Queensland Government

Memorandum

Our ref
Your ref
Date 22 March 2024

To David Hemmings, Principal Designer, Metropolitan Region

Copy to Chris Russell, Director (Hydraulics)

Subject **Hydraulic assessment - Bulimba Creek overflow drain, Tingalpa**

Regarding your inquiry about the clearing dredging of Bulimba Creek drain to improve the flooding condition between Boundary Road and Gateway Motorway, a desktop investigation was conducted utilising Brisbane City Council's Bulimba Creek catchment study, which relied on hydrologic and hydraulic modelling performed in 2021.

According to the modelling findings, numerous residential properties within this area are susceptible to flooding for all events equal to or exceeding the 50% Annual Exceedance Probability (AEP). The likely maximum flood depths within the residential zone appear to be below 0.4 meters, suggesting that most habitable floor levels may remain unaffected at the 50% AEP (refer to Map 1). However, for events surpassing the 50% AEP, nearly all residential properties west of Boundary Street are likely to experience more substantial flood depths. Furthermore, floods from these events could potentially extend further east of Boundary Street (refer to Maps 2 and 3).

The catchment area upstream of Wynnum Road for this drain spans approximately 2 km², while downstream of Wynnum Road, roughly 0.5 km² contributes to its flow. Both the drain and its associated drainage corridor provides adequate conveyance and storage capacity to efficiently manage local runoff, directing it toward the Brisbane River situated approximately 3 km downstream.

However, despite this capacity, the drain's conveyance capability appears significantly constrained by the backwater levels of the Brisbane River. Furthermore, the coincidence of high tides with Brisbane River flood events can exacerbate these capacity constraints, increasing the risk of flooding in the area stretching from Boundary Street to the Gateway Motorway.

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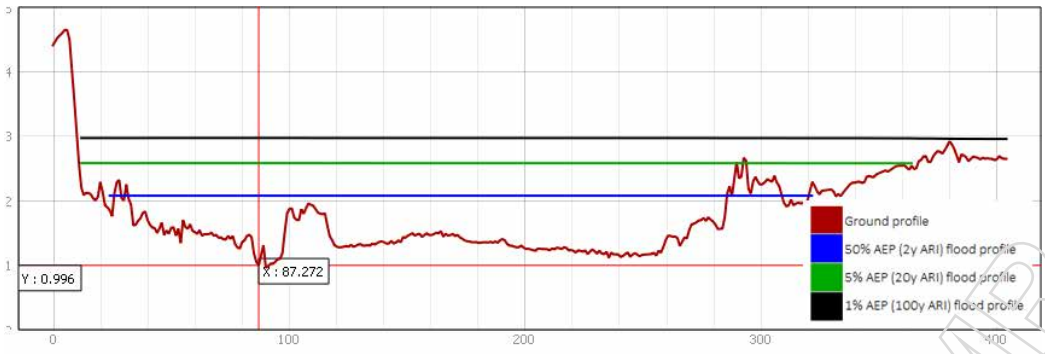
The figure below depicts four cross sections illustrating the ground profiles of the drainage corridor along with maximum water surface profiles for 50%, 5%, and 1% AEP events. For the cross-section locations, please refer to the attached maps (Map 1 to 3). The crosshairs on the cross-sections pinpoint the drain's position within the drainage corridor, providing a visual comparison of its relative cross-sectional area to that of the broader drainage corridor. These sections also highlight the anticipated high water depths across the profiles at the aforementioned events.

Cross Section 1

Cross Section 2

Cross Section 3



Cross Section 4

Therefore, considering the modelling results and the relative cross-sectional areas of the drain and drainage corridor, it appears that clearing and dredging this drain would yield minimal improvements to its conveyance capacity. Additionally, the current vegetation within the drainage corridor, similar to wetlands, poses significant environmental concerns should the removal of established mangrove-type vegetation become necessary.

Jagath Abeynayake
Principal Engineer, Hydraulics and Flooding, E&T

Queensland Government

Memorandum

Our ref1625
Your ref
Date 24 April 2024

To David Hemmings, Principal Designer, Metropolitan Region

Copy to Chris Russell, Director (Hydraulics)

Subject **Drainage Issues - Bulimba Creek Overflow Drain, Tingalpa**

---

1. Introduction

This briefing note was prepared as response to the inquiry made by Metropolitan District office of the Department (DTMR) regarding the clearing dredging of Bulimba Creek drain to improve the flooding condition between Boundary Road and Gateway Motorway. For this, a desktop investigation was conducted utilising Brisbane City Council's Bulimba Creek catchment study, which relied on hydrologic and hydraulic modelling performed in 2021. The findings are discussed in this document.

In response to the aforementioned inquiry, a preliminary investigation was conducted in March 2024[1]. That assessment relied on publicly available data from the same study (BCC, 2021), which the council utilised for planning purposes, though with some conservative assumptions. However, recognising that these assumptions might not fully reflect the present day flooding conditions of the area, this assessment employs flood levels and heights that do not incorporate such assumptions. Therefore, it is presumed to be more representative of the present condition.

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[1] Refer to the draft memo, Hydraulic assessment - Bulimba Creek Overflow Drain, dated 22/03/2024.

2. Analysis

A layout depicting the study area, Bulimba Creek drain, local and state-controlled roads, and the existing stormwater pipe network is presented in Figure 1 along with likely maximum flooding extent for 50% AEP (1 in 2 year) event.

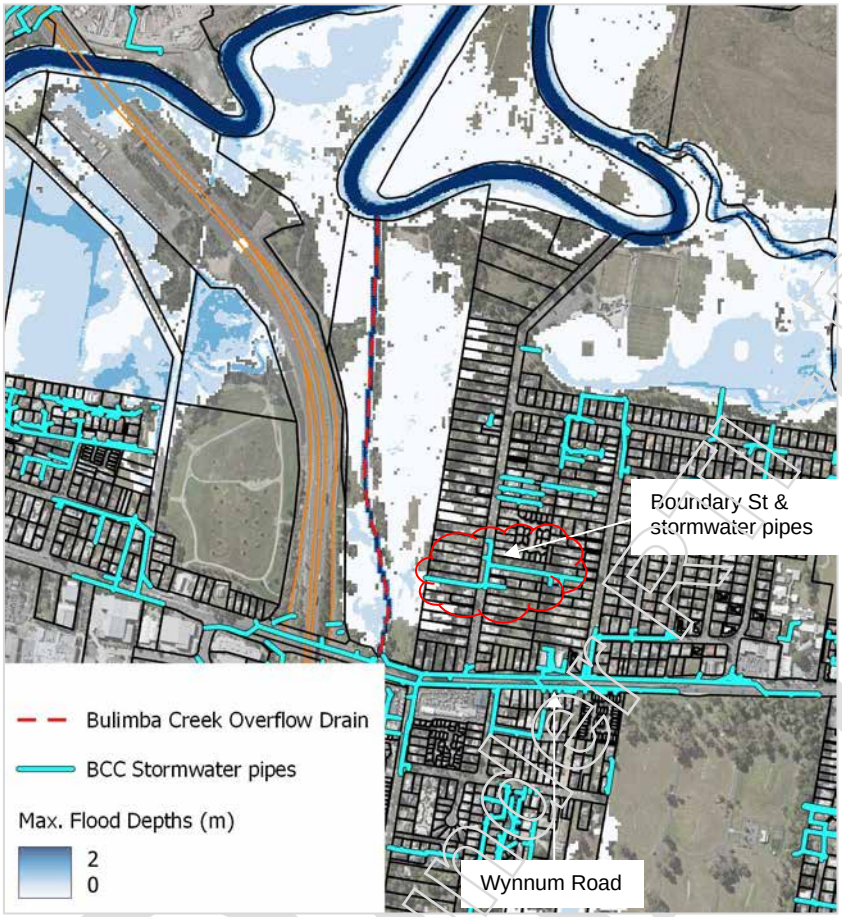


Figure 1 Study area

The majority of residential allotments adjacent to Boundary Street appear to be draining into the drainage reserve via overland flow, with the exception of a few allotments located near Wynnum Road, which have a subsurface stormwater pipe network (Refer to Figure 1).

This analysis was conducted by examining the modelling results (maximum flood depths and flood height grids), along with floodplain terrain information and aerial imagery. A series of flood maps showing the spatial distribution of likely maximum flood depths and flood extents for various design events were produced. Additionally, four sections illustrating design flood profiles have been created to further understand the likely flood depths along the respective sections across the drainage reserve.

3. Catchment and floodplain characteristics

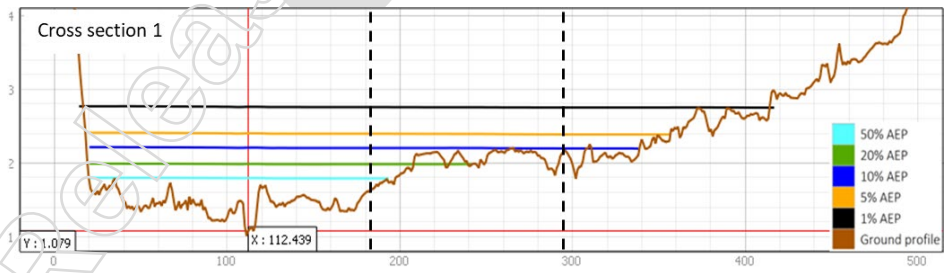
The catchment area upstream of Wynnum Road for this drain spans approximately 2 km², while downstream of Wynnum Road, roughly 0.5 km² contributes to its flow. Additionally, some overbank flow from Bulimba Creek drains into the Brisbane River via Bulimba Creek drain, passing through the culvert across the M1 Motorway located upstream of the Wynnum Road intersection. The drain and its associated drainage corridor appear to have sufficient capacity to effectively manage local runoff, directing it towards the Brisbane River located approximately 3 km downstream. However, despite this capacity, the drain's conveyance capability seems significantly constrained by the backwater levels of the Brisbane River and the flat terrain within the floodplain. Furthermore, the coincidence of high tides with Brisbane River flood events can exacerbate these capacity constraints, increasing the risk of flooding in the area stretching from Boundary Street to the Motorway.

4. Flooding residential properties

According to the modelling findings, a few residential properties within this area are susceptible to flooding for all events equal to or exceeding the 50% AEP (see Map 1.1). Up to the 20% AEP event, the likely maximum flood depths within the residential zone appear to be less than 0.4 meters, suggesting that habitable floor levels may remain unaffected (see Map 1.2). However, for events surpassing the 20% AEP, most residential properties west of Boundary Street are likely to experience flooding, and for those surpassing the 10% AEP, flooding could potentially extend further east of Boundary Street (see Maps 1.3 to 1.6).

5. Flooding within the drainage reserve

The figures below depict four cross sections illustrating the ground profiles of the drainage corridor along with maximum water surface profiles for 50%, 20%, 10%, 5%, and 1% AEP events. For the cross-section locations, refer to Maps 1.2 - 1.6. The crosshairs on the cross-sections pinpoint the drain's position within the drainage corridor, providing a visual comparison of its relative cross-sectional area to that of the broader drainage corridor. Additionally, the location of the eastern boundary of the drainage corridor where the allotments boundary start, and the location of Boundary Street are also indicated for information (dashed lines). These sections illustrate the anticipated flood depths across the profiles at the aforementioned events.



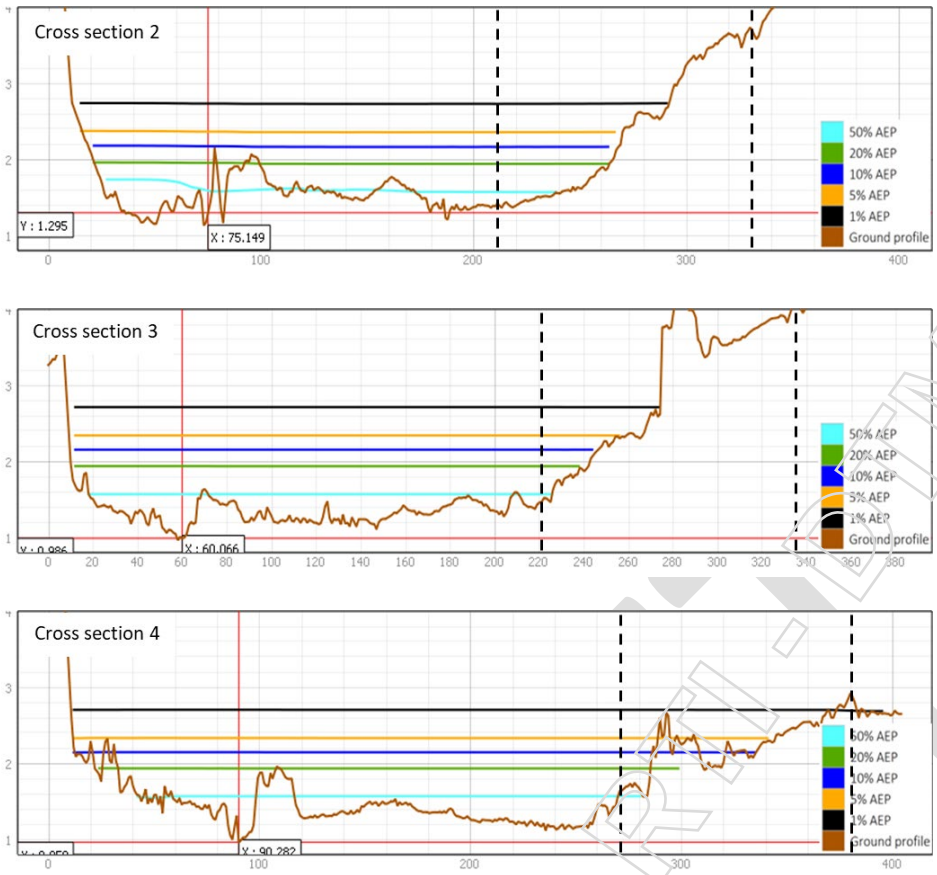


Figure 2 Flood profiles

6. Stormwater pipes

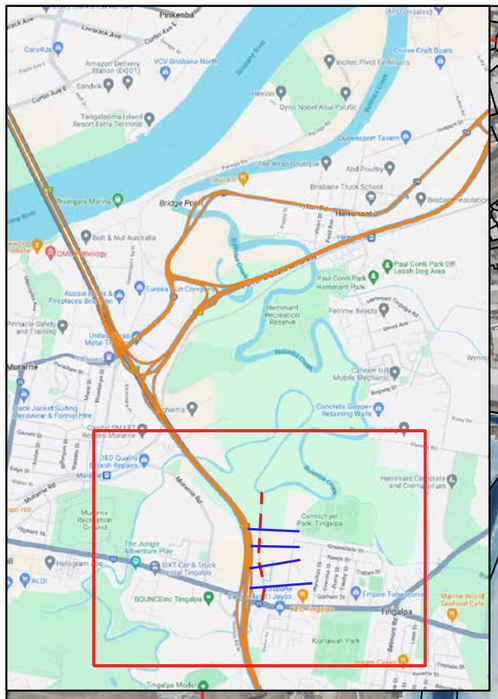
As notes in section 2, only a relatively small portion of the residential allotments situated between the drainage reserve and Boundary Street are currently serviced by the council's stormwater pipes. The configuration of these pipes is unknown at the time of this assessment. Regardless of the configuration, due to the likely flood depths within the drainage reserve, the conveyance capacity of these pipes appears to be restricted during design events of 20% AEP and above. However, it is anticipated that these pipes are in good condition and functioning well to drain the respective stormwater drainage catchment once the flood recedes.

7. Conclusion

Considering the modelling results and the relative cross-sectional areas of the drain and drainage corridor, it appears that in general, clearing and dredging this drain would yield only a minor improvement to its conveyance capacity. Its effectiveness appears to be minimal for the events 20% AEP and above as the flood encroaches the allotments in such events. Additionally, the current vegetation within the drainage corridor, similar to wetlands, poses significant environmental concerns should the removal of established mangrove-type vegetation become necessary.

Despite the flooding condition within the drainage reserve, it is anticipated that the stormwater pipes situated between the drainage reserve and Boundary Street are in good condition and functioning effectively to drain the respective stormwater drainage catchment once the flood recedes.

DRAFT FOR DISCUSSION ONLY



4
3
2
1

LEGEND

- Legend
- State-controlled Roads
- Overflow Drain
- Cross Section Locations
- Cadestre
- Floo Depths (m)
- <= 0.4
- 0.4 - 0.8
- 0.8 - 1.2
- 1.2 - 1.6
- > 1.6

0 250 500 m

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
Engineering & Technology
Department of Transport and Main Roads

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Map 1.1 - Max. Flood Depths (m)
Base Case
50% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

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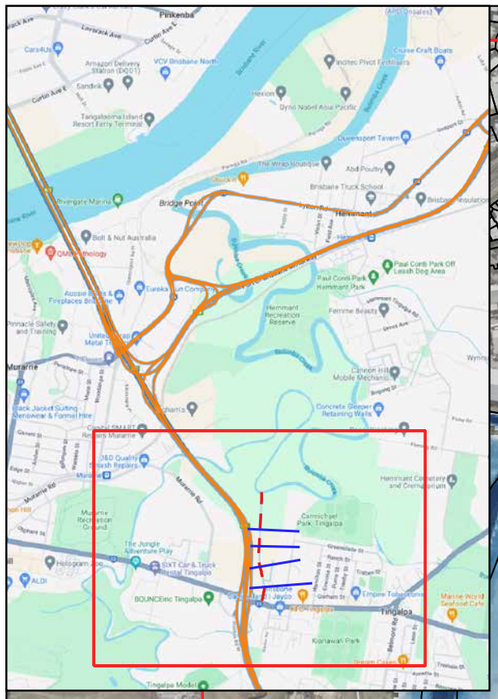

4

3

2

1

LEGEND

Legend

State-controlled Roads

Overflow Drain

Cross Section Locations

Cadestre

Floo Depths (m)

<= 0.4

0.4 - 0.8

0.8 - 1.2

1.2 - 1.6

> 1.6

0 250 500 m

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
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Map 1.2 - Max. Flood Depths (m)
Base Case
20% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

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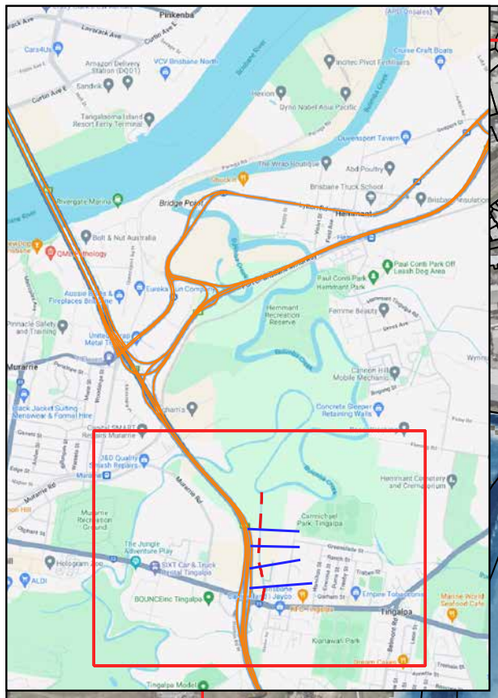

4

3

2

1

0 250 500 m

LEGEND

Legend

State-controlled Roads

Overflow Drain

Cross Section Locations

Cadestre

Floo Depths (m)

<= 0.4

0.4 - 0.8

0.8 - 1.2

1.2 - 1.6

> 1.6

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
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Engineering & Technology
Department of Transport and Main Roads

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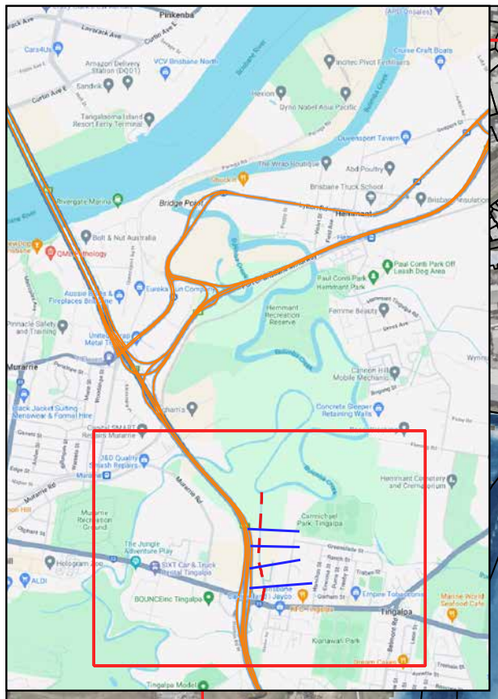
Map 1.3 - Max. Flood Depths (m) Base Case 10% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

DRAFT FOR DISCUSSION ONLY



4
3
2
1

0 250 500 m

LEGEND

Legend
State-controlled Roads
Overflow Drain
Cross Section Locations
Cadestre
Floo Depths (m)
<= 0.4
0.4 - 0.8
0.8 - 1.2
1.2 - 1.6
> 1.6

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
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Map 1.4 - Max. Flood Depths (m) Base Case 5% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

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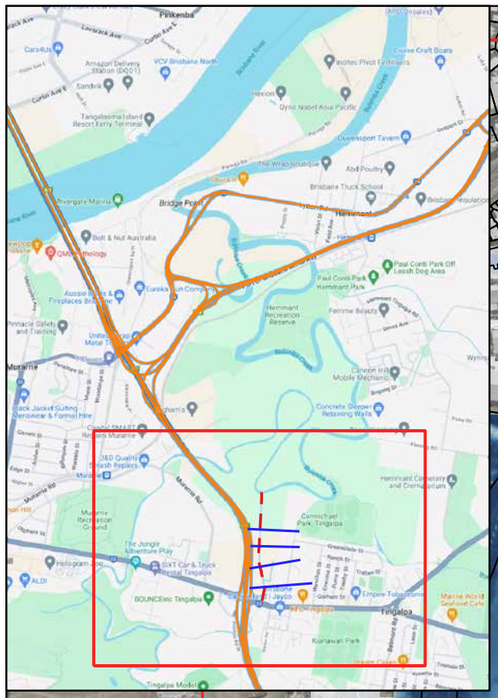

LEGEND

- Legend
- State-controlled Roads
- Overflow Drain
- Cross Section Locations
- Cadestre
- Floo Depths (m)
- <= 0.4
- 0.4 - 0.8
- 0.8 - 1.2
- 1.2 - 1.6
- > 1.6

0 250 500 m

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
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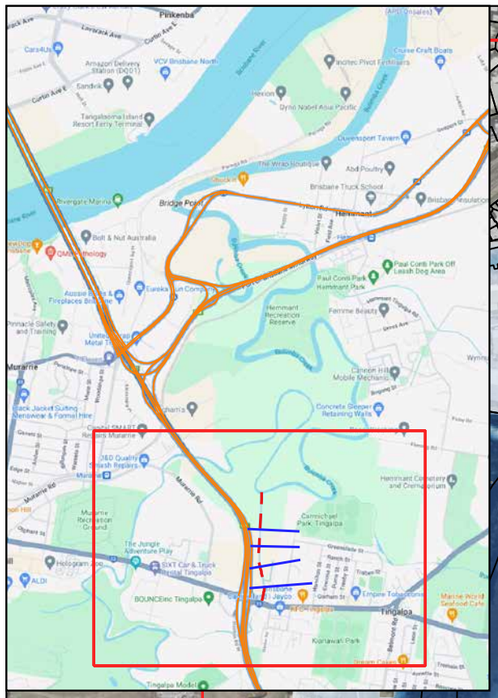
Map 1.5 - Max. Flood Depths (m) Base Case 2% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

DRAFT FOR DISCUSSION ONLY



4

3

2

1

0 250 500 m

LEGEND

Legend
State-controlled Roads
Overflow Drain
Cross Section Locations
Cadestre
Floo Depths (m)
<= 0.4
0.4 - 0.8
0.8 - 1.2
1.2 - 1.6
> 1.6

Bulimba Creek Overflow Drain Flood Assessment

Sorce: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
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Map 1.6 - Max. Flood Depths (m)
Base Case
1% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
16/04/2024	-	-	JA	0

Queensland Government

Memorandum

Our ref: 1625
Date: 08/08/2024

To David Hemmings, Principal Designer, Metropolitan Region
David Gough, Principal Engineer, Metropolitan Region

Copy to Chris Russell, Director (Hydraulics)

Subject **Drainage Issues - Bulimba Creek Overflow Drain, Tingalpa**

---

1. Introduction

This briefing note was prepared as response to the inquiry made by Metropolitan District office of the Department (TMR) regarding the clearing dredging of Bulimba Creek drain to improve the flooding condition between Boundary Road and Gateway Motorway. For this, a desktop investigation was conducted utilising Brisbane City Council's Bulimba Creek catchment study (BCC, 2021), which relied on hydrologic and hydraulic modelling performed in 2021. The findings are discussed in this document.

In response to the aforementioned inquiry, preliminary investigations were conducted in March and April 2024. These assessments relied on publicly available data from the Council's Bulimba Creek catchment study that the council used for planning, incorporating conservative assumptions to account for climate change. Additionally, the drain bed levels were found to be insufficiently accurate for the purposes of this assessment.

This assessment excludes those assumptions and uses drain bed levels derived from a recent project-specific field survey, providing a more accurate representation of current conditions.

2. Analysis

A layout depicting the study area, Bulimba Creek drain, local and state-controlled roads, and the existing stormwater pipe network is presented in Figure 1 along with likely maximum flooding extent for 50% AEP (1 in 2 year) event.

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Hydraulics and Flooding
Engineering and Technology

Enquiries Jagath Abeynayake
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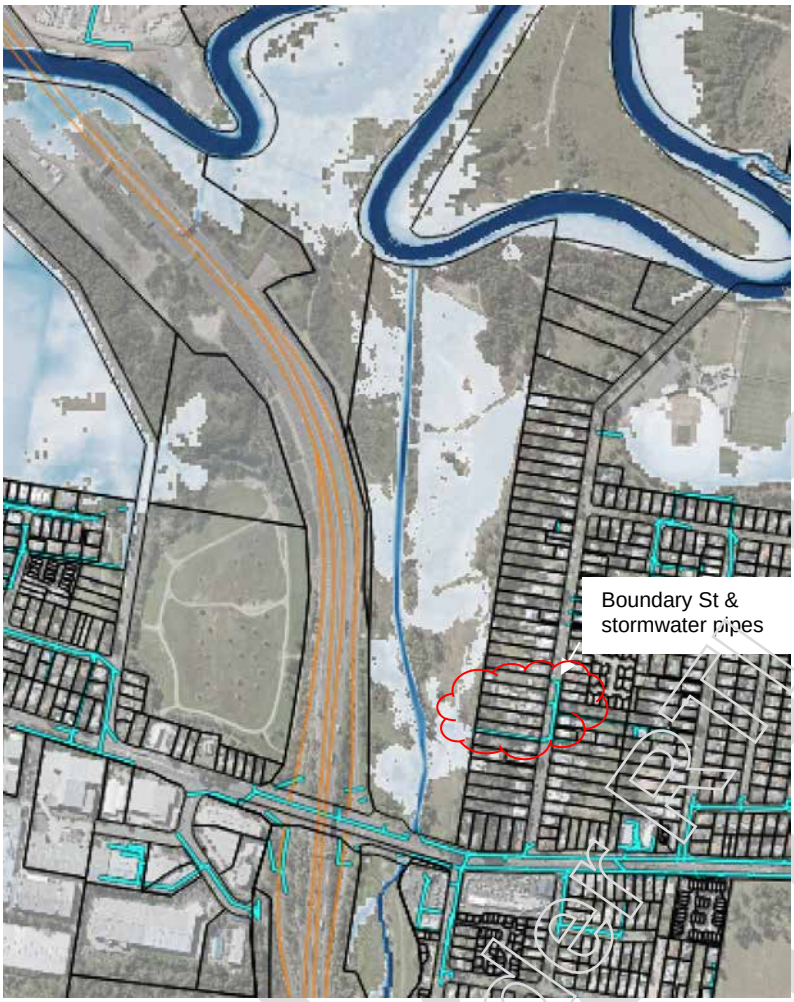

Figure 1 Study area

The majority of residential allotments adjacent to Boundary Street appear to be draining into the drainage reserve via overland flow, with the exception of a few allotments located near Wynnum Road, which have a subsurface stormwater pipe network (Refer to Figure 1).

3. Catchment and floodplain characteristics

The catchment area upstream of Wynnum Road for this drain spans approximately 2 km², while downstream of Wynnum Road, roughly 0.5 km² contributes to its flow. Additionally, some overbank flow from Bulimba Creek drains into the Brisbane River via Bulimba Creek drain, passing through the culvert across the M1 Motorway located upstream of the Wynnum Road intersection. The drain and its associated drainage corridor appear to have sufficient capacity to effectively manage local runoff, directing it towards the Brisbane River located approximately 3 km downstream. However, despite this capacity, the drain's conveyance capability seems significantly constrained by the backwater levels of the Brisbane River and the flat terrain within the floodplain. Furthermore, the coincidence of high tides with Brisbane River flood events can exacerbate these capacity constraints, increasing the risk of flooding in the area stretching from Boundary Street to the Motorway.

4. Flooding residential properties

A series of flood maps showing the maximum flood depths and flood extents for 50% AEP (1 in 2 year), 20% AEP(1 in 5 year) and 10% AEP (1 in10 year) were produced (Refer to Appendix A).

According to the modelling findings, properties adjacent to the drain reserve are unlikely to experience flooding during 50% AEP events. However, a few residential properties within this area are susceptible to flooding during events equal to or less freuqent than 20% AEP (Refer to Map 1.2 and 1.3).

5. Drainage improvements

Two scenarios were assessed to explore potential improvements to the current drainage conditions affecting adjacent properties. A recent survey indicates that the drain is currently obstructed by debris and silt, and it lacks a slope conducive to efficient flood flow.

- Scenario 1: Dredge and clear the drain to create an even slope without deepening it.
- Scenario 2: Dredge and clear the drain to create an even slope and excavate the channel by 0.5 meters all the way to the river.

Results show some improvement in flood levels and extents for frequent events up to 50% AEP. However, since flooding up to the 50% AEP is contained within the drainage reserve, adjacent properties do not benefit. Significant improvements in drainage conditions for events equal to or less frequent than 20% AEP are unlikely. (Refer to the impact maps in Appendices B and C).

6. Conclusion

Considering the modelling results, it appears that in general, clearing and dredging this drain would yield only a minor improvement to its conveyance capacity. Its effectiveness appears to be minimal for the events equal to or less freuqent than 20% AEP (1 in 5 year). Additionally, the current vegetation within the drainage corridor, similar to wetlands, poses significant environmental concerns should the removal of established mangrove-type vegetation become necessary.

Despite the flooding condition within the drainage reserve, it is anticipated that the stormwater pipes situated between the drainage reserve and Boundary Street are in good condition and functioning effectively to drain the respective stormwater drainage catchment once the flood recedes.

Appendix A: Flood depths, Base Case

DRFAT

0 0.1 0.2 km

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Flood Depths (m)

- <= 0.4
- 0.4 - 0.8
- 0.8 - 1.2
- 1.2 - 1.6
- > 1.6

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
Engineering & Technology
Department of Transport and Main Roads

Queensland Government

Map 1.1 - Max. Flood Depths (m) Base Case 50% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT

0 0.1 0.2 km

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Flood Depths (m)

- <= 0.4
- 0.4 - 0.8
- 0.8 - 1.2
- 1.2 - 1.6
- > 1.6

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

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Map 1.2 - Max. Flood Depths (m)
Base Case
20% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

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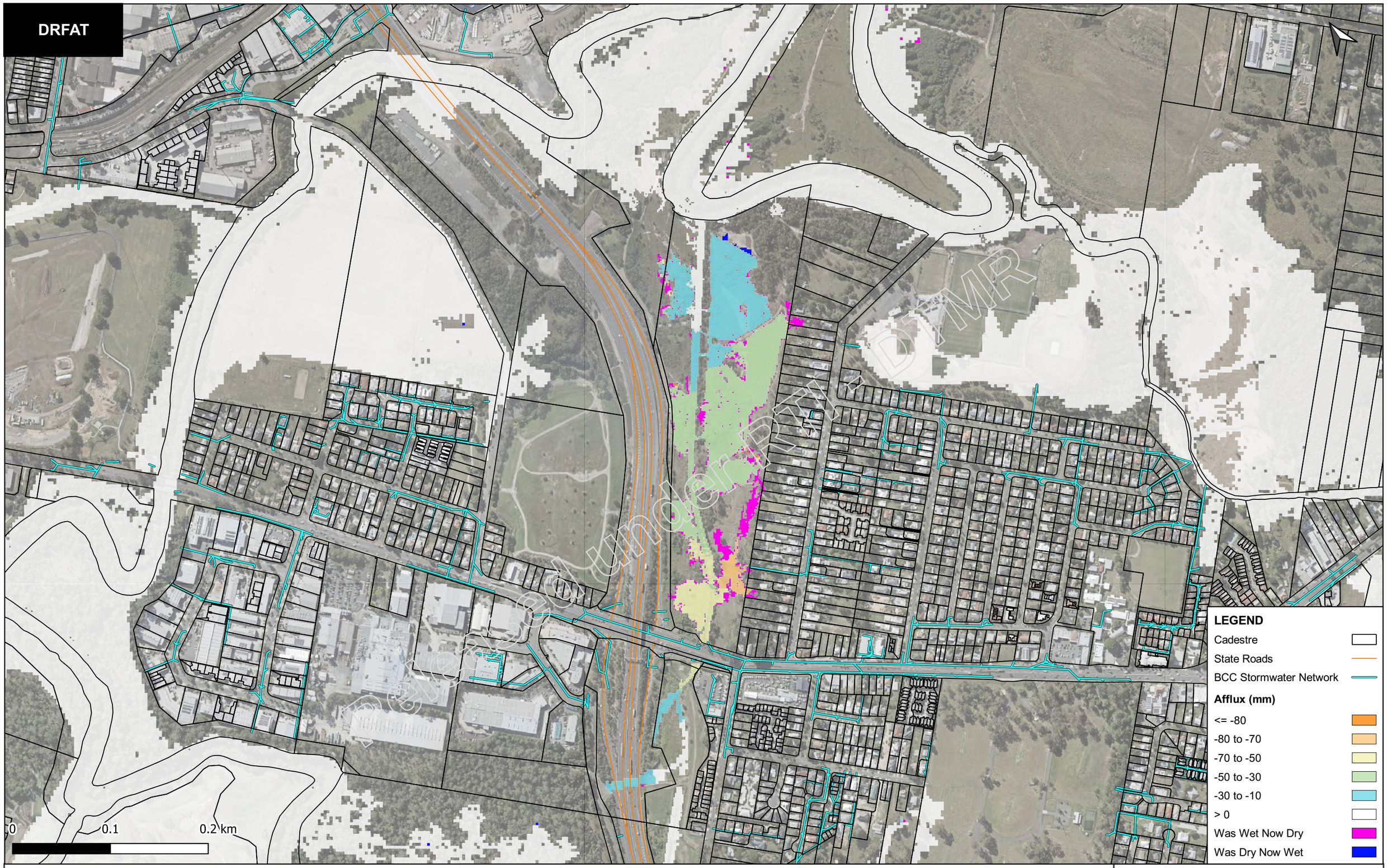
Map 1.3 - Max. Flood Depths (m)
Base Case
10% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

Appendix B: Impacts, Scenario 1

DRFAT



Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
Engineering & Technology
Department of Transport and Main Roads

Queensland Government

Map 2.1 - Afflux (mm)
Scenario 1
50% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT

0 0.1 0.2 km

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Afflux (mm)

- <= -80
- -80 to -70
- -70 to -50
- -50 to -30
- -30 to -10
- > 0
- Was Wet Now Dry
- Was Dry Now Wet

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
Engineering & Technology
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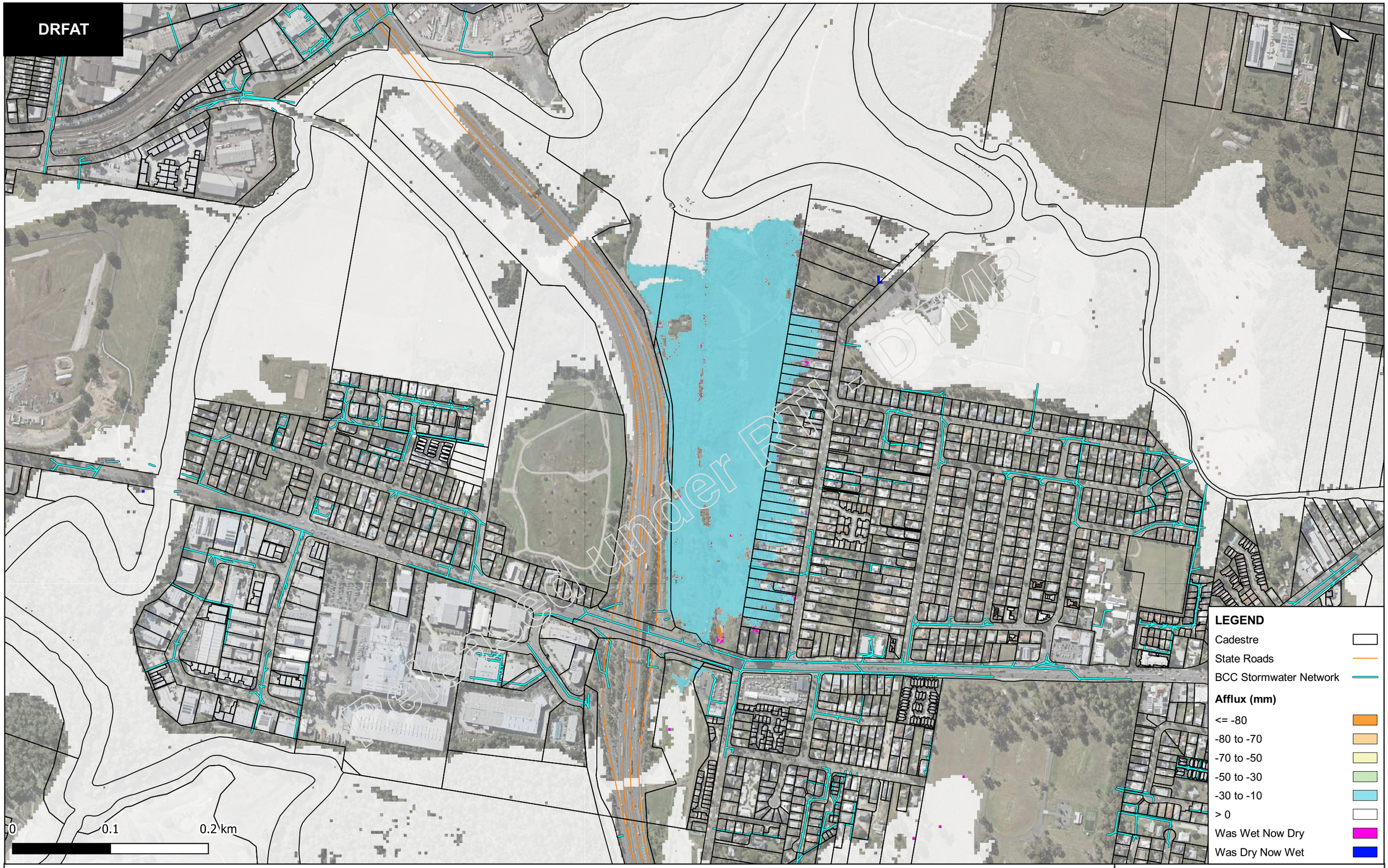
Map 2.2 - Afflux (mm)
Scenario 1
20% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT



Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
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Engineering & Technology
Department of Transport and Main Roads

Queensland Government

Map 2.3 - Afflux (mm)
Scenario 1
10% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

Appendix C: Impacts, Scenario 2

DRFAT

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Afflux (mm)

- <= -80
- -80 to -70
- -70 to -50
- -50 to -30
- -30 to -10
- > 0
- Was Wet Now Dry
- Was Dry Now Wet

0 0.1 0.2 km

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
Hydraulics, Design & Spatial
Engineering & Technology
Department of Transport and Main Roads

Queensland Government

Map 3.1 - Afflux (mm)
Scenario 2
50% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT

0 0.1 0.2 km

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Afflux (mm)

- <= -80
- -80 to -70
- -70 to -50
- -50 to -30
- -30 to -10
- > 0
- Was Wet Now Dry
- Was Dry Now Wet

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
Hydraulics and Flooding Unit
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Queensland Government

Map 3.2 - Afflux (mm)
Scenario 2
20% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2

DRFAT

0 0.1 0.2 km

LEGEND

- Cadestre
- State Roads
- BCC Stormwater Network

Afflux (mm)

- <= -80
- -80 to -70
- -70 to -50
- -50 to -30
- -30 to -10
- > 0
- Was Wet Now Dry
- Was Dry Now Wet

Bulimba Creek Overflow Drain - Hydraulic Assessment

Source: Bulimba Creek Flood Study (BCC, 2021)

Produced by:
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Department of Transport and Main Roads

Queensland Government

Map 3.3 - Afflux (mm)
Scenario 2
10% AEP

DATE	JOB No.	DMS No.	INITIALS	REVISION
08/08/2024	1625	-	JA	2