WATER TECHNOLOGY
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Report

Ipswich City Council Flood Hazard Risk Assessment

Ipswich City Council

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CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Integrating State Planning policy

The State Interest guidance material for *Natural hazards, risk and resilience* provides guidance that must be considered by all local governments when making or amending a local planning instrument. However, it is recognised that *'...local governments need to balance competing state interests and it may mean that it is not possible to address all policies for a particular state interest.'* This guidance material advises how to meet the requirements of the SPP for the Natural hazards, risk and resilience and provides a process of risk identification (policy 1) and risk assessment (policy 2) in order to develop fit-for-purpose measures in a planning scheme (policies 4–6). This is represented in Figure 1-1.

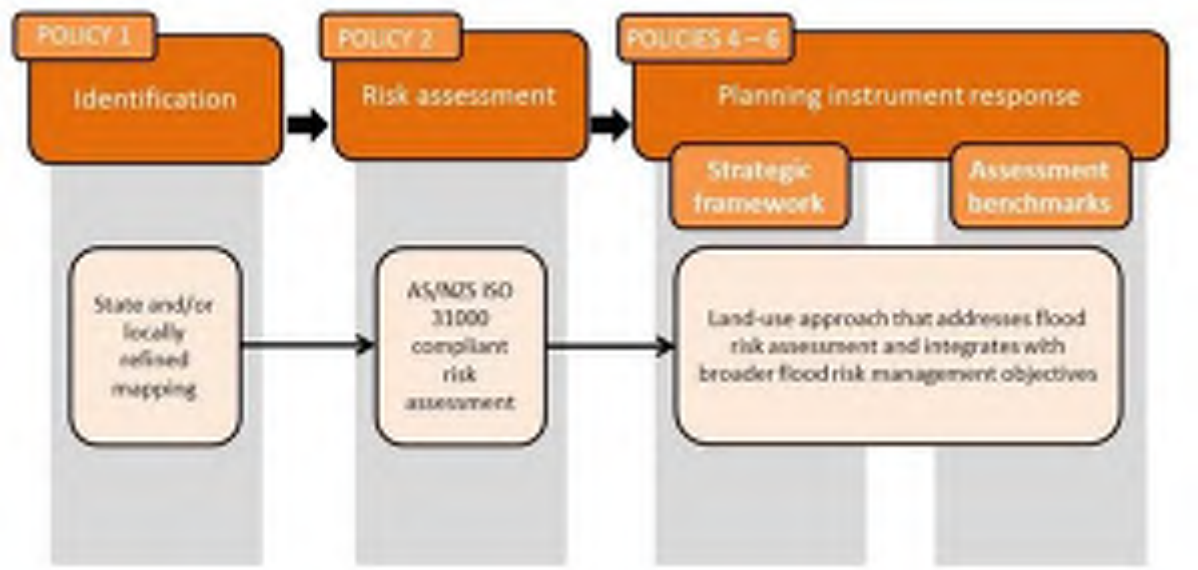


Figure 1-1 Integrating SPP Policies into planning schemes

Land use planning plays a key role in implementing best practice floodplain management and achieving community resilience at a local scale. It is understood that Council, intends to address the SPP and strategically manage floodplain areas for the long-term benefit and safety of people, property, infrastructure, and the environment.

The following key points from the SPP guidance material are noted in the context of this project:

- Identification of LGA-wide flood hazard areas is to be fit-for-purpose (i.e., reflective of level of population, future growth, and floodplain complexity of the areas);
- Flood mapping is to represent the broad spectrum of risk, including events both rarer and more frequent than the defined flood event (DFE) and consider flood behaviour;
- New flood studies produced for the purpose of identifying hazard should incorporate climate change;
- Local governments should prioritise areas for mapping based on growth and development pressures;
- A fit-for-purpose risk assessment is undertaken to identify and achieve an acceptable or tolerable level of risk – at a minimum the assessment should identify the following:
  - Land uses that should not occur in a flood hazard area;

  - The risk criteria (that considers the community's exposure, tolerability, and vulnerability) used to identify a broadly acceptable, tolerable or intolerable level of risk for each land use;
  - Planning provisions used to ensure that the community is not exposed to an intolerable level of risk; and;
  - Hazard and risk information that is available or will be required to achieve the planning provisions;
- Consultation with the community (particularly to identify community tolerance to flood risk); and
- Natural hazards should be reflected in the strategic framework of a planning scheme.

> *Land use planning plays a key role in implementing best practice floodplain management and achieving community resilience at a local scale.*

2 METHODOLOGY

For the Ipswich City Council LGA, a fit-for-purpose methodology for integrating the SPP into the planning scheme has been developed to present a picture of city-wide flood risk based on available data. The objective of the flood risk assessment is to, in accordance with the SPP guidance material:

- Identify flood hazard;
- Consider the community's vulnerability and land use exposure; and
- Evaluate the tolerability of that exposure and evaluate broadly acceptable, tolerable and intolerable levels of risk.

2.1 Identify flood hazard

Council has identified hazard across the LGA through multiple flood studies and mapping products. Through the considerable work undertaken in the IICP program, it is understood that a range of design flood event modelling have been undertaken in the flood studies including a range of available likelihood design events and corresponding depth, velocity and hazard information.

The fit-for-purpose flood study review undertaken for Council as part of the Ipswich City Flood Hazard Risk Assessment project was conducted using the hazard identification and flood risk multiplier analysis associated with the *Current and Future Flood Risk chapter of Ipswich Integrated Catchment Plan*.

No further hazard identification was required for this flood risk assessment.

2.2 The Ipswich Integrated Catchment Plan (IICP)

The IICP has been prepared following the regionally consistent approach established in the Brisbane River Strategic Floodplain Management Plan for catchments of the Bremer River, Brisbane River and the local creeks within the bounds of the Ipswich. The IICP is a non-statutory integrated floodplain management document which assessed and characterised the nature of flood risk across the Ipswich LGA and provides a range of recommendations and actions for how to manage the risk. The IICP was informed by the Ipswich Integrated Catchment Plan – Technical Evidence Report (TER).

This risk assessment uses the analysis undertaken as part of the IICP. This section summarises the key outputs used to inform the exposure analysis of Local Area Frameworks across the Ipswich City LGA.

The vision is that:

"The IICP will deliver a suite of effective, sustainable floodplain management measures that seek to reduce the risk of flooding to Ipswich community using a whole-of-catchment approach that is truly integrated across the whole city."

The IICP identifies six objectives for integrated catchment and flood risk management including:

1. Define and reduce the flood risk, which relates to understanding the flood risk. This objective identifies the flood risk and tolerability (describes whether the flood risk requires mitigation or action to reduce the economic, social or environmental impacts) and establishes the hydraulic risk categorisation and flood risk factors (i.e., flood islands, time to inundation, duration of inundation and economic impacts).

2. Achieve sustainable flood mitigation through physical intervention, which relates to considering flood mitigation. The IICP has adopted a contemporary approach to evaluating flood mitigation options which ensures multiple perspectives have been applied including ensuring:

    a. safety of people is improved and risk to life is reduced

b. stronger more resilient communities are built

c. economic benefits through the reduction in flood damages are provided

d. the mitigation is technically feasible

e. essential infrastructure is protected such as water supply and other critical networks

f. improved water quality and ecosystem health and connectivity

3. Plan for development outcomes that are risk-informed, which relates to minimising flood risk through planning and development controls. It includes identifying highest at-risk areas which are exposed to high hazard and frequent flood events that may be considered intolerable for people, property and most land uses and aligning zoning accordingly.

4. Tolerability of development and/or community tolerability to existing flood risks also depends on how quickly and how long key access roads become flooded. For development to occur in areas where some or all of these flood risk factors cannot be avoided, safe evacuation or safe refuge must be able to be provided and emergency services operations must not be burdened during a flood event.

5. Promote flood-resilient built form, which relate to property specific actions for houses that are the most at risk from hazardous floodwater by adapting the building design, construction and materials so that the property can withstand substantial and multiple inundations of water, for example using wet and dry-proofing methods, house raising and retrofitting with resilient building materials.

a. The IICP references the use of voluntary house purchase programs which can be used in areas susceptible to frequent and severe flooding to mitigate the risk posed to life and property. Due to the associated high cost, they are only implemented when other measures are not suitable for reducing flood risk. In addition, the market value of their property must have decreased to an extent that the owners do not feel they will get a better price on the open market.

6. Enable our community to anticipate, respond and adapt to floods and flooding, which focus on improving the community's flood awareness, flood preparedness, ability to respond to a flood event and tolerability and resilience to enable rapid recovery.

7. Deliver emergency response and recovery decisions that are intelligence based, which focus on emergency management measures including evacuation, flood forecasting, flood classifications, emergency alerts and critical infrastructure (i.e., emergency services stations, evacuation centres, hospitals, power and water supply required during and after a flood).

2.2.1 Land Use Planning

Land use planning and development control represents one of the most cost-effective options for minimising flood risk, especially where developments are designed and situated away from flood risk areas or take appropriate mitigation measures to ensure risk is commensurate with the intended use of the site. This has been undertaken:

- considering current and future land use planning policy settings in Ipswich;
- to align with the State interest policy with due consideration of the SFMP Land Use Planning Guidance Material; and
- undertake a fit-for-purpose risk assessment.

The State interest policy for Natural hazards, risk and resilience provides guidance that must be considered when making or amending a local planning instrument whereas the SFMP provides guidance that specifically deals with integrating the SPP State interest in a regional Brisbane River catchment context. The IICP analysis provided the tools to revise or refine land use planning responses using a local fit-for purpose risk assessment with consideration of local flood risk factors:

- Hydraulic Risk (combination of flood frequency and hazard);

- Vulnerability (special circumstances that introduce further risk through social and economic functions);
- Time to Inundation (an understanding of how long it takes for an area, asset or residence to inundate);
- Duration of Inundation (an understanding of how long an area, asset or residence may be flooded for); and
- Flood Islands (and understanding of whether residents are isolated on low or high flood islands)

The consideration of the different flood risk factors provides an understanding of tolerability to flood risk. In the context of Land Use Planning, the highest HR categories for example, are considered intolerable for people, property and most land uses. Tolerability of development and/or community tolerability to existing flood risks also depends on how quickly and how long key access roads become flooded. Tolerability to risk begins to increase with all of these factors occurring simultaneously. Development in areas where some or all of these flood risk factors cannot be avoided must be able to provide for safe evacuation or safe refuge and must not burden effective emergency services operations during an event.

These flood risk factors have been reviewed in the context of current and future planning scheme and recommendations presented in the next section can be used to inform Council's statutory decision-making process.

In this report, flood risk has been assessed, evaluated and recommendations made for the treatment of risk, aligning with ISO31000 for risk assessments.

2.2.2 Review of current flood risk methods

Review of existing development and planning controls completed in the IICP generally showed an alignment with the key State Interest Policies that apply to the land use planning in Queensland. The following policies are integrated or will be integrated within the Ipswich planning framework:

- Natural hazard areas have been identified, including flood hazard areas;
- A fit-for-purpose risk assessment is undertaken to identify and achieve an acceptable or tolerable level of risk for personal safety and property in natural hazard areas;
- Development in flood hazard areas: (a) avoids the natural hazard; or (b) where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level;
- Development in natural hazard areas: Supports, and does not hinder disaster management capacity and capabilities;
- Development directly, indirectly and cumulatively avoids an increase in the exposure or severity of the natural hazard and the potential for damage on the site or to other properties;
- Avoids risks to public safety and the environment from the location of the storage of hazardous materials and the release of these materials as a result of a natural hazard;
- Development maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard; and,
- Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a natural hazard event.

The draft new planning scheme (Statement of Proposals and draft flood overlay) is considered to demonstrate alignment, for example, with the SPP requirement for a fit-for-purpose risk assessment via risk-based mapping. The risk-based mapping incorporates the SFMP recommended approach of aligning categories of hydraulic risk into a planning scheme overlay.

The Brisbane River SFMP, IICP and LFMP processes are non-statutory resources that support and inform the application of risk-based land use planning instruments.

2.2.3 Hydraulic risk

The IICP was informed by a detailed examination to understand the flood risk for Ipswich and included a consideration of the Hydraulic risk (HR) which maps flood likelihood by Annual Exceedance Probability (AEP) and flood hazard category based on depths and velocities of floodwaters.

Consistent with the Brisbane River Strategic Floodplain Management Plan, HR provided in the Australian Institute of Disaster Resilience (AIDR) Guideline, has been mapped. The IICP adopted the Brisbane River Strategic Floodplain Management Plan five HR categories, but refines the matrix by introducing subcategories based on the hazard level across 10 categories of relative HR:

AEP	LOW HAZARD	MODERATE HAZARD			HIGH HAZARD	
PMF	HR5	HR5	HR5	HR5	HR5	HR5
1 in 2,000	HR5	HR5	HR4	HR4	HR4	HR4
1 in 500	HR5	HR4	HR4	HR3(b)	HR3(c)	HR3(c)
1 in 100	HR4	HR4	HR3(b)	HR2(b)	HR2(c)	HR2(c)
1 in 50	HR4	HR3(b)	HR2(b)	HR2(b)	HR1(c)	HR1(c)
1 in 20	HR3(a)	HR2(b)	HR2(b)	HR1(b)	HR1(c)	HR1(c)
1 in 10	HR2(a)	HR1(b)	HR1(b)	HR1(b)	HR1(c)	HR1(c)

Figure 2-1 IICP HR Matrix

Note: The (a) subcategories represent areas a low hazard risk (i.e. of lesser consequence other than flood damage), the (b) subcategories represent the consequence range where there is risk to vehicles and life, and the (c) subcategories represent the consequence range where there is risk to structures.

Table 2-1 Description of risk tolerability

Risk description	Rationale	Risk profile	Hydraulic risk category
Extreme risk	Frequent flooding Conveyance area Buildings vulnerable to failure and unsafe for vehicles and people	Intolerable	HR1c HR1b
High risk	Unlikely and rare flooding New flow conveyance paths create dangerous conditions Buildings vulnerable to failure	Tolerable	HR2c HR3c
Medium risk	Generally unsafe for vehicles and people Areas still effected by frequent and likely flood events	Tolerable	HR2b HR3b

Risk description	Rationale	Risk profile	Hydraulic risk category
Low risk	Generally safe infrequent and likely flood events High hazard associated with unlikely and rare events	Acceptable	HR2a HR3a HR4
Very low risk	Balance of floodplain Area potentially affected by extremely rare flooding that may not require mitigation	Acceptable	HR5

With regards to land use planning, the IICP provides the following responses for consideration:

Table 2-2 - Potential land use planning HR responses

Flood risk	Potential land use planning responses
Hydraulic risk	Restrictions on future development intensity Ensuring flood water is not impeded by built structures; and controls that Support building critical infrastructure (e.g. hospitals, motorways) in areas that have lowest hydraulic risk

2.2.4 Flood risk factors that multiply or increase the severity of flood risk

A number of flood risk factors can increase the severity of the flood risk (referred to as flood risk multipliers) including:

- **time to inundation** – how many hours it takes water to reach a property from a flood source. If it takes less than 6 hours for floodwaters to reach a property, then residents have a short time to react;
- **duration of inundation** – how many hours properties will be affected by flood water. If properties are affected for more than 36 hours, residents may need to be self-sufficient for an extended time if sheltering at home;
- **flood islands (low and high)** – identify areas that are surrounded by flood water and at risk of isolation;
- **vulnerability (evacuation capacity)** – communities which have been mapped based on particular indicators known to increase risk during flood events; and
- **future flood risk (or filling sensitivity)** – areas highly sensitive to filling and development activities within the floodplain
- **economic impact** – end user impact and the ability to rebuild, insure etc

With regards to land use planning, the fit-for-purpose risk assessment considered the following.

Table 2-3 Potential land use planning flood risk multiplier responses

Flood risk multiplier	Potential land use planning responses
Time to inundation	restrictions on future development intensity avoid allowing land uses that are vulnerable or difficult to evacuate consideration of specific requirements, such as Flood Emergency Management Plans, to demonstrate how occupants are able get to higher ground in times of flooding and how the land use functions in a flood event

Flood risk multiplier	Potential land use planning responses
Duration of inundation	restrictions on intensity of accommodation or residential land uses avoiding allowing land uses that are vulnerable or difficult to evacuate consideration of specific requirements, such as the use of flood resilient building materials that reduce economic damages and enable residents to safely return to their homes faster
Flood islands	avoiding the creation of new flood islands in future development by having regard to flood events up to the Probable Maximum Flood restrictions in increasing the density of existing (brownfield) development on low flood islands restrictions on new development (greenfield) on flood islands avoid vulnerable, accommodation and residential land uses on flood islands consideration of specific requirements such as sheltering in place strategies
Vulnerability (evacuation capacity)	long term infrastructure upgrades to ensure critical connections to emergency services and community consideration of specific requirements to ensure access/egress to higher ground during flood events
Future flood risk	make sure that areas that allow floodwater to flow are not developed in a way that creates ponding or blocks floodwater ensure that filling activities do not worsen the flow of floodwater or flood storage in an area assess impacts of development on flood events beyond the traditional 'defined flood event'

2.2.4.1 Note on vulnerability assessment

The vulnerability of the community and built environment assets to flood hazard is related to its exposure to the hazard, its sensitivity to that exposure, and the ability of the asset or land use to be modified or adapted to manage this exposure. Determining the vulnerability of the community will also allow Council to prioritise land use planning policy and responses. Specifically, to identify risk across the LGA, the approach has been undertaken is summarised in Figure 2-2.

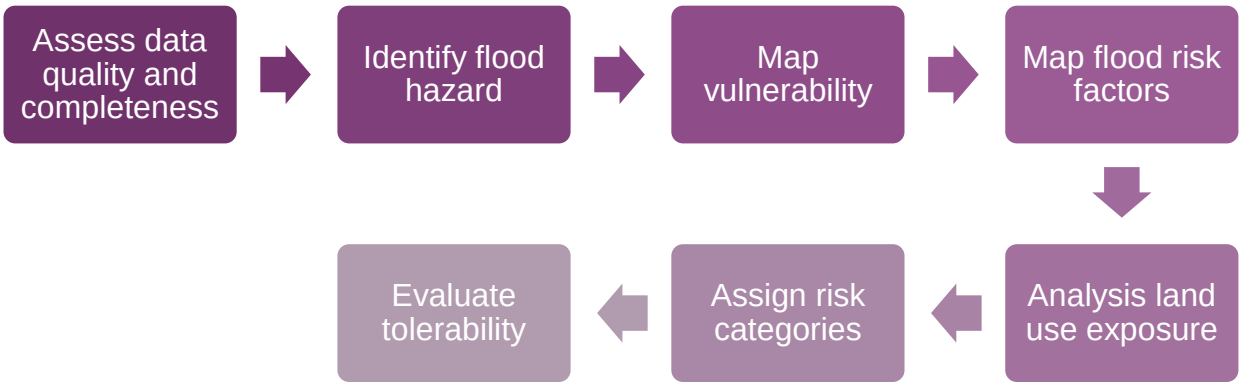


Figure 2-2 Approach to identify risk in Ipswich City Council

2.2.5 Taking a risk-based planning approach

The IICP provides that a new risk informed flood hazard overlay will be developed to ensure that the level of flood exposure on new development is appropriate to the level of flood risk.

This will also inform the overarching strategic location of land uses so that land uses are located in areas commensurate with the level of flood risk. The HR categories provided by the IICP will inform the development of categories of hazard for the new flood overlay.

The risk-based planning approach will ensure that planning and development aligns with Council's other core functions, including emergency management and flood risk mitigation ensuring an integrated catchment and floodplain management approach is undertaken.

2.2.6 The IICP land use planning recommendations

The following land use planning recommendations were identified within the IICP and have been considered in the delivery of the fit-for-purpose risk assessment. There are further IICP Recommendations pulled from the IICP and contextualised for the flood risk assessment in Ipswich available in Appendix E:

- LUP1 Apply a consistent methodology to the identification of hazard categories for the purposes of the draft new flood hazard overlay
- LUP2 Extend any development controls for residential uses to the HR4 category to include the 1 in 500 year H3 hazard category
- LUP4 Develop and include a city-wide overland flow path assessment to allow risk-based assessment of this type of flood risk
- LUP5 Avoid any intensification of development in areas mapped in HR1c and HR1b
- LUP6 Continue the existing requirements in the current planning scheme that promote built form and resilient building materials as an acceptable mitigation response such as building on stilts, or with wet / dry proofing on ground floor, but may consider revising trigger areas based on lower risk areas such as HR2a, HR3a, HR4 and HR5
- LUP7 Include requirements for easements in greenfield areas up to the Defined Flood Event (DFE)
- LUP8 Include requirements for a Flood Risk and Emergency Plan (FEMP) for non-residential uses in locations where TTI is <6 hours and where DFI is >36 hours
- LUP9 Include requirements for responses such as FEMPs linked to new development in locations subject to flood islands
- LUP10 Include development control measures that may be applied to the development assessment process of vulnerable uses below the Probable Maximum Flood (PMF)
- LUP11 Provide a definition of vulnerable uses in the new Ipswich Planning Scheme
- LUP12 Avoid vulnerable uses and non-intensification of residential uses in locations where TTI is <6 hours and DFI is >36 hours, or locations subject to flood islands. In areas of low hazard built form and resilient building materials should be considered as an acceptable mitigation response
- Consider the following changes in draft planning scheme:
- LUP13 Request a Flood Risk Assessment
- LUP14 Adding a provision for commercial, industrial and other non-residential uses to avoid increasing the concentration of people in areas in HR1c and HR1b
- LUP15 For residential uses removing provision relating to a flood depth of no more than 800mm
- LUP16 Minimum clearance for the construction of basements and undercrofts

- LUP18 Preserve pockets of flood storage in the catchment to avoid future flood risk impacts in areas where HR categories and flood levels may increase as a result of filling or due to development activity
- LUP19 Continue provisions that maintain flood storage capacity and do not create impacts on sites upstream or downstream– this is normally a request to provide hydraulic and hydrology report demonstrating compliance.

2.3 ISO 31000 compliant risk assessment

2.3.1 Background

Risk is defined as a function of probability and consequences at a given point in space and time. Best practice consequence assessments consider economic damages to the built environment, the most sophisticated version of this model is given by stage-damage curves. These provide the damage that the asset is expected to incur in response to a range of inundation depths. The use of stage damage curves is dependent on a range of likelihood events to provide an average annual damage and an estimate of economic consequence that informs risk across the floodplain.

Because of previous work on the IICP including economic damage assessment, this risk assessment streamlines several elements of the SPP risk assessment process. It is noted the SFMP and SPP guidance provide a framework of 14 principles to shape the risk assessment, which have been summarised into a six (6) stage process below – the sixth stage being development of local policy response (Phase 3 of this project).

Figure 2-3 The overall six-stage approach undertaken to deliver a SPP Compliant Risk Assessment

Building on the Brisbane River SFMP Potential Hydraulic Risk (PHR) matrix and the hydraulic risk categories established in the IICP, the risk assessment is aligned with international risk management standard ISO31000 and provide an analysis of the existing and future flood risk across the floodplain.

It is noted that the Ipswich Integrated Catchment Plan has undertaken an assessment of flood risk including multiple risk multipliers and a vulnerability assessment – the outputs have been used to inform this flood risk assessment approach.

2.3.2 Risk management principles

The flood risk management principles contained in the fit-for-purpose risk assessment have been considered in conjunction with international, national and state best practice floodplain management and risk management, specifically:

- ISO31000: International Standard for Risk Management (SAI Global, 2018)
- Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia (Commonwealth of Australia, 2017)
- Australian Rainfall and Runoff (Commonwealth of Australia, 2019)
- National emergency risk assessment guidelines (NERAG) (Commonwealth of Australia, 2020)
- State Planning Policy for Natural Hazards, Risk and Resilience – Flood (State of Queensland, 2017)
- Queensland Emergency Risk Management Framework (State of Queensland, 2018)

Figure 2-4 Risk Assessment Framework (QFES, 2018)

In line with best practice this report will:

- Undertake a flood risk assessment as a formal means of identifying and managing the existing, future and residual risks of flooding.
- Be completed by a suitably qualified professional consultant in accordance with the framework outlined in ISO31000:2018 Risk management.
- Aim to ensure that risks, including safety, environmental, social and economic associated with the proposed use are compatible with the flood hazard and level of flood immunity and the risk to people is minimised.

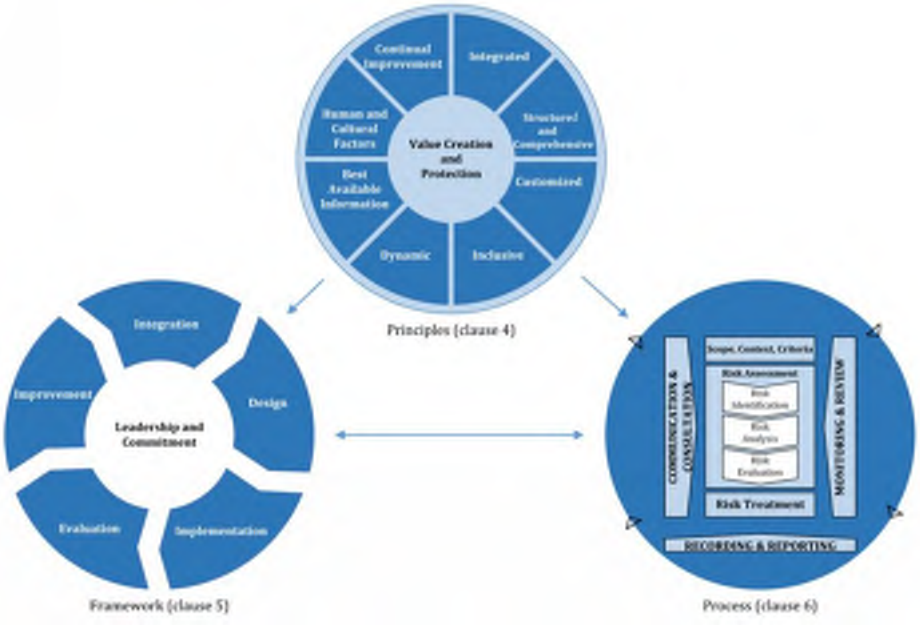


Figure 2-5 Risk assessment guidelines (extracted from ISO31000:2018)

2.3.3 Aim of risk assessment

The key aim of the flood risk assessment will be to profile all zoned land across the Ipswich City LGA, based on the risk assessment, identifying those areas of the floodplain that can be developed with uses:

- compatible with known flood hazards,
- tolerable to known flood hazards,
- intolerable with known land uses.

2.3.4 Spatial context

The Ipswich City LGA has been divided into thirty Local Area Frameworks (LAFs) based on geographically identifiable communities of interest (Figure 2-6). For each LAF an analysis of flood risk exposure has been undertaken to inform the development of land use planning responses in the context of mitigating current and future flood risk. Significant constraints on development will be identified including the analysis of the IICP into Hydraulic Risk and other flood risk multipliers.

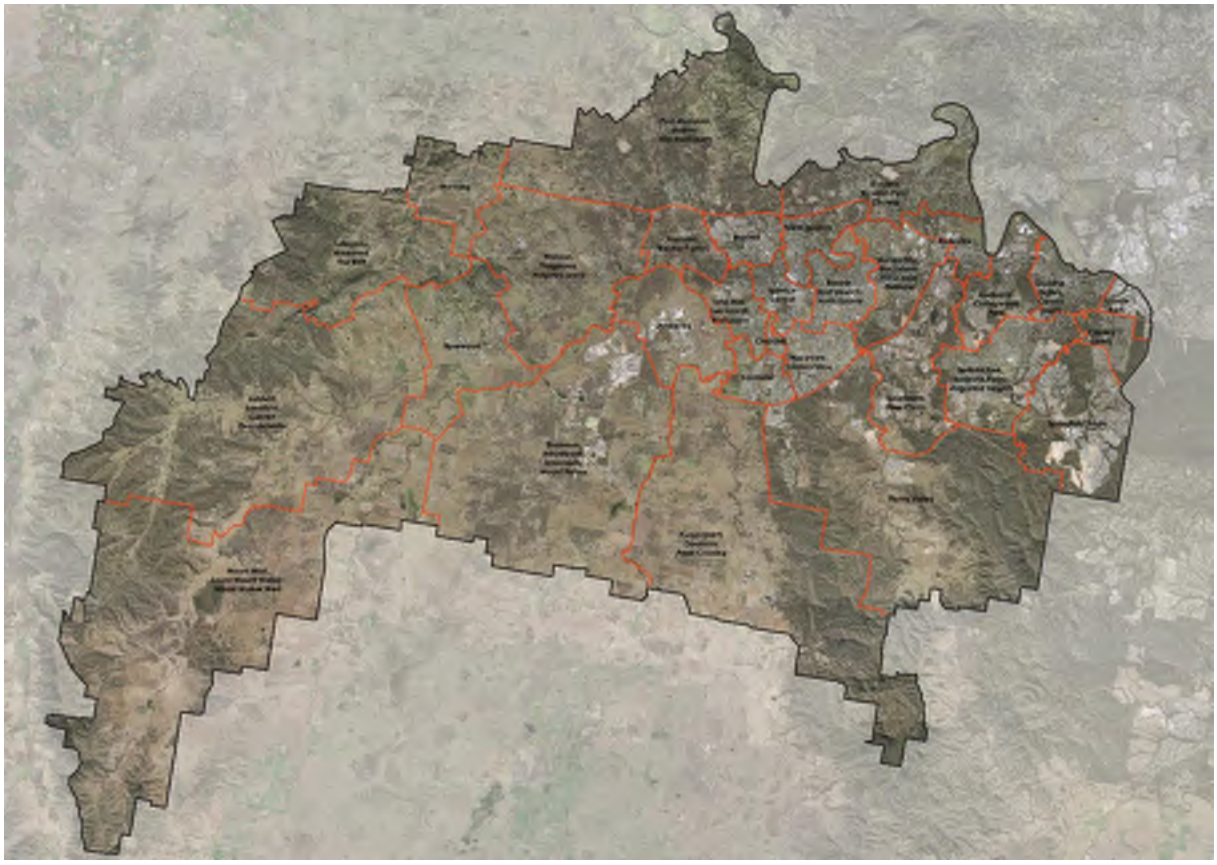


Figure 2-6 Ipswich Local Area Frameworks

3 RESULTS

Understanding the multi-faceted nature of vulnerability and exposure is a prerequisite for determining how weather and climate events contribute to the occurrence of disasters, and for designing and implementing effective risk management strategies (Cardona et al. 2012). Therefore, it is important to not only understand exposure of land use and services but also identify the community's vulnerability and exposure to flooding hazards. This section explores the distribution of flood risk across the Ipswich City LGA.

Using the Local Area Framework (LAFs) spatial areas provided by Council, the following section provides an assessment of the flood risk exposure used to inform local planning policy responses and recommended approaches for each LAF. This analysis includes localised issues and analysis the basis of the risk assessment.

Flood Risk Mapping is presented as part of this analysis as follows:

- Appendix A – Hydraulic Risk by LAF
- Appendix B – Flood Islands by LAF
- Appendix C – Time to Inundation by LAF
- Appendix D – Duration of Inundation by LAF

3.1 Exposure overview

A spatial analysis of the land use zoning, community vulnerability and flood information reveals the following exposure across the Ipswich City LGA. The resultant mapping is to be used for decision making purposes only with specific regard to identifying land use responses that mitigate the intolerable and tolerable risks of the risk assessment and integrates with broader floodplain management objectives.

An analysis of land use risk exposure based upon broad land use activity is shown in Table 3-1, these Local Area Frameworks represent the top 12 by exposure residential zoned property to HR1c, the highest risk category. The data shown is the percentage of residential zone property (by area) within each risk category by Local Area Framework.

- As shown, there is a concentration of residential lots exposed to HR1c in Churchill, North Ipswich and Ipswich Central. Camira has high exposure to the high hazard category HR3c (17%), And Booval, East Ipswich and North Booval has 13% of residential zoned property exposed HR3b.
- In Churchill 94% of Large lot Residential is exposed to HR1c, 23% of Low density residential and 18% of Medium density residential area is exposed to HR1c, the highest risk category.
- In North Ipswich 34% of Large lot Residential and 3% of Low density residential is exposed to HR1c, whereas 18% of CBD High density residential area is exposed to HR2c.
- In Ipswich Central 65% of Large lot Residential is exposed to HR1c, 11% of Low density residential whereas 46% of Medium density residential area is exposed to HR3c.

Table 3-1 Exposure of Residential Uses by Local Area Framework

LAF	HR1c %	HR1b %	HR2c %	HR2b %	HR3c %	HR3b %	HR2a %	HR3a %	HR4 %	HR5 %
Churchill	24%	0%	4%	3%	0%	8%	0%	6%	11%	23%
North Ipswich	13%	0%	2%	3%	0%	10%	0%	8%	8%	22%
Ipswich Central	11%	1%	3%	3%	7%	11%	2%	4%	11%	28%
Karalee, Barellan Point, Chuwar	8%	0%	2%	2%	0%	8%	0%	5%	11%	34%
One Mile, Leichhardt, Wulkuraka	6%	0%	3%	3%	0%	8%	0%	5%	9%	25%
Booval, East Ipswich, North Booval	5%	2%	2%	4%	4%	13%	0%	6%	7%	20%
Goodna, Gailes, Camira (part)	4%	1%	1%	5%	3%	7%	0%	3%	6%	28%
Bundamba, Blackstone, Ebbw Vale, Dinmore	4%	1%	1%	2%	3%	4%	1%	2%	6%	31%
Camira (part)	3%	3%	1%	1%	17%	1%	1%	0%	5%	18%
Brassall	3%	1%	3%	1%	6%	5%	1%	1%	8%	22%
Riverview	3%	0%	3%	2%	0%	10%	0%	2%	16%	41%
Marburg	2%	2%	0%	1%	2%	0%	1%	0%	2%	4%

Table 3-2 Breakdown on Top 3 LAF Exposure by Residential Use Type

LAF – Residential Uses	Sum of HR1c%	Sum of HR1b %	Sum of HR2c%	Sum of HR2b%	Sum of HR3c%	Sum of HR3b%
Churchill						
Large Lot Residential	94%	0%	0%	1%	0%	0%
Residential Low Density	23%	0%	3%	5%	0%	9%
Residential Medium Density	18%	0%	6%	0%	0%	4%
North Ipswich						
Large Lot Residential	34%	0%	2%	6%	0%	13%
Residential Low Density	3%	0%	2%	2%	0%	9%
CBD Residential High Density	0%	0%	18%	0%	0%	13%
Ipswich Central						
Large Lot Residential	65%	0%	0%	7%	0%	12%
Residential Low Density	11%	0%	4%	4%	1%	15%
CBD Residential High Density	1%	1%	5%	1%	4%	7%
Residential Medium Density	0%	4%	0%	3%	46%	0%

3.2 Local Area Framework exposure analysis

A spatial analysis of the land use zoning by total area (square meter) exposed has been undertaken for each Local Area Framework across the Ipswich City LGA. The tables and flood risk narrative presented in this section provide a context of the extent of exposure to inform specific area-specific land use responses to mitigate the intolerable risks.

3.2.1 Area 1 – Goodna, Gailes and Camira (part)

Dual sources of flooding are known to impact the area. Flood inundation in the lower areas is due to backwater flooding from the Brisbane River. In the upper areas, creek flooding is the dominant flood source. At risk properties include low/medium density residential and major centre land zoning. Six low flood islands and a high flood island were identified in this area in the ICP. A priority evacuation area of low and high density residential areas, centred around Bertha St has also been identified.

Table 3-3 Exposure of zone by area (square metres) – Goodna Gailes and Camira (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	-	-	-	-	-	-	-	-	-	5,306
Character Housing Mixed Density	-	-	-	-	-	408	-	-	5,102	29,049
Character Mixed Use	-	-	290	215	-	1,081	-	167	1,242	17,760
Conservation	-	-	441	-	-	4,365	-	-	8,868	33,600
Large Lot Residential	95,663	19,546	10,625	72,396	10,098	63,519	248	40,002	42,234	129,943
Limited Development (Constrained)	38,611	15,243	-	11,762	-	8,543	-	14,671	-	-
Local Business and Industry	45,158	-	13,014	26,334	-	82,982	-	44,594	-	-
Local Business and Industry Buffer	147,142	302	9,691	28,887	-	65,732	-	32,963	558	-
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	-
Major Centres	33,006	4,155	7,244	39,628	2,767	51,660	-	43,002	23,435	63,007
Recreation	539,052	49,718	12,886	125,898	20,338	150,285	2,001	178,233	50,476	142,523
Residential Low Density	59,247	24,138	36,861	83,867	102,497	191,128	8,543	55,583	223,329	1,072,402
Residential Medium Density	8,934	1,096	979	28,835	7,559	11,451	2,458	11,012	14,876	81,178
Special Opportunity	96,360	-	-	35,132	-	13,052	-	16,505	2,707	8,097
Special Uses	25,033	1,367	24,629	30,541	223	79,513	-	14,601	75,783	72,776
Grand Total	1,088,206	115,565	116,660	483,496	143,482	723,720	13,250	451,333	448,610	1,655,641

3.2.2 Area 2 – Carole Park

The regional industrial and business uses in the local area are exposed to lower hazard inundation from Sandy Creek. The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs. Average flood depths are generally low, with an average depth of 0.3m.

Table 3-4 Exposure of zone by area (square metres) – Carole Park

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Carole Park	63,015	135,390	13,697	24,476	400,848	618	35,883	889	162,104	666,531
Recreation	-	-	-	-	-	-	-	-	-	-
Regional Business and Industry - Low Impact	-	19,690	982	2,929	152,129	-	11,528	-	38,952	320,163
Regional Business and Industry - Medium Impact	-	31,981	7,289	12,021	220,565	-	18,771	-	82,398	251,201
Regional Business and Industry Buffer	63,015	83,419	5,375	9,501	17,422	618	4,425	889	38,497	87,921
Special Uses	-	300	50	25	10,731	-	1,159	-	2,258	7,245
Grand Total	63,015	135,390	13,697	24,476	400,848	618	35,883	889	162,104	666,531

3.2.3 Area 3 – Camira (part)

The local area is located in the upper Sandy Creek and Woogaroo Creek catchments. Lower hazard inundation from Sandy Creek includes areas of residential immediately adjoining the watercourse. The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs.

Table 3-5 Exposure of zone by area (square metres) – Camira (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Large Lot Residential	123,792	43,606	24,987	22,647	14,144	39,655	746	11,239	103,259	474,966
Limited Development (Constrained)	15,431	40	-	40	-	-	-	1,206	-	-
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	6
Recreation	71,668	74,356	6,575	12,203	58,909	10,610	4,132	5,555	28,349	49,818
Regional Business and Industry Buffer	-	340	36	78	7,470	-	468	-	1,145	4,267
Residential Low Density	17,603	65,119	6,316	14,557	686,714	109	48,594	298	119,709	273,888
Special Opportunity	3,014	47,661	1,794	5,947	34,845	6	3,240	37	21,035	85,297
Grand Total	231,508	231,121	39,708	55,472	802,082	50,380	57,180	18,335	273,496	888,241

3.2.4 Area 4 – Springfield Estate and Augustine Heights (part)

The Springfield Estate local area flood hazard is driven primarily by Woogaroo Creek and Opossum Creek. Flood hazard is contained to the land immediately adjoining the waterway with very short TTI and short DOI associated with flashy catchments. Much of the development is located outside of the floodplain. Springfield Central is exposed to HR5 category (low risk) that breaks out across the flood plain.

Table 3-6 Exposure of zone by area (square metres) – Springfield Estate and Augustine Heights (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	13,005	6,608	4,736	8,281	23,899	1,399	2,332	2,513	15,550	55,888
Future Urban	2,569	4,534	304	1,378	4,648	54	502	163	3,194	20,907
Large Lot Residential	-	-	-	-	-	-	-	-	-	68
Recreation	72,195	44,746	17,967	36,812	10,061	2,173	2,495	7,598	31,675	103,330
Residential Low Density	1,835	15,256	800	3,129	7,411	118	1,445	99	6,143	79,342
Special Opportunity	-	14,598	1,110	2,255	33,068	-	1,525	-	4,805	9,290
Special Uses	-	-	-	-	-	-	-	-	-	-
(blank)	880,404	365,836	113,216	208,790	348,214	22,149	86,059	51,418	386,963	1,437,261
Grand Total	970,008	451,578	138,133	260,646	427,301	25,893	94,358	61,791	448,330	1,706,087

3.2.5 Area 5 - Bellbird Park, Redbank Plains and Augustine Heights (part)

The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs.

Table 3-7 Exposure of zone by area (square metres) – Bellbird Park, Redbank Plains and Augustine Heights (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	4,036	3,591	861	2,166	8,464	211	1,114	113	4,741	19,536
Future Urban	53,330	23,825	8,696	16,978	165,094	2,555	8,863	7,079	62,973	178,661
Local Business and Industry	-	-	48	7	25	-	106	-	263	39,824
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	-
Major Centres	-	-	-	-	-	-	-	-	-	-
Recreation	196,479	161,150	18,648	56,270	181,289	10,249	30,930	13,302	105,761	396,359
Regional Business and Industry Buffer	5,215	10,175	1,006	1,373	1,402	131	510	25	2,995	35,150
Residential Low Density	74,768	112,195	10,544	39,421	172,476	8,657	30,813	3,573	103,124	915,763
Residential Medium Density	3	620	31	135	2,371	5	549	-	2,042	25,632
Special Opportunity	-	93	-	98	1,010	-	50	-	53	564
Special Uses	11,681	6,170	902	3,019	18,260	76	2,039	75	11,985	51,302
Grand Total	345,511	317,819	40,736	119,468	550,392	21,884	74,975	24,166	293,938	1,662,791

3.2.6 Area 6 – Redbank and Collingwood Park

The local area is exposed to three sources of flooding, Brisbane River, Six Mile Creek and Goodna Creek. Much of the exposed properties are residential. There are pockets of properties exposed to short time to inundation and high hydraulic risk in Namatjira Drive which is identified as a priority evacuation area in the IICP.

Table 3-8 Exposure of zone by area (square metres) – Redbank and Collingwood Park

Row Labels	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	-	-	1	-	-	1,029	-	-	-	-
Character Housing Mixed Density	-	-	1,126	6	-	1,336	-	-	15,242	57,180
Conservation	29,453	940	5,259	7,480	-	24,766	-	8,527	21,929	35,953
Limited Development (Constrained)	-	-	237	-	-	691	-	-	4,371	8,403
Local Retail and Commercial	-	-	618	-	-	-	-	-	10,961	2,889
Major Centres	-	-	4,872	3,456	-	14,391	-	1,527	12,355	54,476
Recreation	256,177	120,589	41,371	103,458	23,990	180,445	4,285	95,003	170,729	430,981
Regional Business and Industry - Low Impact	27,206	665	29,631	14,221	-	467,010	-	22,058	660,947	296,592
Regional Business and Industry - Medium Impact	24,066	-	82,073	37,262	-	458,589	-	34,026	230,930	57,740
Regional Business and Industry Buffer	284,170	3,318	20,560	115,799	-	123,321	-	98,380	40,358	22,682
Residential Low Density	35,475	108,052	37,128	23,646	70,063	65,148	13,258	2,607	204,109	1,277,921
Residential Medium Density	273	-	12,422	1,483	-	19,996	-	3,207	44,307	39,386
Special Opportunity	89,888	30,536	31,941	45,453	6,831	194,299	686	63,803	72,322	139,064
Special Uses	9,206	11,309	17,474	6,386	2,151	35,373	669	784	94,734	280,047
Grand Total	755,913	275,409	284,715	358,650	103,035	1,586,394	18,897	329,922	1,583,295	2,703,315

3.2.7 Area 7 – Swanbank, New Chum, Redbank Plains (part)

The local area is largely rural in the upper Bundamba Creek catchment and Six Mile Creek. Flood risk is driven by creek flooding, with short time to inundation and duration associated with flash flooding. There are a number of large rural lots exposed to high hazard to the south of the area and a series of ponds and weirs near the Asphalt mine in Swanbank. The railway turning loop near Patrick Street is a large low flood island.

Table 3-9 Exposure of zone by area (square metres) – Swanbank, New Chum Redbank Plains (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Business Park	38,336	30,622	24,044	83,097	22,211	4,687	2,313	22,577	31,557	55,121
Large Lot Residential	3,548	9,338	505	1,354	1,354	31	645	10	3,630	74,521
Recreation	131,742	123,192	34,443	59,285	16,050	21,158	3,977	17,377	44,660	54,212
Regional Business and Industry - Medium Impact	81,818	79,897	9,843	33,618	27,781	228	26,656	779	50,871	223,476
Regional Business and Industry Buffer	588,398	568,741	49,522	177,075	56,781	14,460	18,869	36,915	96,729	374,296
Regional Business and Industry Investigation	236,600	196,616	17,321	37,988	13,507	7,986	25,214	5,086	105,587	1,413,334
Regional Business and Industry (Med Impact Sub Area)	5,675	62,177	10,015	45,994	49,211	238	10,282	3,198	41,623	203,141
Regional Business and Industry (Low Impact Sub Area)	16,827	17,303	10,794	23,458	6,289	769	6,910	1,963	31,274	16,731
Special Uses	15,069	34,372	3,859	7,289	13,106	1,569	3,416	1,489	18,571	217,184
Grand Total	1,118,014	1,122,258	160,345	469,157	206,290	51,127	98,281	89,394	424,503	2,632,016

3.2.8 Area 8 – Riverview

Riverview is located near the confluence of the Brisbane and Bremer Rivers and is bound by Six Mile Creek to the south and east. Inundation is associated with riverine flooding, i.e., long durations of greater than 72 hours and a time to inundation of greater than 12 hours in the flood fringe. The regional business areas to the north of the area are exposed to high risk, high hazard floodwaters. Residential lots to the south of the Ipswich motorway are exposed to HR5 category (low risk) as backwater traverse up Six Mile Creek

Table 3-10 Exposure of zone by area (square metres) – Riverview

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	11,446	675	1,856	4,013	-	6,070	-	1,644	2,983	24
Large Lot Residential	-	-	-	803	-	2,374	-	874	-	-
Limited Development (Constrained)	3,868	0	686	2,834	-	5,118	-	2,836	2,416	6
Local Business and Industry	-	-	-	-	-	-	-	-	-	101,292
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	-
Recreation	198,553	5,652	14,475	52,992	7,811	100,525	238	35,472	53,802	125,608
Regional Business and Industry - Low Impact	12,601	-	33,624	26,791	-	166,614	-	77,397	194,631	25,628
Regional Business and Industry - Medium Impact	141,193	-	48,937	29,058	-	171,865	-	100,019	166,409	397,348
Regional Business and Industry Buffer	512,420	-	29,677	36,446	-	184,482	-	223,829	63,951	67,442
Residential Low Density	46,670	3,795	24,611	17,944	806	81,246	-	14,913	136,889	322,796
Residential Medium Density	-	-	15,917	13,787	-	60,760	-	9,519	103,876	277,902
Special Opportunity	236,939	1,126	55,256	106,064	225	433,067	-	229,360	174,416	10,797
Special Uses	1	-	1,513	770	-	4,299	-	487	6,979	73,200
Grand Total	1,163,691	11,248	226,552	291,502	8,842	1,216,420	238	696,350	906,352	1,402,044

3.2.9 Area 9 – Bundamba, Blackstone, Ebbw Vale and Dinmore

Riverine flooding from the Bremer River is the dominant flood source north of Brisbane Road where existing large lots and rural residential properties are exposed to long duration of inundation and short TTI of under 6 hours. There is a pocket of high and medium density residential properties around Bergin Hills Road exposed to HR2(b) and HR 3(b) plus TTI of under 6 hrs identified in the IICP as requiring priority evacuation.

Table 3-11 Exposure of zone by area (square metres) – Bundamba, Blackstone, Ebbw Vale and Dinmore

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Bundamba Racecourse Stables Area	13,542	1,891	-	2,922	12,413	5,682	-	437	-	-
Character Housing Low Density	957	3,263	497	10,528	16,248	52,406	1,897	1,634	6,912	86,281
Character Housing Mixed Density	-	134	2,557	64	1,668	738	90	-	6,913	55,460
Character Mixed Use	-	50	6	219	1,338	-	75	-	123	2,503
Conservation	148,661	92,897	23,163	55,751	19,136	2,795	6,497	17,552	65,764	197,854
Large Lot Residential	136,721	16,068	25,970	48,233	20,619	78,970	3,230	53,516	95,760	128,025
Limited Development (Constrained)	68,450	1,424	-	663	37	0	-	384	4,510	-
Local Business and Industry	27,234	16,342	3,682	27,335	22,024	28,288	1,096	65,743	6,314	24,903
Local Retail and Commercial	-	34	121	903	6,203	437	32	8	580	5,870
Recreation	545,221	16,362	5,505	22,089	6,110	26,852	735	64,174	28,799	140,050
Regional Business and Industry - Low Impact	1,755	-	13,528	80,389	-	83,908	-	72,205	63,784	290,598
Regional Business and Industry - Medium Impact	-	-	9,319	100,945	-	159,040	-	81,555	46,453	137,961
Regional Business and Industry Buffer	145,823	25	29,319	40,900	-	88,454	-	85,557	81,835	72,745
Residential Low Density	12,366	33,633	25,629	35,619	102,482	75,410	20,393	17,505	144,245	1,025,106
Residential Medium Density	-	543	-	594	4,178	-	1,032	-	2,180	84,775
Special Opportunity	1,190,716	40,737	29,856	130,009	47,076	363,320	5,901	433,883	127,777	297,471
Special Uses	100,305	9,103	12,628	29,097	14,938	69,737	4,245	107,747	56,395	228,918
Grand Total	2,391,750	232,507	181,780	586,260	274,470	1,036,036	45,223	1,001,901	738,344	2,778,521

3.2.10 Area 10 – Karalee, Barellan Point and Chuwar

The local area primarily contains many high islands, areas of high hydraulic risk and significant durations of flooding from Brisbane and Bremer Rivers. This combination would create some issues associated with resupply on these high islands. Fortunately, there are only very few properties impacted from fast TTI. Industry investigation area is exposed to back water associated with the Bremer. Colleges Crossing Bridge has very low immunity which hinders self-evacuation to the north. Sections of the Warrego Highway have low flood immunity impacted by multiple types of flooding.

Table 3-12 Exposure of zone by area (square metres) – Karalee, Barellan Point and Chuwar

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	84,216	-	-	-	-	-	-	-	-	-
Future Urban	22,720	376	24,386	4,973	128	85,883	-	12,678	149,757	1,097,034
Large Lot Residential	1,169,057	5,954	360,681	242,548	225	1,216,367	-	785,350	1,748,353	5,084,526
Limited Development (Constrained)	325,836	-	950	64,456	-	27,450	-	180,685	250	-
Local Business and Industry	3,578	-	10,318	7,177	-	44,835	-	14,425	45,103	167,089
Local Business and Industry Investigation	-	-	-	-	-	-	-	-	-	4,331
Major Centre	-	-	-	-	-	-	-	-	-	189
Recreation	934,637	3,387	97,973	235,577	225	623,048	-	248,095	300,532	229,066
Residential Low Density	-	-	-	-	-	-	-	-	4,654	159,380
Special Opportunity	-	-	3,359	-	-	-	-	-	32,910	79,885
Special Uses	59,957	-	10,082	12,213	-	48,994	-	30,748	44,833	253,508
Grand Total	2,600,000	9,717	507,749	566,945	578	2,046,576	-	1,271,982	2,326,393	7,075,009

3.2.11 Area 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket

North Ipswich is bounded by the Bremer River on three sides. Much of North Tivoli is exposed to inundation associated with backwater from the Bremer breaking out across the wide floodplain. As the Bremer River meanders around Moores Pocket, potential isolation occurs. Moores Pocket identified as a priority evacuation area in the IICP. Time to inundation can be short (< 6 hrs).

Table 3-13 Exposure of zone by area (square metres) – Area 11 – North Ipswich, Tivoli, North Tivoli and Moores Pocket

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
CBD North Secondary Business	21,358	75	5,835	15,400	-	91,424	-	13,257	9,367	25
CBD Residential High Density	-	-	17,105	-	-	12,257	-	-	47,000	17,621
Character Housing Low Density	23,391	483	19,574	12,077	1,945	68,484	490	14,711	60,869	188,301
Character Mixed Use	2,310	-	1,244	3,117	-	5,451	-	3,730	11,583	35,846
Large Lot Residential	229,048	-	15,417	43,482	-	86,879	-	129,757	53,790	71,238
Limited Development (Constrained)	482	1,226	1,320	803	2,094	1,630	259	736	4,213	15,272
Local Business and Industry	28,663	-	2,533	1,406	-	9,532	-	7,263	7,184	61,271
Local Business and Industry Buffer	301,128	100	7,398	26,602	-	53,057	-	108,876	27,218	80,308
Local Business and Industry Investigation	12,693	25	10,204	40,643	-	68,344	-	38,542	47,902	165,495
Local Retail and Commercial	-	-	-	-	13	-	2	-	0	8,542
Recreation	696,147	155	20,239	72,662	197	196,468	31	109,967	56,883	91,291
Residential Low Density	40,437	445	20,282	21,109	4,584	116,080	699	43,958	60,692	369,705
Special Opportunity	98,414	2,201	33,607	14,557	74,195	259,670	122	39,396	76,073	375,567
Special Uses	-	46	1,021	-	530	1,442	102	-	8,318	200,714
Grand Total	1,454,069	4,756	155,779	251,858	83,558	970,717	1,706	510,194	471,091	1,681,196

3.2.12 Area 12 - Brassall

The majority of properties at risk are generally described in three categories. Those properties bordering the Bremer River - that experience progressive inundation as the river breaches its banks. Those properties in the upper reaches of Mihi Creek that are exposed to localised creek flooding and the areas below Fernvale/Pine Mountain Rd that are impacted by deep backwater flooding in a riverine event. The latter presents risks to a number of schools and were identified in the ICP as requiring priority evacuation.

Table 3-14 Exposure of zone by area (square metres) – Brassall

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	57	1,247	25	285	8,751	-	1,994	-	6,108	37,127
Conservation	105	1,502	75	288	9,896	1	1,231	-	2,278	12,056
Large Lot Residential	45,831	-	59	5,782	1,155	4,761	-	9,253	0	-
Local Retail and Commercial	218	2,030	3,112	2,636	6,226	2,677	433	681	2,714	12,430
Major Centres	-	980	15,982	319	6,066	22,121	-	6	-	-
Recreation	397,390	66,299	39,964	45,202	67,322	144,395	3,019	69,571	74,024	70,672
Residential Low Density	85,058	53,726	78,896	44,574	255,517	166,297	38,135	54,331	317,050	1,019,254
Residential Medium Density	15,155	1,952	42,746	4,813	32,832	53,121	394	3,090	26,526	2,834
Special Opportunity	10,028	6	-	4,949	24	9,031	-	5,553	-	-
Special Uses	84,756	11,489	3,323	35,778	30,134	72,839	1,341	54,754	7,456	45,072
Grand Total	638,598	139,233	184,182	144,626	417,923	475,243	46,548	197,240	436,157	1,199,444

3.2.13 Area 13 – Ipswich, West Ipswich, Sadliers Crossing, Coalfalls and Woodend

Ipswich Central is surrounded on three sides by the Bremer River. On the north-eastern boundary flood hazards from near Elizabeth St to Milford St are noted as well as on the western boundary near Keogh St.

Table 3-15 Exposure of zone by area (square metres) – Ipswich, West Ipswich, Sadliers Crossing, Coalfalls and Woodend

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
CBD Medical Services	4,223	8,287	1,779	2,208	19,700	1,909	878	372	14,010	43,055
CBD Primary Commercial	51,639	15,469	13,874	24,815	49,018	80,684	3,009	30,963	41,549	46,337
CBD Primary Retail	452	2,317	13,634	4,996	10,791	52,897	13	135	62,683	30,558
CBD Residential High Density	1,783	1,602	9,246	1,327	7,366	11,411	443	1,633	40,229	84,950
Character Housing Low Density	59,628	4,818	16,820	20,417	5,947	75,166	438	24,013	49,072	172,402
Character Housing Mixed Density	2,193	839	12,452	2,034	2,769	20,956	178	442	55,533	215,575
Character Mixed Use	7	6,772	2,193	1,850	11,258	1,141	1,580	19	10,559	51,152
Conservation	43,970	1,705	5,212	3,980	161	11,566	56	5,717	11,409	31,599
Large Lot Residential	31,706	25	7	3,402	-	5,707	-	7,965	1	-
Limited Development (Constrained)	6,847	403	-	559	-	-	-	99	-	-
Local Business and Industry	48,940	25	4,079	30,499	-	53,284	-	54,654	3,204	3
Local Business and Industry Buffer	24,538	-	-	1,474	-	-	-	4,000	-	-
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	1,264
Recreation	303,989	44,119	4,933	48,349	481,764	46,775	23,831	54,600	46,206	143,171
Residential Low Density	63,877	94	20,693	21,786	4,895	86,500	125	24,428	48,959	148,628
Residential Medium Density	-	4,892	48	3,847	54,093	-	18,266	-	10,632	24,149
Special Opportunity	159,586	527	9,559	9,384	2,833	15,643	281	15,656	30,518	156,084
Special Uses	10,826	2,481	14,882	11,223	30,893	33,535	2,219	5,113	55,196	174,583
Top of Town	60	2,281	915	795	11,541	530	323	19	7,121	39,443
Grand Total	814,264	96,658	130,326	192,946	693,026	497,701	51,641	229,828	486,880	1,362,954

3.2.14 Area 14 – Basin Pocket, North Booval, Booval, Silkstone and East Ipswich

Riverine flooding that overtops the banks of the Bremer River and Bundamba Creek can inundate area adjoining the watercourses to a significant depth with limited time to inundation. Low flood islands and deep inundation of existing residential areas north of Brisbane Road are identified. Low density character areas to the west of the area (south of Brisbane Road).

Table 3-16 Exposure of zone by area (square metres) – Booval, North Booval, Silkstone and East Ipswich

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Bundamba Racecourse Stables Area	-	1,514	18,436	850	42,166	16,684	580	-	41,464	23,392
CBD Residential High Density	2,929	-	8,125	309	-	4,030	-	561	13,679	473
Character Housing Low Density	295	9,655	2,137	4,986	159,661	24,662	9,214	1,037	27,482	133,369
Character Housing Mixed Density	98	3,335	16,207	1,007	28,591	20,648	2,402	-	69,307	202,174
Character Mixed Use	242	1,396	1,773	272	32,093	3,944	3,452	9	6,395	29,914
Large Lot Residential	112,102	194	240	39,521	4,286	97,407	-	79,935	-	-
Limited Development (Constrained)	32,383	-	-	-	-	-	-	-	-	-
Local Retail and Commercial	38	206	-	19	3,911	2,690	265	6	4,275	7,411
Major Centres	1,657	34,506	4,439	13,985	51,712	22,744	3,138	22,700	23,957	81,826
Recreation	923,134	43,510	27,325	95,671	111,392	162,991	32,036	314,830	61,728	90,635
Residential Low Density	123,554	21,298	56,137	108,487	92,498	459,095	3,940	180,267	178,428	485,568
Residential Medium Density	697	51,051	32,129	9,148	46,110	21,552	6,215	-	108,239	332,102
Special Opportunity	153,766	495	13,134	37,513	4,480	39,871	-	56,761	22,301	37,934
Special Uses	19,572	5,615	2,714	23,372	21,429	67,605	1,139	39,479	34,932	73,980
Grand Total	1,370,465	172,777	182,797	335,139	598,329	943,922	62,381	695,585	592,189	1,498,778

3.2.15 Area 15 – Raceview, Flinders View, Ipswich (part)

This location has a high number of lots identified within the flood risk category mapping. These properties are zoned for low and medium density residential uses, as well as local business and industry with up to HR2c and HR1b hydraulic risk. Time to inundation is generally less than 6hrs (indicative of flash flooding) and duration of inundation up to 24 hrs (longer durations are experienced in the west of the local area). Two (2) priority evacuation areas are also identified in the local area.

Table 3-17 Exposure of zone by area (square metres) – Raceview, Flinders View, Ipswich (part

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	-	-	-	-	-	-	-	-	-	-
Character Housing Mixed Density	-	-	-	-	-	-	-	-	-	17,970
Character Mixed Use	-	-	-	-	-	-	-	-	-	17,553
Limited Development (Constrained)	7,676	-	-	-	-	-	-	-	-	-
Local Business and Industry	230,247	7,691	55,537	43,070	6,117	110,263	6	68,663	105,040	115,058
Local Retail and Commercial	34	221	14	102	19	-	31	-	1,105	14,016
Recreation	386,723	150,928	48,246	68,616	19,917	54,632	5,846	64,526	133,397	129,791
Residential Low Density	69,871	61,805	21,300	35,843	235,703	30,342	34,346	2,432	158,989	964,827
Residential Medium Density	1,490	5,010	4,176	5,959	35,706	-	13,469	38	20,008	143,151
Special Opportunity	2,110	16,951	175	4,260	64,876	50	4,378	81	7,164	67,144
Special Uses	17,283	14,606	20,716	10,496	63,771	28,232	4,658	1,708	73,337	241,800
Grand Total	715,434	257,212	150,164	168,347	426,109	223,519	62,735	137,448	499,040	1,711,310

3.2.16 Area 16 - Churchill

The Churchill local area is significantly impacted by flooding, with a number of residential properties identified within the 1%AEP flood inundation area. The majority of properties in Churchill are elevated above the mapped flood risk areas with both Warwick Rd and Lobb St as key evac routes out of flood hazard. The short time to inundation and high hazard floodwater associated with riverine backwater causes high risk to properties near Lupton St and Warwick Rd.

Table 3-18 Exposure of zone by area (square metres) – Churchill

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Large Lot Residential	12,786	-	-	177	-	1	-	612	-	-
Local Business and Industry	70,124	-	4,031	10,180	-	9,855	-	32,252	6,618	4,708
Local Business and Industry Buffer	138,758	25	595	1,458	-	1,062	-	2,270	1,312	26
Recreation	149,528	-	0	1,305	-	2,303	-	7,367	-	2,333
Residential Low Density	64,282	372	8,433	12,679	-	25,489	-	21,869	22,427	59,316
Residential Medium Density	21,422	-	6,727	355	-	5,159	-	28	21,127	36,317
Special Opportunity	-	-	-	-	-	-	-	-	-	1,840
Grand Total	456,901	397	19,786	26,155	-	43,869	-	64,398	51,484	104,539

3.2.17 Area 17 – Yamanto, Churchill (part)

Yamanto is exposed to flood inundation of the west, north and east from a variety of sources - Purga and Warrill Creek on the west, Bremer River on the north and Deebing Creek on the east. Low density residential and Local Business and Industry- zoned land are identified as at risk up to and including HR3a. Significant inundation occurs in HR4 and HR5 categorised flooding. A number of lots near Berry Street and Greenway Street are shown to be within the HR1c flood risk extent, which is anticipated to be a function of flood depth in Bremer River flooding. There are also a number of exiting residential lots within the HR2b, 3c and 3a risk categories near Midland Street, Yamanto. Time to inundation across the local area is generally greater than 12hrs and duration of inundation for existing residential lots is less than 48hrs.

Table 3-19 Exposure of zone by area (square metres) – Yamanto, Churchill (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Business Incubator	-	-	-	-	-	-	-	-	-	106
Limited Development (Constrained)	380,005	50	2,847	59,800	-	63,584	-	173,236	5,924	-
Local Business and Industry	100,097	-	42,695	26,278	-	65,622	-	30,119	99,824	229,103
Local Business and Industry Buffer	119,591	75	31,106	11,915	-	27,983	-	16,501	108,869	72,284
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	-
Major Centres	-	-	-	-	-	-	-	-	-	-
Recreation	72,415	10,494	2,603	4,032	3,729	973	1,235	2,076	18,370	65,330
Residential Low Density	43,140	7,015	19,455	28,295	1,708	43,541	397	32,505	125,718	505,824
Rural A	18,699	-	665	738	-	811	-	785	7,088	6,345
Rural B	492,294	-	31,511	46,538	-	60,874	-	50,903	83,459	181,901
Special Opportunity	34,791	174	5,564	5,444	2,738	10,578	-	13,227	14,637	41,886
Special Uses	1,421	2,194	159	465	701	31	200	25	1,058	5,970
Grand Total	1,262,453	20,001	136,606	183,506	8,876	273,998	1,832	319,377	464,947	1,108,749

3.2.18 Area 18 – Ripley Valley

The local area experiences flooding from two sources - the upper Bundamba Creek and Upper Deebing Creek. Time to inundation is less than 6hrs and duration of inundation less than 24 hrs, which is indicative of flash flooding. The local area is an identified future urban region with specific zoning in the north of the area more progressed. A number of lots north of Ripley Road are identified as being within the HR1b hydraulic risk category.

Table 3-20 Exposure of zone by area (square metres) – Ripley Valley

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Business Incubator	2,806	4,951	416	1,106	412	-	159	4	1,317	32,911
Conservation	270,596	251,389	72,330	158,003	372,245	21,803	94,408	40,505	237,345	750,948
Future Urban	335,431	666,169	116,570	501,207	1,297,135	27,607	249,576	30,231	843,035	1,979,973
Large Lot Residential	1,307	5,155	245	1,531	3,454	6	446	19	1,887	6,877
Local Business and Industry	943	5,924	2,779	7,808	913	-	178	13	8,554	92,791
Local Business and Industry Buffer	64,404	48,837	6,567	35,359	249	125	423	2,281	10,845	37,777
Local Retail and Commercial	-	345	-	53	34	-	37	-	56	1,221
Recreation	338,895	330,938	213,357	463,123	479,679	37,131	139,243	46,751	630,590	1,029,684
Recreation - Ripley Valley	3,048	10,229	526	1,672	2,194	-	400	13	1,810	5,361
Regional Business and Industry Buffer	156,685	55,387	2,479	10,767	25	172	208	1,722	7,257	14,662
Residential Low Density	74,611	150,282	8,360	42,411	144,141	1,722	31,119	1,540	63,799	314,541
Rural Constrained - Ripley Valley	183,688	141,927	54,114	137,440	243,910	5,604	57,626	13,198	183,488	664,927
Special Uses	86	6,291	31	875	9,337	-	2,055	-	4,141	11,526
Special Uses - Ripley Valley	-	-	-	-	-	-	-	-	-	-
Sub-Urban (T3) - Ripley Valley	-	-	-	-	-	-	-	-	29	522
Grand Total	1,432,501	1,677,826	477,774	1,361,356	2,553,727	94,170	575,877	136,275	1,994,153	4,943,721

3.2.19 Area 19 – Purga, Goolman and Peak Crossing

The local area is bordered on the west by the Ipswich Rivers with Purga Creek running through the middle of the region. The area is generally zoned for rural uses with flood behaviour shown to be generally characterised by time to inundation of more than 6 hrs, with duration of inundation varying from less than 24hrs to greater than 72hrs is small, isolated areas of the floodplain.

Table 3-21 Exposure of zone by area (square metres) – Purga, Goolma, and Peak Crossing

Row Labels	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	-	-	-	-	-	-	-	-	-	-
Rural A	2,509,315	444,264	932,700	1,015,120	50,264	1,104,851	118,461	856,235	1,929,822	1,212,663
Rural B	1,231,573	1,930,043	750,695	1,595,759	1,182,419	171,738	771,817	175,405	2,284,863	5,173,562
Rural D	33,668	314,225	14,971	390,453	252,817	-	14,762	-	12,468	56,651
Rural E	123,684	58,697	2,541	100,697	-	17,030	5,657	277,582	26,891	30,958
Special Uses	21,431	2,552	6,750	3,946	-	1,257	374	1,187	45,289	4,728
Grand Total	3,919,671	2,749,781	1,707,656	3,105,975	1,485,500	1,294,876	911,070	1,310,409	4,299,332	6,478,562

3.2.20 Area 20 - Amberley

The local area is bordered on the north and east by the Bremer River and to the south by Warrill Creek. The flood behaviour is reflective of regional flooding (deep and slow) with risk multipliers relatively moderate in nature (TTI is generally greater than 6 hrs, DoI is up to 72hrs).

Table 3-22 Exposure of zone by area (square metres) – Amberley

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Amberley Air Base & Aviation	4,107,711	1,727,104	1,593,462	3,408,934	150,816	2,572,317	22,993	1,284,042	1,337,422	1,850,197
Regional Business and Industry Investigation	-	-	-	-	-	-	-	-	-	-
Grand Total	4,107,711	1,727,104	1,593,462	3,408,934	150,816	2,572,317	22,993	1,284,042	1,337,422	1,850,197

3.2.21 Area 21 – One Mile, Leichhardt and Wulkuraka (part)

The local area is surrounded by the Bremer River which, when in flood, impacts residential properties in One Mile. These properties are afforded a time to inundation is generally greater than 12 hours.

Table 3-23 Exposure of zone by area (square metres) – One Mile, Leichhardt, Wulkuraka (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	222	-	2,314	888	-	2,586	-	2,379	13,183	81,766
Character Housing Mixed Density	-	-	2,307	38	-	2,970	-	-	8,352	26,263
Large Lot Residential	51,780	-	1,167	21,179	-	37,608	-	33,596	4,413	86,774
Limited Development (Constrained)	160,602	-	-	-	-	-	-	802	-	-
Local Retail and Commercial	-	-	258	-	-	210	-	-	1,925	3,551
Recreation	1,405,606	100	42,786	108,791	-	141,840	-	270,807	147,567	89,822
Regional Business and Industry - Low Impact	44,983	-	6,722	22,329	-	13,725	-	22,539	10,142	42,031
Regional Business and Industry - Medium Impact	136,238	250	24,951	42,168	-	48,418	-	35,822	55,099	467,974
Regional Business and Industry Buffer	251,415	600	11,221	22,926	-	16,994	-	19,680	29,309	28,465
Regional Business and Industry Investigation	17,708	-	10,948	35,506	-	12,226	-	12,734	31,616	54,036
Residential Low Density	122,641	100	69,344	67,507	-	193,837	-	91,494	237,057	615,409
Residential Medium Density	-	-	2,160	0	-	1,768	-	-	9,157	4,525
Rural C	1,113	-	11,092	5,514	-	16,923	-	1,303	29,341	34,276
Special Uses	1,649	-	2,893	192	-	3,909	-	45	24,596	300,446
Grand Total	2,193,956	1,051	188,164	327,037	-	493,015	-	491,202	601,756	1,835,338

3.2.22 Area 22 – Karrabin (part), Blacksoil (part)

Flooding is contained to the area immediately adjoining the Bremer River, on large rural lots. Much of the local area is not exposed to flood risk.

Table 3-24 Exposure of zone by area (square metres) – Karrabin (part), Blacksoil (part)

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Recreation	259,410	16,130	3,385	7,459	-	-	-	2,412	13,588	7,102
Regional Business and Industry - Medium Impact	9,707	2,073	7,837	21,326	-	-	-	530	59,297	27,614
Regional Business and Industry Buffer	84,363	1,009	2,292	6,003	-	825	-	4,264	7,425	-
Regional Business and Industry Investigation	141,465	1,240	24,763	45,081	-	17,737	-	43,264	81,751	57,598
Rural A	-	-	-	-	-	-	-	-	370	127,763
Rural C	92,145	-	58,273	62,758	-	151,941	-	106,759	278,310	1,303,350
Rural E	4,850	3,063	9,376	16,795	-	132	-	1,499	51,972	90,553
Special Uses	9,139	194	3,791	3,393	-	8,863	-	1,898	17,630	37,771
Grand Total	601,081	23,710	109,718	162,815	-	179,498	-	160,628	510,343	1,651,749

3.2.23 Area 23 – Pine Mountain, Muirlea, Blacksoil (part), Haigslea (part), Ironbark

The local area is border on the east by the Brisbane River and the north by Sandy Creek. Flood behaviour is driven by riverine flooding with time to inundation generally greater than 12 hrs and duration of inundation greater than 72hrs. Generally Rural and Special use land shown as flood affected with one large lot residential lot in the HR5 hydraulic risk category to the south of the local area between the Warrego Highway and Cabernet Crescent.

Table 3-25 Exposure of zone by area (square metres) – Pine Mountain, Muirlea, Blacksoil (part), Haigslea (part), Ironbark

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Large Lot Residential	-	-	-	-	-	-	-	-	-	3,145
Local Business and Industry	-	-	-	-	-	-	-	-	-	-
Recreation	-	-	-	-	-	-	-	-	-	63,479
Rural C	561,276	44,478	364,642	406,400	55,799	1,934,340	9,460	452,250	1,770,604	5,914,682
Rural D	175,644	11,710	59,631	84,602	3,828	267,267	-	49,944	340,508	897,485
Rural E	614,153	6,755	74,027	118,928	450	406,894	-	85,391	369,381	1,029,282
Special Uses	134,552	9,382	24,500	41,507	23,893	150,034	3,453	36,588	133,929	355,802

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Grand Total	1,485,626	72,325	522,800	651,437	83,971	2,758,536	12,913	624,172	2,614,422	8,263,875

3.2.24 Area 24 – Walloon, Thagoona, Haigslea (part) and Mount Marrow

Walloon, Thagoona and Haigslea are located to the north of the Bremer River. Local catchments pose flash flooding risk to residential properties throughout the local area. The nature of localised flooding is a series of breakouts across the floodplain with large areas of HR3a (low hazard). Isolation caused by flood islands is recognised as a key risk factor in this area. There are high hazard flow paths and longer duration floods associated with riverine flooding south of Rosewood-Thagoona Road across rural paddocks.

Table 3-26 Exposure of zone by area (square metres) – Walloon, Thagoona, Haigslea (part) and Mount Marrow

Row Labels	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Conservation	2,190	9,182	1,163	3,450	9,963	-	3,308	-	16,190	36,979
Future Urban	177,702	650,115	11,891	201,452	1,792,896	631	178,438	810	431,726	1,271,548
Large Lot Residential	8,352	59,143	860	12,886	259,129	7	16,825	19	65,126	324,417
Local Business and Industry Investigation	56	7,108	12,723	39,022	-	-	-	6,601	61,248	222,246
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	2,705
Recreation	767,705	301,007	30,804	129,679	180,434	7,312	13,584	58,733	110,808	146,087
Rural A	1,135,169	502,536	149,843	384,292	1,362,392	42,610	95,663	58,480	682,235	1,166,749
Rural B	91,524	53,335	2,836	10,140	360,746	151	16,287	109	36,992	124,686
Rural C	3,470	6,978	397	2,984	9,965	12	2,901	24	5,054	189,884
Rural E	341,012	297,112	135,124	255,259	529,272	-	28,907	728	161,595	703,599
Special Uses	36,533	41,735	4,035	9,124	50,300	540	10,243	75	37,872	171,258
Grand Total	2,563,715	1,928,251	349,676	1,048,289	4,555,097	51,263	366,157	125,579	1,608,847	4,360,158

3.2.25 Area 25 - Marburg

Flood risk associated with creek flooding from Black Snake Creek which flows through the centre of the local area. A secondary flow path has been identified to the east. Low hazard inundation impacts properties in the settlement of Marburg. Time to inundation is under 6 hours associated with flash flooding and duration is under 24hrs.

Table 3-27 Exposure of zone by area (square metres) – Marburg

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Rural A	1,105	17,851	253	1,707	13,727	22	1,270	20	3,594	15,801
Rural B	102,773	85,446	44,054	67,853	125,853	16,249	15,955	20,094	135,218	573,465
Rural C	245,495	181,848	43,348	88,210	296,564	12,681	67,307	18,868	172,555	307,537
Rural E	383	896	599	1,562	1,475	174	126	333	1,952	2,099
Showgrounds, Sport, Recreation, Service Trades	163	7,980	94	6,906	23,529	-	5,713	-	12,991	86,730
Special Uses	63,396	93,931	7,535	40,517	92,877	1,197	28,920	219	76,268	99,444
Township Business	797	2,174	261	2,325	10,952	-	1,755	-	13,174	6,064
Township Character Mixed Use	189	3,767	2,477	5,258	11,784	-	1,463	-	17,009	26,473
Township Residential	18,554	24,565	1,445	10,060	19,261	627	11,543	830	18,080	44,742
Grand Total	432,855	418,458	100,064	224,397	596,022	30,949	134,051	40,364	450,842	1,162,356

3.2.26 Area 26 - Rosewood

Rosewood is located to the north of the Bremer River. The local catchment poses flash flooding risk to residential properties throughout the local area. The nature of localised flooding is a series of breakouts across the floodplain with large areas of HR3a (low hazard). Isolation caused by flood islands is recognised as a key risk factor in this area. There are high hazard flow paths and longer duration floods associated with riverine flooding south of Rosewood-Thagoona Road across rural paddocks.

Table 3-28 Exposure of zone by area (square metres) – Rosewood

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Character Housing Low Density	269	2,620	12	287	172,603	-	25,358	15	47,434	130,846
Character Housing Mixed Density	-	-	585	639	42,773	-	7,316	-	13,432	20,852
Future Urban	62	20,215	31	3,249	568,261	-	20,895	-	14,590	26,779
Large Lot Residential	-	9,447	-	4,573	127,476	-	5,143	-	7,398	3,837
Recreation	14,906	76,309	7,590	10,259	708,252	180	25,494	91	52,653	76,868
Residential Low Density	2,186	34,077	321	7,486	569,491	74	37,852	160	66,596	200,153
Residential Medium Density	191	933	6	975	64,274	-	9,401	-	7,821	75,784
Rural A	2,552,811	1,771,171	387,526	1,560,263	2,666,067	51,281	336,199	119,527	837,298	966,945
Rural B	320,624	782,291	67,038	355,173	916,657	15,145	138,689	12,627	482,442	945,936
Rural D	-	-	-	-	-	-	-	-	-	-
Rural E	7,823	25,745	743	3,738	35,160	6	2,637	1	6,182	36,635
Service Trade and Showgrounds	-	1,494	3	1,961	159,276	-	10,530	-	12,860	35,251
Special Uses	194,435	164,857	60,609	110,406	191,013	10,499	32,870	5,418	142,725	238,775
Town Centre	-	3,250	-	453	73,193	-	20,910	-	16,845	21,400
Urban Investigation	3,223	84,369	863	17,176	331,875	-	31,859	-	108,057	187,126
Grand Total	3,096,531	2,976,778	525,329	2,076,636	6,626,370	77,184	705,152	137,838	1,816,333	2,967,188

3.2.27 Area 27 – Ebenezer, Willowbank, Jeebropilly, Mount Forbes, Mutdapilly

The local area is located in the upper Bremer River and Warrill Creek catchments. At risk properties are large rural paddocks exposed to high hazard floodwaters. There is a large Business and Industry investigation area which is exposed to riverine flooding which is largely contained to the immediate area adjoining the Bremer River.

Table 3-29 Exposure of zone by area (square metres) – Ebenezer, Willowbank, Jeebropilly, Mount Forbes, Mutdapilly

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Large Lot Residential	-	-	-	-	-	-	-	-	-	-
Local Retail and Commercial	-	-	-	-	-	-	-	-	-	1,204
Recreation	-	-	-	-	-	-	-	-	1,023	63,691
Regional Business and Industry Buffer	2,164,989	361,080	33,320	295,334	7,757	16,796	716	240,980	79,855	663,682
Regional Business and Industry Investigation	2,548,221	2,031,844	106,891	508,333	1,036,520	1,478	415,215	3,681	797,097	3,768,649
Residential Low Density	-	-	-	-	-	-	-	-	-	2,751
Rural A	3,832,549	1,945,545	323,730	852,525	508,799	63,951	44,908	95,064	686,355	527,601
Rural B	1,819,112	899,536	493,182	886,999	408,176	118,929	33,383	119,424	1,532,395	1,872,650
Rural C	-	-	-	-	-	-	-	-	12,020	80,059
Rural D	1,765	2,594	47	772	2,899	-	592	-	1,638	9,497
Rural E	466,945	177,005	34,129	69,794	179,237	846	115,907	1,450	125,605	364,967
Special Uses	32,881	17,942	29,173	48,518	-	-	885	652	124,589	158,300
Grand Total	10,866,462	5,435,545	1,020,472	2,662,275	2,143,387	202,000	611,606	461,250	3,360,578	7,513,051

3.2.28 Area 28 – Tallegalla, Woolshed and The Bluff

The local area is largely rural in the upper catchments of Plain Creek, Black Snake and Woolshed Creek. The flood risk is contained to rural paddocks adjoining the creek waterways.

Table 3-30 Exposure of zone by area (square metres) – Tallegalla, Woolshed and The Bluff

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Rural A	-	-	-	-	-	-	-	-	-	-
Rural B	0	1,026	-	25	3,637	-	1,490	-	1,127	59,294
Rural C	-	-	-	-	-	-	-	-	-	9,025
Rural E	-	-	-	-	-	-	-	-	-	-
Special Uses	-	-	-	-	-	-	-	-	-	-
Grand Total	0	1,026	-	25	3,637	-	1,490	-	1,127	68,319

3.2.29 Area 29 – Ashwell, Lanefield, Calvert and Grandchester

The local area is located in the upper Western Creek and Franklin Vale Creek (Bremer River) catchment. Inundation is generally constrained to areas immediately adjoining the watercourse. The northern arm is exposed to flash flooding (less than 6hr TTI) whilst the southern tributary along main watercourse has a relatively longer lead time.

Table 3-31 Exposure of zone by area (square metres) – Ashwell, Lanefield, Calvert and Grandchester

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Rural A	2,098,097	3,452,515	465,884	2,080,428	3,489,045	56,765	691,793	149,959	1,421,191	2,097,806
Rural B	1,171,744	1,438,235	148,573	699,007	934,694	6,959	413,609	24,883	762,681	1,620,016
Rural D	-	-	-	-	-	-	-	-	-	-
Rural E	77,782	91,260	40,807	71,033	116,436	4,350	55,133	3,547	308,587	473,084
Special Uses	42,974	54,172	8,793	40,004	44,466	2,257	13,302	1,992	33,052	83,164

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Township Residential	321	5,535	3,016	9,346	33,620	-	15,109	-	12,837	28,791
Grand Total	3,390,918	5,041,716	667,074	2,899,818	4,618,262	70,332	1,188,946	180,380	2,538,347	4,302,860

3.2.30 Area 30 – Mount Mort, Lower Mount Walker and Mount Walker West

The local area is largely rural with a steep narrow catchment rising up to the south. The flood risk is contained to rural paddocks adjoining the upper Bremer watercourse.

Table 3-32 Exposure of zone by area (square metres) – Mount Mort, Lower Mount Walker and Mount Walker West

Zone	HR1c	HR1b	HR2c	HR2b	HR3c	HR3b	HR2a	HR3a	HR4	HR5
Rural A	1,779,133	1,235,357	560,913	1,196,852	783,803	93,695	128,464	119,670	1,529,008	2,580,505
Rural B	1,263,018	528,597	282,150	400,654	88,391	39,833	124,832	36,166	678,305	1,388,486
Rural D	-	-	-	-	-	-	-	-	-	-
Rural E	378,209	162,029	82,629	119,099	69,544	9,616	22,278	9,049	289,938	1,124,830
Special Uses	-	-	-	-	-	-	-	-	-	-
Town Centre	-	62	-	8	395	-	426	-	43	3
Grand Total	3,420,360	1,926,045	925,693	1,716,613	942,134	143,145	276,000	164,884	2,497,293	5,093,823

3.3 Flood risk description and multipliers

The IICP provides the background flood risk information across the Ipswich City LGA. Included in the analysis of Current and Future Flood Risk is the understanding of flood depth, behaviours, timing and effect of isolation caused by floodwaters. These multipliers provide a more sophisticated appreciation of risk beyond conventional flood risk management approaches and can be used to determine fit for purpose floodplain management responses. The following table summarises the flood risk assessment by Local Area Framework zone.

Table 3-33 Flood Risk Summary by Local Area Framework

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
		Category	Flood Inundation	1%AEP flood Depth	1%AEP Velocity	1%AEP Time to Inundation	1%AEP Duration of Inundation	Flood Islands
Amberley	The local area is bordered on the north and east by the Bremer River and to the south by Warrill Creek. The flood behaviour is reflective of regional flooding (deep and slow) with risk multipliers relatively moderate in nature (TTI is generally greater than 6 hrs, DoI is up to 72hrs).	All hydraulic risk categories (HR1c to HR5) are present in the Amberley area.	Inundation is associated with Warrill Creek and is deepest immediately adjoining the watercourse. Flood waters spread widely across the Amberley Air Base in larger events.	Regional flood depths range from 0 to 18.2m with average flood depth of 2.4 to 2.5 metres.	Regional flood velocity of 0 to 6m/s, with average peak velocity of approximately 0.4 to 0.5m/s.	Time to inundation in the north is 6-12 hrs, indicative regional flooding with TTI increasing to greater than 12 hrs on the eastern and southern areas.	Duration of inundation up to 72hrs+, but generally less than 48hrs. Central and western portion of the Amberley area is outside of the floodplain	Large low flood islands to the east of the local area. Likely evacuation towards the west.
Ashwell, Lanefield, Calvert, Grandchester	The local area is located in the upper Western Creek and Franklin Vale Creek (Bremer River) catchment. Inundation is generally constrained to areas immediately adjoining the watercourse. The northern arm is exposed to flash flooding (less than 6hr TTI) whilst the southern tributary along main watercourse has a relatively longer lead time.	All hydraulic risk categories (HR1c to HR5) are present in the area.	Inundation is generally constrained to areas immediately adjoining the watercourse. The northern (Western Creek) is a secondary tributary to the more major southern watercourse.	Flood depth averages 0.7 to 0.9 metres, with deeper areas located within the main watercourses.	Flood velocity along the southern watercourse are up to 5.3m/s in isolated locations but generally average 0.8m/s. Along the Western Creek tributary velocities average 0.7m/s.	Time to inundation is generally less than 6 hrs along Western Creek. The area along the upper southern waterway has TTI of more than 12hrs in the 1%AEP flood event.	Duration of inundation is generally less than 24 hrs along Western Creek. The area along the southern watercourse has durations of inundation up to 38hrs.	A number of small low flood islands are located near the waterways.
Bellbird Park, Redbank Plains, Augustine Heights	The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs.	Out of bank flooding is generally HR2 to HR5.	Flood inundation in the local area is primarily a function of creek flooding - inundation generally follows the natural waterways across the area. Some isolated wider flood inundation is observed in the upper catchment near Staines Memorial College (Redbank Plains). Some residential areas in the northeast of the area potentially at risk of inundation in the 1%AEP flood event.	Average flood depths associated with flash flooding is up to 1m. Whilst the extent is limited, flood depths of up to 1m (on average) are also possible from riverine flooding.	Peak flood velocities are primarily a consequence of flooding along the waterways of the numerous creek catchments, with average peak velocities of approximately 0.9m/s in the 1%AEP flood event.	Time to inundation is generally less than 6hrs which is reflective of flash flooding behaviour	Duration of inundation in the 1%AEP is generally less than 24hrs.	Three small low flood islands. Extensive high flood island in the northeast (downstream) region of the LAF at Bellbird Park.
Booval, East Ipswich, North Booval	Riverine flooding that overtops the banks of the Bremer River and Bundamba Creek can inundate area adjoining the watercourses to a significant depth with limited time to inundation. Low flood islands and deep inundation of existing residential areas north of Brisbane Road are identified. Low density character areas to the west of the area (south of Brisbane Road)	All hydraulic risk categories (HR1c to HR5) are present in the area.	The area is bordered by the Bremer River on the north and Bundamba Creek to the south and east.	Flood depth from riverine flooding average 7.3-8m along the main flow paths.	Average velocity from riverine and local sources averages 0.5m/s. With the highest peak velocities associated with local flood sources.	Time to inundation in low lying areas is less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of inundation along the watercourse exceed 72 hrs which is reflective of riverine flooding.	Low flood islands, north of Brisbane Road, along the Bremer River and one low flood island on the west of the area along the Bundamba Creek.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Brassall	The majority of properties at risk are generally described in three categories. Those properties bordering the Bremer River - that experience progressive inundation as the river breaches its banks. Those properties in the upper reaches of Mihi Creek that are exposed to localised creek flooding and the areas below Fernvale/Pine Mountain Rd that are impacted by deep backwater flooding in a riverine event. The latter presents risks to a number of schools and were identified in the ICP as requiring priority evacuation.	All hydraulic risk categories (HR1c to HR5) are present in the area.	Flood inundation in the lower areas is due to backwater flooding from the Bremer River. In the upper areas, local flooding is the dominant flood source.	Riverine flood depths average 5.5 meters whilst flood depth in creek flooding averages 0.8 metres. Flood depths downstream of Fernvale/Pine Mountain Rd are driven by backwater from the Bremer River.	Velocities up to 4.1m/s in regional flood events and up to 6.5m/s in creek flooding are reported. Average velocity in riverine events are marginally lower (up to 0.4m/s) than the creek flooding event (0.5m/s)	Time to Inundation (TTI) for properties along the Bremer River range from <6hrs to greater than 12hrs.	Duration of inundation exceeding 72hrs occur on some properties. Localised flood sources experience inundation durations less than 24hrs.	A range of low and high flood islands have been identified across the area
Bundamba, Blackstone, Ebbw Vale, Dinmore	Riverine flooding from the Bremer River is the dominant flood source north of Brisbane Road where existing large lots and rural residential properties are exposed to long duration of inundation and short TTI of under 6 hours. There is a pocket of high and medium density residential properties around Bergin Hills Road exposed to HR2(b) and HR 3(b) plus TTI of under 6 hrs identified in the IICP as requiring priority evacuation.	All hydraulic risk categories (HR1c to HR5) are present in the area.	Flood inundation in the lower areas is due to backwater flooding from the Bremer River. In the upper areas, local flooding is the dominant flood source.	Flood depth in riverine flood events is most significant ranging from an average flood depth of 4.6m in Ipswich Rivers flooding to 5.3m in Brisbane River flooding. Local catchment flooding is less significant, with average flood depth of 1.7m.	Average flood velocity in riverine flood events is relatively lower (between 0.3 and 0.5 m/s) whilst local catchment average velocity is also relatively low at 0.7m/s.	Majority of exposed properties have a TTI of less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of inundation in Bundamba exceeds 72 hrs reflective of riverine flooding. Many south of Brisbane Road exposed to inundation of under 24hrs.	One high island identified in the area of Naomai St / Barclay St. Numerous low flood islands identified generally near Brisbane Rd. TL Cooney Avenue.
Camira (part)	The local area is located in the upper Sandy Creek and Woogaroo Creek catchments. Lower hazard inundation from Sandy Creek includes areas of residential immediately adjoining the watercourse. The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs.	All hydraulic risk categories (HR1c to HR5) are present in the area. Large areas of HR 3a associated with low hazard in residential areas.	Inundation is generally constrained to areas immediately adjoining the watercourse of Sandy Creek and Woogaroo Creek to the north west of the area.	The dominant source of flood depth is Brisbane River flooding with an average depth of 2.9m. Local creek flooding is less dominant with and average flood depth of 0.5m. The local area is not known to be at risk of flooding from Ipswich Rivers.	Flood velocity is generally low, with average flood velocity less than 0.5m/s for local creek flooding and Brisbane River flooding at 0.4 and 0.3m/s respectively. The local area is not known to be at risk of flooding from Ipswich Rivers.	Time to inundation is generally less than 6hrs which is reflective of flash flooding behaviour	Duration of inundation in the 1%AEP is generally less than 24hrs.	One high island in the Moss Rd, Ishmael Rd area. One high island to the south east of the area which is largely forest reserve.
Carole Park	The regional industrial and business uses in the local area are exposed to lower hazard inundation from Sandy Creek. The local area is exposed to flash flooding (less than 6hr TTI) with inundation durations of less than 24 hrs. Average flood depths are generally low, with an average depth of 0.3m.	All hydraulic risk categories (HR1c to HR5) are present in the area. Large areas of HR 3a associated with low hazard are mapped in the business park areas.	Inundation is generally constrained to areas immediately adjoining the watercourse of Sandy Creek	The dominant source of flood depth is creek/local flooding with an average depth of 0.3m which is considered relatively low. The local area is not known to be impacted by riverine flood sources.	Flood velocity is generally low, with average flood velocity less than 0.5m/s for local creek flooding 0.3m/s. The local area is not known to be at risk of flooding from riverine flooding.	Time to inundation is generally less than 6hrs which is reflective of flash flooding behaviour	Duration of inundation in the 1%AEP is generally less than 24hrs.	Large high flood island in the Cobalt St business park area. Smaller low flood islands are identified in the north in Ron Boyle Crescent and Boundary Road.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Churchill	The Churchill local area is significantly impacted by flooding, with a number of residential properties identified within the 1%AEP flood inundation area. The majority of properties in Churchill are elevated above the mapped flood risk areas with both Warwick Rd and Lobb St as key evac routes out of flood hazard. The short time to inundation and high hazard floodwater associated with riverine backwater causes high risk to properties near Lupton St and Warwick Rd.	All hydraulic risk categories (HR1c to HR5) are present in the area. Large areas of HR 1(b) along the Bremer River and Deebing Creek	Inundation is widespread in this suburb associated with riverine flooding and backwater traversing up Deebing Creek. Lobb Street rises up out of floodwaters toward the south. University accommodation on Warwick Rd is exposed to deep flooding.	The average flood depths across Churchill are extremely deep, with riverine flood sources averaging 7.3 to 8.0 metres deep. Creek flooding is also extreme with average flood depth of 4.3m.	Flood velocities across the local area are 0.7m/s for riverine flooding and 0.2m/s for local catchment flooding.	Majority of exposed properties have a TTI of less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of inundation in the 1% AEP is mainly greater than 24 hrs with areas greater than 72hrs on low-lying areas near watercourses.	There are two small low flood islands to the north of Churchill.
Ebenezer, Willowbank, Jeebropilly, Mount Forbes	The local areas is located in the upper Bremer River and Warrill Creek catchments. At risk properties are large rural paddocks exposed to high hazard floodwaters. There is a large Business and Industry investigation area which is exposed to riverine flooding which is largely contained to the immediate area adjoining the Bremer River.	High risk categories of HR1c and HR1b are present throughout the local area.	Inundation is contained to large paddocks of the floodplain associated with Warrill Creek and Bremer River,	Average flood depths for all sources of flooding are greater than 2metres deep. Riverine flooding averages 2.0 to 2.4 metres for Ipswich Rivers and Brisbane River respectively. Creek flooding is the dominant source of flood depth with an average flood depth of 3.1metres.	Average flood velocity in Ipswich Rivers flooding is 0.7m/s, whilst average velocity for Brisbane River and Local catchment flooding is relatively lower at 0.4m/s for both secondary flood sources.	Exposed properties in the north of the area have TTI of under 6 hrs. Properties along the Warrill Creek tend to be greater 12 hours.	Duration of inundation in 1% AEP on exposed properties is between 24 and 72 hours.	There are multiple small low and high flood islands in large paddocks in Willowbank and Mutdapilly.
Goodna, Gailes, Camira (part)	Dual sources of flooding are known to impact the area. Flood inundation in the lower areas is due to backwater flooding from the Brisbane River. In the upper areas, creek flooding is the dominant flood source. At risk properties include low/medium density residential and major centre land zoning. Six low flood islands and a high flood island were identified in this area in the ICP. A priority evacuation area of low and high density residential areas, centred around Bertha St has also been identified.	All hydraulic risk categories (HR1c to HR5) are present in the area.	Flood inundation in the lower areas is due to backwater flooding from the Brisbane River. In the upper areas, creek flooding is the dominant flood source.	Dominant flood depth (averaging 6.4m) is associated with backwater flooding from riverine flood sources. Whilst flooding from the Woogaroo Creek averages 1.5 metres)	Whilst the backwater flooding is from the Brisbane River is the dominant source of flood depth, the highest flood velocities (averaging 0.6m/s) are observed along Woogaroo Creek.	Time to inundation in low lying areas is less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of a number of properties exceeds 72hrs. There are a number of properties that experience flood inundation up to 24hrs.	Six low flood islands and a high flood island were identified in this area in the ICP. A priority evacuation area of low and high density residential areas, centred around Bertha St has also been identified.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Ipswich Central	Ipswich Central is surrounded on three sides by the Bremer River. On the north-eastern boundary flood hazards from near Elizabeth St to Milford St are noted as well as on the western boundary near Keogh St.	All hydraulic risk categories (HR1c to HR5) are present in the area.	The area is north, north west and west by the Ipswich Rivers. Localised stormwater/urban catchment flooding are also known to affect the central regions of Ipswich.	Ipswich flood depth is dominated by riverine flooding with Bremer River and Brisbane River flooding averaging 7.4m and 7.5m respectively. Localised creek flooding is a secondary source of flooding, with an average depth of 2.4m.	Flood velocities are typically low. Averaging between 0.7 to 0.9m/s across the area.	Time to inundation along the river frontages is generally less than 6 hrs with a number of local drainage catchments and urban flow paths also shown as having less than 6hrs time to inundation. Fringe areas and some properties within the CBD commercial and retail zone and in the business areas to the west of the local area are shown to flood with more than 12hrs time to inundation.	Duration of inundation along the river frontages exceeds 72hrs, with a number of properties experience flood inundation of up to 48hrs.	A low flood islands and two high flood island were identified in this area in the ICP. A priority evacuation area of CBD Primary Commercial and Character housing areas, between Woodend Road, Darling Street and the river were identified in the ICP.
Karalee, Barellan Point, Chuwar	The local area primarily contains many high islands, areas of high hydraulic risk and significant durations of flooding from Brisbane and Bremer Rivers. This combination would create some issues associated with resupply on these high islands. Fortunately, there are only very few properties impacted from fast TTI. Industry investigation area is exposed to back water associated with the Bremer. Colleges Crossing Bridge has very low immunity which hinders self-evacuation to the north. Sections of the Warrego Highway have low flood immunity impacted by multiple types of flooding.	All hydraulic risk categories (HR1c to HR5) are present in the area. Some properties exposed to HR3a and HR2a and HR4, but large number of properties exposed to HR5 (low risk)	Inundation is widespread in this suburb associated with riverine flooding. Inundation of floodwaters associated with low lying flood fringe. Ridgeline provides relief and evacuation from the eastern part of the local area (Karalee).	The dominant source of flood depth in this area is associated with Brisbane River flooding, with an average peak depth of 9.5m. The Bremer River is the secondary flood depth source with an average peak flood depth of 6.1m.	Flood velocities are typically low. Averaging between 0.7 to 0.9m/s across the area for riverine flooding and 0.7m/s for local catchment flooding.	Time to inundation in low lying areas is less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of inundation of floodwaters exceed 72 hrs which is reflective of riverine flooding.	A large high flood island has been identified in Karalee along the ridgeline
Karrabin, Blacksoil (part)	Flooding is contained to the area immediately adjoining the Bremer River, on large rural lots. Much of the local area is not exposed to flood risk.	Large areas of HR5 suggests a wide flat floodplain. Large paddocks to the south of the local area are exposed to HR1c	Inundation contained to the south of the local area associated with riverine flooding from the Bremer.	Flood depth is driven by river flooding, with flood depths in a Brisbane River and Bremer River flood event averaging 3.1 and 3.2m respectively.	Flood velocities are typically low. Averaging between 0.5 to 0.6m/s across the area for Ipswich Rivers and Brisbane River flooding. This area is not known to be affected by local creek flooding.	The area along the upper southern waterway has TTI of between 6 and 12hrs in the 1%AEP flood event.	Duration of inundation in 1% AEP on exposed properties is between 24 and 72 hours.	There is one high flood island to the south of the local area.
Marburg	Flood risk associated with creek flooding from Black Snake Creek which flows through the centre of the local area. A secondary flow path has been identified to the east. Low hazard inundation impacts properties in the settlement of Marburg. Time to inundation is under 6 hours associated with flash flooding and duration is under 24hrs.	All hydraulic risk categories (HR1c to HR5) are present in the area. HR4 identified on a number of properties in the Queen St area.	Inundation is generally constrained to areas immediately adjoining the Black Snake Creek watercourse and secondary tributaries.	The creek/local waterway average peak flood depth across the local area is approximately 0.9m	The creek/local waterway average peak flood velocity across the local area is approximately 0.7m/s	Time to inundation is generally less than 6hrs which is reflective of flash flooding behaviour	Duration of inundation in the 1%AEP is less than 24hrs.	There are no flood islands in this local area

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Mount Mort, Lower Mount Walker, Mount Walker West	The local area is largely rural with a steep narrow catchment rising up to the south. The flood risk is contained to rural paddocks adjoining the upper Bremer watercourse.	All hydraulic risk categories (HR1c to HR5) are present in the area but limited to the steep narrow floodplain.	Inundation is generally constrained to areas immediately adjoining the watercourse of the upper Bremer	The dominant source of flood depth is from the Ipswich Rivers. Flood depths average between 0.7 to 1.3m/s across the area for local catchment and Ipswich Rivers flooding. This area is not known to be affected by Brisbane River flooding.	Flood velocities average between 1.5 to 0.8m/s across the area for local catchment and Ipswich Rivers flooding respectively\. This area is not known to be affected by Brisbane River flooding.	Time to inundation is generally greater than 12 hrs associated with riverine flooding	Duration of inundation in the 1%AEP is generally less than 24 hrs	There are multiple small low flood islands in large paddocks in Mount Walker and Lower Mount Walker.
North Ipswich	North Ipswich is bounded by the Bremer River on three sides. Much of North Tivoli is exposed to inundation associated with backwater from the Bremer breaking out across the wide floodplain. As the Bremer River meanders around Moores Pocket, potential isolation occurs. Moores Pocket identified as a priority evacuation area in the IICP. Time to inundation can be short (< 6 hrs).	All hydraulic risk categories (HR1c to HR5) are present in the area. Some properties exposed to HR3a and HR2a and HR4, but large number of properties exposed to HR5 (low risk)	Inundation is widespread in this local area associated with riverine flooding. Inundation of floodwaters associated with low lying flood fringe. Much of North Tivoli is exposed to inundation associated with backwater from the Bremer breaking out across the wide floodplain.	Ipswich North flood depth is dominated by riverine flooding with Bremer River and Brisbane River flooding averaging 7.2m and 7.5m respectively. Localised creek flooding is a secondary source of flooding, however flood depth still remain extreme with an average depth of 3.7m.	Flood velocities are typically low. Averaging between 0.6 to 0.7m/s across the area for Ipswich Rivers and Brisbane River flooding. Local catchment average flood velocities are even lower with an average velocity of 0.2m/s	Time to inundation in low lying areas is less than 6hrs with flood fringe areas exceeding 12hrs.	Duration of inundation of floodwaters exceed 72 hrs which is reflective of riverine flooding.	There are low flood islands in North Tivoli and Moores Pocket.
One Mile, Leichhardt, Wulkuraka	The local area is surrounded by the Bremer River which, when in flood, impacts residential properties in One Mile. These properties are afforded a time to inundation is generally greater than 12 hours.	All hydraulic risk categories (HR1c to HR5) are present in the area. Some f properties exposed to HR3, HR4, HR5 (medium to low risk)	Flood inundation in this local area is from the Bremer River breaking out across the floodplain.	Flood depths across the area are dominated by flooding within the local catchment creek flooding with an average depth of 13.9m. Bremer River and Brisbane River flooding are also extreme with average flood depths 6.0 and 5.7m respectively. The low average flood velocity indicates that although flood depth is dominant within the creek catchment, the flood behaviour is actually a result of slow-moving 'backwater' flooding from riverine flooding.	Flood velocities are relatively low with an average flood velocity of 0.7m/s for riverine flooding and 0.2m/s for creek flooding. This indicates that although flood depth is dominated within the creek catchment, the flood behaviour is actually a result of slow-moving 'backwater' flooding from riverine flooding.	Time to inundation generally exceeds 12hrs.	Duration of inundation upon exposed properties in the 1% AEP is less than 24 hours and up to 48 hours in parts of One Mile and Leichhardt	A large high flood island has been identified in Leichhardt and Wulkuraka in the centre of the local areas.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Pine Mountain, Muirlea, Blacksoil	The local area is border on the east by the Brisbane River and the north by Sandy Creek. Flood behaviour is driven by riverine flooding with time to inundation generally greater than 12 hrs and duration of inundation greater than 72hrs. Generally Rural and Special use land shown as flood affected with one large lot residential lot in the HR5 hydraulic risk category to the south of the local area between the Warrego Highway and Cabernet Crescent.	Hydraulic risk largely contained to areas adjacent to watercourse. Large areas of HR5 exist in large rural lots in Ironbark	Flood inundation in this local area is contained to the area adjacent to the watercourse (Brisbane River).	Not affected by Ipswich Rivers flooding. Extreme flood depth of approximately 9.8 metres on average in Brisbane River flooding. With low flood depths experienced in local creek flooding averaging 0.5 metres deep.	Brisbane River flood velocities are relatively more significant than average peak velocity in creek catchment flood events. Brisbane River flood velocity averages 1.1m/s whilst average flood velocity in the local catchment flood events is approximately 0.7m/s.	Generally greater than 6-12hrs. Low laying areas adjacent the Bremer River and minor waterways north of the Warrego Highway have a time to inundation of less than6 hrs.	Inundation up to 72hrs. Minor waterways north of the Warrego Highway are characterised by duration of inundation of less than 24hrs which is typical of localised overland flow.	Low flood island on the north of the region near McMullen Road and to the south of the area near Riverside Drive. Four (4) small high flood islands across the area.
Purga (part), Goolman, Peak Crossing	The local areas is bordered on the west by the Ipswich Rivers with Purga Creek running through the middle of the region. The area is generally zoned for rural uses with flood behaviour shown to be generally characterised by time to inundation of more than 6 hrs, with duration of inundation varying from less than 24hrs to greater than 72hrs is small, isolated areas of the floodplain.	In the downstream areas around the confluence of Purga Creek and Brisbane River there are large areas of HR1c HR2 H43c and HR4. High risk areas in Purga Creek are largely contained to the areas around the watercourse.	Inundation in this local area is contained to the area adjacent to the watercourse, with exception of downstream in Purga Creek at confluence with Brisbane River where regional inundation dominates.	Most significant flood depths are experienced in Brisbane River flooding with an average depth of 2.3m. Ipswich Rivers flooding and local catchment flooding average 1.5m and 1.6m respectively.	Flood velocities are generally low on average across the local area. Brisbane River and Ipswich Rivers average flood velocity is 0.6m/s, whilst local catchment average peak velocity is 0.2m/s	Generally characterised by time to inundation of more than 6 hrs	Duration of inundation varying from less than 24hrs to greater than 72hrs is small, isolated areas of the floodplain	Large low flood island in the north west of the region and along Purga Creek. Two high flood islands in the south of the area
Raceview, Flinders View	This location has a high number of lots identified within the flood risk category mapping. These properties are zoned for low and medium density residential uses, as well as local business and industry with up to HR2c and HR1b hydraulic risk. Time to inundation is generally less than 6hrs (indicative of flash flooding) and duration of inundation up to 24 hrs (longer durations are experienced in the west of the local area). Two (2) priority evacuation areas are also identified in the local area.	HR1c, HR1b HR2c and HR4 associated with Riverine flooding affect large lots adjacent to Bremer and Brisbane River	Inundation is largely contained to areas adjacent to the Bremer and Brisbane River. Outside of areas dominated by regional riverine flooding, there are localised flow paths which are contained to areas of open space.	Riverine flooding is the dominant source of flood depth with Ipswich Rivers and Brisbane River flood depths averaging 3.8m and 3.7m respectively. Local catchment flood depths average 1.0m deep.	Riverine flood velocities are low, averaging 0.2m/s and 0.1 m/s for Ipswich Rivers and Brisbane River flooding respectively. Local catchment average velocities are relatively more significant, with an average peak velocity of 0.7m/s.	Time to inundation is generally less than 6hrs (indicative of flash flooding)	duration of inundation up to 24 hrs (longer durations are experienced in the west of the local area)	A number of low flood islands located east to west across central Raceview/Flinders View. Two (2) priority evacuation areas also identified as part of the Ipswich ICP.
Redbank, Collingwood Park	The local area is exposed to three sources of flooding, Brisbane River, Six Mile Creek and Goodna Creek. Much of the exposed properties are residential. There are pockets of properties exposed to short time to inundation and high hydraulic risk in Namatjira Drive which is identified as a priority evacuation area in the IICP.	All hydraulic risk categories present in the area, much of the exposed properties are identified as being in HR4 and HR5	Flooding is widespread throughout the local area associated with Brisbane River flooding to the north and creek flooding from Six Mile Creek to the west and Goodna Creek to the west. Much of the low lying area of Redbank are exposed to backwater flooding from Brisbane River traversing up both creek systems.	Riverine flooding is the dominant source of flood depth with Brisbane River flood depth averaging 6.5m. Local catchment flood depths average 1.3m deep. The local area is not known to be affected by Ipswich Rivers flooding.	Local catchment flood velocities average 0.8m/s, whilst Brisbane River average peak velocity is 0.6m/s. The local area is not known to be affected by Ipswich Rivers flooding.	Time to inundation is generally less than 6hrs associated with flash flooding from the creek systems.	Duration of inundation is generally less than 24hrs in the upper catchment with high durations of over 72 hours reflective of backwater from riverine flooding.	High flood islands are identified along Collingwood Drive in Redbank. There are low flood islands closer to the Brisbane River in Redbank.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Ripley Valley	The local area experiences flooding from two sources - the upper Bundamba Creek and Upper Deebing Creek. Time to inundation is less than 6hrs and duration of inundation less than 24 hrs, which is indicative of flash flooding. The local area is an identified future urban region with specific zoning in the north of the area more progressed. A number of lots north of Ripley Road are identified as being within the HR1b hydraulic risk category.	There are areas of HR2c and HR3a that breakout from Bundamba Creek and its tributaries. Some areas of HR4 impact existing residential properties.	Inundation is limited to areas adjacent to the Bundamba Creek watercourse. There are areas of existing residential development that are exposed to floodwaters that breakout of the tributaries of Bundamba Creek.	Local creek catchment flood sources is the only source of flood impacts in the local area. Flood depths average 0.9m deep.	Local creek catchment velocities average 0.8m/s. Riverine/regional flood impacts are not known to inundate the local area.	Time to inundation is less than 6hrs which is indicative of flash flooding	Duration of inundation less than 24 hrs, which is indicative of flash flooding	A number of low and high flood islands located along Bundamba Creek. Other low flood islands identified across the area also. Priority evacuation areas were not located in the area
Riverview	Riverview is located near the confluence of the Brisbane and Bremer Rivers and is bound by Six Mile Creek to the south and east. Inundation is associated with riverine flooding, i.e. long durations of greater than 72 hours and a time to inundation of greater than 12 hours in the flood fringe. The regional business areas to the north of the area are exposed to high risk, high hazard floodwaters. Residential lots to the south of the Ipswich motorway are exposed to HR5 category (low risk) as backwater traverse up Six Mile Creek	Large areas of HR1b, HR3a, HR5 associated with regional riverine flooding from Brisbane River exist in the north Riverview.	Inundation is widespread in the north of Riverview. Large rural and rural residential lots are impacted by floodwaters.	Riverine flooding is the dominant source of flood depth with Ipswich Rivers and Brisbane River flood depths averaging 6.5m and 7.5m respectively. Local catchment flood depths average 1.5m deep.	Local catchment flood velocities are relatively higher than average riverine flood velocities. Local catchment average velocity is approximately 1.0m/s, whilst flooding from Ipswich and Brisbane Rivers catchments average 0.7 and 06m/s	Low laying areas have a time to inundation of less than 12hrs. With 1%AEP time to inundation of greater than 12hrs in other locations.	Duration of inundation of up to more than 72hrs experienced across the area.	Five low flood islands mapped across the area. Priority evacuation areas were not identified in this location as part of the Ipswich ICP.
Rosewood	Rosewood is located to the north of the Bremer River. The local catchment poses flash flooding risk to residential properties throughout the local area. The nature of localised flooding is a series of breakouts across the floodplain with large areas of HR3a (low hazard). Isolation caused by flood islands is recognised as a key risk factor in this area. There are high hazard flow paths and longer duration floods associated with riverine flooding south of Rosewood-Thagoona Road across rural paddocks.	HR1c and H1b exist adjacent to the Bremer River watercourse in the south the LAF. Throughout Rosewood there is large extents of HR2a HR3a and HR2c associated with local flooding.	Through the settlement of Rosewood there are a number of complex flow paths that break out through the suburb associated with local flooding. To the south of Rosewood-Thagoona Rd inundation associated with Bremer River effects large rural lots extensively.	Ipswich Rivers flood depths average 1.3 metres deep across the local area, whilst local catchment flooding depths average 0.7m. Flooding from the Brisbane River does is not known to affect this local area.	Ipswich Rivers average peak flood velocity is 0.7m/s across the local area, whilst local catchment peak average velocity is 0.4m/s. Flooding from the Brisbane River does is not known to affect this local area.	Time to inundation generally less than 6 hrs, with peripheral areas of the floodplain and the upstream (southwest) areas of the area shown to experience up to 12hrs+ time to inundation.	Duration of inundation is generally less than 24hrs with inundation of up to 72 hrs along the main flow paths.	Extensive (by number and extent) low and high flood islands identified across the region as part of the Ipswich ICP. Priority evacuation areas were not identified in this area as part of the Ipswich ICP.
Springfield Estate	The Springfield Estate local area flood hazard is driven primarily by Woogaroo Creek and Opossum Creek. Flood hazard is contained to the land immediately adjoining the waterway with very short TTI and short DOI associated with flashy catchments. Much of the development is located outside of the floodplain. Springfield Central is exposed to HR5 category (low risk) that breaks out across the flood plain.	There are areas of HR5 that breakout from Woogaroo Creek and its tributaries.	Inundation is limited to areas adjacent to Woogaroo Creek watercourse.	Local creek catchment flood sources is the only source of flood impacts in the local area. Flood depths average 1.6m deep.	Flood velocity is generally low, with average flood velocity less than 0.5m/s for local creek flooding 0.8m/s. The local area is not known to be at risk of flooding from riverine flooding.	Time to inundation is less than 6hrs which is indicative of creek/flash flooding	Duration of inundation less than 24 hrs, which is indicative of creek/flash flooding	Six (6) low flood islands located across the Springfield area

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Swanbank, New Chum	The local area is largely rural in the upper Bundamba Creek catchment and Six Mile Creek. Flood risk is driven by creek flooding, with short time to inundation and duration associated with flash flooding. There are a number of large rural lots exposed to high hazard to the south of the area and a series of ponds and weirs near the Asphalt mine in Swanbank. The railway turning loop near Patrick Street is a large low flood island.	In Swanbank, HR1c and HR1b exist across large rural lots adjacent to the creek. In New Chum there are large areas of HR5 associated with Six Mile Creek	Inundation is limited to areas adjacent to Bundamba Creek, however there are large dams and ponds in the Asphalt mines in Swanbank that contain deep water associated with HR1c and HR1b.	Riverine flooding is the dominant source of flood depth with Brisbane River flood depth averaging 2.2m. Local catchment flood depths average 1.4m deep. The local area is not known to be affected by Ipswich Rivers flooding.	Brisbane River flood average peak velocity are low at approximately 0.1m/s. Local catchment velocities are relatively higher with an average peak velocity of 0.7m/s.	Time to inundation is less than six hours across the local area	Duration of inundation is less than 24 hrs across the local area	Two low flood islands located in the south west of the local area. Six small high flood islands are located across the local area as well as a smaller additional low flood island to the south east of the region. No priority evacuation areas were mapped within the area as part of the Ipswich ICP.
Tallegalla, Woolshed, The Bluff	The local area is largely rural in the upper catchments of Plain Creek, Black Snake and Woolshed Creek. The flood risk is contained to rural paddocks adjoining the creek waterways.	Small areas of each HR categories exist along the creek watercourse.	Flood inundation is not extensive in this LAF	Spatial analysis of average flood depths indicates the 1%AEP inundation is not materially significant outside the designated watercourses.	Spatial analysis of average flood depths indicates the 1%AEP inundation is not materially significant outside the designated watercourses.	Time to inundation is less than 6hrs which is indicative of flash flooding	Duration of inundation less than 24 hrs, which is indicative of flash flooding	A number of small low flood islands and one high flood island have been identified along the northern boundary of the local area (which is also the LGA boundary)
Walloon, Thagoona, Haigslea (part) and Mount Marow	Walloon, Thagoona and Haigslea are located to the north of the Bremer River. Local catchments pose flash flooding risk to residential properties throughout the local area. The nature of localised flooding is a series of breakouts across the floodplain with large areas of HR3a (low hazard). Isolation caused by flood islands is recognised as a key risk factor in this area. There are high hazard flow paths and longer duration floods associated with riverine flooding south of Rosewood-Thagoona Road across rural paddocks.	HR1c and H1b exist adjacent to the Bremer River watercourse in the south the LAF. Throughout Walloon there is large extents of HR2a HR3a and HR2c associated with local flooding.	Through the settlement of Walloon there are a number of complex flow paths that break out through the suburb associated with local flooding. To the south of Karrabin-Rosewood inundation associated with Bremer River effects large rural lots extensively.	Regional flooding is the dominant source of flood depth with Ipswich Rivers and Brisbane River flood depths averaging 1.9m and 2.5m respectively. Local catchment flood depths average 0.7m deep.	The average velocities are relatively similar for all sources of flooding, with peak velocity from the Brisbane River averaging 0.7m/s and the average peak velocity for Ipswich Rivers and local catchment flooding being 0.5m/s each.	Time to inundation is generally less than 6hrs which is reflective of flash flooding behaviour	Duration of inundation in the 1%AEP is generally less than 24 hrs	Walloon has a high number of properties located on low flood islands. There are large high flood islands in Thagoona.

Local Area	Risk Narrative	Hydraulic Risk	Flood behaviour			Risk Multipliers		
Yamanto	Yamanto is exposed to flood inundation of the west, north and east from a variety of sources - Purga and Warrill Creek on the west, Bremer River on the north and Deebing Creek on the east. Low density residential and Local Business and Industry-zoned land are identified as at risk up to and including HR3a. Significant inundation occurs in HR4 and HR5 categorised flooding. A number of lots near Berry Street and Greenway Street are shown to be within the HR1c flood risk extent, which is anticipated to be a function of flood depth in Bremer River flooding. There are also a number of exiting residential lots within the HR2b, 3c and 3a risk categories near Midland Street, Yamanto. Time to inundation across the local area is generally greater than 12hrs and duration of inundation for existing residential lots is less than 48hrs.	HR1c and HR1b is largely contained to large rural lots closer to the watercourse. Low density residential and Local Business and Industry- zoned land are identified as at risk up to and including HR3a. Significant inundation of residential areas occurs in HR5 categorised flooding.	Inundation in low-lying rural areas impacts this LAF from a variety of sources - Purga and Warrill Creek on the west, Bremer River on the north and Deebing Creek on the east.	Riverine flooding is the dominant source of flood depth with Ipswich Rivers and Brisbane River flood depths averaging 5.5m and 5.0m respectively. Local catchment flood depths average 1.8m deep.	Average peak velocity is marginally higher for local catchment flooding events at 0.9m/s, whilst Ipswich Rivers average peak velocity is 0.7m/s and Brisbane River average peak velocity is 0.5m/s.	Time to inundation across the local area is generally greater than 12hrs	duration of inundation for existing residential lots is less than 48hrs	Two low flood islands located in the north west of the area. A priority evacuation area is located in the south-east of the area.

4 SUMMARY - FIT FOR PURPOSE RISK ASSESSMENT

4.1 Using the existing IICP

This risk assessment provides overview of flood risk exposure across the Ipswich City LGA using available flood modelled data. The IICP provides a lot of the requisite data and tools to revise or refine land use planning responses with consideration of local flood risk factors. Outputs from the IICP have been reviewed in light of the principles required for an SPP-compliant risk assessment, and Council is considered to be significantly advanced in the risk assessment process.

Identification of risk-based land use considers a range of flood risk factors, including:

- flood frequency and hazard,
- time to inundation,
- duration of inundation,
- isolation associated with flood islands and
- vulnerable communities.

These flood risk factors were recommended in the IICP as a basis of informing land use planning to ensure new developments are designed and situated away from flood risk areas or take appropriate mitigation measures to ensure risk is commensurate with the intended use of the site.

4.2 Fit for purpose test

The State Planning Policy for Natural Hazards, Risk and Resilience – Flood outlines a number of principles to employ for undertaking a fit for purpose flood risk assessment. To demonstrate how each principle has been investigated and/or implemented through the IICP and the Ipswich Flood Hazard Risk Assessment an overall summary table has been provided in Table 4-1.

Table 4-1 Fit for purpose assessment (SPP)

SPP #	SPP Flood Risk Assessment Principle	Estimated status	Rationale
1	**Consider the widest range of flood events possible across the risk spectrum (i.e., for which data is locally available)?**	✓ Principle fully employed	Flood studies across all creek and riverine catchments in Ipswich were used in the completion of the IICP. A comprehensive approach was taken to include the widest range of flood events possible – from the 1 in 10 AEP up to and including the PMF
2	**Analyse flood behaviour.**	✓ Principle fully employed	Extensive studies were conducted as a part of the IICP to analyse flood behaviour, including to identification of multiple zones of hydraulic risk, consideration of time to inundation, duration of inundation, calculation of low and high flood islands and secondary risk indicators such as road flood immunity, flood damages and evacuation capability.
3	**Analyse impact of flood on all zoned land, and to what**	✓ Principle fully	Findings from the IICP were interpreted to inform land use planning recommendations, including the appropriateness of certain land uses exposed to certain flood hazard, flash

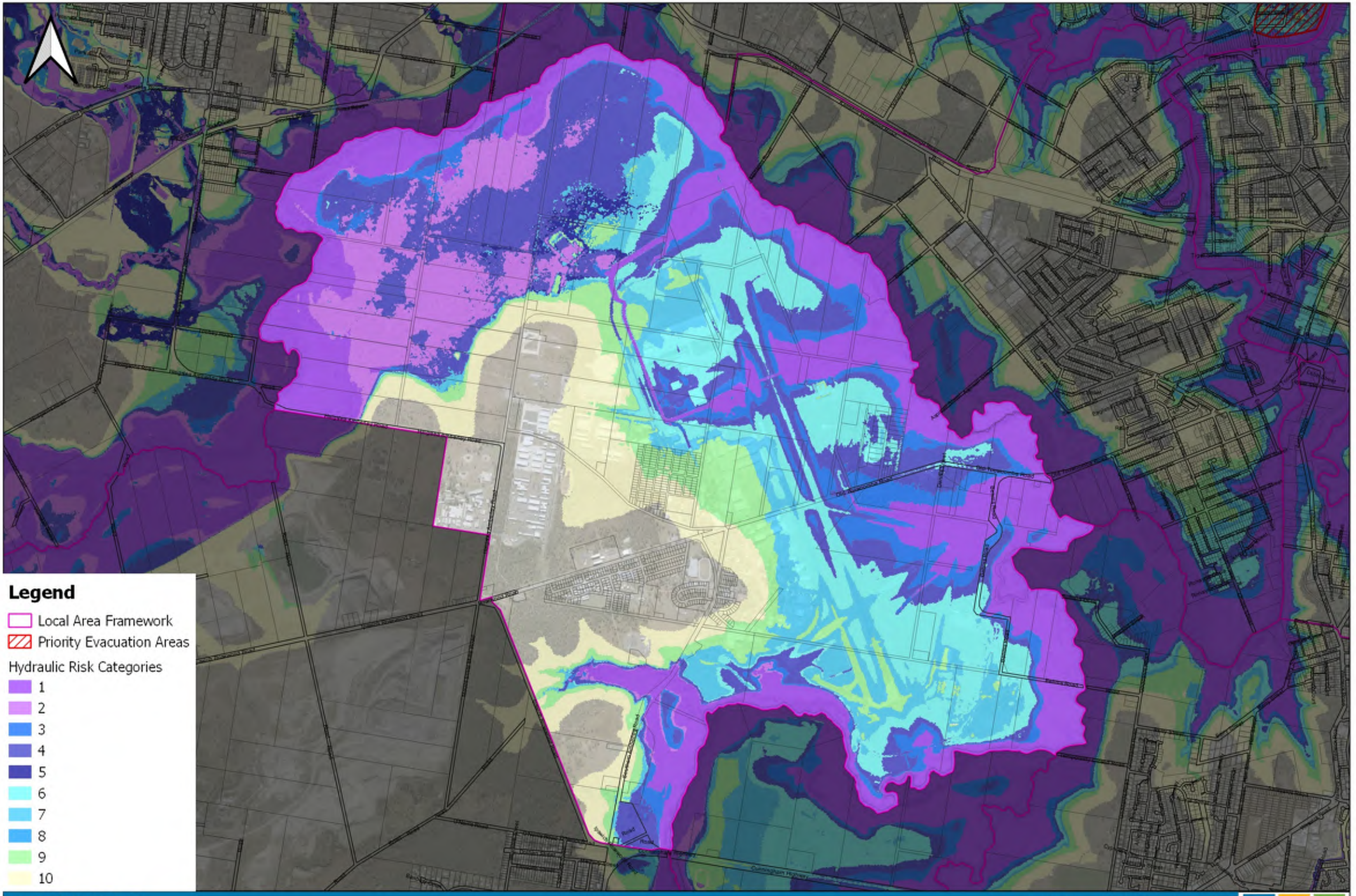
SPP #	SPP Flood Risk Assessment Principle	Estimated status	Rationale
	hazard level.	**employed**	flooding and isolation. A full analysis of the existing settlement pattern and zoning categories has been undertaken in the Ipswich Natural Hazard Risk Assessment.
4	**Assess impact of flood on the number and types of properties affected, and the potential for flood damage.**	✓ **Principle fully employed**	As a part of the IICP, direct and indirect economic damages were also assessed including analysis of residential, commercial and industrial stage damage curves across the broad spectrum of flood events. Property scale spatial data has been created as part of the IICP, including exposure to hazard, hydraulic risk, time to inundation, duration of inundation and flood islands.
5	**Include areas with future land release plans and review impact of flood on those areas.**	✓ **Principle fully employed**	Findings from the IICP were interpreted to inform land use planning recommendations, including the appropriateness of certain land uses exposed to certain flood hazard, flash flooding and isolation. A full analysis of the existing zoned land has been undertaken in the Ipswich Natural Hazard Risk Assessment.
6	**Understand flood mitigation options and urban infrastructure immunity and capacity relative to the flood behaviour.**	✓ **Principle fully employed**	Flood risk exposure, mitigation options and critical infrastructure immunity were investigated through the IICP. Road flood immunity mapping has been undertaken and high level analysis of community infrastructure such as hospitals, schools and vulnerable uses. Physical / structural mitigation options as well as natural flood mitigation management options were analysed through a multicriteria and cost-benefit comparison process. Additionally, community preferences for flood mitigation options were sought through a community values survey.
7	**Ensure the flood risk assessment integrates with investigations related to and preparation of local disaster management plans. See state interest policy 5 for details.**	✓ **Principle fully employed**	Flood intelligence gained through the IICP such as evacuation capability assessment have been provided to Council for consideration in the preparation of local disaster management plans and associated works. Evacuation capability assessment included investigation of hydraulic risk exposure, time to inundation, duration of inundation, road immunity and isolation (high and low flood islands) across the LGA. Council, by addressing Policy 5 of the SPP are to ensure development does not hinder emergency services and disaster management capacity and capability. It is proposed that the development of land use policy responses and plan drafting will include the broad land use policy and development controls that specifically address this policy.
8	**Consider the effect of dams (both referable dams and non-referable dams, if known) on flood behaviour in the catchment, and the**	+ **Principle partially employed**	Flood behaviour modification responses, known in the IICP as 'Physical Mitigation options' were investigated through the IICP. Natural flood management options including large scale revegetation, dams and basins were analysed through a multicriteria and cost-benefit comparison process.

SPP #	SPP Flood Risk Assessment Principle	Estimated status	Rationale
	implications for risks to existing and future development in downstream towns.		Consideration of the natural flood management options including large scale revegetation, dams and basins in upper catchment areas where cost effective should be discussed with the community as a viable management of flooding risks in downstream urban areas.
9	**Consider how to address climate change, particularly if existing available flood studies do not include climate change factors.**	✓ **Principle fully employed**	Climate change sensitivity analysis has been undertaken as part of the IICP. This has considered the 1 in 100 AEP and identifies suburbs that are particularly sensitive to increase hazards associated with climate change.
10	**Understand the demographic and socio-economic characteristics of the community at risk, to better understand community vulnerability to flood.**	✓ **Principle fully employed**	Extensive community vulnerability assessments and planning was conducted as a part of the IICP. A heatmap of community vulnerability was produced to better understand distribution across the LGA. Additionally, the 'driver of vulnerability' from the four categories of awareness, physical, mobility and social-economic vulnerability were statistically derived to identify a focus for each suburb.
11	**Develop and test options to improve risk management outcomes.**	✓ **Principle fully employed**	Physical / structural mitigation options as well as natural flood mitigation management options were analysed through a multicriteria and cost-benefit comparison process. Additionally, the community survey found that structural dams, landscape restoration and detention basins were the most preferred management options.
12	**Consult with the community to identify tolerance to flood risk (if any) and test possible treatment options.**	✓ **Principle fully employed**	A detailed community survey titled 'Managing Future Floods' was conducted through the development of the IICP with over 200 participants from a cross-section of suburbs represented in survey results. A review and comparison of the SFMP regional community tolerance survey results was conducted, particularly to the results collected from Ipswich residents. Key findings included higher tolerability to flooding in residents that have experienced previous flood events, and that the majority of respondents reported they 'know their own risk', understand they are responsible for their own safety, and have taken steps to be prepared for the next flood (flood insurance, emergency plan etc).
13	**Articulate flood risk implications for future growth.**	✓ **Principle fully employed**	Findings from the IICP were interpreted to inform land use planning recommendations, including the appropriateness of certain land uses exposed to certain flood hazard, flash flooding and isolation. A full analysis of the existing settlement pattern and zoning categories has been undertaken as part of the Ipswich Natural Hazard Risk Assessment work.

SPP #	SPP Flood Risk Assessment Principle	Estimated status	Rationale
14	**Develop recommended policy options.**	+ Principle partially employed	A comprehensive list of recommendations was compiled as a part of the IICP across current and future flood risk, physical mitigation, land use planning, property specific actions, community awareness and resilience, and emergency management. This includes suburb-specific recommendations based on the implications of identified flood hazard, recommendations for planning scheme provisions and compliance with SPP requirements. Land use policy response across the Ipswich LGA are developed as part of the Ipswich Natural Hazard Risk Assessment work.

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX A
FLOOD RISK MAPPING: HYDRAULIC RISK BY LAF


Legend
Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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2
3
4
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10
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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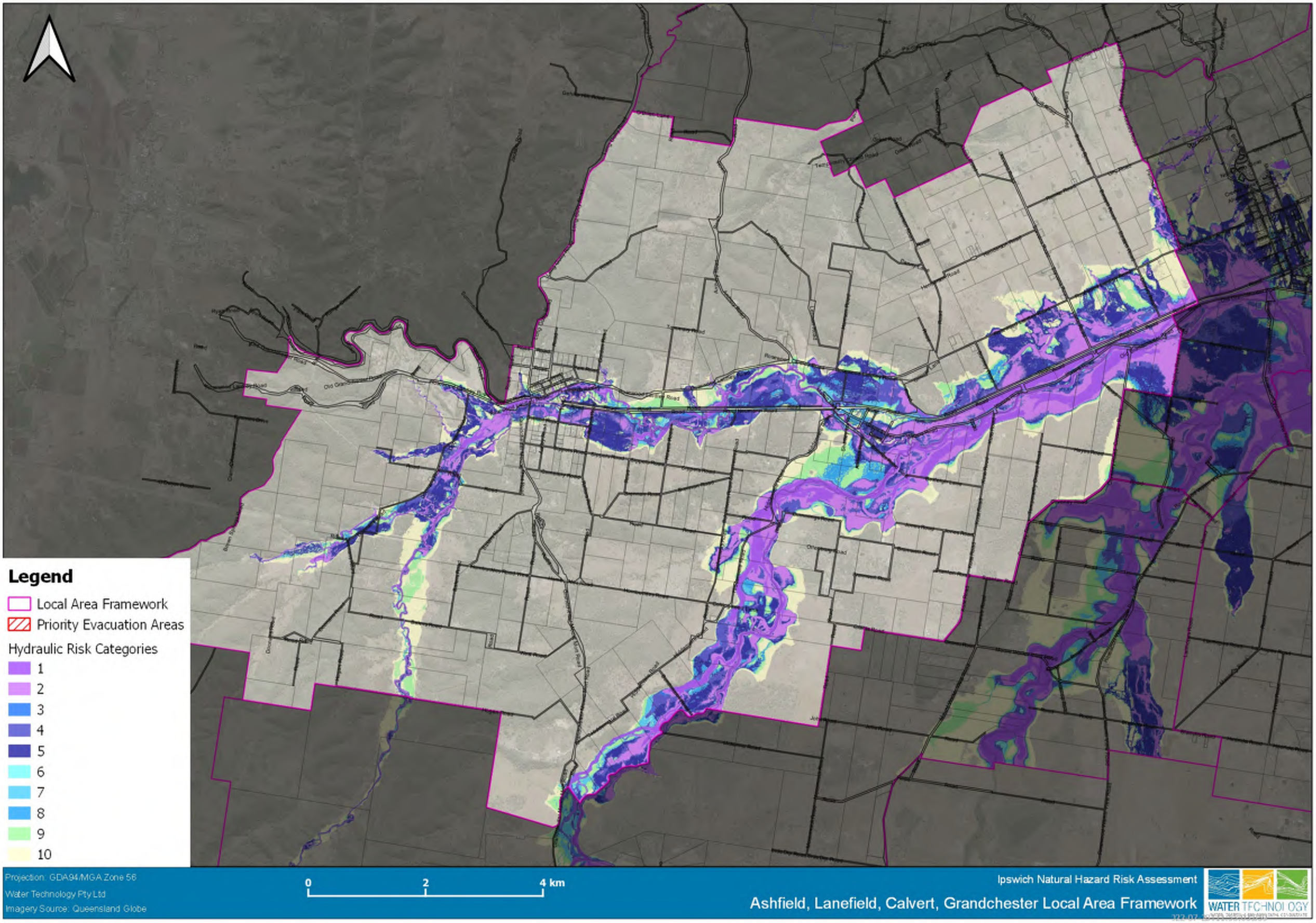
2 km
Ipswich Natural Hazard Risk Assessment
Amberley Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
1
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10
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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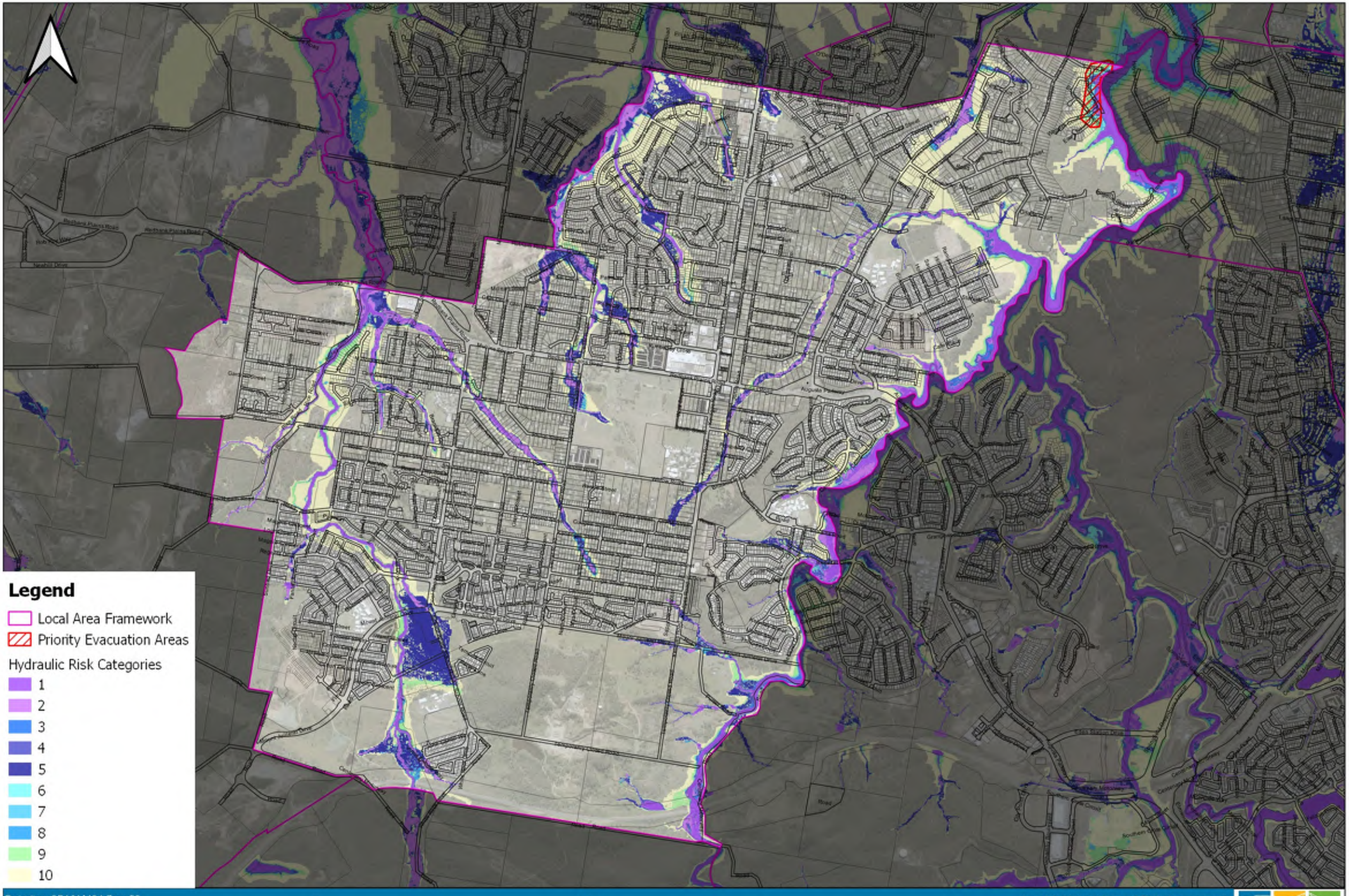
2
4 km
Ipswich Natural Hazard Risk Assessment
Ashfield, Lanefield, Calvert, Grandchester Local Area Framework
WATER TECHNOLOGY


Redbank Plains Road
Nerimbil Drive
Augustine Heights
Bellbird Park
Redbank Plains
Legend
Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
1
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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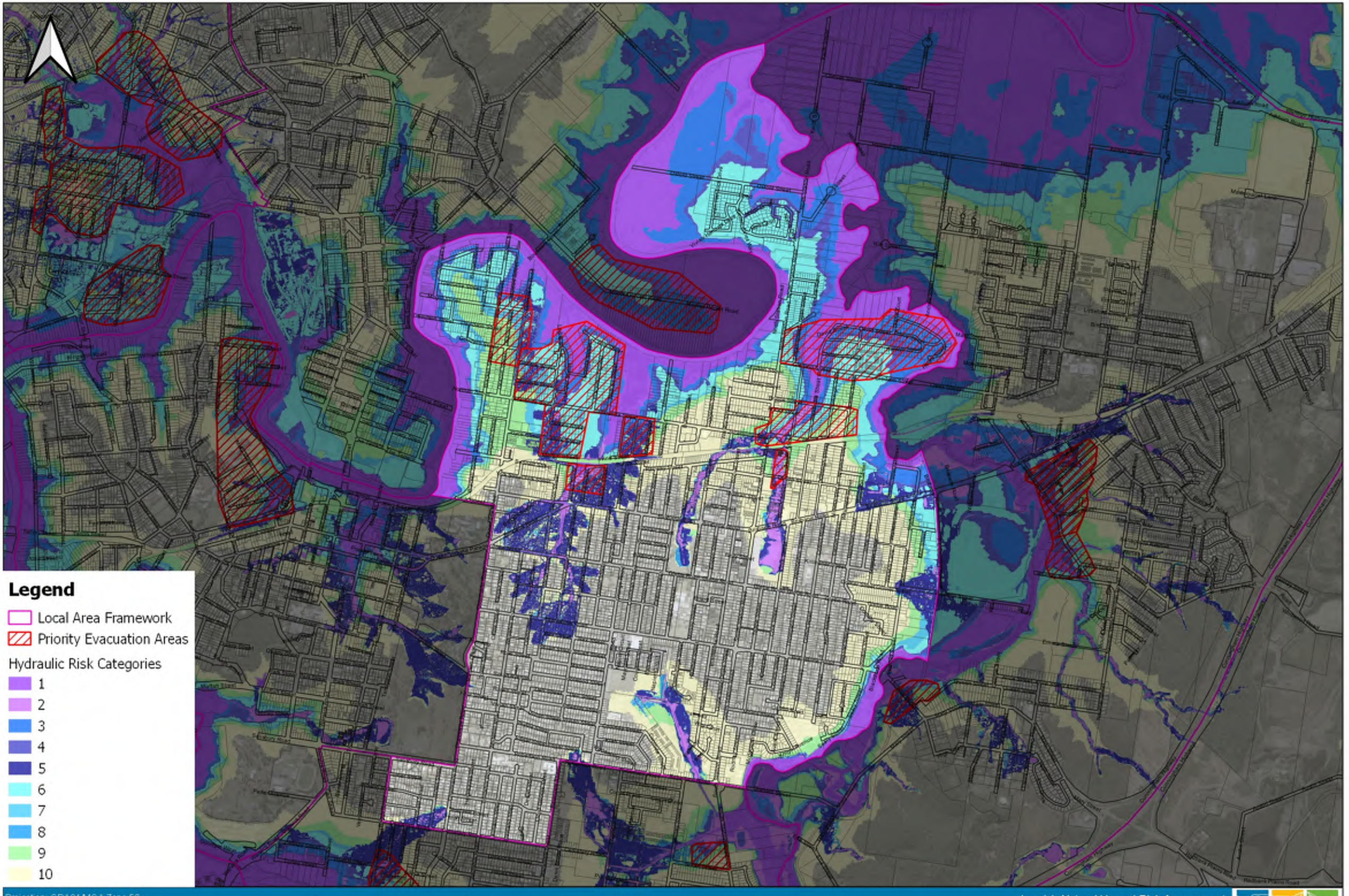
2 km
Ipswich Natural Hazard Risk Assessment
Bellbird Park, Redbank Plains, Augustine Heights Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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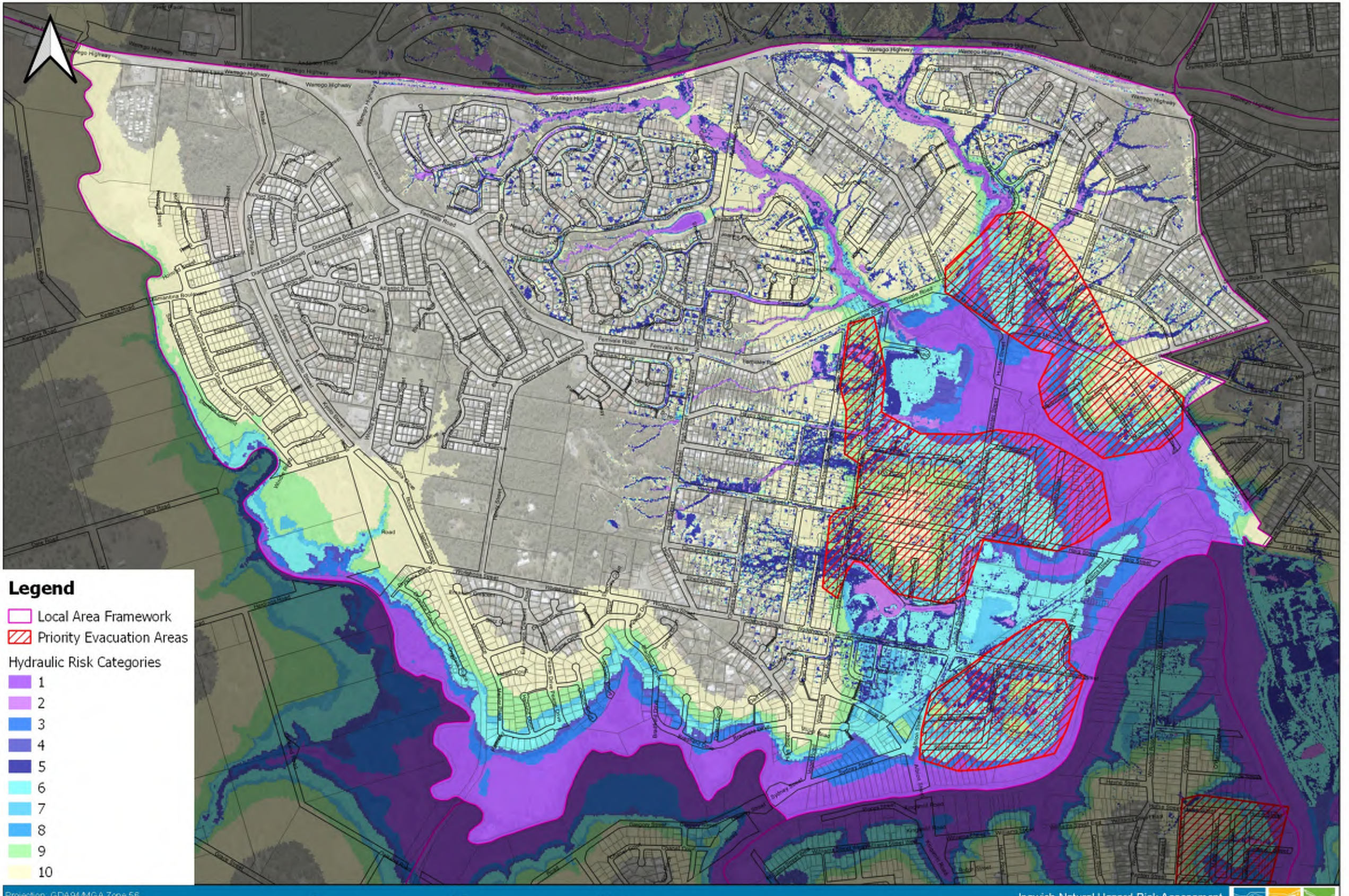
Ipswich Natural Hazard Risk Assessment
Booval, East Ipswich, North Booval Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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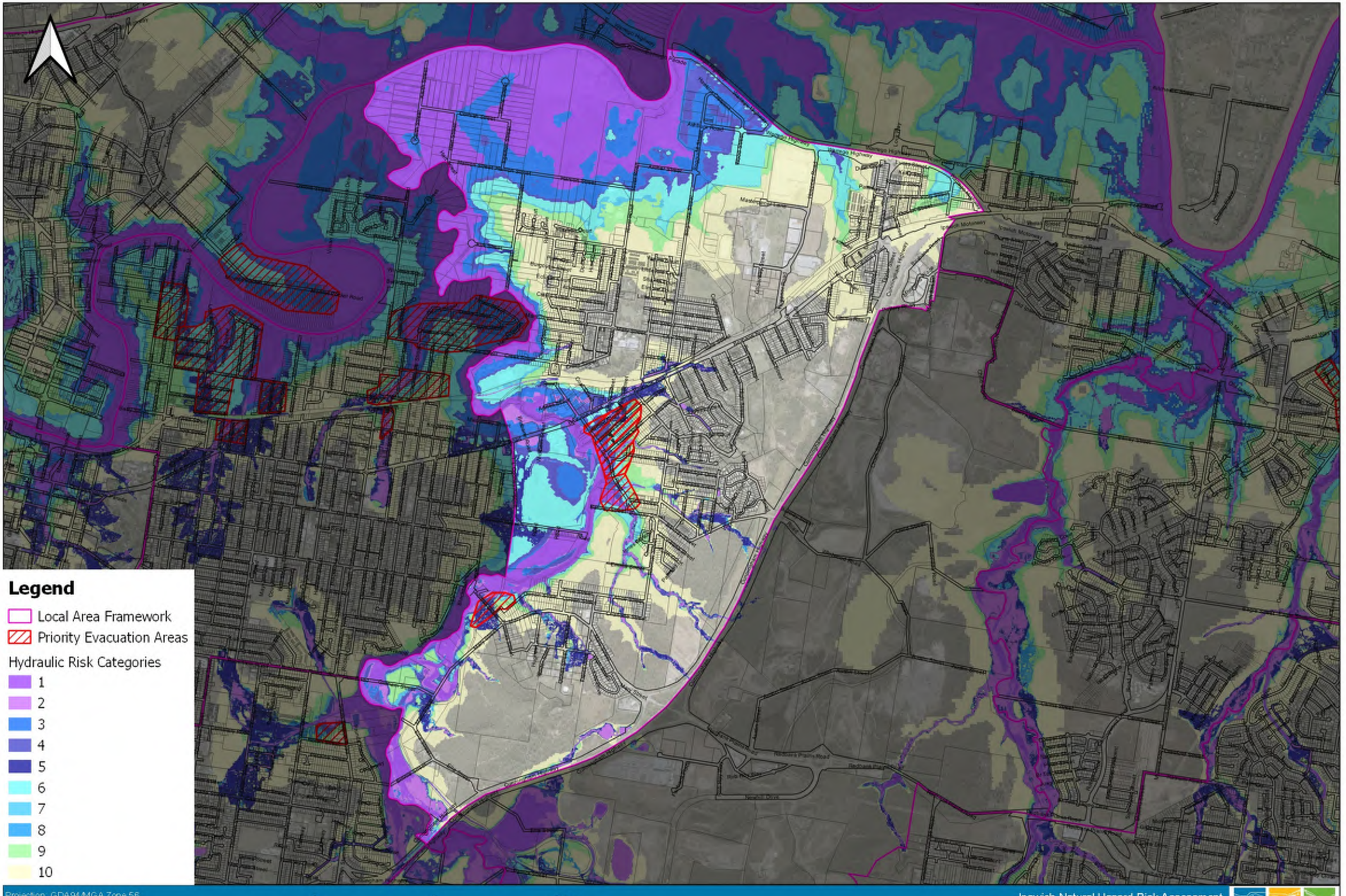
1 km
Ipswich Natural Hazard Risk Assessment
Brassall Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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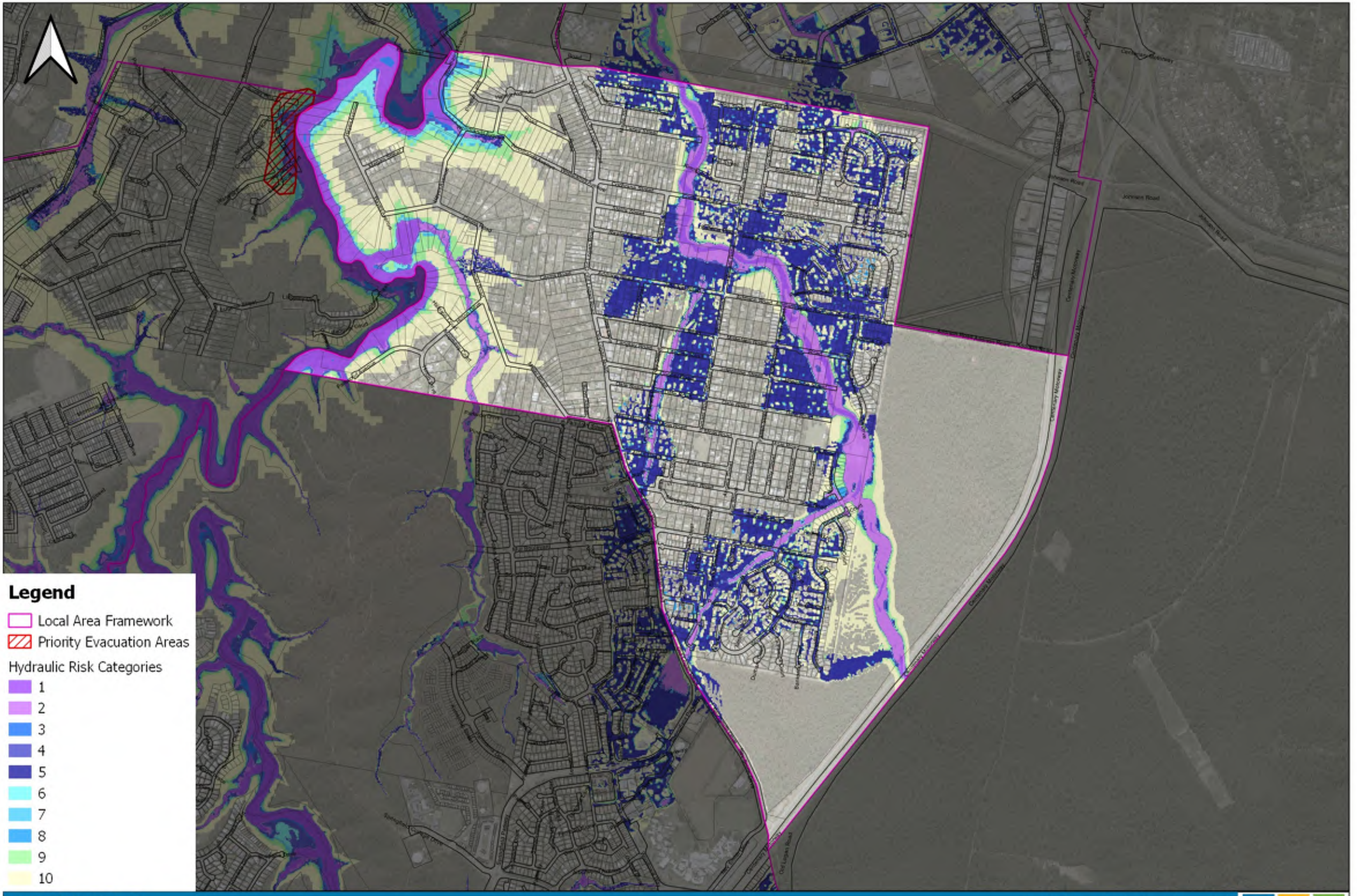
Ipswich Natural Hazard Risk Assessment
Bundamba, Blackstone, Ebbw Vale, Dinmore Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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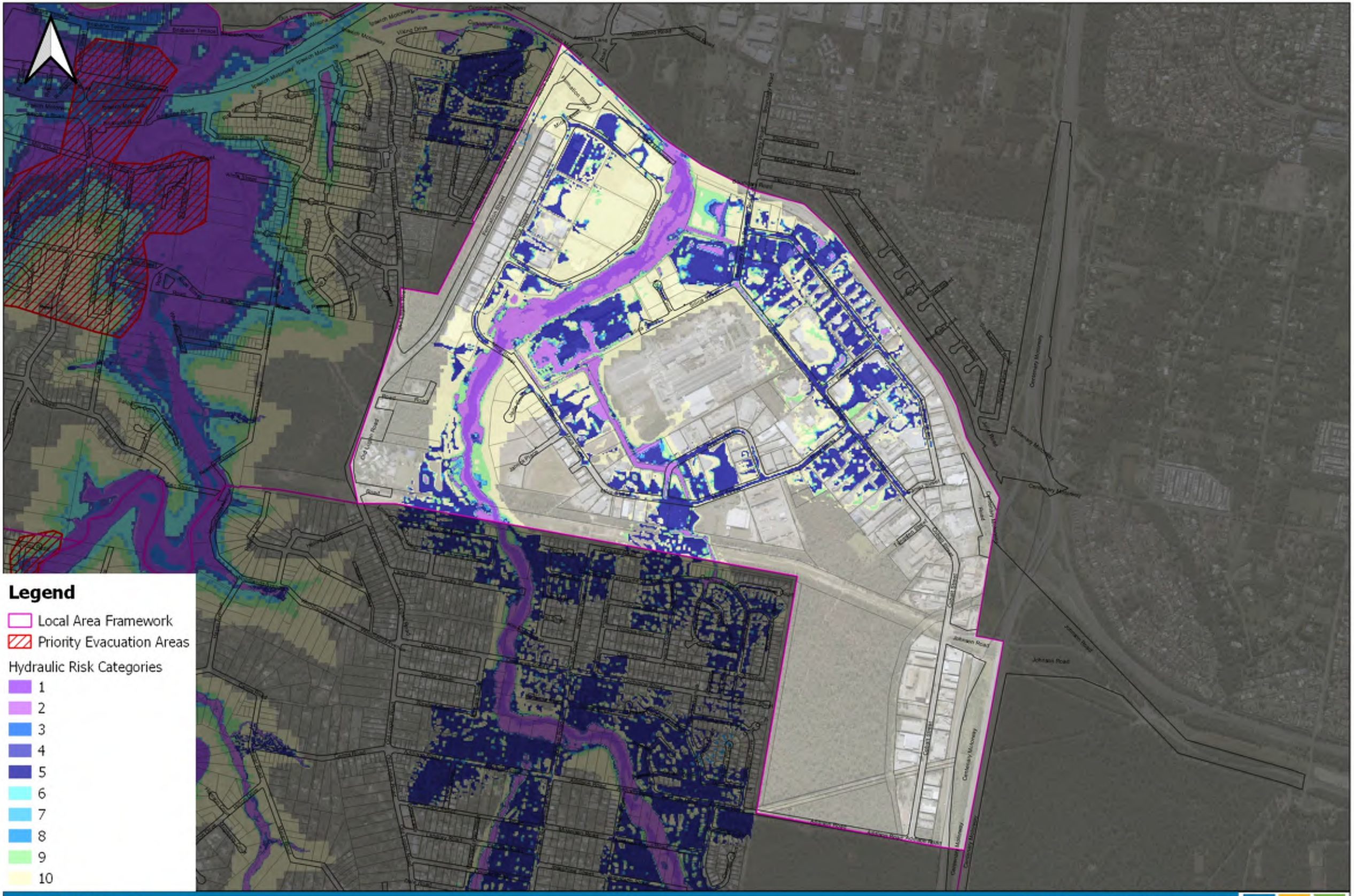
1.4 km
Ipswich Natural Hazard Risk Assessment
Camira (part) Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
1
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3
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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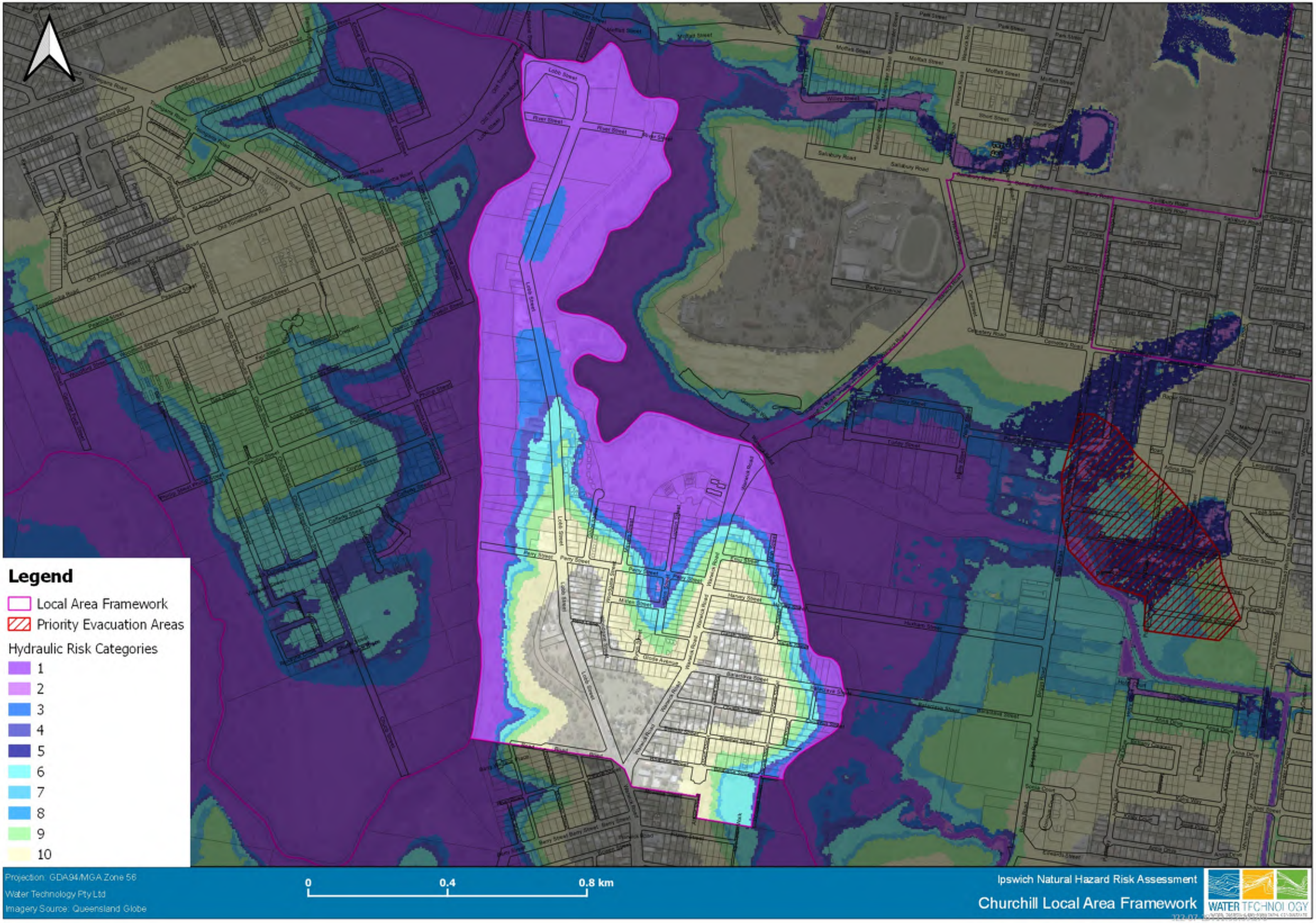
0.6
1.2 km
Ipswich Natural Hazard Risk Assessment
Carole Park Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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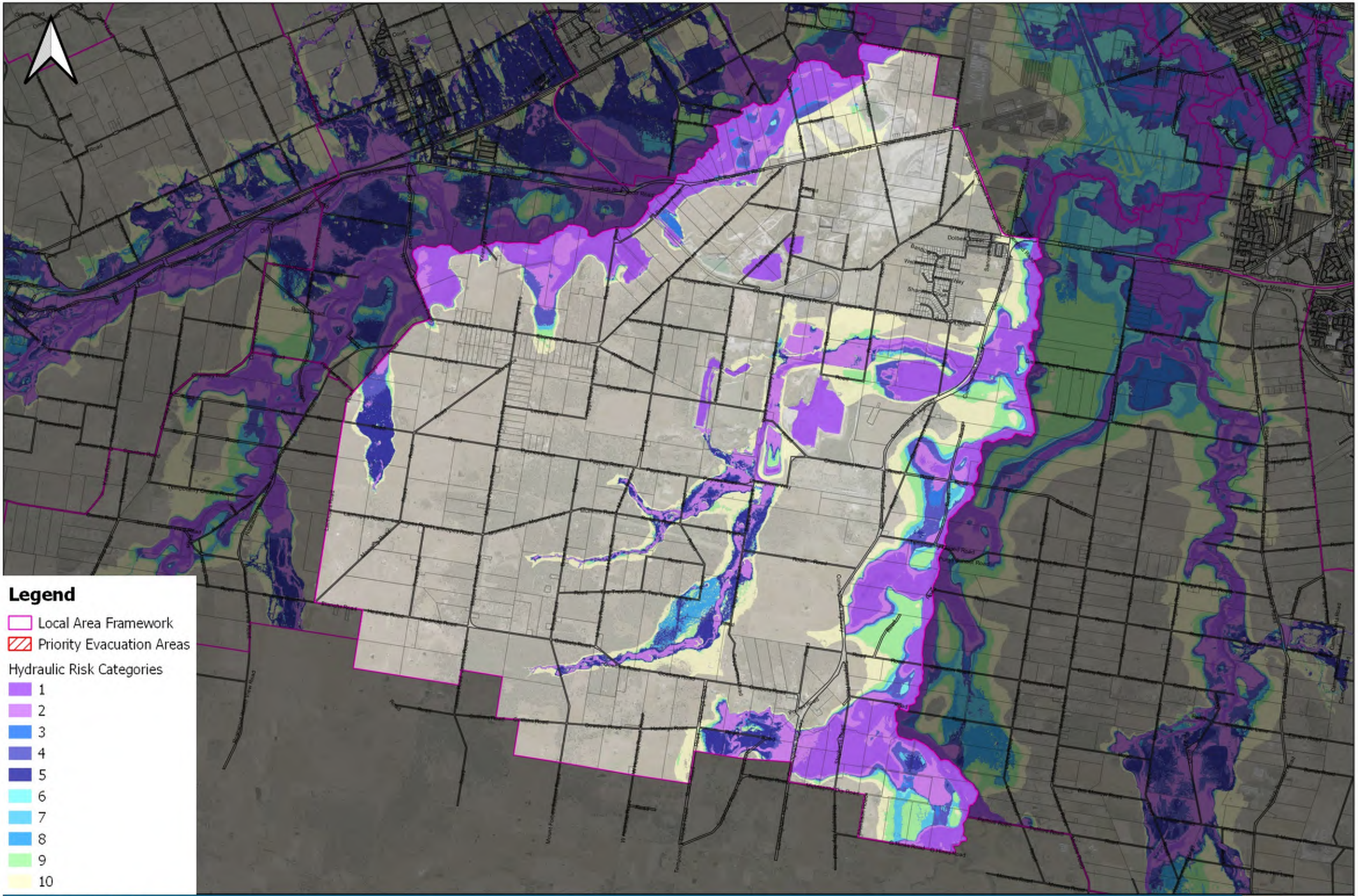
0.8 km
Ipswich Natural Hazard Risk Assessment
Churchill Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
2
4 km
Ipswich Natural Hazard Risk Assessment
Ebenezer, Willowbank, Jeebropilly, Mount Forbes Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

Goodna, Gailes, Camira (part) Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

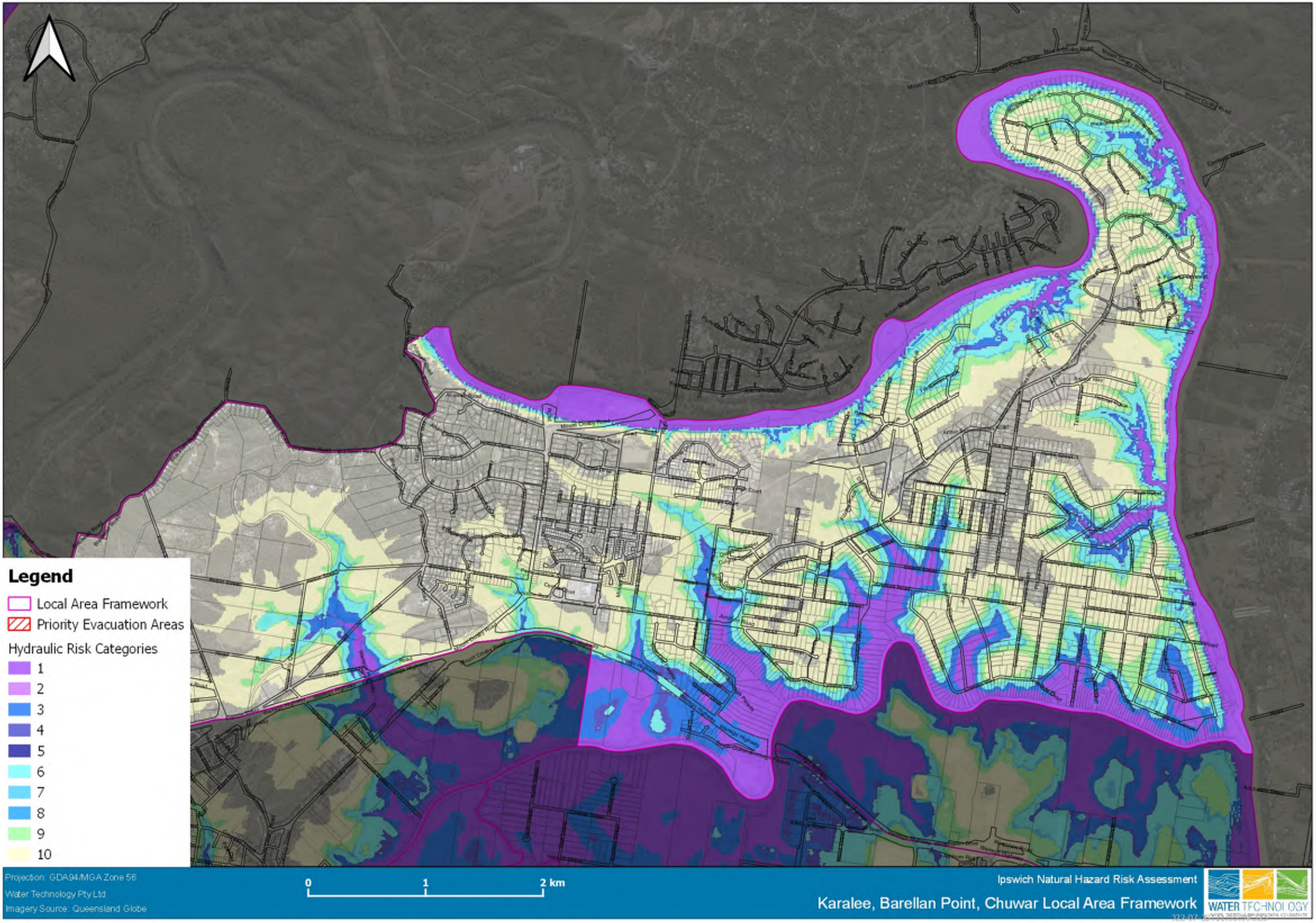
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

Ipswich Central Local Area Framework

WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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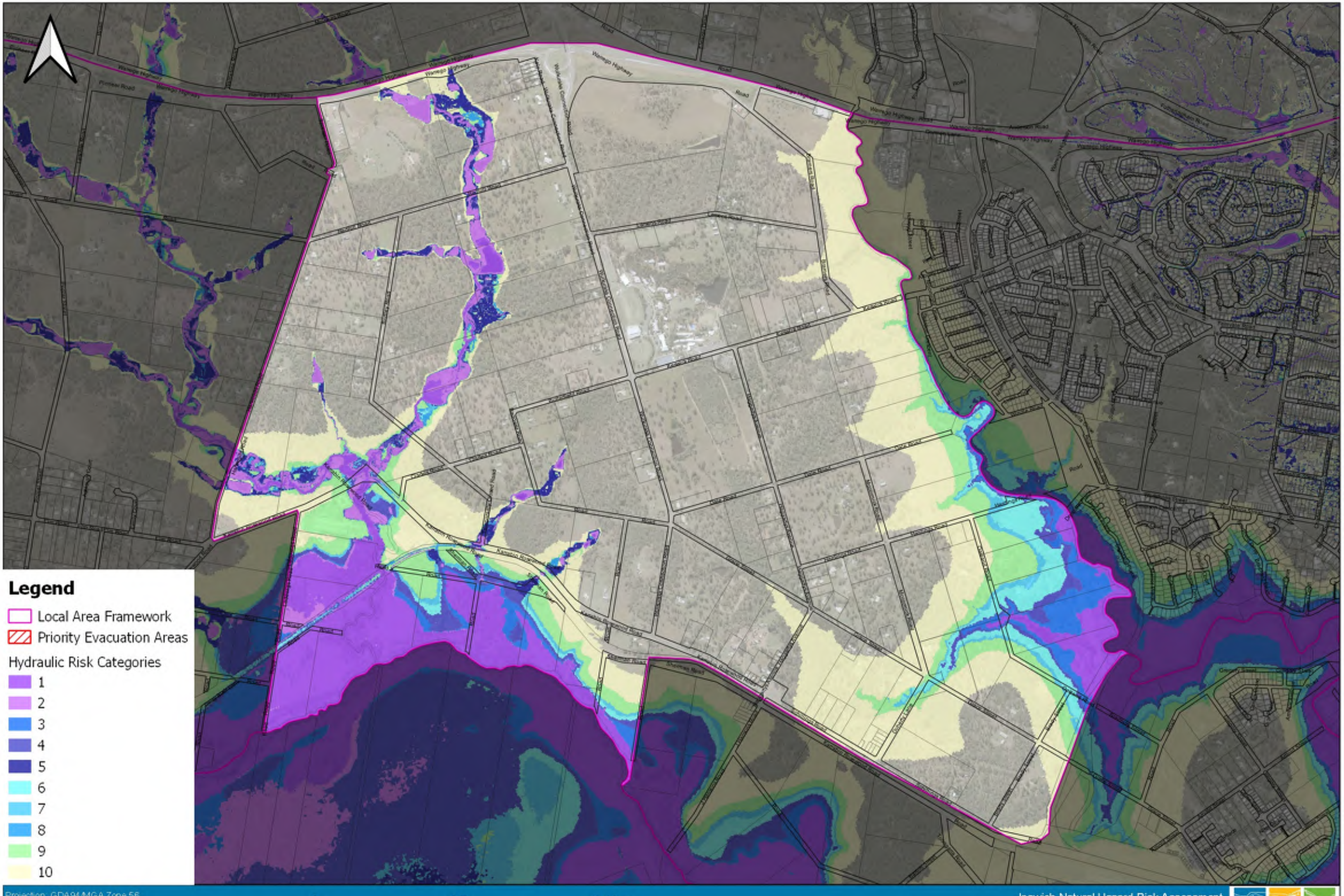
2 km
Ipswich Natural Hazard Risk Assessment
Karalee, Barellan Point, Chuwar Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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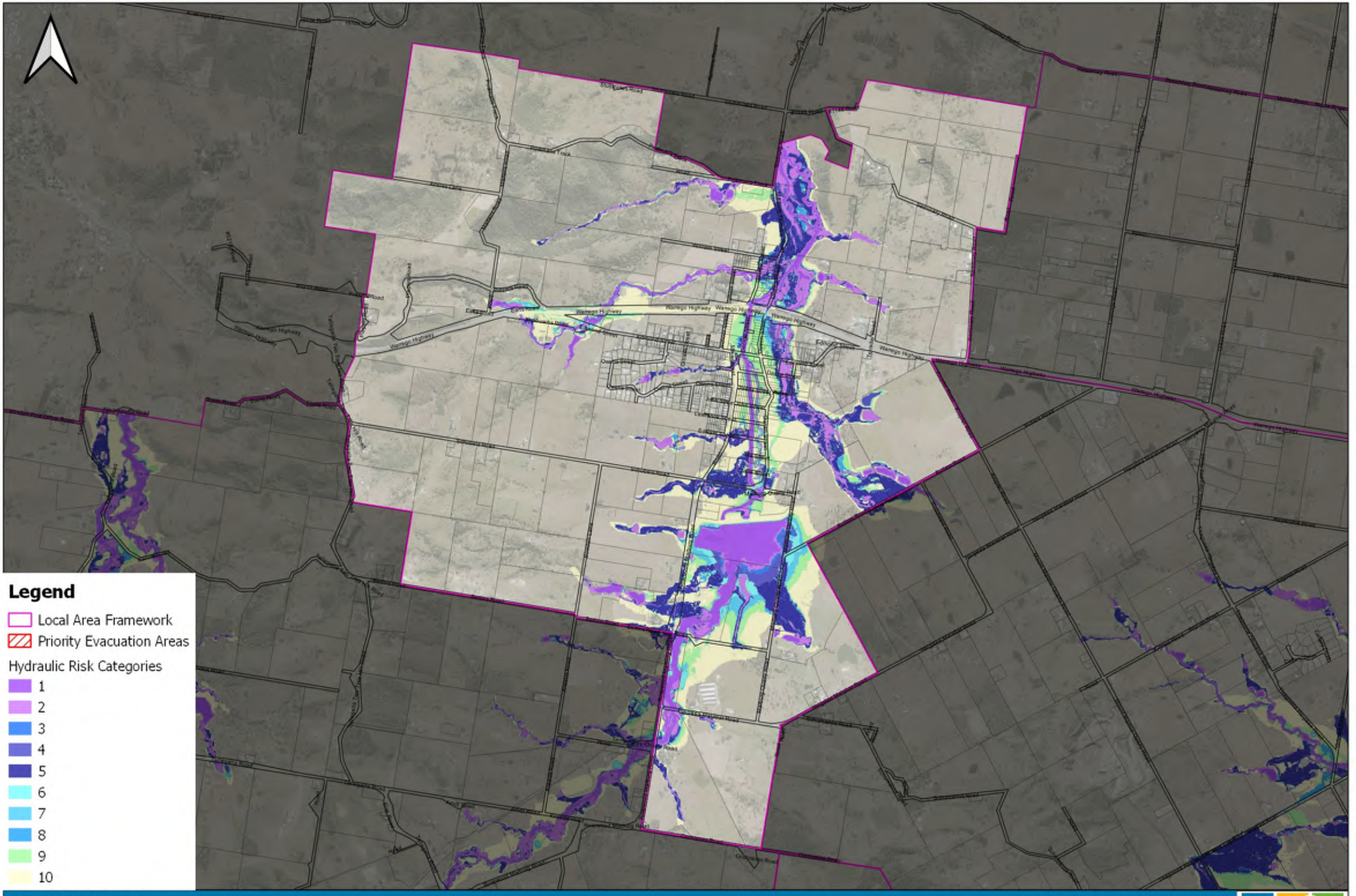
1.4 km
Ipswich Natural Hazard Risk Assessment
Karrabin, Blacksoil (part) Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Warrego Highway
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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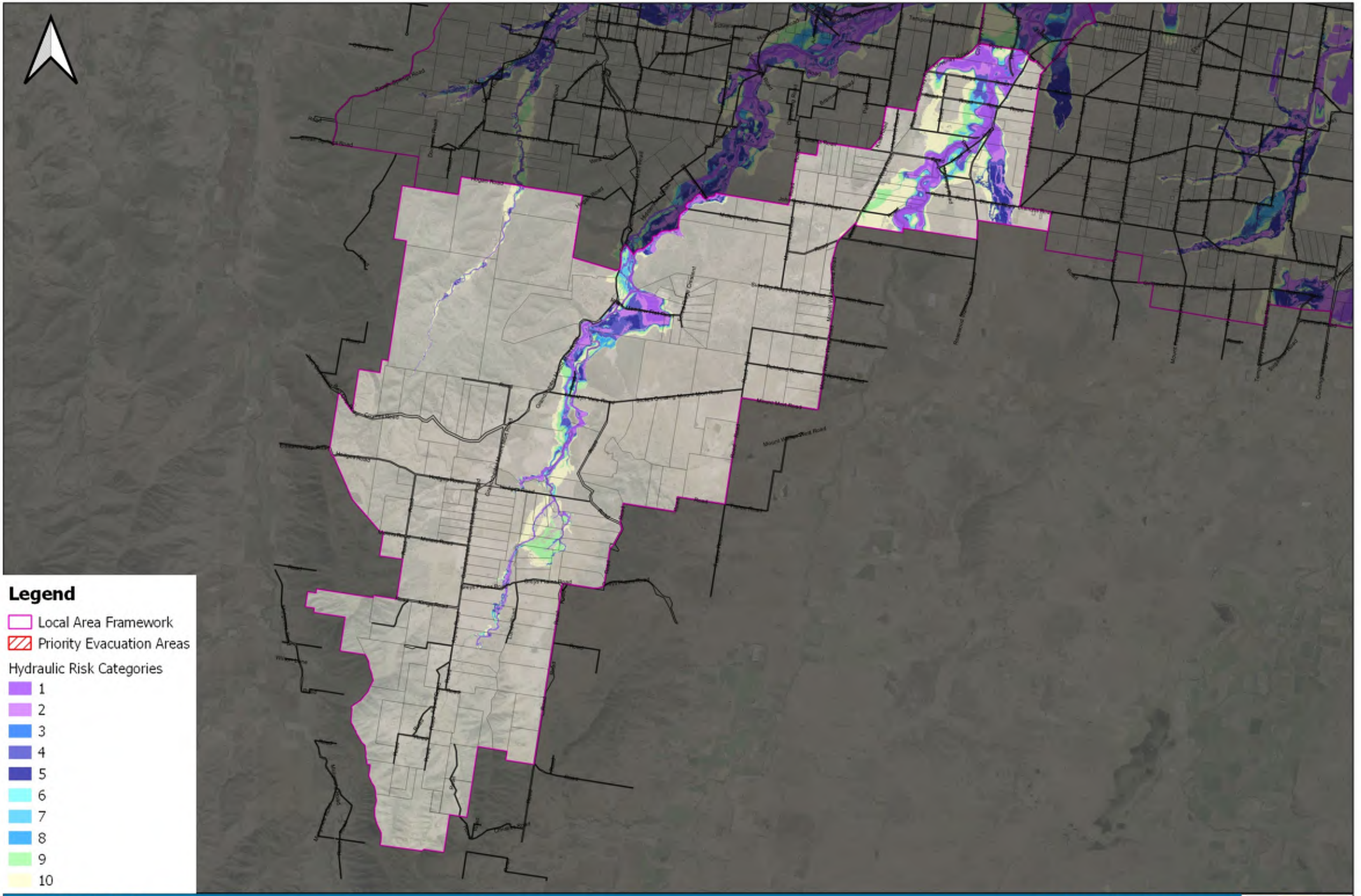
1
2 km
Ipswich Natural Hazard Risk Assessment
Marburg Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
1
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
4
8 km
Ipswich Natural Hazard Risk Assessment
Mount Mort, Lower Mount Walker, Mount Walker West Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

North Ipswich Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.9 1.8 km

Ipswich Natural Hazard Risk Assessment

One Mile, Leichhardt, Wulkuraka Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 2 4 km

Ipswich Natural Hazard Risk Assessment

Pine Mountain, Muirlea, Blacksoil (part) Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

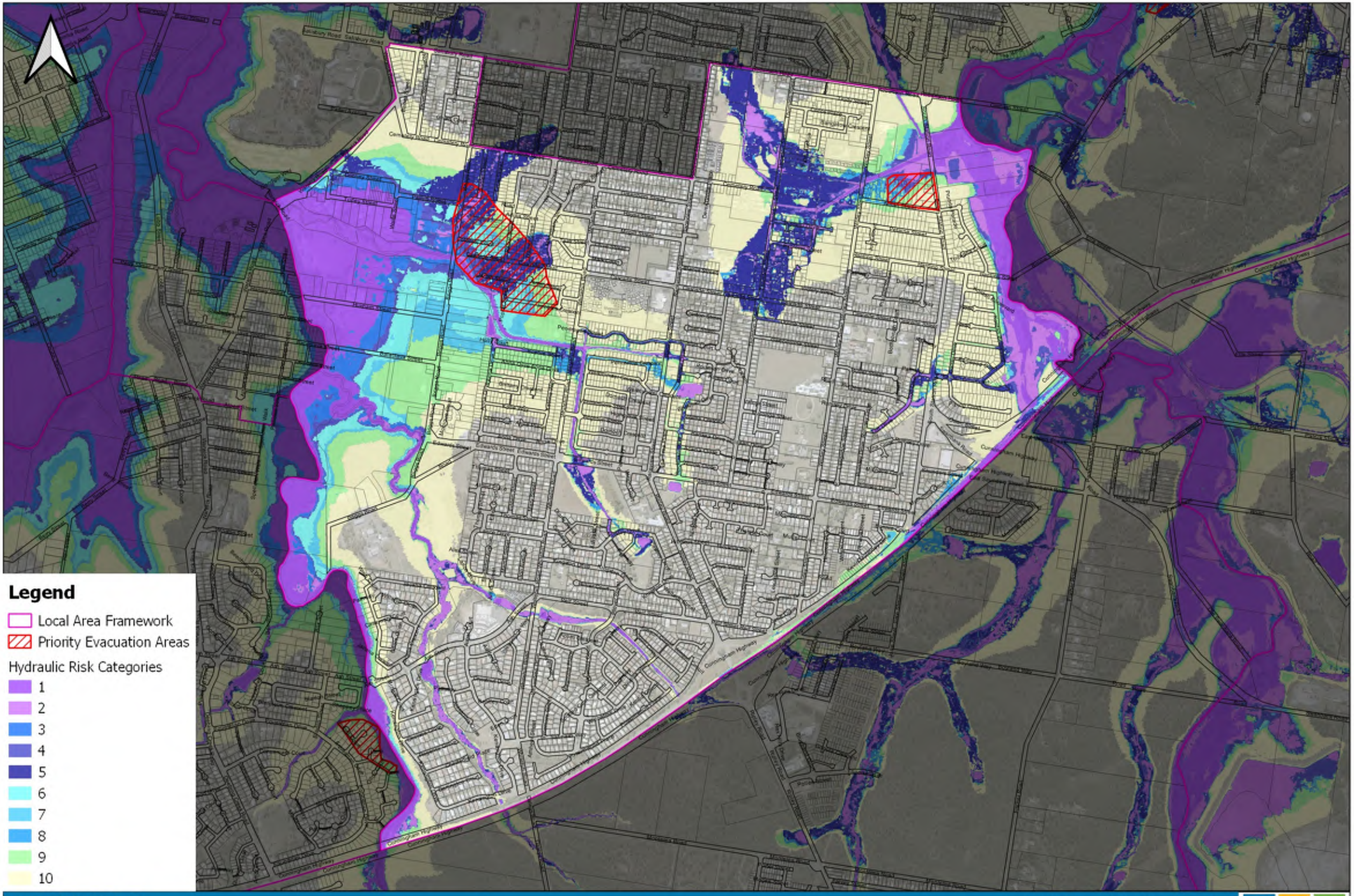
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 4 8 km

Ipswich Natural Hazard Risk Assessment

Purga (part), Goolman, Peak Crossing Local Area Framework

WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.8
1.6 km
Ipswich Natural Hazard Risk Assessment
Raceview, Flinders View Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
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- 7
- 8
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Redbank, Collingwood Park Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 2 4 km

Ipswich Natural Hazard Risk Assessment

Ripley Valley Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

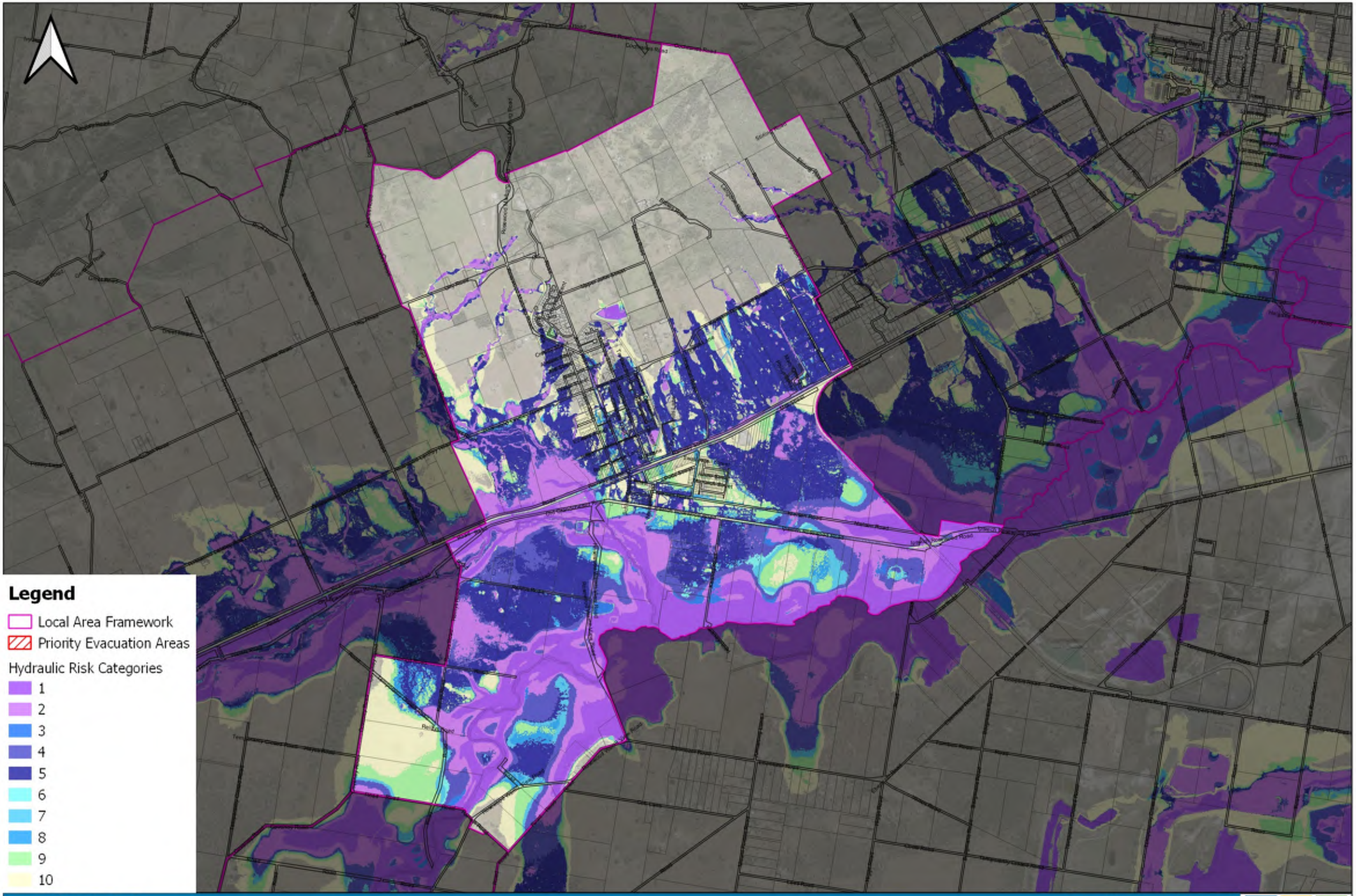
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

Riverview Local Area Framework

WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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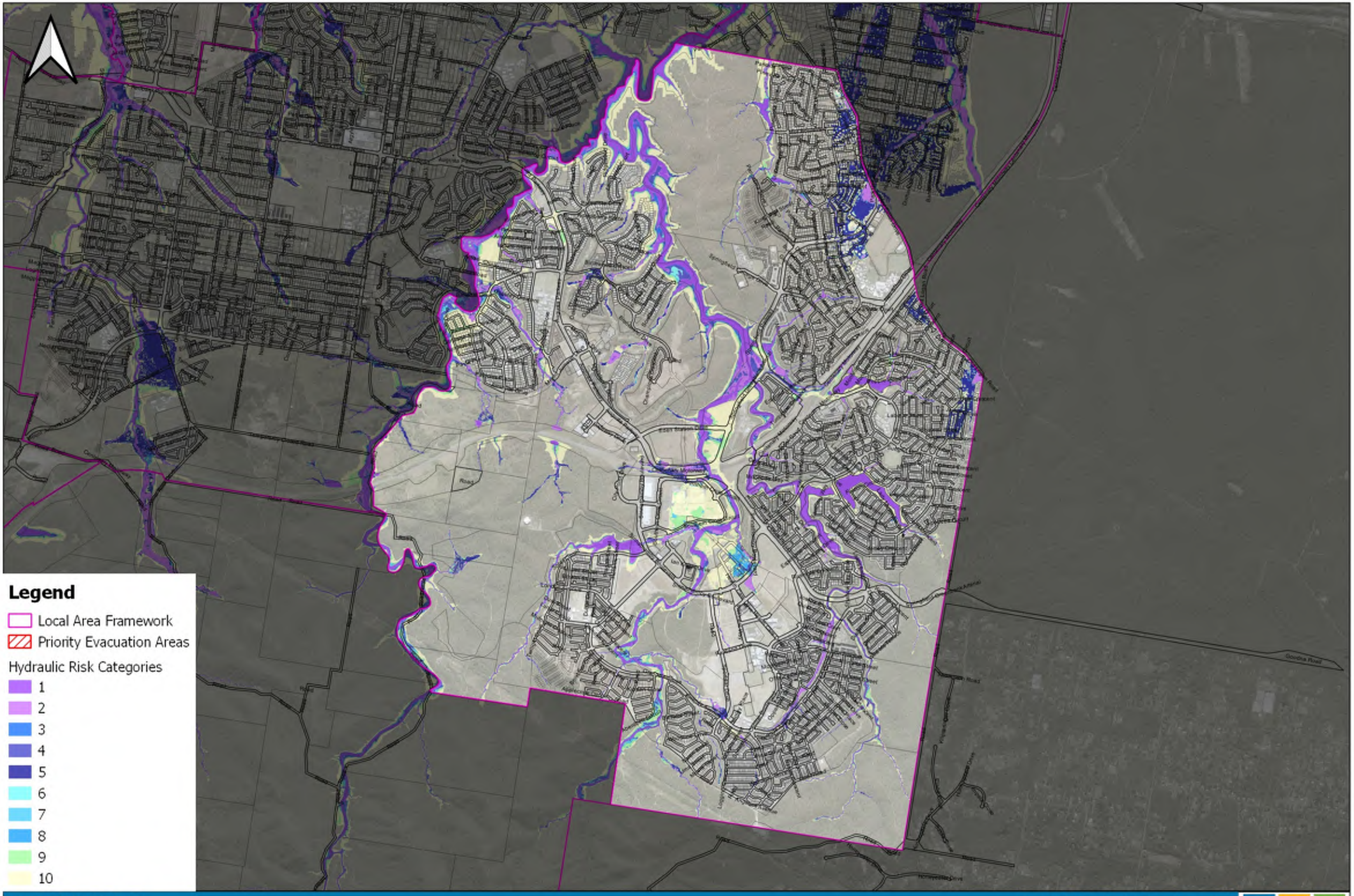
2 km
Ipswich Natural Hazard Risk Assessment
Rosewood Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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2 km
Ipswich Natural Hazard Risk Assessment
Springfield Estate Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
- 4
- 5
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- 9
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Swanbank, New Chum Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework
- Priority Evacuation Areas

Hydraulic Risk Categories

- 1
- 2
- 3
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- 9
- 10

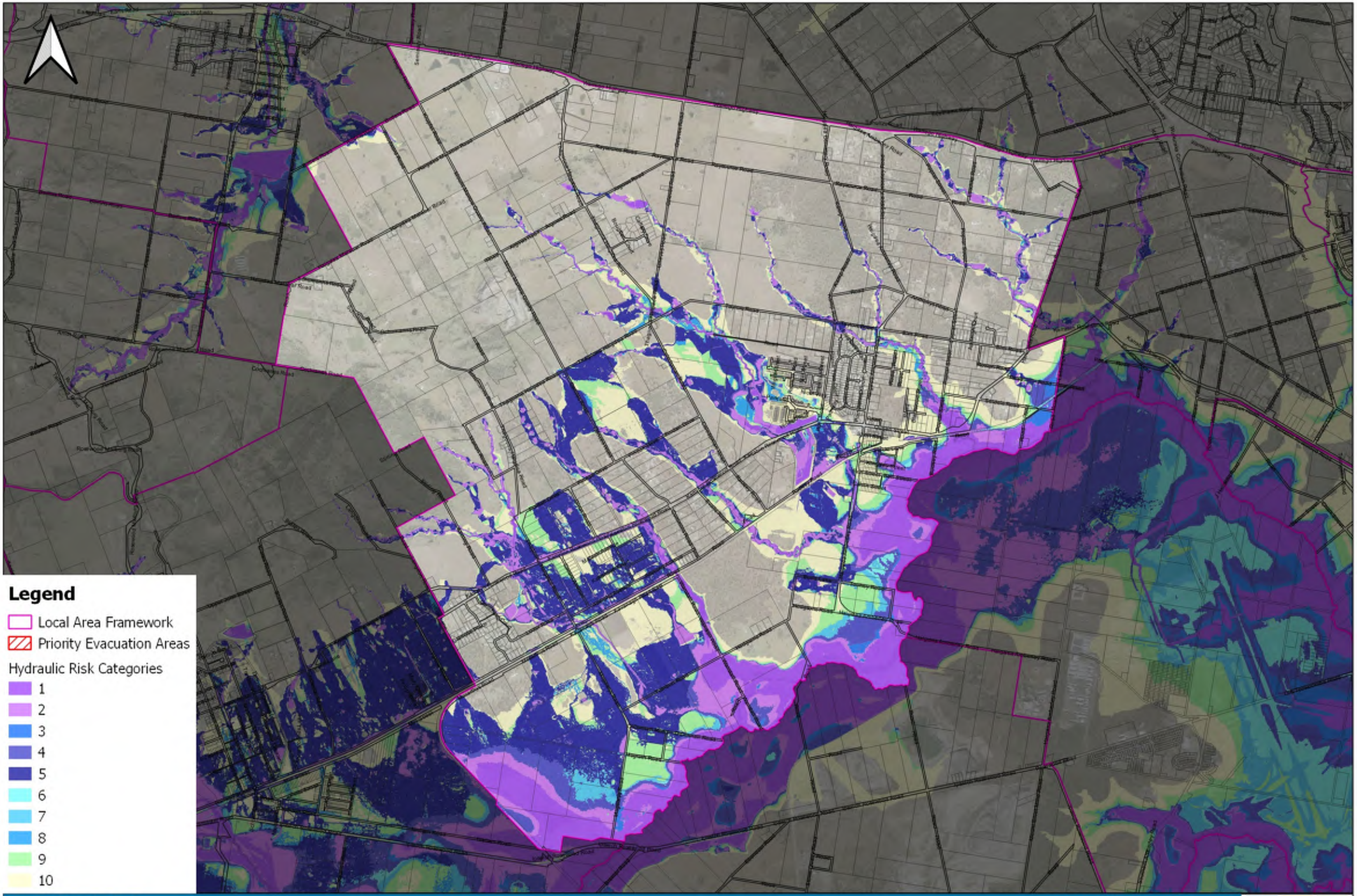
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Tallegalla, Woolshed, The Bluff Local Area Framework

WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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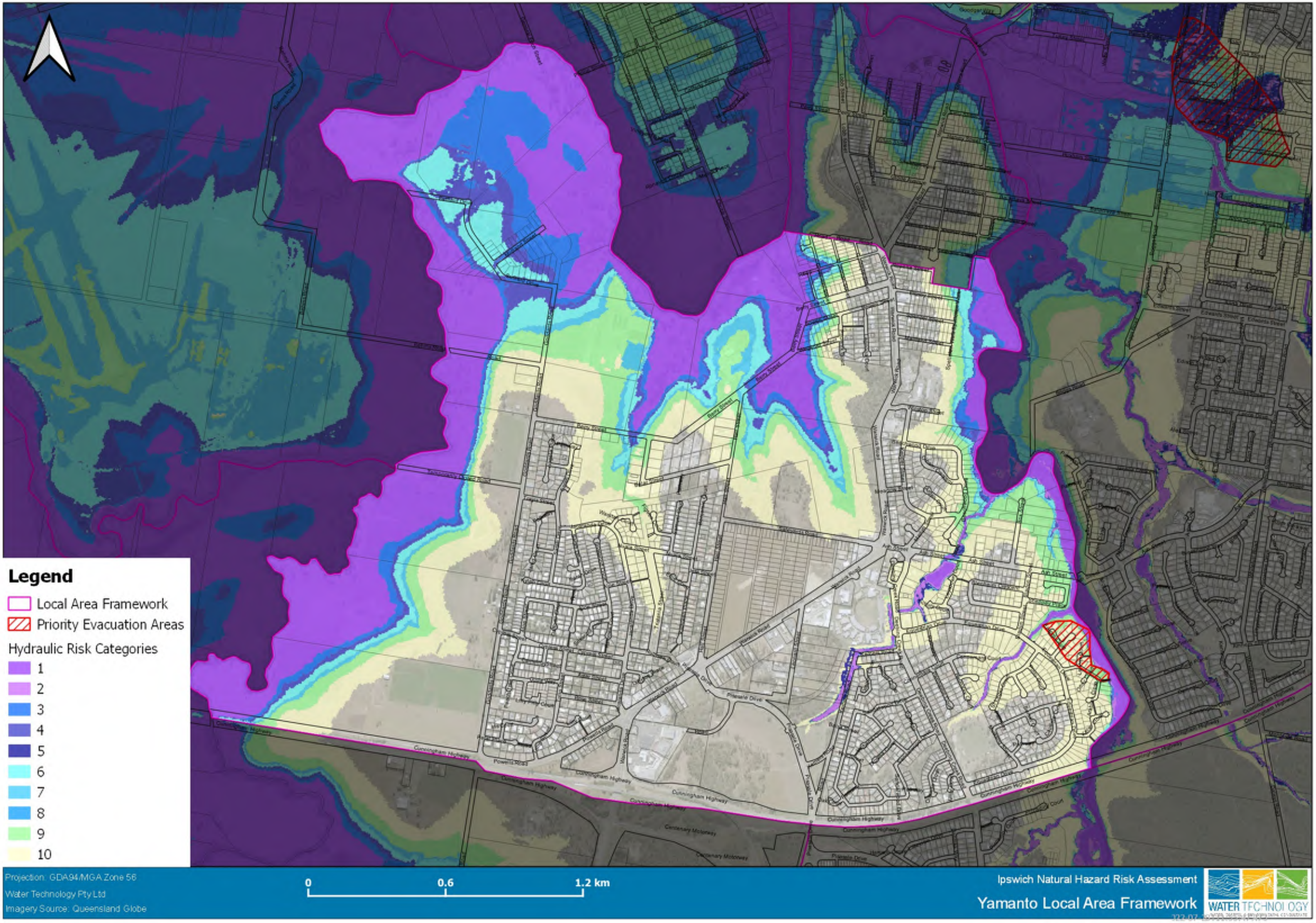
Ipswich Natural Hazard Risk Assessment
Walloon, Thagoona , Haigslea (part) Local Area Framework
WATER TECHNOLOGY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Local Area Framework
Priority Evacuation Areas
Hydraulic Risk Categories
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Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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1.2 km
Ipswich Natural Hazard Risk Assessment
Yamanto Local Area Framework
WATER TECHNOLOGY

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX B
FLOOD RISK MAPPING: FLOOD ISLANDS BY LAF

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

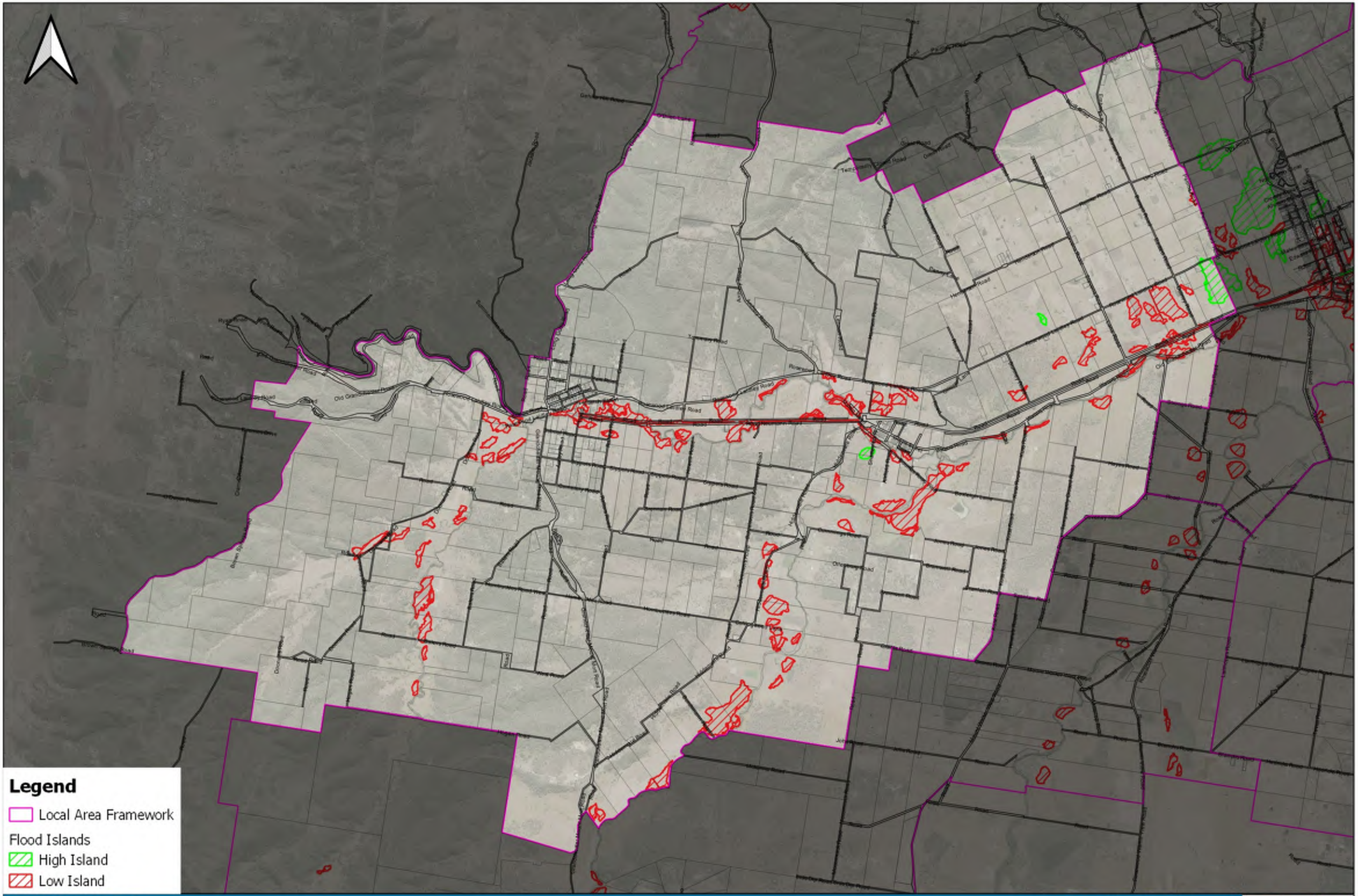
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Amberley Local Area Framework

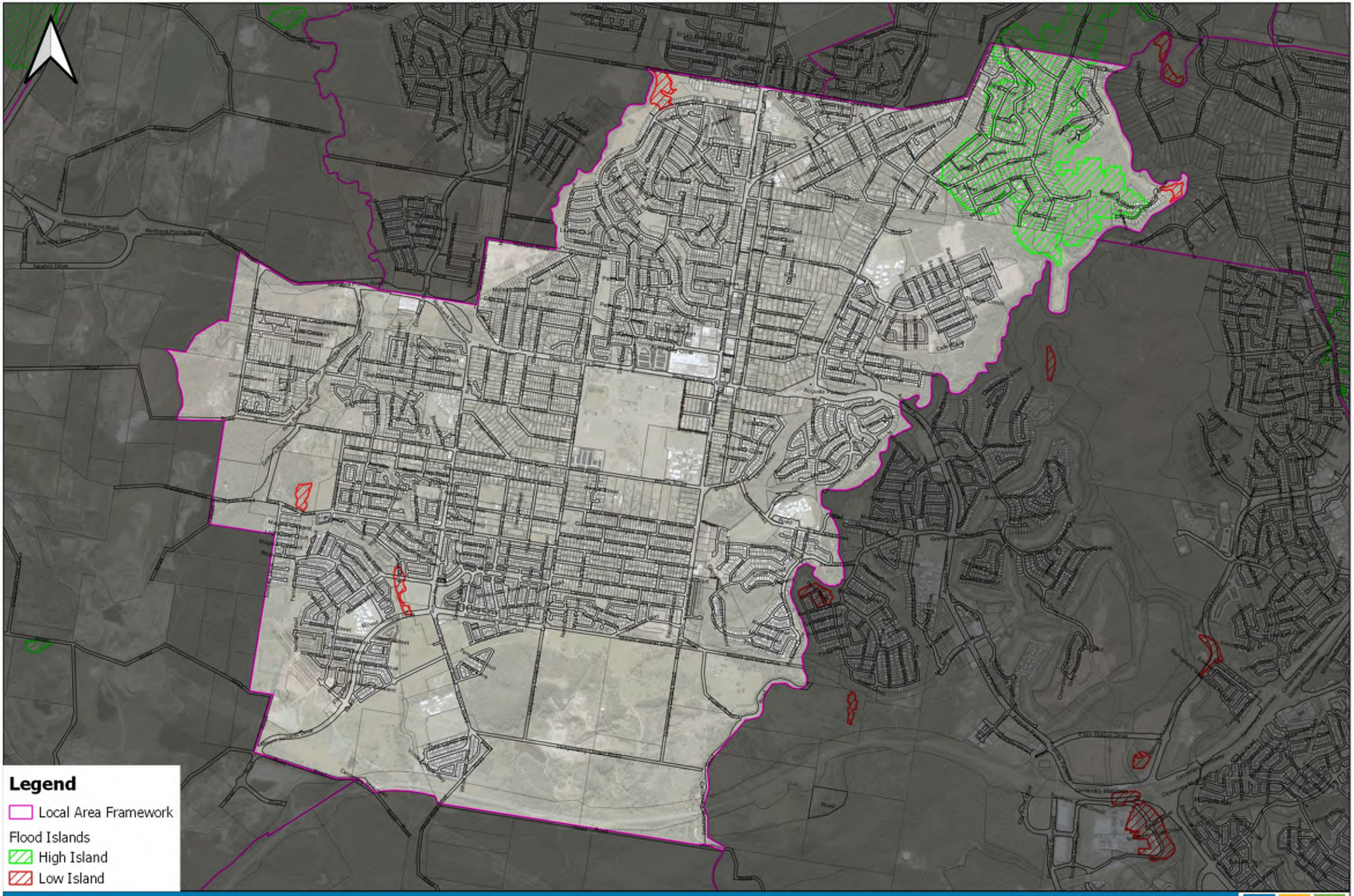
WATER TECHNOLOGY



Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Ashfield, Lanefield, Calvert, Grandchester Local Area Framework


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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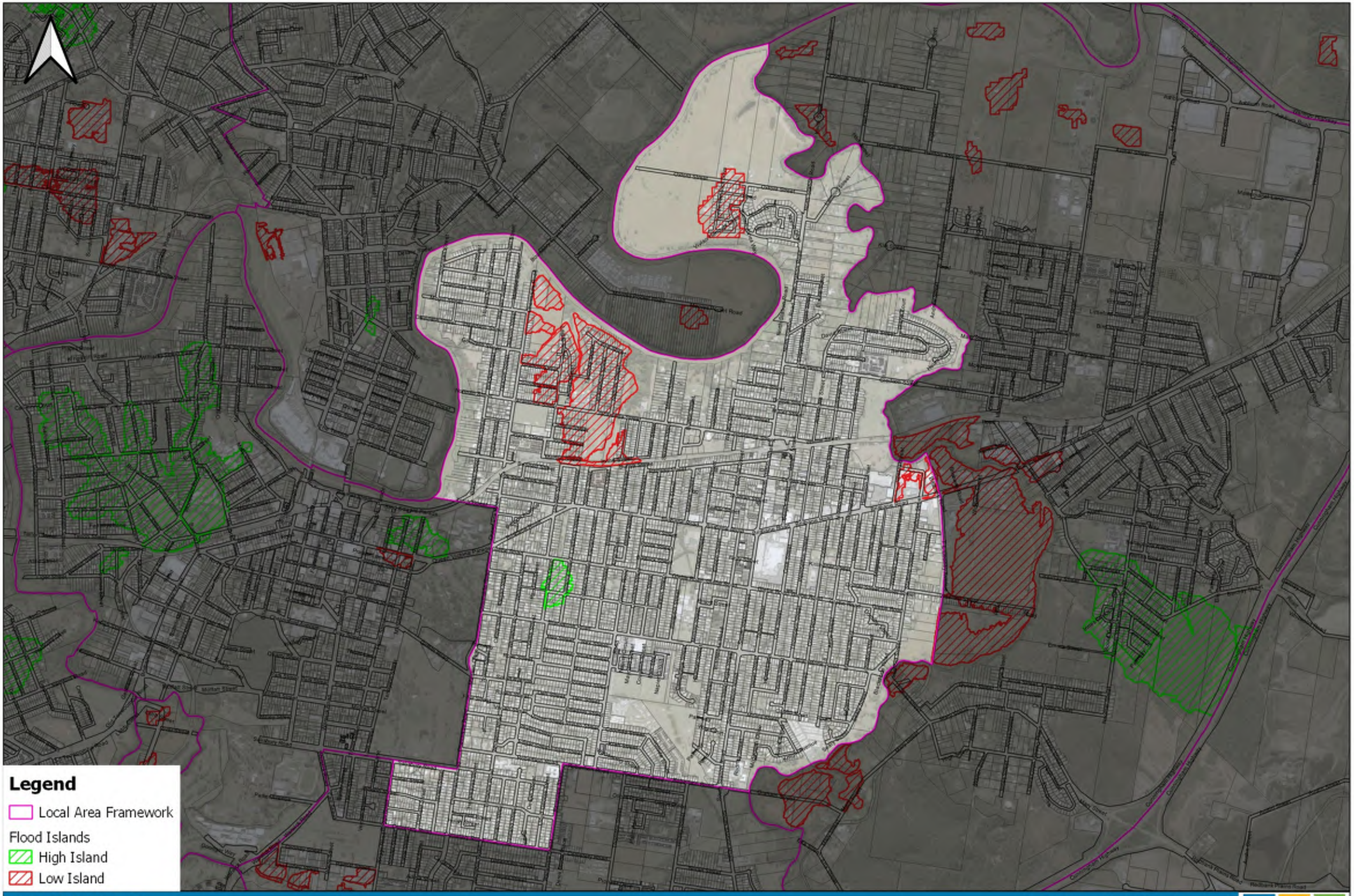
2 km
Ipswich Natural Hazard Risk Assessment
Bellbird Park, Redbank Plains, Augustine Heights Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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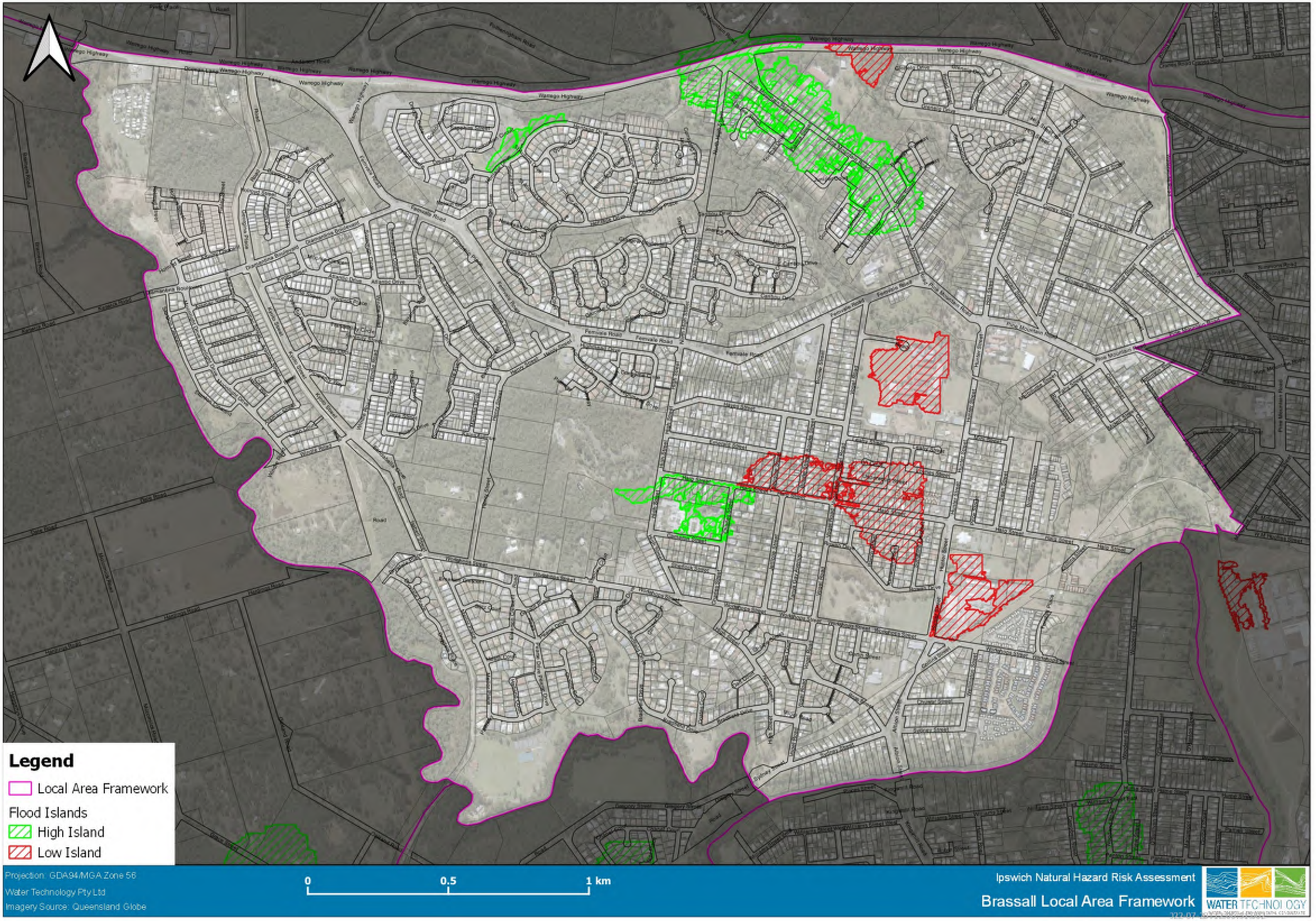
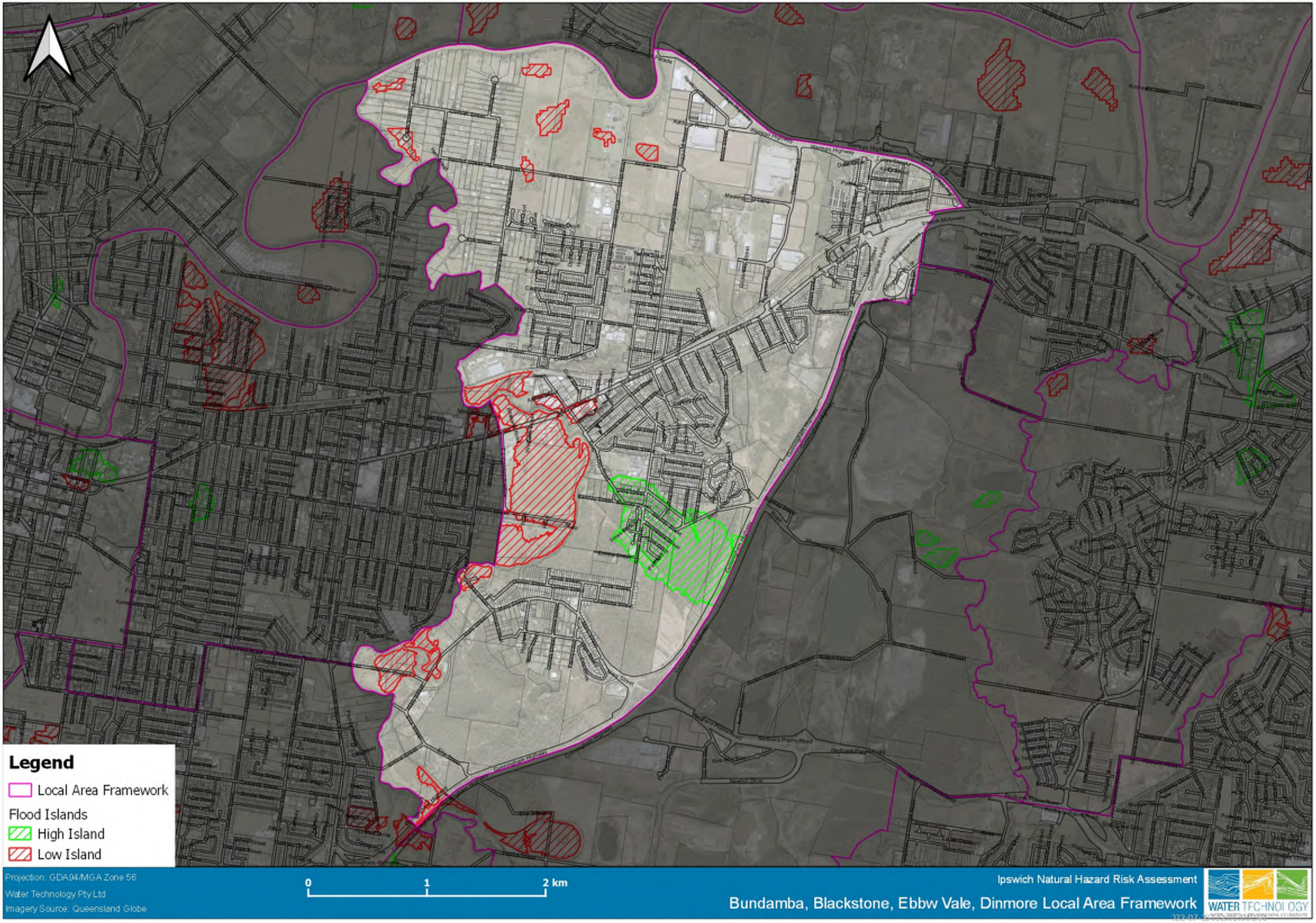
Ipswich Natural Hazard Risk Assessment
Booval, East Ipswich, North Booval Local Area Framework
WATER TECHNOLOGY



Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment
Brassall Local Area Framework


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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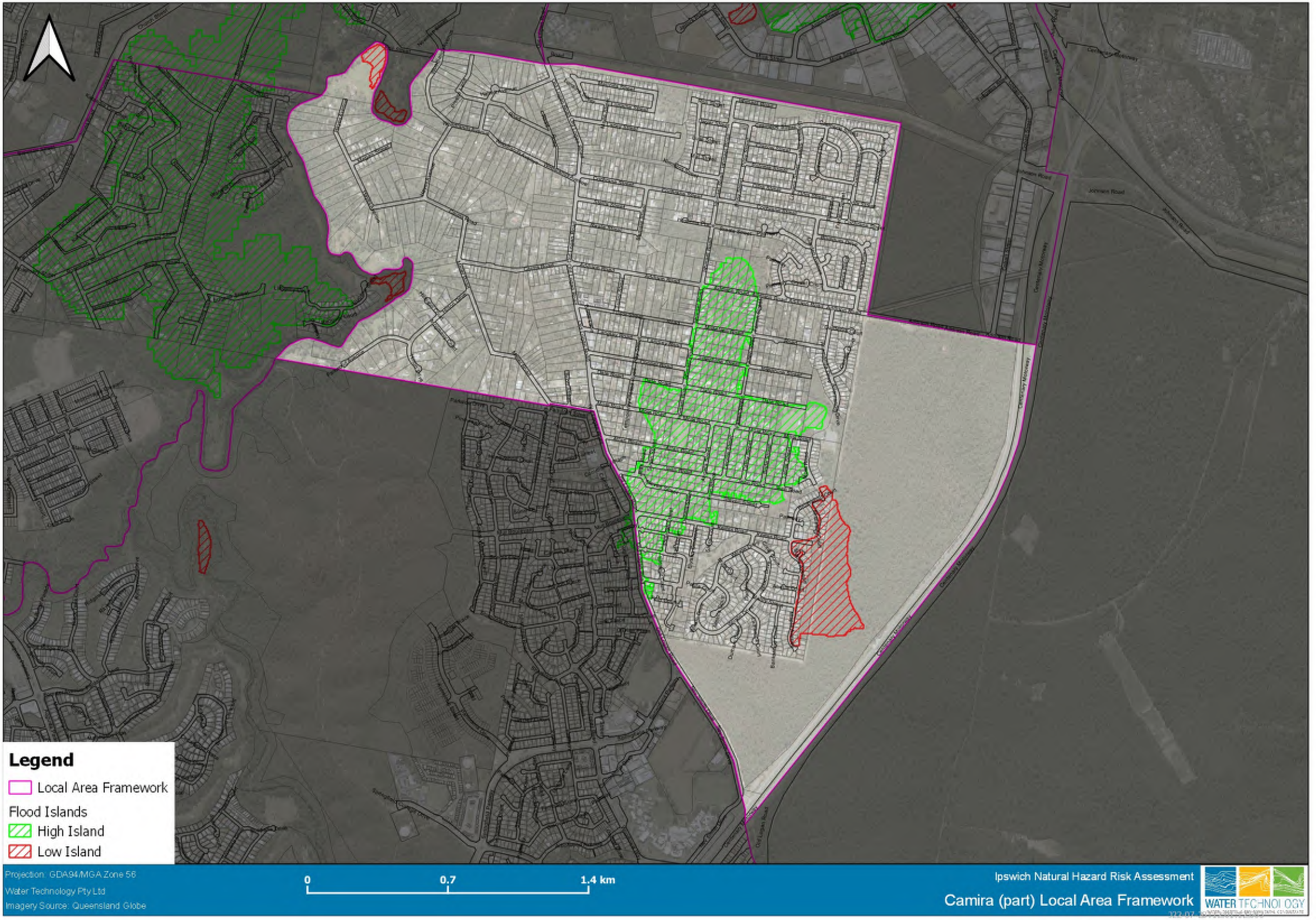
2 km
Ipswich Natural Hazard Risk Assessment
Bundamba, Blackstone, Ebbw Vale, Dinmore Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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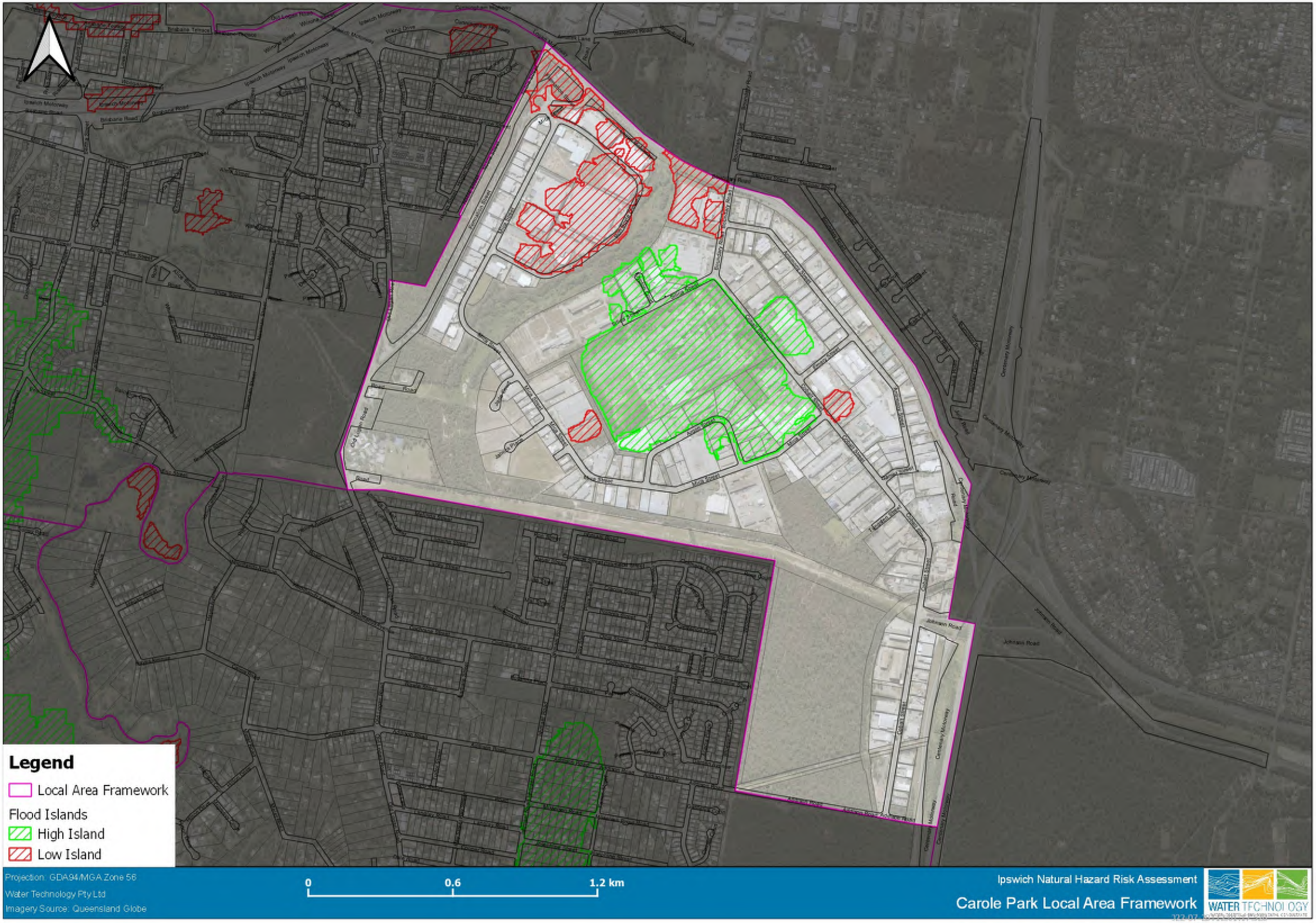
Ipswich Natural Hazard Risk Assessment
Camira (part) Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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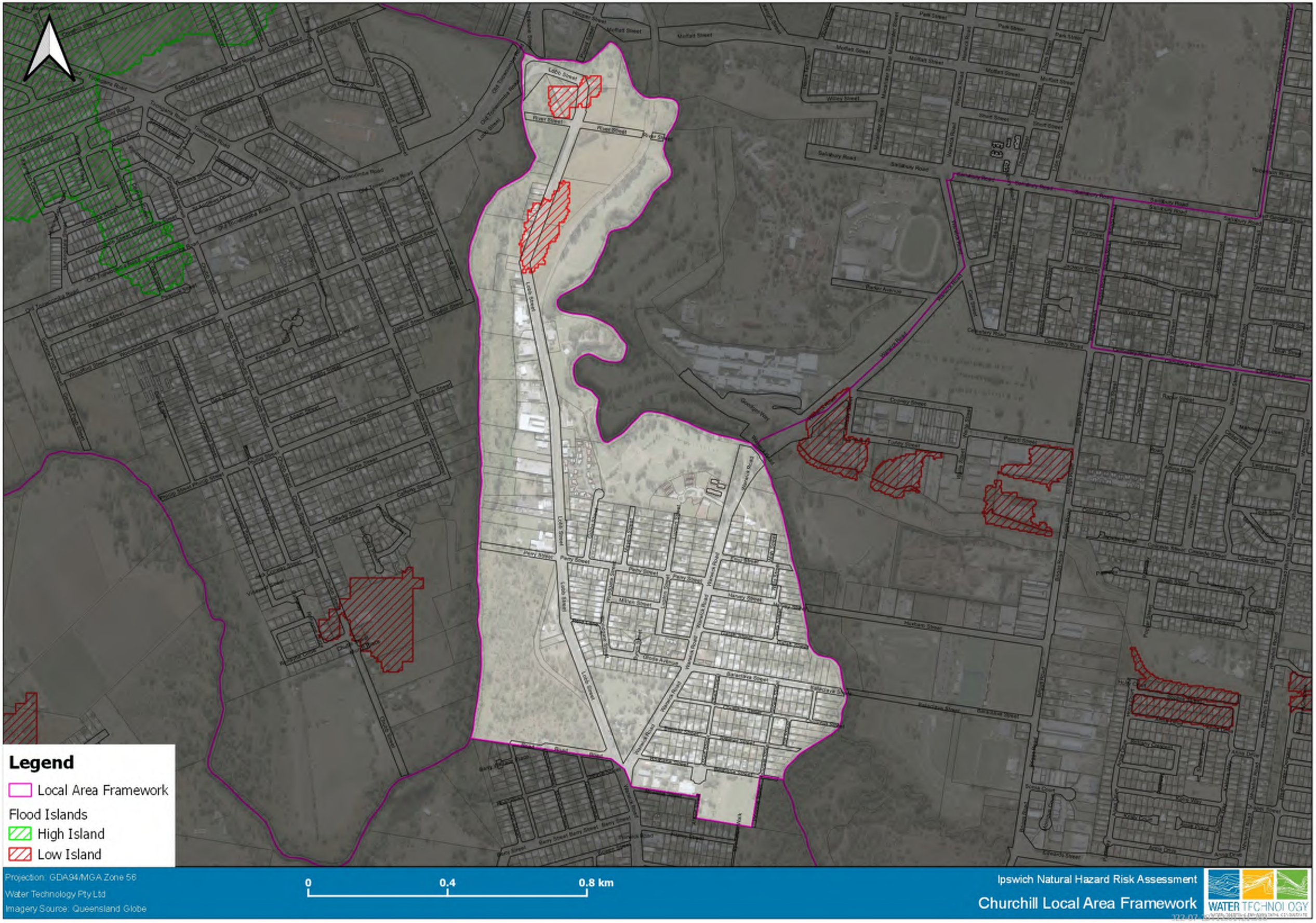
1.2 km
Ipswich Natural Hazard Risk Assessment
Carole Park Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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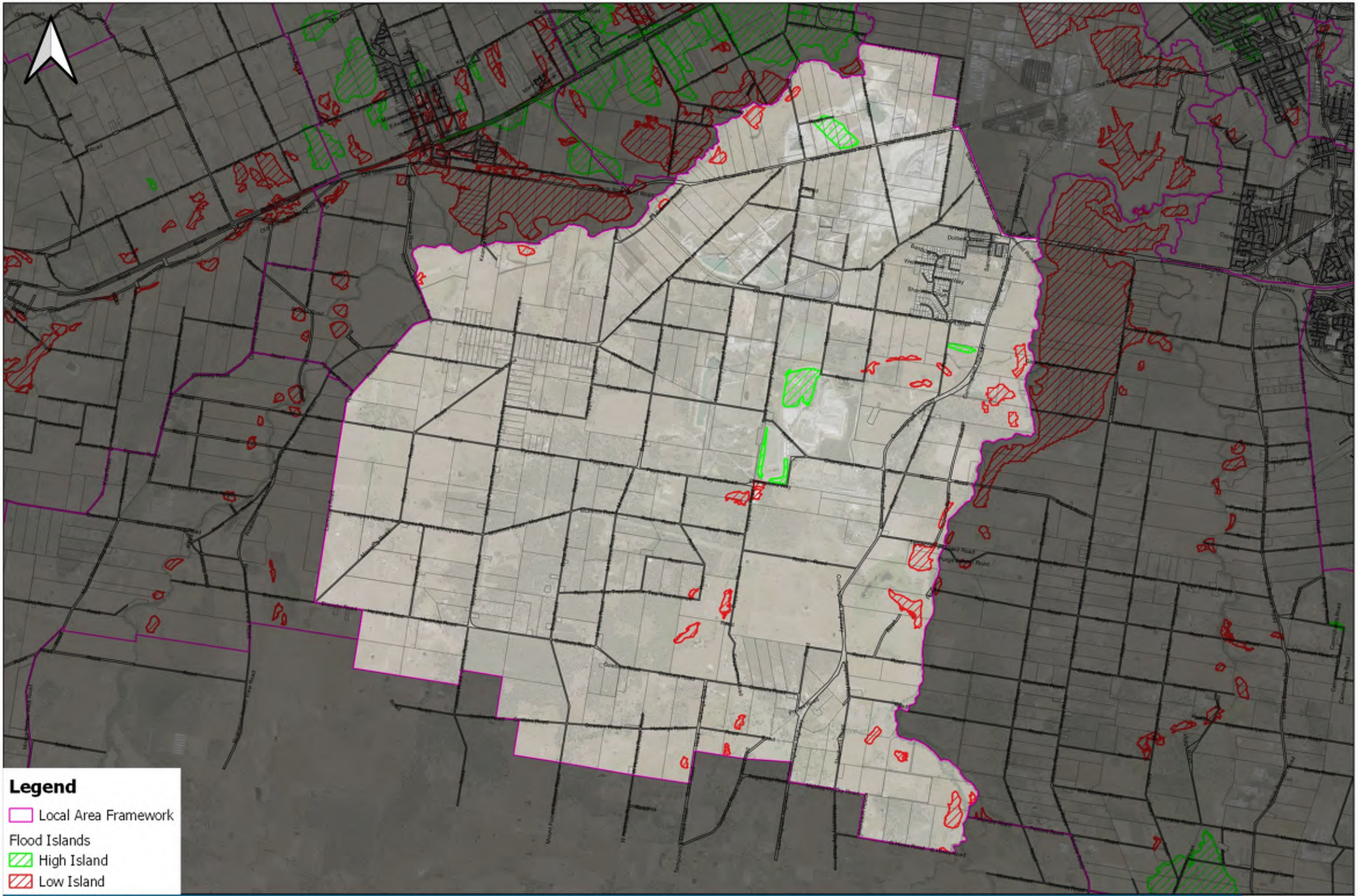
Ipswich Natural Hazard Risk Assessment
Churchill Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
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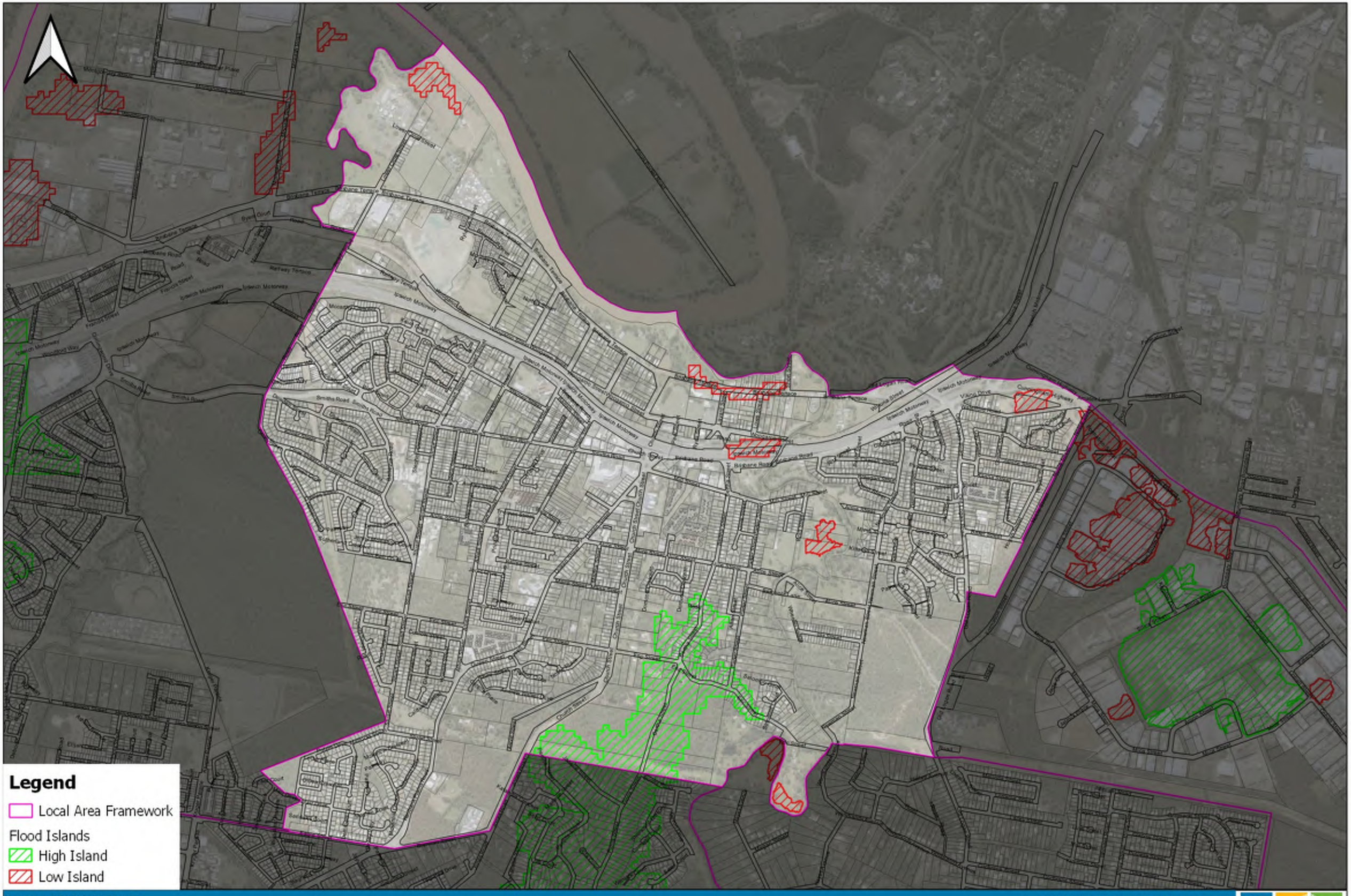
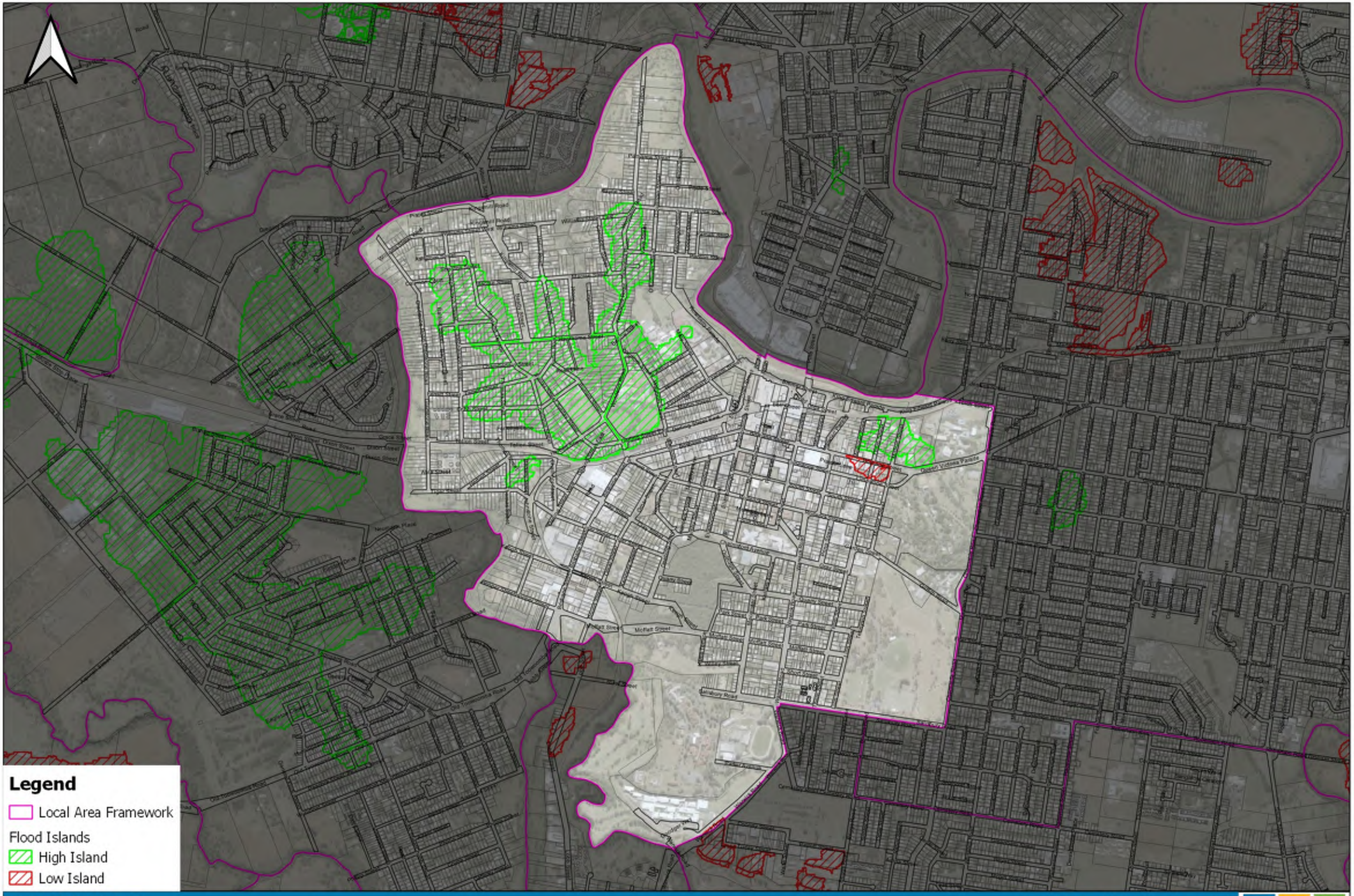
4 km
Ipswich Natural Hazard Risk Assessment
Ebenezer, Willowbank, Jeebropilly, Mount Forbes Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.8
1.6 km
Ipswich Natural Hazard Risk Assessment
Goodna, Gailes, Camira (part) Local Area Framework
WATER TECHNOLOGY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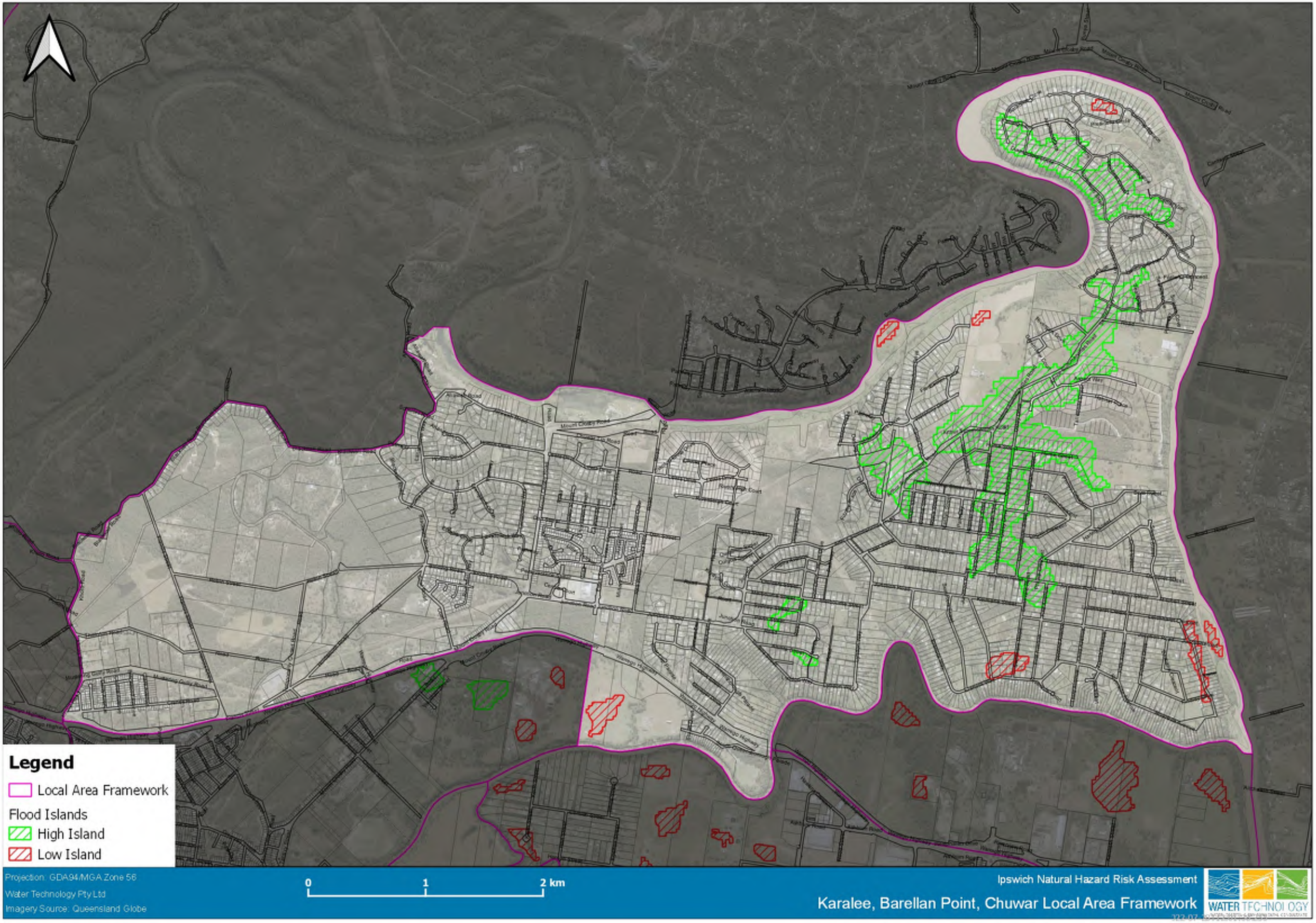
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.8
1.6 km
Ipswich Natural Hazard Risk Assessment
Ipswich Central Local Area Framework
WATER TECHNOLOGY

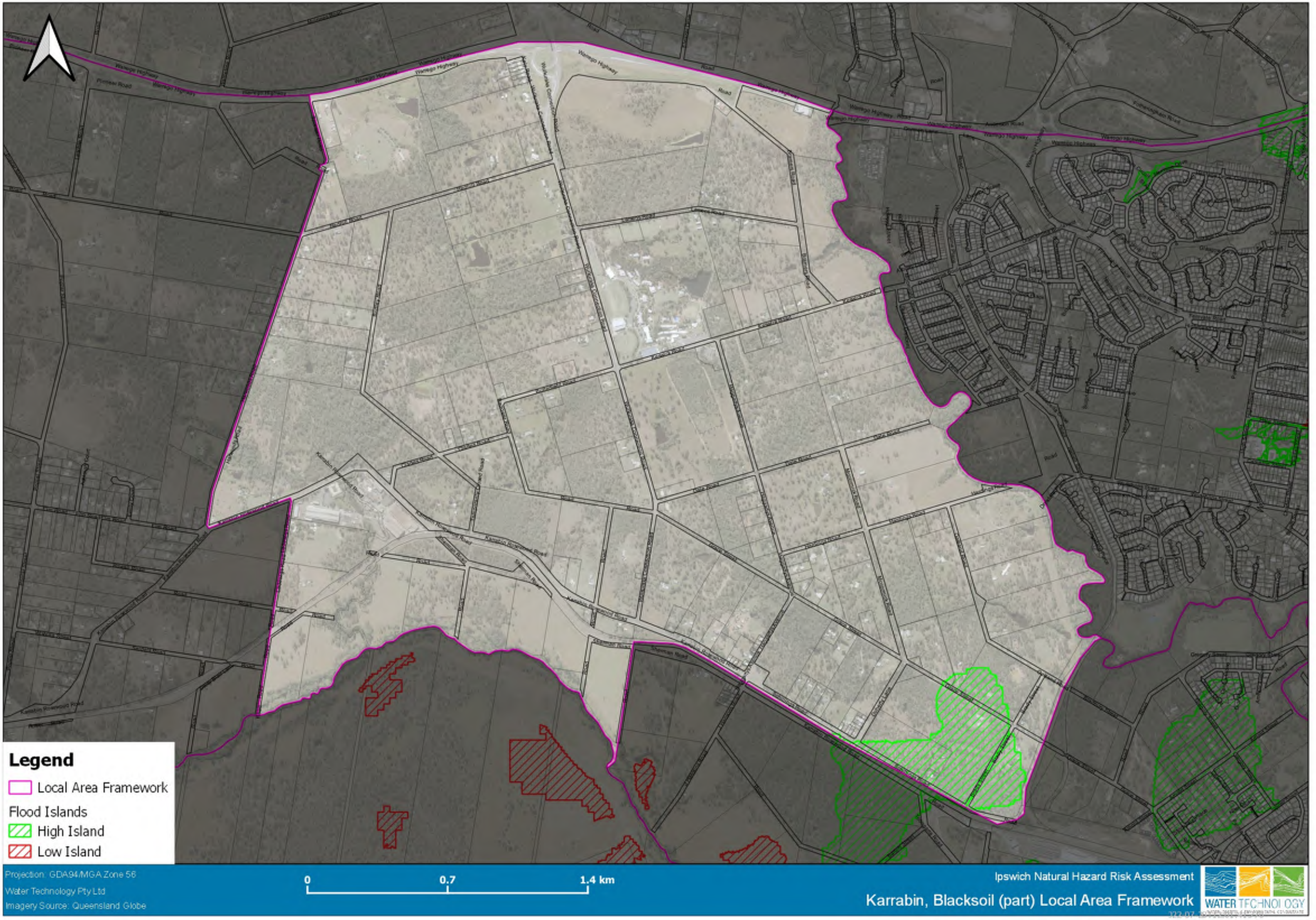


Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Karalee, Barellan Point, Chuwar Local Area Framework

WATER TECHNOLOGY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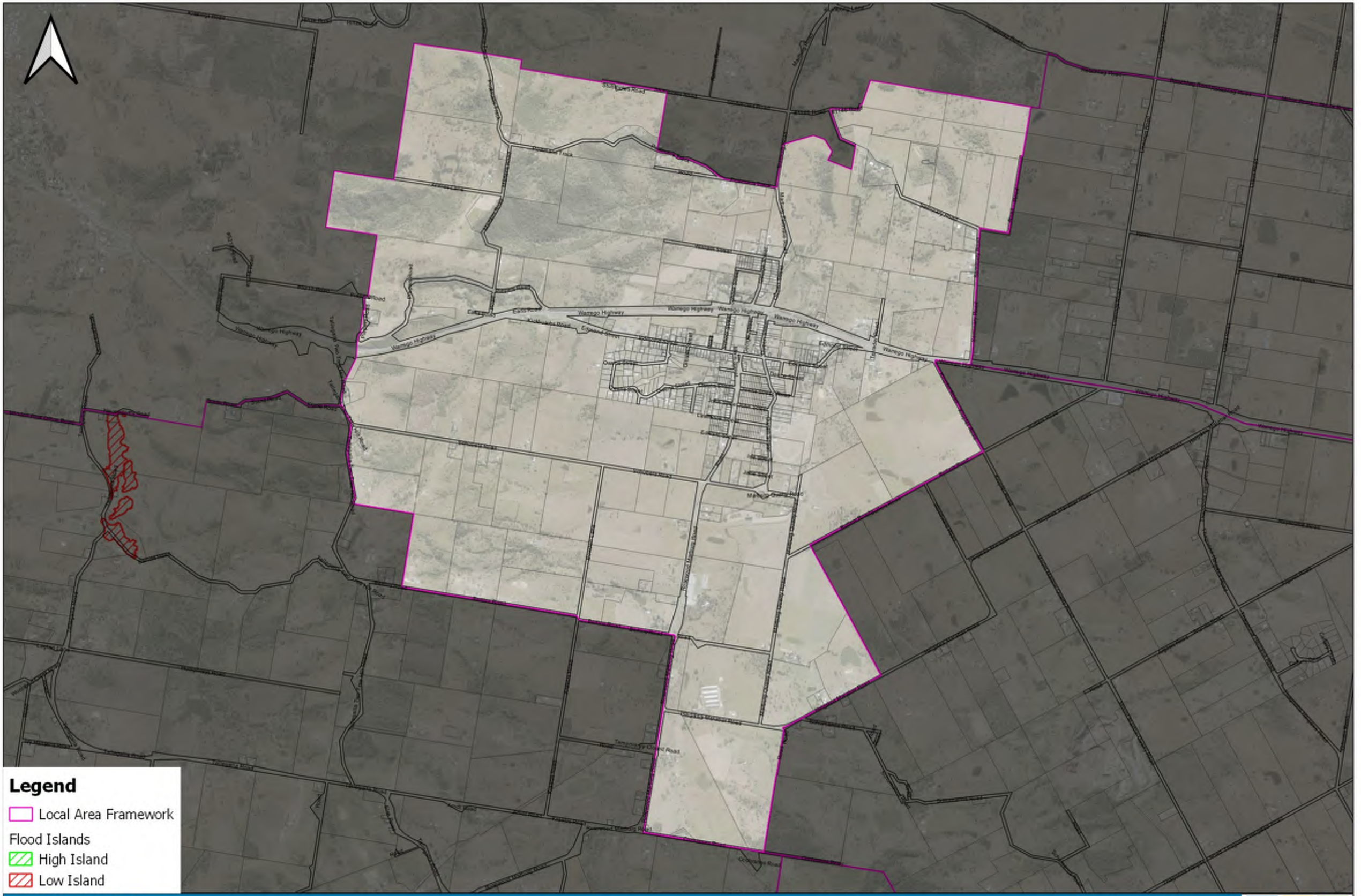
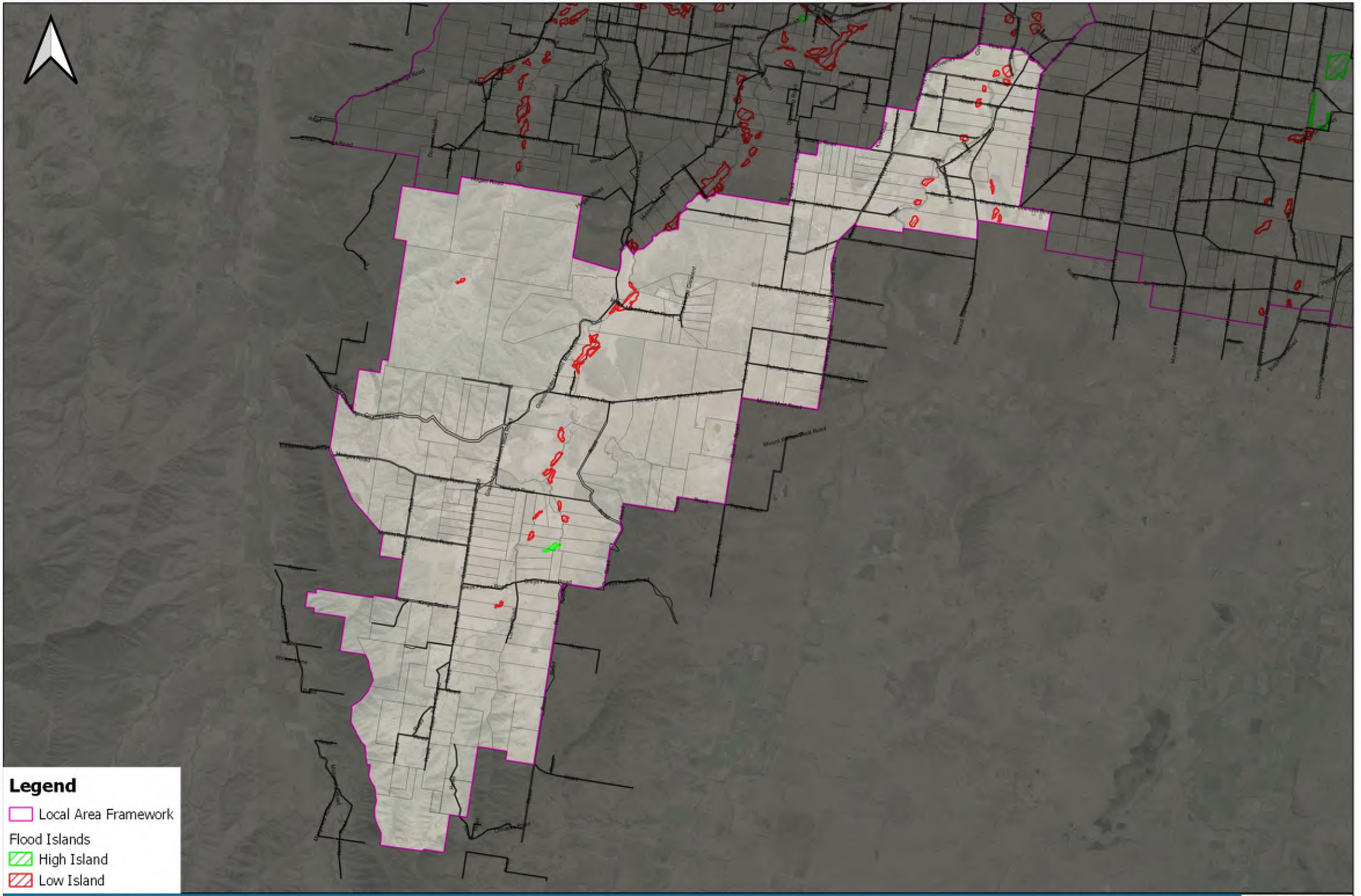
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.7
1.4 km
Ipswich Natural Hazard Risk Assessment
Karrabin, Blacksoil (part) Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Marburg Local Area Framework
WATER TECHNOLOGY



Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Mount Mort, Lower Mount Walker, Mount Walker West Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

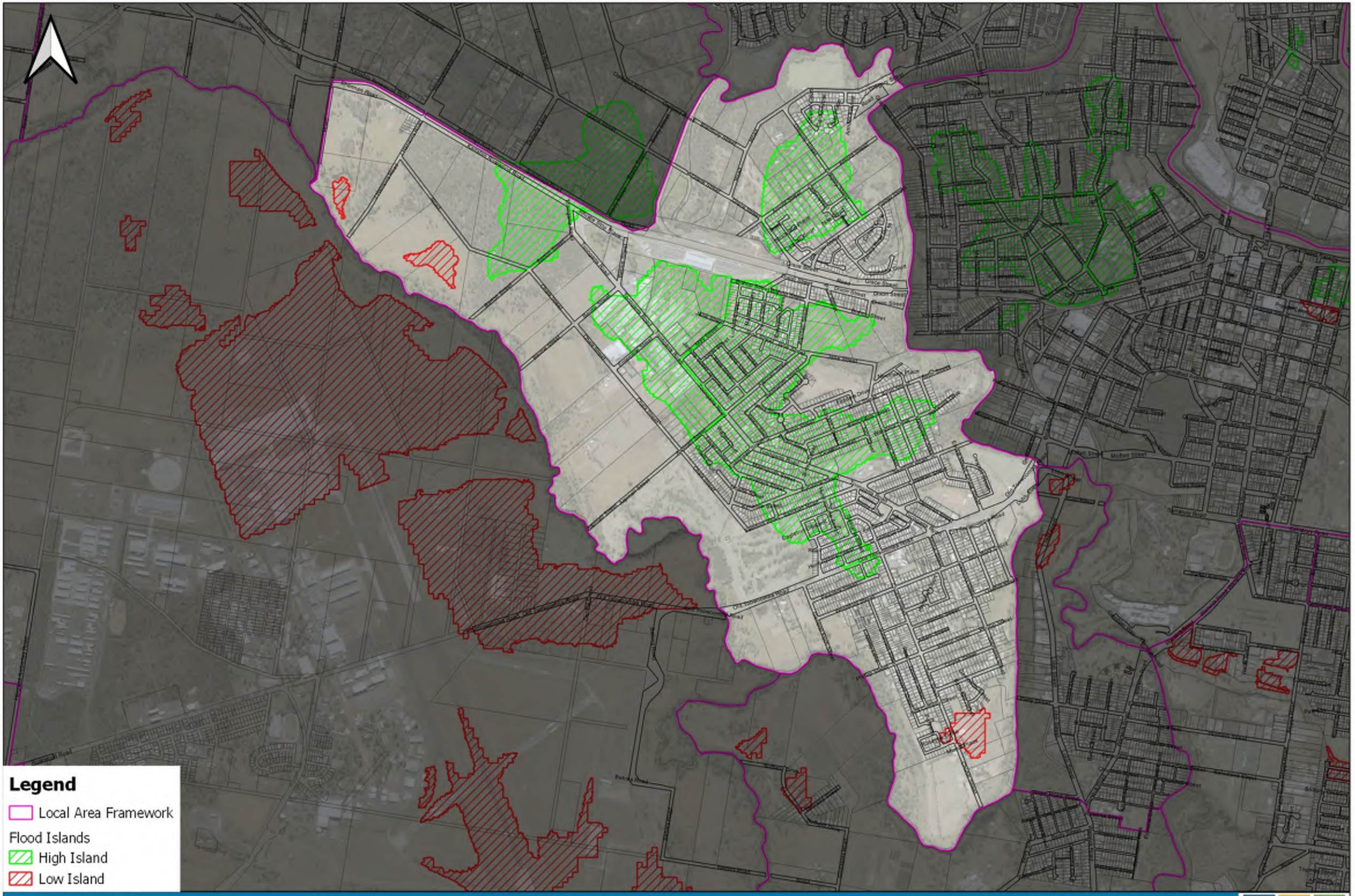
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

North Ipswich Local Area Framework

WATER TECHNOLOGY



Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

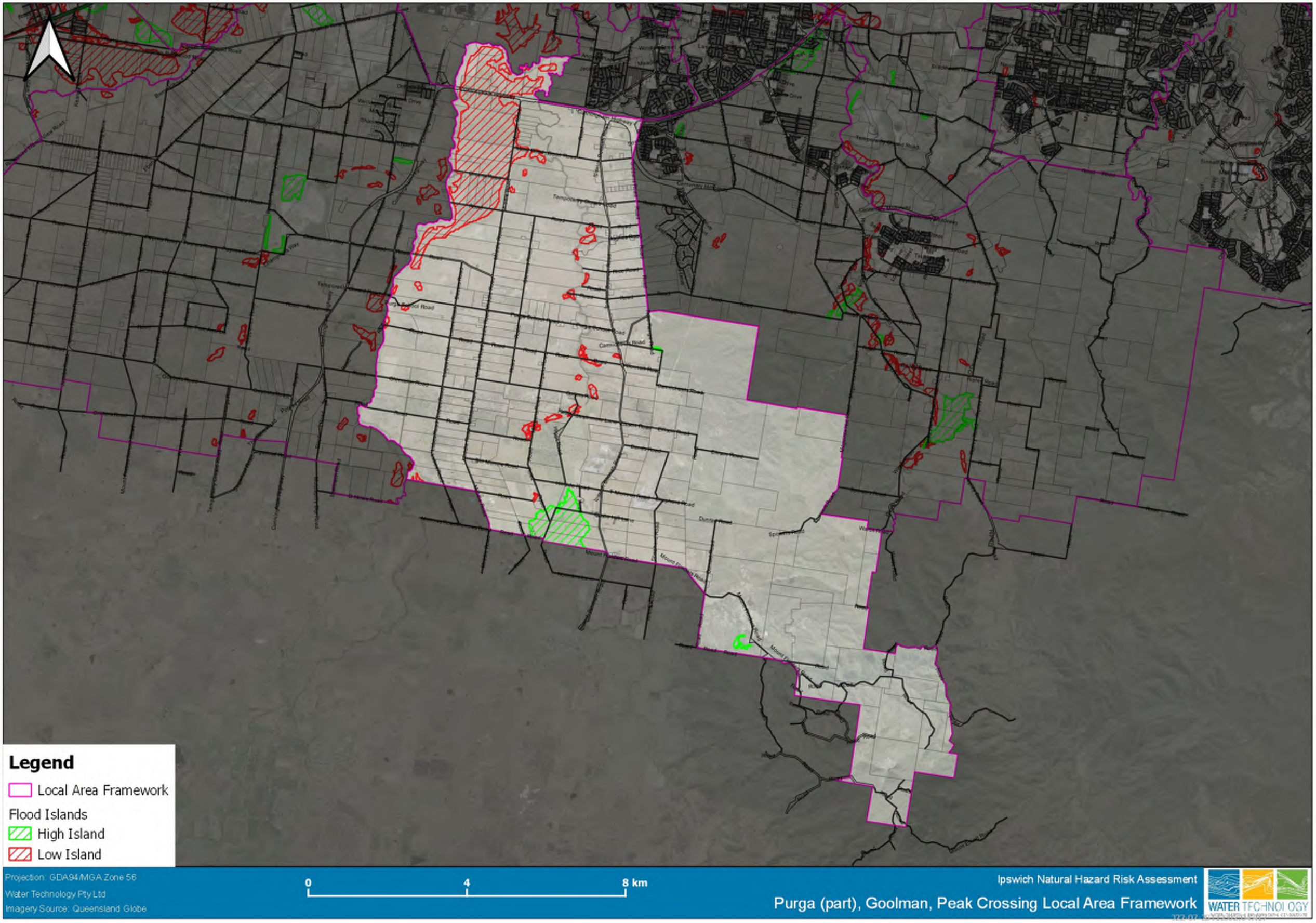
Ipswich Natural Hazard Risk Assessment

One Mile, Leichhardt, Wulkuraka Local Area Framework

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Pine Mountain, Muirlea, Blacksoil (part) Local Area Framework



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Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Purga (part), Goolman, Peak Crossing Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

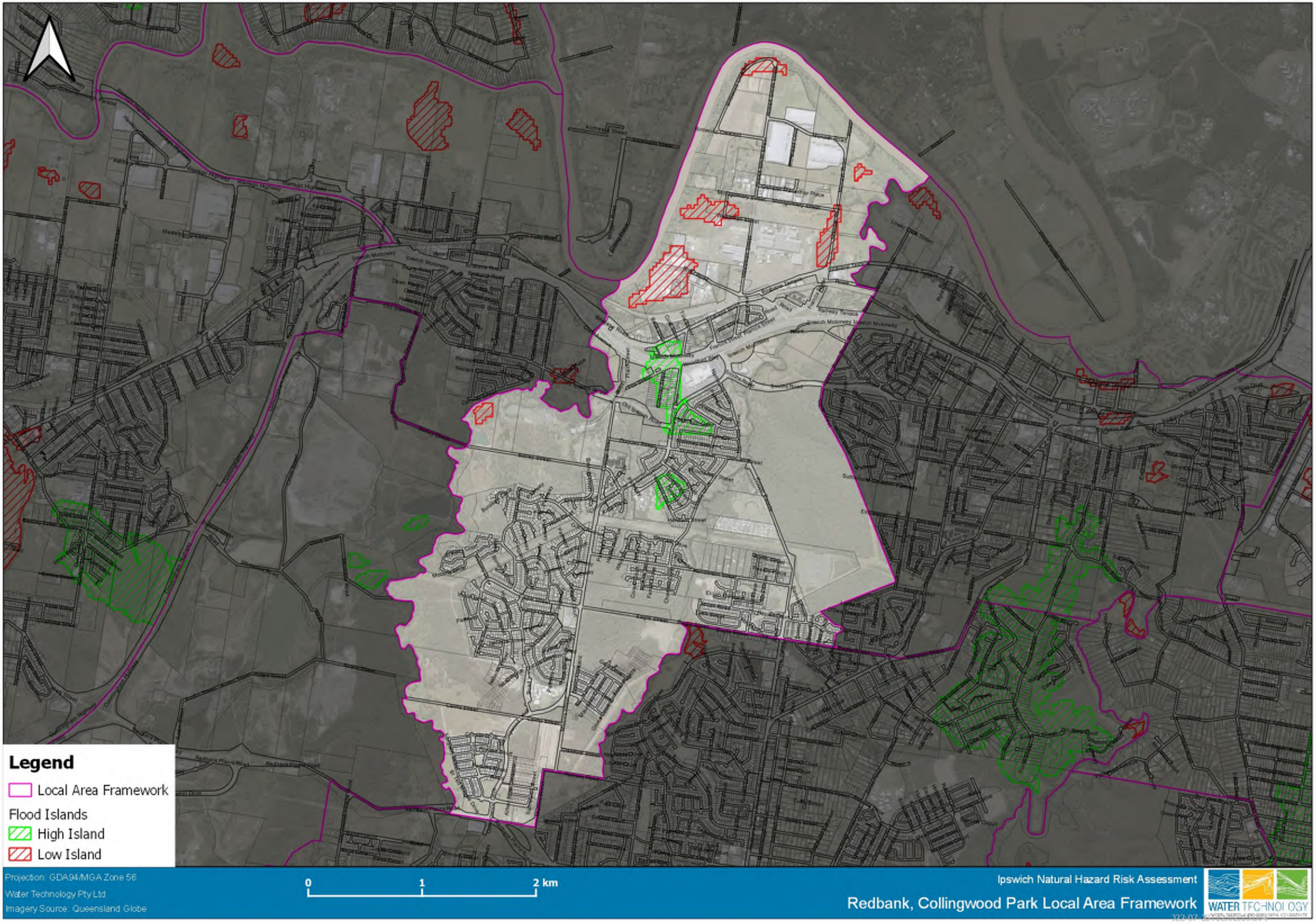
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.8 1.6 km

Ipswich Natural Hazard Risk Assessment

Raceview, Flinders View Local Area Framework

WATER TECHNOLOGY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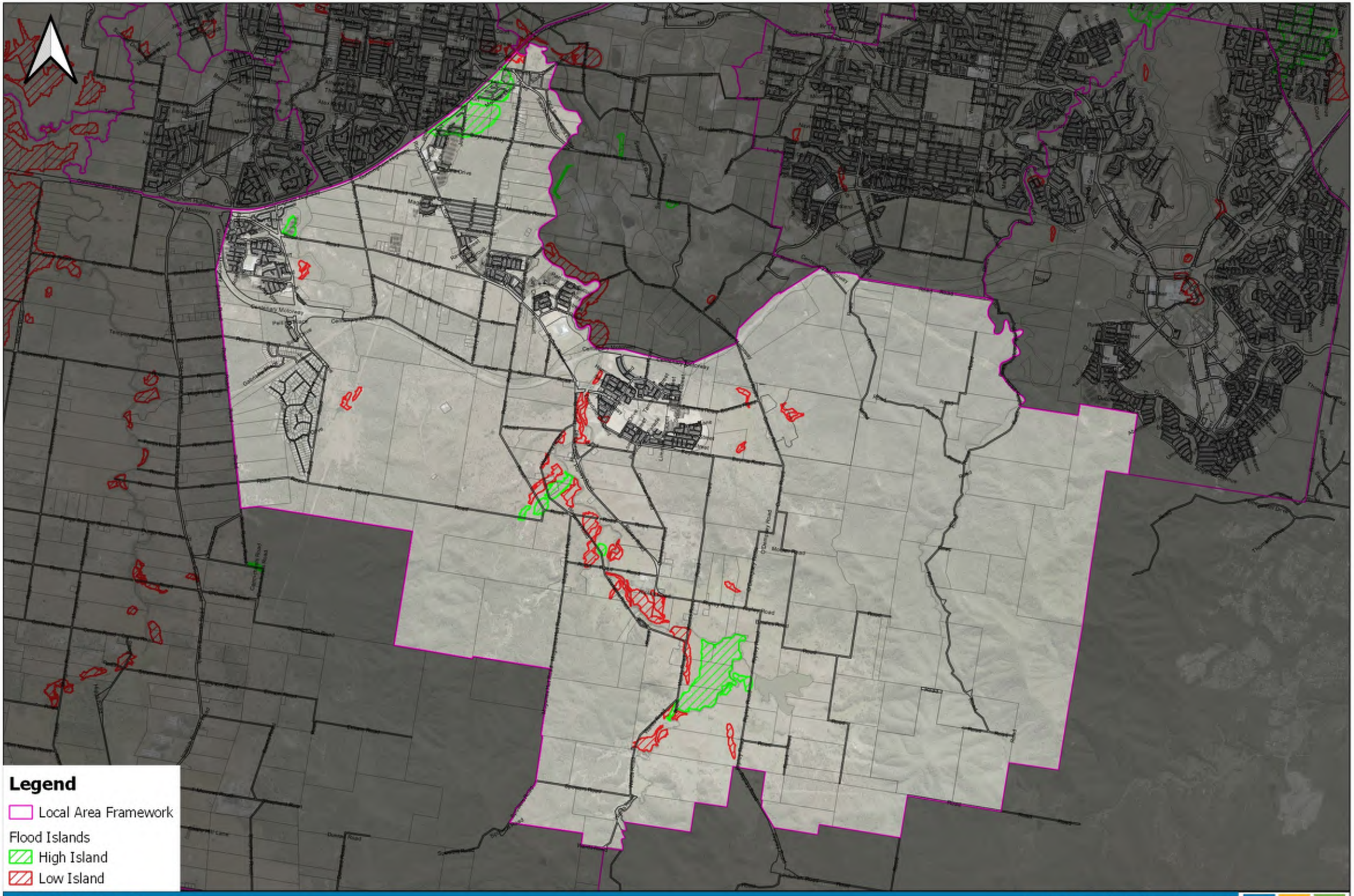
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Redbank, Collingwood Park Local Area Framework
WATER TECHNOLOGY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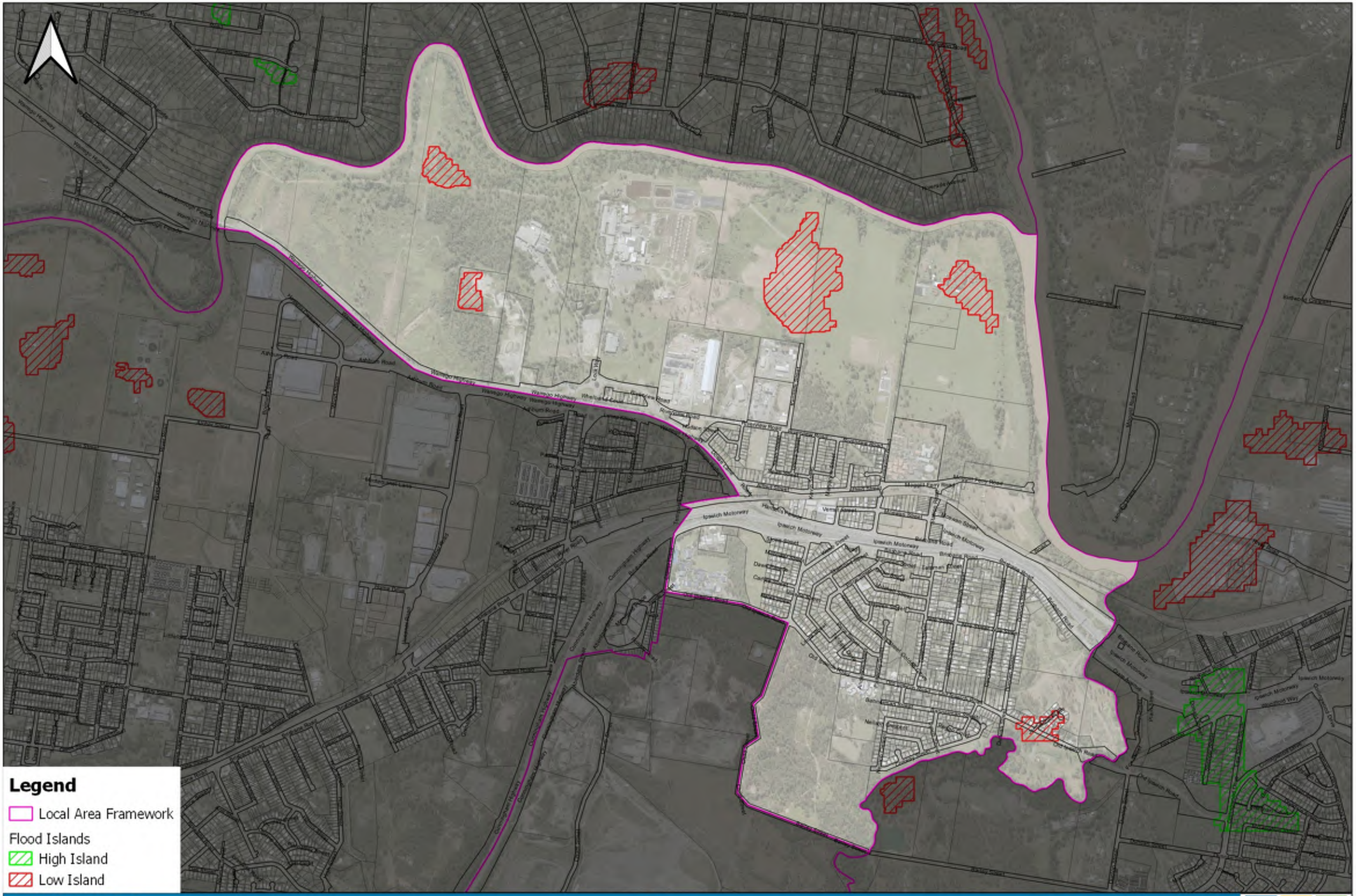
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
2
4 km
Ipswich Natural Hazard Risk Assessment
Ripley Valley Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.8
1.6 km
Ipswich Natural Hazard Risk Assessment
Riverview Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

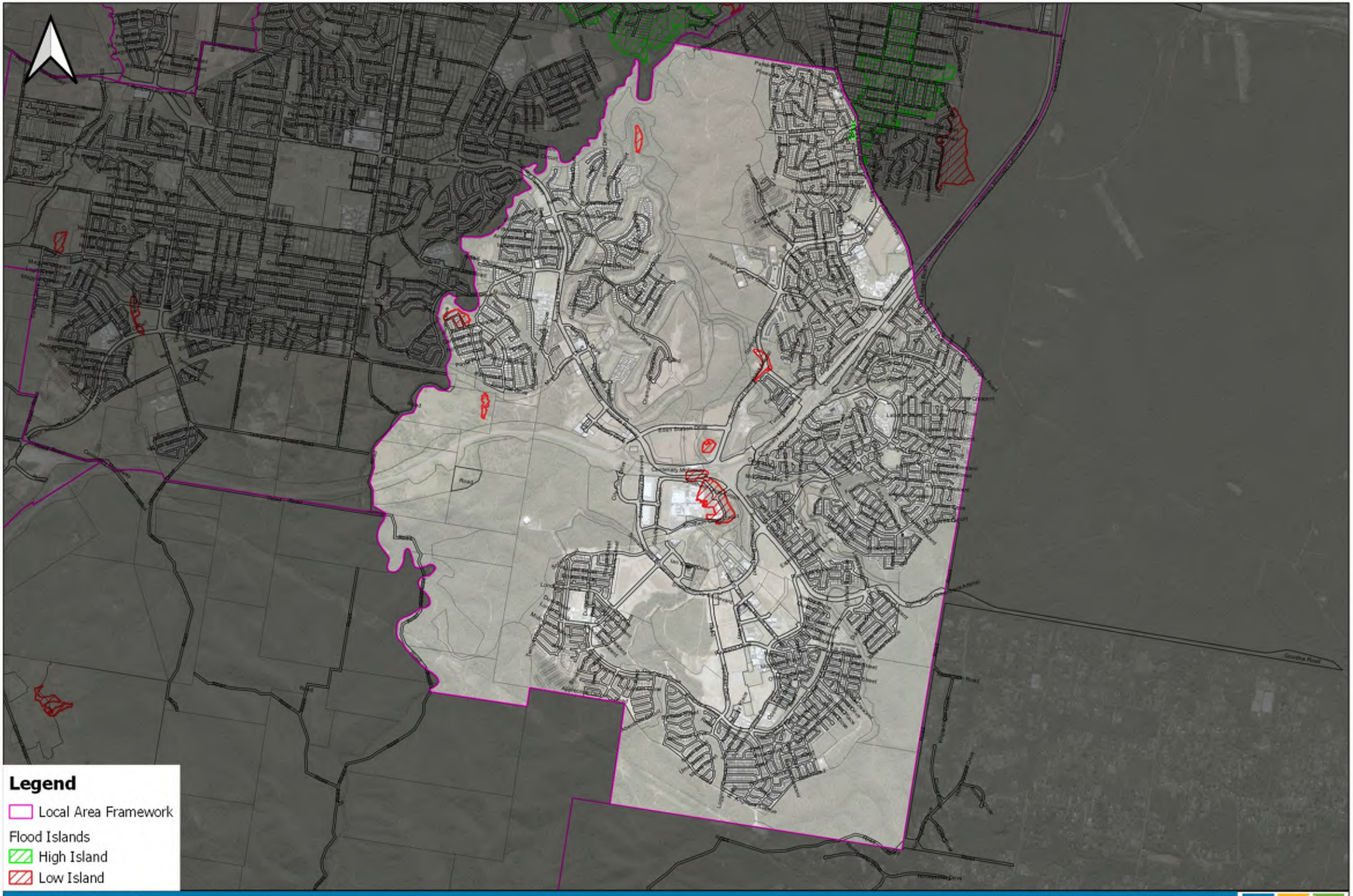
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Rosewood Local Area Framework

WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Springfield Estate Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Swanbank, New Chum Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework

Flood Islands

- High Island
- Low Island

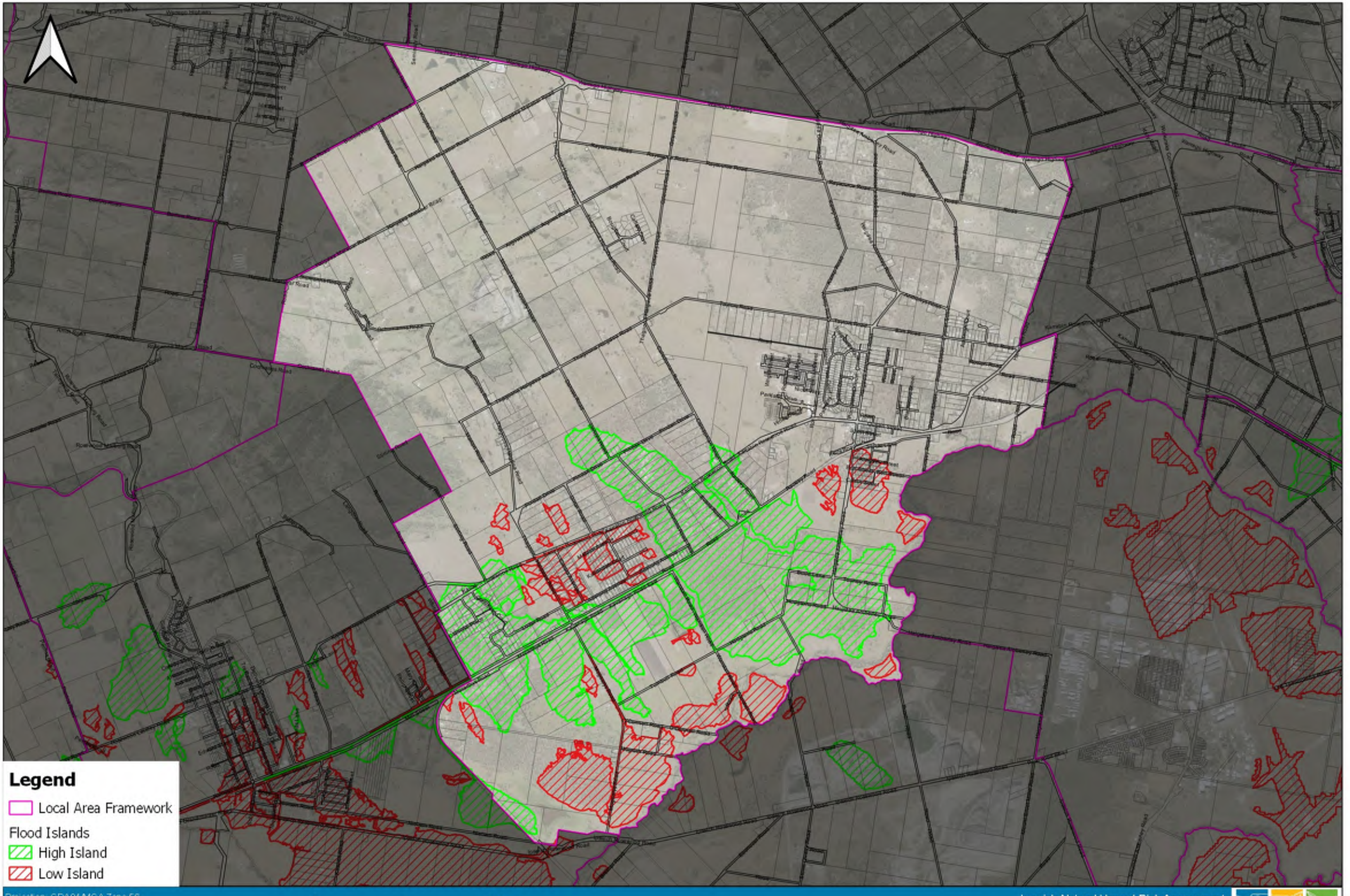
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Tallegalla, Woolshed, The Bluff Local Area Framework

WATER TECHNOLOGY

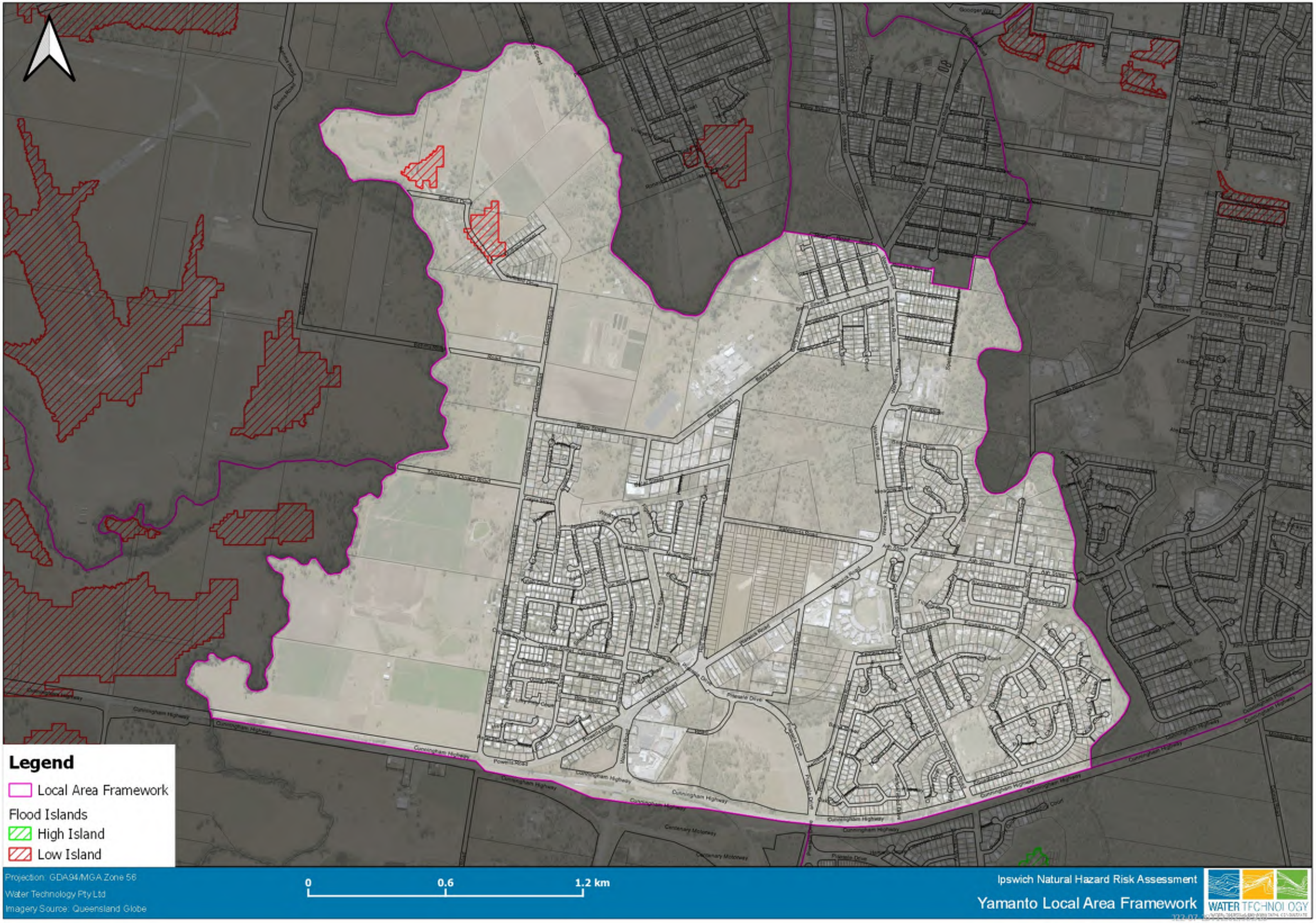


Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

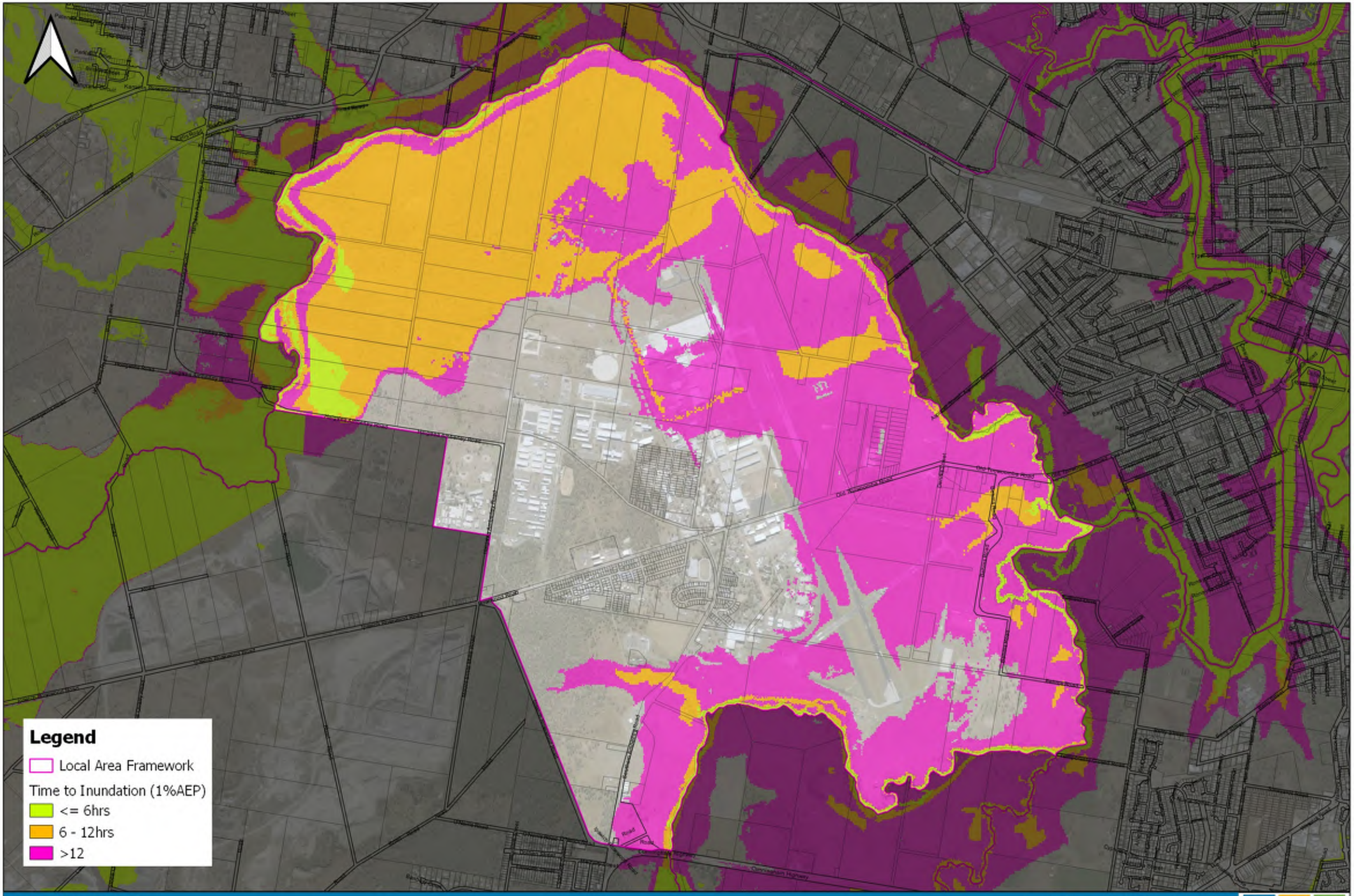
Walloon, Thagoona , Haigslea (part) Local Area Framework

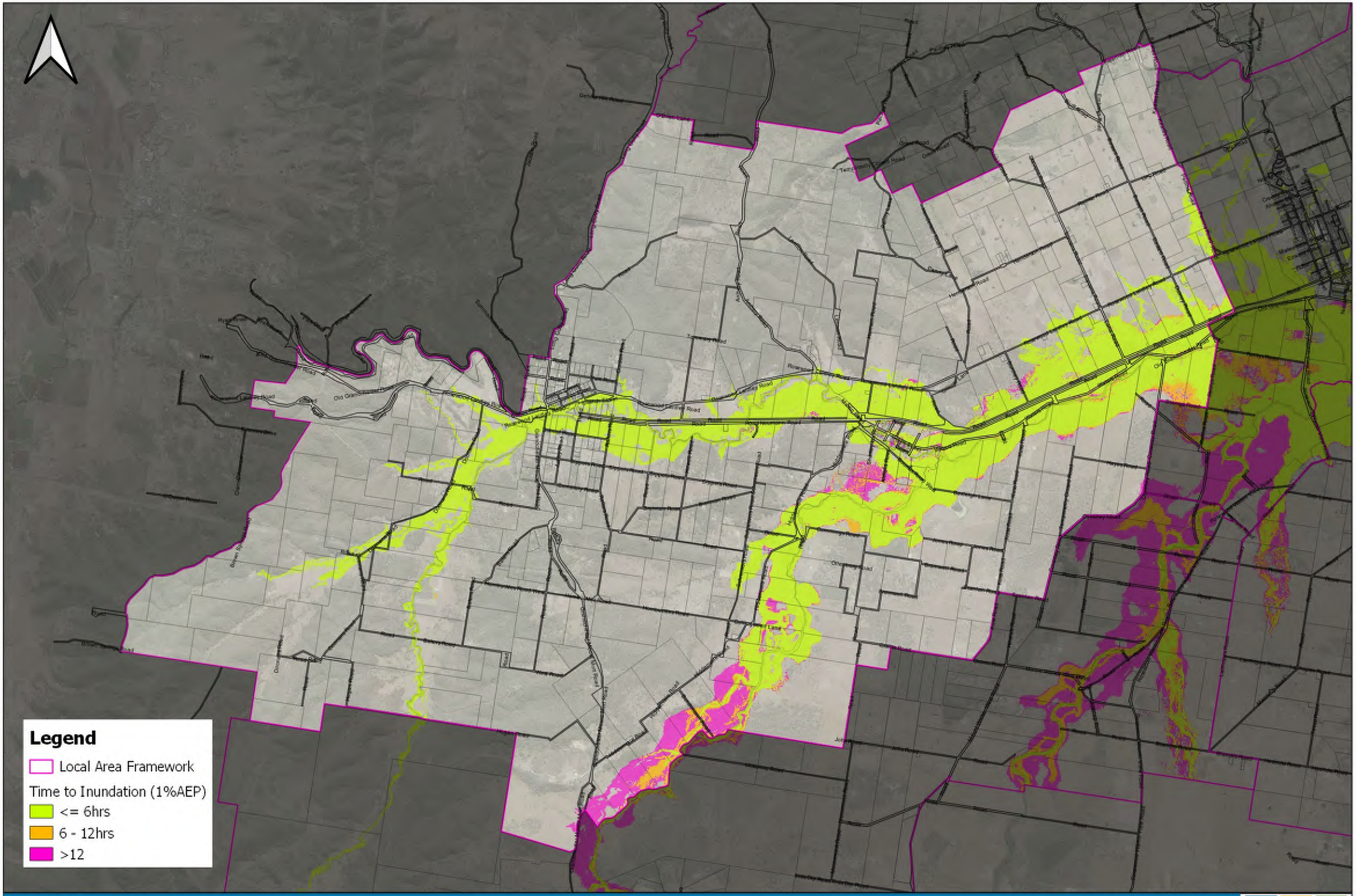
WATER TECHNOLOGY


Legend
Local Area Framework
Flood Islands
High Island
Low Island
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.6
1.2 km
Ipswich Natural Hazard Risk Assessment
Yamanto Local Area Framework
WATER TECHNOLOGY

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX C
FLOOD RISK MAPPING: TIME TO INUNDATION(TTI) BY LAF

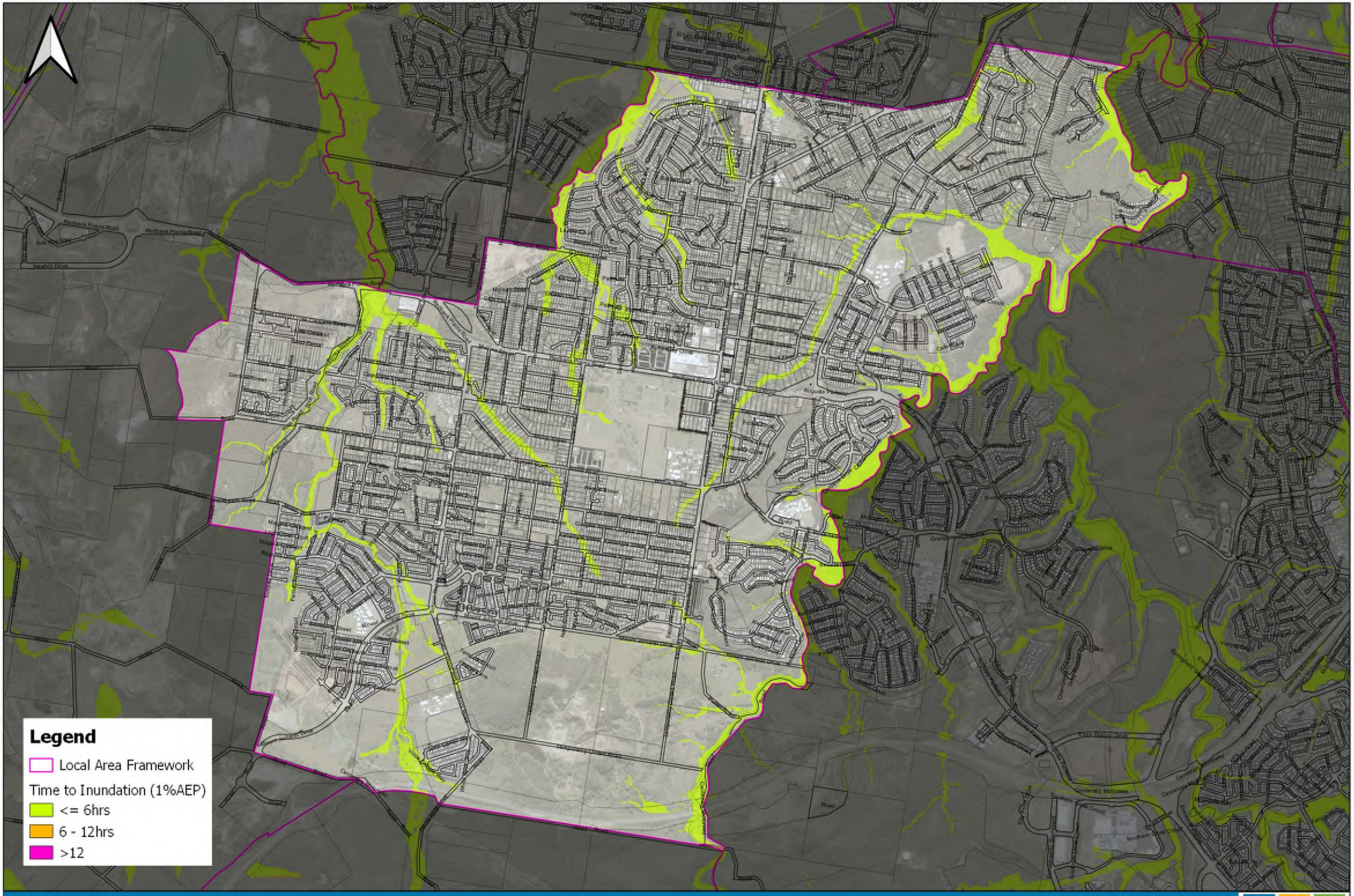

Legend
Local Area Framework
Time to Inundation (1%AEP)
<= 6hrs
6 - 12hrs
>12
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Amberley Local Area Framework
WATER TECHNOLOGY



Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Ashfield, Lanefield, Calvert, Grandchester Local Area Framework


Redbank Plains Road
Nerabil Drive
Gadsden Road
Augustine Heights
Legend
Local Area Framework
Time to Inundation (1%AEP)
<= 6hrs
6 - 12hrs
>12
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Bellbird Park, Redbank Plains, Augustine Heights Local Area Framework
WATER TECHNOLOGY

Legend

- Local Area Framework

Time to Inundation (1%AEP)

- <= 6hrs
- 6 - 12hrs
- >12

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 1 2 km

Ipswich Natural Hazard Risk Assessment

Booval, East Ipswich, North Booval Local Area Framework

WATER TECHNOLOGY

Legend

- Local Area Framework

Time to Inundation (1%AEP)

- <= 6hrs
- 6 - 12hrs
- >12

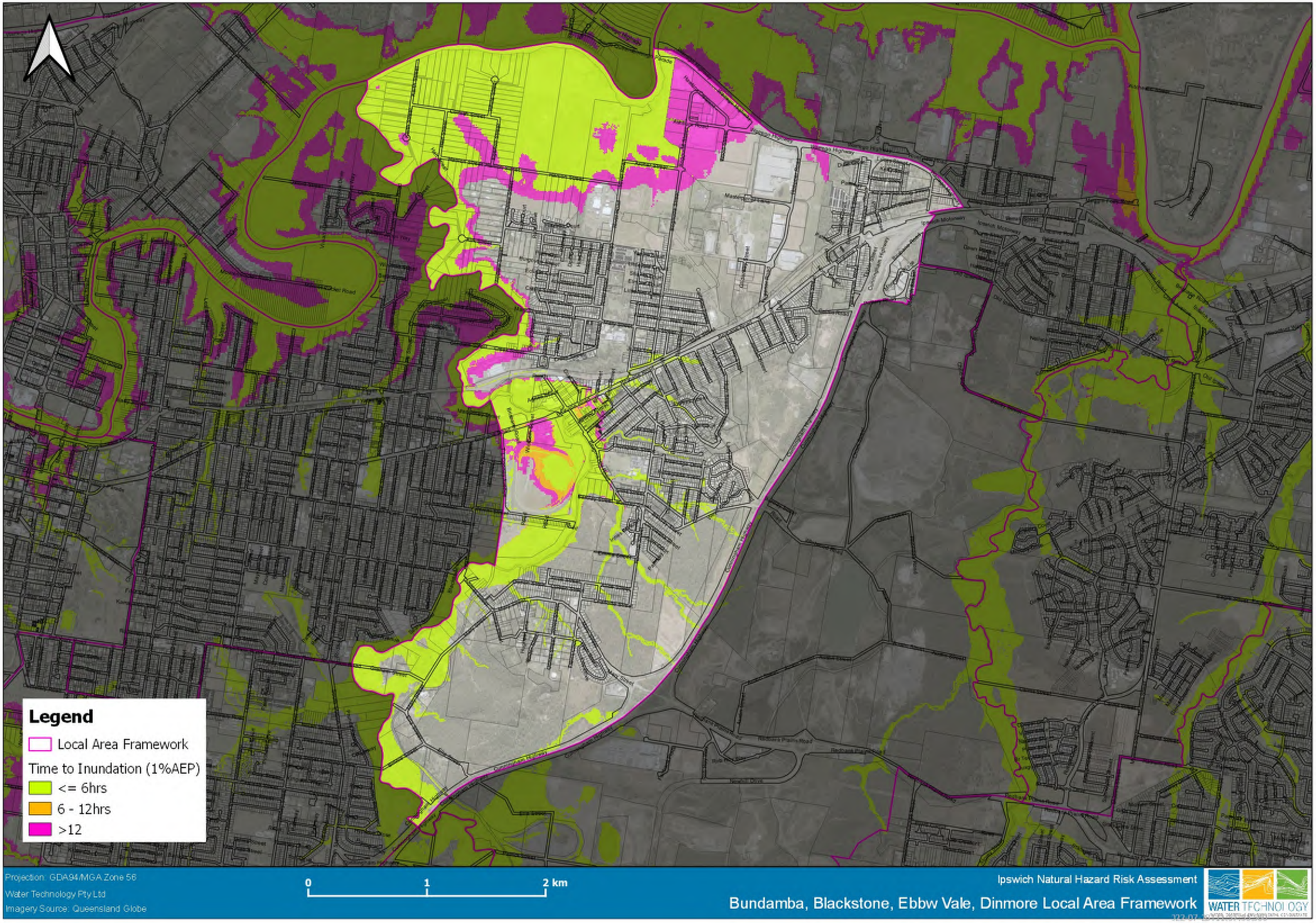
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

0 0.5 1 km

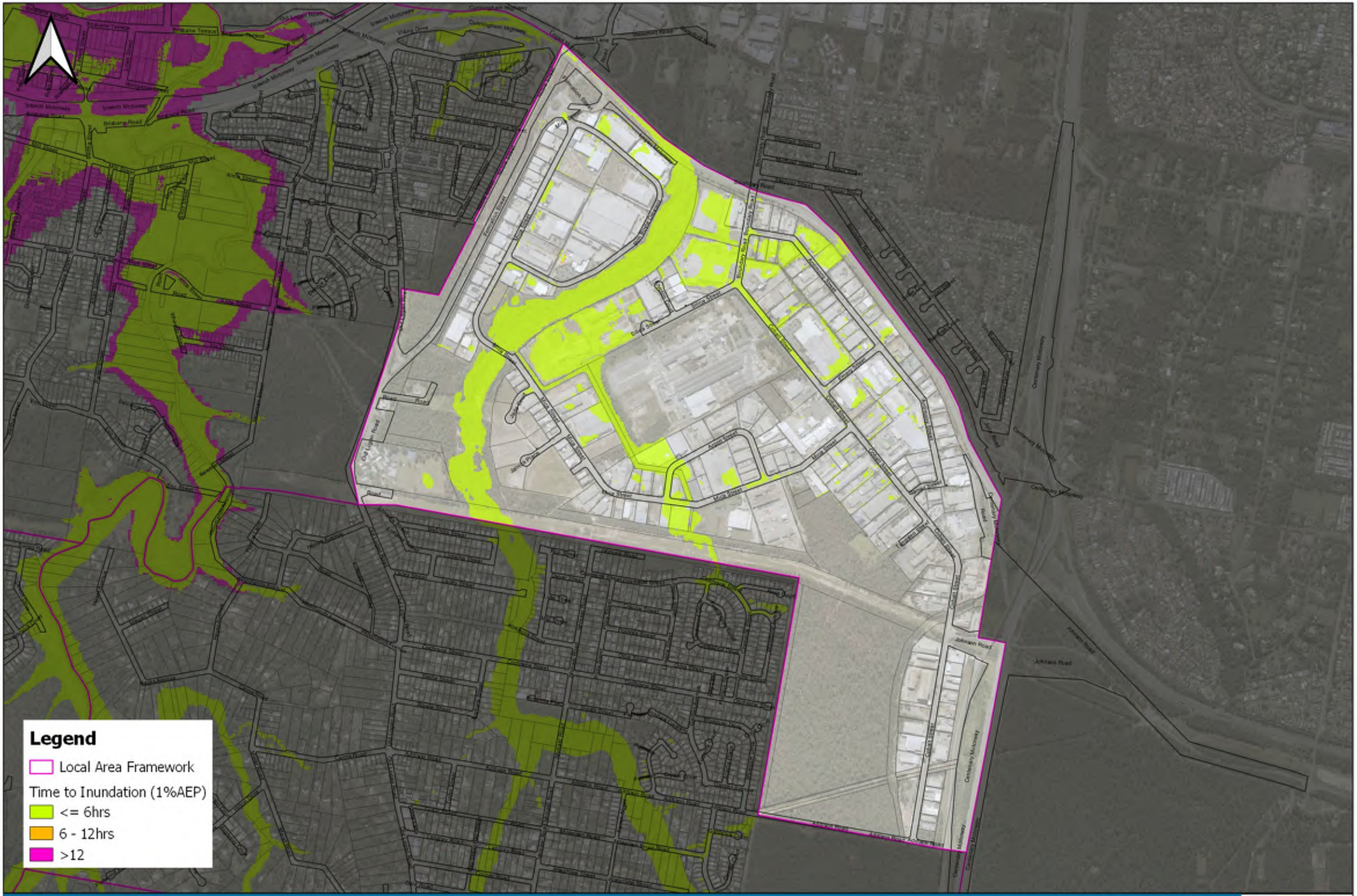
Ipswich Natural Hazard Risk Assessment

Brassall Local Area Framework

WATER TECHNOLOGY


Legend
Local Area Framework
Time to Inundation (1%AEP)
<= 6hrs
6 - 12hrs
>12
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
1
2 km
Ipswich Natural Hazard Risk Assessment
Bundamba, Blackstone, Ebbw Vale, Dinmore Local Area Framework
WATER TECHNOLOGY


Legend
Local Area Framework
Time to Inundation (1%AEP)
<= 6hrs
6 - 12hrs
>12
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.7
1.4 km
Ipswich Natural Hazard Risk Assessment
Camira (part) Local Area Framework
WATER TECHNOLOGY

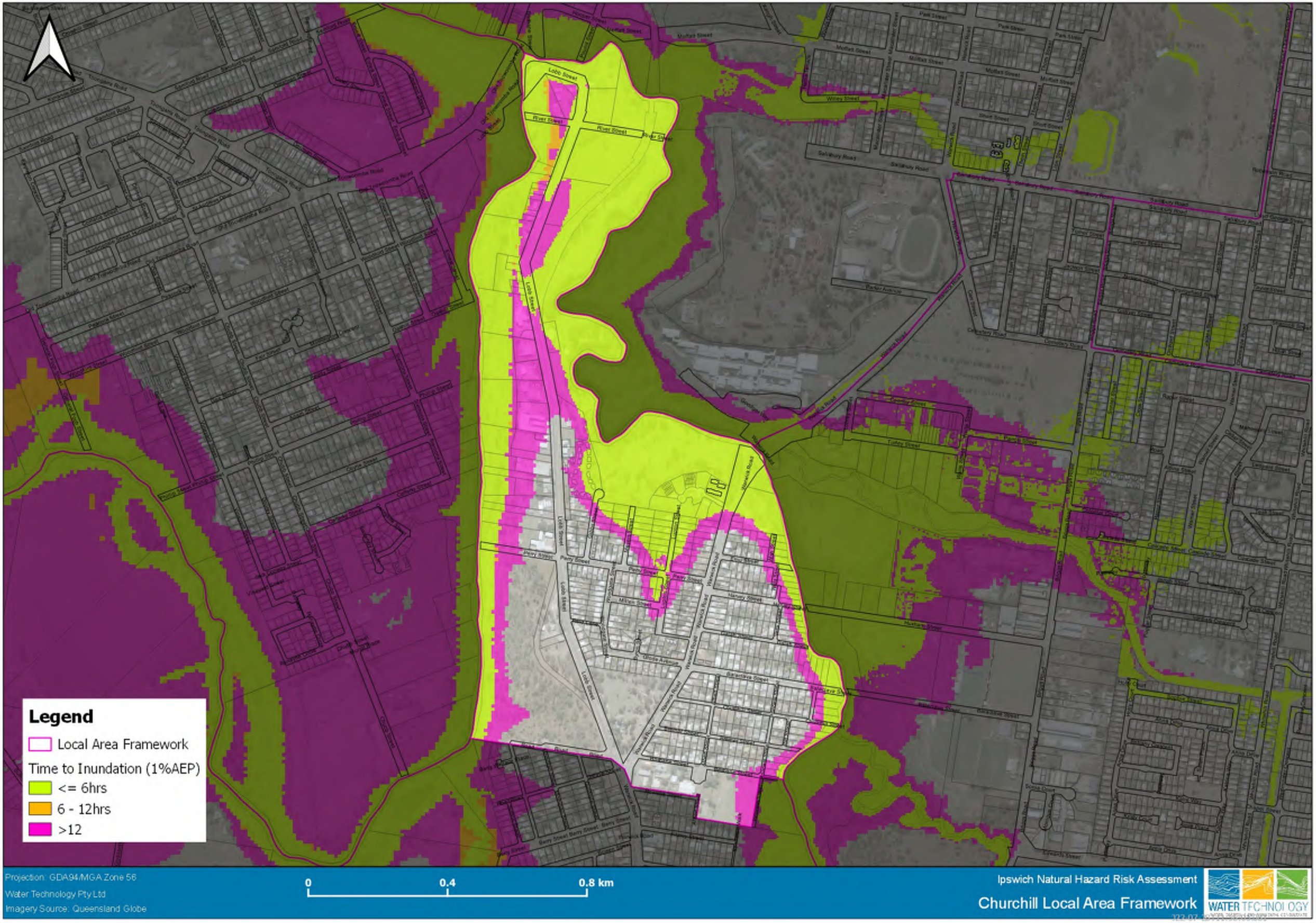


Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Carole Park Local Area Framework

WATER TECHNOLOGY


Legend
Local Area Framework
Time to Inundation (1%AEP)
<= 6hrs
6 - 12hrs
>12
Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe
0
0.4
0.8 km
Ipswich Natural Hazard Risk Assessment
Churchill Local Area Framework
WATER TECHNOLOGY

Projection: GDA94/MGA Zone 56
Water Technology Pty Ltd
Imagery Source: Queensland Globe

Ipswich Natural Hazard Risk Assessment

Ebenezer, Willowbank, Jeebropilly, Mount Forbes Local Area Framework