ARMSTRONG CREEK URBAN GROWTH PLAN BACKGROUND REPORT

21 April 2006



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CITY OF GREATER
GEELONG

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1.0 Background

1.1 Introduction

The Armstrong Creek Urban Growth Plan is one of the City of Greater Geelong's largest and most important strategic projects. It aims to concentrate the majority of the growth of Geelong into a comprehensive community in the area south of the railway line at Grovedale and Marshall. This will enable the creation of a community that is sustainable in all aspects – environmentally, socially and economically.

The Armstrong Creek Urban Growth Plan will include the following key outputs:

- Background Report (this document)
- Vision
- Draft Urban Growth Plan
- Planning Scheme Amendment
- Final Urban Growth Plan

This Background Report summarises the context, opportunities and challenges for development of the Armstrong Creek Urban Growth area. It draws together the key findings from a series of specialist technical reports undertaken as part of the Armstrong Creek Urban Growth Plan (UGP) project between November 2005 and February 2006, and includes a summary of the development constraints, opportunities and capacity of the study area.

The Location Context section describes the geographical context of the study area in relation to Geelong, Torquay, Surf Coast Shire, Golden Plains Shire and the Bellarine Peninsula, as well as describing and mapping the surrounding land uses. The subsequent sections summarise the Technical Reports, which include a review of previous studies, new investigations (where required) and an audit of the Study Area's existing natural, built, cultural and social environments.

This Background Report and the more detailed Technical Reports and their associated maps will guide the preparation of the UGP to ensure that it is based on a thorough assessment of land capability, that the constraints and opportunities are clearly understood prior to the commencement of forward planning and that the UGP considers its local context including its relationship with adjacent urban areas.

1.2 Planning Context

The Armstrong Creek area was originally designated as a growth corridor in the 1980s by the Geelong Region Commission. This was reinforced in 1994 by the Mount Duneed Armstrong Creek Urban Development Study. The status of this area as Geelong's future urban growth corridor was confirmed again in the City's Urban Growth Strategy 1996 and is supported by a range of Council documents including the Municipal Strategic Statement. Armstrong Creek is the major growth area identified in the Geelong Region Plan, currently being prepared by the G21 organisation.

The area has great potential for urban development, with existing railway services and good road links to central Geelong, Barwon Heads, Torquay and the Surf Coast. It provides the opportunity for future residents to take advantage of the employment opportunities and services offered by Geelong city, whilst being only a short distance from the beaches of the Surf Coast and the Bellarine Peninsula. This, combined with the undulating topography of parts of the land makes the area very attractive for a healthy residential and business environment.

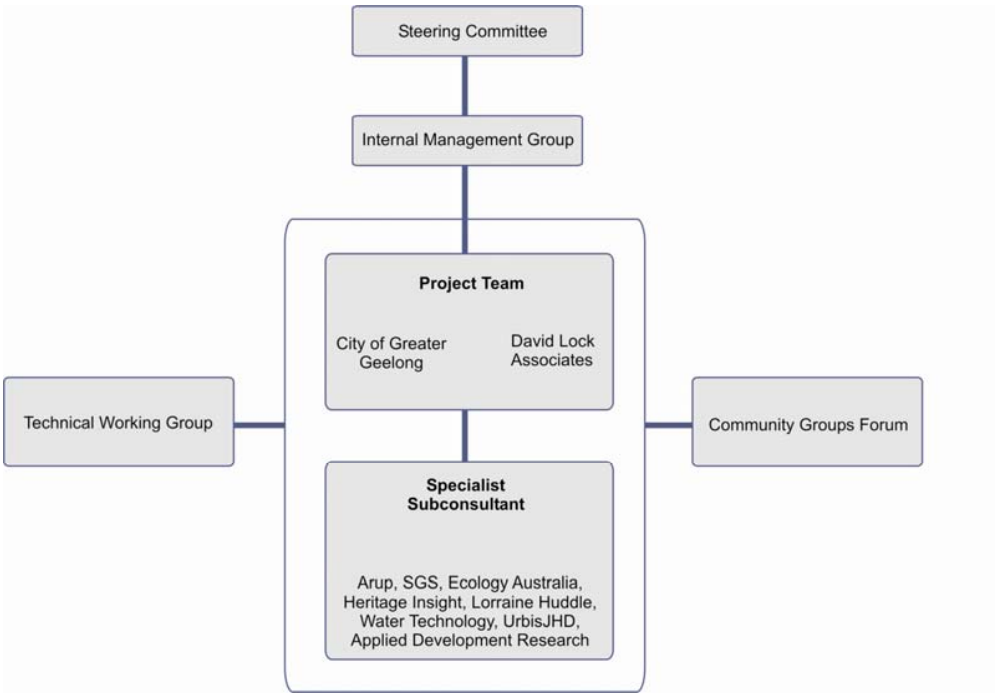
1.3 The Team

This project is being undertaken by a specialist consultant team lead by David Lock Associates. Their roles are as follows:

David Lock Associates – Project leadership and management, Strategic Planning, Urban Design
Arup – Statutory Planning, Transport Planning and Engineering, Civil Engineering, GIS Mapping
SGS – Economic Research and Planning, Development Contributions
Applied Development Research – Activity Centre Economics
Urbis JHD – Social and Community Planning and Demographic Research, Open Space and Recreation Planning
Lorraine Huddle – European Cultural Heritage Assessment
Heritage Insight – Indigenous Cultural Heritage Assessment
Ecology Australia – Flora and Fauna Research, Environmental Planning
Water Technology – Drainage and Flood Engineering

The consultant team is guided by a number of groups, including:

- Council's Internal Management Group
- Council's Project Management Team
- A Steering Committee
- A Technical Working Group
- Community Groups Forum



Internal Management Group
This is an internal group of Council managers to provide internal project leadership, direction and to ensure that there are sufficient staff and other resources allocated to the project. The Internal Management Group has a role in ensuring that the Urban Growth Plan is supported as a high priority project across Council Businesses

Project Management Team
The Council Project Team's role is to direct and manage the project on behalf of Council. The Project Team is responsible for project reporting, budgeting, resources, timelines and outputs. The Team oversees the lead consultants and administers the Steering Committee, Internal Management Group and the Technical Working Group. The Team manages the overall public consultation program including organising community group and landowner forums and workshops.

Steering Committee
The role of the Steering Committee is to provide high level direction on key issues and to allow Council project staff and the Lead Consultant (David Lock Associates) to advise on the progress of the project. This committee includes the City of Greater Geelong Mayor, Ward Councillor, CEO and General Managers, and high level representatives from key government agencies being Barwon Water, Vic Roads, DSE, Barwon Health, DOI, DET and G21. The steering committee meets at key milestones, or approximately every 2 to 3 months.

Technical Working Group
The role of the Technical Working Group is to provide technical advice on the project, ensure all relevant technical issues are considered, guide the preparation of specialist consultant's briefs and assist with managing the specialist consultants. The Technical Working group occasionally meets as a large group.

Community Groups Forum
The role of the Community Groups Forum is to provide an opportunity for the broader community and key stakeholders to have input into the development of the Urban Growth Plan. Opportunities for targeted consultation are provided including a separate forum to allow land owners and developers access to information and briefings on the urban growth planning process.

1.4 **Approach**

This project represents a unique opportunity to create a sustainable urban extension of Geelong. It will utilise current best practice in urban development, including the following planning and design principles:

- **Seamless urban extensions**—to ensure residents of new urban areas are not isolated, provided by:
    - Numerous connections (streets and pedestrian/cycle paths)
    - Continuous open space links
    - Shared community facilities (schools, libraries, community centres, etc)
    - Sensitive interfaces

  … between the existing and new development areas.
- **Green Infrastructure**—a 'skeleton' of retained green spaces, including:
    - Ecological networks (flora and fauna habitats and linkages between them)
    - Floodplains
    - Farmland of high agricultural value
    - Recreational areas (parkland)
    - Forests (for recreation and as carbon sinks)
    - Areas of natural beauty
- **Sustainable travel - public transport**—supported by:
    - Concentration of higher trip-generating uses and densities (employment areas, shops, schools, higher-density housing, etc) on public transport nodes
    - Effective bus routes – central and accessible
    - Priority for road-based public transport (dedicated lanes, tram/ bus boarders, etc)
    - High quality image (attractive trains/ trams/ buses and stations/ stops)
    - Early provision in the development of the new urban area
- **Sustainable travel - walking & cycling**—supported by:
    - Permeable and legible street network
    - Dedicated provision for cyclists on busy streets, on public transport and at destinations
    - Pedestrian friendly streets (footpaths both sides, trees, verandahs/ colonnades in commercial areas, etc)
    - Buildings addressing the street (and no high front fences)

- **Walkable neighbourhoods**—development precincts in which people can walk to their daily needs, created by:
    - Walkable neighbourhoods as organising structure (whole urban development divided into neighbourhoods small enough so that it is a comfortable walk from the periphery to the centre, each with a neighbourhood centre in the middle)
    - Sufficient density to ensure catchment for daily needs (corner shop, primary school, etc)
    - Larger parks on the periphery of the neighbourhood (to avoid reducing the catchment within comfortable walking distance of the centre)
    - Daily needs provided in neighbourhood centres (including corner shop and bus/ tram stop)
- **Housing choice**—provided by:
    - Wide range of house types
    - Mixed private and social housing (not segregated into separate estates)
    - Integrated retirement communities (not gated)
    - 'Lifetime houses' (flexible enough to respond to changing household needs)
- **Local employment**—provided by:
    - Jobs-homes balance (as many jobs as the size of the working population)
    - Relocation of major employers into area
    - Economic development programs (to stimulate new local businesses)
- **Community building**—the development of a sense of community, facilitated by:
    - Community facilities as a focal point (community centre, school, library, etc)
    - Early provision of community facilities and services in the development of the new urban area
    - Community building programs (residents groups, etc)
    - Parks that perform (properly landscaped, overlooked and provided with play equipment, not just leftover spaces)
- **Mixed-use, street-based activity centres**—integrated shopping, business and civic centres, characterised by:
    - Location on main thoroughfares, where they will benefit from exposure (and not necessarily in the middle of their catchment)
    - Mixed use (not just shops)

  - Street orientation, hidden parking (streets lined by buildings, not car parking)
  - Mixed ownership/tenure (not all owned by one company, to facilitate diversity—particularly through inclusion of independent retailers)
- **Green services**—environmentally-sensitive physical services, including:
  - Greywater reuse (recycling of household water for toilets and gardens, etc)
  - Sustainable drainage (water sensitive urban design)
  - Renewable energy (solar power, waste-to-energy, etc)
  - Recycling
- **Green buildings**—environmentally-sensitive building design, including:
  - Energy-efficient buildings
  - Rainwater harvesting (for use in toilets and on gardens)
  - 'loose-fit' homes (able to respond to changes in household needs)
- **Sense of place**—a distinctive image, potentially generated by:
  - Response to site (views of hilltops, retention of mature trees, etc)
  - Creation or reinforcement of local character (through building design 'themes', etc)
  - Focal points (such as a town square or village green)
  - Building and urban design quality
  - Public art

2.0 SUMMARY

2.1 Development Constraints

The development of the Armstrong Creek area must address the following constraints:

Location Context and Built Environment
- Barwon River and Reedy Lake – flood constraints, physical constraint
- Buffer zone of area to west abutting future quarry site - expected to commence in 5 – 6 years
- Geelong Memorial Park and Crematorium – limits adjacent development
- Geelong Airport site whilst in use, requires buffer zones although it has been sold for future redevelopment
- Poultry farms, whilst in use require buffer zones
- Site contamination around the former Tanneries in the Marshall Industrial Area
- Railway line as a barrier
- Geelong Bypass as a barrier
- Retention of key views to Mount Duneed
- Protection and sensitivity of flora and fauna to development
- Protection and sensitivity of Armstrong Creek and hydrological characteristics of the creek
- High grade agricultural land – whether or not it should be protected
- Visual impact of industrial buildings across the Barwon River in Breakwater
- Fragmented land ownership

Economic Activity and Employment
- Further industrial development in existing IN1Z area – poor road access for large trucks and existing investment in housing
- One company – John Wood Transport, livestock and general transport company employing one person – should not be forced to relocate
- Viticulture – buffers
- VicRoads bypass – providing linkages across
- Rail line – providing linkages across to existing suburbs north of the railway line

Community and Social
- Difficult access to nearby community and social facilities

Indigenous Cultural Heritage
- Heritage places and views – are protected

European Cultural Heritage
- Heritage places – State and Local Level – are protected

Natural Environment - Flora and Fauna
- Need to avoid impacts to Lake Connewarre through altered hydrological regimes
- Need to protect values along Armstrong Creek and Barwon River

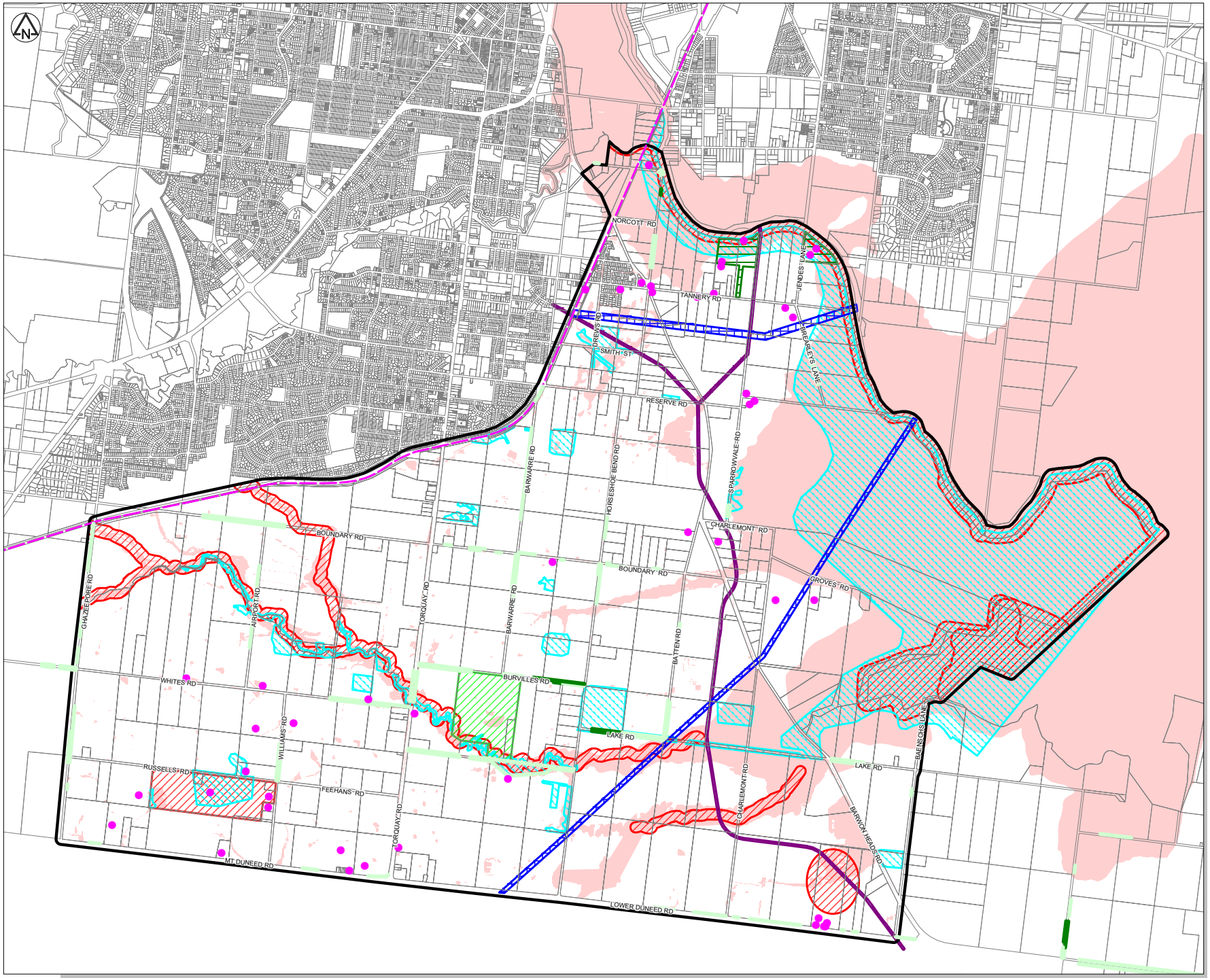
- Need to protect State and Nationally listed species
- Need to protect woodland vegetation on roadsides and in riparian zones

Movement and Access
- Potential of Surf Coast Highway being four lane, 80km/h
- Potential of Geelong Bypass being six lane

Physical Infrastructure and Engineering Services
- Need for retarding basins
- Visual impact of overhead transmission lines and pylons and restricted development opportunities due to overhead transmission lines and pylons – easements of 62 and 36 metres, latter Alcoa
- Restricted development opportunities due to water main easements
- Easement for major feeder main from Pettavel Basin to Study Area

Flooding and Drainage
- 100 year ARI flood extent
- Lower sections east of Horseshoe Bend Road are subject to flooding
- Areas around Armstrong Creek subject to flooding however development may be able to occur within the 100 year flood extent where the depth is less than 500mm (flood fringe), but potential access and egress issues
- Difficult to drain areas where slope is less than 1 in 250
- Overland flow paths can't be developed.

Figure 1 shows an overlay of these constraints.



Armstrong Creek Urban Growth Plan

Synthesis of Constraints (NO Low Constraints)

Constraints

- Flood Overlay (High)
- Indigenous Cultural Heritage Places (High)
- Remnant Vegetation (High)
- Sewer Easements (High)
- Electrical Easements (High)
- European Heritage Places (High)
- Roadside Vegetation (High)
- Curtilages
- Roadside Vegetation (Medium)
- Crematorium (Medium)

STUDY AREA:
4,284 hectares
CONSTRAINTS AREA:
1,554 hectares
TOTAL DEVELOPABLE LAND:
2,730 hectares

0 750 1500 2250
Metres

Figure 1

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2.2 Development Opportunities and Strengths

The development of the Armstrong Creek area could build on the following opportunities and strengths, as illustrated in Figures 1 and 2:

Location Context and Built Environment
- Large size of Study Area
- Close to Geelong CAA and major employment areas
- Transport – railway station, highways, bypass
- Close to Deakin University
- Close to Town and Country Shopping World, Geelong Homemaker Centre
- Close to Surf Coast, Bellarine Peninsula
- Cultural heritage sites
- Some groupings of land in single ownership, adjacent lands where owners have formed a consortium
- Stewarts Reserve
- Mount Duneed Reserve
- Poultry farms, once the cease use, present potential development opportunities
- Visual prominence and views of Mount Duneed

Economic Activity and Employment

- Marshall Pine Products will be relocating from their existing facility in Marshall in the near future
- Large scale manufacturing operations in Breakwater have a market orientation towards intrastate, interstate and international markets
- Future relocation of Geelong Airport
- Viticulture – potential tourism
- VicRoads bypass – providing quick access around Geelong
- Deakin University – potential for student housing
- Industrial growth opportunities within Geelong – Industrial Land Study
- Demand for larger office complexes including CAD style development and campus style developments
- Target high tech or advanced manufacturing that can blend in with commercial precincts
- Logistics given potential development of southern bypass
- Low level of development in Marshall Industrial area – possibly use for other urban purposes

Community and Social
- Large areas of open space available

European Cultural Heritage
- Heritage places – opportunities to make features/landmarks etc
- Opportunities for heritage precincts
- Aqueduct – historic feature

Indigenous Cultural Heritage
- Heritage places – opportunities to make features/landmarks etc

- Narana Creations – Aboriginal Cultural Centre

Natural Environment - Flora and Fauna
- Remnant vegetation along road corridors
- Values along Armstrong Creek and Barwon River

Movement and Access
- Possible Railway Station between Surf Coast Highway and Reserve Road – develop as a major park and ride station for commuters to Melbourne
- Enhancement of Marshall Station as key transport interchange servicing Geelong, Surf Coast, Great Ocean Road and Colac
- New bus services to connect with the new station at Marshall to Grovedale, Waurn Ponds, Deakin University, Highton, Belmont, Barwon Heads and Ocean Grove
- Existing and proposed cycle paths
- As part of Western Link, a river crossing of the Barwon River
- Potential to develop sustainable transport outcomes – TravelSMART, at-home PT consultation etc

Physical Infrastructure and Engineering Services
- Water recycling – opportunity to use recycled water from Black Rock WRP
- Potential for an Integrated Resource Recovery Centre (IRRC) within the Industrial 1 Zone at Marshall, locating close to proposed electricity substation means future technologies for converting waste to energy could be implemented with generated electricity being supplied to the local grid via the substation. Receival of all waste, recovery of whatever material possible, and disposal of residual waste to landfill (Drysdale).

Sustainable Energy Strategies:

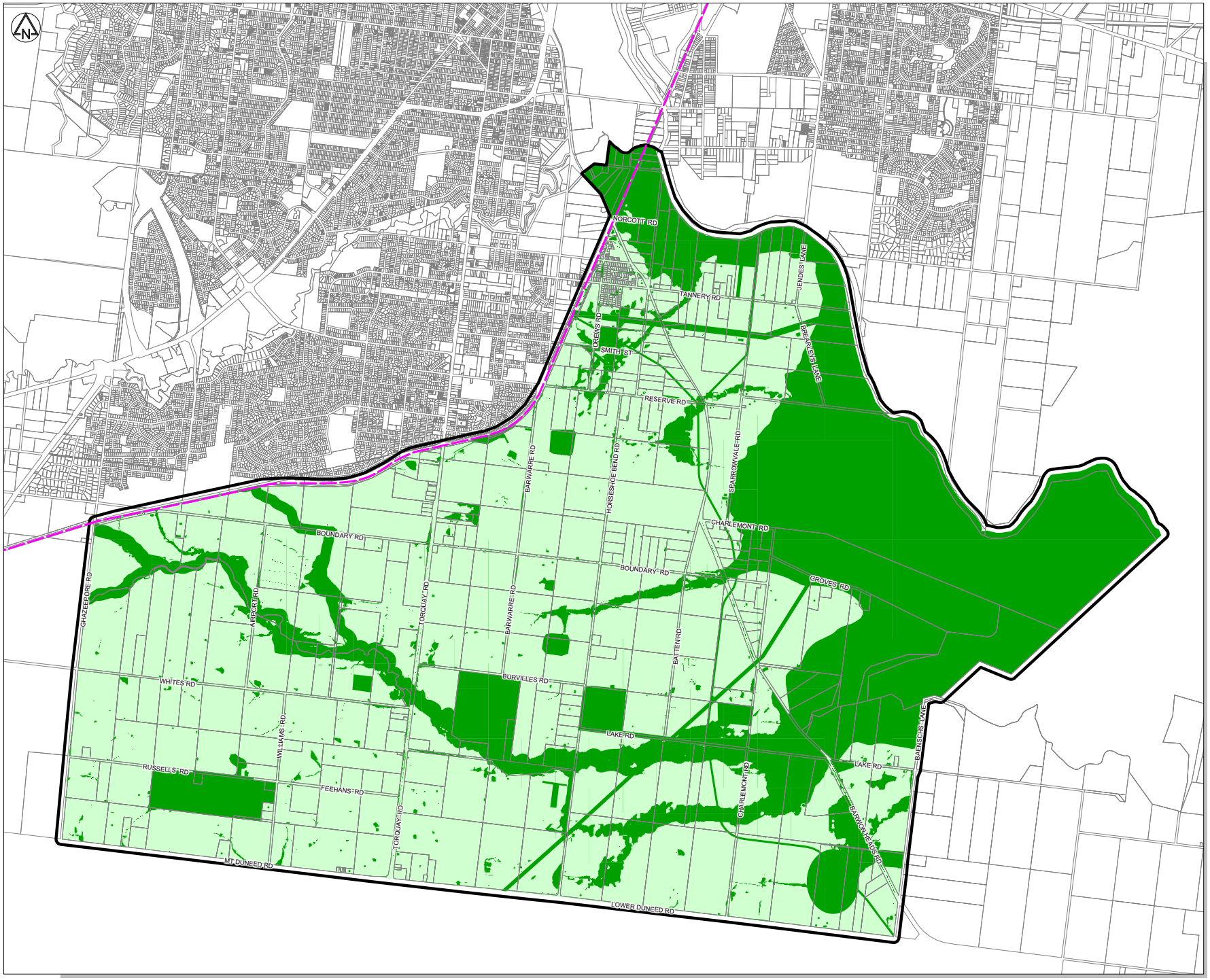
The following table outlines possible sustainable energy strategies and confirmation of the geographic level to which the strategies may be implemented – regional, development wide, precinct, or site specific.

	Regional	Development Wide	Precinct	Site
1. A community that promotes a reduced ecological footprint. From an energy aspect this will involve reduction in operational energy and the energy embodied in the production of infrastructure, sites and buildings. Creation of an "Urban Forest" throughout the entire development (parklands, roadways, individual sites and building green roofs) will embody atmospheric CO_2 to assist reduction in the eco-footprint.	✓	✓	✓	✓
2. Maximise use of affordable renewable energy; encourage sponsorship from government to improve affordability and to ensure implementation of responsible, visible, renewable energy in all precincts.	✓	✓	✓	✓

3.	Careful clustering of uses, for example locate buildings and mixed use facilities in a pattern that will enhance the symbiotic sharing of water, energy, flexible space and transport.		✓	✓	✓
4.	Building material production, transport and installation requires large amounts of energy. Select materials throughout the development based on reduced "embodied" energy as well as reduction in other environmental impacts such as landfill, toxicity, water use, etc.		✓	✓	✓
5.	Leading edge communications to all buildings and dwellings promoting virtual connections to workplaces and the world and assisting reduced physical travel dependency.	✓	✓	✓	✓
6.	Promote community accessible car share plans allowing centralised efficient management and sharing of vehicles including new hybrid energy models and future alternate fuel based vehicles (e.g. hydrogen/electric).	✓	✓	✓	
7.	Plan the development to facilitate individual site and building orientation for solar access, wind/breeze access and views, etc.		✓	✓	✓
8.	Large trees as an important part of the urban forest and ecology, these will shade buildings, streetscapes, parking, paths and open community spaces to reduce "heat island" effects, improve comfort and reduce building energy draw. Large trees will also act as a CO2 sink by drawing in atmospheric CO2 as they grow and will need to be carefully planned for integration into streetscapes, etc.		✓	✓	✓
9.	Cogeneration facilities that efficiently produce electricity and heat with greatly reduced CO2 emissions. These facilities are operate best when large year round heat loads exist (such as aquatic centres) and can be linked into a wider precinct centralised heating water reticulation strategy and into a development wide electrical power strategy.		✓	✓	✓
10.	Install infrastructure initially to facilitate a range of future energy sources as availability and economic feasibility changes:				
	a. High pressure natural gas reticulation to all sites in the entire development; this will allow high energy capacity connection of new local heat & power (co-generation/tri-generation) technologies such as fuel cells, microturbines, absorption chillers, etc. and to facilitate a future "hydrogen economy" such as vehicle power systems and stations alternate to the current petroleum dependant systems.	✓	✓	✓	
	b. Site planning for energy from waste facilities; co-locate precinct bio-energy facilities with the high pressure gas, electrical and heating water reticulation infrastructure for local precinct reticulation and/or whole development wide electricity and combined natural & bio-gas reticulation. The energy from waste plants would convert biological energy (such as green waste products) into electricity and heat.		✓	✓	✓
	c. Plan for integration of centralised renewable energy such as wind power, photovoltaic cells, geothermal plant into the overall integrated energy infrastructure.		✓	✓	✓
	d. Pathways within buildings and street networks for the installation of future technologies (e.g. fuel cells, photovoltaic cells, wind power) and interconnections within the site and to the broader infrastructure.		✓	✓	✓

11. Mandatory energy performance requirements for all building types and for all owners and occupiers; this would be flexible in terms of change in performance hurdles and the introduction of new performance measures over time. Initially minimum 5 Star ABGR for buildings and 6 Star residences. Note that this strategy promotes green buildings in a holistic sense and in particular will result in a focus on energy efficiency issues such as building orientation and footprint, natural ventilation, solar access, shading, building services system efficiency, façade performance, commissioning, solar hot water, etc based on individual site opportunities.				✓
12. Precinct heat rejection and heat reclaim loops; these would entail piping infrastructure allowing heat to be rejected from one building/zone into the loop and this heat to be withdrawn in another building/zone. This is particularly useful where areas requiring consistent heat removal (e.g. supermarket refrigeration) are combined with variable load areas (e.g. residences).			✓	✓

Figure 2 shows the developable area.



Armstrong Creek Urban Growth Plan

Constraints and Developable Land

Constraints

- Constraints
- Developable Land
- Study Area

NOTE
These development parcels are not staging plans or boundaries of areas

STUDY AREA:
4,284hectares
CONSTRAINTS AREA:
1,554 hectares
TOTAL DEVELOPABLE LAND:
2,730 hectares

0 750 1500 2250
Metres

Figure 2

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2.3 Development Capacity

Once the constraints outlined in Section 2.1 have been taken into account, there is approximately 2,730 hectares of developable land within the Study Area. This is illustrated in Figure 3 and Table 1.
Note: these development parcels are not staging plans or boundaries of areas.

Table 1: Overall Development Area

DEVELOPMENT PARCELS	ha
Tannery Road	125
Central	719
Central west	175
Far west	129
Central east	331
South west (Mt Duneed)	691
South central	298
South east	213
Lake Road east	49
TOTAL DEVELOPABLE AREA	**2,730**

Table 2 (below) sets out a series of possible land use budgets based on varying residential development densities.

The following assumptions have been made for all scenarios:

- The take-up of all of the developable land. (It should be noted that this will take many decades to occur, and is therefore impossible to forecast with any degree of accuracy.)
- A nominal 200 hectares of industrial land is required. (The actual amount of industrial land to be provided will be refined in the next stage of the Urban Growth Plan project.)
- One sub-regional centre of around 30 hectares is required.
- One independent and one catholic secondary school are to be provided for.
- Passive regional and district-level open space are provided in undevelopable areas.
- Retail areas incorporate shoptop office and residential space.
- Average household size is 2.46 people, based on demographic forecasts.

Option A assumes an average gross residential density (excluding non-residential uses, but including local streets and parks) of 15 dwellings per

hectare—the state government's benchmark for growth areas and an average lot size of around 550m^2. This results in a total yield of around 33,000 dwellings, or around 79,000 people, and requires 2 district centres, 9 neighbourhood centres, 2 state secondary schools and 9 primary schools.

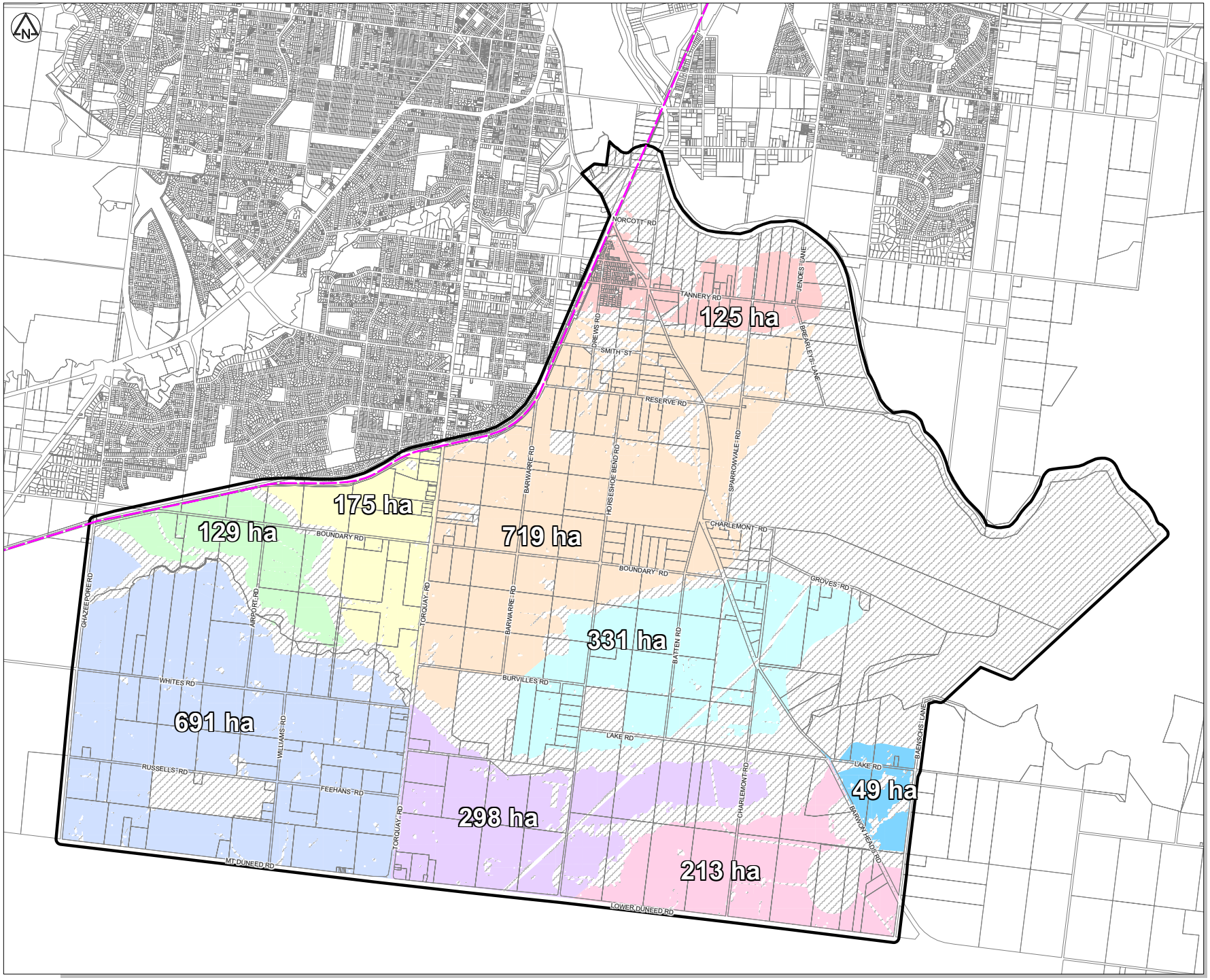
Option B assumes an average gross residential density of 18 dwellings per hectare—an average lot size of around 460m^2. This results in a total yield of around 39,000 dwellings, or around 93,000 people, and requires 3 district centres, 10 neighbourhood centres, 3 state secondary schools and 10 primary schools.

Option C assumes an average gross residential density of 21 dwellings per hectare—an average lot size of around 390m^2. This results in a total yield of around 44,000 dwellings, or around 106,000 people, and requires 3 district centres, 12 neighbourhood centres, 3 state secondary schools and 12 primary schools.

Option D assumes an average gross residential density of 24 dwellings per hectare—an average lot size of around 345m^2. This results in a total yield of around 49,000 dwellings, or around 118,500 people, and requires 4 district centres, 13 neighbourhood centres, 4 state secondary schools and 13 primary schools.

Table 2: Land Use Budget Scenarios

SCENARIOS	A		B		C		D	
Average gross residential density (dw/ha)	**15**		**18**		**21**		**24**	
AREAS	Gross Area	%	Gross Area	%	Gross Area	%	Gross Area	%
TOTAL DEVELOPABLE LAND	**2,730**	100%	**2,730**	100%	**2,730**	100%	**2,730**	100%
PRIMARY INFRASTRUCTURE								
Public transport reserves	26.9	1%	26.9	1%	26.9	1%	26.9	1%
Main road reserves	97.5	4%	97.5	4%	97.5	4%	97.5	4%
Services easements	-	0%	-	0%	-	0%	-	0%
Total	**124.4**	**5%**	**124.4**	**5%**	**124.4**	**5%**	**124.4**	**5%**
EMPLOYMENT PRECINCTS								
Industrial land	200.0	7%	200.0	7%	200.0	7%	200.0	7%
Total	**200.0**	**7%**	**200.0**	**7%**	**200.0**	**7%**	**200.0**	**7%**
ACTIVITY CENTRES								
Sub-regional centre (no.)	**1**		**1**		**1**		**1**	
Civic & health	11.3	0%	11.3	0%	11.3	0%	11.3	0%
Retail	12.5	0%	12.5	0%	12.5	0%	12.5	0%
Entertainment	2.5	0%	2.5	0%	2.5	0%	2.5	0%
Commercial office	3.8	0%	3.8	0%	3.8	0%	3.8	0%
Townhouses (office expansion area)	1.3	0%	1.3	0%	1.3	0%	1.3	0%
Total	31.3	1%	31.3	1%	31.3	1%	31.3	1%
Floorspace of apts above shops/ offices	*1.4*		*1.4*		*1.4*		*1.4*	
District centres (no.)	**2**		**3**		**3**		**4**	
Community & health	2.8	0%	4.1	0%	4.1	0%	5.5	0%
Retail	6.3	0%	9.4	0%	9.4	0%	12.5	0%
Commercial office	0.4	0%	0.6	0%	0.6	0%	0.8	0%
Townhouses (office expansion area)	0.6	0%	0.9	0%	0.9	0%	1.3	0%
Retirement villages & Aged care	35.0	1%	52.5	2%	52.5	2%	70.0	3%
Total	45.0	2%	67.5	2%	67.5	2%	90.0	3%
Floorspace of apts above shops/ offices	*0.4*		*0.6*		*0.6*		*0.8*	
Neighbourhood centres (no.)	**9**		**10**		**12**		**13**	
Community & health	14.1	1%	15.6	1%	18.8	1%	20.3	1%
Retail	2.1	0%	2.3	0%	2.8	0%	3.0	0%
Total	16.2	1%	18.0	1%	21.6	1%	23.4	1%
Total areas	**92.4**	**3%**	**116.7**	**4%**	**120.3**	**4%**	**144.6**	**5%**
Total activity centre residential								
Townhouses (site area)	2		2		2		3	
Retirem villages & Aged care (site area)	35		53		53		70	
Apts ab shops/ offices (floorspace, ha)	2		2		2		2	
Total number of dwellings	**1,651**		**2,383**		**2,383**		**3,115**	
EDUCATION								
Tertiary institutions	18.8	1%	18.8	1%	18.8	1%	18.8	1%
Secondary schools	21.0	1%	31.5	1%	31.5	1%	42.0	2%
Independent & Catholic 2^{o} schools	20.0	1%	20.0	1%	20.0	1%	20.0	1%
Primary schools	39.4	1%	43.8	2%	52.5	2%	56.9	2%
Pre-school	1.6	0%	1.9	0%	2.2	0%	2.4	0%
Total	**100.8**	**4%**	**115.9**	**4%**	**124.9**	**5%**	**140.1**	**5%**
EMERGENCY SERVICES								
Total	**2.1**	0%	**2.5**	0%	**2.6**	0%	**3.0**	0%
RECREATION								
Recreation centres	5.0	0%	5.0	0%	5.0	0%	5.0	0%
Regional parks	-	0%	-	0%	-	0%	-	0%
District parks	8.8	0%	13.1	0%	13.1	0%	17.5	1%
Neighbourhood parks	118.1	4%	131.3	5%	157.5	6%	170.6	6%
Total	**131.9**	**5%**	**149.4**	**5%**	**175.6**	**6%**	**193.1**	**7%**
RESIDENTIAL NEIGHBOURHOODS								
Total land	**2,078**	76%	**2,021**	74%	**1,982**	73%	**1,925**	71%
Total number of dwellings	**31,177**		**36,380**		**41,625**		**46,196**	
TOTAL NUMBER OF DWELLINGS	**32,828**		**38,763**		**44,008**		**49,311**	
TOTAL POPULATION	**79,413**		**93,340**		**106,243**		**118,616**	



Development Parcels

Constraints

- Constraints
- Railways
- Study Area

NOTE
These development parcels are not staging plans or boundaries of areas

STUDY AREA:
4,284 hectares
CONSTRAINTS AREA:
1,554 hectares
TOTAL DEVELOPABLE LAND:
2,730 hectares

0 750 1500 2250
Metres

Figure 3

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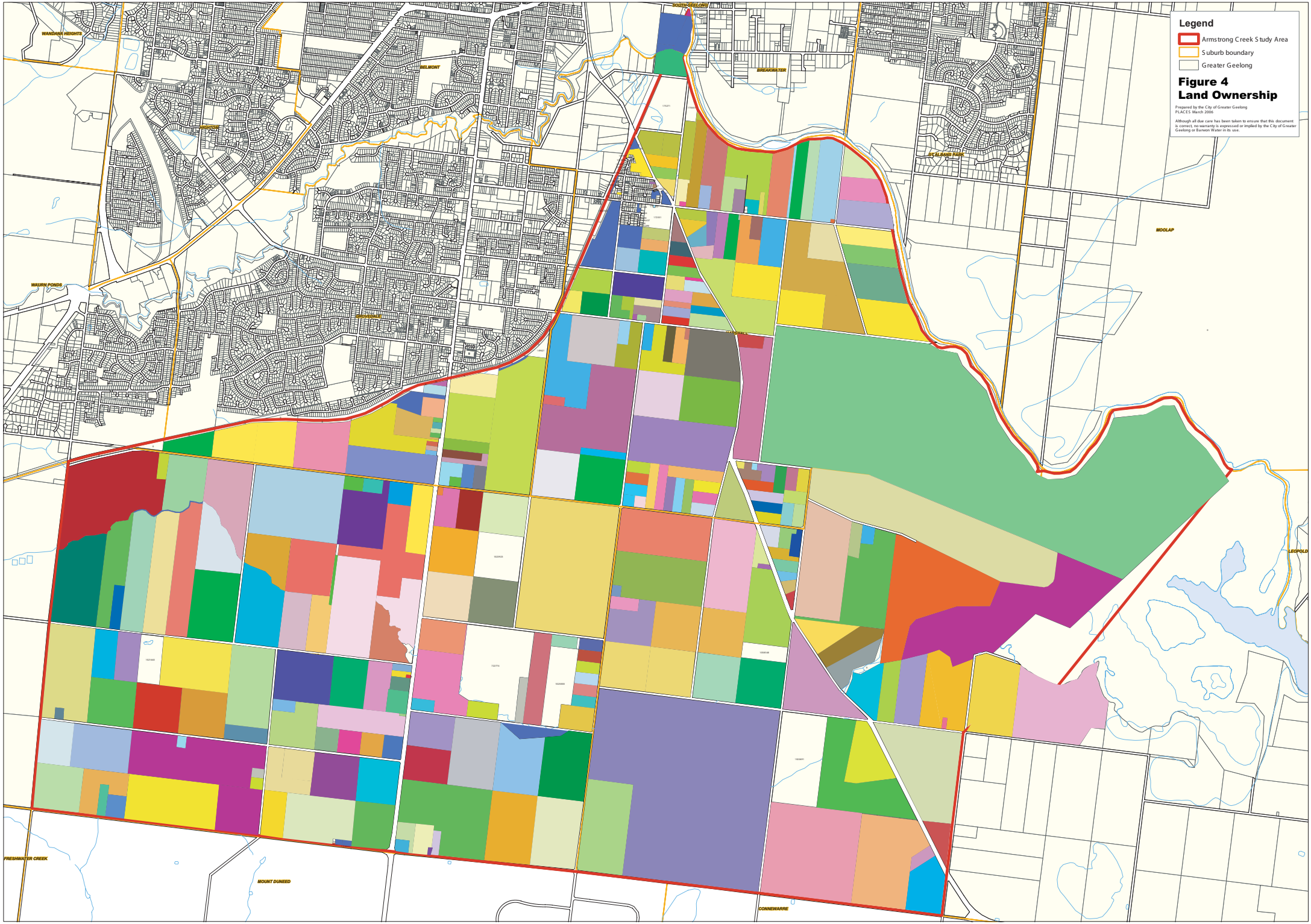
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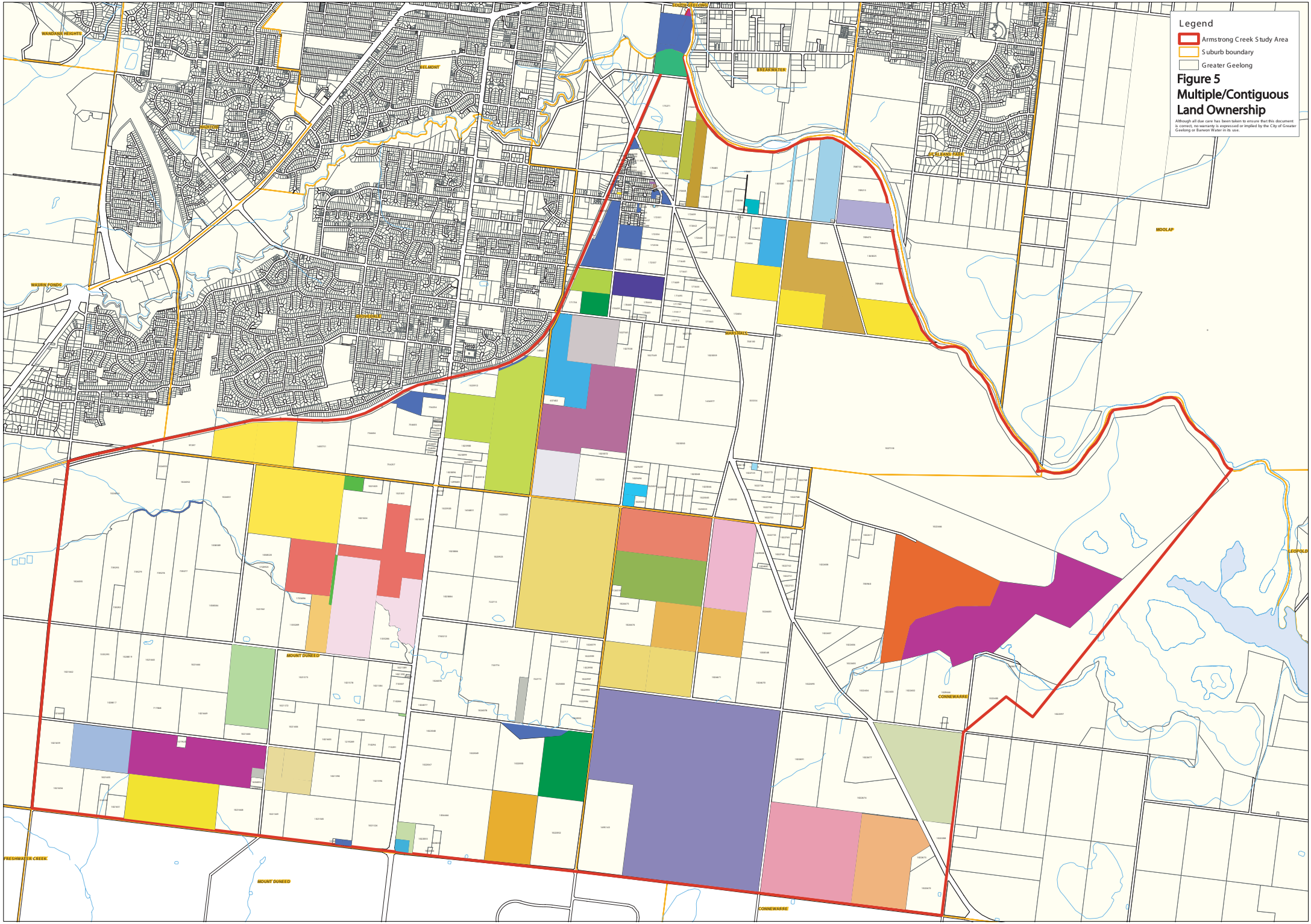
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2.4 Land Ownership

Figure 4 illustrates the current pattern of land ownership within the Study Area.
Figure 5 illustrates multiple and contiguous land ownership.


Legend
Armstrong Creek Study Area
Suburb boundary
Greater Geelong
Figure 4
Land Ownership
Prepared by the City of Greater Geelong
PLACES March 2006
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WANDANN HEIGHTS
BELMONT
BREAKWATER
SOUTH GEELONG
ST ALBANS PARK
MOOLAP
WAURN PONDS
LEOPOLD
FRESHWATER CREEK
MOUNT DUNEED
CONNEWARRE


Legend
Armstrong Creek Study Area
Suburb boundary
Greater Geelong
Figure 5
Multiple/Contiguous
Land Ownership
Although all due care has been taken to ensure that this document is correct, no warranty is expressed or implied by the City of Greater Geelong or Barwon Water in its use.
WANDARA HEIGHTS
BELMONT
BREAKWATER
ST LEONARDS
MOOLAP
WARREN FORDS
MARSHALL
MOUNT DUNEED
CONNEWARRE
FRESHWATER CREEK
LEOPOLD

3.0 Site Analysis

3.1 Location Context and Built Environment

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Location Context and Built Environment Reports*****.** Prepared by David Lock Associates.

3.1.1 Introduction

Technical Reports on Location Context and Built Environment for the Armstrong Creek Urban Growth Area were prepared by David Lock Associates on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, and mapping.

The following summarises the key findings of the Location Context and Built Environment Technical Reports:

3.1.2 Existing Conditions and Information

(Note: this section is a summary of the reports)

As shown in Figures 6 & 7, the Study Area:

- Is 4,267 hectares
- Is close to major employment areas and the Geelong CAA.
- Has excellent road access at present and will straddle part of the Geelong Bypass.
- Abuts the railway line, and contains a railway station at Marshall, and potential for another further west.
- Abuts the Barwon River and Reedy Lake.
- Is close to Deakin University and a number of primary and secondary schools in Grovedale, as well as containing a small primary school at Mount Duneed.
- Is close to a large retail centre in Waurn Ponds to the north west as well as a number of smaller local retail centres in Grovedale.
- Is approximately 10km from Torquay with excellent road access with access to the Surf Coast.
- Is approximately 4.5km from access to the Bellarine Peninsula, forming the link to towns and beachside suburbs.
- Abuts conventional density residential subdivisions in Grovedale to the north.

3.1.3 Key Issues

As shown in Figure 8, the Study Area is predominantly rural, used for grazing and some viticulture. It also contains:

- Some small conventional density residential subdivisions at Marshall.
- The Geelong Airport.
- The Geelong Memorial Park Crematorium and Cemetery and Mount Duneed Cemetery.
- Recreation areas including Stewarts Reserve and Mount Duneed Reserve.
- Highly visible overhead high voltage transmission lines.
- Some industrial sheds adjacent to the north edge in Breakwater.

- A buffer zone to future quarrying to the western edge.
- Some poultry farms whose future is unclear.

Figure 9 shows the current land use categories within the Study Area.

3.1.4 Constraints

- Barwon River and Reedy Lake – flood constraints, physical constraint
- Buffer zone of area to west abutting future quarry site - expected to commence in 5 – 6 years
- Geelong Memorial Park and Crematorium – limits adjacent development
- Geelong Airport site whilst in use, requires buffer zones although it has been sold for future redevelopment
- Poultry farms, whilst in use require buffer zones
- Site contamination around the former Tanneries in the Marshall Industrial Area
- Railway line as a barrier
- Geelong Bypass as a barrier
- Retention of key views to Mount Duneed
- Protection and sensitivity of flora and fauna to development
- Protection and sensitivity of Armstrong Creek and hydrological characteristics of the creek
- High grade agricultural land – whether or not it should be protected
- Visual impact of industrial buildings across the Barwon River in Breakwater
- Fragmented land ownership

3.1.5 Opportunities

- Large size of Study Area
- Close to Geelong CAA and major employment areas
- Transport – railway station, highways, bypass
- Close to Deakin University
- Close to Town and Country Shopping World, Geelong Homemaker Centre
- Close to Surf Coast, Bellarine Peninsula
- Cultural heritage sites
- Some groupings of land in single ownership, adjacent lands where owners have formed a consortium
- Stewarts Reserve
- Mount Duneed Reserve
- Poultry farms, once the cease use, present potential development opportunities
- Visual prominence and views of Mount Duneed

3.1.6 Summary

The large Study Area is well positioned in the context of the City of Greater Geelong with good road connections and some public transport connections. The Study Area has a number of physical constraints, the major of which is flooding, however there are a number of opportunities relating to its proximity to Geelong's CAA and retail in Waurn Ponds.



Figure 6 Location Context in relation to Geelong



Figure 7 Location Context in relation to Torquay, Surf Coast Shire, Golden Plains Shire and the Bellarine Penisula

N

1:250 000 @A3

0 5 10 15 20km

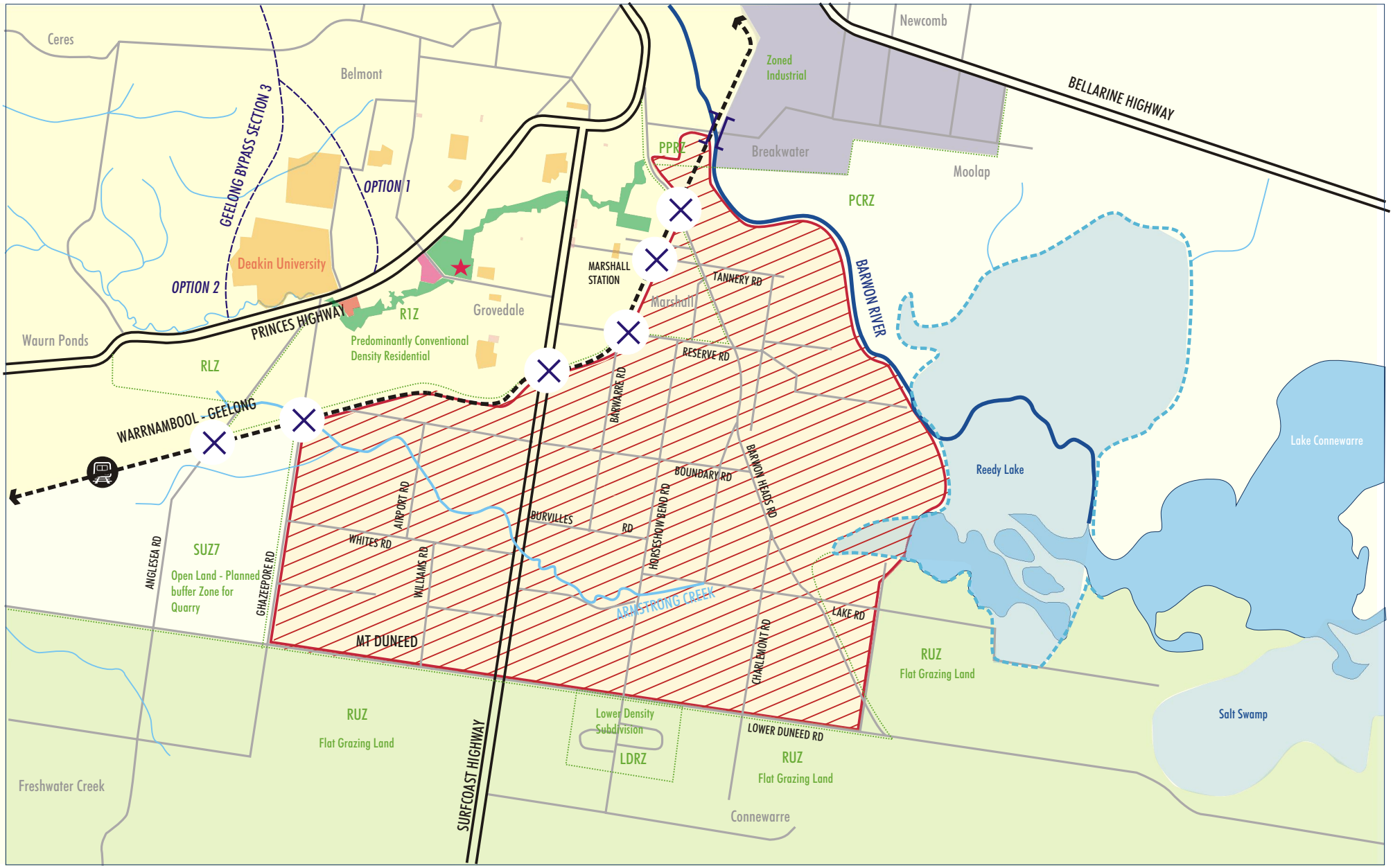


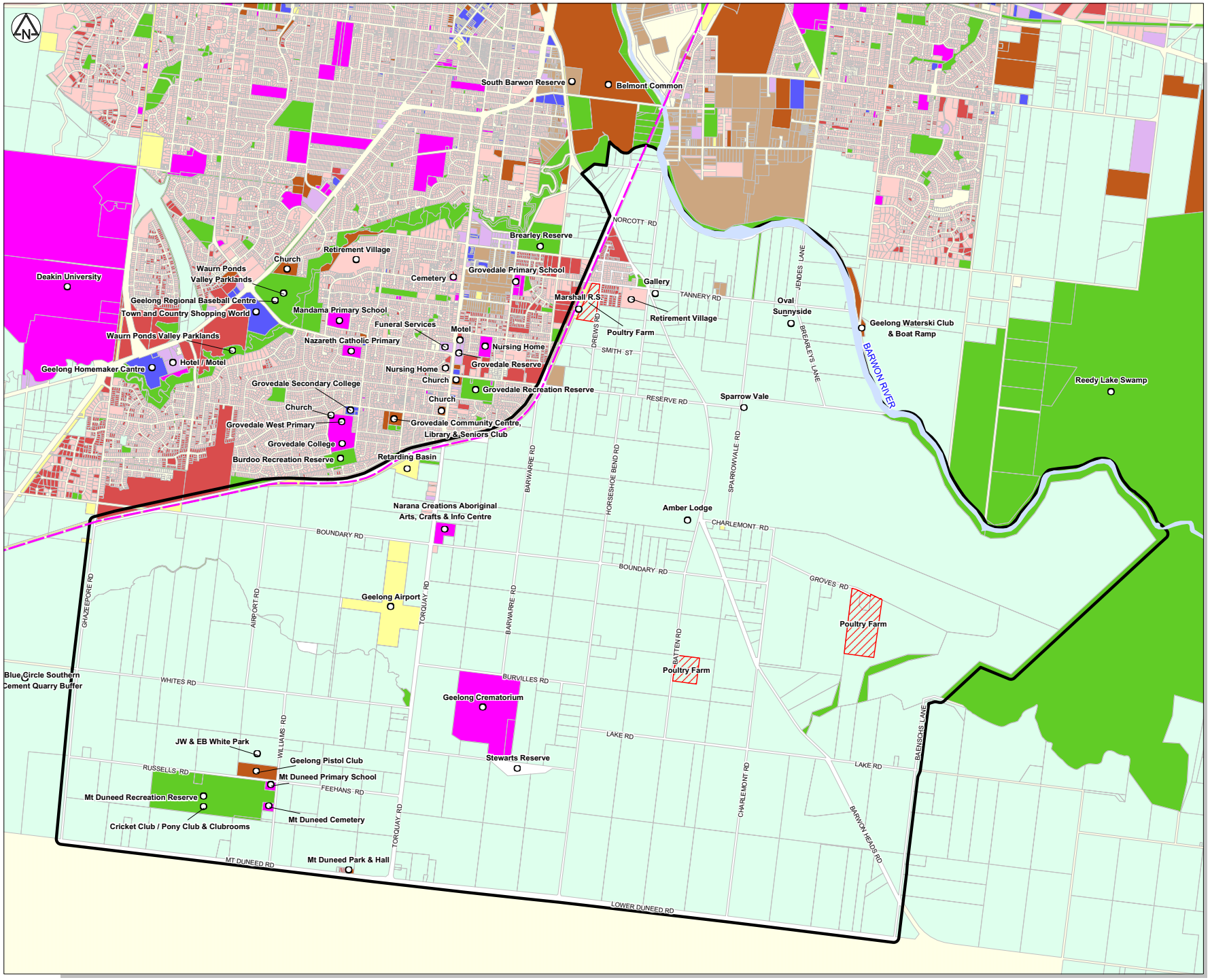
Figure 8 Local Context

N

1:50,000 @A3

0 1 2 3 4 5km

- The Site
- At Grade Vehicle Crossing
- Road Underpass
- Railway Line
- Primary Road
- Secondary Road
- Bypass indicative alignment
- Wetland edge
- Schools
- Local Centres
- Waurn Ponds Creek (Open Space Reserve)
- Geelong Regional Baseball Centre
- Residential
- Rural
- Industrial
- Geelong Homemaker Centre
- Town and Country Shopping World



Armstrong Creek Urban Growth Plan

Existing Land Uses

Landuse Categories

- Commercial
- Community Facilities
- Culture, Recreation and Sport
- Industrial
- Mining
- Public Open Space
- Public Utilities
- Residential
- Retail
- Rural
- Vacant Residential
- Study Area Boundary

0 750 1500 2250

Metres

Figure 9

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3.2 Policy Context

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan –Built Environment Technical Report.*** Prepared by David Lock Associates and Arup.

3.2.1 Introduction

A Technical Report on the Policy Context for the Armstrong Creek Urban Growth Area was prepared by Arup on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing State, Region and Local Policies and mapping.

3.2.2 Existing Conditions and Information

The following summarises the Current Planning Scheme Zoning, Overlays and Policies affecting the Study Area which is contained in the Policy Context Section within the Built Environment Technical Report and includes:

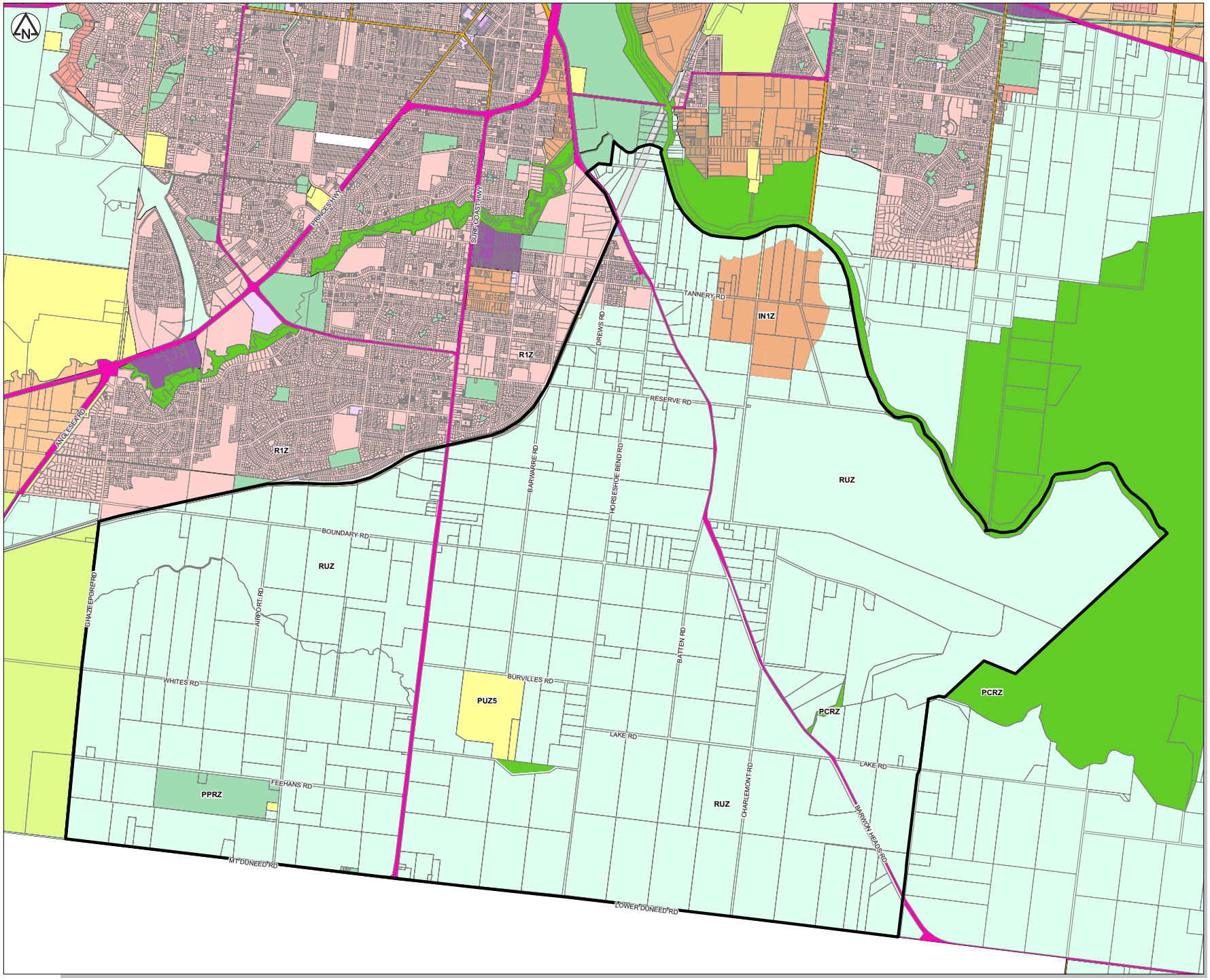
State Planning Policy Framework – Metropolitan Development:
- 12.01-2 Strategies Activity Centres – Neighbourhood Activity Centres
- 12.02-1 Strategies – Better Management of metropolitan growth – Growth Areas
- 12.03-2 Strategies – Networks with regional cities
- 12.05-2 Strategies – A great place to be
- 12.06-2 Strategies – A fairer city
- 12.07-2 Strategies – A greener city
- 12.08-2 Strategies – Better transport links
- Clause 14 Settlement
- Clause 15 Environment
- Clause 17 Economic Development
- Clause 18 Infrastructure

Melbourne 2030 – Policy 3.1

Regional Policy Context:
- G21 Strategic Plan, Region Plan, various plans and strategies
- Corangamite Region Catchment Strategy

Local Policy Context:
- Municipal Strategic Statement
    - Clause 21.08 Urban Growth
    - Clause 21.15 Open Space
    - Clause 21.16 Cultural Heritage
- City of Greater Geelong Urban Growth Strategy
- Zonings and Overlays
    - As shown in Figure 10, the Study Area is almost wholly contained within Rural Zone, two small areas included in Public Use Zone 5 and Public Park and Recreation Zone, with areas in the north as Industrial 1 Zone and Residential 1 Zone.
    - As shown in Figure 11, Development Plan Overlay 3 on the Marshall Industrial Estate, Design and Development Overlay 14

    - on the area around the Residential 1 Zone at Marshall, Heritage Overlay, Vegetation Protection Overlay, Public Acquisition Overlay 3 for road widening on Barwon Heads Road
    - As shown in Figure 12, Land Subject to Inundation Overlay, Floodway Overlay
- City of Greater Geelong Environmental Management Strategy 2005-2010 (Draft)
- City of Greater Geelong Open Space Strategy 2001
- City of Greater Geelong Economic Strategy 2005



Armstrong Creek Urban Growth Plan

Greater Geelong Planning Scheme - Zones

Planning Scheme

- Business 1 Zone
- Industrial 1 Zone
- Public Conservation and Resource
- Public Park and Recreation Zone
- Public Use Zone - Service and Utility
- Public Use Zone - Transport
- Public Use Zone - Cemetery
- Residential 1 Zone
- Road Zone - Category 1
- Rural Zone
- Urban Floodway Zone
- Study Area Boundary

0 750 1500 2250

Metres

Figure 10

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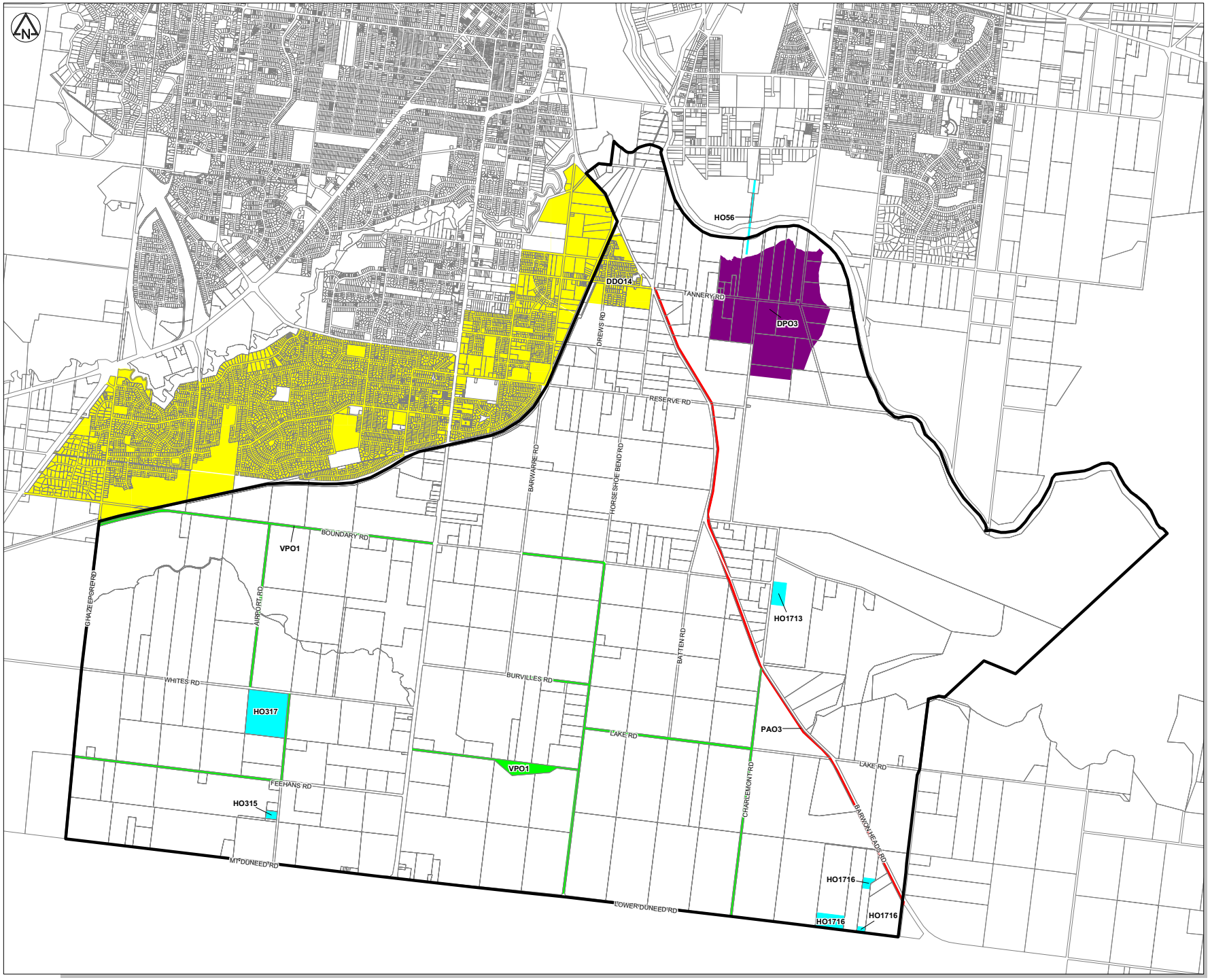
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Armstrong Creek
Urban Growth Plan

Greater Geelong Planning Scheme - Overlays



Legend

- Heritage Overlay
- Vegetation Protection Overlay
- Public Acquisition Overlay
- Development Plan Overlay
- Design & Development Overlay
- Study Area Boundary

0 750 1500 2250
Metres

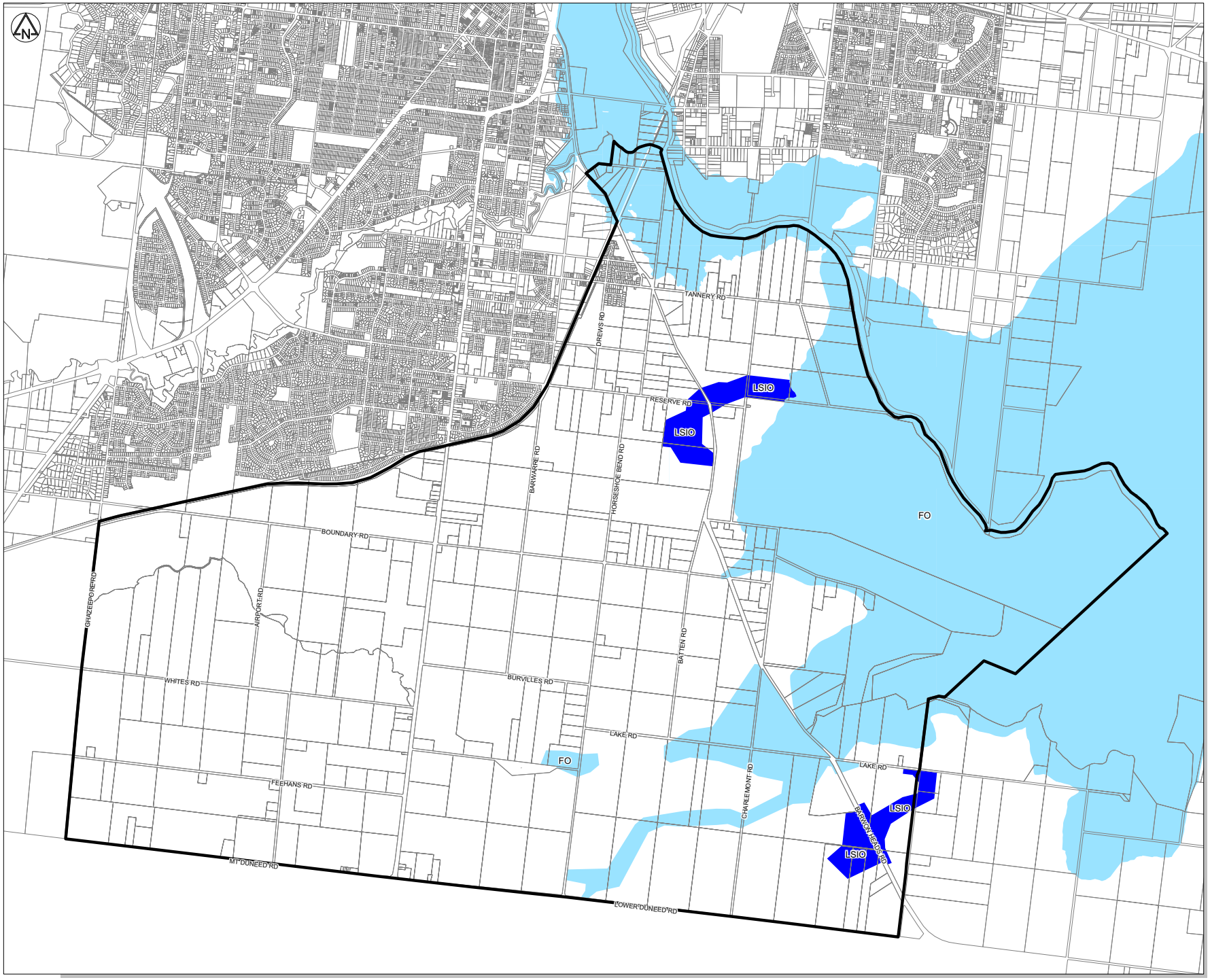
Figure 11

22.12.2005

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Armstrong Creek Urban Growth Plan

Greater Geelong Planning Scheme - Land Subject to Inundation & Floodway Overlay

Legend

- Floodway Overlay
- Subject to Inundation
- Study Area Boundary

0 750 1500 2250

Metres

Figure 12

22.12.2005

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3.3 Economic Activity and Employment

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Economic Activity and Employment Technical Report.*** Prepared by SGS Economics and Planning.

3.3.1 Introduction

A Technical Report on Economic and Employment Activity for the Armstrong Creek Urban Growth Area was prepared by SGS Economics and Planning on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.3.2 Existing Conditions and Information

(Note: this section has been taken from p.48&49 of the Technical Report).

Land Use Profile

- Retail - no retail centres are located within the Study Area, three significant retail centres are located to the immediate north of the Study Area, Geelong Central Activities Area (CAA) and Regional Town Centres (for example Torquay) constitute the regional retail hierarchy.
- Industrial - There is one industrial estate located within the Study Area, the Marshall Industrial Area, and four significant industrial estates located to the immediate north and east of the Study Area. The wider Geelong region has a significant quantum of industrial development.
- Institutional - There are no institutional uses within the Study Area. In the surrounding local area, Deakin University is the most significant institution. In the wider Geelong area, there are a large number of significant institutions. These reflect Geelong's role as a major city in its own right and a service centre for the surrounding region.
- Non-urban and other land uses - include agriculture, mining and utilities (eg. bypass, airport, rail line and crematorium).

Demographic and Economic Profile

- Population - The population size of South Barwon – Inner SLA, which includes the Study Area, has been growing at a higher than average rate from 1996 with growth forecast suggesting this will continue to 2031, with a projected additional 30,000 residents in the SLA.
- Labour Force - Major industries of employment for the resident population of South Barwon – Inner SLA are population driven service industries. Geelong as a whole has a lower percentage of its resident population employed in sectors which incorporate advanced business services, a source of exports in their own right and key supporters of other export drivers.
- Industry – jobs located in the SLA are characterised by local population driven industries. Deakin University is a major 'exporting' industry. The SLA has a poor employment self-sufficiency ratio. Geelong as a whole has a strong manufacturing base, whilst also providing services for its wider region. If jobs are increased in line with population, Geelong should be in the position to provide employment for the majority of new residents in the Study Area. Conversely, commuting to Melbourne could erode high order jobs in the region.

- Investment - Geelong represents a very small proportion of building investment when compared to Melbourne and Victoria. However, investment in Geelong has been increasing at above average rates.

Policy and Strategy Review
The following key policies and strategies were reviewed as part of the Economic and Employment Activity Technical Report:

- G21 Region Plan 2006 (in progress)
- Geelong Industrial Land Study 2001
- Draft Geelong Economic Development Strategy 2005
- Mount Duneed/Armstrong Creek Urban Development Study 1994
- CoGG Economic Indicator Bulletins
- CoGG Retail Strategy 1998 & 2001

Some of the key points from the above studies relevant to Armstrong Creek are:

- Residential Development - The Armstrong Creek growth area is recognised as providing the opportunity to achieve a nodal transit form to the south of Geelong and accommodate the Region's next major phase of urban development.
- Economic Development – The region has an opportunity for competitive advantage in the areas of Education, Research, Advanced Manufacturing, Health, Tourism, Small Businesses, and Food. Future economic growth will rely on maintaining an adequate supply of appropriately zoned industrial land, particularly on highly accessible transport routes. The role of urban form – especially a robust network of activity centres – is recognised in a number of strategies as key to sustainable economic development.

3.3.3 Key Issues

- Key challenges – integrate the area with external employment areas and develop an internal employment structure that achieves job mix and self-containment to the extent this is possible.
- Consolidation model of urban development is more sustainable and on planning grounds is preferred. For employment, this model places great emphasis on the getting the activity centre network 'right', and supplementing this network with industrial opportunities and emerging business opportunities.
- Residential areas should be formed around models of sustainable communities, which favours integrated areas of a minimum 3,000 Household / 9,000 Person community (which is anchored by a primary school) but preferably a 10,000 Household / 30,000 Person community (which is anchored by a supermarket and secondary school).

Activity Centres:

- Armstrong Creek will generate a need for its own network of centres which fit within the regional structure.
- Geelong CAA should be supported as the primary centre.

- Armstrong Creek would perform a support role in this context, perhaps achieving a maximum sub-regional role if demand eventuates.
- Co-location between traditional retail forms, bulky goods and other employment uses should be supported where possible.
- At the lower level of the retail system, a 'larger' number of 'smaller' centres (which encourages walking trips) should be established. This requires high density housing to be located around such centres for them to be viable.
- Institutions form an important part of the employment base of the area and should be related to the activity centre structure, by being located within activity centres to encourage mixed use development and generate co-location benefits.

Offices:
- An office positioning strategy is required in order to maximise opportunities for the growth area. The office structure will need to fit with the wider activity centre network and recognise Geelong CAA as the primary centre in the region.
- There will be a need to accommodate opportunities for home based business and small office tenancy opportunities in activity centres.
- Larger office complexes should be located in Geelong's CAA unless there is a special reason for an external location.

Industry:
- Service Industry is a strong industrial development candidate for the area. Another prospect is to target hi tech or advanced manufacturing that can blend in with commercial precincts. Logistics is an opportunity given the potential development of the southern by-pass. Heavy industry is better suited to other parts of Geelong, where land is already available.
- Marshall Industrial Area has a Low level of development, presents opportunity to use this area for other urban purposes if a superior alternative is identified.
- If so, other sites in the growth area should be considered for industrial development - relatively flat land with good road access and other infrastructure provision, few environmental and design qualities.
- Existing businesses should not be compelled to move.

Infrastructure and liveability:
- Important to ensure the latest IT services are available in the growth area, and that the area is well connected to external business hubs with quality transport links, including public transport.

3.3.4 Constraints

- Further industrial development in existing IN1Z area – poor road access for large trucks and existing investment in housing
- One company – John Wood Transport, livestock and general transport company employing one person – should not be forced to relocate
- Viticulture – buffers
- VicRoads bypass – providing linkages across

- Rail line – providing linkages across to existing suburbs north of the railway line

3.3.5 Opportunities

- Marshall Pine Products will be relocating from their existing facility in Marshall in the near future
- Large scale manufacturing operations in Breakwater have a market orientation towards intrastate, interstate and international markets
- Future relocation of Geelong Airport
- Viticulture – potential tourism
- VicRoads bypass – providing quick access around Geelong
- Deakin University – potential for student housing
- Industrial growth opportunities within Geelong – Industrial Land Study
- Demand for larger office complexes including CAD style development and campus style developments
- Target high tech or advanced manufacturing that can blend in with commercial precincts
- Logistics given potential development of southern bypass
- Low level of development in Marshall Industrial area – possibly use for other urban purposes

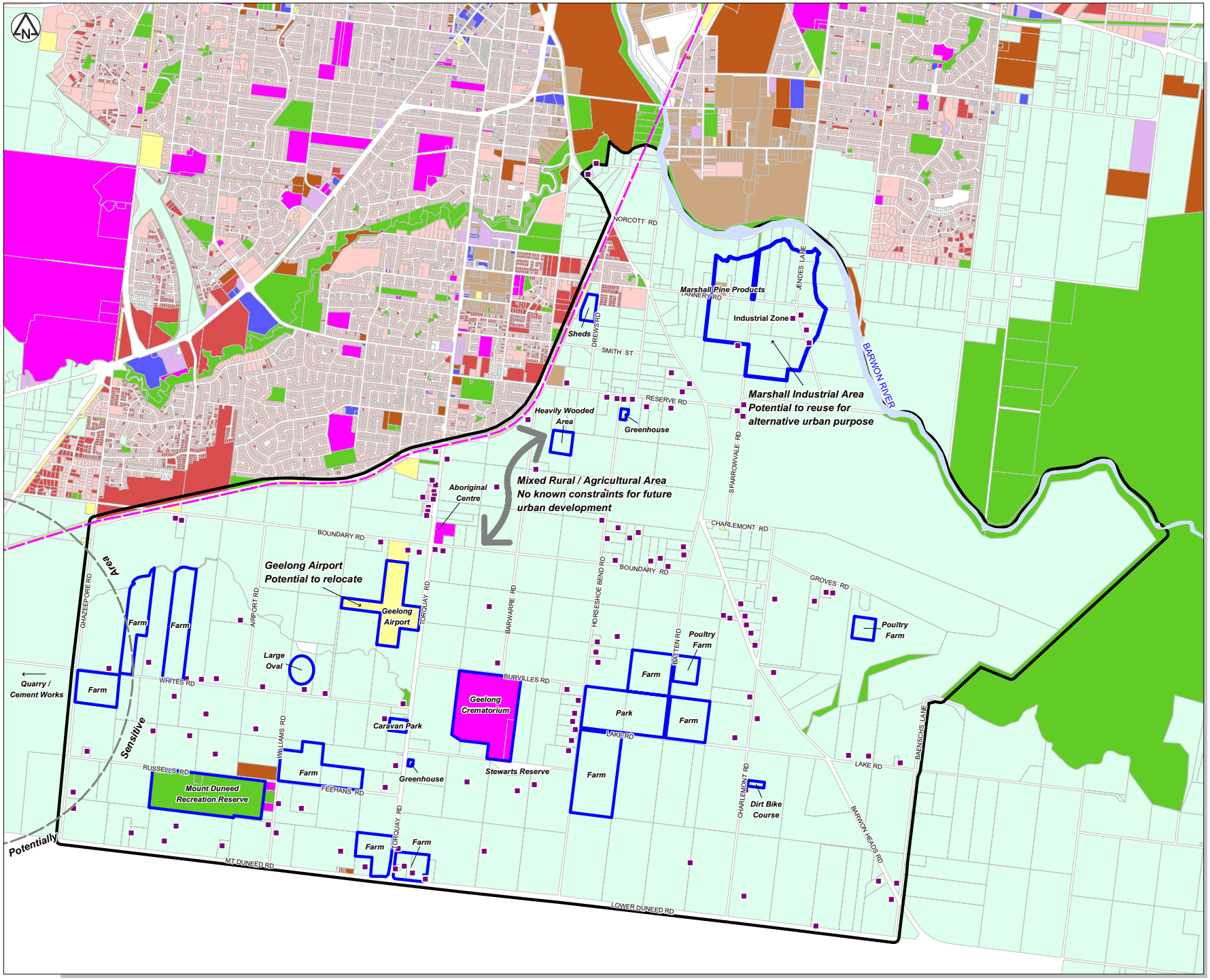
3.3.6 Summary

Summary:
Urban structure is an important supply side input into economic development. Areas that are geared towards particular economic land uses will have a greater chance of attracting those land-uses vis-à-vis areas that have no positioning strategy.

The extent to which the area can generate advanced businesses will be largely driven by the skills base of the area. This will be based on broader economic and demographic issues but also on local liveability. This is in part an issue of market positioning, and the extent to which the growth area can provide a housing and lifestyle offer that is attractive to a range of social groups including highly educated people.

Armstrong Creek Urban Growth Plan

Land Use & Facilities



Landuse Categories

- Commercial
- Community Facilities
- Culture, Recreation and Sport
- Industrial
- Mining
- Public Open Space
- Public Utilities
- Residential
- Retail
- Rural
- Vacant Residential
- Dwellings
- Study Area Boundary

0 750 1500 2250

Metres

Figure 13

04.01.2006

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3.4 Community and Social

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Community and Social/Recreation and Open Space Technical Report.*** Prepared by UrbisJHD.

3.4.1 Introduction

A Technical Report on Community and Social Infrastructure for the Armstrong Creek Urban Growth Area was prepared by UrbisJHD on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping, and discussion with relevant stakeholders.

3.4.2 Existing Conditions and Information

The suburbs adjacent to the study area display the following characteristics:

- See Figures 14 & 15
- Grovedale and Waurn Ponds are occupied by a large proportion of family households, whereas Marshall has an older population;
- household income data indicate that households in Grovedale and Marshall have incomes below the state average, whereas households in Waurn Ponds have higher than average income;
- the level of educational attainment observed in Waurn Ponds is greater than the state average, however, the proportion of residents in Grovedale and Marshall with tertiary qualifications is notably lower than the state average;
- in common with the rest of the nation, population in these areas will continue to age into the future;
- a level of health comparable with the state average and lower than average crime rates;
- leisure patterns indicate the increasing popularity of individualistic activities, at the expense of team sports or other club based pursuits, and
- walking for recreation is common, however, very few people choose to walk in the course of fulfilling their work or domestic commitments;
- Maternal and Child Health Services (MCHS) are currently delivered from 22 points across the City of Greater Geelong, one of which is located in Belmont, just north of the adjacent suburbs.
- Two long day care centres currently located in the adjacent suburbs, offering a total of 170 places.
- Five pre-school/kindergartens in the adjacent suburbs.
- three public primary schools, Grovedale West Primary School, Grovedale Primary School and Mandama Primary School in the adjacent suburbs
- One catholic primary school, the Nazareth School in the adjacent suburbs.
- Christian College Junior Campus is located just west of the adjacent suburbs.
- One government funded high school, Grovedale College in the adjacent suburbs.

- The Aged care number of places available within the community appears to be adequate at present
- There are three venues within the study area available for use by community groups; Grovedale Community Centre, Grovedale Memorial Hall and Cobbin Farm.

3.4.3 Key Issues

- A low density urban form and homogenous land use groupings which restricts pedestrian access to commercial and recreational nodes, makes the provision of efficient public transport networks difficult and ultimately leads to communities dependent on car based transport occurs in the adjacent suburbs and should not be replicated. Also it discourages walking and reduces natural surveillance.
- the community service network (with the exception of facilities oriented to young people) in the adjacent suburbs relating to children's services, educational facilities, aged care and community spaces, is generally adequate and has some scope to accommodate further demand.
- Apart from the Heyers Road precinct, the system is characterised by single purpose facilities which are spatially disparate.
- recreational facilities are currently at capacity;
- The provision of community facilities and services, with the exception of youth facilities, appears adequate. However these facilities have evolved in an ad hoc manner and are spatially disparate;
- indicators of community strength and cohesion indicate that levels of interaction and reciprocity could be improved;
- Population growth in the Armstrong Creek Study Area will necessitate expansion of the existing network of community facilities into the Study Area.
- The pattern of service distribution should be a network that incorporates multipurpose facilities situated within or in close proximity to other activity nodes, such as retail, commercial and recreational spaces.
- it is of paramount importance that some services required at the local and neighbourhood level be available to residents at the outset of the development, for example a multipurpose facility, to avoid problems associated with spatial inequity

Key findings from the historical and forecast population projections are:

- Shown in the table on the following page, illustrating population projections 1991-2021 for suburbs within the South Barwon Inner SLA of Geelong.

Population projections 1991-2021
Suburbs within South Barwon - Inner

	Population							
Suburbs	1991	1996	2001	2004	2006	2011	2016	2021
Waurn Ponds	0	349	842	1,303	2,281	4,380	5,317	5,642
Grovedale	11,157	11,599	12,196	12,614	13,506	14,256	14,721	15,131
Marshall	117	237	765	774	930	1,003	1,079	1,160
Wandana Heights	1,010	1,158	1,622	1,751	1,972	2,347	2,622	2,788
Highton	9,997	11,216	12,921	13,513	13,929	14,854	15,704	16,639
Belmont	16,501	15,005	14,668	14,701	14,768	14,696	14,861	15,086
Study Area[1]	324	546	750	860	797	3,626	7,659	13,002
Unclassified[2]	585	1,070	1,282	1,572	1,882	1,925	1,944	1,961
South Barwon - Inner	39,692	41,181	45,046	47,088	50,064	57,086	63,906	71,408

1. Study Area estimated for 1991, 1996 and 2001
2. Unclassified population not included in an official suburb but in total SLA
Source : ABS Small Area Population Projections 2004-2022, UrbisJHD

Population growth 1991-2021
Suburbs within South Barwon - Inner

	Population					
SLA	1991-96	1996-01	2001-06	2006-11	2011-16	2016-21
Waurn Ponds[1]	n/a	19.3%	22.1%	13.9%	4.0%	1.2%
Grovedale	0.8%	1.0%	2.1%	1.1%	0.6%	0.6%
Marshall	15.1%	26.5%	4.0%	1.5%	1.5%	1.4%
Wandana Heights	2.8%	7.0%	4.0%	3.5%	2.2%	1.2%
Highton	2.3%	2.9%	1.5%	1.3%	1.1%	1.2%
Belmont	-1.9%	-0.5%	0.1%	-0.1%	0.2%	0.3%
Study Area	11.0%	6.6%	1.2%	35.4%	16.1%	11.2%
Unclassified	12.8%	3.7%	8.0%	0.5%	0.2%	0.2%
South Barwon - Inner	0.7%	1.8%	2.1%	2.7%	2.3%	2.2%

1. Waurn Ponds did not exist in 1991
Source : ABS Small Area Population Projections 2004-2022, UrbisJHD

- Extremely strong population growth in Waurn Ponds to 2011, followed by still strong growth to 2016 before capacity constraints slow population growth beyond 2016.
- Solid growth in the established suburbs of Grovedale and Highton over the period and little growth in Belmont.
- Significant population growth in the Study Area over the period, culminating in a population of 13,000 by 2021. This is based on the assumption that land development will occur in 2006 and people residing in the region in 2007. Should development occur at a latter date, then the population projections would be delayed.
- The population growth will necessitate expansion of the existing network of community facilities into the Study Area.
- It is advisable that the pattern of service distribution in the adjacent suburbs not be replicated in the Study Area. The Study Area presents the opportunity to design a community facilities network that accords with State Government policy and the Healthy by Design guidelines - that is, a network that incorporates multipurpose facilities situated within or in close proximity to other activity nodes, such as retail, commercial and recreational spaces. Such a network would create 'clusters' of activity that are accessible by pedestrians and public transport users.
- It should be noted that it is of paramount importance that some services required at the local and neighbourhood level be available to residents at the outset of the development, for example a multipurpose facility, to problems associated with spatial inequity.

Based on these key findings, below are a set of social planning priorities and guidelines. It is of paramount importance that future development of the Study Area concentrate on three desired outcomes at the neighbourhood level:

- community building – a strong community has networks and connections within the fabric of the local community, between people living in the community, between people and organisations (government and non-government) and between organisations;
- equity – supportive communities inhibit physical and social isolation and ensure ready access for all persons to facilities and services; and
- sustainability – a sustainable community is one in which economic vitality, economic integrity, civic participation and social well being are linked in a complementary fashion, thereby fostering the creation of a liveable area,

Table 1 provides a guide to the development of these positive desired outcomes for the Armstrong Creek Growth Area, taking into account the issues and design responses discussed in the previous sections and potential social infrastructure requirements.

Table 1 – Guide to development of positive desired outcomes

Desired Outcomes	Elements	Actions
Community Building	Create opportunities for people to interact	Provide multipurpose facilities that deliver a range of community programs and events that encourage people to participate and feel useful
		Work with relevant organisations to encourage formation of local networks, for example the initiation of a neighbourhood watch committee
		Adequate provision of recreational and sporting facilities and community meeting spaces
	Foster the development of a well integrated community	Provide an attractive built form and landscape character that will engender a strong sense of place and civic pride
		Provide services and opportunities that cater for people at all stages of the lifecycle, including a range of interesting and satisfying local jobs
Equity	Provide equitable access to a range community facilities and services and open space	Adopt 'family hub' or integrated model for delivery of services, where appropriate
		Provide facilities and services including open space at the appropriate geographic level; local, neighbourhood, series of neighbourhoods, sub regional or regional level, centrally located within the different levels of the service provision hierarchy.
		Ensure access to diversity of open space types and that connection between pedestrian and cycling trails are made
	Provide walkable and accessible neighbourhoods with opportunities for social exchange, and for services and jobs within walking distance	Adoption of *Healthy by Design* principles (refer section 6.4)
Sustainability	Integration of land uses and application of design principles that promote a livable and attractive area and which engenders feelings of security and safety;	Adoption of *Healthy by Design* principles (refer section 6.4)
		Adoption of CPTED and *Safer Design Guide* principles (refer section 5.2)
	Integrate study area with adjacent suburbs of Grovedale, Waurn Ponds and Marshall	Minimise access issues associated with the physical barrier presented by the rail line
	Create a diverse community	Provide a range of lots and housing types which attracts a diverse range of households (i.e. density, style, price range)

Table 2 (below) illustrates a summary of the community service provision rates for social infrastructure in Armstrong Creek:

Type	Benchmarks	Number Of 'Clients' (2004)	Existing Provision	Performance
Maternal and Child Health	1 MCH Nurse Eft per 150 Birth's Gr. Geelong - preference for at least 2 nurse EFT equivalent at each centre	706 persons aged 0-3 years	1 Centre, 198 enrolments	100% coverage
Long day care	On average long day care centres cater for 90 children aged from birth to 5 years (FacS) 15-20% of children in this age bracket utilise long day care services[1]	1180 persons aged 0-5 years (175-240 clients)	2 Centres, 170 places	Current supply appears adequate
Pre-School /Kindergarten	Centres generally accommodate around 30 enrollments DHS - 1 enrollment per person aged 4	199 persons aged 4	5 Centres, enrollment data available 4 centers only (157 enrollments)	Current supply appears adequate
Primary School	DET - 1 Primary School per 3,000 dwellings (3.5 ha), 450 students Melton Shire - 1 Government Primary Enrolment per 0.65, 1 Catholic Primary Enrolment per 0.20, 1 Non Govt Primary Enrolment per 0.08, 1 Total Primary Enrolment per 0.93 people aged 5-11	5,200 Dwellings 1428 persons aged 5-11	3 Government Schools (total 991 students), 1 Catholic School	Current supply appears adequate
High School	DET - 1 Secondary School per 10,000 dwellings (8.4ha), 1100 students[2] Melton Shire - 1 Govt Secondary Enrolment per 0.57, 1 Catholic Secondary Enrolment per 0.17, 1 Non Gov Secondary Enrolment per 0.11, 1 Total Secondary Enrolment per 0.84 people aged 12-17	5,200 Dwellings 1372 persons aged 12-17	1 Government School 662 students	Number of dwellings does not surpass DET threshold for high school
General Practice Services	1.48 GPs per 1000 persons (State)	All persons	1.32 GPs per 1000 persons (Geelong)	Provision rate better than state average
Aged Care	Commonwealth planning ratio 108 places per 1,000 people over 70[3]	1553 persons aged 70+	200 aged care places	Current supply appears adequate

[1] FaCS ((2004) *Census of Child Care Services – Summary Booklet*
[2] Pers.Com. DET
[3] http://www.health.gov.au/internet/wcms/publishing.nsf/Content/ageing-acar2005-index.htm

3.4.4 Constraints

- Difficult access to nearby community and social facilities

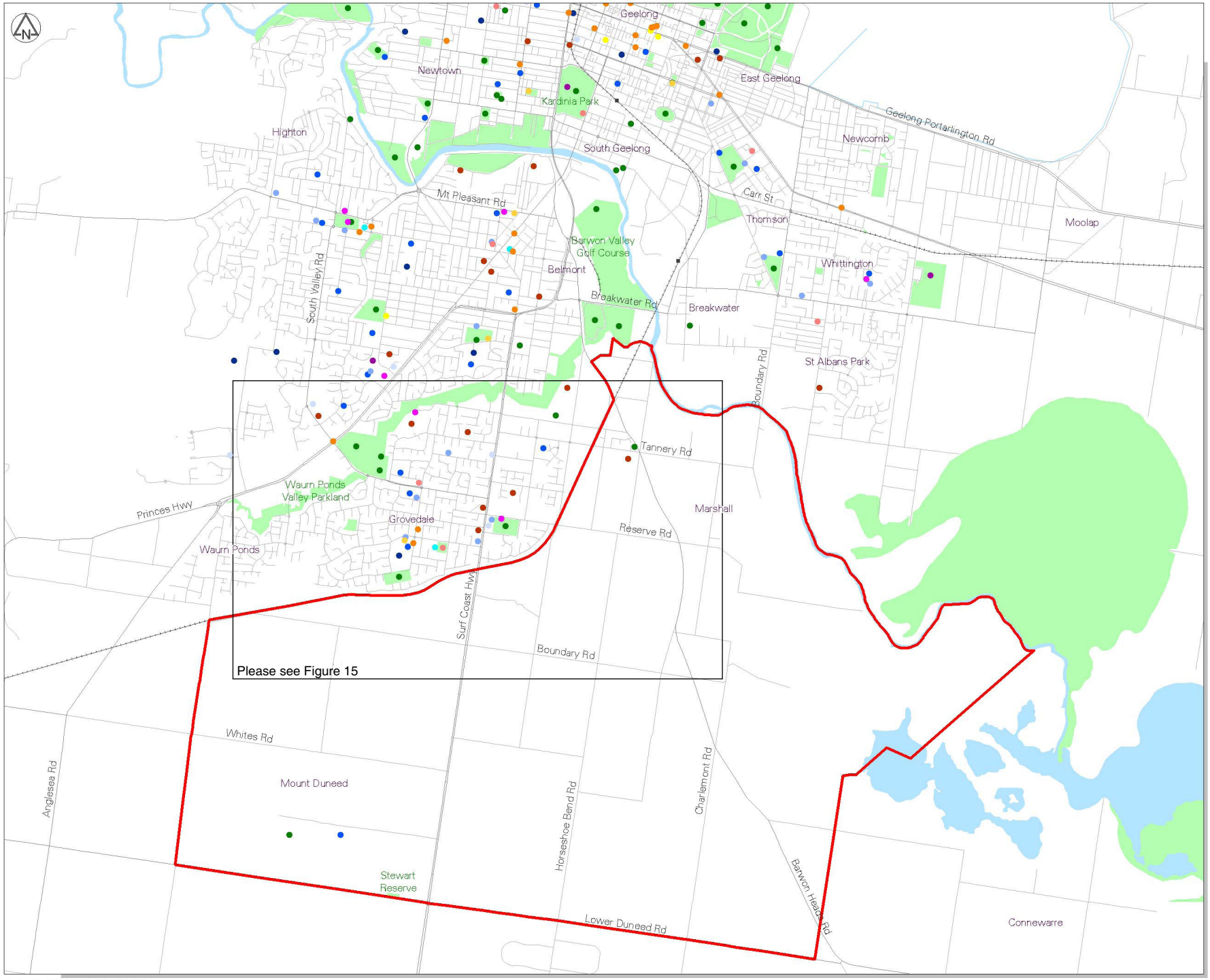
3.4.5 Opportunities

- Large areas of open space available

3.4.6 Summary

The preceding discussion demonstrates that, with the exception of facilities orientated to young people the community service network in the adjacent suburbs relating to children's services, educational facilities, aged care and community spaces, is generally adequate and has some scope to accommodate further demand. However, apart from the Heyers Road precinct, the system is characterised by single purpose facilities which are spatially disparate.

Population growth in the Armstrong Creek Study Area will necessitate expansion of the existing network of community facilities into the Study Area. Given strong policy support for multipurpose facilities and the benefits that accompany this style of community service provision in terms of health, community cohesion and equitable access to facilities, its is advisable that the pattern of service distribution in the adjacent suburbs not be replicated in the Study Area. Rather, the Study Area presents the opportunity for the City of Greater Geelong to design a community facilities network that accords with State Government policy and the *Healthy by Design* guidelines. That is, a network that incorporates multipurpose facilities situated within or in close proximity to other activity nodes, such as retail, commercial and recreational spaces. Such a network would create 'clusters' of activity that are accessible by pedestrians and public transport users.



Armstrong Creek Urban Growth Plan

Grovedale Facilities

- Aged Care
- Child Care Centre
- GP
- Hall
- Health Care
- High School
- Leisure
- Maternal & Child Health
- Municipal Library
- Pre-School/Kindergarden
- Primary School
- Reserve
- Seniors Facility/Club

Study Boundary

0 750 1500 2250

Metres

Figure 14

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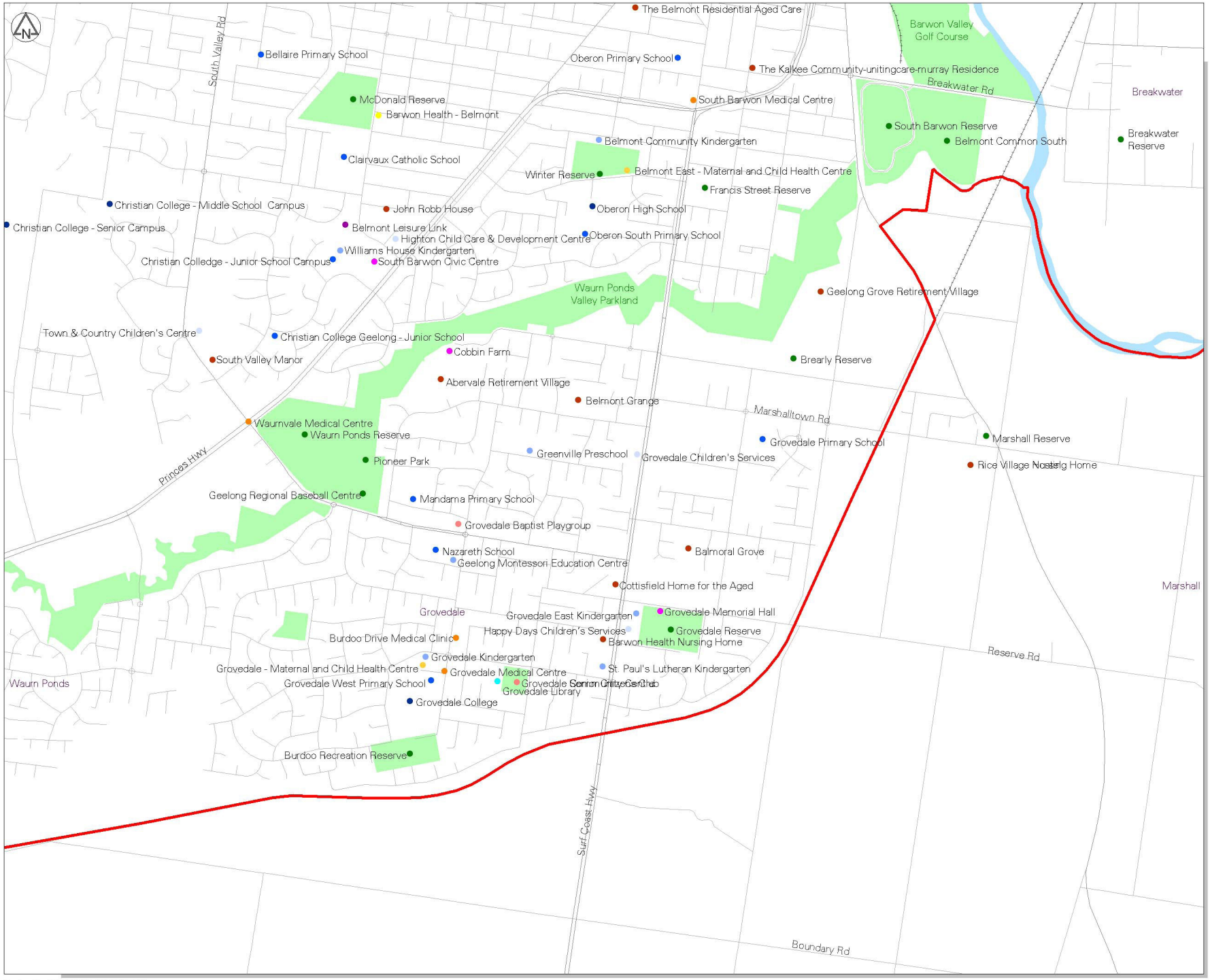
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Armstrong Creek Urban Growth Plan

Grovedale Facilities



- Aged Care
- Child Care Centre
- GP
- Hall
- Health Care
- High School
- Leisure
- Maternal & Child Health
- Municipal Library
- Pre-School/Kindergarden
- Primary School
- Reserve
- Seniors Facility/Club

Study Boundary

0 400 800 1200

Metres

Figure 15

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3.5 Indigenous Cultural Heritage

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Location Context and Built Environment Reports*.** Prepared by David Lock Associates.

3.5.1 Introduction

A Technical Report on Indigenous Cultural Heritage for the Armstrong Creek Urban Growth Plan was prepared by Heritage Insight on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.5.2 Existing Conditions and Information

- The traditional owners of the study area are the Wada wurrung (Wathaurang) language group.
- William Buckley lived with the traditional owners around the Werribee River and on the Barwon River between 1803 and 1835 after he absconded from the Sorrento settlement.
- In 1837 the local indigenous population was said to be 297, by the late 1840s this number had dropped to no more than 75, and by 1858 it was thought that less than 20 remained.
- A number of places have been recorded as being used around the time of contact; Lake Connewarre, Yan Yan wells, Barwon River, Jerringot and Burvilles Road.
- In the 1860s the remaining people were forced off the land, by the Government and placed in Reserves.
- There are two reserves which fall within the study area, being Stewarts Reserve and Mount Duneed Reserve.
- Seven of the last full blood Wada wurrang people were sent to the Mount Duneed Reserve. However the group all died between 1862 and 1885.
- There are six previously recorded Aboriginal archaeological sites that fall within the study area. All these sites are either surface stone artefacts or scatted trees, and are located within close proximity to a water body.
- Four registered Aboriginal historic places fall either within or are situated close to the study area.
    - Connewarre Honorary Correspondent Depot
    - Boorangook Station
    - Duneed Reserve
    - the Barwon (flat country on the river below Geelong)

3.5.3 Key Issues

- Weaver (1994) noted a number of potential archaeological sensitivity areas. This includes stone artifacts scattered at Mount Duneed and on the undulating plains towards Lake Connewarre. She also noted the potential for scar trees along Armstrong Creek and within the vicinity of Lake Road.

- Marshall (2002) recommended that a detailed ground survey be followed by a sub surface testing and detailed excavation of any sites likely to be imported on.

3.5.4 Constraints

- Heritage places and views are protected

3.5.5 Opportunities

- Heritage places – opportunities to make features/landmarks etc
- Narana Creations – Aboriginal Cultural Centre

3.5.6 Summary

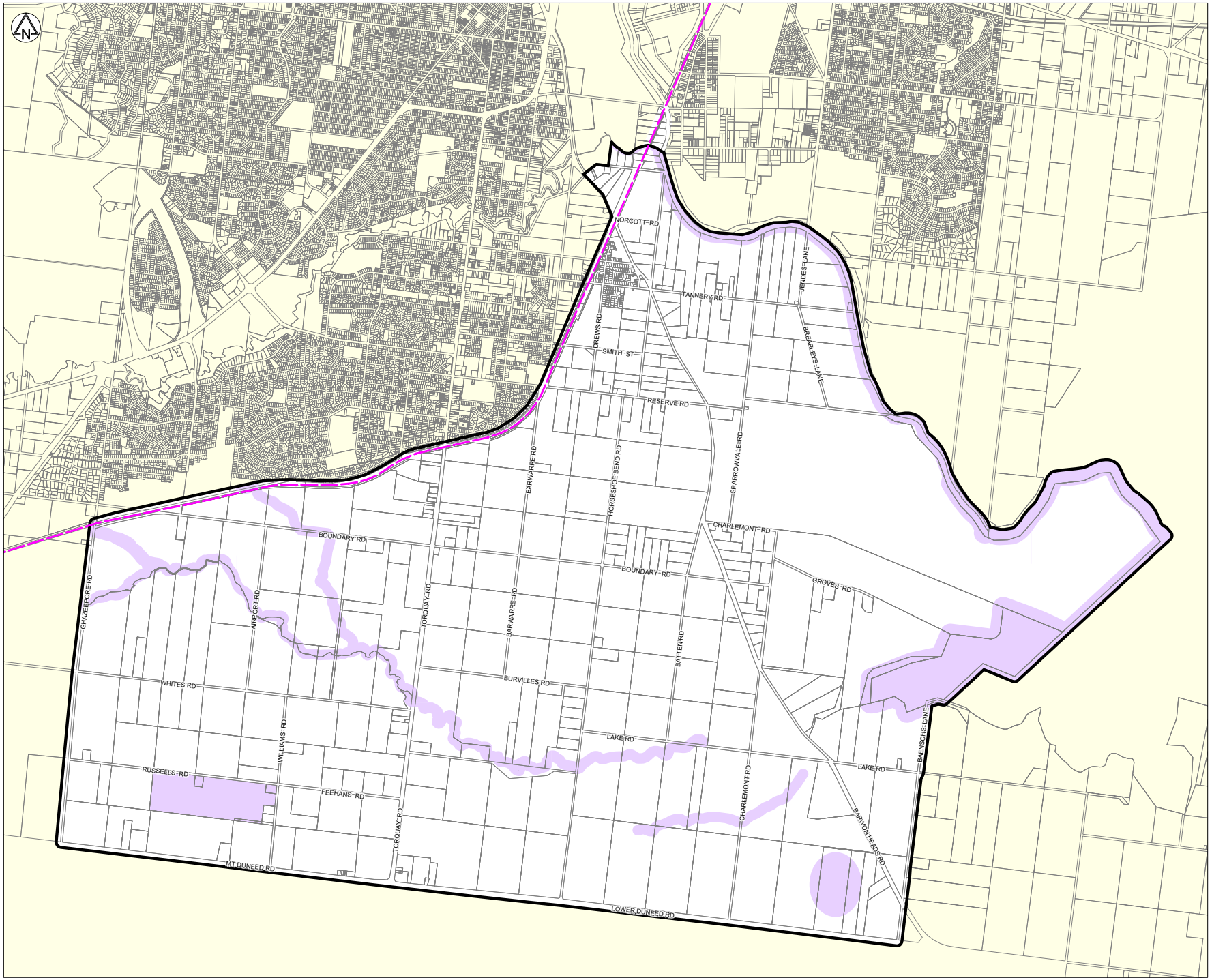
There are a number of areas of indigenous heritage significance which are in most cases protected and need to be protected. These may also represent assets and opportunities as features or landmarks.
The following table illustrates a summary of geological units, soil types and the location of potential archaeological sites within the study area.

Geological Unit	**Sediments**	**Landform**	**Soil Type**	**Potential Archaeological sites**
Unnamed alluvium	Fluvial: alluvium, gravel, sand, silt	Barwon River floodplain, Waurn Ponds Creek floodplain		Shell middens, Stone artefact scatters, Scarred trees
Unnamed colluvium	Fluvial 'gully' alluvium, colluvium: gravel, sand, silt	Floodplain		Shell middens, Stone artefact scatters
Moorabool Viaduct Sands	Brighton Group: gravel, sand, silt	Mount Duneed, undulating plains	Sandy loam with a depth of 1-2m	Burials, Stone artefact scatters
Jan Juc Formation	Marine: marl, clay, silt, glauconitic	Undulating plains	Sandy loam with a depth of 1-2m	Burials, Stone artefact scatters
Newer Volcanics	Extrusive tholeiitic to alkaline basalts, minor scoria and	Low hills and undulating rises, Mount	Red friable soils on higher ground	Stone artefact scatters, scarred trees

	ash	Duneed	(<700mm), black self-mulching soils on lower slopes (<1m)	
Unnamed swamp/lake deposits	Paludial: lagoon and swamp deposits of silt and clay	Flat land – swamps and closed depressions – Reedy Lake	Grey cracking clays and sandy soils with a depth greater than 2m	Shell middens, Stone artefact scatters
Aeolian coastal/inland dunes	Dune sand, some swamp deposits	Undulating plains	Sandy deposits	Stone artefact scatters, Burials

Armstrong Creek Urban Growth Plan

Indigenous Cultural Heritage



Legend

- Indigenous Cultural Heritage Area
- Study Area
- Railways

0 750 1500 2250

Metres

Figure 16

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3.6 European Cultural Heritage

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – European Cultural Heritage Technical Report.*** Prepared by Lorraine Huddle Pty Ltd.

3.6.1 Introduction

A Technical Report on European Cultural Heritage for the Armstrong Creek Urban Growth Plan was prepared by Lorraine Huddle on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.6.2 Existing Conditions and Information

There are 46 places of cultural significance within the Study Area and the greatest numbers are focused in two main geographical areas which are near the former town centres of Mt Duneed and Marshall. There are also a few places in a small part of Connewarre and is a small cluster at Ash's Hill, Sparrovale and towards the end of Tannery Road, Marshall.

The major themes are defined as follows:

1. "**Industrial – manufacturing**" **[7 places]** have historical origins in tanning and wool scouring production and are primarily above ground ruins and archaeological sites but include extant homesteads associated with these works. It is a major theme as most of the sites are concentrated in the Marshall and Barwon River area and they are large places. Extractive industries **[2 places]** is a minor subset of the industrial theme as there are only a few such as the former two bluestone quarries.
2. **"Civic" [9 places]** are primarily those historically connected to the townships of Mount Duneed and Marshall. Most are still in public ownership and use, although the actual activities have changed over time in many cases. They include the footbridge & aqueduct, cemetery, school, public recreation reserves, owned and managed by the City of Greater Geelong and some that are in private ownership or donated to the community by a private individual. Although there are a small number of places representing this theme, it is a major theme as it has cultural significance for large numbers of people and the places have been ongoing for many generations.
3. **"Agricultural – farming complexes" [23 places]** are primarily located in the vicinity of Mount Duneed township and Marshall township but a few are scattered around the study area. They include the homestead, outbuildings, mature trees, tree lined driveways, ruins and special features such as lone graves. Most of these places are privately developed and owned but the Sparrowvale agricultural farm, set up in Marshall by the Geelong Harbour Trust is included in this theme. It is a major theme because the farmhouse complexes tend to be bigger and more elaborate in function and design than houses on suburban

allotments. They generally have a more complex history than solely residential places in the study area.

The minor themes are:

1. "**Residential" [6 places]** are primarily individual houses located on urban sized allotments with little or no history as a former house associated with a farm. These are mostly located in the Marshall township area and at major road intersections such as Ash's Hill where the Barwon Head Road intersects with Batten Road and Groves Road.
2. **"Post contact" [1 place].** Only one post contact place within the study area has sufficient evidence for this category, and it is known as Stewarts Reserve, on Stewarts Road and Armstrong Creek, in Mount Duneed.

Historically there were townships and hamlets in the study area but most of the physical evidence of these has been demolished or otherwise destroyed, thus highlighting the fact that the few remaining heritage places are a rare window into understanding and interpreting the heritage character of the area.

The most important individual place is the former footbridge and sewerage aqueduct over the Barwon River at the north of the Study Area.

3.6.3 Key Issue

The recognition and conservation (where appropriate) of places of European cultural significance.

3.6.4 Constraints

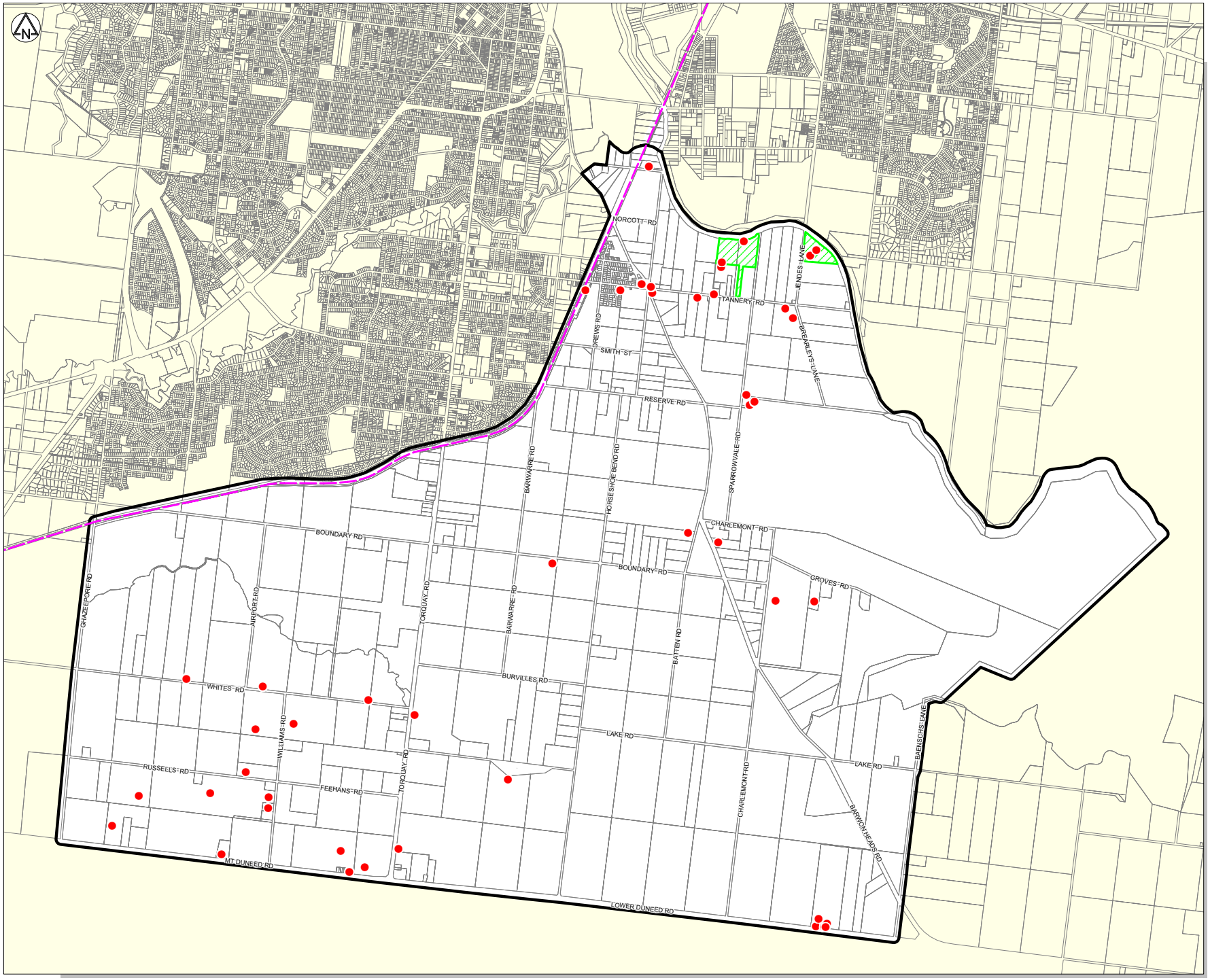
- Heritage places are protected at State and Local Levels

3.6.5 Opportunities

- Heritage places provide potential opportunities to make features/landmarks etc
- Opportunities for heritage precincts
- The aqueduct is a strong historic feature

3.6.6 Summary

There are a number of areas of European cultural significance which are in most cases protected and may need to be protected. These may also represent assets and opportunities as features or landmarks.



Armstrong Creek Urban Growth Plan

European Cultural Heritage Significant Places

Legend

- Significant Places
- Curtilages
- Study Area
- Railways

0 750 1500 2250

Metres

Figure 17

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3.7 Natural Environment - Flora and Fauna

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Flora and Fauna Technical Report.*** Prepared by Ecology Australia.

3.7.1 Introduction

A Technical Report on Flora and Fauna for the Armstrong Creek Urban Growth Plan was prepared by Ecology Australia on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders. This data has been reviewed in respect of field site checking undertaken during April 2006 by Ecology Australia

3.7.2 Existing Conditions and Information

Flora

- 22 State or Nationally significant species previously recorded in a 5 km Data Review Area.
- Significant species, if present, are mostly likely to occur in remnant patches of vegetation along Armstrong Creek, Barwon River and floodplain, and along roadsides maintaining some remnant vegetation. Some significant species and communities also occur in remnant vegetation patches on freehold land.
- Native vegetation has been largely cleared and highly modified.
- Remnant vegetation is generally comprised of grassy woodland, wetland vegetation and grassland.
- Stewarts Reserve is among one of the best remaining examples of Grassy Woodland in the Geelong region. Highly significant grassy woodland patches also occur adjacent to Horseshoe Bend Road, Mt Duneed, Drews Lane, Marshall, and Baenchs Lane, Connewarre.
- Wetland vegetation occurs in swampy sections of Armstrong Creek and on seasonally wet sites throughout.
- Exotic grassland occurs across much of the area.
- To what extent native species persist within these grasslands is unknown, and can only be assessed by site-specific surveys of development proposal lots.

Biosites

There are eight biosites within or potentially impacted by development within the Armstrong Creek UGDA. These sites range from Local to National conservation significance. No plant species or communities listed under the EBPC Act have been recorded in the study area. Spiny Peppercress, listed as Vulnerable under the Act has a moderate likelihood of occurring within the study area. The Bellarine Yellow-gum, listed under the FFG has been recorded and Plains Grassland, which is listed as a Threatened Community, has been modelled for the study area. Much of the modelled Plains

Grassland is in error, and the April 2006 assessment has shown it to be (or have been) predominantly either Grassy Woodland or Plains Grassy Woodland.

Fauna

There were 165 fauna species recorded within the 5km fauna Data Review Area, which included six species listed under the EPBC Act, and 9 listed under the FFG Act. The total consisted of 147 bird species (11 exotic), 4 mammal species (1 exotic), 4 reptile species, 2 frog species, 7 fish species and one invertebrate. The number of fauna species identified within the Fauna DRA is relatively low, considering the size of the area involved and the diversity of habitat types that would have existed in this area.

Six EPBC-listed Vulnerable fauna species are either known or regarded as at least moderately likely to occur in the study area.

Seventeen FFG-listed threatened fauna species are either known or regarded as at least moderately likely to occur in the study area.

Ramsar Wetlands

Although the Armstrong Creek UGDA is situated outside Reedy Lake and Lake Connewarre, it drains into the Ramsar site, and therefore there is the potential for indirect impacts to result from development within the Armstrong Creek UGDA.

The most significant potential impacts to biodiversity values from development within the Armstrong Creek UGDA are associated with:

- Indirect impacts to the Ramsar site through altered hydrological regimes
- Impacts to values along Armstrong Creek and Barwon River
- Potential impacts to State and Nationally listed species
- Potential loss of woodland vegetation on roadsides and in riparian zones

3.7.3 Key Issues

- Avoid native vegetation removal along Armstrong Creek, Barwon River and associated floodplain, and selected sites of highly significant Plains Grassy Woodland on freehold land.
- Avoid works that will impact upon both the instream and surrounding habitat values of Armstrong Creek.
- Where development is to occur investigate implementation of best-management erosion and storm-water control practices to prevent sediment, and pollution run-off into neighbouring areas of high conservation value.
- Utilise the existing road network (containing a substantial portion of remnant vegetation within the study area) as a cycling/walking path network and to create landscape linkages.

- Avoid the removal of stands of indigenous eucalypts and she-oaks where possible.
- Undertake control of woody and other selected weed species.
- Undertake pest animal control programs.
- Undertake revegetation work along Armstrong Creek and roadsides to provide habitat corridors for local fauna.
- Undertake more detailed flora and fauna surveys in areas proposed for development.
- Undertake surveys for significant species (if suitable habitat is deemed to be present within areas proposed for development).

3.7.4 Constraints

- Need to avoid impacts to Lake Connewarre through altered hydrological regimes
- Need to protect values along Armstrong Creek and Barwon River, and selected Plains Grassy Woodland remnants of high significance
- Need to protect State and Nationally listed species
- Need to protect woodland vegetation on roadsides and in riparian zones

3.7.5 Opportunities

- Remnant vegetation along road corridors
- Values along Armstrong Creek and Barwon River

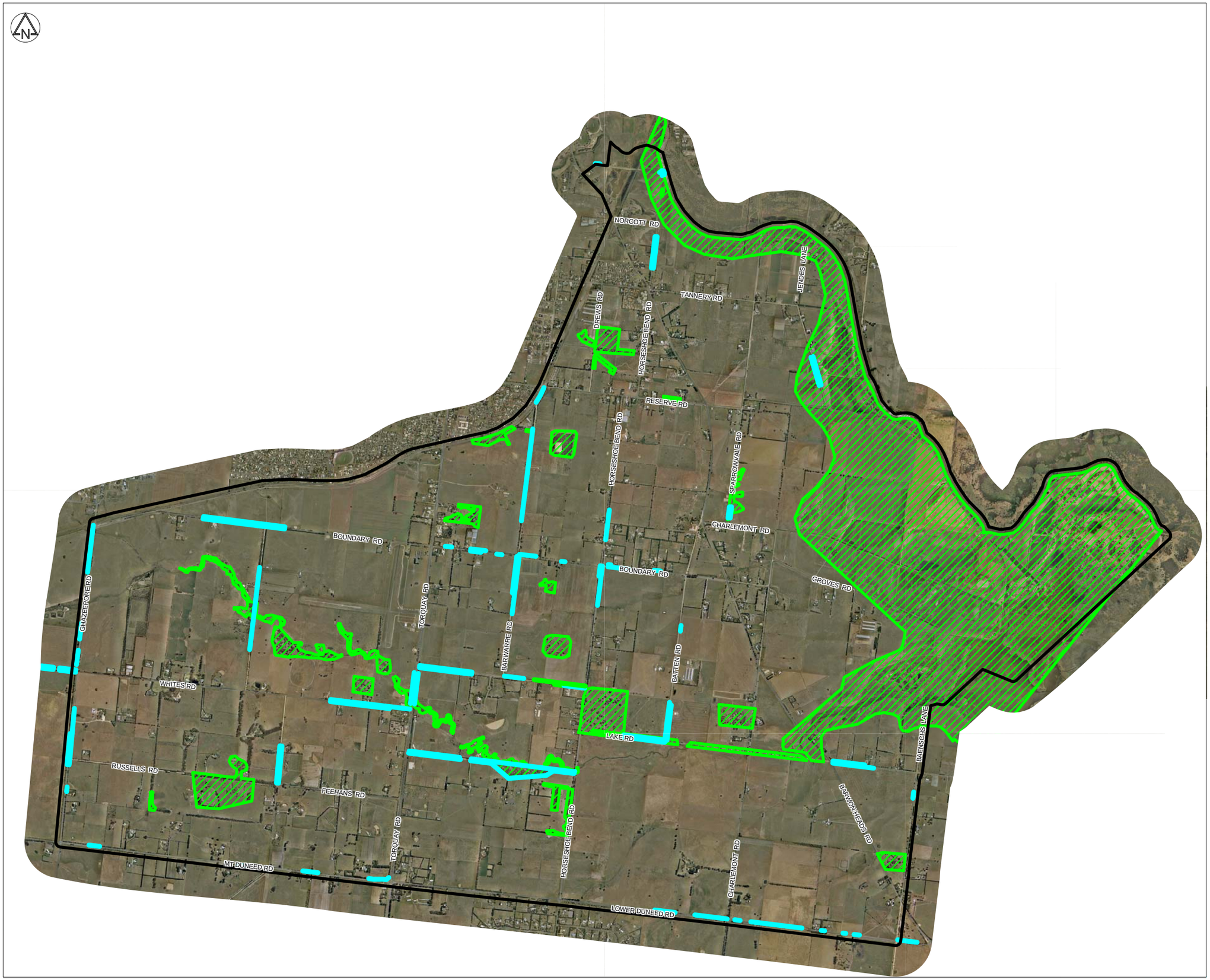
3.7.6 Summary

The greater proportion of this study area is situated in dryland areas in which the habitat values have been greatly reduced, principally due to land clearing and agricultural practices. Remnant vegetation along roadside corridors (both along unmade roads and along road easements) has therefore become valuable in terms of its value to biodiversity.

There is an opportunity for development within the Armstrong Creek Urban Growth area to take advantage of these roadside areas to develop linkages that enhance habitat values and provide movement corridors for fauna. These linkages could also provide amenity value to other user groups i.e. bike paths/walking trails.

Armstrong Creek Urban Growth Plan

Roadside Vegetation & Remnant Vegetation



Legend

Roadside Vegetation

- High
- Medium

Remnant vegetation

Study Area

0 750 1500 2250

Metres

Figure 18

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3.8 Open Space and Recreation

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Community and Social/Recreation and Open Space Technical Report.*** Prepared by UrbisJHD.

3.8.1 Introduction

A Technical Report on Open Space and Recreation for the Armstrong Creek Urban Growth Plan was prepared by UrbisJHD on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.8.2 Existing Conditions and Information

- Limited formal open spaces within the Study Area except Mount Duneed Recreation Reserve
- Adjacent recreational reserves include Burdoo Recreation Reserve; Geelong Regional Baseball Centre; Grovedale Reserve; Marshall Reserve; Pioneer Park; South Barwon Reserve and Waurn Ponds Reserve
- Open space performs various functions within a community, including conservation of biodiversity and accommodation of utilities and services.
- Open space functions which have particular relevance to the quality of an area's social life include:
    - accommodates recreational activities
    - contributes to the sense of livability and appeal of area for residents and visitors
    - provides locations where unforeseen demand for social services can be met
- CoGG gives high priority to creating an equitable distribution of open space and types of open space across the City
- Council's aim is to negotiate with developers to achieve a minimum open space contribution within the City's growth areas of 10%
- The following table lists the recreational reserves located within the vicinity of the Study Area with their catchment and a description

Recreational reserves located within the vicinity of the Study Area

Name	Catchment	Distance*	Description
Burdoo Reserve	Local/ Sub-Regional	200m	A high standard reserve with two well developed ovals with lights, netball courts and tennis courts with associated social facilities. The reserve is home to Grovedale sports club and serves the local schools and community.
South Barwon Reserve	Local/ Regional	200m	South Barwon is an expansive reserve within the larger Belmont Common Reserve. The reserve has eight ovals, two with turf wickets and four hard wicket grounds. The reserve also has an informal BMX track for the local community.
Grovedale Reserve	Local/ Sub-Regional	300m	A large reserve with one oval with a hard wicket cricket pitch. The reserve has a number of tennis courts adjacent and an informal Bmx track. The reserve is primarily used by the Grovedale sports club as a competition venue for their teams not accommodated at Burdoo reserve. Works are currently out for tender to upgrade the facility, including the development of two full size soccer pitches (presently there are no soccer pitches south of the Barwon River)
Waurn Ponds Reserve		1.6km	Waurn Ponds Reserve is a lovely reserve in a rural setting located out the Colac Road in Waurn Ponds. The reserve has six tennis courts and a pavilion. The reserve is home to the Waurn Ponds Tennis Club.
Marshall reserve	Local	Within study area	Small reserve with a tennis court and picnic area. There is no primary tenant.
Pioneer Park	Regional	1.8 km	Pioneer Park is part of the larger Geelong Regional Baseball Centre. The Pioneer Park reserve provides two top quality baseball diamonds with complimentary social facilities.
Leisure Link	Regional	2.8km	Offers a 25 metre indoor heated pool, gymnasium with latest equipment and two aerobics/multi purpose rooms etc Re-location of the facility to the Grovedale/Waurn Ponds area and a substantial upgrade (in the order of $28 million) of the facility is currently being planned by the City of Greater Geelong.
Geelong Regional Baseball Centre:	Regional	1.8km	A top class baseball facility with international standard baseball diamonds and associated social facilities. The reserve has lighting to enable night games and accommodates national and international standard sporting events;
Deakin University	Regional	1.4km	Provides a large fully equipped gymnasium, basketball and squash courts, indoor soccer, karate, netball, squash, table tennis, volleyball, aerobics, full-size billiard tables, tennis courts, multi-purpose ovals and sports fields including football, rugby, soccer, baseball diamonds and golf driving range.

**Shortest distance to study area*

3.8.3 Key Issues

- Allocation of open space should occur in such a way that positive features of the existing landscape are retained and preserved
- Open space in the study area should be integrated with existing open space network particularly those in adjacent suburbs to maximize the utility of this network and assist in the integration of Armstrong Creek with the surrounding community
- Provision should be made for a recreational and open space network capable of servicing the local recreational needs of the Armstrong Creek population
- Establishment of new facilities within the Study Area may reduce pressure on existing facilities in the adjacent suburbs and assist in integrating the two communities
- It is anticipated that over time overall participation in team sports will fall further as older residents generally undertake more passive recreational activities such as walking and cycling

Open Space development guide:

- **Conserve and protect the natural environment:** open space should protect and enhance natural and cultural environments, particularly areas of remnant vegetation or habitat and those areas of indigenous and post European contact cultural value;
- **Reflecting community needs:** open space provision and used decisions will be guided and influenced by, but not necessarily limited to, information from local and municipal communities on their open space interests, needs and aspirations, by demographic characteristics, and by information on the types and [patterns of leisure activity pursued by the community;
- **Enhancing recreation and tourism opportunities:** ensure that open space provision reflects the importance of recreation and tourism to the City of Greater Geelong and the regional economy**;**
- **Improving provision and optimizing access:** decisions on open space acquisition, management and use will give a high priority to creating an equitable distribution of open space and types of open space across the City. Particular attention will be given to providing and developing open space linkages between different open space resources and different parts of the City, and to activity nodes where linkages are difficult but compatible uses are concentrated;
- **Ensuring diversity of provision:** ensure that open spaces with a wide range of characteristics are provided and that in making this provision, conservation and heritage values are retained and where possible n enhanced;
- **Expanding the network of linkages:** ensure that existing pedestrian and bicycle trail networks are enhanced and that additional provision is made to effectively meet recreation and consumer needs;

- **Providing for people with disabilities:** the planning and provision processes must ensure that the needs of community members, including those with disabilities are provided for;
- **Site responsive uses:** ensure that the uses of open space are appropriate to the nature, sustainable capacity and characteristics of the site;
- **Maintenance:** ensure that open spaces are sited, planned and maintained to agreed service and safety standards, with due regard to economic sustainability;
- **Providing clear guidance to Council;** the open space planning process must provide Council with guidance as to development and management actions, which are affordable and are consistent with government policy and funding criteria;
- **Contribute to social and/or economic well-being and growth:** open space planning and provision should contribute to the social and/or economic well being of the community;
- **A flexible long term focus:** the planning process should focus on long term strategic outcomes so as to provide flexible opportunities to meet and adapt to future needs. The outcomes of planning and management should ensure that alienation of open space is minimized;
- **Provision partnerships:** opportunities for partnerships in the provision and management of open space should be integral to the planning process.

Recreational Facility Benchmarks:

Facility	Provision Ratio	Facility	Provision Ratio
Aquatic (regional indoor)	1:50,000	Football Oval	1: 4,500
Baseball	1: 25,000	Lawn Bowls	1: 10,000
Cricket Oval	1: 3,000	Netball (outdoor court)	1: 3,000
Soccer	1: 3,000	Tennis	1: 1,500
Basketball (indoor court)	1: 3,000*		

*Adapted from Shire of Melton, 2003 Community Infrastructure Survey

3.8.4 Constraints

- The adjacent recreational reserves are overutilised except Grovedale Reserve which has deteriorated over time – should be upgraded to be made suitable for soccer
- The existing facilities in adjacent suburbs are unlikely to be sufficient to provide for the Study Area's recreational needs

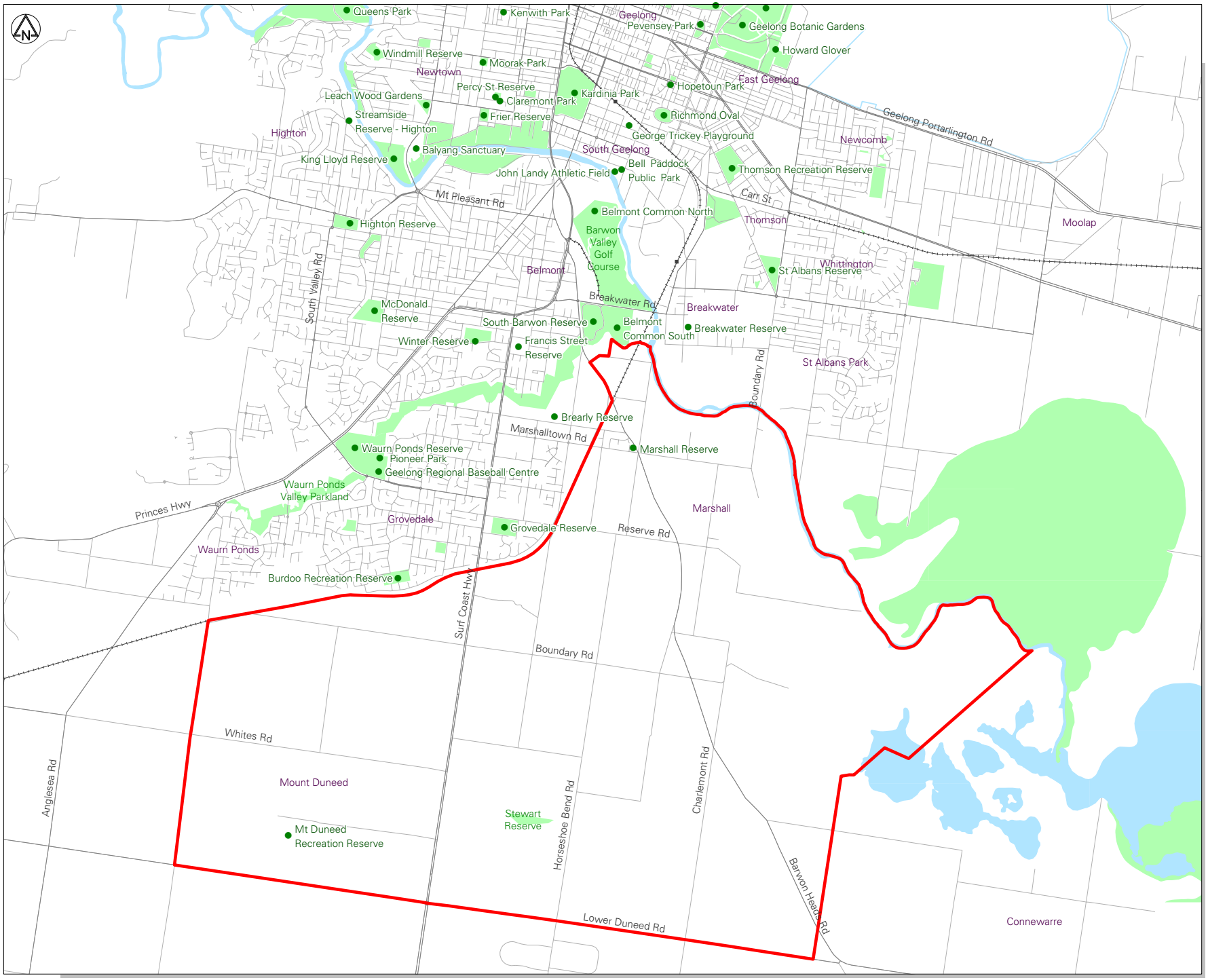
- The physical barrier between Armstrong Creek and the adjacent suburbs presented by the rail line would inhibit the usability of existing recreational facilities by the Armstrong Creek population

3.8.5 Opportunities

- To retain and preserve the positive features of the existing landscape for open spaces
- Integrate the new open space network in the Armstrong Creek Study Area with existing open space networks particularly those in adjacent suburbs

3.8.6 Summary

The popularity of walking and other individualistic leisure activities in the suburbs surrounding the Armstrong Creek Study Area should be considered when the rate of provision of particular recreational facilities is determined. Specifically, a basis is available for greater levels of investment in linked open space networks and walking/cycling trails. These networks should be designed to promote walking and cycling as an attractive mode of transport, link facilities and services in the Study Area and beyond and should meet the actual and perceived safety requirements of all users. In this way, such a network can provide a multitude of benefits including integration of the Study Area with surrounding suburbs, improved physical and mental health and increased interaction and reciprocity with the Study Area population.



Produced by UrbisJHD Pty Ltd (11/01/06)

Armstrong Creek Urban Growth Plan

Recreation and Open Space

Recreation Facility

Study Boundary

0 750 1500 2250

Metres

Figure 19

04.01.2006

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urbis JHD

3.9 Movement and Access

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Movement and Access Technical Report.*** Prepared by Arup.

3.8.1 Introduction

A Technical Report on Movement and Access for the Armstrong Creek Urban Growth Plan was prepared by Arup on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.8.2 Existing Conditions and Information

- Study Area is approximately 10 km from the Geelong CAA which will contribute to additional travel activities for employment, medical and cultural purposes.
- Linked to Melbourne via the proposed Regional Fast Train, due for completion shortly.
- Linked to Melbourne via the Princes Freeway.
- New railway station at Marshall.
- Surf Coast Highway - links Geelong with Torquay and other Coastal towns along the Victorian south coast.
- Barwon Heads Road - links Geelong with Barwon Heads, Ocean Grove and Drysdale.
- Princes Highway – links Geelong with Colac and Warrnambool.
- Mt Duneed and Anglesea Roads – links Geelong with Surf Coast and the Great Ocean Road
- A high seasonal variation in traffic along each route during holiday seasons.
- The area has a nominal 1.5km road grid network.
- Discontinuity in network - width of all road reservations generally 20.12 metres excepting Surf Coast Highway that is 40.24. Provision has been made to widen Anglesea Road beyond its current width of 20.12 metres.

The following outlines key information from previous studies undertaken and current policies relevant to Study Area.

Mount Duneed Armstrong Creek Urban Development Study – recommendations which have been implemented include:

- Construction of the Marshall Station between Tannery Road and Reserve Road albeit further north than proposed.
- Consideration of the east west link from the end of Stage 3 of the Geelong Bypass at Anglesea Road through the Armstrong Creek area.
- Installation of traffic signals at Marshalltown Road/Surf Coast Highway intersection.

- Geelong Western Bypass Reserve – the issue of the bypass reservation and its location is currently being addressed as part of the EES for Stage 3 that was subject to a panel hearing in 2005. Two options for this connection to Princes Highway have been formulated.

Geelong Transport Strategy – Recommendations and Issues:

- Alleviate seasonal variations in traffic along Barwon Heads Road, Anglesea Road and Surf Coast Highway by:
- hinterland routes such as Winchelsea-Deans Marsh Road, Birregurra – Forrest Road
- Public transport services to access coastal towns to reduce these traffic volumes
- Provide travel time advisory signage at Geelong to assist drivers with their decision process regarding route choice.
- Address accident Blackspots – a number of locations along Barwon Heads Road and Surf Coast Highway.
- Existing bus services are:
- Geelong to Torquay-Jan Juc-Apollo Bay along the Surf Coast Highway (Bellarine Transit)
- Geelong to Torquay/Jan Juc to Apollo Bay (V Line Coach)
- Geelong to Barwon Heads-Collandina-Ocean Grove via Barwon Heads Road (Bellarine Transit)
- There is a need to expand the network to meet demands as the area develops - consideration of an additional railway station and associated park ‘n ride and bus interchange facility has been suggested near the end of Rossack Drive

G21 Initiatives:

- Improvement of the service quality of public transport in the region, linked to community needs.
- Integration of public transport services with current and future land use and local activities.
- Maximising the ease of access to the public transport system.
- Enhancing public transport facilities and providing infrastructure that integrates with the surrounding environment.

Cycling

Municipal Bicycle Network - existing on-road bicycle links are provided on Barwon Heads Road and on Surf Coast Highway between the railway line in the north to Whites Road (see Figure 23).

Sustainable Transport – key initiatives

- Working with the DoI to create a TravelSMART community for Armstrong Creek.

- Provision of free ‘at-home’ public transport consultation for new dwelling occupants in addition to Smartcard tickets to the value of $200 for each dwelling as an incentive to use public transport.
- The development of Smart Bus systems to service the new developing area that provides dynamic displays and audible messages indicating times of arrival of “next services”.
- Development of Community bus services that provide for disabled groups, the young “after hours” users when normal services are not available, the aged and family groups that do not own a car, etc.
- Provision of an easily accessible, continuous, and extensive internal pathway network to connect with future and existing external pathways.
- Development of external linkages to shared pathway networks, public transport facilities and Activity Centres.
- Provision of safe pedestrian and cyclist crossings within the vicinity of the site.
- Provision of bicycle facilities within the site such as bicycle storage lockers at any community centres and facilities.
- Provision of public transport (bus) services within the site from ‘Day 1’ of dwelling occupations.
- Provision of public transport services within 400m of dwellings (extension of bus routes currently servicing Grovedale and Marshall and/or new bus route).
- Provision of the facilities required (broadband internet etc) to encourage tele-commuting (working from home).
- Development of a road network that is compatible with public transport.
- Consideration of public transport links near or along Barwarre Road.
- Consideration of the reservation of land for a future railway station on the Geelong Warrnambool railway line west of Marshall Station possibly along the south side of Rossack Drive.
- These initiatives are geared towards encouraging/facilitating public transport usage from Day 1 of dwelling occupations, therefore offering a viable alternative to private car usage from the outset of development.

3.8.3 Key Issues

- The provision of public transport routes at the commencement of the development to minimise the likelihood of new residents developing a car-dependant habit. This would encompass the Government’s Travel Smart initiatives.
- Provision of community bus services to service the aged, disabled, young and poor.
- Development of Smart Bus Systems within the development area.
- Developing efficient cycle and walking paths within the development area.
- Provision of modal interchanges and park ‘n ride facilities within the area.
- Reduce” through traffic” to the Surfcoast by encouraging the implementation of information systems that direct them to hinterland routes as suggested in the Great Ocean Road Strategy.
- The reservation of land for a future railway station on the Geelong Warrnambool railway line west of Marshall Station possibly along the south side of Rossack Drive.

- The reservation of land for a “transport corridor” near or along Barwarre Road.
- The provision of bus friendly road networks in new subdivisions and along roads within the Armstrong Creek area. Routes should be designed to allow for the development of alternative routes when required.

3.8.4 Constraints

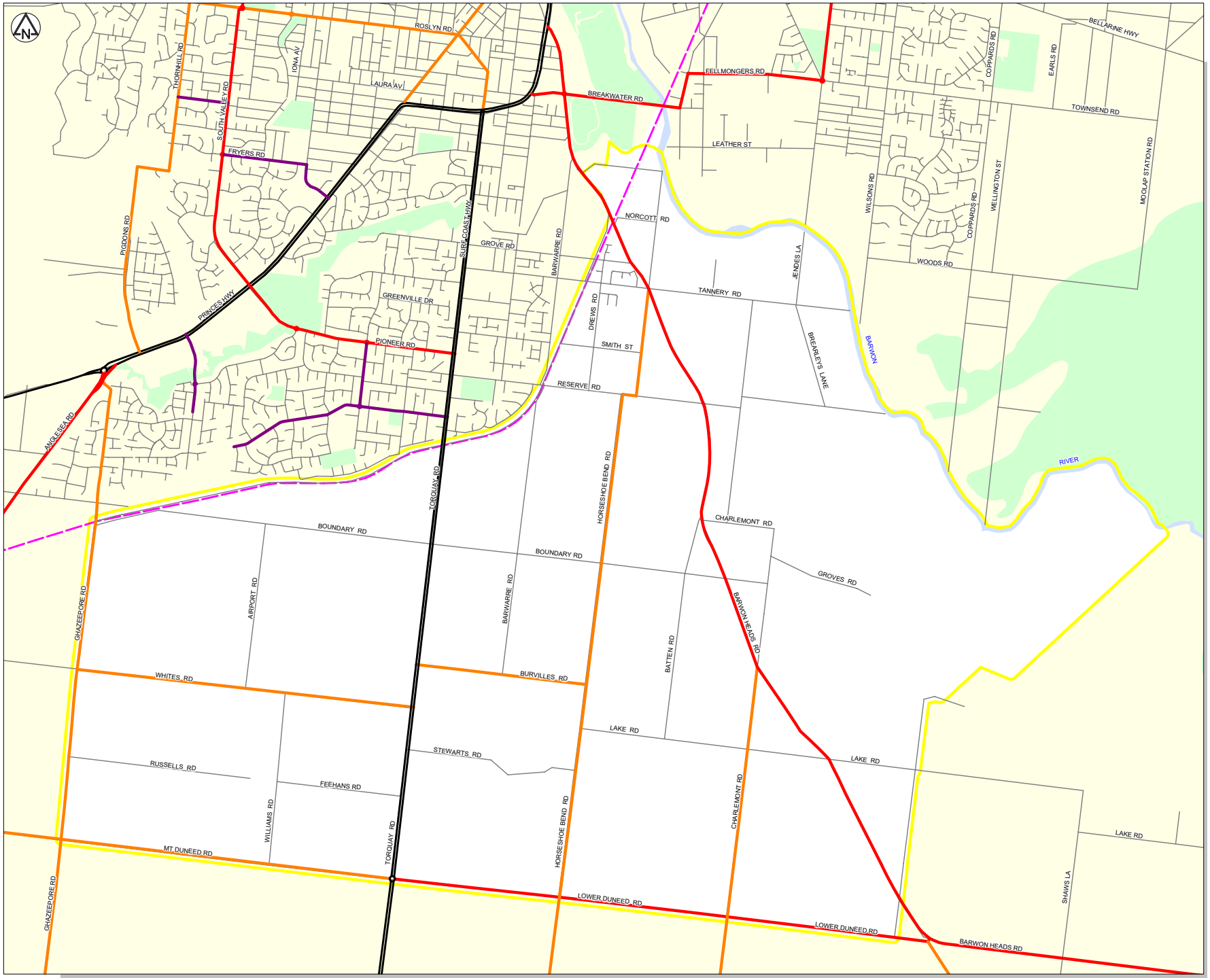
- Potential of Surf Coast Highway being four lane, 80km/h
- Potential of Geelong Bypass being six lane
- North South linkages from the Princes Highway at the end of Stage 3 of the Geelong Bypass to the Barwon Heads Road.
- Limited public transport services.
- Through traffic along the Surf Coast Highway and Barwon Heads Road.
- Discontinuity of road reservations in both the North/South and East Directions.
- Funding of projects.
- Potential impact of an east-west road to link the Geelong bypass to Surf Coast Highway, Barwon Heads Road and areas further to the south on the Armstrong Creek/Mt Duneed development area.

3.8.5 Opportunities

- Possible Railway Station between Surf Coast Highway and Reserve Road – develop as a major park and ride station for commuters to Melbourne
- Enhancement of Marshall Station as key transport interchange servicing Geelong, Surf Coast, Great Ocean Road and Colac
- New bus services to connect with the new station at Marshall to Grovedale, Waurn Ponds, Deakin University, Highton, Belmont, Barwon Heads and Ocean Grove
- Existing and proposed cycle paths
- As part of Western Link, a river crossing of the Barwon River
- Potential to develop sustainable transport outcomes – TravelSMART, at-home PT consultation etc

3.8.6 Summary

The Study Area is currently serviced by the Surf Coast Highway that links Geelong with Torquay and other Coastal towns along the Victorian south coast and Barwon Heads Road that links Geelong with Barwon Heads and Ocean Grove. There is a high seasonal variation in traffic along each route because of the nature of the areas serviced by these key roads and these will need to be addressed when considering Movement and Access issues. The development area is also approximately 10 km from the Geelong CAA which will contribute to additional travel activities for employment, medical and cultural purposes. The Geelong area is linked to Melbourne via the Princes Freeway and via the proposed Regional Fast Train, due for completion shortly.



Armstrong Creek Urban Growth Plan

Existing Road Hierarchy

Legend

- Primary State Arterial Roads
- Secondary State Arterial Roads
- Major Roads
- Collector Roads
- Local Traffic Streets
- Study Area
- Railways

0 750 1500 2250

Metres

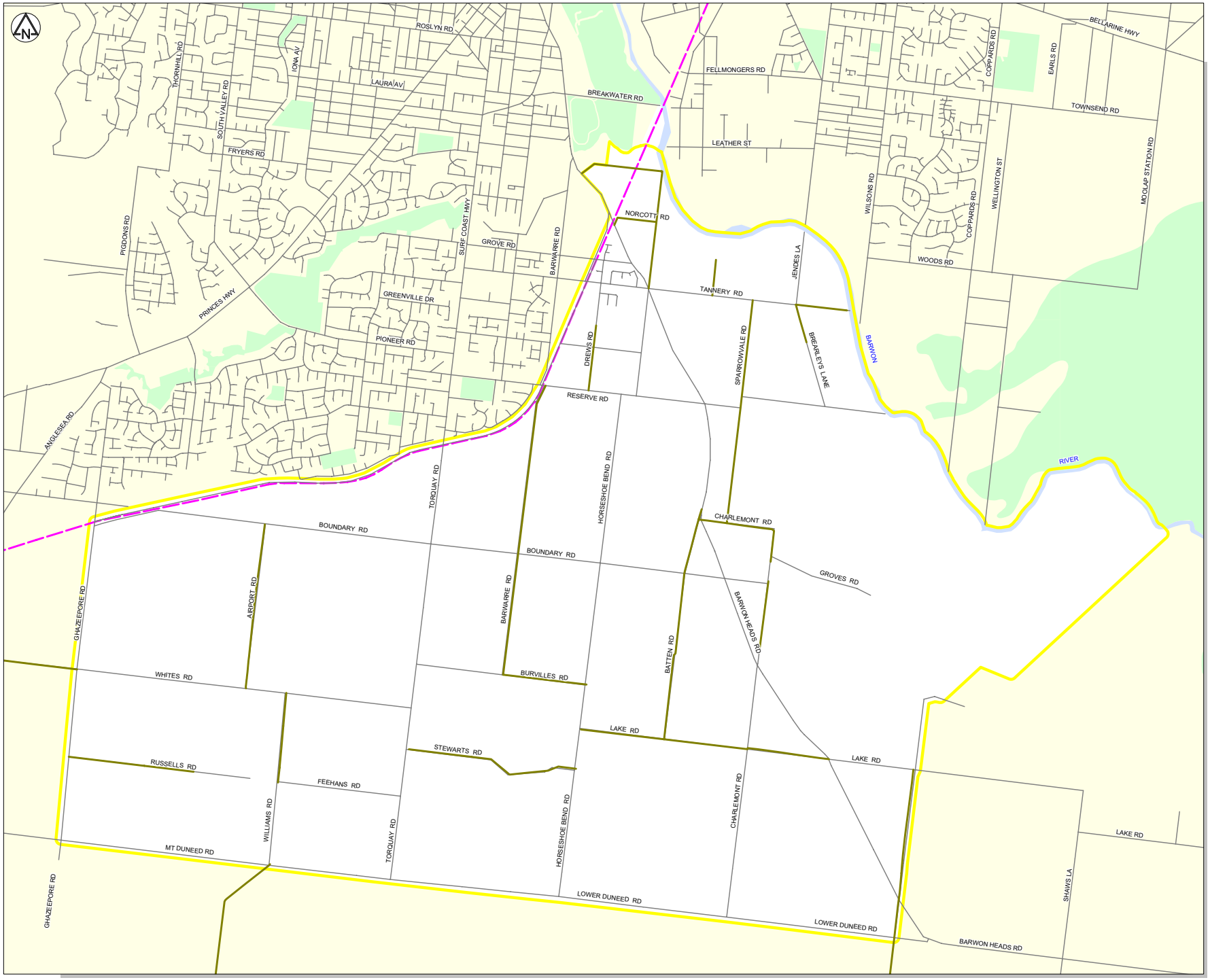
Figure 20

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Armstrong Creek Urban Growth Plan

Sealed and Unsealed Roads

Legend

- Unsealed Roads
- Sealed Roads
- Study Area
- Railways

0 750 1500 2250

Metres

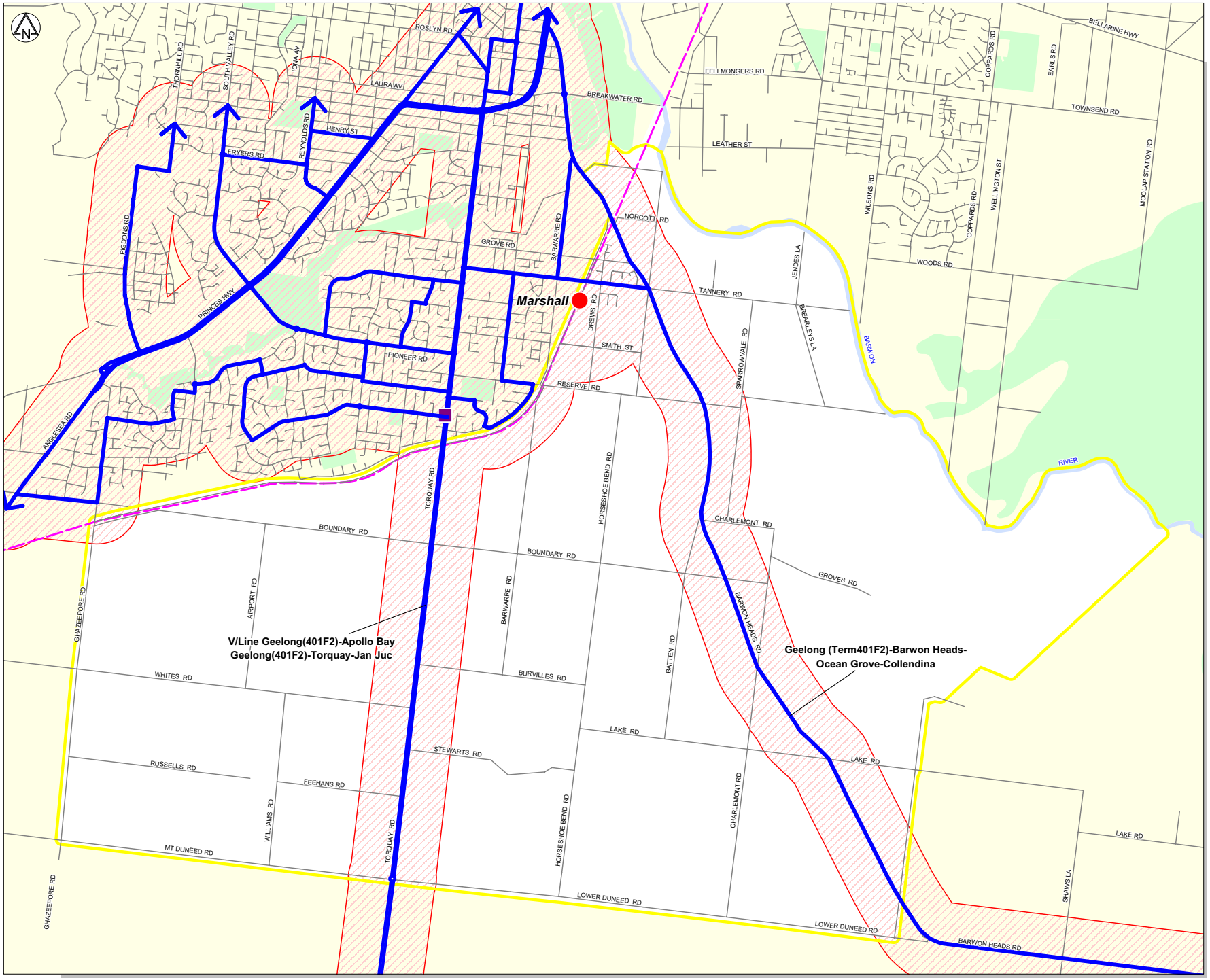
Figure 21

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Armstrong Creek Urban Growth Plan

Existing Public Transport

Legend

- Bus Route
- Bus Stop
- Railway Station
- *Accessibility to PT
- Railways
- Study Area

** Accessibilty to PT -*
400m from bus route
500m radius from bus stop
800m radius from train station
Source: ResCode Clause 56.03-6

0 750 1500 2250
Metres

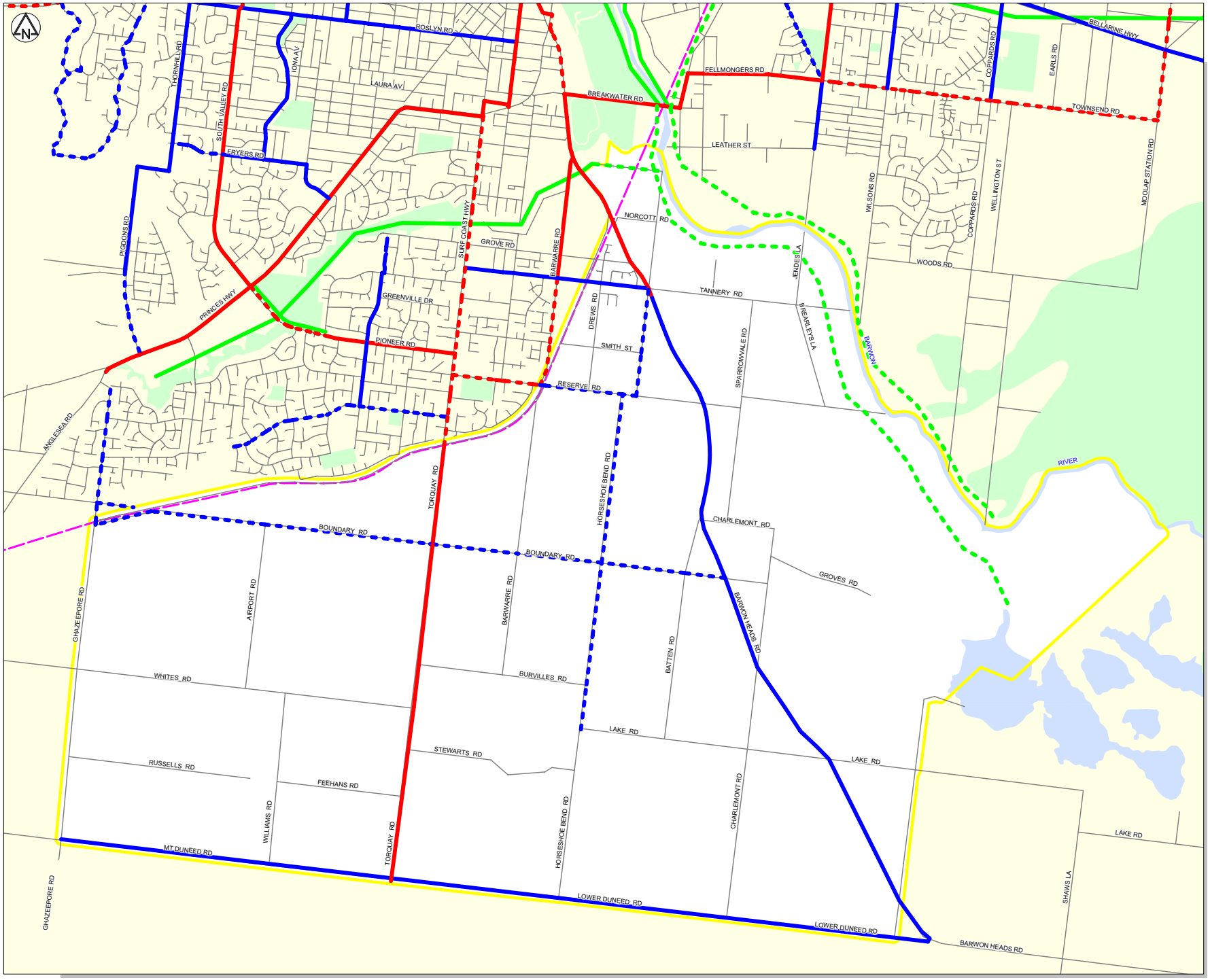
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Armstrong Creek Urban Growth Plan

Municipal Bicycle Network

Legend

LOCAL ROUTES	PRIORITY ROUTES	
		ON ROAD
		Existing
		Proposed
		OFF ROAD
		Existing
		Proposed
		Study Area
		Railways

0 750 1500 2250

Metres

Figure 23

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3.10 Physical Infrastructure

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Movement and Access Technical Report.*** Prepared by Arup.

3.10.1 Introduction

A Technical Report on Physical Infrastructure for the Armstrong Creek Urban Growth Plan was prepared by Arup on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, research, mapping and discussion with relevant stakeholders.

3.10.2 Existing Conditions and Information

- Stormwater drainage mainly consists of a number of drainage depressions and larger watercourses, with some smaller culverts at road crossings.
- Formal stormwater drainage infrastructure is limited to the existing urban development areas.
- Existing flood management consists of a number of retarding basins that have been constructed at outfalls into the study area.
- All major utility services are present in the study area; Sewerage, Water Supply, Gas, Electricity (Distribution), Telecommunications.
- The services all have varying levels of existing reticulation from the mains into and around the study area with the exception of gas, which has no recorded reticulation.
- Overhead electrical transmission lines and pylons exist along two separate routes within the study area.
- The Study Area is currently serviced by a residential refuse collection program managed by the City of Greater Geelong. There is no significant refuse disposal site or recycling facility located within the study area.

3.10.3 Key Issues

The following sections outline the potential for provision of or upgrading utilities within the Study Area.

Sewerage

(See Figure 24)

- Barwon Water has advised that the current capacity of the sewerage system (unquantified) is insufficient to service the proposed development.

Two main options identified to service the study area by Barwon Water:

- A Northern Water Reclamation Plant (Preferred Option) located at the Shell Refinery at Corio; and
- Update the 1996 Geelong Trunk Sewer Strategy, which excludes the Shell Refinery.
- Both have a new pumping station located at Marshall, in conjunction with a new 10km long pipeline between Reserve Road, Marshall and Black Rock treatment facility.

- Barwon Water advises that the construction of the new pipeline will provide sufficient capacity for the proposed development.
- In order to comply with Barwon Water's preferred development phasing, initial construction should take place in the vicinity of the proposed Marshall pumping station, and radiate out from that location.
- Wherever possible gravity systems should be employed for the sewer network, with pumped systems being introduced only where necessary.

Issues that may affect development planning include:

- Timing of the approval and actual construction of the new pumping station and pipeline - critical to the phasing and planning of the trunk infrastructure for the new development.
- Barwon Water's preference for development phasing would be to begin at the Main Outfall Sewer location. This would mean that only small sections of the ultimate mains system would need to be constructed as the development progressed, rather than having to construct large transfer pipes over greater distances if the initial development is remote from the Main Outfall Sewer.
- Barwon Water's build-over policy, which states that no habitable structures are to be built over a sewer main.
- No structure is to be built within 1.0m of existing easement boundaries, such as those for the Main Outfall Sewer.
- Sewer mains may be constructed through private properties, as long as they are covered by an appropriately sized sewerage easement. The only sewer mains that are not permitted in private property are pressure sewer mains.

Water

(See Figure 25)

- All mains that currently supply the study area originate from the Pettavel Basin, which is located to the east of Waurn Ponds at 250 Reservoir Rd, Mt. Duneed.
- Barwon Water has advised that the capacity of the existing water mains (unquantified) is insufficient to service the proposed development. They have also indicated that the water supply source, Pettavel Basin, may not have sufficient capacity for the development.
- The Mount Duneed/Armstrong Creek Urban Development Study states that Barwon Water included the installation of a new water main into the study area and possible augmentation of the Pettavel Basin to improve capacity.
- Barwon Water has set targets to reduce water use by 15% per head over the next 20 years, and increase water recycling from the current level of 11% to 25% by 2015.
- The installation of a new water main and possible augmentation of the Pettavel Basin will be necessary to provide potable water to the proposed development.

Other issues that may affect development planning include:

- Barwon Water will need to ensure that CFA requirements for water supplies are met pursuant to CFA document titled “CFA Requirements for Water Supplies and Access for Subdivisions in Residential 1 and 2 and Township Zones”.
- Barwon Water’s buildover policy, which states that no habitable structures are to be built over a water main,
- Water mains cannot be laid through private properties; they must be located in an easement or a reserve area.

Electricity

(See Figures 26 & 27)

- Some services do exist and capacity investigations for future development are underway.
- Existing electricity transmission assets cross the study area along two separate routes.
- Capacity of the existing transmission lines has no direct influence on the proposed development.
- The presence of the transmission lines and associated infrastructure, and in particular the supporting pylons, has a significant visual impact within the study area.
- SPI Powernet and Alcoa both advise that the transmission lines could be relocated underground but there are no proposals to do so since it is generally cost prohibitive. The approximate cost to replace an existing 220kV overhead line with underground cable would be in the order of $5 million per kilometre.
- Alcoa advise that there is no direction at present as to what will happen when the supply agreement expires. Should the transmission line become redundant, it may free up additional land for development.
- No planned upgrades in the Study Area.

Gas

(See Figure 28)

- t2 advises that the 180mm main currently supplies the Torquay and Jan Juc areas but has limited capacity. There is generally insufficient capacity (unquantified) in the existing gas mains to service the Armstrong Creek development
- Reticulation is provided to Torquay along Ghazeepore Road.
- No recorded gas reticulation in study area.

- A new 160mm diameter supply main to Barwon Heads is scheduled for the latter quarter of 2007 with the supply source originating from Waurn Ponds.
- New gas main will need to be installed to service the proposed development.
- The route of the gas mains should typically fall within road reserves.
- If traversing private property, a gas easement will be required approximately 3.0m wide (1.5m each side of pipe). No building work can take place within the easement.
- The approved route alignment of the proposed Waurn Ponds – Barwon Heads supply main will be critical in determining the gas supply infrastructure requirements for the proposed development, as well as the phasing of the development works.
- A new 160mm diameter gas main connection off the proposed Waurn Ponds - Barwon Heads supply main will be required to supply the Armstrong Creek development. This connection will require the installation of an additional Field Regulator to maintain the distribution pressure in the gas reticulation system, particularly at peak demand times.

Telecommunications

(See Figure 29)

- Some telecommunications services do exist in the Study Area.
- Telstra is the main distributor to residential and commercial customers.
- Telstra advises that existing infrastructure (conduit and exchange) in and around MTDU and GROX are currently limited and will need to be augmented to meet the demands of the proposed development.
- In addition, the mobile phone base station may not be sufficient capacity to accommodate the new development.
- No planned upgrades to cable or mobile phone services.
- Telsta has advised that to supply any future development in the Armstrong Creek area, the most likely scenario is that services will be provided from MTDU and GROX. This will necessitate the redirection of WAPD services south of the railway into the GROX exchange.
- Upcoming technologies include the introduction of ADSL2+technology to Telstra networks. The 2+ version provides 8 times the transfer speed of conventional ADSL, ie speeds of up to 12mbps (megabytes per second) compared with 1.5mbps.
- Telstra is currently piloting a new technology called “Fibre To The Premises” (FTTP), sometimes also referred to as “Fibre To The Home” (FTTH). FTTP is a term used to describe the supply of telecommunications services to customers’ premises using optical fibre instead of the traditional copper cable. A single optical fibre supplies the home with telephone, broadband data and subscription TV services, instead of two or more separate cables.

- "Telstra Smart Community" initiative – aims to provide a dedicated service, offers:
    - Home phone services
    - Mobile Services
    - BigPond Broadband
    - Subscription TV
    - Integrated community

Integrated community involves the creation of community portals with online forums, that allow residents to chat, view community events/newsletter, and book services and appointments with local commercial enterprises, contact security, check public transport times, etc. New services may be added to the portal as the need arises.

Refuse Disposal

(See Figure 30)

- City of Greater Geelong Council is the authority responsible for the collection and disposal of refuse.
- Waste services provided by mobile infrastructure (collection vehicles) only.
- Existing residential collection service is a by three mobile bins – waste, recycling and green matter.
- Council is currently investigating the provision of a hard waste collection service.
- Waste Management Future Directions Strategy in place that identifies that there is no a need for any further putrescible landfill sites and that the Drysdale landfill will become the significant regional site.
- Barwon Regional Waste Management Group is currently reviewing its 10 year Regional Waste Management Plan (not public knowledge as yet) and has also identifies that there is no need for any additional putrescible waste landfill sites. It should be noted that the Regional Plan has not previously taken into account the proposed Armstrong Creek development. However, while significant, it is not likely to change the Plan's recommendations.
- Council has a Waste Management Future Directions Strategy that is based on working towards the targets of the State "Towards Zero Waste Strategy" and identifies the need to investigate the provision of an Integrated Resource Recovery Centre (IRRC) to replace the Corio landfill upon its closure at the end of 2009 and to maximise materials recovery for the whole municipality and the Barwon region.
- If given the go-ahead, the IRRC could be located within the study area's Industrial 1 Zone at Marshall. This would provide a centralised treatment facility with easy access to/from existing refuse facilities, and one which could service the developing Armstrong Creek area by making use of the proposed road linkage from the Geelong Bypass.

- Establishing the IRRC at Marshall means that it would be located close to the proposed electricity zone sub-station. Future technologies for converting waste to energy could then implemented, with generated electricity being supplied to the local grid via the sub-station.

3.10.4 Constraints

- Need for retarding basins
- Visual impact of overhead transmission lines and pylons and restricted development opportunities due to overhead transmission lines and pylons – easements of 62 and 36 metres, latter Alcoa
- Restricted development opportunities due to water main easements
- Easement for major feeder main from Pettavel Basin to Study Area

3.10.5 Opportunities

- Water recycling – opportunity to use recycled water from Black Rock WRP
- Potential for an Integrated Resource Recovery Centre (IRRC) within the Industrial 1 Zone at Marshall, locating close to proposed electricity substation means future technologies for converting waste to energy could be implemented with generated electricity being supplied to the local grid via the substation. Receival of all waste, recovery of whatever material possible, and disposal of residual waste to landfill (Drysdale).

Sustainable Energy Strategies:

The following table outlines possible sustainable energy strategies and confirmation of the geographic level to which the strategies may be implemented – regional, development wide, precinct, or site specific.

	Regional	Development Wide	Precinct	Site
1. A community that promotes a reduced ecological footprint. From an energy aspect this will involve reduction in operational energy and the energy embodied in the production of infrastructure, sites and buildings. Creation of an "Urban Forest" throughout the entire development (parklands, roadways, individual sites and building green roofs) will embody atmospheric CO_2 to assist reduction in the eco-footprint.	✓	✓	✓	✓
2. Maximise use of affordable renewable energy; encourage sponsorship from government to improve affordability and to ensure implementation of responsible, visible, renewable energy in all precincts.	✓	✓	✓	✓
3. Careful clustering of uses, for example locate buildings and mixed use facilities in a pattern that will enhance the symbiotic sharing of water, energy, flexible space and transport.		✓	✓	✓

4. Building material production, transport and installation requires large amounts of energy. Select materials throughout the development based on reduced "embodied" energy as well as reduction in other environmental impacts such as landfill, toxicity, water use, etc.		✓	✓	✓
5. Leading edge communications to all buildings and dwellings promoting virtual connections to workplaces and the world and assisting reduced physical travel dependency.	✓	✓	✓	✓
6. Promote community accessible car share plans allowing centralised efficient management and sharing of vehicles including new hybrid energy models and future alternate fuel based vehicles (e.g. hydrogen/electric).	✓	✓	✓	
7. Plan the development to facilitate individual site and building orientation for solar access, wind/breeze access and views, etc.		✓	✓	✓
8. Large trees as an important part of the urban forest and ecology, these will shade buildings, streetscapes, parking, paths and open community spaces to reduce "heat island" effects, improve comfort and reduce building energy draw. Large trees will also act as a CO2 sink by drawing in atmospheric CO2 as they grow and will need to be carefully planned for integration into streetscapes, etc.		✓	✓	✓
9. Cogeneration facilities that efficiently produce electricity and heat with greatly reduced CO2 emissions. These facilities are operate best when large year round heat loads exist (such as aquatic centres) and can be linked into a wider precinct centralised heating water reticulation strategy and into a development wide electrical power strategy.		✓	✓	✓
10. Install infrastructure initially to facilitate a range of future energy sources as availability and economic feasibility changes:				
a. High pressure natural gas reticulation to all sites in the entire development; this will allow high energy capacity connection of new local heat & power (co-generation/tri-generation) technologies such as fuel cells, microturbines, absorption chillers, etc. and to facilitate a future "hydrogen economy" such as vehicle power systems and stations alternate to the current petroleum dependant systems.	✓	✓	✓	
b. Site planning for energy from waste facilities; co-locate precinct bio-energy facilities with the high pressure gas, electrical and heating water reticulation infrastructure for local precinct reticulation and/or whole development wide electricity and combined natural & bio-gas reticulation. The energy from waste plants would convert biological energy (such as green waste products) into electricity and heat.		✓	✓	✓
c. Plan for integration of centralised renewable energy such as wind power, photovoltaic cells, geothermal plant into the overall integrated energy infrastructure.		✓	✓	✓
d. Pathways within buildings and street networks for the installation of future technologies (e.g. fuel cells, photovoltaic cells, wind power) and interconnections within the site and to the broader infrastructure.		✓	✓	✓

11. Mandatory energy performance requirements for all building types and for all owners and occupiers; this would be flexible in terms of change in performance hurdles and the introduction of new performance measures over time. Initially minimum 5 Star ABGR for buildings and 6 Star residences. Note that this strategy promotes green buildings in a holistic sense and in particular will result in a focus on energy efficiency issues such as building orientation and footprint, natural ventilation, solar access, shading, building services system efficiency, façade performance, commissioning, solar hot water, etc based on individual site opportunities.				✓
12. Precinct heat rejection and heat reclaim loops; these would entail piping infrastructure allowing heat to be rejected from one building/zone into the loop and this heat to be withdrawn in another building/zone. This is particularly useful where areas requiring consistent heat removal (e.g. supermarket refrigeration) are combined with variable load areas (e.g. residences).			✓	✓

There are major benefits that can be gained by implementation of synergistic strategies across the various sustainability aspects, including water, biodiversity, etc.

Some typical integrated strategies include:

1. Biodiversity, Vegetation, Green roofs, and Community:

- Promote an Urban Forest, this requires biodiversity auditing and planning plus regional vegetation planning so that public and private areas all contribute to a consistent strategy.
- This urban forest reduces demand on energy because of shading opportunities to buildings and a more pleasant environment for walking and cycling.
- Green roofs improve capacity for bio-treatment in water sensitive urban design strategies, very important for this particular region. In addition, green roofs improve energy efficiency of buildings (insulation and shade).
- The Urban Forest, vested in a biodiversity and vegetation plan can improve the local indigenous wildlife numbers and diversity. A big plus for eco-cities in the future.
- All of these items improve community, sense of place, branding, etc, and this creates great opportunities for social and economic outcomes that make all the strategies work coherently.

2. Water strategies will be important given the proximity to the Barwon River

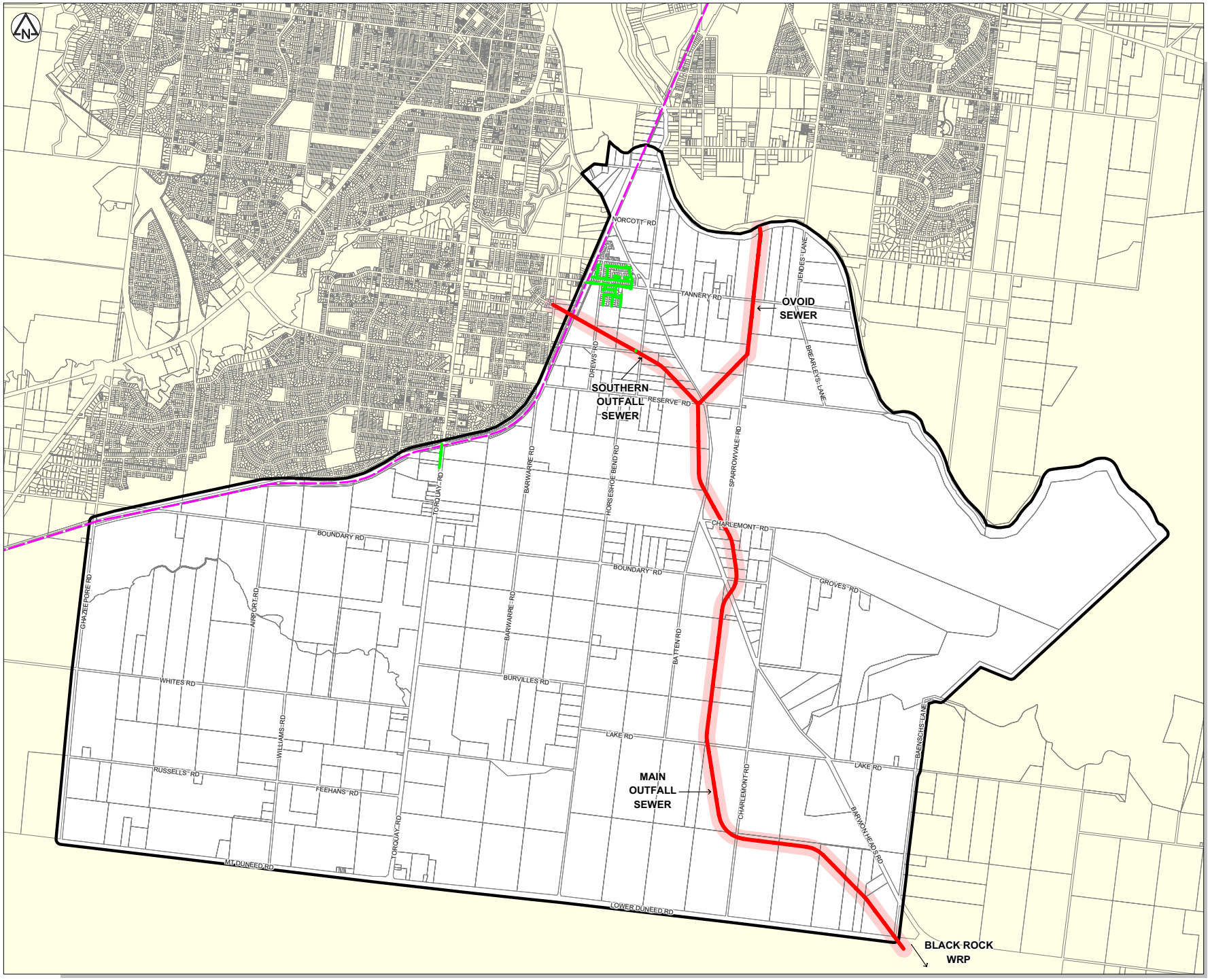
- Water sensitive urban design to harvest, treat and reticulate rainwater and grey water around the precinct. Consider black water treatment.
- Utilise water for community gardens.
- Create local market gardens.
- Promote community.

3. Refuse disposal

- From the community, collect green waste and produce biogas to heat and power community facilities (e.g. aquatic centre) to further promote community, local economy, etc. With excess heat, improve winter comfort of transport facilities to promote public transport use and easy/equitable access to the region.

3.10.6 Summary

All major utility services are present in the Study Area and have varying levels of existing reticulation from the mains into the study area with the exception of gas, which has no recorded reticulation. Electrical transmission lines and pylons exist along two separate routes within the Study Area. Apart from a visual impact and restricted development options in their vicinity, the transmission lines have no direct affect within the development area. The Study Area also presents an opportunity to implement a number of sustainable energy strategies.



Armstrong Creek Urban Growth Plan

Existing Sewer Network (Barwon Water)

Sewer Mains (Diameter)

- < 300mm
- 300mm
- 825mm
- > 825mm
- Easement

0 750 1500 2250

Metres

Figure 24

04.01.2006

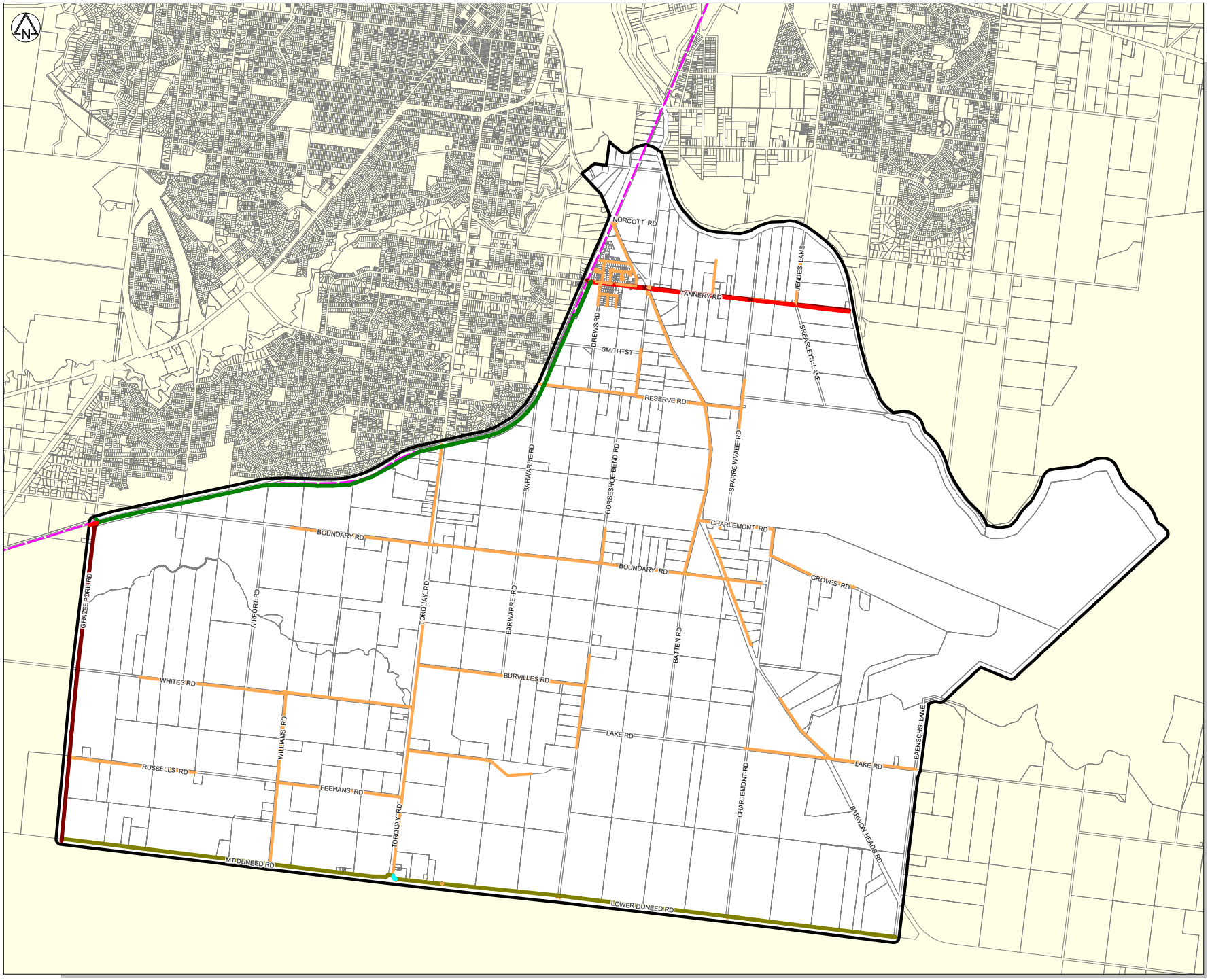
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Armstrong Creek Urban Growth Plan

Existing Water Network (Barwon Water)



Water Mains (Diameter)

- < 300mm
- 300mm
- 375mm
- 600mm
- 825mm
- > 825mm

0 750 1500 2250

Metres

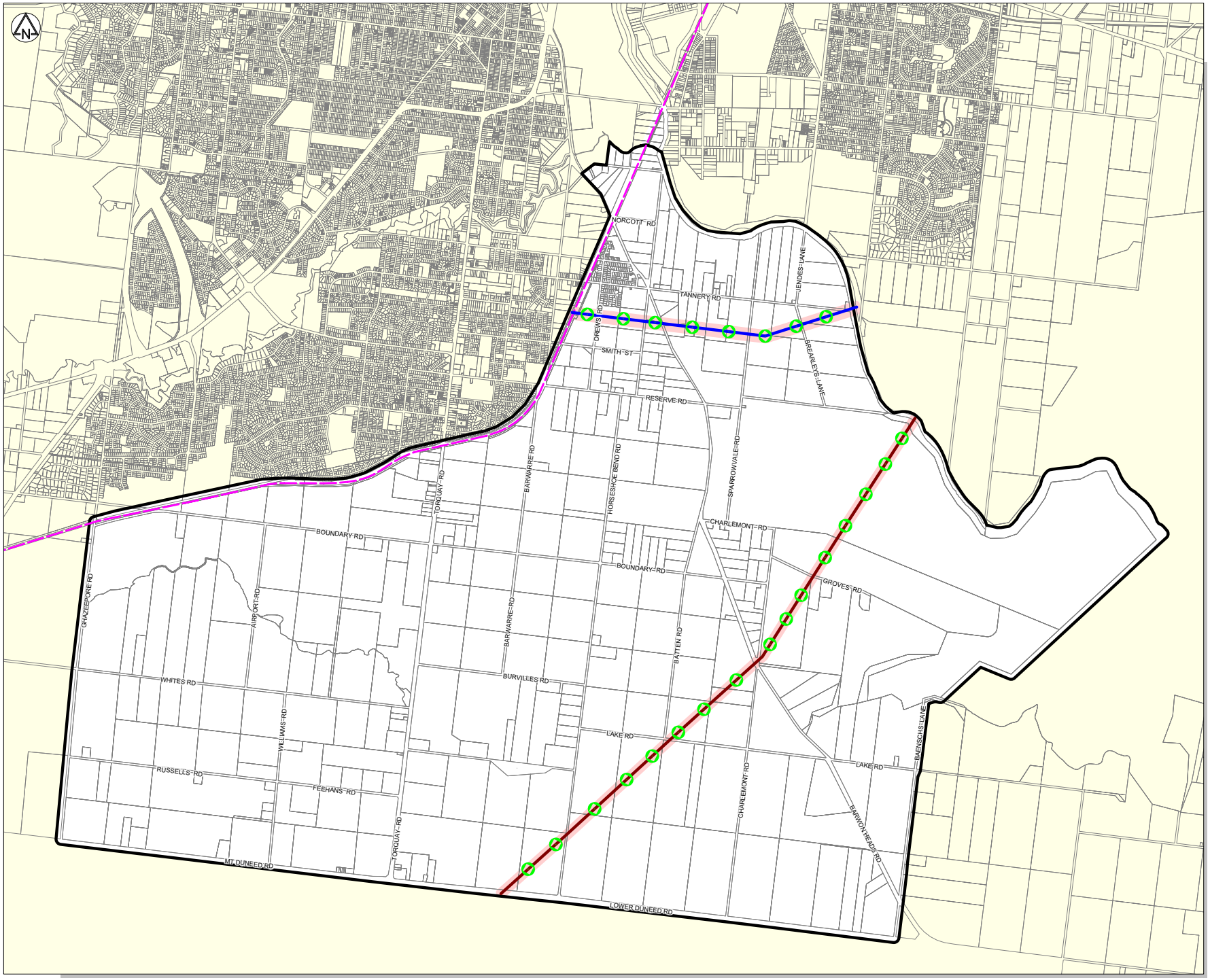
Figure 25

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Armstrong Creek
Urban Growth Plan

Existing Electrical Transmission Network (PowerNET)

Legend

- 220kV Transmission Line (PowerNET)
- 220kV Transmission Line (Alcoa)
- Pylon Locations
- Easements
- Study Area
- Railways

0 750 1500 2250
Metres

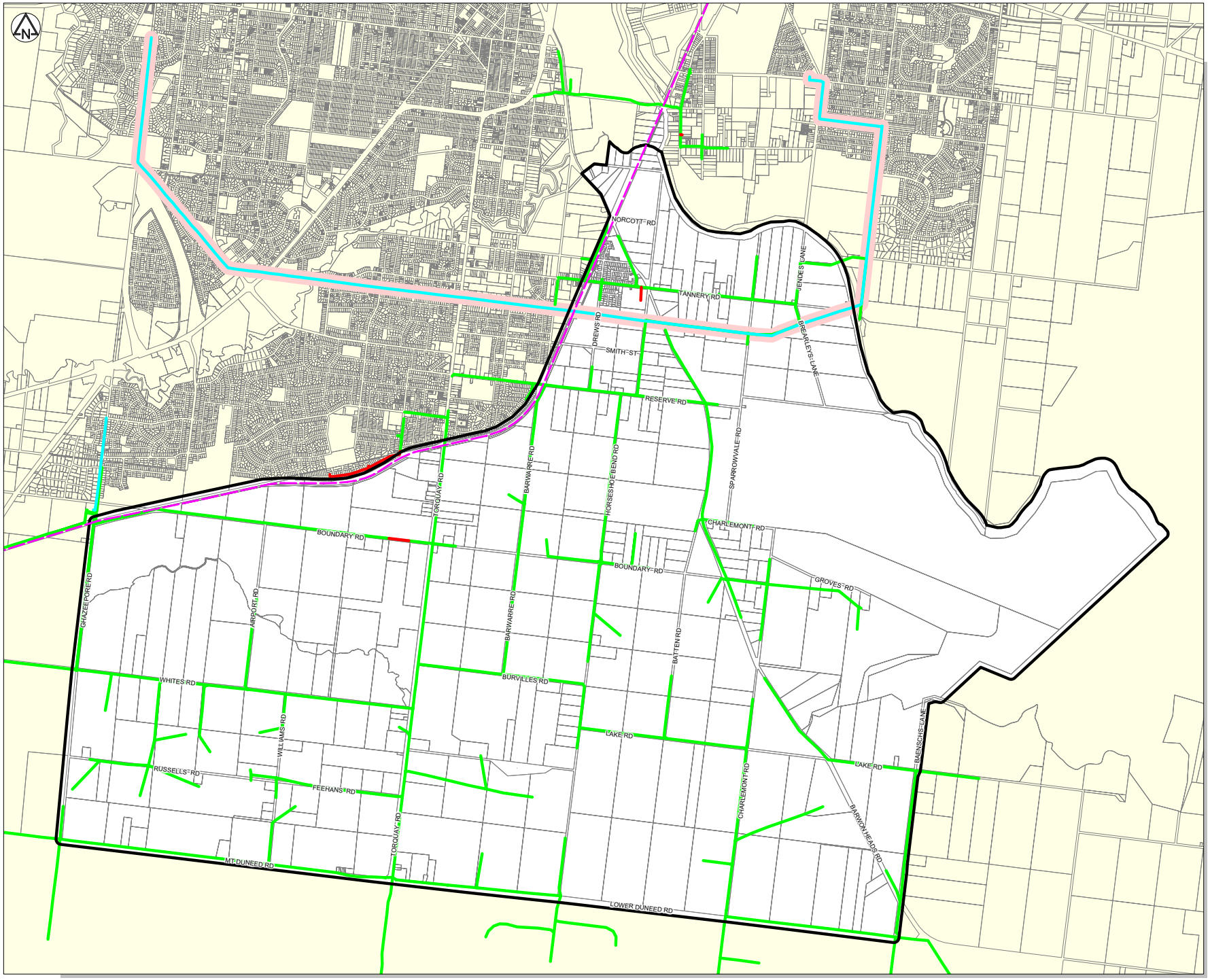
Figure 26

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Armstrong Creek Urban Growth Plan

Existing Electrical Distribution Network (PowerCor)

Legend

- HV Underground (UG) 22kv
- HV Overhead (OH) 66kv
- HV Overhead (OH) 22kv
- Powernet Easement
- Study Area
- Railways

0 750 1500 2250

Metres

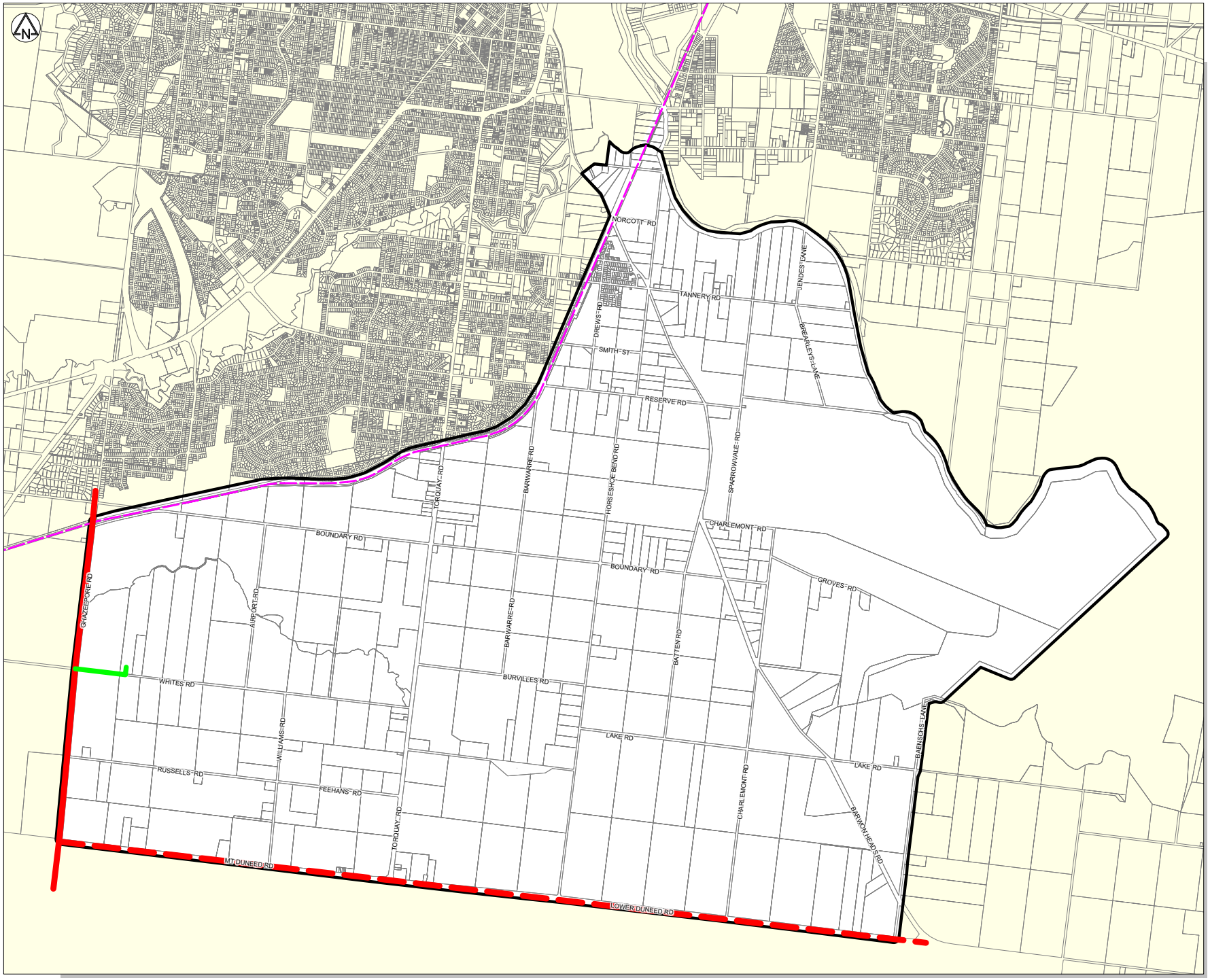
Figure 27

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Armstrong Creek Urban Growth Plan

Existing Gas Network (t-Squared)

Legend

- 180 ø PE Pipe
- 63 ø PE Pipe
- Study Area
- Preliminary route for proposed gas supply main (2007)
- Railways

0 750 1500 2250

Metres

Figure 28

04.01.2006

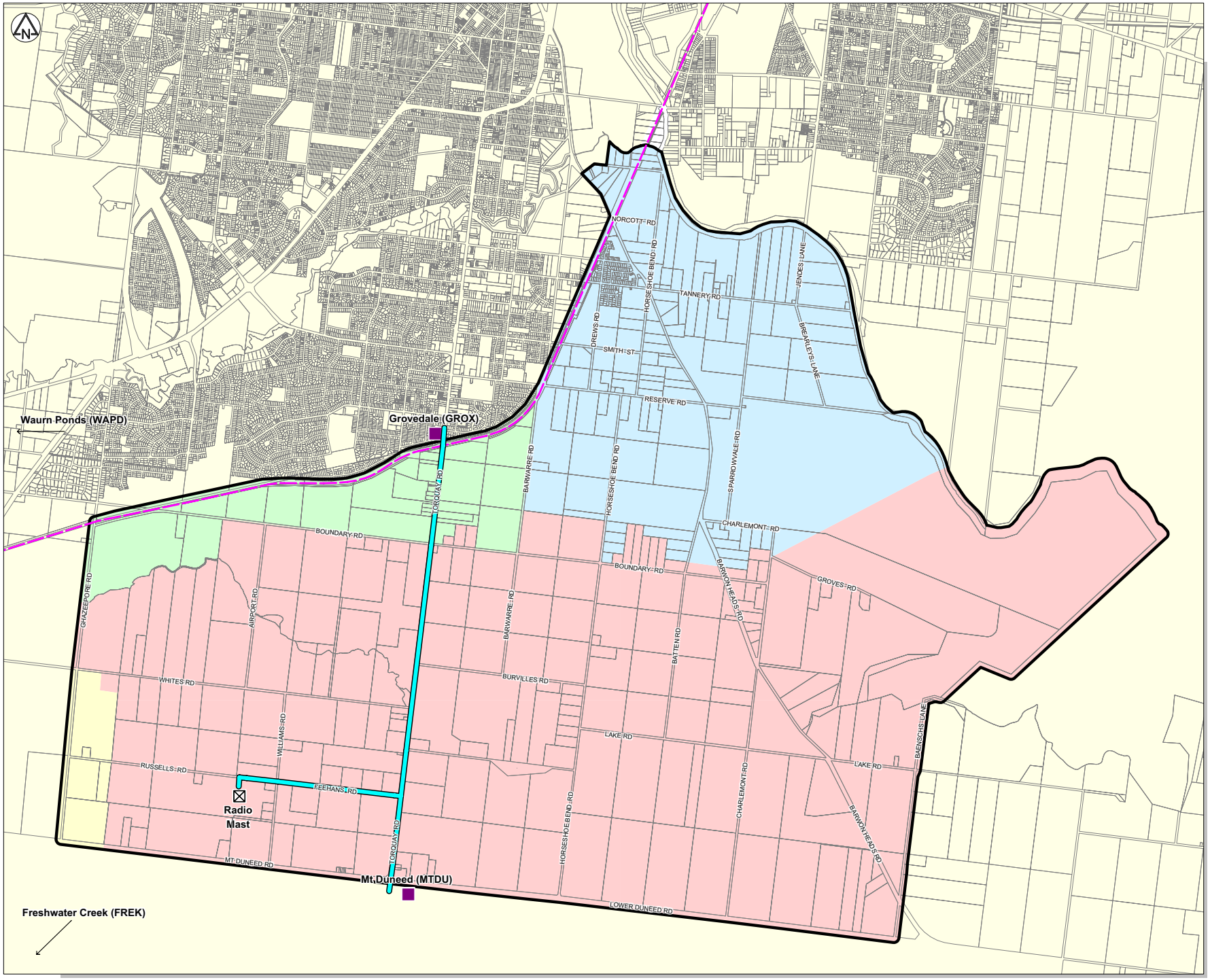
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Armstrong Creek Urban Growth Plan

Existing Telecommunications (Telstra)



Legend

- Telstra Fibre Optic Cables
- Telstra Exchange Locations
- Mt Duneed (MTDU) Exchange Area
- Grovedale (GROX) Exchange Area
- Waurn Ponds (WAPD) Exchange Area
- Freshwater Creek (FREK) Exchange Area
- Study Area
- Railways

0 750 1500 2250

Metres

Figure 29

04.01.2006

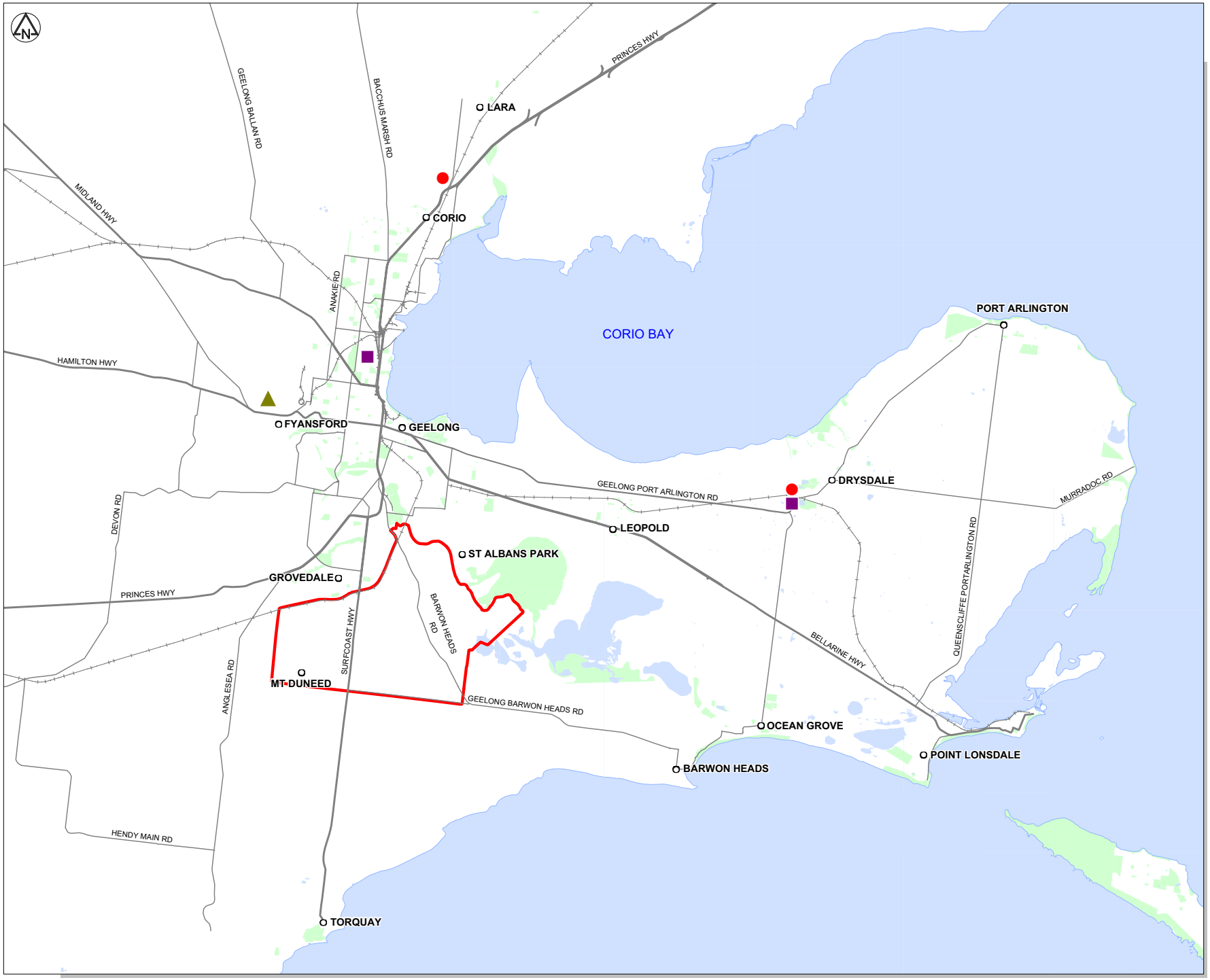
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Armstrong Creek Urban Growth Plan

Existing Refuse Treatment Facilities Plan



Legend

- Solid Inert Landfill
- Putrescible Landfill
- Resource Recovery Centre
- Study Area

0 3 6 9

Kilometres

Figure 30

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3.11 Flooding and Drainage

Source: City of Greater Geelong, 2006, ***Armstrong Creek Urban Growth Plan – Flooding and Drainage Technical Report.*** Prepared by Water Technology.

3.11.1 Introduction

A Technical Report on Flooding and Drainage for the Armstrong Creek Urban Growth Plan was prepared by Water Technology on behalf of the City of Greater Geelong between November 2005 and February 2006. This involved a review of existing information, site analysis, photogrammetric survey, digital terrain modelling, research, mapping and discussion with relevant stakeholders.

3.11.2 Existing Conditions and Information

- The study area consists mainly of rural land.
- The associated drainage is via a number of drainage depressions and larger watercourses.
- Formal stormwater drainage infrastructure in the study area is limited to a small area of urban development.
- Land use planning and drainage management for the study area are the responsibilities of the CoGG.
- Floodplain management is the responsibility of the Corangamite Catchment Management Authority (CCMA).

The CoGG has divided the study area into a number of drainage catchments. Figure 31 shows the catchment delineation.

The following outlines the nature of the drainage infrastructure in each sub-catchment:

C252 Waurn Ponds Creek
• Large catchment with only a small proportion in study area.
• A proportion in the study area is subject to inundation from the Barwon River

C253 Marshall
• Small catchment with partial urban development.
• Serviced by underground drainage system and retarding basins.

C254 South East Grovedale
• Urban development north of railway (outside study area) serviced by underground
drainage system and retarding basin (south of railway).
• Rural land (south of railway) with open watercourses of limited capacity.

C255 Sparrowvale
• Rural land, very flat, with an open constructed drain.
• Private levee encloses low lying land adjacent to the Barwon River and prevents

inundation up to a 1 in 10 year flood.
• Local runoff requires pumping over the levee for discharge to the Barwon River.

C256 Sparrowvale North
• Rural land, very flat, with no formal constructed drainage.
• Low lying area inundated by the Barwon River.

C257 Armstrong Creek
• Urban development north of railway (outside study area) serviced by underground
drainage system and retarding basin (north of railway).
• Poorly defined watercourses with limited capacity.
• Low lying areas subject to winter waterlogging.

C267 Thompsons Creek – Duneed Creek Branch
• Rural land, several ill defined drainage lines.
• No drainage infrastructure.

The Victoria Flood Management Strategy outlines the key agencies in floodplain management. The following acts and strategies form the underlying legislation and policy framework for floodplain planning at a state level:

- Catchment and Land Protection Act 1994 (CALP)
- Water Act 1989
- Planning and Environment (Planning Schemes) Act 1996
- Victoria Flood Management Strategy 1998
- Victoria River Health Strategy 2002
- Victoria Planning Provisions (VPP's)
- Victoria Planning Provisions: Practice Notes

Regional level:

- Corangamite CMA Regional Catchment Strategy 2003-2008
- Corangamite CMA Regional Floodplain Management Strategy 2002
- Corangamite CMA Regional River Health Strategy 2002

Local level:

- Greater Geelong Planning Scheme: State Planning Policy Framework
- Greater Geelong Planning Scheme: Municipal Strategic Statement
- Greater Geelong Planning Scheme: Local Planning Policy Framework

3.11.3 Key Issues

Any development within the study area may change flooding behavior and in turn the flood prone delineation, if appropriate mitigation measures are not undertaken.

A rough rule of thumb to size required flood storage/retarding basins is 500m3 per hectare developed. Based on the study area of 2545 ha approximately, a total of 1.2725 million m3 flood storage would be required.

Table 4 - Flood related development constraints

Activities	Development constraints/requirements (FO)	Development constraints/requirements (LSIO)	Source
Subdivision	No new lots to be created entire within FO	No specific requirement	Greater Geelong Planning Scheme (Clause 44.03)
Dwelling	Floor level at least 300 mm freeboard above 100 year flood level The location, floor level and design of any new building or extension should consider adequate drainage for the site and any adverse hydraulic effects on neighbouring properties.	Floor level at least 300 mm freeboard above 100 year flood level The location, floor level and design of any new building or extension should consider adequate drainage for the site and any adverse hydraulic effects on neighbouring properties.	Building regulations (1994) Planning Practice Notes (DOI 200 a& b)
Commercial buildings	Floor level at least 300 mm freeboard above 100 year flood level The location, floor level and design of any new building or extension should consider adequate drainage for the site and any adverse hydraulic effects on neighbouring properties. Where possible, the building should be aligned to minimise the obstruction to flood flows.	Floor level at least 300 mm freeboard above 100 year flood level The location, floor level and design of any new building or extension should consider adequate drainage for the site and any adverse hydraulic effects on neighbouring properties. Where possible, the building should be aligned to minimise the obstruction to flood flows	Building regulations (1994) Planning Practice Notes (DOI 200 a& b)

Figure 32 shows the proposed draft FO and LSIO for the study area.
Figure 33 shows the parts of the Study Area where natural surface slope is greater or less than 1:250.

3.11.4 Constraints

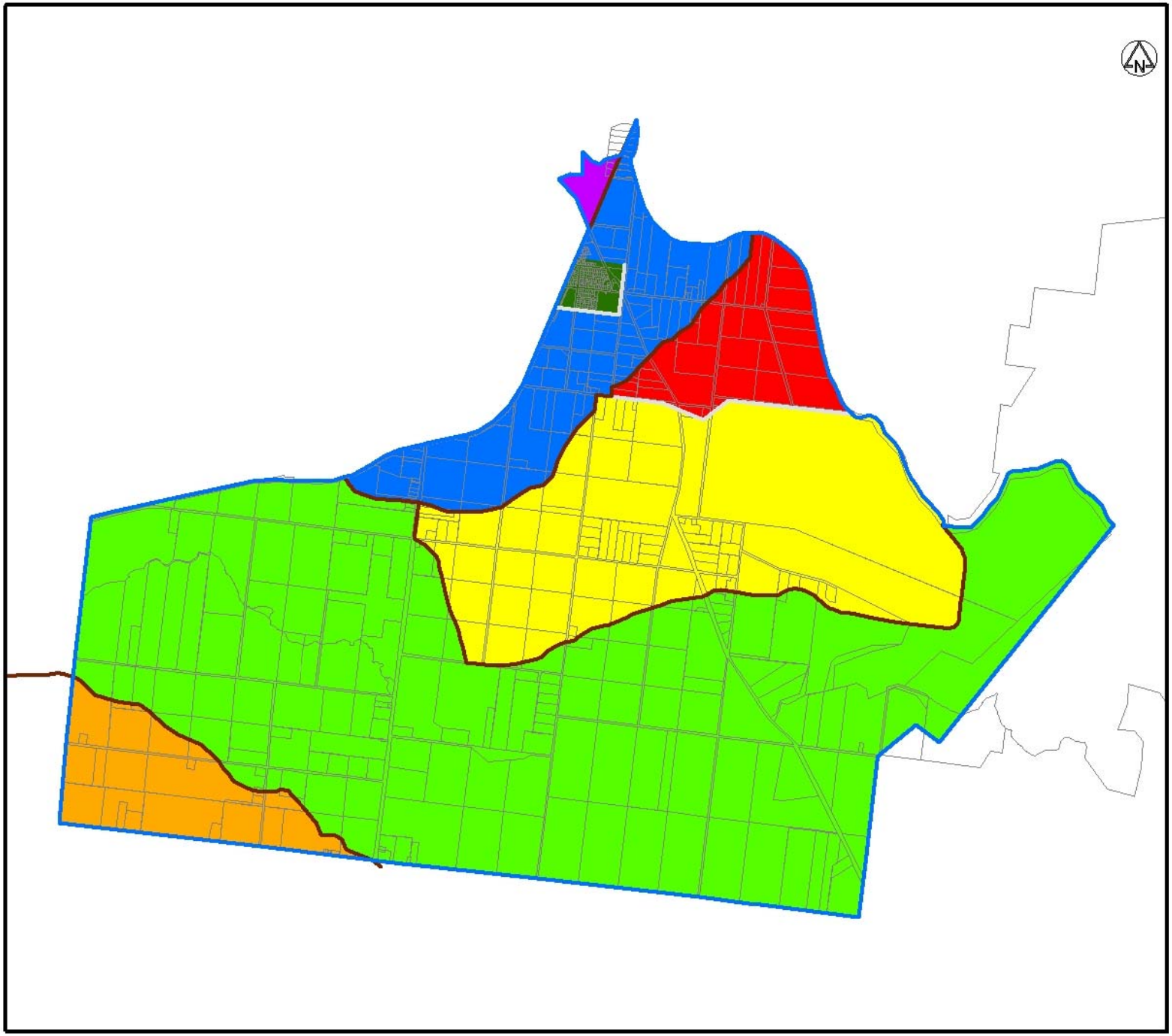
- 100 year ARI flood extent
- Lower sections east of Horseshoe Bend Road are subject to flooding
- Areas around Armstrong Creek subject to flooding however development may be able to occur within the 100 year flood extent where the depth is less than 500mm (flood fringe), but potential access and egress issues
- Difficult to drain areas where slope is less than 1 in 250
- Overland flow paths can't be developed.

3.11.5 Opportunities

- The opportunity to use flood mitigation measures as a feature/landmark
- The implementation of best practice in WSUD

3.11.6 Summary

Flooding is the major physical constraint of the Study Area and development in flood prone areas must consider the risk of flooding. The project presents a great opportunity to utilise water sensitive urban design practices.



Armstrong Creek
Urban Growth Plan

Entire Study Area
Catchments

Legend

- Study Area
- Catchment C252
- Catchment C253
- Catchment C254
- Catchment C255
- Catchment C256
- Catchment C257
- Catchment C267

Catchment Boundaries

- CoGG & Water Technology Defined
- CoGG Supplied

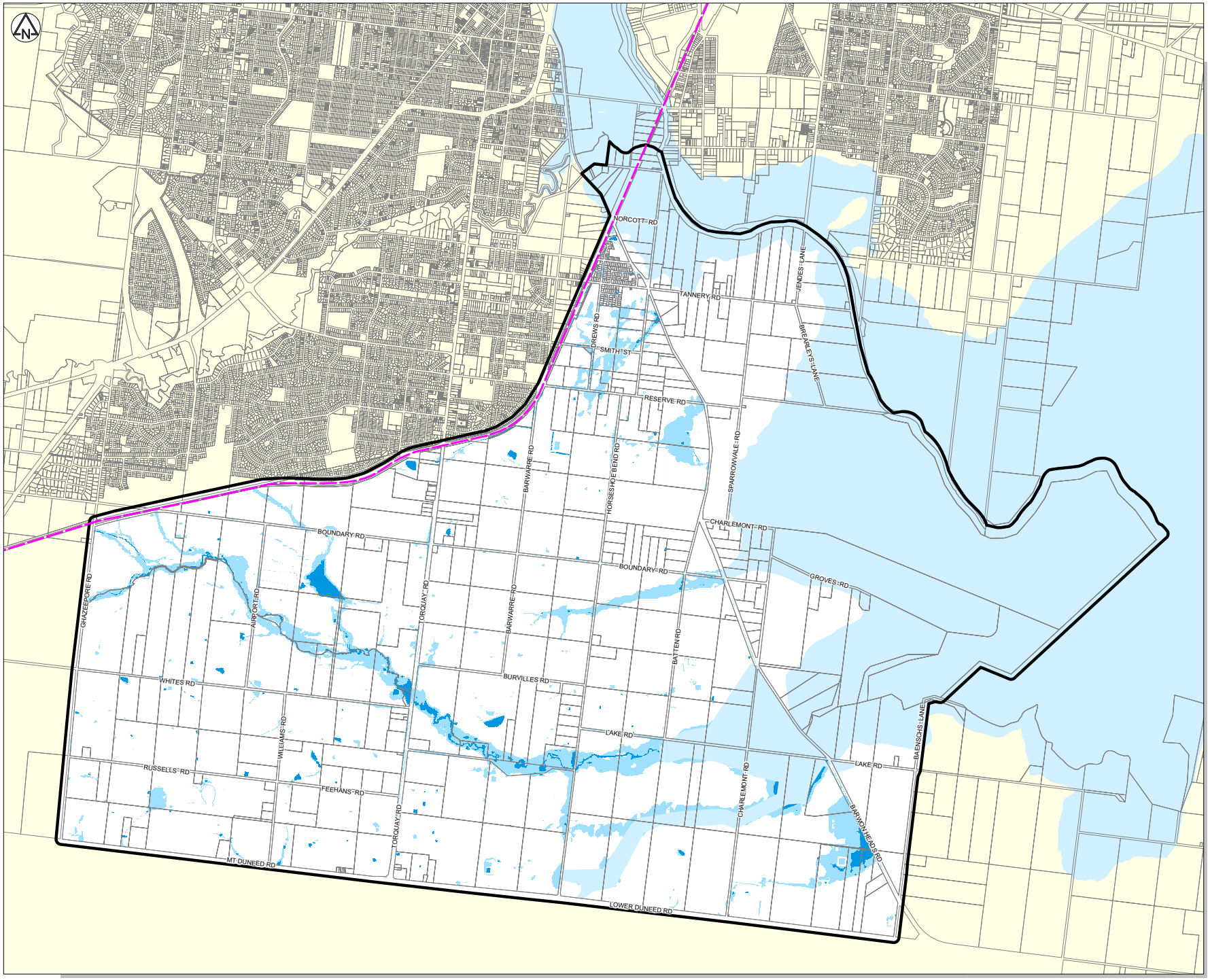
0 500 1,000 1,500
Metres

Figure 31

21.02.2006

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Armstrong Creek Urban Growth Plan

Flooding Constraints

Legend

- CCMA Floodway Overlay
- Proposed Floodway Overlay
- Proposed Land Subject to Inundation Overlay
- Study Area
- Railways

0 750 1500 2250

Metres

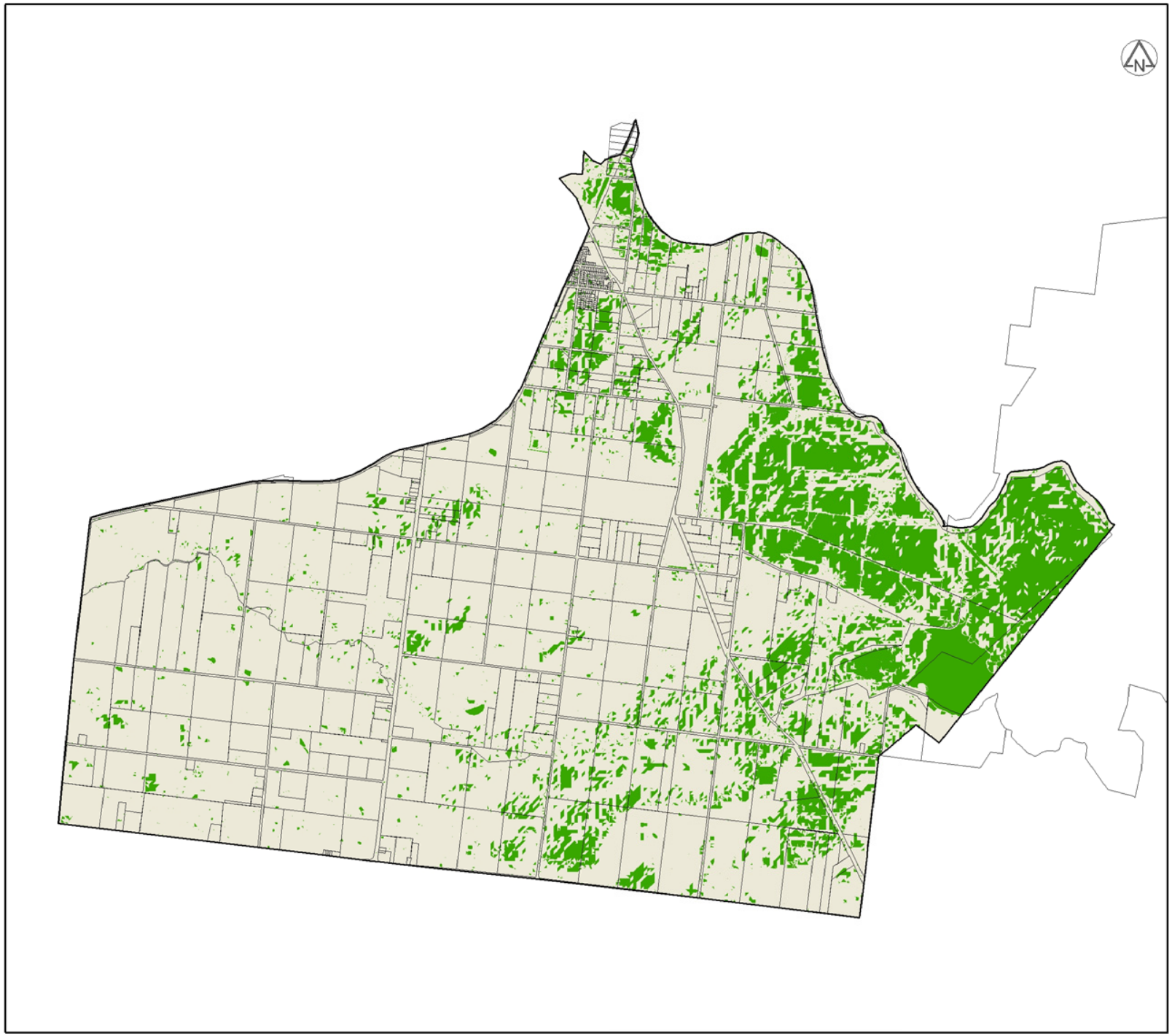
Figure 32

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Armstrong Creek
Urban Growth Plan

Entire Study Area
Natural Surface Slope

Legend

Study Area

Slope

Less than 1 in 250

Greater than 1 in 250

0 750 1,500 2,250

Metres

Figure 33

21.02.2006

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