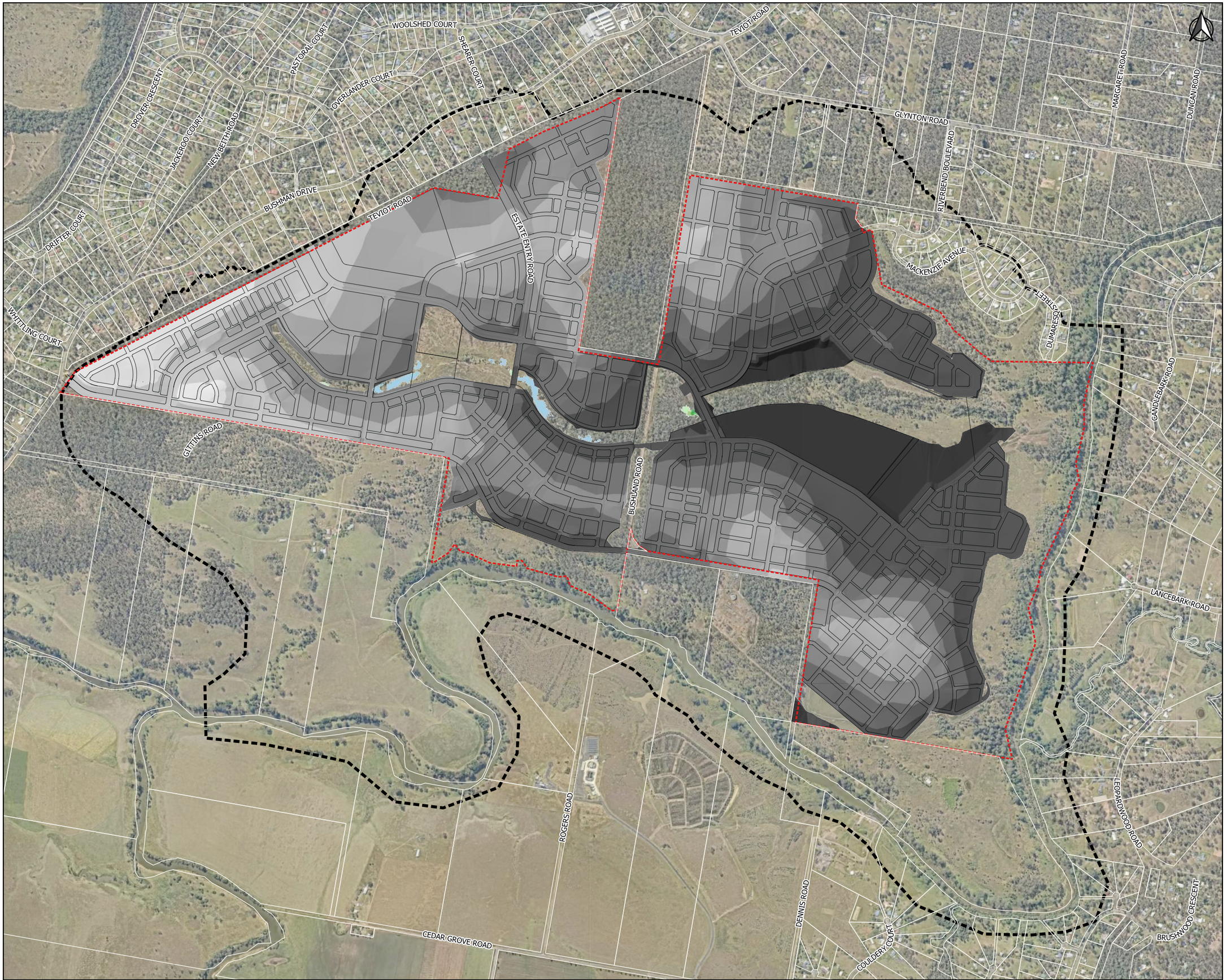
Figure E3

10% AEP Flood Elevation Difference
Local Catchment
Blocked minus Unblocked

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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 E4

20% AEP Flood Elevation Difference
Local Catchment
Blocked minus Unblocked

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap

Appendix E – 63% AEP Flood Figures

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)

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 C5

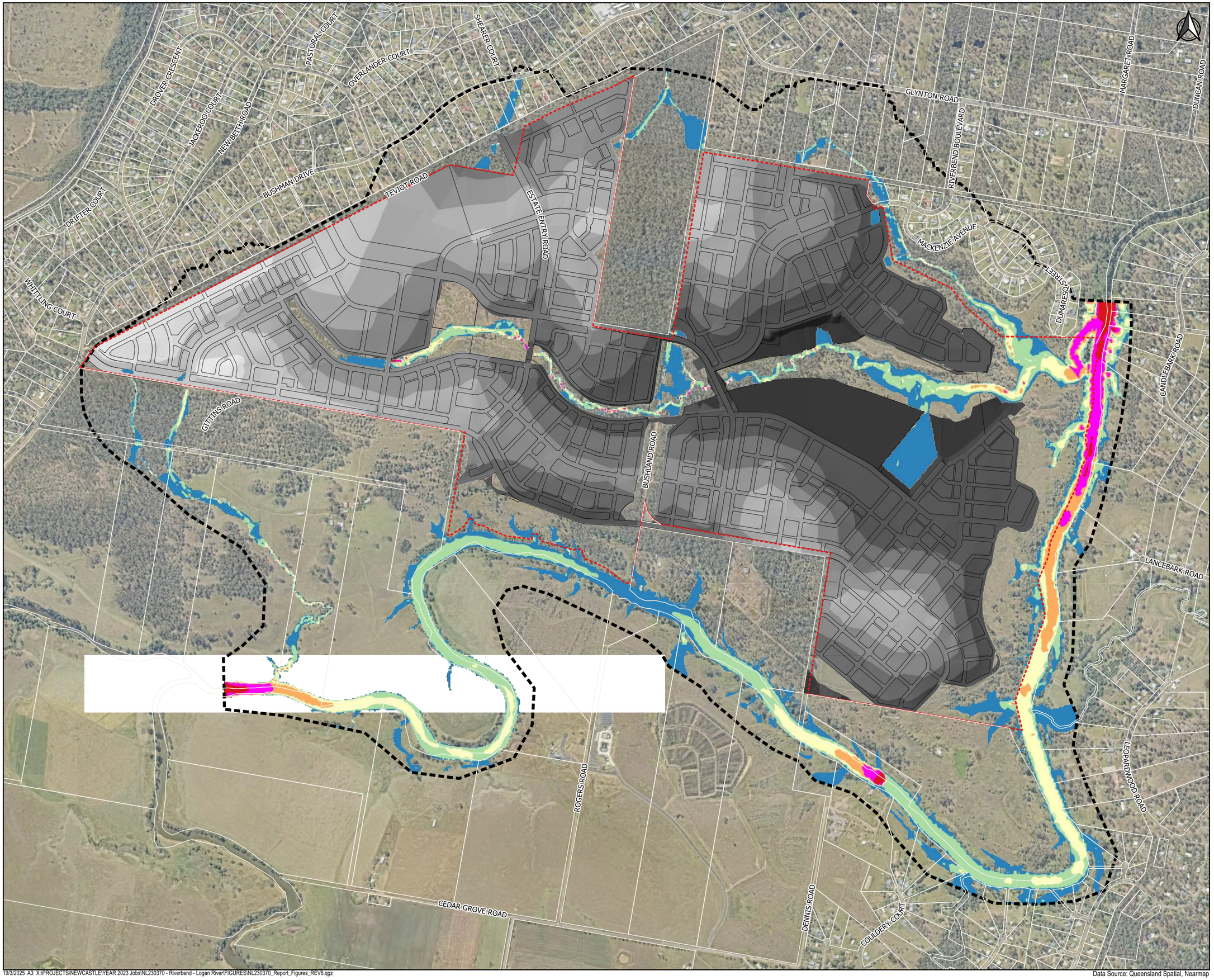
63% AEP Flood Depth and Elevation Local Catchment Developed Conditions

Riverbend

NORTHROP

19/3/2025 A3 X:\PROJECTS\NEWCASTLE\YEAR 2023 Jobs\NL230370 - Riverbend - Logan River\FIGURES\NL230370_Report_Figures_REV6.qgz

Data Source: Queensland Spatial, Nearmap



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

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 3.0
- > 3.0

0 200 400 Metres

1:15,000

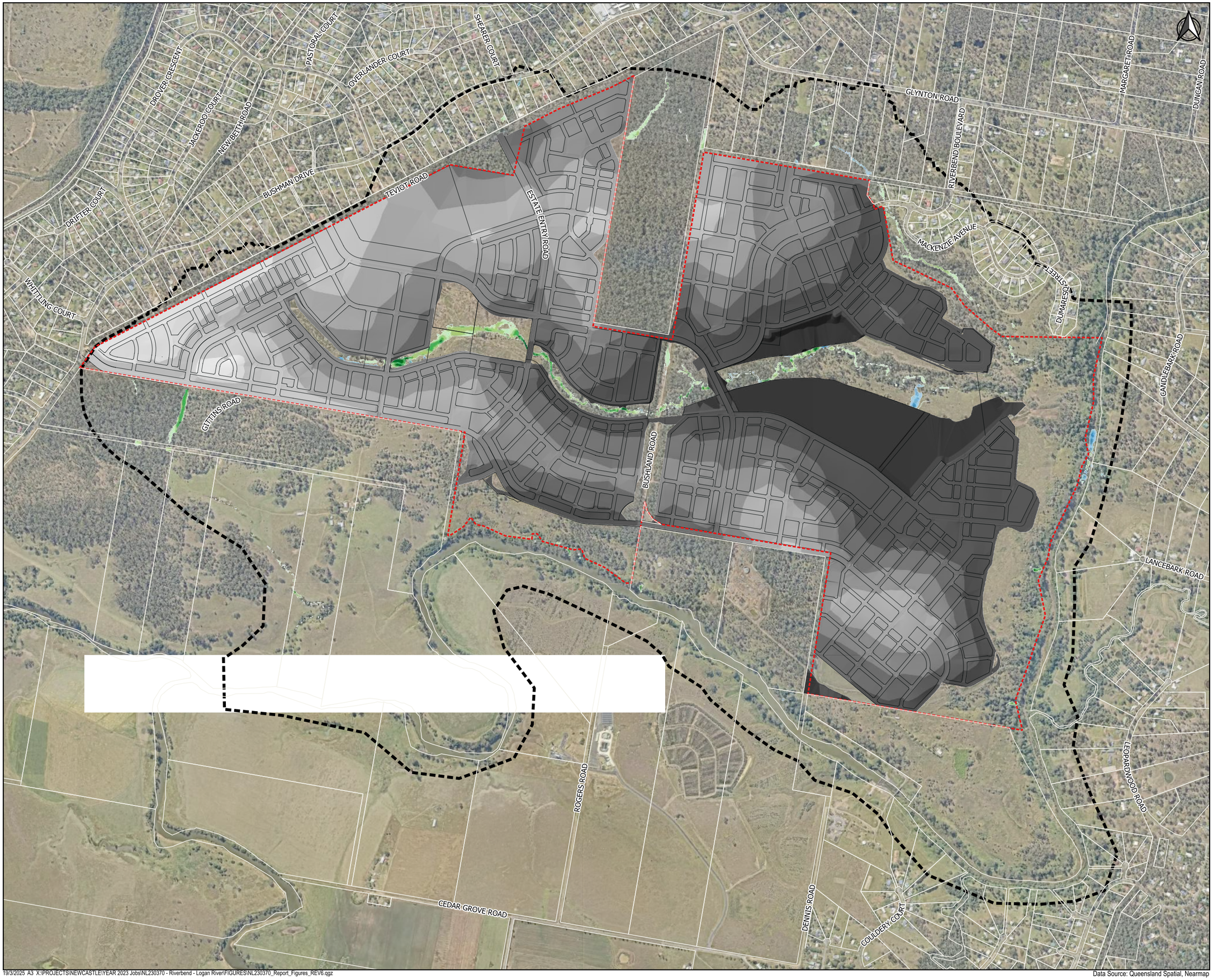
Figure C5-2

63% AEP Flood Velocity
Local Catchment
Developed Conditions

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap



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/s)

- <-1.00
- -1.00 - -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- Less than +/-0.1m/s
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- >1.00

0 200 400 Metres

1:15,000

Figure D5-2

63% AEP Flood Velocity Difference
Local Catchment
Pre-to-Post Comparison

Riverbend

NORTHROP

Data Source: Queensland Spatial, Nearmap