



# CITY OF YARRA

## Identification of Land Liable to Flooding

Technical Report

VC2036\_006-REP-001-3

27 JUNE 2024

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	4/05/2023	Client Issue	Harry George	Scott Dunn	Daniel Hatzihristodoulou	Scott Dunn
1	5/05/2023	Updated Report	Harry George	Scott Dunn	Daniel Hatzihristodoulou	Scott Dunn
2	1/03/2024	Updated Report	Harry George	Scott Dunn	Daniel Hatzihristodoulou	Scott Dunn
3	27/06/2024	Updated Report	Harry George	Scott Dunn	Daniel Hatzihristodoulou	Scott Dunn

Signatures:






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# 1. BACKGROUND

## 1.1 Introduction

City of Yarra (Council) engaged Engeny to develop a secondary flood extent layer for Council to be used to identify / designate land liable to flooding outside of proposed flood overlays (e.g., Special Building Overlay and Land Subject to Inundation Overlay). The development of the 'land liable to flood' layer follows on from Engeny's flood modelling study of the Yarra municipality and will be used internally by Council to assist with review of future development proposals in accordance with the Building Regulations (2018).

This report documents the processes undertaken by Engeny to develop the 'land liable to flood' layer across the Yarra municipality for Council.

## 1.2 Flood Modelling Study

During 2020 Engeny completed a flood modelling / mapping study for Yarra City Council (Council) that covered the entire municipality. The results of this study were communicated to Melbourne Water, whom as a key drainage stakeholder identified the value in adopting consistent flood modelling data with Council across the municipality.

In accordance with Melbourne Water's Flood Mapping Specifications (October 2021), a peer review of Council's 2020 flood models was commissioned by Melbourne Water, and this was completed in early 2022. On the back of this review Engeny were engaged by Melbourne Water to respond to the peer review comments and complete an update of Council's 2020 modelling for the benefit of both Melbourne Water and Council.

At the time of preparing this summary report the 2022 Melbourne Water study is nearing completion with all model runs complete and development of flood extents, amongst other project deliverables, nearing completion (pending final review by Melbourne Water).

The 1 % Annual Exceedance Probability (AEP) event flood extents for climate change rainfall conditions have formed the basis for the development of the 'land liable to flooding' layer.



## 2. APPLICABLE FLOOD PLANNING ZONES AND OVERLAYS

Planning authorities (such as Yarra City Council) have a range of tools to choose from to identify flood affected land in the planning scheme. There are four types of flood provisions available, which are:

- Urban Floodway Zone (UFZ);
- Floodway Overlay (FO);
- Land Subject to Inundation Overlay (LSIO); and
- Special Building Overlay (SBO).

The various flood provisions have been derived based on the type of flooding and the potential level of risk to life and property. The level of planning control in each provision is commensurate with the potential flood risk. For example, the UFZ is a restrictive provision that prohibits most uses and development. It is designed to be applied to urban environments where there is a high potential flood risk and only low intensity uses and development (such as recreation) are suitable. In contrast, the LSIO is used for both urban and rural environments to identify land with a lower potential flood risk or as an interim measure, areas where accurate flood mapping to identify the floodway is yet to be carried out. The LSIO only requires a permit for buildings and works and does not prohibit either use or development.

The UFZ, FO and LSIO all relate to mainstream flooding from a river or stream, while the SBO relates to stormwater flooding along overland flow paths in catchments with underground drainage systems.

In the Yarra municipality there are currently LSIO and SBO in the planning scheme. The LSIO areas are related to flooding along major waterways whilst SBO areas relate to flooding as a direct result of the capacity of existing drainage networks. All planning applications related to the existing SBO or LSIO are referred to Melbourne Water as the relevant floodplain management authority. Melbourne Water has responsibility for main drains that typically have catchments greater than 60 hectares.

The 'land liable to flooding' layer is proposed to accompany the above planning zones/overlays and assist Council to assess future development proposals in accordance with the Building Regulations (2018).

# 3. DEVELOPMENT OF ‘LAND LIABLE TO FLOODING’ LAYER

## 3.1 Inclusion Criteria and Methodology

The ‘land liable to flooding’ layer has been developed based on the hydraulic modelling outputs for the 1 % AEP storm event in Climate Change Scenario. For a rainfall event of this magnitude, all areas of the municipality will have some degree of runoff on the surface. The intention of the layer is to include all areas of flooding and key flow paths where flood depths are equal or greater to 50mm.

The layer does not include areas of flooding relevant to Melbourne Water assets (underground pipes or open channels / waterways).

The first step involved application of filtering criteria to the 1 % AEP Climate Change Scenario flood depth output of hydraulic modelling to determine locations where ‘land liable to flooding’ should be delineated. In determining filtering criteria Engeny has first referred to published guidelines including:

- Applying the Flood Provisions in Planning Schemes – A Guide for Councils, Victorian State Government, June 2015
- Flood Mapping Guidelines and Technical Specification, Melbourne Water, October 2021 (the most recent available Melbourne Water specifications at the commencement of the City of Yarra Flood Mapping Project).

The following filtering criteria, adapted from the existing Melbourne Water flood extent filtering criteria, has been adopted to identify locations for potential inclusion in the ‘land liable to flooding’ layer:

- Depth and area of flooding greater than or equal to 50 millimetres AND
- Area of flooding covers 2 % or greater of the total property area OR
- Area of flooding covers a minimum of 25 % of the road frontage.

The application of these filtering or threshold criteria to the raw modelling outputs creates shapes that have been used to identify locations for inclusion in the ‘land liable to flooding’ layer, but not the final shape of the proposed flood extent. The criteria listed above were used to determine the approximate upstream extent of significant flow paths that should be included in the flood extent. It would not be appropriate to use the above criteria to determine the entire shape of the flood extent as only a portion of the flow path in some locations would be covered, and there would be areas of disconnected flow paths.

To ensure a smooth and continuous flood extent, differing filtering criterion has been adopted where 50-millimetre depth filtered flow paths are disconnected. This has been adopted for flood extents that connect via roads, and through certain parcels / properties where flood results show a clear continued flow path in which water cannot travel down a road or easement. This ensures the flood extent does not end within a property.

Figure 3.1 provides a flow chart illustrating the general steps used to develop the ‘land liable to flooding’ layer.

All initial flood extents used to develop the ‘Land Liable to Flooding’ layer have been produced using Engeny’s MAPPING Results GEnerator (MARGE). MARGE is a high-speed results processing tool that utilises the Safe Software’s Feature Manipulation Engine (FME) and other workflow scripts to automate the creation of a filtered and smoothed flood extent (as based on the threshold criteria listed above) and other GIS deliverables from TUFLOW’s raw output files. The use of FME to create a flood extent from TUFLOW raw outputs is as per Melbourne Water’s Technical Specification (October 2021), which provides a detailed process in developing a smoothed flood extent using FME.

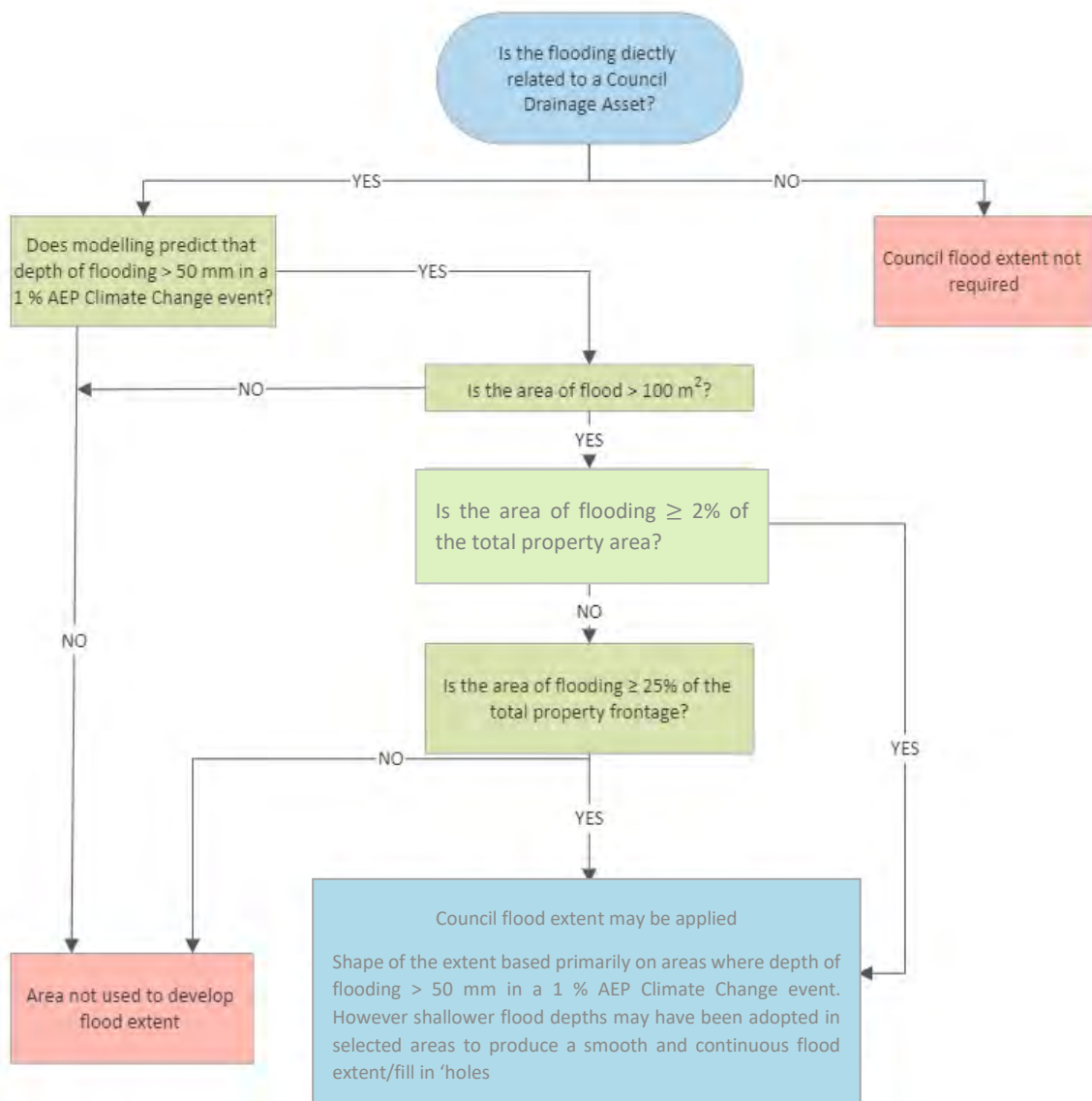


FIGURE 3.1: 'LAND LIABLE TO FLOODING' LAYER DEVELOPMENT FLOW CHART

## 4. PROVISION OF ‘LAND LIABLE TO FLOODING’ LAYER

Engeny has provided the proposed ‘land liable to flooding’ layer to Council in digital format (MapInfo table and ESRI Shapefile). Council has reviewed the layer multiple times, including providing feedback resulting in alterations to the layer undertaken by Engeny to meet Council’s requests and objectives.

Table 4.1 summaries of the number of parcels affected by the ‘land liable to flooding’ and ‘Special Building Overlay’ layer.

**TABLE 4.1: SUMMARY OF PARCELS AFFECTED BY THE ‘LAND LIABLE TO FLOODING’ LAYER**

City of Yarra Catchment	Approx. Area (ha)	Number of Parcels in ‘Special Building Overlay’ Layer		Number of Parcels in ‘Land Liable to Flooding’ Layer
		Council	Melbourne Water	
Alexandra Main Drain Catchment	1,297	2068	3656	3601
Richmond Quarry Main Drain Catchment	892	2380	880	3925
Fairfield Main Drain Catchment	583	63	-*	158

\*Existing Melbourne Water SBO extent will be used for the Fairfield catchment

**Appendix A** provides flood extent plans of the municipality, presenting the proposed Council ‘Land Liable to Flooding’ layer (referred to as BR153 in the plans), Council SBO2 layer and Melbourne Water SBO1 layer.

## 5. QUALIFICATIONS

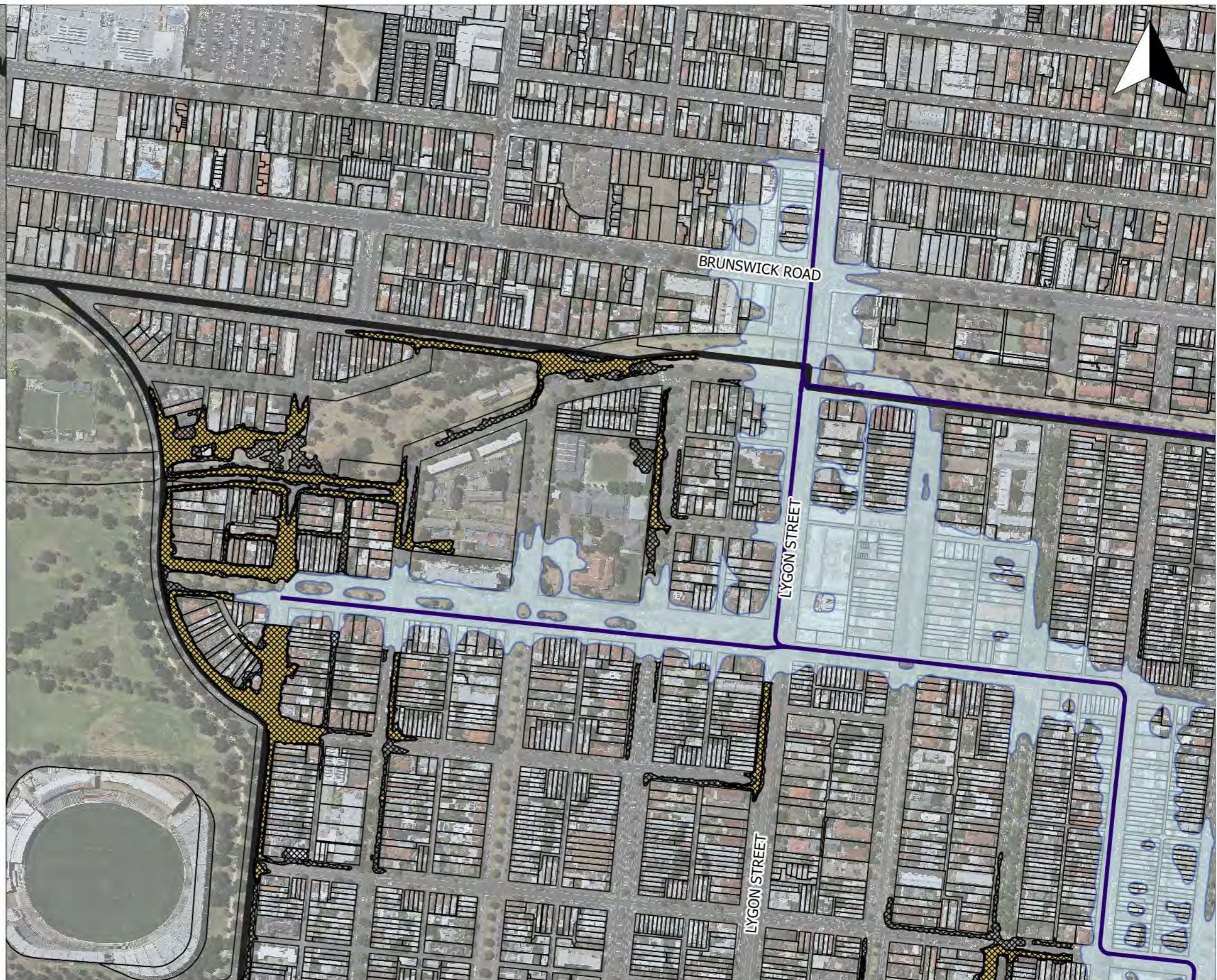
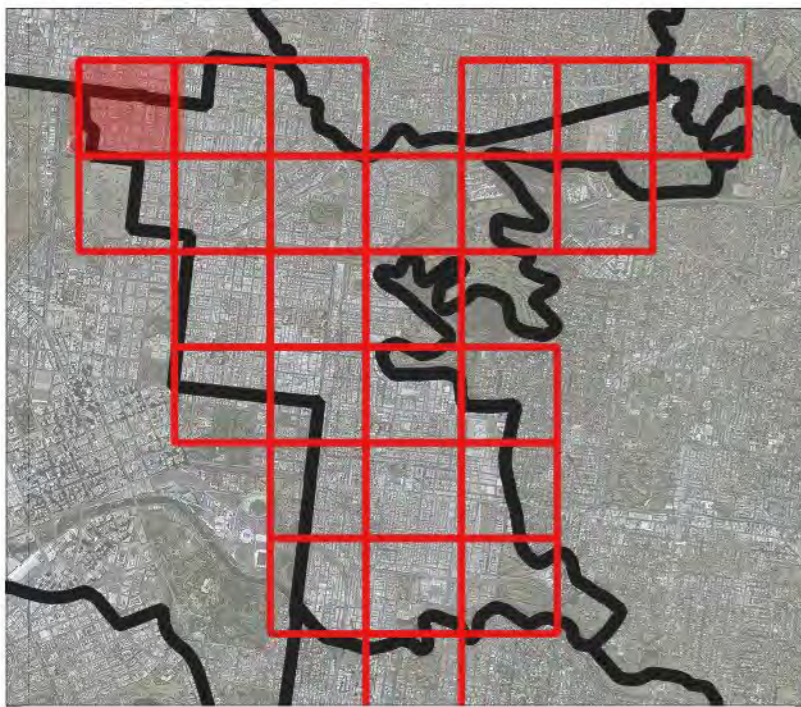
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# APPENDIX A: PROPOSED FLOOD EXTENT PLANS







### Legend

-  Melbourne Water Underground Drain
-  Municipal Boundary
-  Property Boundary
-  BR153 Flood Extent - Council (Proposed)
-  SBO2 Flood Extent - Council (Proposed)
-  SBO1 Flood Extent - Melbourne Water (Existing)
-  LSIO Flood Extent - Melbourne Water (Existing)

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Scale in metres ( 1:4,250 @ A3)

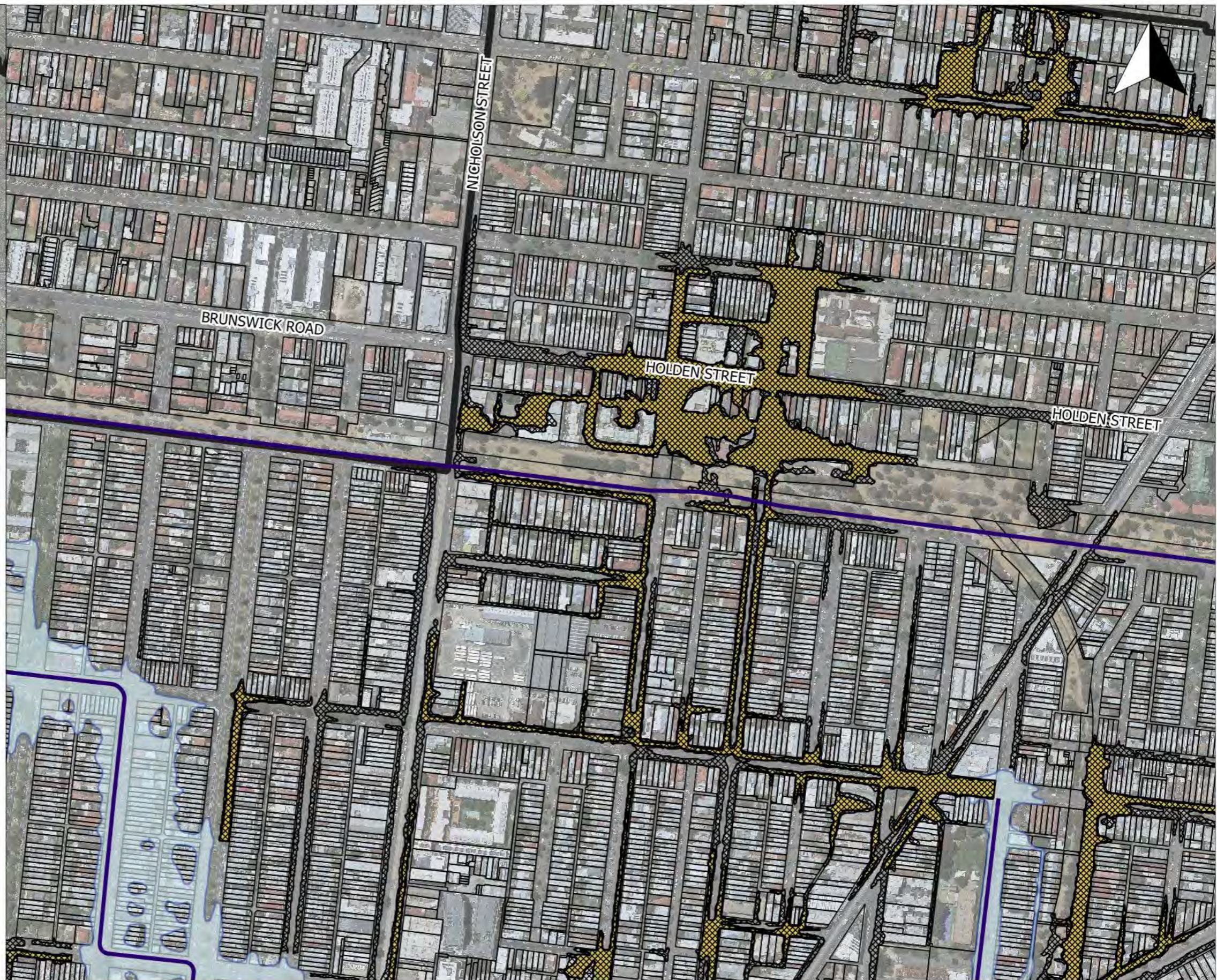
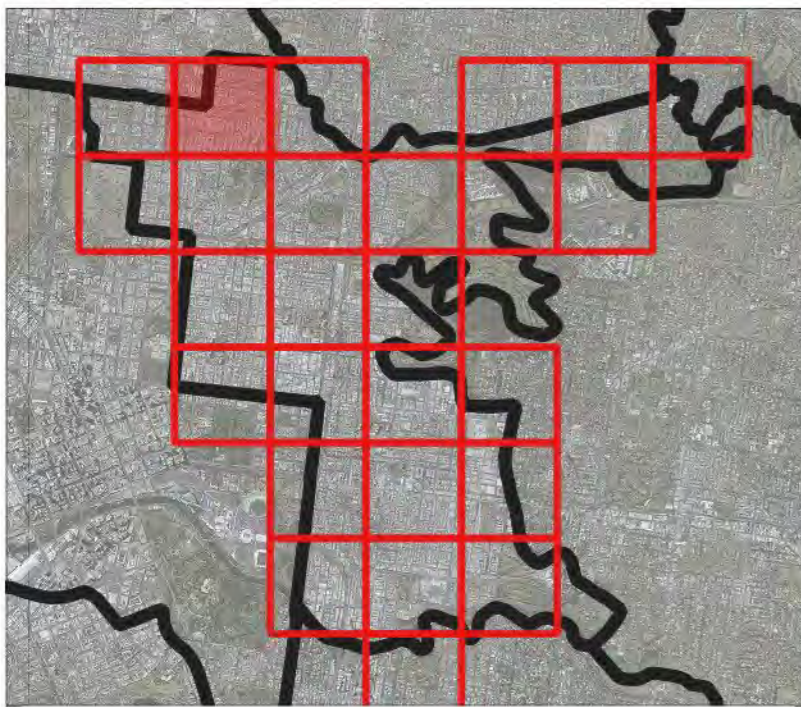
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Horizontal Datum: Geocentric Datum of Australia  
Vertical Datum: Australia Height Datum  
Grid: Map Grid of Australia, Zone 55

### City of Yarra Flood Mapping

### Flood Extent Plan (LSIO, SBO1, SBO2 and BR153)

Job Number: VC2036\_006  
Revision: 1  
Drawn: NB  
Checked: HG  
Date: 27/6/2024





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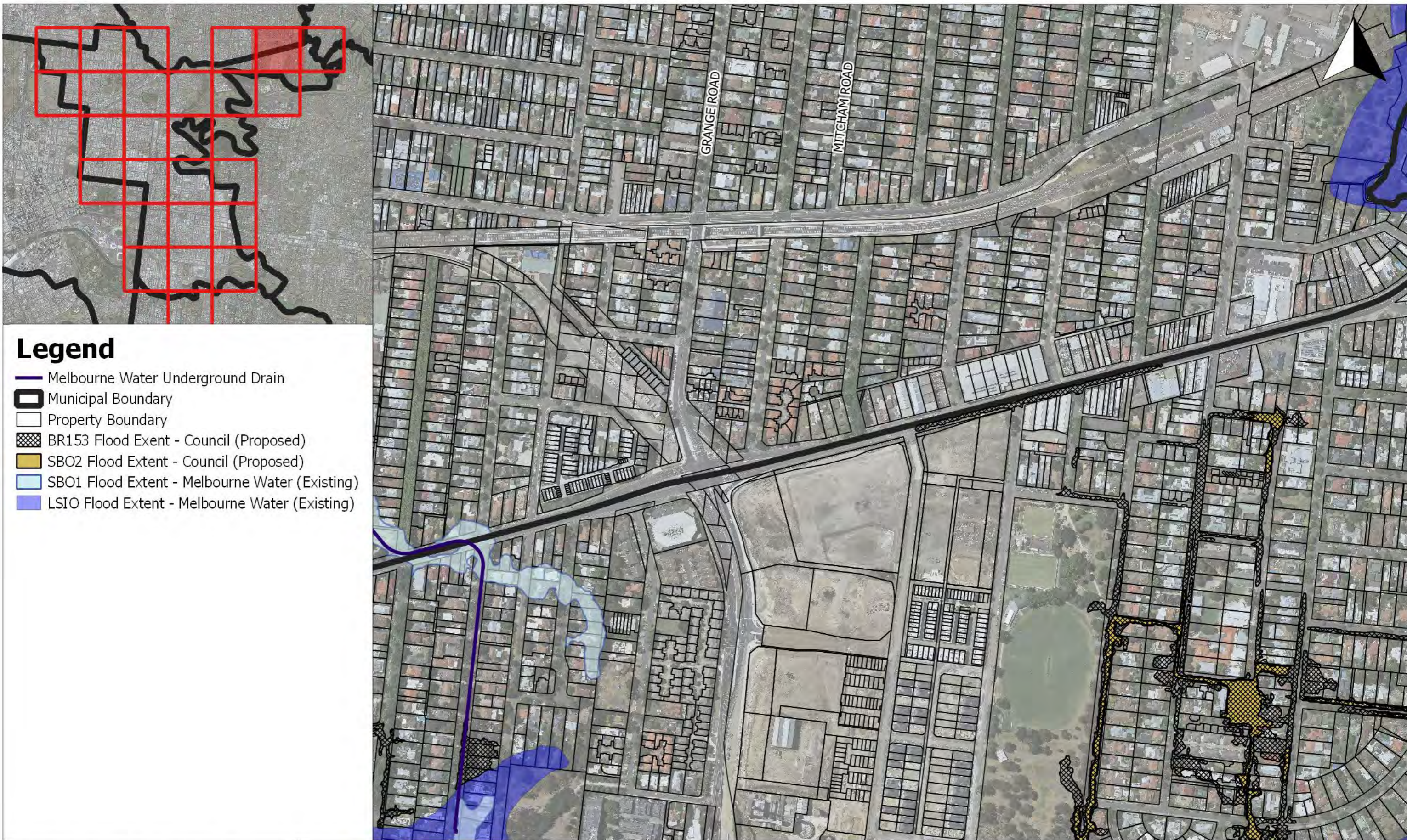
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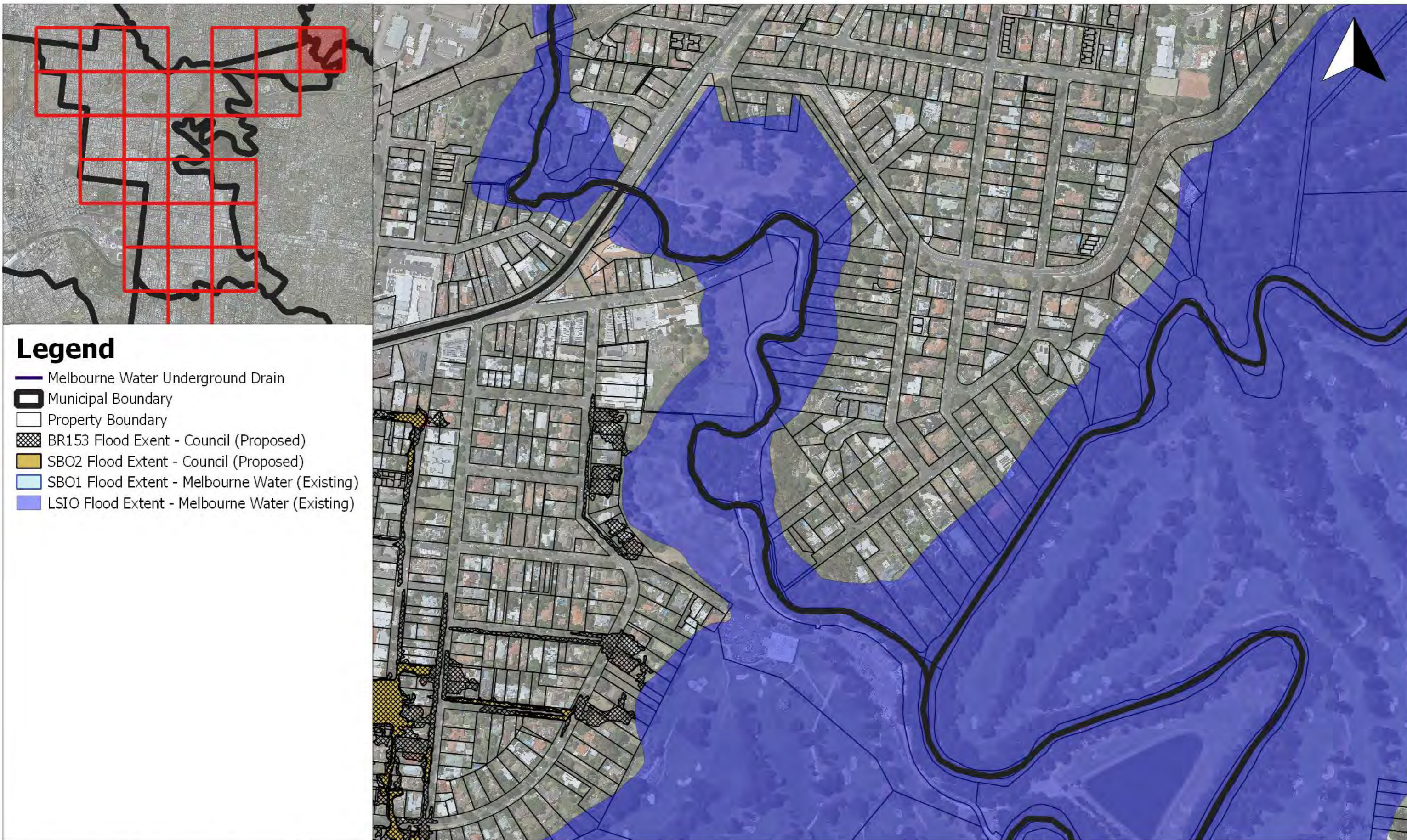
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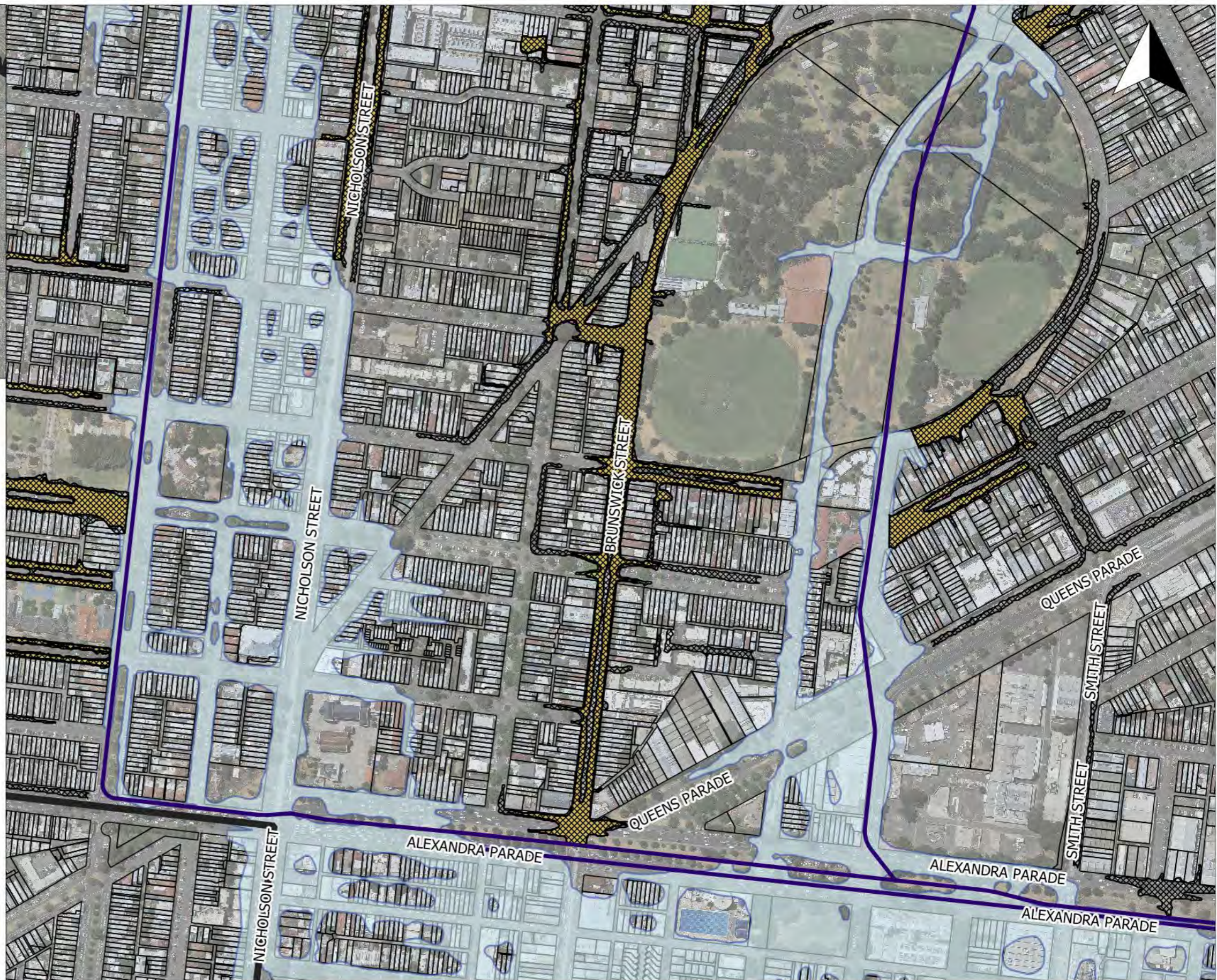
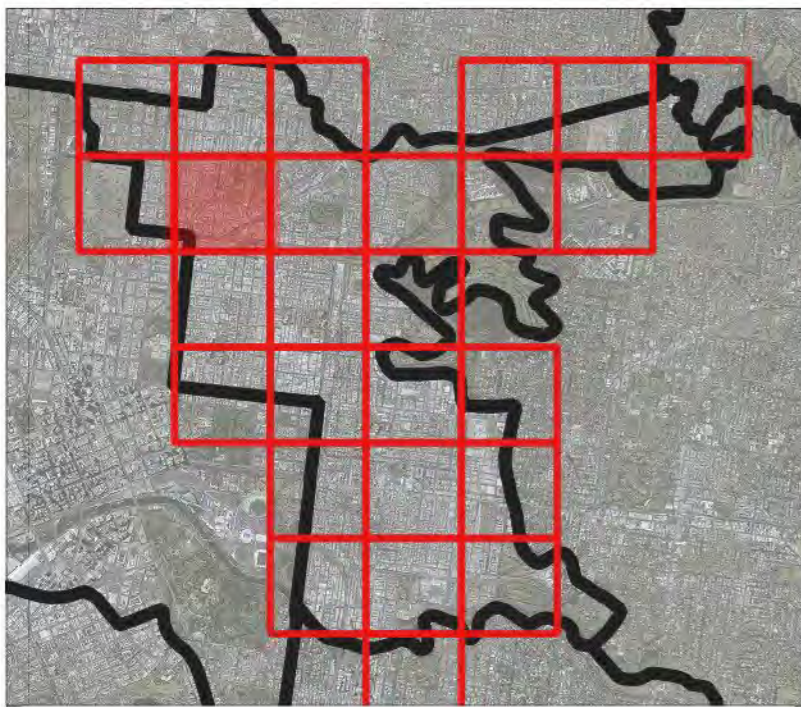
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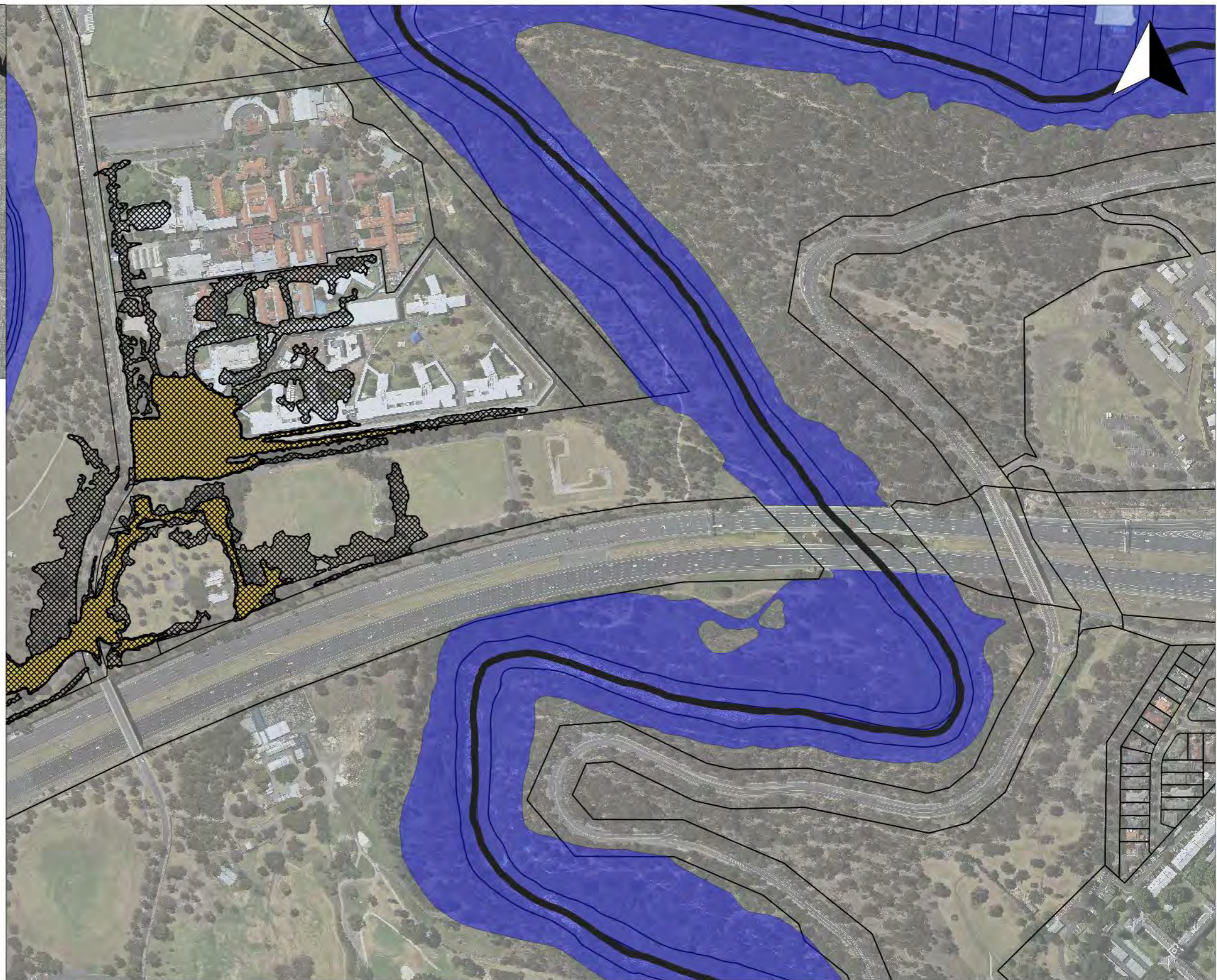
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



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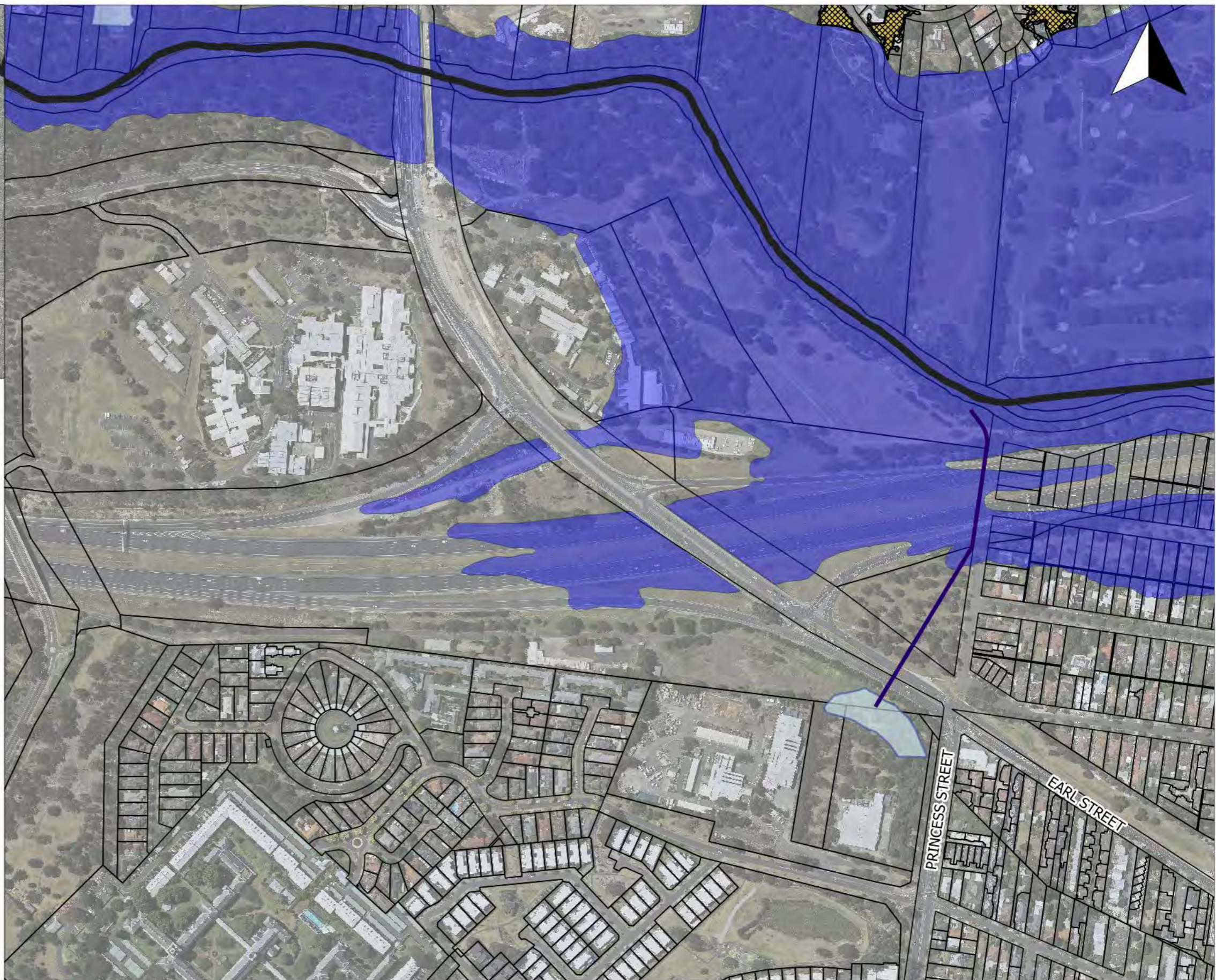
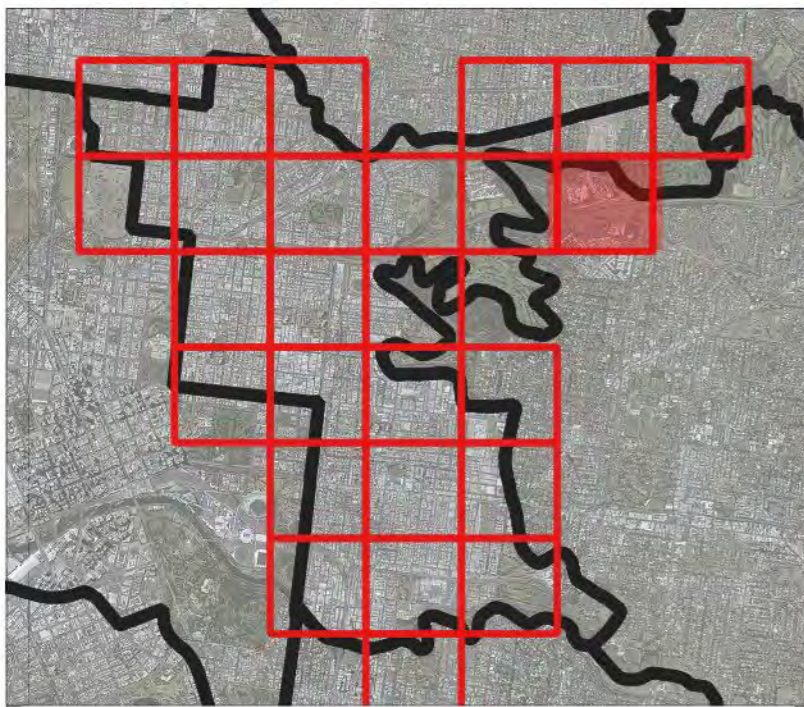
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



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50 0 50 100 150 m



Scale in metres ( 1:4,250 @ A3)

Map Projection: Transverse Mercator  
Horizontal Datum: Geocentric Datum of Australia  
Vertical Datum: Australia Height Datum  
Grid: Map Grid of Australia, Zone 55

### City of Yarra Flood Mapping

### Flood Extent Plan (LSIO, SBO1, SBO2 and BR153)

Job Number: VC2036\_006  
Revision: 1  
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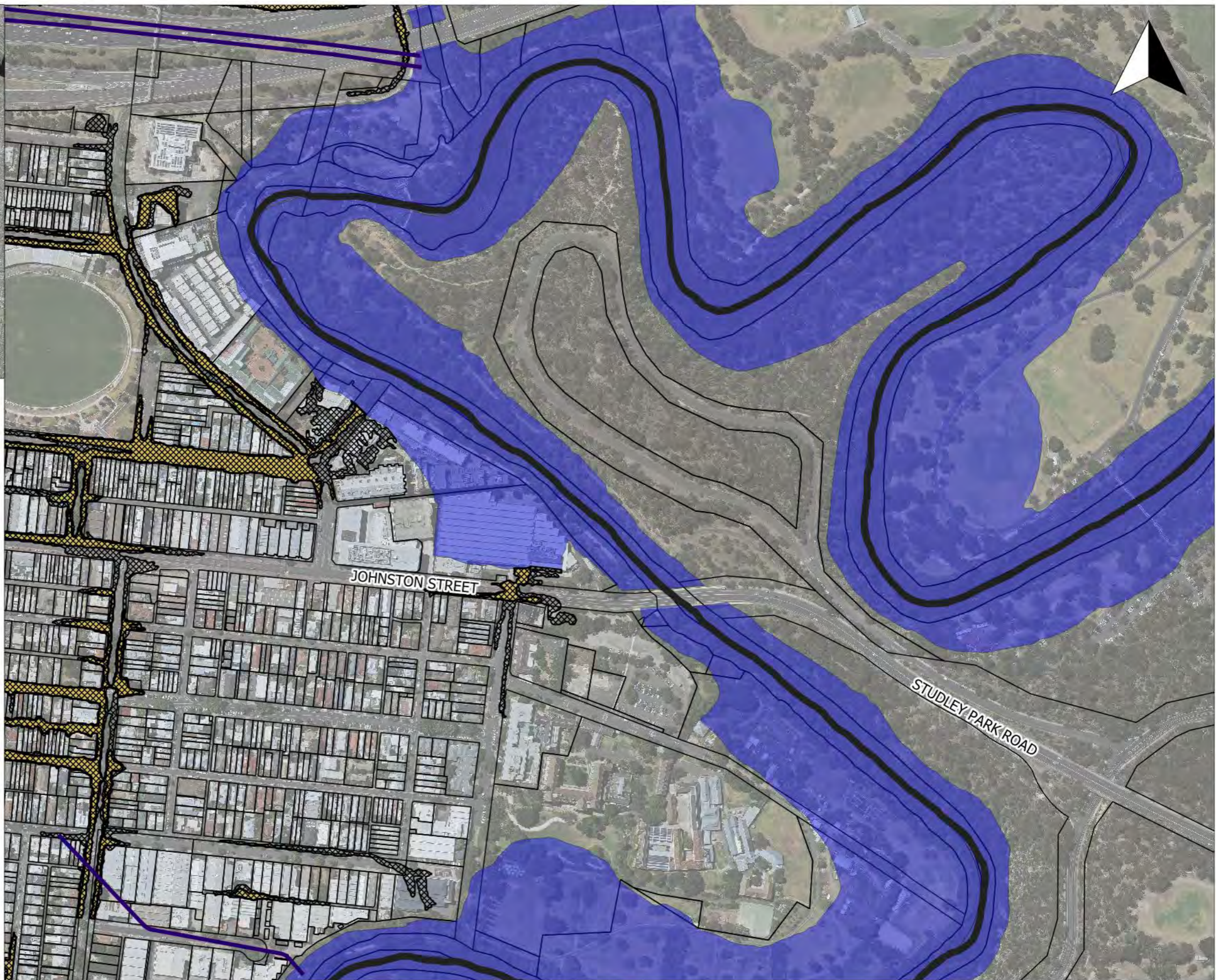
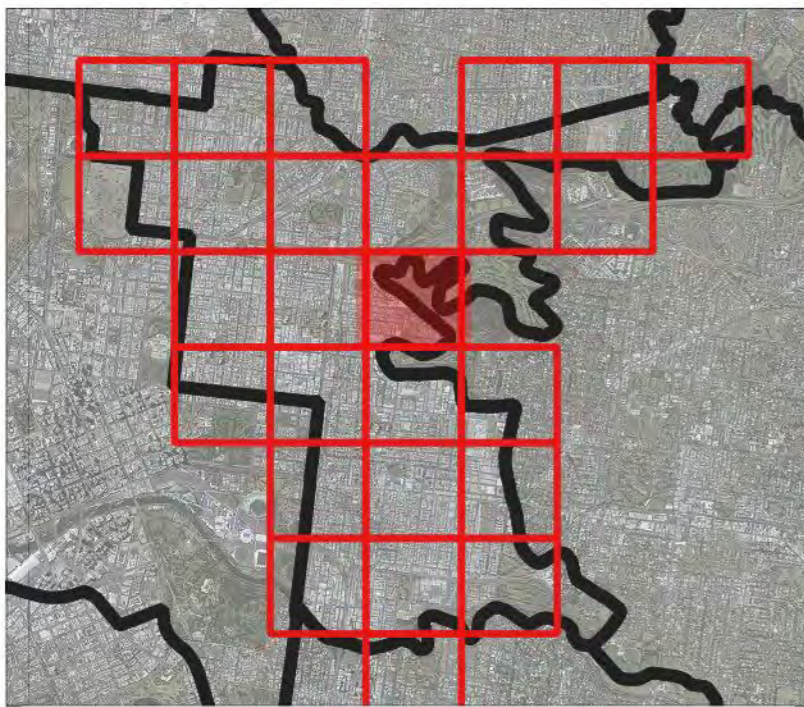
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### City of Yarra Flood Mapping








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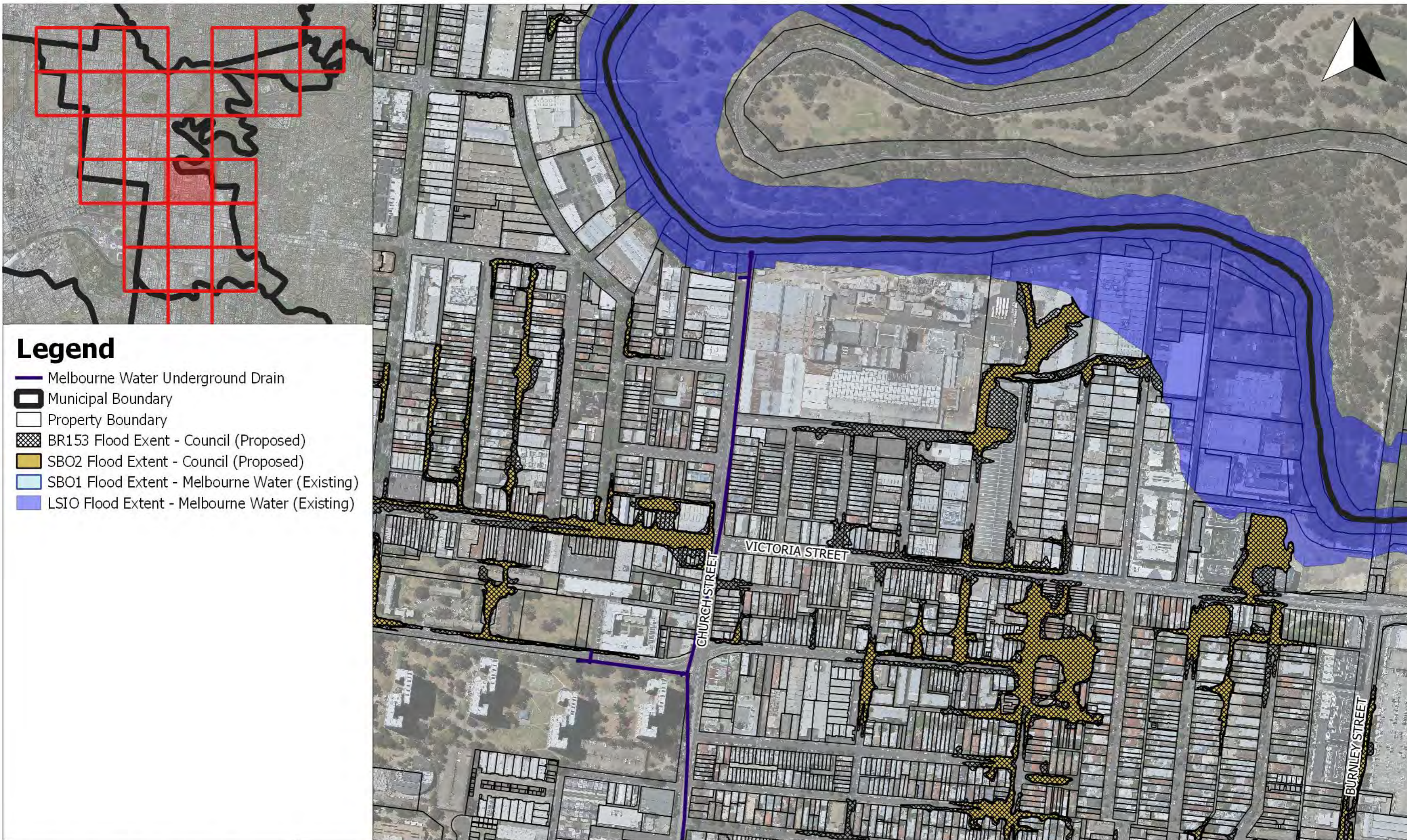
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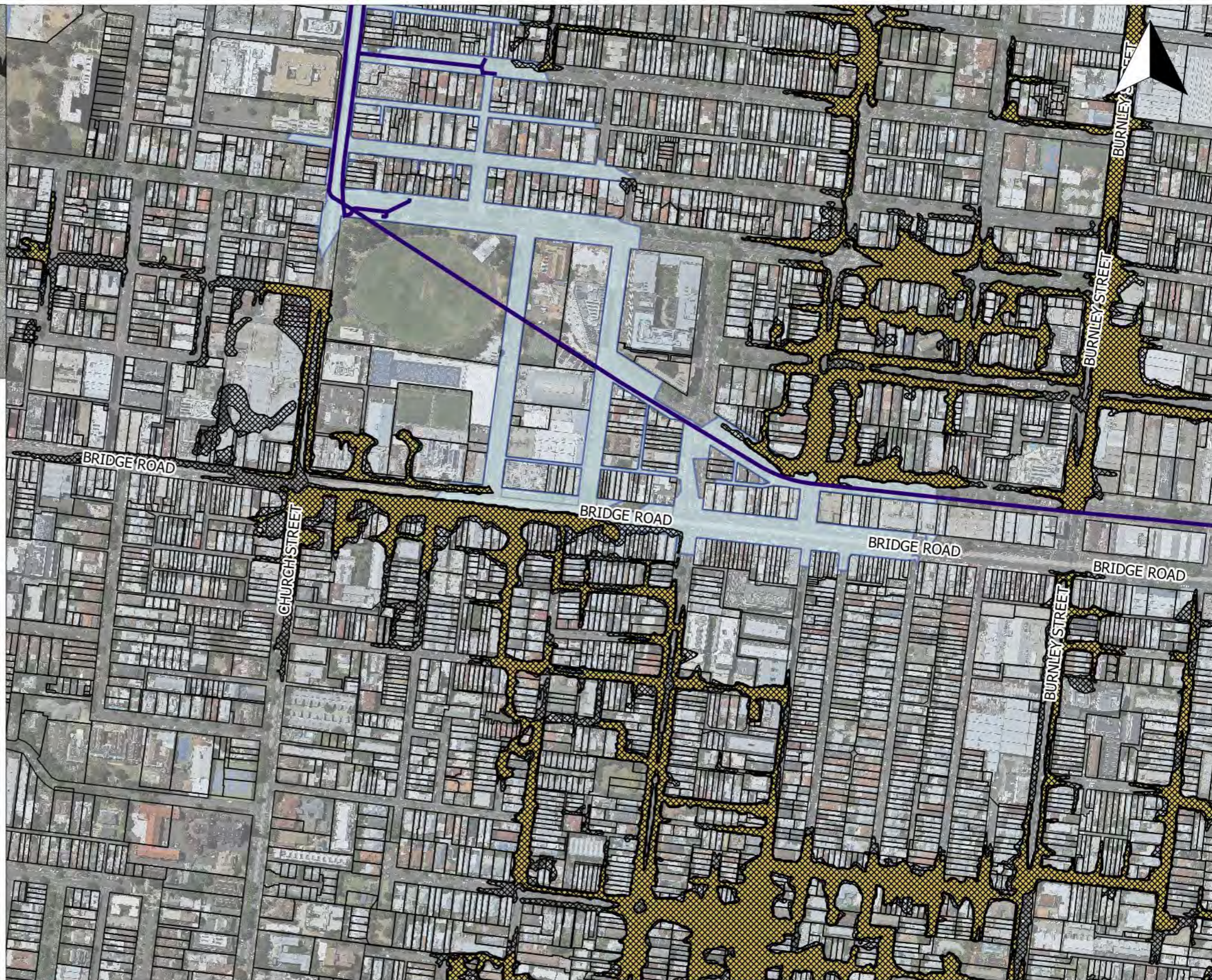
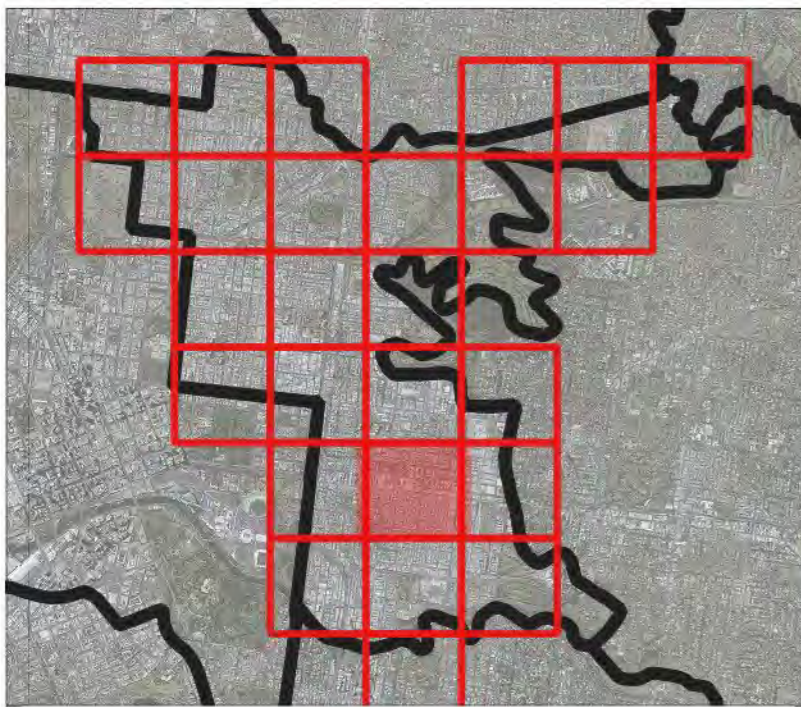
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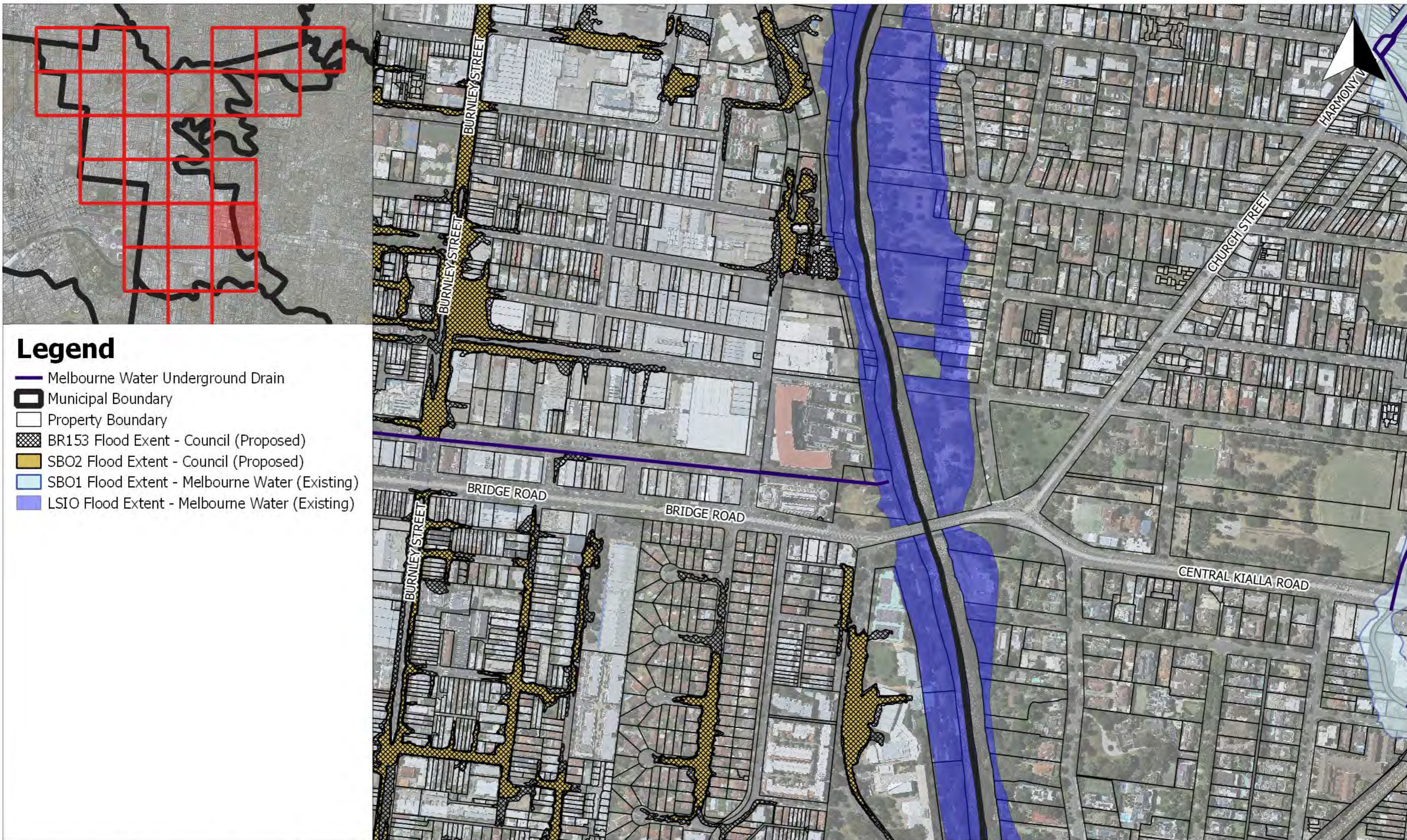
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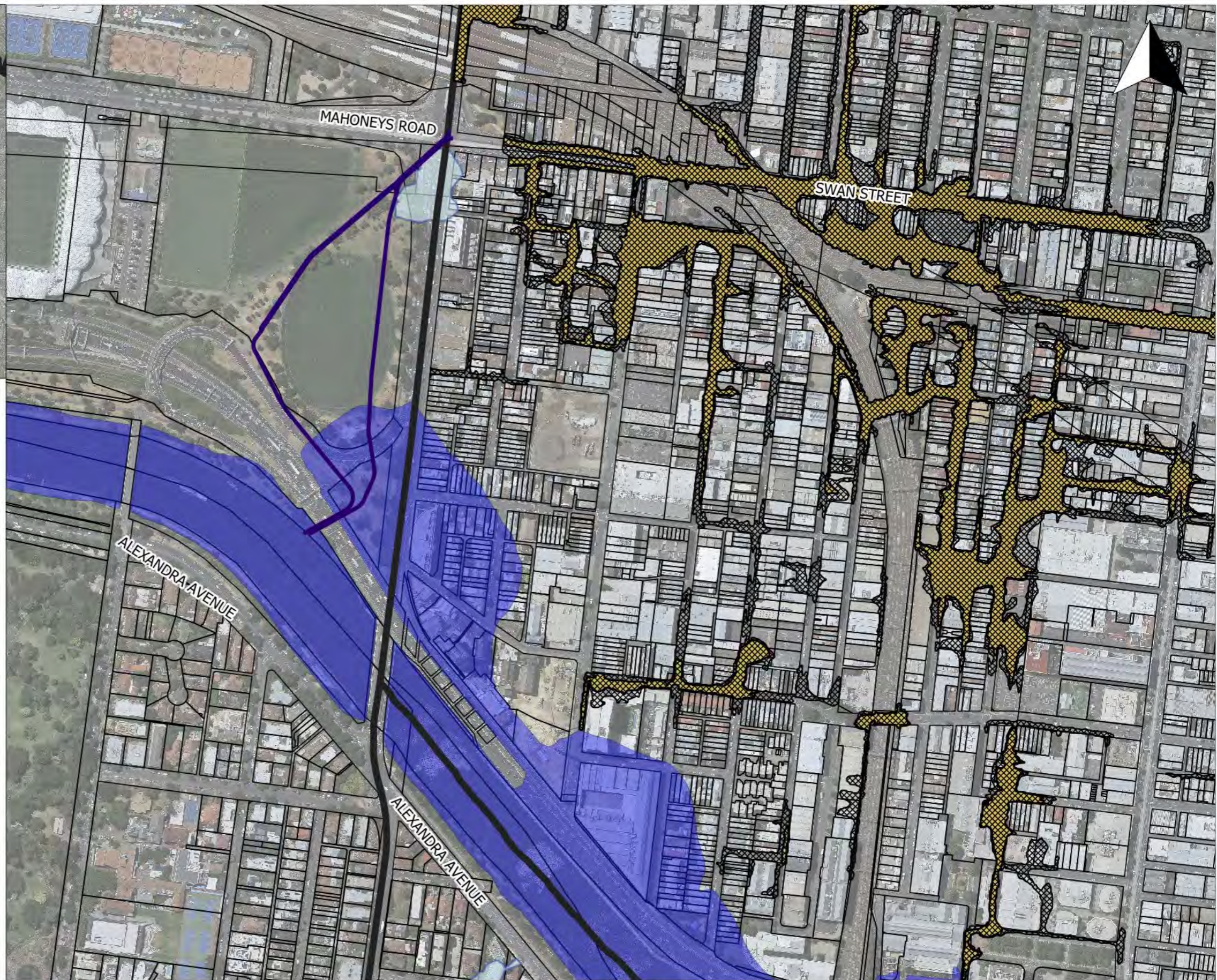
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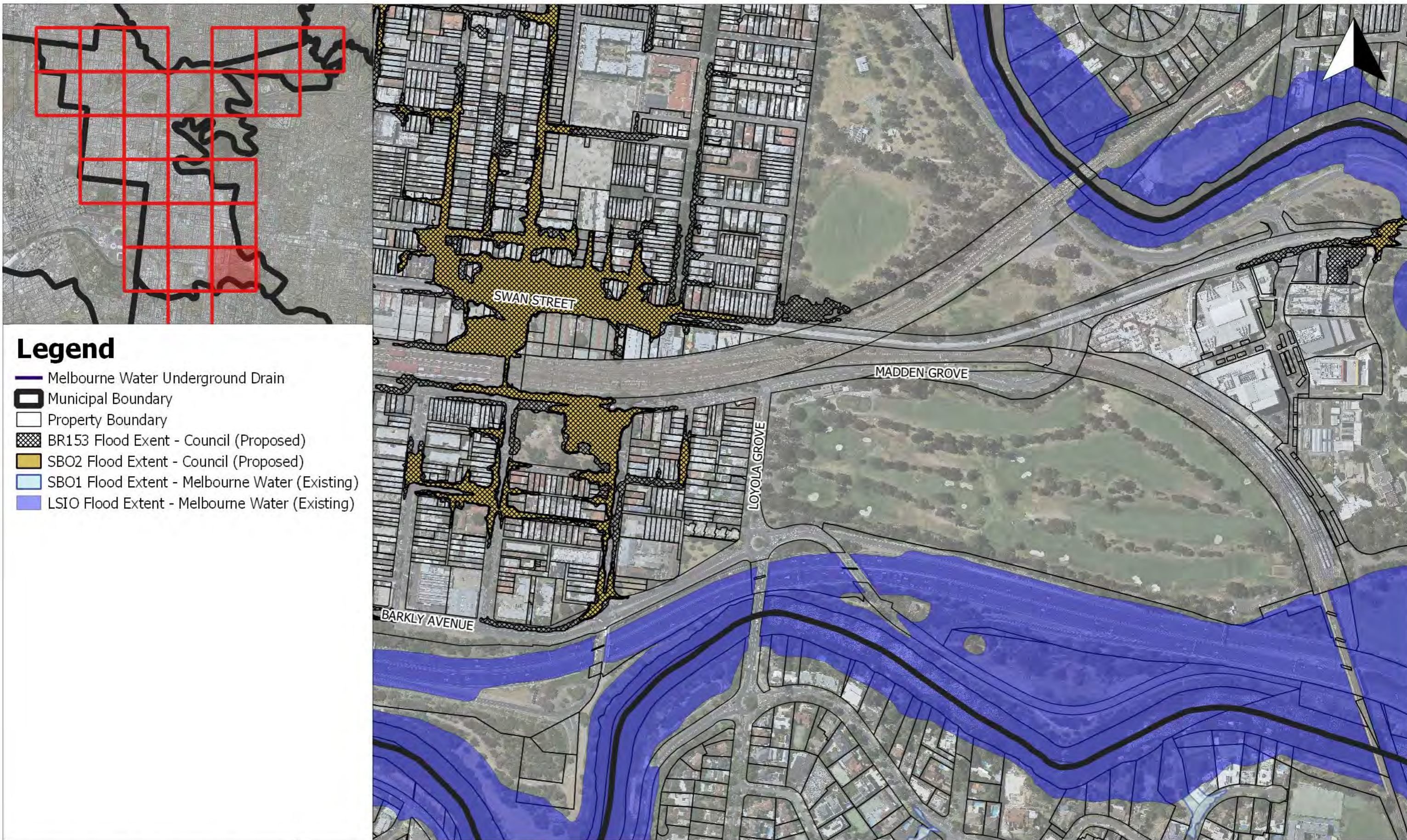
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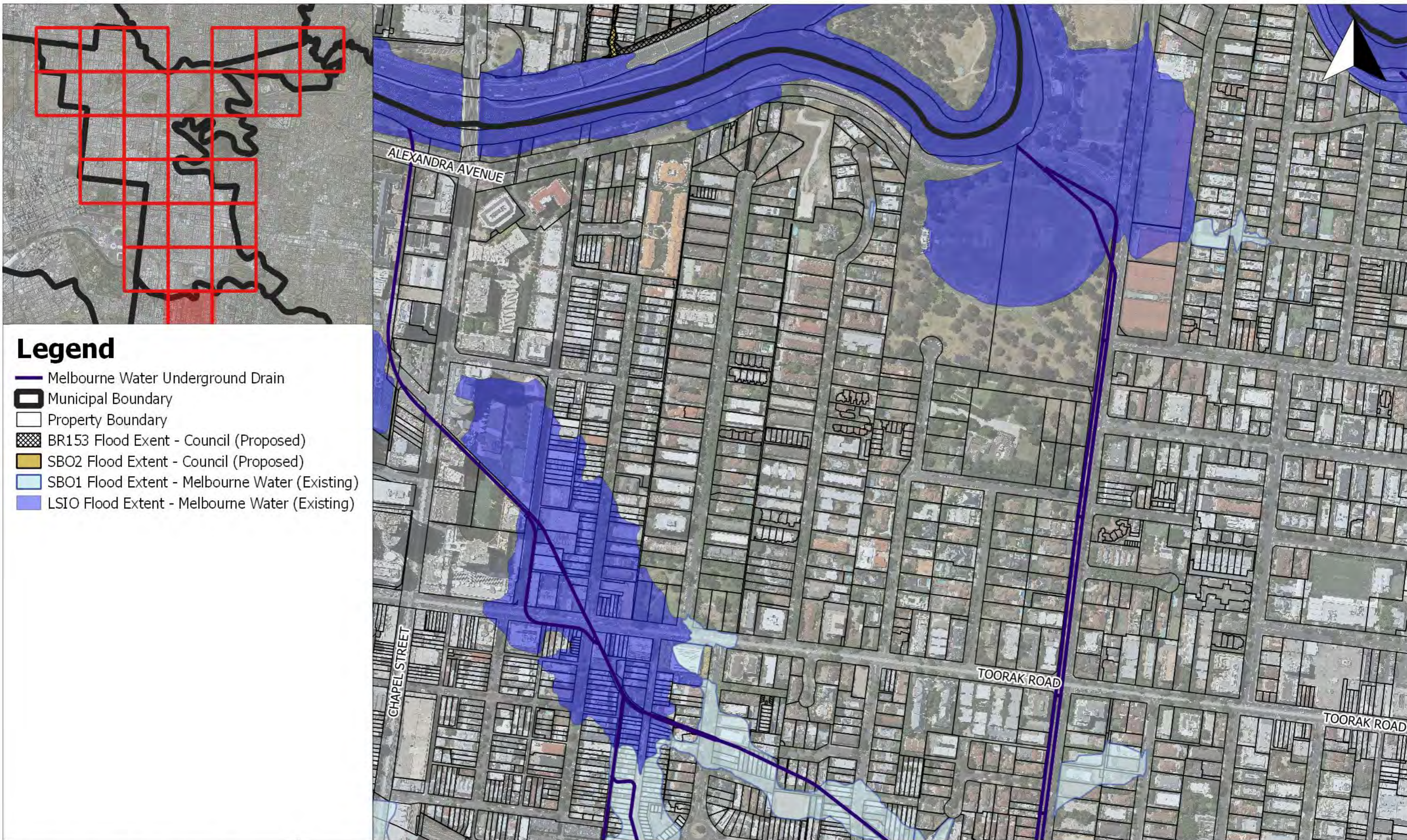
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
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