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Bunya Creek Corridor Master Plan

BLIGH TANNER

Tract

Fraser Coast REGIONAL COUNCIL

Issued
12 June 2022

Quality Assurance

Bunya Creek Corridor Master Plan

Prepared for
Fraser Coast Regional Council

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In the spirit of reconciliation, we acknowledge the Traditional Custodians of Country throughout Australia and their continuing connection to land, sea, community and culture.

We pay our respect to their elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

Revisions

Issue	Date	Description	Prepared By	Reviewed By	Project Principal
1	12 June 2022	Version 1	AH, PN, PM, SE	AH	AH
B	15 May 20212	[Draft]	AH, PN, PM, SE	AH	AH
A	23 February 2022	[Draft 02]	AH, PN, PM, SE	AH	AH

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1 Background

1.1 Introduction

Water is essential for life and when we make space for water within urban environments, we create places for the community.

Waterway corridors provide an opportunity for active lifestyles within natural environments. They provide opportunities for walking tracks, bike paths and recreational trails away from the dangers of traffic and the noise of every day life. They also create unique opportunities for preserving and enhancing biodiversity, for connecting fragmented remnant habitat, and maximizing the opportunity for species preservation. Waterway corridors provide green space that is vital for mental health and well-being.

Fraser Coast Regional Council's Vision is that by 2031 the Fraser Coast will be a diverse, strong and well governed region of vibrant places connected as a whole by community spirit, respect for the natural environment and an innovative and diverse economy (Fraser Coast Community Plan). The region's natural environment, appealing lifestyle and affordable housing have been key factors underpinning sustained population growth. However, continued growth is placing significant pressure on local waterways, while increasing demand for parks, green spaces, roads and other infrastructure.

This Corridor Master Plan will deliver better outcomes for the community by ensuring waterway corridors in the Bunya Creek Catchment are incorporated into future planning and designed to deliver multiple social, environmental and economic outcomes. Developers will benefit from well planned waterway corridors as this provides greater certainty for development and creates a desirable place to live.

1.2 Context

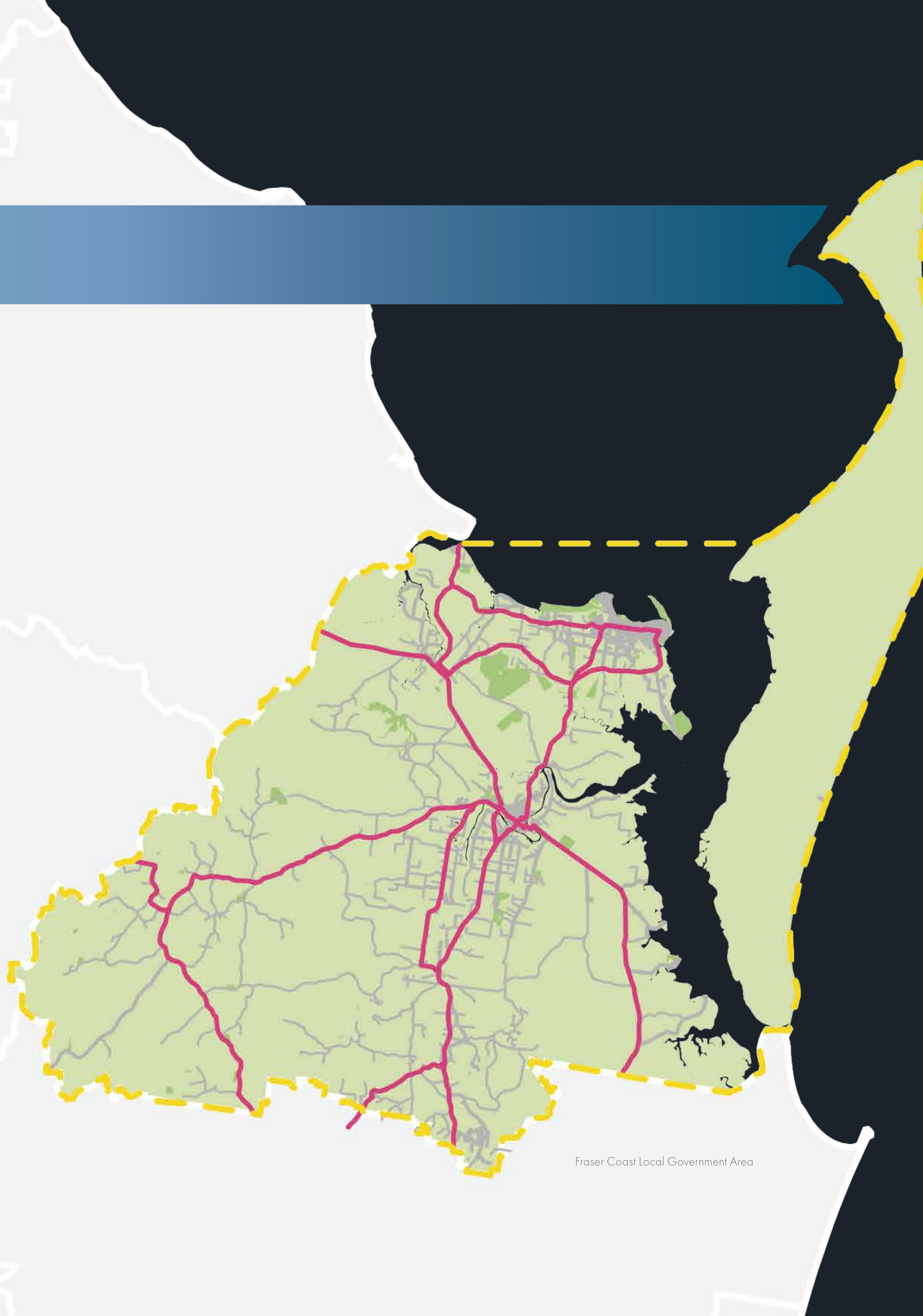
The Fraser Coast population is forecast to grow by approximately 20,000 people to an overall population of 130,000 by 2041 (KPMG 2020). Urban development is already expanding into the Bunya Creek catchment, and significant further urbanisation is expected in coming years.

In most parts of Australia, urbanisation has historically been associated with environmental degradation and loss of natural amenity, however this is an opportunity to proactively master plan the Bunya Creek corridor to create community green space that preserves and enhances the existing natural assets.

In 2020 Council commissioned KPMG to prepare the report 'Insight into the Future of the Fraser Coast' which identified a number of considerations for the planning scheme review including preserving and enhancing the natural assets which underpin the lifestyle experience; the main driver of migration and tourism.

This Plan focuses on the Bunya Creek Catchment; primarily the non-urbanised areas bounded by Booral Road in the south, Chapel Road in the north, Doolong S Road in the east and Maryborough-Hervey Bay Road in the west. The plan has regard for the rapidly urbanising land within the catchment north of Chapel Road, however opportunities for significant corridor planning in that area have passed.

The project has interdependencies with the Water Quality Strategy, Open Space Strategy, the Greening Fraser Coast Strategy and the Fraser Coast Sport and Recreation Precinct Master Plan.



Fraser Coast Local Government Area

1.3 Purpose + Objectives

1.3.1 PURPOSE OF THE REPORT

The report is intended to guide future planning and development within the Bunya Creek catchment to ensure the best overall outcomes are achieved.

The corridor plan is catchment focussed and seeks to address:

- Stormwater management and flood requirements, including water quality objectives;
- Open space and recreation needs;
- Ecological values;
- Areas for rehabilitation to improve connectivity between environmentally significant areas;
- Physical links;
- Buffer and landscape amenity
- Bushfire buffer considerations;
- Land value considerations;
- Role of the corridors as trunk infrastructure; and
- Efficiencies in construction and maintenance costs.

In developing the master plan, consideration has been given to:

- Utilisation of existing Council datasets.
- Alignment with other land use and infrastructure planning activities/strategies. There is also a need to align with other Council capital works programs (e.g. roads, drainage, sewer, water, footpaths, etc.) to ensure alignment and efficiencies in planning and delivery of works.
- Supporting compliance with State Planning Policy requirements and the Walkable Communities Planning Regulation.
- Developing a hierarchy for corridors and desired standards of service (DSS) to reflect the range of embellishments relative to setting. Typical drawings could be used to illustrate these DSS.
- Delivering network connectivity from the perspective of natural wildlife corridors and community passive transport, recreation and future transport.
- Supporting best practice stormwater management design that embraces a 'natural' approach.
- Construction and maintenance cost efficiencies and benefits.
- The role of the Local Government Infrastructure Plan (LGIP) and infrastructure charging framework in delivering the corridors.
- Mechanism for delivering the corridors through the development assessment process.

Objectives of the Report

Develop an understanding and Background	Analysis and Evaluation of the Existing Corridor Conditions	Assessment of the Impacts
Adoption into Planning Scheme +Implementation	Identify Partnerships and Stakeholders	Develop + Present a Series of Targeted Recommendations and Actions

Scope

The scope of this Pilot Master Plan is the waterway corridors of the Bunya Creek Catchment, primarily the non-urbanised areas bounded by Booral Road in the south, Chapel Road in the north, Doolong S Road in the east and Maryborough-Hervey Bay Road in the west. The plan has regard for the rapidly urbanising land within the catchment north of Chapel Road, however opportunities for significant corridor planning in that area have passed. It considers how key bio-geographical factors and infrastructure networks can be integrated and how this can be delivered through the Planning Scheme.

2 Vision

2.1 Vision Statement

The Bunya Creek catchment will be a great place to live and play. A network of bike paths and walking trails along its wooded floodplains will provide opportunities to get around... and get away from it all. Urban development will embrace the natural landscape and the cool green corridors and connectivity to the Sport and Recreation precinct will be a draw card for residents from across the region

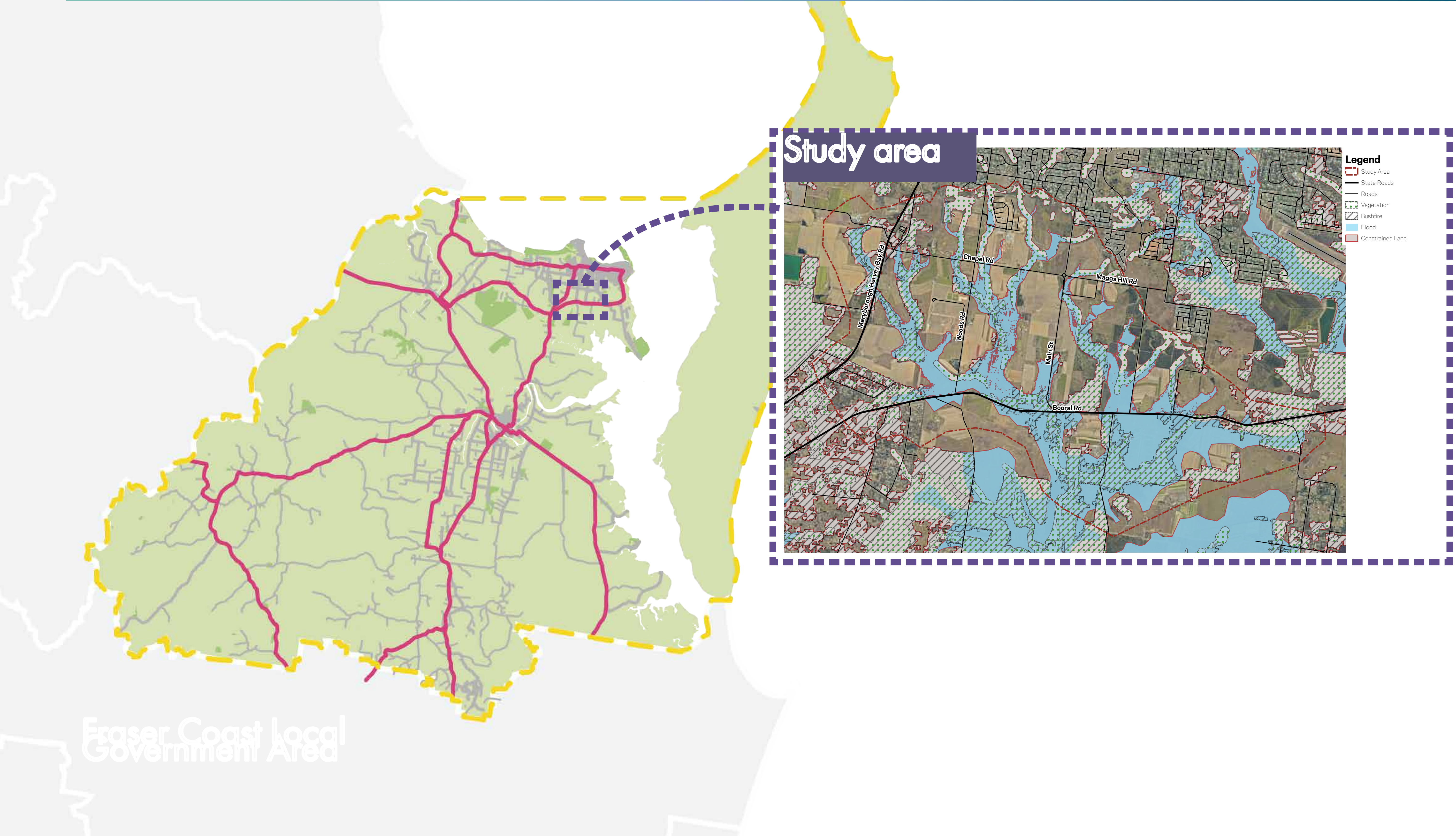
2.2 Objectives

Bunya Creek Catchment will have:

- Active and happy residents who benefit from living in proximity to the natural environment.
- A network of bike paths and walking trails to get around safely, sustainably and efficiently, away from major roads and enjoying natural scenery.
- Large tracts of good quality vegetation that provide a diverse and connected set of habitats.
- Healthy waterways teeming with life and supported by good water quality, a lack of erosion and dense riparian canopy.
- Efficiently designed utility networks making use of shared service corridors.
- An ongoing role in limiting the release of wastewater to the ocean, by using recycled water for irrigation.

Bunya Creek Catchment

3 Analysis of the Corridor



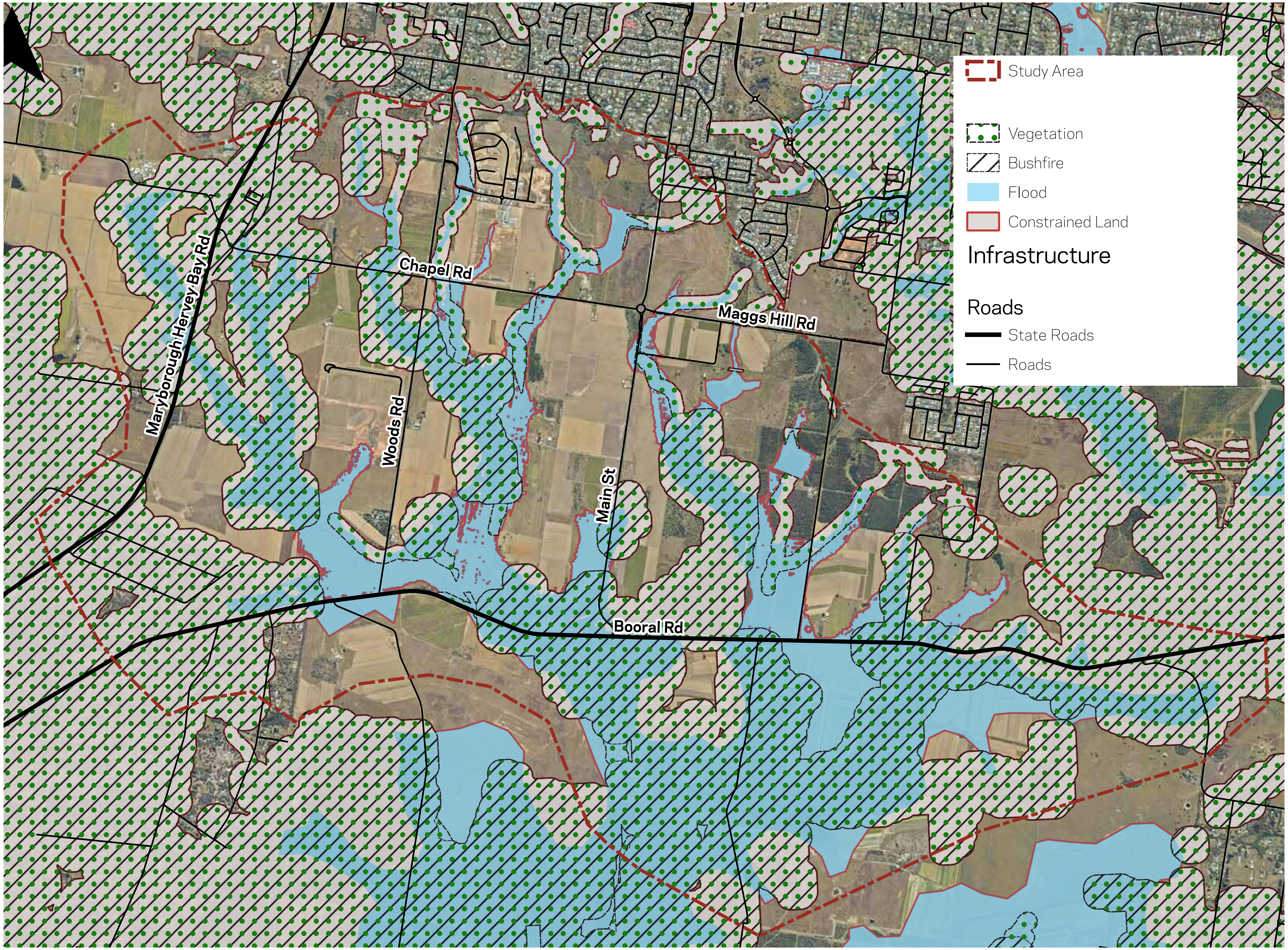
3.1 Overview of constraints

A significant proportion of the study area is constrained in terms of its potential for future urban development.

The major constraints are flooding, regulated vegetation, and bushfire hazard, as shown on the adjacent map.

These constraints, and other key characteristics of the study area, are discussed in more detail on the following pages.

Note land shown as constrained land may still have beneficial uses including agriculture, silviculture, environmental and conservation uses, and open space.



3.2 Site Images

Floodplain in the mid catchment

Waterway in the mid catchment (between Chapel Road and Booral Road)

Forest wetland just north of Booral Road

Forest wetland just north of Booral Road


Forest wetland just north of Booral Road


Forest wetland just north of Booral Road


Bunya Creek south of Booral Road


Ergon easement south of Booral Road

3.3 Topography

The catchment is bounded by a ridgeline along its northern extent, with elevations of up to 75 mAHD.

The land falls steeply to Chapel Road (typically about 15 m AHD), and south of Chapel Road the grades flatten. The drainage lines widen and transition to broader floodplains.

South of Booral Road (typically about 5 m AHD), the landscape transitions to a flat coastal plain, reflected in the meandering nature of Bunya Creek.

While the upper parts of the catchment have moderate to steep slopes, the lowland areas and waterway corridors are much flatter.

This flatter land creates a constraint for development because stormwater drainage becomes more difficult, and it becomes increasingly difficult to construct stormwater quality treatment systems such as bioretention systems in new development.

Legend

Watercourse

Contours

10 mAHD

5 mAHD

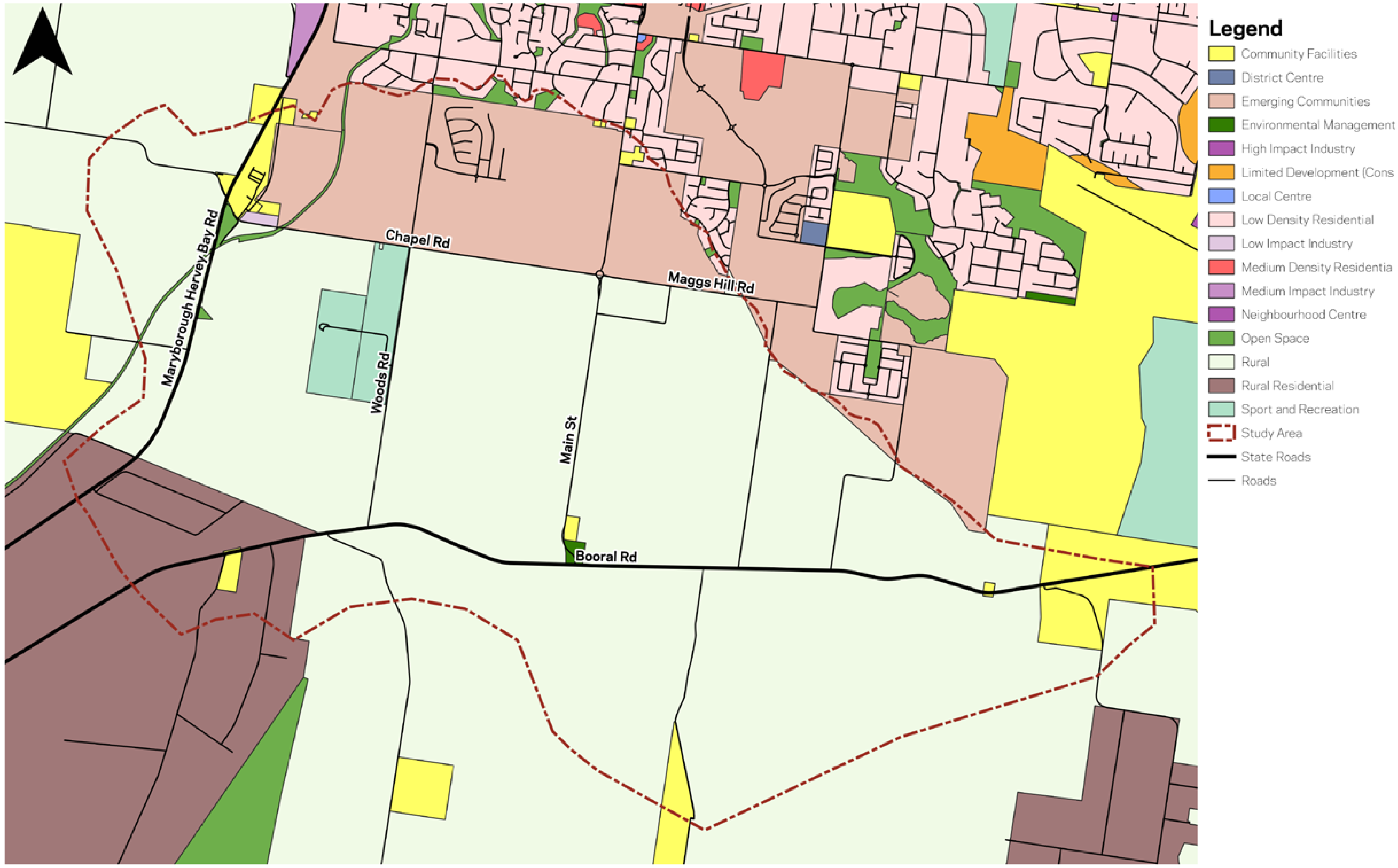
Bunya Creek Catchment Topography

3.4 Zoning

Council's Planning Scheme Zones for properties in the catchment are shown in the figure to the right.

Reflective of recent development, the properties north Chapel Road and Maggs Hill Road are mapped as Emerging Communities and Low Density Residential.

The remaining properties in the catchment are classified as Rural or Rural Residential.



Bunya Creek Catchment - Planning Scheme Zones

3.5 Flooding and waterways

Bunya Creek is a tributary of the Mary River, and flows into the Mary River estuary near River Heads and then into Great Sandy Strait.

Significant areas of the Bunya Creek catchment are inundated by the 1% Annual Exceedance Probability (AEP) flood event. Flood extents would likely increase as a result of any future urbanisation in the catchment and climate change.

Large parts of the catchment have been cleared for agriculture (grazing and cane) and peri-urban development, however this current phase of urbanisation is likely to place unprecedented pressures on the waterways. As areas urbanise, roads, roofs and driveways and other impervious surfaces, coupled with efficient stormwater drainage networks, deliver large volumes of stormwater into waterways, causing erosion and degrading water quality.

Flood detention systems are often designed on a site-by-site approach rather than as part of a coordinated catchment-wide approach. This fragmented approach does not necessarily have a beneficial impact on flooding downstream. In fact, there are circumstances where ad-hoc and uncoordinated flood detention can have adverse impact on flooding, because flood detention systems do not reduce runoff volumes but simply deliver the increased runoff from urban areas over a longer period of time, and are often optimized to a particular short intense 'design storms' on each development site. The collective impact further downstream is difficult to determine.

Further detailed flood modelling and risk assessment is needed to inform future land use planning. For the purpose of waterway corridor planning, the defined flood extent should be based on the following:

- An upstream catchment that is fully developed, and disregarding flood detention systems.
- Climate change impacts to precipitation and tail water levels (sea level rise).
- A fully vegetated riparian corridor (manning's roughness of at least 0.1), so that revegetation activities can proceed without there being any future conflict with flooding impacts.

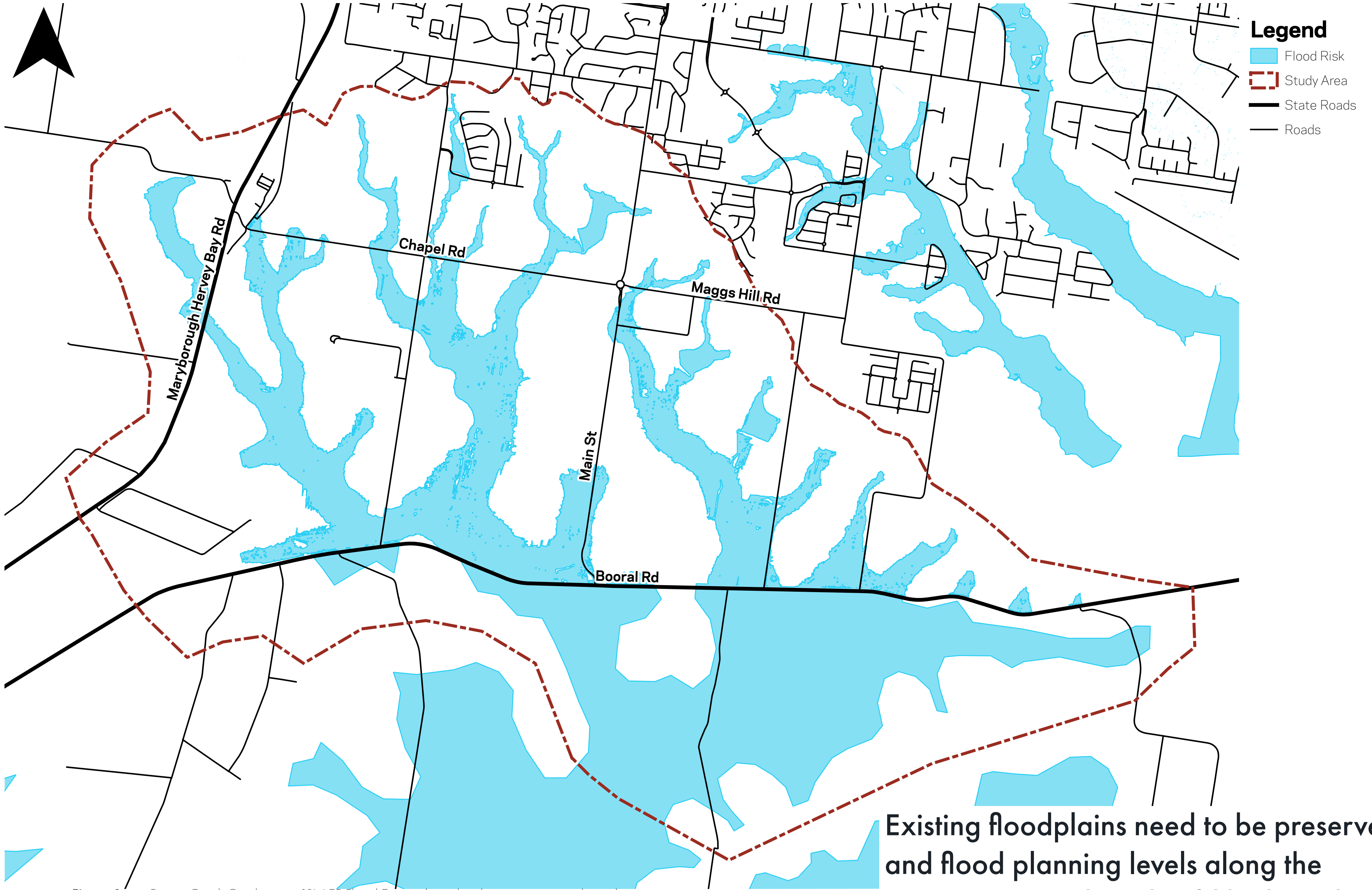


Figure 1. Bunya Creek Catchment - 1% AEP Flood Extents (pre-development, current climate)

Existing floodplains need to be preserved, and flood planning levels along the waterway corridors should be based on a fully developed catchment, revegetated waterways, and climate change.

> **Annual Exceedance Probability (AEP)**
>
> The Annual Exceedance Probability is the probability of a storm event occurring in a given year. The typical flood used for planning purposes is a 1% AEP. This means that in any given year there is a 1% (or 1 in 100) chance of that magnitude of event occurring. It does not mean it will only happen once every 100 years – storm occurrence can sometimes be clustered in a series of large storm events over a relatively short period of time, followed by a prolonged period of inactivity.

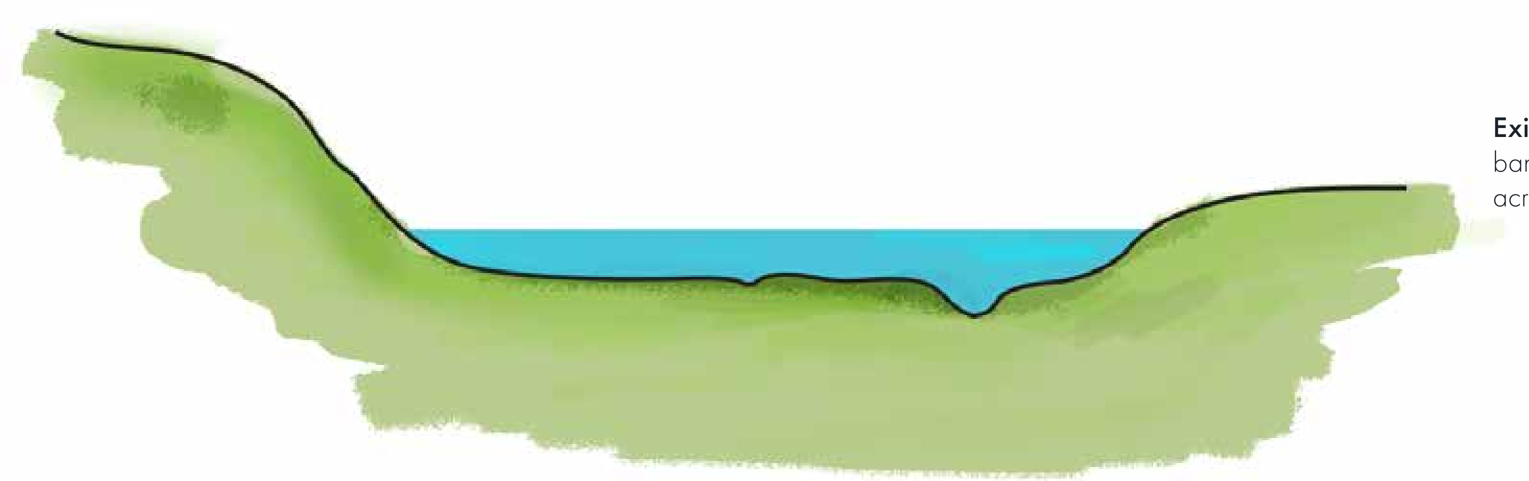
Filling in a Floodplain

Filling of floodplains to increase the amount of developable land is widely regarded as poor practice, as it reduces the storage capacity and conveyance capacity of floodplains and typically to result in worsening flood behaviour in other places.

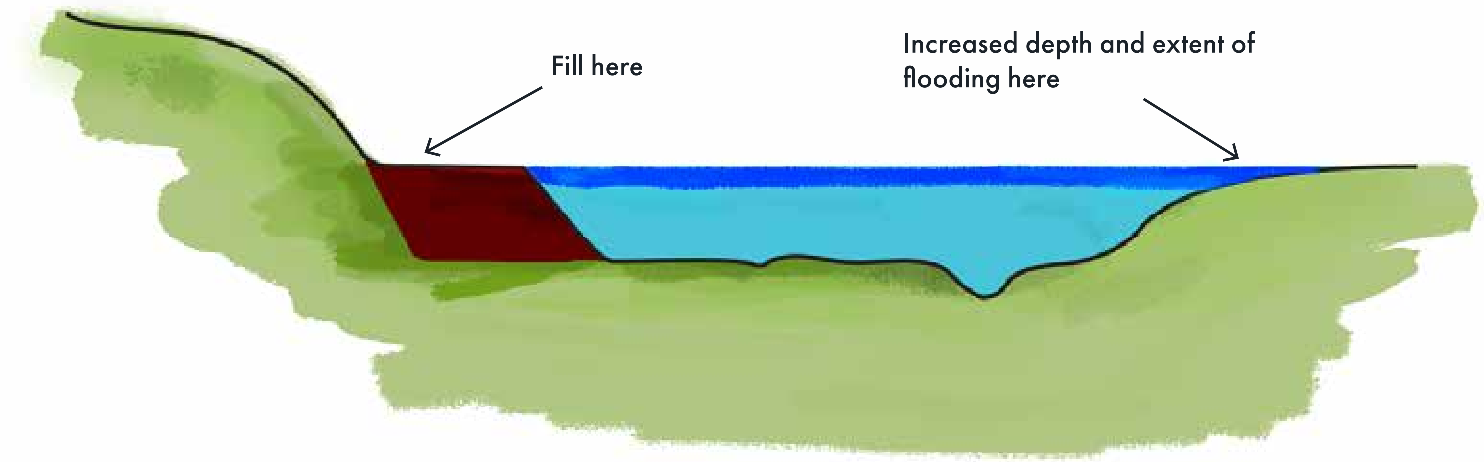
The State Planning Policy (SPP, 2017) includes natural hazards, risk and resilience as a State Interest.

It states: '**The financial, social and human costs placed on all levels of government, industry and the community, to respond to and recover from natural disasters, justifies the restriction of development in vulnerable areas. There is a shared responsibility to manage the impact these natural hazards may have on people, property, the economy, the environment and infrastructure**'.

The SPP requires that development avoids natural hazard areas where possible, and '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'; and 'maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard'.



Existing state: Waters break the banks of the waterway and spread across the floodplain in flood events.



Fill within the floodplain: reduced cross sectional area along the floodplain, resulting in an increase in flood levels, faster flowing floodwaters, and potentially increased flood extents along the edge. There is a risk of worsening flooding for properties upstream, downstream and on the opposite side of the floodplain.

3.6 Biodiversity

While the majority of the catchment has been cleared, there are sections of remnant and regrowth vegetation along the waterway corridors.

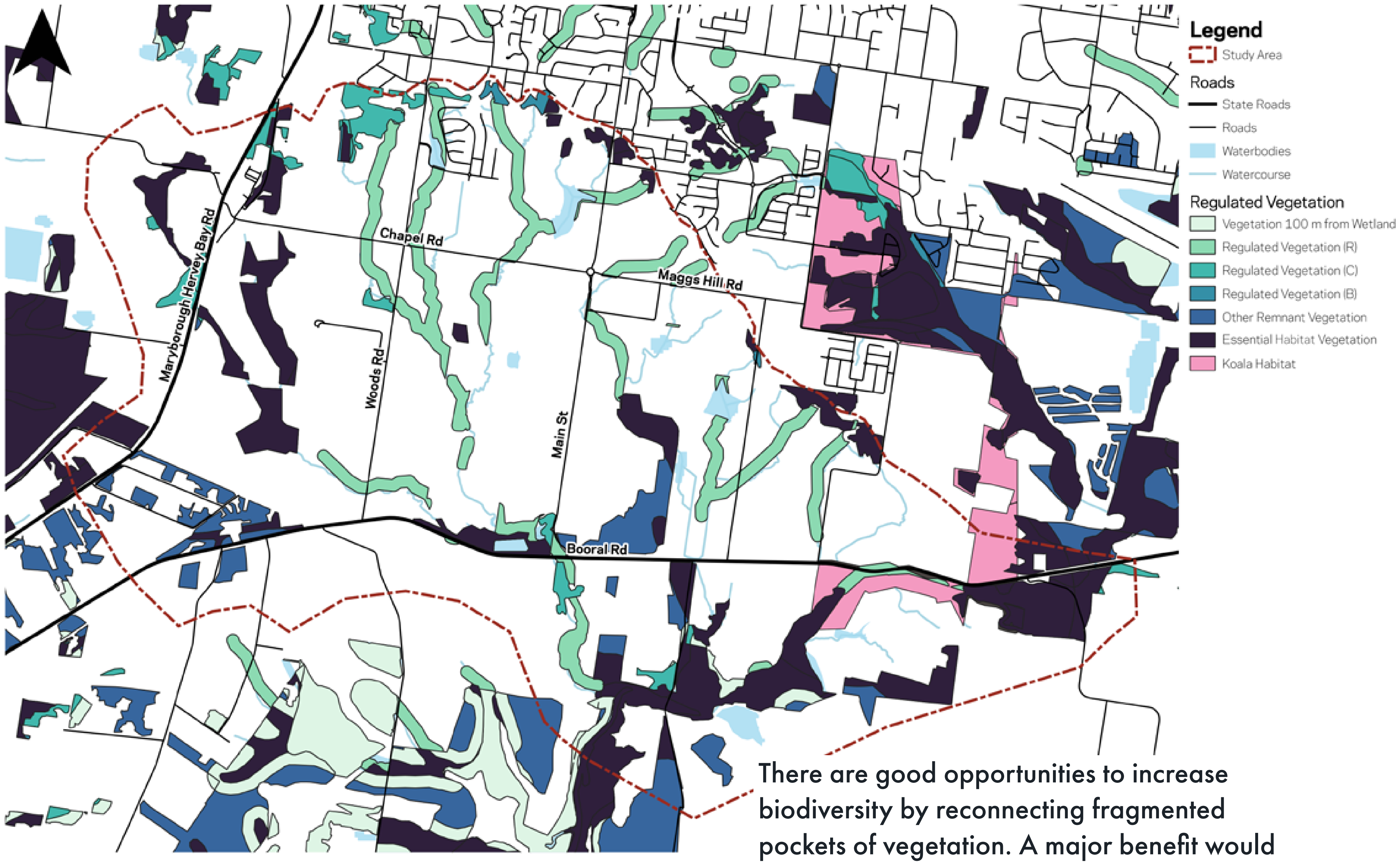
The most widespread regulated vegetation is category R which is in a regrowth watercourse and drainage feature area located within 50 metres of a watercourse.

There are also pockets of land mapped as Koala Habitat, Essential habitat (for protected wildlife) and Regulated Vegetation Category B (Remnant vegetation) and C (High-value regrowth vegetation).

The majority of regulated vegetation sits within the 1% AEP flood extent, and so land use planning that preserves the floodplain also preserves the existing vegetation.

The existing vegetation is quite fragmented, there are major opportunities to expand and reconnect pockets of vegetation, which would likely lead to significant increases in biodiversity, in terms of both species richness and abundance.

Note there are additional biodiversity and environmental matters relevant to the catchment that are not shown on the adjacent map for clarity. These include but are not limited to: MSES Wetland Protection Areas and Waterways for Waterway Barrier Works.



Bunya Creek Catchment - Key biodiversity overlays

There are good opportunities to increase biodiversity by reconnecting fragmented pockets of vegetation. A major benefit would be linking areas of existing koala habitat.

3.7 Parks, Open Space and Active Transport

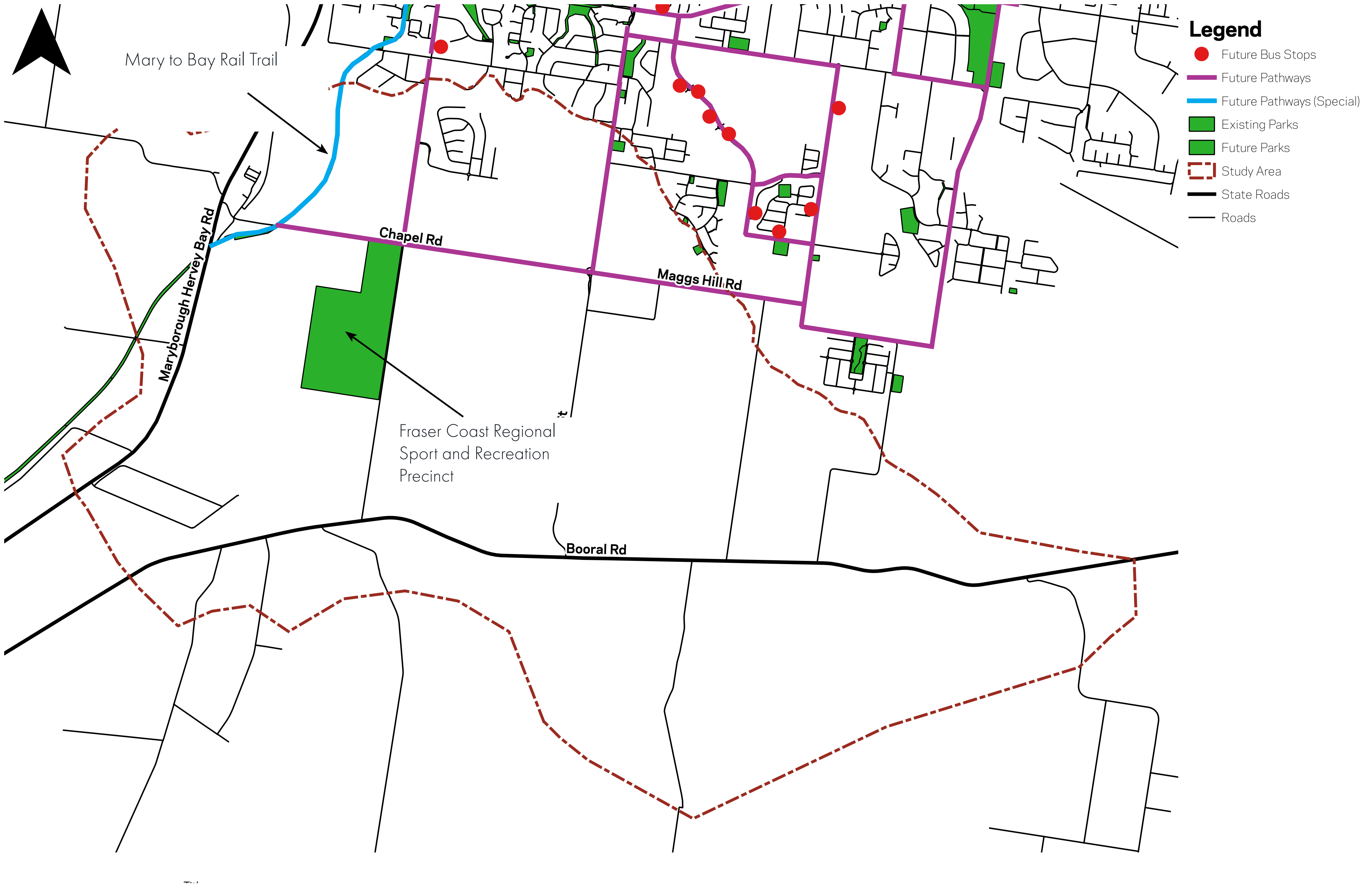
As would be expected of a predominantly agricultural area, there are few parks or areas of public open space.

The Fraser Coast Sports and Recreation Precinct is a major initiative within the catchment. Early stages have already been constructed and further expansion is planned. Its vision is to create a regional sports and recreation hub for the Fraser Coast with accessible, integrated, inviting and sustainable facilities and spaces for the enjoyment of the Fraser Coast community and visitors to engage in a variety of formal and informal sport and recreation opportunities.

The precinct connects to two of the key waterway corridors within the Bunya catchment, and there is potential for pathways along the corridors to provide active transport connections to and from the precinct.

Across the rest of the catchment there are major opportunities to create a network of passive and active open space areas, as discussed later in this report.

The Fraser Coast Active Travel Strategy envisages an increasing demand for active travel facilities as residents and visitors seek alternative modes of transport. The Mary to Bay Rail Trail, and a proposed district link along Chapel Road, will provide key linkages into the catchment. These should b supplemented by a network of paths along the corridors, as discussed later in this report.



Existing Open Space and Recreation Land Uses in the Bunya Creek Catchment

3.8 Bushfire

The existing bushfire hazard is shown on the adjacent map.

Bushfire risk aligns with existing vegetation along the waterway corridors. There are localised pockets of High Hazard Potential, and larger areas of Medium Potential and Potential Impact Buffer.

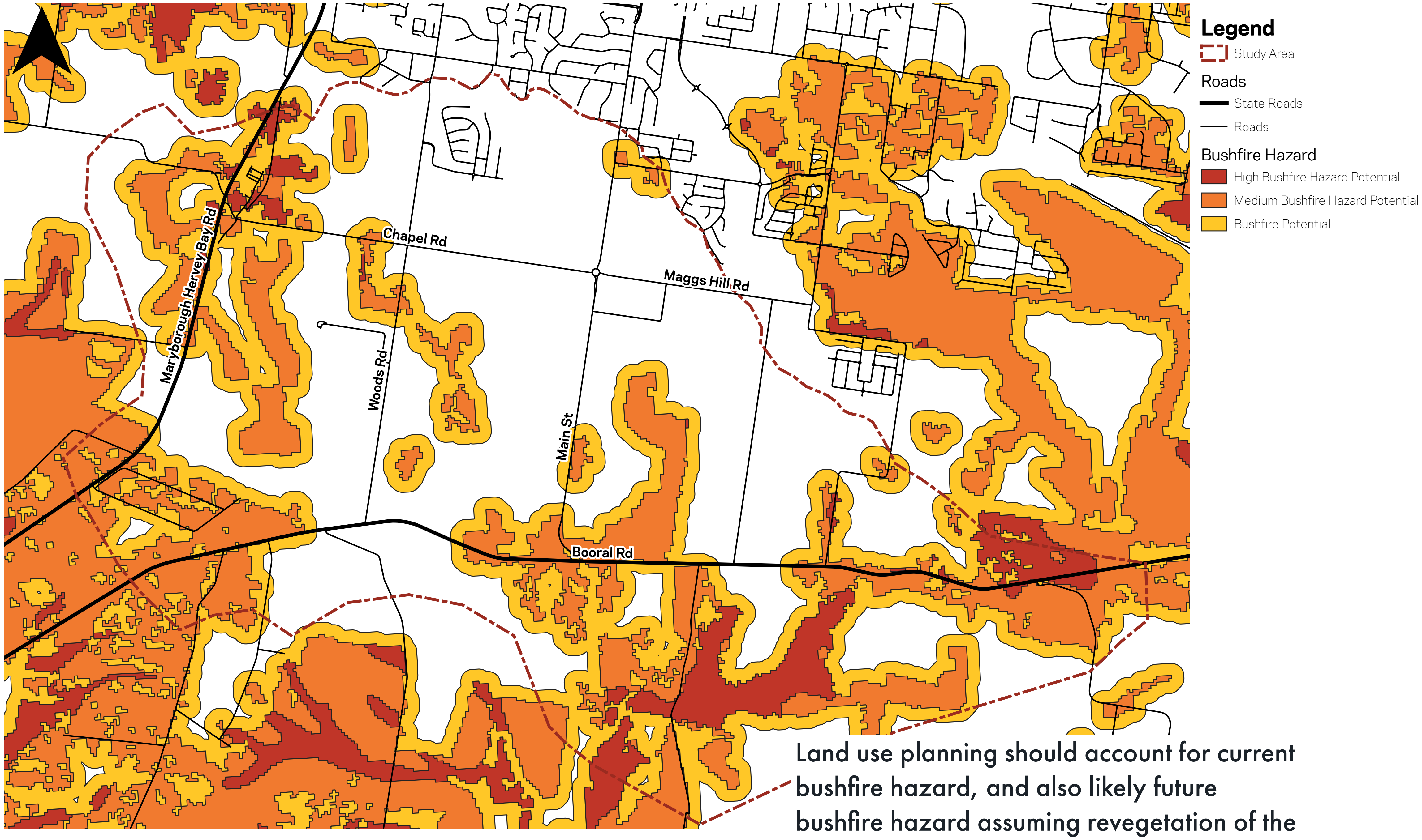
Land use planning should evaluate bushfire hazard against the long-term revegetated condition of the catchment rather than the existing vegetation extents.

The situation whereby urbanisation proceeds without regard for the ultimate bushfire risk could lead to a situation where revegetation potential is constrained.

Dwellings should not back directly onto areas mapped as High Hazard or Medium Potential, and preferably should not back directly onto Potential Impact Buffer areas.

An urban form where roads form the interface between urban areas and waterway corridors (discussed later in this report) enables the roads to also serve as Potential Impact Buffer areas.

This is a far preferable situation to allowing houses to back directly onto waterway corridors, which not only is problematic from a bushfire perspective but also is problematic in terms of equitable access to public spaces, CPTED principles, dumping of rubbish and maintenance.



Potential Bushfire Hazard in the Bunya Creek Catchment

Land use planning should account for current bushfire hazard, and also likely future bushfire hazard assuming revegetation of the waterway corridors.

3.9 Infrastructure

The locality has in place the following existing fundamental infrastructure:

Roads, including the State Roads Maryborough - Hervey Bay Road and Booral Road. It is reasonable to expect that—with appropriate widening and augmentations—the existing overall road grid would be able to service future development.

Electricity (major high voltage transmission lines and associated buffers, and local transmission lines)

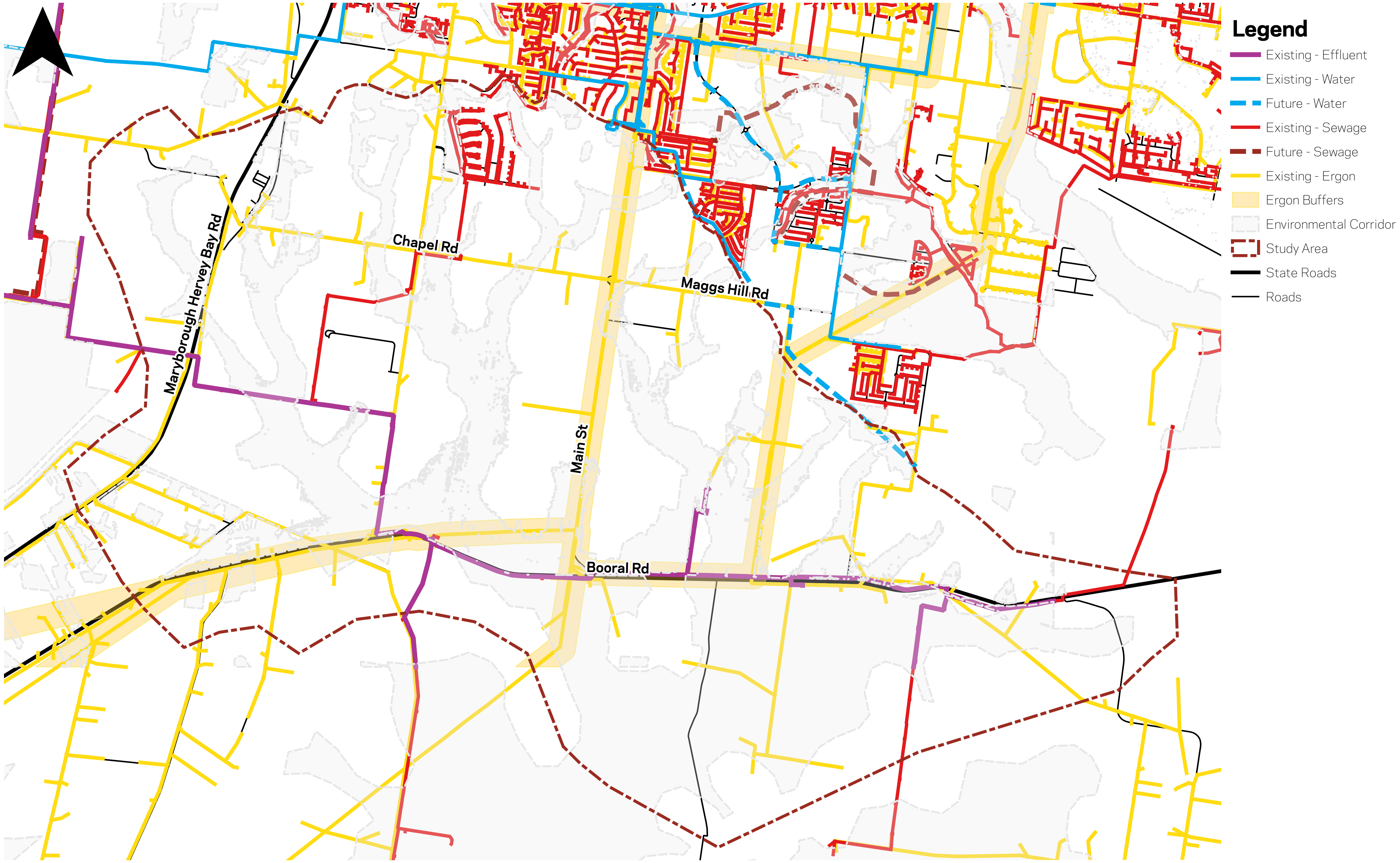
There are presently limited sewers within the catchment, servicing existing urban areas and the sports and recreation precinct, however there do not appear to be any material impediments to expanding the network to service new areas, noting that the topography would necessitate new pump stations and rising mains.

Trunk water mains extend through the northern part of the catchment, and there do not appear to be any material impediments to expanding the network to service new urban areas.

Recycled water mains service the locality, and the use of recycled water is discussed later in this report.

In terms of corridor planning, the logical approach is that electricity, communications and water services would best be located within road reserves, and gravity sewers (being dependent on falling topography) be located within the waterway corridors.

The Local Government Infrastructure Plan (LGIP) does not include any significant infrastructure in the study area, which is consistent with the current agricultural zoning for the majority of the area.



Linear Infrastructure

3.10 Agricultural Land

A significant proportion of the catchment is mapped as agricultural land, as shown on the adjacent map.

Class A1 and A2 land is crop land that is suitable for a wide range of current and potential crops with nil to moderate limitations to production.

Class B land is limited crop land that is suitable for a narrow range of current and potential crops due to severe limitations, but is highly suitable for pastures. Land may be suitable for cropping with engineering or agronomic improvements.

Agricultural land resources are important to Queensland—they support economic growth in regional areas, strong regional communities and provide a resource base for growing food. The Queensland Government considers them a key State resource as Queensland grows.

This is reflected in Agriculture being a State Interest under the State Planning Policy.

The state's interest in agriculture is that planning protects the resources on which agriculture depends and supports the long term viability and growth of the agriculture sector. This includes promoting and optimising agricultural development and increasing production in key areas.

If the agricultural lands were to be rezoned for urban purposes, Council would likely need to demonstrate:

- There are no alternative sites; and
- the proposal is of significant community benefit.

Agricultural land mapping

3.11 Recycled Water

The Bunya Creek Catchment currently plays an important role in Wide Bay Water's integrated water management system through the use of recycled water.

Using recycled water for the irrigation of woodlots (plantation forestry) and agricultural lands significantly reduces the amount of wastewater being discharged into sensitive local waterways such as the Great Sandy Strait and defer expensive upgrades to wastewater treatment plants.

If land use in the Bunya catchment transitions from agricultural to urban, the demand for recycled water will drop while more wastewater will be produced.

Wide Bay Water has a preference not to explore dual-reticulation schemes whereby residential areas are supplied with non-potable recycled water. The preferred strategy is to irrigate lands further afield.

Lands within the waterway corridors are unlikely to be suitable for long-term irrigation with recycled water due to the risks of waterway contamination, however recycled water could help establish revegetation areas.

The use of recycled water for other parks should be evaluated on a case-by-case basis.

The woodlots within the catchment have varying lifespans until harvest. Assuming the catchment were to urbanise, the likely best and highest value use of those woodlot areas would likely be as urban residential areas.

While the areas remain as woodlots, it is important that there be appropriate buffers to any residential development to manage the impacts of agroforestry activities, and also to manage bushfire risk.

Recycled water use within the Bunya Creek Catchment

4 Master Plan

4.1 Overview

The majority of the study area, including the lands south of Chapel Rd, is not currently zoned as urban. Even though the area has a number of key constrains, particularly flooding, regulated vegetation and bushfire hazard, there is potential for future urban growth given its proximity to Hervey Bay and the Regional Sports and Recreation Precinct.

A number of key actions and recommendations to deliver the Bunya Creek Corridor Vision are outlined in this section.

Flooding and waterways

Development does not result in the loss of floodplain storage or conveyance (on a site-by-site and on a cumulative basis).

Flood mapping shall be updated to reflect flood levels based on ultimate catchment conditions including full urban development, revegetation of floodplains and waterway corridors, and climate change impacts to both rainfall and sea levels.

Flood detention shall be coordinated on a whole-of-catchment basis. Disparate flood detention systems tailored to mitigate peak flows from individual development sites have a tendency to flatten hydrographs and prolong the duration of event flows in downstream waterways, possibly making flooding worse of exacerbating erosion. Such unplanned detention systems are also unlikely to deliver desirable catchment hydrology and are not recommended.

Retention of runoff through rainwater tanks and other water sensitive urban design principles is recommended to protect downstream waterways.

Waterways should include in-stream grade control structures to restrict vertical incision (deepening) of waterways associated with the increased erosivity of urbanised catchment runoff.

Waterways should include in-stream chokes—using rocks or logs—that prevent channel widening associated with the increased erosivity of urbanised catchment runoff. This approach will help ensure regular engagement of the floodplain which in turn helps with slowing floodwaters, recharging groundwater, filtering of water through floodplain vegetation, and lessening waterway erosion.

Through applying the above principles, urban development in the catchment should be able to utilise stormwater quality offsets to provide a monetary contribution to Council in lieu of on-site stormwater quality management systems. The offset funds collected can be invested in waterway revegetation and protection.

Agricultural land

Evaluate proposed land use changes against the State Planning Policy—State Interest Guideline Agriculture (Queensland Government 2016).

Biodiversity

Revegetation should seek to re-establish the relevant regional ecosystems, based on Queensland Government mapping supplemented by local knowledge.

Revegetation is to prioritise reconnecting Koala Habitat areas.

Urban design

Residential lots should not back directly onto waterway corridors. The interface between urban residential areas and waterway corridors should be formed by a road reserve. This principle applies for the purposes of Crime Prevention through environmental design principles (CPTED) (Queensland Police Service 2021); avoiding the dumping of rubbish, lawn clippings and other weedy matter; establishing bushfire buffers; ensuring maintenance access; and maximising public access to and enjoyment of public open space areas.

Establish an urban form compliant with the Planning (Walkable Neighbourhoods) Amendment Regulation 2020 as follows.

- Connectivity: grid-like street layout that responds to the local landscape
- Block lengths: a maximum of 250m
- Footpaths: on at least one side of a neighbourhood road, and both sides of a main street
- Park or open space: blocks to be within 400m of a park or open space
- Street trees: planted every 15m on both sides of the street.

Linear infrastructure

Electricity, communications and water services are generally located within road reserves

Gravity sewers are generally located within or adjacent to waterway corridors.

Bunya Catchment Master Plan

1. Fraser Coast Sports and Recreation Precinct is accessible by a network of active travel paths.
2. Constrained land to be revegetated to create green waterway corridors that provide opportunities for active and passive recreation, enhance biodiversity and improve water quality. Preferred location for environmental (vegetation and water quality) offsets.
3. Future urban (as demand warrants and subject to a Council policy position). Flood detention, stormwater quality, open space and walkability requirements are generally satisfied by the adjacent waterway corridors.
4. Esplanade roads along the edges of corridors to improve public safety and equatable access to open space. Esplanade roads also serve as bushfire buffers and improve maintenance access.
5. Future link to lowland reaches of Bunya Creek, with potential for a canoe/kayak trail.
6. Links to Mary to Bay Rail Trail
7. Forest wetland to be protected and enhanced as a key ecological asset.
8. Potential for trail head for future Bunya Creek canoe/kayak trail.
9. Existing and active urban development areas

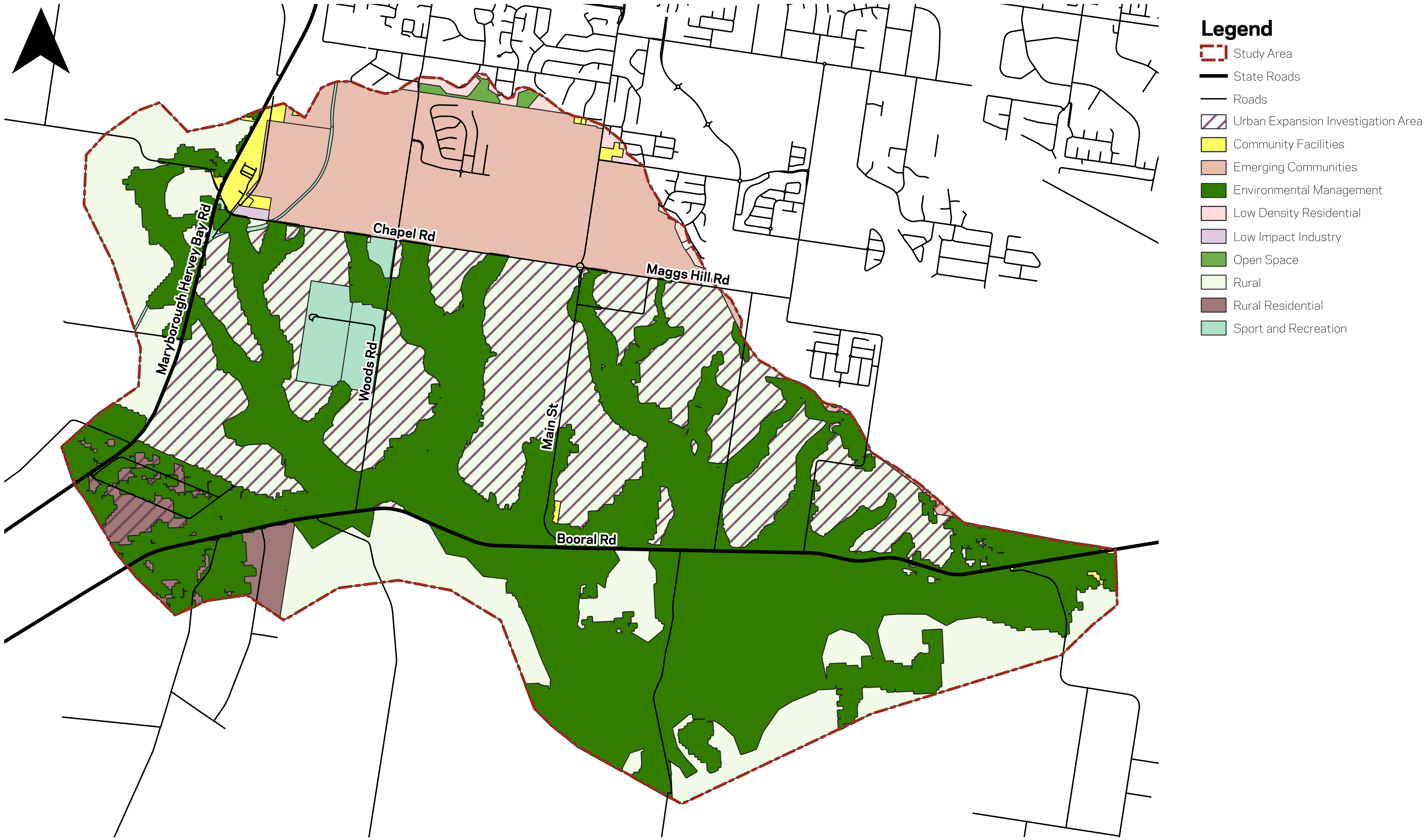
ACTIVE TRANSPORT ROUTES

4.2 Potential Future Land Use

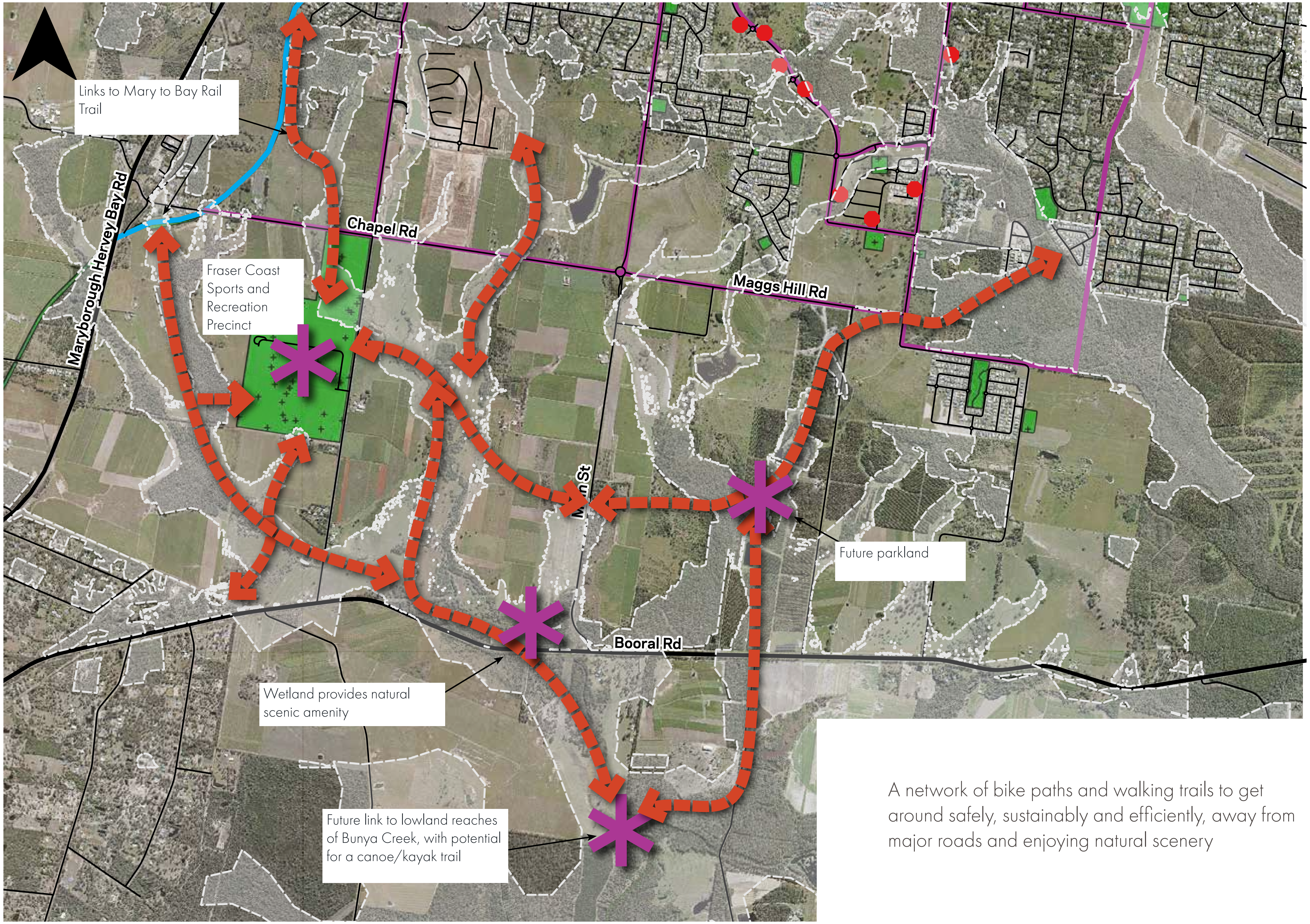
Proposed rezoning within the corridor is shown on the adjacent plan.

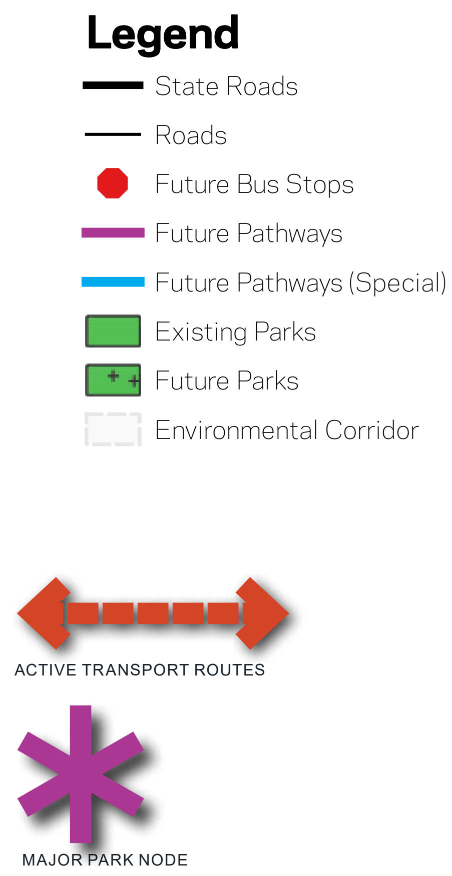
Key points:

- Waterway corridors are recommended to be protected by zoning rather than by overlays, codes or flood immunity criteria. This approach will provide greatest confidence to all parties with regard to development potential, and reduce conflict in regards to applications for filling of floodplain areas.
- The Environmental Envelope shown comprises both Environmental Management and Conservation Zone and Open Space Zone (delineation between these two zones is to be informed by updated flood modelling and bushfire analysis - with the open space zone encompassing the bushfire buffer, but generally not including land within the 63% AEP flood extent).
- The mapping shown is indicative only and should be updated once catchment flood modelling is updated.
- The Urban Expansion Investigation Area has potential for rezoning for urban purposes subject to need, and structure planning.



4.3 Active Transport



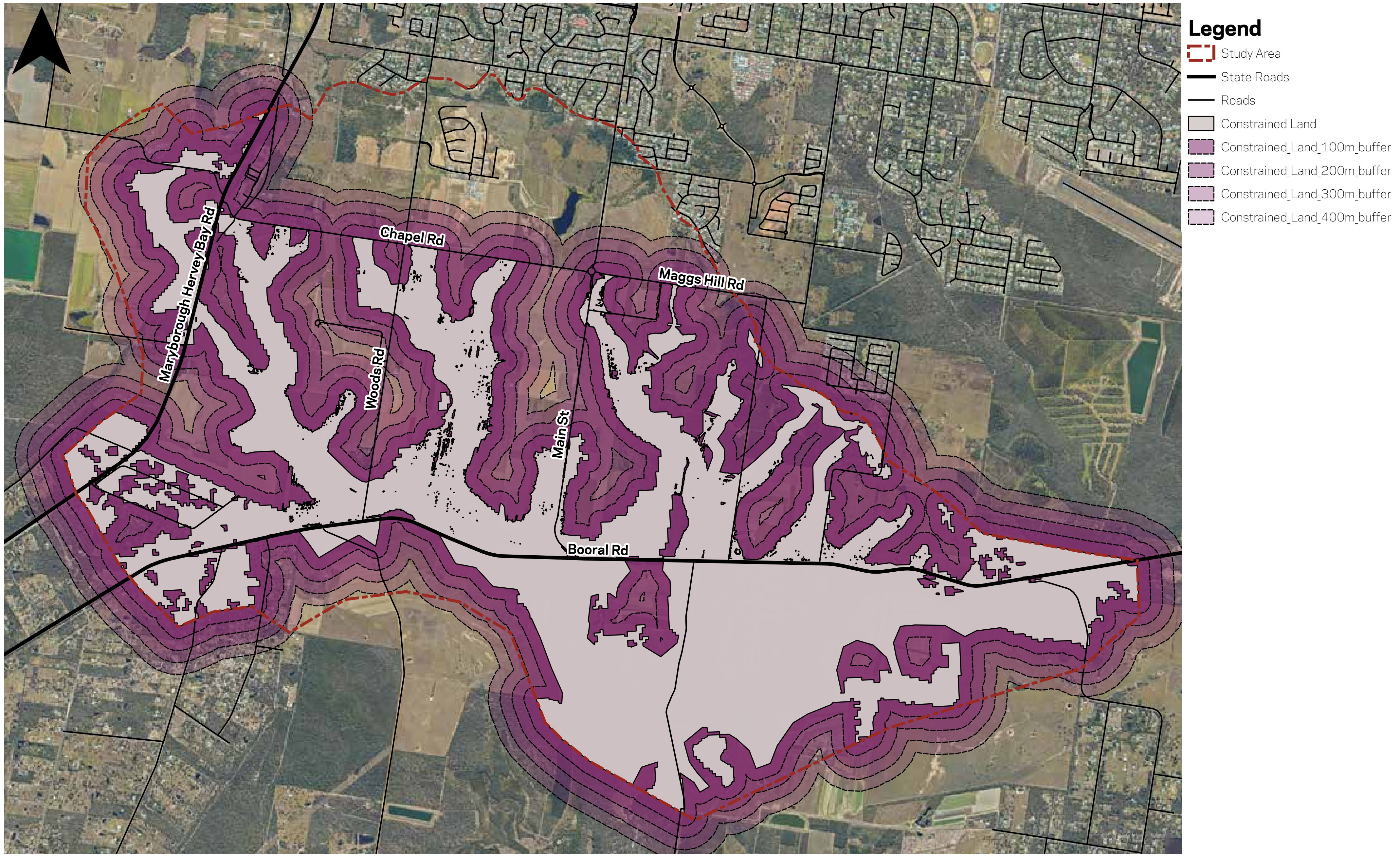


A network of bike paths and walking trails to get around safely, sustainably and efficiently, away from major roads and enjoying natural scenery

4.4 Walkable Neighbourhoods

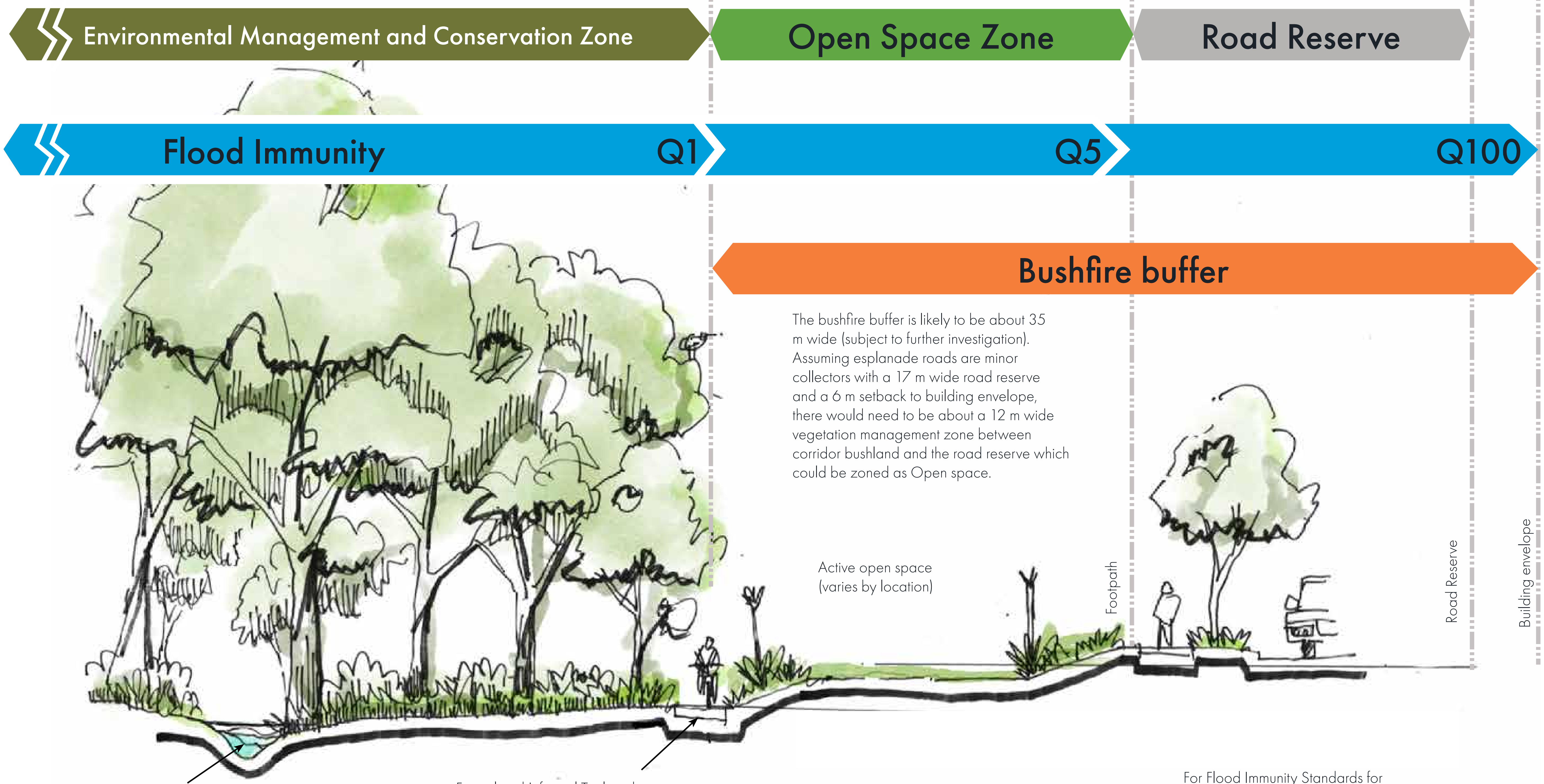
The Planning (Walkable Neighbourhoods) Amendment Regulation 2020 establishes a requirement, when reconfiguring a lot, to ensure access to areas for recreation, leisure or exercise by ensuring that, to the extent topography and other physical constraints reasonably permit, a part of each block for the reconfiguration is within 400m of a park or another area of open space that is accessible to the public (See Schedule 12A Part 2, 8(1)).

The adjacent map shows 100 m offsets from the edge of the proposed waterway corridors. The figure shows the vast majority of the unconstrained land sits within 400 m of a waterway corridor, with 65% of unconstrained land being within 200 m (on a direct line) from a waterway corridor.



4.5 Urban interfaces

Typical interface



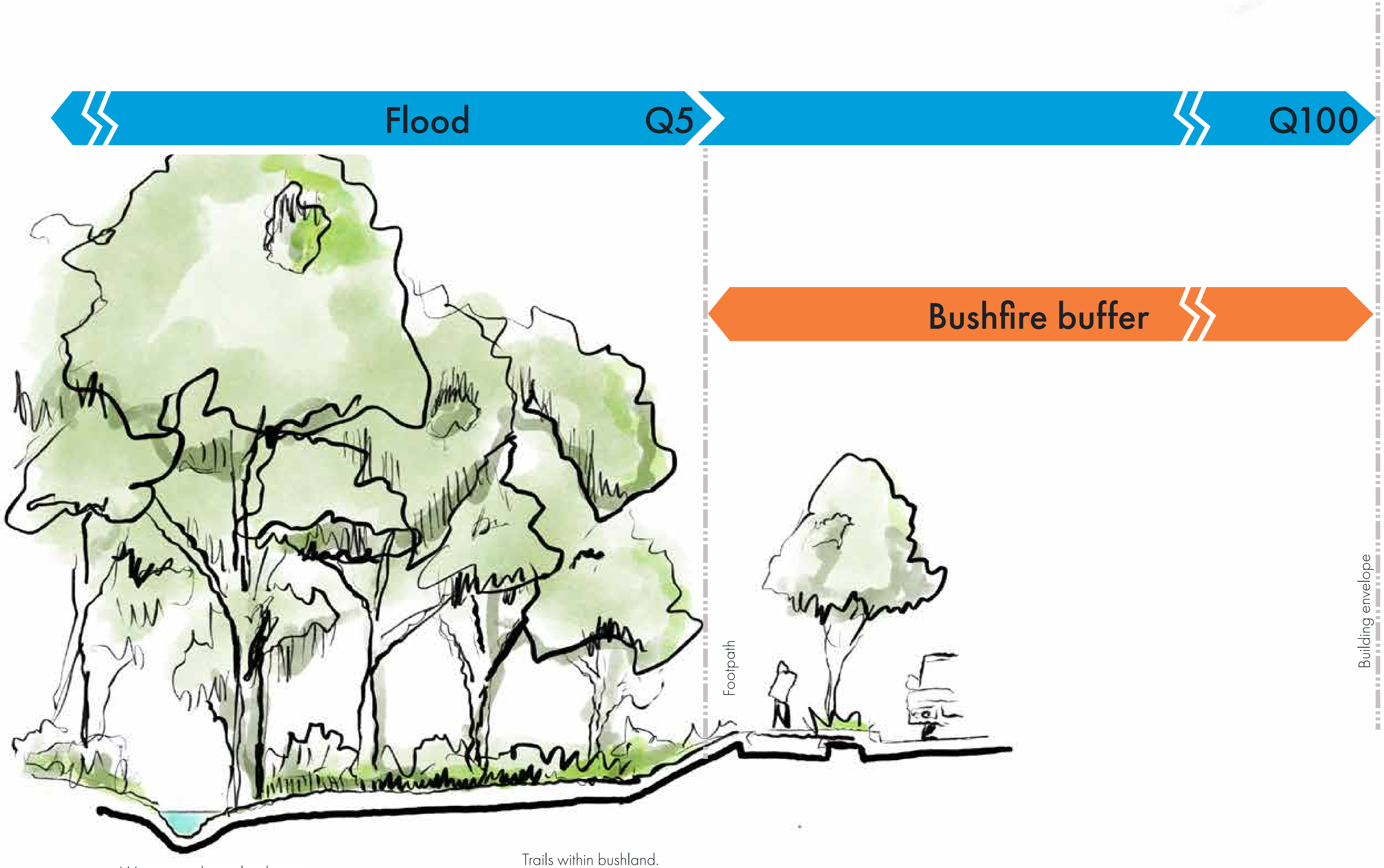
Waterway channel with grade control and chokes at 100 m centres (nominal)

Formal and Informal Trails within bushland.

Flood resilient paths (compacted road-base, deco etc.) that allow access to bushland and waterways, with limited flood immunity. Also serve as fire trails.

For Flood Immunity Standards for particular Open Space elements, refer 4.9 Parks and Flood Immunity

4.6 Typical Interface (without Linear park)



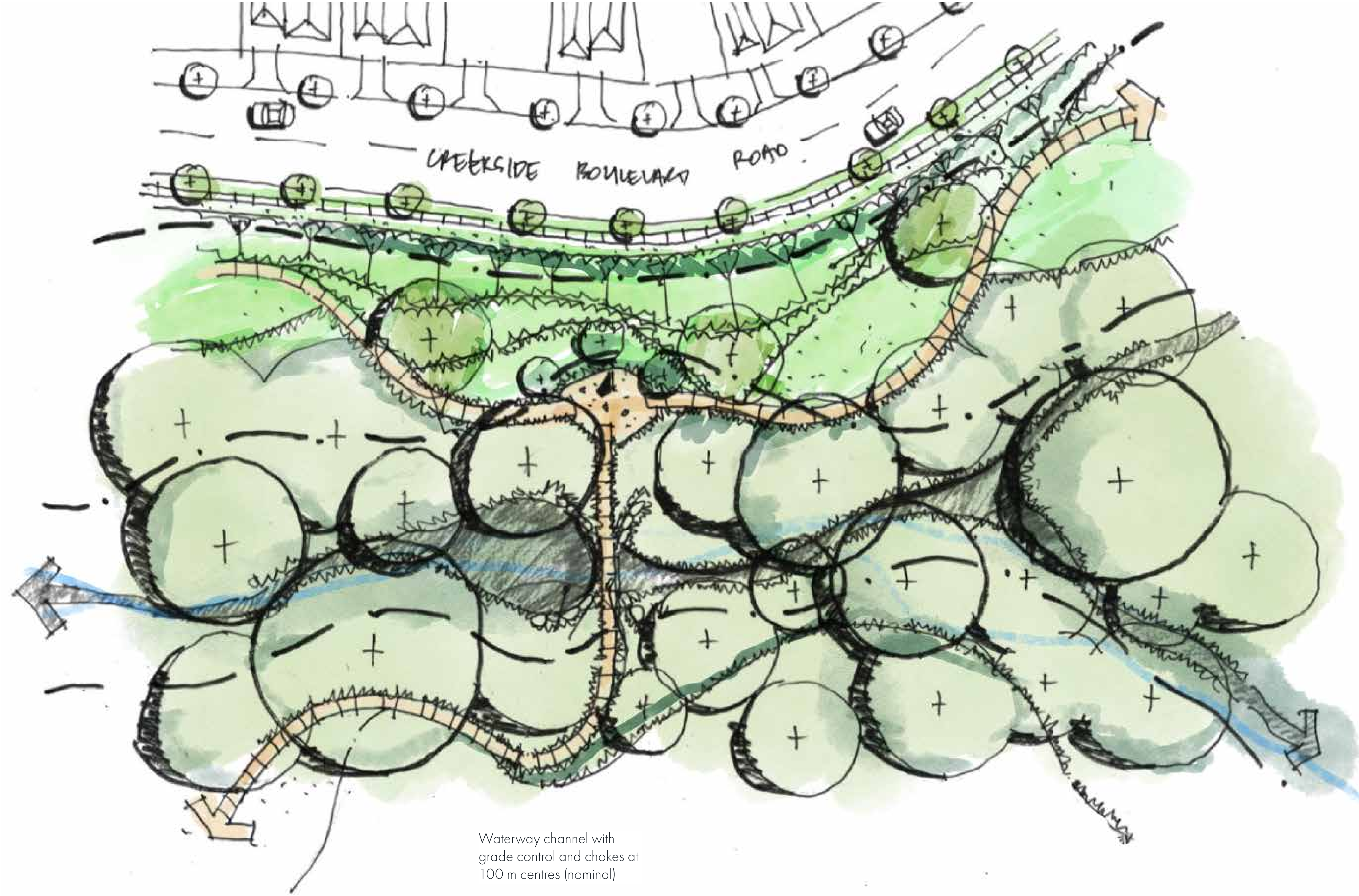
Waterway channel with grade control and chokes at 100 m centres (nominal)

Trails within bushland.

Flood resilient paths (compacted road-base, deco etc.) that allow access to bushland and waterways, with limited flood immunity. Also serve as fire trails.

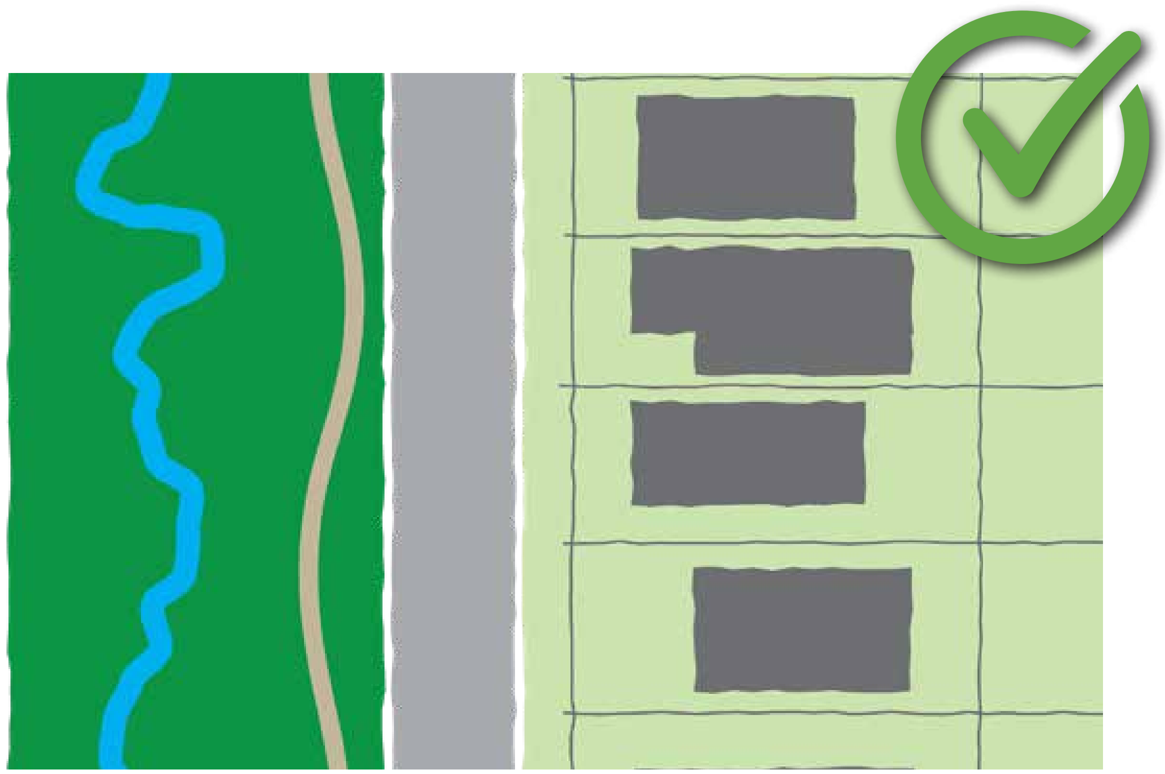
For Flood Immunity Standards for particular Open Space elements, refer 4.9 Parks and Flood Immunity

4.7 Typical Interface (Plan)

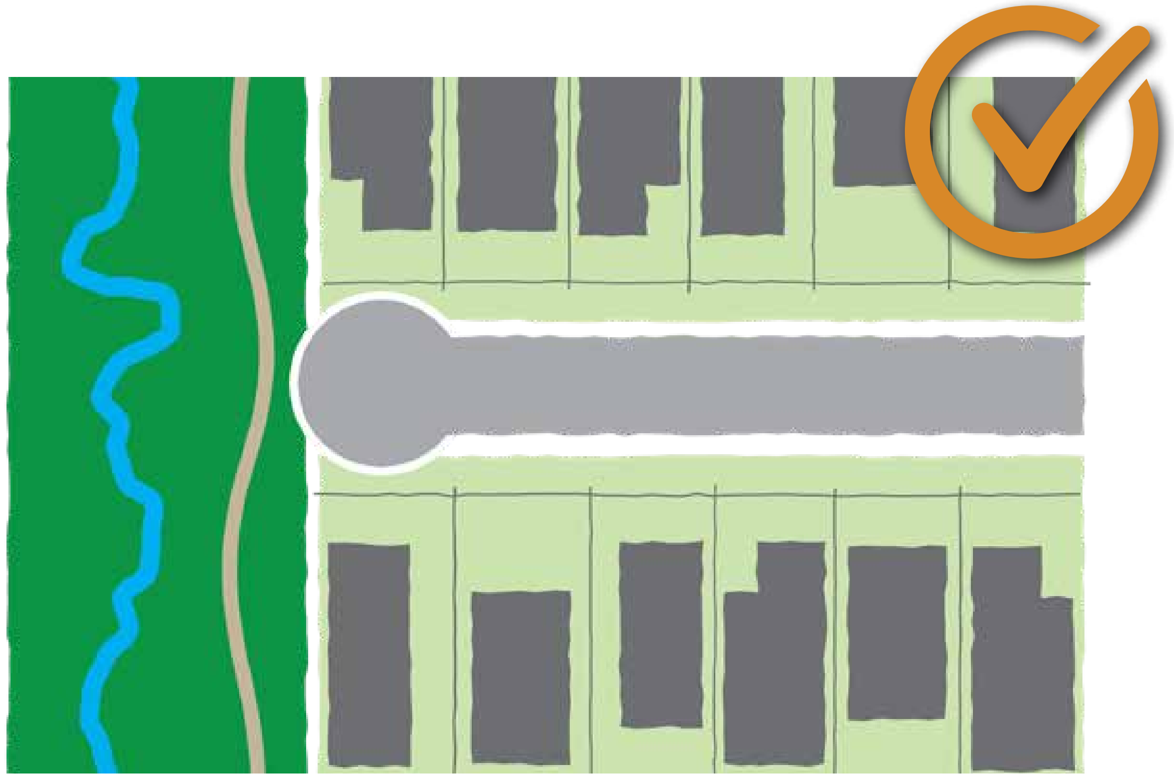


Waterway channel with grade control and chokes at 100 m centres (nominal)

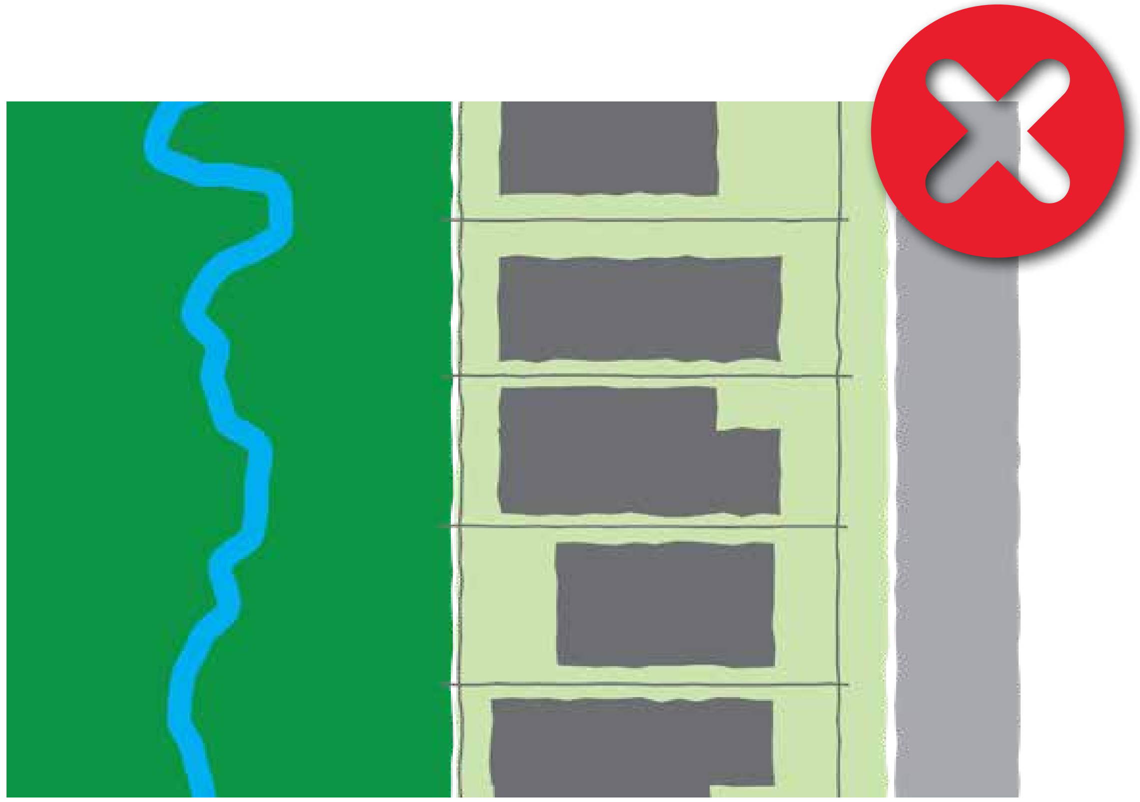
4.8 Residential Interfaces



Urban design with esplanade roads along the edges of the waterway corridor provide the best overall community outcome.



In selected locations where esplanade roads are demonstrated to be not feasible, Council may accept cul-de-sacs which still provide community access to the corridors, and which avoid lots backing on to the corridors.



Lots backing directly on to waterway corridors are inconsistent with the Queensland Police Service's guidelines on Crime Prevention Through Environmental Design (CPTED).

The idea of designing for all to participate in the safe enjoyment of parks, seafronts and the like are complementary to the growing acceptance, indeed promotion, of carefully mixing slow-moving cars and cyclists with pedestrians in shared street and civic places.

Together, they are changing the way neighbourhoods and centres are being designed with respect to such community open spaces and civic assets. Contemporary thinking is moving away from allowing these assets either to be edged directly by private development or merely by a pedestrian walkway between that private development and the community asset of park, river and such.

Such designing is, of course, not new and can be found in the great seaside and river esplanades of many Queensland towns.

So confident is the belief in the surveillance and accessibility outcomes of public streets with cars and with people on footpaths that increasingly civic spaces and assets are being edged by streets. It may be argued that failing to provide slow-moving vehicle access at a park edge could prevent people with disability from accessing those areas either by denying their access outright or making their journey from distant streets more arduous and unsafe..

Crime Prevention Through Environmental Design Guidelines for Queensland, Qld Police Service, 2021

4.9 Parks and Flood Immunity

The benefits of allowing open space areas within areas of flood risk include:

- Efficient land use for higher urban densities and reducing unnecessary greenfield expansion into natural areas
- Assisting to reduce housing costs by maximising areas for residential land supply
- Activating parklands with multiple uses and activities
- Maintenance costs for local government by having less land to maintain.

Traditional stormwater management infrastructure has been seen as compromising the functions of public open space because its purpose was only the rapid conveyance of water with little consideration for amenity or environmental impact. However, public open space is not necessarily compromised by flooding or stormwater infrastructure, provided a number of key principles are followed.

Areas were open space are subject to flooding, or which integrate WSUD elements, must:

- Be fit for any intended active recreation in terms of size, slope and surface
- Be sufficiently safe in terms of the duration, depth and velocity of any inundation
- Rapidly recover from inundation, particularly for playing surfaces
- Be designed to be attractive and allow for social interaction and interpretation when appropriate
- Protect existing conservation features and values.

Delivery of effective outcomes requires clear provisions within the Planning Scheme codes, and an integrated design process including landscape architects, engineers, open space planners and asset owners.

Item	Performance Outcome	Proposed Acceptable Outcome
General	Open space areas below the 1% AEP flood extent are subject to a flood risk assessment, having regard to the nature of flooding, warning times, rate of rise of floodwaters, duration of flooding, debris loads, and impacts on public safety and infrastructure.	-
Playgrounds	Sand and soft fall areas are not contaminated by floodwaters and flood debris	Sandpits and soft fall areas are located above 20% AEP flood level.
	Children are unlikely to be swept off their feet by floodwaters at playgrounds and on main pathways	d.V <0.4 m^2/s in 20% AEP event
Toilets	Floodwater and sewage are kept separate except in major flood events	Pedestals are located above 5% AEP flood level
Turf areas	Turf areas are safe and accessible, and not subject to boggy ground conditions	63% AEP (Q1) flood immunity, min. 2% slope and well drained.
	Regional park network includes active open space areas that are flood free	-
Electrical infrastructure	Electrical infrastructure is safe and resilient	Switchboards are located above 1% AEP flood level or certified by a qualified Electrical Engineer
Pathways	Pathways are built from erosion resistant materials, having regard to the frequency of inundation and velocity of floodwaters	-
	Pathway network is designed to balance flood immunity with providing access to natural areas. Path network provides alternative safe routes in the event of flooding	-
	The risk of flooding is clearly communicated to the community	Paths below the 10% AEP flood level have flood depth indicators
General landscape	Landscape surfaces are erosion resistant	Velocities in general landscape areas < 1m/s

4.10 Waterway Design

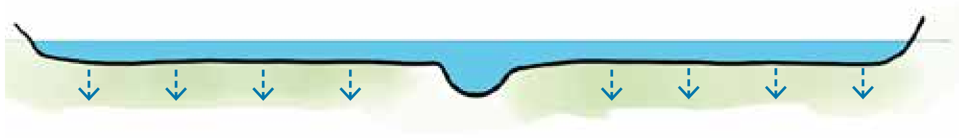
Urbanisation typically alters urban hydrology in a manner that triggers and worsens erosion in waterways. This occurs even if flood detention is installed, and can be exacerbated by it. Once waterway channels start to erode, it kicks off a set of positive feedback loops that lead to increased stream erosion, as illustrated below.

To mitigate against this, a series of in-stream erosion mitigation measures are recommended on the waterway channels between Chapel Rd and Booral Rd to prevent incision and widening typically associated with increased urban runoff.

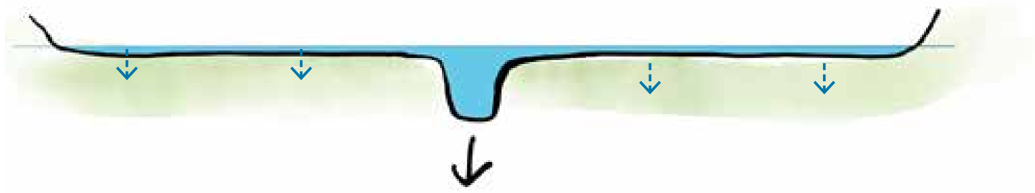
These are described on the following page.

Typical creek erosion process

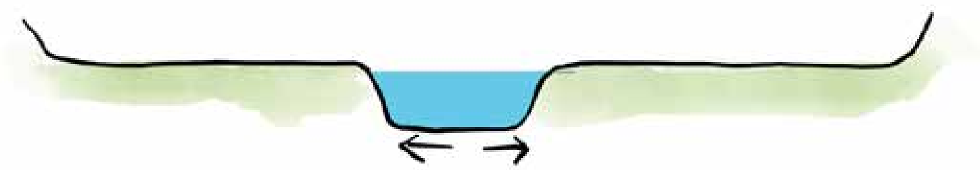
Existing state: small waterway channel and floodplain is regularly engaged

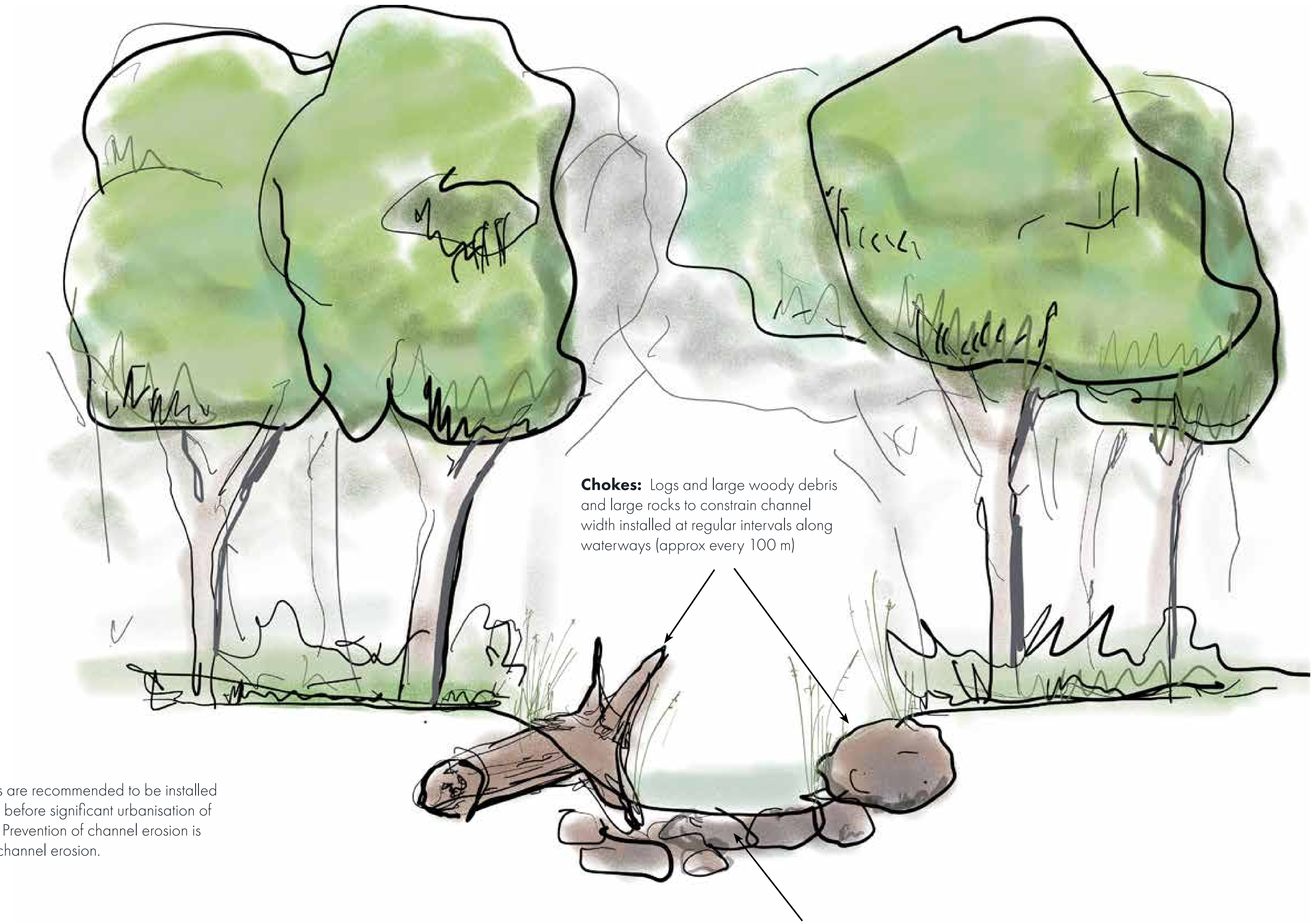


Erosion (early phase): more frequent runoff, and localised channel disturbances result in incision of the waterway. This deepens and enlarges the channel. As a result, more flows are contained within the channel, increasing erosivity, setting in train a positive feedback effect.



Erosion (later phase): channel incision slows and channel widening occurs. Floodplain is engaged less frequently, and floodwaters travel faster.





The proposed treatments are recommended to be installed as early as possible and before significant urbanisation of the catchment occurs. Prevention of channel erosion is cheaper than rectifying channel erosion.

As Bunya Creek and its tributaries flow southward it passes through a range of different landscapes, and accordingly different reaches have differing characteristics and management priorities, which form a series of waterway styles. These are summarised on the following pages.

1

Upland zone (north of Chapel Road). The waterways in the upland zone are relatively steep ephemeral first order gullies.

Waterways should be designed using natural channel design principles, with an emphasis on erosion resistance through rock riffles and energy dissipation using in line rock drop structures, supplemented with good riparian vegetation.

Natural templates

Constructed examples

Poor practices

Rock lined trapezoidal channels - poor ecological function, prone to weed infestations, difficult to maintain without using herbicides in waterway

Hard-edged engineered drains - poor ecological function, often dependent on mowing to maintain conveyance capacity.

Dumped rock - poor ecological function, prone to weed infestations, difficult to maintain without using herbicides in waterway

2

Mid-reach zone (between Chapel Road and Booral Road). This zone is characterised by slightly meandering chain of ponds creeks located within broadening floodplains.

Waterways should be designed to maximise floodplain engagement by preventing the waterway channels from widening and deepening.

Riparian vegetation should be enhanced, and in-stream habitat maximised by protecting and restoring in-stream pools.

Natural templates

Constructed examples

Poor practices

Fish barriers

Geofabric

Concrete

3

Lowland wetland zone (in the vicinity of Booral Road). Immediately upstream and downstream of Booral Road the waterway is characterised by wetland forests, with stands of melaleuca spp. and other species adapted to semi-permanent ponding.

Management of this area should have an emphasis on preservation and enhancement of the existing vegetation, and preservation of the existing hydrologic regime as much as practicable.

Natural templates

4

Tidal lowlands (South of Booral Road).

The lowland areas of Bunya Creek transition into a meandering tidal waterway. Flooding naturally inhibits development in this zone, and management should focus on preservation and rehabilitation of riparian vegetation. Management should have regard to the impacts of sea level rise and likely future increased extent of mangroves.

Natural templates

4.11 Cost Estimate

A high level opinion of cost is provided to inform land use planning decisions.

Because detailed land use planning and structure planning has not yet occurred across the study area, and there are no time frames for possible future development, cost estimates for the whole study area have little relevance.

The cost estimate considers a typical 1 ha area of waterway corridor, assuming 80% is Environmental and Conservation Zone and 20% is Open Space.

This cost estimate is provided for general planning purposes only and further detailed analysis should be undertaken by a Quantity Surveyor prior to making commercial decisions.

Cost Implications for Developers

In the event that land in the Future Urban Investigation Area were to be zoned for urban development, it is noteworthy that the Corridor Plan utilises existing constrained land for the provision of open space, flood detention and stormwater quality management.

Flood detention typically occupies about 5 - 7% of site area, and stormwater quality management, if not co-located within flood detention systems, occupies about 1-3% of site area.

As a result, the costs to developers of developing the unconstrained land will likely be lower, and development yields higher, than a scenario where those services were not being provided within a master planned corridor.

Item	Qty	Unit	Rate	Cost
REVEGETATION				
Allowance for retaining and managing the existing vegetation	8000	m²	$40	$320,000
Tube stock (supplementary planting at 2/m²)	16000	No	$3	$48,000
Cement stabilised decomposed granite pathway 50mm thick with compact finish	200	m²	$100	$20,000
Subtotal				**$388,000**
OPEN SPACE				
Clear and grub	2000	m²	$1	$2,000
Ameliorate top soil	2000	m²	$13	$26,400
Turf	2000	m²	$25	$50,000
Allowance for bins	1	No	$2,500	$2,500
Allowance for bollards	50	No	$1,000	$50,000
Allowance for bench seating	2	No	$2,500	$5,000
Allowance for wayfinding and signage	1	Item	$5,000	$5,000
12 months maintenance	2000	m²	$3	$5,000
Shared Pathways (3 m wide)	360	m²	$150	$54,000
Allowance for play feature	1	Item	$25,000	$25,000
Allowance for shelter	8	m²	$1,000	$8,000
Subtotal				**$224,900**
WATERWAY				
Allowance for rock treatment to channel	100	m²	$35	$3,500
Localised board walk	30	m²	$100	$3,000
Extra over allowance for riparian planting (supplementary planting at 4/m²)	3840	No	$3	$11,520
Subtotal				**$18,020**
TOTAL				**$640,000**

4.12 Implementation

The following actions are necessary to support the successful implementation of the Corridor Plan.

ID	Task	Responsibility	Timing
1	Commence consultation with landowners potentially affected by this Corridor Plan. The focus should be on communicating the constrained land, potential future development potential, importance of pre-emptively installing in-stream erosion mitigation, and revegetation.	FCRC	FY23 / FY24
2	Investigate the feasibility of constructing in-stream erosion mitigation measures on the waterway channels between Chapel Rd and Booral Rd to prevent incision and widening typically associated with increased urban runoff. The feasibility assessment should have regard for access, funding, timing and efficacy of the works.	FCRC	FY23 / FY24
3	Update flood mapping for the Bunya Catchment to take into account ultimate urbanisation, revegetation of waterway corridors, and climate change impacts to rainfall and sea levels.	FCRC	Prior to rezoning
4	Evaluate the benefits of development-scale flood detention systems on flood levels, particularly at Booral Road.	FCRC	FY23 / FY24
5	Undertake a Bushfire Hazard Assessment to determine the width of any required bushfire management area between the vegetated Environmental Management and Conservation Zone (allowing for future revegetation) and adjacent residential housing. This area is likely to become	FCRC	Prior to rezoning
6	Investigate opportunities for funding or corridor works through grants and offsets for: biodiversity, carbon and water quality.	FCRC	FY23 / FY24
7	Undertake structure planning for the area between Chapel Rd and Booral Rd.	FCRC	Prior to rezoning
8	Undertake preliminary LGIP planning for the area between Chapel Rd and Booral Rd	FCRC	Prior to rezoning
9	Undertake an assessment of Good Quality Agricultural Land to support any future rezoning activity.	FCRC	Prior to rezoning
10	Develop staged revegetation plans for the corridors. The revegetation plans should prioritise connecting the disconnected pockets of vegetation that have the highest ecological value in order to deliver best value for money.	FCRC	After rezoning

BLIGH TANNER

Tract

Fraser Coast
REGIONAL COUNCIL