Urangan South Land Use Strategy and Local Area Plan

Context Analysis and Options Review

October 2018

Prepared for Fraser Coast Regional Council
HRP18074.R01.007

Cardno®

Document Information

Prepared for	Fraser Coast Regional Council
Project Name	Context Analysis and Options Review
File Reference	HRP18074.R01.007 (Urangan South Context Analysis Report).docx
Job Reference	HRP18074
Date	October 2018

Document Control

Version	Date	Author	Author Initials	Reviewer	Reviewer Initials
.001	01 August 2018	Morgan Wilson	MW	Leo Mewing	LM
.002	27 August 2018	Morgan Wilson	MW	Leo Mewing	LM
.003	04 September 2018	Morgan Wilson	MW	Catherine Fleming	CF
.004	29 September 2018	Morgan Wilson	MW	Jason Tan	JT
.005	15 October 2018	Morgan Wilson	MW	Leo Mewing	LM
.006	26 October 2018	Morgan Wilson	MW	Jason Tan	JT
.007	30 October 2018	Morgan Wilson	MW	Jason Tan	JT

Prepared for:-
Fraser Coast Regional Council

Prepared by:-
Cardno

Table of Contents

1 Introduction 1

1.1 Purpose 1
1.2 Aims 2
1.3 Project methodology 3
1.4 Project deliverables 4
1.5 Information and data sources 4

2 Project area overview 5

2.1 Strategic context 5
2.1.1 The Fraser Coast Region 5
2.1.2 Hervey Bay 5
2.2 Location and setting 6
2.3 Key features and characteristics 6
2.4 Development activity 6

3 Planning framework applicable to development area 13

3.1 Planning Act 2016 13
3.2 Wide Bay Burnett Regional Plan 13
3.2.1 Overview 13
3.2.2 Regional Framework 13
3.2.3 Regional Plan Land Use Category 13
3.2.4 Desired Regional Outcomes 14
3.2.5 Wide Bay Burnett Regional Plan State Planning Regulatory Provisions 15
3.3 State Planning Regulatory Provisions 15
3.4 State Planning Policies 15
3.5 Fraser Coast Planning Scheme 19
3.5.1 Strategic Framework 19
3.5.2 Zone 20
3.5.3 Overlays 21
3.6 Other planning instruments and legislation 21
3.7 Project implications 22

4 Development area analysis 23

4.1 Land use and tenure 23
4.2 Physical and environmental elements 23
4.2.1 Topography 23
4.2.2 Flooding and drainage 23
4.2.3 Coastal Hazard Areas 24
4.2.4 Waterways and wetlands 24
4.2.5 Vegetation and ecology 24
4.2.6 Land resources 25
4.3 Character and amenity elements 25
4.3.1 Surrounding land uses 25
4.3.2 Character and identity 25
4.4 Infrastructure considerations 26
4.4.1 Transport network 26
4.4.2 Water and Sewer Network 29
4.4.3 Stormwater and drainage 30

4.4.4 Preliminary Community Information and Engagement 31

5 Options Analysis 33

5.1 Project area context analysis plan 33

5.2 Potential scenarios for future development 33

5.2.1 Scenario development 34

5.2.2 Form of urban development 35

5.2.3 Density of assumed development 35

5.2.4 Further Investigation Area 35

5.3 Estimated area of land for urban development 36

5.4 Indicative dwelling and population yield 36

5.5 Infrastructure considerations 36

5.5.1 Stormwater and drainage 36

5.5.2 Transport network 47

5.5.3 Traffic Operational Assessment 50

5.5.4 Water supply 59

5.5.5 Sewerage 59

5.5.6 Summary of potential infrastructure costs 61

5.6 Identification of preferred scenario 62

5.6.1 Council Executive Management Team review 62

5.6.2 Stakeholder Round Table 62

5.6.3 Community Forum 64

6 Implications and recommendations for next project stage 65

6.1 Implications for structure plan design 65

6.2 Recommendations for next project stage 66

6.2.1 Preferred Option 66

6.2.2 Structure Plan recommendations 67

Tables

Table 2-1 Development Activity within the project area – approvals and applications 8

Table 3-1 Summary of relevant Desired Regional Outcomes 14

Table 3-2 Development Activity within the project area – approvals and applications 15

Table 4-1 Local Road Network 27

Table 4-2 Planned Upgrade Works 28

Table 5-1 Indicative Dwelling and Population Yield 36

Table 5-2 Scenario Cost Estimates of Stormwater Drainage Works 47

Table 5-3 Summary of Development Options 48

Table 5-4 Adopted Intersection Performance Threshold – Degree of Saturation 50

Table 5-5 Adopted Intersection Performance Threshold – Critical Delay 51

Table 5-6 SIDRA Results – Boundary Road / Booral Road – Current Assessment 52

Table 5-7 SIDRA Results – Boundary Road / Walkers Road Intersection – Current Assessment 53

Table 5-8 SIDRA Results – Boundary Road / Senorita Road Intersection – Current Assessment 54

Table 5-9 SIDRA Results – Boundary Road / Robert Street / Hughes Road Intersection 55

Table 5-10 SIDRA Results – Boundary Road / Robert Street / Hughes Road Intersection (Upgrade) 56

Table 5-11 Summary of Transport Mitigation Works Costs per Option 58

Table 5-12 Sewer Augmentation Cost by Catchment and Scenario 61

Table 5-13 Summary of infrastructure costs for all networks 61

Table 5-14 Stakeholder Round Table Meeting Attendees 63

Table 5-15 Community Forum Attendees 64

Figures

Figure 1-1	Urangan South Project Area	1
Figure 3-1	Strategic Framework Map Extract	19
Figure 4-1	Site Location	26
Figure 4-2	Local Road Network	27
Figure 4-3	Existing Senorita Parade Cross Section	27
Figure 4-4	Existing Senor Avenue Cross Section	27
Figure 4-5	Existing Walkers Road Cross Section	28
Figure 4-6	Planned LGIP Upgrades	28
Figure 4-7	Existing water network infrastructure	29
Figure 4-8	Existing sewer network infrastructure	30
Figure 5-1	Proposed Stormwater Options Areas	37
Figure 5-2	Large Lot Scenario Flood Extent	39
Figure 5-3	Large Lot Scenario Flood Hazard	40
Figure 5-4	Mixed Lot Scenario Flood Extent	42
Figure 5-5	Mixed Lot Scenario Flood Hazard	43
Figure 5-6	Maximum Yield (existing zoning) Scenario Flood Extent	45
Figure 5-7	Maximum Yield (existing zoning) Scenario Flood Hazard	46
Figure 5-8	Proposed New and Upgraded Roads	48
Figure 5-9	Typical Cross Section for New Access Road in northern catchment	49
Figure 5-10	Typical Cross Section for Proposed Upgrade to Existing Roads (Senor Avenue, Senorita Parade, Walkers Road)	49
Figure 5-11	Study Intersections	50
Figure 5-12	SIDRA Assessed Layout – Boundary Road / Booral Road Intersection	52
Figure 5-13	SIDRA Assessed Layout – Boundary Road / Walkers Road Intersection	53
Figure 5-14	SIDRA Assessed Layout – Boundary Road / Senorita Road Intersection	54
Figure 5-15	SIDRA Assessed Layout – Boundary Road / Robert Street / Hughes Road Intersection	55
Figure 5-16	SIDRA Assessed Layout – Boundary Road / Robert Street / Hughes Road Intersection (Upgrade)	56
Figure 5-17	Summary of Mitigation Measures and Planned Roads	59
Figure 5-18	Maximum yield (existing zoning) scenario Sewer Augmentation	60

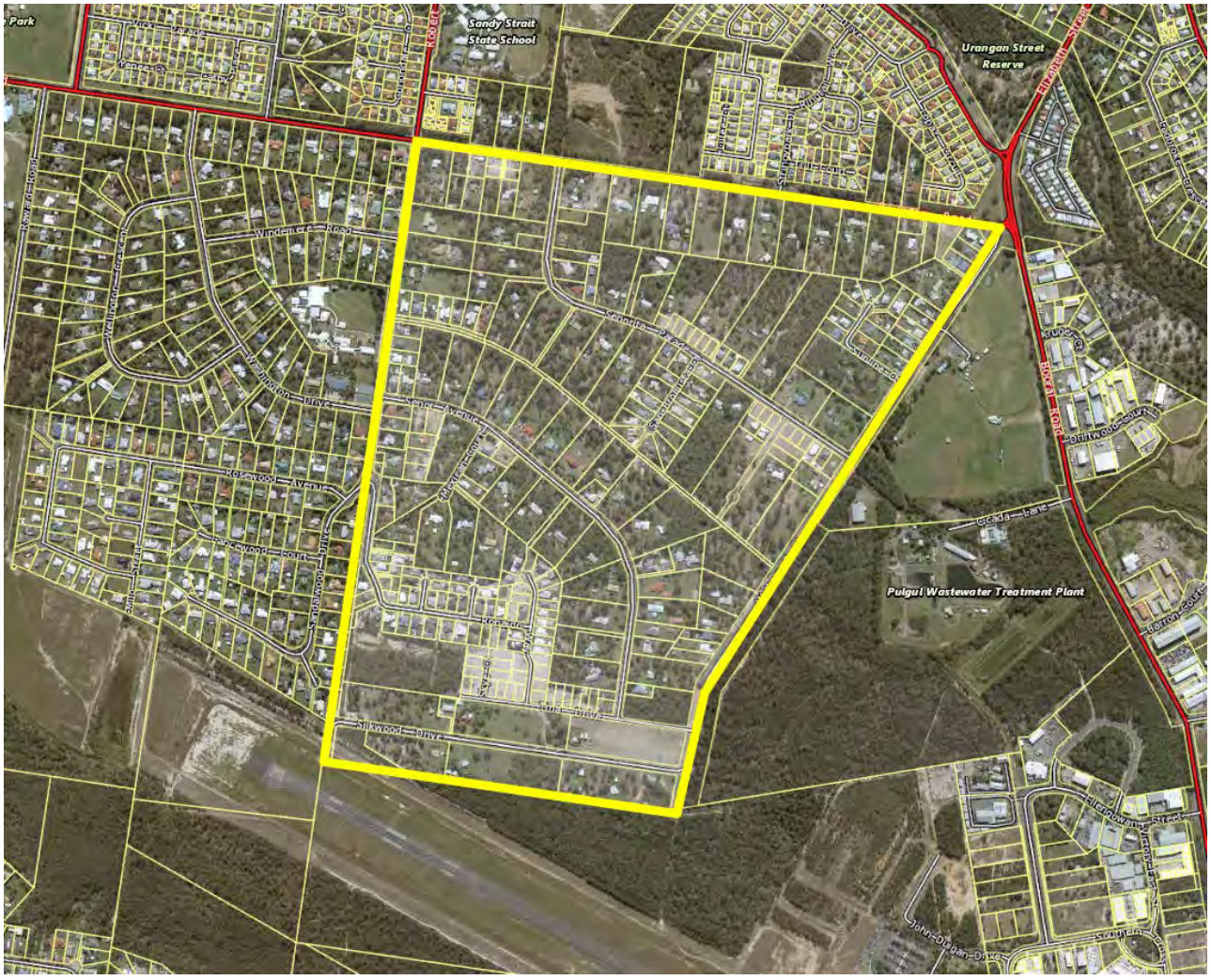
1 Introduction

1.1 Purpose

Cardno has been commissioned by the Fraser Coast Regional Council (the Council) to undertake a structure and local area planning exercise for the area known as Urangan South.

The Urangan South Project Area (the 'project area') has an area of approximately 137.3 hectares, and is located on the south-eastern periphery of the Hervey Bay urban area, approximately 4.5 kilometres from the Pialba CBD.

Figure 1-1 Urangan South Project Area



Referred to as the Land Use Strategy and Local Area Plan (the Project), it is intended to undertake a structure and local area planning exercise for the project area.

Historically, the project area has been used for very low density residential and rural residential type uses, with the area characterised by large lots (between approximately 1-5Ha) occupied by single dwellings.

However, with the continued urban expansion of Hervey Bay towards the urban fringe, the project area is coming under increasing development pressure to accommodate general low-density residential land uses in accordance with the current low density residential zoning.

Given the large number of lots and the fragmented nature of tenure within the project area, this recent development has been opportunistic, with a number of individual small lot subdivisions establishing in an ad-hoc and uncoordinated nature across the locality.

To ensure that development within the project area contributes to the establishment of a sustainable urban settlement pattern and is supported by appropriate urban infrastructure services, Council is now seeking to prepare a land use strategy for Urangan South. The land use strategy (essentially a structure plan) will integrate environmental, land use, transport, urban design and urban infrastructure considerations to identify and guide the preferred type, form, sequencing, and character of future development in the structure plan area.

Subsequently, the role of the Local Area Plan is to translate the structure plans into a format that integrates with the overall structure and operation of the current planning scheme, implements the identified outcomes of the structure plan and, most importantly, provides Council with the regulatory tools to effectively manage development in the project area with certainty.

1.2 Aims

The aim of the Project is to establish a strong and well-founded strategic position from which to effectively manage future growth within the project area and to use this position to achieve key urban development outcomes.

More specifically, in accordance with the Council's project brief, the project aims to:

- Identify and test development scenarios for the optimal management of critical flood constraints within the project area;
- Identify the developable area and potential yields for the project area having regard to environmental values and character and amenity considerations;
- Identify key transport corridors and road linkages that will integrate the project area with surrounding development;
- Identify a stormwater solution for the project area that manages flooding and drainage constraints in a cost effective and achievable manner; and
- Identify the requirements for major water and sewer infrastructure to service the development.

1.3 Project methodology

The methodology for the Project comprises six (6) stages of work as summarised in **Diagram 1-1 (Project methodology)**.

Diagram 1-1 Project methodology

1.4 Project deliverables

The deliverables for the project are summarised below:-

- a Project Area Context Analysis Report and Options Review incorporating a context analysis plan and summarising the key findings from Stage 2 to help inform subsequent project stages;
- a Draft Structure Plan Report incorporating a vision statement, draft structure plan concept and supporting elements (Stage 3);
- production of a Final Structure Plan Report following stakeholder consultation (Stage 5); and
- preparation of a Local Area Plan compliant with the *Planning Act 2016* for incorporation into the Fraser Coast Regional Council Planning Scheme (Stage 6).

The preparation of the Urangan South Context Analysis Report and Options Analysis contained herein is the key deliverable from Stage 2 of the project. It is noted that this report is an interim report which is intended to assist Council deliberations regarding what land use options are presented to the community in preliminary community consultation exercises.

1.5 Information and data sources

The scope of this Project did not envisage or include the preparation of further technical assessments or studies for the respective development areas.

The analysis and structure planning undertaken within the project area has been informed by currently available information and data held by the Fraser Coast Regional Council and other government agencies.

It is noted that the flood information used in the preparation of land use scenarios is based on the 'Pulgul Creek Catchment Model Flood Outputs' and not the flood hazard information and mapping from the current Fraser Coast Planning Scheme. This data is the most up to date and locally detailed flood information available for the project area and provide for the study to develop a higher level of accuracy regarding management of flood impacts.

2 Project area overview

2.1 Strategic context

2.1.1 The Fraser Coast Region

The Urangan South Project Area is located within the Fraser Coast Regional Council local government area (LGA) (refer to **Figure 1 – Location Map**).

The Fraser Coast LGA covers an area of approximately 7,125 square kilometres, and includes the larger urban settlements of Hervey Bay and Maryborough as well as the smaller towns and settlements of Aldershot, Antigua, Aramara, Bauple, Burrum Heads, Brooweena, Dundathu, Eurong, Glenwood, Howard, Maaroom, Poona, River Heads, Tiaro, Tinana, Tinnabar, Toogoom, Torbanlea and Tuan.

The Fraser Coast LGA had an estimated resident population of 103,998 persons as at 30 June 2017[1]. It is currently the 13th largest LGA in Queensland (by population) and has experienced an average annual growth rate of 1.6% since 2007, which is slightly lower than the Queensland average growth rate of 1.8%.

Medium series population projections released by the Queensland Government in 2015[2] indicate that the estimated resident population of the Fraser Coast LGA is likely to increase to 134,973 persons by 2036 - a net increase of approximately 30,975 additional residents between 2017 to 2036 (approximately 19 years).

2.1.2 Hervey Bay

Hervey Bay is the largest urban centre within the Fraser Coast LGA and the area that has experienced the highest level of recent population growth. As at 30 June 2017, the urban centre of Hervey Bay had an estimated resident population of 58,261 persons – more than half of the entire resident population of the Fraser Coast LGA.

A major tourist destination and gateway to Fraser Island and the southern part of the Great Barrier Reef, Hervey Bay offers a relatively affordable coastal lifestyle in a sub-tropical setting that is particularly attractive to retirees and families.

As with many of Queensland's coastal urban areas that have borne the brunt of the 'sea change phenomenon', between 2000 and 2008 Hervey Bay experienced significant development and infrastructure pressures arising from relatively high population growth and increasing popularity as a major coastal resort and residential destination. The impact of the global financial crisis resulted in a downturn in economic and development activity in the area. However, residential lot registrations have recently begun to increase with a total of 360 residential lots registered in the 12 months up to 31 March 2018[3].

[1] Australian Bureau of Statistics, Fraser Coast (R)(LGA)(3320) (Updated 05/02/18).

[2] Projected population by local government area Queensland, 2011-2036, 2015 edition

[3] Queensland Regional Profiles – Hervey Bay SA3 (10 July 2018)

2.2 Location and setting

The Urangan South Project Area (the project area) is a pocket of land located to the east of the Pialba principal centre and south of the coastal centre of Urangan. Refer to **Figure 1 - Location Map**.

The project area is predominantly made up of a number of large residential lots (2,000m^2 and larger), in keeping with its historical location on the periphery of the Hervey Bay urban area. Generally low lying, a number of shallow drainage channels traverse the area, with the various channels of Pulgul Creek converging to the east of the site in a large wetland. The Pulgul Creek Wastewater Treatment Plant is located in this area, with the Hervey Bay Airport located adjacent to the south of the site.

The Urangan South Project Area has a total land area of approximately 137 hectares with the boundaries of the area generally defined by:

- Boundary Road to the north;
- Walkers Road to the east;
- Hervey Bay Airport to the south; and
- Hughes Road to the west.

Refer to **Figure 2 - Structure Plan Area Map** for details.

2.3 Key features and characteristics

Having been historically used for low density and large lot residential purposes, the Urangan South project area retains a predominantly residential character. Due to the large lot sizes available, mature vegetation has been retained throughout the project area, and contributes to the natural character and amenity of the locality. However, due to recent development activity, the southern part of the project area has begun to accommodate typical low-density residential subdivision, and the smaller lot sizes and removal of mature vegetation in this area exhibits a modern suburban character and built form typology.

Key natural features include the major drainage channels that traverse the central part of the project area. These channels support mature vegetation that provide the leafy and natural backdrop to the established residential dwellings.

The project area is also located adjacent to major infrastructure items including the Pulgul Creek Wastewater Treatment Plant and the Hervey Bay Airport. The proximity to these major infrastructure items and their respective potential odour and noise issues have slowed development within the project area and it was used as a form of separation area to limit denser forms of urban development from increasing the numbers of people potentially exposed to these nuisance emissions.

2.4 Development activity

The Urangan South project area has not historically been subject to high levels of urban development. In general, development activity in the locality has been limited to a gradual expansion of low density, large lot residential living typologies on lots of 2,000m^2 and greater.

However, more recently, there have been a number of proposals for more significant urban development within the locality, aiming to take advantage of the recent re-zoning of the land and its adjacency to the eastern development front of the Hervey bay urban area.

A number of approvals for a significant extent of residential development have been granted over the site, predominantly in the southern sections. There are also a number of applications currently under assessment with Council that would significantly add to the scale and extent of urban development within the locality.

In particular, since 2014 and subsequent to the change to zoning, within the project area there is a total of:

- 37 lots approved (but construction not commenced);
- 15 lots discussed at pre-lodgement meetings;
- 15 lots undergoing assessment; and
- 167 lots already constructed.

This equates to a total of 234 additional lots within the project area. Refer to **Figure 3 - Development Activity Map** that identifies the locations of current application and development activity within the project area.

A summary of the development applications within the project area is provided in **Table 2.1**.

Table 2-1 Development Activity within the project area – approvals and applications

	Location and Description	Application Date	Type of Application	Development / Application Status	Yield
	Pre-lodgement Meetings (De-identified)				
1	PLM-179058	Prelodgement Meeting: 09.05.2017	ROL	Prelodgement Meeting	7 lots
2	PLM18/0010	Prelodgement Meeting: 26.04.2018	MCU – retail/commercial	Prelodgement Meeting	No m² available
3	PLM18/0024	Prelodgement Meeting: 17.09.2018	ROL	Prelodgement Meeting	8 lots
	Total Potential Lots - Prelodgement				**15**
	Undergoing Assessment				
4	9 Mexican Court Lot 78 on RP218665	RAL18/0044 Lodged: 05.07.2018	ROL 1 into 4 (lot sizes 2,077m² - 3,000m²)	Application Stage (as of 17.07.2018) Compliance notice due 19.07.2018	No plans on PD Online as of 17.07.2018 4 lots (lot sizes 2,077m² - 3,000m²) Prelodgement Notes: *"Council advised that holding off on submitting any application until the study [Urangan South Structure Plan] has concluded is also an option"*
5	10 Senor Avenue Lot 1 on SP286720	RAL18/0034 Lodged: 23.05.2018	ROL 1 into 2 lots	Decision Stage (as of 13.07.2018) Decision due 26.07.2018	1 into 2 lots 2,000m² and 4,027m²
6	6 Senor Avenue and 56&60 Ronaldo Way Lot 66 on RP180355 and Lots 22&23 on SP287644	RAL18/0041 Lodged: 26.06.18	ROL 3 into 9 lots	Applicant response to action notice (due 12.08.18)	3 into 9 lots
	Total Potential Lots – Undergoing Assessment				**15**

	Location and Description	Application Date	Type of Application	Development / Application Status	Yield
	Approved but not Completed				
7	27-51 Silkwood Drive and 55 Walkers Road Lots 2 and 3 on RP162667	ROL-143041 (and subsequent Change applications) Lodged: 06.06.2014 Latest Approval: 01.12.2015	ROL 2 into 35 lots (3 stages)	Approved No stages completed Stages 1 & 2 under construction	ROL 2 into 35 lots Stage 1: Lots 1-11 (11 lots) Stage 2: 12-26 (15 lots) Stage 3: 101-109 (9 lots) Associated OPW: OP-166054
8	43 Senorita Parade Lot 1 on SP164963	RAL17/0013 Lodged: 23.08.2017 Approved: 31.08.2017	ROL 1 into 2 lots	Approved Not started	ROL 1 into 2 Lot sizes 728m² and 2,022m² Associated OPW: OPW17/0025
9	5 Senor Avenue Lot 64 on RP180345	ROL-163046 Lodged: 26.07.2016 Approved: 13.09.2016	ROL 1 into 18 (2 stages)	Approved Stage 1 completed Stage 2 not started	ROL 1 into 18 Stage 1: Lot 1 and balance Stage 2: Lots 2-18 Lot sizes 516m² to 665m², and 1,530m²
10	2 San Bromista Court Lot 1 on SP178228	RAL17/0002 Lodged: 24.07.2017 Approved: 09.08.2017	ROL 1 into 2 lots	Approved Not started	ROL 1 into 2 Lot sizes 859m² and 1,365m²
11	14 Boundary Road Lot 3 on SP287618	ROL-173011 Lodged: 17.02.2017 Approved: 28/03/2017	ROL 1 into 2 lots and access easement	Approved Not started	ROL 1 into 2 Lot sizes 2,633m² and 2,791m²
12	14-18 Hughes Road Lot 45 on RP170704	RAL17/0028 Lodged: 25.10.2017 Approved: 04.12.2017	ROL 1 into 3 lots and access easement	Approved Not Started	ROL 1 into 3 Lot sizes 5,245m², 2,740m² and 2,015m²
13	38 Senorita Parade Lot 36 on RP172637	ROL-163048 Lodged: 02.08.2016 Approved: 19.12.2016	ROL 1 into 2 lots and access easement	Approved Not started	ROL 1 into 2 Lot sizes 6,787m² and 4,586m²
14	56 Senorita Parade Lot 41 on RP153688	RAL18/0018 Lodged: 19.03.2018 Approved: 24.05.2018	ROL 1 into 8 lots	Approved Not Started	ROL 1 into 8 Lot sizes 806m² to 953m² and 2,226m² Associated OPW: OPW18/0019 (Vegetation Clearing)
	Total Potential Lots – Approved but not completed				**37**

	Location and Description	Application Date	Type of Application	Development / Application Status	Yield
	Approved and completed				
15	6 and 10 Senorita Parade Lots 28 and 29 on RP170702	ROL-143012 (and subsequent change applications) Lodged: 27.05.2014 Latest approval: 08.12.2017	ROL 2 into 23 lots (5 stages)	Stages 1 & 2 completed Stages 3-5 not completed	ROL 2 into 23 (5 stages) Lot sizes 790m² - 3,297m² Associated OPW: OPW17/0001 (Civil), OP-166056 (Civil) & OP-176017 (Civil)
16	21, 25 Senorita Parade Lot 19 and 18 on RP172636	ROL-153072 Lodged: 27.10.2015 Approved: 06.09.2016	ROL 2 into 18 lots	Approved Stage 1 completed Stage 2 not completed	ROL 2 into 18 Stage 1: Lots 1-6 (plus two balance lots) Stage 2: Preliminary Approval Lots 7-17, 29 (with structure plan for further 15 lots on Lot 19 (Now Lot 8 on SP297015) Additional OPW: OP-176019 (Civil Works) & OP-156022 (Vegetation Clearing)
17	38 Senor Avenue Lot 1 on SP261100	ROL-163006 Lodged: 04.02.20616 Approved: 01.03.2016	ROL 1 into 3 lots	Approved Completed	ROL 1 into 3 Lot sizes 1,802m², 1,809m² and 4,723m² Associated OPW: OP-166029 (Civil)
18	25 Walkers Road Lot 27 on RP170702	ROL-143032 Lodged: 22.08.2014 Latest Approval: 04.11.2014	ROL 1 into 5 lots	Approved Completed	ROL 1 into 5 Lot sizes 1,330m² - 1,610m², 4,000m² and 14,278m² Associated OPW: OP-156016
19	31 Senor Avenue Lot 57 on RP213315	ROL-143020 Lodged: 20.06.2014 Approved: 27.08.2015	ROL 1 into 2 lots	Approved Completed	ROL 1 into 2 Lot sizes 2,225m² and 7,841m² Associated OPW: OP-156068 (Civil)
20	33 Walkers Road Lot 2 on RP227258	514/3-082183 Lodged: 16.09.2008 Approved: 10.06.2011 (by court order) Subsequent GIA (07755-05): 28.04.2015	ROL 1 into 3 lots	Approved Completed	ROL 1 into 3 Lot sizes 6,920m², 13,046m² and 4,290m² Changed by GIA to 12,306m², 8,044m² and 4,290m² Associated OPW: OP-156017 (Civil)
21	46 Senor Avenue Lot 82 on RP183522	ROL-163007 Lodged: 16.02.2016 Approved 15.03.2016	ROL 1 into 5 lots	Approved Completed	ROL 1 into 5 lots Lot sizes 2,000m² to 2,196m² Associated OPW: OP-166042 (Civil)
22	Ronaldo Way Lot 21 on SP281518	ROL-173028 Lodged: 17.05.2017 Approved: 29.05.2017	ROL 1 into 2 lots	Approved Completed	ROL 1 into 2 lots Lot sizes 500m² and 476m² Associated OPW: OP-176036 (Civil)

	Location and Description	Application Date	Type of Application	Development / Application Status	Yield
23	100 Boundary Road Lot 42 on RP153688	ROL-163034 Lodged: 05.11.2015 Approved: 07.09.2016	ROL 1 into 6 lots	Approved Completed	ROL 1 into 6 lots Lot sizes 4 x 800m², and 2 x 3,400m² Associated OPW: OP-166058 (Civil)
24	14 Boundary Road Lot 2 on RP153688	ROL-153074 Lodged: Not recorded Approved: 23.12.2015	ROL 1 into 3 lots	Approved Completed	ROL 1 into 3 lots Lot sizes 2,008m², 2,728m² and 5,423m²
25	17 Senorita Parade Lot 20 on RP172636	ROL-103049 Lodged: 08.10.2010 Approved: 18.09.2012	ROL 1 into 9 lots Stage 1 – 1 into 4 Stage 2 – 1 into 6 (Preliminary Approval)	Approved Completed (Stage 1) Not Completed (Stage 2)	ROL 1 into 4 lots Lot sizes 1,000m² to 1,024m² and 17,958m²
26	108 Boundary Road Lot 43 RO153688	ROL-163020 Lodged: 05.05.2016 Approved: 17.05.2016	ROL 1 into 4 lots	Approved Completed	ROL 1 into 4 Lot sizes 2,200m² - 2,610m²
Huntingdale Woods Stages 1-8					
27	20, 22 & 34 Ronaldo Way Lots 51-53 on SP239193	ROL-133038 Lodged: 04.12.2013 Latest Approval: 06.02.2014	ROL 3 into 5	Approved Completed	ROL 3 into 5 Lot sizes 803m² - 885m² Associated OPW: OP-146018 (Civil)
28	Stage 1 66 Hughes Road & 28A Senor Drive Lot 1 on RP88547 and Lot 72 on RP213315	514/3-082005 Lodged: Originally Approved: 12.08.2009 Change Approval: 10.05.2011	ROL 2 into 53 Lots	Approved Completed	ROL 2 into 53 lots Lot sizes 1,000m² - 8,360m² Associated OPW: (516/3) OP-096157 (Civil and Vegetation Removal), & OP-106081 (Civil)
29	Stage 2 Ronaldo Way Lot 500 on SP239193, Lot 2 on RP162667 and Lot 3 on RP162667	ROL-143014 Lodged: 06.06.2014 Approved: 19.09.2014 Change Application (AS150029): 30.07.2015	ROL 3 into 22 lots	Approved Completed	Altered the configuration of lots 17-35 as shown in the Stage 1 approved plans and created an additional 2 residential lots Lot sizes 943m² - 1,825m², and 23,960m² (balance lot for future subdivision) Associated OPW: OP-146088 (Civil)

	Location and Description	Application Date	Type of Application	Development / Application Status	Yield
30	Stages 3 to 7 Ronaldo Way, 21-27 and 37-41 Ronaldo Way, and 2 Senor Avenue Lot 500 on SP239193, Lots 3-6 on SP239193, Lots 11-13 on SP239193, and Lot 65 on RP180355	ROL-143036 Lodged: 01.09.2014 Approved: 08.07.2015	ROL 9 into 54 lots	Approved Completed (Stages 3 & 4) Uncompleted (Stages 5-7)	Creates additional lots as well as alters some lots as shown within Stage 1 ROL 9 into 54 lots Lot sizes 767m² - 1,281m² Associated OPW: OP-156062 (Civil – Stages 3 & 4) & OP176011 (Civil – Stages 5-8)
31	Stage 8 25 Ronaldo Way Lot 5, 6, 11 and 12 on SP239193 and Lot 1 on RP162667	ROL-163040 Lodged: 12.07.2016 Approved: 08.09.216	ROL 1 into 14 lots (Stage 8), including adjacent lots Stage 1 – Frontage works to Lot 1 Stage 2 – Lots 2 - 14	Approved Not constructed	Creates additional lots within Stage 8 ROL 1 into 14 Lot sizes 585m² to 4,108m²
	Total Potential Lots – Constructed				**167**

3 Planning framework applicable to development area

3.1 Planning Act 2016

The *Planning Act 2016* (the Act) provides the overarching planning and development framework for Queensland. Therefore, planning exercises and future development within the Urangan South Project Area will be guided by the Act both in terms of making and amending planning instruments and assessing and deciding future development applications.

3.2 Wide Bay Burnett Regional Plan

3.2.1 Overview

The Wide Bay Burnett Regional Plan (the Regional Plan) commenced on 29 September 2011 and is the first statutory regional plan for the Wide Bay Burnett region. Significantly, the Regional Plan is the pre-eminent plan for the region and takes precedence over all other planning instruments other than State Planning Regulatory Provisions.

The Regional Plan sets a long term strategic direction to guide the growth and development of specific regions, and seeks to ensure that good planning outcomes are delivered that support communities, the economy and the environment. The WBBRP describes the intended settlement pattern for the region, and is supported by ten desired regional outcomes and a range of policies and programs that together provide a planning framework to help sustain the region's communities, strengthen its economy, inform the delivery of social services and infrastructure, and protect its environment.

3.2.2 Regional Framework

Part B – Regional Framework of the WBBRP provides a regional settlement pattern for the region and states that.

> *The preferred settlement pattern seeks to minimise adverse impacts and deliver cost-effective and efficient infrastructure services. Further investigation and planning will be required to ensure development proceeds in a logical and sequential pattern, supported by the timely delivery of appropriate communications, social and transport infrastructure.*

More specifically the regional plan notes that Hervey Bay will continue to attract high levels of growth and that this growth will be able to be accommodated within the existing urban footprint through until 2031.

3.2.3 Regional Plan Land Use Category

All land within the WBBRP is identified within a regional land use category. The project area is included entirely within the 'Urban Footprint' land use category.

The Urban Footprint identifies land that can meet the region's projected urban development needs until 2031. The Urban Footprint includes established urban areas, new and residual broad hectare development lands, as well as land that could potentially be suitable for future urban development.

The intent of the Urban Footprint is to consolidate growth in locations that are well located and have access to employment generators, community facilities and services, and can make efficient use of available urban infrastructure.

The Urban Footprint does not imply that all land within the footprint can be developed for urban purposes, and land within the footprint may be unsuitable for urban development due to the presence of significant constraints such as flood, bushfire hazard, or coastal management issues.

3.2.4 Desired Regional Outcomes

The Desired Regional Outcomes (DROs) set out the desired approach to land use and development within the region. There are ten (10) DROs relating to:

- Sustainability, climate change and natural hazards;
- Environment;
- Natural Resource management;
- Rural futures;
- Strong communities;
- Engaging Aboriginal and Torres Strait Islander peoples;
- Managing growth;
- Urban form;
- Strong economy;
- Infrastructure.

The DROs incorporate policies and programs that seek to implement the achievement of the DROs. A summary of the DROs most relevant to the project area is provided in **Table 3-1** below.

Table 3-1 Summary of relevant Desired Regional Outcomes

Desired Regional Outcome	Policy	Program
Sustainability, climate change and natural hazards	Areas of high exposure to natural hazards, including the effects of climate change on those hazards, are avoided. Risk to development is reduced through effective management of coastal and riparian environments to minimise alterations to natural systems, such as natural flow regimes and flood plain connectivity.	Undertake studies to establish reliable flood hazard mapping and defined flood levels within all drainage sub-basins in the region in order to identify flood-prone areas.
Managing growth	Development is located and sequenced to make the best use of existing infrastructure, and ensure efficient and cost-effective investment in new infrastructure. Development avoids or seeks to mitigate impacts of hazards such as flooding, bushfire, noise and other emissions.	Undertake integrated land-use and infrastructure planning for all urban areas to achieve coordinated outcomes and timely delivery.
Urban form	Opportunities for travel by public transport, cycling and walking are provided to access major trip generators such as employment nodes, across urban communities and to schools, community facilities, open space and public transport interchanges, and include end-of-trip facilities. > Urban areas have an integrated, high quality, urban green space network that caters for community and environmental needs. > Broadhectare planning and development responds to adjacent environments, creating cohesive neighbourhoods identifiable as part of the broader community.	
Infrastructure	> Growth is managed to maximise the use and benefits of existing infrastructure, and minimise the need for new infrastructure or upgrades. > Infrastructure is located and designed to avoid or mitigate impacts from major catastrophic events such as cyclones, flooding and storm surge, and the anticipated impacts of climate change.	Monitor and review infrastructure capacity to inform future infrastructure provision. Develop, upgrade and maintain programs for managing existing and provision of new infrastructure in a timely manner.

3.2.5 Wide Bay Burnett Regional Plan State Planning Regulatory Provisions

The State Planning Regulatory Provisions for the WBBRP ceased to have effect on 16 May 2012. The practical implication of the Regulatory Provisions ceasing to have effect is that any development applications made within the project area will not trigger an assessment by the referral agency (DSDMIP). However, Council must still have regard to the relevant provisions of the regional plan when preparing planning schemes or planning scheme amendments for the locality.

3.3 State Planning Regulatory Provisions

State planning regulatory provisions (SPRPs) are State planning instruments that regulate development and can apply to all or part of the State. Apart from the Wide Bay Burnett State Planning Regulatory Provisions 2011 (referred to in section 3.2.5 above), no current SPRPs have particular relevance to the Urangan South project area.

3.4 State Planning Policies

The State Planning Policy (SPP) is a State planning instrument under the Act that is intended to provide a framework for protecting and managing particular matters of State interest. The SPP has effect when planning schemes are made or amended, and local planning instruments are required to achieve consistency (to the greatest extent possible) with any relevant aspect of the SPP. In the event that there is an inconsistency between an aspect of the SPP and a local planning instrument, the SPP prevails to the extent of the inconsistency.

Where an aspect of the SPP has not been appropriately reflected in a local planning scheme, a development application is required to be assessed against the relevant assessment benchmarks of the SPP.

The Minister has identified that the Fraser Coast Planning Scheme appropriately reflects the relevant aspects of the SPP. However, this advice reflected the version of the SPP in force at the time of preparation and commencement of the planning scheme in 2014. The current State Planning Policy commenced on 3 July 2017. In this regard the planning scheme does not technically reflect the latest SPP and as such may potentially apply to development applications within the project area.

Table 3-2 below identifies the current aspects of the SPP that are considered to be particularly relevant to preparation of planning instruments in the project area along with commentary on the nature and effect of these SPPs.

Table 3-2 Development Activity within the project area – approvals and applications

SPP – Matter of State Interest	Comment
Liveable communities and housing	This aspect of the SPP seeks to provide for well-serviced, accessible and attractive environments that support healthy and sustainable communities. The SPP supports effective planning and development frameworks that:- > Provides a sufficient supply of land that can accommodate a diverse range of housing types; and > Guides development and redevelopment of land in appropriate locations; and > Maximizes the use of existing infrastructure. Relevant policies include: *Land for housing development and redevelopment in areas that are accessible and well-connected to services, employment and infrastructure are identified.* *A diverse, affordable and comprehensive range of housing options in accessible and well-serviced locations, is facilitated through:* • *appropriate, responsive and proactive zoning* • *supporting an appropriate mix of lot sizes and dwelling types, including housing for seniors and people requiring assisted living* *Vibrant places and spaces, and diverse communities that meet lifestyle needs are facilitated by:* • *consolidating urban development in and around existing settlements*

SPP – Matter of State Interest	Comment
	• *higher density development in accessible and well-serviced locations* • *efficient use of established infrastructure and services* *Development is designed to:* • *value and nurture local landscape character and the natural environment* **Implications for project area** The intent of this aspect of the SPP is to provide for diverse and well located urban environments. In this regard, the project area is identified and zoned for low density urban residential development and must consider how best to integrate within the broader development pattern of the locality. In preparing the structure plan and local area plan for the project area, the following will require consideration: > provision of a mix of housing types and densities; > connection and accessibility to employment and social services and facilities; > protection and enhancement of character and amenity; and > provision of urban infrastructure that supports urban development.
Economic growth	This aspect of the SPP seeks to support economic growth by removing unnecessary barriers to business growth and innovation. In relation to development and construction, this will be facilitated through enabling the growth of commercial and industrial development, delivering housing choice and diversity, and coordinating and sequencing the release of land for development. Relevant policies include the following: *A sufficient supply of suitable land for residential, retail, commercial, industrial and mixed use development is identified that considers:* • *existing and anticipated demand* • *the physical constraints of the land* • *surrounding land uses* • *the availability of, and proximity to, essential infrastructure required to service and support such development.* *Appropriate infrastructure required to support all land uses is planned for and provided.* *Mixed use development is achieved by appropriately zoning the land.* **Implications for project area** Given that the project area is identified and zoned for low density residential development, the structure plan and local area plan should also consider opportunities and requirements for other land uses including retail, commercial or community facilities.
Environment and heritage	This aspect of the SPP seeks to protect and enhance the environmental values of the State in relation to biodiversity, coastal environment, cultural heritage and water quality. The purpose of the SPP is to: > protect and enhance the resilience of the environment and support natural ecological functioning; > maintain coastal processes and protect development from coastal hazards; > conserve cultural heritage items and places; and > protect and enhance water quality. To achieve this policy outcome, local planning instruments will be required to reflect the following policies: > Matters of National, State and Local Environmental Significance are identified and development is located to avoid adverse impacts. Where adverse impacts cannot be avoided, they are minimized to the greatest extent practicable; > Coastal processes are protected from the impacts of development; > Indigenous and non-indigenous cultural heritage items and places are protected from inappropriate development; Development is located, sited and designed to avoid and/or minimize impacts on receiving waterways and wetlands.

SPP – Matter of State Interest	Comment
	Implications for project area Having regard to the SPP mapping, the Urangan South Project Area is subject to the following matters: > MSES – Regulated Vegetation (Category R); and > MSES – Regulated Vegetation (intersecting a watercourse). While these are limited to the central part of the site, it is noted that a number of high value wetland and waterway values are located adjacent to the east of the site including: > MSES – Regulated vegetation (wetland); > MSES – High ecological significance wetlands; > MSES – High ecological values waters (wetland); > MSES – Wildlife habitat. While the site itself exhibits only limited in situ ecological values, the waterways and wetlands associated with Pulgul Creek to the east of the site support high quality wetlands and essential wildlife habitat. Given this, any future development of the project area should consider the following: > Identify any remaining significant vegetation communities and consider opportunities for incorporation within the settlement pattern; > Consolidate urban development within areas already disturbed by development to avoid and minimize further disruption to ecological values; > Locate development outside areas that are subject to coastal processes; Development should be design and located to protect wetland and waterway values both within the site and downstream of the site.
Safety and resilience to hazards	This aspect of the SPP relates to identifying and managing the potential impacts of natural hazards on the safety and health of the community. The SPP also relates to the potential impacts of emissions and hazardous activities relating to major infrastructure or industrial land uses. In relation to natural hazards, the site is mapped as being subject to potential bushfire hazard (medium potential bushfire intensity). While not specifically identified on the SPP mapping, the site is mapped on planning scheme overlay mapping as being subject to flood hazard associated with two drainage channels that traverse the central part of the site. Where in an identified flood or bushfire hazard area, the SPP takes a risk management approach. In this regard, development should seek to: > Avoid being located in the natural hazard area; or > Where avoidance is not possible development mitigates risks to people and property. The SPP also requires development to avoid cumulative and indirect increases in the severity of the hazard and level of exposure to people and property. While the SPP seeks to protect sensitive land uses from the potential impacts of emissions and hazardous activities, it also recognizes that existing land uses and infrastructure items require protection form the encroachment of sensitive land uses. In this regard, the SPP seeks to protect critical urban infrastructure such as waste water treatment plants from encroachment by incompatible development. Given that the Pulgul Creek WWTP is located adjacent to the east of the project area, consideration of the potential impacts on the continued functioning of this facility is warranted. **Implications for project area** **Flooding** The project area is subject to overland flow flooding associated with the drainage channels that traverse the central part of the site from west to east. A recent modelling exercise has been undertaken to better identify the extent and nature of the flood impact, and will provide the basis for appropriately managing flood impacts on future development. To ensure appropriate reflection of the SPP, the structure plan will be required to > Identify the nature and extent of the flood hazard; > ensure that development in natural hazard management areas is compatible with the nature of the natural hazard; > minimise the impacts from natural hazards on existing developed areas; and > prevent development from materially increasing the extent or the severity of natural hazards.

SPP – Matter of State Interest	Comment
	It is noted that the project area is currently subject to regular flooding events due to the local topography and the location of two (2) major natural overland flow paths that traverse the site from west to east. Due to the topography, fragmented nature of land ownership, and downstream impediments to the natural drainage channels, it is likely that no cost effective engineering solution will be available to eradicate flooding within the project area. In this regard, the structure plan should seek to limit the impact of flood events on people and property to the greatest extent practicable. **Bushfire** Based on available bushfire hazard mapping held by Council, the project area is not significantly constrained by bushfire hazard. However, patches of "medium risk" bushfire hazard areas are located towards the south-western and north-western boundaries of the area. Given the limited extent of bushfire hazard areas and the level of current development activity which has cleared large stands of potentially hazardous vegetation, the residual level of bushfire risk is considered to be low. Any future development for urban purposes should be designed and located to minimize any unacceptable risks to people, property, economic activity and the environment.
Infrastructure	This aspect of the SPP seeks to integrate land use and infrastructure planning to maximize the efficient use of existing infrastructure, protect critical transport infrastructure assets, and ensure sufficient infrastructure is able to be provided to support development in a cost effective manner. The Urangan South project area is located within and adjacent to existing urban development. In this regard, connections to urban services are available to support the future development of the area. SPP mapping identifies that there is no State transport infrastructure within the project area, however the State controlled Booral Road is adjacent to the north-eastern corner from the site and provides the major north-south linkage for the western part of the Hervey Bay urban area. The Hervey Bay Airport is identified as a strategic airport in the SPP. Under the SPP, the safety and efficiency of strategic airports is to be protected from the encroachment of incompatible development. **Implications for project area** Although not containing State transport infrastructure, the project area will have potential impacts on the safe and efficient operation of the broader road network. In preparing the structure plan, consideration should be given to: > Identification of an internal network of streets that is permeable and legible; > Provision of major corridors that can support public transport and active modes of transport; and > Connections with the broader road network (including the State network) in accordance with the capacity of the network to accommodate an increase in traffic. Managing the potential impacts of the Hervey Bay Airport on the structure plan area is largely related to noise nuisance. Only a small part of the project area on the southern boundary is identified as being within the ANEF contours for the airport, and this area is already committed to urban development. On this basis, a more general consideration of dwelling design to manage potential noise impacts should potentially be included in the structure plan. Development within the project area is also required to protect the safety and efficiency of the airport. Given the close proximity, lighting and building height controls should be implemented to maintain navigational safety and efficiency, and land uses that attract birds or emit gaseous plumes should not be supported. Given the predominantly residential nature of land uses within the project area it is likely that these criteria can be met.

3.5 Fraser Coast Planning Scheme

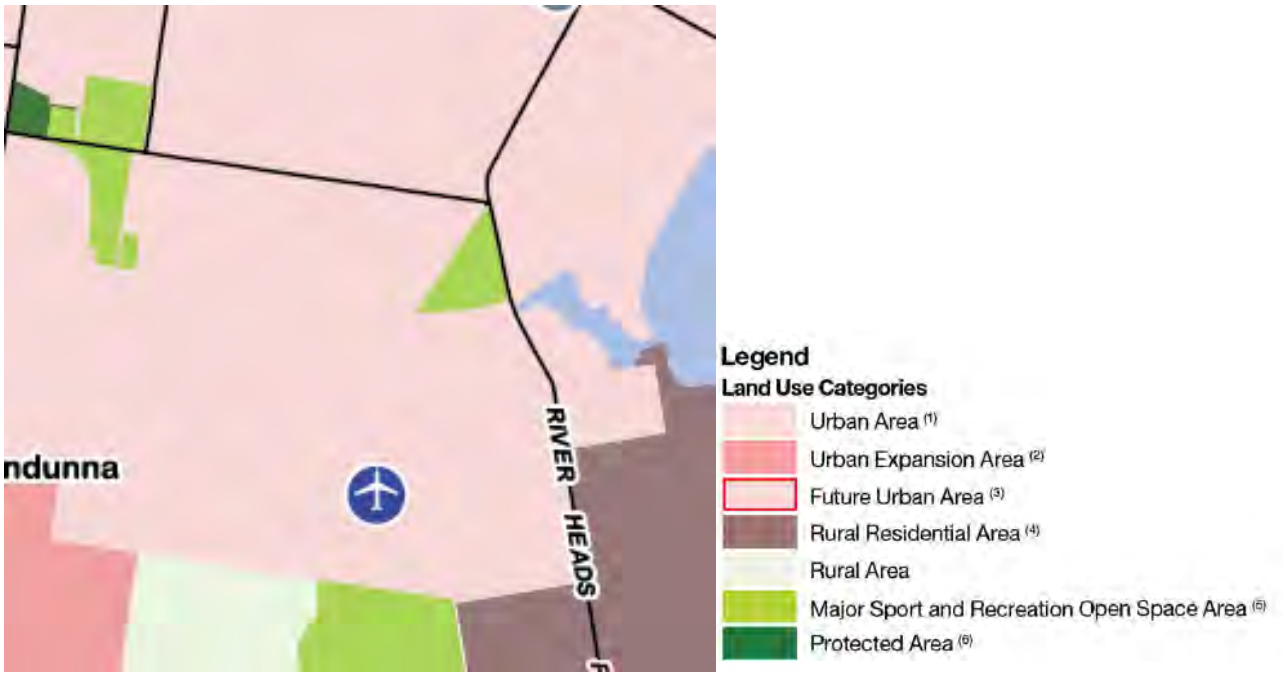
The Fraser Coast Planning Scheme 2014 is the local planning scheme that regulates planning and development within the project area.

The planning scheme was prepared under the Queensland Planning Provisions, and includes a strategic framework and zones that together identify the preferred type and location of development within the local government area. The planning scheme also includes a number of overlays that identify areas where there are specific constraints or opportunities for development. While it is acknowledged that there are a number of use codes and planning scheme policies that provide more detailed guidance as to the technical delivery of development, for the purposes of this structure planning exercise it is considered that the parts of the scheme relating more broadly to land use and settlement pattern are the most relevant.

3.5.1 Strategic Framework

The strategic framework identifies a number of land use categories relating to future land use and development within the local government area. The Urangan South project area is identified as being within the 'Urban Area' land use category.

Figure 3-1 **Strategic Framework Map Extract**



In relation to the settlement pattern for the region, the strategic framework intends that urban development occurs on land within the Urban Area, and in particular:

- Achieves a compact and consolidated urban form;
- Optimises the efficient delivery and use of infrastructure and services;
- Minimises exposure to physical and environmental constraints and natural hazards;
- Minimises the impact of lands supporting environmental, rural production and landscape values; and
- Enhances and preserves the discrete identities of individual cities, towns and villages of the Fraser Coast.

The settlement pattern theme also includes the following specific outcomes:

- Development should support the creation of complete and vibrant communities, including the provision social infrastructure and community facilities;
- New housing is designed to integrate with existing houses and community facilities;
- Residential development is characterised by a distinct identity that reflect the landscape setting and pattern of existing subdivision;
- Major infrastructure is protected from urban encroachment and other incompatible land uses to ensure its continued operation and viability; and
- The potential adverse impacts to people and property from natural hazards are minimised by ensuring that development avoids areas subject to flooding or otherwise mitigates potential impacts.

3.5.2 Zone

The subject site is included predominantly within the Low density residential zone (refer to **Figure 4 - Zoning Map**).

The purpose of the Low density residential zone code is to:

> *…provide for predominantly low density, low-rise residential uses on a range of lot sizes, supported by community uses and small scale services and facilities that cater for local residents.*

While being predominantly for residential purposes, small scale retail and commercial development may be appropriate where it serves the day to day convenience needs of local residents. The location of such non-residential uses must be compatible with the residential character and amenity of the area, and co-location of these services is encouraged.

A small section on the eastern boundary of the project area is included within the Limited development (constrained land) zone. This zone identifies land that is subject to a significant development constraint such as known flooding or land contamination. In this instance, the zone identifies that land that is subject to significant potential odour emissions from the adjacent Pulgul Creek Wastewater Treatment Plant. The inclusion of land within the Limited development zone recognises that the constraint it relates to cannot be managed or mitigated through any other means than by separation. Odour cannot be easily mitigated through mechanical solutions or landscape buffering, and as such the most effective land use strategy is to ensure that sensitive development does not locate within the area known to be affected. On this basis, within the Limited development (constrained land) zone, no further reconfiguration for residential purposes is permitted as a Performance Outcome of the relevant zone code (PO4).

A small part of the south-western corner of the project area is included within the Limited development (constrained land) zone and the Community facilities CF2 (Government purpose and public utilities) zone. The Community Facilities Zone relates to land associated with the Hervey Bay Airport, while the Limited development (constrained land) zone includes a small corridor of land that forms part of the OLS for the airport. No further urban development is generally intended to occur within these zones as they provide a separation distance and buffer to maintain the safe and efficient operation of the airport.

A narrow strip of land is zoned as Open Space. This zone relates to land utilised for the constructed drainage corridor that traverses the central part of the site. As currently configured no urban development is able to be accommodated within the narrow strip of land, however there may be opportunity to build upon this ground feature to provide more useable open space as part of the structure plan.

It is noted that prior to the commencement of the Fraser Coast Regional Council Planning Scheme in 2014 the part of the site now included in the Low density residential zone was included within the Emerging community zone. The Emerging community zone was intended to conserve land that may be suitable for urban purposes, and provide a framework for the planning and sequential development of the area over time. In particular, the Acceptable Solution AS3.1 for the Emerging community zone code stated:

> *Development complies with an approved Structure Plan of Council.*

Effectively this required any development proponent to prepare a 'plan of development' that considered infrastructure provision, coordination of land uses, and sequencing of development across the broader area. However, once the project area was removed from this zone ad-hoc development has occurred which has resulted in a fragmented pattern of isolated developments that do not provide for an integrated and well connected settlement pattern.

The current structure planning exercise is intended to prepare an area wide plan of development for the Urangan South site, which will then be translated into a Local Area Plan in the planning scheme.

3.5.3 Overlays

Overlays identify land that is subject to a particular planning constraint or opportunity, and requires specific management or development controls to ensure development responds appropriately.

Having regard to the Overlay maps in Schedule 2 of the planning scheme, the Urangan South project area is subject to the following overlays (refer to **Figure 5 - Overlays (Planning Scheme)**):

- ASS Overlay – Area 2 (Land above 5m AHD but below 20m AHD);
- Airport and aviation facilities overlay – 20m ANEF Contour, Horizontal Surface Limitation Boundary, 3km distance boundary;
- Biodiversity areas, waterways and wetlands overlay – Other remnant vegetation, MSES Regulated vegetation intersecting a watercourse;
- Bushfire hazard overlay – Medium bushfire hazard area and potential impact buffer;
- Coastal protection overlay – Coastal zone;
- Flood hazard overlay – Flood hazard area; and
- Infrastructure overlay – Waste water treatment plant buffer.

Each overlay is supported by an overlay code. Each code provides a number of provisions which seek to address the impacts of the respective constraints. This may include such things as regulating lighting or building height within the airport overlay to maintain the safety of aircraft when navigating in close proximity to the airport, or requiring specific construction methods to manage the potential interference of ASS when undertaking construction activities.

The overlays will continue to apply to development within the Urangan South project area, and as such specific consideration of their operation is not required. However, the overlays do identify specific locations that are subject to hard constraints such as noise, odour, and natural hazards including flooding which should be reflected in the settlement pattern identified by any future structure plan.

3.6 Other planning instruments and legislation

Apart from the planning instruments described in the preceding sub-sections of this report, no other planning instruments are considered particularly relevant to the development area.

Notwithstanding, the following State and Commonwealth legislation may potentially influence planning and development decisions within the development area:-

- *Nature Conservation Act 1992*, given that essential habitat for several species listed as vulnerable under this legislation is located adjacent to the development area (refer to section 4.2.5 of this report for further details); and
- *Environmental Protection and Biodiversity Conservation Act 1999*, given that fauna species listed as vulnerable under this legislation (Koala) may potentially be located adjacent to the development area.

3.7 Project implications

There are a range of State, regional and local planning dimensions that will require address in considering the future development options for the Urangan South project area.

The most relevant implications that arise from a review of the planning framework are as follows:-

- the Urangan South project area is included in the Urban Footprint land use category of the Regional Plan. Through this designation, the project area is considered to be potentially suitable for urban development;
- the Urangan South project area is identified in the Strategic Framework of the Fraser Coast Regional Council Planning Scheme as being within the Urban Area which further supports the use of the land for urban development;
- the Urangan South project area is included predominantly within the Low density residential zone, which commits the land to some form of low density residential development;
- the part of the Urangan South project area included within the Limited development (constrained land) zone is not further developed so as not to increase the number of people exposed to nuisance odour emissions from the Pulgul Creek Wastewater Treatment Plant;
- various aspects of the SPP are applicable to development in the Urangan South project area. In particular, development in the Urangan South project area must ensure:-
  - the protection of people and property from flood hazard and bushfire;
  - the protection of values associated with Matters of State Ecological Significance (MSES) both on the site and adjacent to the site;
  - the protection of ecological values associated with wetlands and waterways;
  - the protection of the operational safety and efficiency of Hervey Bay Airport.
- any future urban development within the Urangan South project area must consider the protection of the existing Pulgul Creek Wastewater Treatment Plant from encroachment by incompatible development.

4 Development area analysis

4.1 Land use and tenure

The Urangan South project area is predominantly used for low density residential development. Historically the area was characterised by large lot residential forms of living, with detached dwellings and outbuildings on lots of between approximately 1-2 hectares. However, more recently a number of typical suburban subdivisions have begun to commence, particularly in the southern part of the project area south of Senor Avenue.

In the central part of the project area (refer to **Figure 2 - Structure Plan Area**), land use remains predominantly for large lot residential living on lots ranging between 8,000m^2 and 15,000m^2.

The major focus of recent subdivision is on the southern boundary of the area. This area is slightly elevated, and the recent pattern of subdivision provides for a mix of lot sizes between approximately 600m^2 and 1,500m^2. Further low density residential subdivisions have also commenced on the eastern boundary of the project area, with subdivisions on the corner of Senorita Drive and Walkers Rd and Sunline Court and Walkers Rd providing lots between approximately 1,000m^2 and 2,500m^2.

A small landscaping business is located on the corner of Senorita Parade and Boundary Rd. This is the only commercial/retail land use within the project area, and has a total land area of approximately 1 hectare.

Land within the Urangan South project area is predominantly in freehold tenure. A long and narrow reserve extends from Jordan Close to Senor Avenue. The reserve accommodates a drainage corridor to allow for services/drainage infrastructure to extend from the central part of the site to the emerging subdivisions on the southern part of the area.

4.2 Physical and environmental elements

4.2.1 Topography

The Urangan South project area is generally flat, falling gradually from approximately 20m AHD on the southern boundary down to approximately 10m AHD adjoining the Pulgul Creek wetlands on the eastern boundary of the site.

4.2.2 Flooding and drainage

The natural drainage regime for the project area is from the west to east, in keeping with the prevailing topography of the locality. Two major overland flowpaths traverse the central part of the project area from west to east, discharging into the wetlands adjacent to the eastern boundary of the site (refer to **Figure 6 - Flood Hazard Map**).

The major drainage channel extends across the site within a dedicated lot generally between Senor Avenue and Senorita Parade. This channel has been profiled to be approximately 90cm deep and incorporates a granite boulder lining to protect the channel from scour. In rain events, including relatively minor events such as the Q2 rain event, the channel is not able to accommodate the volume of water and overtops, spreading into the near vicinity. The depth of flooding is generally shallow (given the flat topography), with flood depths in the Q100 event ranging from approximately 1.5m within the channel to approximately 0.1m further from the central channel.

Another drainage channel is located in the central/northern part of the site, generally located between Boundary Road and Senorita Parade. This channel is a natural overland flow path and has not been modified in any way. Due to the flat topography of the locality the flood extent is relatively wide, and varies in depth between approximately 0.5m and approximately 0.1m.

Stormwater ponds adjacent to the Walkers Road frontage of the site. At this location the two channels are directed under the road via culverts and discharge into the Pulgul Creek wetlands adjacent to the site. Depths in this area range from between approximately 0.6m to 0.8m.

While the flood depths and velocities potentially have impacts on the safety of people and property, the level of hazard is relatively low.

It is noted that a recent flood modelling exercise for the Pulgul Creek catchment was prepared by Cardno, and the outputs of this investigation have been used in the preparation of this analysis.

4.2.3 Coastal Hazard Areas

Although in proximity to the coast, the Urangan South project area is not identified as being subject to coastal hazard such as storm tide inundation or include areas identified as erosion prone areas.

4.2.4 Waterways and wetlands

4.2.4.1 Waterways

There are no major or permanent waterways within the project area, however Pulgul Creek is located adjacent to the eastern boundary of the site. While not a natural waterway, the main drainage channel that extends through the site functions as a waterway with a defined course and known extent and is identified as a watercourse on the Vegetation Management Supporting Map.

Two (2) non-permanent drainage gullies flow through the central part of the project area, with a number of small ponds providing detention and water storage options for amenity and landscaping purposes on some larger residential lots on the eastern part of the project area.

4.2.4.2 Wetlands

There are no mapped wetlands within the Urangan South project area.

However, High Ecological Significance (HES) wetlands are located adjacent to the eastern boundary of the project area associated with the confluence of the two drainage channels with Pulgul Creek. The ongoing health and function of these wetlands will be influenced by land use and construction practices within the project area, and as such measures to protect the quality of water entering the receiving environment will be an important consideration in future development of the Urangan South project area.

4.2.5 Vegetation and ecology

Although a green and leafy environment, significant clearing associated with dwelling construction has thinned the remaining vegetation on site.

Remnant vegetation is predominantly associated with the two drainage channels that traverse the site. In particular, the southern drainage channel (between Senor Avenue and Senorita Parade) is identified as being a Category R area (Reef regrowth watercourse vegetation) on the Regulated Vegetation Management Map.

A small pocket of Category R area vegetation (Reef regrowth watercourse vegetation) is also located on the south-western corner of the project area. This appears to be associated with a small dam/pond that forms part of the drainage system that extends between the project area and the airport.

Ecological values are generally limited within the Urangan South project area, with the area having been highly modified to support historical residential development and not providing a varied habitat that would support a broad range of terrestrial or aquatic species. However, mapped essential habitat adjacent to the east of the site is identified as being essential habitat for Koala and the Wallum Froglet.

Figure 7 - Ecological Values includes current SPP mapping identifying MSES as it applies to the Urangan South project area and surrounds.

4.2.6 Land resources

Having been historically used for urban development, there are no specific land resources (such as extractive industry or Agricultural Land Classification Class A or Class B lands) within the project area.

4.3 Character and amenity elements

4.3.1 Surrounding land uses

Situated within a pocket of land on the south-eastern periphery of the Hervey Bay urban area, the project area is surrounded by a number of urban land uses.

Surrounding land use to the north and west is predominantly low density residential, with some community infrastructure including the Star of the Sea Primary School and Child Care centre located adjacent to the western boundary of the area on Hughes Road.

Surrounding land uses to the east include the Pulgul WWTP, with a large field sports complex situated adjacent to the eastern boundary on Walkers Rd. Due to the large wetland area adjacent to the eastern boundary, there is a large separation distance of approximately 800m to the industrial development further to the east on Booral Road.

Although not directly adjacent, the Hervey Bay Airport is located to the south of the site. The airport runways and facilities are located approximately 500m to the south of the site, with the intervening land comprising of typical melaleuca vegetation communities as found in lower lying coastal areas.

4.3.2 Character and identity

The Urangan South project area is characterised as a large lot residential area. Individual detached dwelling houses and associated large sheds and other outbuildings predominate in the project are, with stands of retained vegetation throughout that provides an attractive and natural character and amenity.

The major landscape feature of the project area is the retained vegetation and overland flow paths that traverse the central part of the site. Being relatively flat, the vegetation provides a sense of enclosure that frames the low set dwellings, and provides significant separation and privacy between lots. However, the newer development on the southern part of the project area is transforming into a denser form of suburban living, with smaller lots and less natural vegetation providing a modern and organised suburban character and amenity.

Although presenting as a pleasant and quiet residential enclave, the Urangan South project area does not exhibit any particularly distinctive or outstanding visual character elements that would warrant particular protection.

4.4 Infrastructure considerations

4.4.1 Transport network

The project area is accessible via connections off Boundary Road including:

- Walkers Road;
- Senorita Parade; and
- Hughes Road.

Figure 4-1 Site Location

Source: Photomap by nearmap.com

4.4.1.1 Existing Road Network

The project area has an area of approximately 140 hectares, with the boundaries generally defined by:

- Boundary Road to the north;
- Walkers Road to the east;
- Hervey Bay Airport to the south; and
- Hughes Road to the west.

The key roads surrounding the development are illustrated on **Figure 4-2** with the key characteristics of these roads summarised in Table 4-1. A street-view of major connecting roads within the development area out illustrated in **Figure 4-3**, **Figure 4-4** and **Figure 4-5**.

Figure 4-2 Local Road Network

Source: Photomap by nearmap.com

Table 4-1 Local Road Network

Road	Authority	Classification	Posted Speed Limit	Typical Form
Booral Road	TMR	Rural Arterial	60 km/h	Undivided two-way two lane
Boundary Road	FCRC	Traffic Distributor	60 km/h	Undivided two-way one lane
Hughes Road	FCRC	Major Collector	60 km/h	Undivided two-way one lane
Walkers Road	FCRC	Access Street	60 km/h	Undivided two-way one lane
Senorita Parade	FCRC	Access Street	60 km/h	Undivided two-way one lane
Senor Avenue	FCRC	Access Street	60 km/h	Undivided two-way one lane

Figure 4-3 Existing Senorita Parade Cross Section

Source: Photomap by nearmap.com

Figure 4-4 Existing Senor Avenue Cross Section

Source: Photomap by nearmap.com

Figure 4-5 Existing Walkers Road Cross Section

Source: Photomap by nearmap.com

4.4.1.2 Planned Road/Intersection Upgrades

The Fraser Coast Regional Council's Planning Scheme identified the planned upgrades on the trunk road network in its Local Government Infrastructure Plan (LGIP). Of relevance to this development are the following items:

Table 4-2 Planned Upgrade Works

ID	Location	Description of Works	Timing
BS29	Boundary Road (Urangan)	Bus Stop	2031
BS30	Boundary Road (Urangan)	Bus Stop	2031
RC009	Boundary Road	Road Upgrade to Traffic Distributor Type 1 (2-lane undivided to 4-lane median divided)	2025
ISF26	Boundary Road / Robert Street / Hughes Road Intersection	Intersection	2020

Figure 4-6 Planned LGIP Upgrades

Source: Photomap by nearmap.com

As outlined in **Table 4-2**, planned LGIP upgrades on Boundary Road include a duplication from 2-lanes (undivided) to 4-lanes (median-divided) by 2025. Access to lots with frontages along Boundary Road are recommended to be via rear-lot accesses. Therefore, roads internal to the development site are required to accommodate rear-lot access, further details on the internal road network are discussed in **Section 5.5.2.1**.

4.4.2 Water and Sewer Network

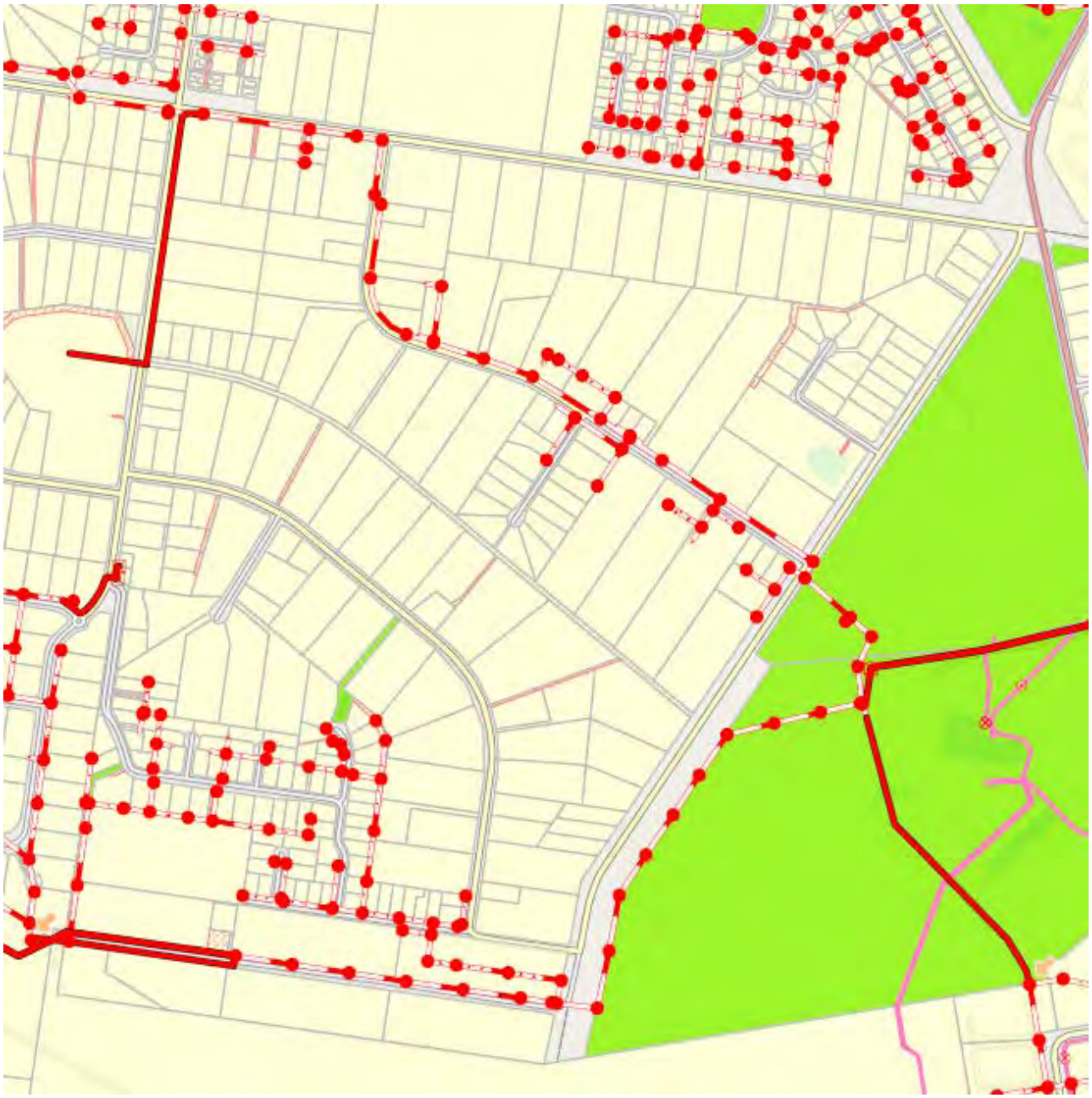
The existing water network consists of a double loop, as shown in Figure 4 in **Appendix A** (extract in **Figure 4-7**).

Figure 4-7 **Existing water network infrastructure**

This allows for consistent pressure and flow delivery throughout the network, servicing all precincts. The pipe size is primarily smaller diameter pipes, ranging from DN100 to DN150 in size.

The sewer infrastructure is well developed in the South Precinct, consisting of DN150 mains feeding into a DN345 main. The northern and central precincts are primarily un-serviced. There is a DN600 main running from the northern precinct through the central precinct. The existing sewer infrastructure can be seen in **Appendix A** figure 5 (extract in **Figure 4.8** below).

Figure 4-8 Existing sewer network infrastructure



The nature of the topography will likely significantly impact on the sewer alignment. In particular, the central catchment which is in a valley will be difficult to service with a purely gravitational system.

Due to the large existing lot size, the project area can be treated similarly to a "green-field". As a result, infrastructure can be placed in the optimal position, to reduce cost and difficulty of construction.

4.4.3 Stormwater and drainage

As noted in earlier sections of this report, stormwater and drainage is a critical constraint to site development. Cardno has recently undertaken a flooding analysis of the Pulgul Creek catchment, which contains the Urangan South project area. Flooding data from this investigation found that there are two critical conveyance paths that flow through the central and northern catchments.

The central flow path includes a constructed channel, which overtops for relatively small events, resulting in low depth flooding over a large area. Flood depth mapping for the area clearly shows that this drain has been constructed roughly along the same alignment as the natural watercourse. Other than the construction of the channel however, no further modification of the floodplain occurs. This would suggest that the channel was constructed primarily to cater for

frequent flows. It is unlikely that the extent of inundation for larger events has been significantly affected by the construction of this drain.

The Northern Precinct currently does not have a formalised drainage channel to contain the flooding extent. Therefore, the overland flow discharged across the Northern catchment follows the natural low points in the topography, inundating several properties.

These two critical locations will be the focus areas in the options analysis undertaken in Section 5.1.

It is considered that the central flow path offers significant opportunities in terms of reducing the extent of flooding through the optimisation of the drain in conjunction with localised filling. Similarly, the northern drain is likely to result in similar benefits through a combination of drain shaping and overbank filling. The primary constraint to this are existing properties which have recently been developed.

4.4.4 Preliminary Community Information and Engagement

To further inform the preparation of the structure plan and make the community aware of the project, Council undertook the following activities:

242 letters/factsheet/surveys were sent to all landowners in the locality;

- A notice was placed on Council's website;
- Council posted on its Facebook page;
- An article about the project was written in the Fraser Coast Chronicle (website and physical newspaper);
- An email was sent to local development consultants in the area; and
- An on-line survey was made available to the public between 10 August and 24 August 2018.

A total of ninety-one (91) survey responses were received. In summary, the key issues relate to the following elements:

- A general preference for less small lot subdivisions and more larger lot sizes (+2000m^2);
- The retention of existing trees and vegetation; and
- Upgrades to drainage infrastructure and roads.

4.4.4.1 Preliminary stakeholder engagement

Targeted consultation was undertaken with a limited number of active developers/landowners and consultants within the Urangan South Project Area. This consultation was preliminary in nature and consisted of informal phone discussions using a series of questions to get initial feedback regarding:

- Key constraints to site development (both in terms of physical constraints and regulatory constraints);
- Key opportunities to facilitate development;
- Drivers of development within the project area; and
- Preferred development outcomes for the area.

Based on the responses, the following matters will need to be considered in preparing the structure plan and ultimate local area plan:

- Stormwater/drainage is the critical physical constraint to development within the central part of the site;
- Catchment based solutions to drainage issues are required to facilitate development;
- The Limited development (constrained land) zoned land is the critical regulatory constraint to development on the eastern part of the area;

- The odour buffer is large, and it is unclear whether the actual impacts of the WTP require such a large setback to mitigate actual level of nuisance;
- Population growth and development in Hervey Bay and the project area generally driven by 'lifestylers' – people seeking quiet areas and larger lots to accommodate house and other larger lifestyle accoutrements such as caravans, boats, large workshops etc;
- Demand is generally for larger lots to cater to lifestyle demand;
- The site is well located in terms of proximity to schools and the coastal urban nodes on the Esplanade;
- Proximity to services does not warrant provision of retail or commercial services, however convenience and neighbourhood retail services may be required depending on ultimate local population;
- The preferred development outcome is for a mix of lot sizes, with larger lots (approximately 1,500m^2 - 2,000m^2) being the preferred predominant lot size;
- Initial applications for subdivision in the area was for larger lots (1,500m^2) however increased density was encouraged by Council;
- Structure planning will potentially have limited effect given the fragmented nature of ownership and the difficulty in amalgamating larger development sites amongst the remaining lots;
- The economics of land development in Hervey Bay dictate that larger blocks will be split into 2 or 3 lots and the existing dwellings will be retained, limiting the options for mixed lot sizes and configurations.

5 Options Analysis

5.1 Project area context analysis plan

Based on the findings of this report, a development area analysis plan has been compiled. Refer to **Figure 8 - Development Area Analysis Plan**. The Project Area Analysis Plan synthesises the important opportunities and constraints identified as part of the development area context analysis process. This includes the identification of key features and potential developable areas within the Urangan South project area.

Importantly, the Project Area Analysis Plan provides a basis for carrying out more detailed planning within the structure plan area and the identification of a preferred structure plan concept.

The Project Area Analysis Plan highlights the following:-

- the project area is highly constrained by flooding along the two channels that traverse the site;
- the influence of the Pulgul Creek Odour Buffer limits potential for significant intensification of land uses on the eastern boundary of the site;
- ecological constraints on the site are limited to a narrow corridor that is generally aligned with the drainage channel that traverse the central part of the site;
- the unconstrained areas are generally contingent with the existing urban area of Hervey Bay to the north and west; and
- existing and approved development has progressed significantly in the northern and southern parts of the project area and has entrenched a particular pattern of development.

5.2 Potential scenarios for future development

Prior to embarking on a structure planning exercise, through discussions with Council officers it has been decided to undertake a high level options analysis of a range of development scenarios. This process is intended to provide Council with an opportunity to understand and consider the comparative opportunities and constraints for a range of development options, as well as a preliminary identification of infrastructure requirements and their costs.

Based on discussions with Council officers and from initial review of site constraints, flooding/drainage is the critical constraint to site development. Existing (and currently under preparation) flood mapping identifies that the central part of the site accommodates two (2) drainage corridors that extend across the site and highly constrain future development (refer to **Figure 6 - Flood Hazard Map**). However, the northern part of the site adjacent to Boundary Road is not constrained by flood impacts, and the southern part of the site has to some degree already been given over to urban development given the scale and nature of approvals/applications between the southern boundary and Senor Drive.

On this basis, the structure plan area has been categorized into three broad catchments to reflect flood catchments and existing approval and application activity:

- Northern Catchment – land generally between Boundary Road and Senorita Parade;
- Central Catchment – land in the central part of the site subject to highest intensity of constraints; and
- Southern Catchment – land generally subject to existing approvals and/or applications.

Figure 9 - Catchment Map identifies the catchments and their relative location. It is noted that these catchments are identified only to assist in developing potential development options, and are not intended to be spatial units that will organise land use and development in the final structure plan or local area plan.

5.2.1 Scenario development

The scenarios have been developed based on a range of assumptions for future development within the project area. It is noted that the scenarios are not intended to provide a refined pattern of urban development. Rather, the scenarios provide a broad range of potential urban development densities and locations that will inform the analysis of relative infrastructure and servicing requirements.

Given the range and extent of current residential approvals (including approved and constructed residential subdivisions) within the Southern Precinct, and the roll out of urban services and infrastructure, it is considered that it will generally be developed as a typical low density residential precinct. For the purposes of the scenario analysis, the Southern Precinct will be assumed as being generally developable for typical low density urban development.

The Northern Precinct has a relatively large area that is free from flood constraints and is adjacent to typical suburban residential development to the north. The existing development is serviced by all urban infrastructure, and extension of this infrastructure into the northern precinct is likely achievable with relatively minimal cost and effort. On this basis, this precinct is a logical extension of the current urban area and will likely accommodate future residential development subject to appropriate address of access issues (which we understand is the major consideration to development within this area). Apart from that part of the precinct potentially subject to flooding constraints, for the purposes of the scenario analysis the Northern Precinct is assumed as being generally developable for urban development for either low density residential or larger lot development.

The Central Precinct is the part of the site where drainage and vegetation impacts have the greatest impact on development potential. Assuming that the northern and southern precincts are generally suitable for urban development, the predominant concern of the scenario analysis will be to understand the implications for infrastructure provision depending on the form and extent of urban development accommodated within this Central Precinct area.

For the purposes of the scenario analysis, the part of the project area included in the Limited development (constrained land) zone is not considered as being suitable for further urban development. Under the current planning scheme controls, no intensification of residential development is envisaged within this zone due to the potential amenity impacts on sensitive development, and this is a long held policy position of Council. On this basis, this land has been excluded from further consideration.

The analysis includes consideration of the following scenarios:

1. Maximum Yield (Existing Zoning) Scenario – this scenario assumes that the entire area (excluding the Limited development (constrained land) zone) is given over to low density residential subdivision typical of suburban neighbourhoods. To deliver a larger development footprint and accommodate higher residential densities in the project area the infrastructure requirements for this scenario are greater and include a more interventionist flood control approach (constructed channels, pipes and road corridor drainage infrastructure etc) (refer to **Figure 10 – Option 1 Maximum Yield (Existing Zoning) Scenario Map**);
2. Mixed Lot Scenario – this scenario is based on the northern and southern precincts accommodating low density residential subdivision, with the central precinct accommodating large lot (2,000m^2) development (refer to **Figure 11 – Option 2 Mixed Lot Scenario Map**). The scenario has been developed on the following basis:
    - The southern precinct is already committed to low density urban development due to the high level of development activity that has already occurred;
    - The northern precinct can appropriately accommodate low density residential subdivision as it is adjacent to similar development, and can be relatively easily serviced by development infrastructure;
    - The central precinct will deliver large lot living options that maintains the leafy character and amenity of the precinct while allowing sufficient room to accommodate mitigation options to manage drainage constraints.

The scenario would require the extension of urban infrastructure into the low density residential areas particularly in the northern precinct, as well as drainage controls (minor modifications to natural channels) and management controls such as setbacks and separation distances in the central precinct to deliver a development footprint suitable for larger lot subdivision.

3. Large Lot Scenario – this scenario is based on maintaining the existing pattern of development within the project area, with the southern precinct accommodating low density residential subdivision and the central and northern precincts providing for large lot residential living (refer to **Figure 12 - Option 3 Large Lot Scenario Map**). This scenario would require only limited infrastructure provision as larger lots could potentially provide for on-site effluent disposal, and minor modifications and planning controls (setbacks and separation distances) would potentially be appropriate to manage drainage issues.

5.2.2 Form of urban development

While the final structure plan will consider and identify a range of urban development types (potentially including commercial, community facilities, parklands etc) that may be required to support the project area, in working up the development scenarios it will be assumed that development is predominantly for urban residential purposes.

This approach accords with the likely predominant form of development within the project area being for residential development, and reflects the nature of recently approved developments and development applications that seek residential subdivision.

5.2.3 Density of assumed development

To inform demand generation and calculations of capacity, it will be assumed that the available development area will have the following general densities:

- Low density residential – 20Du/Ha which equates to lot sizes of approximately 500m^2; and
- Low density residential (LDR1 Precinct) – 5 DU/Ha which equates to lot sizes of approximately 2,000m^2.

This approach is based on the current Reconfiguring a Lot Code which seeks a minimum lot size of 500m^2 within the Low density residential zone, however provides for larger lot sizes in specific precincts. This approach reflects that the area is zoned for low density residential development, however also reflects that the predominant form of historical development is for larger lot living and it is likely that some mix of lot sizes will ultimately be accommodated within the area.

5.2.4 Further Investigation Area

At this stage of the project, the scenarios are not sufficiently refined to allow for a detailed solution of drainage issues to be finalised given that they have been prepared only to inform the analysis. On this basis, the analysis identifies a 'Further Investigation Area' (FIA) generally along the drainage corridors. For each of the scenarios the general type and scale of drainage control works has been identified, however the precise impact in terms of extent of land affected has not been modelled. This approach is considered appropriate in that it acknowledges that this part of the site is subject to constraint and may require mitigation works to facilitate future development, while managing potential community concerns around impacts of flood on individual properties.

5.3 Estimated area of land for urban development

The approximate area of land considered potentially available for urban development is 120Ha.

For the purposes of the scenario exercise this includes all land identified for potential residential purposes including land potentially subject to constraint or required for any future drainage mitigation works. This approach is considered appropriate as it generates a 'maximum' development outcome for each scenario and ensures that preliminary infrastructure estimates are based on a 'worst case' scenario i.e. the maximum potentially required.

Only land within the Limited development (constrained land) zone has been excluded from these calculations.

5.4 Indicative dwelling and population yield

Based on the available development area within each scenario, **Table 5.1** below provides an indicative dwelling and population yield for the various land use mixes.

These scenarios assume that 15% of the potentially unconstrained land will be required to accommodate roads, urban open space and community infrastructure, and a household composition of 2.3 persons per household (based on 2016 census data for Hervey Bay Statistical Area Level 3).

Table 5-1 Indicative Dwelling and Population Yield

Option	Potential Number of Dwellings	Potential Population Yield
Option 1: Maximum Yield (Existing Zoning) Scenario	2,040	4,692
Option 2: Mixed Lot Scenario	1,380	3,174
Option 3: Large Lot Scenario	1,017	2,339

5.5 Infrastructure considerations

5.5.1 Stormwater and drainage

The stormwater and drainage solution for the proposed scenarios consists of the modification of the major flowpaths, to varying levels of engineering intervention, in combination with traditional stormwater drainage (pits and pipes) required to convey stormwater runoff from properties to the major flowpaths.

In order to simplify the analysis, it has been proposed to confine the primary flow path of the northern and central precincts to the further investigation area boundary shown below. External to these major overland flow paths, an approximate drainage network is recommended based on as-constructed information for similar development densities within the Pulgul Creek area.

Each of the scenarios is discussed further below.

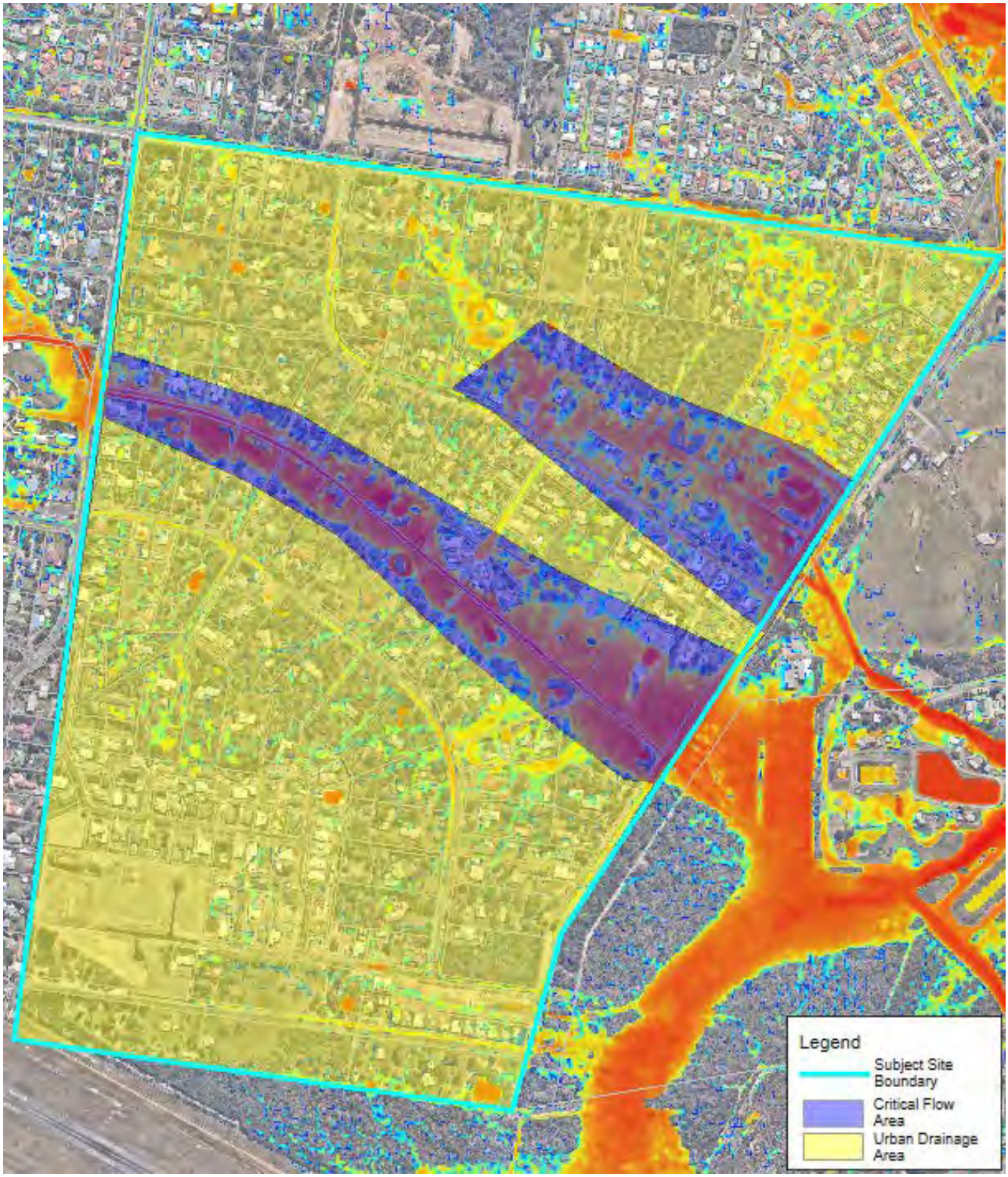
Common to all of the scenarios are the following objectives:

- Development to be located above the 1% AEP flood level, with appropriate freeboard allowance. Filling of low lying areas may be required to achieve this. Council is not responsible for ensuring that all land outside the flood corridor is filled to achieve this objective.
- Development is to be located above the storm tide inundation level, with due allowance for sea level rise.
- Development must be designed for conveyance of overland flows throughout the structure plan area.
- All overland flows are to discharge to legal points of discharge, i.e. to the identified flow paths.
- Overland flow paths are to incorporate natural stream design techniques where possible.

- Upstream catchment runoff must be catered for.
- Impacts to properties downstream of the structure area must be avoided.

Figure 5-1 below shows the existing flood extent overlaid with the proposed approaches to constrain the inundation. It can be noted that inundation is shown outside of the critical flow area. This is a consequence of the methodology used for the flood assessment. The assessment used the 'rainfall on grid' method, which applies rainfall to all cells within the model. This results in ponded areas throughout the model. Many of these areas are not flooding but are isolated ponded areas which can be dealt with through filling associated with appropriate stormwater drainage design.

Figure 5-1 **Proposed Stormwater Options Areas**



5.5.1.1 Large Lot Scenario

The Large Lot Scenario aimed to keep the flooding extent to the further investigation areas shown in **Figure 5-2**. This option investigated the effect of minimal constructed engineering solutions as the lots are large and can therefore tolerate a degree of inundation whilst leaving sufficient land for occupation above the 1% AEP flood level. It has been proposed that the dimensions of the existing drain in the central precinct be unchanged, with minor maintenance measures put in place e.g. grading the channel bed, relining the rock protection, filling of small regions to ensure the flooding extent is within the proposed corridor and management of vegetation.

The northern precinct flow path adopts the same approach as the central region, with only maintenance measures being implemented. Error! Reference source not found. below demonstrates the flooding extent for the 1% AEP event with these solutions implemented. Significant inundation occurs in the vicinity of the channel. Outside of the channel, traditional stormwater drainage (pits, pipes and road drainage) would be used to convey runoff into the channel. As the lots are large for this scenario, the stormwater drainage requirements are low.

A flood hazard map of the Large Lot Scenario has also been provided below (see **Figure 5-3**). Within the central channel a high flood hazard occurs through the channelized open drain. Once the capacity of the channel is reached and water overtops the channel, the inundation depth is low, resulting in low hazard levels for the majority of the inundated area.

Within the northern precinct, as there is no formal drainage channel present, the overland flow discharges at a slower rate over a wider area thus generating a lower flood hazard. This type of flooding is acceptable within a large lot where sufficient land unaffected by flooding is available as it occurs infrequently, the hazard level is low and the duration of flooding is relatively brief.

Figure 5-2 Large Lot Scenario Flood Extent

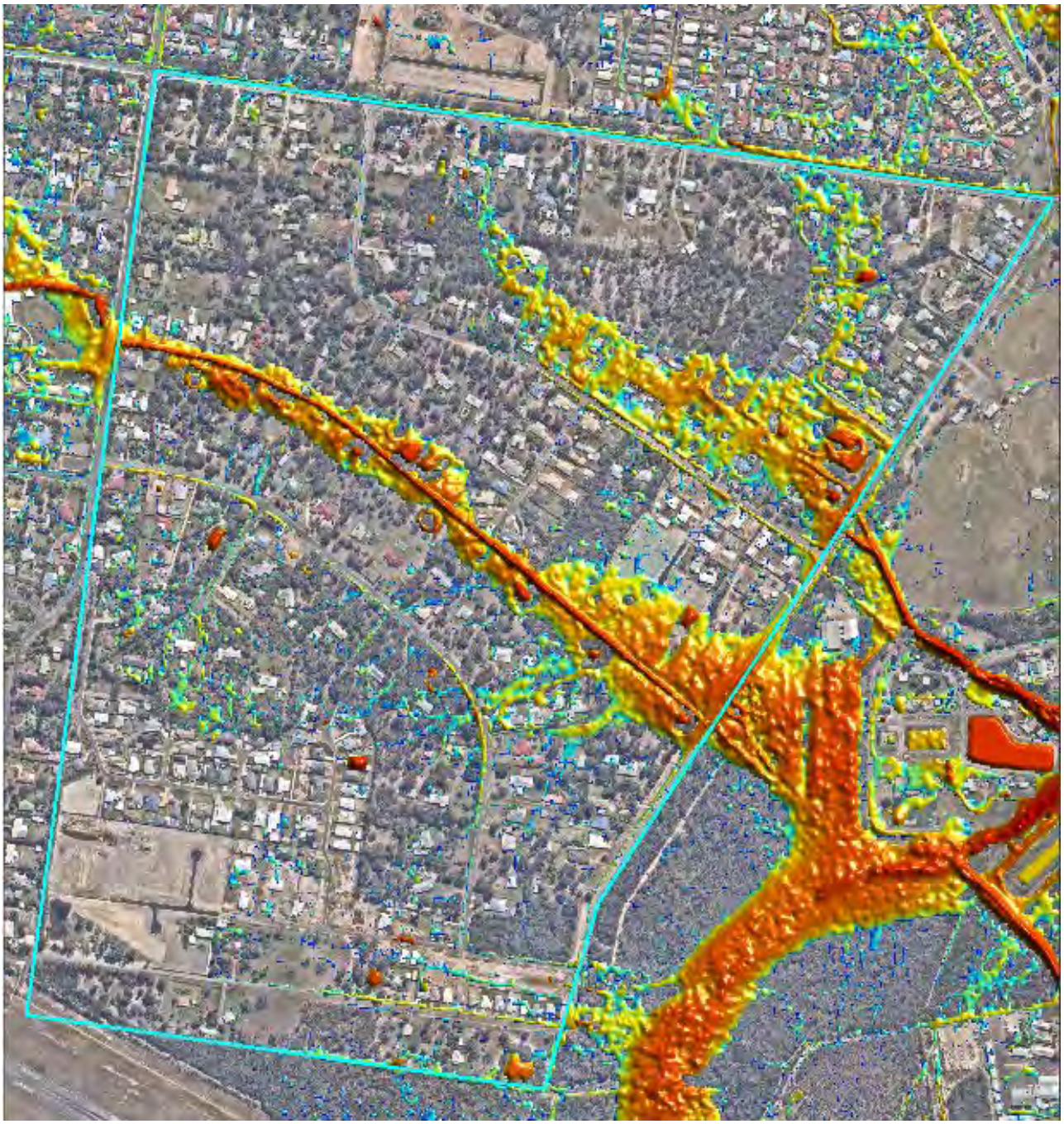
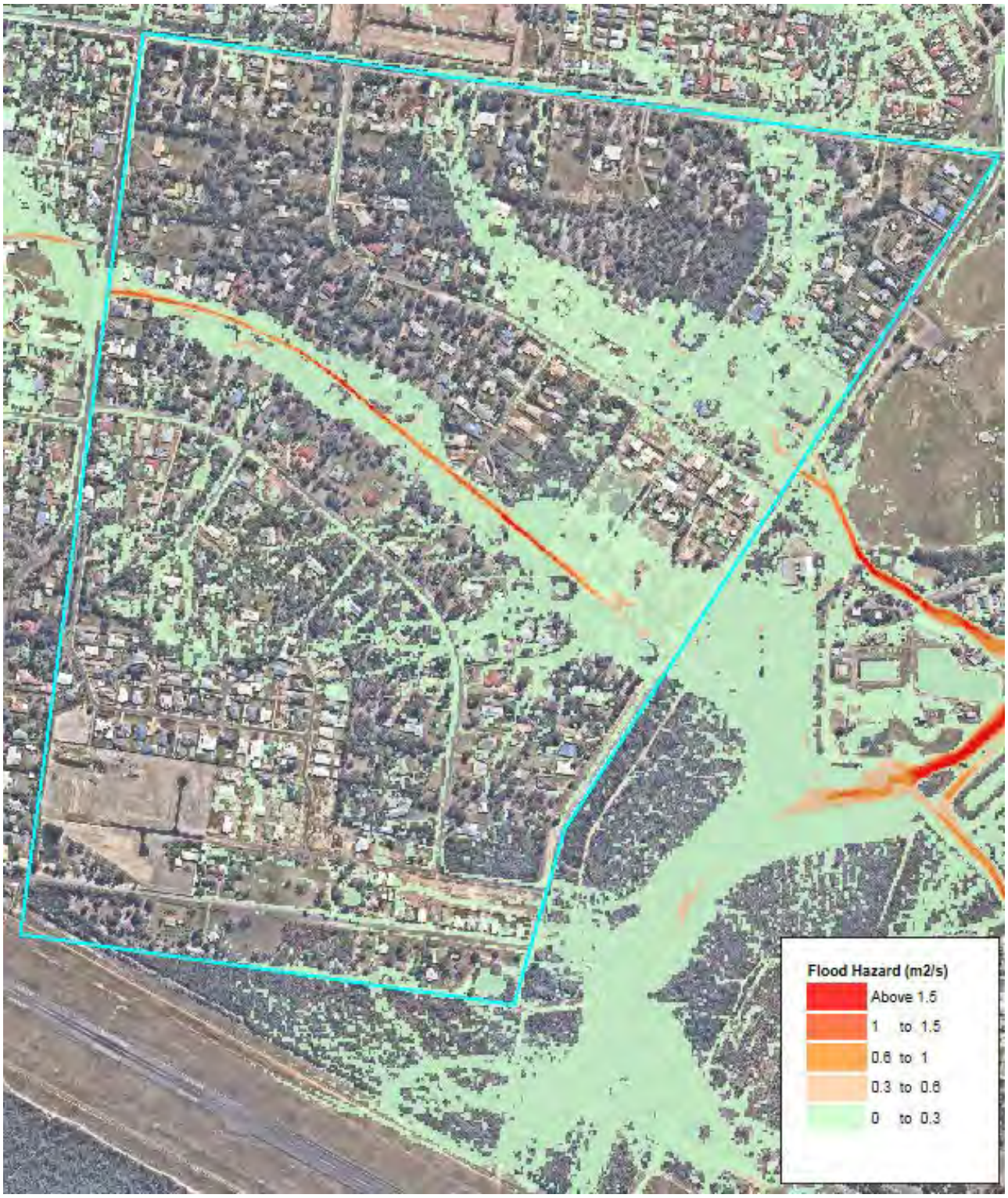


Figure 5-3 Large Lot Scenario Flood Hazard



5.5.1.2 Mixed Lot Scenario

The Mixed Lot Scenario involves the use of a higher density of development than the Large Lot Scenario. The assessment therefore aimed to achieve a lesser flooding extent as the type of flooding occurring in the Large Lot Scenario would not be acceptable within smaller lots.

This option, as part of the land use strategy, includes an environmental buffer. The proposed measure for the central precinct uses this buffer to provide additional conveyance of flood flows, whilst retaining the dimensions of the existing open channel. Although potentially not necessary from a flooding perspective, the flood modelling was conducted assuming that it would be beneficial to use the environmental corridor for flooding during the large events. Hence the extent the flooding encompasses the environmental corridor and may appear to be more extensive than for the large lot scenario. Based on the modelling it is likely that an appropriately designed channel could be designed to carry flood flows without inundating the environmental corridor, thereby reducing the extent of flooding, similar to the option presented for the maximum yield option. Further investigation into the use of the environmental corridor would occur if the mixed use scenario proceeded to further analysis.

The northern precinct flooding strategy involves the use of a 14 metre wide drain with a 1 in 8 batter arrangement to contain the flooding within the proposed extent. **Error! Reference source not found.** below demonstrates the flooding extent in a typical Q100 event with these processes implemented.

It is noted for this option that overtopping of the drain occurs on the southern side of the drain, near Walkers Road. Filling of these areas could potentially ensure that the flooding is confined to the extents of the drain, providing more developable land.

It is also noted that overtopping of the drain occurs at the eastern end just upstream of Walkers Road. Filling of these areas could potentially ensure that the flooding is confined to the extents however no filling has been applied to the area as no intensification of development is to occur in this area due to its location within the odour buffer.

A flood hazard map of the Mixed Lot Scenario has also been provided below (see **Error! Reference source not found.**). Similar to the Large Lot Scenario, the existing open channel generates a high flood hazard. The northern precinct drain, now channelized, also experiences high flood hazard. Hazard for other areas remains low.

Figure 5-4 Mixed Lot Scenario Flood Extent

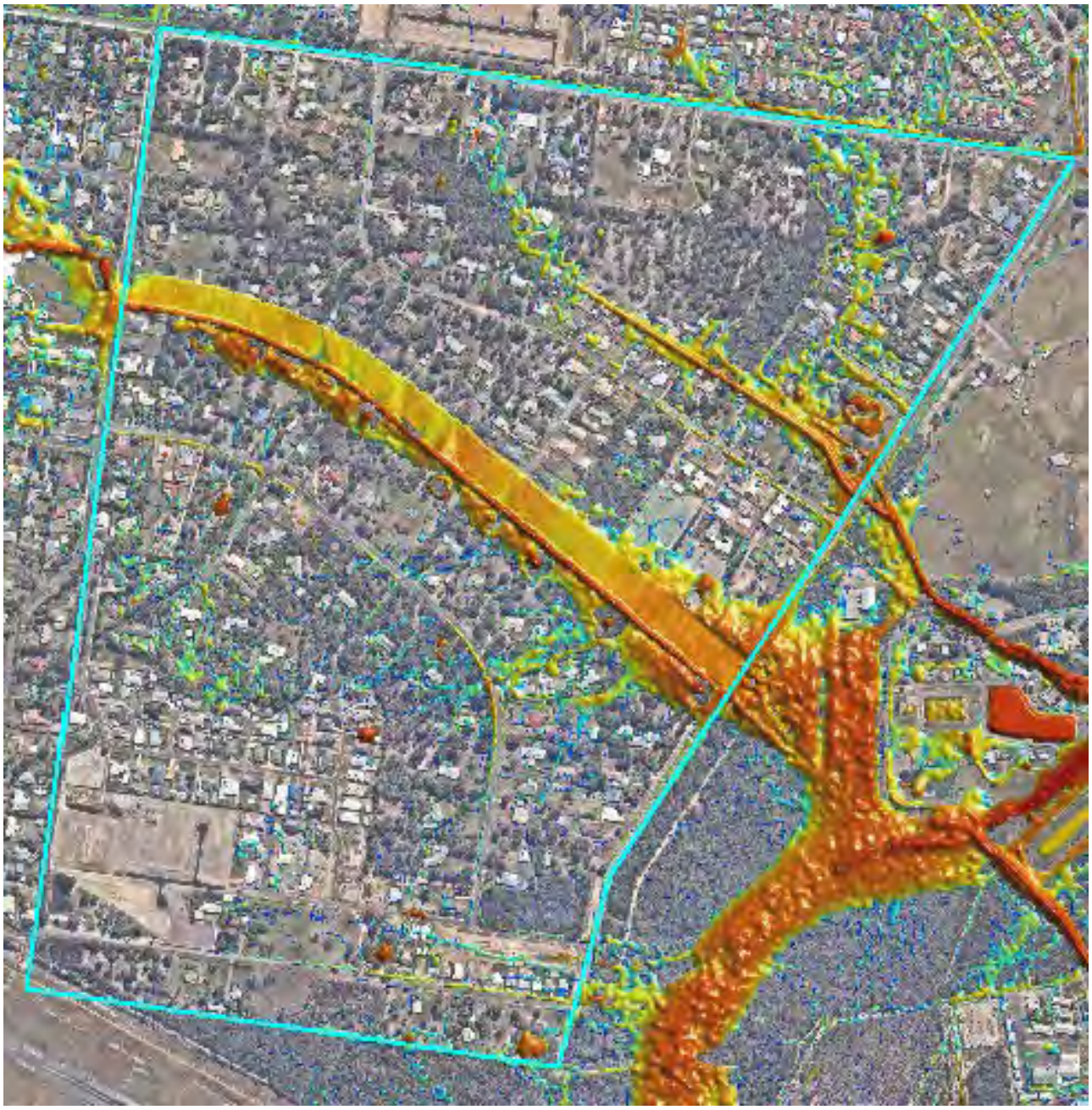
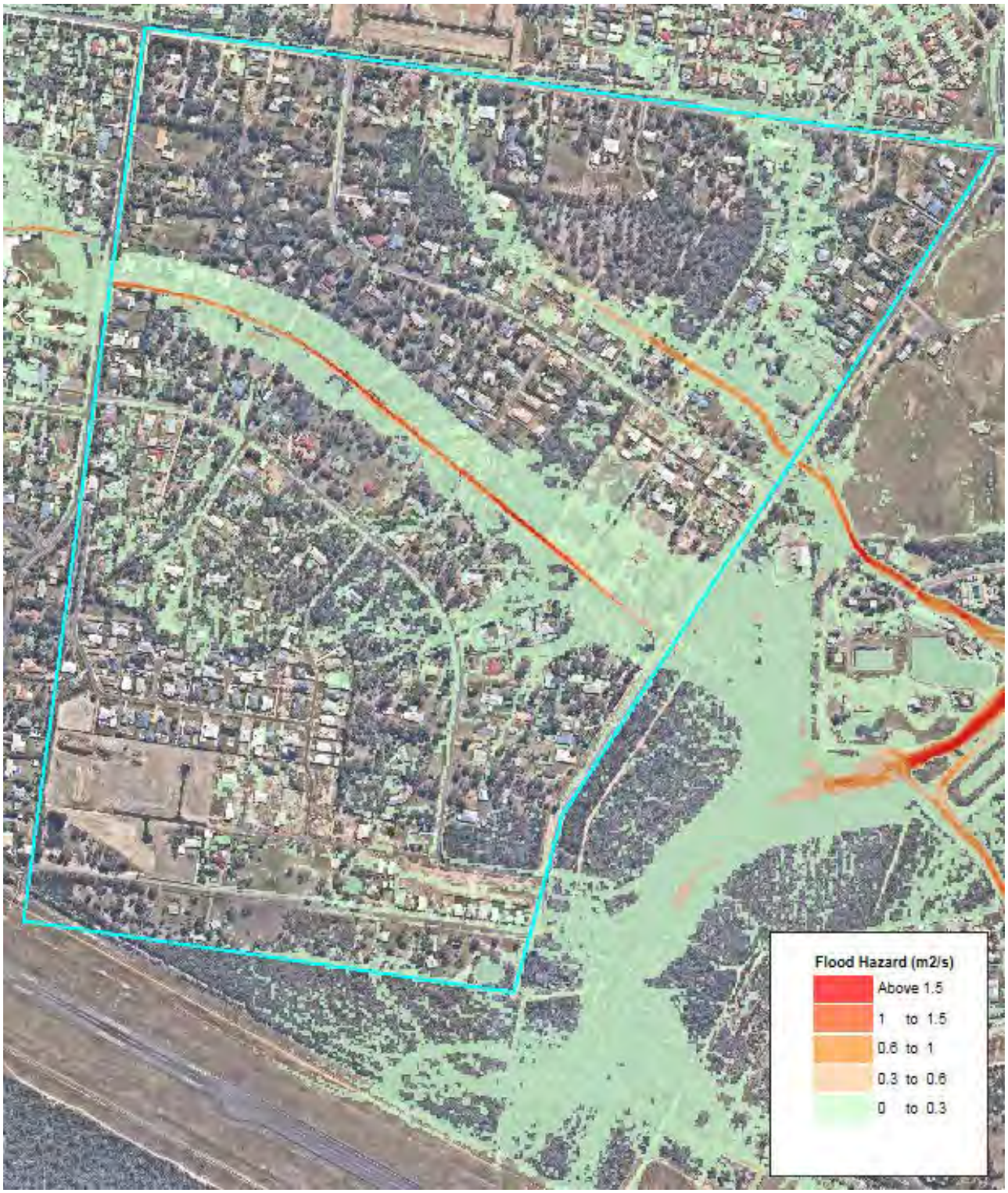


Figure 5-5 Mixed Lot Scenario Flood Hazard



5.5.1.3 Maximum Yield (Existing Zoning) Scenario

The Maximum Yield option involves the highest yield possible. The intent of the flood assessment was therefore to reduce the flood extent to the minimum area possible. Constructed engineering solutions around the major northern and central precinct flow paths have been investigated.

For the central precinct, an upgrade of the existing open channel and an adjacent vegetated environmental corridor was investigated. A 15 metre wide channel with a 1 in 6 batter to replace the existing open channel was adopted. Although the environmental buffer is included in this scenario, it was not required for flooding purposes.

The northern precinct flooding strategy involves construction of a new 10 metre wide drain with a 1 in 6 batter to keep the flooding within the proposed extent. **Figure 5-6** below demonstrates the flooding extent in a typical 1% AEP event with these drains implemented.

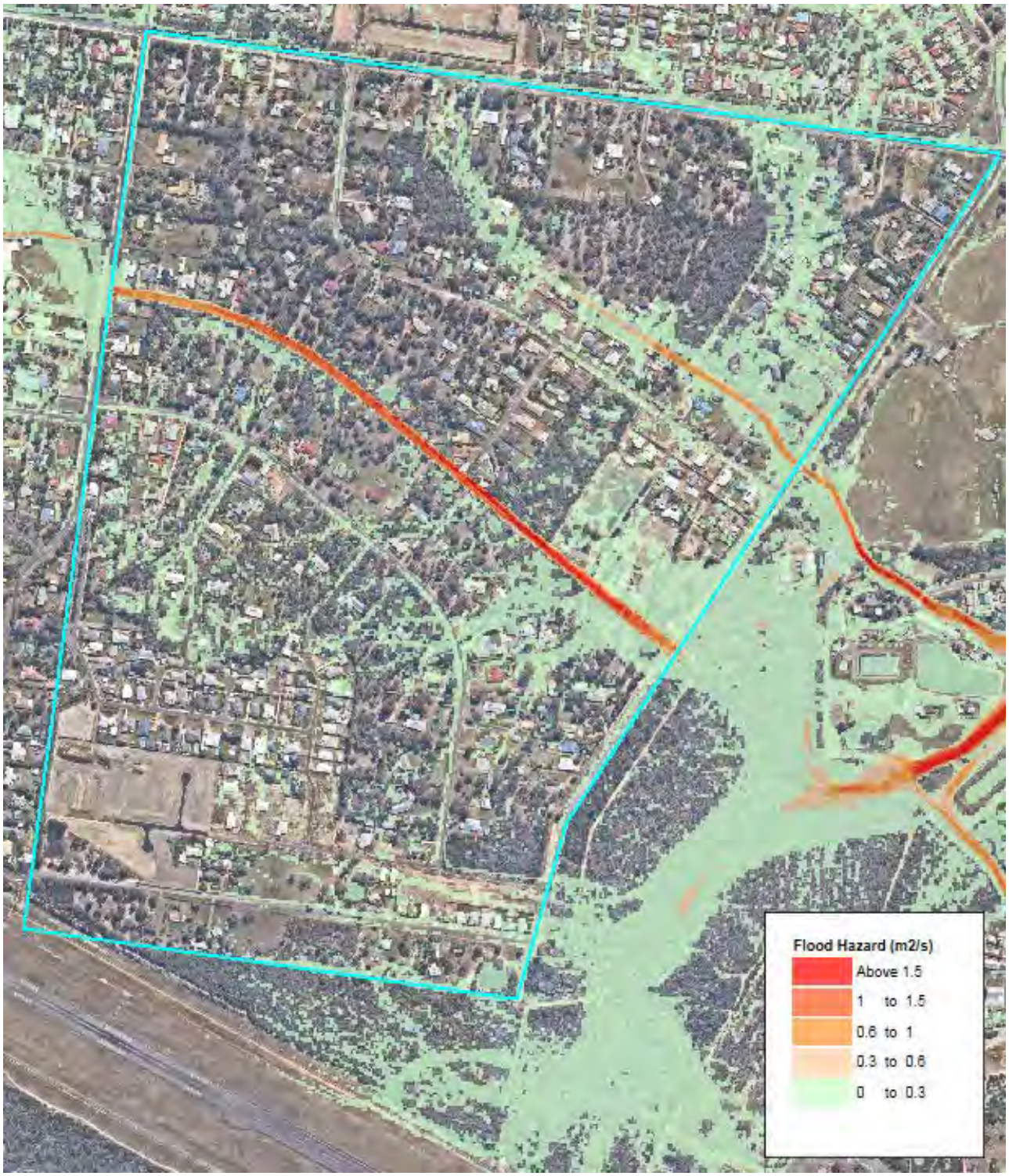
A flood hazard map of the Mixed Lot Scenario has also been provided below (see Error! Reference source not found.). The upgraded open channels in the Central and Northern Precinct produce high flood hazard levels within the drains and would require a similar level of protection as for the existing drain (which is lined with rock). Very little overflow from the drains occurs, except in the area adjacent to Walkers Road, which is within the odour buffer. Flood depths and hazard remain low in this area, other than within the drain itself.

This option results in a significant reduction in the extent of flooding within the area. However, the cost to construct the drain is significantly higher than the previous options primarily due to the need for rock protection throughout the full length of the drain.

It is noted that this drain option and that adopted for the mixed use scenario are interchangeable. That is, this option could be adopted for the mixed use scenario or the mixed use scenario drain option could be adopted for this option.

Figure 5-6 Maximum Yield (existing zoning) Scenario Flood Extent

Figure 5-7 Maximum Yield (existing zoning) Scenario Flood Hazard



5.5.1.4 Stormwater drainage assessment

A cost estimate for the flooding and stormwater drainage works required for the area is provided below. It is noted that this estimate is an approximation, with a large contingency factor due to the many variables involved in stormwater drainage design and construction, including the timing of construction (whilst the roads are being built or after), the locations of infrastructure and the timing of development. The costing provided below is considered to be sufficient only to provide a comparison between the three options.

5.5.1.5 Scenario Costing

Due to the highly conceptual stage of this options analysis, the initial costing of the budget required to undertake these works have been limited to standard rates utilised from previous projects. It cannot be stressed enough that these costs are extremely high level estimates and once a scenario has been selected, a more detailed analysis of the cost can be undertaken. It is also noted that there are alternative and additional drainage works that could also be incorporated to improve site drainage (such as inclusion of stormwater drainage within augmented road infrastructure), and that the available stormwater interventions need not align with any of the yield outcomes.

The total costs of works have been broken up into the cost of the stormwater drainage and flooding (primarily the open channels) works. Estimates for the stormwater drainage have been costed on the quantity of pipework required for similar developments nearby. These quantities are then converted to an approximate price per hectare (depending on the density) and then multiplied to area of each proposed development density within the subject site. At this stage, the approximate cost of flooding works has been estimated from the total of cut required to either upgrade the existing drain, form a new drain and even the existing surface for the environmental corridor. An additional rate of relining the open channel and environmental buffer has also been considered. A combination of these two estimates generates an approximate cost of works with regards to stormwater drainage and flooding. Error! Reference source not found. below provides a cost estimate of all three scenarios.

Table 5-2 Scenario Cost Estimates of Stormwater Drainage Works

Scenario	Cost of stormwater drainage works	Cost of Flooding (drain) works	Total cost of works
Option 1: Maximum Yield (existing zoning) Scenario	$18,000,000	$4,000,000	$22,000,000
Option 2: Mixed Lot Scenario	$11,600,000	$1,400,000	$13,000,000
Option 3 : Large Lot Scenario	$7,000,000	$0	$7,000,000

5.5.2 Transport network

5.5.2.1 Development Options

Based on the three development scenarios, various parts of the area have been assigned a dwelling rate per hectare which informs the basis of the traffic potentially generated onto the road network.

A summary of the approximate dwelling yields per development option is provided in **Table 5-3**. It is noted that the slight discrepancy between the indicative dwelling yields in **Table 5-1** and **Table 5-3** is due to these calculations being based on a CAD model that provides a more detailed and spatially accurate breakdown of the various elements of the development area. For the purposes of this analysis the difference is negligible and the calculated traffic demand provides an appropriate basis to compare the relative impacts of the broad land use scenarios.

Due to the large difference in traffic generation rates between residential and commercial development, the higher density option (Maximum Yield Scenario) has included commercial development of approximately 10,000m^2 of retail as part of the traffic analysis. The quantum of commercial area is an assumption only for the purposes of the analysis. This approach is considered suitable as the higher population density in this scenario may require local retail and commercial facilities to be provided, and allows for the scenario analysis to contemplate the greatest potential impacts.

Table 5-3 Summary of Development Options

Development Option	Developable Dwellings*	Indicative Total Trips in Peak Hour
Option 1: Maximum Yield (Existing Zoning) Scenario	2,155 dwellings 9,970sq.m retail	2,206 vehicles per hour
Option 2: Mixed Lot Scenario	1,501 dwellings	1,220 vehicles per hour
Option 3 : Large Lot Scenario	1,007 dwellings	758 vehicles per hour

*Approximate number of dwellings based on land use scenarios and not including approved uses

5.5.2.2 Proposed Access Roads

Existing access to the development area is via Walkers Road, Senorita Parade and Hughes Road. These roads connect to Boundary Road on the site's northern boundary.

As outlined in **Table 5-3**, the land use plan provides for a range of between approximately 1,000 to 2,100 dwellings in each of their respective scenarios. The traffic demand from these scenarios is expected to exceed the capacity of the existing form of the internal roads, which will therefore require some form of upgrade.

Based on the likely traffic demands, Walkers Road, Senorita Parade, and Senor Avenue would potentially require upgrade to a Major Collector road. Typical cross sections for the potential upgrades to existing roads from the FCRC standard drawings are provided in **Figure 5-9**.

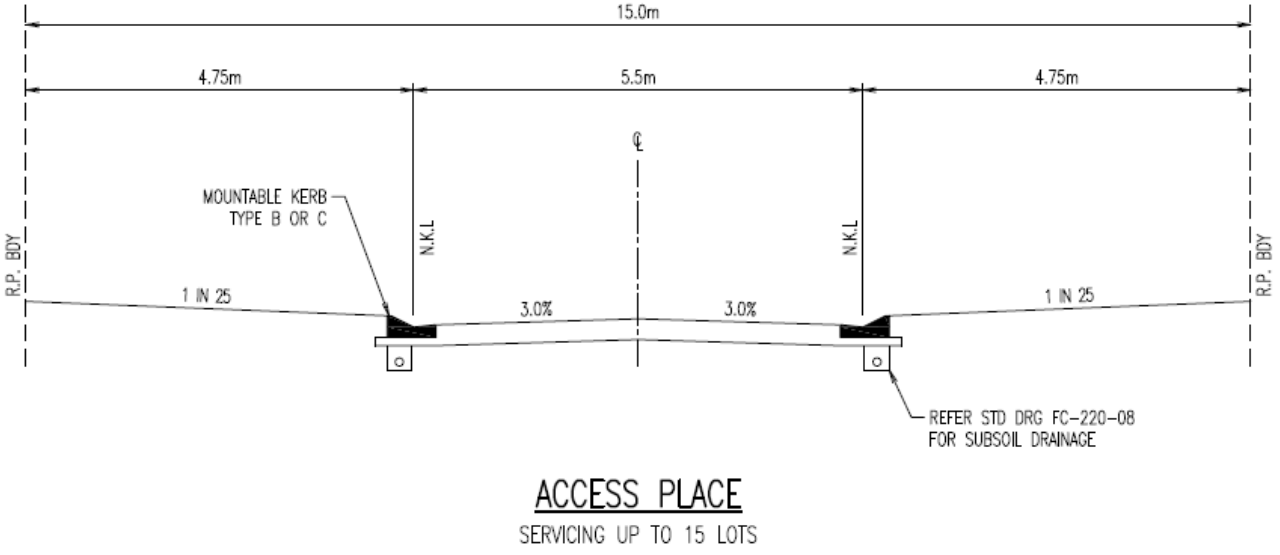
A future LGIP upgrade of Boundary Road from a 2-lane undivided road to a 4-lane median divided road is scheduled to be completed by 2025. The hierarchy of the road will change as result of the duplication which will facilitate an increased traffic flow and a higher speed environment. As such, dwellings with their frontages on Boundary Road will be required to adopt a left in/left out access arrangement in the short term. However, in the longer term direct access to Boundary Road is not considered optimal and alternative access would be required.

In this regard, rear-lot access via a new access road to existing and future dwellings along Boundary Road are recommended to maintain the safety and efficiency of the broader road network, while also allowing for urban development to occur in the northern part of the project area (refer to **Figure 5-8** and a typical cross section in **Figure 5-9**)

Figure 5-8 Proposed New and Upgraded Roads

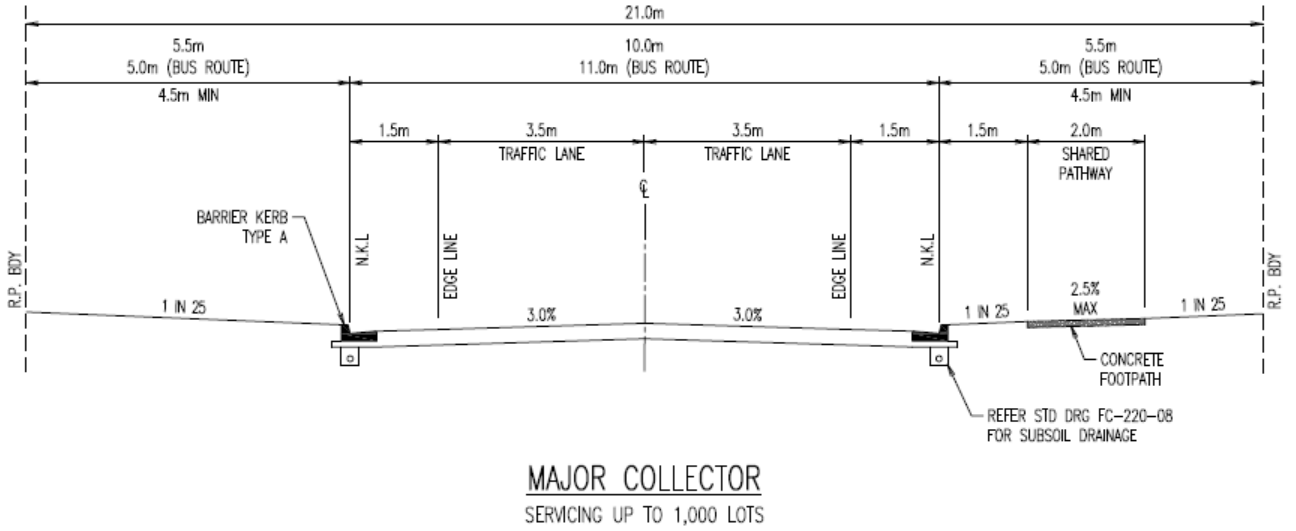
Source: Photomap by nearmap.com

Figure 5-9 **Typical Cross Section for New Access Road in northern catchment**



Source: FCRC Standard Drawings FC-200-01

Figure 5-10 **Typical Cross Section for Proposed Upgrade to Existing Roads (Senor Avenue, Senorita Parade, Walkers Road)**



Source: FCRC Standard Drawings FC-200-02

5.5.3 Traffic Operational Assessment

5.5.3.1 Study Area

For the purpose of this traffic study, the intersections outlined in **Figure 5-11** have been assessed.

Figure 5-11 Study Intersections

Source: Photomap by nearmap.com

Four (4) study intersections have been included in the assessment:

1. Boundary Road / Booral Road
2. Boundary Road / Walkers Road
3. Boundary Road / Senorita Parade
4. Boundary Road / Robert Street / Hughes Road

5.5.3.2 Assessment Criteria

Intersection Degree of Saturation

The performance of each study intersection has been analysed using SIDRA Intersection 7.0 (SIDRA). SIDRA is an industry recognised analysis tool that estimates the capacity and performance of intersections based on input parameters, including geometry and traffic volumes, and provides estimates of an intersection's Degree of Saturation (DOS), queues and delays. Simplistically, DOS is a measure of the proportion of traffic entering an intersection relative to the intersection's capacity. **Table 5-4** provides the TMR-defined DOS thresholds.

Table 5-4 Adopted Intersection Performance Threshold – Degree of Saturation

Intersection Treatment	DOS Threshold
Signalised Intersections	Less than or equal to 0.90
Roundabouts	Less than or equal to 0.85
Priority controlled intersections	Less than or equal to 0.80

Source: TMR Guidelines for Assessment of Road Impacts Development

The guideline notes that a DOS exceeding the values indicated in Table 5-3 indicates that an intersection is nearing its practical capacity and upgrade works may be required. Above these threshold values, users of the intersection are likely to experience increasing delays and queueing.

Intersection Critical Delay

Importantly it is noted that DOS is not the only performance indicator and that other measures such as critical delay should also be considered when assessing the performance of an intersection. Other authorities such as the NSW Roads and Maritimes Services (RMS) recommend the use of the critical movement delay for assessing the performance of priority-controlled intersections.

The RMS Guide to Traffic Generating Developments states that the Delay statistics for the critical movement provides a better indication of intersection performance and safety for priority-controlled intersections and roundabouts than DOS. **Table 5-5** provides the RMS-defined delay thresholds.

Table 5-5 Adopted Intersection Performance Threshold – Critical Delay

LOS	Level of Service Description	Critical Delay
A	Good Operation	Less than 14 sec
B	Acceptable delays and spare capacity	15 to 28 sec
C	Satisfactory, but accident study required	29 to 42 sec
D	Near capacity and accident study required	43 to 56 sec
E	At capacity, requires other control mode	57 to 70 sec

Source: RMS Guide to Traffic Generating Developments

5.5.3.3 Intersection 1: Boundary Road / Booral Road Intersection

The current configuration of this intersection is a priority controlled. The SIDRA assessed layout is illustrated on **Figure 5-12**. The aerial image shows the flyover above the intersection.

Figure 5-12 SIDRA Assessed Layout – Boundary Road / Booral Road Intersection

Source: Photomap by nearmap.com & SIDRA 7.0

The results of the SIDRA network assessment are summarised in **Table 5-6** for the Boundary Road / Booral Road intersection.

Table 5-6 SIDRA Results – Boundary Road / Booral Road – Current Assessment

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95%ile Queue	DOS	Critical Delay	95%ile Queue
2018 BG	0.654	24 sec	27m	0.778	34 sec	38m
2028 BG	0.918	56 sec	66m	1.122	167sec	187m
2028 BG + Option 1	2.962	1785 sec	1504m	4.527	3200 sec	1360m
2028 BG + Option 2	1.870	808 sec	840m	2.44	1325 sec	871m
2028 BG + Option 3	1.527	505 sec	564m	1.828	777 sec	623m

The results of the analysis indicate that the priority controlled arrangement operates above the typical performance thresholds (DOS $\leq$ 0.80 for priority controlled), for all assessed options and mitigation measures are required (discussed in **Section 5.5.3.8**).

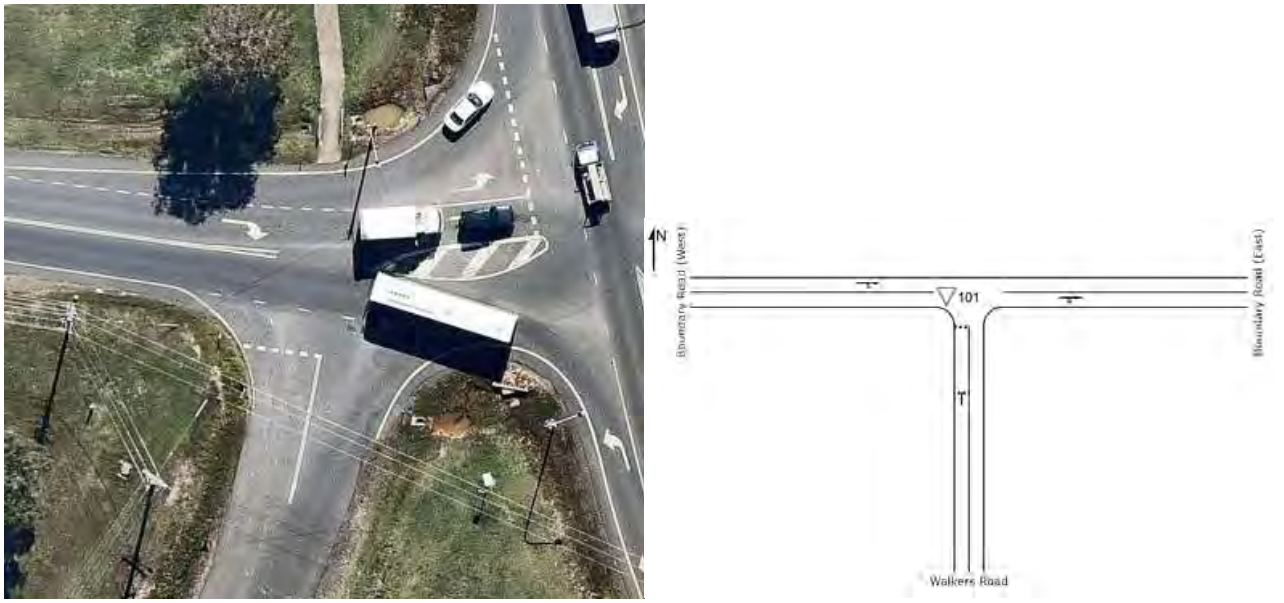
However, as survey volumes used analyse Boundary Road / Walkers Road intersection were derived from a combined count of Boundary Road / Walkers Road / Booral Road, results from both intersections are to be reviewed in conjunction.

Therefore, upgrades of either intersection would likely require upgrade of both intersections and perhaps alignment into a combined intersection as intersection spacing is limited for a signalised option this would not comply with Queensland Streets minimum requirement of 60m for Access Streets intersection spacing.

5.5.3.4 Intersection 2: Boundary Road / Walkers Road Intersection

The current configuration of this intersection is a priority controlled intersection. The SIDRA assessed layout is illustrated on **Figure 5-13**. The aerial image shows the flyover above the intersection.

Figure 5-13 SIDRA Assessed Layout – Boundary Road / Walkers Road Intersection



Source: Photomap by nearmap.com & SIDRA 7.0

The results of the SIDRA network assessment are summarised in **Table 5-7** for the Boundary Road / Walkers Road Intersection

Table 5-7 SIDRA Results – Boundary Road / Walkers Road Intersection – Current Assessment

Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95%ile Queue	DOS	Critical Delay	95%ile Queue
2018 BG	0.214	8 sec	1m	0.22	9 sec	1m
2028 BG	0.255	9 sec	1m	0.263	10 sec	1m
2028 BG + Option 1	1.086	124 sec	213m	0.790	41 sec	56m
2028 BG + Option 2	0.580	14 sec	24m	0.475	14 sec	16m
2028 BG + Option 3	0.416	11 sec	14m	0.411	11 sec	9m

The results of the analysis indicate that the priority controlled arrangement operates within the typical performance thresholds (DOS $\leq$ 0.80 for priority controlled), for all assessed scenarios.

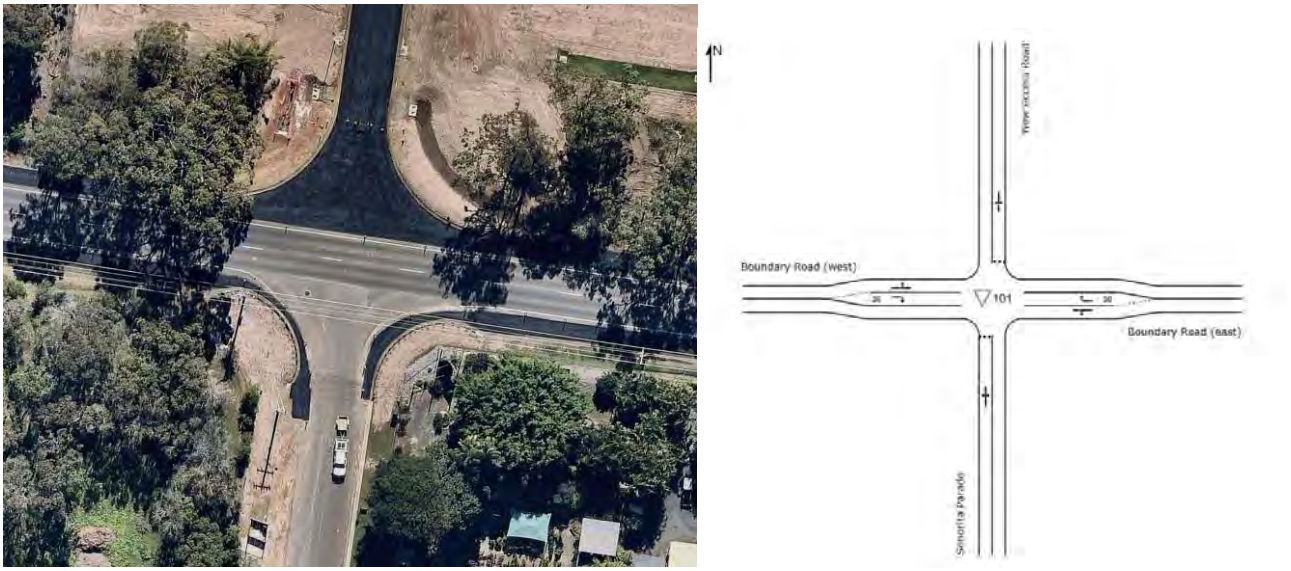
However, as survey volumes used analyse Boundary Road / Walkers Road intersection were derived from a combined count of Boundary Road / Walkers Road / Booral Road, results from both intersections are to be reviewed in conjunction.

Therefore, upgrades of either intersection would likely require upgrade of both intersections and perhaps alignment into a combined intersection as intersection spacing is limited for a signalised option this would not comply with Queensland Streets minimum requirement of 60m for Access Streets intersection spacing.

5.5.3.5 Intersection 3: Boundary Road / Senorita Parade Intersection

The current configuration of this intersection is a priority controlled intersection. The SIDRA assessed layout is illustrated on **Figure 5-14**. The aerial image shows the flyover above the intersection.

Figure 5-14 SIDRA Assessed Layout – Boundary Road / Senorita Road Intersection



Source: Photomap by nearmap.com & SIDRA 7.0

The results of the SIDRA network assessment are summarised in **Table 5-8** for the Boundary Road / Senorita Road Intersection

Table 5-8 SIDRA Results – Boundary Road / Senorita Road Intersection – Current Assessment

Scenario	AM Peak			PM Peak		
	DOS	Delay	95%ile Queue	DOS	Delay	95%ile Queue
2018 BG	0.241	22 sec	6m	0.240	21 sec	3.6m
2028 BG	0.387	35 sec	11m	0.286	32 sec	6m
2028 BG + Option 1	8.20	6503 sec	2695m	7.70	1750 sec	1537m
2028 BG + Option 2	1.68	747 sec	603m	1.025	313 sec	39m
2028 BG + Option 3	0.859	130 sec	30m	0.51	75 sec	12m

The results of the analysis indicate that the priority controlled arrangement operates above within the typical performance thresholds (DOS $\leq$ 0.80 for priority controlled), for all assessed options and mitigation measures are required (discussed in **Section 5.5.3.8**).

5.5.3.6 Intersection 4: Boundary Road / Robert Street / Hughes Road Intersection

The current configuration of this intersection is a four-way priority controlled intersection. The SIDRA assessed layout is illustrated on **Figure 5-15**. The aerial image shows the flyover above the intersection.

Figure 5-15 SIDRA Assessed Layout – Boundary Road / Robert Street / Hughes Road Intersection

Source: Photomap by nearmap.com, SIDRA 7.0

The results of the SIDRA network assessment are summarised in **Table 5-9** for the Boundary Road / Robert Street / Hughes Road Intersection

Table 5-9 SIDRA Results – Boundary Road / Robert Street / Hughes Road Intersection

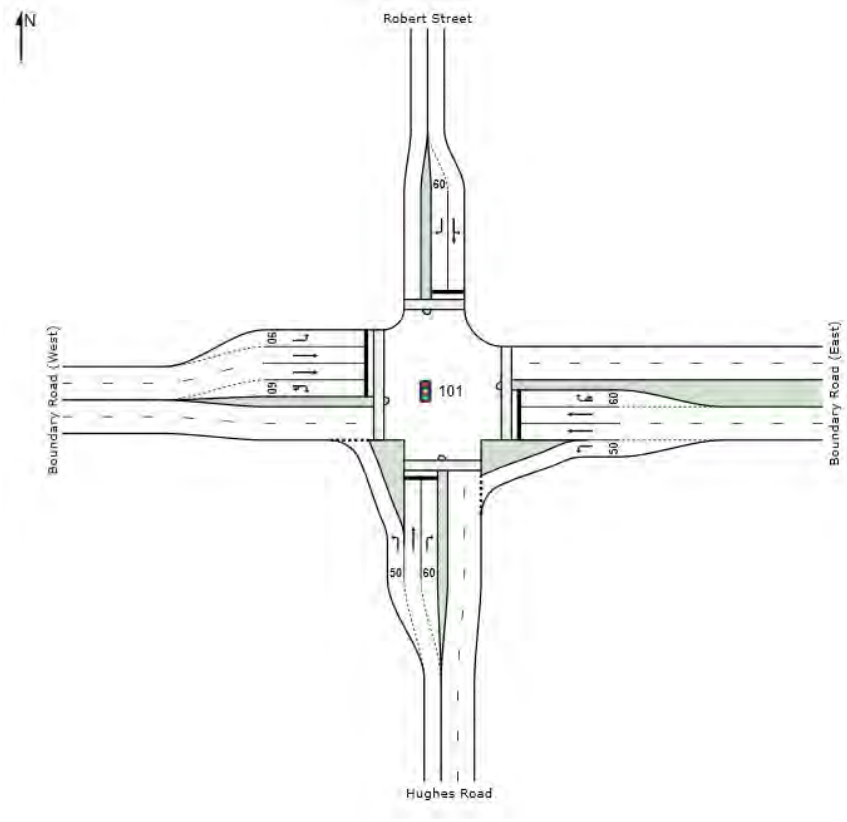
Scenario	AM Peak			PM Peak		
	DOS	Critical Delay	95%ile Queue	DOS	Critical Delay	95%ile Queue
2018 BG	0.253	13 sec	7m	0.207	11 sec	3m
2028 BG	0.301	16 sec	9m	0.247	13 sec	4m
2028 BG + Option 1	6.668	5119 sec	3124m	4.811	3482 sec	1275m
2028 BG + Option 2	2.058	975 sec	1234m	0.967	108 sec	74m
2028 BG + Option 3	1.008	75 sec	160m	0.433	21 sec	20m

The results of the analysis indicate that the priority controlled arrangement operates above the typical performance thresholds (DOS $\leq$ 0.80 for priority controlled), for all assessed options. Upgrades to the intersection are planned in 2020, the upgraded form has been assessed in **Section 5.5.3.7**.

5.5.3.7 Intersection 4: Boundary Road / Robert Street / Hughes Road Intersection (Upgrade)

Council has planned to upgrade the Boundary Road / Robert Street / Hughes Road Intersection to a signalised intersection by 2020. FCRC has provided a proposed SIDRA ultimate layout for the intersection, this layout has been assessed it as per the assessment criteria detailed in section 5.5.3. The SIDRA assess layout is illustrated in **Figure 5-16**.

Figure 5-16 **SIDRA Assessed Layout – Boundary Road / Robert Street / Hughes Road Intersection (Upgrade)**



Source: Photomap by nearmap.com & SIDRA 7.0

The results of the SIDRA network assessment are summarised in **Table 5-10** for the upgrade of Boundary Road / Robert Street / Hughes Road intersection.

Table 5-10 **SIDRA Results – Boundary Road / Robert Street / Hughes Road Intersection (Upgrade)**

Scenario	AM Peak			PM Peak		
	DOS	Delay	95%ile Queue	DOS	Delay	95%ile Queue
2018 BG	0.58	29sec	24m	0.56	28sec	26m
2028 BG	0.67	29sec	31m	0.55	31sec	33m
2028 BG + Option 1	0.83	28sec	104m	0.81	28sec	102m
2028 BG + Option 2	0.76	25sec	74m	0.71	25sec	75m
2028 BG + Option 3	0.70	23sec	49m	0.62	24sec	51m

The results of the analysis indicate that the four-way signalised arrangement operates within the typical performance thresholds (DOS $\leq$ 0.90 for signalised), for all assessed scenarios.

5.5.3.8 Summary and Conclusions

The road network reaches capacity and all intersections will require different levels of mitigation for the options. Therefore, investment in infrastructure improvements will need to be programmed regardless of which development option was ultimately pursued.

The existing internal road network and intersections along Boundary Road, surrounding the land use site has been assessed against three (3) development options. The following summary is identified which relates to all options, with corresponding recommended mitigation measures.

Intersections along Boundary Road requiring upgrades include:

> Boundary Road / Booral Road Intersection (upgrade to signals). This upgrade will incorporate Boundary Road / Walkers Road intersection

> Boundary Road / Senorita Parade (upgrade to signals)

*Options with higher dwelling densities (i.e. Option 1) may require further mitigation works in addition to signals, including additional turn lanes

It is to be noted, as detailed design for mitigations have not been conducted, the extents of the required intersection form and relevant costs are excluded and require further investigation.

Road infrastructure upgrades surrounding the land use area include:

> Proposed access street connecting to Senorita Parade, running parallel to the south of Boundary Road to provide rear-lot access to lots currently fronting Boundary Road

> Proposed access street connecting to Hughes Road, running parallel to the south of Boundary Road to provide rear-lot access to lots currently fronting Boundary Road

> Upgrading Senorita Parade, Senor Avenue and Walkers Road to a higher order road to carry the potential development traffic

Proposed Upgrades (FCRC LGIP)

> Two (2) Bus stops along Boundary Road scheduled by 2031

> Boundary Road upgraded to 4-lanes median divided scheduled by 2025

> Boundary Road / Roberts Street / Hughes Road upgraded to signals scheduled by 2020

Opportunities for connectivity between the land use plan and proposed upgrades along Boundary Road include the following:

> Pedestrian footpath planned along Boundary Road scheduled by 2020

> Provide pathway linkages on both sides on Boundary Road, providing connectivity for pedestrians and cyclists to future public transport infrastructure (bus stops) and existing active and public transport networks

Table 5-11 Summary of Transport Mitigation Works Costs per Option

Location	Options Requiring Mitigation Works			Description of Mitigation Measure	Indicative Costs per Mitigation Measure		
	1	2	3		1	2	3
Boundary Road / Booral Road	X	X	X	Traffic Signals	$200,000 (signalisation) $150,000 (per slip lane)	$200,000 (signalisation)	$200,000 (signalisation)
Boundary Road / Walkers Road	X	X	X	Traffic Signals	Combined cost with Boundary/Booral upgrade	Combined cost with Boundary/Booral upgrade	Combined cost with Boundary/Booral upgrade
Boundary Road / Senorita Parade	X	X	X	Traffic Signals	$200,000 (signalisation) $150,000 (per slip lane)	$200,000 (signalisation)	$200,000 (signalisation)
Boundary Road / Hughes Road / Roberts Street	X	X	X	Traffic Signals*	LGIP Planned Upgrade	LGIP Planned Upgrade	LGIP Planned Upgrade
Senorita Parade – Rear Lot Access Road	X	X	X	New Access Road	Approx. $800k/km See Note 1	Approx. $800k/km See Note 1	Approx. $800k/km See Note 1
Hughes Road – Rear Lot Access Road	X	X	X	New Access Road	Approx. $800k/km See Note 1	Approx. $800k/km See Note 1	Approx. $800k/km See Note 1
Boundary Road	X	X	X	Pedestrian Footpath	LGIP Planned Upgrade	LGIP Planned Upgrade	LGIP Planned Upgrade
Boundary Road	X	X	X	Pedestrian Footpath connectivity Cycling connectivity	To be included in any infrastructure along Boundary Road	To be included in any infrastructure along Boundary Road	To be included in any infrastructure along Boundary Road
Senorita Parade	X	X	X	Upgrade to higher order road (Major Collector)	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1
Senor Avenue	X	X	X	Upgrade to higher order road (Major Collector)	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1
Walkers Road	X	X	X	Upgrade to higher order road (Major Collector)	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1	Approx. $1million/km See Note 1

*Planned upgrade on FCRC LGIP

[1]Dependent on final design, length, ground conditions and construction programme

Figure 5-17 Summary of Mitigation Measures and Planned Roads

Source: Photomap by nearmap.com

5.5.4 Water supply

The project area was assessed in isolation, under the assumption that the wider network has the capacity to fill demand (ie, reservoir and pumps have the required capacity). Within the project area, the existing water network does not require any upgrades to meet the higher demands.

5.5.5 Sewerage

The Southern catchment already has the required infrastructure to meet existing demand, and demand in this catchment does not change across the scenarios. No further consideration of the sewerage system in this southern part of the project area is therefore warranted.

The northern catchment will require augmentation in the mixed lot and maximum yield scenarios. For the low density options (Large lot scenario), lot based sewer treatment could potentially be undertaken, by way of on-site effluent treatment and disposal systems. This would reduce costs of delivery but would require ongoing management to ensure water quality and public health and safety outcomes.

The central catchment requires augmentation in the high density (maximum yield) scenario. For large lot and mixed lot scenarios, on-site effluent treatment and disposal would potentially be appropriate should cost of reticulated provision be prohibitive.

For the required augmentations in the high density (maximum yield) scenario, it is expected that additional pipework will be DN150 PVC (refer to **Figure 5-18** and **Appendix A**). It has been assumed that the existing DN600 main has sufficient capacity to service the additional load and does not need upgrading. This is due to the relatively small increase in demand relative to pipe size, the change in volume in the DN600 would be minimal (<2% of capacity).

Figure 5-18 Maximum yield (existing zoning) scenario Sewer Augmentation

Source: Photomap by nearmap.com

5.5.5.1 Sewer Network Augmentation requirements

Costs by scenario are shown in **Table 5-12** and have been calculated using Cardno's Cost Model (2018), assuming a 2m trenching depth. This assessment of costs does not include any works required outside of the existing site boundary.

Table 5-12 Sewer Augmentation Cost by Catchment and Scenario

Scenario	Catchments Requiring Augmentation			Total Length of Mains	Indicative Costs
	North	Central	South		
Option 1: Maximum Yield (Existing Zoning) Scenario	X	X		4,250 m	$1,860,000
Option 2: Mixed Lot Scenario	X			1,850 m	$810,000
Option 3: Large Lot Scenario				0 m	$0

As noted previously, no augmentations are required for the Large Lot scenario. Alignments, lengths and costs are indicative only, and may change depending on the chosen scenario and ultimate arrangement of land uses and densities.

These options assume an alignment wherein a pump station is not required. Should the alignment change, and a pump station be required, the expected additional cost would likely be between $350,000 and $450,000 subject to sizing, and the extent of ancillary works required.

5.5.6 Summary of potential infrastructure costs

For all scenarios, there will be the requirement for at least some augmentation or provision of infrastructure to support the scale of development. Specifically, preliminary cost estimations calculate the following potential overall costs to provide infrastructure across all networks:

- Option 1 – Maximum Yield (Existing Zoning) Scenario - $28.6 million;
- Option 2 – Mixed Lot Scenario - $18.6 million;
- Option 3 – Large Lot Scenario - $11.8 million.

Table 5-13 provides a summary of the potential costs across all networks. It is noted that the preliminary cost estimates do not take into account any land resumption costs that may be required to acquire required corridors for drainage infrastructure or potential road widenings, and do not include detailed consideration of the potential co-location of drainage infrastructure within any required major road upgrades. In this regard, the preliminary costings are indicative only and may vary significantly from these estimates. More detailed costings can be provided once a final scenario is confirmed and a more specific understanding of the required infrastructure is known.

Table 5-13 Summary of infrastructure costs for all networks

	Option 1 Maximum Yield (Existing Zoning) Scenario	Option 2 Mixed Lot Scenario	Option 3 Large Lot Scenario
Land use mix	All LDR @ 20DU/Ha	Mix of LDR @ 20 DU/Ha and larger lots (2,000m²)	Predominantly large lot (2,000m²)
Indicative Dwellings	2,040	1,380	1,107
Indicative Population	4,692	3,174	2,339
Water Network Upgrades and Costs	Not required	Not required	Not required

	Option 1 Maximum Yield (Existing Zoning) Scenario	Option 2 Mixed Lot Scenario	Option 3 Large Lot Scenario
Sewer Network Upgrades and Costs	Northern catchment Central catchment $1,860,000	Northern catchment $810,000	Not required
Transport Network Upgrades and Costs	Intersection upgrades (Boundary Road / Booral Road, Boundary Road / Walkers Road, Boundary Road / Senorita Parade Existing road upgrades (Senor Avenue, Senorita Parade, Walkers Road to Major Collector) New Access Road (northern catchment) $4,800,000	Intersection upgrades (Boundary Road / Booral Road, Boundary Road / Walkers Road, Boundary Road / Senorita Parade Existing road upgrades (Senor Avenue, Senorita Parade, Walkers Road to Major Collector) New Access Road (northern catchment) $4,800,000	Intersection upgrades (Boundary Road / Booral Road, Boundary Road / Walkers Road, Boundary Road / Senorita Parade Existing road upgrades (Senor Avenue, Senorita Parade, Walkers Road to Major Collector) New Access Road (northern catchment) $4,800,000
Drainage Upgrades and Costs	Central channel new 15m wide channel and corridor Northern channel new 10m wide channel 1/6 batter $22,000,000	Central channel retained but incorporates corridor Northern channel new 14m wide channel with 1/8 batter $13,000,000	Not required (minor maintenance) $7,000,000
Indicative Total Costs	$28.6 million	$18.6 million	$11.8 million

5.6 Identification of preferred scenario

The three (3) scenarios were presented to Council, an industry stakeholder group, and the community to gather feedback on the preferred scenario.

5.6.1 Council Executive Management Team review

The three (3) scenarios were presented to Council's Executive Management Team (EMT) to decide which two (2) scenarios would be taken to further stakeholder and community engagement exercises. Based on this review, the scenarios decided to be presented for further engagement were the:

- Large Lot Scenario; and
- The Mixed Lot Scenario.

These scenarios were considered to provide the best balance between providing for future development potential while containing the potential infrastructure burden that would be borne by Council in undertaking the required works.

5.6.2 Stakeholder Round Table

A 'round table' exercise was held with a range of industry stakeholders to present the two (2) development scenarios confirmed by the EMT and seek feedback. The stakeholder group comprised local consultants, landowners and developers who are active within the project area (refer to **Table 5-14**). The purpose of the exercise was to identify the issues that are facing those who work within the current planning framework that impact on development within the project area.

Table 5-14 Stakeholder Round Table Meeting Attendees

Council technical officer attendees	Industry attendees	Others
Jason Tan (Strategic Planning Officer) Lauren Payler (Manager Strategic Land Use Planning) Ian Gay (Senior Development Engineer) Neale Glanfield (Engineering Technical Officer) John Mclennan (Executive Manager Engineering Services) John Mann (Principal Planning and Network Engineer) Kylie Matheson (Catchment Planning Officer) Paul Orr (Principal Development Engineer)	10 attendees including consultants, developers and landowners	Darren Everard (Divisional Councillor and Member of the Planning and Development Roundtable) Denis Chapman (Councillor and Member of the Planning and Development Roundtable) Morgan Wilson (Cardno) Leo Mewing (Cardno)

The key feedback from the stakeholder group was broadly consistent with the preliminary community engagement with the following issues being identified as the key matters for consideration and address:

- Drainage and stormwater impacts constrain the ability to develop the central part of the site for low density residential development at the current allowable density (20DU/Ha);
- The influence of the odour buffer for the Pulgul Creek WWTP on the eastern boundary is a significant constraint, and it is not clear that such a large buffer area is required to mitigate the perceived odour impacts;
- Notwithstanding that the current framework allows for 500m^2 lots, larger lots of 1,000m^2 and above are the most marketable with a consensus that a mix of lot sizes from approximately 800m2 minimum is the optimal arrangement;
- Landowners/developers are unlikely to develop smaller lots if they cannot easily sell them;
- Fragmentation of ownership makes acquisition of large lots difficult, such that it is hard for any individual developer to address drainage constraints within a single development;
- Acquisition of land for drainage corridors will be difficult given the fragmentation of ownership;
- Drainage infrastructure can be co-located with upgraded roads for a more cost effective solution;
- Given the difficulties facing individual developers, Council should undertake the major works to catalyse development throughout the project area;
- Any delivery of infrastructure should be sequenced to allow for an orderly roll-out of development across the whole project area.

5.6.3 Community Forum

A public forum was held in Urangan to present the two (2) development scenarios and seek feedback from the community. Approximately 48 members of the public attended the forum, with Council technical officers and Councillors also in attendance (refer to **Table 5-15**).

Table 5-15 Community Forum Attendees

Council technical officer attendees	Councillors	Others
Jason Tan (Strategic Planning Officer) Lauren Payler (Manager Strategic Land Use Planning) Paul Rice (Principal Officer Major Developments) Anita Garton (Heritage Planning Officer) Ian Gay (Senior Development Engineer) Neale Glanfield (Engineering Technical Officer) John Mclennan (Executive Manager Engineering Services) Melissa Dower (Manager Community Development & Engagement) – Observer	Darren Everard (Divisional Councillor and Member of the Planning and Development Roundtable) Denis Chapman (Councillor and Member of the Planning and Development Roundtable)	Morgan Wilson (Cardno) Leo Mewing (Cardno)

Subsequent to the presentation, the community attendees were broken into smaller groups for a moderated discussion, with Council representatives using common queries to elicit responses having regard to identifying:

- Community preference for future lot sizes;
- Community preference for the type of approach to drainage (either engineered approaches using concrete channels or a more natural approach); and
- Any other aspects of the project area that the community value and wish to be considered as part of the current planning exercise.

The compilation of the community responses are summarised below:

- There was a clear and consistent preference for larger lot sizes across all the groups, with a general preference for a minimum lot size of approximately 2,000m^2 to maintain the existing character and amenity of the locality;
- Larger lot sizes (approximately 4,000m^2) were preferred in the central catchment;
- Drainage is generally preferred to be managed in a more natural manner, with no support expressed for highly engineered drainage channels apart from some small sections where no other options to mitigate flood would require such works;
- The community values the quiet, small scale and ow intensity of development in the central and northern catchments and do not wish for this character to be diminished through smaller lot subdivision;
- Traffic impacts are already being felt due to the intensification of development in the southern catchment, and upgrades and augmentation of the existing road network is required to maintain a safe and efficient road network;
- There are nuisance issues associated with odour from the Pulgul Creek WWTP and noise from the animal shelter to the east of the project area that should be addressed in further planning for the locality.

6 Implications and recommendations for next project stage

6.1 Implications for structure plan design

Based on the analysis of the physical and environmental elements, character and amenity considerations, infrastructure networks and the preferred land use/settlement pattern approach as identified through community and stakeholder consultation, the key structure planning elements for the Urangan South Project Area include the following:

- A large proportion of the Urangan South Project Area adjacent to the existing drainage channels in the northern and central catchments is identified as being subject to the Q100 flood event. Future urban development in these areas should be located outside areas of higher flood hazard to achieve acceptable standards of flood immunity;
- Consideration of flood mitigation options should be undertaken that builds upon the existing rock lined channel in the central catchment. Constructed channels and other built drainage infrastructure should be low intensity and maintain the more natural character and amenity of the locality. Extensive concrete channels and large drainage infrastructure are not compatible with the intended character and amenity of the project area;
- Drainage infrastructure should be co-located with road infrastructure where possible to limit intrusion into the landscape and maximise the efficiency of both networks to support development within the project area;
- A corridor of higher value vegetation traverses the central part of the project area, generally aligned with the location of the central drainage corridor. Development in the project area should seek to protect the integrity and value of this vegetation;
- Given the central drainage corridor and higher value vegetation are closely aligned along a linear spine, opportunity for a park and/or open space area to coalesce around this corridor is available. The settlement pattern and land use structure of the project area should seek to build upon these values, and consider opportunities for local and regional connectivity that contribute to the nature conservation and active transport networks of the region;
- The character of the Urangan South Project Area is inconsistent, with the central and northern catchments having a generally large lot and open living character while the southern catchment exhibits a more typical suburban character. While there are no specific landscape features or values that require protection, higher intensity urban development should be focused within the northern catchment which adjoins the major road corridor of Boundary Road, with lower intensity development being directed into the more intact large lot areas within the central part of the project area;
- The Hervey Bay Airport is located adjacent to the south of the project area. Noise sensitive development should be avoided in those southern most parts of the project area that are potentially subject to higher levels of aircraft noise;
- The Pulgul Creek Wastewater Treatment Plant is located adjacent to the east of the project area. The facility is intended to be augmented and expanded in the future to accommodate urban growth within the catchment. Due to the current impacts and potentially increased future odour emissions and nuisance generated by this use, future urban development should locate outside the modelled buffer area to maintain an appropriate level of amenity for the locality as well as protecting the ongoing use of the infrastructure;
- Boundary Road that bounds the northern frontage of the project area is planned to be a four-lane separated roadway with construction finalised by 2025. Direct access to Boundary Road will not be available in the longer term, and as such an access road or roads will be required to give access into the northern catchment for future urban development;

- Significant upgrades to Senor Avenue, Senorita Parade and Walkers Road will be required to support the transport needs of future urban development. These roads may potentially function as major collector roads and include public transport infrastructure and active transport networks.
- The intersection of Booral Rd and Boundary Rd is currently problematic, with the nearby intersection with Walkers Rd exacerbating traffic movement issues particularly at peak times. A coordinated solution should be pursued where any upgrades to the Booral Rd/Boundary Rd intersection should include re-alignment of the Walkers Rd intersection to allow for safe and efficient traffic movement;
- Water and sewer networks are available to the southern catchment and can support expected population growth. Any intensification of urban development in the northern and central catchments will require augmentation and extension of existing water and sewer networks, however depending on the ultimate size of lots on-site effluent treatment and disposal could be appropriate;
- The wetlands adjacent to the east of the site are identified a containing Matters of State Environmental Significance including Wildlife Habitat, Regulated Vegetation (Essential Habitat), and High Ecological Significance Wetlands. Given these values, any wastewater treatment and stormwater management approach must meet relevant water quality guidelines and ensure that water discharging from the project area does not negatively impact on the high ecological values of the adjacent wetlands;
- The Urangan South Project Area does not contain community infrastructure, however is adjacent to educational and sporting facilities associate with the Star of the Sea School and a multi-sports facility on the opposite side of Walkers Road. The integration of the Urangan South Project Area into the broader recreation and open space network of Hervey Bay should be considered;
- The Urangan South Project Area has limited access to convenience shopping and services, with a small convenience shop available on the north-western boundary of the site. Although more established shopping and commercial services are available to the north of the site, the provision of local level services and facilities should be considered to support the day to day needs of the local population and minimise reliance on vehicular travel.

6.2 Recommendations for next project stage

Having regard to the findings of the Urangan South Project Area Context Analysis Report including the outcomes of the Scenario Analysis, the following recommendations are provided regarding the preferred land use option to inform the subsequent more detailed structure planning stage of the project.

6.2.1 Preferred Option

It is recommended that the Mixed Lot Scenario (refer to **Figure 11 - Option 2 Mixed Lot Scenario Map**) be used as the broad land use approach to inform the proposed structure plan for the Urangan South project area.

The Mixed lot scenario is preferred on the basis that it:

- Provides an opportunity to deliver a mix of predominantly larger lot sizes (from 1,000m^2 up to 4,000m^2) to meet both the community an industry preference for density expectations;
- Allows for relatively smaller lots to be located in the northern part of the project area where it is easier to connect to existing water and sewer networks and avoids intensification of the most constrained land in the central part of the site;
- Maximises return on infrastructure investment by establishing higher densities in locations that can utilise the required access road in the northern catchment;
- Potentially limits the required roll-out of water and sewer infrastructure depending on the ultimate lot sizes ultimately pursued;

- Provides opportunity to maintain the central catchment for larger lot living, enhancing lifestyle choice and providing options to respond to drainage issues;
- Maintains the intent for the Limited development (constrained land) area as having no further opportunity for intensification;
- Provides opportunity to incorporate a linear park and environmental corridor with the required drainage works in the central channel, creating linkages and enhancing connectivity between the project area and external facilities and services; and
- Protects the small scale and low intensity character and amenity that is valued by the community.

6.2.2 Structure Plan recommendations

In preparing the structure plan for Urangan South, it is recommended that:

- Land included in the 'Odour – Limited Development Zone' be excluded from any further urban intensification;
- Lot sizes and densities in the northern and central catchments be further considered to respond to community and industry preference and coordinate with infrastructure delivery;
- Stormwater drainage options be developed that build upon the existing drainage infrastructure and retain a more natural hydraulic regime in the northern and central catchments;
- Options for road layouts in the northern catchment be further considered to provide for higher density urban development (minimum of approximately 1,000m2 lots) while maintaining the safety and efficiency of Boundary Road; and
- Planned capacities and upgrades of the water and sewer networks be further reviewed to support planned density in appropriate locations.

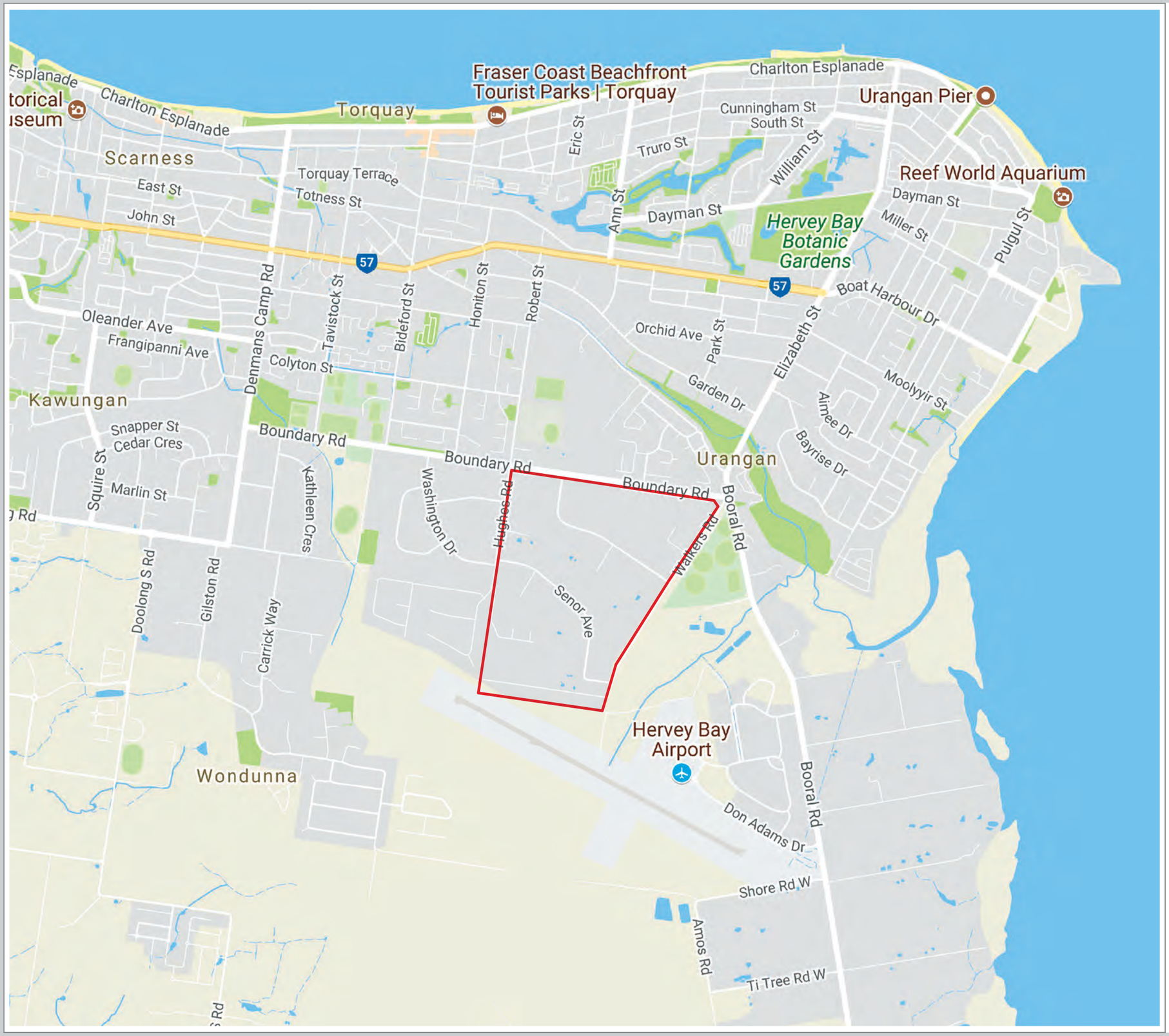
Urangan South Land Use Strategy and Local Area Plan Project

Figures

Figure 1 Location Plan
Figure 2 Structure Plan Area
Figure 3 Development Activity Map
Figure 4 Zoning Map
Figure 5 Overlays (Planning Scheme)
Figure 6 Flood Hazard Map
Figure 7 Matters of State Environmental Significance
Figure 8 Development Area Analysis Plan
Figure 9 Catchment Map
Figure 10 Option 1 Maximum Yield (Existing Zoning) Scenario Map
Figure 11 Option 2 Mixed Lot Scenario Map
Figure 12 Option 3 Large Lot Scenario Map

Prepared for Fraser Coast Regional Council
HRP18074.R01.007

Cardno®



[LEGEND]

Structure Plan Area Boundary

N
W
E
S

0 0.25 0.5 0.75 1.0 1.25

1:25,000 (kilometres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South

LAND USE STRATEGY and LOCAL PLAN AREA

Location Map

FILENAME >	Location Map_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:25,000	VERSION >	1.0
SOURCE >	Map data © GOOGLE MAPS dated 04/09/2018.		

FIGURE 1

2

[LEGEND]

Structure Plan Area Boundary

N
W
E
S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Structure Plan Area Map

FILENAME >	Structure Plan Area_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © NearMap; imagery dated 19/05/2018.		

FIGURE 2

3

[LEGEND]

- Structure Plan Area Boundary
- Prelodgement Meeting
- Undergoing Assessment
- Approved - Not Completed
- Approved - Completed

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

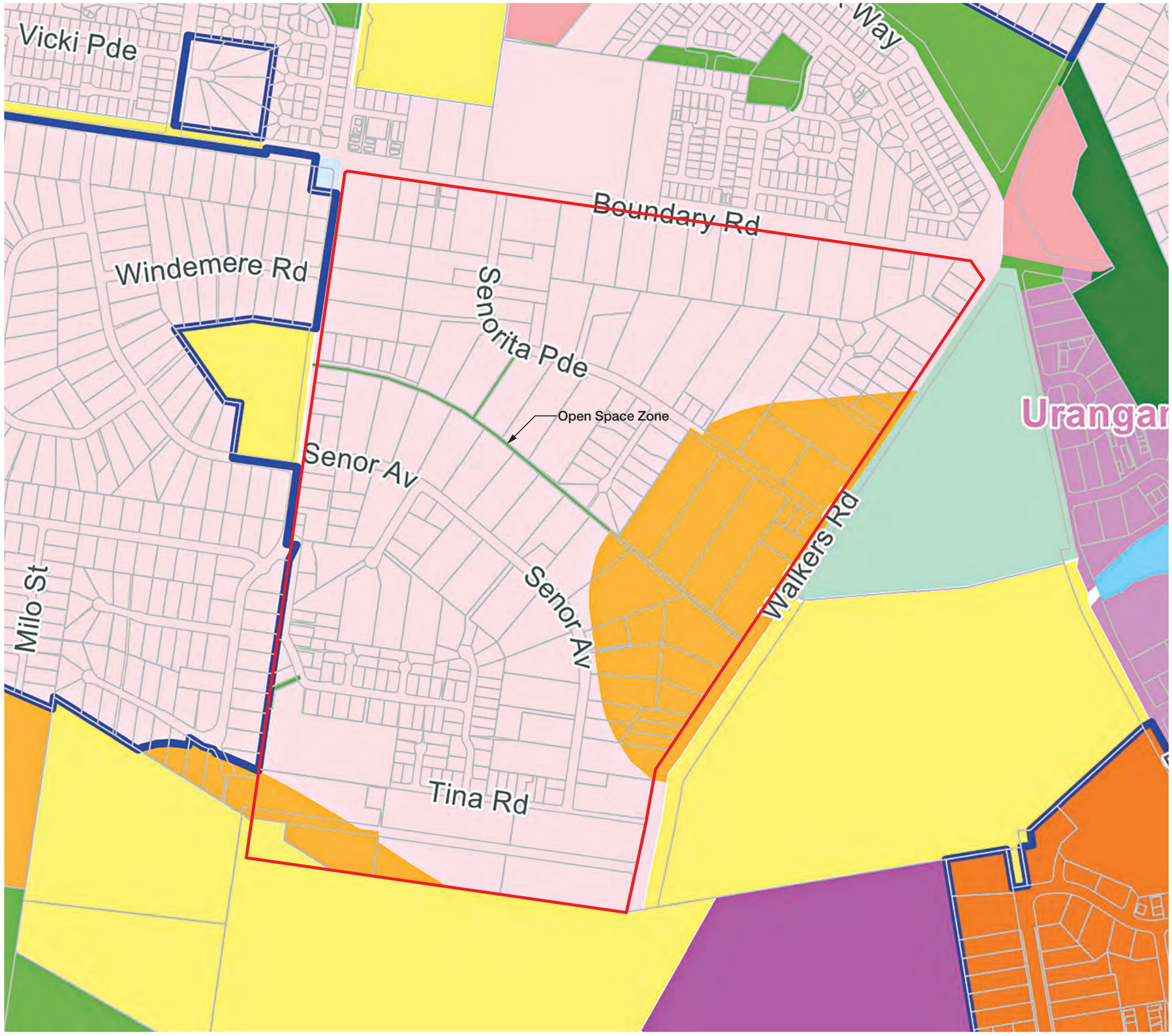
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Development Activity Map

FILENAME >	Development Activity_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 3



[LEGEND]

- Structure Plan Area Boundary
- Low Density Residential
- Open Space
- Community Facilities
- Limited Development (constrained land)
- Medium Density Residential
- Neighbourhood Centre
- Medium Impact Industry
- High Impact Industry
- Sport and Recreation
- Mixed Use
- Environmental Management and Conservation
- Zone Precinct

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South

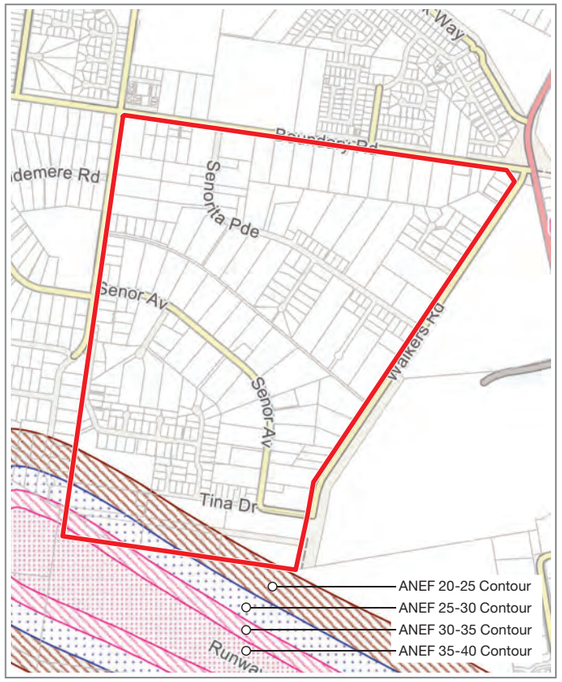
LAND USE STRATEGY and LOCAL PLAN AREA

Zone Map

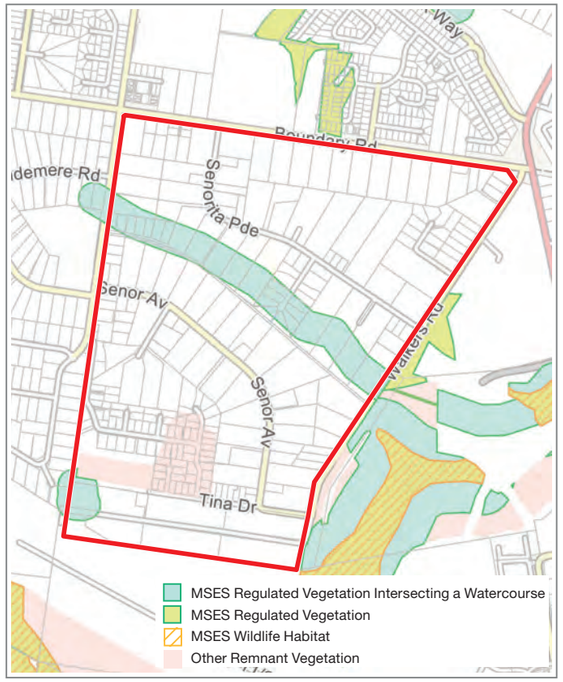
FILENAME >	Zone Map_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Fraser Coast Regional Council; online mapping downloaded 04/09/2018.		

FIGURE 4

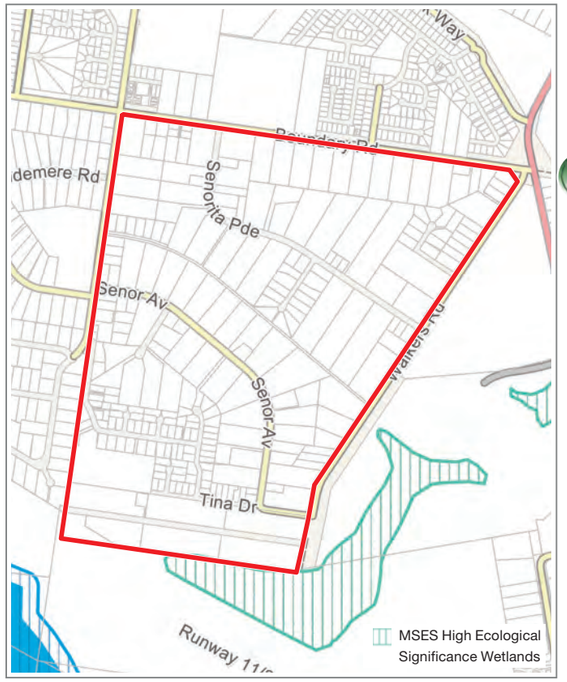
Acid Sulfate Soils



Airport and Aviation Facilities

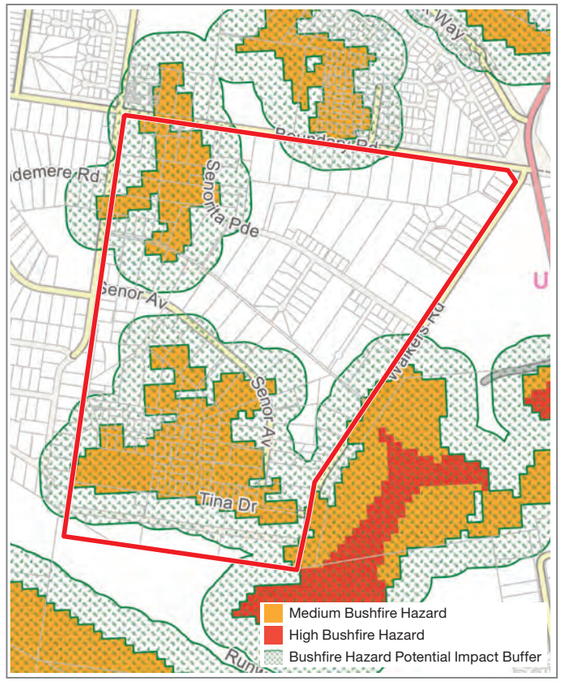


Biodiversity Areas, Waterways and Wetlands (B)

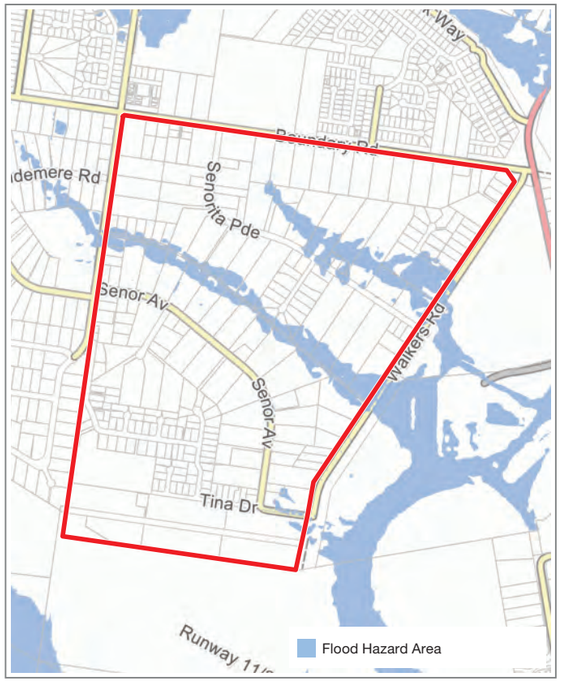


Biodiversity Areas, Waterways and Wetlands (W)

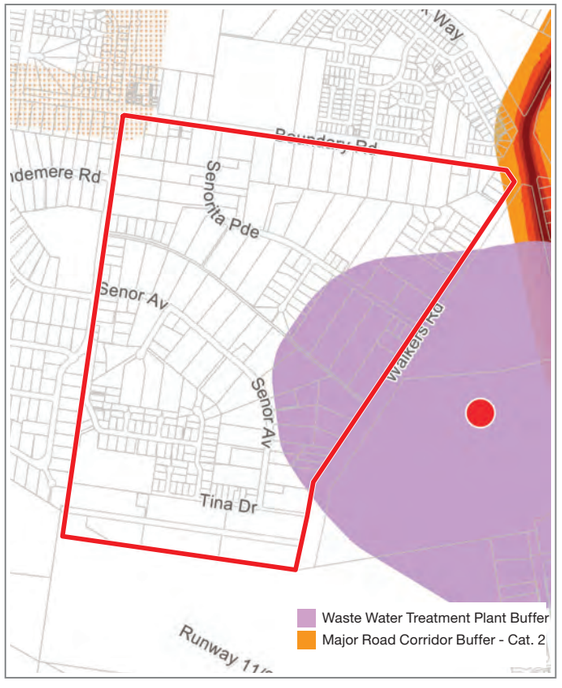
Bushfire



Flood Hazard



Infrastructure



[LEGEND]

Structure Plan Area Boundary

N W E S

0 200 400 600 800 1000

1:20,000 (metres)

GDA 94; MGA Zone 56

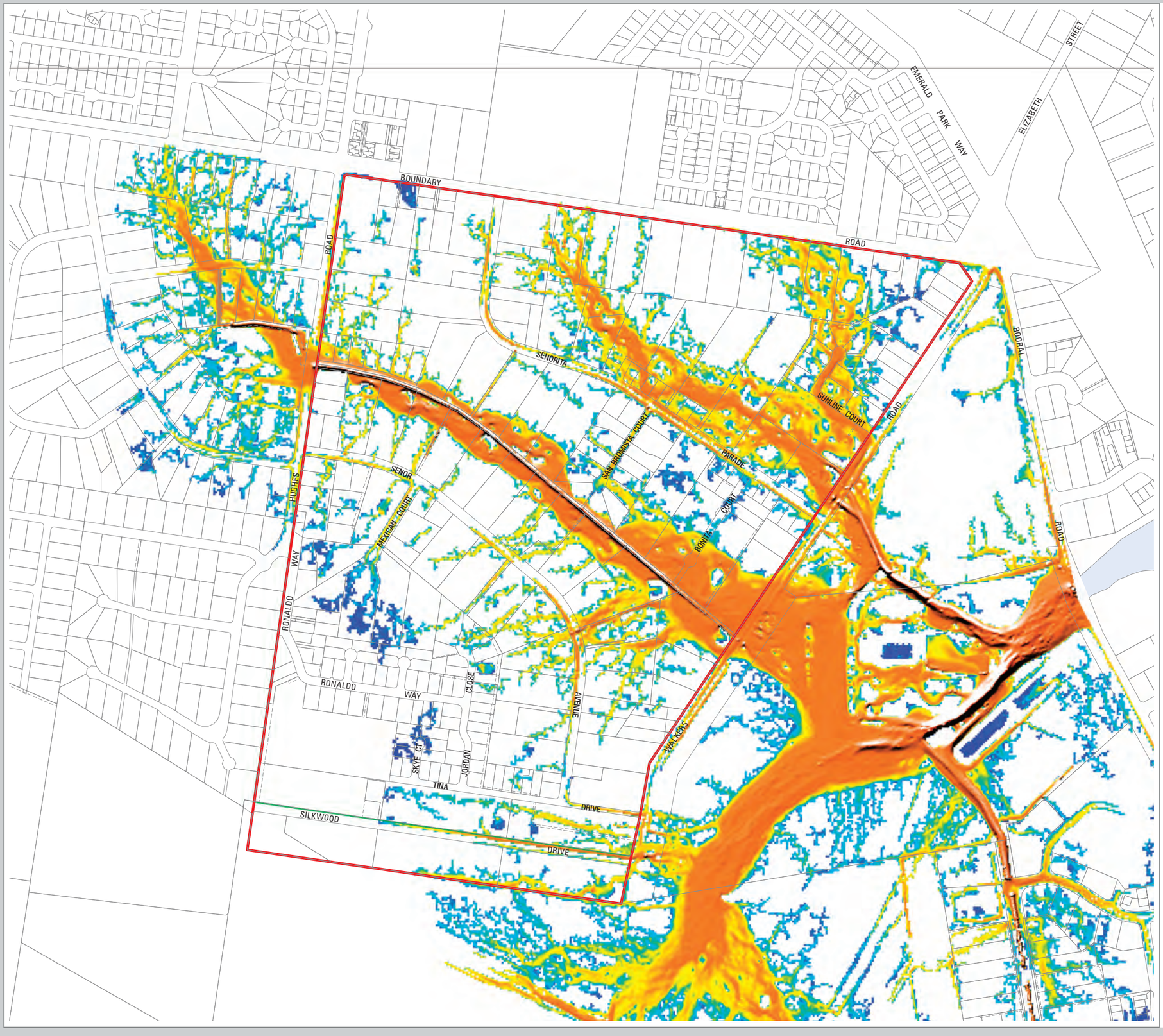
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Overlay Map

FILENAME >	Overlay Map_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:20,000	VERSION >	1.0
SOURCE >	Map data © Fraser Coast Regional Council; online mapping downloaded 04/09/2018.		

FIGURE 5



6

[LEGEND]

Structure Plan Area Boundary

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Flood Hazard Map

FILENAME >	Flood Hazard_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 6

[LEGEND]

- Structure Plan Area Boundary
- MSES - Wildlife Habitat
- MSES - Regulated Vegetation (category B)
- MSES - Regulated Vegetation (category R)
- MSES - Regulated Vegetation (essential habitat)
- MSES - Regulated Vegetation (wetland)
- MSES - Regulated Vegetation (intersecting a watercourse)
- MSES - High Ecological Sigfificance Wetlands

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Matters of State Environmental Significance Map

FILENAME >	MSES_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Queensland Government. Datasets downloaded from the Queensland Spatial Catalogue website on 04/09/2018.		

FIGURE 7

8

[LEGEND]

- Structure Plan Area Boundary
- Land Constrained by the following Fraser Coast Regional Council Overlay Maps:
  - Airport and Aviation Facilities
  - Biodiversity Areas, Waterways and Wetlands
  - Flood Hazard
  - Infrastructure

N
W E
S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

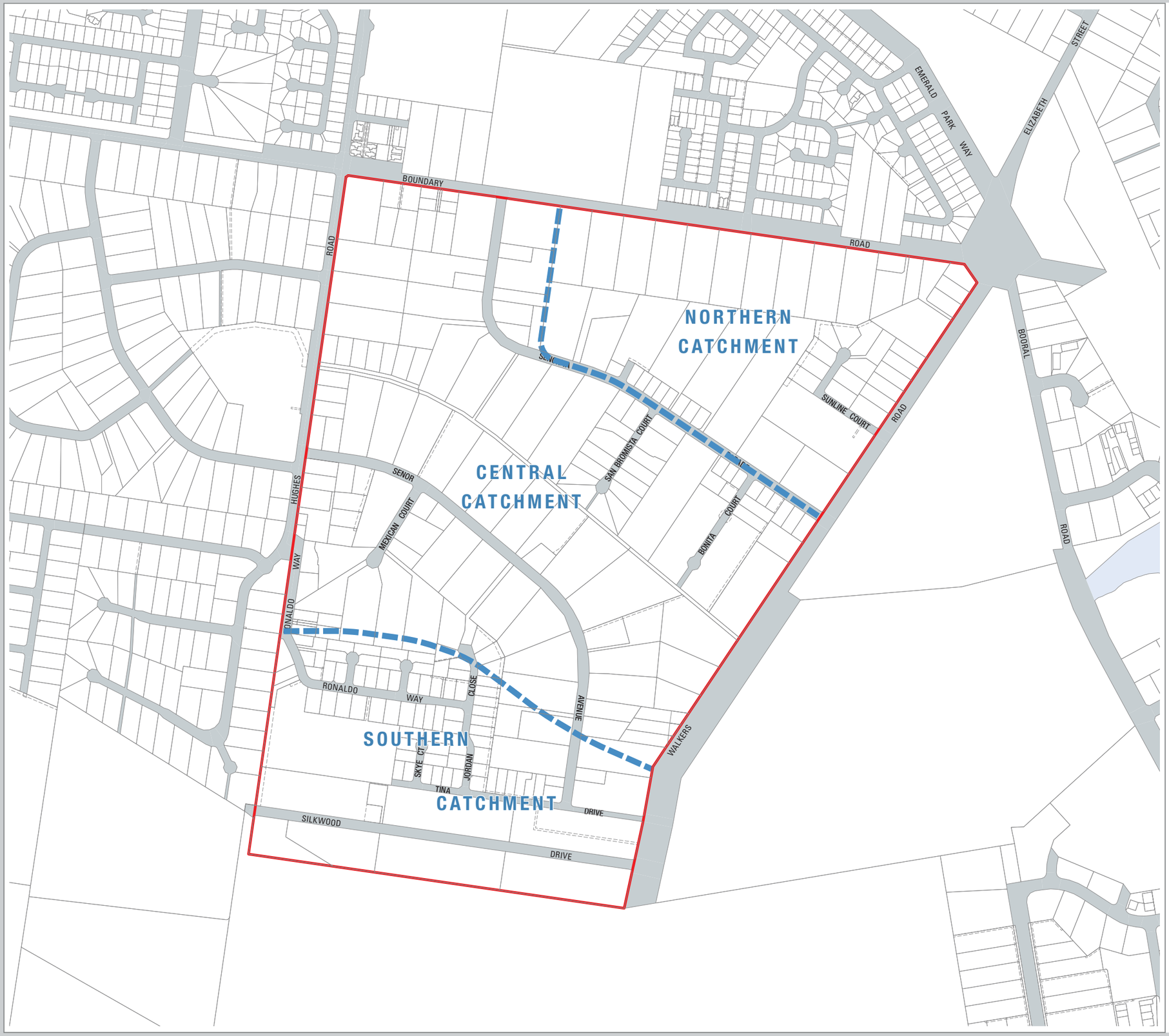
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Analysis Map
(potentially developable land)

FILENAME >	Analysis Map_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Fraser Coast Regional Council; online mapping downloaded 04/09/2018.		

FIGURE 8



[LEGEND]

- Structure Plan Area Boundary
- Catchment Boundary

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

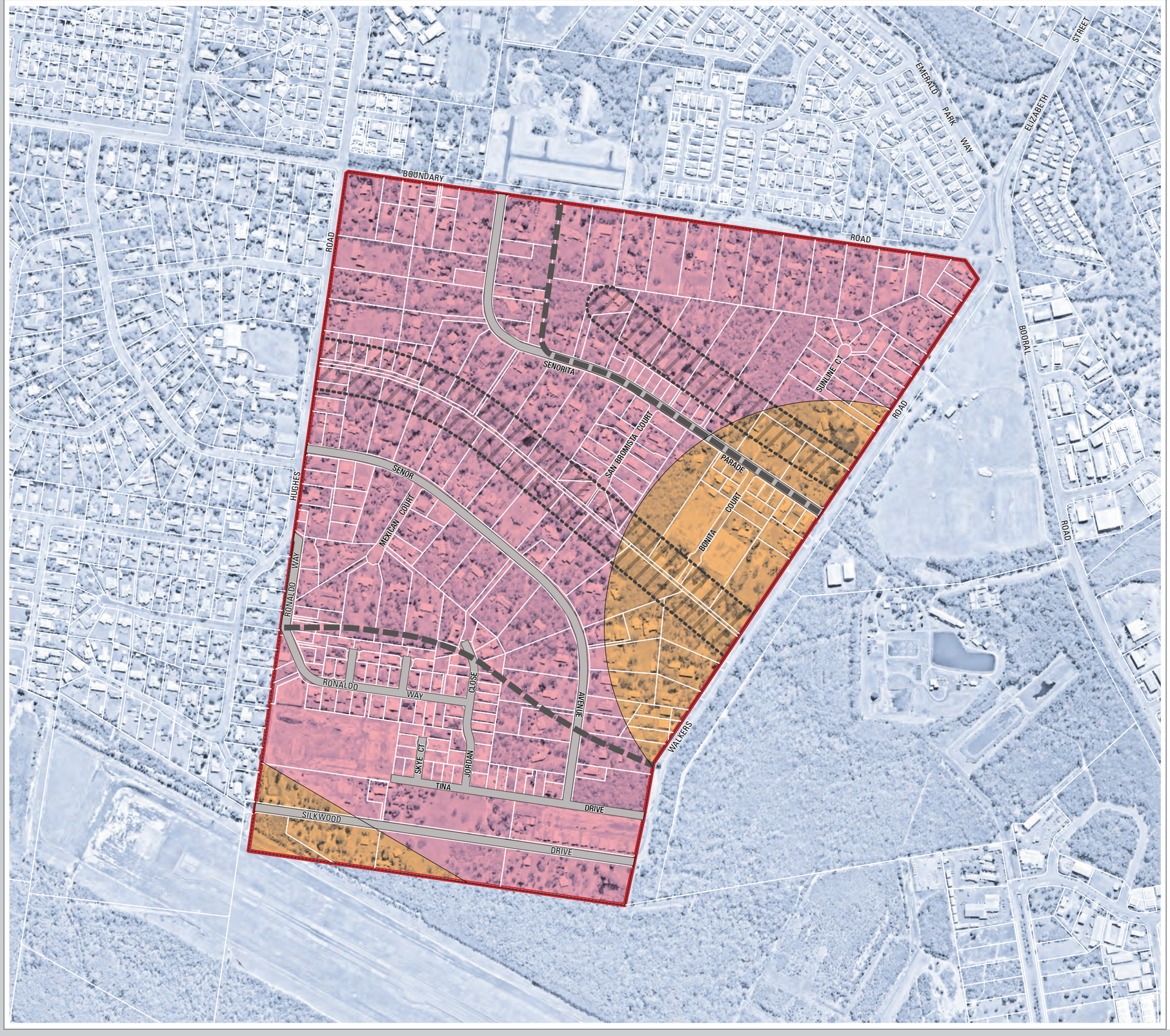
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Catchment Map

FILENAME >	Catchment Map_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	n/a
SCALE >	1:8,000	VERSION >	1.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 9



[LEGEND]

- Structure Plan Area Boundary
- Catchment Boundary
- Road Network
- Further Investigation Area (drainage and environmental corridor)
- Odour (limited development zone)
- Low Density Residential - minimum 500m² lot size (20 dwellings/hectare)

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

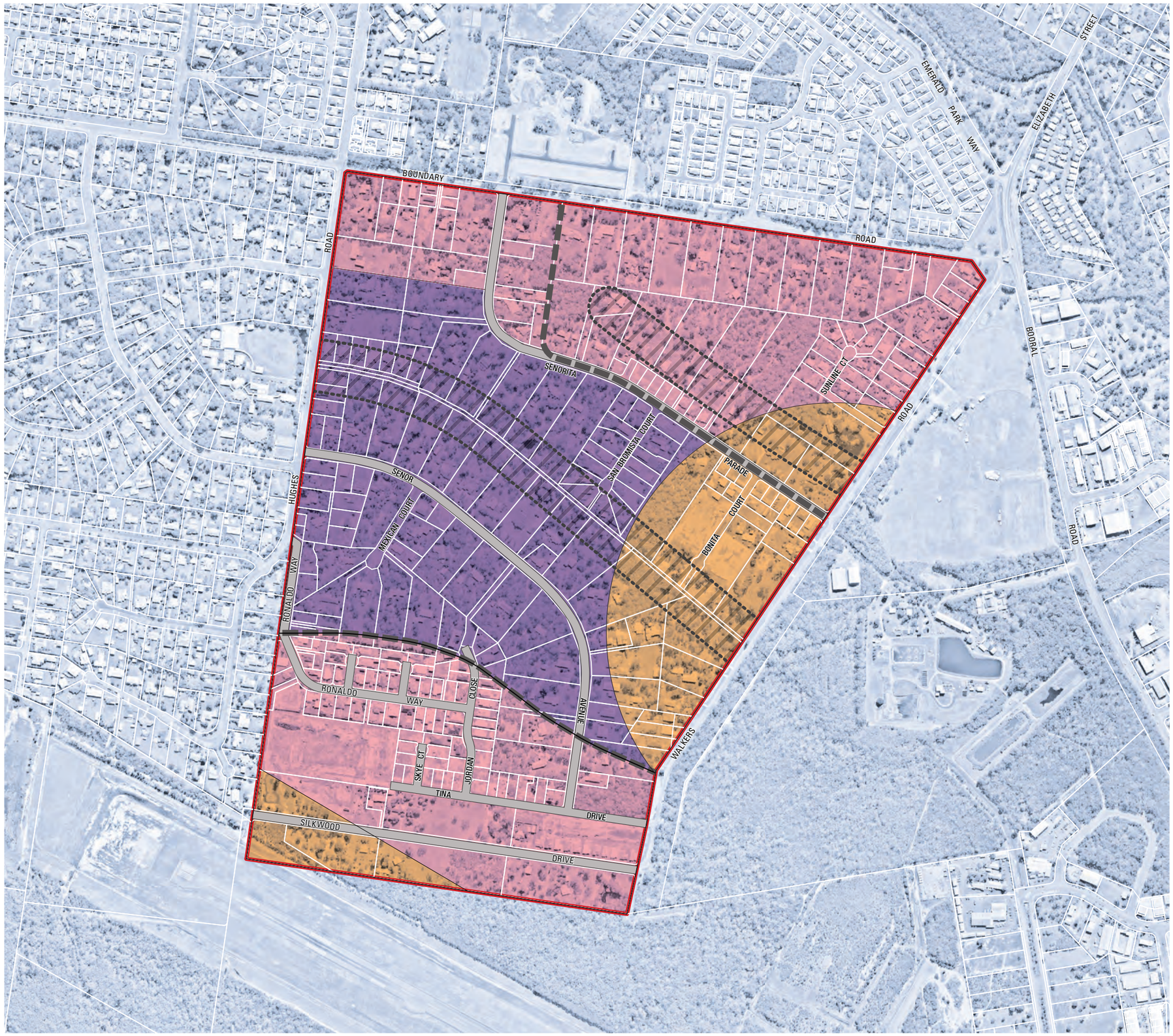
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Maximum Yield (Existing Zoning) Scenario Map

FILENAME >	Maximum Yield Scenario_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	11 October 2018
SCALE >	1:8,000	VERSION >	2.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 10



[LEGEND]

- Structure Plan Area Boundary
- Catchment Boundary
- Road Network
- Further Investigation Area (drainage and environmental corridor)
- Odour (limited development zone)
- Low Density Residential - minimum 500m² lot size (20 dwellings/hectare)
- Low Density Residential - minimum 2,000m² lot size (5 dwellings/hectare)

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

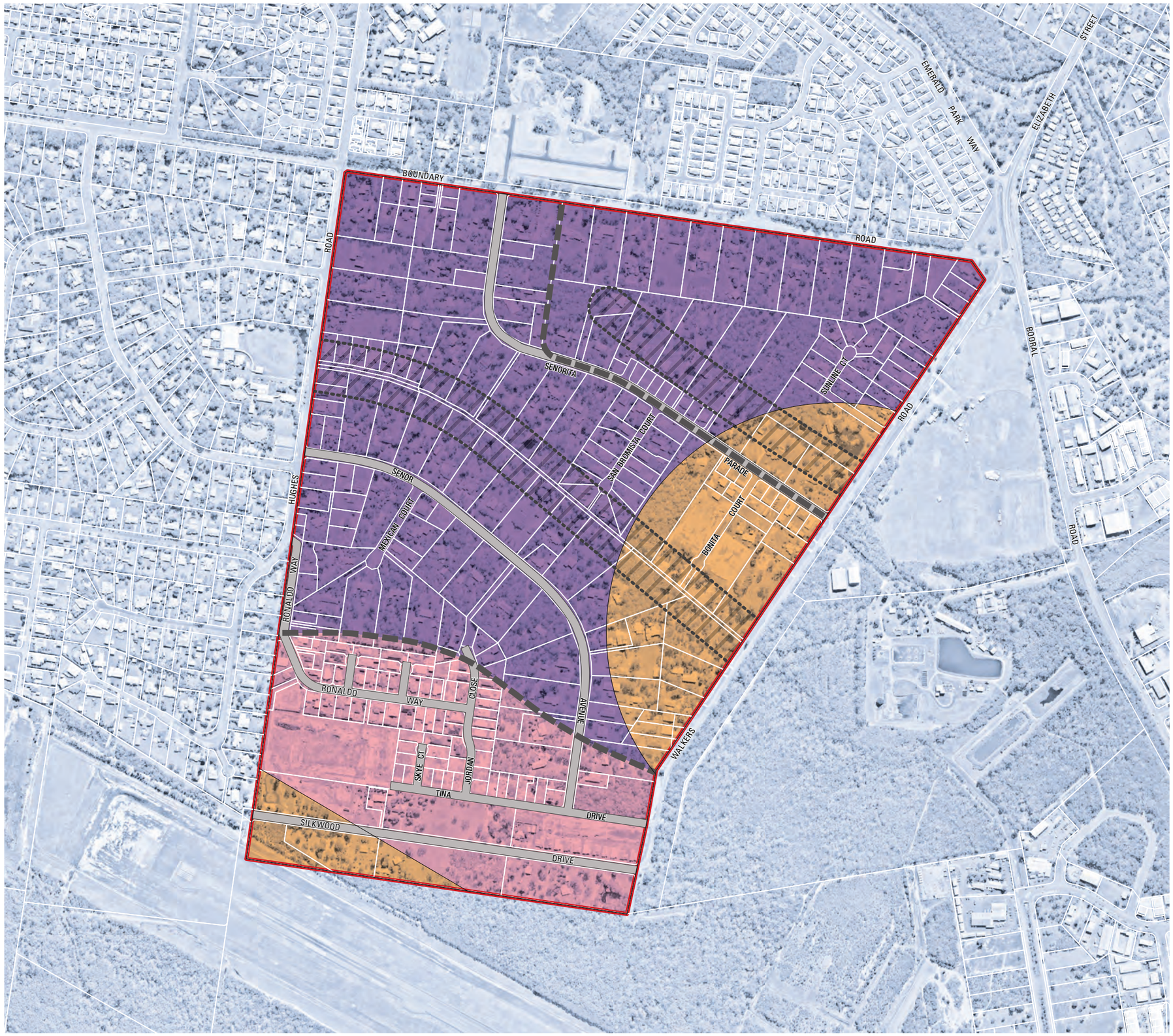
Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Mixed Lot Scenario Map

FILENAME >	Mixed Lot Scenario_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	11 October 2018
SCALE >	1:8,000	VERSION >	2.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 11



[LEGEND]

- Structure Plan Area Boundary
- Catchment Boundary
- Road Network
- Further Investigation Area (drainage and environmental corridor)
- Odour (limited development zone)
- Low Density Residential - minimum 500m² lot size (20 dwellings/hectare)
- Low Density Residential - minimum 2,000m² lot size (5 dwellings/hectare)

N W E S

0 80 160 240 320 400

1:8,000 (metres)

GDA 94; MGA Zone 56

Cardno®
Shaping the Future

Urangan South
LAND USE STRATEGY and LOCAL PLAN AREA

Large Lot Scenario Map

FILENAME >	Large Lot Scenario_v1.ai	DATE >	04 September 2018
JOB NO. >	HRP18074	AMENDED >	11 October 2018
SCALE >	1:8,000	VERSION >	2.0
SOURCE >	Map data © Cardno Qld Pty Ltd.		

FIGURE 12

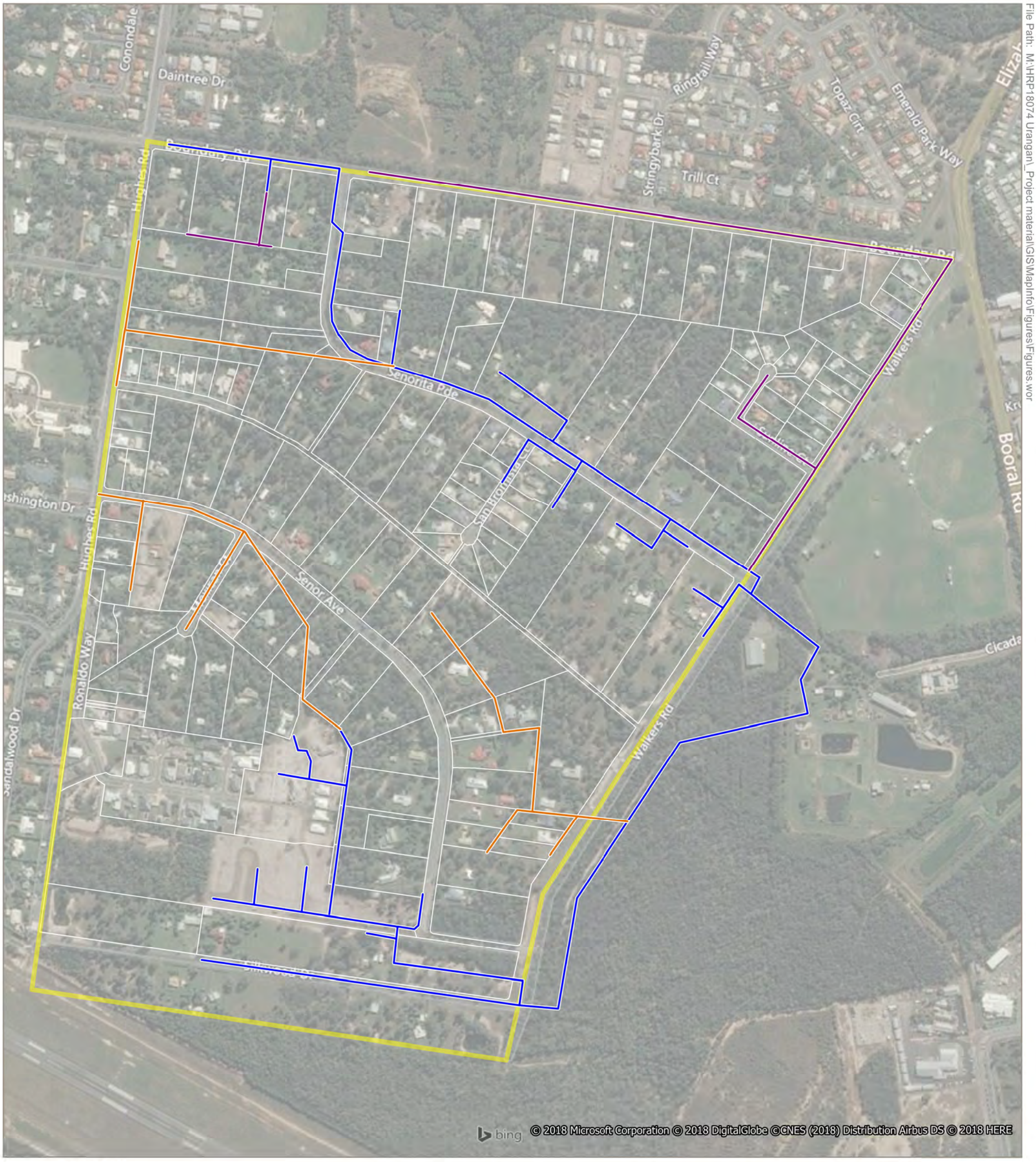
Urangan South Land Use Strategy and Local Area Plan Project

Appendix

A

Prepared for Fraser Coast Regional Council
HRP18074.R01.007

Cardno®



File Path: M:\HRP18074 Urangan_Project material\GIS\MapInfo\Figures\Figures.wor

Scale: 1:6,000

60 0 60 120 180

Metres

N W E S

SHEET	A3
Project No:	HRP18074
Date:	29-08-2018
Revision Number:	
Designed by:	
Client Name:	Fraser Coast Regional Council

LEGEND

- Central District Main
- North District Main
- Existing Main
- Urangan South Boundary

Figure 1

Urangan South Structure Plan and Local Plan

Sewer Infrastructure Maximum Yield (Existing Zone Scenario)

Cardno

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

File Path: M:\HRP18074 Urangan_Project material\GIS\MapInfo\Figures\Figures.wor

Scale: 1:6,000

60 0 60 120 180

Metres

N W E S

SHEET	A3
Project No:	HRP18074
Date:	29-08-2018
Revision Number:	
Designed by:	
Client Name:	Fraser Coast Regional Council

LEGEND

- North District Main
- Existing Main
- Urangan South Boundary

Figure 2

Urangan South Structure Plan and Local Plan

Sewer Infrastructure (Mixed Lot Scenario)

Cardno

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

File Path: M:\HRP18074 Urangan_Project material\GIS\MapInfo\Figures\Figures.wor

Scale: 1:6,000

60 0 60 120 180

Metres

N W E S

SHEET	A3
Project No:	HRP18074
Date:	29-08-2018
Revision Number:	
Designed by:	
Client Name:	Fraser Coast Regional Council

LEGEND

- Existing Main
- Urangan South Boundary

Figure 3

Urangan South Structure Plan and Local Plan

Sewer Infrastructure (Large Lot Scenario)

Cardno

Cardno (QLD) Pty Ltd | ABN 57 051 074 992
Level 11, North Tower, 515 St Pauls Terrace
Locked Bag 4006, Fortitude Valley QLD 4006
Tel: 07 3369 9822 Fax: 07 3369 9722

LEGEND

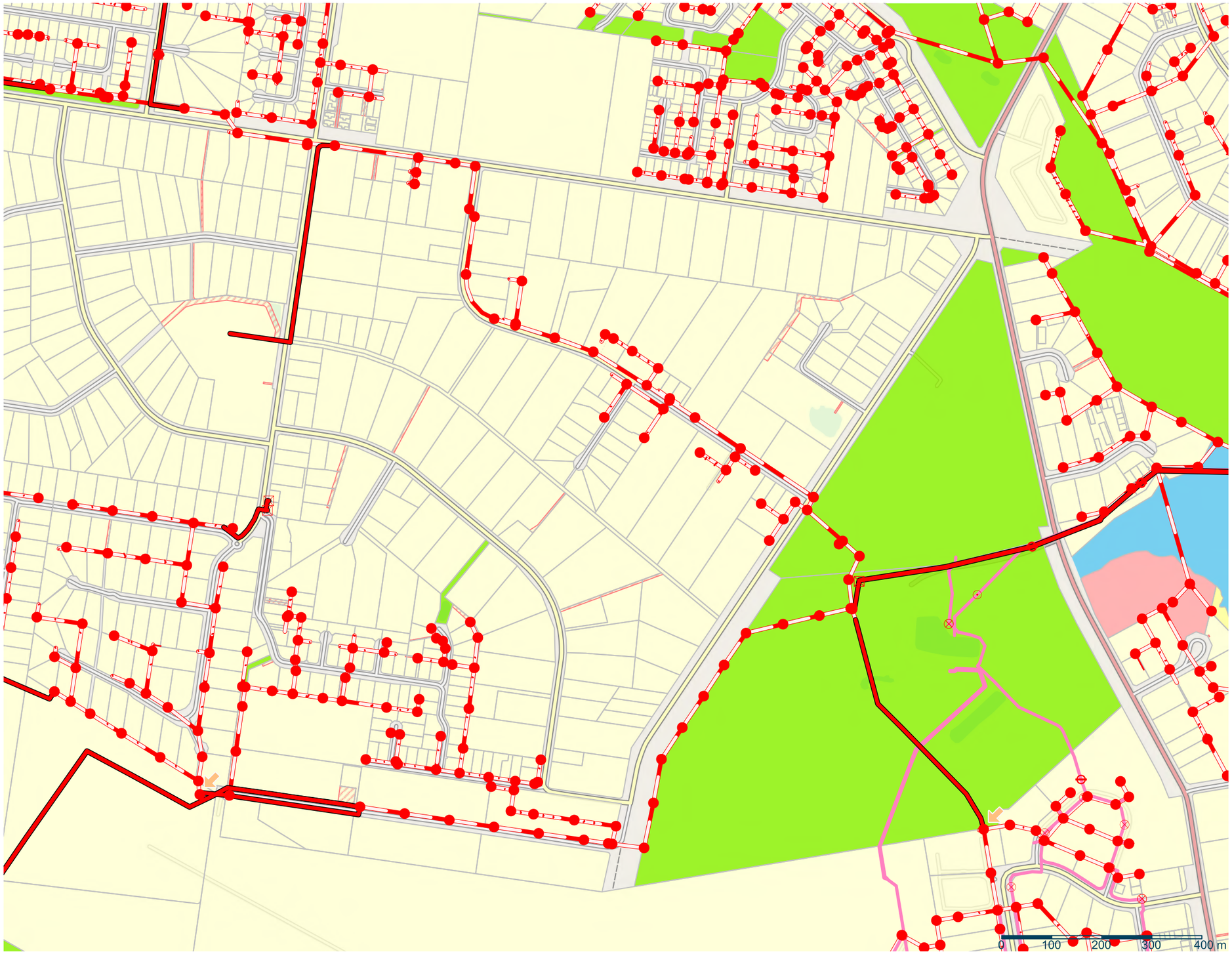
- LABELS Infrastructure
  - Az Water Main Diameter and Material Labels
  - Az Water Conduit Diameter and Material Labels
- Water Infrastructure
  - Water Hydrants
  - Water Valves
    - Stop
    - Scour
    - Ball
    - Boundary
    - Butterfly
    - Air
    - Sluice
    - Non return
    - Altitude
    - Press Relief
    - OTHER
  - Water Pump Stations
  - Water Connections
    - Water Connections
    - Water Connections (non WBW)
    - Reuse Connections
  - Water Conduit
  - Water Mains
  - Decommissioned Water Mains
- Property Boundaries
  - Land Parcels
  - Easements
  - Land Parcels Tenure
    - Freehold
    - Housing Lease
    - Land Lease
    - National Park
    - Reserve
    - Railway
    - State Forest
    - State Land
- Base Map (BM) Layers
  - Fraser Coast Regional Council Boundary Line bm
  - Roads bm
    - State Roads
    - Major Roads
    - Rural Roads
    - Streets
    - Unformed Roads
    - Proposed Roads
    - Other Road
  - Dam / Waterbodies bm
  - Waterbodies bm
  - Land Parcels bm

Fraser Coast Regional Council | PO Box 1943, Hervey Bay Qld 4655 | Ph. 1300 79 49 29

Urangan Water

Fraser Coast REGIONAL COUNCIL

Map created by:	Scale: 1:8000 (When printed @ A3) Date: 16/07/2018



LEGEND

- LABELS Infrastructure
  - Sewer Manhole SL and IL Labels
  - Sewer Gravity Main Diameter and Material Labels
  - Sewer Rising Main Diameter and Material Labels
- Sewer Infrastructure
  - Sewer Effluent Manhole
  - Sewer Effluent Valves
    - Scour
    - Air
    - Sluice
    - Non return
  - Sewer Valve
    - Scour
    - Air
    - Sluice
    - Ball
    - Stop
    - Non Return
  - Sewer Manholes
    - Sewer Inspection Shaft
    - Sewer Manhole
  - Sewer House Connections
    - Sewer House Connections
    - Sewer House Connections (non WBW)
  - Sewer Rising Mains
  - Sewer Effluent Main
  - Sewer Gravity Mains
  - Decommissioned Sewer Mains
- Property Boundaries
  - Land Parcels
  - Easements
  - Land Parcels Tenure
    - Freehold
    - Housing Lease
    - Land Lease
    - National Park
    - Reserve
    - Railway
    - State Forest
    - State Land
- Base Map (BM) Layers
  - Fraser Coast Regional Council Boundary Line bm
  - Roads bm
    - State Roads
    - Major Roads
    - Rural Roads
    - Streets
    - Unformed Roads
    - Proposed Roads
    - Other Road

Fraser Coast Regional Council | PO Box 1943, Hervey Bay Qld 4655 | Ph. 1300 79 49 29

Urangan Sewer

Fraser Coast REGIONAL COUNCIL

Map created by:	Scale: 1:8000 (When printed @ A3) Date: 16/07/2018

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Contact

Cardno (Qld) Pty Ltd
ABN 57 051 074 992

Level 11
515 St Pauls Terrace
Fortitude Valley QLD 4006

Telephone: 07 3369 9822
Facsimile: 07 3369 9722

www.cardno.com

Cardno®