

LOCAL PLANNING STRATEGY

Part Two

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1 INTRODUCTION

The Part 2 of the Local Planning Strategy contains the Local Profile and Context Report. This Part 2 provides the relevant background to the Strategy, including analysis of information and the rationale for the Strategy. At the end of each section there is a summary table of the issues and implications, with identified opportunities that translate into the strategies and actions. The summary tables are also contained at the part of the Part 1 of the Local Planning Strategy.

The content of the Local Planning Strategy is structured as follows:

- Section 2 – State and Regional Planning Context;
- Section 3 – Local Planning Context;
- Section 4 – Land Tenure and Local Environmental Profile;
- Section 5 – Population and Housing;
- Section 6 – Economy and Employment;
- Section 7 – Retail and Commerce;
- Section 8 – Industry;
- Section 9 – Rural and Rangeland Areas;
- Section 10 – Tourism and Visitors;
- Section 11 – Community, Recreation and Open Space;
- Section 12 – Urban Design, Character and Heritage;
- Section 13 – Traffic and Transport;
- Section 14 – Infrastructure Services; and
- Section 15 – Townsite Issues and Opportunities.



2 STATE AND REGIONAL PLANNING CONTEXT

The purpose of this Chapter is to discuss the issues and implications that are relevant to the Shire, based on an analysis of State and Regional literature, projects and policies. The State and Regional Planning Context section has been prepared to cover:

- The State Planning Strategy;
- Pilbara Cities initiatives;
- State Planning Policies;
- Layout Plans;
- Regional Strategies, Regional and Sub-regional Structure Plans; and
- Operational Policies, guidelines, forecasts and reports.

The Local Planning Strategy provides a context for the local planning scheme through consideration and justification of the planning issues and opportunities available to the Shire. Since the endorsement of the Local Planning Strategy, the Shire has adopted a new Strategic Community Plan 2022-2032 and Corporate Business Plan 2023-2027.

Figure 1 provides a contextual summary, updated by Amendment No. 1 to include the recent Shire documents.

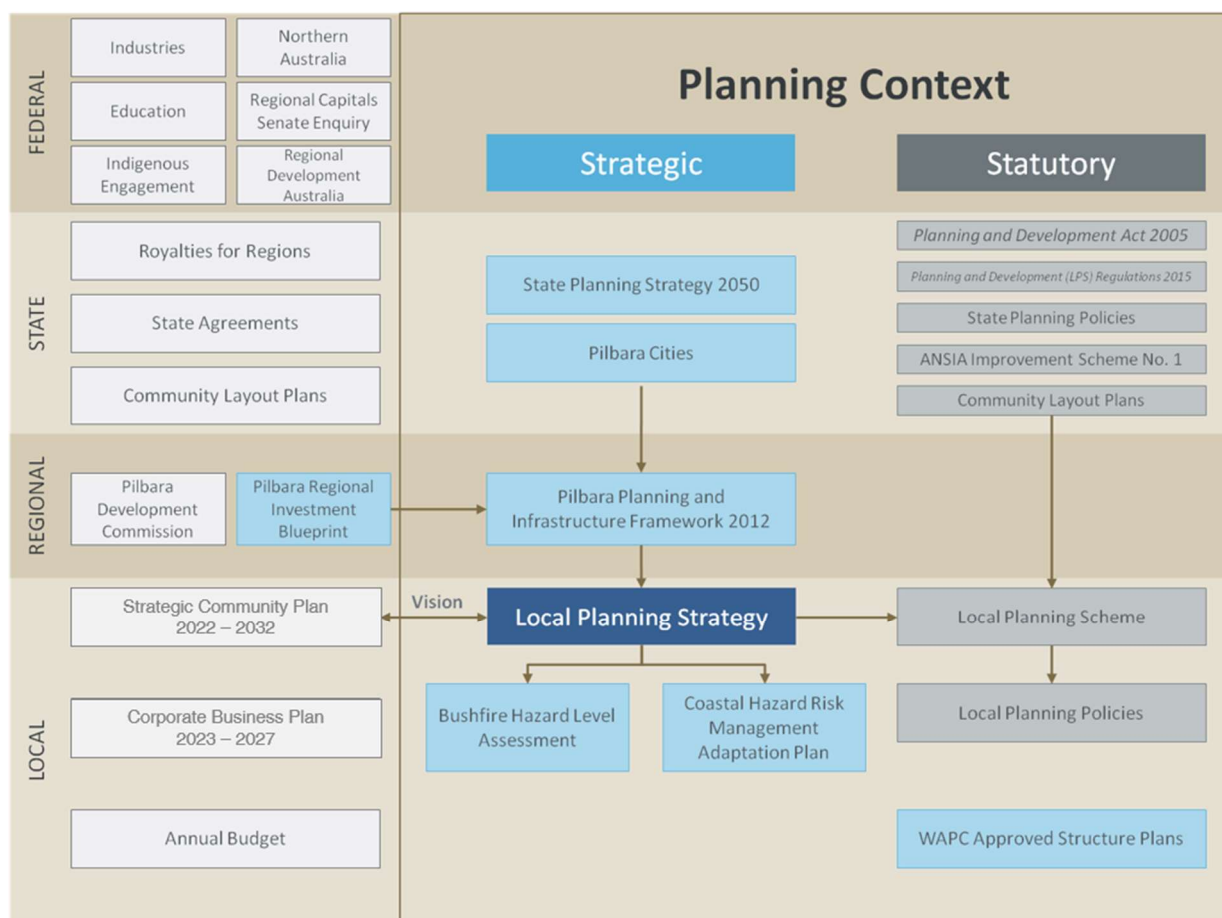


Figure 1 Planning Context to the Local Planning Strategy

2.1 STATE PLANNING STRATEGY

The *State Planning Strategy* (WAPC, 2014) presents a vision for Western Australia to 2050 and beyond, based on a framework of planning principles, strategic goals and State strategic directions. It is the overarching strategic document that informs planning and regional development, as illustrated in **Figure 2**.

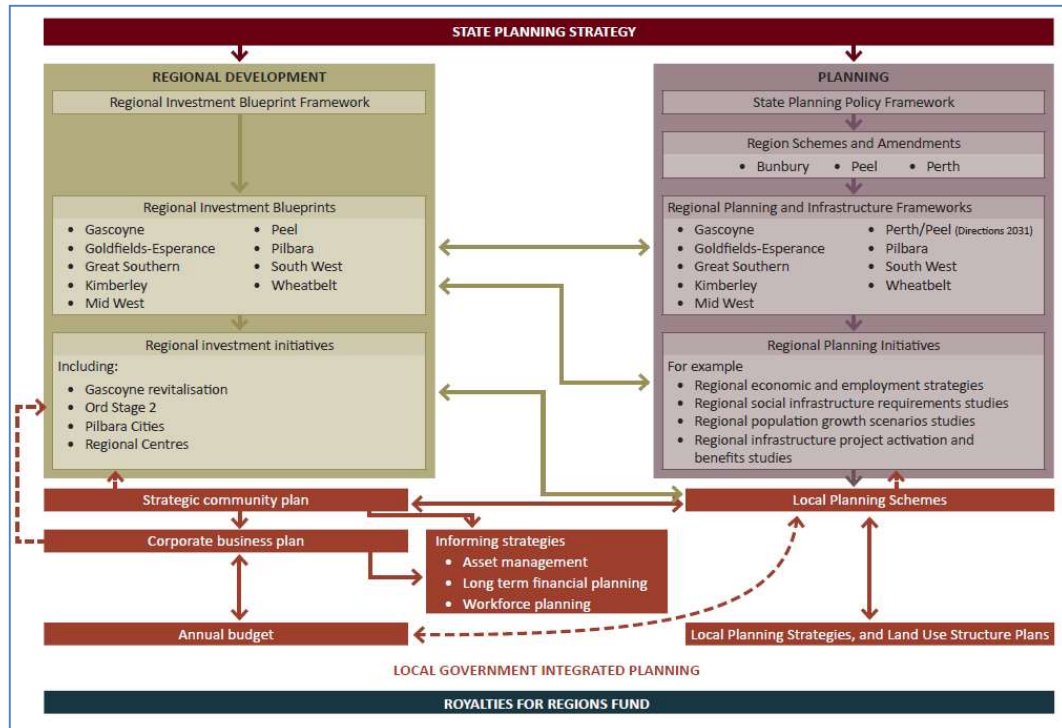


Figure 2 State Planning and Development Framework (WAPC, 2014)

The six inter-related principles of the *State Planning Strategy* are applicable to the Pilbara Region:

- **Community:** enable diverse, affordable, accessible and safe communities;
- **Economy:** facilitate trade, investment, innovation, employment and community betterment;
- **Environment:** conserve the State's natural assets through sustainable development;
- **Infrastructure:** ensure infrastructure supports development;
- **Regional development:** built the competitive and collaborative advantages of the regions; and
- **Governance:** build community confidence in development processes and practices.

The *State Planning Strategy* divides Western Australia into three sectors – Northern, Central and South West. The Shire of Ashburton is within the Northern sector. The Northern sector is recognised for its significant contribution to Australia's Gross Domestic Product, and its collaborative advantages with the Northern Territory and Queensland (WAPC, 2014). It has the ability to continue the development of agricultural and resource projects. It has the potential to promote its natural environment through sustainable development of ecotourism, as well as its potential to become a mineral and energy resource province (including renewable energy). Periods of further economic growth and development are expected with emerging partnerships in South East Asia, India and Africa (WAPC, 2014).

The State Government has targeted the Pilbara for strengthening its resilience through attracting and retaining people and businesses on a more permanent basis. The embracing and celebrating of Aboriginal culture can instil a strong sense of place, belonging and community spirit (WAPC, 2014).

2.2 PILBARA CITIES

Pilbara Cities aims to transform key Pilbara towns into major urban centres and encourage settlement on a permanent basis. “*The Pilbara Cities’ vision is to build the population of Karratha and Port Hedland into cities of 50,000 people by 2035, with other Pilbara towns growing into more attractive, sustainable communities*” (PDC, 2015). The *Pilbara Cities* vision aims to boost the population of the Pilbara Region, primarily through the growth of Karratha, Port Hedland and Newman. These three cities would provide for a population of 115,000 by 2035, whilst ensuring that other Pilbara towns (like Onslow, Paraburdoo and Tom Price) grow to be attractive, sustainable and prosperous.

Since 2010, *Pilbara Cities* has contributed towards towns receiving considerable public and private sector investment in amenity and liveability enhancements. *Pilbara Cities* has helped contribute to \$1.7 billion of investment through the State’s *Royalties for Regions* program. For every \$1 in *Pilbara Cities* expenditure spent, there has been \$1.50 of investment (PDC, 2016). The program has focused on infrastructure coordination, land availability and development, economic diversification, and community projects and engagement.

The *Pilbara Planning and Infrastructure Framework* (WAPC, 2012) provides the method for delivering the Pilbara Cities vision and sets out goals, objectives and actions. The *Pilbara Planning and Infrastructure Framework* is described further in **section 2.2.2**.



2.2.1 PILBARA REGIONAL INVESTMENT BLUEPRINT

The *Pilbara Regional Investment Blueprint* (PDC, 2015) sets out a vision for the region in 2050 as follows:

“In 2050, the Pilbara will have 200,000 people living in vibrant, modern and inclusive cities and communities which offer quality services, career choice, affordable living and strong local communities. The economy will feature diverse, innovative and resilient local and international firms underpinned by the resources and energy industries.”

The *Pilbara Regional Investment Blueprint* is a plan for investment, outlining transformative strategies, priority actions and investment opportunities. The following

Table 1 reflects the transformational opportunities that could assist in positive economic and community outcomes for the region. The *Pilbara Regional Investment Blueprint* will ensure a prosperous and secure future for the Pilbara region. The level of investment within the Pilbara region has helped create a level of permanency for settlements and this is expected to strengthen in the future (PDC, 2015). Continual transformation and diversification of local economies and enhanced liveability will produce a range of opportunities for the region.

Table 1 Transformational Opportunities (PDC, 2015)

Approach	Regional Pillar	Transformational Opportunity
Enabling	Land Access and Economic Infrastructure	Normalised property market and land access
		Secure and sustainable infrastructure services
		Lifelong education

Approach	Regional Pillar	Transformational Opportunity
	Education, Training and a Skilled Workforce	Workforce development and skilled migration
	People and Communities	Diverse and vibrant intergenerational communities Innovative local and remote healthcare delivery
Value-Adding	Logistics, Engineering and Supply Chains	Maritime maintenance, Safety & emergency management Industrial fabrication, assembly and technology
	Innovation and Advanced Technology	Business digital connectivity Automation technology and services
	Diverse and Robust Small to Medium Sized Businesses	Small to Medium sized Businesses support Streamlining governance
	Agriculture & Aquaculture	High value agriculture and cropping Aquaculture, algae biofuels and co-products
		Energy production
Diversifying	Energy	Energy export
	Tourism	Nature based tourism Heritage and Aboriginal tourism development

2.2.2 PILBARA PLANNING AND INFRASTRUCTURE FRAMEWORK

As shown in **Figure 3** the *Pilbara Planning and Infrastructure Framework* (WAPC, 2012) is a regional framework from which land for major industries and sites and corridors for major infrastructure can be set aside. The *Framework* guides the preparation of local planning strategies and schemes across the Pilbara.

The *Framework* vision reflects the 'whole of government' agenda for the physical development of the Pilbara, aiming for a resident population of more than 140,000 by the year 2035. As part of the vision, Karratha and Port Hedland will be supported by Tom Price, Onslow, Paraburdoo and Pannawonica. The settlement structure also acknowledges Aboriginal settlements.

The intent has been to develop the regional cities (Karratha, Port Hedland and Newman) with the support of 'major towns' such as Tom Price and Onslow, and 'towns' such as Paraburdoo and Pannawonica. For the Shire of Ashburton, growth in employment in mining, petroleum and oil and gas sectors has been a significant contributor towards population growth. Over time, new transformational opportunities as outlined in *Pilbara Regional Investment Blueprint* will further contribute to the ongoing sustainability and economic stability of the cities and towns.

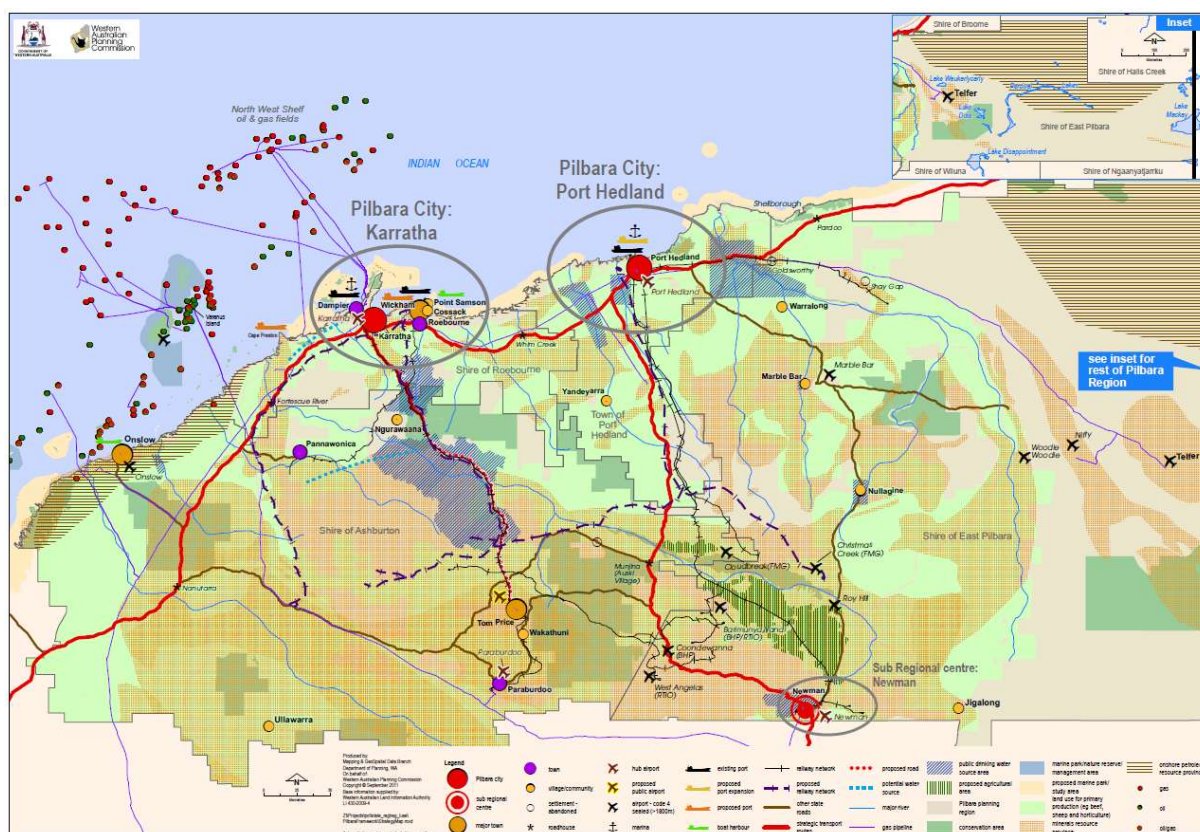


Figure 3 Pilbara Planning and Infrastructure Framework Strategy Plan

The *Pilbara Planning and Infrastructure Framework* outlined a number of infrastructure priorities for the Pilbara Region to be achieved by 2015, covering utility infrastructure, community facilities, transport, natural environment, cultural heritage, development, and governance (WAPC, 2012). Whilst the priorities within the *Framework* are completed or well-progressed, some of the principles and priorities remain ongoing opportunities from a local planning strategy perspective. For the purposes of outlining the context for the Shire of Ashburton, infrastructure and services requirements are discussed in **section 14**.

2.3 STATE PLANNING POLICIES

The following provides a summary of the State Planning Policies (SPP) that are relevant to the Local Planning Strategy.

2.3.1 SPP 2 ENVIRONMENT AND NATURAL RESOURCES POLICY

SPP 2 (WAPC, 2003) defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the *State Planning Strategy*.

The policy will be supplemented by more detailed planning policies, on particular natural resources matters that require additional information and guidance. These supplementary policies may also be state planning policies and should be implemented in conjunction with this SPP.

2.3.2 SPP 2.5 RURAL PLANNING POLICY

SPP 2.5 *Rural Planning* (WAPC, 2016) guides decision-making on rural land and for rural living purposes throughout Western Australia. SPP 2.5 is applicable within the local government area as follows:

Application (s.3.1 of SPP 2.5)		Exemption (s.3.2 of SPP 2.5)	
(a)	Land zoned for rural or agricultural purposes in a region or local planning scheme	(a)	The extraction of basic raw materials within the Perth and Peel planning regions
(b)	Land identified or proposed for rural living in an endorsed scheme or strategy	(b)	Areas subject to State Agreement Acts
(c)	Rural land uses on rural zoned land	(c)	Mining that is in accordance with the Mining Act 1978, with the exception of basic raw materials on Crown Land
(d)	Rural land uses on land that is not zoned for rural purposes	(d)	Existing approvals in retrospect, including structure plans, subdivisions and development
(e)	Land that may be impacted by rural land uses		

The predominant tenure for rural land within the Shire is in the form of pastoral leases, as defined by Part 7 of the *Land Administration Act 1997*. Pastoral leases were subject to renewals from 1 July 2015. Some exclusion areas to pastoral leases were also taken for public purposes (e.g. conservation, expansion of townsites, etc). Pastoral leases by their nature tend to have a limited scope of land uses that could be considered.

Amendments to the *Land Administration Act 1997* were introduced into Parliament on 23 November 2022. The amendments will provide an opportunity for pastoralists, native title parties and others to utilise land for the renewables market, which includes carbon farming, hydrogen, and wind and solar markets, through diversification. The Strategy and new local planning scheme should consider the appropriateness of these uses when determining land use permissibility for the Rural zone.

SPP 2.5 promotes flexibility for rural zones and a wide range of land uses that may support primary production, small-scale tourism, regional facilities, environmental protection and cultural pursuits (WAPC, 2016). Areas for irrigated agriculture have been identified through the Department of Primary Industries and Regional Development's (DPRIRD)(then Department of Agriculture and Food) Pilbara Hinterland Agricultural Development Initiative (PHADI, refer **section 9.2**). Irrigated agriculture may help diversify the economic value and crop output of the rural areas within the Shire. As such, it will be important for the rural zone to recognise these opportunities and enable land managers to be able to pursue irrigated agricultural opportunities.

The Environmental Profile (refer **Appendix A**) acknowledges that a substantial range of minerals have been identified across the Shire by the Department of Mines, Industry Regulation and Safety (then Department of Mines and Petroleum or DMP). However, no significant resources of basic raw materials are currently known to occur within the local government area (DMP, 2016). Accordingly, no areas are required to be protected under the scheme at present.

The local government landfills are likely to remain in rural areas. In accordance with SPP 2.5, new landfills would be subject to scheme amendment processes and environmental referral. Following assessment by the EPA, the Shire has established the Pilbara Regional Waste Management Facility (PRWMF) on Reserve 53324 Onslow Road, approximately 36km south-southeast of the Onslow townsite, and around midway between Onslow and North West Coastal Highway. The PRWMF commenced operations in 2021 as an integrated waste management facility, operating under a Prescribed Premises Licence issued by the Department of Water and Environmental Regulation.

2.3.3 SPP 2.6 STATE COASTAL PLANNING POLICY

SPP 2.6 (WAPC, 2013) provides an approach to the consideration of often competing needs and desires in coastal areas in a way that takes into account the values of the coastal zone. The policy ensures that current and future generations of Western Australians can benefit from opportunities presented by the values and resources of the Western Australian coast.

SPP 2.6 applies to the coast throughout Western Australia with the objectives to:

- *protect, conserve and enhance coastal values, particularly in areas of landscape, nature conservation, indigenous and cultural significance;*
- *provide for public foreshore areas and access to these on the coast;*
- *ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities; and*
- *ensure that the location of coastal facilities and development takes into account coastal processes including erosion, accretion, storm surge, tides, wave conditions, sea level change, and biophysical criteria.*

Guidance is provided for land use and development decision-making within the coastal zone including managing development and land use change; establishment of coastal foreshore reserves; and to protect, conserve and enhance coastal values. The policy recognises and responds to regional diversity in coastal types; requires that coastal hazard risk management and adaptation is appropriately planned for; encourages innovative approaches to managing coastal hazard risk; and provides for public ownership of coastal foreshore reserves.

SPP 2.6 outlines the requirements in terms of the application of coastal foreshore reserves and development setbacks for physical processes. Coastal setbacks refer to the distance required between development and specific coastal features to provide for the protection of both physical and ecological factors. The policy provides several variations to the standard case, where development may need to occur within an area identified to be potentially impacted by physical processes within the 100-year planning timeframe. Clause 7.4 of the SPP 2.6 identifies Industrial and Commercial development (e.g. marinas, recreational boating facilities and port facilities) as examples of variations. Clause 7.4 notes the following:

Industrial and commercial development that is demonstrably dependent on a foreshore location. Such development may include, for example, marinas for tourism and recreational boating facilities, cage based aquaculture operations, and port facilities.

Developments that may be considered as variations under clause 7.4 include:

- Port of Ashburton;
- Onslow Salt wharf and associated development;
- A future wharf coastal-dependent work(s) for the Ashburton Salt project (dependent on the project going ahead);
- Port of Onslow / Beadon Creek Boat Harbour;
- Other tourism facilities, recreational boating facilities (including boat launching ramps); and
- Existing / future aquaculture operations.

Coastal Hazard Risk Management and Adaptation Planning (CHRMAP)

SPP 2.6 outlines a hierarchy of risk adaptation and mitigation options, generally as Avoid, Retreat, Accommodation and Protect. The *Coastal Hazard Risk Management and Adaptation Planning Guidelines* (CHRMAP Guidelines) expand upon section 4 the *State Coastal Planning Policy Guidelines* (WAPC, 2012) and provide an overview and explanation of:

- The process of undertaking CHRMAP;
- Determining appropriate content for CHRMAP; and
- Assessing options for appropriate management and adaptation to risk.

The best-practice processes adopted in the CHRMAP Guidelines has been followed in the preparation of a CHRMAP for Onslow (Cardno, 2017).

Coastal Processes

Along other parts of the coastline where protection is not afforded by the existing seawall, erosion can be expected (MP Rogers & Associates, 2011). Table 2.2 of the MP Rogers report identifies recommended severe storm allowances to account for this modelled erosion. Table 5.1 of the MP Rogers report identified total recommended setbacks from the coastline; although the seawall provided notable protection for the existing townsite.

The report indicates the seawall is not expected to fail based on simulated beach erosion models (MP Rogers & Associates, 2011). However, it is not designed for the modelled 100-year ARI event and may experience damage during storms or cyclone activity.

Finished Floor Levels for development within town should have regard to the recommendations of the report, which have been generated through calculations for the 100-year water level, allowance for climate change (100-year planning horizon), and contingency factor for safety (MP Rogers & Associates, 2011). Recommended Finished Floor Levels are identified for 'Residential or Non-Emergency Response Infrastructure', 'Critical or Emergency Response Infrastructure', with lesser weight given to lower value infrastructure or land uses.

The Strategy advocates for development in Onslow to have due regard to physical coastal processes and recommended Finished Floor Levels. Scheme Amendment 24 to LPS 7 inserted scheme provisions including recommended Finished Floor Levels for various types of development based on the MP Rogers report. The LPS 7 provisions have not been reviewed since the preparation of the CHRMAP for Onslow by Cardno in 2017. The new local planning scheme should include provisions consistent with the CHRMAP, though additionally, the Shire should review the implementation of the CHRMAP's recommendations, which may in turn, lead to a further review of the local planning scheme provisions. For example, the Shire has committed to extending the Onslow townsite's sea wall eastwards to protect assets including the Bindi Bindi community which therefore will affect the CHRMAP's recommendation that the Bindi Bindi community be relocated.

2.3.4 SPP 2.7 PUBLIC DRINKING WATER SOURCE POLICY

SPP 2.7 (WAPC, 2003) applies to proclaimed Public Drinking Water Source Areas (PDWSAs) throughout Western Australia. The objective of this policy is to ensure that land use and development within PDWSAs is compatible with the protection and long-term management of water resources for public water supply. The proclaimed PDWSAs within the Shire of Ashburton are tabled in **section 14.3.1** and discussed in the Environmental Profile (refer **Appendix A**).

The policy specifies that all priority (P1, P2, and P3) source protection areas should be shown as special control areas in region schemes and local planning schemes. This will be in accordance with the recommendations of any relevant land use, water management strategy, or water source protection plan. In the absence of a region scheme the Local Planning Strategy can identify all priority source protection areas. In this instance, the priority source protection areas are outlined on **Plan 1 Shire Wide Strategy Plan**.

Furthermore, land uses and developments in all priority source protection areas that have the potential to impact detrimentally on the quality and quantity of public drinking water supplies should not be permitted. Land use and development may be favourably considered where it can be demonstrated, having regard to advice from the Department of Water and Environmental Regulation, that such impacts can be satisfactorily managed.

The local planning scheme and local government decisions on land use and development should have regard for any adopted policy or relevant environmental protection policy on public drinking water supply.

2.3.5 SPP 2.9 WATER RESOURCES

SPP 2.9 (WAPC, 2006) pledges Western Australia to pursuing sustainability through an integration of environmental protection, social advancement and economic prosperity. This vision is encapsulated in *A State Water Strategy for Western Australia* (Government of WA, 2003), which seeks to develop and protect water resources in an economically and environmentally responsible way by providing a whole government framework for setting strategies and plans for water resources.

This policy provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning strategies, proposals and applications.

The objectives of SPP 2.9 are to:

- *protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values;*
- *assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources; and*
- *promote and assist in the management and sustainable use of water resources.*

Water issues are outlined further in **section 14.3** and in the Environmental Profile (refer **Appendix A**). The Strategy promotes the objectives of SPP 2.9, given the vital need of water availability, quality and efficiency within the Pilbara for ecological, mining, industrial and domestic potable purposes.

The WAPC reviewed the State's water planning policy framework and released Draft State Planning Policy 2.9: Planning for Water (SPP 2.9) and Planning for Water Guidelines for public comment at the end of 2021. It is intended that Draft SPP 2.9 and Guidelines will replace the current SPP 2.9 and other water-related policies of the State.

The implications of Draft SPP 2.9 and Guidelines will be considered in a future review of the Local Planning Strategy, subject to the finalisation of these documents.

2.3.6 SPP 3 URBAN GROWTH AND SETTLEMENT

SPP 3 (WAPC, 2006) sets out the principles and considerations that apply to planning for urban growth and settlement.

The objectives of this policy are:

- *To promote a sustainable and well planned pattern of settlement across the State, with sufficient and suitable land to provide for a wide variety of housing, employment, recreation facilities and open space.*
- *To build on existing communities with established local and regional economies, concentrate investment in the improvement of services and infrastructure and enhance the quality of life in those communities.*
- *To manage the growth and development of urban areas in response to the social and economic needs of the community and in recognition of relevant climatic, environmental, heritage and community values and constraints.*
- *To promote the development of a sustainable and liveable neighbourhood form which reduces energy, water and travel demand whilst ensuring safe and convenient access to employment and services by all modes, provides choice and affordability of housing and creates an identifiable sense of place for each community.*
- *To coordinate new development with the efficient, economic and timely provision of infrastructure and services.*

The policy sets out principles and considerations which apply to planning for urban growth and settlements and of these, five of the seven policy measures can be considered to be applicable:

- Creating sustainable communities;
- Managing urban growth and settlement across Western Australia;

- Planning for liveable neighbourhoods;
- Coordination of services and infrastructure; and
- Planning for Aboriginal communities.

2.3.7 SPP 3.2 ABORIGINAL SETTLEMENTS

SPP 3.2 (WAPC, 2011) sets out a process for ensuring the planning needs of large permanent Aboriginal communities are accommodated through the preparation and approval of layout plans, and that they are appropriately zoned in local planning schemes. The SPP 3.2 only applies to Aboriginal Settlements, intended to be wholly or principally inhabited by persons of Aboriginal descent. The SPP 3.2 requires a minimum of 5 houses connected to essential services provided by one or more state agency(s). The number of settlements and known reserves are contained in **Table 2**.

Under the *Planning and Development (Local Planning Schemes) Regulations 2015*, a 'Settlement' zone can apply to existing and proposed Aboriginal settlements. The zone would require preparation and endorsement of a layout plan in accordance with SPP 3.2, and ensure that development accords with the layout plan. The Department of Planning, Lands and Heritage is responsible for the orderly and proper development of these Aboriginal settlements, through the preparation of layout plans. Four Aboriginal Communities that are consistent with SPP 3.2 exist within the Shire, of these only Wakathuni has an endorsed layout plan.

There are eight town based reserves within the Pilbara Region, with the Bindi Bindi Community being the only town based reserve within the Shire. The Pilbara Development Commission (PDC) initiated the Pilbara Town Based Reserves project to prepare individual plans for each reserve to provide long term sustainable outcomes for the communities. PDC have advised that consultation with the Bindi Bindi Community has occurred and that a draft plan for the community is in progress, as of July 2023. The plans may recommend changes to the local planning framework however at this stage there are no actions for Local Planning Scheme No. 8 as a consequence of this project.

Table 2 Aboriginal Settlements within the Local Government Area (Source: Shire of Ashburton)

Community / Settlement Name	No. of Dwellings	Essential Service Provider/s	Existing Endorsed Layout Plan	Tenure
Bellary Springs (Innawonga)	9	Meta Mala (Department of Communities)	No	Rocklea Pastoral Lease
Wakathuni	26	Meta Mala (Department of Communities)	Yes – November 2012	Leasehold
Youngaleena Bunjima	7	Remote Areas Service Provider	No	Crown Lease
Ngurrawaana	11	Meta Mala (Department of Communities)	No	

2.3.7.1 LAYOUT PLANS

The Department of Planning, Lands and Heritage previously considered that, based on the criteria in SPP 3.2, the following are considered to be an Aboriginal Settlement:

- Wakathuni;
- Youngaleena Bunjima;
- Bellary Springs (Innawonga); and
- Ngurrawaana.

Wakathuni has an existing endorsed Layout Plan. There have been no 'Endorsed' or 'Ratified' layout plans for Youngaleena Bunjima, Ngurrawaana and Bellary Springs (Innawonga). Various plans may have been in circulation or utilised over time, however, these plans have no authority and have not been endorsed by the WAPC.

In accordance with cl. 6.16 of SPP 3.2, a 'Settlement' zone and applicable provisions will be included in Local Planning Scheme No. 8 and applied to Wakathuni and Ngurrawaana settlements.

Wakathuni

Wakathuni falls within a Crown Reserve leased to the Wakathuni Aboriginal Corporation. The lease covers an area of 1,662.532 hectares.

The Wakathuni Layout Plan (Hames Sharley, 2000) aims to coordinate the delivery of municipal services by those responsible for the provision and maintenance of services and infrastructure. Wakathuni Layout Plan 1 was endorsed by the WAPC on 2 October 2001. Amendment 7 to Wakathuni Layout Plan 1 was endorsed by the WAPC on 29 August 2017 (refer Figure 4). All endorsed Layout Plans can be found here for reference - <https://www.dplh.wa.gov.au/information-and-services/layout-plans>.

The Layout Plan is the primary document guiding development within the community. The Layout Plan allows the Shire to better program its provision of municipal services to meet the future needs of the community.

Community social infrastructure is limited to the clinic located by the office, providing childcare facilities and assistance to women. A community meeting place is near the office (Hames Sharley, 2000). At the centre of the loop road is an area set aside for sporting and recreation facilities, with a football oval and playground equipment.



Bellary Springs (Innawonga)

Bellary Springs (Innawonga) is located on Paraburdoo – Tom Price Road, between Paraburdoo and Tom Price. The community is located within the Determined Yinhawangka (WAD340/2010) native title claim area.

Youngaleena Bunjima

Youngaleena Bunjima is located on Nanutarra Munjina Rd, between Tom Price and Auski Roadhouse. The community is located within the Determined Banjima (WAD6096/1998) native title claim area.

Not Considered Aboriginal Settlements

The following are not considered to be Aboriginal Settlements by the Department of Planning, Lands and Heritage. Layout Plans will not be prepared for these places and a 'Settlement' zone under the scheme would not be applicable:

- Wirrlu Murra;
- Bindi Bindi;
- Jundaru (Peedamulla Station);
- Yalathala; and
- Westside.

2.3.8 SPP 3.4 NATURAL HAZARDS AND DISASTERS

SPP 3.4 (WAPC, 2006) addresses planning for natural disasters and minimising the adverse impacts of natural disasters on communities, the economy and the environment.

The objectives of this policy are to:

- *include planning for natural disasters as a fundamental element in the preparation of all statutory and non-statutory planning documents, specifically local planning schemes and amendments, and local planning strategies; and*
- *through the use of these planning instruments, to minimise the adverse impacts of natural disasters on communities, the economy and the environment.*

Planning instruments are to take into account natural elements (climate, soils, hydrology etc) that may create hazards, as well as:

- the built environment;
- community awareness;
- historical events; and
- the potential for long-term changes to risk such as climate and land use change.

The Shire is exposed to several natural hazards including flood risk, bush fire, cyclonic activity, severe storms and storm surge, and addresses these factors through the following local planning framework provisions:

- Part 10A, Schedule 2 'Deemed Provision' of the Planning and Development (Local Planning Schemes) Regulations 2015 for bushfire;
- LPS 7:
 - Cl. 6.7.2 varies the R-Codes to require a fully enclosed, outdoor storeroom for the purposes of storing domestic outdoor items during cyclones;
 - Cl. 6.20 – Flood and Storm Surge Prone Land;
 - Cl. 7.2 – Tidal Inundation Areas (Special Control Area); and

- Cl. 7.3 – Onslow Coastal Hazard Area (Special Control Area) and Appendix 12: Requirements for Onslow Coastal Hazard Area.

The above LPS 7 provisions are consistent with SPP 3.4 and should be updated and retained in LPS 8.

2.3.9 SPP 3.5 HISTORIC HERITAGE CONSERVATION

SPP 3.5 (WAPC, 2007) sets out the principles of sound and responsible planning for the conservation and protection of Western Australian historic heritage.

A number of national, state and local heritage sites are within the local government area. As outlined in the Environmental Profile (refer **Appendix A**), the Shire's role in heritage is to identify significant sites within the local planning scheme. The local planning scheme can designate heritage areas (and local planning policies) and establish a heritage list (usually based on a Local Heritage Survey). Heritage is a consideration for assessing and determining development applications.

SPP 3.5 does not cover matters associated with Aboriginal heritage unless Aboriginal heritage places or areas are entered in the state register, a local heritage list or heritage area. The *Aboriginal Heritage Act 1972* establishes a framework whereby Aboriginal heritage and culture are identified, protected and considered where land use and/or development occur.

2.3.10 SPP 3.7 PLANNING IN BUSHFIRE PRONE AREAS

This policy (WAPC, 2015) seeks to guide the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure.

It applies to all higher order strategic planning documents, strategic planning proposals, subdivision and development applications located in designated bushfire prone areas (unless exemptions apply). SPP 3.7 also applies where an area is not yet designated as bushfire prone but the proposed development is planned in a way that introduces a bushfire hazard (e.g. revegetation).



Figure 61 and Figure 62).

In accordance with SPP 3.7 and the *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2019), the Local Planning Strategy addresses bushfire risk in a focused manner. A Bushfire Hazard Level assessment (GHD, 2017) was undertaken for all investigation and infill areas identified within the towns of Tom Price, Paraburdoo and Onslow to consider how bushfire risk may influence future development. The Bushfire Hazard Level assessment is contained in **Appendix C**.

The towns are influenced by a moderate bushfire hazard level. Whilst pockets of extreme hazard level were modelled and mapped within Tom Price, the small size and spatial extent of these areas makes it unlikely they would present an extreme hazard in reality. Subject to design and having regard to the *Guidelines* (WAPC, 2019), these areas can be developed. These areas would need to consider appropriate services and vehicular access, and site design to meet policy requirements.

Some clearing of land would be required for areas identified for urban expansion. No biodiversity issues have been identified that would preclude clearing land for urban expansion, thereby this would remove much of the bushfire hazard in these locations.

It is noted that the Shire has a separate emergency management plan in place, that considers and plans for necessary actions and investment to manage the risk of bushfire to its community, including strategic emergency evacuation plans. Other management responses may also be required. Dust generated from bushfires should be monitored and management responses developed to inform the public regarding health risks during bushfire events. Management of fuel loads without exceeding threshold air quality standards should also be considered through the development of an Air Quality Management Plan, and a program of regular fuel reduction which minimises air quality impacts on townsites and sensitive environments, on advice from the Bushfire and Natural Hazards Cooperative Research Centre.

The most recent 2021 Bushfire Prone Area mapping within the Shire remains consistent with the 2017 mapping used for the Strategy's Bushfire Hazard Level Assessment. Although the *Guidelines* have been updated since 2017 (Versions 1.3 and 1.4), and Version 1.5 was advertised for public comment until 17 July 2023, the findings, recommendations and actions of the 2017 Bushfire Hazard Level Assessment remain applicable and appropriate to the Strategy.

2.3.11 SPP 4.1 INDUSTRIAL INTERFACE

SPP 4.1 (WAPC, 2022) seeks to ensure buffers around industry and infrastructure are appropriately identified and secured from inappropriate land uses, and the safety and amenity of surrounding land uses is addressed. The objectives of the draft amended policy are to:

- *Protect existing and proposed industry, and infrastructure facilities from encroachment by incompatible land uses that would adversely affect efficient operations;*
- *Avoid land use conflict between existing and proposed industry/infrastructure facilities and sensitive land uses; and*
- *Promote compatible land uses in areas impacted by existing and proposed industry and infrastructure facilities.*

Buffer areas should be designated for existing and proposed Strategic Industrial Areas; infrastructure facilities of State significance which generate off-site impacts; individual industrial sites/facilities of State significance which generate off-site impacts; and as determined by the Minister for Planning on advice from the Western Australian Planning Commission. These will be applied consistent with SPP 4.1 and relevant EPA buffer guidance statements.

Buffers are shown on the Scheme Maps for the Waste Water Treatment Plants. Wittenoom is also subject to a special control area that prohibits development to minimise health impacts and risks of exposure related to the asbestos contamination in the area.

A potential buffer issue is identified for Beadon Creek Boat Harbour, where there is land available for future industrial development that is associated with the marina and planned for through the *Land Use Framework* (refer **section 8.4.1.1**). However, there are practical difficulties of new industrial development which would have to address emissions and manage risk in relation to the existing tourism development that is in the vicinity of the working harbour.

Other buffers may be required for high-pressure gas pipelines. The DC Policy (refer **section 14.2**) provides generic setbacks for development to pipelines.

Buffers have informed the boundaries of the ANSIA Improvement Scheme No. 1. Buffer distances have been considered and investigated in relation to the Onslow Salt operations. Where buffer distances are satisfied, this is considered to comply with the policy's objectives.

The Shire has modelled buffers for the waste facilities outside Onslow, Tom Price and Paraburdoo. These are relatively distant from townsites expansion areas, however should be given due consideration if sensitive land uses are proposed in proximity.

2.3.12 SPP 5.2 TELECOMMUNICATIONS INFRASTRUCTURE

SPP 5.2 (WAPC, 2015) establishes a framework for preparation, assessment and determination of applications for telecommunications facilities to facilitate an effective state-wide telecommunications network.

This SPP is generally well understood and applied by local governments and strategically does not add significant complications to the planning of the local government. Due regard will be given to the SPP during the review of the local planning scheme, structure plans, and development applications for telecommunications infrastructure.

It is noted that within the Shire there is limited telecommunication coverage. Mobile phone coverage is predominately around the main towns (Onslow, Tom Price, Paraburdoo, and Pannawonica) with some limited coverage on the highways, at Chevron's operations on Barrow Island, and sparsely around Karijini National Park. Over time, coverage could expand along major transport routes and around major developments.

2.3.13 SPP 5.4 ROAD AND RAIL NOISE

In September 2019, SPP 5.4 *Road and Rail Noise* become operational. SPP5.4 seeks to minimise the impact of road and rail noise on noise-sensitive land uses/development. It also seeks to protect the functionality of major transport corridors and infrastructure from encroachment of incompatible uses.

The objectives of the Policy are to:

- *Protect the community from unreasonable levels of transport noise;*
- *Protect strategic and other significant freight transport corridors from incompatible urban encroachment;*
- *Ensure transport infrastructure and land-use can mutually exist within urban corridors;*
- *Ensure that noise impacts are addressed as early as possible in the planning process; and*
- *Encourage best practice noise mitigation design and construction standards.*

SPP 5.4 applies to 'strategic freight and major traffic routes', 'other significant freight/traffic routes', passenger railways and freight railways. **Table 3** lists the road transport routes identified by SPP 5.4. The Policy also applies to the freight railways within the Shire.

Table 3 SPP5.4 Classified Roads in Shire of Ashburton (WAPC, 2019)

Road Name	Classification	Start Point/Intersection	End Point/Intersection
Onslow Road	Other significant freight/traffic route	McAullay Road	North West Coastal Highway
McAullay Road	Other significant freight/traffic route	Onslow Road	Beadon Creek Road
Pannawonica Road	Other significant freight/traffic route	North West Coastal Highway	Deepdale Road
North West Coastal Highway	Strategic Freight and Major Traffic Route	<i>Extends through and beyond the local government boundary</i>	
Great Northern Highway	Strategic Freight and Major Traffic Route	<i>Extends through and beyond the local government boundary</i>	
Nanutarra Road	Other significant freight/traffic route	North West Coastal Highway	Munjina Road
Paraburdoo Road	Other significant freight/traffic route	Nanutarra Road	Beasley Road
Beasley Road	Other significant freight/traffic route	Paraburdoo Road	Camp Road
Camp Road	Other significant freight/traffic route	Rocklea Road	Beasley Road
Rocklea Road	Other significant freight/traffic route	Tom Price Paraburdoo Road	Camp Road

Road Name	Classification	Start Point/Intersection	End Point/Intersection
Manuwarra Red Dog Highway (formerly Bingarn Road)	Other route	Nanutarra Road	Mine Road
Mine Road	Other route	Bingarn Road	Tom Price Paraburdoo Road
Tom Price Paraburdoo Road	Other route	Mine Road	Rocklea Road
Manuwarra Red Dog Highway (formerly Warlu Road)	Other route	North West Coastal Highway, City of Karratha	Roebourne Wittenoom Road
Roebourne Wittenoom Road	Other route	Manuwarra Red Dog Highway (formerly Bingarn Road)	Rio Tinto Rail Access Road
Rio Tinto Rail Access Road	Other route	Roebourne Wittenoom Road	Nanutarra Road / Bingarn Road intersection
Munjina Road	Other route	Nanutarra Road	Great Northern Highway
Karijini Drive	Other route	Tom Price Paraburdoo Road	Great Northern Highway

The policy (WAPC, 2019) emphasises the application of the precautionary principle of avoidance where there is risk of future land use conflict. In most circumstances, the identified roads and railways are not close to noise sensitive land uses. It becomes more relevant where the identified roads intersect or pass through the towns or adjacent to campsites, Aboriginal settlements or communities. In these instances, the trigger distances are 300 metres for 'strategic freight and major traffic routes' and 200 metres for 'other significant freight/traffic and freight railways (WAPC, 2019). The *Implementation Guidelines* contain model special control area provisions for local planning schemes, to apply to applicable roads and railways.

Noise should be considered at the earliest possible stages of the planning process and not defer its resolution or management to subdivision or development assessment stage. This should include due regard to the policy measures that seek to apply noise criteria in order to demonstrate mitigation against the noise impacts.

2.3.14 SPP 7 DESIGN OF THE BUILT ENVIRONMENT

On 24 May 2019, SPP 7 *Design of the Built Environment* become operational. The policy sets out the principles, processes and considerations which apply to the design of the built environment across Western Australia. It provides an overarching framework for the State Planning Policies that deal with design related issues.

SPP 7 is intended to guide and complement other state planning policies, and apply to the design, review and assessment of activity centre plans, structure plans, local development plans, subdivision, residential development, institutional development and public works.

SPP 7 establishes 10 design principles that have been considered to be relevant to the urban design and character of the Shire (refer **section 12.1**). SPP 7 will have relevance to the Shire's consideration and determination of development applications.

2.3.14.1 LIVEABLE NEIGHBOURHOODS

Liveable Neighbourhoods is an operational policy that falls under the framework of SPP 7. *Liveable Neighbourhoods* is implemented for the purposes of the design and assessment of structure plans and subdivision for new urban areas in the metropolitan area and country centres. *Liveable Neighbourhoods* is applied in the design and approval of urban development, structure planning and subdivision for greenfield sites and for the redevelopment of large brownfield and urban infill sites. New residential development would have regard to *Liveable Neighbourhoods*.

2.3.15 SPP 7.3 RESIDENTIAL DESIGN CODES

The R-Codes (WAPC, 2015) set out residential development requirements to provide for a range of housing types and densities; local neighbourhood character; amenity; conservation of heritage values; and environmentally sensitive design. They must be given regard when assessing and determining development applications. Local variations can be approved subject to clear justification.

The LPS 7 superimposes residential density codes on land zoned 'Residential'. Where no coding applies in the 'Residential' zone, the default density is 'R20'. The following **Table 4** indicates the typical density codes within Onslow, Tom Price and Paraburdoo.

Table 4 Typical Residential Density Codes

Townsite	Typical Residential Density Coding	Townsite	Typical Residential Density Coding	Townsite	Typical Residential Density Coding
Onslow	R12.5 (Bindi Bindi) R20 R12.5/30	Tom Price	R20 R30 R50	Paraburdoo	R20 R30 R50

Within Onslow, the split coding of R12.5/30 applies to existing and future development areas. The higher density of R30 is applied when connection to reticulated sewerage is available. Also, within Onslow, LPS 7 may permit residential development in the following circumstances:

ONSLow		
Residential zone Density code	Development potential, where sewerage and water is available	Conditions
R20	Two grouped dwellings on a vacant lot comprising not less than 875m ² with a minimum site area of 435m ² per grouped dwelling Grouped dwellings at a maximum density of R30 on a vacant lot greater than 1,500m ²	Formal advertising Reduced setbacks to reflect R30 code Consideration of likely impacts of development on area provisions (Part 7 of LPS 7), any relevant local planning policy, and amenity of immediate locality
Other zones	Density code	Conditions
Commercial and Civic Tourism	R50	For land within Onslow Hazard Special Control Area, residential development shall not exceed R30
Industrial	N/A	One caretaker's dwelling (1 bedroom with a total floor area 80m ²) permitted on a lot

Within Tom Price and Paraburdoo, and where sewerage and water are available, LPS 7 may permit the development of grouped dwellings in the following circumstances:

TOM PRICE and PARABURDOO		
Density code	Development potential	Conditions
R20 or greater	Two grouped dwellings on a lot comprising not less than 874m ² with a minimum site area of 437m ² per grouped dwelling	Formal advertising
R20	Grouped dwellings at a maximum density of R30 on a lot greater than 1,500m ²	Formal advertising

R30	Grouped dwellings at a maximum density of R40 on a lot greater than 1,500m ²	Consideration of likely impacts of development on area provisions (Part 7 of LPS 7), any relevant local planning policy, and amenity of immediate locality
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Within the local government area, workforce accommodation (whether intended as permanent or temporary structures), is regarded as residential development and is subject to the R-Codes. For workforce accommodation proposed in areas not zoned 'Residential', the R-Codes requirements may be varied with justification. A signed agreement may be required to detail the rehabilitation and conversion of workforce accommodation, and the timeframes.

2.4 OPERATIONAL POLICIES

2.4.1 DEVELOPMENT CONTROL POLICIES

The WAPC has adopted a range of operational Development Control (DC) Policies to guide its decision making on subdivision and development applications. These policies apply when the Shire and the WAPC consider applications for subdivision or development:

- DC 1.1 Subdivision of Land - General Principles (2020)
- DC 1.2 Development Control - General Principles (draft 2018)
- DC 1.3 Strata Titles (2009)
- DC 1.5 Bicycle Planning (1998)
- DC 1.7 General Road Planning (draft 2018)
- Operational Policy 1.12 Planning Proposals adjoining Regional Roads in Western Australia (draft 2023)
- DC 2.2 Residential Subdivision (2017)
- DC 2.3 Public Open Space in Residential Areas (2002)
- DC 2.4 School Sites (1998)
- DC 2.6 Residential Road Planning (1998)
- DC 3.4 Subdivision of Rural Land (2016)
- DC 4.1 Industrial Subdivision (1988)
- DC 4.2 Planning for Hazards and Safety (1991)
- DC 4.3 Planning for High-Pressure Gas Pipelines (draft 2016) (also refer **section 14.2**)
- DC 5.1 Regional Roads (Vehicular Access) (draft 2018).

2.5 IMPLICATIONS FOR STATE AND REGIONAL PLANNING CONTEXT AND KEY ISSUES FOR LOCAL PLANNING STRATEGY

The following **Table 5** considers the implications, issues and opportunities from a state and regional planning context and summarises the key issues to be addressed in the Local Planning Strategy as it relates to the State and Regional planning context.

Table 5 Implications, Issues and Opportunities – State and Regional Planning Context

State and Regional Planning Context	Implications	Issues	Opportunities
State Planning Strategy	Six inter-related principles of community, economy, environment, infrastructure, regional development and governance	Balancing natural resource and landscape values with industrial pursuits (mining, energy, ecotourism, pastoralism). Ensuring sustainable development is supported by infrastructure and service investment. Recognising the valuable contributions of Aboriginal culture within the Pilbara region.	Maintaining the region's significant contribution to Australia's GDP. Advocating State government investment into strengthening resilience in the Pilbara Region through attracting and retaining people and businesses. Embracing and celebrating Aboriginal culture to instil a strong sense of place, belonging and community spirit. Native Title information being recognised and reflected in the Local Planning Strategy plans.
Pilbara Cities	Vision to build Karratha and Port Hedland as 'Pilbara Cities' supported by other towns.	Requires public and private investment in amenity and liveability in towns.	Drive investment into towns through the Royalties for Regions programme.
Pilbara Regional Investment Blueprint	A plan for investment, economic transformational opportunities, priority actions and investment opportunities.	Ensuring a prosperous and secure future for the Pilbara region. Recognising opportunities to diversify the economy. Recognising mining and energy sectors will dominate for decades to come.	Planning for anticipated population growth with an emphasis and focus on the three main settlements of Onslow, Tom Price and Paraburdoo, and recognised Aboriginal Settlements. Ensuring the land use planning framework within the Shire is able to readily respond to changes in the economy that can rapidly affect the growth, stabilisation and decline in population numbers within the towns as well as remote communities and camps. Target investment for retaining permanent residents in towns and settlements. Link the transformational opportunities in the Blueprint with aims and goals within the Local Planning Strategy.
Pilbara Planning and Infrastructure Framework	Regional framework for identifying land, sites and corridors for major industries.	Have regard to the Framework in the preparation of local planning strategies and schemes.	Update the infrastructure priorities within the Shire of Ashburton to ensure population forecasts are supported by appropriate infrastructure and services.
SPP 2 Environment and Natural Resources Policy	Defines principles and considerations that represent good and responsible planning in terms of environment and natural resource issues.	Integrate environment and natural resource management with broader land use planning and decision-making. Protect, conserve and enhance the natural environment. Promote and assist in the wise and sustainable use and management of natural resources.	Improve and promote best-practice natural resource management at a local government level. Areas for focus include: weed management, soil stabilisation and dust, groundwater, extraction of basic raw materials, illegal dumping, protecting wetlands and water courses.

State and Regional Planning Context	Implications	Issues	Opportunities
SPP 2.5 Rural Planning	Guides decision-making on rural land and for rural living purposes.	Identify areas for rural or agricultural purposes. Recognise significant basic raw materials. Appropriately identify waste facilities in rural areas within local planning schemes. Manage and improve environmental and landscape attributes.	Promote flexibility within 'Rural' zoning to cater for a wide range of land uses that may support primary production, small-scale tourism, regional facilities, environmental protection and cultural pursuits. Promote landscape protection and ecological biodiversity within rural areas.
SPP 2.6 State Coastal Planning Policy	Guidance for the coastal zone including managing development and land use change; establishment of coastal foreshore reserves; and to protect, conserve and enhance coastal values.	Development setbacks for coastal processes. Risks to people and property from storm surge and severe storm inundation. Consideration of sea level rise, vertical allowances and setback distances will be required when managing existing infrastructure and planning future development, as per IPCC and CSIRO modelling and coastal vulnerability studies. Ensure that any substantial future development is supported by a current storm surge and flood inundation study consistent with the most current predictions for sea level rise and coastal processes, consistent with SPP 2.6.	Recognising development as variations to clause 7.4 of SPP 2.6: industrial and commercial development that is demonstrably dependent on a foreshore location. Planning for coastal processes and future risk management and adaptation, particularly within Onslow, which has several areas affected by future predicted sea level rise and storm surge. The CHRMAP and available report (MP Rogers & Associates, 2011) regarding coastal processes and inundation for the Onslow Townsite, to be recognised and addressed in the Local Planning Strategy and future Scheme Review.
SPP 2.7 Public Drinking Water Source Policy	Ensure land and development is compatible with the long-term protection and management of water resources.	There are a number of important water sources which provide water for public supply within the region. Priority source protection areas to be identified in local planning strategies. Land use and development to consider management of priority source protection areas. Planning decision-making should be consistent with the Department of Water and Environmental Regulation's <i>Water Quality Protection Note: Land Use Compatibility within Public Drinking Water Source Areas</i> (2016) in the vicinity of any drinking water borefields, including the requirements for well-head protection zones. Although allocation currently remains in some aquifers and investigations into available groundwater supplies are continuing, declining rainfall in coastal areas may result in reduced recharge and consequently availability in these areas in the future, particularly as population and industry expands.	Identify priority source protection areas in local planning schemes. Adopt scheme provisions for protection of public drinking water source areas. Consideration should be given to the reservation and/or use of a special control area to improve the level of protection of public drinking water sources in future, particularly in relation to Bungaroo Creek water reserve.

State and Regional Planning Context	Implications	Issues	Opportunities
		Dewatering/over-abstraction has also impacted local groundwater levels, potentially affecting groundwater-dependent pool ecosystems and wetlands through drying up and loss of habitat. This in turn can impact wildlife and cultural and social values. This is especially critical given the presence of nationally important wetlands in the Shire.	
SPP 2.9 Water Resources	Develop and protect water resources in an economically and environmentally responsible way.	Promote the management and sustainable use of water resources. Maintaining or improving the quality and quantity of water resources. It is recognised that the Shire is a Waterwise Council, and it should continue to investigate and expand water efficiency opportunities, such as irrigation of public open space and sports ovals where practical. Due to increasing demand for water associated with residential growth and industrial expansion, it is considered that water recycling and reuse to provide fit-for-purpose sources of water should continue to be investigated in Onslow and other townsites where practical, as an alternative to groundwater use. This will require cooperation with the Water Corporation and Rio Tinto. Landfill sites are a potential source of pollutants to ground and surface waters. These land uses, and others with the potential to pollute ground and surface waters must be carefully located, designed, managed and monitored to avoid impacts.	Promote the objectives of SPP 2.9 in considering water availability, water quality and water efficiency for ecological, mining, industrial and domestic potable purposes. Townships and communities associated with waterways in the Shire may be subject to risk of flooding. Any proposed development should be consistent with SPP 2.9, and in Onslow, consistent with the <i>Local Water Management Strategy</i>, and address flood risk appropriately. Adequately manage the risk of flooding, and consequences particularly associated with sediment transport management, in townsites and industrial areas through application of SPP 2.9. The Shire may also need to review existing townsite drainage systems and ensure appropriate levels of service will be maintained as development occurs (such as at Onslow Airport).
SPP 3 Urban Growth and Settlement	Sets out the principles and considerations that apply planning urban growth and settlement.	Manage urban growth and settlement, planning for liveable neighbourhoods. Coordination of services and infrastructure. Planning for Aboriginal communities.	Planning for well-located and serviced town centres that provide the needs of the community. Planning for managed urban expansion of towns having regard to population forecasts. Planning for and coordinating appropriate servicing and delivery of infrastructure. Advocate the preparation of Layout Plans for the Shire's Aboriginal settlements.
SPP 3.2 Aboriginal Settlements	Sets out a process for ensuring the planning needs of large permanent Aboriginal communities are	Prepare Layout Plans for Aboriginal Settlements – Ngurrawaana, Bellary Springs (Innawonga), and Youngaleena Bunjima.	Recognise the Wakathuni Layout Plan as the primary document guiding development within the community by recognising the document in LPS 8.

State and Regional Planning Context	Implications	Issues	Opportunities
	accommodated through the preparation and approval of layout plans, and that they are appropriately zoned in local planning schemes.		Advocate preparation of Layout Plans for all Aboriginal settlements. Coordinate services and infrastructure to Aboriginal settlements.
SPP 3.4 Natural Hazards and Disasters	Planning for natural disasters as a fundamental element in the preparation of all statutory and non-statutory planning documents.	Take into account natural elements (climate, soils, hydrology etc) that may create hazards. Consider long-term changes to risk such as climate change and land use change.	Incorporate hazard mitigation and other measures into the local planning scheme. Such matters may relate to cyclone events, contaminated sites, floodplains, bush fire, industrial risks. Guidance should be sought from environmental agencies with regards to appropriate separation distances to manage noise and dust for new industrial areas. Odour from industries and waste water treatment plants should be considered as part the location of any new development.
SPP 3.5 Historic Heritage Conservation	Sets out the principles of sound and responsible planning for the conservation and protection of Western Australian historic heritage.	A number of national, state and local heritage sites are within the local government area. Heritage is a consideration for assessing and determining development applications.	Identify significant sites within the local planning scheme through the Municipal Heritage Inventory.
SPP 3.7 Planning in Bushfire Prone Areas	Guides the implementation of effective risk-based land use planning and development.	Majority of the Shire of Ashburton is within a bushfire prone area. The majority of the Shire is identified as being Bush Fire Prone. Future planning and development within Bush Fire Prone areas will need to meet the requirements of SPP 3.7 and the <i>Guidelines for Planning in Bushfire Prone Areas</i> (WAPC, 2015).	Consideration for bushfire risk based planning in bushfire prone areas. Consideration also should be given to the location of firebreaks in semi-rural areas around townsites and emergency management including access routes.
SPP 4.1 Industrial Interface	Ensure buffers around industry and infrastructure are appropriately identified and secured from inappropriate land uses, and the safety and amenity of surrounding land uses is addressed.	Buffer areas for all industrial categories; major infrastructure; waste water treatment plants and power generation facilities.	Planning for future industrial development and provision of appropriate buffers to existing and new industries. Buffers shown as special control areas on the Scheme Maps.
SPP 5.2 Telecommunications Infrastructure	Facilitate an effective state-wide telecommunications network.	Due regard to SPP 5.2 during the preparation of the local planning strategy. Limited telecommunications coverage across the Shire.	Advocate expansion of telecommunications coverage beyond towns and some sections of highways. Planning for appropriate servicing and delivery of infrastructure, including telecommunications.
SPP 5.4 Road and Rail Noise	Protect people from unreasonable levels of transport noise.	Use assessment criteria in the SPP 5.4 and Guidelines.	Protect major transport corridors and infrastructure from encroachment of incompatible uses, through a range of means in the local planning scheme (zoning, special control areas, and development provisions).

State and Regional Planning Context	Implications	Issues	Opportunities
SPP 7 Design of the Built Environment	Sets out the principles, processes and considerations which apply to the design of the built environment.	Consider local design issues when assessing proposals. Application of <i>Liveable Neighbourhoods</i> in design of urban development, structure planning and subdivision.	Have regard to the 10 design principles contained in SPP 7 for the assessment of proposals. Promote character and amenity through local design vernacular. Advocate development to have due regard to local design guidelines.
SPP 7.3 Residential Design Codes	Residential development requirements for a range of housing types and densities, character and amenity, conservation of heritage values, environmentally sensitive design.	Application of appropriate residential densities to address projected housing demand. Justification for local variations to the R-Codes.	Planning for residential development that has due regard to the local climate, natural hazards, and local community expectations for housing typologies. Outline local variations through scheme provisions or local planning policy. Consider the impact of workforce accommodation within towns, with a focus on development integrating with neighbourhood character and amenity.
Development Control Policies	A range of operational policies to guide the WAPC's decision making on subdivision and development.	Consider the provisions of DC Policies in considering applications for subdivision and development.	Development to respond to the local planning scheme and have due regard to applicable DC Policies.

3 LOCAL PLANNING CONTEXT

3.1 SHIRE OF ASHBURTON STRATEGIC COMMUNITY PLAN 2022 –2032

The Shire of Ashburton's Strategic Community Plan 2022-2032 (SoA, 2022) outlines the Shire's vision "*We will be a welcoming, sustainable and socially active district, offering a variety of opportunities to community*". There are four key aspirational themes included in the Plan that provide the foundation of the delivery of services and projects to the community. A strategic objective has been defined for each of the four themes – People, Place, Prosperity and Performance. Each of four objectives has several desired outcomes the Shire aims to progress over the life of the Plan.

The *Local Planning Strategy* builds upon this overall Community Vision, and articulates that the towns of Onslow, Tom Price and Paraburdoo will continue to support the community's requirements and needs. The community goals are embedded within the strategic planning for the local government area. The *Local Planning Strategy* also works in alignment with the strategic community goals and objectives.

1. People – We will support opportunities for the community to be safe, socially active, and connected

Strategy 1.1 – Coordinated delivery of social services and projects for the community
Strategy 1.2 – Communities connected with opportunities
Strategy 1.3 – Individual and community learning opportunities

2. Place – We will provide sustainable, purposeful, and valued built and natural environment opportunities for the community

Strategy 2.1 – Coordinated delivery of natural and built environment services and projects for the community
Strategy 2.2 – Appropriate, inviting, and diverse employee accommodation and land management opportunities
Strategy 2.3 – Attractive and sustainable townscapes offering opportunities for all communities
Strategy 2.4 – Effective, compliant, and sustainable management of community assets and infrastructure
Strategy 2.5 – Enhance community opportunities for sustainable waste management
Strategy 2.6 – Land use opportunities to benefit current and future communities
Strategy 2.7 – Quality, well-maintained, and purposeful community facilities
Strategy 2.8 – Safe and interconnected transport networks for the community

3. Prosperity – We will advocate and drive opportunities for the community to be economically desirable, resilient, and prosperous

Strategy 3.1 – Coordinated delivery of economic services and projects for the community
Strategy 3.2 – Aviation transport opportunities for the community
Strategy 3.3 – Clean, safe, and accessible communities
Strategy 3.4 – Sustainable commerce and tourism opportunities

4. Performance – We will lead the organisation, and create the culture, to deliver demonstrated performance excellence to the community

Strategy 4.1 – Coordinated delivery of organisational leadership and performance excellence for the benefit of the community
Strategy 4.2 – Appropriate, sustainable, and transparent management of community funds
Strategy 4.3 – A range of effective opportunities for the community to receive information in a timely manner
Strategy 4.4 – Information systems to aid delivery of services to the community are robust, reliable, and secure
Strategy 4.5 – Safe, engaged, inclusive, and productive workforce culture
Strategy 4.6 – Visionary community leadership with sound, diligent and accountable governance

3.2 CORPORATE BUSINESS PLAN 2023 – 2027

The Shire has adopted a new Corporate Business Plan 2023 – 2027 on 8 August 2023, replacing the former CBP 2019 – 2023, and aligning with the more recent Strategic Community Plan 2022 – 2032.

As outlined in the table below, the Corporate Business Plan (SoA, 2023) has provides a suite of outcomes, which the Local Planning Strategy can provide inputs.

1. People – We wil support opportunities for the community to be safe, socially active, and connected.
1.1 – Coordinated delivery of social services and projects for the community 1.2 – Communities connected with opportunities 1.3 – Individual and community learning outcomes
2. Place – We will provide sustainable, purposeful, and valued built and natural environment opportunities for community.
2.1 – Coordinated delivery of natural and built environment services and projects for the community 2.2 – Appropriate, inviting, and diverse employee accommodation and land management opportunities 2.3 – Attractive and sustainable townscapes offering opportunities for all communities 2.4 – Effective, compliant, and sustainable management of community assets and infrastructure 2.5 – Enhanced community opportunities for sustainable waste management 2.6 – Land use opportunities to benefit current and future communities 2.7 – Quality, well maintained, and purposeful community facilities 2.8 – Safe and interconnected transport networks for the community
3. Prosperity – We will advocate and drive opportunitis for the community to be economically desirable, resilient, and prosperous.
3.1 – Coordinated delivery of economic services and projects for the community 3.2 – Aviation transport opportunities for the community 3.3 – Clean, safe, and accessible communities 3.4 – Sustainable commerce and tourism opportunities
4. Performance – We will lead the organisation, and create the culture, to deliver demonstrated performance excellence to the community.
4.1 – Coordinated delivery of organisational leadership and performance excellence for the benefit of the community 4.2 – Appropriate, sustainable, and transparent management of community funds 4.3 – A range of effective opportunities for the community to receive information in a timely manner 4.4 – Information systems to aid delivery of services to the community are robust, reliable, and secure 4.5 – Safe, inclusive and productive workforce culture 4.6 – Visionary community leadership with sound, diligent and accountable governance

3.3 SHIRE OF ASHBURTON STRATEGIC ASSET MANAGEMENT PLAN 2023-2028

The Shire's *Strategic Asset Management Plan* (SoA, 2023) provides a comprehensive overview of the assets that are identified, managed and have the potential to be maintained to an appropriate level of service or replaced. Particularly, it categorises assets into buildings, roads, stormwater drainage, footpaths, parks & recreation, and town infrastructure.

The Shire's asset portfolio represents its commitment to operational expenditure on maintaining levels of services for infrastructure assets, over a 5 to 20 year period. It identifies that there is a gap between renewal expenditure and funding availability. When considering the financial viability of assets, strategic planning should consider the most appropriate growth scenarios for the population of the Shire, to maximise the level of accessibility of existing and future residents and businesses and the relevant infrastructure assets.

As buildings and assets reach the end of their useable life, the Shire may be able to dispose of the buildings (and potentially the land if appropriate or surplus to requirements). Any future change in use of Council land will need to be considered in the context of this Local Planning Strategy.

A summary overview of community facilities is described in **section 11.1**.

3.4 SHIRE OF ASHBURTON SNAPSHOT OF PRIORITY ROJECTS 2022

The Shire of Ashburton published a Snapshot of Priority Projects in 2022 to highlight the many ongoing benefits that can arise from critical funding of infrastructure projects and liveability within the Shire, and to assist with its relations with government and industry in supporting the growth and diversification of the local economy.

Thirteen priority projects have been identified, listed as follows:

1. Construct a new Onslow Airport Business Precinct.
2. Support development of Onslow Community Boating Precinct.
3. Construct a new jetty in Onslow.
4. Develop the Pilbara Inshore Islands Tourism Initiative.
5. Investigate Yardie Landing as a prospective Heavy Industry Site.
6. Continue to implement Onslow Foreshore Revitalisation.
7. Alleviate the critical shortage of key worker accommodation.
8. Construct a new Arts and Cultural Centre in Onslow.
9. Development of Dreamers Hill in Onslow.
10. Development of the Pilbara Trails network.
11. Prepare a Community Lifestyle and Infrastructure Plan.
12. Onslow Airport Taxiway Development.
13. Establish Onslow as a Defence Base.

3.5 SHIRE OF ASHBURTON LOCAL PLANNING SCHEME NO. 7

The Shire of Ashburton Local Planning Scheme No. 7 (LPS 7) was gazetted on 24 December 2004. The Shire prepared a 'health check' report to the Council on 9 December 2015, which made recommendations into relation to bringing the scheme text into compliance with the *Planning and Development (Local Planning Schemes) Regulations 2015*. The decision has been to prepare a new local planning scheme.

The aims of the LPS 7 provide the current strategic basis for decisions made by the local government:

1. *To facilitate development that responds to the character and amenity, geographical context and environmental constraints of the Shire and its urban and rural areas.*
2. *To provide areas available for urban development where there is a perceived potential for population growth and provide development standards for urban development.*
3. *To locate recreation, commercial and community services in central places within urban centres to maximise access and efficiency of infrastructure provision.*
4. *To respond to potential strategic industry and resource development.*
5. *To provide areas and development standards for local industrial and mixed business development.*
6. *To provide sites and development standards for recreation, community uses and public infrastructure, including infrastructure corridors for transporting multiple types of materials and energy of regional and state significance.*
7. *To identify the location and land requirements of roads within a defined State, regional and local hierarchy.*

8. To allow the continued use of rural land for pastoral and other associated rural and remote uses, particularly rural settlements.
9. To identify areas for conservation, recreation and natural landscapes which are important for ecological, heritage and amenity purposes in addition to the major tourist assets of the Shire.
10. To facilitate development that takes account of the heritage value of places, buildings and objects.
11. To acknowledge the health risks within the Wittenoom townsite.
12. To facilitate development that has regard for the long term protection of natural resources, such as clean air, water, soil and biological diversity.
13. To facilitate the orderly development of Onslow Structure Plan.
14. To assist in the effective implementation of regional plans and policies, including the State Planning Strategy.

LPS 7 outlines a number of reserves, zones and special control areas that apply within the local government area:

Scheme Reserve	Scheme Zone	Special Control Area
• Open Space ◦ Conservation, Recreation and Nature Landscape ◦ Parks, Recreation and Drainage • Roads ◦ State/Regional ◦ Local • Other Public Purposes ◦ Cemetery ◦ Energy ◦ Port Facilities ◦ Telecommunications ◦ Waste Disposal and Treatment ◦ Water and Drainage • Other Purposes ◦ Infrastructure	• Commercial and Civic • Community ◦ Airport ◦ Education ◦ Community • Industrial and Mixed Business Development • Industry • Mixed Business • Residential • Rural • Rural Living • Special Use • Strategic Industry • Tourism • Urban Development	• Cane River Water Reserve Area • Onslow Airport Height Restrictions Area • Onslow Coastal Hazard Area • Tidal Inundation Area • Turee Creek, Mt Lionel and Mt Stevenson Borefields • Waste Water Treatment Plant Odour Buffer • Wittenoom

On 10 October 2023, the Shire's Council adopted Local Planning Scheme No. 8 (LPS 8) for public comment, following assessment by the WAPC and Environmental Protection Authority if required. LPS 8 has been prepared in the format of Schedule 1 'Model Provisions' of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Amendment No. 1 to the Local Planning Strategy has been prepared to align with LPS 8 and will be advertised and progressed concurrently. Following approval, the Shire will have a contemporary planning framework, headlined by an aligned and current Local Planning Strategy and Local Planning Scheme.

3.5.1 LOCAL PLANNING POLICIES

Amendment No. 1 has updated this section to reflect the local planning policies in operation as at August 2023, noting that 20 local planning policies were revoked by the Shire on 25 August 2021 (after approval of the Local Planning Strategy).

The following local planning policies apply:

- LPP03 Advertising Signs
- LPP11 Cash-in-lieu Car Parking Requirements
- LPP13 Transient Workforce Accommodation
- LPP14 Percent For Public Art Policy

- LPP15 Parking and Setback - First Avenue, Onslow
- LPP20 Social Impact Assessment
- LPP26 Onslow Interim Town Centre Design Guidelines
- LPP27 Interim Car Parking Provisions (Onslow)
- LPP29 Lot 381 Second Avenue/Third Avenue Onslow

3.5.2 MUNICIPAL HERITAGE INVENTORY

The Municipal Heritage Inventory (O'Brien Planning Consultants, 1999) (MHI) identifies assessed places, with 29 listed for various levels of heritage management. The MHI considered a further 17 places, however considered that these required further research or reconsideration before being added to the Inventory. Given the age of the MHI, it is recommended to be reviewed and updated.

3.5.3 STRUCTURE PLANS

The Shire has endorsed Structure Plans for:

- Gregory Way, Paraburdoo
 - Approved 6 March 2012.
 - This structure plan has been implemented through subdivision.
 - Approval in effect until 18 October 2025, in accordance with cl. 28, Schedule 2 of the *Planning and Development (Local Planning Schemes) Regulations 2015*.
- Onslow Townsite Expansion Stage 1 Development Plan (refer **section 3.7.2**)
 - Approved 10 June 2016.
 - Approval in effect until 9 June 2026, in accordance with cl. 28, Schedule 2 of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Structure planning is likely to continue to be undertaken to ensure that future expansion of the townsites will be undertaken in an orderly and properly planned manner. It is the preference of the local government that townsite growth would be considered:

- Firstly for infill housing development on available serviced lots;
- Secondly for reconfiguration of existing lots to alter lot boundaries or re-subdivide existing lots, where this would result in a net increase in lot yield; and
- Thirdly through structure planning for expansion areas.

3.6 ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA (ANSIA)

3.6.1 IMPROVEMENT PLAN NO. 41 – ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA

Improvement Plan No. 41 – Ashburton North Strategic Industrial Area (Improvement Plan No. 41) was prepared pursuant to s.119 of the *Planning and Development Act 2005* and gazetted on 13 March 2015. The Improvement Plan No. 41 provided the head of power for the preparation of the *Ashburton North Strategic Industrial Area Improvement Scheme No. 1* (ANSIA Improvement Scheme No. 1).

3.6.2 ANSIA IMPROVEMENT SCHEME NO. 1

The ANSIA Improvement Scheme No. 1, including the Guide Plan, came into effect on 30 September 2016 coinciding with its publication in the *Government Gazette*. LPS 7 ceases to have effect on the Improvement Scheme No. 1 area. The Improvement Scheme No. 1 area includes the industrial buffers to preserve the integrity of the ANSIA. The Improvement Scheme No. 1 boundary is reflected on the LPS 7 Scheme Maps and is reflected on the Strategy Plans.

A Guide Plan is included within Appendix A of the Improvement Scheme No. 1. Structure plans and development plans under LPS 7 have ceased to be applicable within the Improvement Scheme No. 1 area, including the:

- ANSIA Structure Plan;
- Wheatstone Development Plan;
- ANSIA Stages 1B & 1C Development Plan; and
- Eastern General Industrial Area Outline Development Plan.

Within the Improvement Scheme No. 1, several fit-for-purpose land use definitions were prepared, to achieve the objectives set out under the Improvement Plan 41. The uses include 'Harbour and marine facilities', 'Industry – hydrocarbon processing', 'Industry – strategic extraction', 'Supply base', 'Workforce accommodation', 'Utility – public', and 'Utility – private'.

Operational workforce may be considered under the 'Workforce accommodation' use, and may be considered within the 'Workforce Accommodation' zone and the 'Special Use No. 1' zone, as identified on the Guide Plan. The result of allowing operational workforce within the ANSIA will have bearing on Onslow's population growth rates into the future. By 31 December 2018, the Workforce Accommodation located within the General Industrial area (near Macedon) would have to be decommissioned and if latent demand remains, such accommodation would thereafter be relocated to the 'Workforce Accommodation' zone.

It is noteworthy that the definition of 'Workforce accommodation' refers to modular or relocatable buildings. With the specific mention of modular or relocatable dwellings in the definition, it would be implied that higher quality, more permanent accommodation typologies will not be considered by the WAPC to be suitable for being in the ANSIA. Such higher quality accommodation therefore would likely be directed towards the Onslow townsite.

3.6.2.1 FUTURE INDUSTRY WORKFORCE REQUIREMENTS WITHIN ANSIA

An extension to BHP Billiton's Macedon Wet Gas Compression project may occur within a 5-10 year time horizon. Should an extension to BHP Billiton's Macedon Wet Gas Compression project occur, it is anticipated that a project workforce of around 100 employees would be required. No additional land will be required, as the footprint for the additional infrastructure has already been cleared next to the existing plant. Existing accommodation options may be utilised within the area.

Ongoing maintenance of the Wheatstone LNG plant will generate regular, biennial peak workforce numbers (typical 500-750 with biennial peaks 1,250-2,250). Chevron Australia proposes to accommodate the project's FIFO operational workforce at the Workforce Accommodation site, subject to securing necessary development approvals from WAPC and DevelopmentWA.

3.7 REGIONAL AND SUB-REGIONAL STRATEGIES AND STRUCTURE PLANS

3.7.1 ONSLOW TOWNSITE STRATEGY

The Onslow Townsite Strategy has been superseded by the endorsement of the Local Planning Strategy, however this section has been retained for historical reference.

The *Onslow Townsite Strategy* (SoA, 2011) was formally adopted by the Shire in July 2010 and endorsed by the WAPC in March 2011. The *Strategy* is a response to the opportunities and challenges facing Onslow, in the context of recent developments at the ANSIA and the potential population growth within the town. Through population growth, the town's character and its residents' easy-going lifestyle are important to maintain.

As such, the *Onslow Townsite Strategy* seeks to fulfil the three objectives of sustainable living, economic vitality and community wellbeing. Future development within the Onslow Townsite should have regard to these objectives and the relevant development principles.

Once endorsed by the WAPC, the *Local Planning Strategy* will supersede the *Onslow Townsite Strategy*. Any departures from the *Onslow Townsite Strategy* are discussed in **section 5.3**.

3.7.2 ONSLOW TOWNSITE EXPANSION STRUCTURE PLAN

The *Onslow Townsite Expansion Structure Plan* (TPG, 2016) reflects the planning processes that have been undertaken for the townsite. These have included Scheme Amendments 19, 21 and 22, the Structure Plan and the *Stage 1 Development Plan*, and the various subdivision applications that have been determined.

The *Structure Plan* (refer **Figure 5**) is consistent with the long-term strategic goal to ultimately provide for accommodating 3,500 people in the townsite. It should be noted that the accommodation capacity of 3,500 people is greater than the *WA Tomorrow* population forecasts (refer **section 5.3**). This does not mean that the *Structure Plan* is invalid, but helps future proof the ultimate development and sustainability of Onslow as a key town within the Shire of Ashburton, and within the Pilbara Region.

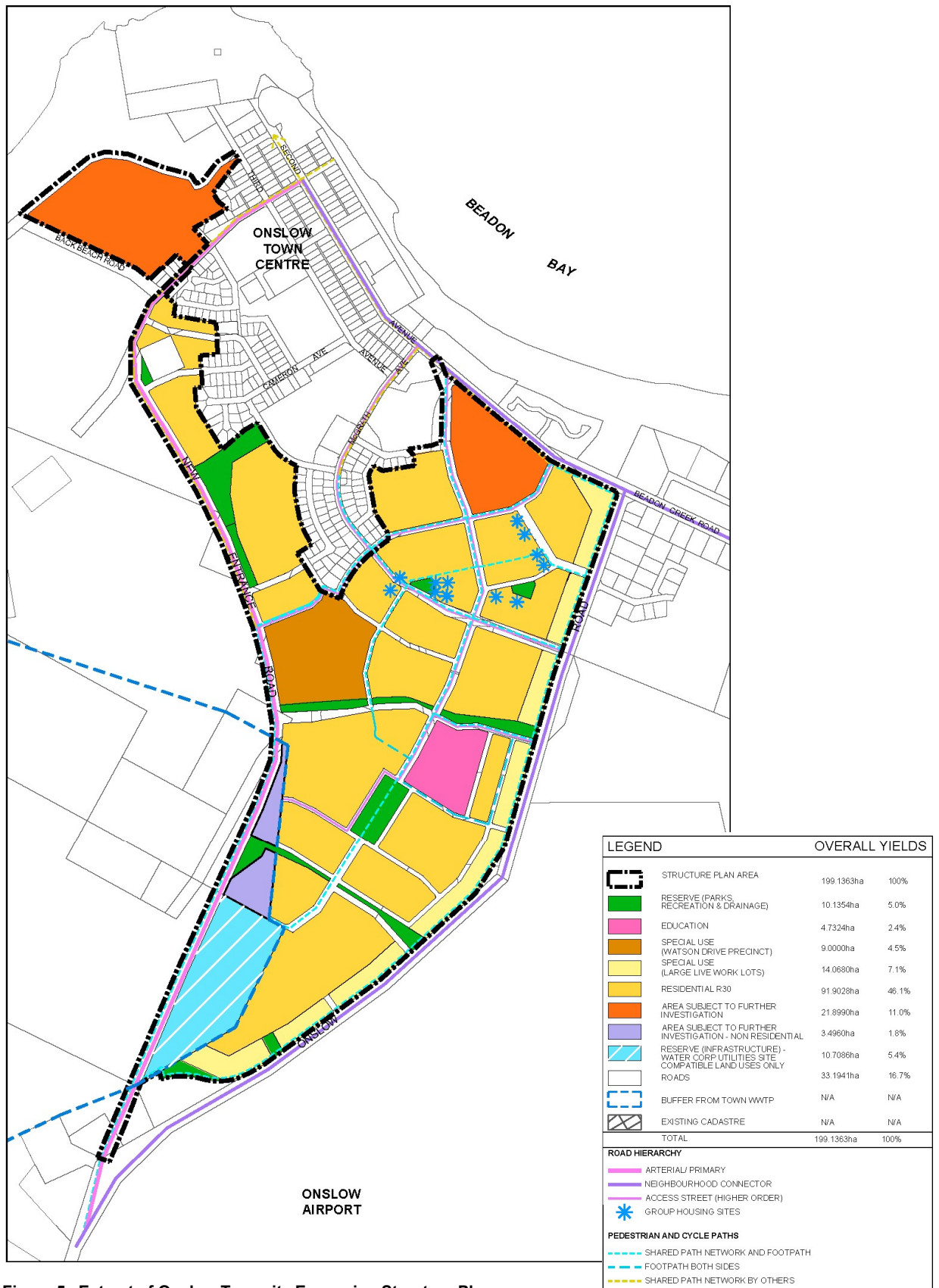


Figure 5 Extract of Onslow Townsite Expansion Structure Plan

3.7.3 ONSLOW TOWNSITE EXPANSION STAGE 1 DEVELOPMENT PLAN

The *Onslow Townsite Expansion Stage 1 Development Plan* (TPG, 2013) was certified by the Shire Council in July 2012 and the WAPC in March 2013. The *Stage 1 Development Plan* was prepared to enable delivery of residential land in Onslow, in response to mounting housing pressure due to the development of ANSIA. The *Stage 1 Development Plan* provides land use and development provisions for residential, Chevron Australia's site (Lot 4001), and public open space. Essentially, the *Stage 1 Development Plan* covered DevelopmentWA's Barrarda Estate area and Chevron Australia's proposed operations village site on Lot 4001.

The Stage 1 subdivision delivered 223 residential lots and two public open space reserves in order to bring forward land supply for residential purposes. The Stage 1 subdivision application was approved by the WAPC in March 2013. Barrarda Estate has been developed in accordance with the *Stage 1 Development Plan*.

Chevron Australia submitted a superlot subdivision application for a 9-hectare operations village site that was approved by the WAPC in March 2013. The lot has since been created yet remains vacant. The gazettal of the ANSIA Improvement Scheme No. 1 facilitates operational workers being housed within the Wheatstone Workforce Campsite and the adjacent 'Workforce Accommodation' zone. This is likely to be the preferred location for employee accommodation for the short-term.

The Shire's long-term aspiration is for Lot 4001 to be developed as an integrated workforce accommodation site. The *Stage 1 Development Plan* provides relevant planning principles and objectives for the site and identifies the need to prepare a Local Development Plan for the site, prior to development, to ensure the objectives are met. The Shire's expectations of a well-integrated development with the existing townsite should be given weight. It may be preferable to continue with the preparation of a Local Development Plan, in the absence of amending the *Stage 1 Development Plan*.

3.8 ONSLOW AIRPORT MASTER PLAN

Onslow Airport is owned and operated by the Shire of Ashburton, and is a Civil Aviation Safety Authority certified facility. The *Onslow Airport Master Plan* (REHBEIN Airport Consulting, 2016) sets out the long-term framework for the airport and facilities. In 2017, as part of implementing the framework, a business plan has been prepared for the construction of an aircraft hangar for rotary wing aircraft.

In September 2023, Council received a report on runway and terminal expansion options for the Onslow Airport (Item 12.4, decision 166/2023). The report explained that due to the impending phasing out of the Fokker F100 aircraft and replacement with larger, heavier aircraft, the runway and terminal will need upgrading. Council resolved to explore external funding sources and to undertake a cost-benefit analysis on the opportunity cost of developing a 2200m runway versus a 2460m runway.

The Onslow Airport is approximately 3 kilometres south of the Onslow townsite and approximately 75 kilometres to ANSIA. The Onslow Airport incorporates the airport terminal building and associated airside and landside infrastructure. It allows for the expansion of the runway and some expansion of uses.

Local Planning Scheme No. 7 includes Special Control Area (SCA) provisions under cl. 7.5 Onslow Airport Height Restrictions Area. However, the SCA on the Scheme Map aligns with the former runway alignment and needs to be amended to reflect the current runway alignment and Obstacle Limitation Surface, and potentially to accommodate for future Airport expansion.

3.9 GUIDELINES, FORECASTS AND REPORTS

A number of government reports have been considered in relation to Onslow, Tom Price and Paraburdoo, including:

- *Regional Hotspots Land Supply Update – Newman and Tom Price* (WAPC, 2015), refer **section 5.4.2**;
- *Pilbara Residential Housing & Land Snapshot* (PDC, 2016), refer **section 5.4.3**;
- *Assessment of Accommodation Need in Onslow* (AEC Group, 2016); and
- *Assessment of Accommodation Need in Tom Price, Onslow & Paraburdoo* (AEC Group, 2015).

3.9.1 COASTAL HAZARD RISK MANAGEMENT & ADAPTATION PLAN FOR THE ONSLOW COAST

The *Coastal Hazard Risk Management & Adaptation Plan for the Onslow Coast* (Cardno, 2017) puts forward 37 recommendations for implementation for the current Onslow townsite. Of these, a number of key strategies and actions to plan for future adaptation in the immediate (<5 years) and short-term (5-10 years) may be summarised under the 'avoid', 'retreat', 'accommodate' and 'protect' risk management and adaptation hierarchy. The following **Table 6** identifies the key strategies and actions contained in the CHRMAP.

Table 6 Immediate and Short Term Strategies and Actions (Cardno, 2017)

Risk management and adaptation hierarchy	CHRMAP key strategies and actions
Avoid	Implement changes to the land zonings that are currently covering undeveloped land within the designated 2110 coastal erosion hazard zones. Update the Special Control Area.
Planned or managed retreat	Immediate Action – Develop an integrated coastal and water management plan to guide stormwater management strategies and planned retreat from the town's flood-prone areas. Short-term – Monitor sea level, coastal vegetation boundaries and storm erosion movements and review the hazard line estimates and strategies for retreat of public and private assets (including the Onslow Salt infrastructure) in the current foreshore zone. Review the foreshore land zone boundaries and adjust, where appropriate, to facilitate retreat of assets within the future foreshore zones.
Accommodate	Immediate action – Establish database of assets in the 2110 flood-prone area including present day value and projected end of life cycle. Identify options for mitigating the impacts of increased flooding, undertake a detailed cost-benefit analysis and communicate with the community and stakeholders to agree on preferred options and communicate the significance of residual risk. Review and adjust local government planning controls to ensure proposed developments in the flood prone areas accommodate the future threats and minimise liabilities. Incorporate coastal erosion and flooding risks into emergency response plans. Short term – monitor flood levels and extents and review boundaries and water level implications for the Hazard Control Area and planning controls.
Protect	Immediate action – Collect data on the geology of the Front Beach hinterland (including the possible sea wall extension to the northeast of the existing seawall) to assess whether the current hazard line estimates can be revised. Liaise with the stakeholders to assess future protect and retreat options at the end of life of houses in the housing estate. Short term – monitor beach profiles at Front Beach to assist considerations of future beach nourishment options.

The planning horizon for the CHRMAP goes beyond that of this Local Planning Strategy. The future of the town is at threat from steadily rising sea levels, combined with storm events, which will affect the viability of low lying areas of the Onslow townsite. Coastal erosion is likely to threaten some infrastructure in the lee of the present Town Beach, including the Bindi Bindi community (Cardno, 2017). However, these considerations have been factored into the issues and opportunities for Onslow, refer **section 15.1**, in particular identifying the Onslow townsite and Bindi Bindi community for eventual relocation. As the Shire has implemented several infrastructure projects recommended by the CHRMAP, it would be appropriate to review the CHRMAP and inundation modelling that underpins these recommendations.

3.9.2 ONSLOW TOWNSITE PLANNING COASTAL SETBACKS & DEVELOPMENT LEVELS

The *Onslow Townsite Planning Coastal Setbacks & Development Levels* report on coastal vulnerability (MP Rogers & Associates, 2011) was commissioned by DevelopmentWA as part of their work on the *Onslow Townsite Expansion Structure Plan* (TPG, 2016) to account for coastal processes in accordance with the June 2003 gazetted version of SPP 2.6. The report utilised the recommended criteria outlined in a WAPC Position Statement published in 2010, which updated the requirements of the SPP 2.6. It was published prior to the SPP guidelines in July 2013 and September 2014.

The report indicates that the shoreline around Onslow has been generally stable or accreting in the longer term. Cyclonic activity is known to affect the shoreline and contributes to loss of vegetation and dunes, although these generally tend to recover over a period of time (MP Rogers & Associates, 2011).

The report investigated historical shoreline movement and modelled erosion to take into account recommended coastal setbacks. These were complemented with scenarios for sea level rise to determine a total recommended coastal setback for various intervals of coastline around Onslow.

The report investigated severe storm inundation for both a 'current day scenario' and a '100-year planning horizon' (MP Rogers & Associates, 2011). This considered full coastal inundation water levels, which are likely to be expected around Onslow given its close proximity to the coastline. The severe storm inundation has been included on the Issues and Opportunities Plan for Onslow, refer to **section 15.1** and **Figure 60**.

The understanding is that the final CHRMAP for the Onslow Coast would supersede the MP Rogers & Associates report.

3.9.3 LIVING IN THE REGIONS 2013 STATE REPORT

The Department of Primary Industries and Regional Development (then Department of Regional Development) undertook the *Living in the Regions* survey to understand the barriers to living in the regions; to measure the quality of life in the regions; and to use that information to guide regional development initiatives (Department of Regional Development, 2013). It builds on the first survey that was undertaken in 1997.

The Department of Primary Industries and Regional Development conducted a *Living in the Regions Survey 2016* from 10 October to 30 November 2016. The region has undergone a remarkable transformation since 2013 when the last survey was conducted, so the results will be an important indicator of how this change is affecting residents' overall happiness and lifestyle. The survey results may be pivotal to shaping the future development of the Pilbara and regional WA.

The 2013 survey still provides valuable information in relation to the trends for people moving, living and continuing to live in the regions. Lifestyle was a major attraction, as was the quality of social life and career advancement (Department of Regional Development, 2013). The report notes that roughly one-third of Pilbara region respondents had been living within the region for less than 6 months, reflecting the high incidence of FIFO work. One-third had lived within the region between 6-20 years and one-third for over 21 years (Department of Regional Development, 2013).

Aspects of regional living were rated by respondents from a score of 1 to 10. Of the nine WA regions, the Pilbara region ranked:

- 1st in financial situation, and employment prospects;
- 8th in safety, health and general wellbeing, and education and training; and
- 9th in happiness; lifestyle, sense of community, and community connectedness.

What can be implied is that financial windfall opportunities and the significant number of jobs are factors for people wanting to live in the Pilbara. What makes it more challenging for retaining population is the ability to ensure lifestyle opportunities are in line with expectations. What is positive is that new arrivals to a region tend to engage in local activities quite quickly. Participation in sporting, community or volunteer activity indicated little differentiation between younger or older cohorts, although frequent sporting activity was more prevalent in young respondents. All age groups had more than half involved in regular local activity (Department of Regional Development, 2013). This appears to correlate with lifestyle and quality of social life as key reasons for living in the regions.

Plans to stay in the regions were considered by respondents. Of the survey sample, 41% indicated that they were considering moving. 58% of Pilbara respondents indicated they were seriously considering leaving hence the regional population may appear to be mobile, especially in areas of high economic activity (Department of Regional Development, 2013). The longer a person has lived in the region, the more likely they are to remain. The top five reasons for relocating were:

- Access to better shopping;
- Access to health services or better quality health services;
- Social activities;
- Cost of living is lower elsewhere; and
- To be closer to family.

Not all those intending to move were planning to leave their region, or regional Western Australia. Most people indicated that they were considering a number of options. For the Pilbara, 28% indicated an intention to stay. These are challenges that the State aims to address through building sustainable, vibrant, inclusive and resilient cities and towns.

The insights into living in the regions is helpful for both the State, local governments, non-government organisations and community groups to understand some of the factors of liveability and reasons why people would be drawn to live in the Pilbara region, what could compel them to remain as long-term residents, or what may drive them to relocate.

3.10 SUMMARY AND IMPLICATIONS FOR LOCAL PLANNING CONTEXT

The following **Table 7** considers the implications, issues and opportunities from a local planning context..

Table 7 Implications, Issues and Opportunities – Local Planning Context

Local Planning Context	Implications	Issues	Opportunities
Shire of Ashburton Strategic Community Plan 2022-2032	The Shire's 10-year <i>Strategic Community Plan</i> and articulates its vision for the towns of Onslow, Tom Price and Paraburdoo.	Embed the community goals within the strategic planning for the local government area.	Over time, the Local Planning Strategy may need to be reviewed and updated to maintain the close relationship between the Vision, goals and objectives of the <i>Strategic Community Plan</i> and this Local Planning Strategy.
Corporate Business Plan 2019-2023	The Corporate Business Plan implements the first four years of the previous <i>Living Life</i> Strategic Community Plan 2017-2027.	Identifies priorities for six theme areas.	Utilise the Local Planning Strategy for addressing priorities outlined in the Corporate Business Plan. The Shire will undertake a review of its Corporate Business Plan and the Local Planning Strategy may need to be reviewed and updated.
Shire of Ashburton Strategic Asset Management Plan 2023-2027	Provides a comprehensive overview of the assets to be maintained to an appropriate level of service, or replaced.	There is an identified renewal expenditure and funding gap. Assets to be replaced/disposed may identify land of buildings for re-use.	Strategic planning should consider the most appropriate growth scenarios for the population, to maximise the level of accessibility of existing and future residents and business to relevant infrastructure assets.
Shire of Ashburton Snapshot of Priority Projects 2022	Clearly articulates the Shire's priorities for capital infrastructure investment.	Identifies 13 projects, eight of which have land use and zoning implications.	Ensure that the Local Planning Strategy and Scheme support delivery of the identified projects.
Onslow Airport Master Plan	Long-term framework for the Onslow Airport and facilities, and protects future development against the effects of current decisions.	Shire of Ashburton will prepare ANEF contours for the Airport. Airport Future Obstacle Limitation Surfaces and Onslow Airport's flight paths may constrain building height. Consider flight paths, ANEF and Obstacle Limitation Surface for the future extension of the runway.	Reflect the current Obstacle Limitation Surface as a special control area within the local planning scheme.
Shire of Ashburton Local Planning Scheme No. 7 (LPS 7)	Provides the statutory planning framework for decisions made by the local government.	This Local Planning Strategy provides the rationale and justification for the preparation of a new local planning scheme, or amendments. Incorporation of the Model Provisions and integration of the Deemed Provisions contained in Schedules 1 and 2 of the <i>Planning and Development (Local Planning Schemes) Regulations 2015</i> . The Shire has an extensive local planning policy manual. Structure Planning is likely to continue to be undertaken to guide certain land use and development.	The Municipal Heritage Inventory should be reviewed and a Heritage List prepared and adopted in accordance with the Deemed Provisions. Undertake a broad review of the local planning policy manual and undertake modifications to adopted policies, to align with the amended LPS 7 and Scheme Review. Investigate opportunities to guide townsite expansion through broad-scale structure plans. Review extent of existing development and facilitate new development in appropriate locations to support the Shire's objectives.

Local Planning Context	Implications	Issues	Opportunities
		The current Municipal Heritage Inventory is old (1999) and considered places that required further research or reconsideration before being added to the Inventory.	
Ashburton North Strategic Industrial Area (ANSIA)	Improvement Plan No. 41 provided the head of power for the Improvement Scheme No. 1. The Improvement Scheme No. 1 and Guide Plan is the operational scheme for the ANSIA.	Western Australian Planning Commission (WAPC) operates and implements the Improvement Scheme No. 1. The WAPC is the decision-maker for development applications. Under the Improvement Scheme No. 1, the 'Workforce Accommodation' and 'Special Use No. 1' zones are provided and would allow operational workforce to be based within the ANSIA, which will have an impact on Onslow's population and growth.	Shire of Ashburton will advocate and plan for workforce to be accommodated within the Onslow townsite wherever possible. This enables workforce to have access to town facilities and social cohesion.
Onslow Townsite Strategy	A response to the opportunities and challenges facing Onslow in the context of recent major industrial development and the potential for significant population growth.	Maintain the town's character and lifestyle values of town residents. Fulfil the 3 objectives of sustainable living, economic vitality and community wellbeing.	Incorporate these objectives into the local planning scheme and local planning policies. Appropriately plan for ultimate development scenarios for Onslow.
Onslow Townsite Expansion Structure Plan	Provides the overall structure for accommodating 3,500 people in the townsite.	Identified areas subject to future investigation, which are reflected in the Issues and Opportunities Plan. Large live-work lots to McCaullay Road to have regard to SPP 5.4 Road and Rail Noise provisions.	Identified non-residential land uses within the area bound by the Waste Water Treatment Plant odour buffer. Provision of 6 hectare School site as per Department of Education requirements. Long-term development of Lot 4001 as an integrated component of the townsite. Review of the future transition of the town centre towards a location that is not affected by predicted sea level rise and inundation.
Onslow Townsite Expansion Stage 1 Development Plan	Enabled delivery of residential land in Onslow in response to mounting housing pressure due to the development of ANSIA.	Chevron Australia's operations village site is retained for workforce accommodation development. Shire of Ashburton expects well-integrated development with the existing townsite.	Apply the relevant planning principles and objectives of the Onslow Townsite Strategy in any future modifications to the Development Plan. Support investigations into the ultimate use of Chevron Australia's landholding.
CHRMAP for the Onslow Coast	Some infrastructure and low lying areas of the Onslow townsite are at risk of steadily rising sea levels, combined with storm events.	The CHRMAP has identified key strategies and actions for planning for future adaptation in the immediate (<5 years) and short term (5-10 years).	Have regard to the recommendations contained in the CHRMAP for the planned adaptation and management of risk for the Onslow townsite.
Onslow Townsite Planning Coastal Setbacks & Development Levels	Report accounted for coastal processes and investigated severe storm inundation	Have regard to the coastal inundation scenarios for determining appropriate response for urban development.	Incorporate modelling from the report on coastal vulnerability for planning in Onslow.

Local Planning Context	Implications	Issues	Opportunities
Living in the Regions 2013 State Report	To understand barriers to living in regions; measure quality of life in regions; and guide regional development initiatives.	Acknowledge the aspects of regional living that could influence people moving, living and continuing to live in the Pilbara.	Have regard to the findings of the 2013 report and future survey reports.

4 LAND TENURE AND LOCAL ENVIRONMENTAL PROFILE

This section is structured to discuss:

- Land Tenure, including Native title; and
- Summary overview of the Environmental Profile (contained in **Appendix A**).

4.1 LAND TENURE

The Shire of Ashburton has an area of 100,816.2 square kilometres (ABS, 2021), which represents approximately 4% of Western Australia's land area. It is the equivalent of 44% of Victoria's land area, and is almost 1.5 times the land area of Tasmania. The large scale of the local government area is in contrast to its low population of around 7,400 people (ABS, 2021).

The predominant land tenure within the Shire is Crown land (refer **Figure 6**). This situation is reflected across most of regional Western Australia. Of the Crown land, a number of land parcels are identified as unallocated crown land, whilst the majority of Crown Land is subject to reserves and management orders, or leases (such as pastoral leases, or mining leases) and other leases to Aboriginal communities (such as Wakathuni).

Onslow demonstrates that a vast majority of lots are freehold (refer **Figure 7**). The Onslow land tenure plan indicates that Chevron Australia, Onslow Salt and the Shire of Ashburton own a number of properties in freehold. This reflects Onslow Salt's workforce population within town, and the 50 houses built for Chevron employees within the Barrarda Estate.

Paraburdoo and Tom Price contain a significant proportion of leased or freehold owned land by Hamersley Iron (Rio Tinto), refer **Figure 8** and **Figure 9**. These are also subject to State Agreements (refer **section 8.1**). A number of properties are also owned in freehold by others, including the Shire of Ashburton.

Pannawonica is a closed town owned by Hamersley Iron and the Shire of Ashburton does not have care and control within the townsite boundary.

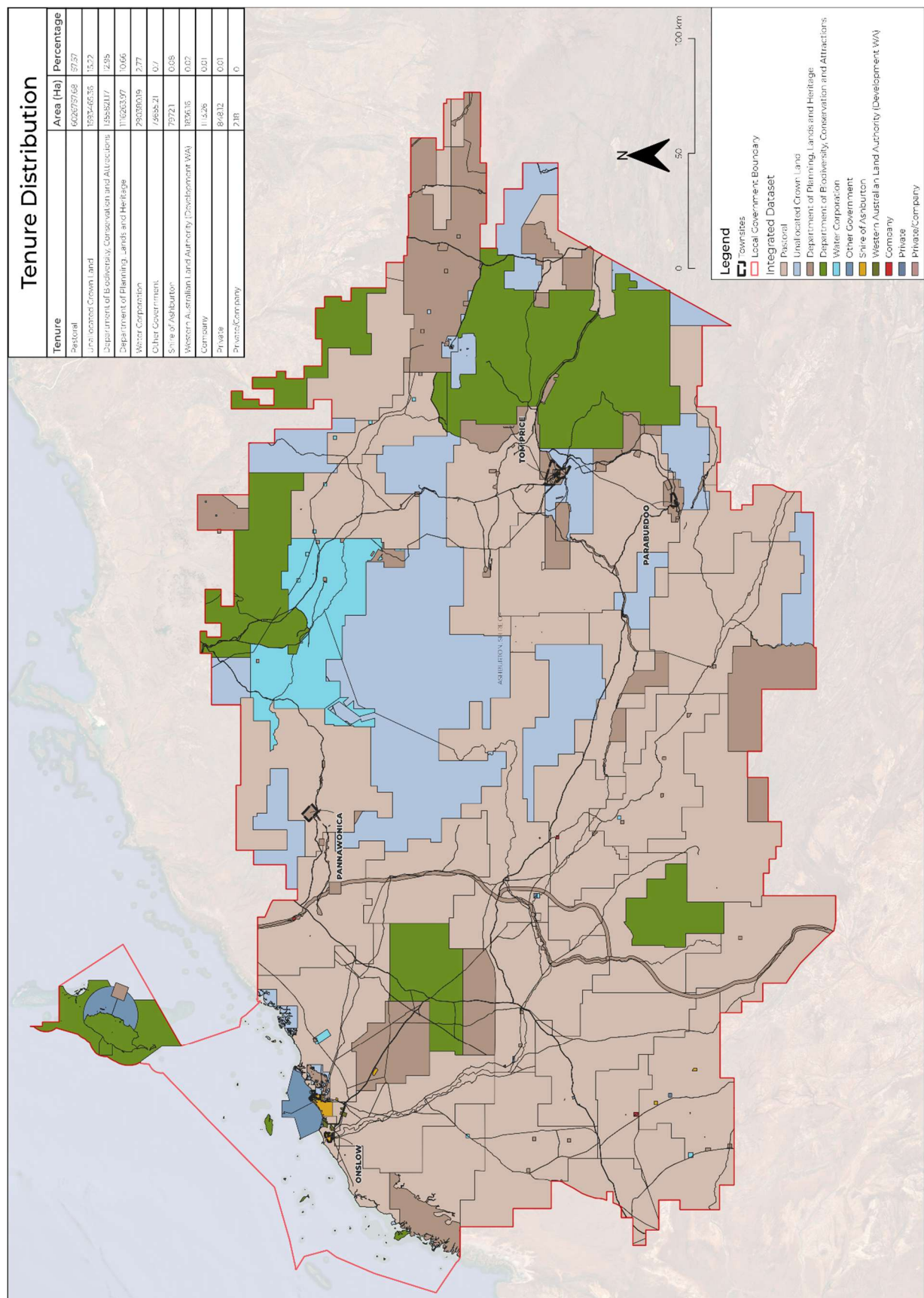


Figure 6 Generalised Land Ownership and Tenure – Overall

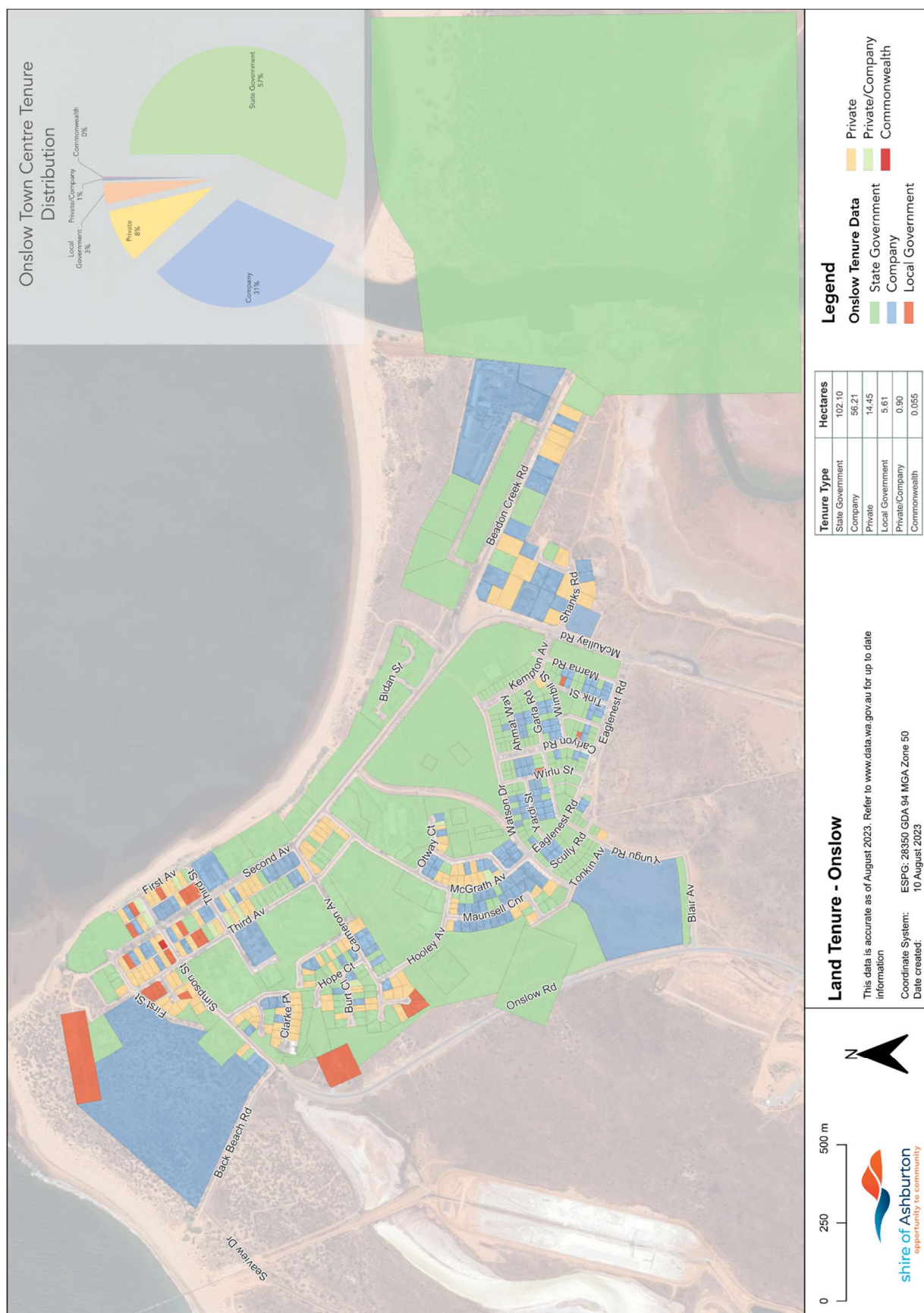


Figure 7 Generalised Land Ownership and Tenure – Onslow

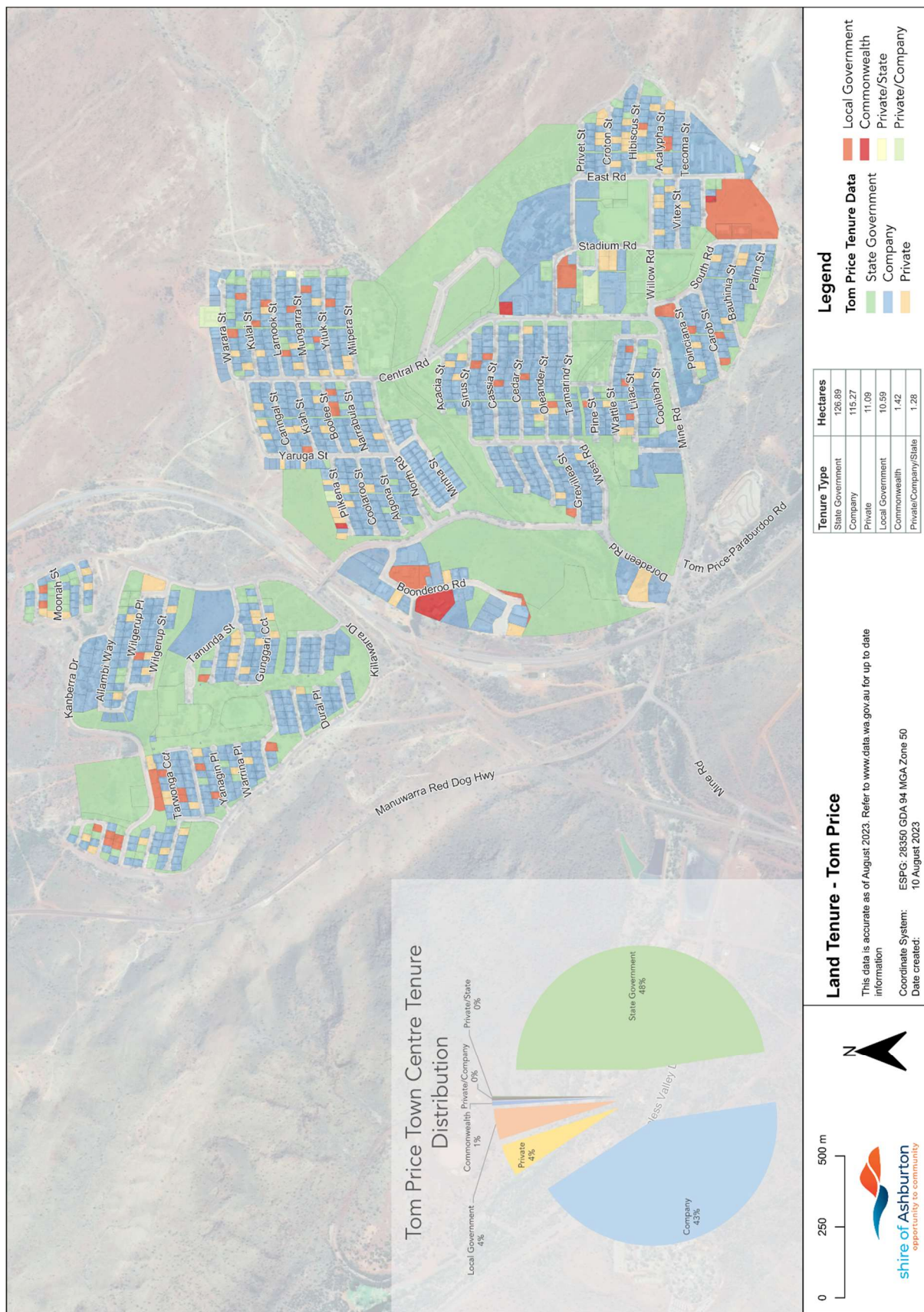


Figure 8 Generalised Land Ownership and Tenure – Tom Price

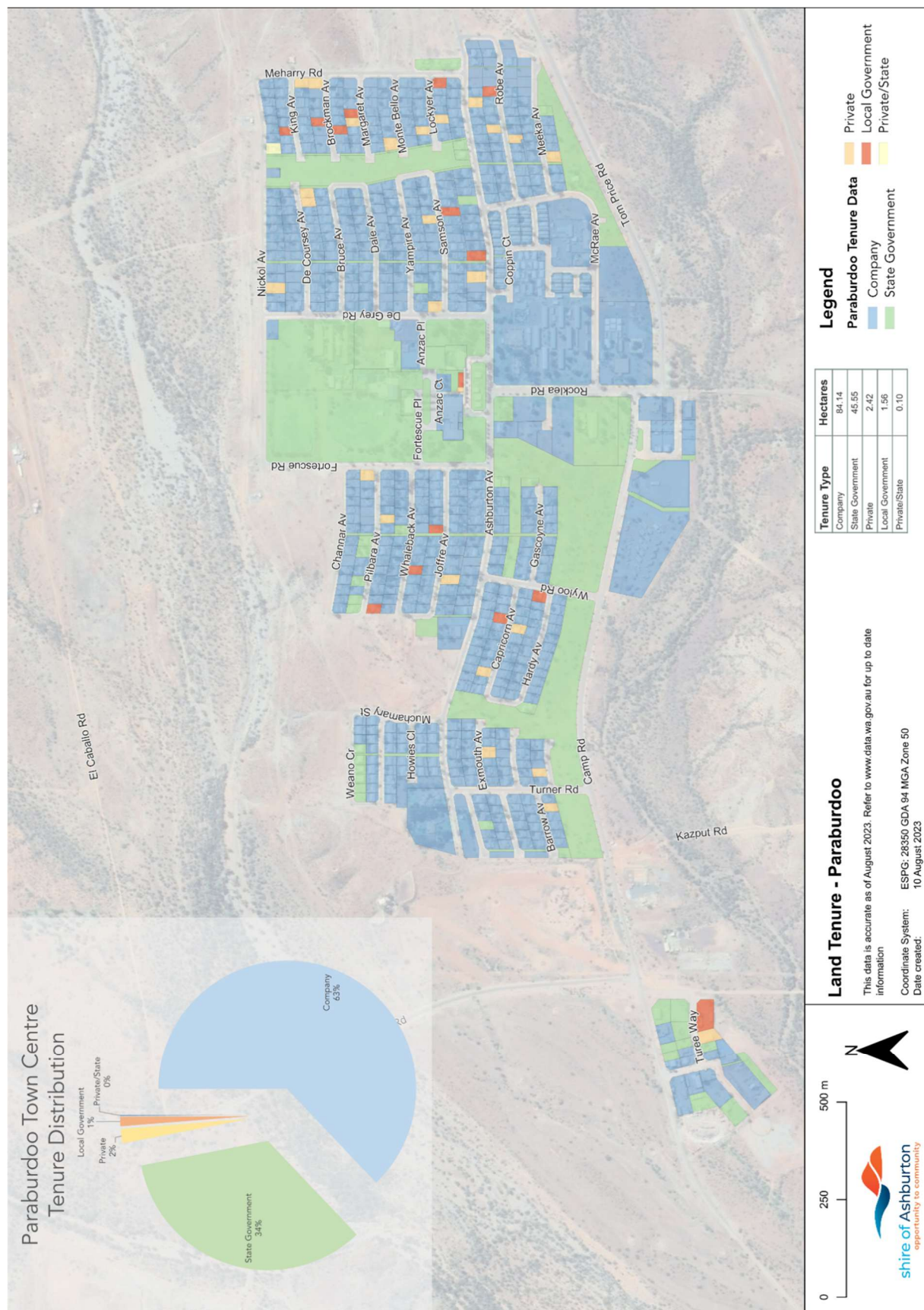


Figure 9 Generalised Land Ownership and Tenure – Paraburdoo

4.1.1 NATIVE TITLE

Traditional owners have special rights to use unallocated Crown land for traditional purposes (except to the degree restricted by any valid law). Within the Pilbara region, access to land and water sources is important for Aboriginal people as these sources are linked to their way of life and system of beliefs. Their beliefs require regularly performed rituals and to conduct lore business at water sources. Water sources can also act as boundaries to the countries of different language or tribal groups.

Native title is the recognition in Australian law that some Aboriginal people continue to hold native title rights to lands and water arising from their traditional lore and customs. The bundle of native title rights of a particular group will depend on the recognised traditional lore and customs of those people. Aboriginal and Torres Strait Islander people can apply to the courts to have their native title rights recognised under Australian law. Native title holders have the right to be compensated if governments compulsorily acquire their native title rights in order to grant exclusive tenure to others for the purpose of a future act.

4.1.1.1 FUTURE ACTS AND IMPACTS ON NATIVE TITLE

A “future act” is a proposed activity or development on land and/or waters that may affect native title, by extinguishing it or by creating interests that are inconsistent with the existence or exercise of native title. Common examples of future acts in Western Australia are the proposed grants of mining or land titles by the Department of Mines, Industry Regulation and Safety, Department of Primary Industries and Regional Development, and Department of Planning, Lands and Heritage respectively.

Native title can co-exist with other forms of land title (such as pastoral leases) but is extinguished by others (such as freehold). Some other forms of land tenure also extinguish native title. The vesting of reserves under section 33 of the *Land Act 1933* totally extinguishes native title in Western Australia.

Within the townsites of Onslow, Tom Price and Paraburdoo, native title rights may continue to exist within unallocated Crown Land parcels of land. Further consultation would be necessary to determine where native title and Aboriginal heritage exists in these areas. This consultation would be undertaken with the applicable native title representatives / Aboriginal corporations including Yamatji Marlpa Aboriginal Corporation (YMAC), Buurabalayji Thalanyji Aboriginal Corporation (BTAC) and Eastern Guruma.

4.1.1.2 NATIVE TITLE DETERMINATIONS

Areas of the Shire subject to native title determinations or native title claims are outlined in **Figure 10** (NNTT, 2023).

There are 23 native title determinations either partially or wholly within the Shire as follows:

Short name	Registered Native Title Body Corporate	Determination date
Jurrura/Yinhawangka Gobawarra	Gobawarra Yinhawangka Aboriginal Corporation, The Jurruru Aboriginal Corporatoion RNTBC	26/08/2022
Budina 2	Budina Aboriginal Corporation RNTBC	26/02/2021
Gnulli, Gnulli #2 and Gnulli #3 – Yinggarda, Baiyungu and Thalanyji People	Nganhurra Thanardi Garrbu Aboriginal Corporation, Yinggarda Aboriginal Corporation	17/12/2019
Combined Thiin-Mah, Warriyanka, Tharrkari and Jiwarli People	Woodgoomungoooh Aboriginal Corporation	16/04/2019
Palyku Part A	Palyku-Jartayi Aboriginal Corporation	12/03/2019
Jurruru People #3	The Jurruru Aboriginal Corporation RNTBC	20/12/2018
Kariyarra	Kariyarra Aboriginal Corporation	13/12/2018
Niyiyaparli and Niyiyaparli #3	Karlka Niyiyaparli Aboriginal Corporation RNTBC	26/09/2018
Yaburara and Mardudhunera People	Wirrawandi Aboriginal Corporation RNTBC	27/07/2018
Kuruma Marthudunera Part B	Robe River Kuruma Aboriginal Corporatoion RNTBC	26/04/2018
Yindjibarndi #1	Yindjibarndi Ngurra Aboriginal Corporation RNTBC	13/11/2017
Budina People	Budina Aboriginal Corporation RNTBC	16/10/2017
Yinhawangka People Part A and B	Yinhawangka Aboriginal Corporation RNTBC	18/07/2017
Kuruma Marthudunera (Part A)	Kuruma Marthudunera Aboriginal Corporation RNTBC	01/11/2016
Puutu Kunti Kurrama People and Pinikura People #1 and #2	The PKKP Aboriginal Corporation RNTBC	02/09/2015
Jurruru People Part A	The Jurruru Aboriginal Corporation RNTBC	01/09/2015
Banjima People	Banjima Native Title Aboriginal Corporation RNTBC	11/03/2014
Eastern Guruma – Area B	Wintawari Guruma Aboriginal Corporation RNTBC	20/11/2012
Thudgari People	Kulyamba Aboriginal Corporation RNTBC	18/11/2009
Thalanyji	Buurabalayji Thalanyji Aboriginal Corporation RNTBC	18/09/2008
Eastern Guruma	Wintawari Guruma Aboriginal Corporation RNTBC	01/03/2007
Ngarluma/Yindjibarndi	Yindjibarndi Aboriginal Corporation RNTBC, Ngarluma Aboriginal Corporation RNTBC	02/05/2005
Nharnuwangga	Jidi Jidi Aboriginal Corporation RNTBC	29/08/2000

Yamatji Marlpa Aboriginal Corporation (YMAC) is the native title representative body for the Pilbara region. YMAC represents groups for a number of native title claims that are partially or wholly within the Shire of Ashburton, including:

- Budina People;
- Kariyarra People; and
- Yinhawangka People.

Thalanyji Native Title Determination Area

Onslow is located within the native title determination area for the Thalanyji people. Native title was awarded to the Thalanyji people on 18 September 2008 (BTAC, 2016). Within the native title determined area for the Thalanyji people, mining and pastoral leases, as well as any private or government construction and maintenance works on the determined land are managed by BTAC.

Yinhawangka Native Title Determination Area

Yinhawangka native title was determined on 18 July 2017 for an area that covers approximately 10,113 square kilometres, within the Shires of Meekatharra and Ashburton. YMAC assisted the Yinhawangka people and BHP Billiton Iron Ore reach a project agreement in 2016. An Indigenous Land Use Agreement was negotiated with the State which created a managed reserve with a management order to the Yinhawangka Aboriginal Corporation for the Bellary Springs (Innawonga) Community and surrounds for social, cultural and economic development purposes.

Eastern Guruma Native Title Determination Areas

The Eastern Guruma native title determination area surrounds Tom Price (NNTT, 2007) and the Eastern Guruma People Part B determination area largely covers the area of the Tom Price township (NNTT, 2012).

Between 2007 and 2012 the Eastern Guruma people continued to negotiate with the respondents (the State, Rio Tinto, Telstra, and the Shire of Ashburton) in relation to an area of land surrounding the Tom Price townsite, which was excised from the Part A Determination for legal reasons. After a period of negotiation and hearings, the parties agreed to consent to the Eastern Guruma people receiving a further determination of native title over land in and around the Tom Price town site, known as the Part B area.

Extinguishment of Native title over the full extent of Tom Price has occurred however under s 47B of the *Native Title Act 1993* extinguishment over some of the crown land must be disregarded. Native title was not found to exist over public works, residential freehold, roads, some reserves and leases, and certain areas of vacant Crown land (NNTT, 2012). The Eastern Guruma People will not be able to veto future development in the area, but their native title rights must be taken into account (NNTT, 2012).

Eastern Guruma Pty Ltd is owned by members of the Eastern Guruma group and provides employment and career opportunities for Eastern Guruma members and other Aboriginal people. Eastern Guruma Pty Ltd provides services including civil and mining, facilities management, drilling and landscaping for several resource companies.

4.2 ENVIRONMENTAL PROFILE

The Environmental Profile contained in **Appendix A** provides a thorough analysis of the natural environment. The key issues and implications identified within the Environmental Profile are reflected in **section 4.2.1**.

The broad and diverse landforms of the Shire, from the Hamersley Ranges in the inland east, to the flood plains and coast in the west, underpin the soil, water and vegetation characteristics. The great river systems that flow across the Shire, through the steep gorges and hills and across the scrubby steppe regularly flood the surrounding landscape during the wet season and from tropical cyclones. The river systems form important catchments for surface water runoff and feed groundwater systems.

Increases in temperature and extreme weather events are projected to occur as a result of climate change. This would have the potential to impact on the health of the environment and the community, as well as the maintenance of public lands and capacity of infrastructure systems including those managed by the Shire.

Sea level rise and coastal vulnerability will increase along the rangelands coastline in the near future. Management of existing infrastructure and planning future development will require consideration of vertical allowances and setback distances.

Expansion of tourism, commercial fishing, aquaculture and resource industry activity will increase pressure on sensitive and productive coastal marine environments which provide habitats and breeding grounds (seagrass meadows, turtle nesting on beaches, river mouths/intertidal mud flats) for marine life. Recreational activity (camping, coating, fishing, swimming and 4WDing) around sensitive coastal environments associated with population growth and industry development will also impact upon local biodiversity and environmental values.

Coastal spaces which support recreational activity should consider cumulative impacts on sensitive environments and minimise impacts through appropriate management.

The majority of the Shire is indicated as being located within a Bush Fire Prone Area of Western Australia as designated by the Fire and Emergency Services (FES) Commissioner. Any future planning and development within a designated Bush Fire Prone area should be consistent with the requirements of SPP 3.7 (refer **section 2.3.10**).

4.2.1 ENVIRONMENTAL ISSUES

A summary list of issues and opportunities is provided:

- Weed management – this has become problematic. In particular, *Aerva javanica* (Kapok bush), *Leucaena leucocephala* (Coffee Bush, previously used as cattle feed, which invades riparian areas and disturbs the ecological regimes associated with waterways), *Parkinsonia aculeata*, and *Prosopis glandulosa/glandulosa x velutina/pallida* (Mesquite, a declared plant (noxious weed) and weed of national significance which is particularly problematic towards the coast near the Fortescue River delta and in/around Tom Price).
- Soil stabilisation and dust – high winds and human disturbance (construction/industry) can result in significant sand drift and dust, and it is often not properly managed. It is particularly problematic in coastal Onslow.
- Groundwater – in terms of the lack of knowledge of availability/quality and competing interests (mining vs. drinking water vs. agricultural use).
- Sand mining from creek beds for extraction of basic raw materials/concrete manufacturing has negative impacts on waterway ecosystems and habitats.
- Illegal dumping of oils/asbestos and other rubble/goods is problematic in the Shire as it is not monitored/managed very much.
- Wetlands and marshes are particularly sensitive and require appropriate management and protection.

4.3 SUMMARY AND IMPLICATIONS FOR LAND TENURE AND LOCAL ENVIRONMENTAL PROFILE

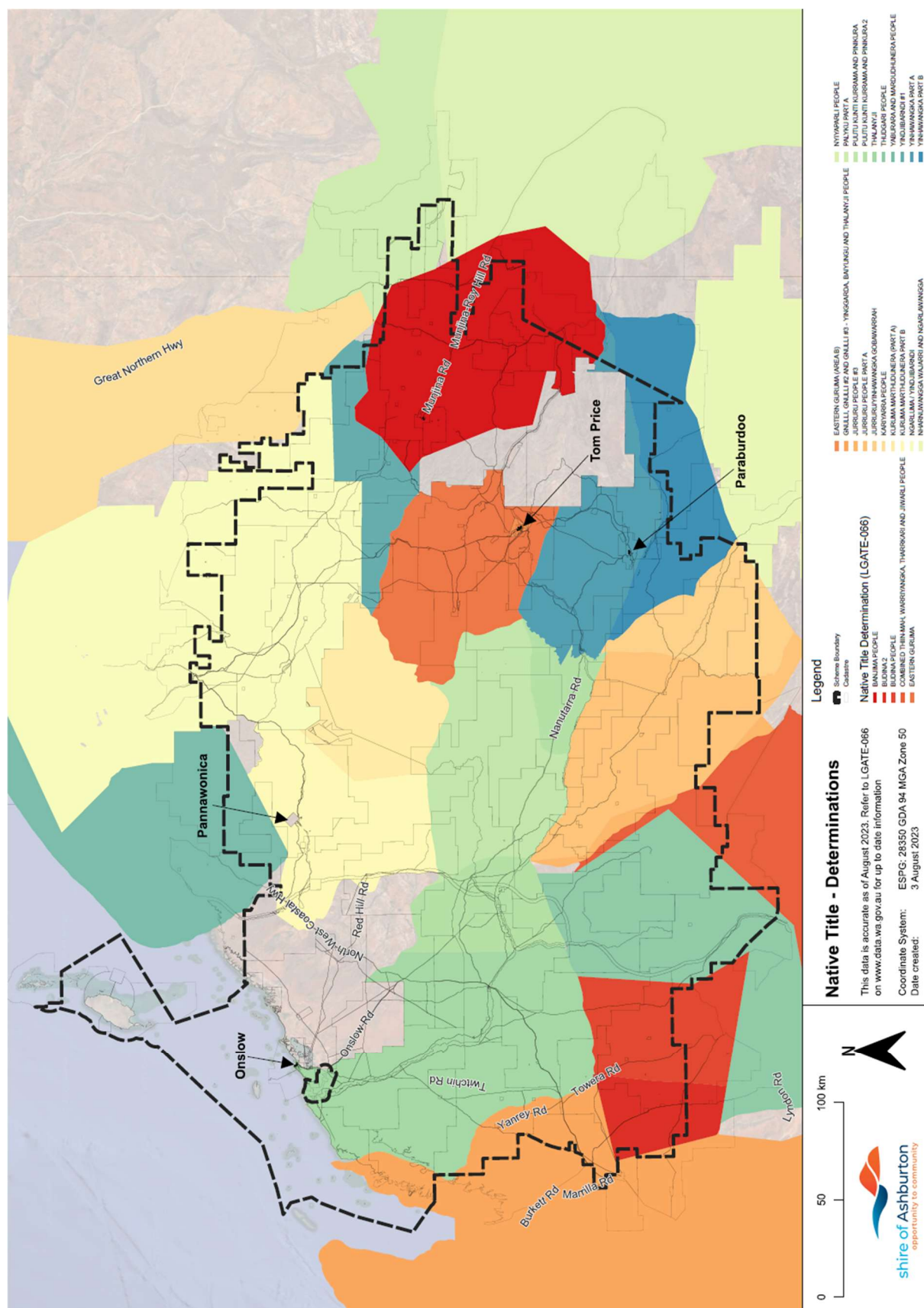
The following **Table 8** considers the implications, issues and opportunities from a land tenure and local environmental profile context.

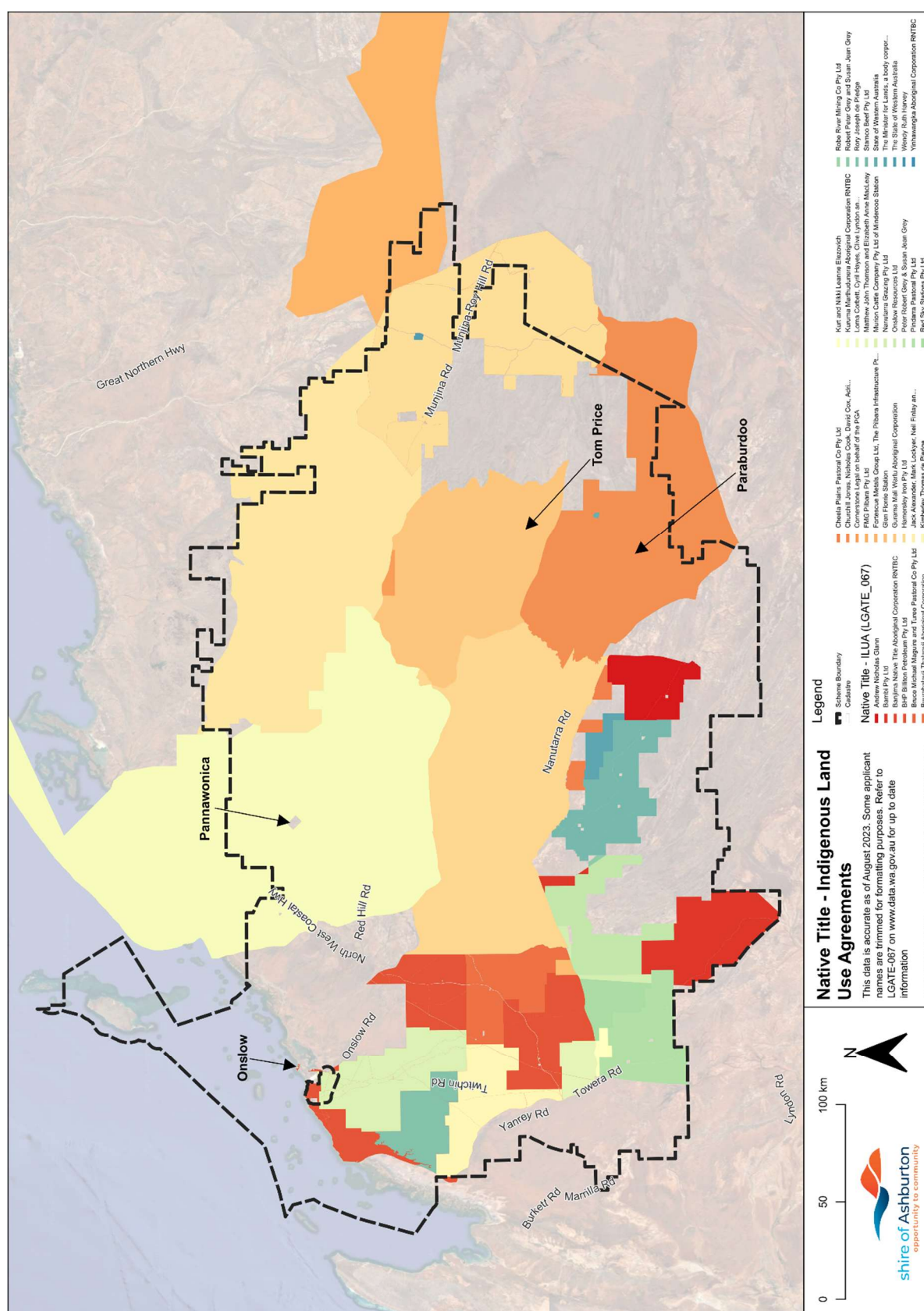
Table 8 Implications, Issues and Opportunities – Land Tenure and Local Environmental Profile

Land Tenure and Local Environmental Profile	Implications	Issues	Opportunities
Land Tenure	Overall land tenure is Crown land. Crown land is unallocated, or is subject to reserves, or to leases. Freehold land is more typical within the three townsites of Onslow, Tom Price and Paraburdoo.	Pastoral leases are issued by the Department of Planning, Lands and Heritage. Amendments to the <i>Land Administration Act 1997</i> propose to introduce diversified pastoral leases. These will have a broader range of uses than the current limited scope of pastoral leases. While conservation reserves are managed by the Department of Biodiversity Conservation and Attractions, the Shire may consider active management of the following issues to assist in conservation and protection of biodiversity regarding uncontrolled access, weeds and feral animals.	While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements with traditional owners and optimise opportunities for Indigenous training, employment and businesses. Consideration should also be made to native title and ILUAs where applicable, when considering any planning or development proposals, in discussion with appropriate traditional owners.
Native Title	A number of native title determination areas and native title claim areas cover the Shire of Ashburton. Pastoral leases (under the <i>Land Administration Act 1997</i>) do not extinguish native title, and are able to co-exist.	Urban expansion within townsites should be alienated from Crown land as freehold land. There may be implications associated with addressing native title and Aboriginal heritage.	Engagement with traditional owners is required to meet legislative requirements of native title. Increased benefits may be observed through an elevated level of involvement of the traditional owners within the Shire in terms of land and cultural heritage management. Identify Crown land for urban expansion or other uses and work with agencies and the representative Traditional Owners to address native title and Aboriginal heritage within Onslow, Tom Price and Paraburdoo. Ensure that land is ready for future/anticipated housing supply within townsites.
Local Environmental Profile	Environmental Profile contained in Appendix A provides a thorough analysis of the natural environment.	Increases in temperature and extreme weather events are projected to occur as a result of climate change. This would have the potential to impact on the health of the environment and the community, as well as the maintenance of public lands and capacity of infrastructure systems including those managed by the Shire. Sea level rise and coastal vulnerability will increase along the rangelands coastline in the near future. Management of existing infrastructure and planning future development will require consideration of vertical allowances and setback distances. Expansion of tourism, commercial fishing, aquaculture and resource industry activity will increase pressure on sensitive and productive coastal marine environments which provide habitats and breeding grounds (seagrass meadows, turtles nesting on beaches, river mouths/intertidal mud flats) for marine life. Recreational activity (camping, coating, fishing, swimming and 4WDing) around sensitive coastal	Temperature – Increases in temperature are likely to result in increased needs for cooling and/or impacts on environmental and public health. Consideration should be given to heat island impacts in regional towns and the need for green infrastructure and shade in public and private places to mitigate heat increases in built environments. This may also result in an increase in water demands, and thus adequate water sources. Development should also incorporate passive solar design and breezeways. Extreme weather – Increases in extreme weather events, particularly bushfires as well as rainfall/tropical cyclones, may require development to be located away from areas of risk and/or improved emergency management responses and plans. Infrastructure adequate to manage extreme weather conditions will also require consideration. Rainfall change – Increases in rainfall event intensity may result in greater localised flooding and increased pressure on stormwater systems. Stormwater systems should be designed with contingency for increased rainfall intensity.

Land Tenure and Local Environmental Profile	Implications	Issues	Opportunities
		environments associated with population growth and industry development will also impact upon local biodiversity and environmental values. Coastal spaces which support recreational activity should consider cumulative impacts on sensitive environments and minimise impacts through appropriate management. The majority of the Shire is indicated as being located within a Bush Fire Prone Area of Western Australia as designated by the Fire and Emergency Services (FES) Commissioner - this is addressed through the Bushfire Hazard Level Assessment prepared for the <i>Local Planning Strategy</i>. The Shire is well known for its impressive terrestrial, marine and aquatic biodiversity. A significant proportion of the Shire's biodiversity is protected in a number of conservation areas.	Dust – Dust generated from bushfires should be monitored and management responses developed to inform the public regarding health risks during bushfire events. Management of fuel loads without exceeding threshold air quality standards should also be considered through the development of an Air Quality Management Plan, and a program of regular fuel reduction which minimises air quality impacts on townsites and sensitive environments, on advice from the Bushfire and Natural Hazards Cooperative Research Centre. Dust from localised extraction and production of minerals, particularly near townsites, should be monitored and infringement notices issued where necessary, consistent with the <i>Extractive Industries Local Law 2013</i>. Greenhouse gas emissions – Emissions which result from Shire operations may be reduced through increased use of renewable energy and implementation of actions to improve energy efficiency. Asbestos – The Shire should maintain advice with regards to potential for health risks from the former mine sites and associated communities. Resource extraction – Clearing of the land for resource extraction results in a loss of biodiversity and can lead to erosion. Mining activities impact on the visual landscape of the Shire; can result in off-site impacts on nearby land uses including dust, noise and light; and can also lead to the lowering of groundwater tables. Acid sulphate soils – Declining soil and land quality can occur as a result of activity where acid sulphate soils are disturbed. This leads to the release of acid and heavy metals which can cause significant harm to the environment and infrastructure. Appropriate management of acid sulphate soils, particularly in areas of high risk where changes in groundwater are likely or mining is proposed, is required, consistent with current best practice. Contaminated sites – Given that contaminated sites within the Shire are located within operational oilfield facilities, and within the Wittenoom abandoned townsite, consideration should be given to processes established under the <i>Contaminated Sites Act 2003</i>, particularly in coordination with the Department of Planning, Lands and Heritage with respect to Wittenoom. In addition, any unsewered residential and industrial areas within the Shire have the potential to lead to contamination of land and groundwater and alternative treatment units should be used in areas of high environmental risk. Waste management – Consideration should be given to opportunities to establish local or regional waste management and/or recycling facilities as population in the region increases, as well as opportunities to subsidise recycling schemes. This should include industries with multiple benefits such as waste to energy plants.

Land Tenure and Local Environmental Profile	Implications	Issues	Opportunities
			Soil and vegetation condition – Vegetation retention assists in the maintenance of soil health. Soils and vegetation (grasslands and shrublands) in good condition are also associated with higher agricultural productivity. Supporting the development and planning process of Ecologically Sustainable Rangeland Management (ESRM) Plans for land managers in coordination with the Pastoral Lands Board and DPIRD should also be considered. Commercial activity – Planning for and management of activities associated with the resources industry, commercial fishing and aquaculture must consider impacts on sensitive coastal environments which provide habitat for coastal and marine life. Consideration should be given to the location of supporting industrial areas, which adequately manage any potential off-site or environmental impacts. In addition, coastal spaces which are shared with recreational activity should be planned to ensure multiple, cumulative impacts on sensitive environments are considered and impacts are appropriately managed. Tourism – management and planning of sustainable tourism activity such as camping, boating, swimming, fishing, and 4WDing, and development around sensitive coastal environments such as beaches, river mouths (Beadon Creek), and seagrass meadows, will be critical with population and industry growth, development of tourism, and townsite expansion. Engagement with traditional owners should be considered to ensure that cultural heritage values are not lost, particularly within the native title area for the Thalanyji community.





5 POPULATION AND HOUSING

Population and demographic information for the Shire and Pilbara region has been sourced from the ABS Census Data (ABS, 2012), (ABS, 2021) (ABS, 2021) and from the PDC's website (REMPAN, 2017). The PDC website has considered statistics across the region and the following data has been extracted for the Shire of Ashburton.

This section is structured to discuss the background context as well as implications, issues and opportunities in relation to:

- Ashburton Demographics;
- Observed Population Growth Trends;
- Population Growth Forecasts;
- Housing Characteristics; and
- Development Scenarios.

The prevalence of fly-in, fly-out (FIFO) workers is a central issue to recognise when analysing census data within the Shire, and how the responses from this group can affect the data.

Normally, the population of a place is determined by using the 'Place of Usual Residence' census data set produced by the ABS, which is where a person normally resides. However, it is known that FIFO workers interpret this question differently, leading to varying responses based on whether the respondent:

1. Considers their workforce accommodation as their place of usual residence given that many workers can reside there for more than 6 months of each year (and therefore meet the ABS threshold for that place being considered the place of usual residence); or
2. Considers that they are visiting the area, given they have a home elsewhere and fly in and out of the workforce accommodation (.id, 2013) (DAA, 2013).

Consequently, the 'Place of Usual Residence' may not be an accurate reflection of the Shire's population. Further, as the PURP response is used as base data for demographic information provided by the ABC, these demographic trends can be affected by the interpretation of FIFO workers.

This Local Planning Strategy is cognisant of this matter and has adapted how the demographic profile, trends and projections of the Shire are described and portrayed to be appropriately deal with the somewhat unique circumstances of the Shire's population. In some circumstances, it is better to use the 'Enumerated Resident Population' which is the simple count of where people were on census night, whilst in other instances, additional data has been analysed and compared to understand accurately the Shire's demographic profile.

Each section will explain clearly the source of data, if and how it has been interpreted to arrive at the Strategy's observations and recommendations.

5.1 ASHBURTON DEMOGRAPHICS

On the night of the 2021 Census, 10 August 2021, there were 15,435 persons located within the Shire (Enumerated Resident Population) (ABS, 2021). On the night of the 2016 Census, 9 August 2016, 24,869 persons were recorded within the Shire (ABS, 2021).

As shown in **Table 9** below, a significant proportion of the 2021 ERP count were visiting from elsewhere within Western Australia, which would likely include the Shire's known high number of FIFO workers.

Table 9 Place of Usual Residence, By Place of Enumeration on Census Night (ABS, 2021)

		Percentage
Counted at home on Census Night	6,859	44%
Visitor from elsewhere within the Shire	10	0.1%
Visitor from elsewhere within Western Australia	7,372	48%
Visitor from elsewhere within Australia	1,192	8%
<i>Total visitors from outside of the Shire</i>	<i>8,567</i>	<i>56%</i>
Total	15,435	

Note – Overseas visitors are not included and due to small random adjustments by the ABS, the table totals may differ slightly from the sum of the rows.

The Enumerated Resident Population figure is a simple count of all persons present within the Shire and includes all visitors and temporary workers that normally reside outside of the Shire. It is a useful count to gauge temporary population such as tourists and temporary workers.

The Census 'Place of Usual Residence' count is normally used to determine population, however as mentioned earlier in Section 5, this count may not be an accurate reflection of population in areas that experience considerable temporary worker population, or FIFO.

The 2021 population for the Shire was 7,391 persons. The spatial distribution of the Shire's population is shown in **Table 10** below.

Table 10 Population (ABS, 2021)

Locality	Persons	Percentage
Onslow	829	11%
Tom Price	2,910	39%
Paraburdoo	1,324	18%
Pannawonica	685	9%
Outside of townsites	1,643	22%
Total	7,391	

The following **Figure 12** provides an overview of the demographic characteristics for the Shire of Ashburton, based on the 2021 Census data.

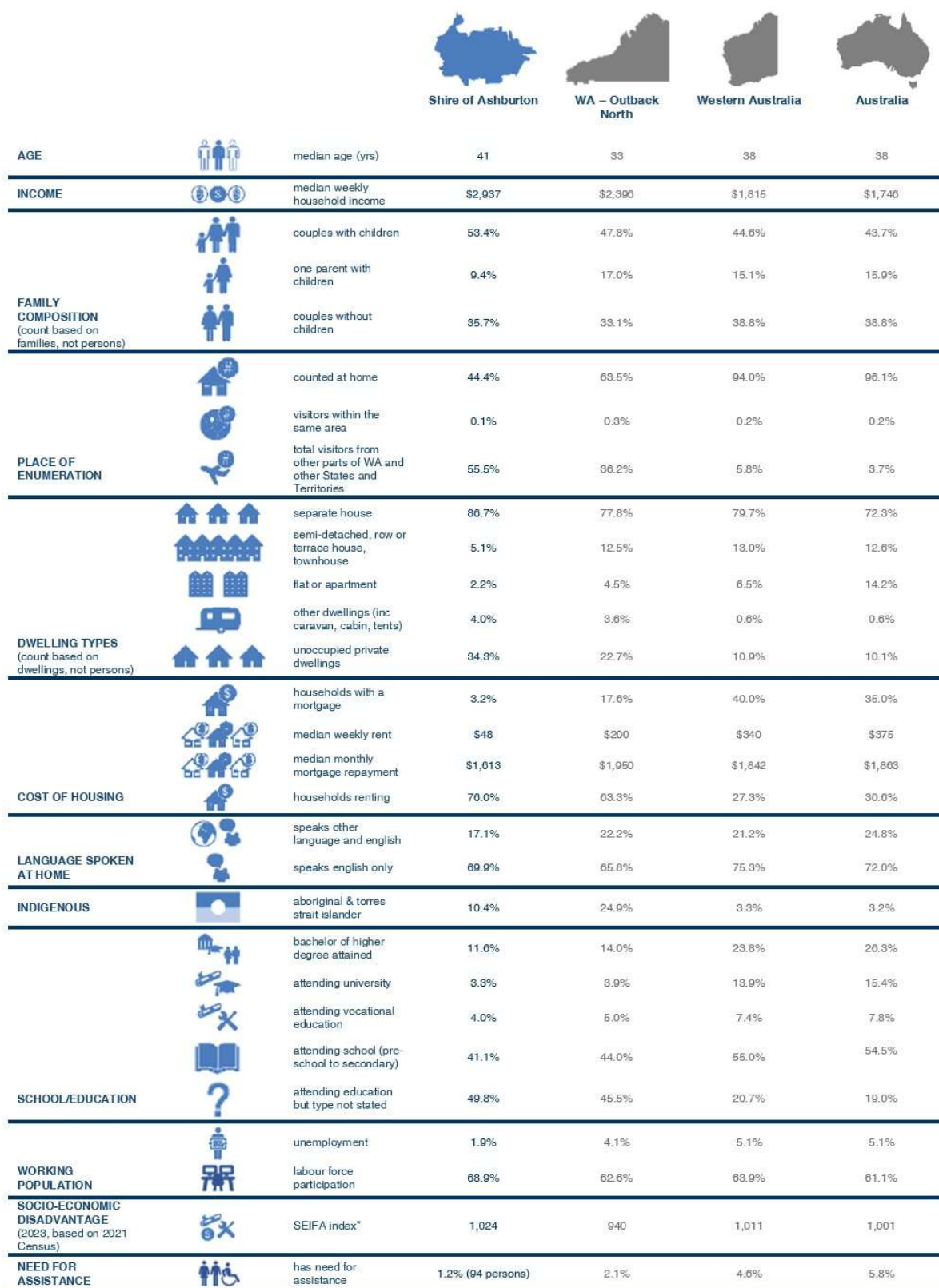


Figure 12 Overview of Shire of Ashburton Demographics (ABS, 2021)

5.1.1 POPULATION CHANGES

Table 11 shows population changes within the townsites between 2001 and 2021, based on 'Place of Usual Residence' data.

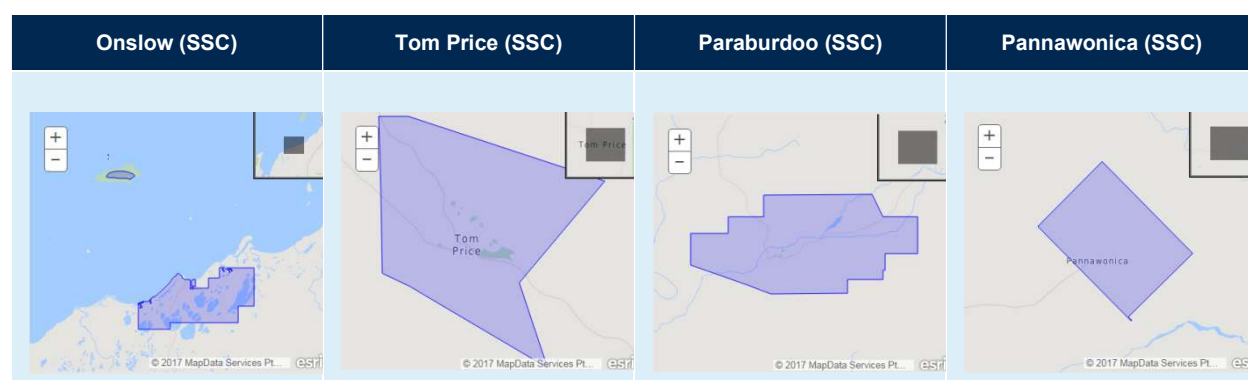
The data shows that population change within the townsites is relatively moderate, compared to the significant fluctuations experienced outside of the townsites. Predominantly, these fluctuations are due to temporary workers accommodation associate with resource projects.

Table 11 Population changes 2001 - 2021 (ABS, 2002), (ABS, 2007), (ABS, 2012), (ABS, 2016), (ABS, 2021)

POPULATION CHANGES BETWEEN 2001 AND 2021 - Basic Community Profiles, Place of Usual Residence													
ANNUAL AVERAGE GROWTH RATE - Based on a yearly annual growth rate between each census period													
Census Year	Onslow		Tom Price		Paraburdoo		Pannawonica		Townsites		Outside of Townsites		Whole of Shire
2001	815		2,370		1,207		632		5,024		613		5,637
2006	575	-42%	2,720	13%	1,605	25%	684	8%	5,584	10%	494	-24%	6,078
2011	666	14%	3,134	13%	1,508	-6%	652	-5%	5,960	6%	4,041	88%	10,001
2016	857	22%	3,005	-4%	1,380	-9%	695	6%	5,937	0%	7,089	43%	13,026
2021	829	-3%	2,910	-3%	1,324	-4%	685	-1%	5,748	-3%	1,643	-331%	7,391
Change 2001 - 2021	14	2%	540	19%	117	9%	53	8%	724	13%	1,030	63%	1,754
Average annual growth rate 2001 - 2021	0.1%		1.2%		0.6%		0.5%		0.8%		4.2%		1.6%

The following **Table 12** illustrates the spatial areas of the four townsites, as per the 2016 and 2021 Census.

Table 12 Census Areas for State Suburb Catchments as at 2016 and 2021 (ABS, 2021)



Townsite demand on housing accommodation can generally be attributed to the number of resource sector developments that have occurred within the Shire and the Pilbara region. This analysis is broken down further for each town:

- It is noted that the population of Onslow may substantially increase during high season to approximately 3,000-4,000 people (SoA, 2017). A number of new houses have been built as referred to in **section 5.4**. The construction of new homes has contributed to population growth within the townsites. As a consequence, the town service population is estimated at 1,160 people, with an estimated 850 permanent residents (AEC Group, 2016). The estimation of 850 residents is consistent with the 2016 census and 2021 census.

- Additional housing has been developed within the northern half of Tom Price. The Shire of Ashburton also initiated a rezoning of land within Area W to Residential in 2017 and 2018 by way of Amendments 27 and 31 to LPS 1. land areas were also identified in the *HotSpots Update* (WAPC, 2015).
- The population of Pannawonica has remained relatively stable, although Rio Tinto calculates the population to be approximately 800 people (Rio Tinto, 2015). It is understood that during 2009-2012, Rio Tinto refurbished all 230 houses within the town and upgraded community and commercial infrastructure (Rio Tinto, 2015).

5.1.2 AGE-SEX DISTRIBUTION

Coinciding with the influx of workers associated with the construction phase of the mining and resources sector, the ratio of males as a proportion of the Shire's population increased from 56% male in 2006, 65% male in 2011, to 72% in 2016. The proportion of males has since reduced to 58% in 2021, representing a near return to the split in population in 2006 (ABS, 2021). The age-sex population pyramid charts in **Figure 13** below show the dramatic ratio changes in the Shire's total population over the period between 2001 and 2021. When compared with the age-sex population pyramid data for Western Australia, the Shire exhibits a higher proportion of both females and males between the ages of 25 and 39. This proportion reduces comparatively for the population groups 65 years and older.

It would be strategically important to improve the balance in the male-female ratio closer towards the regional or State average, in order to improve the representation of both genders. Greater balance within the community would contribute to more long-term lifestyle choices (i.e. single people seeking partners could then choose to remain within the Shire).

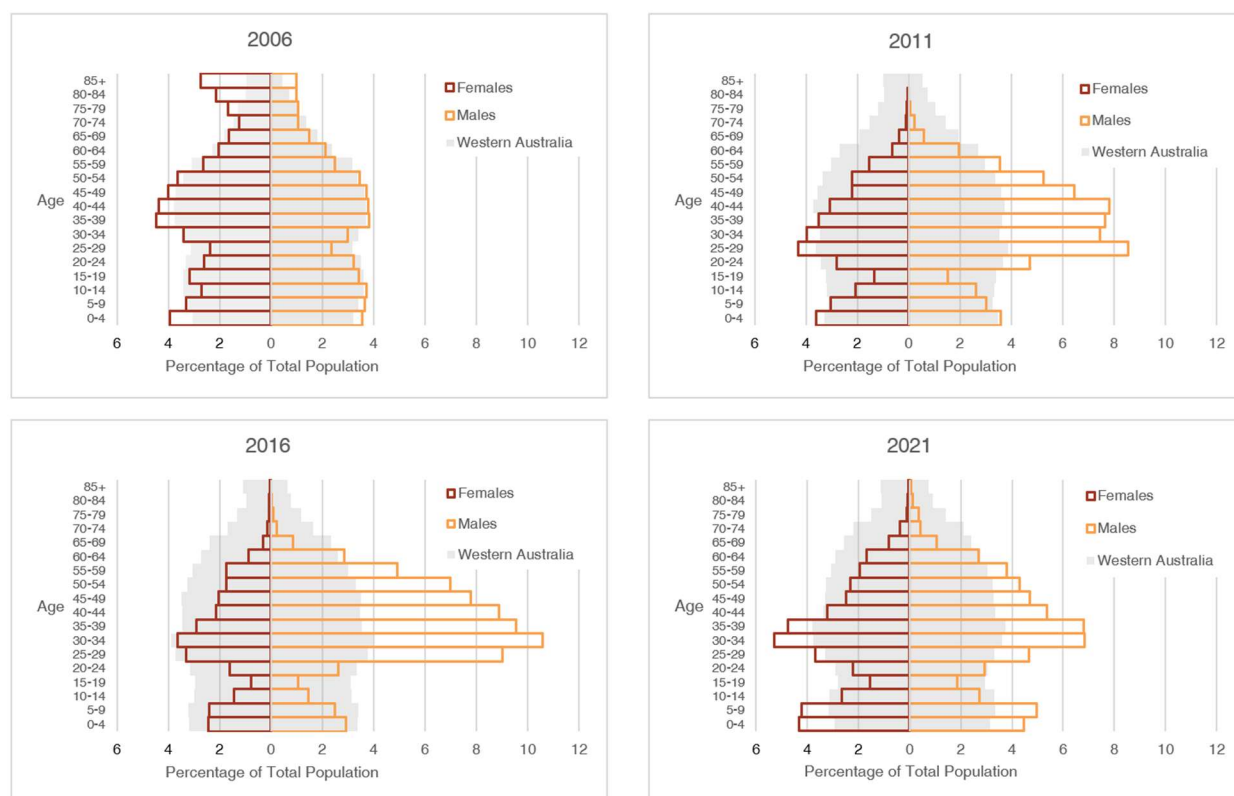


Figure 13 Population Pyramids 2006 – 2021 (ABS, 2021)

As discussed in **section 3.9.3**, the longer that people remain within the region the more likely they are to stay. This is particularly relevant to Onslow, which has a reasonably stable long-term population base when compared with other resource towns (AEC Group, 2016). It is important for the Shire and neighbouring local governments to focus on the attributes that not only attract people to stay (such as work) but to remain and age in place in a manner that enhances their own lives and their family formations (such as shopping, services, quality of life, social life, recreation, etc).

5.1.3 INDIGENOUS STATUS

Figure 14 illustrates the ratio of the population being of Aboriginal and Torres Strait Islander origin (REMPPLAN, 2017). The percentage of the population identified as Aboriginal and Torres Strait Islander was 9.3% in 2011 (Profile.id, 2016), 7.9% in the 2016 census, and 10.4% in the 2021 census (ABS, 2021). The data represents an increase of 348 Aboriginal and Torres Strait Islanders between the census periods of 2006 and 2011, and a further increase of 90 Aboriginal and Torres Strait Islanders between the 2011 and 2016 census periods. The number of Aboriginal and Torres Strait Islanders declined by 252 persons to 772 persons between 2016 and 2021, although, increased as a proportion of the Shire's total population. These changes are shown graphically in **Figure 14** below.

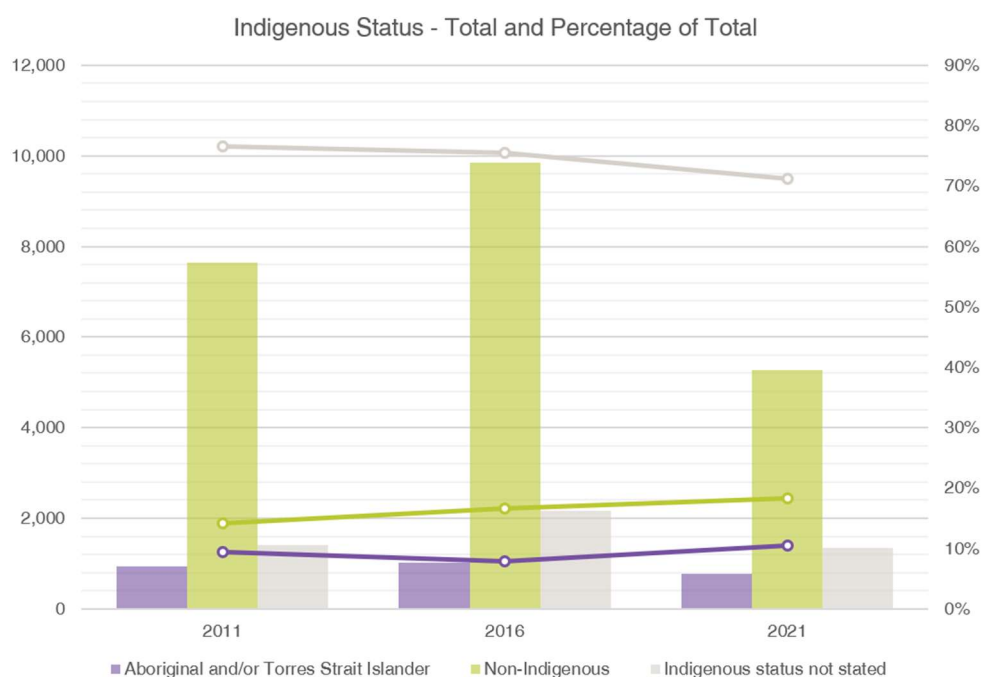


Figure 14 Indigenous Status, Shire of Ashburton (ABS, 2016) (ABS, 2021) (ABS, 2012)

Based on the 2021 census, the following number of Aboriginal and/or Torres Strait Islanders were counted for each town: Onslow – 121 (14.6%); Tom Price – 296 (10.2%); Parburdoo – 111 (8.4%); and Pannawonica – 45 (6.5%).

5.1.3.1 ABORIGINAL SETTLEMENTS

A Layout Plan for the Wakathuni settlement has been endorsed, however no layout plans have been endorsed or ratified for other Aboriginal Settlements within the Shire. None of the Aboriginal Settlements within the Shire are currently zoned 'Settlement' and under SPP 3.2, the 'Settlement' zone is to apply only communities where a layout plan has been endorsed or will be prepared. Consequently, the Ngurrawaana and Wakathuni communities will be zoned 'Settlement' in the new local planning scheme.

The following community populations have been made available from various sources (Hames Sharley, 2000) (SoA, 2017):

- Wakathuni – approximately 90 people and 26 houses. The Wakathuni Layout Plan indicates that approximately 10 dwellings will be needed over the life of the plan;
- Bindi Bindi – approximately 120;
- Bellary Springs (Innawonga) – approximately 50;
- Youngaleena Bunjima – approximately 50; and
- Ngurrawaana – approximately 30.

5.1.3.2 STATE GOVERNMENT ROADMAP TO REFORM

Since 2015, the State has reviewed and initiated several reforms to address the following challenges facing Aboriginal people in Western Australia, particularly within the regions:

- The scale/size and remoteness of Aboriginal communities;
- History of exclusion as communities were established in the colonial and Federation eras, and exodus of Aboriginal people from pastoral stations during the 1960s and homelands movement in 1970s;
- Living conditions and relationship to environmental health conditions;
- Impediments to self-determination due to land tenure and other limitations;
- Distance to markets, jobs, etc as a result of remote community locations; and
- *Ad hoc* and unmanaged delivery arrangements for key services.

The following reports and events provide an overview of these activities, and whilst not directly relevant to the preparation of a new local planning scheme, are important matters for Aboriginal people within the Shire.

- *Delivering Essential Services to Remote Aboriginal Communities, Auditor General, Government of Western Australia, May 2015* (OAG, 2015).

Following the end of Commonwealth funding for infrastructure and municipal services in remote aboriginal services in July 2015, the report was prepared to determine how the State could best take on the Commonwealth responsibilities and to blend them with its existing services to remote communities. The report reviewed the effectiveness and efficiency of the Remote Area Essential Services Program, and identified areas where the Program could be delivered better and more efficiently.

- *Resilient Families, Strong Communities – A roadmap for regional and remote Aboriginal communities, Government of Western Australia, July 2016* (State of WA, 2016).

A roadmap was prepared to set directions for reform to improve education opportunities, employment opportunities, childhood development, earlier intervention to help ‘at risk’ families, and to break the welfare trap. The roadmap set direction statements for reform and the five principles underpinning reform include:

1. Every child lives in a safe environment that nurtures early childhood development;
2. Every child receives an education to equip them to make life choices;
3. All adults can access training and employment or other purposeful occupation;
4. Aboriginal people can maintain links to country, culture and kin; and
5. Aboriginal people living remotely have certainty about the State Government’s framework for investing in remote communities.

- *Delivering Essential Services to Remote Aboriginal Communities – Follow-up, Auditor General, Government of Western Australia, June 2021 (OAG, 2021).*

This report reviewed the Department of Communities actions to improve the delivery of power, water and wastewater services to remote Aboriginal communities since the Auditor General’s 2015 report. The report found:

- Power and water supplies were more reliable, wastewater services were more consistently monitored, and more communities had consistently safe water supplies.
- But 37 communities we looked at in 2015 still had water that did not meet Australian Drinking Water Guidelines and in 44 of the smallest communities (all formerly Commonwealth managed) the water is not being tested for microbes and may pose health risks.
- Better service coordination had begun in 10 communities however the report identified further improvement opportunities in governance and procurement practices of the Department.

5.2 OBSERVED POPULATION GROWTH TRENDS

5.2.1 PILBARA REGIONAL POPULATION GROWTH TRENDS

The Pilbara regional population grew by 24% from 49,413 people in 2006 to 61,539 people in 2016, peaking in 2013 with 65,062 people and then declining between 1.13-2.43% per year between 2013 and 2016. The declining trend continued through to 2021, though reversed into 2022 where the Pilbara regional population is estimated as being 58,904 (REMPPLAN, 2023).

Figure 15 demonstrates the population change for the four local government areas within the Pilbara region (Ashburton, East Pilbara, Port Hedland and Karratha) over the 10-year period between 2012 and 2022. It is notable that the high rate of population growth experienced in the Shire of Ashburton prior to 2016 reversed dramatically from 2017 to 2021, coinciding with the end of the construction phase of large resource projects in the Shire.

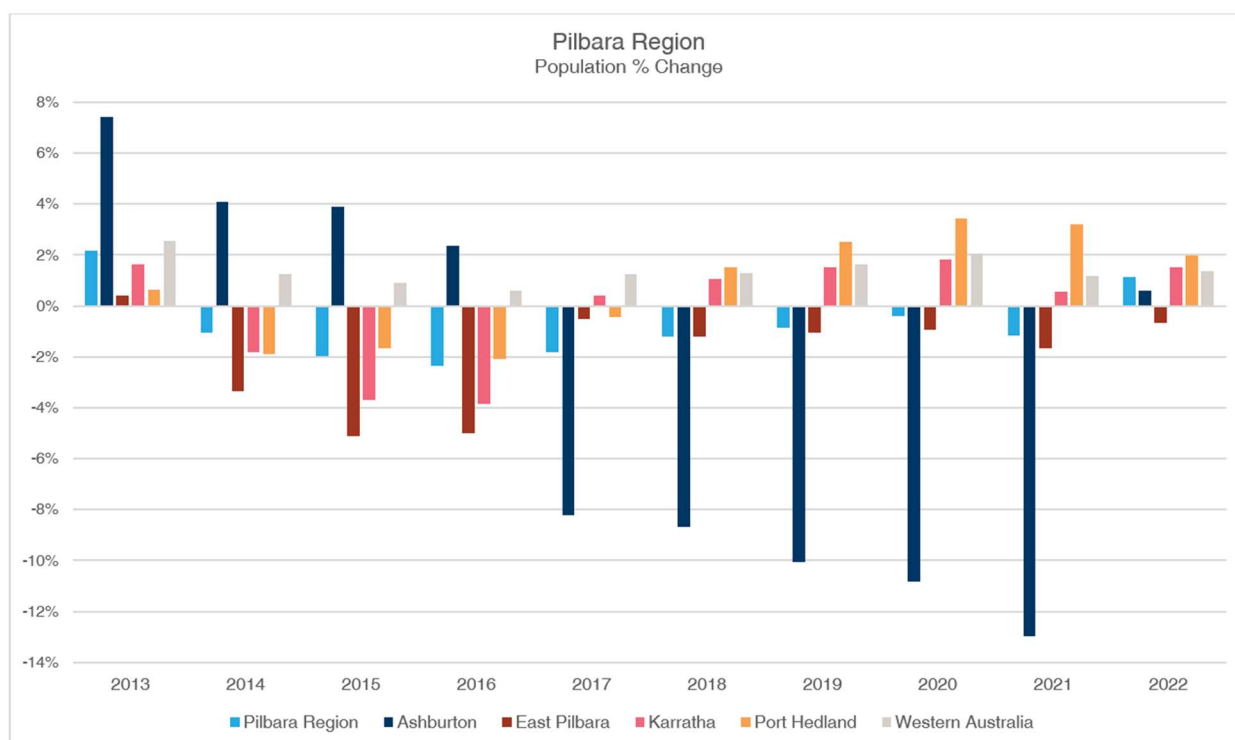


Figure 15 Population % Change by Local Government Area, 2012-2022 (REMPPLAN, 2023)

The *Pilbara Regional Investment Blueprint* sets what it calls an aspirational yet achievable population target of 200,000 by 2035, an increase of 135,000 people across the region. Focus will be on Port Hedland, Karratha and Newman, although the *Blueprint* does not intend to specify population growth targets for towns or cities. Instead, other cities and towns (such as Tom Price, Paraburdoo and Onslow) would also grow in a sustainable manner that ensures that communities can develop in a socially cohesive manner with the appropriate availability and access to necessary services, employment opportunities, and housing choice.

5.2.2 ASHBURTON LOCAL GOVERNMENT POPULATION GROWTH TRENDS

Census data provides interesting insight into the population growth trends for the Shire. The census between 2006 and 2016 identifies that there has been a higher trend of people living at different addresses (1 year ago and 5 years ago), implying a somewhat migratory population. However, when compared against the 2021 Census data, **Figure 16** shows across a general trend of more people being in their address of 1 or 5 years ago across the three census dates, and particularly shown in the Western Australian data. Between 2016 and 2021 the proportion of the Shire's population who lived at a different address decreased considerably, from 82.3% to 69.9%.

There is a noted reduction of employment in the mining industry (a trend representative across Australia), which would attribute to population stabilisation and population migration. Given the strong relationship between town population and mining activity, there has been a marked reduction on housing demand and population growth. This can be observed through significant drops in property values (refer **section 5.4.3**).

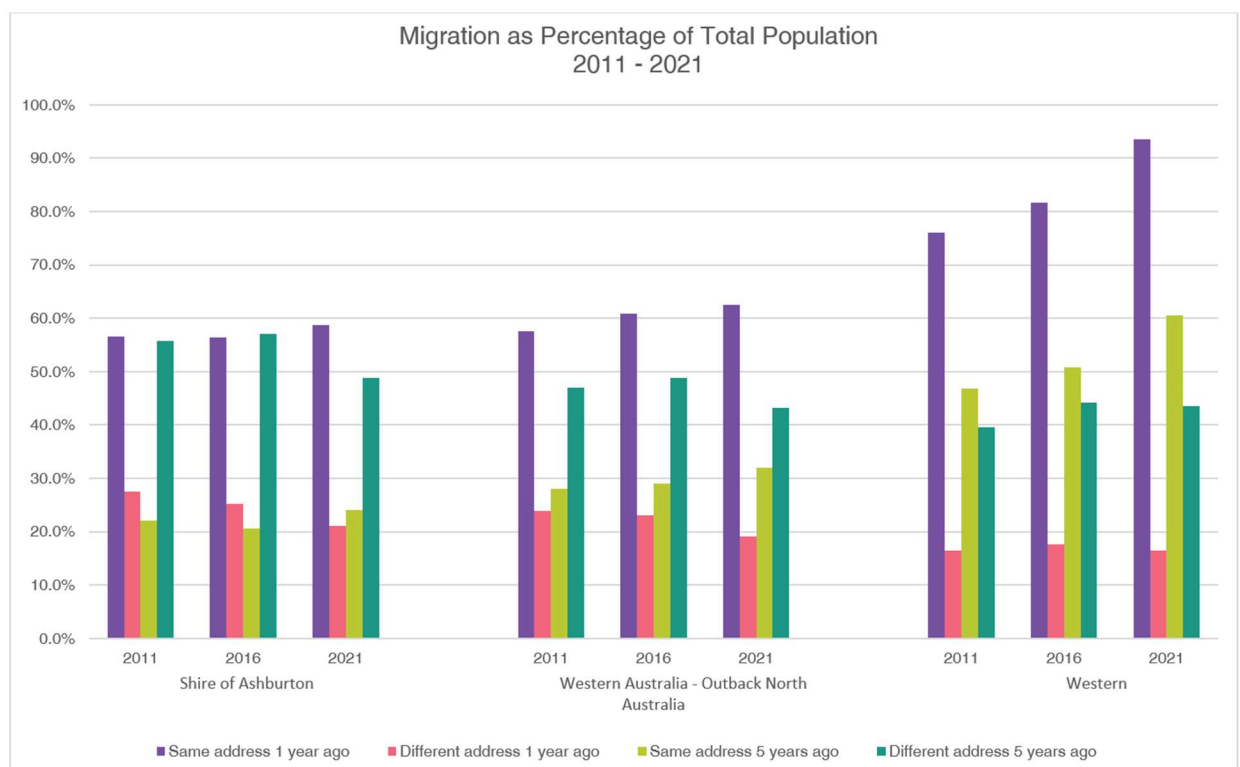


Figure 16 Population Migration 2011 – 2021 (ABS, 2021)

Population growth has been brought on by housing demand as a result of the eight-year period of increased activity within the mining and oil and gas industry sectors. Whilst the data may be slightly different, both the REMPLAN and ABS information supports the inference that future population growth is likely to be directly impacted by the growth or contraction of commodity economic performance. The size of the employment sector of mining, oil and gas sectors will continue to play a role in population growth across the townsites and the region.

As discussed in **Chapter 6**, diversification of the economy can help strengthen the population and provide more of a buffer against changes in the mining and oil and gas industry sectors. As a greater number of occupations could be introduced across a wider range of sectors, this can help create with the permanency and resilience of the population. This also links to the opportunities to improve on liveability factors and other issues that, if promoted, can contribute to people deciding to settle within the Shire. Such areas of focus can be in safety; health and wellbeing; education and training; lifestyle; sense of community; and community connectedness.

5.3 POPULATION GROWTH FORECASTS

The ANSIA in particular was expected to treble Onslow's population between 2011 and 2016 (Creating Communities, 2011). The State Government has gazetted the ANSIA Improvement Scheme No. 1, which considers construction and operational 'Workforce Accommodation' to be located within the ANSIA. Operational workforce within ANSIA will have a bearing on population growth in Onslow. The approval for Chevron Australia's operational workforce to be housed in the Wheatstone Construction Village for the next 15 years, rather than in Onslow, has potentially negated the need for additional housing stock. Through the ability for operational workforce to reside within the ANSIA, pressure for housing in Onslow would subside.

Mineral Resources is constructing a 412-room workforce accommodation facility at Lot 300 Back Beach Road, Onslow, with an expected opening date mid-2024. Whilst providing primarily for FIFO workers, the facility is designed as a 'resort-style accommodation village', including accommodation for couples and families, as well as allowing public access to some of the facility's amenities. Mineral Resources also intends to build 10 four-bedroom houses in Onslow *"to attract more families to relocate to the town and become a part of the community."* (MRL, 2022)

Growth in Tom Price, Paraburdoo and Pannawonica is largely governed by the level of activity within the mining industry. Current forecasts indicate that growth is likely to be limited to infill development and small green field site developments within and around the existing township footprints.

Limited population growth has been anticipated in Paraburdoo and Tom Price. Notwithstanding, investigations suggest that there is the ability for infill housing within both townsites, as well as opportunities for expansion of the urban footprint within the gazetted townsite boundaries. Paraburdoo and Tom Price population growth is largely dependent on accommodation demand for Rio Tinto's workforce.

5.3.1 WA TOMORROW POPULATION FORECASTS (2019)

WA Tomorrow is a series of population forecasts based on historical trends. The forecasts represent the best estimate of future population size if trends in fertility, mortality and migration continue. The first publication of the Local Planning Strategy was based upon the population projections of *WA Tomorrow Population Report No. 10* (WAPC, 2015) which contained the population forecasts by age and sex, and represented the official State Government forecast for the years 2014-2026. In August 2019, the State Government published *WA Tomorrow Population Report No. 11* (WAPC, 2019) which forecasts population growth from 2016-2031. This section has been updated to reflect the State Government's most recent population forecast, however it should be noted that the forecast was prepared prior to the 2021 Census. As highlighted earlier, the Shire of Ashburton experienced a considerable decrease in population between 2016 and 2021 Census dates, which has not yet been reflected in official population projection documents. The following population forecasts should therefore be treated cautiously, and the Local Planning Strategy updated once official forecasting is published that incorporates 2021 Census data.

WA Tomorrow consists of five bands of forecasts (bands A to E). As the Strategy does not wish to favour one any particular probability of population growth, Band C is selected as the strategic scenario. 'Band C' represents the median forecast and represents a stable pattern of growth. The *WA Tomorrow* forecasts do not take into account unforeseen events that may change trends, such as significant shifts in government policy, significant economic shifts, natural disasters and epidemics.

5.3.1.1 PILBARA REGION 'BAND C' POPULATION TRENDS

The following **Table 13** provides a comparison between the Band C growth projections for the Shire of Ashburton, the Pilbara Region, and Western Australia. The population growth projections are based on the average annual growth rates, refer **Table 15**. The data demonstrates that over the next 15 years, the Shire's population will slightly decrease ~~increase~~ as a percentage share of the regional population.

Table 13 Medium Term Population Characteristics 2016 to 2031 (WAPC, 2019) (WAPC, 2015)

Year	BAND C		
	Shire of Ashburton Population (% of Regional Population)	Pilbara Region Population (% of WA Population)	Western Australian Population
2016	13,205 (21.5%)	61,340 (2.4%)	2,559,000
2021	12,975 (21.4%)	60,510 (2.2%)	2,720,000
2021 (ABS Census)	7,391 (15.6%)	47,427 (1.8%)	2,660,026
2026	13,170 (21.1%)	62,510 (2.1%)	2,980,000
2031	13,270 (20.8%)	63,870 (2.0%)	3,252,000

5.3.1.2 SHIRE OF ASHBURTON 'BAND C' POPULATION TRENDS

The following **Figure 17** indicates the population forecast from 2016-2031, showing Bands A – E projections contained in *WA Tomorrow* (WAPC, 2019) (WAPC, 2015). This represents population growth of 65 people over the 15 year period, using the Band C projection.

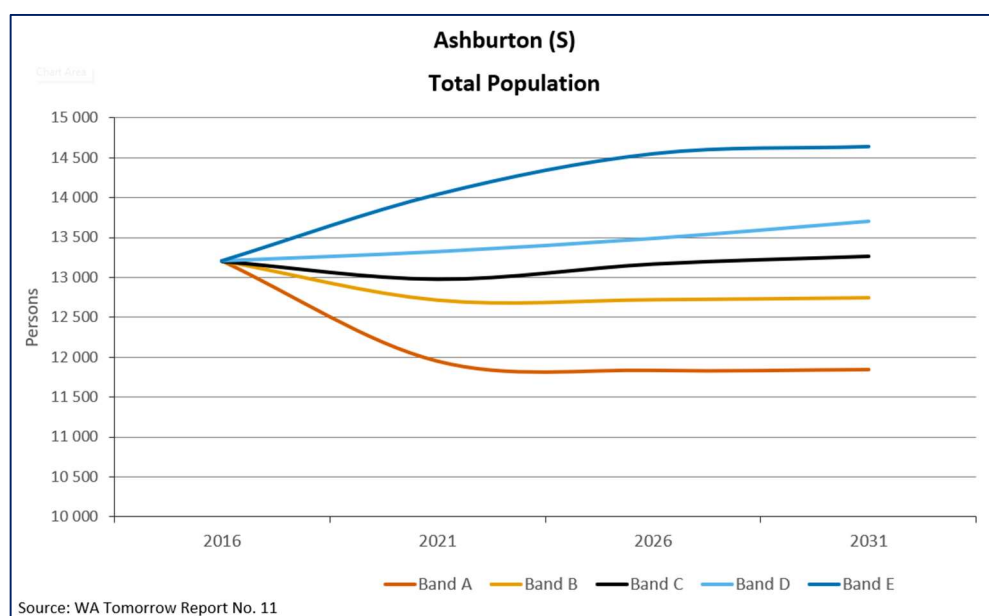


Figure 17 WA Tomorrow Population Projection, Shire of Ashburton (WAPC, 2019)

The Band C annual average growth rates are demonstrated in **Table 14**. These rates are also much higher than the latest trends from 2013-2015 (ABS, 2017); however, the Band C annual average growth rate is also far lower than the rates of growth experienced during 2005-2013.

Table 14 Average Annual Growth Rates (Band C) (WAPC, 2019) (WAPC, 2015)

BAND C – AVERAGE ANNUAL GROWTH RATE			
Year	Shire of Ashburton	Pilbara Region	Western Australia
2021	-0.35%	-0.27%	1.23%
2026	-0.03%	0.19%	1.53%
2031	0.03%	0.27%	1.61%

The AEC Group compiled a range of population projections and generated Population Projections (excluding visitors) for Onslow, Tom Price and Paraburdoo (including in-town Operational FIFO). These are summarised in **Table 15**.

Table 15 Population Projections (Exc. Visitors), Onslow, Tom Price, Paraburdoo.
Sources: (AEC Group, 2015) (AEC Group, 2016)

Year Ending	Onslow		Tom Price		Paraburdoo		Total
	Residents	In Town Operational FIFO	Residents	In Town Operational FIFO	Residents	In Town Operational FIFO	
2013	750	100	3,400	660	1,600	400	6,910
2014	770	140	3,430	660	1,600	400	7,000
2015	1,030	220	3,460	660	1,610	400	7,380
2016	850*	150*	3,480	660	1,610	400	7,150*
2017	970*	170*	3,500	660	1,600	400	7,300*
2018	1,000*	150*	3,520	660	1,600	400	7,330*
2019	1,010*	150*	3,540	660	1,590	400	7,350*
2020	1,030	130	3,540	660	1,580	400	7,340
2021	1,020	130	3,550	660	1,570	400	7,330

2022	1,020	130	3,550	660	1,560	400	7,320
2023	1,010	130	3,550	660	1,550	400	7,300
2024	980*	140*	3,550	660	1,540	400	7,270*

Note: * indicates projections from (AEC Group, 2016); remainder of projections from (AEC Group, 2015).

5.3.2 WORKFORCE ACCOMMODATION

Companies have increasingly taken advantage of air travel to use FIFO workforces in lieu of establishing new towns or settlements within the local government area. Advances in technology and cost advantages to industry have led to a substantial proportion of the district population being within workforce accommodation, which based on the 2016 census appears to be up towards 55%. At a national level, there was an 11-year growth period (2001-2012) for employment in mining, with the industry tripling in its workforce size and peaking in May 2012 (ABS, 2016). The sector then experienced a contraction of 18% between May 2012 and May 2015.

An interesting component of the 2016 Census is the count of 12,671 persons (excluding overseas visitors) within the Shire of Ashburton. This represents 51% of the total number of persons counted on census night in the Shire. Whilst the count would also include visitors visiting the area for tourist or non-work related purposes, it is evident in Table 16 that there are a significant number of people aged between 25-64 years visiting from Queensland and other parts of Western Australia. The seven bolded bands in Table 16 below equate to 9,223 persons or 72.8% of all visitor.

Table 16 Place of Usual Residence of Visitors on Census Night (by age) (ABS, 2016)

Visitors Counted	0-14 yrs	15-24 yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65-74 yrs	75+ yrs	Total
From Shire of Ashburton	0.03%	0.06%	0.24%	0.21%	0.15%	0.11%	0%	0%	0.8%
NSW	0.11%	0.24%	1.66%	1.51%	1.82%	1.19%	0.77%	0.15%	7.4%
Victoria	0.14%	0.13%	1.37%	1.14%	1.38%	1.18%	0.60%	0.18%	6.2%
Queensland	0.05%	0.51%	3.45%	4.07%	3.80%	2.30%	0.47%	0.05%	14.7%
South Australia	0%	0.05%	0.58%	0.81%	0.78%	0.51%	0.24%	0.02%	3.0%
Western Australia	0.37%	2.73%	18.68%	17.20%	15.93%	9.66%	1.77%	0.37%	66.8%
Tasmania	0%	0%	0.12%	0.16%	0.18%	0.11%	0.02%	0%	0.6%
Northern Territory	0%	0.03%	0.08%	0.07%	0.09%	0.06%	0.03%	0.02%	0.4%
ACT	0%	0%	0%	0.06%	0%	0.02%	0.06%	0%	0.2%
Total Visitors	0.71%	3.67%	26.21%	25.18%	24.17%	15.16%	4.03%	0.81%	51.0%

Table 17 provides the same analysis based on the 2021 Census for the 8,578 visitors within the Shire. This number represents 56% of the total number of persons counted on census night in the Shire – a moderate proportional increase from 2016 (51.0%). Similar to the 2016 Census data, there are a high number of people aged 25-64 years visiting from Queensland and other parts of Western Australia. The seven bolded bands in **Table 17** below total 5,371 persons, or 62.6% of all visitors.

Table 17 Place of Usual Residence of Visitor on Census Night (by age) (ABS, 2021)

Visitors Counted	0-14 yrs	15-24 yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	65-74 yrs	75+ yrs	Total
From Shire of Ashburton	0.03%	0.06%	0%	0.03%	0.05%	0%	0%	0%	0.06%
NSW	0.23%	0.05%	0.38%	0.68%	0.47%	0.86%	0.63%	0.12%	1.99%
Victoria	0.15%	0%	0.15%	0.36%	0.63%	0.73%	0.93%	0.07%	1.65%
Queensland	0.10%	0.12%	0.43%	0.87%	1.05%	0.97%	0.36%	0.20%	2.30%
South Australia	0.22%	0%	0.28%	0.42%	0.51%	0.41%	0.41%	0%	1.21%

Western Australia	0.78%	5.01%	18.45%	17.13%	19.42%	15.59%	7.59%	1.98%	47.76%
Tasmania	0.07%	0%	0.12%	0.10%	0.2%	0.12%	0.05%	0%	0.34%
Northern Territory	0.06%	0%	0.09%	0%	0.06%	0.07%	0.05%	0%	0.17%
ACT	0.03%	0%	0%	0%	0%	0%	0%	0%	0.05%
Total Visitors	1.70%	5.26%	19.96%	19.65%	22.39%	18.79%	9.89%	2.33%	55.57%

The following numbers in

Table 18 help to identify where enumerated residents and visitors were counted in the 2016 Census and 2021 Census. It is assumed that some respondents have replied in workforce accommodation such as in Talandji (where Wheatstone is located), Mount Sheila (the locality surrounding Tom Price), and Barrow Island. As such, whilst the census picks up population growth, this may be more likely due to respondents being 'counted at home' whilst being in workforce accommodation.

Table 18 Enumerated Population Figures (ABS, 2016) (ABS, 2021)

Locality	Counted at home on Census Night		Visitors		Total Private Dwellings (and people)	
	2016	2021	2016	2021	2016	2021
Barrow Island	1,823	39	3,777	255	0 (3 people)	0 (0 people)
Cane	3	5	9	13	0 (0 people)	0 (5 people)
Chichester	18	40	30	144	3 (10 people)	0 (0 people)
Fortescue	44	183	18	579	14 (30 people)	18 (28 people)
Hamersley Range	N/A	196	N/A	611	N/A	0 (0 people)
Innawanga	13	4	29	11	3 (8 people)	0 (4 people)
Juna Downs	224	0	463	35	0 (0 people)	0 (0 people)
Karjini	33	39	466	269	12 (26 people)	23 (34 people)
Millstream	17	5	96	90	8 (14 people)	5 (11 people)
Mount Sheila	1,004	782	1,613	2,522	0 (0 people)	10 (17 people)
Mulga Downs	159	14	162	9	8 (21 people)	8 (11 people)
Nanutarra	68	37	234	230	16 (30 people)	20 (34 people)
Onslow	748	789	404	747	440 (717 people)	445 (662 people)
Pannawonica	644	620	301	147	270 (564 people)	111 (131 people)
Paraburdoo	1,274	1,182	468	486	637 (1,148 people)	518 (816 people)
Peedamulla	11	15	0	59	5 (11 people)	6 (20 people)
Rocklea	272	152	271	1,138	41 (110 people)	42 (98 people)
Talandji	3,098	77	3,682	346	0 (4 people)	12 (24 people)
Tom Price	2,724	2,673	590	834	1,209 (2,545 people)	1,177 (2,388 people)
Wittenoom	11	0	36	0	10 (9 people)	-
Yannarie	8	14	37	66	0 (0 people)	3 (10 people)
ASHBURTON	12,195	6,859	12,671	8,578	2,675 (5,253 people)	2,401 (4,286 people)

Transient Worker Accommodation in the Pilbara was prepared by the Pilbara Development Commission (PDC, 2012) to investigate the extent of workforce accommodation within the Pilbara. The report identified an additional 7,587 beds for the Shire of Ashburton during 2012-2015, with the Wheatstone Construction Camp (now constructed) comprising the main component of the growth. Workforce campsite locations identified within the Shire of Ashburton are documented in **Table 19**. It is understood that the number of beds at the Wheatstone Camp has reduced to circa 4,500.

The report notes the complication of assessing the number of workforce accommodation beds, due to private homes, hotels and caravan parks also historically serving the mining sector (PDC, 2012). As such, it anticipates that workforce accommodation numbers are higher than what the report portrays. This also appears to be reflected in the 2016 ABS Census, which identified a high number of visitors in localities that have large camps (Barrow Island, Talandji, Mount Sheila).

Table 19 Shire of Ashburton Transient Workforce Accommodation Listing (SoA), (PDC, 2012), (AEC Group, 2016)

Name	Number of Beds (2011)	Projected Number of Beds (2012-2015)	Notes
Apache Varanus		181	Apache Energy
Beadon Bay	98		Beston Parks Land Co Pty Ltd
BGC Mobile Camp	48		BGC
Barrow Island	50	3,300	Chevron Australia Pty Ltd
Blacksmith		20	Flinders Mining
Bonnie Doon	100	90	Fortescue Metals Group
Brockman 2 / Nammuldi	386		Rio Tinto
Brockman 4	1,200		Rio Tinto
Brolga		332	Chevron Australia Pty Ltd
Compressor Station Accommodation	14		
Cowra	320		BHP Billiton
Delphine		60	Fortescue Metals Group
Eliwana		70	Fortescue Metals Group
Jundunmunnah	522	178	Rio Tinto
Juna Downs	100		Rio Tinto (Hamersley Iron)
Kirri Kulli	118		Rio Tinto
Macedon Construction Camp	350		BHP Billiton sold to Chevron Australia Pty Ltd
Koodaideri	48		Rio Tinto
Mackerel (Ashburton Resort Hotel)	41	25	
Marandoo FIFO	244		Rio Tinto
Marandoo Minesite	863		Rio Tinto
Mesa A	800		Rio Tinto
Mt Elvira Camp	20		Australian Premium Iron Joint Venture
Mt Minnie		57	WA Limestone
Pannawonica Tavern (inc Camp David)	251		Rio Tinto
Paulsens Gold Project	187		Northern Star Resources Ltd
Rocklea Palms	433	84	Rio Tinto
Silver Grass	90		Rio Tinto
Solomon Camp Castle	500		Fortescue Metals Group
Solomon Camp Kangi		1,768	Fortescue Metals Group
Solomon Camp Dally		986	Fortescue Metals Group
Ti Tree	50		Rio Tinto
Turbridgi Camp	14		DBP Development Group Pty Ltd
Wandoo Housing Project Village	141		Rio Tinto (Robe River Mining Co Pty Ltd)
Tom Price Camp (Construction)	400		Rio Tinto
WA Oil		100	Chevron Australia Pty Ltd
Weelamurra Camp	120		Hope Downs Joint Venture (Hamersley WA Pty Ltd and Hope Downs Iron Ore Pty Ltd)

Name	Number of Beds (2011)	Projected Number of Beds (2012-2015)	Notes
Wheatstone Construction Camp	8,794		Chevron Australia Pty Ltd BHP has ability to use a camp at Macedon until 31 December 2018. Future accommodation would be within the 'Special Use No. 1' and 'Workforce Accommodation' zones, refer section 3.6 .
Windawarri	250		Rio Tinto information indicates 458 rooms
West Pilbara Iron Ore Project (Cardo Camp)	50	1,000	Australian Premium Iron Joint Venture
Yandi		1,500	BHP Billiton
Yarri		68	Yarri Mining Pty Ltd
TOTAL	16,602	9,638	

The PDC report was prepared at a time where the Pilbara region was experiencing a construction boom; and a doubling of the Pilbara workforce was expected around the approximate time of the report being published (PDC, 2012). In contrast, a number of construction projects within Ashburton have been transitioning into operational phases, particularly within the ANSIA (Macedon, Wheatstone and Port of Ashburton). Therefore, and without significant projects entering a construction phase, overall workforce accommodation numbers are likely to progressively decline.

An ongoing issue raised is the limited consideration of legacy benefits for Pilbara communities from major resources projects. Opportunities are available to local governments in the Pilbara Region, through focussing on policy and scheme provisions that encourage workforce accommodation to be integrated into existing townsites. The local governments have the ability to apply scheme provisions and local planning policies/design guidelines to address issues such as workforce integration with towns, utility infrastructure, and time limits on developments (PDC, 2012).

5.3.2.1 FUTURE TRENDS IN FIFO WORKFORCE

FIFO will still be required to service off-shore and mine sites, so it is reasonable to assume that FIFO will remain as an important employment sector for the foreseeable future. FIFO enables the flexibility for companies to have staff on-site at short notice and for brief periods of time. It is also noteworthy that whilst construction workforces tend to be large and project-related, operational workforces can be small and therefore may be more reasonably expected to be accommodated within established towns. This holds true given that towns such as Tom Price, Paraburdoo and Pannawonica have existed as a direct result of providing housing for operational workforce.

The Council does not support FIFO as it considers that this leads to a loss of economic and social value to the Shire, and the regional area as a whole. The Council does acknowledge that there will be circumstances such as remoteness and limited life of a particular project (mining or industrial activity) that would result in a need for workforce accommodation camps to be established.

FIFO workers (i.e. predominately male, aged 25-45) tend to be from the demographic cohort that is at a higher risk of mental health issues and suicide. It is also important that the industry consider the vulnerability of its workforce to the additional stresses of FIFO work practices on a person.

The Education and Health Standing Committee's report on the impact of FIFO work practices on mental health (Parliament of Western Australia, 2015) held concern that FIFO work systems can become normalised work practices and can reduce the possibility of workers being able to choose between FIFO and a residential option, where such an option could be available. In this regard, the four towns (Onslow, Pannawonica, Paraburdoo and Tom Price) all provide residential accommodation options of varying type (i.e. relocatable dwellings, motel style accommodation, residential buildings, and houses). Optimising town sites for housing workers and their families is considered to be a more appropriate alternative to the development of campsites for operational/longer-term workforce requirements.

The Shire remains committed towards integrating workforce with towns. There are benefits for local communities and FIFO workforce. The location of the four townsites near major industrial developments (such as mine sites and the ANSIA) provides reasonable opportunities for operational workforce to reside within towns and not in camps.

5.4 HOUSING CHARACTERISTICS

The estimated housing supply within the four townsites is as follows (AEC Group, 2015), (AEC Group, 2016) & (Rio Tinto, 2015):

- Onslow – 495 dwellings, including 68 recently constructed in Barrarda Estate (ABS 2016 census indicated 440 private dwellings);
- Tom Price – 1,300 dwellings (ABS 2016 census indicated 1,209 private dwellings);
- Paraburdoo – 325 dwellings (ABS 2016 census indicated 637 private dwellings); and
- Pannawonica – 230 dwellings (ABS 2016 census indicated 270 private dwellings);

Across the Shire, in 2016 nearly two thirds of households are renting, compared with only a third of houses in regional WA and 28% across WA (Figure 18). In contrast, only 3% of households had a mortgage, compared with 27% of regional WA and 36% of WA (Profile.id, 2016). This is fairly representative of the extent of houses owned by Rio Tinto in Pannawonica, Tom Price and Paraburdoo, company-owned houses in Onslow, and company-operated camps.

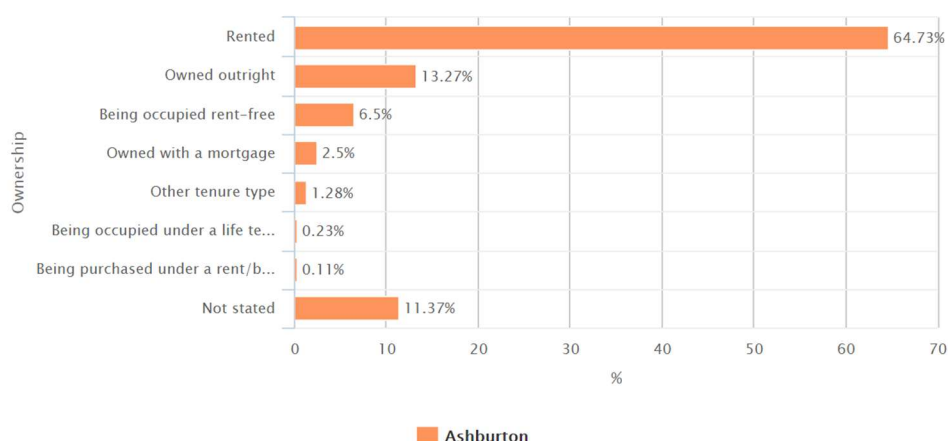


Figure 18 Housing – Tenure, Ashburton, 2016 (REMPPLAN, 2017)

In 2021, the proportion of dwellings rented had decreased to 52.5%, whilst the proportion of dwellings owned outright had increased to 20.9% (**Figure 19**). The proportion of dwellings owned with a mortgage was similarly low to the 2016 figure of around 3%.

Ashburton

Ownership

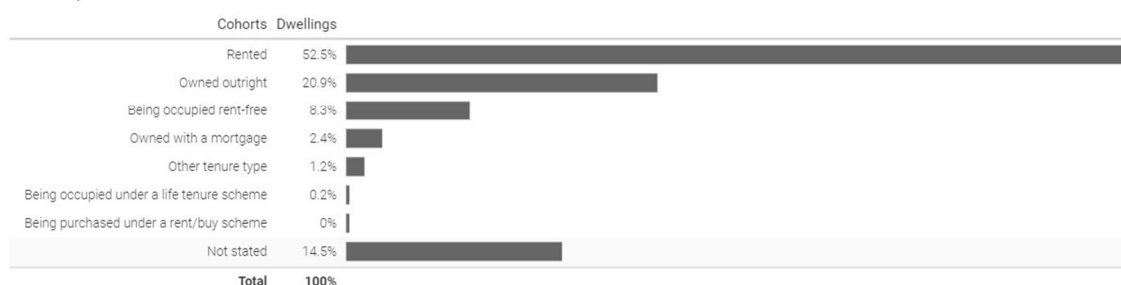


Figure 19 Housing – Tenure, Ashburton, 2021 (REMPAN, 2021)

Figure 20 illustrates the extent of non-private dwellings to occupied private dwellings within the Shire of Ashburton in 2021 (REMPAN, 2023).

Ashburton

Dwelling Type

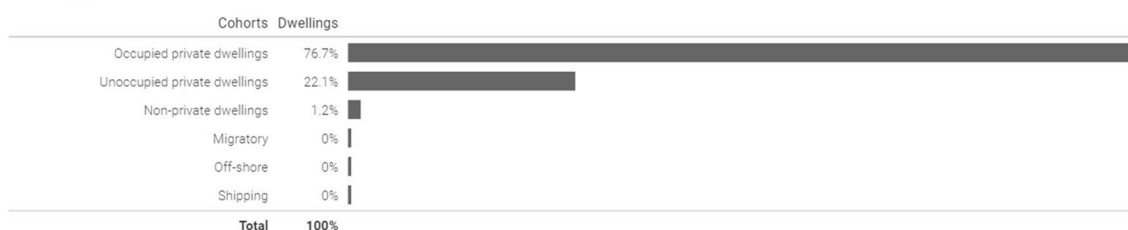


Figure 20 Housing – Dwelling Type, Ashburton (REMPAN, 2021)

5.4.1 HOUSING TRENDS

The *Pilbara Planning and Infrastructure Framework* (WAPC, 2012) considered a future regional demand for an additional 35,430 homes, although most of these would be within Karratha, Port Hedland and Newman. However, the report considers the new housing demand will mean more apartments, townhouses and other forms of medium and higher density living.

In 2015 and 2016, the AEC Group analysed dwelling demand, summarised for the three towns in

Table 20 as 'unmet demand'. It identified the demand projections from the perspectives of:

- **Social housing** – public housing generally provided by the Department of Communities;
- **Government Regional Officers' Housing (GROH)** – housing for Government Regional Officers including teachers in primary and secondary school roles, nurses, police officers, and fire-fighters;
- **Service Worker Accommodation** – someone who provides a service to the community but excludes GROH occupations, but tends to encompass broader occupational groups between low-moderate and moderate-income brackets, i.e. sales/shop assistants, general clerical workers, cleaners and laundry workers, community and personal service workers; and
- **Other housing.**

Table 20 Apparent and Latent Dwelling Demand Projections, Onslow, Tom Price, Paraburdoo.
Sources: (AEC Group, 2015), (AEC Group, 2016)

Type	Number of Dwellings		
	Onslow	Tom Price	Paraburdoo
Social Housing	1 x 1 BR unit 8 x 2 BR detached 3 x 3 BR detached	4 x 1 BR units 2 x 2 BR detached/units 3 x 3 BR detached	3 x 1 BR units 1 x 2 BR detached 1 x 3 BR detached
Government Regional Officers' Housing	1 x 4 BR detached	3 x 2 BR units 1 x 3 BR detached	1 x 3 BR detached 2 x 4 BR detached
Service Worker Accommodation	6 x 2 BR detached 6 x 3 BR detached	10 x 2 BR detached/units 10 x 3 BR detached	Nil
Other Housing	16 x 1-2 BR units 50 x 3-4 BR detached	4 x 1 BR units 4 x 2 BR detached/units 8 x 3 BR detached 2 x 4 BR detached	2 x 1 BR units 4 x 2 BR detached 6 x 3 BR detached 4 x 4 BR detached
Total	30 x 1-2 BR units 60 x 3-4 BR detached <i>90 total dwellings</i>	8 x 1 BR units 19 x 2 BR detached/units 22 x 3 BR detached 2 x 4 BR detached <i>51 total dwellings</i>	5 x 1 BR units 5 x 2 BR detached 8 x 3 BR detached 6 x 4 BR detached <i>24 total dwellings</i>
Total for all Towns (Onslow + Tom Price + Paraburdoo)	67 x 1-2 BR units 98 x 3-4 BR units 165 total dwellings		

Housing supply is potentially addressed in all towns as follows:

- Onslow: Barrarda Estate – provides 210 lots as a first stage of the estate. 68 dwellings are constructed;
- Paraburdoo: vacant lots – approximately 41 lots are available for housing;
- Tom Price: vacant lots – approximately 46 lots are available for housing. A number of lots may be large enough to accommodate grouped or multiple dwelling development.

5.4.2 REGIONAL HOTSPOTS LAND SUPPLY UPDATES – NEWMAN AND TOM PRICE

The *Regional HotSpots Land Supply Update* (WAPC, 2015) provides detailed information in relation to land development and infrastructure constraints and opportunities for Tom Price. The WAPC updated Regional Land Supply Assessments for Karratha in 2020, and Port Hedland in 2022, however has not prepared a further update to the 2015 *Hotspots Update* for Tom Price and Newman.

The *HotSpots Update* analysed the townscape from the perspective of identifying land that could be available for future urban expansion. It identified a number of issues to address, including:

- Obstacles associated with urban consolidation of housing, which usually would require costly redevelopment, or lot amalgamation.
- Most new dwellings constructed in Tom Price are on Greenfield lots instead of existing lots.
- Based on a projected population increase to 4,750, there currently is not suitable residential land available to accommodate growth.
- Identification of additional industrial land was considered to be critical.
- Issues to consider include drainage through town.

- The distance of Tom Price to the Paraburdoo Airport as well as ability for convenient access to Royal Flying Doctor Services for patients.

5.4.3 PILBARA HALF YEARLY HOUSING & LAND SUMMARY DECEMBER 2022

The *Pilbara Half Yearly Housing and Land Summary – December* was prepared by the Pilbara Development Commission (PDC, 2022) and at the time of amending the Strategy it represented the latest report of its kind for the Pilbara region. Data of note in relation to the Shire of Ashburton is outlined below. In summary:

- The inland and coastal towns in the Shire have distinct property markets, with different economic drivers, resulting in differing levels of demand and variances in stock levels across the rental and sales markets.
- In Tom Price, prices continued to rise despite stock levels increasing across the sales and rental market.
- In Onslow, rental and sales prices continued to rise as available stock levels across both markets continue to fall. Interestingly, although demand remained strong the number of days on market increased by 101.54% to over 4 months.
- Activity reported in Paraburdoo and Pannawonica was too low to offer meaningful data and was not reported separately.

The number of advertised 'for sale' price of residential properties within the Shire were as follows:

- Onslow – 18 (median sale price \$589,500, an increase of 101.54%)
- Tom Price – 22 (median sale price \$607,500, an increase of 59.87% compared to the same period in 2021)
- Pannawonica – nil.

The residential house and land activity within the Shire is subdued when considered in the context of the Pilbara region, with Onslow and Tom Price being the most active and Paraburdoo and Pannawonica having very little activity. Tom Price has experienced an increase in housing prices over the past 6-7 years and now has higher house values than Onslow and Paraburdoo. The housing and land sales data of Tom Price broadly align with those of the Pilbara region, whereas Onslow has remained somewhat stagnant over this time. These observations are illustrated in **Figure 21**, **Figure 22**, **Figure 23**, and **Figure 24**.

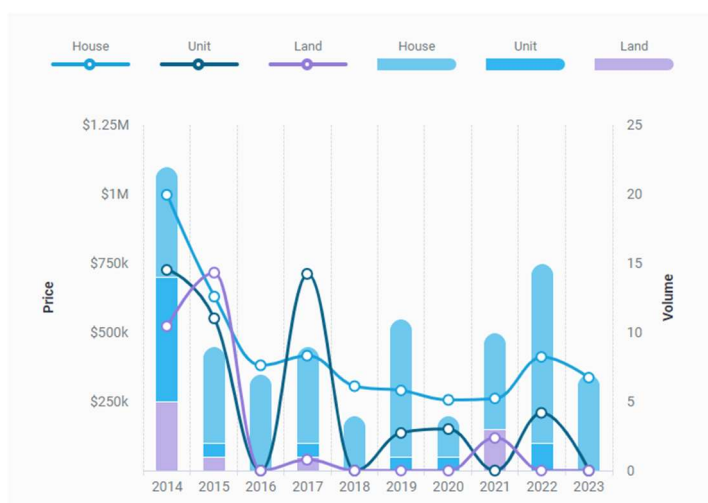


Figure 21 Median Price Data - Onslow (REIWA, 2023)

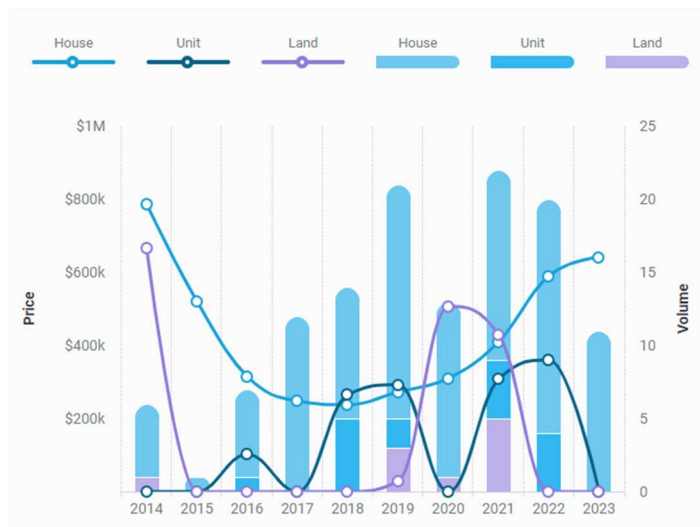


Figure 22 Median Price Data - Tom Price (REIWA, 2023)



Figure 23 Median Price Data – Paraburdoo (REIWA, 2023)

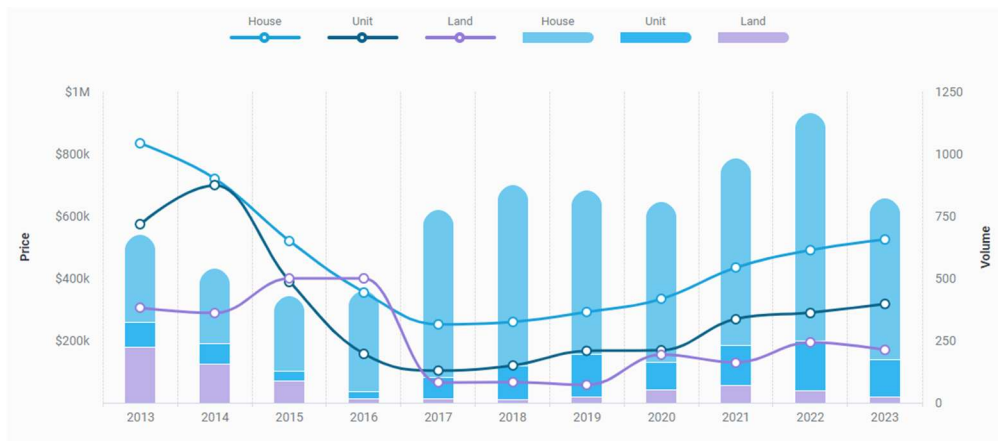


Figure 24 Median Price Data - Pilbara Region (REIWA, 2023)

Dropping median values for houses can lead to issues where owners may have little to no equity in their homes. Homes that have dropped in value may lead to people unable to refinance until prices increase or loans can be paid off. There is risk that home values fall or households are hit by unemployment, with households then unable to refinance or repay loan amounts. There has been growth in the number of residential home loans in arrears. Some financial institutions including National Australia Bank (NAB) have compiled towns and suburbs where they have capped lending to property buyers because of growing risks in the housing market. For the Shire of Ashburton, the NAB listed suburbs requiring higher deposit requirements include Cane, Onslow, Peedamulla, Talandji, Yannarie, Pannawonica, Tom Price and Paraburdoo².

5.5 DEVELOPMENT SCENARIOS

5.5.1 TOM PRICE

At the 2016 Census, Tom Price had a stated population of 3,005 people. The *HotSpots Update* acknowledges that Tom Price could reach a resident population of approximately 4,750 (WAPC, 2015). This has not been reflected in the population figures contained within the *Assessment of Accommodation Need in Tom Price, Onslow and Paraburdoo* (AEC Group, 2015), which considers the population to be closer to 3,500 through towards 2024. The more recent 2021 Census data supports this projection, recording Tom Price's population as being 2,910 (ABS, 2021).

There are some potential expansion areas and these are shown on **Figure 62**.

Sufficient land has been identified to accommodate new project or expansionary demands. The *HotSpots Update* identified land that could be made available for future development within Tom Price, including Area W (WAPC, 2015). This may imply that pressure for housing may not be significant in the short-term, however hindsight emphasises the need to be prepared to respond to sudden changes in housing demand. These expansion areas could also replace camps, as workers are housed in town in the longer-term. The Shire's recently adopted Community, Lifestyle and Infrastructure Plan 2023 identifies several opportunity sites within Tom Price for development to address housing affordability concerns, short stay accommodation and key worker housing. It is important that a new Scheme zones land appropriately to facilitate these initiatives.

² <https://www.domain.com.au/news/600-towns-and-suburbs-on-nab-property-lending-blacklist-20161022-gs8a17/>

5.5.2 ONSLOW

The *Onslow Townsite Strategy* (SoA, 2011) contemplated employment, household formation, housing demand and land requirements to accommodate five separate development scenarios, as reflected in **Table 21** below. Population forecasting is discussed in the *Onslow Townsite Strategy* and the preparation of the *Onslow Townsite Expansion Structure Plan* reflects the ability to accommodate significant population growth.

Table 21 Development Scenarios (SoA, 2011)

Scenario	Employment		Household Formation		Housing Demand		Total Dwellings	Gross Residential Land (ha)
	Base	Indirect	Single 30%	Family 70%	Units (400m ²)	Houses (700m ²)		
Base	100	60	48	112	48	162	210	21.40
Low	250	150	120	280	120	280	400	40.67
Medium	500	300	240	560	240	560	800	81.33
High	1,000	600	480	1,120	480	1,120	1,600	162.67
Extreme	1,500	900	720	1,680	720	1,680	2,400	244.00

The *Onslow Townsite Strategy* contemplates that the high demand scenario is possible in the longer term. Planning has considered the need to ensure the identified 162 hectares of residential land is capable of being brought on to accommodate this rate of development. The initial considered demand for at least 210 additional dwellings is largely accommodated through Stage 1 of DevelopmentWA's Barrarda Estate (AEC Group, 2016). Chevron Australia has recently taken possession of 50 residential house lots within Barrarda Estate. Onslow Salt owns five lots, with the Shire owns another three in freehold (refer **Figure 7**). The remainder are likely to be taken up by the private sector.

Chevron Australia has a 9-hectare site (Lot 4001) in Onslow, identified on the *Onslow Townsite Expansion Stage 1 Development Plan* as the 'Wheatstone Operations Village Precinct'. The *Development Plan* contemplated Lot 4001 for high-quality, resort style accommodation with good connectivity and presenting an appropriate frontage to adjacent residential areas. The assumptions contained in the *Onslow Townsite Strategy* remain relevant, albeit acknowledging that 'Workforce Accommodation' is a defined land use within the ANSIA Improvement Scheme No. 1 for construction and operational workforce (refer **section 3.6.2**). In particular, this is likely to impact on the future development of Lot 4001 (owned in freehold by Chevron Australia), which may not be required for workforce accommodation.

With the gazettal of the ANSIA Improvement Scheme No. 1, future planning for Lot 4001 may need to identify what long-term opportunities are available for its development as an integrated urban development within the Onslow Townsite, as well as what other uses may be considered complimentary with housing.

Mineral Resources is constructing a 412-room workforce accommodation facility at Lot 300 Back Beach Road, Onslow, with an expected opening date mid-2024. Whilst providing primarily for FIFO workers, the facility is designed as a 'resort-style accommodation village', including accommodation for couples and families, as well as allowing public access to some of the facility's amenities. Mineral Resources also intends to build 10 four-bedroom houses in Onslow "to attract more families to relocate to the town and become a part of the community." (MRL, 2022)

5.5.3 PARABURDOO

It is anticipated that Paraburdoo will expand or contract as mining does. There is little impetus to intervene in any growth plans for Paraburdoo unless there is a compelling regionally significant reason to do so. The growth of Paraburdoo is likely to have minimal impact on development scenarios in Onslow, Tom Price or the Pilbara Cities (Karratha, Port Hedland or Newman), due to the distance from these centres.

Rio Tinto is committed to the ongoing operation of Paraburdoo as a mining support centre. Post mining, the town is expected to contract to core activities; however, there would be opportunities for Aboriginal services and tourism within the town. There are no immediate plans to expand the urban area of Paraburdoo, and Rio Tinto has not built a significant amount of housing stock in the town since the 1970's. The economic implications for building homes will limit abilities to build new housing stock in the town. Although development growth can be unpredictable due to the high dependency on the mining sector, the Shire is progressing initiatives through its 2023 Community, Lifestyle and Infrastructure Plan to provide aged care / retirement living within the town, construct new housing on vacant lots, and encourage housing renewal on existing lots. These initiatives will address current housing needs and create the capacity within Paraburdoo to respond quickly to mining sector growth in the future.

5.6 SUMMARY AND IMPLICATIONS FOR POPULATION AND HOUSING

The long-term factor for a stable population is the ability to address the permanence of the workforce, and therefore the permanence of residents. The historical population growth has been driven by mining and oil and gas company requirements. As the strategic push is to diversify the economy, greater opportunities for permanent residents need to be available as the towns begin to transition towards a range of industrial sectors creating new employment and new housing needs.

The demographics of the region are unique. There is a disproportionate ratio of males to females; 7.9% of the population being Indigenous Australian (2.9% national rate); and a low rate of residents older than 65 (3.4% compared to 16.1% of WA residents). It will be important to ensure future housing and development caters for more diverse and balanced social demographics, taking into account the particular needs of key sectors of the population (including Indigenous Australians, children, teens, and aged persons).

Limited population growth has been anticipated in Paraburdoo and Tom Price. Notwithstanding, investigations suggest that there is the ability for infill housing within both townsites, as well as opportunities for expansion of the urban footprint within the gazetted townsite boundaries. Paraburdoo and Tom Price population growth is largely dependent on accommodation demand for Rio Tinto's workforce.

Operational workforce within ANSIA will have a bearing on population growth in Onslow. Under the Improvement Scheme, a Special Use No. 1 and a Workforce Accommodation zone are provided. These zones allow operational workforce to be based within the ANSIA, which will have an impact on Onslow's population and growth. Mineral Resource's resort-style workforce accommodation in Onslow with some public access offers a contemporary model to at least partially integrating a predominantly FIFO workforce into an established town.

The future risks of coastal hazards and flooding will influence the development of Onslow, particularly the path of risk management and adaptation that would be undertaken. Relocation of development is likely to be unavoidable particularly those areas in close proximity to the coast and floodplains. The Local Planning Strategy considers the planning undertaken on coastal hazards in order to ensure future growth and development of the town is not prejudiced by shorter-term decisions on the direction of growth and development.

Within Paraburdoo and Tom Price, the future development of housing would be considered in terms of the following preferences:

- Infill – by identifying lots that could be amalgamated and re-subdivided, to create additional lots. There are opportunities to investigate lot boundaries in context to existing dwellings, to identify if new lots can be created in existing areas;
- Corner lots – corner lots provide opportunities for subdivision, as a second street frontage allows for new dwellings to have a street presence;

- Greenfields – there may be existing land within range of services and with existing street frontages within the townsites. These land areas therefore would have a greater opportunity to be available for new housing whilst minimising servicing and other costs to development (given the high costs of construction of houses). Where such land is available, development should not jeopardise future urban expansion by ensuring future road connections, drainage lines and open space networks are considered; and
- Refurbishment – existing housing stock within the towns can date back a number of decades, and whilst the housing stock is ageing, there are financial advantages to refurbishing properties in lieu of demolition and rebuilding (unless demolition is necessary due to a structural or safety reason).

5.6.1 IMPLICATIONS FOR POPULATION AND HOUSING

The following **Table 22** considers the implications, issues and opportunities from a population and housing context.

Table 22 Implications, Issues and Opportunities – Population and Housing

Population and Housing	Implications	Issues	Opportunities
Pilbara regional population	Within the period of 2005-2013, population growth rates were between 3.2-5.4%, down to 0.2% in 2013-2014 and -0.7% in 2014-2015.	The <i>Pilbara Regional Investment Blueprint</i> sets what it calls an aspirational yet achievable population target of 200,000 by 2035, an increase of 135,000 across the region. Population growth rates have more recently stabilised, however historical trends indicate that fluctuations in market conditions can place pressure on towns to accommodate population growth and demand.	Tom Price, Paraburdoo and Onslow should grow in a sustainable manner that ensures communities can develop with availability and access to a range of necessary services, employment opportunities, and housing choice.
Ashburton local government population growth trends	ABS data indicates within Ashburton that there is a stabilisation of the population. Demographic analysis indicates a disproportionate ratio of males to females, a lower than national average median age, a higher ratio of Indigenous Australians, and a low ratio of residents older than 65.	ABS information supports the inference that future population growth is likely to be directly impacted by the growth or contraction of mining and oil and gas industry sectors. These industry sectors will likely continue to have a significant influence on population growth rates within the local government. It will be important for future housing and development cater for the demographics of the region, taking into account the particular needs of key sectors including all youth, young adults, and aged persons.	Diversification of the economy and a broader employment base may lessen the impacts of mining and oil and gas on population growth/decline rates. Areas of focus for improving liveability – safety; health and wellbeing; education and training; lifestyle; sense of community; community connectedness.
Ashburton demographics	At the following census periods, the percentage of the Shire population recorded within towns (Onslow, Tom Price, Paraburdoo, Pannawonica) was as follows: 2001 – 89%. 2006 – 92%. 2011 – 60%. 2016 – 45.6% 2021 – 78.8%	Current population estimates from official sources at the town level can be potentially unreliable or not available. The census data in 2011 and 2016 show a disconnect from previous census periods, as a lower ratio of Ashburton's population was counted within the townsites. This may be related to the census also picking up respondents in workforce camps. The 2021 census data revealed a dramatic decline in population outside of the townsites, resulting the ratio returning to post-resource construction levels.	In 2017, the ABS released the first packages of the 2016 Census data. Subsequent release of data may provide a more accurate snapshot of population and other demographic trends for the townsites and the Shire overall. Further information can be sought in relation to the ratio of townsite population and workforce campsite population trends.
Aboriginal Settlements	DPLH considers that, under SPP 3.2, the following are considered to be Aboriginal Settlements: Wakathuni Youngaleena Bunjima Bellary Springs (Innawonga) Ngurrawaana	There is State level recognition of challenges for remote Aboriginal communities. State government agencies remain responsible for delivering existing services.	Advocate the Shire's position, that the State Government agencies should ensure appropriate services are adequately planned and delivered for Aboriginal Settlements.

Population and Housing	Implications	Issues	Opportunities
Population Growth Forecasts	Aspirational population growth forecasting appears to have been based on historical growth rates seen during 2005 and 2013, in lieu of more recent trends of population stabilisation. <i>WA Tomorrow</i> (2015) population forecasts consider lower growth rates (2.65% in 2016, 2.23% in 2021, 1.99% in 2026). These growth rates may be currently optimistic, however provide a good guide on anticipated population growth.	Anticipated population growth may affect the ultimate direction of service delivery by local government, government agencies, and utilities/service providers.	Ensure local government services are in line with projected population growth. Cater for growth for approximately 3,500 additional people to 2026, and/or to have capacity to respond quickly to resource industry changes. Identify land to ensure sufficient supply is available, should significant population growth demand occur in another mining cycle.
Onslow Housing Stock	There have been considerable additions to housing stock in Onslow during 2014-2017. Urban development and growth within Onslow will need to have regard to coastal processes and hazards, and physical, infrastructure and industrial considerations. Native title and Aboriginal heritage will need to be addressed for Crown land identified for new development or expansion.	The resident population should stabilise around 950-1,000 persons through the medium term without any additional significant projects beyond those operating or planned. 68 new dwellings have been completed within the Barrarda Estate, with additional vacant lots available. Some future demand could be absorbed by available vacant lots.	The Onslow Townsite Expansion Structure Plan identified some areas for future planning. Consider options for these and whether the Local Planning Strategy should recommend land uses for these areas. Check future planning areas on the Structure Plan. Ensure future urban infill and development suitably considers coastal processes, climate change and the impacts on the existing town centre and urban development in low lying areas from flood events, tidal inundation and sea level rise.
Paraburdoo Housing Stock	Paraburdoo will expand or contract as mining activity does. There is little impetus to intervene in any growth plans unless there is a compelling, regionally significant reason to do so.	There are approximately 41 vacant lots available within the townsite for infill housing. Preference for new housing would be towards available vacant lots and to encourage housing stock renewal and diversification through increasing density coding. Development investigations for new expansion should consider land with direct road frontage and service availability. Clearing permits may be required in some cases. Aboriginal Heritage matters would need to be addressed as part of any investigations.	Support post-mining diversification of the economic sectors in town, including Aboriginal services, and tourism. Prepare and present scenarios for the long-term development opportunities for residential purposes in Paraburdoo, and to seek agreement on the planned development of land as well-integrated and functional components of the townsite.
Tom Price Housing Stock	The WAPC <i>HotSpots Update</i> considers Tom Price could reach a resident population of 4,750 however this is not reflected in population figures, putting population numbers closer to 3,500. Sufficient land has been identified to accommodate new project or expansionary demands. The Shire is undertaking Scheme Amendments that will make identified land	There are approximately 46 vacant lots available within the townsite for infill housing. A number of lots may be large enough to accommodate grouped or multiple dwelling development. The <i>HotSpots Update</i> considered areas for urban infill and development and the Local Planning Strategy supports further investigations into their development capability.	Support amendments to the local planning scheme that contribute towards bringing de-constrained land forward for consideration as urban infill or urban development. Prepare and present scenarios for the long-term development opportunities for residential purposes in Tom Price, and to seek agreement on the planned development of land as well-integrated and functional components of the townsite.

Population and Housing	Implications	Issues	Opportunities
	available for future development within Tom Price, including Area W.		
Workforce Accommodation – Onslow and ANSIA	Chevron Australia operates its workforce accommodation campsite within the ANSIA. A number of properties within Onslow are used for workforce accommodation, whether for Government Regional Officer Housing, or housing for workforce for Chevron Australia, Onslow Salt, BHP Billiton and others. There is high demand for workforce accommodation for the Wheatstone project construction period. Workforce demand is expected to fall away through 2017.	The Wheatstone project is transitioning from construction to operational phases. As construction activity moves towards completion, workforce numbers will decline. Other proponents do not have access to Chevron's workforce accommodation site within the ANSIA. BHP Billiton may require workforce accommodation within the ANSIA should the Macedon Wet Gas Compression project proceed. There is no short-term plan to develop the 'Operational Village' Lot 4001 within the Onslow townsite.	Provide and plan for the development of the 'Operational Village' on Lot 4001 within the Onslow townsite, as a well-integrated component of the townsite. Promote the provision of higher quality, more permanent accommodation within the Onslow townsite. Mineral Resources Limited's workforce accommodation in Onslow is potentially a contemporary model for integrated accommodation within an established townsite.
Workforce Accommodation – Tom Price and Paraburdoo	Workforce camps are considered to have legacy issues for the local government. When they are located beyond the townsites, the result is a lack of integration with the local communities, and limited opportunities for social interaction.	As iron ore prices decline, iron ore producers are anticipated to find cost reduction strategies or solutions, including reducing reliance on human labour to undertake some parts of operations. Technological advancement, the use of automated technology and drove vehicles, can contribute towards a reduction in operational workforce. There are concerns at a State level that FIFO work could lead to a heightened risk of mental health issues.	The Shire of Ashburton maintains its position on requiring operational workforce to be directed towards existing townsites. Prepare scenarios for the short and long-term development opportunities of land and buildings for Workforce Accommodation in Tom Price, Paraburdoo and Pannawonica, as well-integrated and functional components of townsites.
Aged Care	Whilst there are some limited aged person dwellings within the Shire, there are no purpose-built dwellings to accommodate their particular needs.	There is an urgent need for aged care accommodation and respite facilities, particularly for the Indigenous community. It is understood that Regional Development Australia is conducting an aged care housing strategy across the Pilbara region.	Consider demand for aged care sites within the towns.

6 ECONOMY AND EMPLOYMENT

6.1 ECONOMIC TRENDS

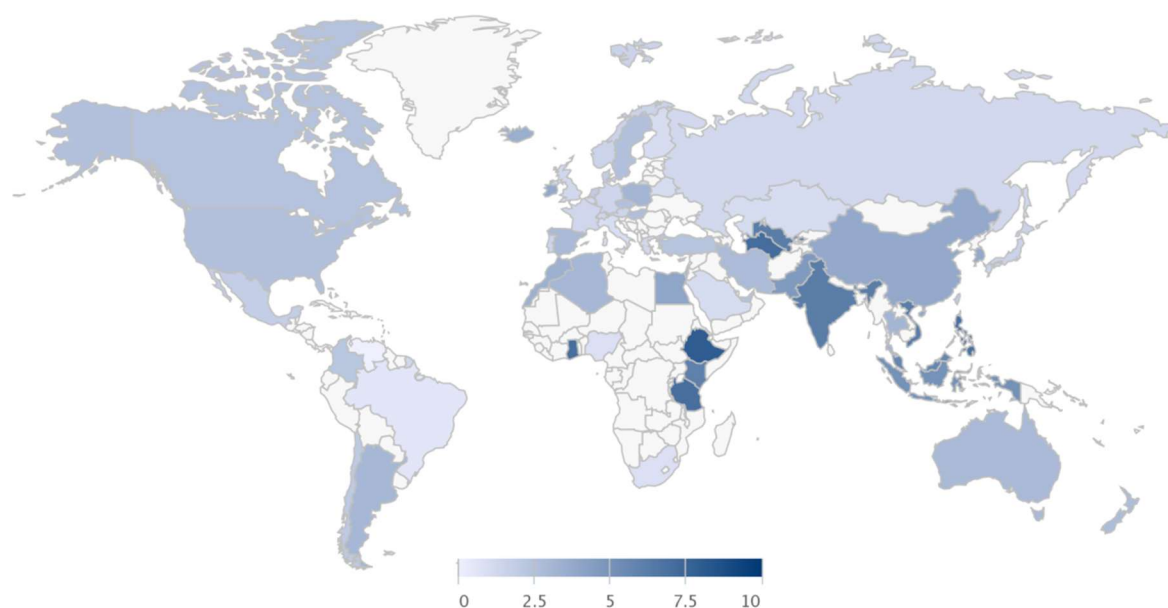
Economic development plays an integral role in the development of sustainable communities. The skills and composition of the local and regional labour force, its transport connections, infrastructure and other assets all contribute to an area's economic success.

6.1.1 GLOBAL AND NATIONAL

Global growth was estimated to hit a low of 2.3% and was projected to rise to 2.7% in 2017 (World Bank Group, 2017). Global output growth was analysed to be remaining stable at about 3% from 2017, with stable or stronger-than expected pickup in growth in advanced economies (such as the USA, Spain, Japan and the United Kingdom) (IMF, 2017), (The Conference Board, 2017). There is a probability that ongoing global economic growth will be around 2.7% (World Bank Group, 2017). A number of emerging market and developing economies, such as China and India, have a strong bearing on demand for exports from the Pilbara Region. The International Monetary Fund forecasts some growth prospects for China are due to expected policy stimulus, however India's economy had its growth estimates for 2016-2018 revised down due to its cash shortages and payment disruptions due to its recent currency note withdrawal and exchange initiative (IMF, 2017). Australia is positioned to have comparable or better outlooks for gross domestic product growth rates from 2016-2026 (The Conference Board, 2017), refer **Figure 25** and **Table 23**.

Table 23 Australia vs Other Mature Regions: GDP Growth rates, 2016-2026 (The Conference Board, 2017)

Global Outlook, GDP	Australia (Advanced Economy)	Other Mature Regions
Growth Rate 2016	3.1%	2.5%
Growth Rate 2017	2.9%	2.9%
Growth Rate 2017-2021	3.4%	3.0%
Growth Rate 2022-2026	2.8%	2.8%



Note: Projections are based on trend growth estimates, which – for the period 2017–2021 – are adjusted for remaining output gaps. Color ramp is based on GDP growth rates in 2017.
Source: The Conference Board Global Economic Outlook 2017, February update.

Figure 25 Global Outlook for GDP Growth rates, 2016-2026 (The Conference Board, 2017)

There are a number of economic risks that could impact on global economic growth (IMF, 2017), including:

- Policy shifts on global trade restrictions and migration restrictions;
- Weak commodity prices, although prices are firming;
- Vulnerability from high corporate debt, declining profitability, and weak bank balance sheets; and
- Geopolitical issues – war zones in Africa and Middle East; refugee migration to neighbouring countries and Europe; global terrorism activity; drought in eastern and southern Africa; and the spread of the Zika virus.

Oil prices have increased, reflecting an agreement among major producers to trim supply. Prices for base metals have strengthened due to infrastructure and real estate development in China.

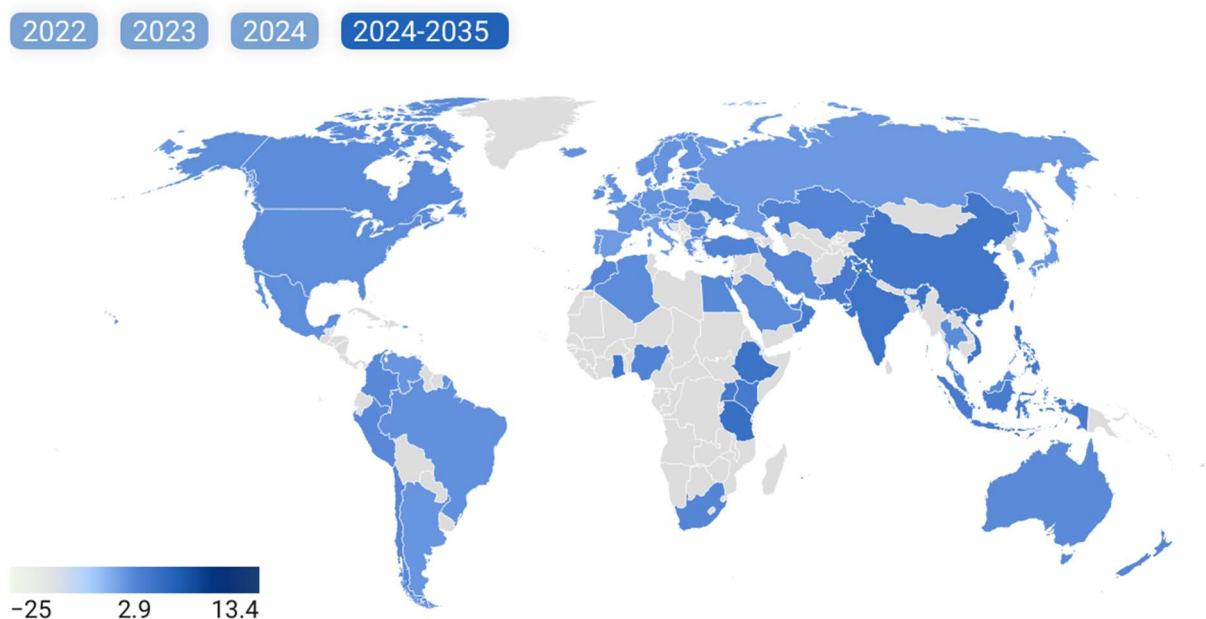
At a global level, business is considered to stay focused on strengthening qualitative growth factors such as technology, innovation and skills (The Conference Board, 2017). Over the longer term, countries with economies highly dependent on commodity products would need to work to diversify their export bases (IMF, 2017).

The world economy and outlook have changed considerably since the preparation of the Local Planning Strategy, due mainly to the coronavirus triggering the deepest global recession since World War Two, and more recently, the Russian Federation's invasion of Ukraine, and the sharp tightening of monetary policy to contain inflation. The World Bank's latest projections indicate that the world economy will remain weak, and at risk of a deeper downturn, during 2023 and in 2024. Global growth is forecast to slow from 3.1% in 2022 to 2.1% in 2023, before inching up to 2.4% in 2024. However, the International Monetary Fund (IMF) projects that advanced economies to see an especially pronounced growth slowdown, from 2.7% in 2022 to 1.3% in 2023 (IMF, 2023). The World Bank notes that even this moderate growth assumes that stress in the banking sector of advanced economies does not spill over to emerging market and developing economies (The World Bank, 2023).

Figure 26 below shows 'The Conference Board's' real GDP growth projection between 2024 and 2035, and is an updated version of **Figure 25** above. **Table 24** below shows recent GDP Growth rate data and projections to 2035.

Table 24 Australia vs Other Mature Regions: GDP Growth rates, 2022-2035 (The Conference Board, 2023)

Global Outlook, GDP	Australia (Advanced Economy)	Other Mature Regions
Growth Rate 2022	3.7%	2.7%
Growth Rate 2023	1.9%	1.4%
Growth Rate 2024	1.6%	1.1%
Growth Rate 2025-2035	2.2%	1.4%



Map: Global Economic Outlook (September 2023) • Source: The Conference Board • Created with Datawrapper

Figure 26 Global Outlook for Real GDP Growth, 2024-2035 average % change (The Conference Board, 2023)

6.1.2 NATIONAL

Over the past 40 years, annual growth in real GDP was at an average 3.1%. At a national level, Australia's GDP growth is projected to average 2.8% per annum until 2055 (Commonwealth of Australia, 2015), which is comparable to the 2022-2026 forecasted growth shown in **Table 23**. Average annual population growth for Australia is projected to be 1.2% to 2050. Average growth in GDP per person will decrease from 1.9% to 1.5% per annum. Underpinning these models are some key assumptions including an expected fall in the labour force participation rate largely due to ageing, a constant fertility rate (1.9 persons per household), and a constant net migration rate (0.6% per annum).

There is a role for the Federal Government to continue its efforts in leading and coordinating domestic policies to drive better environmental management and economic growth for future generations. Policies that create strong economic growth and a sustainable budget will ensure the Government is better placed to invest in environmental protection, which in turn can contribute to economic sectors such as tourism (Commonwealth of Australia, 2015). Environmental protection and management will also affect the quality of life for Australians.

The Federal Government is committed to rein in its debt levels. In preparing for the future, the Government is looking at steps to:

- Boost productivity and encourage higher workforce participation;
- Invest in critical aspects of Australia's infrastructure
- Stabilise and reduce debt, and to be able to respond to future economic shocks;
- Improve the tax system to ensure Australia is attractive for investment, boosts economic growth and creates new jobs;
- Focus efforts on efficient provision of services in the face of major demographic change; and
- Clarify the roles and responsibilities of Federal, State and Territory governments to reduce waste, duplication and second-guessing.

6.1.3 WESTERN AUSTRALIA

The State Government's 2023-24 Fiscal Budget (Government of WA, 2023) (Government of Western Australia, 2016) provided the following economic outlook highlights:

- Western Australia's economy (as measured by Gross State Product) is forecast to grow by 4.25% in 2022-23 – the strongest rate of growth since 2013-14 – before moderating to 2.25% growth in 2023-24 as household consumption continues to slow in response to higher interest rates.
- Despite challenging conditions in the global economy, the State's export performance has been strong, with goods exports reaching a record \$272 billion over the year to March 2023 (representing 44.7% of national exports).
- Conditions in the State's labour market remain strong, with employment in March 2023 reaching a record 1.53 million people and wages growing at their fastest rate in almost a decade. The unemployment rate is forecast to gradually rise from 3.5% in 2022-23 (the lowest annual rate in 15 years) to 4.5% by 2025-26, as labour demand is outpaced by additions to the working age population.
- Population growth is being supported by strong migration to the State since the re-opening of international borders, with the State's population now expected to grow by 2% (around 56,000 people) in 2022-23 – above long-run average growth of 1.7%.
- Consumer price inflation remains elevated, but appears to have peaked in the December 2022 quarter, and is forecast to ease to 3.5% by the June 2024 quarter as supply chain pressures continue to reduce (Government of WA, 2023).

Figure 27 demonstrates the historic and forecast trends for Gross State Product and Economic n Western Australia.

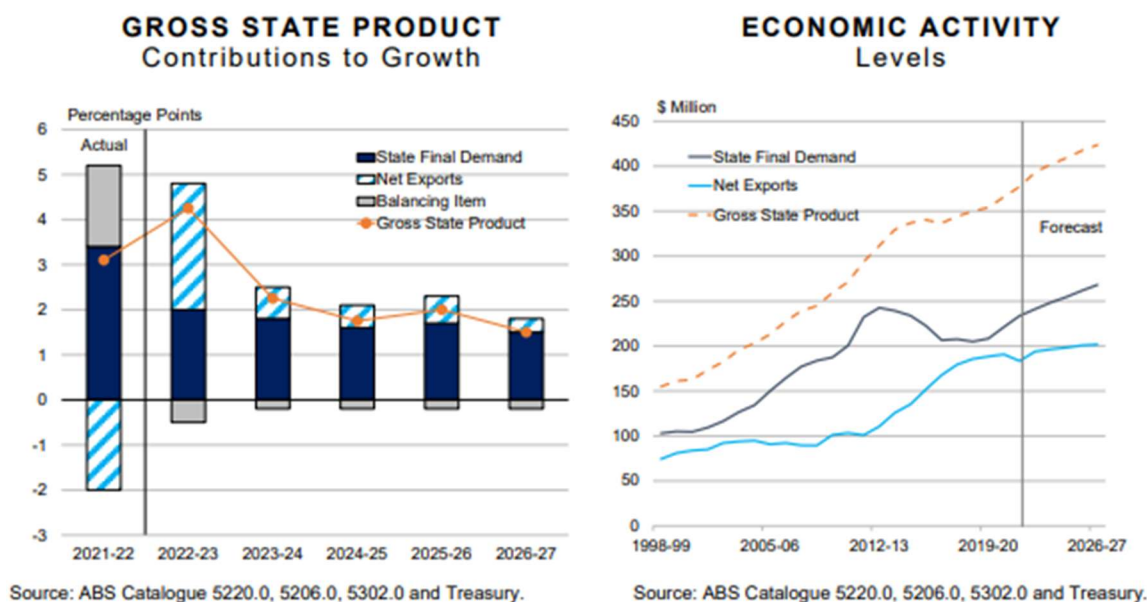


Figure 27 Economic Growth, (Government of WA, 2023)

According to the 2023-24 Budget, the Western Australian economy remains strong, with Gross State Product (GSP) expected to grow by 4.25% in 2022-23 – the strongest rate since 2013-14. Despite challenging conditions in the global economy, economic growth is being boosted by a lift in exports across a range of mining commodities, along with agricultural exports following a record harvest (Government of WA, 2023).

The 2023 Budget also notes that goods exports have been very strong, reaching a record \$272 billion over the year to March 2023 (representing 44.7% of national exports). In volume terms, goods exports are expected to grow by 6% in 2022-23, the strongest growth in six years, underpinned by a lift in exports across a range of commodities including iron ore, LNG and lithium, as well as wheat and canola.

Growth in goods exports is then projected to moderate to 2% in 2023-24 and 0.75% by 2026-27, with key producers operating at close to capacity. Iron ore is forecast to continue to underpin growth, with production ramping up at some mines through the period, including Gudai-Darri, Eliwana and South Flank in the near term, and Iron Bridge and Onslow Iron in the outyears. Three of these noted iron ore projects, Gudai-Darri (Rio Tinto), Eliwana (FMG) and Onslow Iron (Mineral Resources) are situated within the Shire, thereby highlighting the Shire's significant contribution to Western Australia's goods exports (Government of WA, 2023).

6.1.4 PILBARA REGION

The Pilbara is regarded to have a strong economy due in part to its plentiful supplies of minerals, petroleum and natural gas. The region accounted for 95% of iron ore and 99% of petroleum products (RDAP, 2013). It has been the focus of iron ore production since the 1960's, and the rapid development of industry, settlements, infrastructure and services can be directly linked to the rapid expansion of iron ore, oil and gas. There are other industries that provide for some diversification including tourism, livestock pastoralism and fishing.

Based on data from the ABS June 2015 Gross State Product, 2012/2013 National Input Output Tables and 2011 Census data, it is noted that the Shire of Ashburton contributed 29.82% of the gross regional product of the Pilbara. As a result of this strong emphasis on the production of iron ore, minerals and petroleum products, the Pilbara region contributes towards over a quarter of global iron ore production and over 6 percent of Australia's Gross Domestic Product (PDC, 2015). In turn, the Pilbara Region represented 10.91% of Western Australia's Gross State Product and 1.68% of Australia's gross regional product (REMPAN, 2017).

Since the preparation of the Local Planning Strategy in 2017, the Gross Regional Product of the Pilbara region has increased from \$36.6 billion in 2017 (PDC, 2018), to \$77.8 billion in 2022, which now represents 19.2% of Western Australia's Gross State Product (PDC, 2023) and 1.6% of Australia's Gross Domestic Product. The Shire of Ashburton contributed \$24.2 billion towards the Pilbara region economic output, or 31.1%, an increase compared to the 2017 figures of \$12.8 billion and 27.26%, quoted in the first publication of the Local Planning Strategy.

The Pilbara Region economy generates an estimated \$101.264 billion in output. Pilbara Region represents 13.6% of the \$744.109 billion output generated by Western Australia, and 2.2% of the \$4.680 trillion output generated by Australia (proportional increases from 9.15% and 1.41% respectively from 2017, as published in the first version of the Local Planning Strategy) (REMPAN, 2022).

Further economic diversification could be unlocked through agriculture, horticulture, aquaculture, tourism and renewable energy. In the future, economic diversification will help to ensure local workforces are employed in a wider range of industries. The region's competitive advantages, such as the presence of large mining and hydrocarbon industries, and proximity to Asia, will yield some opportunities. The regional economy is anticipated to leverage off the resource industries, and encompass more knowledge-based industries and an increasing capacity for exports (WAPC, 2012).

6.1.5 SHIRE OF ASHBURTON

Based on 2017 data, the Shire of Ashburton contributed the following regional exports by Industry as per **Table 25**.

Table 25 Regional Exports by Industry (REMPLAN, 2017)

Industry	Regional Exports by Industry					
	Ashburton		Pilbara Region		Western Australia	
Mining	\$9,878.699 million	(88.28%)	\$30,452.758 million	(83.65%)	\$81,214.783 million	(60.95%)
Construction	\$1,025.779 million	(9.17%)	\$4,139.985 million	(11.37%)	\$7,677.606 million	(5.76%)
Manufacturing	\$59.061 million	(0.53%)	\$742.867 million	(2.04%)	\$28,736.874 million	(21.57%)
Transport, Postal & Warehousing	\$52.450 million	(0.47%)	\$333.382 million	(0.92%)	\$2,572.956 million	(1.93%)
Remainder of Industry Sectors	\$173.995 million	(1.55%)	\$734.061 million	(2.02%)	\$13,050.089 million	(9.79%)
Total	\$11,189.984 million	(100%)	\$36,403.053 million	(100%)	\$133,252.308 million	(100%)

When compared to the 2021/22 data in **Table 26** below, there has been a nearly threefold increase in the value of Mining exports across all three regions during the 4-5 years since 2017. Increases of similar magnitude are also seen in the Total value of exports for Ashburton and the Pilbara Region, reflective of the Mining Industry's dominant proportion of total export value (approximately 95%).

Table 26 Regional Exports by Industry (REMPLAN, 2022)

Industry	Regional Exports by Industry					
	Ashburton		Pilbara Region		Western Australia	
Mining	\$27,586.0 million	(95.0%)	\$86,897.6 million	(94.8%)	\$219,122.8 million	(75.3%)
Construction	\$990.9 million	(3.4%)	\$2,451.2 million	(2.7%)	\$10,089.4 million	(3.5%)
Manufacturing	\$76.6 million	(0.3%)	\$528.8 million	(0.6%)	\$33,153.3 million	(11.4%)
Transport, Postal & Warehousing	\$43.1 million	(0.1%)	\$455.6 million	(0.5%)	\$6,406.7 million	(2.2%)
Remainder of Industry Sectors	\$333.0 million	(1.1%)	\$1,286.8 million	(1.4%)	\$22,198.3 million	(7.6%)
Total	\$29,029.75 million	(100%)	\$91,622.98 million	(100%)	\$290,970.4 million	(100%)

The reasons for the remarkable increase in Mining export values since 2017 include supporting China's rebounding economy (Australian Mining, 2020) and high iron ore and mineral prices in general (MCA, 2021). Whilst the demand for iron ore is projected to decline in coming years, the world's energy transition will see continued demand for commodities such as lithium, nickel and aluminium, all of which are present within the Pilbara region and Western Australia broadly (DISR, 2023).

This emphasises the dominance of mining and construction within the Shire of Ashburton, and the benefits that could be realised through a greater diversification of the local economy, as discussed further.

6.2 BUILDING ACTIVITY

Total lot creation within the Shire has increased from 2,972 at the end financial year 2004, to a total of 4,177 at the end of 2015. This represented an increase of 1,205 lots across a 10-year period, giving an approximate growth rate of 1.2%. The Shire noted that the predominant increases in lot creation have been for the purposes of mining/industrial, reflective of the growth in these sectors within the local government district (SoA, 2015). The Department of Planning, Lands and Heritage have not published a land supply update for Tom Price and Paraburdoo since 2015, and for Onslow since 2011.

The Shire has collected building application data from August 2007 and published information in December 2015. This activity is expressed in **Figure 28** with a significant amount of non-residential building activity during 2009-2014. During that timeframe, the total number of building applications received by the Shire was 3,313, refer **Table 27**. Smaller-scale residential additions generated the most building application types, followed by building works on camp/mine/station sites, where the majority of employment is generated in the local government district.

Table 27 Building Application Totals by Type, 2007-2015 (SoA, 2015)

Building Application Types	Number		
	Residential	Commercial	Camps / Mines / Stations
Number	557 – residential dwelling 1,423 – residential additions	514 – commercial	819 – camp / mines / stations

Ashburton (S) Building Approvals

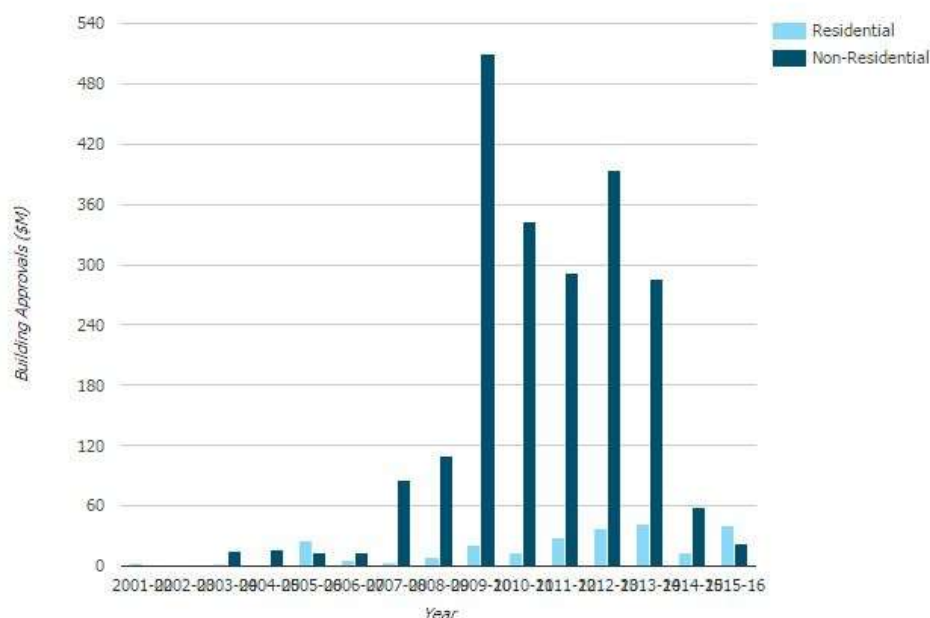


Figure 28 Building Approvals (REMPAN, 2017)

Additional housing has recently been constructed, with 10 new homes for key Government workers in Onslow³. These are provided as 4 four-bedroom, 2 three-bedroom and 4 two-bedroom dwellings. In addition, Chevron Australia has also completed 50 modular homes that have been commissioned within DevelopmentWA's Barrarda Estate⁴. The remainder of lots within the Barrarda Estate are available for sale.

³ <https://www.mediastatements.wa.gov.au/Pages/Barnett/2016/09/New-Onslow-homes-for-Government-workers.aspx>

⁴ <https://www.chevronaustralia.com/our-businesses/wheatstone/chevron-in-onslow>

Figure 29 below shows updated building approval data to 2022-23 within the Shire. Clearly, the value of non-residential building approvals has declined from the ‘boom’ construction period between 2009-2015 back to levels comparable with the years leading up to 2009. Since 2019, there has been a relatively consistent value of ‘residential’ building approvals, increasing in the most recent year 2022-23.



Source: Australian Bureau of Statistics, Regional Population Growth, Australia (3218.0). Compiled and presented in economy.id by .id (informed decisions).

.id informed decisions

Figure 29 Building Approvals, Shire of Ashburton (Profile ID, 2023)

6.3 OIL AND GAS RESOURCES

The Shire of Ashburton has a number of oil and gas tenements and wells, which are reflected in **Figure 30**. The DMP website indicates that many of the resources are shut in, undeveloped or depleted, as per **Table 28**.

Table 28 Status of Wells (DMP, 2023) (DMP, 2017)

Field	Status	Discovery Date	Well
Agincourt	Shut In	May 1996	Agincourt 1
Albert	Depleted	March 2005	Albert 1
Alkimos	Depleted	September 2005	Alkimos 1
Australind	Undeveloped	September 1993	Australind 1
Barrow Island	Producing	August 1966	Barrow_M43A
Blencathra	Undeveloped	September 1995	Blencathra 1
Cadell	Undeveloped	November 1999	Cadell 1
Chervil	Depleted	June 1983	Chervil 1
Coaster	Undeveloped	December 1999	Coaster 1
Cowle	Depleted	December 1989	Cowle 1
Crest	Depleted	January 1994	Crest 1
Cyrano	Undeveloped	March 2003	Cyrano 1
Denver	Undeveloped	November 2011	Denver 1
Double Island	Shut In	January 2002	Double Island 1
Gibson	Depleted	February 2001	Gibson 1

Field	Status	Discovery Date	Well
Ginger	Undeveloped	July 2003	Ginger 1
Gudrun	Depleted	October 2001	Gudrun 1
Harriet	Shut In	January 1983	Harriet 2 ST1
Hoover	Depleted	April 2002	Hoover 1
Little Sandy	Shut In	February 2002	Little Sandy 1
Mohave	Depleted	July 2005	Mohave 1
Monet	Depleted	April 2004	Monet 1
Narvik	Undeveloped	July 1967	Narvik 1
Nasutus	Undeveloped	November 1999	Nasutus 1
North Alkimos	Shut In	June 2000	North Alkimos 1
North Herald	Depleted	March 1983	North Herald 1
North Pedirka	Depleted	August 2003	North Pedirka 1
Pasco	Undeveloped	April 1967	Pasco 1
Pedirka	Shut In	February 2002	Pedirka 1
Roller	Depleted	January 1990	Roller 01
Rosette	Depleted	July 1987	Rosette 1
Saladin	Depleted	June 1985	Saladin 01
Simpson	Shut In	June 2000	Tanami 1
Skate	Depleted	October 1991	Skate 01
South Chervil	Undeveloped	November 1983	South Chervil 1
South Pepper	Depleted	November 1982	South Pepper 01
South Plato	Shut In	February 2001	South Plato 1
Tanami	Depleted	June 1991	Tanami 1
Taunton	Undeveloped	June 1991	Taunton 1
Tubridgi	Depleted	June 1981	Tubridgi 01
Victoria	Shut In	February 2002	Victoria 1
West Cycad	Shut In	October 2006	West Cycad 1
Wonnich	Shut In	July 1995	Wonnich 1
Wonnich Deep	Undeveloped	March 2007	Wonnich Deep 1
Yammaderry	Depleted	July 1988	Yammaderry 1
Zephyrus	Depleted	March 2006	Zephyrus 1

The Department of Jobs, Tourism, Science and Innovation implements State Agreements and State Development Agreements, and is the Lead Agency to support the approvals processes for major resource projects. Under the Lead Agency Framework, the Department would manage, negotiate and coordinate planning, environmental, Aboriginal heritage, native title and other relevant approval processes across Government.

Chevron Australia generates significant economic benefits for Australia through its Gorgon and Wheatstone projects. These are two of the world's largest LNG projects. The ANSIA is continuing to develop as a major hydrocarbon processing precinct. Chevron has committed and construction key infrastructure including the Port of Ashburton (shipping channel, breakwater and materials offloading facility). Initial capital expenditure on the Gorgon and Wheatstone projects is in excess of \$84 billion, with over 900 contracts awarded to Australian suppliers to develop the projects; almost 19,000 workers have been directly employed; \$323 billion added to real incomes in Australia, and over \$1 trillion would be added to Australia's GDP between 2009 and 2040 (Chevron, 2016).

\$250 million has been committed by Chevron for critical and social infrastructure in Onslow as part of its obligations under the Wheatstone State Development Agreement (Chevron, 2016). Contributions by Chevron and the State have led to the new airport, power plant, hospital, government employee housing, swimming pool, access road into Onslow and housing subdivision (DSD 2015).

Also within the Shire, the Gorgon project involved the construction of a three-train, 15 mtpa LNG facility, and a 300 terajoule per day domestic gas plant. Around \$33 billion had been committed by 2015 to Western Australian workers, suppliers and companies (DSD 2015). About 60 percent of the project total expenditure will have been spent within Australia.

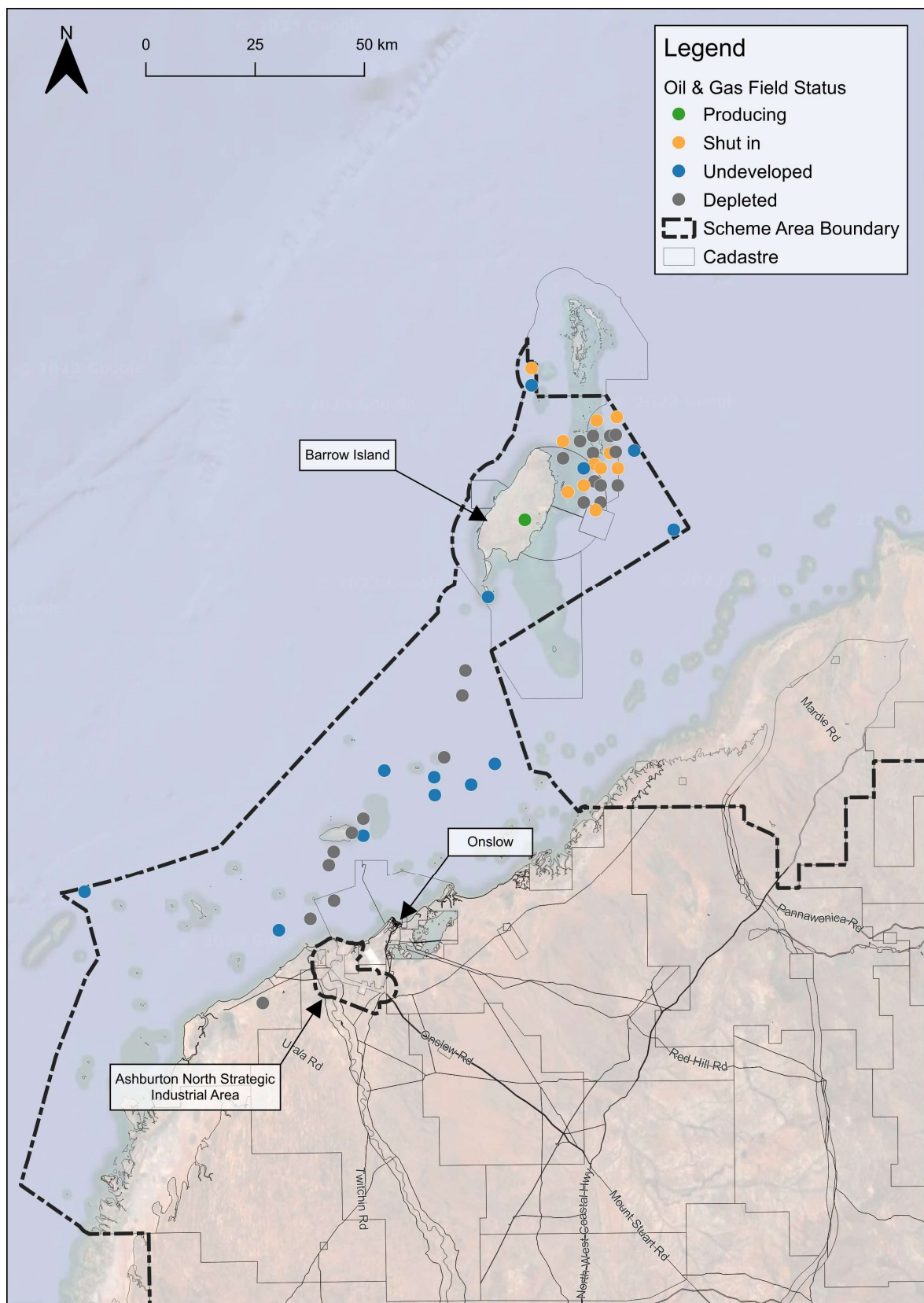


Figure 30 Petroleum Tenure and Wells

6.4 MINING

Western Australia is home to a number of mineral resources. The Pilbara Region is best known for its iron ore reserves, and other minerals such as gold, silver, copper and manganese (Geoscience Australia, 2016).

Iron ore emerged as a significant export commodity during the latter half of the 1960s, once deposits were confirmed and the global demand for steel saw the iron ore prices being to increase. According to Geoscience Australia, iron ore reserves may last for another 65 years, based on current production rates (Geoscience Australia, 2016). The estimated lifespan of iron ore reserves will depend on a number of factors, possibly including (but not limited to):

- Global market positioning and competition,
- Multinational mining company decisions on which deposits to invest in,
- Development and extraction costs,
- Environmental, social and political factors; and
- Land access, infrastructure, and the location and scale of the mining operations.

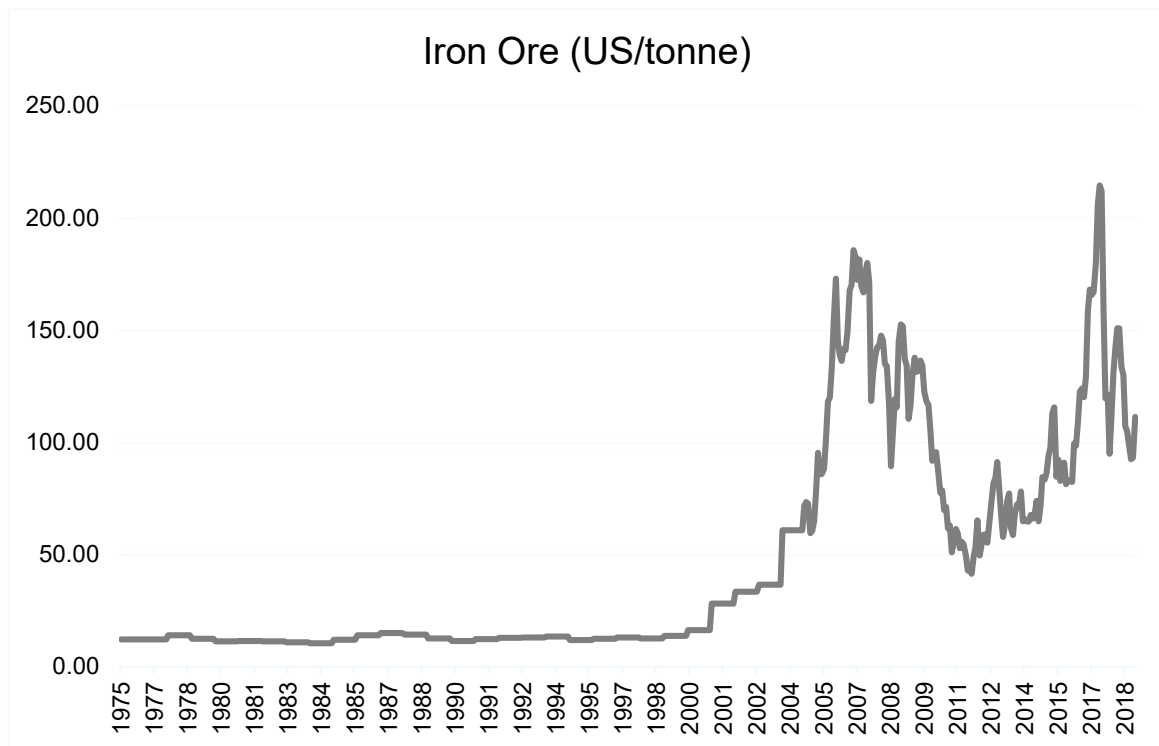


Figure 31 Historical Chart of Iron Ore Spot Prices - January 1980 to December 2022 (Market Index, 2022)

The above graph (**Figure 27**) illustrates the range of iron ore prices from January 1980 until December 2022. Prices at December 2022 were around \$111 USD per metric tonne. The Reserve Bank of Australia notes that “*the bulk of Australian iron ore producers are at the lower end of the global iron ore cost curve, which means that most Australian production remains profitable at current iron ore prices*” (RBA, 2015). The iron ore price at the time of the RBA’s remarks in February 2015 was \$62.69 USD per metric tonne; in February 2017 the spot price was \$88.80USD per metric tonne (Market Index, 2022).

As such, and as eluded to in the commentary above, mining operations may be forced to extract at greater efficiencies; place mines on care and maintenance; or defer/cancel developments or close operations (Geoscience Australia, 2016). The weakness in the iron ore price has decreased exploration and drilling.

Rio Tinto, BHP Billion and FMG are regarded as the largest operators in the Pilbara Region, although a number of smaller mining companies operate within the local government area.

FMG's Solomon Hub is developed to the north of Tom Price. The *Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006* establishes the preparation of a Community Development Plan, which covers training and employment for local residents, local purchasing of goods and services and regional development, contribution to community services and facilities, and developing a regionally based workforce. In December 2020, FMG opened its Eliwana Iron Ore Mine located 90 km west of Tom Price. The operation includes a new dry ore processing facility with capacity of 30 million tonnes per annum and a new 143 km rail line.

Mineral Resources Limited (MRL) is constructing its Onslow Iron Ore Project to commence production in December 2023 (MRL, 2022). Iron Ore will be transported to the Port of Ashburton, where 35 megatonnes of iron ore will be shipped per year. The Onslow Iron Ore Project has a projected life span of 30 years.

Rio Tinto has a significant presence in the Shire, being a major landowner within Tom Price, Paraburdoo and Pannawonica. Rio Tinto Pilbara operations increased production to 309 megatonnes in 2015 and was expected to increase iron ore shipments to 350 megatonnes in 2016 (Geoscience Australia, 2016). In 2022, Rio Tinto Pilbara operations produced 324.1 megatonnes of iron ore shipments (RTIO, 2023). Rio Tinto operates mines within the Shire as per **Table 29** below.

Table 29 Rio Tinto Mines (RTIO, 2023)

Mine	Commenced Production	Workforce
Brockman 2 / Nammuldi	1992	FIFO
Brockman 4	2010	FIFO
Robe Valley Operations	Robe Valley 1972 Mesa A 2010 Mesa J 1992	49% residential; 51% FIFO (Pannawonica)
Mt Tom Price (including Western Turner Syncline)	1966	Residential (Tom Price)
Greater Paraburdoo	Paraburdoo 1972 Channar 1990 Eastern Range 2004	78% residential; 22% FIFO (Paraburdoo)
Marandoo	1994	FIFO
Gudai-Darri	2022	FIFO

BHP operations were considered to increase 6% in the December 2015 half-year period to 131 megatonnes, with the company anticipating production to rise to 290 megatonnes over time as a result of operational efficiencies and increasing capacity (Geoscience Australia, 2016).

6.4.1 MINING TENEMENTS

Pursuant to section 120 of the *Mining Act 1978*, the provisions of any planning scheme in force under the *Planning and Development Act 2005* would be taken into account, but would not prohibit or derogate from the granting of a mining tenement or the carrying out of any mining operations authorised under the *Mining Act*. The Shire or the WAPC can inform the Minister in writing, that the mining lease or general purpose lease would, if granted, authorise the carrying on of mining operations contrary to the provisions of the local planning scheme. The Minister would consult and obtain the Minister for Planning's recommendation.

Unsurprisingly, there are hundreds of mining tenements of varying sizes and types within the Shire of Ashburton covering an extensive range of minerals and resources. **Figure 32** shows the top ten companies' various tenement holdings.

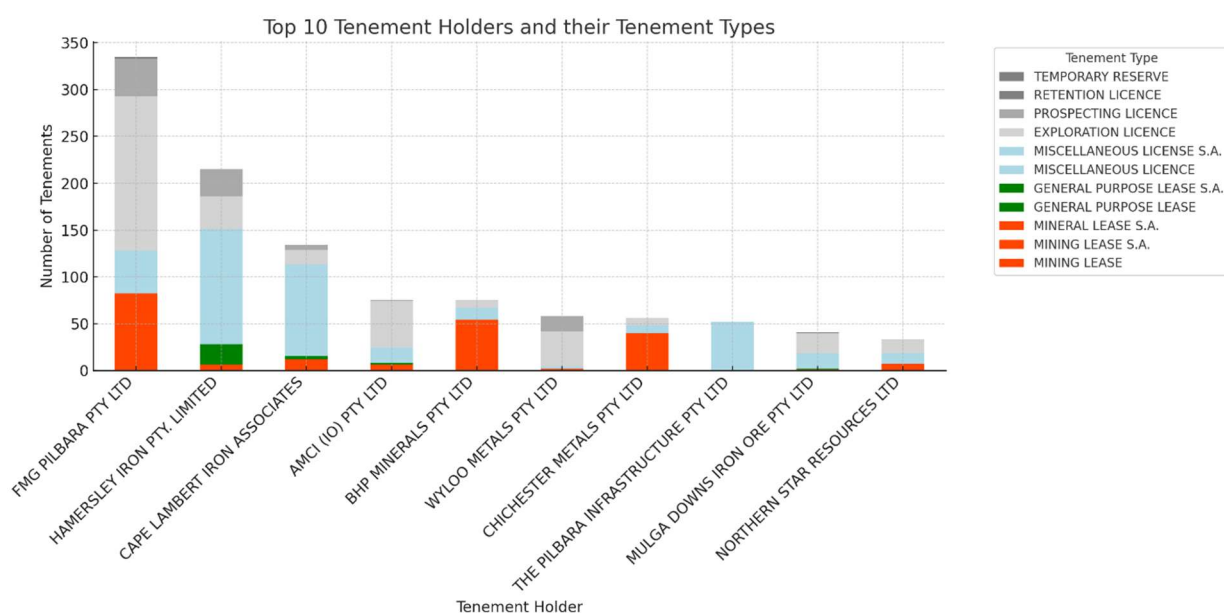


Figure 32 Tenement Holdings, Shire of Ashburton (DMIRS, 2023)

There are 26 mining projects within the Shire of Ashburton, with all but one project in operation. There are 73 mines within the projects, shown in **Table 30** (DMIRS, 2023).

Table 30 Status of Mining Tenements (DMIRS, 2023)

Mining Project	Primary Owner	Commodity	Operating Status	Number of Mines within Project
Ashburton Sand and Shingle	Onslow Resources	Construction Materials	Operating	1
Cane River	Hanson Construction	Construction Materials	Operating	1
Mt Minne Granite		Construction Materials	Operating	1
Murchinson-Gascoyne	Main Roads WA	Construction Materials	Operating	1
Onslow	NTC	Construction Materials	Operating	3
Paraburdoo Sand and Gravel		Construction Materials	Operating	1
Parry Range and Maroonah Marbles	Huau Stone	Construction Materials	Operating	4
Range Aggregate	MCS	Construction Materials	Operating	1
Tom Price Aggregate	MCS	Construction Materials	Operating	1
Glen Florrie White Rocks		Dimension Stone	Operating	3
Nanutarra Marbles		Dimension Stone	Operating	1
Sheela Bore Green Marble		Dimension Stone	Operating	1
Brockman 2 – Nammuldi – Silvergrass – Homestead	Rio Tinto	Iron Ore	Operating	8
Brockman 4 Area	Rio Tinto	Iron Ore	Operating	1
Channar	Rio Tinto	Iron Ore	Operating	4
East Pilbara Iron Ore	FMG	Iron Ore	Operating	11
Marandoo	Rio Tinto	Iron Ore	Operating	2
Paraburdoo	Rio Tinto	Iron Ore	Operating Under Development	11 2
Robe River – Deepdale	Rio Tinto	Iron Ore	Operating	3
Solomon – Greater Solomon	FMG	Iron Ore	Operating	2

Mining Project	Primary Owner	Commodity	Operating Status	Number of Mines within Project
Under Development				
Tom Price	Rio Tinto	Iron Ore	Operating	7
Turner Syncline West	Rio Tinto	Iron Ore	Operating	4
West Pilbara – Red Hill	API	Iron Ore	Under Development	5
Western Hub	FMG	Iron Ore	Operating	2
Ashburton River North	Quarry Park	Limestone – Limesand	Operating	1
Onslow Salt	Onslow Salt	Salt	Operating	1

6.4.2 SALT

6.4.2.1 ONSLOW SALT

The Onslow Salt saltfield is owned and operated by Shark Bay Salt Pty Ltd, a wholly owned subsidiary of Mitsui & Co Ltd⁵. The saltfield was built in the late 1990s and began shipment of salt in 2001. The saltfield was built by enclosing a vast natural flat area with sea wall levees and encompasses an area of 220 square kilometres. The 87 square kilometres occupied by the saltfield comprises of:

- 77 square kilometres for 6 evaporation ponds; and
- 10 square kilometres for 15 crystalliser ponds.

The salt is harvested, washed and stockpiled. It is exported by sea for a range of industrial purposes. The salt is loaded via conveyor belts from the stockpiles via the wharf to vessels.

The operation is subject to the *Onslow Solar Salt Agreement Act 1992*⁶. The *OSSA Act 1992* ratifies the agreement between the State and Onslow Salt Pty Ltd (Onslow Salt) to establish and operate a solar salt field at Onslow and for incidental and other purposes. The *OSSA Act 1992* indicated an initial production of 1 million tonnes of salt with a capacity to produce up to 2.5 million tonnes of salt per annum. Rights, obligations and responsibilities are outlined in the *OSSA Act 1992*.

It is understood the operation has a range of tenure, including some freehold, mining tenement lease, and general purpose lease. A gas pipeline, Water Corporation lease, Shire of Ashburton managed reserve, and a reserve for a golf course are also within the operational area. The lease ensures the company has rights, but does not offer totally secure tenure.

6.4.2.2 ASHBURTON SALT

The Ashburton Salt project was announced in May 2016 by K+S⁷ to be located south of the ANSIA and approximately 40 kilometres south-west of Onslow. The project is a response by K+S to move into the Asian market where there is growing demand for industrial salt.

⁵ <http://www.salt.com.au/os.php>

⁶ https://www.slp.wa.gov.au/legislation/statutes.nsf/main_mrtitle_660_homepage.html

⁷ <https://www.businessnews.com.au/article/350m-salt-project-unveiled>

In August 2022, the Shire's Council resolved that it has no objection to the proposal in principle, subject to certain conditions and clarifications to align with the Shire's responsibilities and interests. K + S reportedly signed a Native Title Agreement with Thalanyji traditional owners for the project in March 2023.

K + S prepared an Environmental Review Document which the Environmental Protection Authority (EPA) advertised for public comment between 12 June 2023 and 4 September 2023. The EPA has determined the proposal will be assessed under Part IV of the *Environmental Protection Act 1987* and it will also be assessed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* as a controlled action, via an accredited process.

Annual production would be approximately 3.5 million tonnes per annum, with an approximate capital expenditure of \$350 million.

Currently, no State Agreement applies to the project.

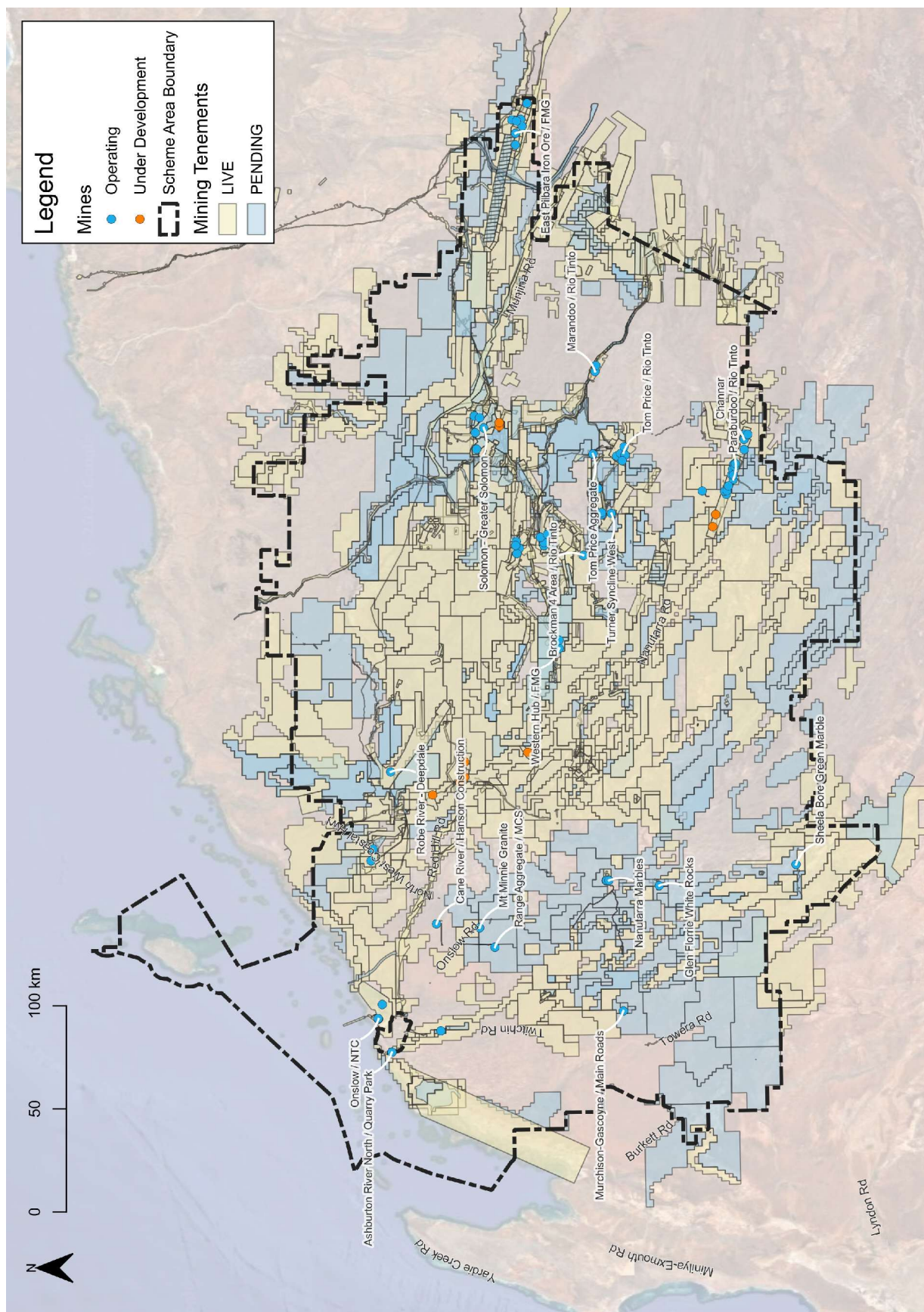


Figure 33 Mining Tenements and Mines

6.5 BUSINESS TURNOVER

A number of businesses operate within the Shire. The following **Figure 34** identifies that between 2012-2015 there was:

- A reduction in businesses with a turnover of 0-\$50k;
- Near parity resurgence in businesses with a turnover of \$50k-\$100k;
- Slight reduction in businesses with a turnover of \$100k-\$200k;
- A notable decline in businesses with a turnover of \$200k-\$500k;
- A positive increase in businesses with a turnover of \$500k-\$2m; and
- Near parity in businesses with a turnover of \$2m or more.

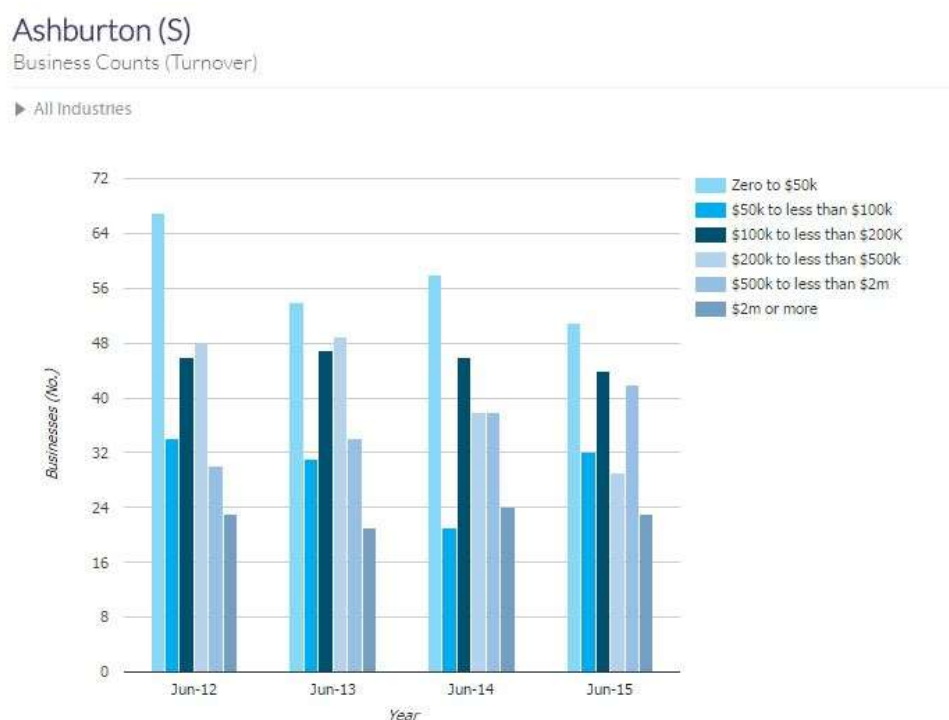


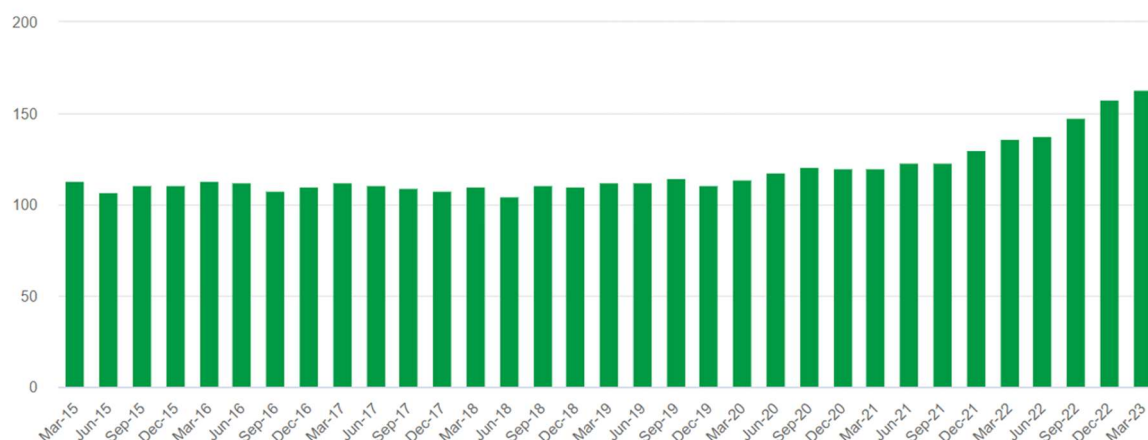
Figure 34 Ashburton Business Counts, Turnover

There appears to be resilience in the number of businesses within the Shire. Business growth may be leveraged from mining, or growth in other industry sectors such as agriculture, tourism, construction etc. Through diversification of the economy, broadening the scope of the economy could also contribute to a growth in business counts.

Figure 35 below shows a 36% increase in GST registered businesses from 120 businesses in March 2021 to 163 businesses in March 2023 within the Shire (Profile.id, 2023) following a relatively stable period from 2015. The recent growth indicates favourable local conditions that have supported the establishment of new business.

Number of GST registered business

Shire of Ashburton - All industries



Source: Australian Business Register. ©2020 Compiled and presented in economy.id by .id (informed decisions).

Figure 35 Shire of Ashburton GST Registered Businesses (Profile ID, 2023)

6.6 ECONOMIC TRANSFORMATIONAL OPPORTUNITIES

The diversification of the economy can help strengthen its adaptability and resilience to market changes, as a greater number of occupations will be spread across a wider range of sectors. Existing sectors include resources, agriculture, tourism and fisheries. Supporting services also contribute to a broadening of the economic base.

The *Pilbara Regional Investment Blueprint* identified new sources of growth through 'Transformational Opportunities' that will be catalysts for projects, refer **Table 1** in **section 2.2.1**. If transformational opportunities are not harnessed, the 'business as usual' trajectory is flat (RDAP, 2013) and population growth will not be as possible compared to an economy that includes a greater range of industry sectors/businesses and employment opportunities.

Opportunities within the Pilbara region (RDAP, 2013) have been identified in the sectors of:

- Sustainable commercial scale algae;
- Bio-fuels;
- High-tech greenhouse;
- Aquaculture fish farming and fish processing; and
- Tourism, and as a consequence, retail and food services.

Whilst the Local Planning Strategy does not aim to predict what transformational opportunities may arise within the Shire, it is able to facilitate the ability for new, emerging or growth industry sectors to be able to consider establishing themselves within the local government area. Capitalising on proximity to Asian, other international and domestic markets, the Shire's rangelands can prove to be a significant source for investment in a range of areas. The Shire is already home to industry sectors such as commodities, non-traditional cropping, agriculture, aquaculture, fishing, tourism, aviation, construction, health, education, and the public sector.

6.7 EMPLOYMENT

It is estimated that the number of people working in the Pilbara Region increased by 33% from 44,956 in 2017 (REMPAN, 2017), to 59,782 in 2023 (REMPAN, 2023). **Table 31** shows employment data by local government area, demonstrating total employment numbers as well as each LGA's employment percentage of the Pilbara Region.

Table 31 Pilbara Region Employment 2017-2023

Local Government Area	2017	2023	Change of %
City of Karratha	14,831 (33.0%)	14,910 (24.9%)	-8.0%
Shire of East Pilbara	11,279 (25.1%)	19,094 (31.9%)	+6.8%
Shire of Ashburton	10,277 (22.9%)	14,793 (24.7%)	+1.9%
Town of Port Hedland	8,569 (19.1%)	10,985 (18.4%)	-0.7%
Pilbara Region (total)	44,956 (100%)	59,782 (100%)	

Whilst the City of Karratha experienced minimal growth, considerable employment growth was observed in the Shires of East Pilbara and Ashburton, and the Town of Port Hedland during this period. These LGAs proportion of the Pilbara Region's employment increased as a consequence.

and Food Services are the top three employment industry sectors. For the Pilbara, mining jobs may typically increase or decrease irrespective of the population growth trends. For mining, the number of jobs available may be affected by the number of FIFO jobs which would imply local employment opportunities may not be as diverse or readily available.

Within the Shire of Ashburton and the Pilbara region, employment is heavily oriented to mining and construction, refer **Table 32**, followed by accommodation and food services; and transport, postal and warehousing. **Table 32** has been updated to include the more recent 2021 Census data, with an arrow indicating whether the sector proportionally increased (↑) or decreased (↓) from 2017. Sectors that are projected to have significant employment growth include professional, scientific and technical services; and transport, postal and warehousing (Department of Training and Workforce Development, 2013).

Table 32 Industry by Sector, Shire of Ashburton and Pilbara Region (REMPAN, 2017) (ABS, 2021)

Employment Sector	Shire of Ashburton			Pilbara Region		
	2017	↑-↓	2021	2017	↑-↓	2021
Mining	52.83%	↓	48.4%	41.15%	↓	32.88%
Construction	18.05%	↓	8.4%	18.69%	↓	8.67%
Education & Training	2.25%	↑	6.6%	3.40%	↑	7.12%
Accommodation & Food Services	6.14%	↓	5.2%	5.49%	↓	4.99%
Health Care & Social Assistance	1.77%	↑	4.2%	3.17%	↑	6.88%
Administrative & Support Services	2.73%	↑	4.0%	3.07%	↑	3.75%
Transport, Postal & Warehousing	4.19%	↓	3.0%	5.24%	↑	6.06%
Retail Trade	1.79%	↑	3.0%	3.00%	↑	5.24%
Other Services	1.49%	↑	1.9%	2.45%	↑	3.13%
Wholesale Trade	0.78%	↑	1.5%	1.39%	↑	1.95%
Agriculture, Forestry & Fishing	0.60%	↑	1.5%	0.36%	↑	0.70%
Rental, Hiring & Real Estate Services	0.62%	↑	1.1%	1.53%	↑	1.74%
Professional, Scientific & Technical Services	2.67%	↓	0.9%	3.04%	↑	1.93%
Manufacturing	1.17%	↓	0.8%	3.21%	↓	2.50%
Electricity, Gas, Water & Waste Services	0.57%	↑	0.7%	1.01%	↑	1.64%
Financial & Insurance Services	0.18%	↑	0.3%	0.32%	-	0.32%
Arts & Recreation Services	0.05%	↑	0.3%	0.22%	↑	0.74%
Information Media & Telecommunications	0.19%	↑	0.2%	0.21%	↑	0.30%

Table 32 and **Table 33** indicate the dominance of mining sector and occupations for technicians and trades workers and machinery operators and drivers. Whilst these tend to dominate in terms of employment, other sectors could experience strong employment growth. With projections that other industry sectors have growth opportunities, there is the ability to broaden employment opportunities. This would assist in providing greater representation of other industries. As such it is likely that in the longer term professional occupations may be more representative within the Shire.

Table 33 Workers by Occupation (REMPAN, 2017) (REMPAN, 2023)

Occupation	Percentage					
	Shire of Ashburton		Pilbara Region		Western Australia	
	2017	2021	2017	2021	2017	2021
Technicians and Trades Workers	29.47%	34.6%	29.29%	31.6%	16.83%	15.4%
Machinery Operators and Drivers	28.92%	29.0%	21.52%	23.6%	7.73%	7.7%
Professionals	11.33%	10.2%	12.91%	12.3%	20.16%	22.4%
Labourers	11.03%	10.7%	11.67%	10.2%	9.63%	9.4%
Clerical and Administrative Workers	7.32%	4.6%	9.40%	6.6%	14.43%	12.0%
Managers	6.56%	5.2%	7.51%	7.0%	12.28%	12.3%
Community and Personal Service Workers	3.19%	3.2%	4.29%	4.9%	9.47%	12.1%
Sales Workers	1.31%	1.2%	2.42%	2.5%	8.67%	7.9%
Not Stated / Inadequately described	0.86%	1.3%	0.99%	1.2%	0.80%	0.9%

As shown by updated **Table 32** and **Table 33**, the employment dominance of the mining and construction sectors within the Shire and Pilbara Region declined between 2017 and 2021, with notable proportionate growth occurring in the education and training, and health care and social assistance sectors, as well as general proportionate growth in most other sectors.

6.7.1 UNEMPLOYMENT

The unemployment rate in the 2021 census was 3.6% compared to the Western Australian average of 5.1% (Profile.id, 2023). The following **Table 34** and **Figure 36** identify the dominance of males in the labour force and in employment.

Table 34 Employment, Unemployment and Total Labour Force, Shire of Ashburton (ABS, 2021)

Workforce (Male and Female)	Employed (of persons aged 15+yrs)			Unemployed	Total Labour Force	
	Full-Time	Part-Time	Away from Work		Labour Force	% Employment to Population
Male (2021)	80%	8%	8%	1.4%	71%	70%
Female (2021)	58%	28%	8%	3.0%	66%	64%
Male (2016)	66.2%	4.3%	6.2%	1.3%	77.8%	76.3%
Female (2016)	14.3%	4.7%	2.2%	4.2%	22.3%	64.5%
Male (2011)	59.5%	4.1%	6.1%	1.2%	70.6%	76.5%
Female (2011)	18.9%	6.9%	2.8%	2.9%	29.4%	67.1%
Male (2006)	51.6%	3.8%	5.8%	1.9%	62.5%	79.4%
Female (2006)	20.1%	12.8%	3.2%	3.3%	37.5%	63.4%

The extent of male full-time employees is indicative to the high rates of FIFO workers within the Shire. This is reinforced where nearly two-thirds of workers in the Shire of Ashburton working more than 49 hours per week, refer **Table 34**. An inference is that the workforce is over-represented as a male-dominant workforce within the construction, mining, and oil and gas sectors. These industry sectors typically have their employees on shift work. Shift work enables 24/7 operations, however FIFO based working environments can lead to risks associated with operating heavy machinery, demanding rosters, intensive commutes, disruptive sleep environments, and inexperienced workers (Wood, 2013). Fatigue research has received significant resources, and guidelines and legislation has been introduced to help with fatigue management and staff training. However, with FIFO environments it is implied that fatigue can never be completely removed.

Unemployment within the Pilbara region is well below the Western Australian unemployment rate, as shown in **Figure 36**.

Pilbara Region

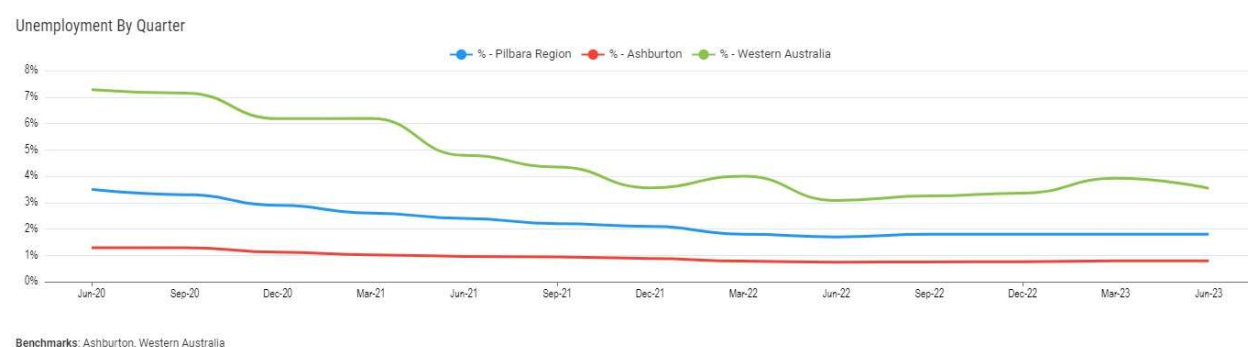


Figure 36 Unemployment Rates (REMPAN, 2023)

6.7.2 WORKFORCE AGE COHORTS

In the 2016 census, the Shire of Ashburton had a labour force of 8,469 persons (77.8% male, 22.2% female) with an overall labour force participation rate of 74.9% (77.3% male, 67.7% female) (ABS, 2021). The 2021 census revealed that the Shire's labour force had reduced considerably to 3,909 persons (61.9% male, 38.1% female), whilst the overall labour force participation rate of 68.9% (71.2% male, 65.6% female) also shows a reduction.

In 2016, the age of the workforce was dominated mainly by 25-34 year olds (29.89%), 35-44 year olds (28.13%) and 45-54 year olds (22.2%). The age of the workforce remained dominated by these age groups in 2021 – 25-34 year olds (26.81%), 35-44 year olds (28.42%) and 45-54 year olds (19.01%) as shown in **Table 35** (ABS, 2021).

The Shire's labour force participation rate of 68.9% is higher than that of broader Western Australia (63.9%) and second highest local government area in the Pilbara region (Karratha 69.2%, Port Hedland 68.4% and East Pilbara 61.6%). This can be an indication for potential local labour shortages as well as the driving forces of employment demand particularly in mining and construction.

Table 35 Workers in Pilbara and Ashburton by age (REMPAN, 2023) (REMPAN, 2017)

Age cohort	Percentage					
	Shire of Ashburton		Pilbara Region		Western Australia	
	2016	2021	2016	2021	2016	2021
15-19	1.62%	1.0%	2.56%	2.3%	6.07%	5.5%
20-24	8.02%	4.7%	8.86%	5.7%	9.98%	8.8%

Age cohort	Percentage					
	Shire of Ashburton		Pilbara Region		Western Australia	
25-34	29.89%	24.7%	28.50%	25.8%	21.62%	21.5%
35-44	28.13%	26.8%	26.17%	27.0%	22.60%	22.6%
45-54	22.20%	24.3%	22.48%	22.5%	22.19%	20.8%
55-64	9.46%	16.4%	10.39%	14.5%	14.46%	15.8%
65-74	0.62%	2.1%	1.02%	2.2%	2.80%	4.5%
Over 75	0.06%	0.1%	0.02%	0.0%	0.47%	0.5%

Further to the distinct growth of the labour force within the Shire of Ashburton, the employment and unemployment rates have remained steady for the total population, refer **Table 36**.

Table 36 Changes in Employment, 2001- 2021 (ABS, 2021)

Workforce (Male and Female)	Employed			Unemployed		Total Labour Force	
	Full-Time	Part-Time	Away from Work / Not Stated	Looking for Full- Time	Looking for Part- Time	Labour Force	Status not Stated
2001	68.33%	17.91%	10.4%	2.17%	1.18%	67.19%	7.61%
2006	73.34%	14.53%	9.76%	1.66%	0.70%	67.17%	14.49%
2011	80.15%	8.78%	9.75%	1.01%	0.31%	70.64%	18.18%
2016	80.6%	9.1%	8.4%	1.5%	0.5%	75%	18.2%
2021	71.6%	15.5%	10.9%	1.1%	0.9%	68.9%	20.5%

6.7.3 RATIO OF MALE TO FEMALE WORKFORCE

Whilst decreasing between 2016 and 2021, the ratio of male to females in the Shire's workforce remains considerably higher than that of Western Australia, as shown in

Table 37 below.

Table 37 Gender Ratio of Workforce (Profile ID, 2023)

Local workers	2021			2016			Change 2016 to 2021
	Number	Percentage	Western Australia %	Number	Percentage	Western Australia %	
Total local workers (Census)	13,727	100.0	100.0	23,449	100.0	100.0	-9,722
Males	10,760	78.4	52.4	19,847	84.6	53.8	-9,087
Females	2,967	21.6	47.6	3,602	15.4	46.2	-635

Figure 37 below shows the changes in the Shire's labour force between 2011 and 2021 (ABS, 2021). Consistent with the changes in population, the labour force grew in 2016, however decreased considerably by 2021.

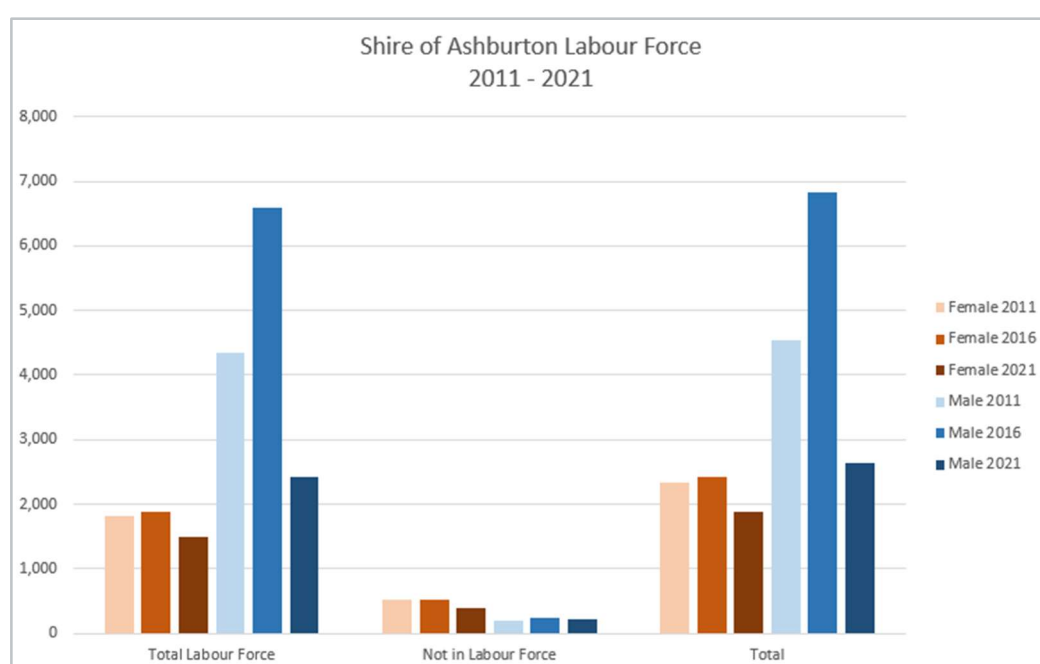


Figure 37 Changes in Labour Force, Shire of Ashburton (ABS, 2021)

Figure 38 demonstrates the labour status of the Shire's workforce and shows the gender difference between full-time and part-time employment, whereby a greater proportion of the male workforce is employed full-time than females.

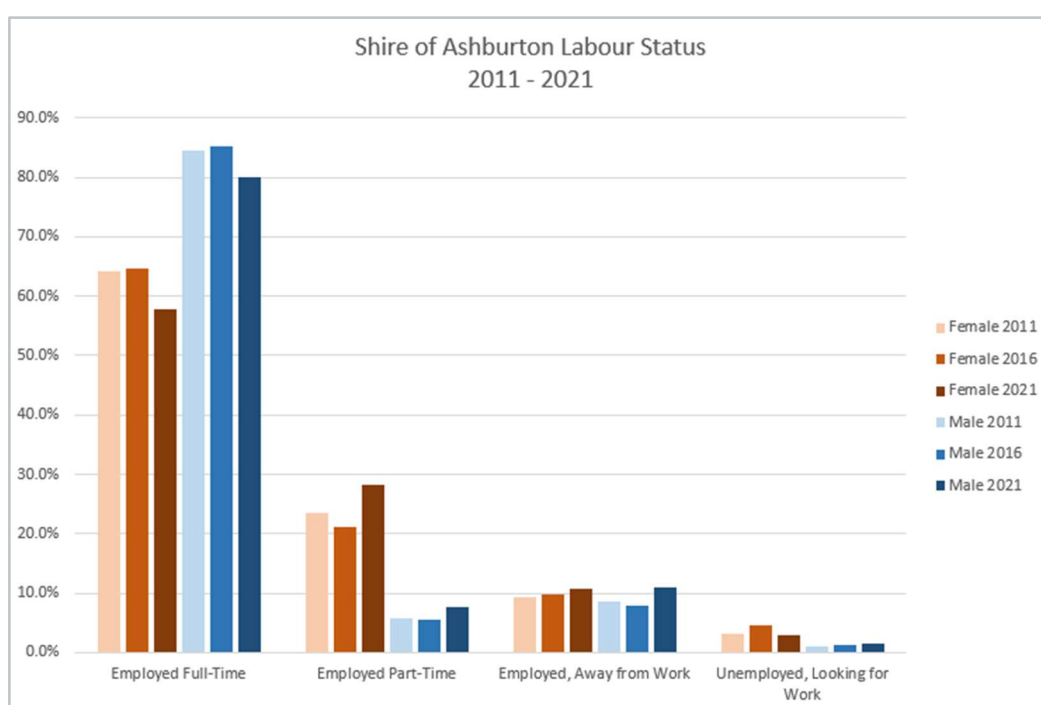


Figure 38 Changes in Employment (Male and Female), Shire of Ashburton 2011-2021 (ABS, 2021) (ABS, 2012)

6.7.4 EMPLOYMENT AND HOURS WORKED

The percentage of the population aged 15 years and over increased from 82% 2011 to 87% in 2016, however has since decreased to 77% in 2021 (ABS, 2021).

Table 38 shows that the Shire's ratio of the workforce working 49 hours or more per week is 62.5% in 2021, reducing slightly from the 65% recorded in 2016. This is higher than the Pilbara regional average of 52.5% in 2021, and more striking is the comparison to the Western Australian average of 16.6%. It is notable that the factors and pressures imposed on workforce associated with FIFO employment can have detrimental health impacts on individuals, relationship impacts on their networks, and socio-economic impacts on communities (Parliament of Western Australia, 2015). Whilst the local population enjoys low rates of unemployment, it is illustrative in **Table 38** that company-imposed rosters lead to very high hours worked.

Table 38 Workers - by hours worked (REMPLAN, 2017) (REMPLAN, 2022)

Number of Workers, by Hours Worked	Shire of Ashburton		Pilbara Region		Western Australia	
	2016	2021	2016	2021	2016	2021
0 hours	8.95%	12.5%	7.49%	10.6%	4.68%	4.6%
1 – 15 hours	2.75%	3.1%	3.19%	4.4%	10.78%	11.9%
16 – 24 hours	2.51%	2.6%	2.91%	3.3%	9.21%	10.3%
25 – 34 hours	2.50%	2.4%	3.34%	3.8%	9.57%	11.7%
35 – 39 hours	3.45%	3.4%	5.58%	7.2%	15.84%	18.0%
40 hours	4.08%	3.8%	7.72%	7.0%	17.38%	16.6%
41 – 48 hours	9.37%	8.2%	10.41%	9.9%	11.02%	9.2%
49 hours or more	65.11%	62.5%	58.08%	52.5%	20.18%	16.6%

6.7.5 INDEX OF ECONOMIC DISADVANTAGE

The Shire of Ashburton's Socio Economic Indexes for Areas (SEIFA) Index of Disadvantage, as shown in Figure 39, measures the relative level of socio-economic disadvantage based on a range of Census characteristics. The index is derived from attributes that reflect disadvantage such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations (REMPPLAN, 2017). A higher score on the index indicates a lower level of disadvantage. The score for the Shire of Ashburton is above the average. However, it is important to note that disadvantages are more pronounced within the Indigenous community, as referred to in **section 5.1.3.2**. Whilst a higher score is given for the Shire overall, there are pockets of the community that would experience greater disadvantage.

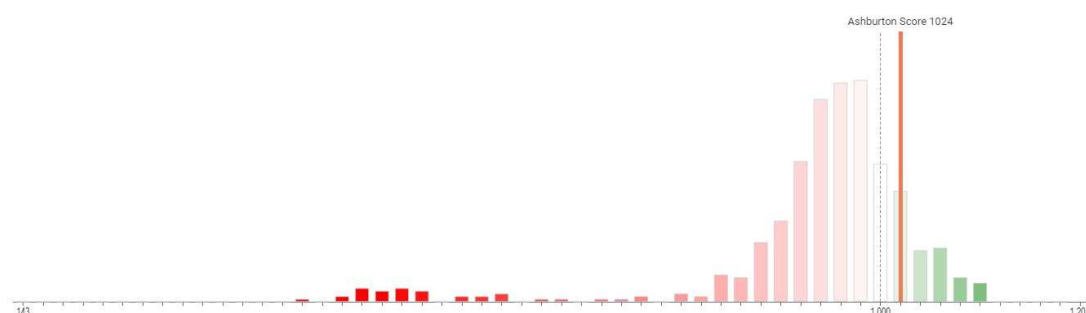


Figure 39 SEIFA Score 2021, Shire of Ashburton (REMPPLAN, 2023)

The high score on the SEIFA index arguably is reflected by more than half of the workforce within the Shire earning over \$2,000 per week (refer to **Table 39**). These high incomes typically are associated with FIFO work arrangements. Therefore, whilst incomes are high, a large number of these high-income earners would reside outside of the Shire (such as within Perth).

Table 39 Workers by Income (REMPPLAN, 2023)

Weekly Income Range	Shire of Ashburton	Pilbara Region	Western Australia
Negative / Nil Income	0.1%	0.2%	0.4%
\$1-\$149	0.3%	0.9%	2.8%
\$150-\$299	0.2%	0.9%	3.1%
\$300-\$399	0.4%	0.7%	3.1%
\$400-\$499	0.3%	0.6%	3.8%
\$500-\$649	0.6%	1.4%	6.1%
\$650-\$799	0.8%	1.9%	7.4%
\$800-\$999	3.1%	2.1%	9.8%
\$1,000-\$1,249	3.6%	5.5%	12.2%
\$1,250-\$1,499	5.7%	6.8%	10.1%
\$1,500-\$1,749	7.4%	8.3%	9.4%
\$1,750-\$1,999	8.7%	9.4%	7.4%
\$2,000-\$2,999	37.4%	31.7%	14.2%
\$3,000 or more	31.8%	27.9%	9.3%
Not stated / Not applicable	0.8%	0.6%	0.7%
Total	100%	100%	100%

6.7.6 LABOUR FORCE SKILLS

Table 40 and **Table 41** indicate that there has been notable growth in the proportion of the workforce holding formal qualifications, and a lower proportion with no formal qualifications. There has been a notable growth in the proportion of the workforce with a vocational qualification, which can arguably be reflected by the qualifications required for construction workforce – predominately certificate III level qualifications with a relatively smaller pipeline of certificate I and II participants.

Table 40 Changes in Qualified Workforce 2016-2021 (Profile ID, 2023)

Qualification Level	2021		2016		Change 2016 - 2021
	Number (%)	Regional WA %	Number (%)	Regional WA %	
Bachelor or Higher degree	597 (15.6%)	18.8%	1165 (14%)	16.5%	-568
Advanced Diploma or Diploma	357 (9.3%)	9.6%	702 (8.5%)	9.4%	-345
Vocational	1,527 (39.9%)	32.6%	3,708 (44.6%)	31.9%	-2,181
No qualification	1,255 (32.8%)	36.3%	2,547 (30.7%)	38.8%	-1,292
Not stated	91 (2.4%)	2.8%	185 (2.2%)	3.4%	-94
Total Persons aged 15+	3,827 (100%)	100%	8,307 (100%)	100%	-4,480

Table 41 Changes in Qualified Workforce 2006-2011 (ABS, 2012) (Profile.id, 2016)

Qualification Level	2011		2006		Change 2006 to 2011
	Number (%)	Regional WA %	Number (%)	Regional WA %	
Bachelor or Higher degree	796 (9.7%)	10.2%	407 (9.3%)	8.8%	+389
Advanced Diploma or Diploma	502 (6.1%)	6.4%	208 (4.8%)	5.7%	+294
Vocational	2,496 (30.4%)	22.6%	1,140 (26.1%)	19.1%	+1,356
No qualification	2,821 (34.3%)	46.9%	1,890 (43.2%)	51.2%	+931
Not stated	1,600 (19.5%)	13.8%	730 (16.7%)	15.1%	+870
Total Persons aged 15+	8,215 (100%)	100%	4,375 (100%)	100%	+3,840

Government educational investment is occurring in the Pilbara Region to boost opportunities for local training, including a new training facility at North Regional TAFE Karratha campus, for delivering new courses for training in electronics, communications, renewable energy, signalling and electro-technology maintenance⁸.

There are low levels of take-up of higher level vocational and training qualifications, especially in the oil and gas and downstream process manufacturing sectors. Existing job roles are being reshaped and there is demand for higher level skills (RITC, 2016). There is the capacity to deliver level 5 and 6 qualifications, although there is a need to match higher level skills with future job role needs amidst increased sophistication and technological advancement in the industry.

⁸ <https://www.mediastatements.wa.gov.au/Pages/Barnett/2016/11/New-electrical-centre-delivers-training-in-Pilbara.aspx>

This is important, as higher level vocational training and education more directly relates to the job roles and skills necessary during the operational phase of a project. Workforce qualifications for construction phases are not directly transferrable to operational project workforces. Research confirmed that qualifications as they stand within the oil and gas and process manufacturing industries, do not meet the current needs of the industry (RITC, 2016). The biggest skills gaps to address generally revolve around leadership and business skills. Existing vocational courses on offer have been identified for changes to create new sets of qualifications or skill sets to meet industry needs.

The key objective of the *Pilbara Workforce Development Plan 2013-2016* (WDP) was to identify current and future workforce development and skills needs, and to develop strategies to ensure that these needs can be addressed (Department of Training and Workforce Development, 2013). The WDP identifies workforce issues that can be taken into account as part of decision-making processes. The WDP also recognises the vision put forward through Pilbara Cities (refer **section 2.2.1**).

Projections anticipate a transition of the Pilbara economy towards more diverse employment distribution by 2035. Whilst this is beyond the timeframe of the Local Planning Strategy, actions may need to be taken well in advance to facilitate growth in other employment sectors that are currently under-represented (i.e. retail, health care, manufacturing, education and training).

6.8 ECONOMIC AND EMPLOYMENT IMPLICATIONS

6.8.1 ECONOMIC IMPLICATIONS

In short:

- Onslow's economic growth is heavily dependent on LNG and salt.
- Paraburdoo and Tom Price's economic growth is heavily dependent on iron ore and other mineral reserves.

The Shire has been fortunate to capitalise on the previous resource boom, which facilitated in the funding of a number of facilities. Further, Rio Tinto operates within the townsites of Paraburdoo, Tom Price and Pannawonica, which provide more of an ongoing legacy through the establishment of facilities, housing, and the investment in community development.

Rio Tinto, Chevron and BHP are all large sector businesses that contribute to the economy through mining and hydrocarbon industries. The development of towns, roads, infrastructure and utilities is a testament to their long-term presence within the Shire as well as their ongoing investment.

Other sectors to have consideration for include the service sectors that provide support to the mining and hydrocarbon industries. These tend to fluctuate depending on the economic conditions.

Tourism (nature-based, eco, industrial and Aboriginal), pastoralism, commercial fishing, agriculture and aquaculture, and local services are all considered to have a bearing on the economic profile of the Shire.

- Fluctuations to commodity prices can have a direct influence on workforce (i.e. projects may be postponed, scaled-back, cancelled, accelerated to meet new rising demand etc) and can lead to rising costs, shortages in local labour, housing and land.
- OCCI has previously provided an outline of economic issues and opportunities that may be relevant to the economic prosperity of business within Onslow
- Acknowledge the Onslow community would be boosted by construction activity.
- The location of the Shire is within the same time zone as many of the highest growth countries in the world, which can provide interesting opportunities.

- Future projects will provide direct and indirect job growth, such as the OMSB, Ashburton Salt, and community/social and infrastructure projects.
- Access to heavy strategic and industrial land and associated utilities and infrastructure.
- Establishment of new industries producing products from downstream processing of natural gas and by-products and associated employment generation.
- Provision of utility synergies.
- Access to port and facilities and airport as supply and/or service base.
- Expansion and extension of hydrocarbon projects.
- Investigation of opportunities for growth in pastoral tourism; agriculture; aquaculture.

6.8.2 EMPLOYMENT IMPLICATIONS

Sustainable population growth and retention will arguably rely in some part on the need for economic development and diversification. This is a major challenge for regional economies. To sustain positive and ongoing population growth, new jobs will be required to see improvements to employment self-sufficiency and employment self-containment. Investment in new businesses, new industry sectors, and new job creation will need to keep up with population growth.

The accommodation of operational workforce in townsites will contribute to their economic growth/self-sufficiency. Particularly, presence of operational workforce in permanent residences can contribute to population growth, making education, health, community, social, recreational services more justifiable to retain and maintain.

The Onslow Chamber of Commerce and Industry (OCCI) has documented issues in relation to competitive labour margins, which is more of a business sector issue than a planning matter. The OCCI also recognises the economic stimulus that has been generated as a result of investment at Wheatstone, Macedon, Beadon Creek Boat Harbour, Onslow light industrial land and Onslow Airport, and the Onslow Marine Supply Base.

- Employment generation associated with workforce accommodation camps and business opportunities during construction, operation and shutdown.
- Contract packages for procurement available through ProjectConnect (information provider for the Wheatstone project).
- BHP in cooperation with OCCI identifies opportunities for local business during operations and shutdown activities.
- Spending on community infrastructure by mining companies.
- Establishment of a helicopter base and operations to supply and provide workforce transfers to offshore facilities and sites.
- Recreational and lifestyle benefits associated with marina.
- Ensure Local Planning Strategy provides opportunities for land/growth for range of industry sectors, i.e. light industry, general industry, small business, health & education, core infrastructure (and buffers).

Mining and oil and gas industry sectors will continue to be dominant within the Pilbara Region. A key challenge will be to ensure education and training of the workforce will keep up with the predicted transformation of the workforce, with job roles not in existence today potentially becoming mainstream. Considering technological advancements and changes in how the industry will do business, there are a number of roles that will place a greater emphasis on leadership and business skills (RITC, 2016), such as:

- Virtual reality technology and its application in process manufacturing industries;
- Analytics and big data;
- Robotics managers and drone supervisors;
- Biotechnology installers;

- Project management skills;
- Analytical skills and pro-active problem solving;
- Stronger communication skills;
- Greater specialist knowledge in an array of technology and associated software.

There is an understanding at a regional, State, and national level that other industry sectors need to be promoted and cultivated, to help diversify the local economy. Education and training, liveability factors, and incentives to attract emerging or embryonic industry sectors, will need to be considered.

6.8.3 ISSUES AND OPPORTUNITIES FOR ECONOMY AND EMPLOYMENT

The following **Table 42** considers the implications, issues and opportunities from an economy and employment perspective.

Table 42 Implications, Issues and Opportunities – Economy and Employment

Economy and Employment	Implications	Issues	Opportunities
Economic Growth	Forecasts show a gradual recovery in global, national and state economic growth, domestic economic activity and growth in exports. There appears to be resilience in the number of businesses within the Shire. The Shire of Ashburton has a higher than average SEIFA score, indicating lower levels of disadvantage. However, disadvantage is still pronounced within the Indigenous community.	The Pilbara Region is exporting unprecedented levels of iron ore, whilst experiencing weaker iron ore prices. Business growth may be leveraged from mining, or growth in other industry sectors (agriculture, tourism, construction, etc.).	The Local Planning Strategy can facilitate future urban and industrial development through identifying land areas suitable for town growth, should it be required. Support diversification of the economy to broaden the scope of its regional export potential. Support government initiatives to reduce socio-economic disadvantage within the Indigenous community.
Building Activity	Shire reports indicated an approximate growth rate of 1.2%, based on creation of new lots.	New lots may be required to address projected population increase within the townsites.	Identify land for urban infill and urban investigation, with a view to ensure that capable land is de-constrained and available, should demand warrant growth to occur.
Oil and Gas Resources	Significant economic benefits are generated from oil and gas, particularly from Gorgon and Wheatstone.	Commitments have been made by Chevron Australia for critical and social infrastructure within Onslow, as part of its State Development Agreement. The major oil and gas development are located within the ANSIA. The Shire has limited scope given it has no authority over the ANSIA.	Liaison and coordination with the Western Australian Planning Commission and State Agencies in relation to major proposals and developments occurring, that may have an impact on social, economic or environmental factors within the Shire. Ongoing liaison with the State Government in sourcing funding commitments to critical and social infrastructure.
Mining	Iron Ore is the most significant resource (in export terms) within the Shire of Ashburton. Global competition; mining company decision making; costs of extraction; access; infrastructure; and environmental, social and political factors all play a role in the viability of iron ore projects. Recognition that the <i>Mining Act</i> is not subject to the <i>Planning and Development Act</i>. Recognise that State Agreements exist and grant particular rights to mining companies. Development of worker accommodation can fall under the scheme.	Iron ore reserves across Australia may last for another 65 years, noting that the majority of iron ore is located in the Pilbara Region. Agreements can leverage the provision of critical and social infrastructure for supporting the liveability and sustainability of towns. Issuing of mining leases and tenements can have a bearing on the use of land. Mining projects are supported by workforce accommodation (i.e. construction camps), which can be isolated from communities and services.	Work with mining companies and State Agencies in relation to ensuring the community's needs and expectations are being considered and met through ongoing mining activity within the Shire. Work with Department of Planning, Lands and Heritage, State Agencies, and service providers to ensure that appropriate infrastructure is in place to minimise bottlenecks for projects. Ongoing liaison with the State Government in sourcing funding commitments to critical and social infrastructure. Advocate for workforce accommodation to be located in close proximity of construction project sites, to minimise impacts on land; support worker accommodation within gazetted townsites.
Salt	Onslow Salt is an established operation, with a local workforce based in Onslow. A more recently announced proposal by K+S is still in planning phase. Future	Onslow has the capacity and facilities available for accommodating employees for the proposed salt operations.	Ensure that Onslow is the town of choice for housing of employees for projects in proximity to the town.

Economy and Employment	Implications	Issues	Opportunities
	employees may be housed in Exmouth or Onslow.	The Asian market is in proximity, and is experiencing growth in demand for industrial salt.	Work with Onslow Salt and K+S to maintain a good working relationship between the salt operations and the town.
Economic Transformational Opportunities	Government investment is occurring into a range of economic transformational opportunities. The Shire is in proximity to Asian markets, other international markets such as the Middle East, and domestic markets.	Opportunities have been identified in sustainable commercial-scale algae; bio-fuels; irrigated agriculture; beef; high-tech greenhouse; aquaculture; tourism. Diversification of the economy can help to build robust communities, diversify employment choices, and encourage a greater spread of skill sets and knowledge.	Facilitate and encourage new, emerging or growth industry sectors to consider establishing themselves within the local government area. Work with State Agencies and service providers to ensure the Shire and the region is ready for economic transformation projects, whether through appropriate education and training, infrastructure, services, or other business needs.
Employment	Employment is heavily oriented to mining and construction, followed by accommodation and food services; and transport, postal and warehousing. The emphasis of mining and construction work is represented by 65% of labour force working more than 49 hours per week.	Significant employment growth can be anticipated in professional, scientific and technical services; and transport, postal and warehousing. Long work weeks and FIFO employment is noted to have detrimental health impacts on individuals, relationship impacts on their networks, and socio-economic impacts on communities.	Economic transformational opportunities could improve the ability to broaden employment, and potentially lead to growth in other professional occupations. Variety in job types and employment choice may assist in bringing in a broader demographic group, including women.
Workforce Development	Projections anticipate a more diverse employment distribution in the Pilbara Region by 2035. Actions need to be taken in advance to facilitate growth in other employment sectors. At a State level, education and training providers will work harder to predict and provide more relevant vocational courses that will be valued by industry, and also help deliver skill sets that will future-proof the workforce to future economic changes / transformational opportunities.	Occupations experiencing critical workforce shortages include trade, education, professional services, health care, mining, hospitality, and community service workers. Most post-school qualifications attained in the Pilbara are insufficient to meet the requirements of the employment market. Low attendance is recorded at the education and training institutions that are available in the Pilbara region (i.e. primary schools, high schools, community schools, State Training Provider campuses, college campuses, education outlets). Attendance rates and Literacy and numeracy results for Pilbara Students are below State averages, which have an impact on local capacity for graduates to meet industry demand at the working age. Schools also have difficulties attracting staff. Accurately characterising the Pilbara Aboriginal population is difficult; however, the above issues are broadly applicable. Literacy and numeracy levels are low, which can create barriers to gaining employment. Pilbara Aboriginal residents have a lower average schooling (19.4%) completed relative to the Western Australian Aboriginal population (20.6%).	Support government initiatives to identify future workforce development and skills and ensure that these can be addressed. Vocational education and training is likely to be an important means of providing post-school qualifications for the workforce. Apprenticeships and traineeships assist in up-skilling the workforce; however, the State has identified that more work is required to ensure an appropriate number of participants are in training. All levels of government, education stakeholders and industry all actively collaborate to increase participation, workforce development and training outcomes.

7 RETAIL AND COMMERCE

The Shire does not have a retail strategy for the townsites. Retail and space for commercial enterprise would be largely determined by population growth, demand for services and retail, as well as available land. It is noted that Rio Tinto also subsidises some businesses within the towns under their management, in order to maintain basic levels of services for the population.

7.1 PILBARA COMMERCIAL PROPERTY AND LAND SNAPSHOT – QUARTER ENDING JUNE 2015

The *Pilbara Commercial Property & Land Snapshot – Quarter Ending June 2015* was prepared by the Pilbara Development Commission (PDC, 2015) and at the time of preparing the Strategy, was the latest available report of its kind. For context, data of note in relation to the broader Pilbara region is outlined below:

Commercial properties for lease:

- The number of industrial/warehouse properties increased and the lease price decreased;
- The number of retail properties advertised for lease decreased and the lease price decreased also; and
- The number of office properties advertised for lease is 25, the advertised rent decreased.

Commercial properties for sale:

- All average advertised sale price decreased across retail, office and industrial warehouse; and
- The advertised average vacant commercial land price decreased, 119 commercial properties were advertised for sale, of those for sale the highest proportion was for industrial/warehouse uses.

In relation to the Shire of Ashburton, data of note is summarised below.

- The Shire had the lowest number of advertised commercial leases; only office and retail were advertised;
- The Shire had one of the highest advertised retail and office properties average annual lease cost;
- The Shire had the lowest number of advertised commercial properties (vacant land);
- No retail, office or industrial/warehouse properties were advertised for sale; and
- The Shire experienced substantial growth in non-residential building approvals, consistent with all local governments in the Pilbara, which peaked in 2011/2012 and then has subsequently declined.

Consistent with the residential activity (refer **section 5.4.3**) within the Shire, commercial activity is also subdued.

PDC published a more recent *Pilbara Half Yearly Commercial Property Snapshot* in December 2018 that superseded the data noted above, and reflected the slowing activity of the economy broadly experienced at that time. Across the Retail and Industrial/Warehouse sectors, there was an increase in properties listed for lease and sale, as well as decreases in leasing and sale rates. Similar trends were observed in the Office sector for leasing data (both numbers of properties available and the lease rates), however as no properties sold during the preceding six-month period, no trend in sales data were established.

PDC has not prepared a subsequent snapshot for the Pilbara region.

7.2 RETAIL AND BULKY GOODS

An adequate supply of retail space would be required to reflect population growth scenarios. For the purposes of identifying possible land requirements, the Local Planning Strategy has applied assumed residential retail demand per capita and residential bulky good demand per capita rates, and used the Band C population forecasts (WA Tomorrow, Population Report No. 10, 2015) to apply a multiplier to the future projected floor space requirements. The Local Planning Strategy assumes a 1:3 ratio for retail floor space and 1:4 ratio for bulky goods to the equivalent land requirements.

Table 43 indicates that an additional 25,593m² of land is projected to meet demand for retail and bulky good floor space between 2016 and 2026. This land would be distributed, as required, between the townsites of Onslow, Tom Price and Paraburdoo.

Table 43 General Projections for Retail and Bulky Good Floor Space Requirements

	2011	2016	2021	2026
Band C Population	10,230	11,660	12,760	13,740
Floor space Requirements per Capita				
Residential Retail Demand per Capita (m ²)	1.37	1.37	1.38	1.39
Add-on Trade	0.21	0.21	0.21	0.21
Residential Bulky Good Floor space Demand per Capita (m ²)	0.45	0.45	0.45	0.46
Add-on Trade	0.09	0.09	0.09	0.09
Floor space Demand – Shire of Ashburton				
Residential Retail Demand	14,015.1m ²	15,974.2m ²	17,608.8m ²	19,098.6m ²
Add-on Trade	2,148.3m ²	2,448.6m ²	2,679.6m ²	2,885.4m ²
Bulky good Retail Demand (m ²)	4,603.5m ²	5,247m ²	5,742m ²	6,320.4m ²
Add-on Trade	920.7m ²	1,049.4m ²	1,148.4m ²	1,236.6m ²
Land Requirements – Shire of Ashburton				
Total floor space	21,687.6m ²	24,719.2m ²	27,178.8m ²	29,541m ²
Land required 1:3 ratio for retail + 1:4 ratio for bulky goods	70,587m ²	80,454m ²	88,426.8m ²	96,180m ²
Net Land Required	-	9,867m ²	7,972.8m ²	7,753.2m ²
Current Available Land				
Onslow	88,973m ²	Land classified as 'Commercial' shown on Plan 2 – Onslow Town Site Strategy Plan		
Tom Price	111,894m ²	Land classified as 'Commercial' shown on Plan 3 – Tom Price Town Site Strategy Plan excluding Doradeen Road lots		
Paraburdoo	64,415m ²	Land classified as 'Commercial' shown on Plan 4 – Paraburdoo Town Site Strategy Plan		

It should be noted that this 'Band C' population is for the whole of the Shire and not limited to townsite residents. As such, the above floor space and land requirements should be deemed to be conservative, as they correspond to calculations for the Shire-wide population, and not the individual town site population growth projections. It is further noted that, and as discussed previously under **section 5.3.1.2**, the Shire's population recorded at the 2021 Census of 7,391 is significantly less than the figure predicted by the WA Tomorrow Population Report No. 10 (2015), and its more recent successor, WA Tomorrow Population Report No. 11 (March 2019). In the absence of revised WA Tomorrow Population forecasting, Amendment No. 1 has not changed the estimated floorspace needs contained in the table above. Instead, and in recognition of the dramatic changes in population that can be experienced in regional areas, the Strategy focusses on ensuring sufficient land is available and appropriately zoned to accommodate significant increases in demand, albeit without compromising the established fabric and commercial centres of the Shire's towns.

As detailed townsite structure plans are prepared, further modelling for retail and bulky goods should be undertaken to ensure retail and other retail sustainability is considered in line with proposed development.

7.3 IMPLICATIONS FOR RETAIL AND COMMERCE

The following **Table 44** considers the implications, issues and opportunities from a retail and commerce context.

Table 44 Implications and Opportunities – Retail and Commerce

Retail and Commerce	Implications	Issues	Opportunities
Lease and Sale Data	The Shire was reported in 2015 to have the lowest number of advertised commercial leases, and one of the highest advertised retail and office average annual lease costs. The Shire had the lowest reported number of industrial/warehouse properties advertised for sale. Growth in non-residential building approvals peaked and since declined.	Project population growth and more residents living permanently in towns will help to sustain more retail activity and potential expansion of retail and commercial.	Identify the Town Centres for Onslow, Tom Price and Paraburdoo within the Strategy. Zone the Town Centres in the Scheme with the aim to encourage and facilitate a compatible range of retail, commercial, mixed use, community/civic, entertainment and hospitality uses. Ensure the Town Centres are accessible by walking, cycling and vehicles.
Modelled Floor Space Demand – Shire-wide	Future population growth can increase demand for retail and bulky goods trade. The overall distribution of additional retail and bulky good floorspace would be dependent upon the population growth experienced within the individual town sites.	The Strategy needs to identify appropriate land available for future retail and commercial development, to predict and provide for forecasted population growth. Based on Band C Population growth, a total land area of 25,593m² may be required to service the requisite growth of 10,160m² of retail floorspace and 4,355m² in bulky goods retail. The land area considers the net leasable area, and additional land for other land requirements such as warehouse/storage space and car parking.	Identify land within the town centres of Tom Price and Paraburdoo for supporting future retail and commercial development, commensurate with population growth. Undertake a retail sustainability assessment if considered necessary for the three townsites to confirm future land and floorspace requirements, based on projected population growth and scenarios modelled on dramatic changes in resource sector activity. Support the incubation of retail and small business.

8 INDUSTRY

The Pilbara region is a large producer of mining and petroleum resources, accounting to 95% of the value of Western Australia's iron ore and two-thirds of Australia's oil and gas (PDC, 2015).

The Shire also has rural pursuits (refer **section 8.8**) that herald back to the agricultural legacies of the local government area.

8.1 STATE AGREEMENTS

The Department of Jobs, Tourism, Science and Innovation (formerly the Department of State Development) administers the *Government Agreements Act 1979* for State Agreements, of which some are within the Shire's local government area. The following State Agreements⁹ apply (in whole or in part) within the Shire of Ashburton:

- *Barrow Island Act 2003* (which incorporate the Gorgon Gas Processing and Infrastructure Project Agreement)
- *Iron Ore (Channar Joint Venture) Agreement Act 1987*
- *Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006*
- *Iron Ore (Hamersley Range) Agreement Act 1963*
- *Iron Ore (Hope Downs) Agreement Act 1992*
- *Iron Ore (Robe River) Agreement Act 1964*
- *Iron Ore (Wittenoom) Agreement Act 1972*
- *Railway (Roy Hill Infrastructure Pty Ltd) Agreement Act 2010*
- *Railway (BBI Rail Aust Pty Ltd) Agreement Act 2017*
- *Railway and Port (The Pilbara Infrastructure Pty Ltd) Agreement Act 2004*
- *Onslow Solar Salt Agreement Act 1992*

8.2 ASHBURTON NORTH STRATEGIC INDUSTRIAL AREA

The Department of Jobs, Tourism, Science and Innovation (JTISI), under the State Government's Lead Agency Framework, is responsible for government coordination and delivery of the Ashburton North Strategic Industrial Area (ANSIA), 11 kilometres south-west of Onslow. JTISI administers the:

- Macedon domestic gas plant (BHP Billiton; \$1 billion); and
- Wheatstone liquefied natural gas (LNG) plant (Chevron Australia; \$29 billion).

Pilbara Ports Authority (PPA) was formed on 1 July 2014 as an amalgamation of the Port Hedland Port Authority and the Dampier Port Authority. PPA is the world's largest bulk export port authority, encompassing the ports of Dampier, Port Hedland and Ashburton, as well as the future ports of Anketell, Balla Balla and Cape Preston East.

In 2009, the State Government entered into a State Development Agreement with Chevron Australia for the Wheatstone project in the ANSIA. PPA is responsible for constructing the multi-user port, common user coastal area (CUCA) facilities and Eastern Infrastructure Corridor (EIC) (PPA, 2014).

⁹ <https://www.wa.gov.au/organisation/departments/departments-of-jobs-tourism-science-and-innovation/state-agreements>

As described in **section 3.6**, the State Government has established the planning framework for the ANSIA through its Improvement Plan No. 41 and the Improvement Scheme No. 1. The ANSIA provides for future strategic and general industrial development to support the major proponents.

Chevron Australia announced its intention to develop the Wheatstone LNG and 200 terajoule per day domestic gas plant, with a final investment decision to proceed made in September 2011. Construction started in December 2011. The Wheatstone project includes an onshore facility in the ANSIA, initially with two LNG trains with a combined capacity of 8.9 million tonnes per annum. Start-up of the first LNG train occurred in October 2017, with the second train becoming operational in June 2018. Commercial production of domestic gas commenced in March 2019. The project has the potential to expand to five LNG trains producing up to 25 million tonnes per year.

A pipeline links Wheatstone with the Dampier to Bunbury Natural Gas Pipeline. DBP has completed the last pipeline, a gas lateral to the future Power Station site. All gas pipelines should be located within the Multi User Infrastructure Access Corridor (MUAIC). The pipeline for BHP Billiton's Macedon plant is also within the MUAIC.

Chevron Australia operates its workforce accommodation site within the ANSIA. Other proponents do not have access to the workforce accommodation site. Chevron Australia proposes to operate the Workforce Accommodation site for the Wheatstone FIFO operational workforce as per the ANSIA Improvement Scheme No. 1.

Land allocations have also been approved for the following proponents:

- Equus Energy (a subsidiary of Western Gas Corporation);
- Fortescue Future Industries; and
- Hastings Technology Metals.¹⁰

8.3 BARROW ISLAND

Barrow Island is controlled by Chevron Australia and is not publicly accessible. Chevron Australia operates the crude oil production facilities and the Gorgon LNG and domestic gas project at Barrow Island. Barrow Island has produced more than 320 million barrels of oil. The Barrow Island port is a Restricted Port due to the vessel activity associated with Gorgon, and permission must first be obtained from the Barrow Island Marine Controller.

Barrow Island was proclaimed as a "permanent reserve Class A" in 1910, and has been used for oil production since 1967. Chevron implements an environmental management plan to protect the island's largely intact ecology.

8.4 ONSLOW

8.4.1 GENERAL INDUSTRY AREA

The Onslow General Industry area covers just over 13 hectares of land, with 19% of the land contained in Crown Land lots and 81% of the land in freehold lots. It is located at the mouth of Beadon Creek, fronting Beadon Creek Road, Shanks Road and Cornish Way. It represents the industry precinct for the townsite for a range of general, light and service industry uses.

¹⁰ <https://developmentwa.com.au/projects/industrial-and-commercial/ashburton-north-sia/overview>

The land is predominately zoned as 'Industry' under the LPS 7. This zone is for industrial and associated land uses, providing for manufacturing, extraction or processing industries, public utilities, storage or wholesaling or similar business activities.

Lot 558 Beadon Creek Road is zoned 'Tourism' and Lot 460 Beadon Creek Road is classified 'Public Purposes – Port Facilities'.

Current limitations include:

- Proximity of short-stay accommodation at Discovery Holiday Park to the existing industrial uses, and the implications of noise-sensitive receptors in proximity to the Department of Transport's boat harbour at Beadon Creek, the future OMSB, and existing/future general industry.
- DoT is currently working with the Shire on a Community Boating Precinct in the Beadon Creek boat harbour, providing a small marina suitable for powered vessels only and incorporating the existing boat launching facility as identified in the *Beadon Creek Boat Harbour Land Use Framework* (DoT, 2014). The Local Planning Strategy can reflect the planning for the Community Boating Precinct and the broader intent for the Beadon Creek boat harbour.

8.4.1.1 BEADON CREEK BOAT HARBOUR

Beadon Creek is a working boat harbour and port facility that is managed and operated by the Department of Transport (DoT). DoT has prepared the *Beadon Creek Boat Harbour Land Use Framework* (GHD, 2014) as a result of the changing pressures and demand that has been placed on the boat harbour. Over time it has gone from catering to local demand and a small fishing charter industry, to a broader range of industrial and commercial activities.

The *Land Use Framework* is used by decision-makers to consider future development applications within the boat harbour, however as it has not been adopted under the Shire's Local Planning Scheme No. 7, it has limited weight from a statutory planning assessment perspective. The boat harbour is reflected on the Strategy Plans.

The objectives of the *Land Use Framework* are:

- To provide the local government a clear understanding of the DoT's future land use intentions for the Beadon Creek Boat Harbour.
- To provide a clear framework for future development within the Beadon Creek Boat Harbour.
- To provide consistency in decision making within the Beadon Creek Boat Harbour in accordance with orderly and proper planning principles.
- To designate and protect land for recreational purposes.
- To facilitate uses which are compatible within the Beadon Creek Boat Harbour and port facility.

The boat harbour is divided into five precincts (GHD, 2014), also refer **Figure 40**:

- Precinct 1: Public fishing platform and public boating users;
- Precinct 2: Community Boating Precinct as the main recreation hub for use by the community and commercial operators, with a proposed public boat ramp, parking, boat pens, picnic area, and fishing infrastructure;
- Precinct 3: Major Industry Precinct for the offshore resource industry (restricted access);
- Precinct 4: Heavy Industry Precinct for land-based activities that do not require direct access to Beadon Creek (restricted access); and
- Precinct 5: Interface Precinct between the nearby Tourism areas and the Boat Harbour, providing setbacks, screening and landscaping.

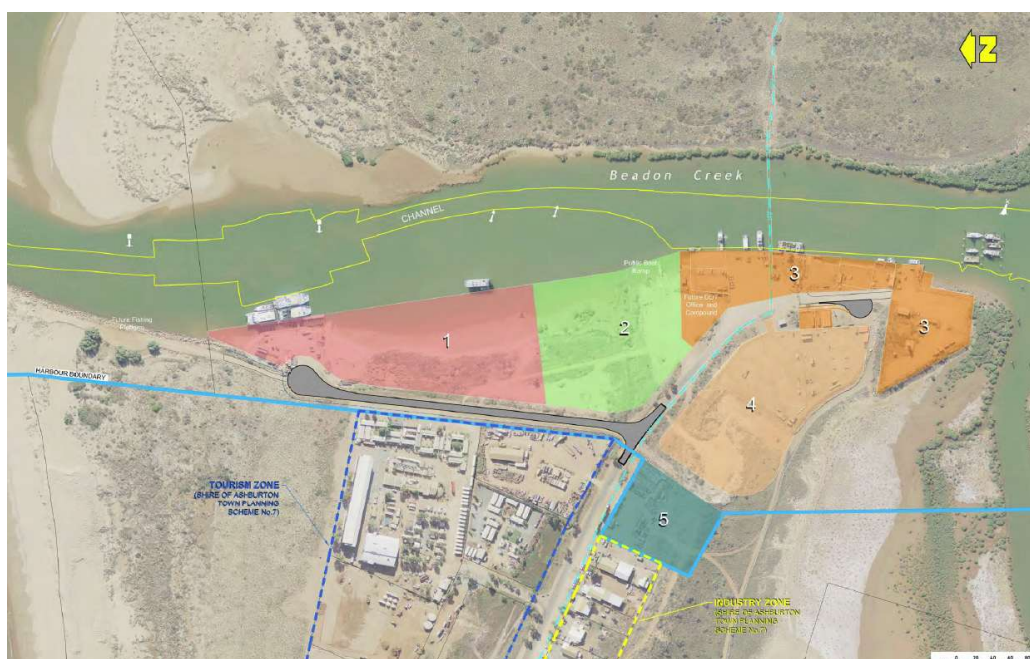


Figure 40 Beadon Creek Boat Harbour Precincts (GHD, 2014)

The *Land Use Framework* includes preferred land uses and development principles that would apply to the relevant precincts. These provisions can be given regard when considering proposals for land use and development within the Boat Harbour, however, would better to be formalised in an adopted planning instrument, such as a structure plan or master plan for the Precinct. Future planning processes could consider vacant land west of Beadon Creek to McAullay Road for its suitability for industrial and service commercial land uses.

The Onslow Marine Supply Base (OMSB) is operational within the Beadon Creek Boat Harbour. The OMSB represents an important local economic opportunity, as it generates full-time employment opportunities and would service the hydrocarbon industry sector. The project included a dredging programme that enhanced the capability of the Beadon Creek facility to attract more service work for the northern Carnarvon Basin.

8.4.2 ONSLOW AIRPORT MIXED BUSINESS PRECINCT

The Onslow Airport Mixed Business Precinct is contained within Lot 9500 on Plan 405414, covering approximately 34.4 hectares. The precinct will provide for a range of light and service industry opportunities. The precinct is located south of the entry road to the Onslow Airport, and is bound by the existing airport facilities and McAullay Road and Onslow Road.

The *Onslow Airport Industrial Precinct Masterplan* provides spatial consideration for areas with preferences for warehousing, storage, light industry, logistics, and associated services. The *Onslow Airport Industrial Precinct Masterplan* provides land areas with preferred locations (refer **Figure 41**) for:

- Logistics – 18.5747 hectares;
- Fuel and truck service station and associated facilities including lay-up areas – 2.8737 hectares;
- General and Commercial Industry Uses / Offshore Chemicals – 5.0764 hectares; and
- Concrete, cement and mud manufacturing – 5.4688 hectares.

The *Masterplan* notes there is an indicative 25m wide road reserve that provides a loop, refer **Figure 41**. The road network design will depend on tenancy requirements and final land allocations. In addition, consideration could be made for the loop road to connect through to the Onslow Airport entry road.

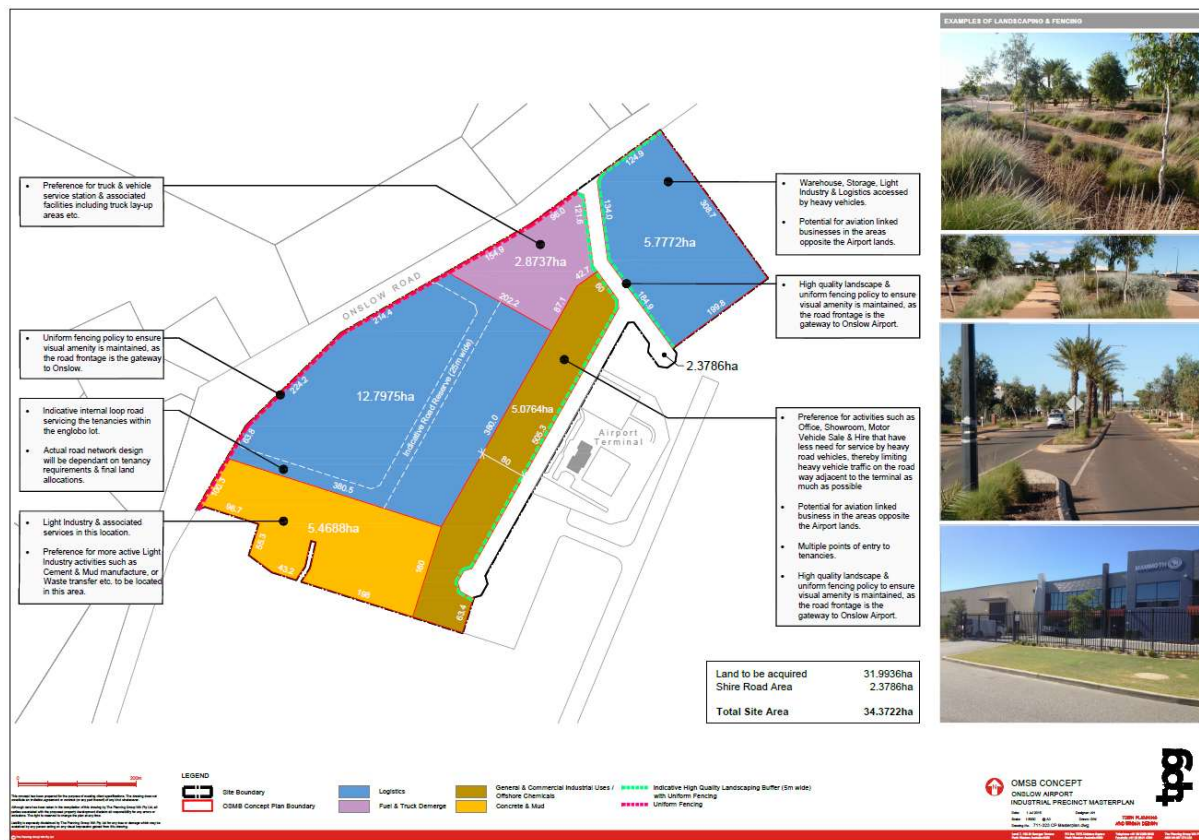


Figure 41 OMSB Concept – Onslow Airport Industrial Precinct Master Plan

Subdivision approval, subject to conditions, was granted by the WAPC on 22 September 2021 for 3 large lot subdivision within the Onslow Industrial Park, with large areas of land retained as balance lot (Figure 41). The Shire will progress development and clearance of the lots to create an industrial park that leverages its proximity to Onslow Airport, the townsite, resources and tourism sectors.

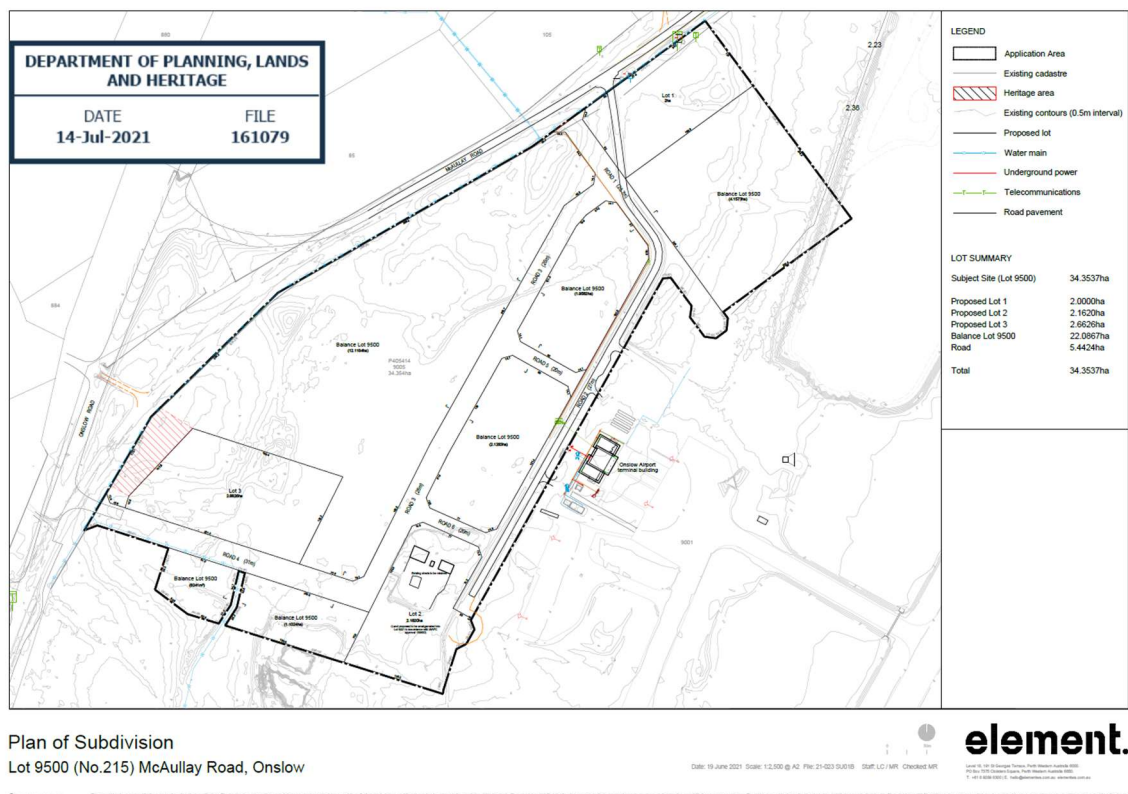


Figure 42 Onslow Industrial Park – Plan of Subdivision

8.5 TOM PRICE MIXED BUSINESS AREA

The existing Tom Price Mixed Business area covers just over 11.3 hectares of land, with 8.5% of the land in unallocated Crown Land. The remaining land in lots is distributed as 74.3% freehold (others), 9.9% freehold (Shire of Ashburton), and 7.3% freehold (Hamersley Iron Pty Ltd). Rio Tinto subsidises rents within the Tom Price Mixed Business area. There is limited vacant land remaining within the Tom Price Mixed Business area, although additional supply was made available as a result of an expansion constructed 2012-2013, being the lots fronting Eucalyptus Court.

Under the LPS 7, the Tom Price Mixed Business area is zoned 'Mixed Business', which is intended to provide a range of light and service industrial land uses, showrooms and wholesale businesses which, by reason of their scale, character and operational requirements, are not generally appropriate to, or cannot conveniently or economically be accommodated within Commercial or Industrial zones.

A portion of Lot 39 Boonderoo Road and Lot 107 Eucalyptus Court are zoned as 'Industrial and mixed business/development'. Pursuant to the objectives of the zone, the intention is for the undeveloped land to be undertaken in accordance with a structure plan.

A portion of Lot 550 and the whole of Lot 551 on Boonderoo Road are classified as 'Parks, recreation and drainage' under LPS 7. These have been identified by the Strategy for industry, should the land be investigated to be capable of such development.

Leaseholders are responsible for buildings, including obtaining necessary approvals. The Shire has the ability to control the land uses that are contained within the Tom Price Industry Area, through zoning and development provisions under its local planning scheme.

8.6 PARABURDOO

8.6.1 PARABURDOO INDUSTRY AREA

The existing Paraburdoo Industry Area covers an area of 45.15 hectares, with 40.3% as Crown Land (one lot is UCL, remainder are Leases of Crown Land). The remaining is distributed as 54.7% freehold (others), 3% freehold (Shire of Ashburton), and 2% freehold (Hamersley Iron Pty Ltd).

The Crown land is generally leased to operators for a range of general and service industrial uses. The Paraburdoo Industry Area has historically been the location for businesses that provide support services to the mining industry. Major mining projects in the vicinity of Paraburdoo have supported local industry businesses in the past, including Paraburdoo, Channar and Eastern Ranges mines.

From a management perspective, Rio Tinto notes there are some issues with illegal littering and dumping within proximity of the Paraburdoo Industry Area.

8.6.2 GREGORY WAY MIXED BUSINESS AREA

The Gregory Way Mixed Business area covers approximately 44.8 hectares, with 7.4% of land as Crown land (Lots 52 and 59 Gregory Way as Crown reserves, and Lots 40 and 39 Camp Road as UCL). The remaining is distributed as 55.2% freehold (Hamersley Iron Pty Ltd), and 37.5% freehold (others). Some land within the Mixed Business area remains vacant, available for development.

The WAPC-endorsed Gregory Way Development Plan is applicable to the lots. The Development Plan provides for development within defined building envelopes for each property. The Development Plan identifies a number of preferred uses, with design requirements to ensure suitable and compatible land use and development is achieved.

8.7 INDUSTRY EXPANSION

8.7.1 ONSLOW GENERAL INDUSTRY AREA

There is merit in investigating the suitability for additional land being available in Onslow for general and service industry. Expansion for future industrial development can be investigated for an eastern expansion towards Beadon Creek Boat Harbour, with potential road extensions made to Cornish Way and Shanks Road. Considerations to address may include:

- Surrounding land is classified within the 'Public Purposes – Port Facilities' local scheme reserve. A scheme review may identify future expansion areas within a zone that considers future industrial development.
- Appropriate drainage treatment to prevent untreated runoff from reaching Beadon Creek.
- Maximise on-site infiltration or integrated drainage within new industrial areas.
- Appropriate height limits having regard to the Obstacle Limitation Surface for the Onslow Airport. Measures should be taken to consider the future extension of the main runway to accommodate larger jet aircraft.
- Ensure that caretaker dwellings are not permitted where within an area subject to excessive noise associated with the normal operations of the Onslow Airport.
- Appropriate hazard risk management and adaptation of the land in terms of Recommended Finished Floor Levels for development.
- Addressing any native title, heritage, and environmental matters.

8.7.2 MCAULLAY ROAD

Expansion for future industrial development can be investigated, potentially along McAullay Road, between the existing Onslow General Industry Area and Onslow Airport Mixed Business Precinct. The identification of land along McAullay Road needs to consider the future expansion of the urban area as contemplated by the *Onslow Townsite Expansion Structure Plan*. An appropriate interface along McAullay Road would need to be considered to ensure there is an attractive streetscape setting in order to provide relief and visual amenity for residential development on the western side of McAullay Road.

Therefore, the land between the Onslow General Industry Area and the Onslow Airport Mixed Business Precinct may only be suitable for interim/temporary uses or short-term (i.e. 10 years), or until there is residential development fronting the area where development then is relocated or suitable landscape treatments have been put in place and established. Should development warrant relocation, the land would need to be rehabilitated. Considerations to address may include:

- Appropriate on-site drainage infrastructure to prevent untreated runoff from reaching Beadon Creek, and to maximise on-site or precinct-based infiltration to ameliorate impacts on the Onslow Airport.
- Appropriate height limits being imposed, having regard to the Obstacle Limitation Surface for the Onslow Airport. Measures should be taken to consider the future extension of the main runway to accommodate larger jet aircraft.
- Ensure that caretaker dwellings are not permitted in locations subject to excessive noise associated with the normal operations of the Onslow Airport.
- Appropriate hazard risk management and adaptation of the land in terms of Recommended Finished Floor Levels for development.
- Addressing any native title, heritage, servicing and environmental matters.
- Ability to stage development in a manner where interim or temporary development that would not be compatible adjacent to residential development can then relocate and the land is capable of being rehabilitated.

8.7.3 LAND WITHIN WWTP BUFFER AREA

An existing area of land zoned for industry within the Reserve 19291 on Onslow Road could be investigated for general industry. This is reflected on the Issues and Opportunities Plan and shown on the Strategy Plan as an extension to the industrial zone. It is anticipated that this land would require a road connection to Onslow Road and would be located outside of the Onslow Salt State Agreement area.

Another location within Onslow for investigating land capability for mixed business, light and service industry development can be the land surrounding the water tanks between Onslow Road and McAullay Road and within (although not necessarily limited to) the waste water treatment plant (WWTP) buffer area. The buffer area surrounding the WWTP was determined by odour modelling and resulted in the WWTP Odour Buffer Special Control Area being included in Local Planning Scheme No. 7 by way of Amendment 26, gazetted on 22 December 2015. This land has not been identified to be significantly impacted by the 1 in 500 ARI 2110 inundation extent modelled in the CHRMAP for the Onslow Coast (Cardno, 2017). Considerations to address may include:

- Appropriate on-site drainage infrastructure to prevent untreated runoff from reaching Beadon Creek, and to maximise on-site or precinct-based infiltration to ameliorate impacts on the Onslow Airport.
- Appropriate height limits being imposed, having regard to the Obstacle Limitation Surface for the Onslow Airport.
- Ensure that caretaker dwellings are not permitted within the WWTP buffer area.
- Appropriate hazard risk management and adaptation of the land in terms of Recommended Finished Floor Levels for development.
- Addressing any native title, heritage, servicing and environmental matters.

8.7.4 ONSLOW AIRPORT MIXED BUSINESS PRECINCT

Expansion of the area may be possible in the longer term, should industry demand exceed available land supply within the Precinct. The surrounding land is contained within Lot 9001 on Plan 405414, held in freehold by the Shire of Ashburton. Under the LPS 7, the surrounding land to the south is classified under the 'Public Purposes – Airport' local scheme reserve, with a portion in 'Special Use 4 – Transient Workforce Accommodation' for Shire staff use. Due to the use of some of the land to the south for Shire staff accommodation, some of the land is already cleared. Considerations to address may include:

- Appropriate on-site drainage infrastructure to prevent untreated runoff from reaching Beadon Creek, and to maximise on-site or precinct-based infiltration to ameliorate impacts on the Onslow Airport.
- Appropriate height limits being imposed, having regard to the Obstacle Limitation Surface for the Onslow Airport. Measures should be taken to consider the future extension of the main runway to accommodate larger jet aircraft.
- Access and road network for connecting through to the existing Mixed Business Precinct, if possible, or to Onslow Road.
- Ensure that caretaker dwellings are not permitted where within an area subject to excessive noise associated with the normal operations of the Onslow Airport.
- Appropriate hazard risk management and adaptation of the land in terms of Recommended Finished Floor Levels for development.
- Addressing any native title, heritage, servicing and environmental matters.

As discussed under **section 8.7.2**, the Shire has prepared and gained conditional approval for a 3-lot subdivision adjacent to the Onslow Airport to being the establishment of an Industrial Park (**Figure 42**). Further subdivision of the remaining balance lots will create a range of lots to cater for a variety of industrial and service commercial uses that leverage the Airport, provide freight and logistics support to the resources sector, townsite and tourism sectors.

8.7.5 TOM PRICE MIXED BUSINESS AREA

The Tom Price Mixed Business area is constrained to the west and east by the existing topography; the existing railway to the west also acts as a significant physical barrier. To the south-east of the Tom Price Mixed Business area, some lower lying vacant land with frontage to Doradeen Road could be investigated for industrial development, that could be compatible (in terms of emissions and amenity) with existing residential development to the immediate east.

The LPS 7 has zoned Lot 9001 Boonderoo Road, Lot 350 Boonderoo Road South and Lot 524 Doradeen Road for 'Industrial and mixed business/development' zone, which contemplates future development guided by a structure plan. Together, these land parcels are calculated to be approximately 18.5 hectares, which is effectively a larger land area than the existing Tom Price Mixed Business area. Notwithstanding, the topographical constraints of the land may not yield as much developable land.

The Shire has vested management to Crown Reserve 38467 (Agricultural Research Station, Gravel use) on Lot 41 on Plan 184619, accessible from Nameless Valley Drive, west of Tom Price. The reserve has merit in being investigated for a change in its purpose, such as to industrial development, and investigated as a possible location for industry growth to service Tom Price. The **Plan 3 – Tom Price Town Site Strategy Plan** reflects the intention of the undeveloped land to be investigated for industrial and mixed business land use and development, which would proceed in accordance with a structure plan. Considerations to address may include:

- Topography and the amount of earthworks that would be required to deliver serviceable industrial/mixed business lots.

- Connectivity between Boonderoo Road, Boonderoo Road South, and Doradeen Road (if road connections can be achievable, noting gradients of the land).
- Maximise on-site infiltration or integrated drainage within new industrial areas.
- Addressing any native title, heritage, servicing and environmental matters.

8.7.6 PARABURDOO INDUSTRY AREA

The Paraburdoo Industry Area is in an area of relatively flat land, and vacant land is available within the Paraburdoo townsite boundary. Additional land could be investigated for expansion of the Industry Area, should demand exceed available supply.

The **Plan 4 – Paraburdoo Town Site Strategy** Plan reflects the intention to investigate land surrounding the Paraburdoo Industry Area for additional land, should demand for land arise. In addition, west of Gregory Way, the existing drive-in (and abutting UCL) could also be considered for industrial/mixed business development opportunities.

For both areas, considerations to address may include:

- Maximise on-site infiltration or integrated drainage within new industrial areas.
- Confirm servicing availability (Rio Tinto provides water and electricity services to Paraburdoo).
- Consider and address the proximity of the industry area to community/club facilities to the east.
- Addressing any native title, heritage, servicing and environmental matters.

8.8 IMPLICATIONS FOR INDUSTRY

The following **Table 45** considers the implications, issues and opportunities from an industry perspective.

Table 45 Implications, Issues and Opportunities – Industry

Industry	Implications	Issues	Opportunities
ANSIA	DevelopmentWA and WAPC are responsible for administering the ANSIA. Land is available for heavy industry and general industry.	Land remains available in ANSIA for complementary industrial development.	Support heavy industry and general industry that are compatible with existing uses, being located within the ANSIA, where buffers are already taken into consideration.
Industry – Onslow	Onslow's General Industry Area, near Beadon Creek, is limited in its ability to expand due to proximity of short-stay accommodation, the waterways and unknown capability for drainage. The Beadon Creek Boat Harbour will provide for some additional industrial land, and is a working boat harbour and port facility. The Onslow Airport Mixed Business Precinct provides for light and service industry and mixed business. It may be enhanced with road access to Onslow Road, and possible expansion.	Industrial development and growth may be investigated within Onslow, having regard to the coastal processes and hazards, drainage implications, minimum floor level requirements, height limitations, infrastructure, native title, heritage and environmental matters. Coastal processes, climate change and the impacts on the existing town centre and urban development in low lying areas from flood events, tidal inundation and sea level rise. Onslow Salt operations associated with its evaporation and crystalliser ponds, stockpiles, conveyor system and jetty. As part of the State Agreement, sensitive land uses may be impacted by the operations. Technical studies may be required to determine appropriate buffer requirements, or for structural treatments for new development, to minimise potential impacts. Development within the hydrological catchment for Onslow Salt must ensure there are no adverse impacts. Harbour and port facilities at Beadon Creek Boat Harbour, as public works, are exempt from development control where undertaken by a public authority. The Shire's local planning scheme applies to Lessees and private landowners, however currently lacks clarity. Beadon Creek waterbody and floodplain are physical barriers to expansion of industry.	Consider investigations for an eastern expansion of the Onslow General Industry Area towards Beadon Creek Boat Harbour, with potential road extensions made to Cornish Way and Shanks Road. Expansion for future industrial development can be investigated, potentially along McAullay Road, between the existing Onslow General Industry Area and Onslow Airport Mixed Business Precinct. Other land for investigation could be land within the WWTP buffer (between Onslow Road and McAullay Road) for mixed business, light and service industry. Longer-term expansion of the Onslow Airport Mixed Business Precinct over land held in freehold by the Shire of Ashburton may be investigated, if land demand exceeds supply.
Industry – Tom Price	Tom Price's Mixed Business area is constrained by landform, and the railway line to the west. Some expansion has happened within the last 5-6 years.	Expansion of the Tom Price Mixed Business area may be investigated for land fronting Doradeen Road. Rio Tinto subsidises rents within the Tom Price Mixed Business area. Future expansion areas may need to be considered in the context of their capability of having viable industrial businesses.	Consider land capability investigations to confirm whether land fronting Doradeen Road for industry/mixed business. Investigate opportunities for connecting the road network, should land gradients allow. Consider land surrounding the Tom Price Refuse Tip, east of Bingarn Road, for industrial/mixed business. Investigate options for industrial development within Reserve 38467.
Industry – Paraburdoo	Paraburdoo's Industry Area is within Rio Tinto's lease holding, with lots in freehold or leased to operators. Major mining projects	Vacant land is available within the townsite boundary and surrounding the Paraburdoo Industry Area.	Investigate land capability and opportunities for expansion of the Paraburdoo Industry Area.

	in the vicinity have supported local industry in the past	Rio Tinto subsidises rents within the Paraburdoo Industry Area. Future expansion areas may need to be considered in the context of their capability of having viable industrial businesses.	Consider future land use direction for the existing Drive-In.
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9 RURAL AND RANGELAND AREAS

The Strategy expresses the vision for the rural/pastoral components of the Shire, protecting existing land use opportunities and key natural resources (water, ecosystems, minerals and basic raw materials). The Strategy will also identify other land use opportunities within the rural areas of the local government.

The rural areas of the Shire are characterised by several land uses – pastoralism (i.e. cattle stations), agriculture, tourism (refer **section 10**), mining (refer **section 6.4**), and indigenous activities. Camps for FIFO workers are common within the Pilbara region and several are located within the local government area. These are populated exclusively by non-resident workforce generally close to resource sites, with temporary and limited services (WAPC, 2014).

A significant proportion of the local government area is subject to native title. **Figure 10** identifies registered and notified Indigenous Land Use Agreements (ILUA) with further explanation contained in **section 4.1**.

The vast majority of land within the local government area is identified within a 'Bushfire prone area'. This is reflected in the Environmental Profile in **Appendix A**. Consistent with the SPP 3.7, a Bushfire Hazard Level assessment has been prepared (refer **Appendix C**) to address matters outlined in the *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2019). However, the Bushfire Hazard Level assessment focuses only on the land identified for future development within 100m of Bushfire Prone Areas within the townsites of Onslow, Paraburdoo and Tom Price. Rural and rangeland areas have not been included in the Bushfire Hazard Level assessment.

9.1 PASTORALISM

The Shire contains a number of pastoral leases. The extent of the Pastoral Leases is depicted in **Figure 45**. All eligible Western Australian pastoral leases were renewed where applicable on 1 July 2015. Lease renewal gave lessees tenure for up to 50 years, affording ongoing security and certainty. Lease renewal allows pastoralists to continue to focus on their pastoral business and contribute to the economic and social fabric of Western Australia.

A Rangeland inventory and condition survey was undertaken for the Ashburton River catchment between 1976 and 1978, and an inventory and condition survey was published in 2004 for the Pilbara Region. There appears to be a correlation between the worst areas of degradation and erosion, and the most valuable pasture lands (refer **Appendix A** – section 2.3.7 of the Environmental Profile). Rangelands pastoral condition has been assessed by DPIRD in order to provide advice on the planning and management of grazing pressure on pastoral leases. Threats to pastoralism includes the decline in vegetation and soil condition (which can be exacerbated by drought), and a reliance on areas with better vegetation coverage for livestock to graze and be supported.

Rangelands Natural Resource Management and the potential delivery of Ecologically Sustainable Rangeland Management (ESRM) plans for land managers would assist in prioritising action/response to issues. Issues to be addressed would be relevant to the sustainable productive potential of pastoral lands, together with acknowledging risks and issues of ongoing or future degradation/erosion. There have been many assessments of 'good' condition in a variety of landscapes which have been used for pastoralism. This would indicate that, at a broad level, appropriate management of pastoralism can be ecologically sustainable (van Vreeswyk, 2004). However, severely degraded and eroded areas should be removed from pastoral use and regeneration works are to be considered where such efforts would improve the changes of successful results for catchments or sub-catchments (van Vreeswyk, 2004).

Table 46 below shows the 28 pastoral leases within the Shire of Ashburton with leaseholder details included, where known.

Table 46 Pastoral Leases within Shire of Ashburton

Pastoral Lease	Leaseholder (if known)	Pastoral Lease	Leaseholder (if known)
Ashburton Downs		Cheela Plains	
Coolawanyah		Emu Creek	
Glen Florrie		Hamersley	Rio Tinto
Hooley		Juna Downs	Rio Tinto
Koordarrie		Kooline	
Marrilla		Maronnah	
Mininer		Mount Stuart	
Mulga Downs	Rio Tinto	Nanutarra	
Peedamulla		Red Hill	
Rockela	Rio Tinto	Towera	
Turee Creek		Uaroo	
Ullawarra		Urala	
Wyloo		Yanrey	
Yalleen	Rio Tinto	Yarraloola	Rio Tinto

Western Australia's beef industry provides for exports of beef and veal, and for domestic consumption. Half of the beef herd in Western Australia is distributed between the northern/eastern rangelands and southern agricultural regions. As demonstrated in **Figure 43** the Pilbara has the third largest herd (approximately 243,000), behind the Kimberley and South-West regions. Cattle are grazed on improved pasture, however in some stations there is concern regarding non-native grass being produced for cattle feed.

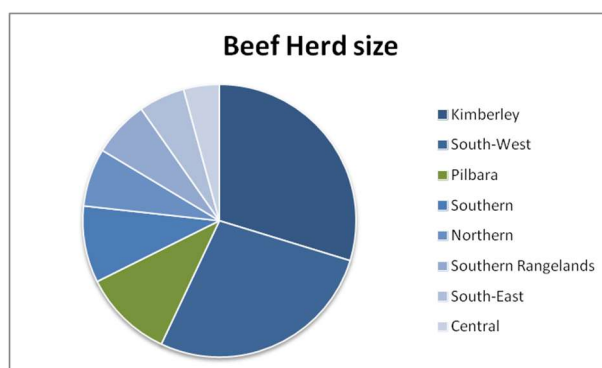


Figure 43 Distribution of Beef Herd (DPIRD, ABS 2011, PLB 2013)

DPIRD, through the Northern Beef Futures project, which commenced in August 2014, is looking to invest in the transformation of the northern beef industry through market diversity and improved business models, and integrated supply chains (DPIRD, 2017). At the moment, it is understood cattle from Minderoo Station is live exported, and potentially would use Port Hedland. The focus of the Northern Beef Futures project is on Asian markets, such as China, Thailand, Vietnam and other ASEAN countries. The project aims to collaborate with industry groups to value-add to beef, to provide improved access to live export markets, and opportunities for improved supply chains.

9.2 AGRICULTURE

Twenty-two countries are identified as 'high potential target markets' for new agricultural products that could be produced in northern Western Australia (DPIRD, 2015). These markets have growing populations and incomes, and a larger consumer spend on more food is occurring. Asia and the Middle East import a wide variety of food products, and the North of WA could potentially produce a number of these products in reasonable quantities, at a high quality, and in a profitable manner (DPIRD, 2015). DPIRD's research identified a number of products showing very strong demand growth in target markets, and which products may be most appropriate for growing in the Pilbara Region. The 'best products' identified included cassava, sesame seeds, sorghum, almonds, tobacco and cotton (DPIRD, 2015).

Agriculture opportunities could be leveraged from irrigation, with water sourced from mine dewater surplus and from managed aquifer recharge to minimise evaporation. Irrigated agriculture could potentially focus on the production of grain, horticultural crops, and fodder for the beef industry.

Planning for the future of irrigated agriculture development is being investigated through the Pilbara Hinterland Agriculture Development Initiative (PHADI). The PHADI is a DPIRD-led demonstration project that assesses and provides a regional overview of the soil capabilities across the Pilbara Region. The project aims to illustrate the potential opportunities for rural and rangeland areas for higher and better agricultural products than what currently can be offered through pastoralism. The PHADI investigates and undertakes research into agronomics, regulatory processes, market opportunities, soil and water resource capabilities, irrigation concepts and economic viability (DPIRD, 2016). Importantly the PHADI discounts land that is subject to constraints and risks, such as flood hazards, land gradients above 2%, and land contained within the conservation areas.

The region's hinterland has the potential to become a source of biofuel (McHugh, 2011). Research and development is occurring in a manner where vegetation can provide for food for cattle/livestock and for biodiesel, contributing towards export opportunities of both products.

The PHADI land and water resource assessment (refer **Figure 44**) notes that there are existing aquifers (Lower Robe, Upper Bungaroo, Callwingina, Weelumurra West) and existing irrigation south of Onslow, north-west and east of Tom Price (i.e. the Marandoo below water table expansion is being used to irrigate areas of Hamersley station). It also identifies higher capability land suitability downstream of the Ashburton River and throughout the pastoral leases.

Rio Tinto is also using some of the water removed from open pit mines (de-watering) for forage and hay production (Infrastructure Australia, 2016). Water from the Marandoo below water table expansion is being used to irrigate areas of Hamersley station and produce hay to feed cattle across six stations (Rio Tinto, 2012). Surplus water from the nearby Nammuldi mine is also being used for irrigated agriculture projects at nearby stations. A recent joint CSIRO and Pilbara Development Commission study found the sustainable yield of the existing aquifers is estimated to be 200-400 gigalitres per year. This information is critical in determining the total sustainable use of water to support more agriculture in the region (Infrastructure Australia, 2016).

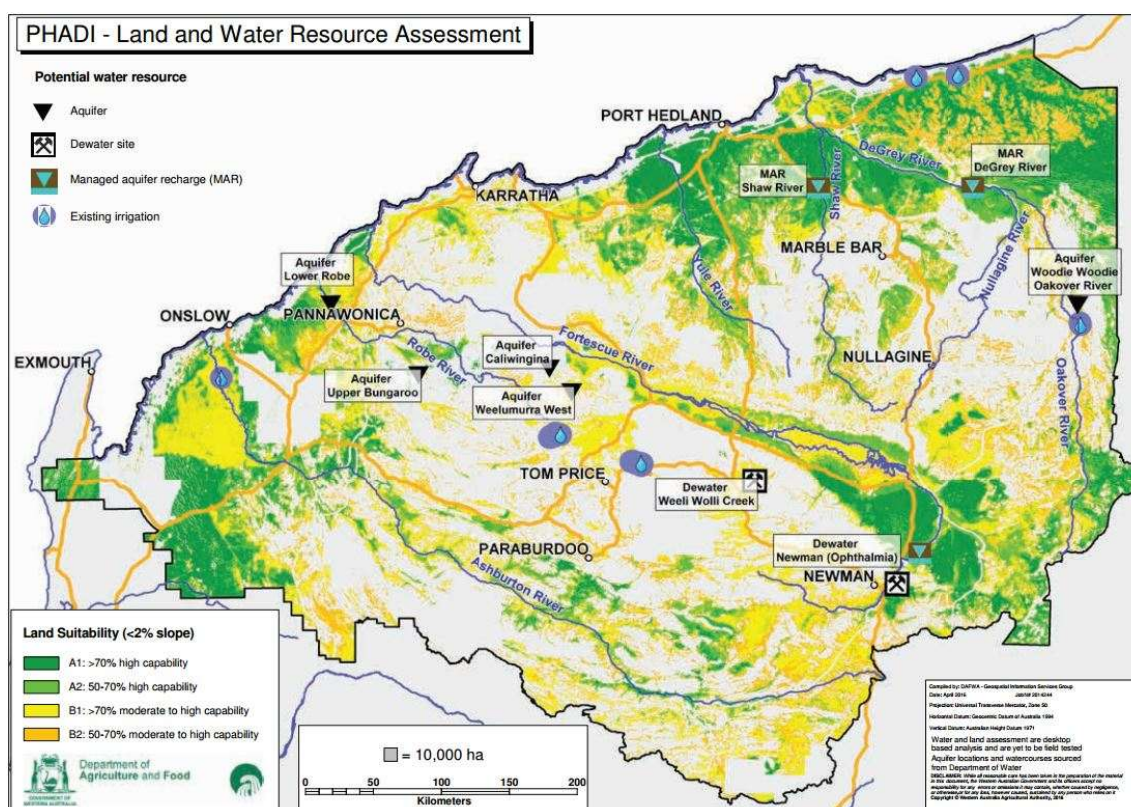


Figure 44 PHADI Land and Water Resource Assessment (DPIRD)

The quality of soils and vegetation (grasslands and shrublands), particularly those in good condition, are generally associated with higher agricultural productivity. The quality of soils and vegetation can be maintained at a local government level, such as through active management of weeds, uncontrolled access, and feral animals (refer **Appendix A**).

9.3 AQUACULTURE

Aquaculture is a fast-growing food production sector and is both a significant opportunity for investment and food security. Currently the Pilbara Region does not host an aquaculture industry of economic significance. The region does have suitable characteristics for aquaculture, including coastal land and abundant sunlight. Aquaculture has also been identified as an economic transformational opportunity (refer **section 6.6**).

Aquaculture is identified to have the potential to generate revenue, employment and provide economic diversification (McHugh, 2011). Aquaculture also has the potential to be high growth and there are private initiatives in pearls, coral, algae, and possibly fish species. Aquaculture can be an intensive industry sector and may be demanding on labour to be viable. The region is potentially suited for oysters, some finfish species, and algae (Department of Fisheries, 2016). Thevenard Island has also been identified as a possible site for offshore/nearshore aquaculture. Onshore areas within 10km of Onslow, near McCann Well, and some land in Tom Price were identified as inland areas of interest.

A Market Analysis conducted for the Pilbara-Gascoyne coast noted that significant investment in marketing would be necessary, for building up demand in domestic/export markets and to establish provenance (AVC, 2016). The Analysis looked at the suitability of the Pilbara-Gascoyne coast for edible oysters, yellowfin tuna, amberjack and mahi mahi. Amberjack was considered the most lucrative product, as its production in aquaculture systems is well demonstrated and there is growth potential and opportunity to attain premium pricing (AVC, 2016). Marketing challenges exist, including a small domestic market, intense global market competition, and the need to begin producing from the region as a place of origin that needs to be known for its quality.

Aquaculture requires managing risks to establishing and managing the facility (and tenure security), addressing the biological requirements of the species, managing the physical environment, and market access. Regulatory controls and addressing other government requirements, such as biosecurity and disease management, access to coastal waters, water use and management of waste, are also necessary to be taken into consideration.

9.4 CONSERVATION AREAS

The Shire is recognised as having significant terrestrial, marine and aquatic biodiversity. The biodiversity of the Shire is outlined further in **Appendix A** – refer section 2.5 of the Environmental Profile.

The Shire contains a number of areas which have been reserved for conservation (refer to **Appendix A** – section 2.5, table 8 of the Environmental Profile). These comprise of 17,295 square kilometres of reserved land. The level of reservation of land for conservation purposes in the Shire of Ashburton is much greater than the rest of the Pilbara and greater than the internationally recognised standard of reservation of between 10% and 15% of each bioregion.

While many conservation reserves are managed by the DBCA, the Shire could consider a more active role in the management of weeds, uncontrolled access, and feral animals to assist with vegetation retention, which in turn would assist in the maintenance of soil health. Soils and vegetation (grasslands and shrublands) in good condition are also associated with higher agricultural productivity.

9.5 PUBLIC DRINKING WATER SOURCE AREAS

Public Drinking Water Source Areas are also identified within the rural area. These are identified on **Plan 1 – Shire Wide Strategy Plan** and would be reflected in the local planning scheme. The priority source protection areas are described in **sections 2.3.4 and 14.3** (also refer **Appendix A** – section 2.4.2 and Table 5 of the Environmental Profile).

9.6 IMPLICATIONS FOR RURAL AND RANGELAND AREAS

The following **Table 47** considers the implications, issues and opportunities from a rural and rangelands perspective.

Table 47 Implications, Issues and Opportunities – Rural and Rangeland Areas

Rural and Rangeland Areas	Implications	Issues	Opportunities
Pastoralism	Pastoral activities may continue throughout the majority of the Shire. There appears to be a correlation between the worst areas of degradation and erosion, and the most valuable pasture lands.	Pastoral activities have an impact on native vegetation, flora and fauna, erosion and other factors that need to be adequately addressed and managed by pastoral landowners. Pastoralism can be ecologically sustainable with appropriate management in place. Cattle from Minderoo station is live exported, with potential for exports through Port Hedland.	Cattle industry sector has been identified as a transformation economic opportunity. A number of planning considerations can be taken into account for the benefit of encouraging further pastoral and agricultural pursuits within the Shire: • Consideration of natural resource management and land management practices to minimise negative impacts and contribute towards sustainable pastoralism. • Ensuring that remnant vegetation and areas with significant values are protected and maintained. • Agricultural pursuits should be directed such that they minimise impacts as a result of clearing, bushfire management, uncontrolled access, weeds, pests and feral animals.
Agriculture	The Pilbara Hinterland Agricultural Development Initiative (PHADI) provides for future of irrigated agricultural development, through Royalties for Regions, supporting public and private sector investment decisions for new irrigated agricultural developments. 22 countries are identified as 'high potential' target markets for new agricultural products that could be grown in the Pilbara.	Legislation currently allows for irrigation of a range of crops on a pastoral lease. A number of irrigated agricultural developments could be possible on a medium-to-large scale. There are opportunities for large areas of soils to be investigated for capability and suitability for irrigated agriculture. Mine dewater surplus can be reinjected for reuse for agricultural and other purposes.	Work and collaborate with the partnerships held between DPIRD, PDC, DRD, Aboriginal groups and the pastoral industry for delivering projects and other outcomes, through demonstration and prospective projects. Ensure intensive agricultural proposals, are appropriate to the sustainable capability of the land. Expansion of projects like Rio Tinto's Hamersley Agricultural Project may arise as future opportunities.
Future Growth in Agriculture	Asia and Middle East are attractive markets that demand products that the North of WA can produce. The Pilbara climate is in a similar zone to other countries that produce and export high value products.	Success will depend on products that are robust, mechanically harvested, can thrive in the heat, and can be achieved at scale to be globally competitive. A wide range of agricultural products have been identified, some have proven experience and others will require new skills, new investment, new systems and capital.	Encourage investigations into export market opportunities for crops/food products that could be grown in the Pilbara.
Aquaculture	Aquaculture is an emergent industry sector. It requires development of the sector to a level where it is of a sustainable scale to be economically viable and internationally competitive. Thevenard Island was identified for possible offshore/nearshore aquaculture.	Aquaculture projects (R&D etc) present opportunities that may contribute to investment, employment. Aquaculture requirements appropriate risk management to address biosecurity, water use, wastewater management.	Encourage investigations into market opportunities for aquaculture products that could be grown in the Pilbara. The emergence of new sectors such as aquaculture may require particular consideration of the industry's land requirements, environmental management, and export logistics.

Rural and Rangeland Areas	Implications	Issues	Opportunities
	Onshore areas within 10km of Onslow, near McCann Well, and some land in Tom Price were identified as inland areas of interest.		
Conservation Areas	The level of reservation within the Shire of Ashburton is greater than the rest of the Pilbara region.	Management of conservation reserves under the Department of Biodiversity Conservation and Attractions. A number of new reserves are proposed, including Mulgalands Conservation Park and West Hamersley Range Conservation Park. Management of public access and visitor numbers in a manner that balances tourism, visitation and conservation values.	Shire could consider active management of weeds, uncontrolled access, and feral animals. There are proposals for new additions within the Conservation areas, which can be considered by the Shire of Ashburton.

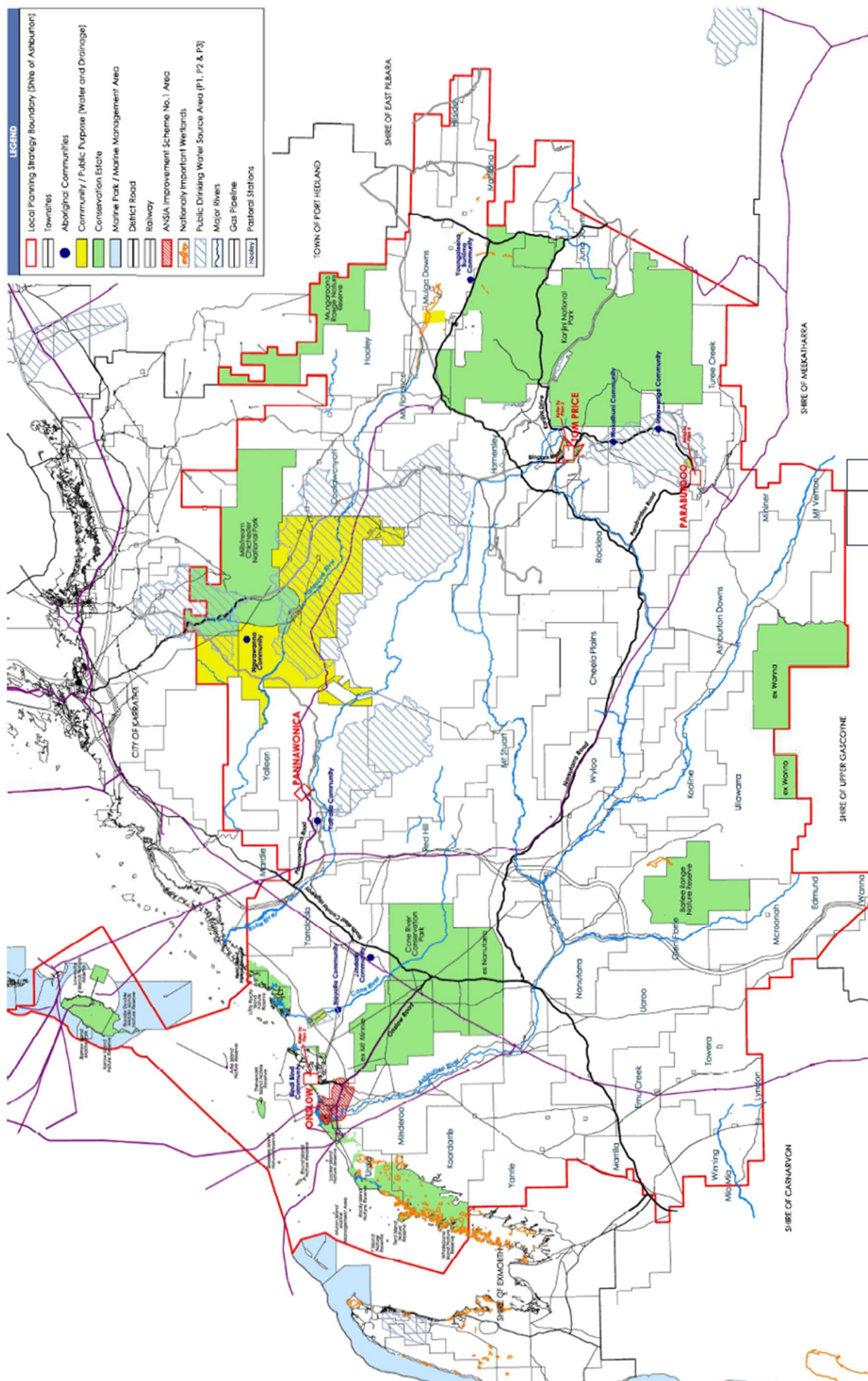


Figure 45 Pastoral Leases in the Shire

10 TOURISM AND VISITORS

Tourism is an important and strategic economic sector. At a state level, Tourism WA has prepared the *Australia's North West Destination Development Strategy 2007-2017* (Tourism WA, 2007). The *Destination Development Strategy* considered that the North West Region (which includes the Shire of Ashburton) was appropriate for its visitor market, with improvements identified for product and infrastructure.

In 2016, the Pilbara Development Commission prepared the *Pilbara Tourism Activation Infrastructure Report*, which identified the region's three main National Parks (i.e. Karijini, Millstream-Chichester, and Murujuga) as natural starting points for the activation of tourism in the region, as they were the most significant leisure tourism attractions in the region. The report undertook a current state and gap assessment to identify tourism infrastructure needs over the immediate (3-5 year term) and long-term (5+ years). Of particular interest to the Local Planning Strategy are the following two large scale infrastructure actions:

1. To provide a sealed road between Millstream-Chichester National Park and Karijini National Park to improve accessibility and increase visitation and length of stay in the region. The near complete construction and sealing of the Mannuwarra Red Dog Highway (Tom Price – Karratha Road) fulfills this action.
2. To construct a sealed airstrip that services Karijini National Park to improve safety outcomes, and allow planes/helicopters access to the park, to overcome the disadvantage of isolation and driving distance.

Recently, the Shire has prepared two documents to direct and focus tourism as an essential part of a diversified economy.

Economic and Development Tourism Strategy (2019)

Twenty-three actions are identified in the Strategy, grouped under the following three primary goals, described as follows:

Primary Goal	Key Focus Area
1. Promote the Shire	- Targeted destination marketing for increased tourism - Supporting capacity building - Maximising regional itineraries promotion
2. Encourage Infrastructure Development & Investment	- Encouraging development of tourism and transport infrastructure - Lobbying on behalf of the Shire and industry to promote funding investment
3. Promote Business Development	- Encouraging investment in local business - Facilitating networks for growth and support

Onslow – Towards a Visitor Economy (2022)

Principle	Planning Project
1. We will embrace our foreshore as a place for people to stay, meet and experience our unique way of life.	- Onslow Foreshore Revitalisation - Onslow Jetty Restoration - Dreamers Hill 360° Cultural & Convention Centre
2. We will enhance the Gateway to the Mackerel Islands experience.	- Community Boating Precinct Stage Three - The Pilbara Inshore Islands Tourism Initiative - Rigs to Reef

Principle	Planning Project
	Onslow Airport Expansion Investigation
3. We will create vibrant spaces, places and experiences that reflect our history, culture and character.	- Onslow Arts Culture Precinct - Onslow Main Street Upgrade - Visit Ashburton App – A self-guided interpretive visitor circuit

Tourism has been identified as a sector that has the potential to act as an economic stimulus for the Shire, particularly through the generation of significant employment opportunities, particularly to remote Indigenous communities (SoA, 2015). The following information in **Table 48** (TRA, 2016) provides the following key tourism metrics and statistics for the Shire of Ashburton for both 2016 and 2019.

Table 48 Local Government Tourism Profile (TRA, 2016) (TRA, 2019)

Metrics	International		Domestic Overnight		Domestic Day		Total	
	2016	2019	2016	2019	2016	2019	2016	2019
Visitors ('000)	25	23	227	287	np	np	Np	365
Nights ('000)	459	236	2,061	2,387	-	-	2,519	2,623
Average Stay (nights)	18	10	9	8	-	-	10	8
Spend (\$m)	\$13	\$8	\$118	\$141	np	np	np	np
Average spend per trip (\$)	\$13	\$364	\$118	\$491	np	np	np	np
Average spend per night (\$)	\$495	\$35	\$520	\$59	np	-	\$52	\$57
Average spend (commercial accommodation) per night (\$)	\$40	\$51	\$104	\$71	-	-	\$82	\$68
Tourism Statistics	International		Domestic Overnight		Domestic Day		Total	
Reason ('000)								
Holiday	14	17	24	50	np	np	np	99
Visiting friends or relatives	np	np	np	np	np	np	np	np
Business	5	3	193	229	np	np	np	255
Other	6	3	np	np	np		np	
Travel party type (visitors '000)								
Unaccompanied	17	13	112	125	-	-	128	138
Couple	5	7	12	24	-	-	17	31
Family group	np	np	np	np	-		np	np
Friends/relatives travelling together	2	2	np	np	-		np	np
Accommodation (nights '000)								
Hotel or similar	24	11	np	np	-	-	np	np
Home of friend or relative	np	np	np	np	-	-	np	np
Commercial camping/carvan park	33	21	np	np	-	-	np	np
Backpacker	np	np	np	np	-	-	np	np
Other	390	197	1,899	2,193	-	-	2,289	2,391

10.1 ATTRACTIONS AND AMENITIES

The North West is considered to be a location that provides for iconic holiday experiences (Tourism WA, 2007) that are associated with:

- Outback experiences – Karijini National Park; four wheel driving; camping, outback adventuring;
- Scenery experiences – beaches, national parks, organised tours; and
- Indigenous experiences – Indigenous art and crafts; cultural displays; visiting an Aboriginal site or community.

10.1.1 ONSLOW

Onslow provides attractions and amenities including:

- Water activities – diving, snorkelling, fishing charters, turtle/dolphin/whale watching;
- Swimming Pool;
- Old Onslow – tours;
- Minderoo Station – cattle station and camping;
- Ian Blair Memorial Walkway – timber walkway between Beadon Point and Sunset Beach;
- Onslow Rodeo – annual events and competitions;
- Chevron Wheatsone and Onslow Salt – industrial tours;
- Onslow Community Garden / Pizza Oven – community attraction;
- Mackerel and Montebello Islands – access from Beadon Creek Harbour (and proposed marina);
- Ashburton River;
- Termite Mounds; and
- Sunrise, Sunset and Four Mile beaches.

Coastal environment is home to islands, and fishing related tourism. The Mackerel Islands Tourism Company provides amenity for tourism around Thevenard and Direction Islands. There are opportunities to develop the breadth and range of tourism products related to islands and fishing tourism.

10.1.2 TOM PRICE

Tom Price provides attractions and amenities including:

- Mt Nameless – highest accessible mountain by four wheel drive vehicle, in Western Australia;
- Mine site tours;
- Natural scenery of the Hamersley Ranges;
- Unsealed road access to the Chichester Ranges and to Roebourne;
- Access through to Karijini National Park;
- Visitor Centre;
- Wildflower experiences.

10.1.3 PARABURDOO

Paraburdoo is regarded to be on the edge of the Great Sandy Desert and is within the Hamersley Ranges. There are few attractions identified within the townsite, however the surrounding lands are renowned for wildlife, wildflowers (after rains) and scenery. It is understood that Hamersley Iron conducts mine tours.

10.1.4 PANNAWONICA

The Rodeo held in Pannawonica draws visitors from across the State (Rio Tinto, 2015). The Rodeo is held on the first weekend in September, and is well supported by the local community and pastoral properties.

A number of the town facilities can provide food and beverage options for visitors, including the supermarket, deli, tavern and hotel, and service station.

10.1.5 RURAL

Eco and heritage tourism opportunities can be explored, which celebrate the unique natural beauty, biodiversity and cultural of the Shire. This may include accommodation, entertainment and artistic opportunities as well as adventure and recreational activities. This could be extended to educational opportunities associated with practical and on-ground environmental and cultural heritage learning.

Camping is available along the Ashburton River. However, this is on pastoral lease land (Minderoo Station), and access is restricted unless permission is obtained. Better access to camping sites and appropriate management along the coast could provide an opportunity to encourage people to visit coastal areas of the Shire.

10.2 ACCOMMODATION

From a State perspective (Tourism WA, 2007), development should:

- Reflect, reinforce and build upon WA's core brand values: fresh, natural, carefree and alive;
- Fit in with or enhance the existing/natural environment;
- Ensure the quality of the experience is always paramount;
- Have a 'local' feel that retains (or enhances) what is unique about the area; and
- Suit the market (i.e. ensure unique experiences desired by the target market are provided).

10.2.1 DEMAND NEEDS ANALYSIS FOR SHORT-STAY ACCOMMODATION IN THE PILBARA REGION (FEBRUARY 2013)

The *Demand Needs Analysis for Short-Stay Accommodation in the Pilbara Region* (AEC Group, 2013) made several key findings from a regional perspective, outlined below:

- Tourism in the region injected \$250 million into the local economy – retail, accommodation and food service sectors;
- 30% of total regional visitors fall within the leisure drive tourism market;
- New hotel supply has been slow, as there are issues with viability due to construction costs, operational costs, land availability, staff availability and costs; and
- Projected regional demand considers an additional 2,760 hotel rooms and 2,129 caravan park sites/cabins by 2022, the equivalent to 80 ha of land.

The report (AEC Group, 2013) contains recommendations for:

- Encouraging new short-stay accommodation growth; and
- Encouraging growth through investment attraction.

It is considered that the recommendations can be captured into the Strategy.

10.2.2 AVAILABLE TOURISM ACCOMMODATION

Table 49 reflects the tourism accommodation that is available^{11 12 13} across the Shire of Ashburton at the time of preparing the Local Planning Strategy in 2017.

Table 49 Tourism Accommodation, Shire of Ashburton

¹¹ <http://www.tomprice.org.au/accommodation/hotels-motels/>

¹² AECgroup 2015, *Assessment of Accommodation Needs in Tom Price, Onslow and Paraburdoo*

¹³ AECgroup 2016, *Assessment of Accommodation Need in Onslow*

Accommodation	Location	Accommodation capacity	Star-rating	Facilities
Tom Price Hotel/Motel	Tom Price	87 motel rooms	2 stars	2 bars Bistro Function Room
Windawarri Lodge	Tom Price	Motel rooms subject to availability	3.5 stars	Bistro / Bar
Karijini Eco Retreat	Karijini National Park	87 unpowered campsites 50 eco tents	3 stars	Restaurant / Bar BBQ area / Campers kitchen Shop / kiosk Ablutions
Dales Gorge Campsite	Karijini National Park	140 unpowered sites		Bush toilets Picnic tables & BBQs
Miliyanha Stargazers Campgrounds	and Millstream Chichester National Park	Unpowered sites		BBQs
Emu Creek Station	Barradale	Homestead rooms Camping and Caravan Park		Station Kitchen Laundry
Cheela Plains Station	Paraburdoo	25 rooms Unpowered camping areas		Conference Rooms Shared Kitchen and Ablutions BBQ
Paraburdoo Caravan Park	Paraburdoo	10 caravan sites		
Tom Price Tourist Park	Tom Price	20 rooms 116 powered sites 20 unpowered sites		Swimming Pool Ablutions Kitchen / BBQs
Paraburdoo Inn	Paraburdoo	62 rooms		Pub
Rocklea Palms	Paraburdoo	433 beds (FIFO, may be available to public)		Mess Hall Gym
Mackerel Islands Resort	Thevenard Island	13 cabins (sleep 2-10) 34 room village		Swimming pool / BBQ area
	Direction Island	1 cabin (sleeps 8)		
Onslow Beach Resort	Onslow	86 executive apartment rooms	3.5 stars	Restaurant / Bar Swimming pool / BBQ area Function / Conference room Vehicle hire agent
Onslow Sun Chalets	Onslow	16 units/chalets		Swimming pool / BBQ area Ablutions
Beaon Bay Hotel	Onslow	70 rooms	3 stars	Corporate Conference facilities 2 Restaurant / Bars Bottle shop
Discovery Holiday Park	Onslow	408 rooms 26 powered sites	2.5 stars	Kitchen / BBQs / Dining Room Ablutions Swimming Pool & recreation Bar Conference facilities
Ocean View Caravan Park	Onslow	9 cabins 84 powered sites 2 unpowered sites		Toilets & showers BBQ area

Accommodation options in Onslow include two caravan parks, self-contained units and motel rooms. As a result of the cost of housing and accommodation in Onslow being at a premium in 2012, there has been significant visitor accommodation development in the community leading to increased availability and affordability (OCCI, 2016). Particularly in the past, this accommodation has often been taken up by major project construction workforces and is regarded as a major impediment to the growth of tourism in the short to medium term. The opening of the airport to commercial flights and regular passenger services may assist with any potential tourism growth (AEC Group, 2015). In 2021, the Shire acquired Lot 381 on Plan 205462, located on the ocean side of Onslow Lookout. In 2023, the Shire commenced development of Lot 381 to provide for overflow caravan parking, with the ultimate intent being that Lot 381 will be developed for a mixture of caravan parking and chalets.

10.2.3 ONSLOW

Onslow presents the most opportunities for tourism:

- Attractions in Onslow include access to the Mackerel Islands Resort (Direction Island and Thevenard Island) and Montebello Islands from Beadon Creek Harbour (and proposed marina). Attractions also include the Old Onslow historical townsite, Onslow Salt, the Ashburton River, termite mounds and Sunrise, Sunset and Four Mile beaches.
- Accommodation options in Onslow include two caravan parks, self-contained units and motel rooms. As a result of the cost of housing and accommodation in Onslow being at a premium in 2012, there has been significant visitor accommodation development in the community leading to increased availability and affordability
- Opportunities for increased promotion of tourist attractions including increased promotion and marketing of industrial tourism experiences (e.g. visitors to ANSIA and Onslow Salt), conference and training location.
- Coastal environment – islands/fishing/tourism. The Mackerel Islands Tourism Company provide amenity for tourism around Thevenard and Direction Islands. However, it is not available/affordable for the general public – there is opportunity here to develop this.

10.2.4 TOM PRICE

Assessment of Accommodation Need in Tom Price, Onslow and Paraburdoo (AEC Group, 2015) identifies no capacity issues at present in the provision of and demand for short stay accommodation in Tom Price. However, the quality of this accommodation is regarded as poor.

10.2.5 PARABURDOO

The existing pub and caravan park provide limited supply for short-stay accommodation. Demand for short-stay accommodation in Paraburdoo is low with any tourism investment likely to occur in Onslow and Tom Price initially (AEC Group, 2015).

10.2.6 PANNAWONICA

Whilst Pannawonica is a closed town, visitors may stay within accommodation available from Rio Tinto village facilities or alternatively at powered, four bay caravan park with grassy camping sites (Rio Tinto, 2015).

10.3 ACCESSIBILITY

10.3.1 TOURISM AND ITS POTENTIAL IMPACT ON ECONOMIC DEVELOPMENT IN THE SHIRE OF ASHBURTON – A PROPOSAL TO SEAL THE MANUWARRA – RED DOG HIGHWAY (FORMERLY KNOWN AS KARRATHA TO TOM PRICE ROAD)

The *HotSpots Update* recommended improving road connectivity to Tom Price from Paraburdoo Airport and main Highways, to improve prospects for developing the town's tourism industry role (WAPC, 2015). In turn, the Shire has also put forward a recommendation for the sealing of the road between Tom Price and Karratha (SoA, 2015). These work in concert for improving the accessibility and destination appeal for road-based visitors and tourists to travel within the Pilbara region and in particular from major highways and cities/towns and Tom Price.

The Shire sought funding support from Royalties for Regions to complete the sealing of the Karratha to Tom Price Road, now known as Manuwarra-Red Dog Highway, as it is regarded as a major inhibitor to the growth of the tourism sector. However, it is noted in this document that *"wider benefits are not likely to be created by transport investments alone as they rely on other initiatives such as provision of more and improved tourist accommodation"*. This is a common theme that has emerged through various tourism studies relevant to the Shire and there are significant challenges that must be overcome in order to realise the benefits of tourism in the region.

Sealing of Stage 3 of the Manuwarra – Red Dog Highway was completed in September 2020 and planning and development is underway for the final Stage 4 section (MRWA, 2023).

10.4 AWARENESS

Tourism within the region is regarded as an under-utilised resource that has the ability to provide many economic benefits, particularly for the major towns of Onslow, Tom Price and Paraburdoo. This can often be attributed to the seasonality of visitation, geographical isolation, the shortage of adequate accommodation and facilities (in some areas) and the significant costs associated with delivering tourism facilities versus the future revenue generated.

The promotion of tourism in the region requires significant investment in the marketing of tourism opportunities, upgrading of infrastructure and consideration of accommodation options. However, the most significant barrier to enhancing tourism opportunities in the region is effectively managing the relationship between tourism and the mining and resource industries, particularly given the recent dominance of these sectors in the region. The demand for informal FIFO accommodation as the major resource projects wind down has underpinned the viability of many short-term accommodation options. The PDC estimates that in 2010-11 mining accounted for 74.6% of activity in the Pilbara, whereas tourism was estimated at only 0.7% (SoA, 2015).

The following opportunities have been identified for the region (PDC, 2015), (SoA, 2017):

- Transformational opportunities in nature based tourism;
- Heritage and Aboriginal tourism development;
- Capitalise on proximity to Asia and its airport infrastructure;
- Arts and cultural programs to attract national and international recognition;
- Upgrade and expand Visitor Centre facilities and services, tourism accommodation, camping grounds and associated facilities;
- Product development, marketing and promotions, and training and support, targeting older couples, backpackers, international couples, nature-based visitors and cruise ship passengers;

10.5 IMPLICATIONS FOR TOURISM AND VISITORS

The following **Table 50** considers the implications, issues and opportunities from a tourism and visitors perspective.

Table 50 Implications, Issues and Opportunities – Tourism and Visitors

Tourism and Visitors	Implications	Issues	Opportunities
Attractions and Amenities	The North West is considered for its outback experiences, scenery experiences and indigenous experiences. In the economic context, tourism is a very small contributor to current economic activity, however its value can be sustainable over time and opportunities are available for its increased contribution. Mackerel Islands Resort (Direction Island and Thevenard Island) and Montebello Islands are accessible from Beadon Creek Boat Harbour (and proposed marina). Attractions around Onslow include the Old Onslow historical townsite, Onslow Salt, the Ashburton River, termite mounds and Sunrise, Sunset and Four Mile beaches. Tom Price is considered to be the gateway to Karijini National Park. The town acts as a service centre for people to purchase necessary supplies in anticipation of staying within the National Park. Tom Price has the potential to capitalise on its proximity to Karijini National Park; however, this requires significant investment in infrastructure and marketing/tourism awareness. Aboriginal culture, heritage and experiences are significant tourism assets.	Onslow is a hub for tourism that has a coastal or island focus. Tom Price and Paraburdoo can provide outback, scenery and indigenous experiences. Some attractions or activities (such as fishing and island-based tourism) are perceived to be expensive for the general public.	Develop the breadth and range of tourism products related to islands, fishing tourism, national parks, and indigenous art and culture. Increased promotion of tourist attractions including increased promotion and marketing, particularly for Karijini National Park and other natural attractions. Opportunities to leverage from nature based tourism and heritage and aboriginal tourism development. Arts and cultural programs to attract national and international recognition.
Accommodation	Accommodation options in Onslow include two caravan parks, free camping facility, self-contained units and motel rooms. Onslow accommodation is becoming more accessible as occupancy rates normalise, due to lower accommodation demand from construction workforce.	Tom Price is acknowledged as a tourism destination for visitors to Karijini National Park and there is an opportunity for in-town mining accommodation to transition to short-stay accommodation if there is demand (i.e. Windawarri Lodge, Marandoo Annex) or additional area to the north of Karijini Lodge to be considered for expansion purposes.	Consider mechanisms such as flexibility between short stay accommodation and permanent residential development, provision of land for iconic tourism use at reduced or no cost and government underwriting of portions of some strategic tourism developments.
Accessibility	Some seats are available on flights from Perth to Onslow and Paraburdoo. Tom Price is accessible by road to Paraburdoo Airport.	Regional airports to expand to cater for increased passenger flights to increase visitation. The improvement and sealing of the Karratha - Tom Price Road is considered an ideal opportunity to generate substantial economic benefits for the Pilbara and the State through both increased tourism and improved freight traffic movements.	Capitalise on proximity to Asia and its airport infrastructure. The RFDS airstrip near Tom Price could be investigated for upgrading to an airport. Shire of Ashburton advocates sealing of the Karratha - Tom Price Road.

Tourism and Visitors	Implications	Issues	Opportunities
Awareness	Tourism within the region is regarded as an under-utilised resource that has the ability to provide many economic benefits, particularly for the major towns of Onslow, Tom Price and Paraburdoo.	Seasonality of visitation, geographical isolation, the shortage of adequate accommodation and facilities. The promotion of tourism in the region requires significant investment in the marketing of tourism opportunities, upgrading of infrastructure and consideration of accommodation options.	Product development, marketing and promotions, and training and support, targeting older couples, backpackers, international couples, nature-based visitors and cruise ship passengers. Opportunities for increased promotion of tourist attractions including increased promotion and marketing of industrial tourism experiences (e.g. visitors to ANSIA and Onslow Salt), conference and training location. Preparation of a Tourism Strategy as identified in the <i>Strategic Community Plan</i>. Upgrade and expand Visitor Centre facilities and services, tourism accommodation, camping grounds and associated facilities.

11 COMMUNITY, RECREATION AND OPEN SPACE

11.1 COMMUNITY FACILITIES

Through State Development Agreements signed by Chevron Australia and BHP Billiton with the Western Australian Government, extensive provisions have been made to improve community infrastructure and critical services within Onslow, providing a sound basis for the future growth of the town. Chevron has committed more than \$250 million to social and critical infrastructure projects that will upgrade health, education and recreation services and facilities, as well as road, power and water infrastructure. Through a Community Infrastructure and Services Partnership between Rio Tinto and the Shire of Ashburton, a number of town infrastructure projects, services and events have been supported¹⁴. These cover education, health, culture, environment, regional sustainability and employee support.

A *Map and Gap Analysis* conducted in 2012 identified a high level of investment. Chevron and BHP Billiton have also introduced funding programs to support a range of community-based projects and activities. Through construction of BHP Billiton's Macedon domestic gas project and the Chevron-operated Wheatstone LNG project, major contributions have been made to the local economy through construction contracts and services, such as transport and marine services, and general supplies.

The Shire of Ashburton has analysed the number of assets across the local government district for ongoing maintenance and management. **Table 51** reflects the community facilities and assets that are identified in the *Strategic Asset Management Plan* (SoA, 2023).

Table 51 Assets covered by Strategic Asset Management Plan

Asset Class	Asset	Asset Description	Quantity
Buildings	Shire / Community Buildings	Halls, Library, Sports Clubs, Public Amenities, Shire offices, Depot workshops and sheds	74
	Residential Housing	Housing for staff, aged care units	42
	Other Accommodation	Caravan Park buildings, Motel accommodation, camp accommodation	14
	Other Structures / Buildings	Caravan Park / camp BBQ's, shade structures, hardstands, fencing, lighting and landscaping	51
Roads	Sealed Roads	Urban & Rural – asphalt or sprayed seal	130 km
	Unsealed Roads	Rural & Limited Urban – unsealed gravel roads, tracks	1,860 km
	Carparks	Sealed and unsealed, 39 sites	59,078 m ²
	Kerbs	Barrier & mountable kerbs	118 km
	Road Infrastructure	Town entry signs, guardrails	13
Drainage	Open Drains	Drainage swales	22 km
	Underground Drains	Drainage pipes	13 km
	Culverts	Culverts	11 km
	Pits	Drainage access pits, junction pits	1,127
Footpaths	Dual Use	Concrete	7.5 km
	Pedestrian Paths	Concrete, brick paving, asphalt	22 km

¹⁴ <http://www.riotinto.com/ironore/operations-9602.aspx>

Asset Class	Asset	Asset Description	Quantity
Parks & Recreation	Parks & Recreation Space	Park, reserves & gardens	199,154 m ²
	Playgrounds	Sites including equipment and softfall	15
	Skate Parks	Sites including infrastructure	3
	Sport Fields	Ovals, rugby fields – 7 sites	99,019 m ²
	Outdoor Courts	Basketball, netball, tennis – 7 sites, includes 2 half courts	10,201 m ²
	Bowling Green	Bowling site and infrastructure	2
	Cricket Pitch	Cricket facilities – indoor/outdoor, nets, surface	7
	Swimming Pools	Facilities, pool structures and infrastructure	2
	Coastal Infrastructure	Boat ramps, jetties, seawall, boardwalk	6
	Memorial Parks	Sites and infrastructure	2
	Signage	Park, playground & oval signage	4
	Park Infrastructure	Park bench, picnic tables, lighting, drink fountains, fencing, reticulation	86
Town Infrastructure	Structures	Carpark shade, awnings, canopies	12
	Artwork	Statues, wall hangings, murals	8
	Fountains	Drinking, water fountains, water features	6
	Street Furniture	Park bench, picnic tables, bin enclosures, notice boards	7
	Signage	Information signage & town centre signage	2
	Concrete surrounds	Mall surrounds, pathways, decking, retaining walls	3,231 m ²
	Landscaping	Reticulation, gardens, turf, trees	7,800 m ²

Whilst Rio Tinto and its contractors are responsible for the facilities in Pannawonica, it is noted that the following are provided for that community:

- The Shire has a partnership agreement with Rio Tinto, and together they have holiday programs and events throughout the year.
- The town facilities include a primary school, day care centre, playgroup, medical centre, post office, library, supermarket, deli, tavern and hotel, sporting club, bank agency, service station, swimming pool, and open-air cinema (Rio Tinto, 2015).
- Recreational facilities include the town sports oval and playground, Yannarie Park sports precinct and skate park, Tony Lyons Park, and The Rocks.

11.1.1 FUTURE PROVISION OF COMMUNITY FACILITIES

The *Strategic Asset Management Plan* (SoA, 2023) makes the following commentary in relation to the future provision of community facilities:

- The same level or slight increase in younger families is expected, which primarily make use of parks, playgrounds and recreation space;
- Advancements in technologies and the useful life of materials can assist in reducing maintenance costs or offset asset replacement to a later date;
- Potential to recycle materials to reduce greenhouse gas emissions and waste generation;
- Delivery of assets will occur along with town centre revitalisation projects;
- Careful consideration of population growth with the supply of services, to minimise over-capitalisation.

The following priorities are identified in *Living Life* Community Strategic Plan for Onslow, Pannawonica, Paraburdoo, Tom Price, and Remote Aboriginal Communities (SoA, 2017), as well as those facilities documented for delivery in the *Strategic Asset Management Plan* (SoA, 2023). The following list reflects the developments and projects that have occurred since the publication of the Strategic Community Plan and the *Strategic Asset Management Plan*:

Onslow Facility Requirements

- Onslow Administration Centre upgrades have been completed and commissioned in October 2016.
- Onslow Caravan Park upgrade – Stage One has been completed.
- Development of a public swimming pool has commenced construction, anticipated to open in January 2017.
- A youth centre – V-Swans in Onslow are upgrading the current building.
- The construction of a new Onslow hospital, which will better meet the town's increasing health service needs.

Paraburdoo Facility Requirements

- Paraburdoo CHUB – approved with construction anticipated to commence in 2017. As part of the CHUB project, upgrades to the main oval including a shared-use club house facility for sporting clubs, and single court indoor recreation centre with two squash courts are proposed to replace existing sports pavilion and squash courts.
- Paraburdoo Child Care – completed with the official opening held on 8 October 2016.
- Upgrades to the Paraburdoo Swimming Pool – change rooms, office, first aid room as part of the CHUB.

Tom Price Facility Requirements

- Upgrades have been completed to the Clem Thompson Memorial Oval.
- Upgrades have been made to the Area W oval to provide an alternative sports venue.
- A new skate park has been completed.

Remote Aboriginal Communities Facilities Requirements

- Upkeep of community infrastructure
- Upgrade basketball courts
- Shade structures
- Skate parks
- Access to playgroups, early learning and schools.

Pannawonica Facilities Requirements

- During 2009-2012, Rio Tinto upgraded community and commercial infrastructure in town.

11.2 COMMUNITY LIFESTYLE AND INFRASTRUCTURE PLAN

In October 2023, the Shire's Council adopted the Community Lifestyle and Infrastructure Plan (CLIP). The CLIP identifies a range of opportunities, strategies, and actions to support the growth of Tom Price and Paraburdoo as vibrant, liveable, and sustainable communities with less dependence on the resources sector than has traditionally been the case.

The CLIP will support and inform the Shire's advocacy agenda, relationship-building with key stakeholders, future townscape improvements, and efforts relating to investment attraction, employment growth, and economic diversification in Tom Price and Paraburdoo.

The CLIP is a guiding document and not one that binds the Council to actions, decisions and expenditure; rather it will be one of several 'informing strategies' in the Shire's Integrated Planning and Reporting Framework (IPRF).

The CLIP identifies six core themes (Housing, Commercial, Community, Tourism, Sports and Recreation, Greening and Connection), and articulates various strategies and actions to implement the following visions for each town:

Tom Price: From Mineral Wealth to Community Health, Building a Sustainable Tomorrow Together.

Paraburdoo is a thriving and integrated community, with a welcoming, sustainable, and socially active town centre, offering a variety of opportunities to the community.

11.3 SCHOOLS

The Department of Education's Pilbara Education Regional Office¹⁵ is responsible for 29 public schools with over 9,600 students within the Pilbara Region. Within the Shire, this equated to 1,123-1,155 students recorded to attend local schools in 2016. Enrolment numbers from 2022 show a broad increase in students, demonstrated in the following table.

School Name	2016 Enrolments	2022 Enrolments	Change
Onslow Primary / Secondary School	100-103	144	↑ 41-44
Pannawonica Primary School	113	154	↑ 12
Paraburdoo Primary School	195-205	221	↑ 16-26
North Tom Price Primary School	207-214	267	↑ 53-60
Tom Price Primary School	222-231	303	↑ 72-81
Tom Price Senior High School	286-289	318	↑ 29-32

The Tom Price Primary School, North Tom Price Primary School, Tom Price Senior High School and Paraburdoo Primary School have combined to form the Ashburton School Alliance (ASA). Combined school student activities are also organised through the ASA.

Ngurrawaana is a medium-sized Aboriginal community and is situated within the Yindjibarndi country. The Ngurrawaana Remote Community School may be closed¹⁶.

11.4 PUBLIC OPEN SPACE

The following **Table 52** summarises the Crown Reserves in proximity to the townsites of Onslow, Tom Price and Paraburdoo. Their current purposes are collected from the Landgate Land Enquiry System. The table does not include reserves listed only for drainage purposes. References to the Shire of West Pilbara refer to the historical local government which was renamed during the amalgamation with Tablelands to form the Shire of Ashburton.

Table 52 Register of Crown Reserves for Recreation – Onslow, Tom Price and Paraburdoo (Landgate, 2016)

Townsite	Reserve Name and Address	Purpose of Reserve (Management Order)	Land Area (ha)
Onslow	R49320 Lot 3002 on DP48469 (3002 Second Avenue)	Recreation (Shire of Ashburton) – Onslow War Memorial	0.2249 ha

¹⁶ http://www.det.wa.edu.au/redirect/?oid=com.arsdigita.cms.contenttypes.FileStorageItem-id-16442973&title=Remote+Teaching+Service+Schools&stream_asset=true

Townsite	Reserve Name and Address	Purpose of Reserve (Management Order)	Land Area (ha)
	R37453 Lot 83 on Plan 184612	Golf, Recreation (Shire of West Pilbara) – location of Onslow Salt Headquarters and Horizon Power power station	58.4366 ha
	R30686 Lot 644 on Plan 214895 & Lot 555 on Plan 66576 (51 Third Avenue)	Recreation (Shire of Ashburton) – Oval, Tennis Courts, Bowling Club	5.0424 ha
	R25799 Lot 643 on Plan 214895 (McRae Place)	Recreation (Shire of Ashburton)	0.3781 ha
	R22611 Lot 302 on Plan 40120 (55 Second Avenue)	Civic Purposes, Recreation (Shire of Ashburton) – Recreation and Community Centre	0.1012 ha
	R42090 Lot 970 on Plan 220088	Recreation (Shire of Ashburton) – Basketball Complex, future Pool	7.0275 ha
	R45561 Lot 500 on Plan 58872 (500 McGrath Avenue)	Civic Purposes, Recreation (Shire of Ashburton) – Community Centre and Recreation	0.3586 ha
	R52027 Lot 8000 on Plan 403451 (corner Eagle Nest Road & Yungu Road)	Drainage, Recreation (Shire of Ashburton) – Barrarda Estate	0.2491 ha
	R52117 Lot 8001 on Plan 403452 (corner Wimbil Street & Juru Road)	Public Recreation (Shire of Ashburton) – Barrarda Estate	0.2752 ha
	R52034 Lot 4003 and 4004 on Plan 403450 (corner Ring Road and Blair Avenue)	Drainage, Public Recreation (Shire of Ashburton) – adjacent to Chevron's Lot 4001	2.3153 ha
	R38264 Lot 71 on Plan 214441, Lot 105 on Plan 46040, Lot 85 on Plan 215492, Lots 884, 886, 887 on Plan 402083 (71, 85, 105 Onslow Road)	Equestrian Purposes (Shire of Ashburton)	20.6132 ha
Tom Price (Area W)	R40797 Lot 500 on Plan 406730 (Kanberra Drive)	Recreation (Shire of Ashburton)	4.2943 ha
	R40799 Lot 309 on Plan 188298 (Kanberra Drive)	Drainage, Park (Shire of Ashburton)	0.3812 ha
	R40798 Lot 501 on Plan 406730 (Kanberra Drive)	Clubs (Shire of Ashburton)	0.4341 ha
	R42328 Lot 312 on Plan 15091 & Lot 316 on Plan 15092 (312 & 316 Tanunda Street)	Recreation (Shire of Ashburton) – netball courts and Tom Price Civic Centre	1.8254 ha
	R39907 Lot 277 on Plan 15091, Lot 281 on Plan 15094, Lot 323 on Plan 14565 (323 Jabbarup Place)	Public Recreation (Shire of Ashburton) – North Tom Price oval	12.3256 ha
	R39866 Lot 282 on Plan 15094 (282 Marradong Place)	Public Recreation (Shire of West Pilbara)	0.0655 ha
	R39874 Lots 267, 268, 269 on Plan 15095, Lots 270, 271, 272, 273 on Plan 15093 (fronting Killawarra Drive)	Public Recreation (Shire of West Pilbara)	2.5206 ha
Tom Price	R43617 Lot 330 on Plan 14576 (corner Yaruga Street & Pilkena Street)	Public Recreation (Shire of Ashburton)	0.0778 ha
	R44839 Lots 332 & 334 on Plan 15263 (332 North Road & 334 Acacia Street)	Public Recreation (Shire of Ashburton) – Lions Park	2.5064 ha
	R40059 Lot 288 on Plan 15565 (corner Doradeen Road and North Road)	Public Recreation (Shire of West Pilbara)	0.3918 ha
	R39868 Lot 275 on Plan 15210, Lots 298, 299, 300 on Plan 14830, Lot 301 on Plan 14829 (fronting Central Road)	Public Recreation (Shire of West Pilbara)	0.6383 ha
	R39728 Lot 69 on Plan 15337 (fronting Doradeen Road, Mine Road, West Road)	Public Recreation (Shire of West Pilbara)	8.4749 ha

Townsite	Reserve Name and Address	Purpose of Reserve (Management Order)	Land Area (ha)
	R42327 Lot 315 on Diagram 67532 (315 Central Road)	Recreation (Shire of Ashburton) – Tom Price Visitor Centre	0.5500 ha
	R41388 Lot 317 on Diagram 67300 (317 Central Road)	Recreation (Shire of Ashburton)	0.6530 ha
	R39753 Lot 247 on Plan 15338 (corner Mine Road & Court Road)	Public Recreation (Shire of West Pilbara)	0.1514 ha
	R40195 Lot 291 on Plan 14829 (corner Mine Road and Coolibah Street)	Public Recreation (Shire of West Pilbara)	0.7198 ha
	R52223 Lot 339 on Plan 219965 (corner Willow Road and Stadium Road)	Recreation (Shire of Ashburton) – swimming pool and skate park	1.5302 ha
	R45726 Lot 340 on Plan 219965 (Willow Road)	Tennis Courts (Shire of Ashburton)	0.2927 ha
	R40194 Lot 293 on Plan 14720 (293 Willow Road)	Public Recreation (Shire of Ashburton) – Tjiluna baseball field	1.4684 ha
	R40222 Lot 292 on Plan 15207 (Poinsettia Street)	Public Recreation (Shire of West Pilbara)	0.3332 ha
	R39857 Lot 348 on Plan 29716 (348 Willow Road)	Public Recreation (Shire of Ashburton) – Clem Thomson Memorial Oval	3.1215 ha
	R40835 Lots 345 & 347 on Plan 29716 (345 & 347 Jacaranda Drive)	Recreation (Shire of Ashburton) – bowls club	0.8808 ha
	R42659 Lot 346 on Plan 29716	Club and Club Premises (Shire of Ashburton) – squash courts	0.1388 ha
	R39986 Lot 287 on Diagram 70283 (287 Bauhinia Street)	Public Recreation (Shire of Ashburton)	0.1974 ha
	R39852 Lot 274 on Plan 15209 (Palm Street)	Public Recreation (Shire of West Pilbara)	0.8777 ha
	R40209 Lot 294 on Plan 14722 (Hibiscus Street)	Public Recreation (Shire of West Pilbara)	0.3022 ha
	R41534 Lot 245 on Plan 189344 (245 Tom Price-Paraburdoo Road)	Go Kart Racing (Shire of Ashburton)	6.0001 ha
	R40965 Lot 58 on Plan 216346 (58 East Road)	Recreation (Shire of Ashburton) – golf course	69.4464 ha
Tom Price (outskirts)	R39277 Lot 555 on Plan 75412 (Tom Price-Paraburdoo Road)	Rifle Range (Shire of Ashburton)	27.6261 ha
	R39327 Lot 53 on Plan 186853 (Nameless Valley Drive)	Recreation (Shire of West Pilbara) – Tom Price Speedway	13.3118 ha
	R38328 Lot 60 on Plan 186853 (Nameless Valley Drive)	Recreation (Shire of West Pilbara) – BMX circuit	5.9888 ha
	R42510 Lot 326 on Plan 190955 (Mine Road)	Car Racing (Shire of Ashburton) – Motor Cross Track	13.8649 ha
	R39204 Lot 52 on Plan 186852 (Mine Road)	Recreation (Shire of Ashburton) – archery	6.7999 ha
	R42428 Lot 54 on Plan 216331 & Lot 331 on Plan 192625 (54 Nameless Valley Drive)	Equestrian Purposes (Shire of Ashburton)	121.4198 ha
Paraburdoo	R43567 Lot 144 on Plan 14725 (144 Barrow Avenue)	Public Recreation (Shire of Ashburton)	0.0782 ha
	R43566 Lot 141 on Plan 14725 (141 Camp Road)	Public Recreation (Shire of Ashburton)	5.4257 ha
	R43577 Lot 146 on Plan 14951 (146 Joffre Avenue)	Public Recreation (Shire of Ashburton)	0.2560 ha

Townsite	Reserve Name and Address	Purpose of Reserve (Management Order)	Land Area (ha)
	R40065 Lots 66 & 67 on Plan 15080, Lot 377 on Plan 14859 (66 Ashburton Avenue, 67 Rocklea Road, 377 Wyloo Road)	Public Recreation (Shire of Ashburton)	7.4062 ha
	R40405 Lot 52 on Plan 216817 (52 Gregory Way)	Drainage, Park (Shire of Ashburton)	0.0455 ha
	R40406 Lot 59 on Plan 216817 (59 Gregory Way)	Drainage, Park (Shire of Ashburton)	0.0308 ha
	R39572 Lots 37 & 38 on Plan 15365, Lot 566 on Plan 409044 (20, 37, 38 Fortescue Road)	Public Recreation (Shire of Ashburton) – Peter Sutherland Reserve and parkland	9.3356 ha
	R40483 Lot 84 on Plan 15743 (Fortescue Road)	Public Recreation (Shire of West Pilbara)	0.0826 ha
	R42331 Lot 90 on Plan 15743 (90 Ashburton Court)	Recreation (Shire of Ashburton) – Paraburdoo library	0.3450 ha
	R42332 Lot 89 on Plan 15365 & Lot 310 on Plan 402816 (89 Fortescue Road)	Recreation (Shire of Ashburton) – swimming pool and car parking	0.9263 ha
	R42129 Lot 88 on Plan 190513 (88 Fortescue Road)	Sports Ground (Shire of Ashburton) – sports centre, bowling green, tennis courts, basketball courts	1.4314 ha
	R43569 Lot 142 on Plan 14946 (between Ashburton Avenue and Nickol Avenue)	Public Recreation (Shire of Ashburton)	3.1098 ha
	R43565 Lot 143 on Plan 14968 (143 McRae Avenue)	Public Recreation (Shire of Ashburton) – Train Park	2.2816 ha

11.5 IMPLICATIONS FOR COMMUNITY, RECREATION AND OPEN SPACE

The following **Table 53** considers the implications, issues and opportunities from a community, recreation and open space perspective.

Table 53 Implications, Issues and Opportunities - Community, Recreation and Open Space

Community, Recreation and Open Space	Implications	Issues	Opportunities
Community Facilities	The Shire of Ashburton has analysed the number of assets across the local government district for ongoing maintenance and management. Advancements in technology and materials can assist in reducing maintenance costs or offset asset replacement.	<i>A Map and Gap Analysis</i> conducted in 2012 identified a high level of investment. Chevron and BHP Billiton have also introduced funding programs to support a range of community-based projects and activities. Priorities were identified in the <i>Community Strategy Plan</i> for Onslow, Pannawonica, Paraburdoo, Tom Price and remote Aboriginal Communities. Careful consideration of population growth in towns, with the supply of services.	Review the need for new and existing community facilities and analyse the whole-of-lifecycle costs to ensure facilities are capable of being maintained to an acceptable community standard. Maintain the <i>Strategic Asset Management Plan</i> which reflects the community facilities and assets for ongoing maintenance and management. Where practical and reasonable, encourage the development of new community facilities within co-located facilities, or in proximity to town centres. Progress and implement the various strategies and actions of the Shire's <i>Community Lifestyle and Infrastructure Plan</i>.
Schools	Department of Education's Pilbara Education Regional Office is responsible for public schools. 6 public schools are identified in the Shire of Ashburton.	Four schools have combined as the Ashburton School Alliance, which organise combined school student activities. 6ha site in Onslow for future school.	Support local government use of facilities and open spaces in relation to school student activities.
Public Open Space	Significant areas within the townsites are within managed Crown reserves for public recreation.	Prediction for the same level or slight increase of younger facilities is expected (which make use of parks, playgrounds and recreation space).	Careful consideration of population growth and demographic changes in towns, with the supply and quality of public open space. Promote landscaping where appropriate to be of low-water use, drought tolerant, and resilient to high winds or cyclonic events.

12 URBAN DESIGN, CHARACTER AND HERITAGE

12.1 URBAN DESIGN

SPP 7 (WAPC, 2016) espouses 10 design principles that can be considered through a local context for the Shire itself, as well for the townsites (Onslow, Tom Price and Paraburdoo):

1. Context and character – good design responds to and enhances the distinctive characteristics of a local area, contributing to a sense of place.
2. Landscape quality – good design recognises that together landscape and buildings operate as an integrated and sustainable system, within a broader ecological context.
3. Built form and scale – good design provides development with massing and height that is appropriate to its setting and successfully negotiates between existing built form and the intended future character of the local area.
4. Functionality and build quality – good design meets the needs of users efficiently and effectively, balancing functional requirements to deliver optimum benefit and performing well over the full life-cycle.
5. Sustainability – good design optimises the sustainability of the built environment, delivering positive environmental, social and economic outcomes.
6. Amenity – good design optimises internal and external amenity for occupants, visitors and neighbours, contributing to living and working environments that are comfortable and productive.
7. Legibility – good design results in buildings and places that are legible, with clear connections and memorable elements to help people find their way around.
8. Safety – good design optimises safety and security, minimising the risk of personal harm and supporting safe behaviour and use.
9. Community – good design responds to local community needs as well as the wider social context, providing buildings and spaces that support a diverse range of people and facilitate social interaction.
10. Aesthetics – good design is the product of a skilled, judicious design process that results in attractive and inviting buildings and places that engage the senses.

12.2 TOWNSITE CHARACTER

The purpose of the Townsite Character Statements is to describe the three main townsites as they currently exist. The Statements focus on the towns of Onslow, Tom Price and Paraburdoo, providing general information on their landscape, built form, and facilities. By capturing the town's identities and sense of place in each townsite, criteria are formed for future development and to guide further growth of the towns. The character of the towns will determine parameters, principles and objectives and consider appropriate design strategies.

12.2.1 TOM PRICE

Tom Price is located approximately 1,600 kilometres from Perth, and situated on the edge of the Hamersley Ranges. Established in 1967, the town is described as a picturesque, modern and fully serviced town, designed to blend with the natural environment¹⁷.

The Shire maintains a strong presence within Onslow, with the development of new Council Chambers and offices on Second Avenue. Tom Price is now the administrative centre for the Shire, commensurate with relocation of the administrative offices in 1990. The town centre offers a range of services to support the local community including retail, commercial, business services, and areas for recreation.

Tom Price presents a green and pleasant landscape setting which strongly contrasts with the scenic backdrop of hills with iron-rich colouration. Landscaping around homes and within the town generally incorporates lawn, shrubs and ground covers, with a preference for Pilbara native flora, whilst palm trees are also notable. The extensive landscaping assists with softening the appearance of the town, and provides respite, shade and habitat. The extent of landscaping provides visual relief to the surround aridity of the landscape, as well as providing dust suppression within the town. It also incorporates tree species that have been proven to be suitable for cyclone areas.

The perimeter of the town is generally constrained due to the rocky characteristics of the ground, and the challenges due to topography.

Figure 46 Open Space within Tom Price Town Centre



12.2.2 PARABURDOO

Paraburdoo is located 80 kilometres south of Tom Price. It is a small town that largely accommodates operational workforce for surrounding mines. It is within a flat area and has remarkable views to the nearby Hamersley Ranges. The town is within a 'saddle' between two drainage lines to the north and south, providing for a relatively flat landscape that is easy for residents to walk and cycle throughout town.

The town's climate can be pleasant during winter days, although nights can be cold, whilst summer daytime temperatures on average are above 35 degrees. With good rainfall the area can also experience springtime blooms of seasonal wildflowers, which can transform the landscape with colour.

¹⁷ http://www.riotinto.com/documents/RT_Welcome_File_Tom_Price%202015.pdf

Within the centre of town, a shopping centre contains a supermarket, pharmacy, news agency, cafe and hairdresser. Integrated within this centre is the Shire library, which provides community space for residents. The centre of town contains a number of community facilities including a primary school, swimming pool, bowling club, ovals, and child care centre.

Limited accommodation is available in town for tourists. Rooms are sometimes available within some of the accommodation sites such as at Rocklea Palms, and caravaners may use the Caravan Park on Mine Road (refer **Figure 47**).

Figure 47 Hall Pack, Paraburdoo (L), accommodation in Caravan Park (R)



12.2.3 ONSLOW

The Old Onslow townsite (established 1883), located at the mouth of the Ashburton River, was abandoned following repeated cyclone damage in 1925¹⁸ as well as siltation and flooding issues. The town was relocated to Beadon Creek, where there was deeper water to assist with establishing a fleet of pearl luggers and a small port facility.

Onslow's accessibility has been progressively enhanced through the proximity of the Ashburton North Strategic Industrial Area, the opening of the new ring road (Onslow Road) and construction of Onslow Airport. The town has strongly held on to its identity and history following its relocation, with an emphasis on its organic development and less so about the large mining and petroleum industries that dominate to the south-west at ANSIA.

The town is closely situated to Beadon Point and has proximity to the coastline, bringing with it a connection to the water. It is a small townsite; however, it has an extensive range of community facilities, as well as commercial, industrial and tourism operations. The town has matured with notable tree lined streets, with improvements providing amenity along the coastline and areas of public open space. The coastal relationship of the town is exemplified through the proximity of development, particularly near the sea wall (refer **Figure 48**).

Within the Onslow town site is the Bindi Bindi town-based reserve. The State Government notes that there are 24 houses within Bindi Bindi and an estimated population of 120¹⁹. Whilst accessible from Second Avenue, the reserve is still relatively discrete from the overall townsite.

¹⁸ <https://www.ashburton.wa.gov.au/tour/onslow.aspx>

¹⁹ <http://regionalservicesreform.wa.gov.au/p/factsheets>



Figure 48 Sunrise Beach (L); Landscaped land behind the Sea Wall, First Avenue (R)

New residential areas may be developed to offer a variety of housing options, potentially with a mix of detached houses of various sizes, residential buildings to accommodate a mix of residents, and terrace/town house dwellings.

New residential areas should take account of the well-connected movement network, have regard to the landscape and vegetation patterns in the locality, and maximise opportunities for climate-responsive design (i.e. shade, passive cooling, ventilation and access to sea breezes). Wherever possible, new residential areas should aim to integrate and be connective to other areas of the townsite.

12.3 ABORIGINAL, EUROPEAN AND NATURAL HERITAGE

A number of Aboriginal, European and natural heritage sites are identified on various heritage lists (national, state and local) that are identified in the Environmental Profile (refer **Appendix A** – section 2.8 of the Environmental Profile).

Protection of heritage is an ongoing commitment at all levels of government.

12.3.1 CULTURAL HERITAGE

A number of Registered Aboriginal Heritage Sites are located within the Shire (refer **Appendix A** – section 2.8 and of the Environmental Profile).

While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements and tourism opportunities with traditional owners, and optimise opportunities for Indigenous training, employment and businesses. This should include effective engagement with the appropriate traditional owners depending on the location of heritage sites and business opportunities, to support protection of cultural values.

There is opportunity for Aboriginal heritage and culture/working with Traditional owners. This can include their involvement in a range of cultural, eco-tourism and environmental management and cultural/eco-tourism. The Pilbara has many opportunities which should be supported and developed.

12.4 IMPLICATIONS FOR URBAN DESIGN, CHARACTER AND HERITAGE

The following **Table 54** considers the implications, issues and opportunities from an urban design, character and heritage perspective.

Table 54 Implications, Issues and Opportunities – Urban Design, Character and Heritage

Urban Design, Character and Heritage	Implications	Issues	Opportunities
Urban Design	Buildings and housing have high construction costs due to the isolated nature of the towns. Development needs to consider a total life-cycle cost to ensure that built form is most appropriate having regard to existing weather patterns and climate, future projected climate change.	Guidance that promotes sustainable design principles, is responsive to the Pilbara climate, address the use of finite resources (such as water) and enhance the liveability and wellbeing of residents. Attractive places and spaces will enhance the liveability and attractiveness of the towns.	Implement Design Guidelines for Onslow. Prepare local planning policy for climate change. Prioritise higher quality landscaping along gateway entrances into the townsites, and along Neighbourhood Roads.
Aboriginal, European and Natural Heritage	A number of Aboriginal, European and natural heritage sites are identified on various heritage lists.	Consider ability to use land for Aboriginal purposes, including Native Title, Aboriginal Heritage, and other pursuits including Aboriginal tourism. Work closely with Traditional Owners in terms of getting their involvement in environmental management and cultural/eco-tourism (running the caravan park, organising tours in places such as Millstream etc.). Focus of this development/industry has been in the Kimberley, and that the Pilbara has many such opportunities which should be supported and developed.	Review and update the Municipal Heritage Inventory to be used as the Heritage list in the Scheme. Require, where appropriate, that heritage matters are addressed in structure plans and design guidelines. Consider opportunities for the protection and enhancement of identified sites as part of any assessment of development and/or subdivision applications. Opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements and tourism opportunities with traditional owners, and optimise opportunities for Indigenous training, employment and businesses.

13 TRAFFIC AND TRANSPORT

13.1 TRAFFIC AND TRANSPORT PROFILE FOR THE SHIRE

13.1.1 CURRENT ROAD INFRASTRUCTURE

The major roads that pass through the Shire include North West Coastal Highway and Great Northern Highway. The MRWA functional road hierarchy classification, for this and other significant roads, can be seen in **Figure 49**.

In addition to the sealed road network, the Shire has in the region of 1,800 km of unsealed roads.

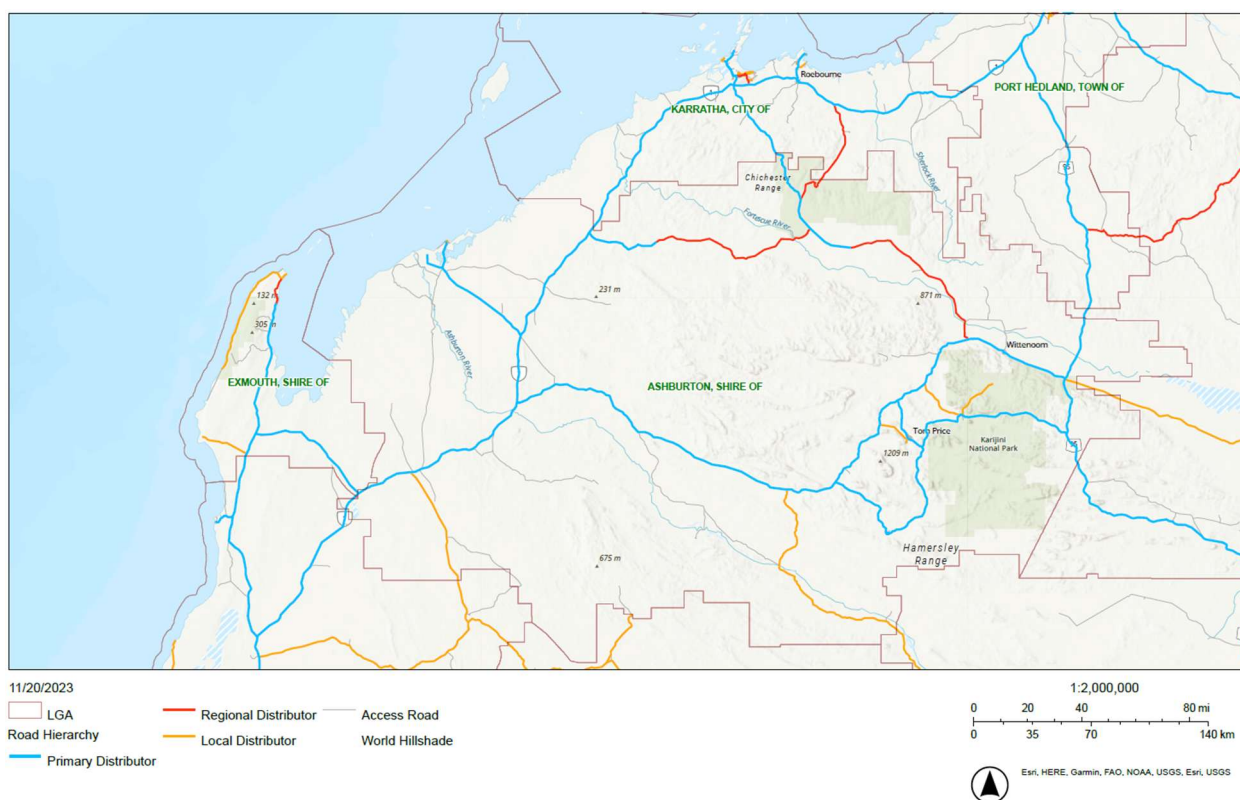


Figure 49 Functional Road Hierarchy (Main Roads WA)

13.1.2 PLANNED ROAD INFRASTRUCTURE

The most significant planned changes to the existing road infrastructure within the Shire have been identified through consultation with the Shire and MRWA. These are covered in the following sections.

13.1.2.1 WIDENING OF NORTH WEST COASTAL HIGHWAY

MRWA widened NWCH between Minilya and Nanutarra, part of which runs through the Shire of Ashburton. This upgrade occurred in 2016 and included the reconstruction of two bridges, one at Cave Creek and one at Goodeman Creek. The widening rendered the road more suitable for the high proportion of road train traffic that uses this route, whilst the bridge reconstruction works reduce the likelihood and length of delays caused by road closures due to flooding.

13.1.2.2 SEALING OF THE KARRATHA – TOM PRICE ROAD (ROEBOURNE – WITTENOOM ROAD) – MANUWARRA RED DOG HIGHWAY

Three of the four stages to upgrade and seal this key transport route are complete, with project development for the fourth and final stage underway. Upon completion, the newly named Manuwarra Red Dog Highway will provide a direct 273km sealed road between Karatha and Tom Price.

13.2 TRAFFIC COUNTS

Traffic data from the *Statewide Traffic Digest 2018/19 – 2023/24* (MRWA, 2023) (MRWA, 2016) recorded the annual average weekday traffic (AAWT) volumes for major routes within the Shire as shown in

Table 55. Selected flows from the Strategy's 2016 'Transport Technical Notes' are also shown in **Figure 50** and **Figure 51**.

The following trends and observations are noted:

- Traffic around Onslow has increased since 2018/19; and
- A significant proportion of road usage is for heavy vehicle, with heavy vehicle accounted for around 1/3 of all road users throughout most of the Shire.

Table 55 Selected Traffic Flows

Location	Annual Average Weekday Traffic (AAWT)					
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Paraburdoo – Tom Price Road	West of Rocklea Road	-	-	-	-	183 (31.7)
	South of Karijini Drive	-	-	670 (31.1)	650 (32.7)	700 (31.8)
	North of Karijini Drive	-	-	-	-	1,440 (21.4)
	South of Tom Price	-	-	1,220 (30.5)	1,080 (33.6)	1,320 (35.0)
Onslow Road	North of ANSIA Access Road	400 (24.8)	500 (26.8)	-	480 (24.1)	670 (22.8)
	South of Twitchin Road	160 (32.7)	270 (34.1)	-	250 (52.2)	360 (40.3)
	North of Tom Price	300 (41.7)	430 (43.3)	400 (38.7)	350 (31.0)	310 (28)
Manuwarra Red Dog Highway	North of Nanutarra Road	-	560 (26.3)	350 (34.6)	650 (27.3)	-
	South of Onslow Road	360 (35.6)	380 (37.8)	400 (33.6)	410 (36.3)	440 (41.0)
	North of Panawonica	-	440 (45.6)	450 (73.8)	900 (58.4)	-
	North West Coastal Highway	-	-	-	-	-

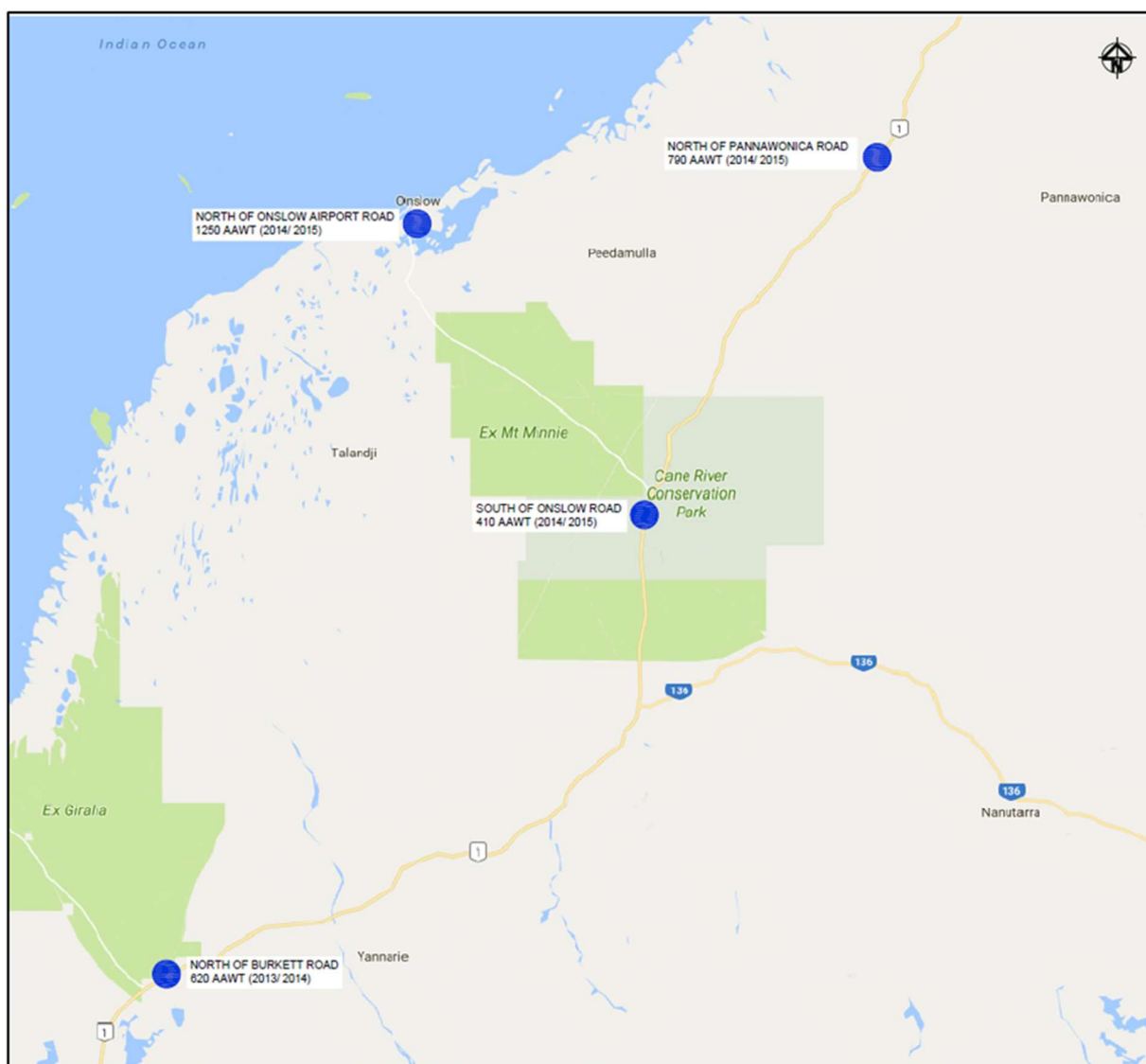


Figure 50 North West Coastal Highway and Onslow Road AAWT (DVC, 2016)

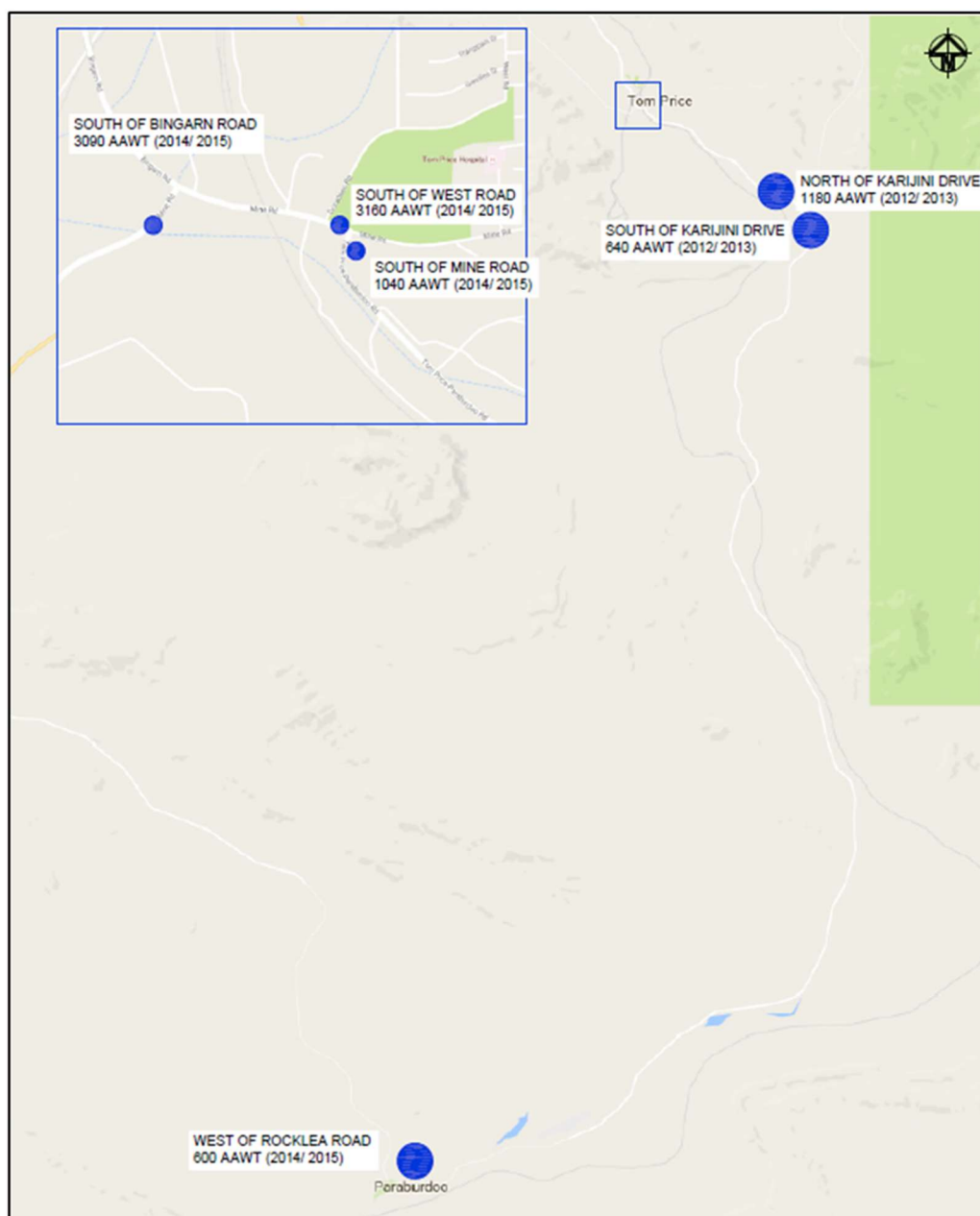


Figure 51 Tom Price Paraburdoo Road and Mine Road AAWT (DVC, 2016)

13.3 OTHER MODES

13.3.1 PUBLIC TRANSPORT

Public transport is limited in the Pilbara, due to low populations, great distances and low population densities. Three regular public bus routes are operated by the Public Transport Authority (PTA) in Port Hedland (population 16,660) however none within the Shire's townsites. Private operators offer charter bus and taxi services in Onslow and Tom Price, and the PTA fund a daily school bus for students to Tom Price Senior High School.

There are no passenger rail lines available, although a number of private freight lines are run by the various major mining companies. The majority of mineral exports are moved to ports on privately owned railways (WAPC, 2014).

Most of the larger towns generally have access to reasonably local airports which are often used primarily by mining sector workers employed on a FIFO basis. Mine companies have charter bus services for their workforces.

13.3.2 AIR SERVICES

Onslow Airport is a Category 3 Security Controlled Airport, currently servicing almost 30 Fokker F100 flights per week, and accommodated for 50,000 passengers per year.

In September 2023, Council received a report on runway and terminal expansion options for the Onslow Airport (Item 12.4, decision 166/2023). The report explained that due to the impending phasing out of the Fokker F100 aircraft and replacement with larger, heavier aircraft, the runway and terminal will need upgrading. Council resolved to explore external funding sources and to undertake a cost-benefit analysis on the opportunity cost of developing a 2200m runway versus a 2460m runway.

Paraburdoo Airport lies some 10 km to the north east of the town. Pannawonica is also provided with a small airport, with airstrips at Barrow Island and Cloudbreak. Of these, Onslow and Paraburdoo airports are public facilities, whilst the airport at Pannawonica and airstrips at Barrow Island and Cloudbreak area privately owned. Several additional airstrips and aerodromes exist elsewhere in the Shire to service mining, resource and agricultural operations.

Main Roads is agreeable to sections of State roads being built or upgraded to act as emergency landing areas for use by the RFDS. The provision of emergency landing areas is subject to meeting the Guideline requirements, the availability of funds, and funding priorities.

The Department of Transport had a management order over Lot 143 on Deposited Plan 92386 (Munjima Airstrip). In early 2016, the DoT commenced closing the airstrip and relinquishing its management order.

13.3.3 MARINE SERVICES

The following **Figure 52** outlines the areas of jurisdiction for the Port of Onslow and the Port of Ashburton.

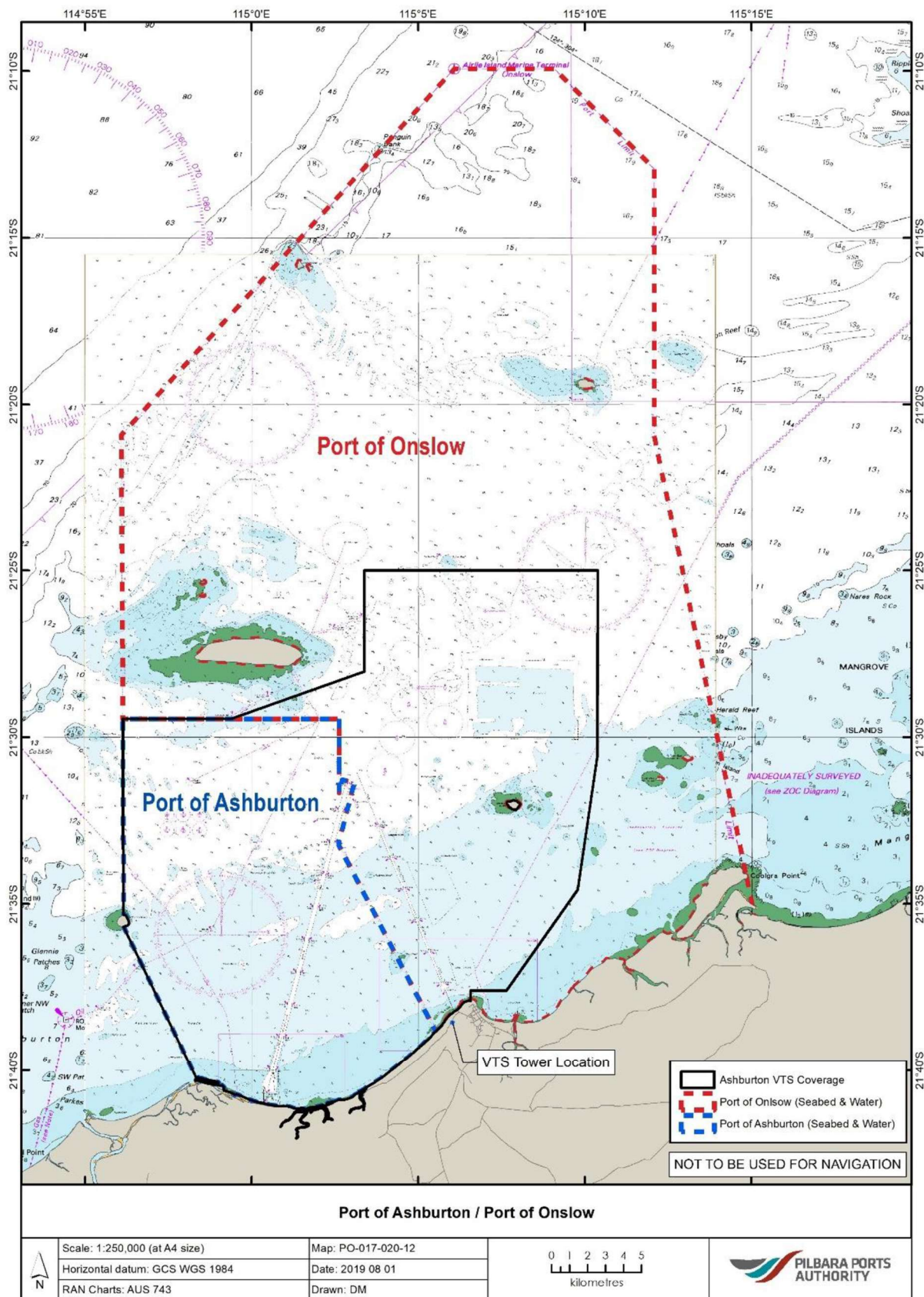


Figure 52 Port of Ashburton and Port of Onslow Reference Map (PPA, 2019)

13.3.3.1 ONSLOW SALT WHARF

Onslow Salt's rights and protections are provided for within the *Onslow Solar Salt State Agreement 1992*. The wharf is neighbouring to the Port of Ashburton and the Port of Onslow.

The wharf near Beadon Point is not constructed to be flexible for other exports other than salt. The wharf is not structurally capable of being used for commodities such as iron ore. It is considered by Onslow Salt that salt is not compatible with other commodities. The Port of Ashburton would be more appropriate for use by other exports.

13.3.3.2 PORT OF ONSLOW

The Port of Onslow is managed and operated by the Department of Transport. It is managed in accordance with the *Shipping and Pilotage Act 1967* and the *Marine and Harbours Act 1981*.

13.3.3.3 PORT OF ASHBURTON

The Pilbara Ports Authority (PPA) was formed on 1 July 2014 as an amalgamation of the Port Hedland Port Authority and the Dampier Port Authority. PPA is the world's largest bulk export port authority, encompassing the ports of Dampier, Port Hedland and Ashburton, as well as the future ports of Anketell, Balla Balla and Cape Preston East. The Port of Ashburton is operated by PPA in accordance with the *Port Authorities Act 1999* and has regard to the *Port of Ashburton Master Plan* (PPA, 2017). The Master Plan documents the foundation stage of the port, and the proposed port layout for 2050.

In 2009, the State Government entered into a State Development Agreement with Chevron Australia for the Wheatstone project in the ANSIA. PPA is responsible for constructing the multi-user port, common user coastal area (CUCA) facilities and Eastern Infrastructure Corridor (EIC)²⁰.

During 2015-2016, the Port of Ashburton recorded 95.7% its total throughput as general cargo imports, and the remainder as general cargo exports. Once the Port of Ashburton is operational, it is anticipated that this percentage will switch around, as the overall trend of Pilbara Ports is over 99% of throughput as exports (PPA, 2016).

Chevron Australia's Wheatstone project commenced operations in 2017. PPA is responsible for common-user marine assets and port-vested land at the Port of Ashburton. PPA has commenced port monitoring and communications services, facilitated by the PPA's Vessel Traffic Services Centre at the Port of Dampier (PPA, 2016). PPA will establish an administration building and car park, security fencing, power and water infrastructure, gatehouse, and oil spill equipment sheds.

There is a transition towards larger ships and reduced offshore activities which has seen a decreased number of vessel visits to Pilbara Ports. Generally overall, port trade across all ports has exceeded the PPA's 2015-2016 financial year targets (PPA, 2016).

13.3.3.4 BARROW ISLAND

Barrow Island has produced more than 320 million barrels of oil²¹. The Barrow Island port is a Restricted Port due to the vessel activity associated with Gorgon, and permission must first be obtained from the Barrow Island Marine Controller.

²⁰ <https://www.pilbaraports.com.au/Home/Port-operations/Our-ports,-services-and-facilities>

²¹ <https://www.chevronaustralia.com/our-businesses/barrow-island>

13.3.4 PEDESTRIANS AND CYCLISTS

Very little dedicated infrastructure is available for cyclists within the Shire. Whilst the number of workers commuting by bicycle is unlikely to be high, some leisure and recreational cycling may be found in and around most of the towns.

In 2021, the Department of Transport published the 'Pilbara 2050 Cycling Strategy' aimed at promoting cycling and identifying infrastructure improvements in the Pilbara region²². Overall 2050 cycling network plans have been prepared for the main towns within the Pilbara, including for Onslow, Tom Price and Paraburdoo within the Shire.

The Strategy identifies 8 'priority projects' to be delivered over 2021-2023, shown in **Table 56** below.

Table 56 Pilbara 2050 Cycling Strategy Projects within the Shire

Strategy Reference	Action	Project Type	Objective / Justification	Status
A1	Tom Price – Boardwalk	Feasibility and design	Shire of Ashburton to undertake detailed feasibility study and prepare a design to develop a boardwalk link between Mine Road and Doradeen Road, where there are existing informal tracks. This project will be the first stage in a connection from Tom Price town centre to the Tom Price Tourist Park and Mine.	In planning
A2	Tom Price – Oval Link	Construction	Shire of Ashburton to construct a path around the Clem Thompson Oval Block including Jacaranda Drive, East Road and Willow Road, extending the existing path on Stadium Road. Providing this path will support safe access to the numerous sport and recreation destinations on this block.	Complete
A3	Tom Price – Area W Loop	Construction	To complete a missing link of the Area W Loop, Shire of Ashburton to extend the existing Killawarra Drive path to the north east, as well as constructing a path along Canberra Drive and Allambi Way to link to another existing segment of the loop.	In progress, priority 1
A4	Tom Price – Willow Road / South Road Link	Construction	In Tom Price, Shire of Ashburton to construct paths along South Road between Willow Road and Palm Road, and along Willow Road between South Road and the existing path at the eastern edge of the softball field. As part of this link the Shire is to formalise an existing informal track at the eastern boundary of the softball field between Willow Road and South Road.	In planning, priority 1
A5	Paraburdoo – Hospital to Information Bay	Construction	In Paraburdoo, Shire of Ashburton to construct a path connecting to the existing path at the hospital on Rocklea Road.	Complete
A7	Paraburdoo – Loop Fortescue Road / Nickol Road	Design and construction	In Paraburdoo, Shire of Ashburton to design and construct paths on Fortescue Road north of Channar Avenue, Nickol Avenue, and Meharry Road, to connect to existing paths and create a complete loop around key destinations in the town.	In planning, priority 2
A6	Onslow – Biden Street to Beadon Creek Harbour	Feasibility	In Onslow, Shire of Ashburton to undertake feasibility study to extend the Second Avenue path to run along Second Avenue and Beadon Creek Road, from Biden Street to the Boat Ramp. This will provide connection between the Bindi Bindi Aboriginal Community, Caravan Park, Boat Ramp and Onslow town centre, as well as serving future development at Beadon Creek Harbour.	In planning

²² <https://www.transport.wa.gov.au/active/transport/long-term-cycle-network.asp>

Strategy Reference	Action	Project Type	Objective / Justification	Status
A6	Onslow – Bidan Street to Beadon Creek Harbour	Construction	Following feasibility study in the previous financial year, Shire of Ashburton to construct an extension to the Second Avenue and Beadon Creek Road, from Bidan Street to the Boat Ramp. This will provide connection between the Bindu Bindu Aboriginal Community, Caravan Park, Boat Ramp and Onslow town centre, as well as serving future development at Beadon Creek Harbour.	In planning, priority 3

In November 2022, the Shire opened the Tom Price Pump Track. As part of an overall \$1.6m Bike Park project, the pump track was designed by Common Ground Trails in consultation with community and Council's vision for the facility (SoA, 2023).

The Shire also intends to develop the Pilbara Trails network to connect with existing walking, cycling, trail biking, driving, 4WD and horse trails. The Pilbara Trails project will include the significant trails that form part of the Warlu Way, Karijini National Park and Millstream Chichester National Park, and will link with regional, interstate and international trail networks. The Shire has identified this as a priority project with an anticipated timeline for delivery during 2023/24.

13.4 MAJOR TOWNSHIPS

13.4.1 ONSLOW

A number of significant upgrades have been carried out to the road network around Onslow, with additional work still ongoing.

Accessibility into Onslow has been improved, with the opening of a new road extension from the Onslow Airport Mixed Business Precinct, northwards through to Simpson Street. This now forms the main entry route into the town centre for residents and tourists, with the old Onslow Road route now being used primarily for freight access to the port area. The Minister for Lands has approved the naming of the new road extension 'Onslow Road', with the old alignment renamed to 'McAullay Road' (refer **Figure 53**).

As can be seen in **Figure 53**, a number of new areas have also been cleared for development to the south and southeast of the town, with new roads being provided to service them.

Significant work has also been done in recent years to improve access and parking at the Onslow Airport. Much of the work was originally scheduled to cater for the forecast influx of additional workers to the area for the Wheatstone LNG project.



Figure 53 Recent Changes to the Road Network in Onslow

13.4.2 TOM PRICE

Tom Price is the administrative centre for the Shire of Ashburton. The town is effectively split into two areas by a freight railway, with the main town to the south east and a slightly newer section to the northwest (often referred to as 'Area W'). This northern section houses the North Tom Price Primary School, but lacks any significant retail development.

The main road connection between the two sections is Doradeen Road, which traverses the railway on a two-lane bridge (refer **Figure 54**). The northern section can also be accessed from Bingarn Road, which forms a western bypass before joining Mine Road, the main entry route into the southern town centre.

The most heavily trafficked road in the Shire is the section of Mine Road between Bingarn Road and Paraburdoo – Tom Price Road. This section of road carries in excess of 3,000 vehicles per day (vpd) past the Coles Express service station in the southern part of the township of Tom Price.

Satellite imagery suggests that the intersection of Paraburdoo – Tom Price Road with Mine Road used to form a crossroads, with Doradeen Road supplying the fourth leg. However, the southern approach appears to have been relocated some 70m further east, to provide a staggered T intersection (refer **Figure 54**). This would appear to have been implemented as a road safety measure.

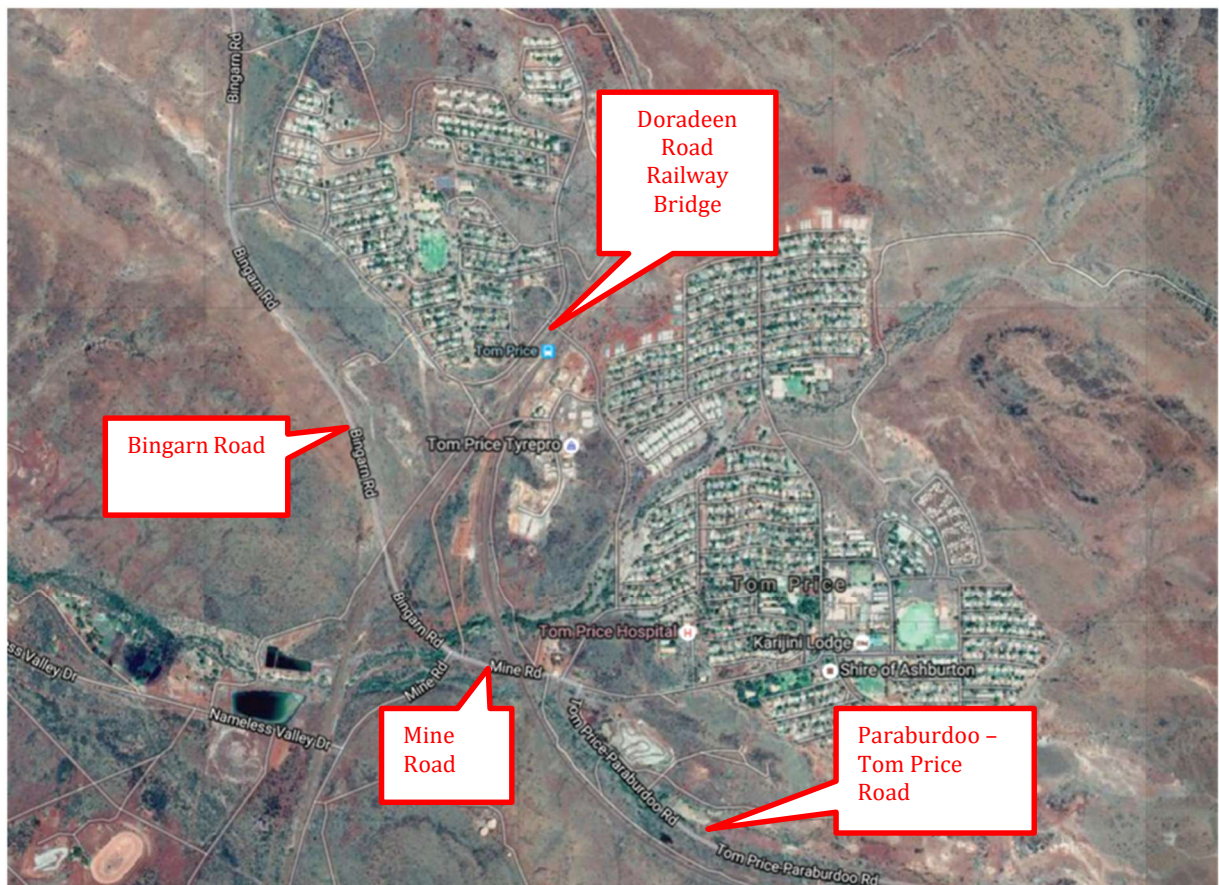


Figure 54 Tom Price

13.4.3 PARABURDOO

The Paraburdoo – Tom Price Road (refer **Figure 55**) that lies within Rio Tinto's leasehold land is not currently gazetted. However, Main Roads WA (Pilbara Region) has recently completed a high level strategic document, namely: the 'Safety Improvements Strategy for Paraburdoo – Tom Price Road (M051) SLK 0-130' based on treatments to be implemented over a 5 to 10-year period.

There do not appear to be any specific safety or capacity issues with the existing road infrastructure in or around the town.

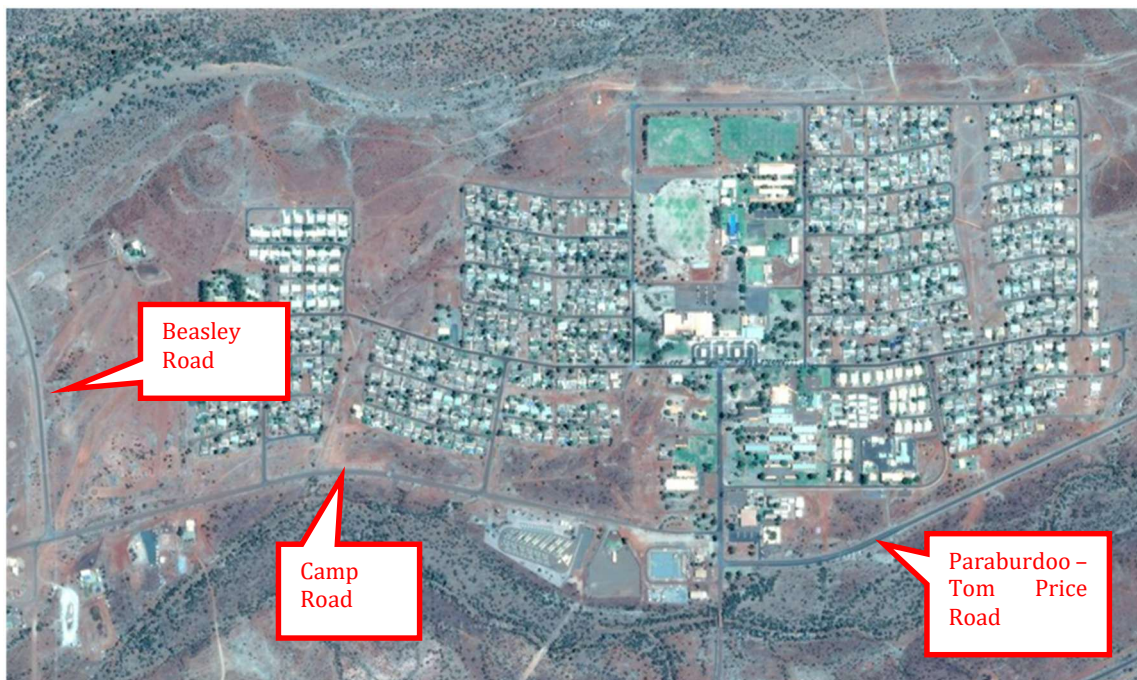


Figure 55 Paraburdoo

13.4.4 PANNAWONICA

Pannawonica is situated at the intersection of Pannawonica Road and Deepdale Drive, refer **Figure 56**. There do not appear to be any capacity issues with the existing road infrastructure at the present time.

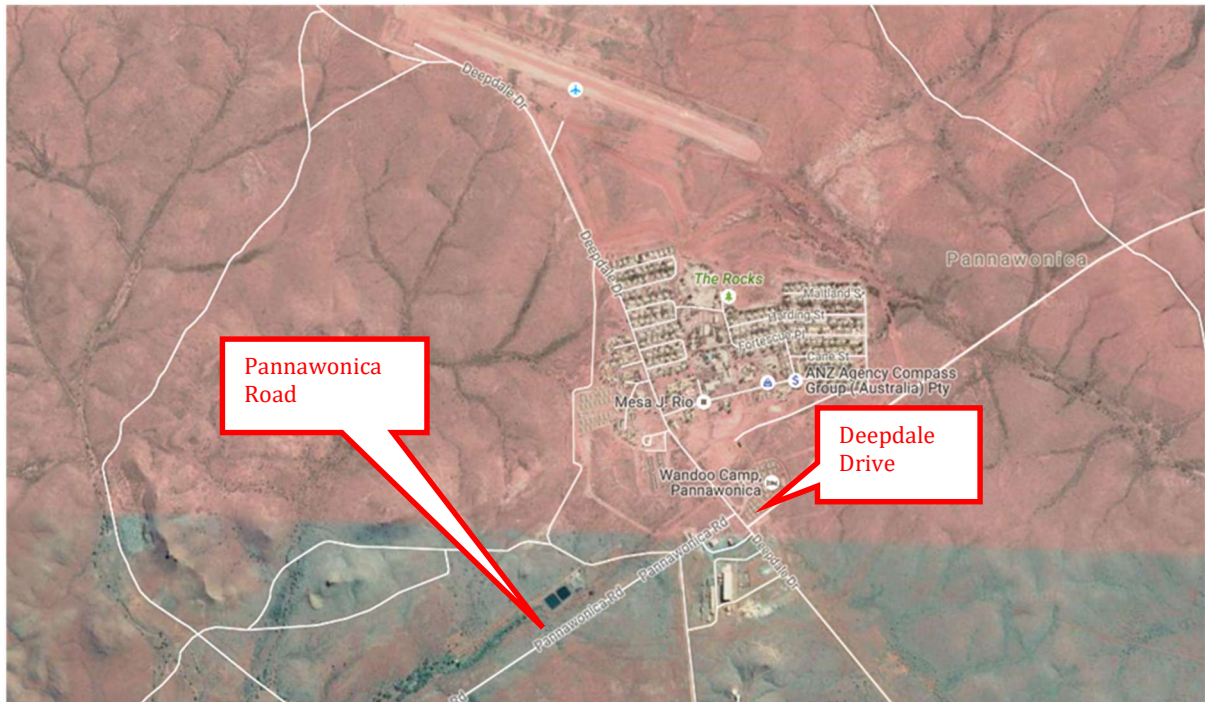


Figure 56 Pannawonica

13.5 OPPORTUNITIES AND CONSTRAINTS

13.5.1 ONSLOW

Onslow has a number of partially developed areas in which it is expected expansion and further development will take place as part of Chevron's Wheatstone LNG project. A number of projects have also been funded throughout the town, refer **Figure 57**.



Figure 57 Extract of proposed development around Onslow (DSD, 2014)

However, the level of growth previously expected as a result of this project has not yet materialised. The range of upgrades currently being constructed appear to be well in excess of those required by the likely growth of Onslow within the study planning horizon, and should provide sufficient spare capacity for expected growth in traffic generation for many years to come.

13.5.2 TOM PRICE

Whilst there is a second route between the two parts of Tom Price via Bingarn Road, this is not a convenient route for most purposes (refer **Figure 58**). Should there be an issue that closed the bridge over the railway at Doradeen Road, this would cause significant inconvenience, both for residents of the northern area wishing to access the town centre, and for parents taking their children to the school.

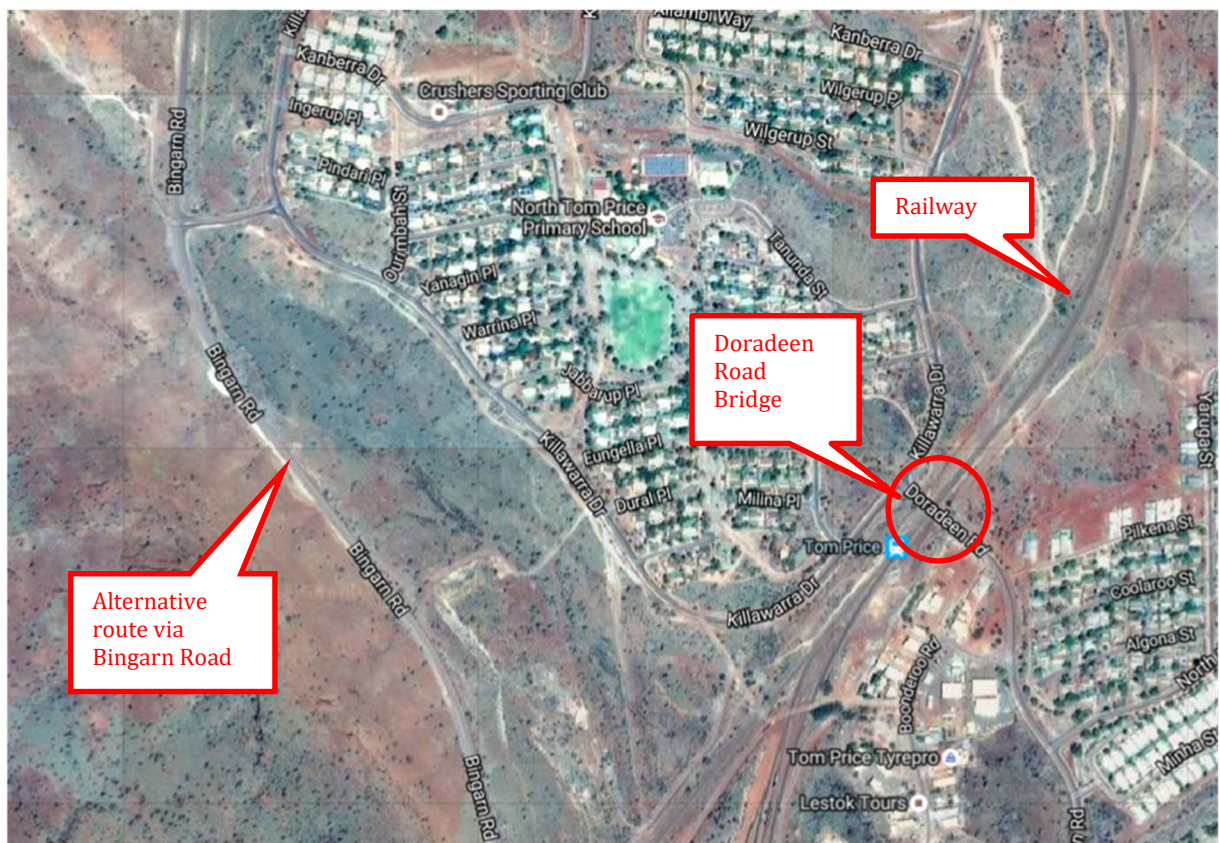


Figure 58 Limited connectivity between northern and southern sections of Tom Price

13.5.3 PARABURDOO

There is little potential for growth in Paraburdoo. Any additional residential demand is likely to be limited and taken up by infill development. It is not expected that the level of growth would generate sufficient additional traffic to result in significant traffic implications, or render any extensive upgrading of the existing infrastructure necessary.

13.5.4 PANNAWONICA

There is little potential for growth in Pannawonica. Any additional residential demand is likely to be limited and taken up by infill development. It is not expected that the level of growth would generate sufficient additional traffic to result in significant traffic implications, or render any extensive upgrading of the existing infrastructure necessary.

13.6 KEY TRAFFIC AND TRANSPORT ISSUES

13.6.1 GENERAL

Given the low population levels throughout the Shire, traffic flows on most roads are well within capacity. The levels of growth expected within the planning horizon of this study are not expected to change this to any great extent.

The largest growth area is likely to be in and around Onslow, and the rate at which this occurs will be dependent upon the economic climate in the mining sector. However, the planned and ongoing upgrades to the road infrastructure in this area should easily cope with the likely increases in traffic and transport generation associated with the most optimistic growth in this sector over the period being considered.

Generally, residential and commercial growth in the other townships is expected to be limited to infill developments and the occasional small green-field site.

Thus, the key traffic and transport issues that need to be addressed within the LPS are more focussed on the limitations of the existing infrastructure rather than the need for additional links or major upgrades, and may relate more to regional traffic than local.

The Shire has a vast road network, catering for a wide range of demands. The roads are essential not only for traffic generated by the mining and pastoral industries, but for local residents and tourism traffic too. The geographic location also leads to widely differing road conditions, with huge variations in seasonal traffic, temperatures and rainfall across the Shire.

13.7 KEY ISSUES

Key issues for inclusion in the LPS would include the following:

Road safety

The vast distances travelled through the Shire, much on unsealed roads, inevitably lead to some road safety issues, whether related to geometric design or maintenance issues, fatigue or other environmental or behavioural aspects.

Road Maintenance

The extent to which road maintenance is carried out is normally predicated on the amount of funding available. With limited funds available, maintenance must be targeted to ensure maximum value for money. A lack of regular maintenance will inevitably lead to degrading of the asset, with corresponding safety issues and a significant replacement cost in the longer term.

The Shire is considering a *Road Management Strategy* that includes a new *Road Management Policy*, Road Hierarchy, Road Asset Management Plan and Levels of Service, Geometric and Maintenance Standards. Adoption and implementation of these would potentially occur late 2016 or early 2017.

Tourist Facilities

The encouragement of tourism is a key factor in creating jobs and attracting money to the Shire. Investment in facilities such as public dump points for camper vans to enhance the tourist experience within the Shire is essential to grow this sector. To this end, in 2023 the Shire commenced developing an overflow caravan parking area on the foreshore in Onslow and is currently investigating other tourism expansion opportunities in Tom Price and Paraburdoo.

The improvement and sealing of the Karratha - Tom Price Road (now named Manuwarra Red Dog Highway) is considered an ideal opportunity to generate substantial economic benefits for the Pilbara and the State through both increased tourism and improved freight traffic movements.

Freight Facilities

A significant proportion of the vehicles using the roads throughout the Shire is freight traffic of one sort or another. Strategically located road train assembly points provide a necessary facility to ensure these vehicles can be safely operated on the appropriately designated roads.

Roadhouses

Strategically located roadhouses provide essential facilities for both tourist and freight traffic, such as fuel, water, food and rest areas. Such facilities assist with preventing fatigue and its associated road safety issues.

Overtaking opportunities

Frustration can be a significant road safety issue, and may be caused by drivers being stuck behind a slower moving vehicle with no safe opportunities to overtake. Many of the road trains using the regional roads in the Shire are doubles or triples, which require a significant length of straight road to ensure visibility is sufficient for overtaking. The provision of additional lanes at regular intervals addresses this issue.

Flood mitigation measures

Certain parts of the Shire are regularly affected by cyclonic weather, and the resulting torrential rainfall can seriously damage or block key roads. Such flooding can result in anything from mild inconvenience to locals to severe safety issues, as well as delays to freight causing significant costs.

13.7.1 MRWA INPUT

Whilst MRWA were unable to provide any detailed input to the original Strategy due to time and staffing constraints, a draft list of potential projects was provided for various roads within the area, extracted from the Heavy Vehicle Operations Safety & Productivity Strategy & Program for the Pilbara Region Road Network.

These projects included the following general strategies:

- Construction of overtaking lanes;
- Construction of pullover bays;
- Retrofitting of sealed shoulders;
- Upgrading of stock fencing; and
- Grade separation of existing level crossings.

13.8 IMPLICATIONS FOR TRAFFIC AND TRANSPORT

The consistent factor required to address the key issues identified above is funding.

There are a number of avenues open to local governments for accessing additional funding for various purposes, including *Royalties for Regions*, Federal and State Blackspot programmes etc. In the case of black spot funding, it is not always necessary for a project to be based on a cost benefit analysis, and sites with no significant crash history may be eligible for funding if potential safety issues have been identified within a formal Road Safety Audit report.

The Shire needs to identify all such opportunities, and develop a strategy for maximising the amount of funding that can be accessed. In most cases, this will involve the early identification of projects in order to ensure that a robust case can be presented.

14 INFRASTRUCTURE SERVICES

14.1 POWER

14.1.1 CURRENT TOWN POWER SUPPLIES

Current town power supplies for Onslow are provided by Horizon Power, from a power station that also services the Onslow Salt operations.

Town power supplies for Tom Price, Paraburdoo and Pannawonica are supplied by Rio Tinto. Power generation capacity in the region is unlikely to present a barrier to future urban expansion.

Distribution networks are anticipated to age and in some cases, may require upgrades to enable substantial urban expansion (WAPC, 2015).

14.1.2 FUTURE POWER SUPPLIES

As technological advancements continue, renewable energy solutions and microgrids will become more cost competitive, more reliable and better understood to be alternative approaches to electricity generation, distribution and storage. It has been considered that a suitable use of renewable energy is in a hybrid situation, where renewable sources exist alongside conventional generation to save fuel and lower ongoing costs (Evans & Peck, 2011). Renewable energy sources and microgrids can help to build resilience and reliability in the electricity network, through stabilising energy supply to demand, and also work to offset carbon emissions.

Rio Tinto has a number of off-grid systems in place throughout the Pilbara, including Pannawonica, Paraburdoo and Tom Price (Nu Energy, 2015). Whilst mining activity is energy-intensive and reliant on fossil fuels, mining site energy requirements are increasingly met from renewable power sources.

In 2014, Energy Made Clean constructed an off-grid modular solar photovoltaic system with battery storage and diesel power generation, to supply the Mackerel Island Resort on Thevenard Island. The system runs at 94% offset of diesel, reducing costs to the tourism operator (EMC, N.D.).

Horizon Power made an announcement in September 2016 to deliver more than half of Onslow's electricity needs through a renewable energy microgrid. The microgrid will include a mix of solar generation and battery storage, as well as a scalable gas-fired modular power station (Horizon Power, 2016). The State Government has committed about \$70 million to the project with a contribution from the Chevron Wheatstone project under the terms of its State Development Agreement. Onslow's renewable energy power system was completed and commissioned in November 2019.

14.2 GAS PIPELINES

Natural gas is sourced from:

- Woodside operated Karratha Gas Plant;
- Apache operated Varanus Island facilities;
- BHP Billiton operated Macedon Gas Plant (200 terajoules per day);
- Apache operated Devil Creek Gas Plant;
- Empire Oil & Gas operated Red Gully facility; and
- Chevron operated Wheatstone is planned to add up to 200 terajoules per day for domestic supply from 2018.

Dampier Bunbury Pipeline (DBP) is the owner and operator of the Dampier to Bunbury Natural Gas Pipeline (DBNGP). Almost all of the natural gas transported by the Pipeline is produced in the offshore Carnarvon Basin on the North West Shelf. The Dampier to Bunbury Natural Gas Pipeline has part of its alignment within the Shire. The pipeline is recognised in the Local Planning Strategy and there are exemptions for pipeline-related works from requiring local government development approval. The Department administers land use within the Dampier to Bunbury Natural Gas Pipeline. The Department's Infrastructure Corridors team manages the corridor by:

- acquiring additional land;
- managing conferral of rights on pipeline operators; providing advice to the WAPC on development proposals within or in close proximity to the corridor;
- regulating non-pipeline related land uses; and
- engaging with relevant stakeholders.

All the Wheatstone LNG pipelines have been constructed. The last pipeline was completed, being a gas lateral to the future power station site. All gas lines should be located within the ANSIA Multi User Access and Infrastructure Corridor (MUAIC), which is within the 'Infrastructure' zone and do not require development approval pursuant to clause 36(f) of the Improvement Scheme No. 1. BHP Billiton's Macedon DomGas pipeline is within the MUAIC.

The draft DC Policy 4.3 *Planning for High-Pressure Gas Pipelines* applies to development (some exemptions apply such as common infrastructure corridors) that may be proposed within 300 metres to the DBNGP and other pipelines that operate at or above 1.9 megapascals. The DC Policy 4.3 aims to protect both the pipeline and its ongoing operation/maintenance, together with ensuring people and development are not subject to an unacceptable risk from that infrastructure (WAPC, 2016). The Local Planning Strategy will identify the location of all high-pressure gas pipeline licence areas to provide greater ease of the implementation of DC Policy 4.3 within the local government area.

14.3 WATER

Water is vital to the sustainability of the natural environment, ecological processes, Traditional Landowner customs and ways of life, as well as settlements, tourism, pastoral/rural activity and the mining industry. Securing access to quality water resources and employing sustainable water cycle management practices will be ongoing priorities.

Groundwater is available for allocation in many aquifers, however, declining rainfall in coastal areas may result in reduced recharge and consequently availability in these areas in the future, particularly as population and industry expands. Dewatering/overabstraction have also impacted local groundwater levels and thereby potentially affecting groundwater-dependent pool ecosystems and wetlands through drying up and loss of habitat, affecting vegetation and wildlife dependent on them as well as groundwater-dependent cultural and social values. This is especially critical given the presence of proposed Ramsar sites, and nationally important wetlands in the Shire.

14.3.1 PUBLIC DRINKING WATER

Public drinking water is supplied predominately from groundwater. The Public Drinking Water Source Areas (PDWSAs) are outlined in **Table 57** below and discussed in the Environmental Profile (refer **Appendix A**).

Table 57 PDWSAs in the Shire of Ashburton

PDWSA	Source	Priority
Bungaroo Creek Water Reserve	Groundwater	P1
Cane River Water Reserve	Groundwater	P1
Harding Dam Catchment Area	Surface water	P1
Millstream Water Reserve	Groundwater	P1 & P2
Marandoo Water Reserve	Groundwater	P1
Pannawonica Water Reserve	Groundwater	Not Assigned
Paraburdoo Water Reserve	Groundwater	P1 & P3
Southern Fortescue Water Reserve	Groundwater	P1

14.3.1.1 OTHER WATER REQUIREMENTS

Water is a valuable resource for future agriculture and aquaculture. Increased government information on the feasibility, economic viability and sustainability on water resources and water management will allow for better information being available for agriculture, aquaculture (possible), and other public/private projects.

14.3.1.2 WATER SUPPLY INFRASTRUCTURE REQUIREMENTS

For Onslow, current town water supplies come from the Cane River bore field. A desalination plant is proposed within ANSIA, which would provide for potable water supply to Onslow and to ANSIA. Dependent on the long-term viability and management of the Cane River bore field, the desalination plant may be a longer-term infrastructure delivery item. The Water Corporation plans to construct a reverse osmosis seawater desalination plant in Onslow at Beadon Bay, with a 2.9 kilometre below-ground pipeline to tanks, where the water will connect to Onslow's water supply. Construction is expected to be completed by the end of 2025.

Rainfall data indicates that average annual rainfall has declined around Onslow yet has increased in inland areas (refer **Appendix A**).

The use of surface water and groundwater resources may be augmented through a reliance on seawater desalination. The use of water from mine run-off and water extraction is a logistically difficult yet potentially viable option (McHugh, 2011).

14.3.2 WATER MANAGEMENT

Flooding occurs semi-regularly in the Shire, particularly during the wet season and extreme tropical cyclones. Adequate management of flood risk, and associated sediment transport in townsites and industrial areas requires consideration consistent with SPP 2.9 (refer **section 2.3.5** and **Appendix A**). The Shire may need to review existing townsite drainage systems and ensure appropriate levels of service will be maintained as development occurs (such as at Onslow Airport) and water quality including sediments in stormwater is addressed.

Better Urban Water Management (WAPC, 2008) has been designed to facilitate better management of urban water resources, by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system. It also provides guidance on the implementation of SPP 2.9 *Water Resources* (refer **section 2.3**).

There are opportunities for expanding irrigation for investigation in the Pilbara hinterland, from using excess water from mine dewatering (WAPC, 2014). Surplus water from below water table mining at Rio Tinto's Marandoo mine is also to be reinjected to the Southern Fortescue borefield to replenish the aquifer which supplies the Tom Price township. Surplus water from the nearby Nammuldi mine is also being used for irrigated agriculture projects at nearby stations. This is opportune as it is generally not a natural occurrence in the Pilbara for waterways or evaporative basins to have constant base flows of water (Infrastructure Australia, 2016). Agricultural-based water management activities can reduce the environmental impact of surplus mine water discharge and make best use of water resources.

14.3.3 WASTEWATER

The *Pilbara Planning and Infrastructure Framework* identified the need to provide deep water sewerage facilities in all Pilbara cities and towns, and provide adequate local absorption systems in other smaller scale settlements and Aboriginal communities (WAPC, 2012).

In late December 2016, the Onslow wastewater treatment plant capacity was doubled to 870,000 litres per day. This was funded by the Wheatstone Project under its State Development Agreement. This plant expansion provides support for the long-term future growth of Onslow, predicted to accommodate a near-doubling of the population in the town.

14.4 SOLID WASTE MANAGEMENT

The *Pilbara Waste Infrastructure Project* (Talis Consultants Pty Ltd, 2014) within the Pilbara indicated the following sources of waste generation:

- 2% from camps;
- 22% from domestic sources;
- 28% from mining;
- 14% from petroleum and natural gas processing; and
- 34% from other/mixed sectors.

Waste Treatment is indicated in **Figure 59** below. Currently, there are low rates of recycling occurring in Onslow and Tom Price, with a significant proportion of waste being sent to landfill.

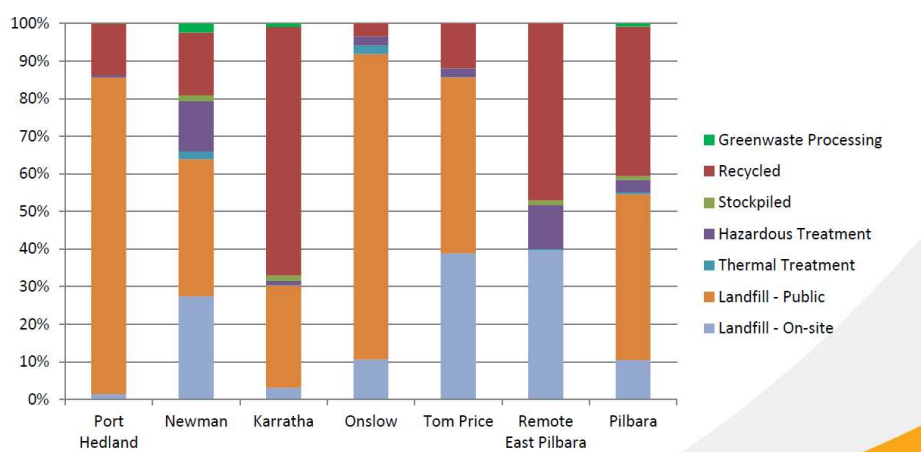


Figure 59 Waste Treatment – Pilbara (Talis Consultants Pty Ltd, 2014)

The priority wastes are outlined in **Table 58**.

Table 58 Priority Wastes (Talis Consultants Pty Ltd, 2014)

Local Government Priorities	Iron Ore Priorities	Oil and Gas Priorities
• Refuse – mixed refuse from kerbside collections, generated by residents and commercial properties. • Greenwaste – generated from clearing or pruning • Tyres – generated when tyres are replaced on vehicles (currently stockpiled, possible fire risk) • Liquid waste	• Old timber railway sleepers – replaced by concrete sleepers, currently stockpiled • Rubbers (conveyors/tyres) – currently being landfilled on-site • Contaminated Soils (hydrocarbon / miscellaneous) – some re-use / remediation, or disposed in Perth • Recyclables – town and mine sites • Construction wastes	• Hazardous Materials – mercury slurry; naturally occurring radioactive materials; contaminated solids; organic waste from offshore operations • Construction waste • Operational wastes – food waste, bulky items, recycling

The *Pilbara Waste Infrastructure Project* outlined a number of infrastructure and market opportunities for waste processing facilities and recycled products. Some are relevant to the Shire, including:

- A joint dirty Material Recovery Facility in Newman and Tom Price;
- Development of local community resource recovery parks, and transfer facilities;
- Adoption of quality standards for local recycled materials; and
- Government support for use of recycled materials.

Waste management facilities are located in proximity to Onslow, Tom Price and Paraburdoo. A new waste management facility has been identified approximately 36km south of Onslow (Talis Consultants, 2014). The Feasibility Study confirmed the location of the preferred site was appropriate subject to further studies, confirmation of the approvals process and consultation with the management authority (DBCA). It was recommended the preferred site be developed to include Class 3 and Class 4 standard with the waste cells providing for standard waste, construction and demolition waste, liquid waste, waste oil, and tyre and rubber waste (Talis Consultants, 2014). It is understood such a facility would be used by Chevron Australia. The Class IV facility will cater for both local waste from the Onslow community and a variety of waste from the mining and resources sector of the Pilbara and wider regions.” The facility, now referred to as the Pilbara Regional Waste Management Facility (PRWMF), commenced operating in 2021 and consists of a green waste facility, construction and demolition facility, liquid waste facility, tyre mono-cell and a Class IV landfill. The PRWMF is operated by Pilbara Environmental Services on behalf of the Shire.

Australia’s oil and gas industry is entering a phase where significant infrastructure is nearing its end of life and decommissioning will need to occur. Only a few oil and gas facilities have been decommissioned in Commonwealth waters, however as most of Australia’s offshore facilities are now more than 20 years old, these facilities are entering a phase where additional maintenance and removal is likely (CDA, 2020) (NOPSEMA, 2023). This phase presents a significant need, and opportunity, for the efficient recovery, dismantling, recycling and disposal of oil and gas associated infrastructure.

Land surrounding the PRWMF could be investigated to create a broader ‘Eco-Industrial Park’ with complementary businesses associated with the dismantling, recycling and disposal of oil and gas associated infrastructure.

Pannawonica rubbish tip is located six kilometres from the town site. There is a general rubbish collection system and a once-only verge collection per year as a pre-cyclone pick up during late October (Rio Tinto, 2015).

14.5 TELECOMMUNICATIONS

Broadcast Australia distributes digital television and radio services on behalf of Australia’s national public broadcasters and commercial broadcasters. Broadcast Australia operates a number of facilities throughout the Shire of Ashburton:

- Onslow – Triangular Guyed Mast (25.3m height) off Payne Way, off McGrath Avenue (Site ID: 6071);

- Pannawonica – Triangular Guyed Mast (50m height) 1.4 kilometres south of Pannawonica, 55 kilometres off North West Coastal Highway (Site ID: 6072); and Triangular Guyed Mast (62m height) on Earth Road, Location 54 (Site ID: 6073);
- Paraburdoo – Triangular Guyed Mast (37m height) on Locations 34 & 35 of Windell (Site ID: 6075); and
- Tom Price – Triangular Guyed Mast (37m height) off Nameless Valley Drive at Mt Bruce (Site ID: 6088), and Triangular Guyed Mast (43m height) off Mine Road, approximately 900m along Tom Price-Paraburdoo Road (Site ID: 6087).

Mobile phone coverage is not universally available throughout the whole of the Shire. Mobile phone coverage is limited due to the extensive size of the local government area, and the relative confinement of the population to towns and camps. Mobile phone coverage is generally available around the townsites, mines and campsites within the Shire, and along portions of the Northwest Coastal Highway.

There are mining opportunities that arise from the use of mobile networks at mine sites. As part of Rio Tinto's "Mine of the Future" program, automation of machinery and vehicles is expected to benefit from a mobile broadband network. The program aims to improve employee safety, increase productivity, lower energy consumption and reduce environmental impact (Rio Tinto, 2014). This is reflective of the replacement of some human labour with autonomous systems which is already occurring for example with autonomous drilling systems and autonomous haulage systems (trucks and trains). This has allowed for a Perth-based operations centre to communicate with automated systems.

A telecommunication service is proposed for connecting South East Asian and Western Australian markets, which will provide high quality telecommunications for mining, oil and gas, government and other commercial users. The system comprises of three transmission routes and data centres. A submarine cable from Perth to Onslow and onward to Indonesia and Singapore would be constructed (Trident, 2013). A stage 2 terrestrial link will be constructed from Onslow to Karratha and Port Hedland following the North West Coast Highway. Further expansions could be made using subsea services to platforms, and terrestrially into the east Pilbara.

14.6 IMPLICATIONS FOR INFRASTRUCTURE SERVICES

The following **Table 59** considers the implications, issues and opportunities from an infrastructure services perspective.

Table 59 Implications, Issues and Opportunities – Infrastructure Services

Infrastructure Services	Implications	Issues	Opportunities
Power	Onslow town power supplies are provided by Horizon Power. Town power supplies for Tom Price, Paraburdoo and Pannawonica are supplied by Rio Tinto. There is some presence of renewable energy sources in the local government area including a renewable energy microgrid for Onslow, proposed by Horizon Power.	Intent is to develop a gas fired power plant within the ANSIA Improvement Scheme area. This service is intended primarily for Onslow town usage, with potential for ANSIA users to connect thereafter. Horizon Power's renewable energy microgrid was completed in 2018. Underground power has been completed for Onslow. Global microgrid market is experiencing transformational growth, which tend to combine conventional and renewable sources, and battery storage technology.	Growth/expansion of towns will need to consider the capacity of existing power supplies, proposed/future power supplies, and the required transmission infrastructure. Microgrids may assist with delivering reliable and viable energy solutions.
Gas Transmission Pipelines	High pressure gas transmission pipelines do not require development approval.	The Shire may have a role in approving the construction of facilities in the initial stages, i.e. the construction camps, waste water treatment facilities, and road usage.	Apply DC Policy 4.3 <i>Planning for High-Pressure Gas Pipelines</i> policy measures to assess proposals that in the vicinity of any high-pressure gas pipelines in the Shire.
Potable Water	Public Drinking Water Source Areas are predominately groundwater supplies.	Long term utility intent is to develop a water desalination plant in the ANSIA Improvement Scheme area. This service is intended primarily for Onslow town usage, with potential for ANSIA users to connect thereafter. However, abundance of water supplied from the Cane River bore field may lead to a deferral of the water desalination plant being constructed. Since publication of the Strategy, Water Corporation intend to construct a water desalination plant in Beadon Bay, Onslow, to provide longer term water solutions for the townsite. The plant is scheduled for completion in 2025. The use of mine run-off and water extraction may be a difficult yet potentially viable water supply option. There are opportunities for expanding irrigation for investigation in the Pilbara hinterland, from using excess water from mine dewatering.	Support the sustainable abstraction of potable water sources. Support water reuse/recycling associated with mines and townsites. Protect public drinking water supply areas in accordance with relevant water source protection plans, Department of Water and Environmental Regulation's Water Quality Protection Note 25, and SPP 2.7.
Water Management	Rainfall data indicates that average annual rainfall has declined around Onslow yet has increased in inland areas. Adequate management of flood risk, and associated sediment transport in townsites and industrial areas requires consideration.	<i>Better Urban Water Management</i> has been designed to facilitate better management of urban water resources, ensuring an appropriate level of consideration to the total water cycle. It is recognised that the Shire is a Waterwise Council, and it should continue to investigate and expand water efficiency opportunities, such as irrigation of public open space and sports ovals where practical.	Review existing townsite drainage systems and ensure appropriate water quality of stormwater and runoff is addressed. The Shire could also investigate partnerships to establish water recycling and reuse schemes to provide fit-for-purpose sources of water where practical, as an alternative to groundwater use to support future development.

Infrastructure Services	Implications	Issues	Opportunities
Wastewater	Appropriate sewage facilities for all towns and adequate systems in place for smaller scale settlements and Aboriginal communities.	Onslow wastewater treatment plant capacity was doubled, funded by the Wheatstone Project, providing long-term future growth of Onslow. The odour buffer area applies to the upgraded WWTP.	Support ongoing delivery of sewage infrastructure in towns and adequate systems for smaller scale settlements and Aboriginal communities.
Solid Waste Management	There are limited opportunities to divert recyclable material from landfills. Infrastructure and market opportunities will arise in relation to recycling and diverting resources from landfills.	There are a number of opportunities for Pilbara regional waste processing facilities and recyclable products. A joint dirty Material Recovery Facility is recognised as an opportunity, for Newman and Tom Price. A feasibility study recommended a new waste management facility for Onslow be capable of accepting Class 3 and Class 4 waste. The Pilbara Regional Waste Management Facility (PRWMF), located approximately 36km south of Onslow, commenced operations in 2021.	Support a State Government comprehensive waste recycling and disposal plan for strategic waste transfer, collection, treatment, recycling and disposal facilities. Support diversion of waste from landfills through reduction, reuse and recycling opportunities. Investigate expansion of the PRWMF to cater for decommissioning and complementary dismantling, recycling and waste disposal industries. Ensure Aboriginal communities have an effective waste management programme to minimise pollution and risks to human health and water sources.
Telecommunications	Broadcast Australia operates a number of townsite-based telecommunication facilities. Existing mobile phone coverage is generally limited to townsites, mines, camps and segments of the North West Coastal Highway.	Greater mobile phone coverage for all towns, district roads and highways, and areas frequented by the community, workers and visitors will improve convenience and safety. Future mine sites will benefit from telecommunications as companies roll-out automated systems (i.e. Rio Tinto's "Mine of the Future" program and its automated drilling and haulage systems). Proposed telecommunication links to South East Asia will improve bandwidth within the Shire, and its connections to neighbouring markets.	Support the ongoing improvement of availability, coverage, and reliable accessibility to telecommunications services (telephone, mobile network, broadband) and TV/radio broadcasting.

15 TOWNSITE ISSUES AND OPPORTUNITIES

15.1 ONSLOW

The following is a summary of issues and opportunities identified when considering growth scenarios for Onslow (refer to **Figure 60**):

- Potential expansion of hospital/medical precinct
- Future Primary and District High Schools site in new expansion area (consideration of staff housing)
- New Entrance Road/Ring Road constructed
- Potential flooding consideration, whether current or modelled flooding as per the MP Rogers study (2011) and the CHRMAP (Cardno 2016) in town with potential to impact existing development
- Opportunity for future housing development beyond existing urban areas (Includes DevelopmentWA's *Onslow Townsite Expansion Structure Plan* area)
- New civic, cultural and tourism attractions, such as the planned Arts and Cultural Centre, Jetty and Dreamers Hill
- Area to be preserved as Conservation & Natural Landscape
- Ideal drainage patterns to run toward creek and avoid airport
- Expansion and upgrades to Beadon Creek boat harbour, including future stages of the Department of Transport's Community Boating Precinct, whilst protecting the amenity of nearby residential and tourism uses as well as the broader Onslow townsite
- Site for Water Corporation desalination plan at Beadon Bay
- Potential development areas subject to further investigation (relocation of commercial uses and Bindi Bindi in the future)
- Opportunity for future industrial/business park uses adjacent to Airport
- Potential new road links between proposed Mixed Business Area at Airport and Onslow Road
- Opportunity for future Tourism and Short-Stay accommodation along Second Avenue, and Beadon Creek Road, and additional RV and caravan parking
- Onslow Strategic Industrial Buffer may limit southerly development of Onslow
- Onslow WWTP may constrain development
- Airport Future Obstacle Limitation Surfaces and Onslow Airport's flight paths may constrain building height. The current flight paths for Onslow Airport, as shown as a Special Control Area on the face of the Scheme map, do not relate to the new runway and should be amended accordingly.
- Airport upgrade and possible expansion to address ageing infrastructure and replacement aircraft
- Land use interface issues (Industrial/Residential, Industrial/Tourism)
- Access to Mackerel Islands, Monte Bello Islands

15.2 PARABURDOO



Figure 61):

- Opportunity for infill housing within existing urban areas (through coordinated redevelopment of Rio Tinto land and housing when ready for replacement)
- Vacant lots available in town for immediate development to meet demand for new housing
- Opportunity for future housing development beyond existing urban areas (existing areas zoned Residential could be refined and further investigated for suitability).
- Opportunity for infill workforce accommodation and short stay accommodation development within existing urban areas (includes additional capacity at Rocklea Palms, expansion of accommodation at Paraburdoo Inn and additional areas on McRae Avenue, You Yi Lane – former nurser's quarters and former Channar Lodge)
- Opportunity for an essential services precinct with new medical care facility on the current Paraburdoo hospital site, which could be complemented by aged or community housing nearby.
- Potential for expansion of existing industrial area (subject to relocation of community sporting clubs on Camp Road)
- Existing sports and recreation club houses should either be relocated towards the Oval / town centre / CHUB, where co-location advantages could be realised. It is noted some clubs prefer the peripheral locations to minimise impacts on residents in town (i.e. noise).
- Opportunity for Pump Track and Destination Playground at Western Green
- Opportunity to relocate Football club within sports and recreation complex
- Opportunity to relocate Scouts clubhouse closer to town centre
- Shooting club to remain on outskirts of town. Potential to explore recognising land use zone on scheme map
- Potential future road alignment for Nickol Avenue extension west to Muchamary Street (gazetted but not constructed)
- Opportunity to maintain and improve streetscapes through landscaping in priority areas within road reserves (entry roads to town – sections of Camp Road, Tom Price Road and Rocklea Road)
- Potential road realignment to align with road reservation (Beasley Road)
- Existing entry road and connection to airport (Tom Price Road) is on Crown Land under General Lease to Rio Tinto (not gazetted road) note improve existing WWT to remove need to discharge into bush.

15.3 TOM PRICE

The following is a summary of issues and opportunities identified when considering growth scenarios for Tom Price (refer **Figure 62**):

- Steep terrain to be considered in future design; may limit future road connection and/or development; may limit future urban expansion
- Key vehicle access to school/community facility is currently a cul-de-sac.
- Opportunity for infill housing within existing urban areas, through coordinated redevelopment of Rio Tinto housing when ready for replacement, and development of underutilised vacant open space.
- Existing residential grouped housing with additional development potential (Weelamurra and Mandarray Courts, East Road)
- Opportunity for future housing development beyond existing urban areas (Areas on Mine Road including the Tom Price Hospital site subject to the construction of a new Hospital in another location, northern extension of Area W and Northern extension of Central Road to be investigated)
- Consider the future desirable mix of infill worker accommodation and short-stay accommodation and opportunity to transition from one use to the other (eg. Karijini Lodge, Marandoo Annex workers camp, Windiwarri)
- Opportunity for additional grouped residential or tourism development on vacant land north of Karijini Lodge
- Possible future road links and road realignments to increase legibility (Doradeen Road and West Road intersections)

- Opportunity to explore improvements to pedestrian connectivity, noting existing disconnected street network (Area W)
- Railway track forms physical barrier and limits contiguous future urban development between Tom Price and Area W
- Investigate sites for aerodrome to support new Hospital, RFDS, tourism, and mining sector opportunities
- New Hospital and Consolidation of Essential Services Precinct on South Road
- Activation of central village greens and redevelopment of Administration and Library
- Improve tourism offerings, including RV shortstay, visitor centre, overflow caravan parking, and Kings Lake experience.
- Improvements to sport and recreation, including new multi-purpose sports and recreation centre, Minna Oval mountain biking trails and cycling plan

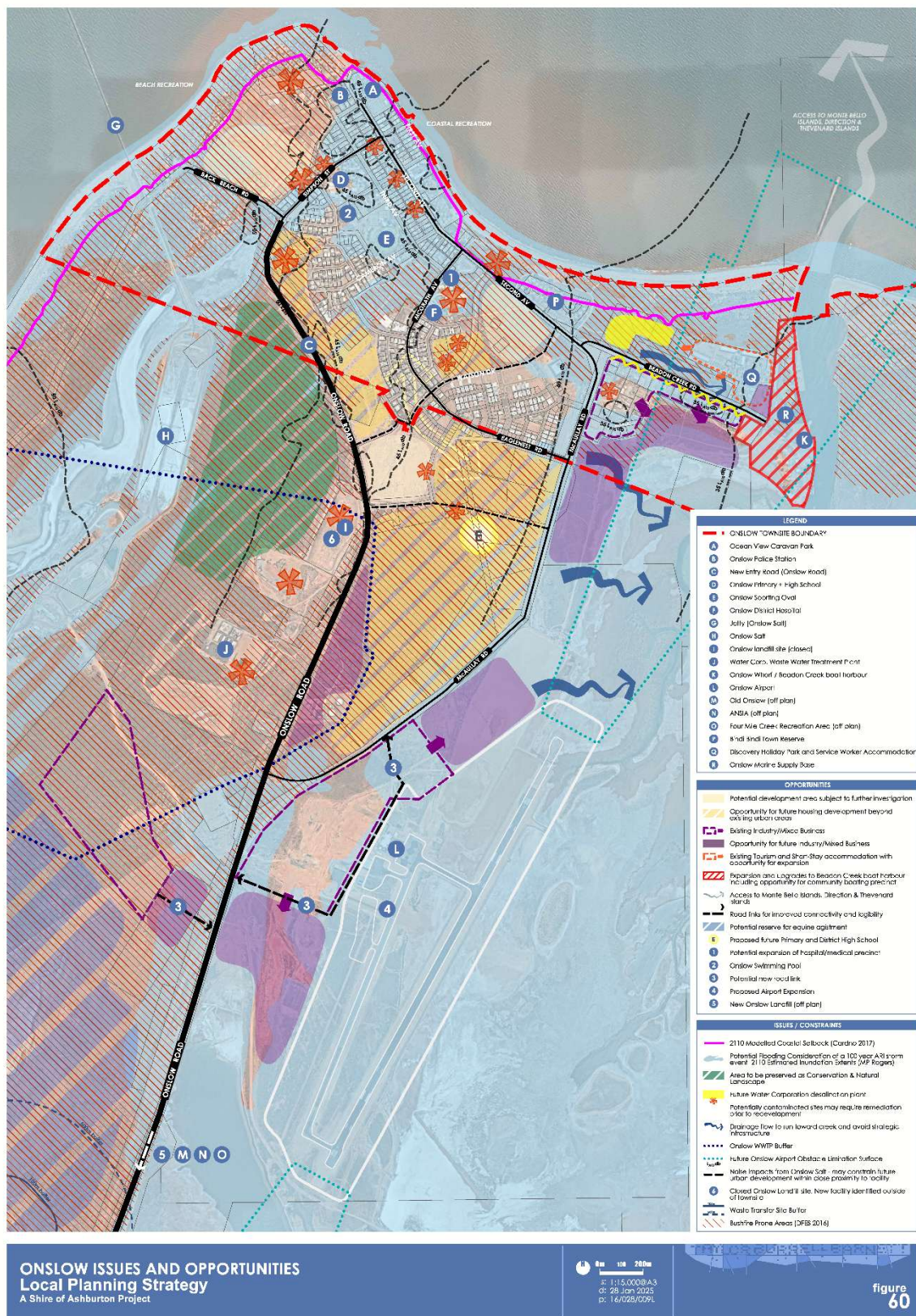


Figure 60 Issues and Opportunities - Onslow

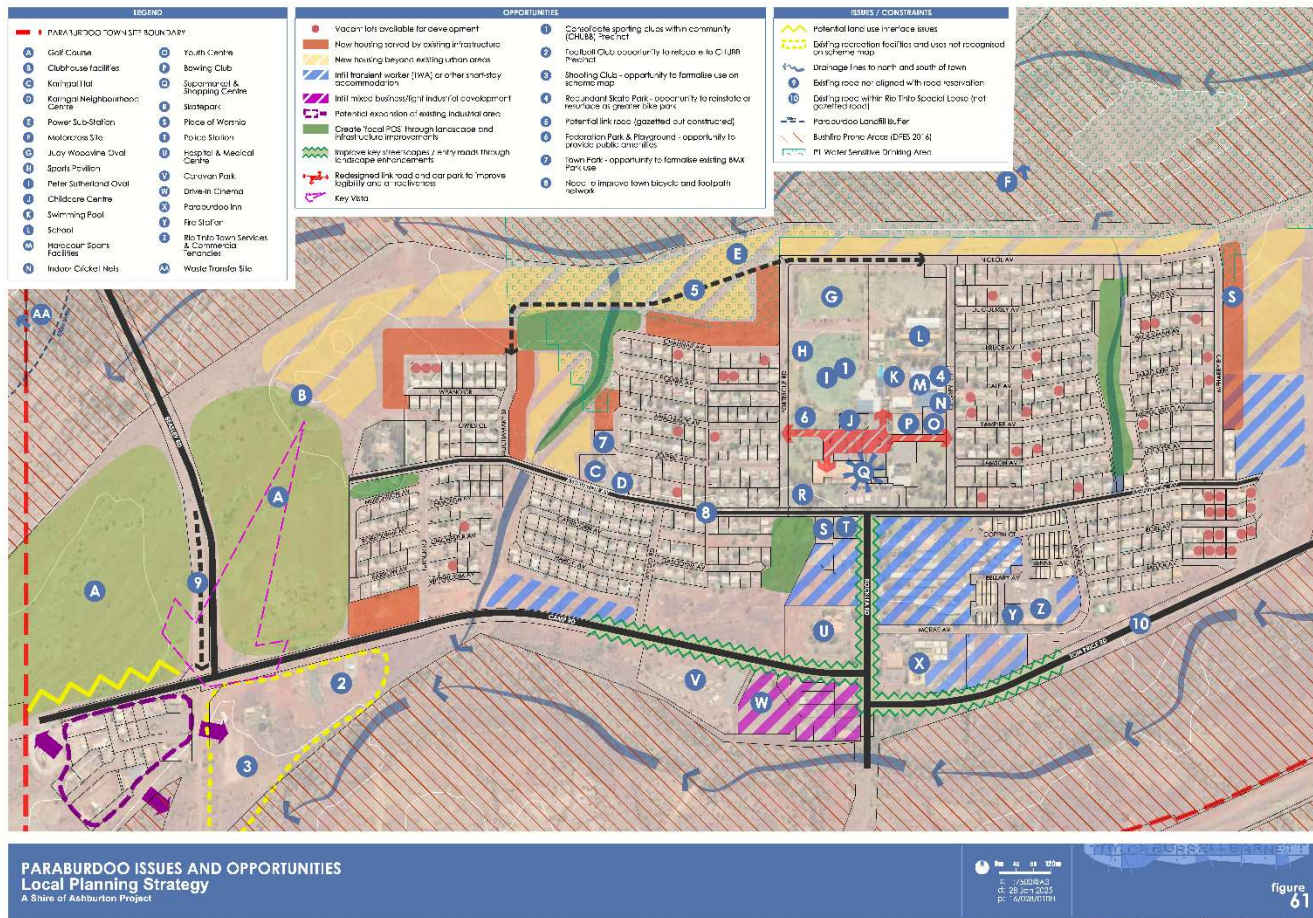


Figure 61 Issues and Opportunities Plan – Paraburdoo

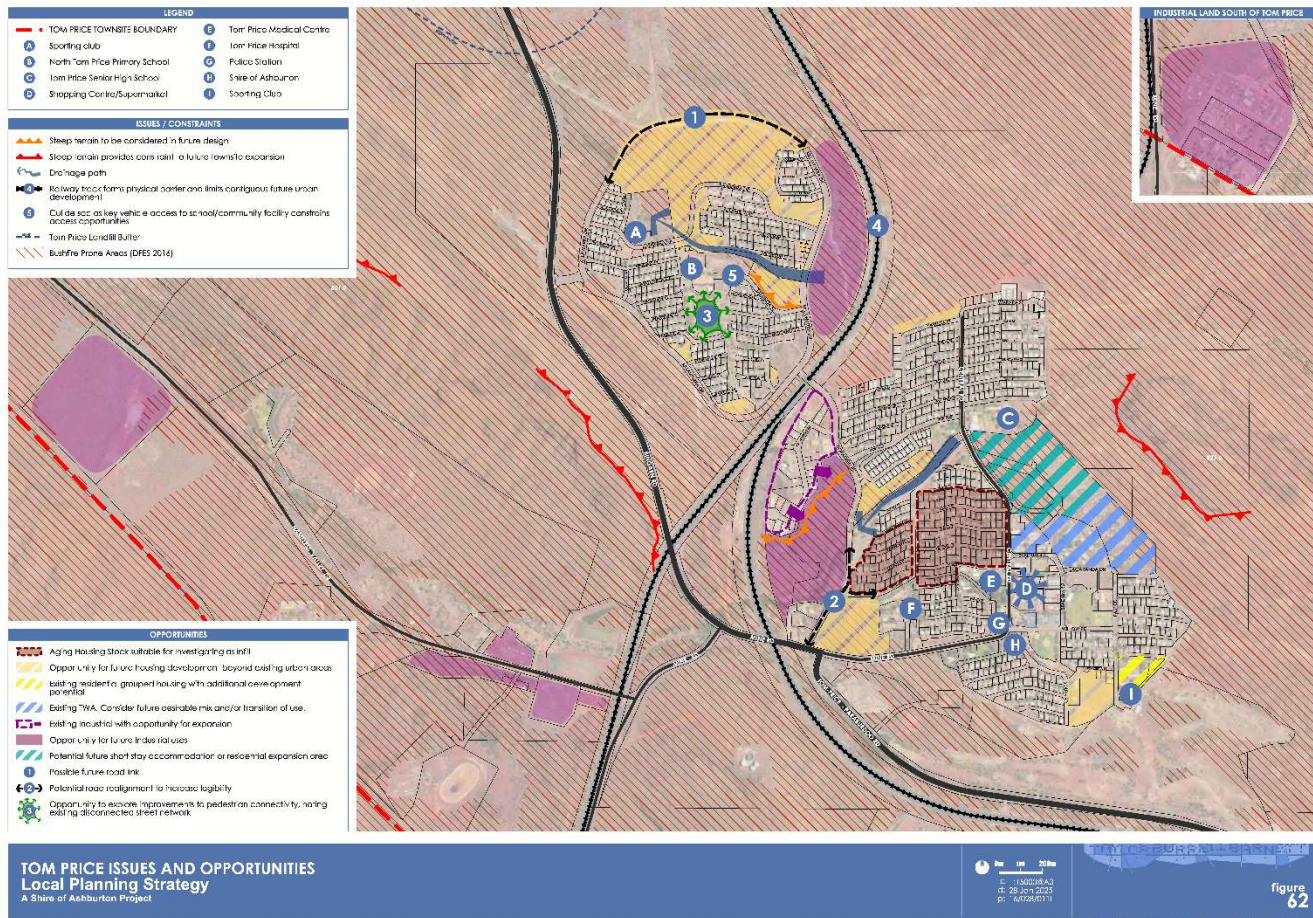


Figure 62 Issues and Opportunities Plan – Tom Price

BIBLIOGRAPHY

- .id, 2013. *Fly-in/Fly-out workers*. [Online]
Available at: <https://blog.id.com.au/2013/economic-analysis/fly-infly-out-workers/>
[Accessed 03 July 2023].
- ABS, 2002. *Basic Community Profile 2001 Census*, Canberra: Commonwealth of Australia.
- ABS, 2007. *Basic Community Profile 2006 Census*, Canberra: Commonwealth of Australia.
- ABS, 2012. *2011 Census Community Profiles: Ashburton (S) LGA50250*. [Online]
Available at:
http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/communityprofile/LGA50250?opendocument&navpos=230
[Accessed 31 October 2016].
- ABS, 2016. *2016 Census of Population and Housing General Community Profile, Ashburton (S) (LGA50250)*, Canberra: Australian Bureau of Statistics.
- ABS, 2016. *3218.0 - Regional Population Growth, Australia, 2014-15*. [Online]
Available at: <http://www.abs.gov.au/ausstats/abs@nsf/Latestproducts/3218.0Feature%20Article12014-15?opendocument&tabname=Summary&prodno=3218.0&issue=2014-15&num=&view=>
[Accessed 31 October 2016].
- ABS, 2017. *Ashburton (WA) SA2*. [Online]
Available at: <http://stat.abs.gov.au/itt/r.jsp?databyregion>
[Accessed 25 October 2017].
- ABS, 2017. *Quickstats*, Canberra: Australian Bureau of Statistics.
- ABS, 2021. *2021 Census of Population and Housing General Community Profile, Ashburton (S) (LGA50250)*, Canberra: Australian Bureau of Statistics.
- ABS, 2021. *2021 Census of Population and Housing General Community Profile, Ashburton (S) (LGA50250)*, Canberra: Australian Bureau of Statistics.
- ABS, 2021. *Ashburton 2021 Census Community Profiles - Time Series Profile*. [Online]
Available at: <https://www.abs.gov.au/census/find-census-data/community-profiles/2021/LGA50250>
[Accessed 3 October 2023].
- ABS, 2021. *Tom Price - 2021 Census QuickStats*. [Online]
Available at: <https://www.abs.gov.au/census/find-census-data/quickstats/2021/SAL51456>
[Accessed 16 September 2023].
- AEC Group, 2013. *Demand Needs Analysis for Short-Stay Accommodation in the Pilbara Region*, Perth: Pilbara Development Commission`.
- AEC Group, 2015. *Assessment of Accommodation Need in Tom Price, Onslow and Paraburdoo*, Perth: Pilbara Development Commission.
- AEC Group, 2016. *Assessment of Accommodation Need in Onslow*, Perth: AEC Group.
- Australian Mining, 2020. *Mining exports drive Australian trade amid COVID-19 impact*. [Online]
Available at: <https://www.australianmining.com.au/mining-exports-drive-australian-trade-amid-covid-19-impact/>
[Accessed 4 October 2023].
- AVC, 2016. *Pilbara Aquaculture Studies: Market Analysis Edible Oysters, Yellowfin Tuna, Amberjack and Mahi Mahi*, East Perth: Australian Venture Consultants Pty Ltd.
- BTAC, 2016. *Native Title*. [Online]
Available at: <https://www.thalanyji.com.au/native-title/>
[Accessed 7 October 2016].
- Cardno, 2017. *Coastal Hazard Risk Management & Adaptation Plan*, West Perth: Cardno WA Pty Ltd.
- CDA, 2020. *A Baseline Assessment Australia's Offshore Oil and Gas Decommissioning Liability*, s.l.: Australian Government.
- Chevron, 2016. *Economic Benefits Summary*, Perth: Chevron Corporation.
- Commonwealth of Australia, 2015. *2015 Intergenerational Report Australia in 2055*, Parkes: The Treasury.

- Creating Communities, 2011. *Onslow Community Visioning Project Community Consultation Report*, Jolimont: Creating Communities Australia Pty Ltd.
- DAA, 2013. *Census Data - Beyond the Figures*. [Online]
Available at: <https://www.daa.com.au/articles/newsletter-articles/census-data-beyond-the-figures/>
[Accessed 03 July 2023].
- Department of Fisheries, 2016. *The technical and economic viability of aquaculture within the marine and terrestrial environments of the Pilbara and Gascoyne regions, Western Australia*, Perth: Pilbara Development Commission.
- Department of Regional Development, 2013. *Living in the Regions 2013*, Perth: Government of Western Australia.
- Department of Training and Workforce Development, 2013. *Pilbara workforce development plan 2013-2016; Executive summary*, Osborne Park: Department of Training and Workforce Development.
- Development WA, 2023. *Ashburton North SIA - Overview*. [Online]
Available at: <https://developmentwa.com.au/projects/industrial-and-commercial/ashburton-north-sia/overview>
[Accessed 6 November 2023].
- DISR, 2023. *Department of Industry, Science and Resources, 'Australia resources and energy exports set to fall back in 2023-24'*. [Online]
Available at: <https://www.industry.gov.au/news/australia-resources-and-energy-exports-set-fall-back-2023-24#:~:text=Commodity%20export%20earnings%20are%20forecast,the%20extraordinary%20peaks%20of%202022>
[Accessed 3 October 2023].
- DMIRS, 2023. *Mining Tenements (DMIRS-003)*. [Online]
Available at: <https://catalogue.data.wa.gov.au/dataset/mining-tenements-dmirs-003>
[Accessed 8 November 2023].
- DMP, 2016. *Basic Raw Materials (BRM)*. [Online]
Available at: <http://www.dmp.wa.gov.au/Geological-Survey/Basic-Raw-Materials-1411.aspx>
[Accessed 6 July 2016].
- DMP, 2017. *Major Resources Projects*. [Online]
Available at: <http://www.dmp.wa.gov.au/Investors/Major-resources-projects-16523.aspx>
[Accessed 22 March 2017].
- DMP, 2023. *Petroleum and Geothermal Information (WAPIMS)*. [Online]
Available at: <https://www.dmp.wa.gov.au/Petroleum-and-Geothermal-1497.aspx>
[Accessed 7 November 2023].
- DoT, 2014. *Beadon Creek Boat Harbour Land Use Framework*, Perth: Department of Transport.
- DPIRD, 2015. *Growing the North*, Perth: Western Australian Agriculture Authority.
- DPIRD, 2016. *Pilbara*. [Online]
Available at: <https://www.agric.wa.gov.au/pilbara>
[Accessed 14 September 2016].
- DPIRD, 2017. *Northern Beef Futures*. [Online]
Available at: <https://www.agric.wa.gov.au/r4r/northern-beef-futures>
[Accessed 8 February 2017].
- DSD, 2014. *Major Development for Onslow*. [Online]
Available at: <http://www.dsd.wa.gov.au/docs/default-source/default-document-library/onslow-major-projects-map-and-update-december-2014?sfvrsn=6>
[Accessed 11 August 2016].
- DVC, 2016. *Ashburton Local Planning Strategy Transport Technical Notes*, Perth: Donald Veal Consultants.
- EMC, N.D.. *Utility Scale*. [Online]
Available at: <http://www.energymadeclean.com/utility-scale/>
[Accessed 4 April 2017].
- Evans & Peck, 2011. *Assessment of the potential for renewable energy projects and systems in the Pilbara*, Perth: Australian Government.
- Geoscience Australia, 2016. *Australia's Identified Mineral Resources*, Canberra: Geoscience Australia.
- GHD, 2014. *Beadon Creek Boat Harbour Land Use Framework*, Perth: Department of Transport.
- GHD, 2017. *Local Planning Strategy Bushfire Hazard Level Assessment*, Perth: GHD.

- Government of WA, 2003. *Securing our water future: a state water strategy for Western Australia*, Perth: Government of Western Australia.
- Government of WA, 2015. *Planning and Development (Local Planning Schemes) Regulations 2015*, Perth: State Law Publisher.
- Government of WA, 2023. *2023-24 Budget, Economic and Fiscal Outlook*, Perth: Government of WA.
- Government of Western Australia, 2016. *2016-17 Budget Paper No. 3: Economic and Fiscal Outlook*, Perth: Government of Western Australia.
- Government of Western Australia, 2016. *Resilient Families, Strong Communities: A roadmap for regional and remote Aboriginal communities*, Perth: Regional Services Reform Unit.
- Hames Sharley, 2000. *Wakathuni Community Layout Plan*, Perth: Hames Sharley.
- homesales.com.au, 2016. *Suburb Profile - Pannawonica*. [Online]
Available at: <https://homesales.com.au/location/pannawonica-wa/>
[Accessed 28 November 2016].
- homesales.com.au, 2017. *Suburb Profile - Onslow*. [Online]
Available at: <https://homesales.com.au/location/onslow-wa/>
[Accessed 26 October 2017].
- homesales.com.au, 2017. *Suburb Profile - Pannawonica*. [Online]
Available at: <https://homesales.com.au/location/pannawonica-wa/>
[Accessed 26 October 2017].
- homesales.com.au, 2017. *Suburb Profile - Tom Price*. [Online]
Available at: <https://homesales.com.au/location/tom-price-wa/>
[Accessed 26 October 2017].
- Horizon Power, 2016. *Australia's largest distributed energy microgrid*. [Online]
Available at: <https://horizonpower.com.au/news-events/news/australias-largest-distributed-energy-microgrid/>
[Accessed 5 April 2017].
- id, 2023. *Shire of Ashburton Economic Profile, Building Approvals*. [Online]
Available at: <https://economy.id.com.au/ashburton/value-of-building-approvals>
[Accessed 28 September 2023].
- IMF, 2017. *World Economic Outlook Update*. [Online]
Available at: <https://www.imf.org/external/pubs/ft/weo/2017/update/01/>
[Accessed 28 March 2017].
- IMF, 2023. *World Economic Outlook - A Rocky Recovery, April 2023*. [Online]
Available at: <https://www.imf.org/en/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023>
[Accessed 4 October 2023].
- Infrastructure Australia, 2016. *Australian Infrastructure Plan: Priorities and reforms for our nation's future*, Canberra: Infrastructure Australia.
- Landgate, 2016. *New Map Viewer and Land Enquiry*. [Online]
Available at: <https://www0.landgate.wa.gov.au/>
[Accessed 2016].
- Market Index, 2022. *Iron Ore*. [Online]
Available at: <http://www.marketindex.com.au/iron-ore>
[Accessed 4 October 2022].
- MCA, 2021. *Minerals Council of Australia 'Mining Export Revenue Leads Australia's Economic Recovery'*. [Online]
Available at: <https://minerals.org.au/resources/mining-export-revenue-leads-australias-economic-recovery/>
[Accessed 4 October 2023].
- McHugh, L., 2011. *Pilbara Prospects 2020: Developments and Challenges for the Region*. [Online]
Available at: <http://www.futuredirections.org.au/publication/pilbara-prospects-2020-developments-and-challenges-for-the-region/>
[Accessed 29 September 2016].
- Mineral Resources Pty Ltd, 2023. *MinRes to set a new benchmark for FIFO life with resort-style accommodation*. [Online]
Available at: <https://www.mineralresources.com.au/news-media/minres-to-set-a-new-benchmark-for-fifo-life-with-resort-style-accommodation/>
[Accessed 4 October 2023].

- MP Rogers & Associates, 2011. *Onslow Townsite Planning Coastal Setbacks & Development Levels*, Perth: MP Rogers & Associates PL.
- MRL, 2022. *Mineral Resources 'Onslow Iron Project set to redefine mining in WA'*. [Online]
Available at: <https://www.mineralresources.com.au/news-media/onslow-iron-project-set-to-redefine-mining-in-wa/>
[Accessed 4 October 2023].
- MRWA, 2016. *Ashburton Traffic Digest 2009/10 - 2014/15*, Perth: Main Roads Western Australia.
- MRWA, 2023. *Manuwarra Red Dog Highway Upgrades*. [Online]
Available at: <https://www.mainroads.wa.gov.au/projects-initiatives/all-projects/regional/karratha-tom-price/>
[Accessed 6 October 2023].
- MRWA, 2023. *Statewide Traffic Digest*, Perth: Main Roads Western Australia.
- NNTT, 2007. *First Schedule Description of Determination Area A*, Canberra: National Native Title Tribunal.
- NNTT, 2012. *Hughes on behalf of the Eastern Guruma People (No 2) v State of Western Australia [2012] FCA 1267*. [Online]
Available at: <http://www.atns.net.au/agreement.asp?EntityID=6125>
[Accessed 14 September 2016].
- NNTT, 2023. *National Native Title Tribunal*. [Online]
Available at: <http://www.nntt.gov.au/assistance/Geospatial/Pages/Spatial-aata.aspx>
[Accessed 21 July 2023].
- NOPSEMA, 2023. *Decommissioning*. [Online]
Available at: <https://www.nopsema.gov.au/offshore-industry/decommissioning>
[Accessed 15 February 2023].
- Nu Energy, 2015. *Renewable Energy, Mining & Rio Tinto*. [Online]
Available at: <http://www.nuenergy.com.au/renewable-energy-mining-rio-tinto/>
[Accessed 5 April 2017].
- OAG, 2015. *Report 8 Delivering Essential Services to Remote Aboriginal Communities*. [Online]
Available at: <https://audit.wa.gov.au/reports-and-publications/reports/delivering-essential-services-remote-aboriginal-communities/auditor-generals-overview/>
[Accessed 10 October 2023].
- OAG, 2021. *Report 25 Delivering Essential Services to Remote Aboriginal Communities - Follow up*. [Online]
Available at: <https://audit.wa.gov.au/reports-and-publications/reports/delivering-essential-services-remote-aboriginal-communities/auditor-generals-overview/>
[Accessed 14 October 2023].
- O'Brien Planning Consultants, 1999. *Shire of Ashburton Municipal Heritage Inventory*, Perth: O'Brien Planning Consultants.
- OCCI, 2016. *Onslow Business Investment Guide*, Onslow: Onslow Chamber of Commerce and Industry.
- Parliament of Western Australia, 2015. *The impact of FIFO work practices on mental health*, Perth: Parliament of Western Australia.
- PDC, 2012. *Transient Worker Accommodation in the Pilbara - Final Draft*, Perth: Pilbara Development Commission.
- PDC, 2015. *Pilbara Commercial Property and Land Snapshot*, Perth: Pilbara Development Commission.
- PDC, 2015. *Pilbara Regional Investment Blueprint*, Perth: Pilbara Development Commission.
- PDC, 2015. *Pilbara Regional Investment Blueprint*, Karratha: Pilbara Development Commission.
- PDC, 2016. *Pilbara Residential Housing & Land Snapshot*, Perth: Pilbara Development Commission.
- PDC, 2016. *The New Pilbara*, Karratha: Pilbara Development Commission.
- PDC, 2018. *Pilbara Economic Snapshot Edition 1 August 2018*. [Online]
Available at:
https://www.pdc.wa.gov.au/Profiles/pdc/Assets/ClientData/Documents/Pilbara_Economic_Snapshot_August_2018.pdf
[Accessed 4 October 2023].
- PDC, 2022. *Pilbara Half Yearly Housing and Land Summary - December 2022*, s.l.: Pilbara Development Commission.
- PDC, 2023. *Economic Snapshot June 2023, Edition 2*. [Online]
Available at:
https://www.pdc.wa.gov.au/Profiles/pdc/Assets/ClientData/Documents/Economic_Snapshot_June_2023_V2.pdf
[Accessed 4 October 2023].

- PPA, 2014. *Our Ports, Services and Facilities*. [Online]
Available at: <https://www.pilbaraports.com.au/Home/Port-operations/Our-ports-services-and-facilities>
[Accessed 1 June 2016].
- PPA, 2016. *Pilbara Ports Authority Annual Report 2015-2016*, West Perth: Pilbara Ports Authority.
- PPA, 2017. *Port of Ashburton Master Plan 2050*, Perth: Pilbara Ports Authority.
- Profile ID, 2023. *Economic Profile*. [Online]
Available at: <https://economy.id.com.au/ashburton>
[Accessed 16 November 2023].
- Profile.id, 2016. *Ashburton*. [Online]
Available at: <http://profile.id.com.au/ashburton/about>
[Accessed 8 September 2016].
- Profile.id, 2023. *Shire of Ashburton Economic Profile Business Trends*. [Online]
Available at: <https://economy.id.com.au/ashburton/business-trends?Indkey=23000>
[Accessed 27 September 2023].
- RBA, 2015. *Statement on Monetary Policy - February 2015, Box A: The Effects of Changes in Iron Ore Prices*. [Online]
Available at: <http://www.rba.gov.au/publications/smp/2015/feb/box-a.html>
[Accessed 22 March 2017].
- RDAP, 2013. *Regional Plan 2013 - 2016*, Canberra: Australian Government.
- REHBEIN Airport Consulting, 2016. *Airport Master Plan Onslow Airport*, Tom Price: SoA.
- REIWA, 2023. *Insights - Onslow*. [Online]
Available at: <https://reiwa.com.au/suburb/onslow/>
[Accessed 03 August 2023].
- REIWA, 2023. *Insights - Paraburdoo*. [Online]
Available at: <https://reiwa.com.au/suburb/paraburdoo/>
[Accessed 3 August 2023].
- REIWA, 2023. *Insights - Regional market insights - Pilbara*. [Online]
Available at: <https://reiwa.com.au/regional/pilbara/>
[Accessed 3 August 2023].
- REIWA, 2023. *Insights - Tom Price*. [Online]
Available at: <https://reiwa.com.au/suburb/tomprice/>
[Accessed 3 August 2023].
- REMLAN, 2017. *Pilbara Region - Economy Profile*. [Online]
Available at: <http://www.economyprofile.com.au/pilbara/>
[Accessed 25 October 2017].
- REMLAN, 2021. *REMLAN Our Place - Our Community*. [Online]
Available at:
<https://app.remlan.com.au/pilbararegion/community/housing/ownership?state=pAv3h4z!OA4RhRMrqIQWgl9Sg5wDpszCGuquN7JhGbi4FDuxuEFojY>
[Accessed 4 October 2023].
- REMLAN, 2022. *Economy, Jobs and Business Insights*. [Online]
Available at: <https://app.remlan.com.au/pilbararegion/economy/industries/regional-exports?state=Ma5RIx!QWaoFdxOnU9LK4YSn7vdyU3txhIPnFENvN9tO2J2qfohAliASzfVSkky5f2RG>
[Accessed 4 October 2023].
- REMLAN, 2022. *Pilbara Region - Economy, Jobs and Business Insights*. [Online]
Available at:
<https://app.remlan.com.au/pilbararegion/economy/industries/output?state=Ma5RIx!WZmOFR3pxcVYR8xCRmBzXtRtBhzlBF5LNLAcROYO5HRhBataSPvtOSRRW4fXdL>
[Accessed 6 October 2023].
- REMLAN, 2023. *Economy, Jobs and Business Insights*. [Online]
Available at:
<https://app.remlan.com.au/pilbararegion/economy/workers/age?state=zqdwH2!2o4qUO2MWIP41NgI3Zxr0tZtqhDyGFYhkbPbVHahd5crhLS33YkTv1N>
[Accessed 28 September 2023].

- REMPPLAN, 2023. *Our Place - Our Community*. [Online]
Available at: <https://app.rempplan.com.au/pilbararegion/community/wellbeing/seifa-relative-disadvantage?state=mkvDIZ!RpdRS4wJdunwVJWUnwKRgTdCluDukxZTdFpFjFxFe5Z>
[Accessed 16 November 2023].
- REMPPLAN, 2023. *Pilbara Region - Economy Profile*. [Online]
Available at:
<https://app.rempplan.com.au/pilbararegion/economy/trends/population?state=Kp9MIN!gLjNFWnQmI3gMWvskqYoIUWtEhA5qsOhjh3twSxf5IX>
[Accessed 9 September 2023].
- Rio Tinto, 2012. *First water flows for Rio Tinto's innovative Hamersley Agricultural Project*. [Online]
Available at: http://www.riotinto.com/media/media-releases-237_5907.aspx
[Accessed 21 June 2016].
- Rio Tinto, 2014. *Mine of the Future*, Melbourne: Rio Tinto.
- Rio Tinto, 2015. *Pannawonica Town and Robe Valley*. [Online]
Available at: http://www.riotinto.com/documents/RT_Welcome_File_Panna%202015.pdf
[Accessed 27 September 2016].
- Rio Tinto, 2016. *Mines*. [Online]
Available at: <http://www.riotinto.com/australia/pilbara/mines-9939.aspx>
[Accessed 15 September 2016].
- RITC, 2016. *Diploma and Advanced Diploma of Process Plant Technology*, Perth: Resources Industry Training Council.
- RTIO, 2023. *Rio Tinto Pilbara Operations*. [Online]
Available at: <https://www.riotinto.com/en/operations/australia/pilbara>
[Accessed 4 October 2023].
- SoA, 2011. *Onslow Townsite Strategy*, Tom Price: Shire of Ashburton.
- SoA, 2015. *Item 14.1 Review of Shire of Ashburton Planning Scheme No. 7 as required fr the 'Planning Health Check' per Planning and Development (Local Planning Schemes) Regulations 2015*, Tom Price: Shire of Ashburton.
- SoA, 2015. *Tourism and its potential impact on economic development in the Shire of Ashburton: A proposal to seal the Karratha to Tom Price Road*, Tom Price: Shire of Ashburton.
- SoA, 2017. *Living Life - Strategic Community Plan 2017-2027*, Tom Price: Shire of Ashburton.
- SoA, 2022. *Strategic Community Plan 2022-2032*, s.l.: Shire of Ashburton.
- SoA, 2023. *Corporate Business Plan 2019-2023*, Tom Price: Shire of Ashburton.
- SoA, 2023. *Corporate Business Plan 2023-2027*, s.l.: SoA.
- SoA, 2023. *Strategic Asset Management Plan*, Tom Price: Shire of Ashburton.
- State of WA, 2016. *Resilient Families, Strong Communities*, Perth: Government of Western Australia.
- Talis Consultants Pty Ltd, 2014. *Pilbara Waste Infrastructure Project*, Leederville: Waste Authority and Pilbara Development Commission.
- Talis Consultants, 2014. *Feasibility Study: Onslow Waste Management Facility*, Leederville: Talis Consultants Pty Ltd.
- The Conference Board, 2017. *Global Economic Outlook 2017*. [Online]
Available at: <https://www.conference-board.org/data/globaloutlook/>
[Accessed 28 March 2017].
- The Conference Board, 2023. *Global Overview October 2023*. [Online]
Available at: <https://www.conference-board.org/topics/global-economic-outlook>
[Accessed 6 October 2023].
- The World Bank, 2023. *Global Economic Prospects, June 2023*, Washington: World Bank Group .
- Tourism WA, 2007. *Australia's North West Destination Development Strategy 2007-2017*, Perth: Tourism Western Australia.
- TPG, 2013. *Onslow Townsite Expansion Stage 1 Development Plan*, Perth: TPG.
- TPG, 2016. *Onslow Townsite Expansion Structure Plan*, Perth: TPG.
- TRA, 2016. *Local Government Area Profiles, 2016: Ashburton (S), Western Australia*, Canberra: Tourism Research Australia.

- TRA, 2019. *Local Government Area Profiles, 2019: Ashburton (S), Western Australia*. [Online]
Available at: <https://www.tra.gov.au/en/regional/local-government-area-profiles.html>
[Accessed 4 October 2023].
- Trident, 2013. *Overview*. [Online]
Available at: <http://www.tridentsc.com.au/overview.html>
[Accessed 5 April 2017].
- van Vreeswyk, A. L. K. P. A. a. H. P., 2004. *An inventory and condition survey of the Pilbara region, Western Australia*. [Online]
Available at: www.agric.wa.gov.au
[Accessed 14 September 2016].
- WAPC, 2003. *State Planning Policy 2 Environment and Natural Resources Policy*, Perth: State Law Publisher.
- WAPC, 2003. *State Planning Policy 2.7 Public Drinking Water Source Policy*, Perth: State Law Publisher.
- WAPC, 2006. *State Planning Policy 2.9 Water Resources*, Perth: State Law Publisher.
- WAPC, 2006. *State Planning Policy 3 Urban Growth and Settlement*, Perth: State Law Publisher.
- WAPC, 2006. *State Planning Policy 3.4 Natural Hazards and Disasters*, Perth: State Law Publisher.
- WAPC, 2007. *State Planning Policy 3.5 Historic Heritage Conservation*, Perth: State Law Publisher.
- WAPC, 2008. *Better Urban Water Management*, Perth: Western Australian Planning Commission.
- WAPC, 2010. *Local Planning Manual*, Perth: Western Australian Planning Commission.
- WAPC, 2011. *State Planning Policy 3.2 Aboriginal Settlements*, Perth: Western Australian Planning Commission.
- WAPC, 2012. *Pilbara Planning and Infrastructure Framework*, Perth: Western Australian Planning Commission.
- WAPC, 2012. *State Coastal Planning Policy Guidelines*, Perth: Western Australian Planning Commission.
- WAPC, 2013. *State Planning Policy 2.6 State Coastal Planning Policy*, Perth: State Law Publisher.
- WAPC, 2014. *Coastal Hazard Risk Management and Adaptation Planning Guidelines*, Perth: Western Australian Planning Commission.
- WAPC, 2014. *State Planning Strategy 2050*, Perth: Western Australian Planning Commission.
- WAPC, 2015. *Newman & Tom Price: Regional HotSpots Land Supply Update*, Perth: Western Australian Planning Commission.
- WAPC, 2015. *Residential Design Codes*, Perth: Western Australian Planning Commission.
- WAPC, 2015. *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth: Western Australian Planning Commission.
- WAPC, 2015. *State Planning Policy 5.2 Telecommunications Infrastructure*, Perth: Western Australian Planning Commission.
- WAPC, 2015. *Western Australia Tomorrow, Population Report No. 10*, Perth: Western Australian Planning Commission.
- WAPC, 2016. *DC Policy 4.3 - Planning for High-Pressure Gas Pipelines (Draft)*, Perth: Western Australian Planning Commission.
- WAPC, 2016. *Draft State Planning Policy 7 Design of the Built Environment*, Perth: Western Australian Planning Commission.
- WAPC, 2016. *State Planning Policy 2.5 Rural Planning*, Perth: Western Australian Planning Commission.
- WAPC, 2019. *Guidelines for Planning in Bushfire Prone Areas*, Perth: Western Australian Planning Commission.
- WAPC, 2019. *State Planning Policy 5.4 Road and Rail Noise (draft)*, Perth: Western Australian Planning Commission.
- WAPC, 2019. *Western Australia Tomorrow, Population Report No. 11*, Perth: State of Western Australia.
- WAPC, 2022. *Draft State Planning Policy 4.1 Industrial Estate*, Perth: Western Australian Planning Commission.
- Wood, H., 2013. *Managing FIFO fatigue in mining*. [Online]
Available at: <https://www.australianmining.com.au/features/managing-fifo-fatigue-in-mining/>
[Accessed 10 October 2016].
- World Bank Group, 2017. *Global Economic Prospects, January 2017 Weak Investment in Uncertain Times*, Washington DC: The World Bank.
- YMAC, 2016. *Native Title Groups*. [Online]
Available at: <http://ymac.org.au/about-us/native-title-groups/>
[Accessed 1 September 2016].



APPENDIX A ENVIRONMENTAL PROFILE

Shire of Ashburton Environmental Profile

DRAFT

Prepared for Taylor Burrell Barnett

By Essential Environmental

November 2016



essential
environmental



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1 INTRODUCTION

The Shire of Ashburton ('the Shire') has commenced preparation of a Local Planning Strategy. This Environmental Profile provides a summary of the natural environment of the Shire for input into the Strategy, highlighting issues associated with the environmental characteristics of the Shire in the context of future growth and development.

This report addresses the environmental context of the Shire of Ashburton only. It is recognised that this will need to be considered, together with economic and community (social) issues and opportunities, as part of the preparation of the local planning strategy.

Preparation of the Environmental Profile has included a review of available information relating to the natural environment, resources and environmental land use planning within the Shire of Ashburton. This is summarised in Section 2 and Appendix 1.

1.1 The study area

The Shire of Ashburton ('the Shire') is the southern most local government area in the Pilbara region. It is located approximately 1,000 km north of Perth and comprises over 100,000 km². The Shire is bound by the local governments of Exmouth and Carnarvon to the west, Upper Gascoyne and Meekatharra to the south, East Pilbara to the east, and Karratha and Port Hedland to the north.

It stretches approximately 500 km west to east from the coastal beaches, rocky hedlands, mudflats and mangroves around Onslow, across the Stewart Hills to Pannawonica, and the Hamersley Ranges to Tom Price and Paraburdoo (Figure 1). The Shire's populated places include Onslow, a coastal port town and the oldest townsite in the Shire, established in 1885 for exporting wool from sheep stations of the Pilbara hinterland. Tom Price, Paraburdoo and Pannawonica are towns largely based on the development of major mining operations, with Tom Price being the Shire's seat of government and administrative centre (see Table 1 for 2011 locality populations). Pannawonica is a 'closed town', and primarily serves to house Rio Tinto Iron Ore employees and their families. It is managed by Rio Tinto and not by the Shire. Although these towns contain the majority of the Shire's population of almost 11,000 residents, many Aboriginal people reside in the communities of Bindi Bindi, Wakathuni, Jundaru, Bellary (Innawonga), Youngaleena and Ngurawaana.

Table 1: Census 2011 locality populations - Shire of Ashburton

Locality	Population	Per cent of local government population
Onslow	667	6.7
Pannawonica	651	6.5
Paraburdoo	1,509	15.1
Tom Price	3,134	31.3

Source: Australian Bureau of Statistics (2012), QuickStats: Onslow (UCL), Pannawonica (UCL), Paraburdoo (UCL) & Tom Price (UCL).

The Shire is best known for mining, agriculture and fishing, and for its rugged, ancient landscape supporting tourism in the region. It is home to some of the world's largest open cut mines, immense pastoral leases and cattle stations, and prawn, pearl and mackerel fishing industries.

The North West Coastal Highway is the main road transport link in the west, traversing the Shire in a north-south direction. Great Northern Highway similarly crosses the Shire in the east (Figure 1).

1.2 Key guidance documents

Strategic guidance for the Shire is provided by a number of key documents at both local and regional level. These include:

- Shire of Ashburton 10 Year Community Strategic Plan 2012 – 2022 (SoA, 2012);
- Onslow Townsite Strategy (DoP and SoA, 2011);
- Onslow Townsite Strategy Background Report (SoA, 2010);
- Onslow Townsite Expansion Development Plan (TPG, 2012);
- Shire of Ashburton Tourism Destination Development Strategy (RBA Consulting, 2011);
- Pilbara Planning and Infrastructure Framework (WAPC, 2012) and
- Pilbara Regional Investment Blueprint (PDC, 2015).

In addition, the following local planning policies were considered as part of the development of this environmental profile:

- ELM21 Tree Management Overview Policy;
- ENG08 Bushfires; and
- LPP25 Onslow Coastal Hazard Area – Scheme Control Area.

These documents are described briefly below. Additional documents which have been considered as part of the preparation of this report are summarised in Appendix 1.

1.2.1 Shire of Ashburton 10 Year Community Strategic Plan 2012 – 2022

The Shire of Ashburton 10 Year Community Strategic Plan 2012 – 2022 is the key guiding document for the Shire. It outlines a mission of

‘working together, enhancing lifestyle and economic vitality’

The Strategic Plan defines key environmental outcomes to be delivered in the Shire of Ashburton as maintaining the integrity and quality of the Shire’s natural environments, together with celebrating and valuing the Aboriginal and European history and heritage, with the aim of being a recognised leader in sustainability practices. These outcomes are to be delivered via a number of strategic directions that are outlined under *Goal 3: Unique Heritage and Environment*, and *Goal 4: Distinctive and well serviced places*.

The objectives, strategic directions, desired outcomes and key contributors are summarised in Table 2. These objectives and strategic directions should guide preparation of the Local Planning Strategy.

Taylor Burrell Barnett - Shire of Ashburton Environmental Profile

Figure 1: Study area



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Scale 1: 1,500,000 @ A3
0 60 km



essential
environmental

Table 2: CSP Goal 3 objectives and directions relevant to the Environmental Profile

Goal 3: Unique Heritage and environment		
Objective	Strategic directions	Key contributors
Objective 1: Flourishing natural environments	Encourage Aboriginal participation in the management of natural assets Protect (manage) the diversity of the Shire’s natural environments Improve recreational access to natural environments with a focus on signage, access and safety Manage the industry/natural asset interface	• Shire of Ashburton • Aboriginal communities • Aboriginal corporations • Key industry stakeholders • Local environmental groups • Local schools
Desired outcome:	The integrity and quality of the Shire’s natural environments are maintained	
Objective 2: Leading regional sustainability	Build capacity to encourage protection of natural assets, good air quality and responsible use of electricity and water Implement waste minimisation strategies	• Shire of Ashburton • Key industry stakeholders • Community representatives • Local schools
Desired outcome:	The Shire of Ashburton is a recognised leader in sustainability practices	
Objective 3: Celebration of history and heritage	Initiate programs and attract funding to celebrate the Aboriginal and European history and heritage of the Shire	• Shire of Ashburton • Key industry stakeholders • Aboriginal communities • Aboriginal corporations • Local museums • Libraries • Local schools • Community groups
Desired outcome:	The Aboriginal and European history and heritage of the Shire is celebrated and valued	
Goal 4: Distinctive and well serviced places		
Objective 1: Quality public infrastructure	Facilitate development of the Tom Price to Karratha Road – Key factor in linking Tom Price and Parraburdoo to the Pilbara Cities Provide and maintain affordable infrastructure that serves the current and future needs of the community, environment, industry and business Develop strategies to effectively manage the planned transition of municipal services in Aboriginal communities, ensuring active engagement of communities and stakeholders Actively advocate for the supply and cost of utilities and services that meet commercial, industrial and retail needs Develop plans for water conservation and water-wise use across the Shire	• Shire of Ashburton • Key industry stakeholders • Business associations • Residents associations • Aboriginal communities • Aboriginal corporations
Desired outcome:	Adequate, accessible and sustainable public infrastructure	

Objective	Strategic directions	Key contributors
Objective 3: Well planned towns	Plan appropriately for future housing and accommodation needs balancing State government growth targets, changing industry needs, community expectations and the need for timely and affordable release of land and housing Ensure new developments are sensitive to the natural and built environments Ensure buildings and landscaping enhance the local character of towns and integrate with the natural environment, with a focus on beautification Incorporate social planning and ecological sustainable development principles in planning strategies and policies Provide a diverse range of high quality open spaces Ensure there is an effective interface between government and industry to ensure holistic planning and development	- Shire of Ashburton - Key industry stakeholders - State government agencies
Desired outcome: Distinctive and well functioning towns		

1.2.1 Growth outlook

The relationship between employment and population growth is more pronounced in the mining towns of the Pilbara than in many other areas of the State. Consequently, population growth in the resource sector oriented towns of the Shire tends not to occur at a steady rate, rather in bursts, driven by resource project cycles. This dynamic makes preparing accurate population forecasts challenging (WAPC, 2015a).

The direct connection between employment in the resource sector and regional population has meant that population growth in the Shire has slowed down with the end of the mining boom. Department of Planning forecasts also suggests that the high rate of population growth in the Shire of Ashburton is unlikely to continue (WAPC, 2015a).

The most recent estimated residential population of the Shire for 2015 is 10,951 (ABS, 2016). The ABS has estimated that population growth in the Shire has significantly decreased from 7.5% growth in 2011, to 0.04% growth in 2015 (ABS, 2016), with a similar slowdown observed across the region.

Tom Price, the Shire's largest town, has experienced relatively modest population growth in recent years. Most of the additional workforce requirements created by resources projects have been met by fly-in fly-out (FIFO) workers who generally stay at camps outside town. Recent population data has also shown that growth in Tom Price has not been as pronounced as in other major Pilbara centres (WAPC, 2015a).

The Pilbara Industry's Community Council predicts that the total minerals and energy workforce in the Shire of Ashburton will decline over the next seven years. Projects currently under construction are moving into operational phase and no major new projects are likely to commence in the Shire.

The Pilbara Industry's Community Council employment-based forecasts indicate that the population of Tom Price could potentially increase by 1,400 residents to a population of approximately 4,750 in 2020. Achieving growth of this nature is likely to require an increase in the proportion of resident workers relative to FIFO, or a substantial expansion of the town's role as a service hub for mining operations in the area. Available data suggests that population growth will stagnate in the near future, unless industry projects within the Shire are developed.

The Shire of Ashburton Working Group (Department of Housing, Department of Lands, LandCorp, Pilbara Development Commission, Rio Tinto, and Shire of Ashburton) identified a lack of accurate knowledge and understanding of the current population and accommodation profile, future employment and population growth trends for Tom Price, Onslow and Paraburdoo (WAPC, 2015a). Therefore, the Pilbara Development Commission, together with the governance of the Working Group, has instigated an Assessment of Accommodation Need in the major towns of Tom Price and Onslow and the townsite of Paraburdoo (WAPC, 2015a).

1.2.2 Onslow Townsite Strategy (2011)

The Onslow Townsite Strategy was developed to define a way to achieve the following vision:

'That Onslow be a vibrant, sustainable and prosperous place for work, living and leisure - for both residents and visitors'

and to ensure that Onslow is known as a 'town with LNG plants and not an LNG town'.

The townsite strategy seeks to fulfil the following three goals:

1. Sustainable living
2. Economic vitality
3. Community wellbeing

Based on the development of Ashburton North Strategic Industrial Area and associated population growth, the strategy identified that significant reorientation of Onslow's urban structure is required to accommodate the residential, community and civic needs of an anticipated residential population expansion. A basic premise of the strategy is that there are no operational workforce camps within the Onslow area. The townsite strategy seeks to balance pressure for the establishment of new living areas with the need to revitalise and, where appropriate, restructure the existing residential precincts. The strategy identifies that the introduction of higher densities in existing areas will provide the opportunity to:

- make these areas more viable in terms of urban and community services;
- reduce the urban footprint thus conserving land with high biodiversity, cultural and pastoral value; and
- identify under utilised land for 'community purposes' for residential use.

The strategy provides development principles and desired future character for:

- new residential areas;
- commercial centre;
- Onslow Salt area;
- Townsite industrial areas;
- Beadon Creek Harbour;
- Airport area;
- Beaches; and
- transient workforce accommodation.

1.2.3 *Shire of Ashburton Tourism Destination Development Strategy (2011)*

The Shire of Ashburton Tourism Development Strategy was prepared to identify opportunities to diversify and expand the tourism industry in the Shire, and generate employment for local people outside of the resource industry. The Strategy identifies that there are opportunities for tourism to take advantage of and leverage off substantial infrastructure constructed by the larger resources industry. It recognises that the Shire includes significant natural environmental assets, both inland (most obviously Karijini and Millstream Chichester National Parks) and on the coast in the form of recreational fishing and diving opportunities. Outside of the nature based attractions, the strategy also focuses on tourism potential at the town centres of Tom Price and Onslow, as Paraburdoo and Pannawonica are recognised as focussing on the servicing of local resource projects in the near future.

In summary, the Strategy identifies that to develop tourism as a thriving economic centre in the Shire, the following actions are required:

- increase tourism products;
- improve quality and value;
- enhance infrastructure that support tourism;
- improve visitor servicing in particular delivery of visitor information (visitor centres, website, information bays, brochures);
- create new experiences that will attract visitors and encourage existing to stay longer; and
- create a positive image of Indigenous tourism in the region.

1.2.4 *Pilbara Planning and Infrastructure Framework (2012)*

The *Pilbara Planning and Infrastructure Framework* defines a strategic direction for the future development of the Pilbara region over the next 25 years. It seeks to ensure that development and change in the Pilbara is achieved in a way that improves people's lives and enhances the character and environment of the region.

In summary, the *Framework*:

- addresses the scale and distribution of future population growth and housing development, as well as identifying strategies for economic growth, environmental issues, transport, infrastructure, water resources, tourism and the emerging impacts of climate change;
- sets out regional planning principles, together with goals, objectives and actions to achieve these. It represents an agreed 'whole of government' position on the broad future planning direction for the Pilbara, and will guide the preparation of local planning strategies and local planning schemes; and
- informs government on infrastructure priorities across the Pilbara and gives the private sector more confidence to invest in the region. The infrastructure priorities identified in the Framework have been determined following extensive liaison with State Government agencies, local government and other key stakeholders.

1.2.5 *Pilbara Regional Investment Blueprint (2015)*

The *Pilbara Regional Investment Blueprint* was recently developed in recognition that there is a need to drive new growth in the region. The vision of the Blueprint is underpin by economic diversity and enhanced liveability for the region in 2050.

In particular, the Blueprint has a strong focus on opportunities for growth in and diversification into agriculture, aquaculture, tourism (nature-based and Aboriginal heritage) and energy (uranium, LNG, and renewable energy production and export) projects. These can be new sources of long-term sustainable growth for the region, in addition to continued support of the minerals and energy industries. In this way the Blueprint seeks to transform the Pilbara as a region of mining towns into more developed and sustainable Pilbara Cities which offer diversity of jobs and career opportunities, high standards of services, and vibrant community life. It builds on the Pilbara Cities Vision to sustainably grow and develop communities that meet the aspirations of their people. The Blueprint Vision is supported by nine regional investment “Pillars” based on analysis of needs, regional interests and comparative advantages that will deliver new sources of growth.

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2 EXISTING ENVIRONMENT

2.1 Climate

The climate in the Shire of Ashburton is typical of the Pilbara region, characterised by high temperatures, particularly during the summer months and variable rainfall patterns interspersed with long dry periods. The Bureau of Meteorology (BoM) defines the wet season for the Pilbara as the period extending from December to the end of March. Tropical cyclones are a feature of the summer months and usually develop between November and May, often bringing intense rainfall and resulting in flooding. Some areas of the Pilbara have the highest average annual evaporation rate in Australia (Van Vreeswyk *et al.*, 2004). The annual evaporation rate throughout the Pilbara is considerably higher than the average rainfall.

The climate of the Pilbara region can be broadly described by two climate categories: tropical along the coastal areas and arid through the central and eastern parts of the region. Regional variations in rainfall occur, with coastal areas and western inland areas located in the path of tropical cyclones often receiving higher rainfall. The arid desert areas in the central east of the region are characterised by higher temperatures and significantly lower rainfall.

Given the coastal location of the Shire it may be described as experiencing a tropical climate. However, as a result of the breadth of the local government area, from the coastal areas around Onslow to the inland ranges around Tom Price and Paraburdoo approximately 500 km away, some variability in temperature and rainfall occurs between the west and east. In order to demonstrate this variability, climate data was obtained from BoM stations at Onslow Airport (no. 5017), Pannawonica (no. 5069) Paraburdoo Aero (no. 7185), and Wittenoom (no. 5026). Mean maximum and minimum temperatures are shown in Chart 1, and mean rainfall is shown in Chart 2 below.

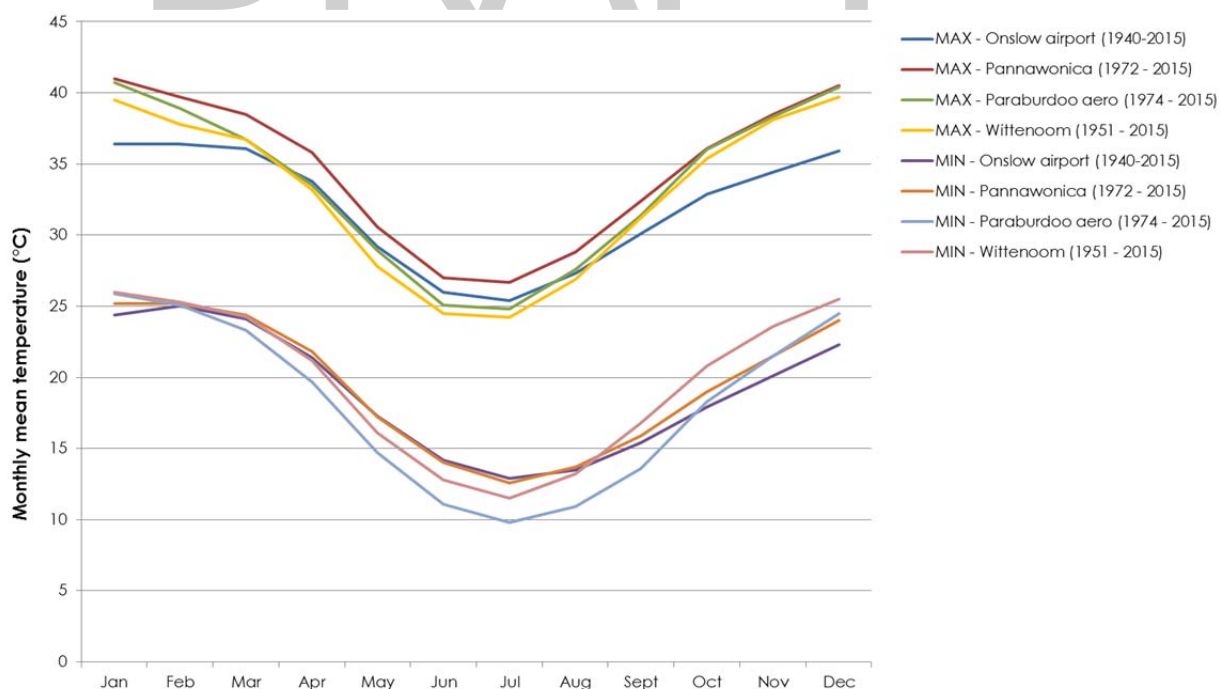


Chart 1: Shire of Ashburton mean monthly maximum and minimum temperature (BoM, 2016a)

Maximum temperatures in the Shire of Ashburton occur in summer and minimum temperatures occur in winter, with average maximum temperatures peaking in December-January at

approximately 36°C in Onslow and 40-41°C at inland locations, and average minimum temperatures occurring at approximately 10-13°C in July (BoM, 2016a)(Chart 1). Temperature data confirms that coastal areas in the Shire (Onslow) experience a more moderate climate than inland areas.

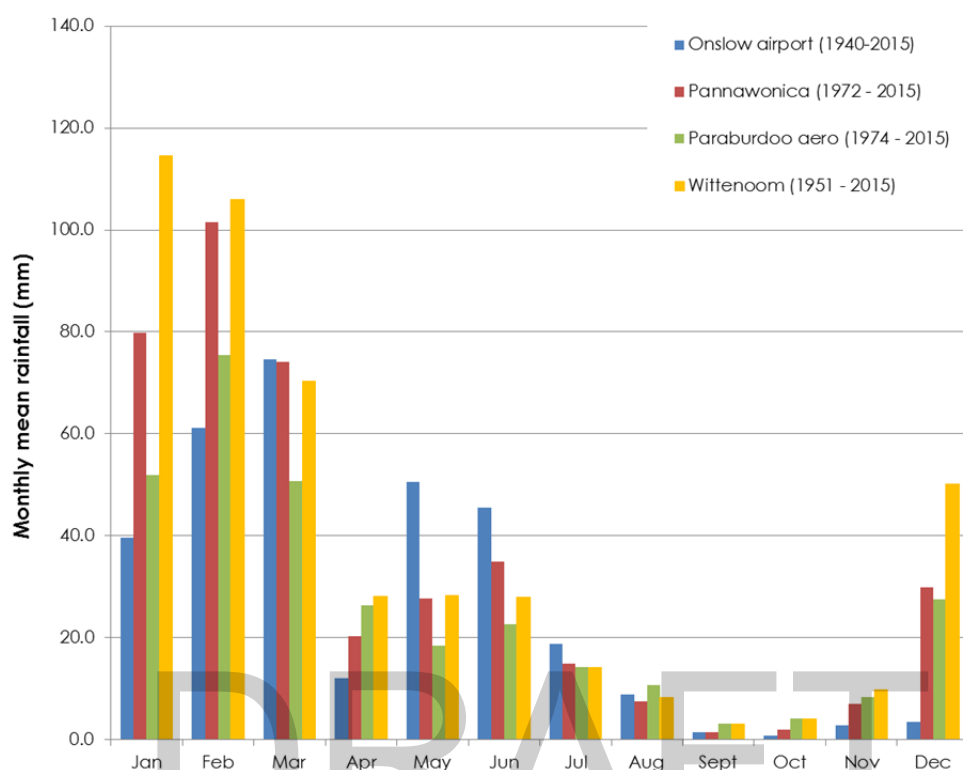


Chart 2: Shire of Ashburton mean monthly rainfall (BoM, 2016a)

Average annual rainfall recorded in the Shire varies from 317 mm at Onslow airport to 465 mm at Wittenoom. As shown in Chart 2, the majority of rainfall occurs in summer between December and March with the driest months being September and October. Chart 2 also demonstrates the variability in rainfall events across the Shire, with more northern, inland areas experiencing higher volume summer ('wet season') rains, while Onslow and nearby coastal areas are also subject to winter frontal systems.

BoM data indicates that while average annual rainfall has declined around Onslow in the last 20 years, in contrast it has increased in inland areas (Pannawonica, Paraburdoo and Wittenoom) (see During most of the cooler times of the year, winds tend to be easterly or south-easterly over most of the Pilbara, influenced by the passage of winter high pressure systems that move east across the mainland. In spring prevailing winds weaken as a semi-permanent heat low develops over the land. In coastal areas the wind direction becomes more variable, particularly in the warmer months, when the wind direction often reverses in the afternoon and sea breezes from the north and north-west dominate (Van Vreeswyk *et al.*, 2004).

Table 3). In particular, rainfall in inland areas of the Shire has increased between October-December and April, while decreasing during the winter months. This may be indicative of changing rainfall patterns bringing more frequent intense rainfall events over the summer 'wet season', with more dry periods in between.

During most of the cooler times of the year, winds tend to be easterly or south-easterly over most of the Pilbara, influenced by the passage of winter high pressure systems that move east across

the mainland. In spring prevailing winds weaken as a semi-permanent heat low develops over the land. In coastal areas the wind direction becomes more variable, particularly in the warmer months, when the wind direction often reverses in the afternoon and sea breezes from the north and north-west dominate (Van Vreeswyk *et al.*, 2004).

Table 3: Average annual rainfall at the Shire of Ashburton

BoM Station	Rainfall (1940-2015)	Rainfall (1998-2015)	Change in average rainfall
Onslow airport (BoM no. 5017)	317 mm	273 mm	-44 mm
BoM Station	Rainfall (1972-2015)	Rainfall (1995-2015)	Change in average rainfall
Pannawonica (BoM no. 5069)	404 mm	432 mm	28 mm
BoM Station	Rainfall (1974-2015)	Rainfall (1995-2015)	Change in average rainfall
Paraburdoo aero (BoM no. 7185)	324 mm	364 mm	40 mm
BoM Station	Rainfall (1951-2015)	Rainfall (1995-2015)	Change in average rainfall
Wittenoom (BoM no. 5026)	465 mm	587 mm	122 mm

2.1.1 Cyclones

Onslow is one of the most cyclone affected towns on the Western Australian coastline, averaging one cyclone with wind gusts in excess of 90 km/h every two years. Between 1953 and 1963 Onslow suffered five severe cyclone impacts having wind gusts exceeding 170 km/h and a further three cyclones causing damage, some flood related (Shire of Ashburton, 2010a). Cyclones are generally associated with flooding and have the potential to increase storm surges in coastal areas.

The Shire of Ashburton has acknowledged that the cyclone activity around Onslow increases the risk of the town being affected by flooding and storm surge. The Onslow Coastal Hazard Special Control Area provides for the Shire to require any planning application to be supported by an assessment, prepared to the satisfaction of the Shire, of the impact of potential flood and storm surge events on the proposed development.

2.1.2 Climate change

Reports from the International Panel on Climate Change (IPCC) provide limited detail on Australian climate change, particularly when it comes to regional climate change projections. *Climate Change in Australia* (CSIRO, 2015a) was developed by the Australian Greenhouse Office together with CSIRO and BoM. It is based upon international climate change research including conclusions from the IPCC's fifth assessment report. It also builds on a large body of climate research that has been undertaken for the Australian region in recent years.

The CSIRO has provided a number of projections based on the outputs of global climate models (named CMIP5) that estimate likely changes in regional climate for defined natural resource management clusters around 2030 (near future) and 2090 (late century). Regional clusters correspond to the broad-scale climate and biophysical regions of Australia. The majority of the

Shire of Ashburton is located in the Western Australian Rangelands North sub-cluster, and wholly within the Rangelands cluster (Watterson I. et al., 2015).

The CSIRO predicts that mean, maximum, and minimum temperatures in the Rangelands North sub-cluster will continue to substantially increase. In addition, the frequency of hot days and duration of warm spells is also predicted to increase, as are evaporation rates. Specifically, temperature is projected to increase by 0.6 to 1.5°C above the climate of 1986-2005 by 2030, and up to 3.1-5.6°C by 2090 (CSIRO, 2015a) (see Figure 2). This rise in temperature has the potential to impact on plants, animals and people, through increased heat stress and increased risk of bushfires.

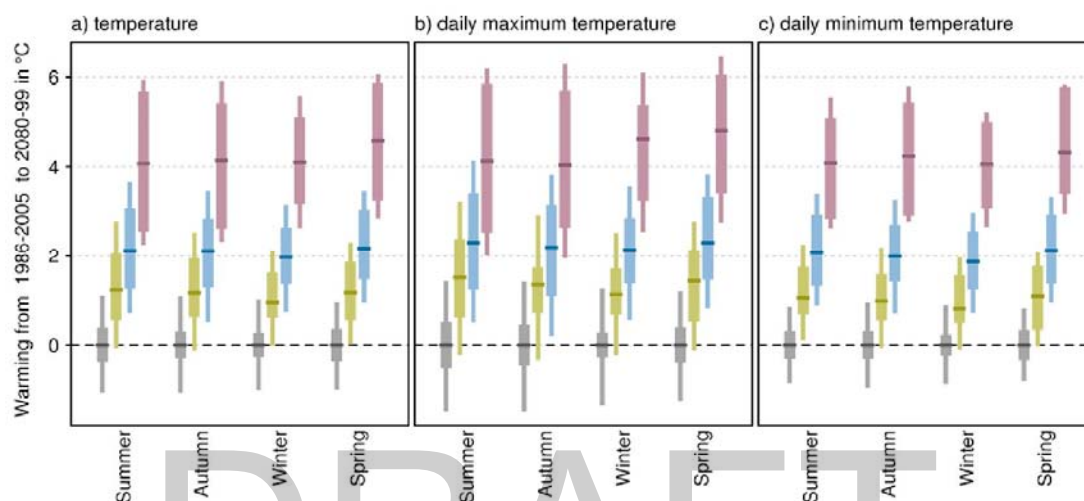


Figure 2: Projected seasonal surface air temperature changes for the Rangelands cluster to the mean (a), daily maximum (b) and daily minimum temperature (c). Temperature anomalies are given in °C relative to the 1986–2005 mean under RCP2.6 (green), RCP4.5 (blue) and RCP8.5 (purple). Natural climate variability is represented by the grey bar (Watterson I. et al., 2015).

Decreases in spring rainfall in the Rangelands North sub-cluster has also been projected by the CSIRO as a result of climate change (Figure 3). This decrease in rainfall coupled with increases in evapotranspiration has also been linked to potential reductions in soil moisture, and possibly in runoff. Time spent in drought is also expected to increase by 2090 with medium confidence. However, the intensity in heavy rainfall events is highly likely to increase which will have implications for localised flooding in built up areas.

Bushfire risk is also linked to rainfall, as it drives vegetation growth. Thus when vegetation growth occurs after the end of the wet season and bushfires follow, the behaviour of these fires is expected to be more extreme in the future as a result of higher temperatures.

Sea levels will also continue to rise along coastal areas of the Rangelands, having implications for Onslow and other coastal settlements and infrastructure. Specifically, the intermediate emissions scenario gives a rise of 0.28-0.64 m and the high emissions scenario gives a rise of 0.4 to 0.84 m by 2090 (Watterson I. et al., 2015). Increases in sea surface temperature (up to 2.4-3.7°C by 2090) and sea surface acidity (decrease of up to 0.3 pH units by 2090) are also highly likely as a result of climate change, which will in turn affect marine life and thus impact on the biodiversity of coastal and marine environments and local fisheries.

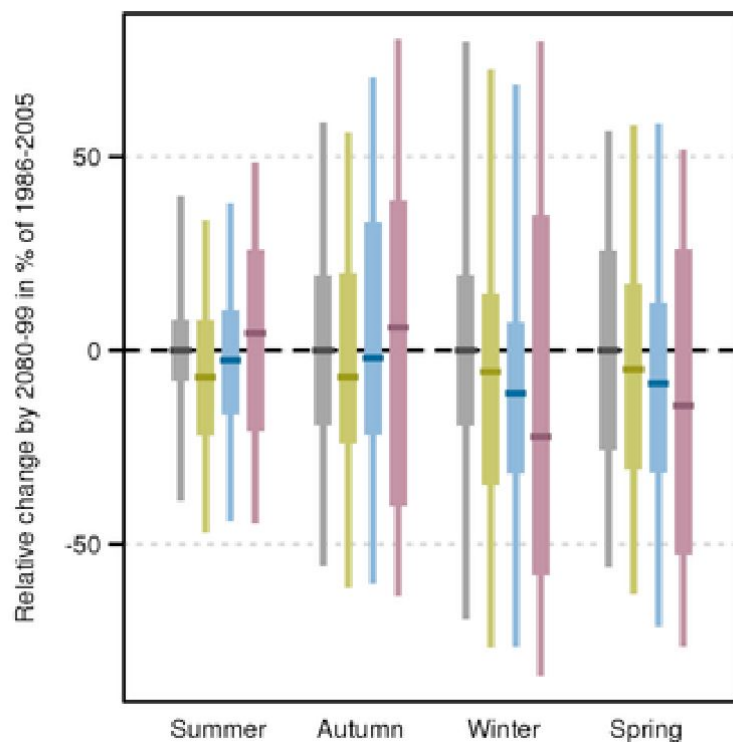


Figure 3: Projected seasonal rainfall changes for the Rangelands North sub-cluster for 2090. Rainfall anomalies are given in per cent with respect to the 1986–2005 mean under RCP2.6 (green), RCP4.5 (blue) and RCP8.5 (purple). Natural variability is represented by the grey bar (Watterson I. et al., 2015).

2.1.3 Key considerations for strategic environmental planning

Key climate considerations for strategic planning are:

- **Temperature** – Increases in temperature are likely to result in increased needs for cooling and/or impacts on environmental and public health. Consideration should be given to heat island impacts in regional towns and the need for green infrastructure and shade in public and private places to mitigate heat increases in built environments. This may also result in an increase in water demands, and thus adequate water sources. Development should also incorporate passive solar design and breezeways.
- **Extreme weather** – Increases in extreme weather events, particularly bushfires as well as rainfall/tropical cyclones, may require development to be located away from areas of risk and/or improved emergency management responses and plans. Infrastructure adequate to manage extreme weather conditions will also require consideration.
- **Rainfall change** – Increases in rainfall event intensity may result in greater localised flooding and increased pressure on stormwater systems.

2.2 Air quality

Air quality can be affected by bushfires, mining, agriculture and industry. Key pollutants are dust from industrial and construction activities and particulates (measured as PM10 and PM25) from bushfires. Other pollutants of interest are oxides of nitrogen, ozone, lead, sulphur dioxide, and carbon monoxide. Pollutants are predominantly driven by wind patterns and topography and have the ability to affect the environment and landscape as well as human health in the region.

Air quality in the Shire of Ashburton is generally good. Dust can be a significant issue in the Pilbara, as it can impact on the health of both humans and the environment. No ports in the Shire of Ashburton currently export iron ore, often associated with dispersion of particulates into the local air space. The main source of dust in the local government area is from particulate matter generated by fire. Major bushfire events typically generate particulate concentrations well beyond the threshold National Environment Protection Measures level. Fires also burn off the cryptogams (microbial organisms that help maintain soil cohesion) holding soil together and leave behind a fine friable powder that can become airborne at low wind speeds.

Dust may also be generated from transport and industrial processing, and construction sites. This risk has been recognised by the Shire in the vicinity of Ashburton North Strategic Industrial Area (ANSIA) through the establishment of a special control area which requires consideration of off-site impacts and buffers.

The extraction and production of minerals can also result in air quality impacts such as dust, noise and light. However, impacts from these sources tend to be localised. Overspray of chemicals should also be considered in areas of intense agriculture.

Another potentially significant air quality issue is associated with the Wittenoom Town site, Wittenoom Airfield, Wittenoom Gorge, Yampire Gorge and the Joffre Creek flood plain between the Wittenoom Townsite and the Fortescue River. This area is a registered contaminated site due to the known presence of free asbestos fibre contamination within soils at the site. Transport of asbestos is dependent on disturbance activities such as vehicle traffic and cattle mustering, as well as activities that result in loss of vegetation and increase the potential for erosion by wind and/or water. Although waterborne migration of asbestos has been identified as a significant method of migration, windborne migration has been considered more significant in terms of health risk associated with respirable fibres (GHD and PB, 2006).

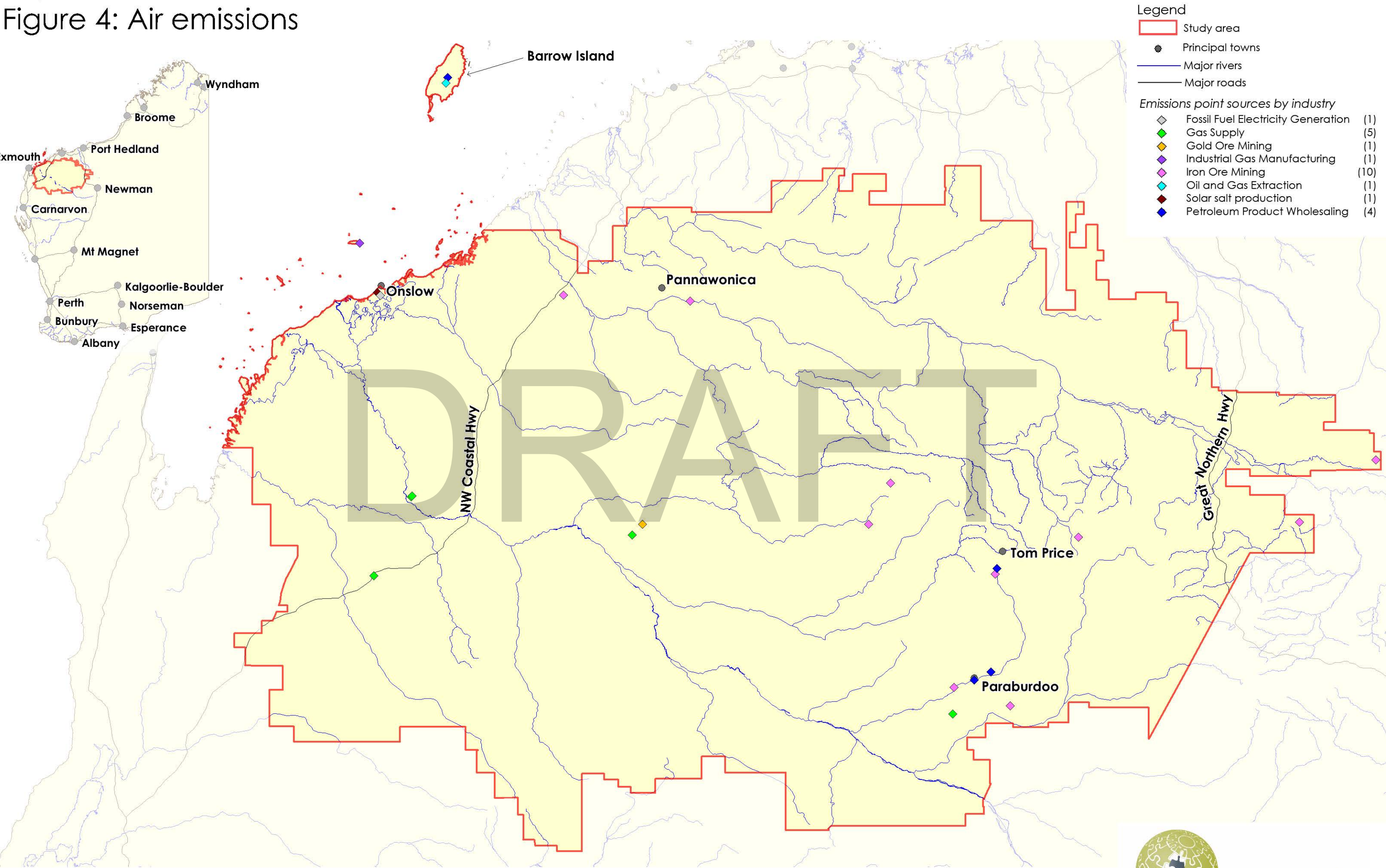
Wittenoom has been classified under the *Contaminated Sites Act 2003* as "Contaminated - Remediation Required" and its status as a town has been formally removed; however, no action has yet been undertaken to clean up the site. The Shire has also prohibited any future development within Wittenoom through the establishment of a special control area.

A study undertaken in 2006 examining the recent management of asbestos contamination in Wittenoom indicated that priority should be given to the stabilisation of the Colonial mine site, as well as to reducing the risk to human health by isolation or remediation of areas with high concentrations of asbestos that is in a form which can be subject to release to air (GHD and PB, 2006).

Noise has also been identified as a potential air quality issue, particularly noise generated at industrial sites in close proximity to townships. Advice on noise generation at industrial sites and separation distances from sensitive land uses is provided by the Environmental Protection Authority in their 'Guidance for the Assessment of Environmental Factors' report no. 3 (EPA, 2005) and the Department of Environment Regulation's draft *Guidance Statement: Separation Distances*, which was released for consultation on 21 August 2015.

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Figure 4: Air emissions



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Scale 1: 1,500,000 @ A3
0 60 km



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environmental

Odour from industrial processing and other uses including waste water treatment has the potential to impact on neighbouring uses. This is recognised by the Shire through a special control area in Town Planning Scheme No 7. The purpose of identifying the Waste Water Treatment Plant Odour Buffer is to avoid sensitive land uses being established within the odour buffer, and to protect the long term operation of the plant which provides an essential service to the community through the treatment, re-use and safe disposal of the town's wastewater.

2.2.1 Greenhouse gas emissions

The Shire of Ashburton has begun to actively reduce its greenhouse gas emissions through the installation of renewable energy sources to provide power for Shire buildings. This includes Onslow Airport which has installed a solar generation management system, however, it is not yet in operation. The Shire is also currently considering the heating of the Vic Hayton Memorial Swimming Pool in Tom Price using solar panels (Perera, 2016).

A new power station planned for Onslow near a proposed desalination plant is also expected to be partly operated using renewable energy via solar panels (pers. comm. Department of State Development, 21st June 2016).

The development of Australia's largest distributed energy resource microgrid, which aims to deliver more than 50% of Onslow's electricity needs with renewable energy, was announced in September 2016 (Government of WA, 2016). The new Onslow microgrid will include a mix of distributed solar energy generation and battery storage. The project includes essential electricity network infrastructure, a new transmission line and substation, and a 5.25 megawatt gas-fired modular power station, designed to efficiently contract in size as the renewable energy contribution expands to meet energy needs. Works on the power station are set to start in early 2017, with completion expected in early 2018.

2.2.2 Key considerations for strategic environmental planning

Key air quality considerations for strategic planning are:

- **Dust** – Dust generated from bushfires should be monitored and management responses developed to inform the public regarding health risks during bushfire events. Management of fuel loads without exceeding threshold air quality standards should also be considered through the development of an Air Quality Management Plan, and a program of regular fuel reduction which minimises air quality impacts on townsites and sensitive environments, on advice from the Bushfire and Natural Hazards Cooperative Research Centre (<http://www.bnhcrc.com.au/>). Further details regarding management of bushfire risk is presented in section 2.7.1.
Dust from localised extraction and production of minerals, particularly near townsites, should be monitored and infringement notices issued where necessary, consistent with the *Extractive Industries Local Law 2013*.
- **Noise** – Guidance should be sought from environmental agencies with regards to appropriate separation distances to manage noise and dust for new industrial areas.
- **Odour** – from industries and waste water treatment plants should be considered as part the location of any new development.
- **Greenhouse gas emissions** – Emissions which result from Shire operations may be reduced through increased use of renewable energy and implementation of actions to improve energy efficiency.
- **Asbestos** – The Shire should maintain advice with regards to potential for health risks from the former mine sites and associated communities.

2.3 Land resources

2.3.1 Geography, topography and landforms

The Shire of Ashburton comprises two distinct landforms across its vast 100,000 km² area from east to west. The eastern half of the Shire is characterised by some of the oldest landforms in the world made up of rugged, deep and steep gorges separated by winding river systems, and reaching an elevation of up to 1,200 m AHD as shown in Figure 5. From east to west the landscape undulates through steep hills, flattening across a series of rivers to flood plains reaching the coast at a low elevation (Figure 5). The Ashburton, Cane, Robe and Fortescue rivers and associated tributaries run across the Shire from east to west, regularly flooding the surrounding landscape during the wet season and from tropical cyclones. They also form important catchments for surface water runoff and feed groundwater system throughout the Shire.

The Shire of Ashburton is also characterised by a series of islands along the length of its coastline, the largest (and second largest in Western Australia) and most iconic being Barrow Island (Figure 5). The island's main feature is its undulating limestone uplands surrounded by flat beaches, dunes and low cliffs.

2.3.2 Geology and soils

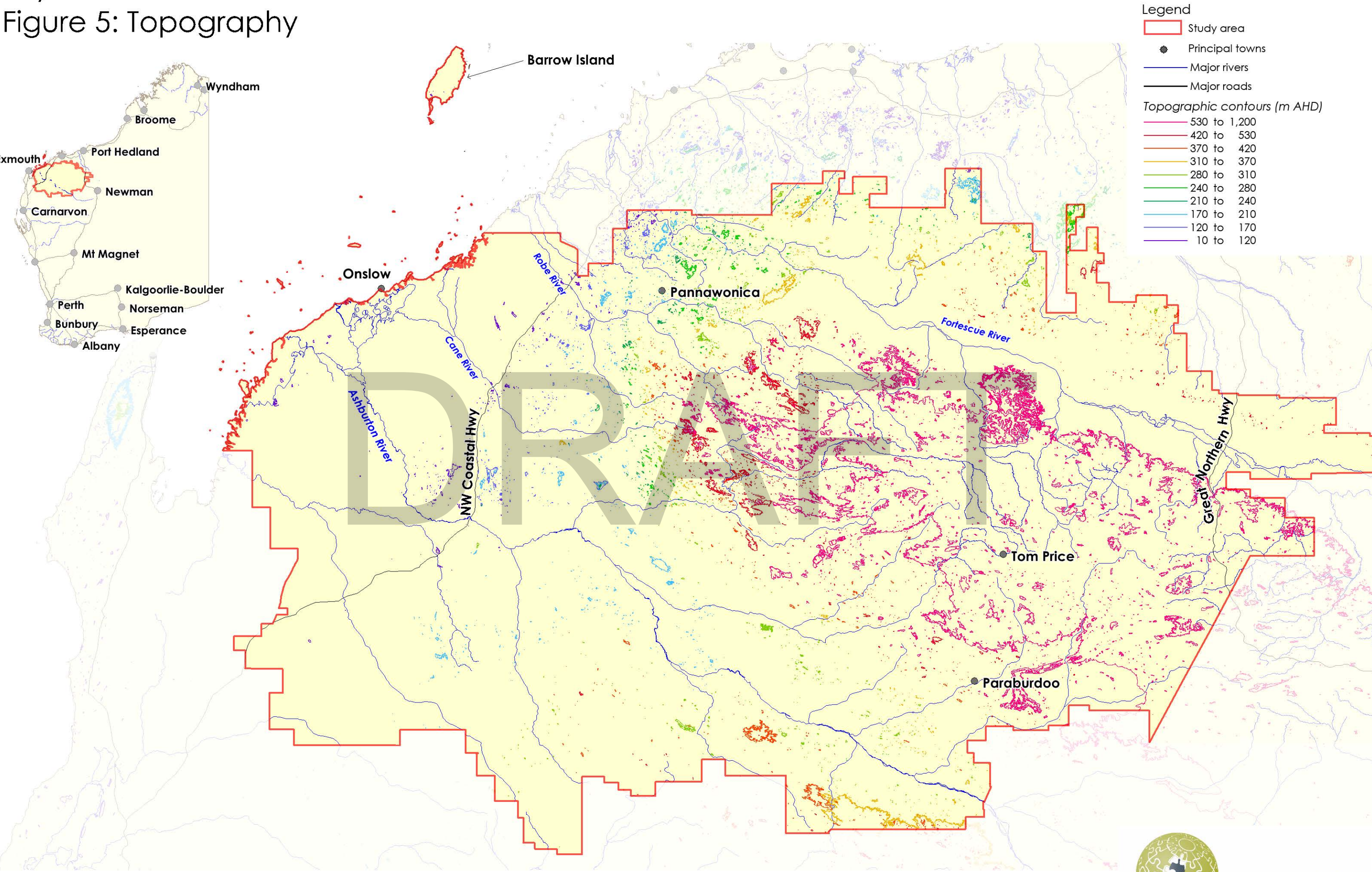
Figure 6 presents mapping from the Department of Mines and Petroleum's 1:2,500,000 *Generalised geology of Western Australia 1999*. The soils of the Shire are generally reflective of the topography. The eastern half of the Shire typically has a surface geology of iron formation and shale, and basalt and sandstone, with a strip of alluvial deposit through the north. Small areas of metamorphosed and volcanic rock, and granite and gneiss are also located in the south around Tom Price and Paraburdoo. The western lower-lying, flat plains comprises a combination of alluvial deposits along the coast, and marine, metasedimentary, basic and intrusive rocks, sandstone, shale, and granite and gneiss further inland. Barrow Island is comprised completely of marine limestone, sandstone and valley-fill deposits, small pockets of which are also found throughout inland areas of the Shire. The lithographic description of surface geology is provided in Table 4.

Table 4: Surface geology of the Shire of Ashburton (source: DMP, 2010)

	Map symbol	Lithographic description
Eastern gorges & hills	Ab	metamorphosed basic and ultrabasic volcanic and intrusive rocks
	AP_b	basalt, dacite, and sandstone
	AP_i	iron-formation and shale
	Agn	granite and gneiss
	Asf	metamorphosed sedimentary and acid volcanic rocks
	Cza	alluvial, shoreline, and eolian deposits
Western plains	Cza	alluvial, shoreline, and eolian deposits
	Czsl	marine limestone, sandstone and valley-fill deposits (primarily at Barrow Island, however also scattered in small areas across the Shire)
	TRKs	marine and continental sedimentary rocks
	P-d	basic and ultrabasic intrusive rocks
	P_gn1	granite and gneiss
	P_s1	metasedimentary rocks
	P_st1	sandstone
	P_ss2	sandstone and shale

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Figure 5: Topography



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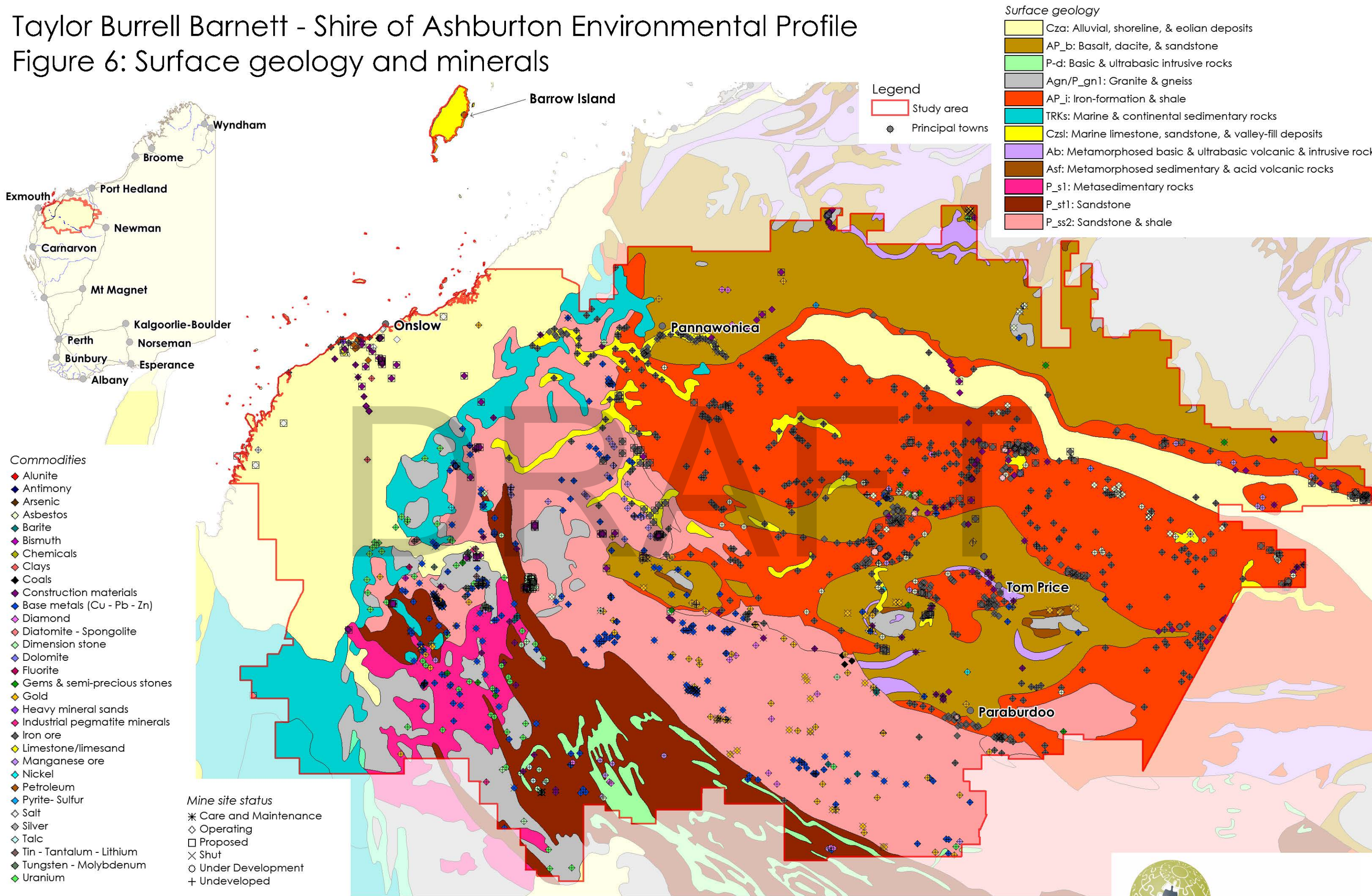
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Figure 6: Surface geology and minerals



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2.3.3 Minerals and basic raw materials

A substantial range of minerals have been identified by the Department of Mines and Petroleum across the Shire, the majority of which are undeveloped as shown in Figure 6. The primary commodity identified in the east of the Shire is iron ore, with a significant number of mines under development or in operation around Tom Price and Paraburdoo. Gold, manganese ore, and base metals are also significant commodities in the Shire, with deposits mainly located through the centre of the local government area. Uranium deposits have also been identified in the south west of the Shire. Salt and construction material deposits and operations infrastructure primarily comprise the commodity processing activity within coastal areas. Commodity deposits and mining activity status in the Shire is presented on Figure 6.

No significant resources of basic raw materials are considered to occur within the Shire (DMP, 2016a).

2.3.4 Acid sulfate soils

Acid sulfate soils are naturally occurring soils, sediments and peats that contain iron sulfides, predominantly in the form of pyrite materials (DER, 2015). These soils are commonly found in low-lying land bordering the coast or estuarine and saline wetlands and freshwater groundwater-dependent wetlands throughout Western Australia. They occur naturally in Western Australia and are harmless when left in an anoxic, waterlogged, and undisturbed environment.

Disturbing acid sulfate soils through excavation or drainage causes the iron sulfides in these soils to be exposed to and react with oxygen and water to produce iron compounds and sulfuric acid (DER, 2015). This acid can also release other substances, including heavy metals, from the soil and into the surrounding environment and waterways, thus potentially resulting in significant environmental and economic impacts including (DER, 2015):

- contamination of groundwater resources by acid, arsenic, heavy metals and other contaminants;
- fish kills and loss of biodiversity in wetlands and waterways;
- loss of agricultural productivity; and
- corrosion of concrete and steel infrastructure by acidic soil and water.

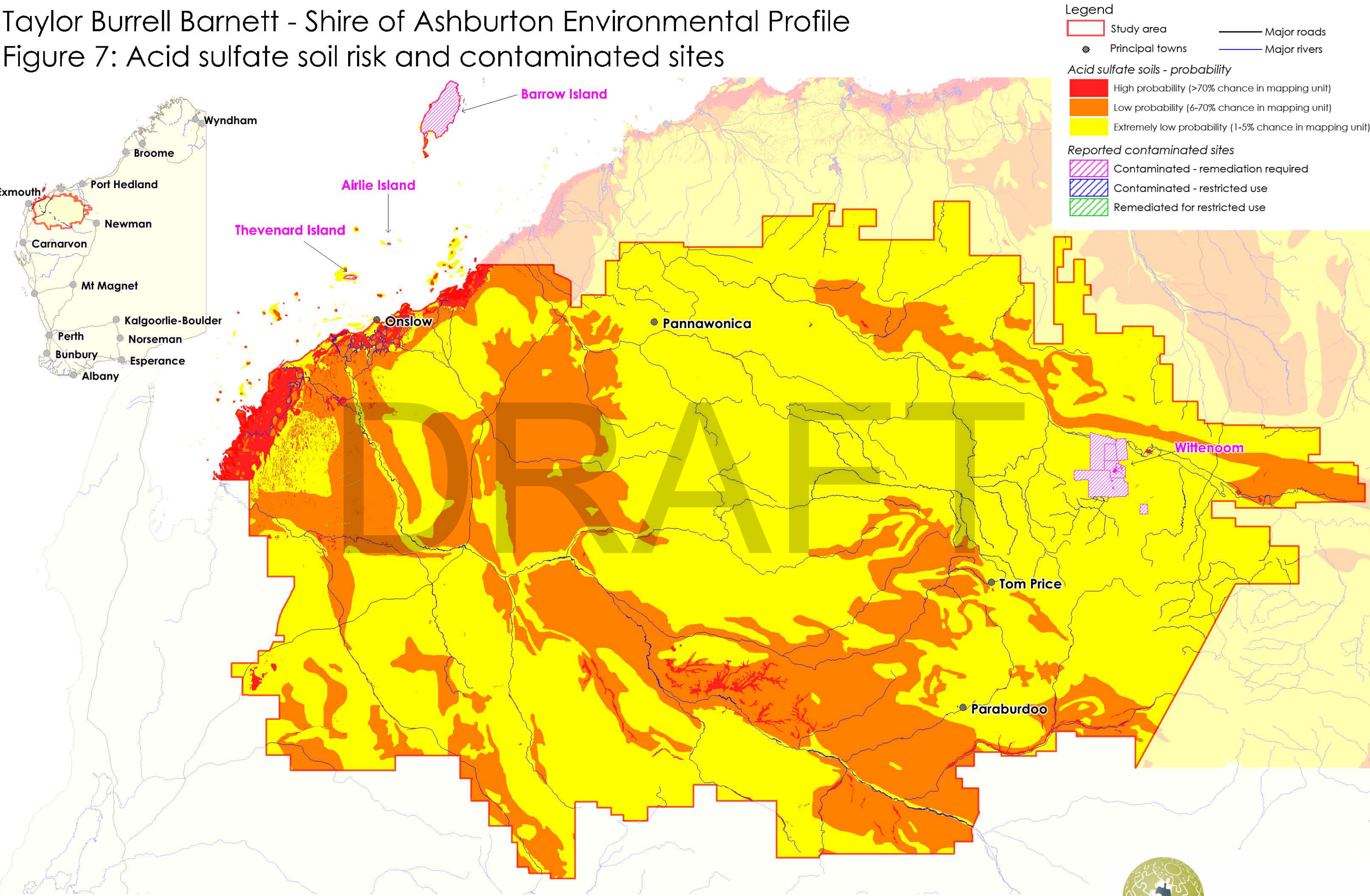
Much of Western Australia's acid sulfate soil material lies just below current water-tables. Changes in land use and increasing groundwater abstraction, as well as declining rainfall, will lead to lower water-tables resulting in possible acid sulfate soil oxidation (DEC, 2013b).

The WAPC released the *Acid Sulfate Soils Planning Guidelines* (WAPC, 2008) which outline a range of matters that need to be addressed at various stages of the planning process to ensure that the subdivision and development of land containing acid sulfate soils is planned, and managed, to avoid potential adverse effects on the natural and built environment.

Current mapping indicates areas within the Shire with a high probability of acid sulfate soils occur largely along coastal areas, both north and south of Onslow (see Figure 7). Small pockets of high probability areas also occur in the south along waterways, as well as in localised sites in the southwest, north and east.

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Figure 7: Acid sulfate soil risk and contaminated sites



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2.3.5 Contaminated sites

Historical land uses have the potential to result in contamination of soil and groundwater. The contamination of land often renders the land unusable until it is remediated. It also has the potential to cause surface water or groundwater contamination through the transmission of contaminants where they come into contact with stormwater.

Western Australia has developed contaminated sites legislation to protect people's health and the environment from harm. Under the *Contaminated Sites Act 2003*, contaminated sites must be reported to the Department of Environment Regulation, investigated and, if necessary, remediated.

Land owners, occupiers and polluters are required to report all known or suspected contaminated sites to the Department of Environment Regulation. Reported sites are then classified, in consultation with the Department of Health, based on the risks posed to the community and environment.

Figure 7 indicates sites within the Shire currently registered on the Department of Environment Regulation's Contaminated Sites database. There are four main areas within the Shire containing registered contaminated sites; Wittenoom (ex-)townsite, Barrow Island, Thevenard Island and Airlie Island. All the contaminated sites within the Shire have been classified as 'Contaminated – remediation required'. The nature and extent of contamination on Barrow Island, Thevenard Island and Airlie Island is primarily hydrocarbons in both soil and groundwater associated with surrounding oilfield facilities, as well as heavy metals and other contaminants.

Oilfield operations off Thevenard Island ceased in 2014 and infrastructure is currently in care and maintenance mode. A decision was made by owners Chevron Corporation to decommission the Thevenard Island facilities, with the removal of all plant, road and footing expected to take two years (Wilkinson, 2015). Oilfield facilities at Airlie and Barrow Islands are still in operation.

Buildings and materials found to contain asbestos at the old Onslow horse racing track (also known as the Onslow speedway), located approximately 17 km south of Onslow, have recently been removed by an approved asbestos removal contractor (pers. comm. Tahi Morton, Shire of Ashburton, 16th November 2016). However, soil at the site has not been tested for asbestos. The old horse racing track is expected to be turned into a motor cross track in the near future.

Soil testing for asbestos was undertaken at the Onslow rodeo grounds and marked as a future contaminated site. The Shire is currently working to finalise the assessment with the Department of Environment Regulation (pers. comm. Tahi Morton, Shire of Ashburton, 16th November 2016). An additional 0.5 m layer of topsoil has recently been laid over the asbestos-contaminated site at the rodeo grounds in order to use this area as a car park. The contaminated site has previously been covered by topsoil, however, an additional layer was required in order for it to be used safely and minimise risk.

Other sites reported to the Department of Environment Regulation, including sites awaiting classification, are recorded separately by the Department of Environment Regulation and have not been mapped.

A search of the Department of Defence's Unexploded Ordnance (UXO) online mapping indicates that a classification of 'Other' UXO potential exists in some coastal areas of the Shire and one inland area (see Plate 1 below). The areas classified as having 'Other' UXO potential indicates that they were used by the Department of Defence for military training, but use of live firing has not been confirmed, and UXO or explosive ordnance fragments / components have not been recovered from the site. Defence recommends that Local Government notify affected landowners if their property is in a 'Slight' or 'Substantial' potential UXO contamination area only.

However, the Shire is required to inform affected landowners, residents and those working in these areas that they were used for military activities and ensure that they receive the appropriate UXO warning and advice as issued by Defence (DoD, 2016).

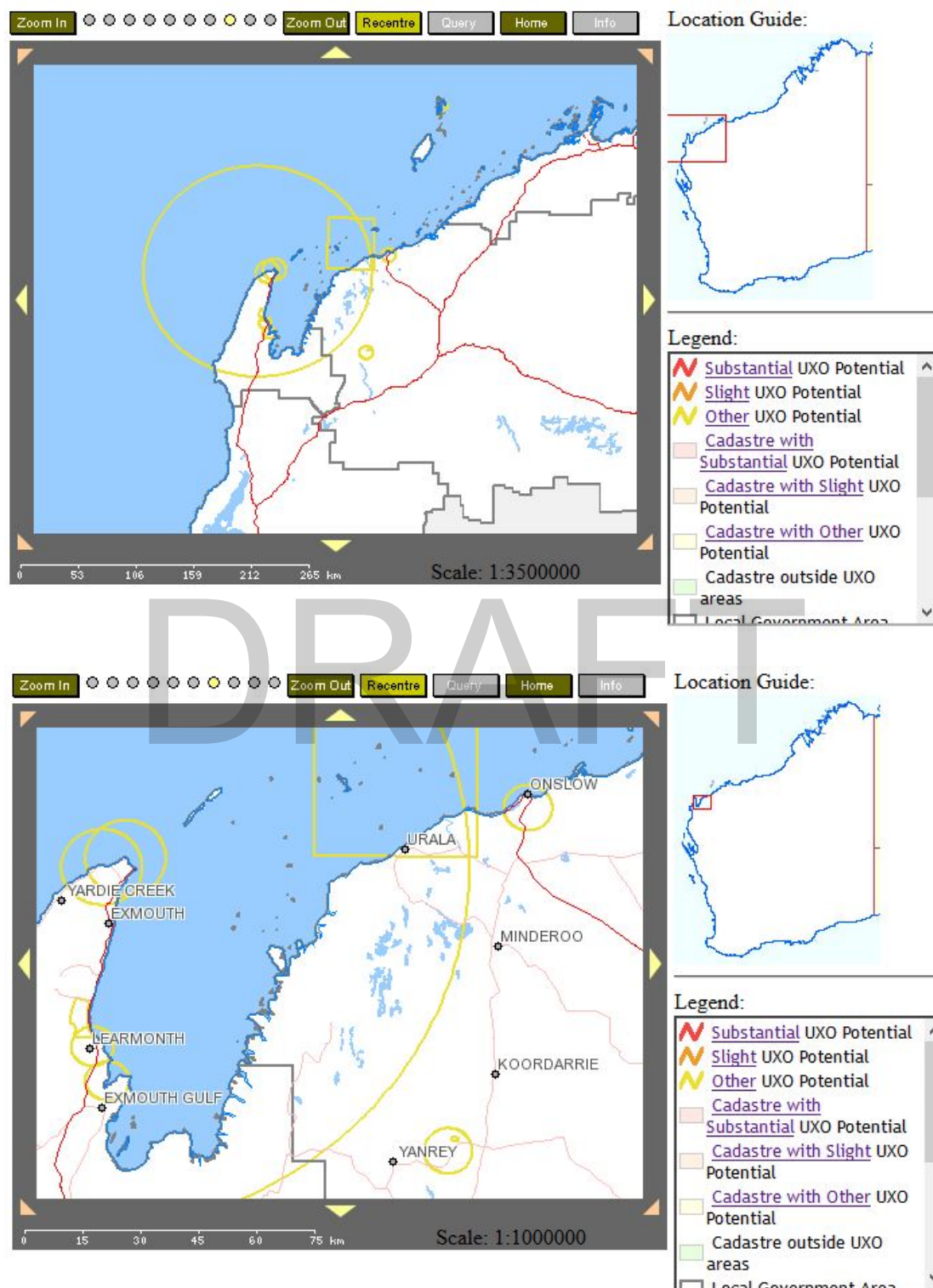


Plate 1: Potential for UXOs in the Shire (DoD, 2016)

Wittenoom

Wittenoom townsite and its surrounding areas is the most notable contaminated site in the Shire. It is now a degazetted town, the legacy of contamination due to crocidolite mining and milling between the 1940s and 1960s. The State Government began phasing down activity in Wittenoom in 1978 as a result of the widespread contamination of crocidolite. In 1993 the Government commissioned a feasibility study for cleaning up the townsite which found that there was still extensive contamination, after approximately fifteen years during which attempts were made to clean up the town. A proposed clean up involved the removal of 100 mm of contaminated top soil and replacement by gravel capping under strict guidelines at a cost of approximately \$2.43 million. However, a systematic clean-up of the town was not undertaken. Members of the Interdepartmental Committee on Wittenoom believed it was unlikely the town could be satisfactorily cleaned up and the benefits of attempting to clean up the town were not in proportion to the costs, or the risks involved.

In 2006 GHD and Parsons Brinckerhoff undertook a study on behalf of the Department of Industry and Resources, and Department of Local Government and Regional Development, to develop a risk-based strategy for managing the health risks posed by asbestos tailings in Wittenoom. The objectives of the study were to undertake a field survey of the extent and nature of the asbestos contamination, develop a risk assessment process and identify and evaluate options for the management of any risk identified. The risk assessment indicated that the Wittenoom gorges posed a high or extreme risk to Aboriginal people, tourists and mining industry contractors. The floodplain, and contaminated creek beds in particular, used by Aboriginal people, pastoralists, residents and construction contractors was also considered of high to extreme risk to these groups. Waterborne migration of asbestos was identified as the most significant method of migration, although windborne migration was considered more significant in terms of health risk associated with respirable fibres. A major conclusion of the study was that priority should be given to the stabilisation of particular mine sites and tailings dumps (Colonial mine site) to reduce the risk to human health by isolation, or by remediation of areas with high concentrations of asbestos in a form which could be subjected to release to air (GHD and PB, 2006).

In addition, it was recommended that residents be removed from the townsite, and townsite buildings and infrastructure be demolished and removed. Recommendations were put forward to the Wittenoom Steering Committee, established by the Western Australian Government in 2002 (Government of Western Australia, 2016). Both the Department of Health and an accredited contaminated sites auditor also reviewed the report, with the latter finding that the detected presence of free asbestos fibres in surface soils from sampled locations presented an unacceptable public health risk. The auditor recommended that the former townsite and other impacted areas defined in the report be classified as "Contaminated - Remediation Required".

In December 2006, the Minister for the Pilbara and Regional Development announced that Wittenoom's status as a town would be removed, and in June 2007 the townsite status was officially removed (Government of Western Australia, 2016). The Department of Environment and Conservation subsequently classified Wittenoom as a contaminated site under the *Contaminated Sites Act 2003* on 28 January 2008.

Most recently, in 2013 the Department of Lands engaged environmental consultants to undertake feasibility studies on the preferred remediation options for the three highest risk sites at Wittenoom, including Wittenoom Mine, Colonial Mine and the Wittenoom Gorge. The Department of Lands also began working with relevant agencies and stakeholders to raise awareness of the risks posed by Wittenoom to the general public and local Aboriginal people, and assess long term solutions for the management of the area.

The Government of Western Australia also began drafting special legislation in December 2015 to allow the forcible removal of the last few remaining residents of Wittenoom (Perpitch, 2016).

2.3.6 *Waste management*

Effective waste management is essential to protect groundwater resources and wetlands, coastal zone areas and other areas with environmental values.

Waste in the Shire is generated from domestic land uses including building and construction, council works and commercial and industrial activities, including mining. Waste management facilities are generally operated by the Shire including in the townships of Onslow, Paraburdoo and Tom Price. However, some private facilities exist, such as at Pannawonica, which are operated by mining companies.

The predominant means of disposing waste in the Shire is by landfill, with limited recycling or reuse of materials. This is largely a factor of high transport costs and a lack of markets for recyclable materials; however, it is compounded by high levels of contamination, the costs of recovery, and the generally free access by households to dump trailer waste at landfills.

Waste management in remote communities is also difficult, due to low levels of community awareness and participation in recycling as well as inappropriate waste management practices that have the potential to impact on drinking water resources. Illegal dumping of waste is particularly an issue with reports of dumping occurring in Paraburdoo near the light industrial area.

Increased growth in the region will lead to increased amounts of waste that are generated. This is of concern primarily due to the low level of reuse and recycling that are currently occurring, suggesting that the majority of all new waste will end up in landfill.

Due to development in Onslow, continued residential growth and expansion of the resources industry, the old Onslow Landfill was officially closed and in a new, modern waste transfer station opened August 2015. Waste collected at the transfer station in Onslow is being transported to Tom Price. Another landfill site has also been identified for development 30 km south of Onslow, as a Class 4 facility for use by Chevron as part of its operations (OCCI, 2016). The land is currently vested to the Department of Parks and Wildlife for conservation and a feasibility study will be completed in 2016.

The landfill site in Tom Price has an estimated capacity of around fifteen years, with the capacity of the Paraburdoo landfill estimated at 9-10 years.

Long-term waste management planning is currently being undertaken by the Shire. A Landfill Strategic Waste Plan which includes an assessment of the lifecycle of landfills has recently been developed for the Shire of Ashburton and has been received by Council.

2.3.7 *Land capability for agriculture*

The Department of Agriculture and Food WA (DAFWA) undertook an assessment of soil capability and degradation hazards across Western Australia, however, the assessment did not extend to the Pilbara region (DAFWA, 2016a).

A Rangeland inventory and condition survey was undertaken for the Ashburton River catchment between 1976 and 1978 (Payne et al., 1988). A survey report was prepared providing a baseline record of the existence and condition of the natural resources within the catchment to assist with the planning and implementation of land management practices. The report identified and described the condition of soils, landforms, vegetation, habitat, ecosystems, and declared plants and animals. It also assessed the impact of pastoralism and made land management recommendations.

The area surveyed covers approximately 93,600km² and includes the catchment of the Ashburton River and part of the catchment of the Yannarie River. About 65% (61,130km²) of the area was then occupied by 30 pastoral leases grazing sheep and/or cattle. The remaining 35% (32,470km²) consisted of various reserves and vacant crown land unsuitable for pastoral purposes. Pasture and soil condition was assessed at a number of points throughout the survey area and found that:

- 9% of the points surveyed indicated that perennial vegetation was in poor to very poor condition;
- 27% indicated fair rangeland condition; and
- 64% indicated good or very good condition.

The worst areas of degradation and erosion were identified on the most valuable pasture lands. These areas are readily accessible, close to permanent water supplies and support attractive pastures. Therefore, they received preferential overuse in the early days of settlement, and sensitive parts of these areas are now seriously degraded.

Rangelands pastoral condition was also assessed by DAFWA in order to provide advice on the planning and management of grazing pressure on leases, and to report to the Pastoral Lands Board. Lessees and station managers can use these assessments to improve management and long-term condition of the rangeland resource. The Western Australian Rangeland Monitoring System (WARMS) has been the key assessment tool used by DAFWA to monitor change in vegetation condition and provide information on rangeland condition trends at a regional or district scale. This included grassland and shrubland assessments to indicate pasture condition and trends, and thus land capability. Grassland sites were assessed on a three-year cycle and shrubland sites assessed on a five-year cycle through the WARMS tool. Regular lease inspections were carried out by DAFWA until 2012, when responsibility was given to lessees and land manager to undertake these assessments (DAFWA, 2016b).

Reporting data from the most recent sampling period (2012 – epoch 7 for grasslands) for the Ashburton Land Conservation District (LCD) indicates that perennial grass coverage continued to decreased despite favourable climatic conditions, and a stock density below the estimated carrying capacity of the LCD in the previous two years (see Chart 3, Novelty and Thomas, 2013). Data on rangelands condition has not been reported since 2013 and the Annual Rangeland Condition and Data Input Application (ARCADIA) administered by the Pastoral Lands Board is no longer in operation.

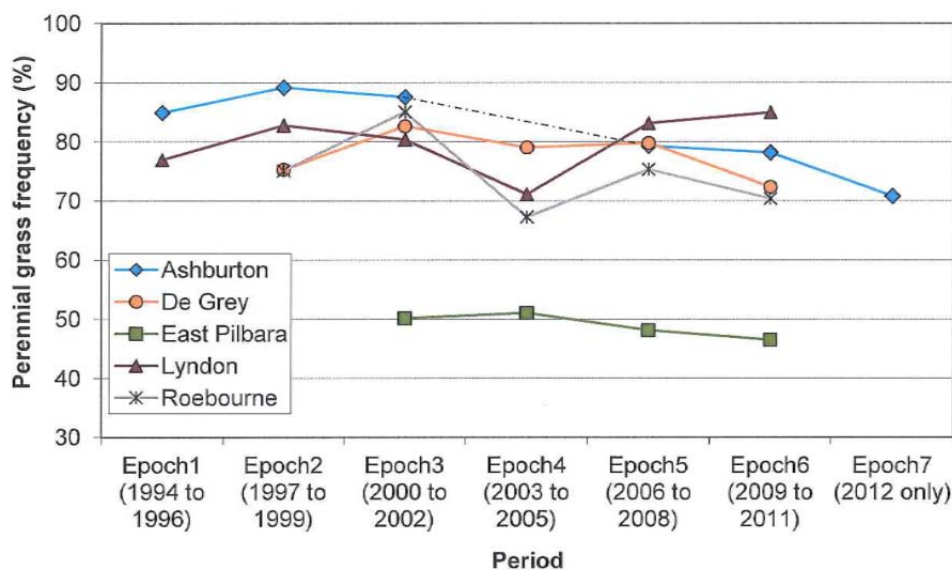


Chart 3: Reported grassland cover (frequency) (Novelly and Thomas, 2013)

The decline in vegetation and soil condition (particularly when exacerbated by drought) in the rangelands of the Shire of Ashburton has implications for the regional pastoral industry (Novelly and Thomas, 2013). As vegetation coverage decreases, the capacity for livestock to graze and be supported by the rangelands will also decrease. This pattern places pressure on pastoralists to increase stock density to make up for market shortfalls, which in turn has environmental implications.

Rangelands NRM has recently been working with the Federal Government to deliver Ecologically Sustainable Rangeland Management (ESRM) plans for land managers in the rangelands. Through the ESRM planning process, the land manager identifies land systems, notes their productive potential and degradation risks and prioritises them into action/response categories. Land systems with the greatest productive potential with the highest risks of on-going or future degradation are prioritised to ensure sustained productivity. Land managers can then use this knowledge to assess current management practices and develop appropriate interventions (Rangelands NRM, 2016). In particular, Rangelands NRM is working with pastoralists in the Fortescue catchment to assist in managing total grazing pressure and control livestock access to areas of high biodiversity value, by increasing ground cover and its condition on pastoral properties, and improving cattle management.

Although mining activities require environmental approval, the widespread exploration for resources and their associated extraction and transport has resulted in some impacts on the regional landscape. This includes a loss in land capability in areas that are actively mined, as well as utilised for associated infrastructure. Other localised landscape impacts are evident as a result of mining activities in coastal and marine areas, such as the construction of off-loading facilities, ports, pipelines and causeways.

2.3.8 Key considerations for strategic environmental planning

Key land resource considerations for strategic planning are:

- **Resource extraction** – Clearing of the land for resource extraction results in a loss of biodiversity and can lead to erosion. Mining activities impact on the visual landscape of the Shire; can result in off-site impacts on nearby land uses including dust, noise and light; and can also lead to the lowering of groundwater tables.

- **Acid sulfate soils** - Declining soil and land quality can occur as a result of activity where acid sulfate soils are disturbed. This leads to the release of acid and heavy metals which can cause significant harm to the environment and infrastructure. Appropriate management of acid sulfate soils, particularly in areas of high risk where changes in groundwater are likely or mining is proposed, is required, consistent with current best practice.
- **Contaminated sites** – Given that contaminated sites within the Shire are located within operational oilfield facilities, the Onslow townsite, and within the Wittenoom degazetted townsite, consideration should be given to processes established under the *Contaminated Sites Act 2003*, particularly in coordination with the Department of Lands with respect to Wittenoom. In addition, any unsewered residential and industrial areas within the Shire have the potential to lead to contamination of land and groundwater and alternative treatment units should be used in areas of high environmental risk.
- **Waste management** – Consideration should be given to opportunities to establish local or regional waste management and/or recycling facilities as population in the region increases, as well as opportunities to subsidise recycling schemes. This should include industries with multiple benefits such as waste to energy plants.
- **Soil and vegetation condition** – Vegetation retention assists in the maintenance of soil health. Soils and vegetation (grasslands and shrublands) in good condition are also associated with higher agricultural productivity. Supporting the development and planning process of Ecologically Sustainable Rangeland Management (ESRM) Plans for land managers in coordination with the Pastoral Lands Board and DAFWA should also be considered.

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2.4 Water resources

2.4.1 Surface water – waterways, wetlands and flooding

Long, wide river systems drain the rocky outcrops of the inland region and flow over the coastal plains to discharge northwest into the Indian Ocean. These are a significant environmental feature of the Shire's landscape. River flowpaths are often wide and intertwining, and discharge points are usually a combination of direct ocean channels and dispersal through marshy flats.

As a direct response to irregular rainfall patterns and extreme climatic conditions, rivers in the Shire are subject to massive, seasonal variations in flow. These conditions result in a landscape with wide floodplains which allow the periodic passage of large volumes of water and sediment across the tablelands to the coastal areas and near-shore marine environment, particularly during cyclonic events. With the exception of some small but important, spring-fed sections, all waterways in the region are ephemeral, in that surface flow ceases for at least part of each year.

Major surface water basins within the Shire include the Onslow Coast and Cane River, Fortescue River, Robe River, Yannarie River, and Ashburton River (Figure 8). The Ashburton River Catchment covers over 75,000 km² and includes the Ashburton, Angelo, Hardey, Henry Rivers and Tunnel, Perry, Ethel, Turee, 7 Mile, Duck Creeks.

The largest rivers in the Shire, the Fortescue and Ashburton rivers, flow for significantly greater periods of time than the other rivers. However, in wetter years only the Fortescue River flows for more than half the year. The major rivers contribute significant recharge to groundwater resources such as the Millstream aquifer, while flowing over the coastal plains towards the Indian Ocean. However, streamflow has been estimated to exceed groundwater recharge volumes by five to six times, due to the very large flows resulting from cyclonic events and tropical depressions, which exceed the amount of water that can infiltrate during these events (CSIRO, 2015b).

Most runoff occurs during the period of January to March, largely as a result of cyclonic activities, with typically less runoff during December and April (WAPC, 2009). Mean annual runoff rates from the major rivers in the Pilbara region typically represent 2% to over 10% of the annual rainfall and between 8-30 mm of rainfall is required to make the rivers and streams flow (CSIRO, 2015b).

The Shire of Ashburton is located within the Pilbara Surface Water Area, which is proclaimed under the *Rights in Water and Irrigation Act 1914* for the purposes of regulating the taking of water from watercourses and wetlands.

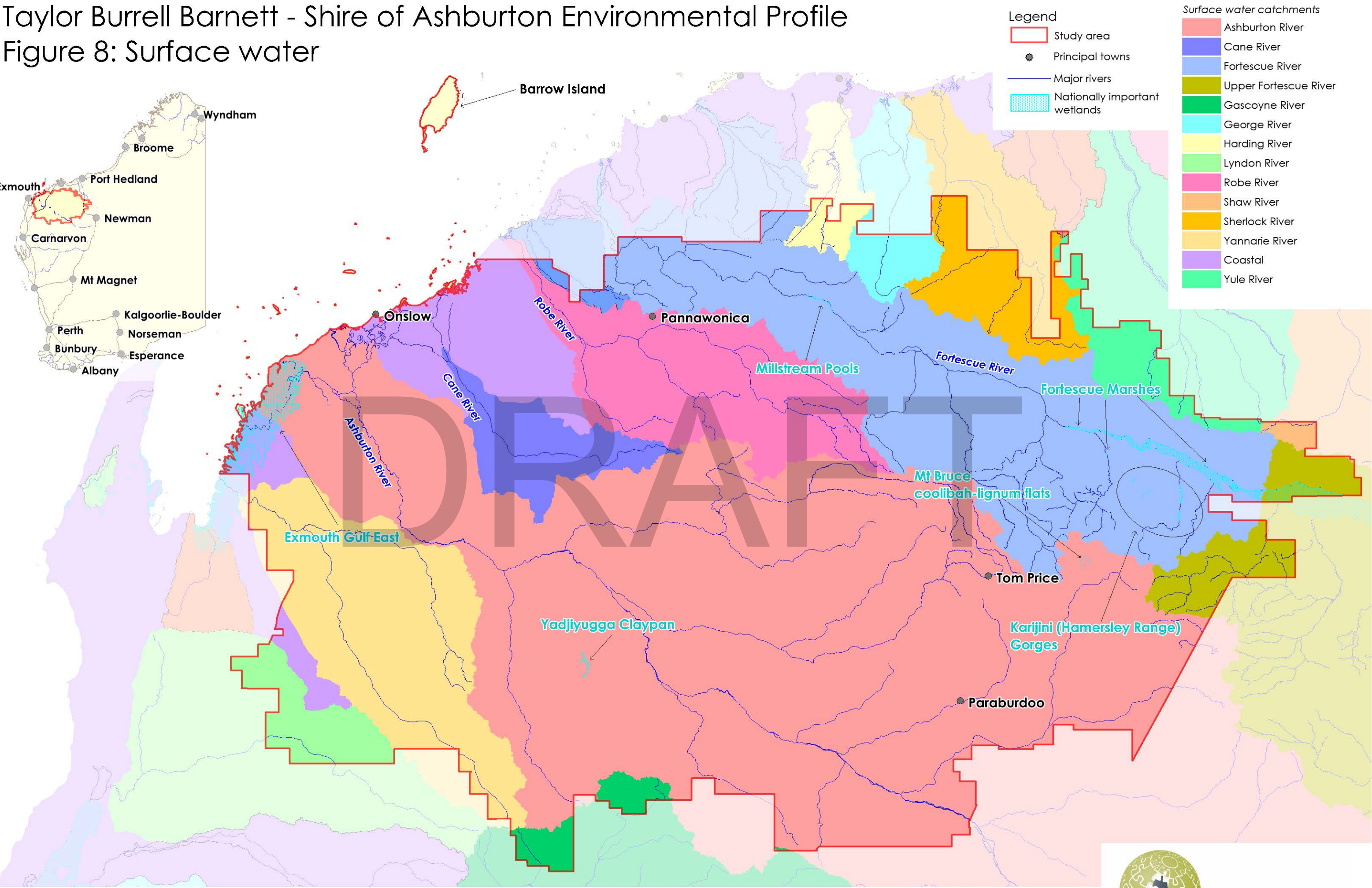
Wetlands

While no Ramsar wetlands are located within the Shire, Millstream Pools and Fortescue Marshes are being considered as Ramsar sites (DoW, 2010b). A number of wetlands have been listed in the *Directory of Important Wetlands in Australia* (Environment Australia, 2001). These include; Millstream Pools, Karijini Gorges, Weeli Wolli Spring, Exmouth Gulf East, Fortescue Marshes, Kookhabinna Gorge, Mt. Bruce coolibah-lignum flats and Yadjiyugga Claypan. Nationally important wetlands are shown on Figure 8.

Due to the arid climate of the region, permanent and semipermanent pools are of high ecological value. These pools and wetlands sustain populations of terrestrial and aquatic flora and fauna during times of drought and are refuge areas from which biota expand during times of flood. Permanent pools with recognised significance include those associated with the Yule, Sherlock, Harding, and Fortescue coastal rivers (Kendrick and Stanley, 2001).

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Figure 8: Surface water



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Pools and wetlands also have significant cultural value to local Aboriginal people. For instance, stories of 'The Dreaming' from the Millstream area provide the basis for the cultural practices of the Yindjibarndi and Ngarluma people (WAPC, 2009).

Flooding

Episodic flooding is a natural hydrologic feature of the Shire and greater Pilbara region. Episodic flooding provides critical recharge of groundwater aquifers and inundation of waterways and wetlands that may have been dry for extended periods. Episodic flooding also results in explosive ecological responses, which are a remarkable feature of the region.

Heavy rainfall and associated river flooding is the main impact from most cyclone events, particularly in the inland region of the Shire. The highest rainfall is usually found along or just east of the cyclone track. The flood potential of a cyclone system is not directly related to its intensity but is associated with its track, speed, aerial extent and saturation of catchments from prior rainfall. Rainfall totals in excess of 100 mm are common with tropical lows that move over land. In February 1997, a slow moving low moving over the west Kimberley, Pilbara and Gascoyne caused rainfall in excess of 400 mm in parts, and one of the highest ever floods along the Ashburton River. Cyclone Joan in December 1975 caused over 400 mm of rain near its track, the highest fall being 591 mm at Marandoo (BoM 2016b).

Flooding is enhanced when multiple tropical lows occur within a few weeks of each other. During January and February 1961 rainfall totals exceeded 200 mm during two tropical cyclones. At Wittenoom it was described as the worst flood in memory as water levels rose to 23 m in sections of the Gorge. In both events Wittenoom was isolated. In 1980 cyclones Amy, Dean and Enid moved over the eastern Pilbara causing total rainfall to exceed 600 mm in some areas (BoM, 2016b).

Flood risk and stormwater in townsites requires management by the Shire. Key stormwater management issues associated with development in the Shire include the management of erosion, silt, sediment, water quality and weeds, particularly in sensitive environments. It is recognised that the red soils of the Pilbara region have a high capacity for erosion. This, coupled with the high volumes of stormwater which flow in the wet season, requires active and effective management to adequately control erosion and sediment transport.

The Shire is responsible for the management of flooding and drainage in the major townsites of Onslow, Tom Price and Paraburdoo. This includes routine maintenance of systems and approval of new systems for new areas of development. Rio Tinto Iron Ore is responsible for the provision of services in Pannawonica.

Anecdotal evidence suggests that there are no significant issues with regards to major event flooding in Tom Price and Paraburdoo; however, some impacts may result from blocked infrastructure. Maintenance typically involves semi-regular removal of vegetation from drains, replacement of old infrastructure (end of life, e.g. rusted corrugated iron pipes), and removal of sediment after big events.

Flood risk is also addressed in section 2.7.2.

2.4.2 Groundwater – resources, availability and use

Groundwater is the major source of water in the greater Pilbara region and thus particularly important to the Shire. Due to the arid climate of the region, highly seasonal and variable rainfall and very high evaporation rates, surface water is not a reliable water resource for users.

The main groundwater resources in the region are contained within karstic dolomites, channel-iron deposits, and mineralised zones in the Hamersley Range, fractured rock aquifers, in channel-iron deposits at Bungaroo Creek and potentially other paleochannels, and in alluvium along the lower river systems along the coast. Alluvial groundwater is generally fresh close to riverbeds and saline further away where they are less well flushed of salts (CSIRO, 2015b).

Groundwater aquifers in the Pilbara region are recharged by direct infiltration of rainwater and from streamflow leaks through riverbeds during surface water flows. The quantity, quality and reliability of groundwater resources depends on the different aquifer types, thus impacts of abstraction from aquifers also vary.

Groundwater is most easily located and accessed near surface water drainage lines or alluvial channels. Aquifers in coastal areas of the Pilbara are considered small, receiving a typical annual recharge of less than 10 GL/year (DoW, 2010b).

Groundwater is critical to biodiversity in the region. It is the source of many small, spring-fed systems and sustains riparian areas along the ephemeral rivers, as well as many significant groundwater dependent ecosystems which have important environmental, social and cultural values. In particular, aquifers provide important habitat for stygofauna and troglifauna. The presence of stygofauna in the Pilbara has been well documented in groundwater dependent ecosystems. The Fortescue System, particularly the Millstream Aquifer, has many identified global stygofauna “hot spots” (Rangelands NRM Coordinating Group, 2005).

The Shire contains a number of important aquifers, including Carnarvon – Birdrong, Hamersley – Millstream, Lower Robe alluvial, Lower Cane alluvial and Lower Bungaroo Valley (Table 5). The Shire is located entirely within the Pilbara Groundwater Management Area, and Ashburton Groundwater Management Subarea, which is proclaimed under the *Rights in Water and Irrigation Act 1914*.

Public drinking water supply

Public drinking water is supplied predominantly from groundwater and the Shire’s Public Drinking Water Source Areas include the Cane River Water Reserve, Millstream Water Reserve, the Harding Dam Catchment Area and Bungaroo Creek Water Reserve, as well as a number of smaller areas as indicated in Table 5 and shown on Figure 9.

Table 5: Public drinking water sources areas in the Shire

PDWSA	Source	Priority	Management Plan	Included in TPS No. 7 Reserve
Bungaroo Creek Water Reserve	Groundwater	P1	Bungaroo Creek Water Reserve Drinking water source protection plan (West Pilbara water supply scheme) (2012)	No
Cane River Water Reserve	Groundwater	P1	Cane River Water Reserve water source protection plan (Onslow Town Water Supply) (1999)	Yes – Cane River water reserve area SCA
Harding Dam Catchment Area	Surface water	P1	Harding Dam water source protection plan (West Pilbara water supply scheme) (1999)	Yes - Public purposes: water & drainage; Millstream Chichester National Park
Millstream Water Reserve	Groundwater	P1 & P2	Millstream Water Reserve Drinking water source protection plan (West Pilbara integrated water supply)	P1: Yes - Public purposes: water & drainage; Millstream Chichester National

PDWSA	Source	Priority	Management Plan	Included in TPS No. 7 Reserve
			scheme) (2010)	Park P2: No
Marandoo Water Reserve	Groundwater	P1	Southern Fortescue & Marandoo Water Reserves Drinking water source protection plan (Tom Price town water supply) (2011)	Yes – Other purposes: infrastructure
Pannawonica Water Reserve	Groundwater	Not assigned	-	No
Paraburdoo Water Reserve	Groundwater	P1 & P3	Paraburdoo Water Reserve Drinking water source protection plan (Paraburdoo town water supply) (2013)	P1: Partial – Public purposes: water & drainage P3: No
Southern Fortescue Water Reserve	Groundwater	P1	Southern Fortescue & Marandoo Water Reserves Drinking water source protection plan (Tom Price town water supply) (2011)	Yes – Borefield SCA

All water reserves are covered by water source protection plans, with the exception of the Pannawonica water reserve which is not yet assigned a category (see Table 5). These water source protection plans provide guidance on the management of risks to the water source and are managed by the Department of Water.

Water for the main towns (Onslow, Tom Price, Paraburdoo, and Pannawonica) comes from a variety of groundwater sources near the towns and is provided by the Water Corporation or mine operators (DoW, 2013), as shown in Table 6.

Table 6: Major water supplies and their sources for the Shire of Ashburton

Water Supply Scheme	Local government area	Water source	Water service provider
Onslow	Shire of Ashburton	Cane River alluvial aquifer	Water Corporation
Tom Price	Shire of Ashburton	Southern Fortescue borefield & Marandoo mine aquifer dewater	Rio Tinto
Paraburdoo	Shire of Ashburton	Paraburdoo wellfield	Rio Tinto
Pannawonica	Shire of Ashburton	Robe River alluvial aquifer	Rio Tinto

The Water Corporation currently hold an allocation license for 15 GL from the Millstream aquifer (DoW, 2013). This is nearly three times the long-term sustainable yield of this resource which is estimated at 5.2 GL/year (DoW, 2010d). Although the licence conditions for Millstream and Harding Dam require the dam to be used as the primary water source for the West Pilbara water supply scheme (supplying Karratha, Dampier, Roebourne, Wickham, Point Samson and Cape Lambert), water supply issues in the dam have required the use of the Millstream aquifer to supplement supply during peak demand periods (see Figure 9, DoW, 2013).

The State Government reached an agreement with Rio Tinto to develop an extra 10 GL/year groundwater source from the Lower Bungaroo Valley. This water is used to supplement the Water Corporation's West Pilbara Water Supply Scheme and reduce the reliance on Millstream aquifer.

At present the Lower Cane alluvial aquifer supplies water via a pipeline to Onslow. While plans had recently been developed to treat saline groundwater in the coastal Carnarvon – Birdrong.

aquifer via desalination to provide additional drinking water for Onslow, and for gas processing, (CSIRO, 2015a), these have recently been placed on hold due to higher than expected freshwater production from the Lower Cane alluvial aquifer.

Rio Tinto Utilities owns and operates the water supply schemes for Tom Price, Paraburdoo and Pannawonica. The company is licensed under the *Water Services Licensing Act* (1995) to supply potable and wastewater services to these towns, as well as Dampier in the Shire of Roebourne. Tom Price, Pannawonica and Paraburdoo are supplied with water from bore fields in shallow alluvial aquifers and supply is not currently considered to be at capacity. Groundwater management is administered by Rio Tinto through Groundwater Operating Strategies which are agreements between the Department of Water and Rio Tinto detailing abstraction and monitoring requirements and reporting by both parties.

Groundwater availability

Information on groundwater availability for some aquifers within the Shire is presented in the Department of Water's Pilbara groundwater allocation plan (DoW, 2013).

Table 7 provides information on the committed allocation and remaining volume of groundwater resources within the Shire in the Ashburton groundwater subarea (data requested from DoW 22nd June 2016). Groundwater used for stock and domestic purposes at pastoral stations is exempt from groundwater licensing.

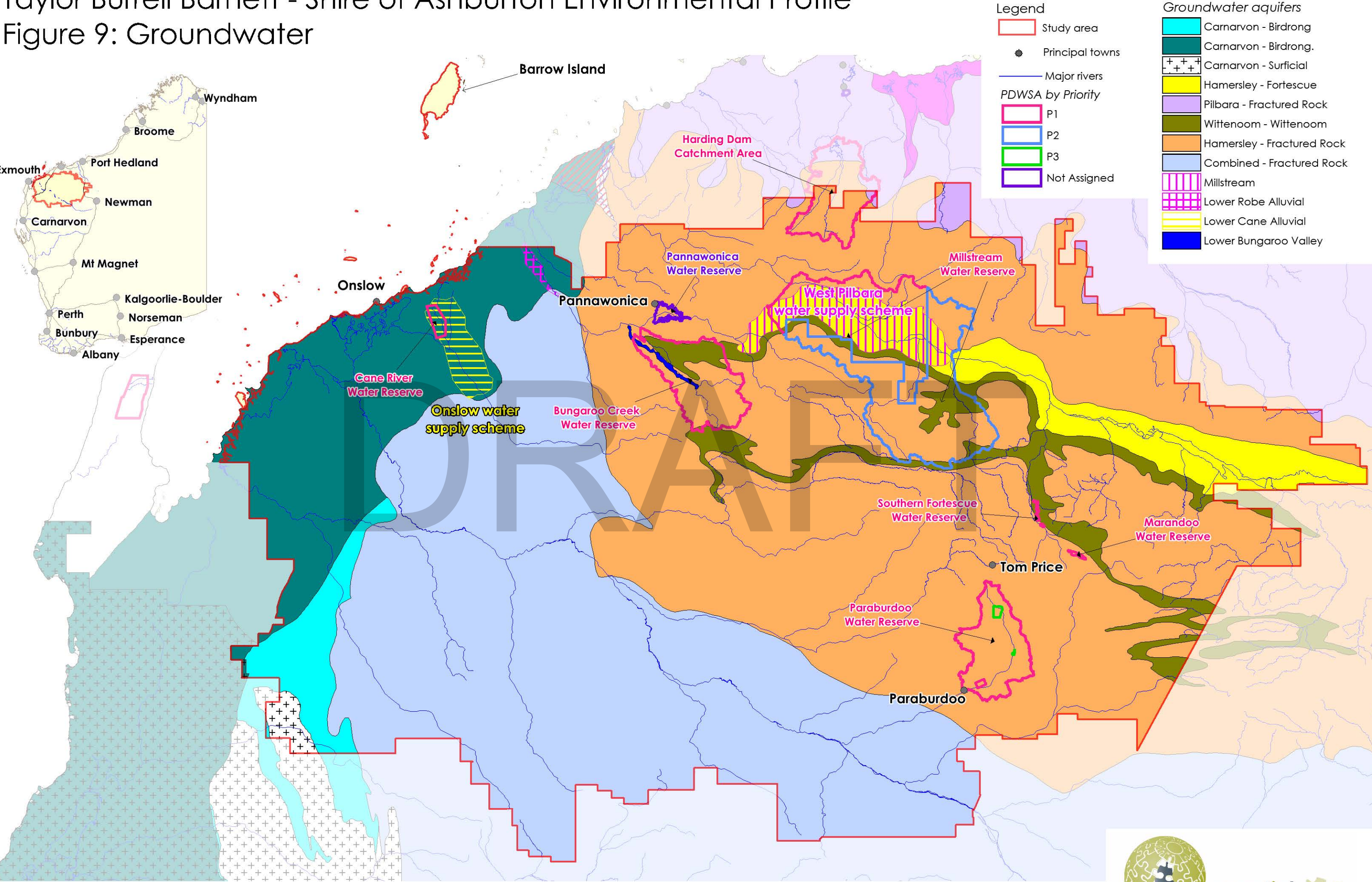
Table 7: Groundwater resource and allocation limits (source: DoW, June 2016)

Aquifer	Allocation Limit	Allocated Volume	Committed Volume	Remaining Volume	% Allocated and Committed	Additional Requested
Carnarvon - Birdrong	100,00	2,400	0	97,600	2.40 %	10,000
Carnarvon – Birdrong.	1,500,000	1,220,000	0	280,000	81.33 %	0
Carnarvon - Surficial	2,000,000	1,858,570	0	141,430	92.93 %	12,000,000
Hamersley – Fortescue	Not set	127,544,000	0	-	0 %	0
Pilbara – Fractured Rock	Not set	15,994,320	0	-	0 %	0
Wittenoom – Wittenoom	19,980,000	10,155,500	0	9,824,500	50.83 %	0
Hamersley – Fractured Rock	Not set	334,356,615	0	-	0 %	15,922,000
Combined – Fractured Rock	Not set	3,303,270	0	-	0 %	20,000
Hamersley - Millstream	682,500*	585,500	0	97,000	85.79 %	0
Lower Robe Alluvial	3,000,000	0	0	3,000,000	0 %	0
Lower Cane Alluvial	92,5000	0	0	92,5000	0 %	0
Lower Bungaroo Valley	0	95,000	0	-95,000	0 %	0

*15 GL/yr is the maximum amount that can be taken from Water Corporation's borefield, provided management conditions are met and Harding Dam cannot be used. The long-term reliable allocation is an average of 5.2 GL/yr.

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Figure 9: Groundwater



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Mining and irrigated agriculture

The mining industry is the dominant water user in the region with mining operations, mine dewatering and other related water uses (including minesite and exploration camp irrigation and residential water uses) accounting for over 80% of total water licenced for use in the region compared with just 9% used for public drinking water supply and other industries respectively (Chart 4) (DoW Water Register, 2013).

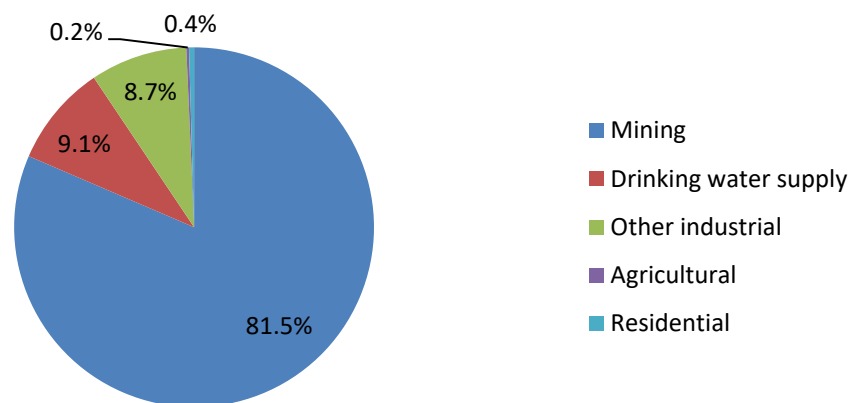


Chart 4: Breakdown of water licensing in the Pilbara (Source: DoW Water Register, 2013)

It is estimated that 'mining related uses' such as transportation, infrastructure projects and residential water use on minesites and exploration camps collectively accounts for around 30% of total mining water licensing, whilst mine dewatering is the biggest single water use accounting for approximately 40% of licensed water use alone (Chart 4) (DoW Water Register, 2013).

Mine dewatering is managed under the *Rights in Water and Irrigation Act 1914* to minimise adverse impacts of the abstraction and release of water. Part V of the *Environmental Protection Act 1986* also manages the discharge of mine dewater to ensure receiving water bodies are not degraded.

A number of studies have been undertaken throughout the Pilbara to assess long-term use and security of groundwater resources for potential expansion of irrigated agriculture in the region.

The Pilbara Water Discovery project, funded by the Royalties for Regions program, is a four year study involving electromagnetic surveys to determine the viability of agricultural expansion in the region, as part of the Department of Water's Water for Food program. Collection of survey data and associated test drilling will be completed in 2016.

In addition, the *Pilbara surplus mine dewater options and feasibility study*, also funded through Royalties for Regions, was completed to assess the availability and possible use of surplus mine dewater to supply irrigated agricultural enterprises in the Pilbara. The Department of Water has confirmed the availability of surplus mine dewater in relation to prospective irrigation precincts in nearby locations where viable soils are concentrated, particularly in the central and eastern Pilbara, and potentially in the very east of the Shire in the Harmersley Range (DoW, 2015).

Surplus water from below water table mining at Rio Tinto's Marandoo mine is currently being used in an irrigated agriculture scheme known as the Hamersley Agricultural Project 45 km north east of Tom Price. Water from the Marandoo below water table expansion is being used to irrigate areas of Hamersley station and produce hay to feed cattle across six stations (Rio Tinto, 2012). However, some concern regarding the production of the non-native grass using recycled water from Marandoo exists.

2.4.3 *Alternative water supply and water efficiency*

While water recycling schemes are not widespread in the Shire, a number of schemes are being implemented in the region in recognition of the need to facilitate growth in townships whilst conserving existing town drinking water supplies.

The Shire of Ashburton was declared a Waterwise Council in 2014 and maintained its status 2015, with the aim of continuing to work towards improving water efficiency in Onslow in particular. The Shire has developed a Waterwise demonstration garden in Onslow and a 'Waterwise Garden Guidelines' information pack for the Onslow community to promote water efficiency.

A wastewater recycling scheme is also being investigated in Onslow to provide a fit-for-purpose alternative water source for irrigation of public open space and parks, and potentially drought-proofing Onslow's landscape. In addition, wastewater from Onslow Airport will be treated and recycled to irrigate the airport's waterwise garden.

Surplus water from below water table mining at Rio Tinto's Marandoo mine is also to be reinjected to the Southern Fortescue borefield to replenish the aquifer which supplies the Tom Price township (DoW, 2011). Similarly, surplus water from the nearby Nammuldi mine (60 km north west of Tom Price) is also being used for irrigated agriculture projects at nearby stations. Seeding of Rhodes grass for the Nammuldi Agricultural Project began in April 2014.

2.4.4 *Key strategic environmental planning issues for consideration*

Key water resource considerations for strategic planning, consistent with *State Planning Policy 2.9: Water Resources* are:

- **Flooding from stormwater** - Adequately manage the risk of flooding, and consequences particularly associated with sediment transport management, in townsites and industrial areas through application of *State Planning Policy 2.9: Water Resources*. The Shire may also need to review existing townsite drainage systems and ensure appropriate levels of service will be maintained as development occurs (such as at Onslow Airport).
- **Public drinking water sources** – There are a number of important water sources which provide water for public supply within the region. Although most of these public drinking water sources are protected in the existing planning scheme, consideration should be given to the reservation and/or use of a special control area to improve their level of protection in future, particularly in relation to Bungaroo Creek water reserve. Planning decision-making should be consistent with the DoW's *Water Quality Protection Note: Land Use Compatibility within Public Drinking Water Source Areas* (2016) in the vicinity of any drinking water borefields, including the requirements for well-head protection zones.
- **Groundwater availability** – although allocation currently remains in some aquifers and investigations into available groundwater supplies are continuing, declining rainfall in coastal areas may result in reduced recharge and consequently availability in these areas in the future, particularly as population and industry expands. Dewatering/over-abstraction have also impacted local groundwater levels, potentially affecting groundwater-dependent pool ecosystems and wetlands through drying up and loss of habitat. This in turn can impact wildlife and cultural and social values. This is especially critical given the presence of nationally important wetlands in the Shire. Therefore groundwater allocations and availability require consideration of these values when planning for residential and industrial expansion.
- **Water use efficiency**- It is recognised that the Shire is a Waterwise Council. It should continue to investigate and expand water efficiency opportunities, such as irrigation of public open space and sports ovals where practical.

- **Water reuse** – Due to increasing demand for water associated with residential growth and industrial expansion, it is considered that water recycling and reuse to provide fit-for-purpose sources of water should continue to be investigated in Onslow and other townsites where practical, as an alternative to groundwater use. This will require cooperation with the Water Corporation and Rio Tinto. In addition, reuse of mine dewater for irrigation of agricultural projects should continue to be investigated where practical.
- **Contamination of water resources** - Landfill sites are a potential source of pollutants to ground and surface waters. These land uses, and others with the potential to pollute ground and surface waters must be carefully located, designed, managed and monitored to avoid impacts.

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2.5 Biodiversity

The Shire is characterised by a diverse range of terrestrial, aquatic and coastal landscapes, flora and fauna. In order to better understand the terrestrial and aquatic biodiversity, a bioregional framework was developed by the Commonwealth and State governments, which divides the country into Interim Biogeographical Regions and bio-subregions.

The Shire contains eight Interim Biogeographic Regionalisation for Australia (IBRA) subregions: Cape Range, Ashburton, Hamersley, Chichester, Fortescue and Roebourne, with small portions of Augustus and Wooramel. Vegetation types in these regions are predominantly scrub, shrub-, low tree-, and grass-steppe, and grassland, with small amounts of samphire, tidal mudflats and mangroves located in coastal region (see Figure 10). A more detailed description of the bio sub-regions in the Shire is found in section 3.2 of the *Pilbara Framework: Regional Profile* (WAPC, 2009) and in the DPaW's *Biodiversity Audit* (CALM, 2003).

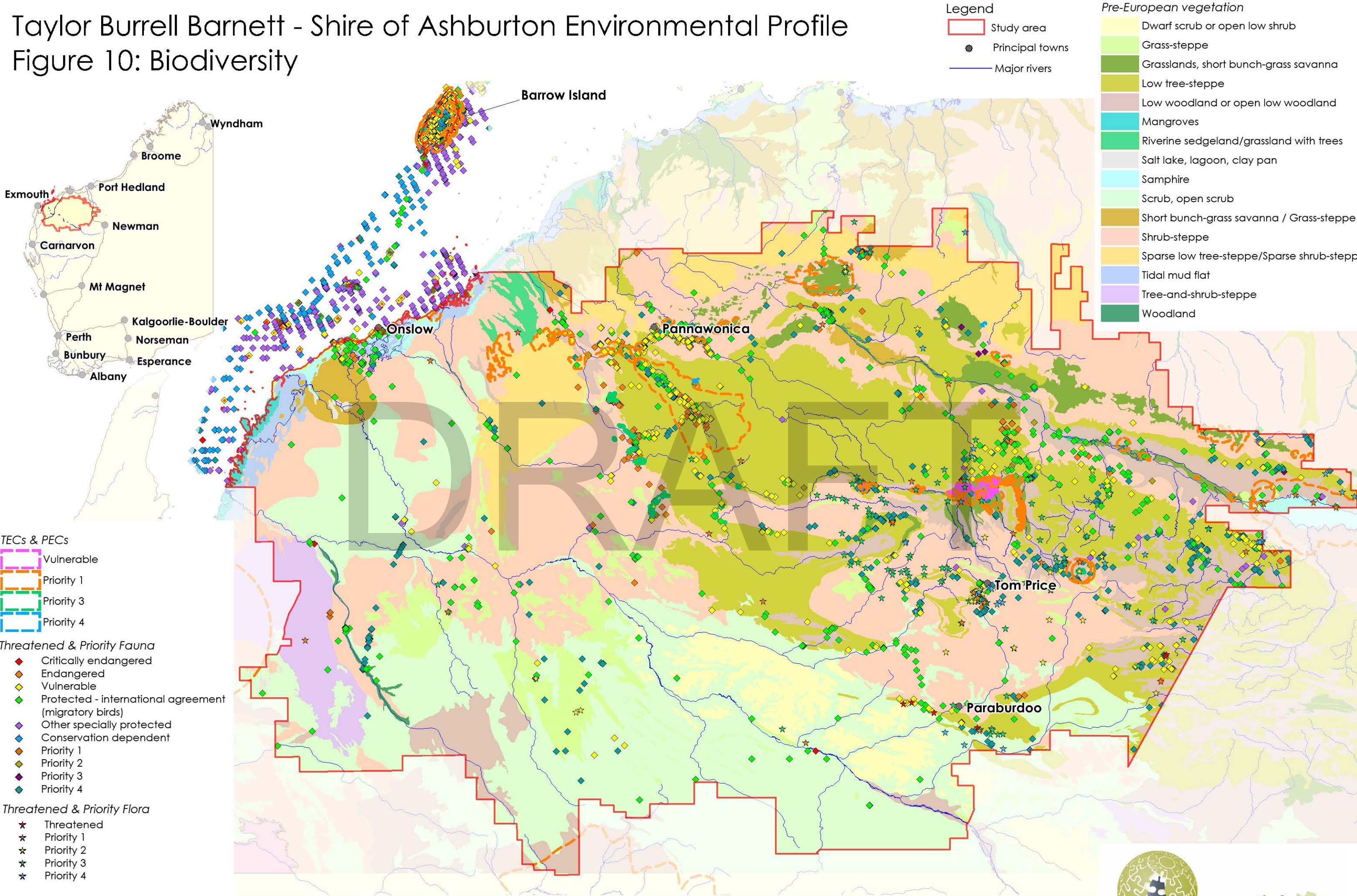
Western Australia's conservation reserve system plays a pivotal role in conserving WA's biodiversity, which is both rich and exhibits a high degree of endemism (i.e. plants and animals occurring nowhere else (CALM, 2003). *Australia's Biodiversity Conservation Strategy 2010-2030* (DSEWPaC, 2010) contains objectives to 'maintain the extent of habitat' and 'create nature reserves or conservation management agreements on public and private land'. Conservation reserves account for approximately 17 per cent of land tenure in the Shire of Ashburton and include Barlee Range Nature Reserve, Cane River Conservation Park, Karijini National Park, Millstream-Chichester National Park, and Mungaroona Nature Reserve, as well as a number of offshore island nature reserves including Barrow Island and Thevenard Island (Table 8, Figure 11).

Table 8: Terrestrial conservation reserves in the Shire of Ashburton (Source: DPaW, 2016)

Type of reserve	Name of reserve	Area (km ²)
National parks	Karijini National Park	6,683
	Millstream-Chichester National Park	2,413
Conservation parks	Cane River Conservation Park	3,334
Proposed Conservation Parks	West Hamersley Range Conservation Park	-
	Mulgandals Conservation Park	-
Nature reserves	Mungaroona Range Nature Reserve	1,061
	Barlee Range Nature Reserve	1,072
	Barrow Island Nature Reserve	253
	Tent Island Nature Reserve	19
	Thevenard Island Nature Reserve	6.2
	Boodie, Double Middle Islands Nature Reserve	5.5
	Serrurier Island Nature Reserve	3.1
	Little Rocky Island Nature Reserve	3.1
	Burnside & Simpson Island Nature Reserve	1.3
	Bessieres Island Nature Reserve	0.5
	Y Island Nature Reserve	0.4
	Locker Island Nature Reserve	0.3
	Airlie Island Nature Reserve	0.3
	Great Sandy Island Nature Reserve	0.2
	Victor Island Nature Reserve	0.2
	Gndaroo Island Nature Reserve	0.05
	Round Island Nature Reserve	0.03
	Rocky Island Nature Reserve	0.02
	Whalebone Island Nature Reserve	0.007
Former leasehold	Reserve Ex. Wanna Station	1,446
TPS No. 7 conservation reserves		992
Total conservation areas		17,295

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Figure 10: Biodiversity



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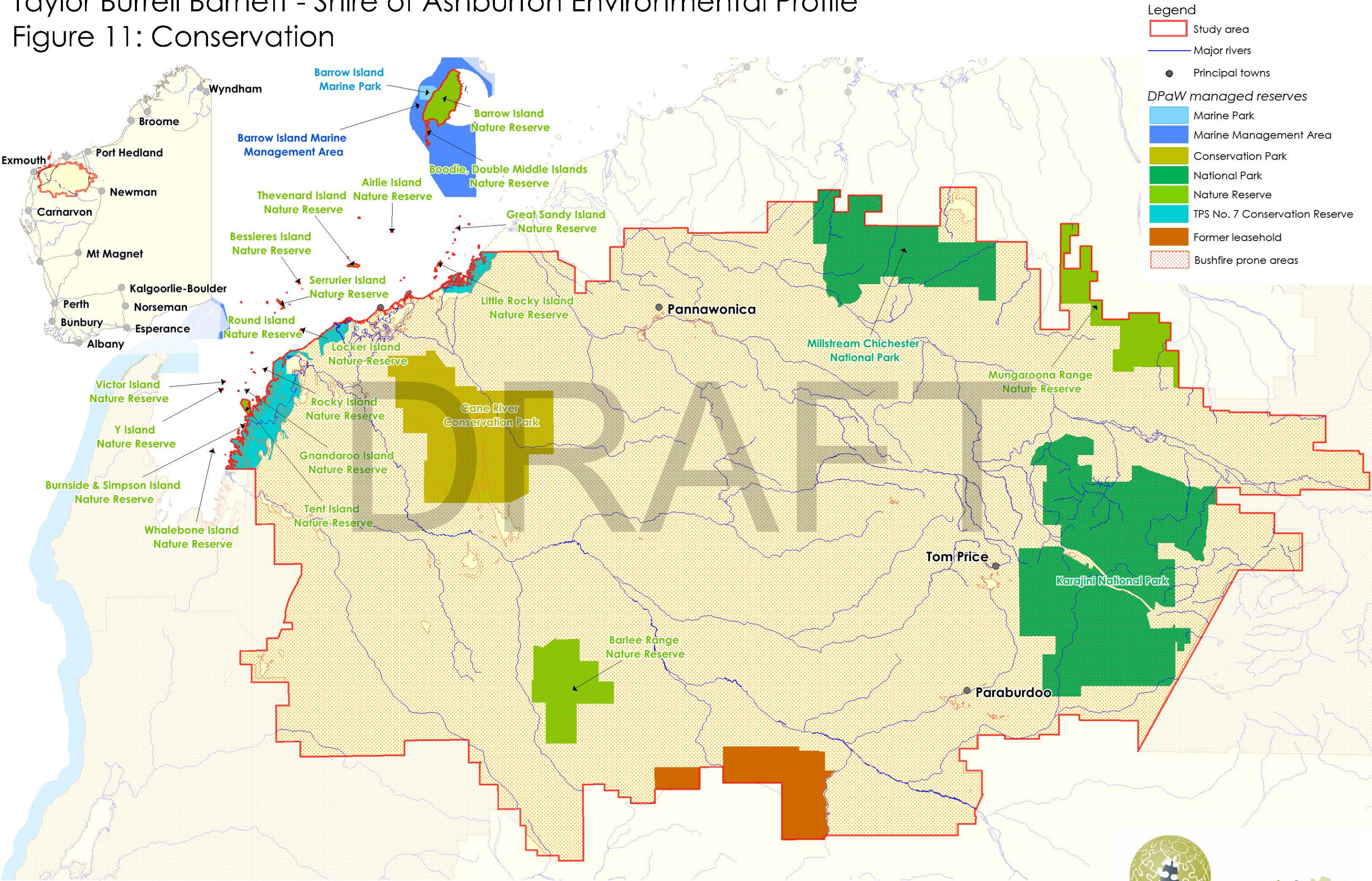


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Figure 11: Conservation



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It is noted that the Shire has reserved a number of areas along the coast for conservation in the local planning scheme, primarily in the intertidal area, which contain environmentally sensitive mangrove communities.

The state government has purchased a number of former leaseholds throughout the southern rangelands to expand the state's conservation system. In the Shire this included Ex. Wanna Station (DPaW, 2013a). A new terrestrial conservation reserve has also been planned for the Shire of Ashburton, the proposed West Hamersley Range Conservation Park. A small portion of the proposed Mulgalands Conservation Park, most of which is situated in the Shire of East Pilbara, is also located in the very east of the Shire of Ashburton.

The Hamersley Ranges are a nationally recognised Biodiversity hotspot. They contain numerous endemic mammals, reptiles and plants, and their gorges have been described as 'valuable refuge for plant species', as their topographical location generally protects them from fire (Rangelands NRM, 2010).

The Pilbara Corridors' Conservation Action Planning (CAP) process is now underway and will identify priorities and establish working groups to implement management actions. The CAP process aims to develop and maintain a collaborative, long-term conservation strategy for the Pilbara Bioregion.

2.5.1 Remnant vegetation

Removal of native vegetation is a major process threatening biodiversity in the region. The loss of habitat area through clearing is currently the primary cause of declines in species and populations worldwide (EPA, 2007). Forms of degradation include burning, over grazing, fragmentation, and draining/flooding of land, which can result in the removal of native vegetation and degradation or loss of ecosystems.

Fragmentation of the landscape occurs as a result of removal of large areas of native vegetation, leaving behind small and unconnected remnant bushland. Fragmentation of landscapes also occurs as a result of the construction of large linear infrastructure such as railways and pipelines. Many flora, fauna and communities become threatened as a result of fragmentation, often resulting in diminished biodiversity and extinctions in some areas.

Change in tree cover across the Shire reflects overall removal of remnant vegetation by processes including bushfire, land clearing and other degradation (although bushfire is recognised as having the most significant impact). Data provided in 'Australia's Environment in 2015' (ANU, 2016) indicates that tree cover was approximately 0.5% in 1972, and has fluctuated between 0.2 and 0.5% between 1972 and 2015, with a decrease of approximately half of the area of tree cover since 2012, as shown in Chart 5 below. This is equivalent to a loss of approximately 252 km² of tree cover in the Shire. It is noted, however, that the native vegetation of the majority of the Shire comprises grassland, shrubland, and low tree steppe and thus the low percentage of tree cover reflects this.

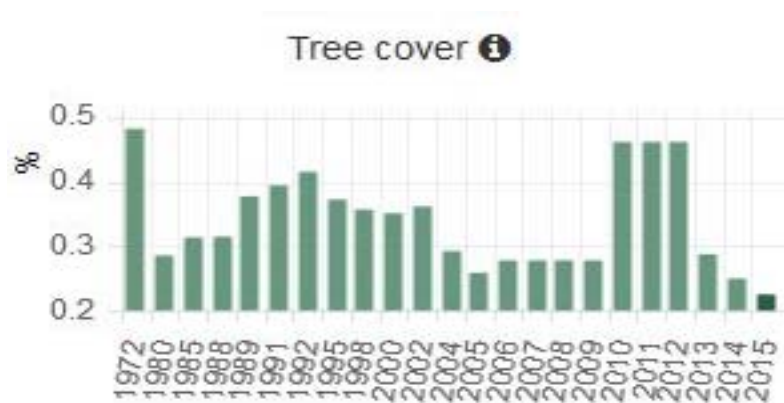


Chart 5: Tree cover (%) in the Shire of Ashburton (Source: ANU, 2016)

2.5.2 Protected flora, fauna and ecological communities

At the Commonwealth level, flora, fauna and ecological communities may be recognised as matters of national environmental significance and are protected under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act), 1999, administered by the Department of the Environment. The categories of threatened flora and fauna protected under the EPBC Act are (i) extinct in the wild (ii) critically endangered, (iii) endangered and (iv) vulnerable. An additional category of “conservation dependent” exists, which requires special consideration but is not protected under the EPBC Act.

The Commonwealth lists a number of matters of national environmental significance in the Shire including 37 threatened species and 36 migratory species. The threatened species listed under the EPBC Act include the critically endangered bar-tailed godwit (*Limosa lapponica baueri*), and short-nosed seasnake (*Aipysurus apraefrontalis*) (see Appendix 2 for the full listing).

A search of the Department of Parks and Wildlife (DPaW) Threatened Species data base revealed 48 species of rare fauna, including the night parrot, short-nosed seasnake, leaf-scaled seasnake, the loggerhead turtle, and the northern quoll; six specially protected fauna species (including the dugong and whale shark), 30 Species protected under international agreements and 27 species of priority fauna which are known to occur in the Shire (Figure 10).

The DEC Threatened Species data base also contained two listings of declared rare flora (*Aluta quadrata* and *Thryptomene wittweri*) as well as 122 species of priority flora. The Shire of Ashburton contains 20 Priority Ecological Communities and one Threatened Ecological Community, the Themeda grasslands which is dominated by the perennial Themeda (kangaroo grass and many annual herbs and grasses) and exists to the north west of Tom Price. In addition, Beadon Creek near Onslow and other coastal mudflat areas are likely to support mangrove and samphire communities which are of interest to the Environmental Protection Authority (EPA) as benthic primary producer habitat as well as nursery, feeding and breeding grounds for marine fauna. See *EPA Guidance Statement No. 1 – Tropical Arid Zone Mangroves along the Pilbara coastline*, April 2001, for further information.

Flora and fauna is also protected at the State level under the *Wildlife Conservation Act 1950*, administered by DPaW. The *Wildlife Conservation (Specially Protected Fauna) Notice, 2010* recognises four categories of Rare and Endangered fauna taxa, and the *Wildlife Conservation (Rare Flora) Notice 2012* recognises two categories of rare flora. In addition, DPaW also classifies flora and fauna under five different Priority codes, with different management requirements.

DPaW have recorded a number of threatened species in the Shire which are summarised in Table 9 and listed in Appendix 2.

Table 9: Threatened and priority flora and fauna in the Shire of Ashburton (DPaW, 2016)

Conservation Status (<i>Wildlife Conservation Act, 1950</i>)	No. fauna species	No. flora species
Threatened – Critically endangered	3	-
Threatened – Endangered	4	1
Threatened – Vulnerable	41	1
Protected under international agreement	30	-
Other specially protected fauna	6	-
Priority 1	4	29
Priority 2	6	24
Priority 3	3	58
Priority 4	14	11
Total	111	124

2.5.3 Offshore islands

The Shire of Ashburton also contains a number of offshore islands, which are part of the chain of Mackerel Islands that provide important marine habitat and marine resources including petroleum. Barrow Island is the second largest island in Western Australia with an area of 202 km². It is a Class A nature reserve designated for the “Conservation of Flora and Fauna” and is surrounded by the Barrow Island Marine Park and Barrow Island Marine Management Area (Figure 12). The Barrow Island nature reserve is considered one of the most important conservation reserves in the State due to its importance as a biological refuge. The island is home to 22 endemic species of mammal, reptile, bird and subterranean fauna (DPaW, 2015), many of which are considered threatened fauna (20 taxa) because they are not found on the mainland (EPA, 2007). Both Barrow Island and Thevenard islands are subject to mining activity associated with Chevron’s Gorgon LNG project.

2.5.4 Aquatic ecosystems

Stygofauna are animals that live permanently in groundwater systems, in habitats ranging from minute spaces between sand grains to pools and streams in caves (DPaW, 2016). Troglifauna occur in humid air chambers in underground caves or other smaller voids (EPA, 2003). Most stygal and troglobitic species in Western Australia are invertebrates, although stygal fish and troglobitic snakes do occur in subterranean caves. Crustaceans form the richest group of stygofaunal invertebrates, with the greatest biogeographic significance (EPA, 2003).

Many of these animals have been shown to be endemic to the Pilbara region with highly restricted short range distributions, with some stygofauna even limited to single aquifers. In addition to being endemic, many species have considerable scientific importance and conservation significance because they appear to represent links to the time when Australia was part of Gondwanaland (EPA, 2003). Some studies suggests that stygofauna have important ecosystem service functions, such as the maintenance of water quality in groundwater aquifers (EPA, 2003), which provide the majority of the Pilbara’s water supply.

Members of two amphipod stygofauna families, the Melitidae and Paramelitidae, have been extensively collected and documented in the Pilbara mainland as well as Barrow Island (King, 2011). The biology and habitation of stygofauna was also a major focus of the seven year *Pilbara Region Biological Survey 2002-2012* (DPaW, 2013) (Plate 2). As part of this survey, stygofauna found in over 500 bore sites and 20 wetland springs in the Pilbara region were documented from sites representing a cross section of the Pilbara's major geological features and groundwater types (DPaW, 2016). Results from the survey indicate that the region is incredibly rich in aquatic invertebrates and over 300 new species of stygofauna were recorded. The permanent pools and streams of Millstream Chichester National Park are considered a particular hotspot for stygofauna and as a result, are recognised as containing a Priority Ecological Community (Science Network WA, 2012).

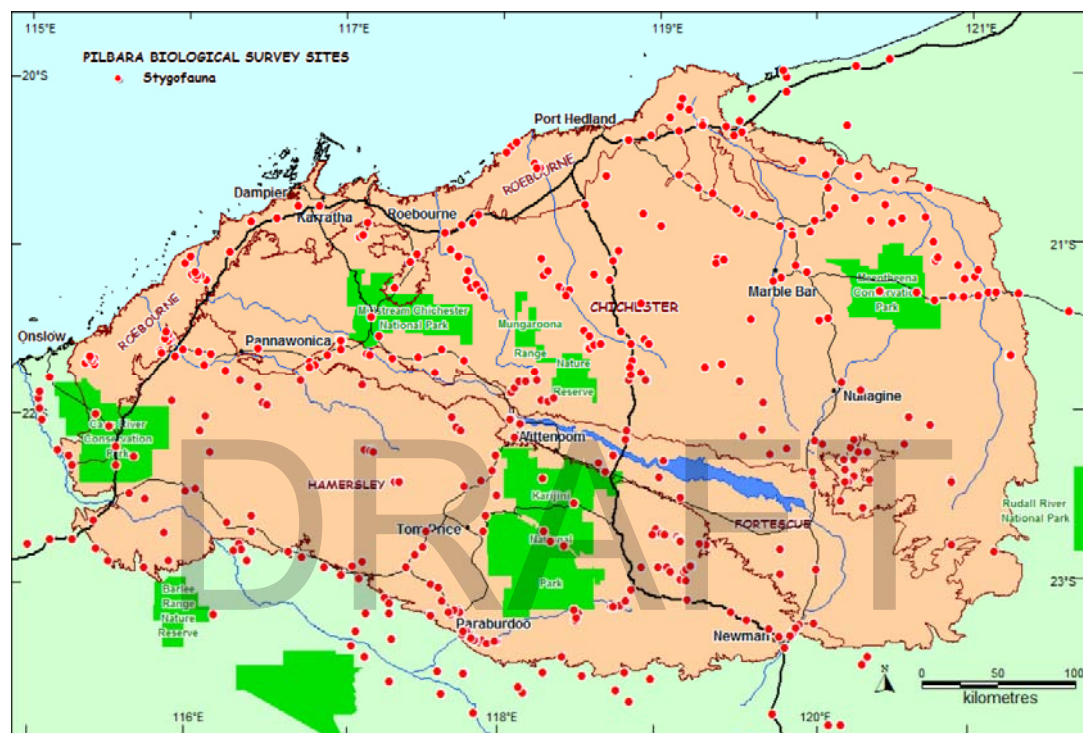


Plate 2: Location of bores sampled for stygofauna during the DEC's Pilbara biological survey in the Pilbara and adjacent IBRA regions

2.5.5 Key strategic environmental planning issues for consideration

Key biodiversity considerations for strategic planning are:

- **Biodiversity** – the Shire is well known for its impressive terrestrial, marine and aquatic biodiversity. A significant proportion of the Shire's biodiversity is protected in a number of conservation areas. No Biodiversity strategy has been prepared for the Shire.
- **Management of conservation areas** – While conservation reserves are managed by the Department of Parks and Wildlife, the Shire may consider active management of the following issues to assist in conservation and protection of biodiversity:
 - o **Uncontrolled access** – which leads to direct loss of biodiversity as well as impacts from rubbish dumping, weeds and bushfires.
 - o **Weeds** - many Shire reserves with high biodiversity values have aggressive weeds such as parkinsonia and mesquite, which require management, particularly in highly disturbed areas.
 - o **Feral animals** - feral animals, especially goats, camels, rabbits and foxes, have a major impact on the native flora and fauna.

2.6 Coastal environment

The coastal environment of the Shire of Ashburton contains a variety of landscapes and land forms, including deltas (such as the Ashburton River delta), wide intertidal mudflats, mangroves, dunes, and long stretches of sandy beach (Figure 12). This variety of coastal habitat types is due to the changing depositional and erosional coastal processes operating along the Pilbara coast. These land and seascapes support a wide variety of marine and terrestrial biodiversity, much of which is recognised at a national level. Seagrass meadows are also prevalent along the Shire coast, and provide habitat and breeding grounds for many forms of marine life.

Intertidal mudflats are a key feature of the mainland shores of the region. As the coast is largely low-lying with extreme tidal ranges, the extensive mud flats are usually exposed at low tide (Nayton, 2011). The flats are well recognised as supporting rich and diverse invertebrate communities and shorebirds including samphire. The mudflats in most cases are bordered by tropical arid-zone mangroves that are of international scientific importance, providing nursery and habitat for commercial fish species, increased inshore productivity, marine nutrient resources, sediment trapping and protection from coastal erosion. Sandy beaches also provide nesting sites for sea turtles and sea birds.

The major activities that occur within the coastal and marine environment of the Shire include recreational activities such as camping, boating, fishing, swimming, diving and 4WDing, as well as commercial fishing and activities associated port facilities.

2.6.1 Offshore islands

The environmental values of the Pilbara coastline and offshore and barrier islands are well known and some of these areas are considered to be the most biologically diverse in the state. Some of the key environmental assets in the coastal and marine areas of the Shire include:

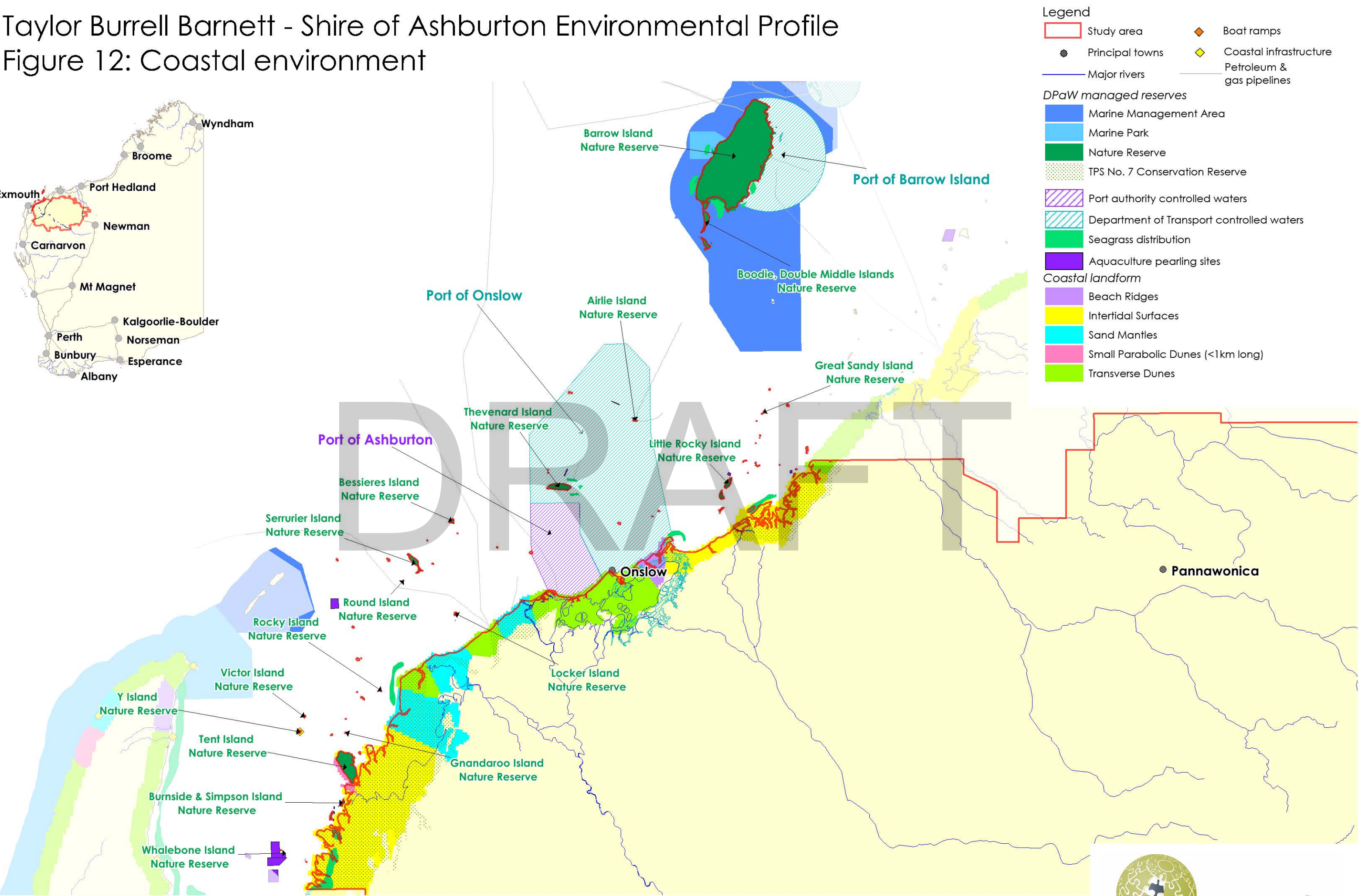
- seagrasses & algal beds that support a diverse fauna of herbivorous fish, marine turtles and dugong (benthic primary producer habitat);
- well established and species-rich coral reefs;
- important and protected marine species including sea turtles, dugong, marine mammals (whales and dolphins), colourful invertebrate communities, seabirds and waders/shorebirds and marine reptiles;
- important nesting sites for turtles and migratory seabirds; and
- faunal refuges from mainland impacts.

In particular, Barrow and Thevenard Island groups and surrounding marine areas are particularly significant due to their unique biodiversity and the external pressures presented from expansion of the off-shore petroleum industry. They have significant value to the resource industries as locations for port and processing facilities and these can clash with the environmental values of the region.

Barrow Island is one of Australia's leading producers of oil after it was discovered in commercial quantities in 1964 and has supported ongoing production of crude oil from oil fields located on the island since 1967. Oil tankers are filled by a submarine pipeline that extends 10 km offshore. Approval for construction of the Gorgon gas processing hub in 2009 has seen Barrow Island further influenced by development pressures. The gas processing plant on the island is currently facilitating development of the Greater Gorgon gas field approximately 40-110 km to its north. The Port of Barrow Island (Figure 12), controlled by the Department of Transport, is the major site for vessels to import and export resources and supplies to Barrow Island, the Gorgon gas field and surrounding operations.

Taylor Burrell Barnett - Shire of Ashburton Environmental Profile

Figure 12: Coastal environment



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Scale 1: 750,000 @ A3

0 30 km



essential environmental

Wheatstone is a liquefied natural gas (LNG) plant under construction in the Ashburton North Strategic Industrial Area (ANSIA), being developed by Chevron on the Shire coast approximately 11 km south-west of Onslow. The first LNG is expected to be processed by mid-2017. ANSIA and the Port of Ashburton (managed by the Pilbara Ports Authority) provide the industrial land and transportation facilities to export gas for both the Wheatstone LNG and nearby Macedon domestic gas project (developed by BHP Biliton). The Port of Onslow (managed by the Department of Transport) at Beadon Creek is used more generally as a maritime facility for the resources sector, fishing and charter vessels.

The Mackerel Islands is another group of islands, located approximately 20 km off the coast of Onslow that abound with tropical marine life and habitat. Two of the major islands, Thevenard and Direction Island, have been leased for tourist accommodation facilities since 1968. Thevenard Island (classified as a Nature Reserve) has also been the hub from which crude oil from Chevron-operated offshore petroleum reservoirs is processed and readied for shipment by ocean tankers to Australian refineries since the late 1980s.

In addition, oil and gas processing facilities have been operational on Airlie Island (managed by Apache) since the late 1980s. Oil and gas facilities on and offshore Thevenard Island are currently in care and maintenance mode, and are expected to be decommissioned from 2016. Onshore decommissioning and remedial work is expected to take two years.

Projected increases in shipping demand for port facilities is expected as large scale oil and gas projects increase their production and export. This means that effective management of dredging activities, construction of land based infrastructure, and installation of subsea infrastructure, will become critical in the near future in order to ensure that impacts on coastal and marine values in the Shire are minimised.

Dredging often results in the loss of benthic primary producer habitat such as mangroves, seagrasses and algal beds. Degradation of the marine environment may also occur as a result of industrial discharge or accidents (oil spills) from adjacent industrial and mine processing sites, wastewater treatment plants or vessel traffic. Potential threats are also thought to occur from acoustic pollution, excessive lighting (to which nesting and hatching turtles are very sensitive), and aquaculture, which may restrict feeding grounds and interfere with preferred travel routes of marine life. There are major implications for the coastal and marine environment if degradation pressures continue. Marine ecosystems will become more fragmented and less equipped to adapt to changing conditions, such as the effects of climate change (EPA, 2007).

The *Barrow Island Act 2003* was ratified to authorise the implementation of an agreement between the State government and the Gorgon joint venturers to undertake offshore production of natural gas on Barrow Island. The agreement regards the need to minimise environmental disturbance on Barrow Island and provide support for conservation programs relating to Barrow Island and other areas. As part of the environmental approvals process, the Gorgon Joint Venture participants agreed to fund a series of conservation initiatives. Draft Environmental Assessment guidelines for Protecting the Quality of Western Australia's Marine Environment were developed by the EPA in 2014, and provide a basis for management of marine environmental quality in WA, including discharge regulation, the environmental management of ports and marinas, and environmental quality management in marine parks and reserves.

2.6.2 Fishing

Commercial fishing is an important industry in the Shire, with the major regional fisheries including: Onslow Prawn Managed Fishery, Pilbara Trap Managed Fishery and the Pilbara Trawl Managed Fishery. A small pearling industry is also based in the waters around Onslow.

Substantial closures of trawling fisheries in coastal and offshore waters were introduced to manage impacts of finfish trawling by Australian vessels (subject to Ecologically Sustainable Development requirements under the EPBC Act 1999). However, trawling is still permitted in a small number of limited locations. Spanish mackerel fishing occurs from vessels around reefs shoals and headlands. The catch has more than doubled since 2009 in the bioregion. The Department of Fisheries *State of the Fisheries Report 2014/15* notes that stock levels of Pearl Oysters and Onslow/Nickol Bay Prawns are currently adequate.

Pearl Oyster industry was classified by the Department of Fisheries as having a 'low' ecological risk, while prawning and finfish (Spanish Mackerel) were classified as 'moderate' in 2014/2015. Introduced pests and species were classified as a 'high' current risk status of impacting the Bioregion, while Climate and Oil & Gas Development Activity were both classified as 'low' risk.

The only fisheries in the region that have reported any interactions with Endangered, threatened and protected species (cetaceans, dugongs, marine turtles, sea snakes, elasmobranchs, seahorses and pipefish, crocodiles, seabirds and migratory shorebirds) are the two trawl fisheries, the Onslow Prawn Managed Fishery (OPMF) and the Nickol Bay Prawn Managed Fishery (NBPMF) (as well as Gillnet Barramundi Fishery). However, interactions are few due to use of bycatch reduction devices and separation of trawling activities from most protected species' primary habitat.

Aquaculture development is dominated by pearling. Establishment of an aquaculture zone is being considered by the Department of Fisheries. The establishment of an aquaculture zone would streamline the processes for commercial projects, leading to the development of further aquaculture operations in the region. Marine production of barramundi is also in development.

Recreational fishing experienced significant growth in 2014/2015, with a seasonal peak occurring in winter when tourists swell the local population. Angling fishing is boat-based, and small boat fishing occurs in creeks, mangroves, rivers and ocean beaches.

Recreational fishing is managed through size and catch limits based on risk categories for various species. In addition, the Department of Fisheries is able to monitor the intensity of recreational fishing through the recent change to licensing of recreational boat users. A large proportion of the Pilbara community own or have access to a boat and undertake recreational fishing. Although recreational fishing activities are likely to continue as population increases, the overall population of the Pilbara is still fairly low and their impact on fish stocks is considered to be manageable (*State of the Fisheries Report 2014/15*, DoF, 2015).

2.6.3 Ports

The Port of Ashburton in ANSIA is a relatively recent addition to the Pilbara region, only formally vested to the Pilbara Ports Authority in December 2011. The Port of Ashburton is a multi-user port with common infrastructure to support the export of LNG and downstream hydrocarbon products. The coastal area and port remain Crown Land with a Reserve for Port purposes. Chevron Australia is using the port facilities at ANSIA as part of their Wheatstone LNG Project.

The main boat harbour in the Shire is at Beadon Creek near Onslow, with plans to expand in the near future. A number of boat launching ramps are also located around Onslow for use by the community. While there is significant commercial and recreational activity around Onslow, the remainder of the Shire's coastal zone is sparsely settled and is generally used for pastoral activities.

2.6.4 *Tourism and coastal camping*

There are currently no designated sites for coastal camping in the Shire of Ashburton. However, some camping is known to currently occur at the mouth of the Ashburton River and along other areas of the coast. Impacts from recreational use of the coast are increasing, with greater numbers of people having access to the coast, seeking off road experiences, camping, boating and fishing.

Concerns identified by the community and managers of the coastal and marine environment in the Shire include:

- the sustainability of consumptive recreational activities (largely around Beadon Creek), particularly by fly-in-fly-out workers. In particular, management of coastal camping to ensure social, economic and environmental values are protected and enhanced;
- the suitability and enforcement of recreational fishing regulations; and
- the suitability and maintenance of boat ramps and associated facilities (Rangelands NRM, 2009).

The *Onslow Business Investment Guide* (OCCI, 2016) indicates that tourism, aquaculture and commercial fishing provide opportunities to further develop the town of Onslow. In particular, access to offshore islands from Beadon Creek Harbour and Sunset, Sunrise and Four Mile beaches have been considered as coastal environment which will attract visitors as part of tourism experiences. Commercial fishing out of Beadon Creek Harbour and aquaculture are also considered industries with opportunities for growth (OCCI, 2016).

In September 2008, the Federal Court of Australia determined that native title claimed by the Thalanyji existed in large parts of Ashburton's coastal area. Consultation and engagement with traditional owners will therefore be necessary when considering the planning of activities and uses along the coast.

2.6.5 *Sea level rise*

The coastal town of Onslow contains a significant proportion of the Shire's population and has been under pressure to support the growth of the region, particularly around the oil and gas and mining industries. Current and planned development in Onslow and adjacent to the coast may be vulnerable to the effects of sea level rise and storm surges. This includes the town itself, ports, marinas, boat ramps and other infrastructure, and recreational areas.

The key sea level processes affecting Onslow include tides, cyclonic surges, seasonal variation and inter-annual mean sea level variations. The spring tide range in Onslow is 1.9 m. Cyclonic storm surges of up to 0.8 m have been recorded in Beadon Creek, with anecdotal or inferred evidence of much higher events, particularly on the exposed coast. The most extreme elevated water levels are generally associated with onshore wind events caused by tropical cyclones passing to the west of Onslow.

CSIRO modelling indicates that the continued increase in sea level for both the west and south coasts of the Rangelands are projected with a very high confidence. In Port Hedland (the closest town to be modelled) the projected range of sea level rise is 0.07-0.17m by 2030, and 0.28-0.64 m by 2090. This will have significant implication for existing environments and built infrastructure, particularly at Onslow, and will require management and planning to ensure that the coastal environment is protected.

A coastal vulnerability study was undertaken for Onslow in 2011. The *Onslow Townsite Planning Coastal Setbacks & Development Levels* report (M P Rogers and Associates PL, 2011) focusses on the effects of 100 year ARI storm inundation for current day and 2110, on current infrastructure and future development of Onslow, with recommendations for finished floor levels.

The study recommended setbacks to allow for the action of physical coastal processes. The recommended setbacks in Onslow were calculated to range from 30 m for the area protected by a seawall up to 372 m from the coast. These setbacks could be reduced if low-lying areas were raised prior to development, to allow development of land that would otherwise be unused. The study also noted through cyclone inundation modelling that large areas of Onslow and its surrounds are vulnerable to coastal inundation, and that care must be taken to ensure that any future development is located safely above these inundation levels.

A Draft Coastal Hazard Risk Management and Adaption Plan (CHRMAP) was prepared by Cardno for the town of Onslow, including ANSIA, in August 2016 (Appendix 3). Physical assets and areas with economic, social/cultural and environmental value potentially at risk within the study area were identified. The risk level of thirteen (13) assets or areas of importance were then determined in relation to the impact of coastal erosion and inundation, or fluvial (riverine) inundation hazards, as presented in Table 10 and Table 11 below. Based on the risk level analysis, management and adaption options were recommended for specific assets with the aim of mitigating risk and vulnerability through one or more of the following actions:

- Avoiding the risk;
- Removing the risk;
- Changing the likelihood;
- Changing the consequences;
- Increasing adaptability; and
- Transferring or accepting the risk.

'Avoid' and 'managed retreat' options are the preferred options for new and existing developments. 'Accommodate' options aim to re-design existing infrastructure to mitigate potential impacts as they occur. 'Accommodate' options may also be employed for new developments, when there is no practical option to avoid or retreat from coastal hazards. 'Protect' options are often considered the last line of defence and are the least favourable options. A number of protection options are recommended for each of the thirteen assets including physical maintenance and management, as well as planning actions. These are detailed in Table 5-2 of the Draft CHRMAP for Onslow, as shown in Appendix 3.

The CHRMAP recognises that planning timeframes need to be considered when determining adaptation options. The report also recommends that assets are monitored over time and that potentially no action may be taken until the risk level becomes intolerable. It identifies that relocation can occur as part of future town planning schemes.

Recognition of the need for consideration of storm surge is provided within Town Planning Scheme No 7 through the establishment of the Onslow Coastal Hazard special control area.

Table 10: Risk levels for assets predicted to be under impact from coastal erosion and inundation at Onslow

Assets	Values	Risk Level ¹			
		Present day	2040	2070	2110
On-ground infrastructure at Onslow Jetty	Commercial	Low	High	Extreme	Extreme
Onslow Back Beach picnic area (low risk)	Aboriginal	Low	High	Extreme	Extreme
Front Beach / Sunrise Beach	Public infrastructure	Low	High	Extreme	Extreme
Seawall (the setback allowed for in this section mainly consists of the uncertainty factor required as per SPP2.6)	Recreational Environmental	Low	High	Extreme	Extreme
Seaview Drive near 12 Mile Creek / 4 Mile Beach	Public infrastructure	High	High	High	Extreme
Assets adjacent to crest of seawall (bins, shade structures, benches)	Recreational	Low	Low	Medium	High
Shire of Ashburton Offices at the intersection of Second Ave and McGrath Rd	Commercial Aboriginal	High	High	Extreme	Extreme
Aboriginal community on Second Ave		Medium	Medium	Extreme	Extreme
Western half of Ian Donald Blair Memorial Walkway	Recreational Public infrastructure	Low	Low	High	High
Intersection of Seaview Drive and Back Beach Road	Public infrastructure	Medium	Medium	High	High
Eastern end of Ian Donald Blair Memorial Walkway	Recreational	Low	Medium	High	High
Lot 381 (at the top of the hill at Beadon Point)	Residential	Medium	Medium	Medium	High
Second Ave		Medium	Medium	Medium	High

¹Risk evaluation and ranking based on likelihood and consequence analysis, as per Table 12 and Table 13 below

Table 11: Risk levels for assets predicted to be under impact from fluvial inundation in Onslow under the 2015 timeframe

ARI event	Assets type	Planning timeframe ²			
		Present day	2040	2070	2110
100 year	Housing, buildings & property	High	High	Extreme	Extreme
	Parks & recreation grounds	Low	Low	Medium	High
	Public infrastructure (fencing, light poles, playgrounds etc.)	Low	Low	Medium	High
	Car parks	Low	Low	Medium	High
	Roads / footpaths	Medium	Medium	High	High
	Sheds	Low	Low	Medium	High
500 year	Housing, buildings & property	High	High	Extreme	Extreme
	Parks & recreation grounds	Medium	Medium	High	High
	Public infrastructure (fencing, light poles, playgrounds etc.)	Medium	Medium	High	High
	Car parks	Medium	Medium	High	High
	Roads / footpaths	High	High	High	Extreme
	Sheds	Medium	Medium	High	Extreme

¹Risk evaluation and ranking based on likelihood and consequence analysis, as per Table 12 and Table 13 below

Table 12: Risk priority matrix (adapted from CHRMAP guidelines (WAPC, 2014))

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	High	High	Extreme	Extreme	Extreme
Likely	Medium	High	High	Extreme	Extreme
Possible	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Medium	High	High

Table 13: Risk levels and tolerances (example from CHRMAP guidelines (WAPC, 2014))

Risk level	Action required	Acceptance / tolerance
Extreme	Immediate action required to eliminate or reduce risk to acceptable levels	Unacceptable
High	Immediate to short-term action required to eliminate or reduce risk to acceptable levels	Tolerable / unacceptable
Medium	Short to medium term action to reduce risk to acceptable levels, or accept risk	Tolerable
Low	Accept risk	Acceptable

2.6.6 Tides

Although the tidal range in the Shire is moderate, the Shire has recognised an area of tidal influence within a town planning scheme special control area. The key purpose of this area is to consider the impact of any proposed development on the natural environment, in particular the mangrove ecosystem and the potential for storm surge impacts.

Three tidal creeks and coastal lagoons are present within the study area; the Ashburton Eastern Delta Entrance and lagoon, Hooley Creek and Four Mile Creek. Hooley Creek and the Ashburton Delta eastern lagoon are recognised as valuable mangrove and tidal creek habitats which support a variety of marine fauna, including protected species such as sawfish and juvenile turtles.

2.6.7 Key strategic environmental planning issues for consideration

Key coastal considerations for strategic planning are:

- **Sea level rise** – consideration of sea level rise, vertical allowances and setback distances will be required when managing existing infrastructure and planning future development, as per IPCC and CSIRO modelling and coastal vulnerability studies. Ensure that any substantial future development is supported by a current storm surge and flood inundation study consistent with the most current predictions for sea level rise and coastal processes, consistent with State Planning Policy 2.6: State Coastal Planning Policy (2014).
- **Commercial activity** – Planning for and management of activities associated with the resources industry, commercial fishing and aquaculture must consider impacts on sensitive coastal environments which provide habitat for coastal and marine life. Consideration should be given to the location of supporting industrial areas, which adequately manage any potential off-site or environmental impacts. In addition, coastal spaces which are shared with recreational activity should be planned to ensure multiple, cumulative impacts on sensitive environments are considered and impacts are appropriately managed.
- **Tourism** – management and planning of sustainable tourism activity such as camping, boating, swimming, fishing, and 4WDing, and development around sensitive coastal environments such as beaches, river mouths (Beadon Creek), and seagrass meadows, will be critical with population and industry growth, development of tourism, and townsite expansion.
- **Traditional owners** - engagement with traditional owners should be considered to ensure that cultural heritage values are not lost, particularly within the native title area for the Thalanyji community.

2.7 Hazards and natural disasters

2.7.1 Bushfire risk

Fire plays an important part in maintaining the landscape of the Pilbara region. Fire helps shape the diversity of plants and animals (EPA, 2007). Many native plants have evolved fire-related adaptations over time, such as fire-induced flowering or smoke-induced germination. Fires are most often naturally started by lightning strokes. Electrical storms are common in the Pilbara particularly in some remote desert areas, and can result in the ignition of multiple fires across a vast area at the same time. These fires are particularly difficult to control due to the vast areas of land and their inaccessibility (EPA, 2007). Fire in the rangelands has been used as a land management technique, first by the Aboriginal inhabitants and later by the pastoral industry.

Natural regimes have been altered significantly with the settlement of humans in the region. Altered fire regimes, particularly those that occur late in the dry season in the Pilbara, have the ability to significantly impact on the land and biodiversity values of the area. They have the potential to change ecosystems and the composition of species within (EPA, 2007). In addition to electrical storms, fires are also started by human error in remote areas and have the ability to cause widespread damage, burning out of control in the hot, Pilbara climate. Problems occur when ecosystems are burnt too often and can lead to loss of biodiversity through inadequate recovery and reproduction times for many plants and animals (EPA, 2007). This can result in a simplification of ecosystems. Animals can be adversely impacted upon if they have limited capacity to escape fire or to find alternative food sources and shelter if fire temporarily removes habitat.

Fires can also exacerbate or cause additional threatening processes to occur such as soil erosion, release of particulates to the atmosphere and weed invasion. Fires can also result in the release of greenhouse gases. Very intense fires which destroy mature native vegetation can contribute to long-term ecosystem change by removing adults and leaving new seedlings vulnerable to drought (EPA, 2007).

The frequency of fires in the Shire has varied considerably between 2002 and 2015 (no data was available in 2000 or 2001), as shown in Chart 6. Chart 6 demonstrates the approximate geographic area of the Shire which experienced fire during each year. For example, in 2015 a frequency of 0.08 may be interpreted as approximately 8% of the Shire experienced fire during that year.

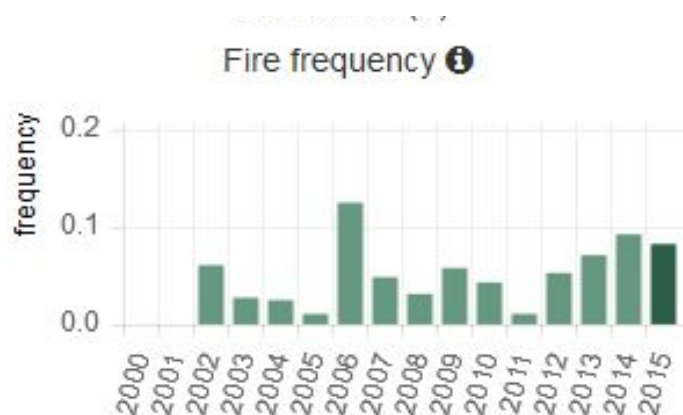


Chart 6: Fire frequency in the Shire of Ashburton (no. of fires per 2.5 km grid cell) (ANU, 2016)

Data recorded for the overall Pilbara bioregion also varied considerably between 1997 and 2005, as indicated in Table 14, with relatively large areas burnt in 1997 and 2000 (DSEWPac, 2008). The majority of fires occurred during the hotter August to December period and were presumed to produce hotter, more intense burns than fires in other months (DSEWPac, 2008). This confirms the strong link between climate and fire intensity.

Table 14: Percentage of areas burnt as a result of bushfires in the Pilbara bioregion 1999-2005 (DSEWPac, 2008)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
% area burnt	20.1	2.5	9.7	25.8	9.4	11.8	3.1	3.1	1.1

In accordance with the Map of Bush Fire Prone Areas gazetted by the Department of Fire and Emergency Services, the overwhelming majority of the Shire is designated as a Bush Fire Prone Area (see Figure 14), with the exception of relatively small areas cleared for urban development or agriculture, water bodies, and areas affected by mining.

Future planning and development within Bush Fire Prone areas will need to meet the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015) and the *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2015).

2.7.2 Flood risk

Many rivers and creek pass through or near to the townships and communities of the Shire, flowing inland from the Hamersley Ranges, west across the plains towards the Indian Ocean. Severe flooding of these waterways is a well-known risk to towns and communities in the region during the wet season, particularly during extreme cyclonic events when flood waters travel fast and wide.

Historically, major flooding in Onslow has been typically associated with storm surge rather than heavy rainfall, though localised flooding will occur in low-lying areas adjacent to Beadon Creek.

A review of the Onslow townsite drainage system was undertaken in 2010 and assessed the condition of the existing drainage infrastructure. It identified a number of drainage issues in the townsite as follows (GHD, 2010):

- The hydraulic gradient of the drainage system is limited by sea level and existing natural surface levels. The surface levels through the town are low lying, generally varying between 2 and 4 m AHD.
- Undrained low points were observed along the intersections of Simpson Street, Third Street and Third Avenue which are subject to localised ponding. Similarly inconsistent and flat grades of the stormwater pipes on Third Avenue do not allow stormwater to flow effectively.
- Unkerbed roads within the town prevent the containment of runoff within the road corridor, allowing adjacent lots to be potentially flooded during major storm events.
- Three stormwater basins (in Second and Third Ave) fill periodically and provide an environment that promotes mosquito breeding, posing a health risk.

The Onslow Townsite Development Local Water Management Strategy (LWMS)(Hyd2o, 2012) addresses flood protection for Onslow by defining an approach based on safe conveyance of flood flows to receiving water bodies rather than attenuation. One of the recommendations of

the LWMS is to extend the existing watercourse/drain which flows to the Beadon Creek harbour and grade it appropriately to enable drainage from the townsite to access this outlet. The LWMS also specifies that overland flow paths should occur in road reserves and linear public open space corridors for the safe conveyance of 100 year flows off site; that habitable building floor levels are set at 0.5m above 100 year flooded stormwater levels; and that habitable building floor levels are set at 100 year storm surge levels allowing for 100 year climate change.

Any future development in proximity to waterways within the Shire will be required to be consistent with *State Planning Policy 2.9: Water Resources* to minimise risk of flooding, and manage the safety of lives and property when flood events do occur.

2.7.3 Key strategic environmental planning issues for consideration

Key hazards and natural disasters considerations for strategic planning are:

- **Bushfire risk** – the majority of the Shire is identified as being Bush Fire Prone. Future planning and development within Bush Fire Prone areas will need to meet the requirements of *State Planning Policy 3.7: Planning in Bushfire Prone Areas* (SPP 3.7) (2015) and the *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2015). Consideration also should be given to the location of firebreaks in semi-rural areas around townsites and emergency management including access routes; and
- **Flood risk** – Townships and communities associated with waterways in the Shire may be subject to risk of flooding. Any proposed development should be consistent with *State Planning Policy 2.9: Water Resources* and in Onslow, consistent with the Local Water Management Strategy, and address flood risk appropriately.

It is not considered necessary to include a special control area in a local planning future scheme to highlight either bushfire risk or flood risk, as these issues are adequately addressed through existing policy.

2.8 Heritage

Heritage is important in understanding the history, identity and people of a region, and exists in many forms both tangible and intangible, such as places, objects, landscapes, languages and customs. The value of heritage places in the Pilbara may be recognised by the natural and cultural values that are significant for aesthetic, historic, scientific, or social reasons (*Environment and Heritage Legislation Amendment Act (No. 1) 2003*).

The Pilbara is well known for its rich Aboriginal history, modern European history and unique and diverse natural heritage. The numbers of national and state heritage sites identified on various heritage lists is presented for the Shire in Table 15 and Figure 13. It should be recognised that a search of the Department of Aboriginal Affairs (DAA) database does not comprise a full assessment of existing Aboriginal sites under the *Aboriginal Heritage Act 1972*.

Table 15: Number of heritage sites within the Shire of Ashburton (Source: Australian Heritage Database, DAA Aboriginal Heritage Inquiry System* and inHerit - State Heritage Office^)

Local Government Area	No. heritage sites
RNE – Historic	4
RNE – Indigenous	3
RNE – Natural	17
DAA Registered Aboriginal Sites*	1,655
Municipal Inventory^	28

2.8.1 Aboriginal Heritage

The Pilbara region is home to a great variety of traditional landowner language groups, many of which have a strong spiritual, physical and cultural connection to their region and landscape. Aboriginal people are thought to have inhabited the region for up to 40,000 years. As such a rich cultural and historical indigenous heritage exists in the region, particularly in natural features such as rivers, hills and rock formations where people, animals and characters left traces of their journey across the landscape. These places may be valuable because of mythological lore (The Dreaming); because of past use as meeting places for special ceremonies; as burial grounds for ancestors; or as places where culture and history was recorded through rock art. The location of these important cultural sites within the natural landscape means there is considerable overlap between Aboriginal and natural heritage in the region.

Aboriginal heritage is an integral part of Aboriginal culture, customary law, and spirituality. Therefore, its conservation is critical in ensuring that the unique indigenous culture in the Shire is not lost. The protection of Aboriginal heritage also requires consideration of the 31 individual languages identified in the Pilbara, many of which have between two and five dialects (Wangka Maya Pilbara Aboriginal Language Centre, 2016) and their ability to access sites of cultural significance, as well as the heritage sites themselves.

The original inhabitants of the Ashburton area are the Yamatji people of the Murchison, Gascoyne and Pilbara regions. The main Aboriginal groups living within the Shire include (but are not limited to) (DAA, 2015; AIATSIS, 2016 and NNT, 2016):

- Nhuwala;
- Jadira;

- Kuruma;
- Marduthunera;
- Banjima;
- Inawongga;
- Jurruru;
- Pinikura;
- Thalanyji;
- Tenma;
- Djiwal;
- Yindjibarndi;
- Budina;
- Gnulli;
- Palyuku;

Given the historically fluid nature and often forced movement of Aboriginal people, this list should not be considered complete nor final, but gives an indication of the diversity of people, culture and language within the Shire.

The local Traditional Owners in the Onslow area are the Thalanyji people. The Thalanyji cultural tradition is associated with the rainbow serpent Burra Balanyji that created underground tunnels in the area which link all of the water bodies around Onslow – the rivers, the creeks and all the fresh water soaks (Shire of Ashburton, 2010).

Over 1,600 indigenous heritage sites have been identified in the Shire and are protected under the *Aboriginal Heritage Act 1972*. The geographical spread of places in the Aboriginal Heritage Sites Register largely reflects where Aboriginal heritage surveys have been conducted (EPA, 2007). As heritage surveys are normally undertaken in response to development proposals, large areas of the region have not been surveyed. Therefore site identification is biased towards areas subject to recent development.

The DAA maintains a register of known Aboriginal sites, which records the places and objects of significance that the *Aboriginal Heritage Act 1972 (WA)* applies to. The presence of an Aboriginal site places restrictions on what can be done to the land. Anyone proposing to undertake activity upon land on which an Aboriginal heritage site is located will require permission through engagement and consultation with the region's traditional owners and may be required to first apply for consent from the Minister for Aboriginal Affairs under section 18 of the *Aboriginal Heritage Act 1972*. The Aboriginal Heritage Due Diligence Guidelines (DAA & DPC, 2013) describes the list of land use activities and associated risk of disturbance to an Aboriginal heritage site to determine whether a Section 18 application may be required. Data from the DAA presented in Table 16 indicates that the number of Section 18 applications lodged for the Shire increased between 2008 and 2012. This reflects the increase in activity in the Shire, where the number of applications has doubled in 2011-2012.

Table 16: Number of lodged Section 18 applications in the Shire of Ashburton (Source: DAA, 2013)

Year	No. applications
2008	10
2009	8
2010	8
2011	19
2012	22

There have been 44 Indigenous Land Use Agreements (ILUAs) registered within the Shire of Ashburton since 2001. An ILUA is a voluntary agreement between a native title group and others about the use of land and waters. These agreements allow people to negotiate flexible, pragmatic agreements to suit their particular circumstances. An ILUA can be:

- over areas where native title has, or has not yet, been determined;
- entered into regardless of whether there is a native title claim over the area or not;
- part of a native title determination or settled separately from a native title claim.

ILUAs can cover topics such as:

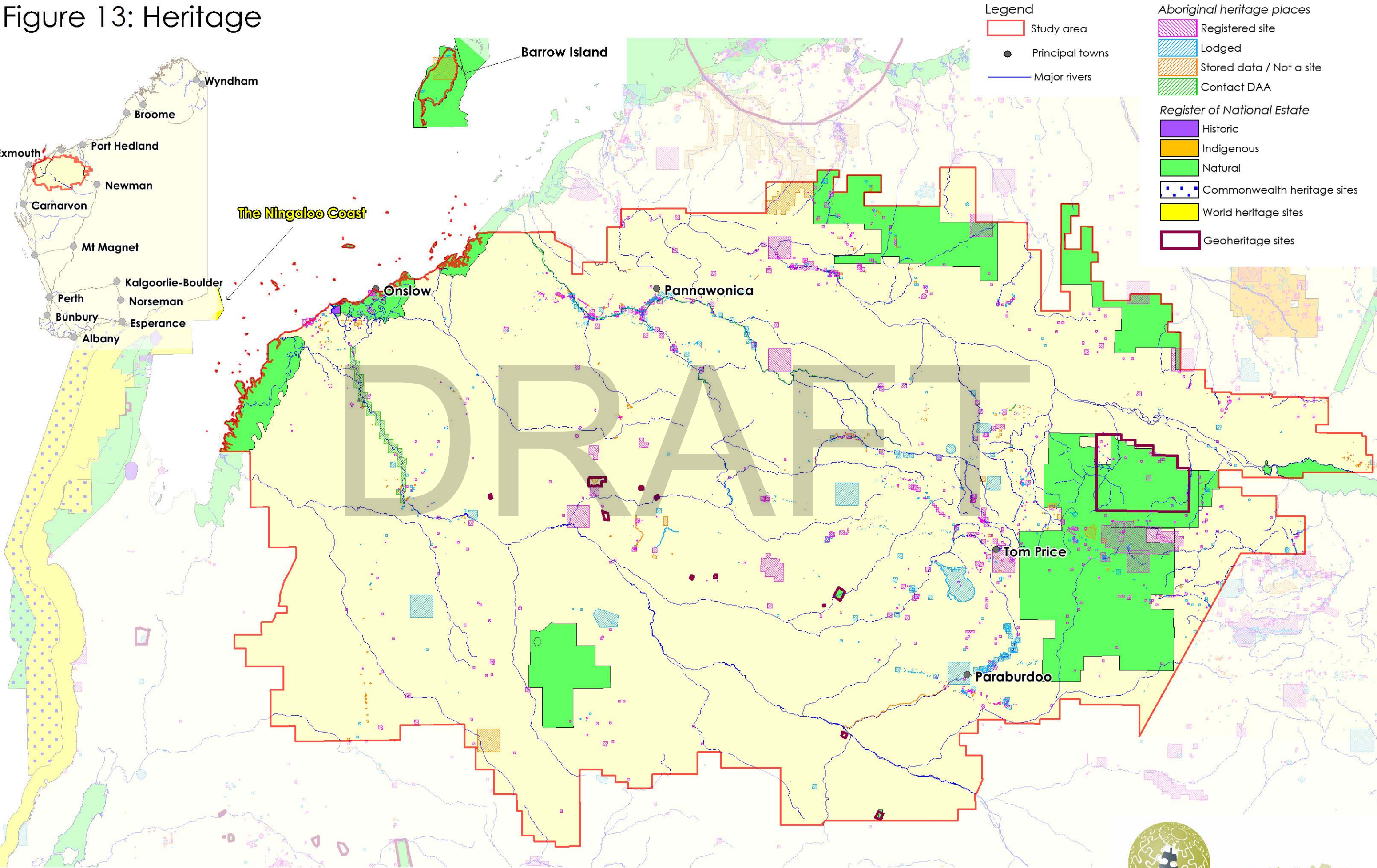
- native title holders agreeing to a future development;
- how native title rights coexist with the rights of other people;
- access to an area;
- extinguishment of native title;
- compensation;
- employment and economic opportunities for native title groups;
- cultural heritage; and
- mining.

When registered, ILUAs bind all parties and all native title holders to the terms of the agreement.

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Figure 13: Heritage



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Scale 1: 1,500,000 @ A3
0 60 km



essential
environmental

2.8.2 *European Settlement Heritage*

The original town of Onslow was gazetted as a townsite on 26 October 1885 and named after Sir Alexander Onslow, the Chief Justice of Western Australia at the time (SoA, 2016). It supported the nearby stations that had been established along the Ashburton River and the gold mines that had developed in the hinterland. One of the first recorded stations was Minderoo which was established in 1882. By 1890 all land along the Ashburton River had been taken up, running mainly sheep, but also a few cattle (SoA, 2016).

In the early days of settlement, pearls were found in the Exmouth Gulf and Onslow and pearling became home port to a fleet of pearling luggers. By 1925, the port facilities at the mouth of the Ashburton were affected by the silting up of the river causing more and more problems in the loading and unloading of visiting ships (SoA, 2016). Today pearling is a small industry with the shells farmed for blister and culture pearls.

Mining of the now infamous blue asbestos began in the region in 1937 in Wittenoom Gorge (Rom and Markowitz, 2007), and following the discovery of iron ore in the Hamersley Ranges in the 1960s, mining became the dominant driver of the region and state's economy with towns built to accommodate the mining boom.

Onslow was actively involved in World War II with the Navy refuelling at the jetty and the town becoming the furthest town south to be bombed by the Japanese. Onslow was also used as a base by the Royal Navy between 1952 and 1956 to conduct tests on the nearby Monte Bello Islands. On 3rd October 1952 the British conducted their first atomic bomb tests on the Monte Bello Islands as part of Operation Hurricane (DEC, 2009).

Surveys proved that there was deep water at Beadon Point and so the town was moved some eighteen kilometres to the east to where it is today (SoA, 2016).

Evidence of the region's colonial European past remains in the form of a number of preserved heritage sites, of which four are recognised on the Register of National Estate (Table 15).

A large number of historic heritage sites are located within the Shire, and registered with both the Heritage Council of WA and the Shire of Ashburton Municipal Inventory (State Heritage Office, 2016). A small number of key sites, including the Old Onslow Townsite, Bessieres Island Lighthouse, and Tambrey Station Homestead (ruins) and Surrounds are also part of the Register of National Estate and the National Trust.

A large number of historic shipwrecks have also been identified off the Pilbara coast, associated with the region's European history. Sixteen wrecks have been identified in the Onslow area on the Australian National Shipwreck Database, dating back to 1868 (DSEWPaC, 2016).

Like in many areas of Australia, European settlement resulted in the introduction of disease, alcohol, indentured labour and the forced removal of Aboriginal children from their families by government agencies of the time.

In contrast to the historical settlement of Onslow, Pannawonica and Paraburdoo were gazetted as 'closed towns' in 1972, meaning that the towns were purpose-built and were managed by a mining company (in this case Rio Tinto). Facilities at the towns were limited for visitors and accommodation is reserved for mining staff. Tom Price was also founded as a mining town and was gazetted in 1964. It is still primarily serves to support the local mining activity. All but Pannawonica have been naturalised and are now managed by the Shire.

2.8.3 *Natural Heritage*

The natural heritage of the region is renowned because of its unique and diverse collection of marine and terrestrial landscapes and habitats. Twenty natural heritage sites within the Shire are listed on the Register of National Estate (Table 15). In addition, the region's unique natural heritage is largely preserved and managed through the conservation reserve system and the identification of numerous national parks and nature reserves, including Karijini National Park, Millstream-Chichester National Park, and Barrow Islands National Park.

The Shire also contains a number of sites of important world geoheritage, some of which contain the oldest known examples of fossil stromatolites (3.5 billion years old) (DMP, 2016b). These fossils are identified and managed through the Geological Survey of Western Australia, twelve of which are located within the Shire (shown in Figure 13). They are considered the best preserved and oldest indicators of early life on Earth.

2.8.4 *Key strategic environmental planning issues for consideration*

Key heritage considerations for strategic planning are:

- **Protection of heritage sites and values** – While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements with traditional owners and optimise opportunities for Indigenous training, employment and businesses. Consideration should also be made to Native Title and ILUAs when considering any planning or development proposals, in discussion with appropriate Traditional Owners.
- **Engagement with Traditional Owners** – is required to meet legislative requirements of Native Title. Increased benefits may be observed through an elevated level of involvement of the Traditional Owners within the Shire in terms of land and cultural heritage management.

3 SUMMARY

The Shire of Ashburton ('the Shire') is the southern most local government area in the Pilbara region. It is located approximately 1,000 km north of Perth and comprises over 100,000 km². The Shire is best known for mining, agriculture and fishing, and for its rugged, ancient landscape supporting tourism in the region. It is home to some of the world's largest open cut mines, immense pastoral leases and cattle stations, and thriving prawn, pearl and mackerel fishing industries.

The Community mission for the Shire is

'working together, enhancing lifestyle and economic vitality'

The Shire's Community Strategic Plan defines key environmental outcomes to be delivered in the Shire of Ashburton as *maintaining the integrity and quality of the Shire's natural environments, together with celebrating and valuing the Aboriginal and European history and heritage, with the aim of being a recognised leader in sustainability practices.*

The Shire of Ashburton has commenced the process of preparing a Local Planning Strategy (LPS) to guide future growth and development. In order for these outcomes to be achieved in the future, it is critical that the natural and environmental assets of the Shire are recognised, and any environmental opportunities and constraints are considered as part of the LPS process. This report provides a snapshot of the Shire's environmental context and highlights opportunities and constraints for consideration.

The key environmental context and considerations are summarised as follows:

- Increases in temperature and extreme weather events as a result of climate change have the potential to impact on the health of the environment and the community, as well as the maintenance of public lands and capacity of infrastructure systems including those managed by the Shire;
- The broad and diverse landforms of the Shire, from the Hamersley Ranges in the inland east, to the flood plains and coast in the west, underpin the soil, water and vegetation characteristics. The great river systems that flow across the Shire, through the steep gorges and hills and across the scrubby steppe regularly flood the surrounding landscape during the wet season and tropical cyclones and form important catchments for surface water runoff and feed groundwater systems;
- Minerals extraction and processing will continue to occur throughout the Shire. Clearing of the land for resource extraction results in a loss of biodiversity and can lead to erosion. Mining activities can also lead to the lowering of groundwater tables, and can also impact on the visual landscape of the Shire and can result in off-site impacts on nearby land uses including dust, noise and light;
- Flooding occurs semi-regularly in the Shire, particularly during the wet season and extreme tropical cyclones. Adequate management of flood risk, and associated sediment transport in townsites and industrial areas requires consideration consistent with *State Planning Policy 2.9: Water Resources*. The Shire may need to review existing townsite drainage systems and ensure appropriate levels of service will be maintained as development occurs (such as at Onslow Airport) and water quality including sediments in stormwater is addressed.
- Groundwater is available for allocation in many aquifers, however, declining rainfall in coastal areas may result in reduced recharge and consequently availability in these areas in the future, particularly as population and industry expands. Dewatering/over-abstraction have also impacted local groundwater levels and thereby potentially affecting groundwater-dependent pool ecosystems and wetlands through drying up

and loss of habitat, affecting vegetation and wildlife dependent on them as well as groundwater-dependent cultural and social values. This is especially critical given the presence of proposed Ramsar sites, and nationally important wetlands in the Shire.

- The Shire contains a number of important water resources which supply drinking water to the region. These areas should be protected and managed in accordance with relevant water source protection plans, DoW's Water Quality Protection Note 25 and State Planning Policy 2.7: *Public Drinking Water Sources*.
- It is recognised that the Shire is a Waterwise Council, and it should continue to investigate and expand water efficiency opportunities, such as irrigation of public open space and sports ovals where practical. The Shire could also investigate partnerships to establish water recycling and reuse schemes to provide fit-for-purpose sources of water where practical, as an alternative to groundwater use to support future development.
- The Shire is recognised as having significant terrestrial, marine and aquatic biodiversity. The level of reservation of land for conservation purposes in the Shire of Ashburton is much greater than the rest of the Pilbara and greater than the internationally recognised standard of reservation of between 10% and 15% of each bioregion.
- The Shire contains a number of areas which have been reserved for conservation. While many conservation reserves are managed by the Department of Parks and Wildlife, the Shire could consider active management of weeds, uncontrolled access, and feral animals to assist with vegetation retention, which in turn assists in the maintenance of soil health. Soils and vegetation (grasslands and shrublands) in good condition are also associated with higher agricultural productivity.
- Sea level rise and coastal vulnerability will increase along the rangelands coastline in the near future. Management of existing infrastructure and planning future development will require consideration of vertical allowances and setback distances.
- Expansion of tourism, commercial fishing, aquaculture and resource industry activity will increase pressure on sensitive and productive coastal marine environments which provide habitats and breeding grounds (seagrass meadows, turtle nestings on beaches, river mouths/intertidal mud flats) for marine life. Recreational activity (camping, coating, fishing, swimming and 4WDing) around sensitive coastal environments associated with population growth and industry development will also impact upon local biodiversity and environmental values.
- Coastal spaces which support recreational activity should consider cumulative impacts on sensitive environments and minimise impacts through appropriate management.
- The majority of the Shire is indicated as being located within a Bush Fire Prone Area of Western Australia as designated by the Fire and Emergency Services (FES) Commissioner. Any future planning and development within a designated Bush Fire Prone area should be consistent with the requirements of *State Planning Policy 3.7 Planning in Bushfire Prone Areas*.
- While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both aboriginal and European cultural heritage through joint management arrangements and tourism opportunities with traditional owners, and optimise opportunities for Indigenous training, employment and businesses. This should include effective engagement with the appropriate traditional owners depending on the location of heritage sites and business opportunities, to support protection of cultural values

The above considerations and the implications for management and planning are broadly summarised in Table 17, with supporting mapping presented on Figure 14.

Within this local environmental context, consideration should also be given to emerging global, national and regional environmental priorities. These include:

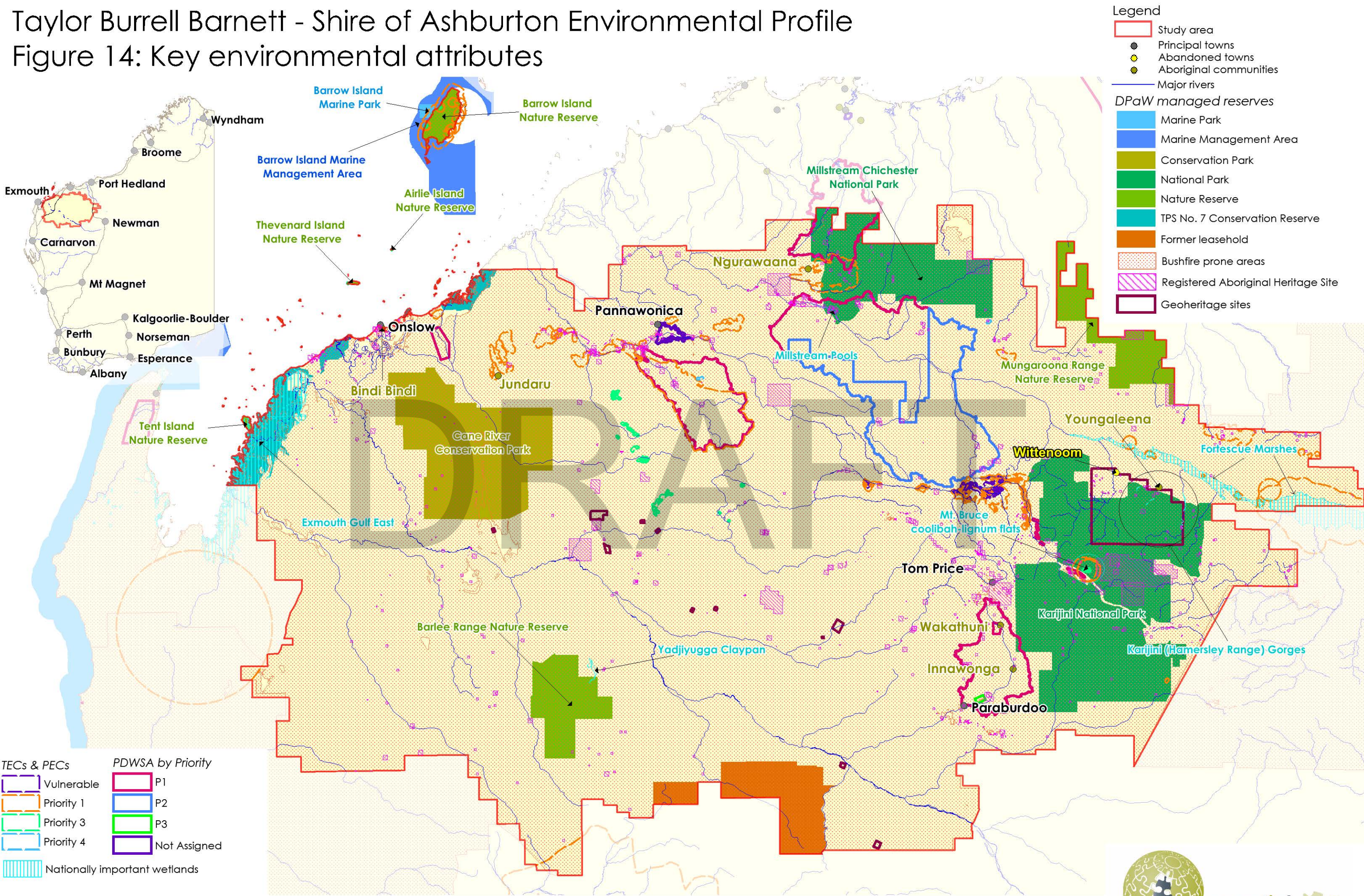
- Climate change leading, in addition to the issues raised above, to global (land and ocean) temperature rise, sea level rise, ocean acidification and increases in extreme weather;
- Reducing greenhouse gas emissions and energy use through improved energy efficiency and increased use of renewable energy;
- Reducing resource consumption and a move towards community acceptance of smaller environmental footprints;
- Innovation leading to the creation of new ways to address sustaining problems including poorly functioning communities, and water scarcity, which result in improved built form and optimised delivery of services and infrastructure; and
- Enhanced liveability of communities which are adaptive and able to respond to changing environments and community priorities.

It is recognised that the Shire of Ashburton desires a sustainable, connected and thriving community into the future. This supports many opportunities for environmental innovations. Key areas of focus may include:

- Provision of wastewater recycling facilities and renewable energy schemes to reduce reliance on groundwater (and support green infrastructure to manage a hotter climate) and traditional energy sources, as well as decentralised waste-management strategies which optimise reuse and recycling of waste materials, or schemes to transform waste into energy.
- Eco and heritage tourism opportunities which celebrate the unique natural beauty, biodiversity and cultural of the Shire. This may include accommodation, entertainment and artistic opportunities as well as adventure and recreational activities. This could be extended to educational opportunities associated with practical and on-ground environmental and cultural heritage learning.

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Figure 14: Key environmental attributes



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The following table provides broad generalisations only. Specific solutions for individual locations should be determined through more detailed planning and assessment as part of the planning and development approvals process.

Table 17: Summary of strategic environmental planning considerations

Key environmental value	Impacts from and on land use	Red – high	Orange - medium	Green - low	Shire's role in managing the impact	Recommendations for planning control
	Residential /town/ village /commercial	Industrial	Rural residential	Rural/agriculture		
Air quality	Haze and smog Light overspill Dust (construction sand)	Noise, dust, light, odour	Haze	Overspray, noise, dust	Manage impacts through enforcement of by-laws and Environmental Health regulations	Provide buffers and management of off-site impacts consistent with SPP 4.1: State Industrial Buffer Policy and DER/EPA buffer guidelines.
	Health risks to residents	Health risks to employees	Health risks to residents	Health risks to residents & livestock		
Soils	Erosion, nutrient export and acidification	Erosion, and contamination	Erosion, nutrient export and acidification	Erosion, nutrient export, contamination and acidification	Ensure land clearing and site management practices are implemented which are appropriate to the land use and capability of the soils.	Ensure land use is appropriate to the capability of the land to sustain the land use. This is particularly important for intensive agriculture proposals
	Structural impacts including subsidence and erosion	Structural impacts including subsidence and erosion	Structural impacts including subsidence and erosion	Productivity and structural impacts including subsidence and erosion		
Minerals and basic raw material	Sterilisation of resource	Sterilisation of resource	Sterilisation of resource	Sterilisation of resource	Enforce conditions of development approval with regards to the management of off-site impacts	Ensure planning approvals are consistent with the protection of significant values and that potential off-site impacts are managed.
	Not permitted within this land use however may be affected by off-site impacts including noise, light and dust	Noise, light and dust	Not permitted within this land use however may be affected by off-site impacts including noise, light and dust	Noise, light and dust		
Groundwater for drinking water purposes	Nutrient pollution of recharge areas	Contamination of recharge areas	Contamination of recharge areas	Contamination of recharge areas	Planning approvals should restrict land use in PDWSAs	Ensure land use is consistent with SPP 2.7 and DoW's water quality protection notes
	Land use is restricted based on WQPN 25	Land use is restricted based on WQPN 25	Land use is restricted based on WQPN 25	Land use is restricted based on WQPN 25		

Key environmental value	Impacts from and on land use	Red – high	Orange - medium	Green - low	Shire's role in managing the impact	Recommendations for planning control
	Residential /town/ village /commercial	Industrial	Rural residential	Rural/agriculture		
Waterways and wetlands	Direct impacts from filling, draining, clearing, contamination and erosion	Direct impacts from filling, draining, clearing, erosion, contamination,	Direct impacts from clearing, erosion, contamination, and/or uncontrolled access by stock	Direct impacts from clearing, erosion contamination, and/or uncontrolled access by stock	Avoid development which results in direct impacts on values and address flood risk and management of stormwater.	Identify waterways and wetlands with significant values and ensure future development is not proposed in these locations or is managed appropriately Protect development from flood risk. and manage the water cycle consistent with State Planning Policy 2.9: <i>Water Resources</i> .
	Mosquitoes, flooding	Mosquitoes, flooding	Mosquitoes, flooding	Mosquitoes, flooding		
Remnant vegetation, biodiversity and fauna habitat	Direct impacts from clearing and bushfires and indirect impacts from rubbish, uncontrolled access, weeds, pests and feral animals	Direct impacts from clearing and bushfires and indirect impacts from rubbish, uncontrolled access, weeds, pests and feral animals	Direct impacts from clearing and bushfires and indirect impacts from rubbish, uncontrolled access, weeds, pests and feral animals	Direct impacts from clearing and bushfires and indirect impacts from agricultural practices, rubbish, uncontrolled access, weeds, pests and feral animals	Identify areas of remnant vegetation with significant values and aim to limit the location of high risk land uses	Protect as appropriate through reservation or use of a special control area.
	Bushfires, Snakes	Bushfires, Snakes	Bushfires, Snakes	Bushfires, Snakes		
Coastal environments	Loss of environmental, cultural and recreational values from clearing for development and unmanaged use	Loss of environmental, cultural and recreational values from clearing for development, and/or commercial activities	Loss of environmental, cultural and recreational values from clearing for development and unmanaged use	Loss of environmental, cultural and recreational values from clearing for agricultural activities	Planning approvals should avoid environmentally sensitive areas and consider risks from storm surge and sea level rise.	Demonstrate compliance with State Planning Policy 2.6: <i>State Coastal Planning Policy</i> and protect (reserve) areas of significant environmental value.
	Inundation from sea level rise and storm surge	Inundation from sea level rise and storm surge	Inundation from sea level rise and storm surge	Inundation from sea level rise and storm surge		

Key environmental value	Impacts from and on land use	Red – high	Orange - medium	Green - low	Shire's role in managing the impact	Recommendations for planning control
	Residential /town/ village /commercial	Industrial	Rural residential	Rural/agriculture		
Aboriginal and European heritage	Direct impacts from disturbance or reduced access to sites	Direct impacts from disturbance or reduced access to sites	Direct impacts from disturbance or reduced access to sites	Direct impacts from disturbance or reduced access to sites	Identify significant sites should be identified in the Scheme	Decision making should be consistent with the <i>Heritage Act</i> and <i>Aboriginal Heritage Act</i>
	Potential to limit scope of development	Potential to limit scope of development				

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4 REFERENCES

- Australian Bureau of Statistics (ABS) 2016, *profile.id community profile, Shire of Ashburton*. Available from: <<http://profile.id.com.au/ashburton>> [23rd June 2016]
- Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) 2016, *The AIATSIS Map of Indigenous Australia*. Available from: <<http://aiatsis.gov.au/explore/articles/aiatsis-map-indigenous-australia>> [23rd June 2016]
- Australian National University (ANU) 2016, *Australia's Environment in 2015*. Available from: <<http://wenfo.org/aus-env/#/>> [23rd June 2016]
- Bureau of Meteorology (BoM) 2016a, *Climate Data Online*. Available from: <<http://www.bom.gov.au/climate/data/?ref=ftr>> [13th June 2016]
- Bureau of Meteorology (BoM) 2016b, *Tropical Cyclones Affecting Pilbara*. Available from: <<http://www.bom.gov.au/cyclone/history/wa/pilbara.shtml>> [21st June 2016]
- Cardno 2016, *Draft Risk Assessment CHRMAP for the Onslow Coast*
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) 2015a, *Climate Change in Australia*. Available from: <<http://www.climatechangeinaustralia.gov.au/index.php>> [16th June 2016]
- Commonwealth Scientific and Industrial Research Organisation (CSIRO) 2015b, *Pilbara Water Resource Assessment*. An overview report to the Government of Western Australia and industry partners from the CSIRO Pilbara Water Resource Assessment, CSIRO Land and Water, Perth
- Department of Aboriginal Affairs (DAA) 2015, *Western Australia Tindale Tribal Boundaries*. Determined by Norman Tindale in 1940, republished in 1974. Available from: <<http://www.daa.wa.gov.au/about-the-department/publications/maps/state-maps/>> [23rd June 2016]
- Department of Agriculture and Food, Western Australia (DAFWA) 2016a, *Natural Resource Management Shared Land Information Portal*. Available from: <<http://maps.agric.wa.gov.au/nrminfo/>> [22nd June 2016]
- Department of Agriculture and Food, Western Australia (DAFWA) 2016b, *Assessing rangeland condition*. Available from: <<https://www.agric.wa.gov.au/rangelands/assessing-rangeland-condition>> [22nd June 2016]
- Department of Conservation and Land Management (CALM) 2003, *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, Government of Western Australia, Perth
- Department of Defence (DoD) 2016, *Unexploded Ordnance (UXO) Categorisation Criteria, Warnings and Advice*. Available from: <<http://www.defence.gov.au/uxo/what/Categories.asp>> [4th November 2016]
- Department of Environment Regulation (DER) 2015, *Identification and investigation of acid sulfate soils and acidic landscapes*, Government of Western Australia, Perth

Department of Indigenous Affairs (DIA) and Department of Premier and Cabinet (DPC) 2013, *Aboriginal Heritage Due Diligence Guidelines Version 3.0*, Government of Western Australia, Perth

Department of Mines and Petroleum (DMP) 2010, *1:2 500 000 Generalised geology of Western Australia 1999*, Government of Western Australia, Perth

Department of Mines and Petroleum (DMP) 2016a, *Basic Raw Materials*. Available at: <http://www.dmp.wa.gov.au/Geological-Survey/Basic-Raw-Materials-1411.aspx> [22nd June 2016]

Department of Mining and Petroleum (DMP) 2016b, *Stromatolites and other early life*. Available from: <http://www.dmp.wa.gov.au/Stromatolites-and-other-evidence-1666.aspx> [21st June 2016]

Department of Parks and Wildlife (DPaW) 2013a, *Pilbara Region Biological Survey 2002-2013*. Available from: <https://www.dpaw.wa.gov.au/about-us/science-and-research/biological-surveys/115-pilbara-biological-survey> [21st June 2016]

Department of Parks and Wildlife (DPaW) 2013b, *Background Paper Management of former pastoral properties purchased for nature conservation in the southern rangelands*, Government of Western Australia, Perth

Department of Parks and Wildlife (DPaW) 2015, *Barrow group nature reserves management plan 82*, Government of Western Australia, Perth

Department of Parks and Wildlife (DPaW) 2016, *Stygofauna of the Pilbara*, Available from: <https://www.dpaw.wa.gov.au/about-us/science-and-research/biological-surveys/204-sytogfauna-of-the-pilbara> [21st June 2016]

Department of Planning and Shire of Ashburton (DoP and SoA) 2011, *Onslow Townsite Strategy*, Shire of Ashburton, Tom Price

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2008, *Pilbara bio-region*, Commonwealth of Australia, Canberra

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2010, *Australia's Biodiversity Conservation Strategy 2010-2030*, Commonwealth of Australia, Canberra

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2016, *Australian National Shipwreck Database*. Available from: <http://www.environment.gov.au/heritage/shipwrecks/database.html> [21st June 2016]

Department of Water (DoW) 2010a, *Millstream Water Reserve, Drinking water source protection plan West Pilbara water supply WRP 116*, Water and Rivers Commission, Perth

Department of Water (DoW) 2010b, *Pilbara Regional water plan 2010-2030*, Department of Water, Perth

Department of Water (DoW) 2010c, *Water for the Future – Statutory water planning for the Pilbara*, Department of Water, Perth

Department of Water (DoW) 2010d, *Millstream Aquifer – Determination of a long-term sustainable yield and long-term reliable allocation*, Allocation Planning Series, report No. 42, Department of Water, Perth

Department of Water (DoW) 2012, *Proclaimed public drinking water source areas*. Water quality protection note 75, Department of Water, Perth

Department of Water (DoW) 2013, *Pilbara groundwater allocation plan*, Department of Water, Perth

Department of Water (DoW) 2015, *Pilbara surplus mine dewater study: Summary*, Department of Water, Perth

Environmental Protection Authority (EPA) 2003, *Guidance Statement No. 54 - Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia*, Government of Western Australia, Perth

Environmental Protection Authority (EPA) 2005, *Guidance for the Assessment of Environmental Factors, Separation Distances between Industrial and Sensitive Land Uses No. 3*, Government of Western Australia, Perth

Environmental Protection Authority (EPA) 2007, *State of the Environment Report: Western Australia 2007*, Government of Western Australia, Perth

GHD Pty Ltd and Parsons Brinckerhoff (PB) 2006, *Management of Asbestos Contamination in Wittenoom Non-Technical Summary*, Department of Industry and Resources and Department of Local Government and Regional Development, Perth

Government of Western Australia 2011, *Government policy for Wittenoom*. Available from: <http://www.lands.wa.gov.au/Crown-Land/Contaminated-Sites/Pages/Wittenoom.aspx> [21st June 2016]

Government of Western Australia 2016, Media Statements: Australia's largest distributed energy microgrid. Available from: <https://www.mediastatements.wa.gov.au/Pages/Barnett/2016/09/Australias-largest-distributed-energy-microgrid.aspx> [30th September 2016]

Hyd2o 2012, *Onslow Townsite Development Local water Management Strategy*. Prepared by Hyd2o and Josh Byrne and Associates for LandCorp, Perth

Kendrick P. and Stanley F. 2001, *Pilbara 4 (PIL4 – Roebourne synopsis) Subregional description and biodiversity values*. In: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002

King R. 2011, *Exploration of a unique subterranean Australia fauna*, The Environment Institute, The University of Adelaide. Available from: <http://blogs.adelaide.edu.au/environment/2011/09/27/exploration-of-a-unique-subterranean-australian-fauna/> [21st June 2016]

M P Rogers & Associates, 2011, *Onslow Townsite Planning Coastal Setbacks & Development Levels for LandCorp*

National Native Title Tribunal (NNTT) 2016, Maps. Available from: <http://www.nntt.gov.au/assistance/Geospatial/Pages/Maps.aspx> [23rd June 2016]

Nayton, G. 2011, *The Archaeology of Market Capitalism: A Western Australian Perspective*, Springer Science+Business Media, New York.

Novelly PE and Thomas PWE 2013, *Report to the Commissioner of Soil and Land Conservation on the condition of the Western Australian pastoral resource base, 2013*, Department of Agriculture and Food WA, Perth

Onslow Chamber of Commerce and Industry (OCCI) 2016, *Onslow Business Investment Guide*. Sponsored by the Pilbara Development Commission.

Payne A., Mitchell A. and Homan W. 1988, *An inventory and condition survey of rangelands in the Ashburton River catchment, Western Australia*, Department of Agriculture and Food, Western Australia. Technical Bulletin 62, 318p

Perera, A 2016, 'Dampener placed on solar heating plan for Tom Price pool over costs, bird worries', *The West Australian – Regional (Pilbara News)*, 11th April 2016. Available from: <<https://au.news.yahoo.com/thewest/>> [21st June 2016].

Perpitch, N 2015, 'West Australian Government to draft legislation to forcibly evict last Wittenoom residents', *ABC News*, 11th December 2015. Available from: <<http://www.abc.net.au/news/>> [22nd June 2016].

Pilbara Development Commission (PDC) 2015, *Pilbara Regional Investment Blueprint*, Government of Western Australia, Perth

Pilbara Regional Planning Committee 2012, *Pilbara planning and infrastructure framework*, Western Australian Planning Commission, Perth

Rangelands NRM Co-ordinating Group 2005, *A Strategy for managing the natural resources of Western Australia's rangelands*, Kununurra

Rangelands NRM 2009, *Human uses of the rangelands*, Kununurra

Rangelands NRM 2009, *A Strategy for managing the natural resources of Western Australia's rangelands*, Kununurra

Rangelands NRM 2010, *Pilbara Investment Strategy*, Kununurra

Rangelands NRM 2016, *Sustainable Pastoralism*. Available from: <<http://www.rangelandswa.com.au/851/sustainable-pastoralism>> [22nd June 2016]

RBA Consulting 2011, *The Shire of Ashburton Tourism Destination Development Strategy*. Prepared for the Shire of Ashburton

Rio Tinto 2012, *First water flows for Rio Tinto's innovative Hamersley Agricultural Project*. Available from: <http://www.riotinto.com/media/media-releases-237_5907.aspx> [21st June 2016]

Science Network Western Australia (WA) 2012, *Pilbara's aquifer stygofauna protected under new plan*. Available from: <<http://www.sciencewa.net.au/topics/environment-a-conservation/item/1164-pilbaras-aquifer-stygofauna-protected-under-new-plan.html>> [21st June 2016]

Shire of Ashburton (SoA) 2010, *Onslow Townsite Strategy Background Report*, Shire of Ashburton, Tom Price

Shire of Ashburton (SoA) 2012, *Shire of Ashburton 10 year Community Strategic Plan 2012 – 2022*. Developed by Creating Community Pty Ltd. Shire of Ashburton, Tom Price

Shire of Ashburton (SoA) 2016, *History*. Available from: <<http://www.ashburton.wa.gov.au/visit-ashburton/onslow/history>> [23rd June 2016]

TPG 2012, *Onslow Townsite Expansion Development Plan*, Perth

Van Vreeswyk A. M. E., Payne, A. L., Leighton K.A. and Hennig P. 2004, *Technical Bulletin No. 92 An inventory and condition survey of the Pilbara region, Western Australia*, Department of Agriculture, Perth.

Wangka Maya Pilbara Aboriginal Language Centre 2016, *Information on Pilbara's Languages*. Available from: <<http://www.wangkamaya.org.au/pilbara-languages/information-on-pilbaras-languages>> [22nd June 2016]

Watterson, I. *et al.* 2015, *Rangelands Cluster Report*, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports, eds. Ekström, M. *et al.*, CSIRO and Bureau of Meteorology, Australia

Wilkinson R. 2015, 'Chevron group plans decommissioning of Thevenard Island facilities', *Oil and Gas Journal*, 4th April 2015. Available from: <<http://www.ogj.com/articles/2015/04/chevron-group-plans-decommissioning-of-thevenard-island-facilities.html>> [23rd June 2016]

Western Australian Planning Commission (WAPC) 2009, *Regional Profile: Pilbara Framework*, Western Australia Planning Commission, Perth

Western Australia Planning Commission (WAPC) 2008, *Acid Sulfate Soils Planning Guidelines*, Western Australia Planning Commission, Perth

Western Australian Planning Commission (WAPC) 2012, *Pilbara Planning and Infrastructure Framework*, Western Australia Planning Commission, Perth

Western Australia Planning Commission (WAPC) 2015a, *Newman & Tom Price Regional HotSpots Land Supply Update*, Western Australia Planning Commission, Perth

Western Australia Planning Commission (WAPC) 2015b, *Guidelines for Planning in Bushfire Prone Areas*, Western Australia Planning Commission, Perth

APPENDIX 1: POLICY AND REGULATORY FRAMEWORK

4.1 Guiding legislation

The management of the environment and natural resources in an urban and regional context is governed by a substantial number of acts and regulations, the most relevant of which are considered to be:

- Aboriginal Heritage Act 1972
- Biosecurity and Agriculture Management Act 2007
- Conservation and Land Management Act 1984
- Contaminated Sites Act 2003
- Country Areas Water Supply Act 1947
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
- Environmental Protection Act 1986
- Health Act 1911
- Heritage of Western Australia Act 1990
- Local Government Act 1995;
- Native Title (State Provisions) Act 1999
- Native Title Act 1993 (Commonwealth)
- Planning and Development Act 2005
- Rights in Water and Irrigation Act 1914
- Soil and Land Conservation Act 1945
- Waste Avoidance and Resource Recovery Act 2007
- Water Agencies (Powers) Act 1984
- Water Resources Legislation Amendment Act 2007
- Water Services Act 2012
- Waterways Conservation Act 1976
- Wildlife Conservation Act 1950

4.2 State policy context

Strategic guidance for the management of our environment is also provided by a number of State-level policies, strategies and guidelines. These include:

4.2.1 *Relevant State Planning Policies*

State Planning Policy 2: Environment and Natural Resources (2003)

The environment and natural resources policy defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.

The policy will be supplemented by more detailed planning policies on particular natural resources matters that require additional information and guidance. These supplementary policies may also be state planning policies and should be implemented in conjunction with this policy.

State Planning Policy 2.6: State Coastal Planning Policy (2013)

State Coastal Planning Policy provides an approach to the consideration of often competing needs and desires in coastal areas in a way that takes into account the values of the coastal zone. The policy ensures that current and future generations of Western Australians can benefit from opportunities presented by the values and resources of the Western Australian coast.

Guidance is provided for land use and development decision-making within the coastal zone including managing development and land use change; establishment of coastal foreshore reserves; and to protect, conserve and enhance coastal values. The policy recognises and responds to regional diversity in coastal types; requires that coastal hazard risk management and adaptation is appropriately planned for; encourages innovative approaches to managing coastal hazard risk; and provides for public ownership of coastal foreshore reserves.

State Planning Policy No 2.7: Public Drinking Water Source (2003)

This policy applies to proclaimed Public Drinking Water Source Areas (PDWSAs) throughout Western Australia. The objective of this policy is to ensure that land use and development within PDWSAs is compatible with the protection and long-term management of water resources for public water supply.

The policy specifies to regions outside the metropolitan region that all priority (P1, P2, and P3) source protection areas should be shown as special control areas in region schemes and local government schemes. This will be in accordance with the recommendations of any relevant land use, water management strategy, or water source protection plan. Furthermore, land uses and developments in all priority source protection areas that have the potential to impact detrimentally on the quality and quantity of public drinking water supplies should not be permitted unless it can be demonstrated, having regard to advice from the Water and Rivers Commission (now Department of Water), that such impacts can be satisfactorily managed.

Planning schemes and decisions on land use and development should have regard for any adopted region scheme policy or relevant environmental protection policy on public drinking water supply.

State Planning Policy 2.9: Water Resources (2006)

The *State Planning Policy 2.9: Water Resources* pledges Western Australia to pursuing sustainability through an integration of environmental protection, social advancement and economic prosperity. This vision is encapsulated in A State Water Strategy for Western Australia (2003), which seeks to develop and protect water resources in an economically and environmentally responsible way by providing a whole government framework for setting strategies and plans for water resources.

This policy is directly related to the overarching sector policy State Planning Policy 2 Environment and Natural Resources Policy and provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning strategies, proposals and applications, for example local and regional planning strategies, structure plans, town planning schemes and amendments, subdivisions and development applications, and other town planning mechanisms.

State Planning Policy 3.7 - Planning in Bushfire Prone Areas (2015)

This policy seeks to guide the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure.

It applies to all higher order strategic planning documents, strategic planning proposals, subdivision and development applications located in designated bushfire prone areas (unless exemptions apply). This policy also applies where an area is not yet designated as bushfire prone but the proposed development is planned in a way that introduces a bushfire hazard (e.g. revegetation)

4.2.2 State-level guidelines

There are a number of State-level guidelines which assist local governments to meet their regulatory requirements. Those that provide guidance for improved environmental management, protection and natural resource use are summarised in Appendix 1 and listed in Table 18 below. It should be noted that these documents are not statutory and provide guidance only.

Table 18: Relevant State-level guidelines

Environment area	Report
General	• Directions Paper on the Integration of NRM into Land Use Planning, (Western Australian Planning Commission, 2013). • Guidance for the Assessment of Environmental Factors No 33: Environmental Guidance for Planning and Development (EPA, 2008) • Western Australian State Sustainability Strategy (Government of WA, 2003)
Built form	• Building Code of Australia • State Planning Strategy (Western Australian Planning Commission, 2013) • Guidelines for Planning in Bushfire Prone Areas
Air quality and emissions	• Working together — WA Health Strategic Intent 2010-2015 (Department of Health, 2010)
Water	• Australian Guidelines for Water Recycling • Better Urban Water Management (WAPC, 2008) • Government Sewerage Policy- Draft Country Sewerage Policy (Government of WA, 2011) • Guidelines for the approval of non-drinking water systems in Western Australia - urban developments (Department of Water, 2013) • Pilbara regional water plan 2010-2030 (Department of Water, 2010) • River restoration manual, (Department of Environment and Conservation, 2004) • State Water Plan (Department of Water, 2007) • Stormwater management manual for Western Australia, (Department of Water, 2004-2007)
Waste	• Western Australian Waste Strategy (WA Waste Authority, 2012)

4.3 Local regulatory context

The Shire is in the process of developing a local planning strategy. Planning guidance is currently provided by Shire of Ashburton Town Planning Scheme No. 7 and local planning policies. Some strategic direction is also provided by the Community Strategic Plan.

The strategies and reports that are most relevant to the management of the environment and natural resources across the Shire are outlined below.

4.3.1 Shire of Ashburton Town Planning Scheme No. 7

Originally gazetted in 2004, the Shire of Ashburton Town Planning Scheme No. 7 (the Scheme) provides the statutory basis for land use and development in the Shire. The following Scheme objectives are considered to assist in the achievement of environmental outcomes

- 1.6(a) To facilitate development that responds to the character and amenity, geographical context and environmental constraints of the Shire and its urban and rural areas
- 1.6(i) To identify areas for conservation, recreation and natural landscapes which are important for ecological, heritage and amenity purposes in addition to the major tourist assets of the Shire.
- 1.6(j) To facilitate development that takes account of the heritage value of places, buildings and objects.
- 1.6(k) To acknowledge the health risks within the Wittenoom townsite.
- 1.6(l) To facilitate development that has regard for the long term protection of natural resources, such as clean air, water, soil and biological diversity.

Provisions that are relevant to the protection and management of the environment include:

5.6 Additional Heritage Information

In addition to the requirements of other provisions of the Scheme, the Local Government may require an application for planning approval, where the proposed development may affect a place of cultural heritage significance or an entry on the Inventory, to include additional information to assist the Local Government in its determination.

6.20 Flood and Storm Surge Prone Land

6.20.1 When considering applications for planning approval Council shall have regard to the requirements for the Onslow Coastal Hazard Special Control Area in clause 7.3.

6.20.2 In areas not subject to Onslow Coastal Hazard Area provisions contained in Clause 7.3 of the Scheme but where the Local Government considers development to be potentially incompatible with land prone to flood and storm surge events, it must be satisfied that approval of such planning applications has regard to flood and storm surge events and may approve, with or without conditions, or refuse proposals at its discretion.

The Scheme also contains a number of special control areas which address environmental issues. These generally require that consideration is given to the key issue and that the application is supported by sufficient information to assist decision making.

The following special control areas address a range of environmental issues:

- 7.2 Tidal Inundation Areas
- 7.3 Onslow Coastal Hazard Area
- 7.4 Onslow Strategic Industrial Buffer

- 7.6 Cane River Water Reserve Area
- 7.7 Turee Creek, Mt Lionel and Mt Stevenson Borefields
- 7.8 Wittenoom
- 7.10 Waste Water Treatment Plant Odour Buffer Special Control Area

4.3.2 *Shire of Ashburton Community Strategic Plan 2013-2023*

Setting out goals and plans to achieve them with focus on job creation, sustainable development, water management and resource management.

4.3.3 *Local environmental policy context*

The local policies which provide guidance for environmental management include:

- LPP25 Onslow Coastal Hazard Area – Scheme Control Area;
- ELM21 Tree Management Overview Policy;
- ENG08 Bushfire Policy; and
- ENG10 Guidelines for Urban Development.

4.4 Other guiding documents

4.4.1 *State Water Plan (2007)*

The *State Water Plan* provides a strategic framework manage water resources in Western Australia, highlights and builds upon the *State Water Strategy*. The Plan details priority actions identified in the Strategy, with a larger focus on water policy and planning. Priority actions included developing regional water plans, statutory water management plans, and further study to demand management and supply options including regional areas.

4.4.2 *Better Urban Water Management (2008)*

Better Urban Water Management (WAPC, 2008) provides guidance on the implementation of *State Planning Policy 2.9 Water Resources* (2006). It outlines the requirements for integrating land and water planning and improving the achievement of total water cycle outcomes and water sensitive urban design as part of land use planning and development.

Better Urban Water Management is designed to facilitate better management and use of water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system. The document provides guidance for regional, district and local land use planning, as well as subdivision phases of the planning process. *Better Urban Water Management* is to be used by all stakeholders and decision makers and has statewide application for new urban, commercial, industrial and rural-residential developments.

APPENDIX 2: THREATENED FLORA AND FAUNA LISTS – STATE & COMMONWEALTH

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

LGA SHIRE OF ASHBURTON, WA

Report created: 23/06/16 19:55:37

[Summary](#)

[Details](#)

[Matters of NES](#)

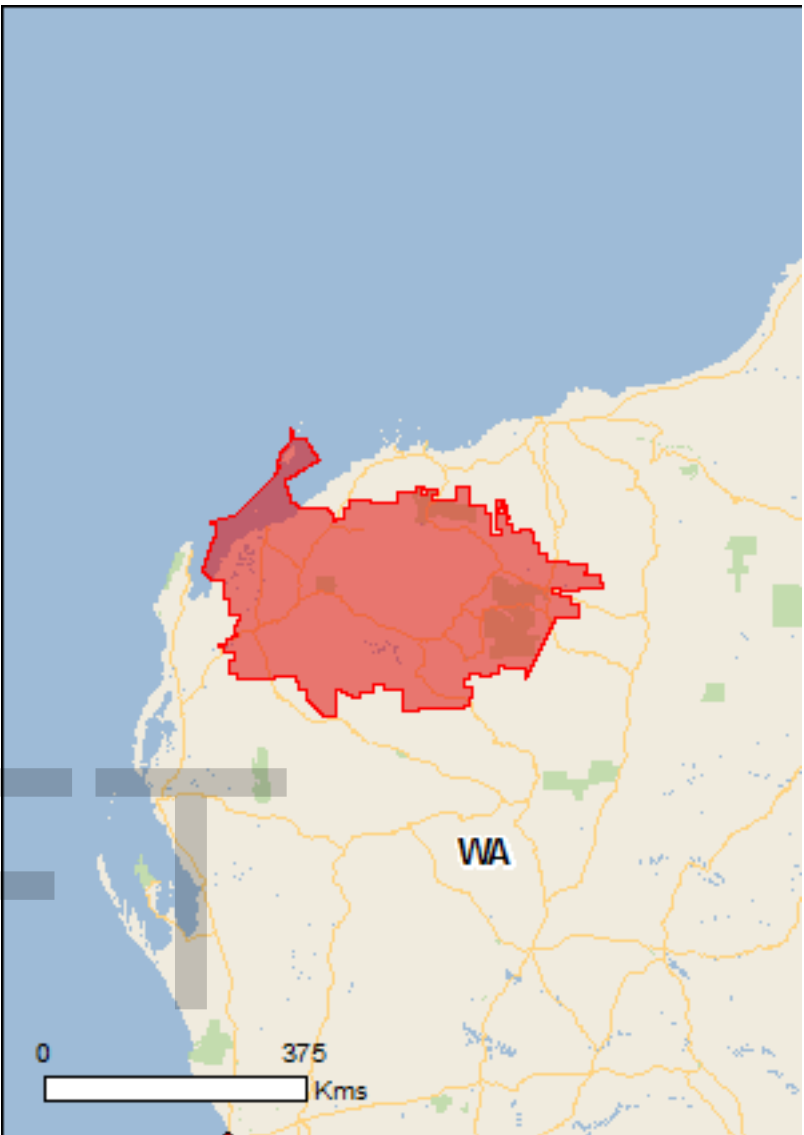
[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

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Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://environment.gov.au/protection/environment-assessments>

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Significance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Threatened Ecological Communities:	None
Threatened Species:	37
Migratory Species:	36

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits-and-application-forms>

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	79
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	28
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	7

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
The Ningaloo Coast	WA	Declared property

National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area		[Resource Information]
Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.		

Name
EEZ and Territorial Sea

Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
FISH		
Milyeringa veritas Blind Gudgeon [66676]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding known to occur within area
Macropus robustus isabellinus Barrow Island Wallaroo, Barrow Island Euro [26196]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Petrogale lateralis lateralis Black-flanked Rock-wallaby [66647]	Vulnerable	Species or species habitat known to occur within area
Rhinonictis aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Roosting known to occur within area
PLANTS		
Lepidium catapycnon Hamersley Lepidium, Hamersley Catapycnon [9397]	Vulnerable	Species or species habitat known to occur within area
Pityrodia augustensis Mt Augustus Foxglove [4962]	Vulnerable	Species or species habitat likely to occur within area
Thryptomene wittweri Mountain Thryptomene [16645]	Vulnerable	Species or species habitat likely to occur within area
REPTILES		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARKS		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Species		
[Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Migratory Wetlands Species		
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species habitat may occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Thalasseus bergii		
Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands	[Resource Information]
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The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name	Threatened	Type of Presence
Commonwealth Land - Defence - TOM PRICE TRAINING DEPOT		
Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		

Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae		
Silver Gull [810]		Breeding known to occur

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		within area Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus hystrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species

Name	Threatened	Type of Presence	
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]	Critically Endangered	habitat may occur within area	
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area	
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area	
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]	Critically Endangered	Species or species habitat may occur within area	
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	
Mammals			
Dugong dugon Dugong [28]		Breeding known to occur within area	
Reptiles			
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area	
Aipysurus apraefrontalis Short-nosed Seasnake [1115]		Species or species habitat known to occur within area	
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area	
Aipysurus eydouxii Spine-tailed Seasnake [1117]	Critically Endangered	Species or species habitat may occur within area	
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within	

Name	Threatened	Type of Presence
Astrotia stokesii Stokes' Seasnake [1122]		area Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]	Vulnerable	Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Commonwealth Reserves Marine		[Resource Information]
Name	Label	
Montebello	Multiple Use Zone (IUCN VI)	

Extra Information

State and Territory Reserves		[Resource Information]
Name		State
Airlie Island		WA
Barlee Range		WA
Barrow Island		WA
Bessieres Island		WA
Boodie, Double Middle Islands		WA
Burnside And Simpson Island		WA
Cane River		WA
Cane River (Mount Minnie and Nanutarra)		WA
Giralia		WA
Gnandaroo Island		WA
Karijini		WA
Little Rocky Island		WA
Locker Island		WA
Lowendal Islands		WA
Millstream Chichester		WA
Mungaroona Range		WA
Rocky Island		WA
Round Island		WA
Serrurier Island		WA
Tent Island		WA
Thevenard Island		WA
Unnamed WA40322		WA

Name	State
Unnamed WA41696	WA
Unnamed WA44665	WA
Victor Island	WA
Wanna	WA
Whalebone Island	WA
Y Island	WA

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit,

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur

Name	Status	Type of Presence
Parkinsonia aculeata		within area
Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp.		
Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name		State
Exmouth Gulf East		WA
Fortescue Marshes		WA
Karijini (Hamersley Range) Gorges		WA
Kookhabinna Gorge		WA
Millstream Pools		WA
Mt. Bruce coolibah-lignum flats		WA
Yadjiyugga Claypan		WA

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Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining oigations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Parks and Wildlife Commission NT, Northern Territory Government](#)
- [-Department of Environment and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-Forestry Corporation, NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

[Please feel free to provide feedback via the Contact Us page.](#)

APPENDIX 3: DRAFT RISK ASSESSMENT CHRMAP FOR THE ONSLOW COAST (CARDNO, 5TH AUGUST 2016)

DRAFT

Risk Assessment

CHRMAP for the Onslow Coast

59916801

DRAFT



Prepared for
Shire of Ashburton

5 August 2016

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Executive Summary

For all communication regarding this project, the Shire of Ashburton is to please contact:

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Study Terminology

Abbreviation	Description
AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
ANSIA	Ashburton North Strategic Industrial Area
AS	Australian Standard
CHRMAP	Coastal Hazard Risk Mitigation and Adaption Plan
MCA	Multi-criteria analysis
MS	Microsoft
WAPC	Western Australian Planning Commission
SPP2.6	State Planning Policy No 2.6
GIS	Geographical information Systems

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1 Introduction

The Shire of Ashburton (herein referred to as 'the Shire') is undertaking a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) for the Town of Onslow (herein referred to as 'the Town') and immediate surrounds, in accordance with the State Coastal Planning Policy No 2.6 (SPP2.6, WAPC 2013). The Ashburton North Strategic Industrial Area (ANSIA) is located around 13 km to the west of the Town. This industrial area and the Town are two of the Shire's important coastal development zones. Their proposed and potential future development is the key driver for the undertaking of a CHRMAP for the area. This report presents the Risk Analysis and Evaluation component of the study (Elements 4 & 5, Figure 1-1).

The study area is subject to a range of natural hazards associated with coastal erosion, storm surge inundation, fluvial runoff inundation and various combinations of the events. Element 1 of the CHRMAP process investigated coastal processes, combined with future sea level rise, for the study area and used computer modelling to predict likely future inundation and erosion hazards (Cardno 2016a). The results of the hazard mapping were used to undertake the risk identification, which is detailed in the Key Issues Paper (Cardno 2016b). The Risk Identification is also summarised in Section 2.

The risk analysis presented here (Element 4 in Figure 1-1) further develops an understanding of the identified risks by assessing the likelihood of the risk occurring and the likely consequences if it does.

Risk evaluation and ranking utilises the outcomes of the risk analysis process and is applied to the risk priority level matrix (SPP2.6, WAPC 2013). Following the evaluation, each risk is ranked, and then assigned a risk prioritisation level. This will help identify risks to be treated, and how important or urgent that treatment is. It will also provide a mechanism to compare the level of risk after a preferred adaptation option has been theoretically implemented.

To assess the level of risk, or potential impact, posed to the assets by the identified coastal hazards this CHRMAP has employed risk analysis techniques outlined in AS 5334-2013 (Australian Standards Ltd, 2013), with some modifications.

This also report provides preliminary details of risk management and adaptation options (Elements 6 in Figure 1-1) which will be undertaken as part of the next phase of work.

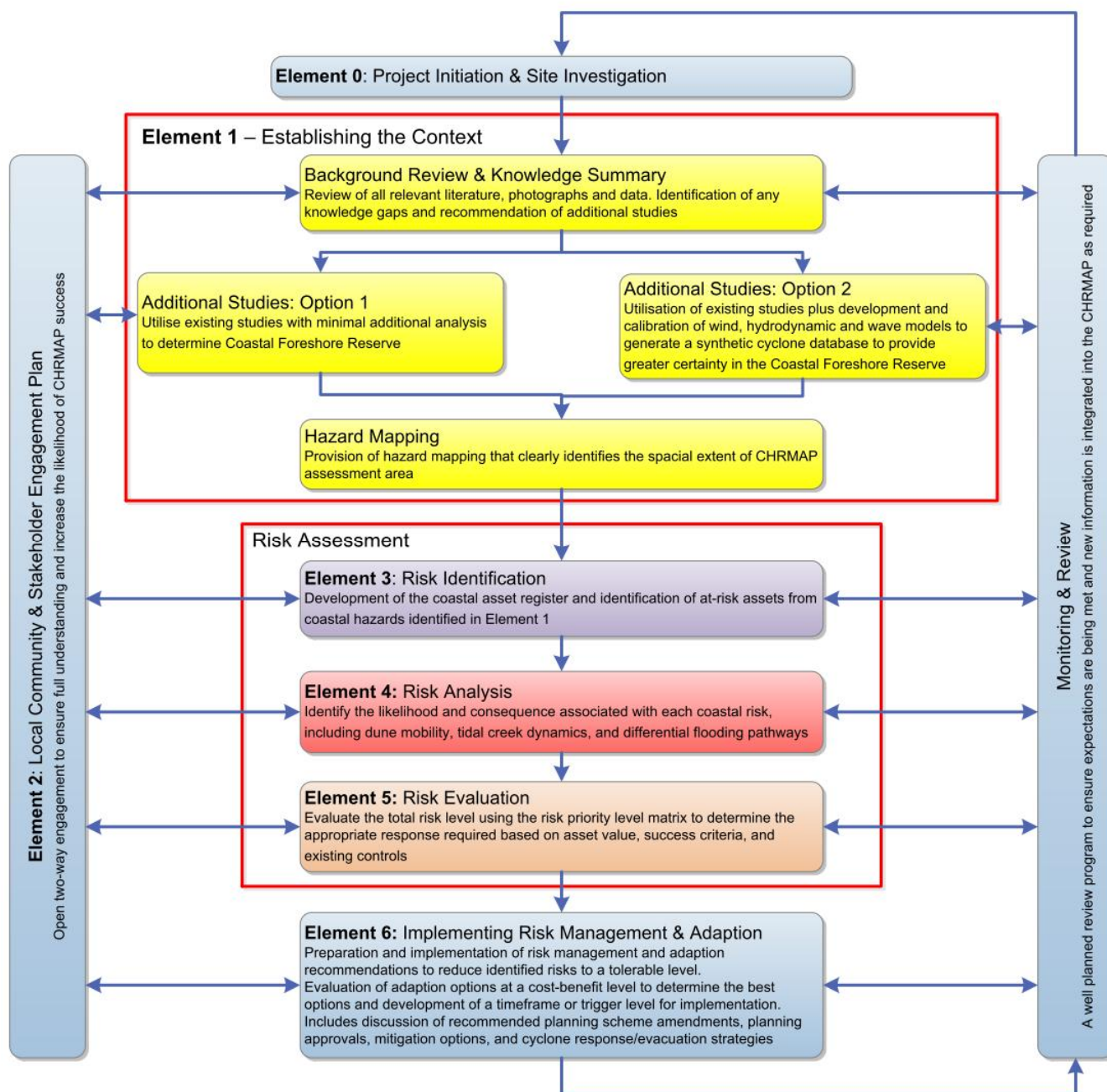


Figure 1-1 CHRMAP methodology flow chart for the Onslow coast (adapted from WAPC CHRMAP Guidelines, 2014)

2 Risk Identification

The coastal hazard maps for the various extreme events and future time horizons were overlain on the town cadastre and assets maps to identify the assets within the predicted hazard zones. Assets were identified to be at risk of coastal erosion and inundation and/or fluvial inundation. Complete details of the risk identification undertaken for the CHRMAP process are provided in the Key Issues Paper (Cardno, 2016b). The process involved the identification and classification of all key assets within the study area. The vulnerability of these assets to coastal processes, such as erosion and inundation, was predicted through a range of modelling techniques. Consultation with the community and key stakeholders was undertaken in conjunction with this process to define the success criteria, to help guide and prioritise risk management options.

2.1 Asset Identification

The identification of physical assets and areas with economic, social/cultural and environmental value, potentially at risk within the study area, involved the following steps:

- Initiation and site visit: General overview of town layout and assets therein. Provision by the Shire of existing spatial asset data;
- Stakeholder engagement: Collection of data on assets and areas seen as important by key stakeholders, including the general community; and
- Further asset capture and classification: Cardno engaged sub-consultants Talis to catalogue, classify and assess the condition of assets within the study area.

An asset inventory was delivered to the Shire in GIS and MS Excel format (Figure 2-1). This report presents only those assets identified as potentially at risk over the planning timeframes (present day, 2040, 2070 and 2110).

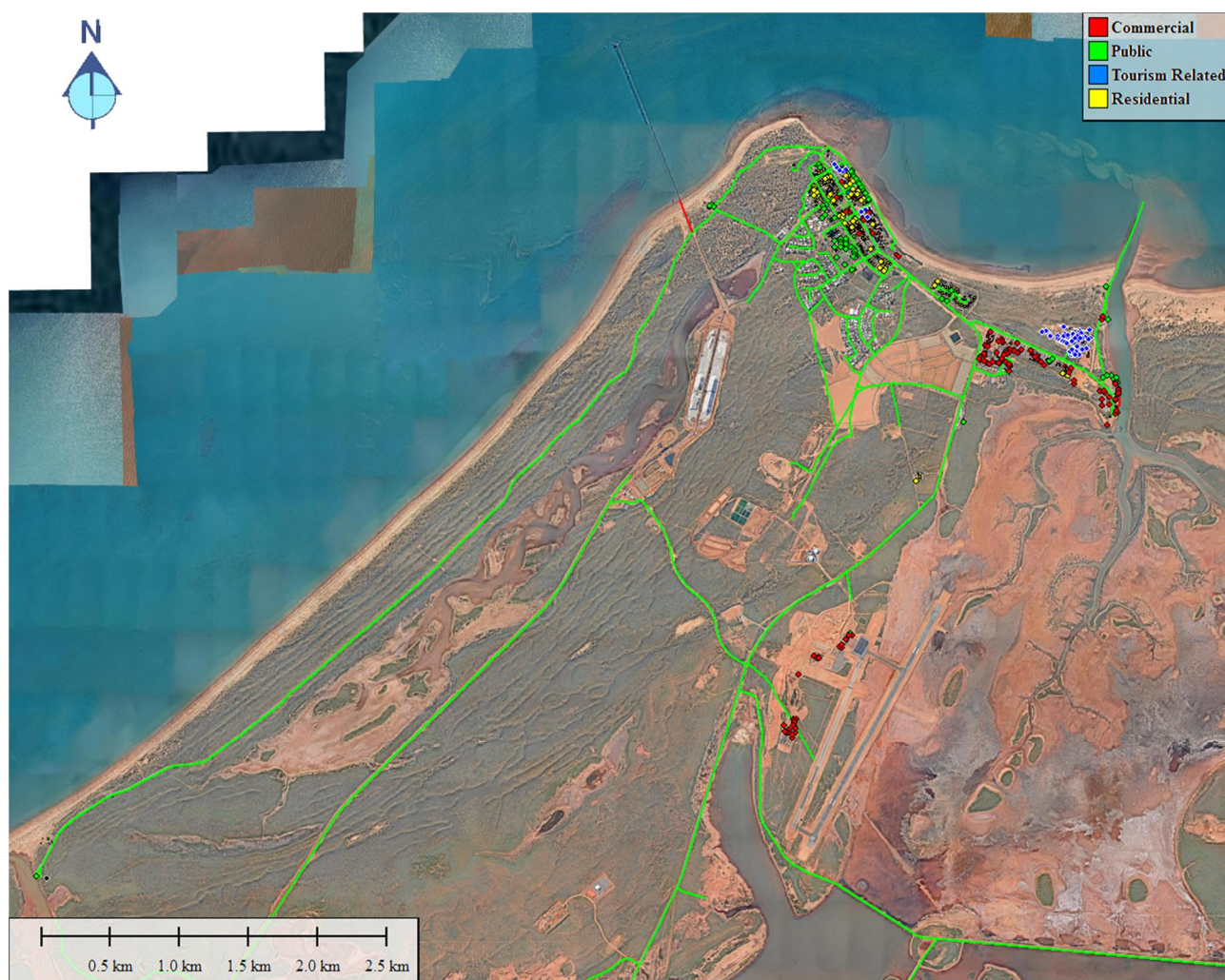


Figure 2-1 Physical assets identified within the study area, generally classified by their primary purpose

2.2 Success Criteria

The community and stakeholder engagement undertaken to date has been used to establish the spatial, social, and economic context of the CHRMAP. The stakeholder values were mapped according to the following categories:

- Recreational;
- Commercial;
- Environmental;
- Historic / heritage;
- Physical infrastructure; and
- Aboriginal cultural significance.

Feedback and data collected through stakeholder engagement was used to define the success criteria for the CHRMAP, which will guide the assessment of management options. These criteria are as follows:

- Maintenance of the foreshore;
- Protection and enhancement of the local economy;
- Well maintained community structures;
- Year round accessibility to Onslow via Onslow Road (noting The Onslow Ring Road has been completed and now provides this functionality)

- Realistic and sustainable strategies;
- Sustaining and enhancing natural environmental values;
- Strategy not reliant on building heights;
- Not prohibitive of future development; and
- Year round accessibility to the foreshore (as was the case historically).

These criteria ranged in importance from 24 responses to 3 responses. Whilst all of these success criteria will be considered during the CHRMAP process, it should be noted that not all may be realistically achievable. Preference will be given to higher ranked criteria.

2.3 Vulnerability Assessment

Further to the asset identification process, the vulnerability of the assets or areas of importance were determined in relation to the erosion or inundation hazards.

The coastal processes and fluvial (pluvial) flooding affect different areas of the coast through different impact pathways. Here we categorise the key impact pathways due to coastal erosion and inundation either by ocean storm surge flooding from the sea or rainfall runoff from the catchment flooding the town.

This study is primarily focused on the coastal aspects and fluvial (and pluvial) flooding issues are assessed to a broad level of sufficient detail for these long-term planning purposes. The Shire is commissioning additional, more detailed flood modelling to assist with the mitigation of the current flood risks within the Town.

2.3.1 Coastal Erosion and Inundation

Coastal process hazard lines were overlain on a map of the study area to determine the identified assets and areas at risk for each of the planning timeframes (Present day, 2040, 2070, 2110). The assets and areas identified, and the planning timeframe in which they are predicted to first be at risk, are provided in Table 2-1. The risk assessment has defined either specific items of infrastructure, collections of co-located assets, areas of importance (i.e. based on stakeholder values) or collections of similar low-value assets within hazard zones. This has allowed each asset, group of assets or area to be assessed in its own right.

Table 2-1 Assets predicted to be at risk from coastal process hazards and the vulnerability timeframe's

Timeframe	Assets At Risk	Value
Present Day	• On-ground infrastructure at Onslow Jetty • Onslow Back Beach picnic area (low risk) • Front Beach / Sunrise Beach • Seawall (the setback allowed for in this section mainly consists of the uncertainty factor required as per SPP2.6)	• Commercial • Aboriginal • Public infrastructure • Recreational • Environmental
2040	• Seaview Drive near 12 Mile Creek / 4 Mile Beach • Assets adjacent to crest of seawall (bins, shade structures, benches) • Shire of Ashburton Offices at the intersection of Second Ave and McGrath Rd • Aboriginal community on Second Ave	• Public infrastructure • Recreational • Commercial • Aboriginal
2070	• Western half of Ian Donald Blair Memorial Walkway	• Recreational • Public infrastructure
2110	• Intersection of Seaview Drive and Back Beach Road • Eastern end of Ian Donald Blair Memorial Walkway • Lot 381 (at the top of the hill at Beadon Point) • Second Ave	• Public infrastructure • Recreational • Residential

2.3.2 Fluvial Inundation

Fluvial inundation within the study area is extensive due to the flat, low lying terrain, with the majority of the town's assets exposed to some flooding in the most extreme scenarios. Because of the large number of assets affected by flooding and the uncertainty about the scale of the impacts, a more general approach has been selected to assess the risks of fluvial inundation. The risk identification assesses the total number of assets affected by a flooding as a percentage of the overall number of assets registered. The type of asset is not considered in this identification but is factored into the risk analysis.

The total count of assets affected by inundation hazards over the various planning horizons and event recurrence frequency are presented in Table 2-2.

Table 2-2 Assets present in 2015 predicted to be at risk from future inundation hazards

Planning Horizons & ARI Event	Affected Assets	Assets Not Affected	Total Assets	Percentage Affected
Present Day 100 Year	259	277	536	48%
2040 100 Year	282	254	536	53%
2070 100 Year	286	250	536	53%
2110 100 Year	373	163	536	70%
Present Day 500 Year	327	208	536	61%
2040 500 Year	352	182	536	66%
2070 500 Year	395	117	536	74%
2110 500 Year	447	84	536	83%

3 Risk Analysis

The Risk Analysis (Element 4 in Figure 1-1) aims to develop an understanding of each risk based on likelihood of the risk occurring and the potential consequences. This provides the basis for the risk evaluation (Element 5 in Figure 1-1).

As discussed in Section 2, different approaches have been adopted to analyse the risks of coastal erosion and inundation and the risk of fluvial inundation. Assets or groups of assets are assessed individually for the risk of coastal impacts, while a more general risk to asset types is analysed for fluvial inundation.

3.1 Likelihood

According to WAPC (2014) and for the purposes of this study, likelihood is defined as the chance of erosion and storm surge inundation occurring or how often they might impact on the existing and future assets and their values. There are two main components that need to be considered when determining likelihood of a risk occurring: the frequency of the event (storm or large waves) and the probability of the event occurring over a given time (WAPC 2014).

Often the Annual Exceedance Probability (AEP) or its inverse, the Average Recurrence Interval (ARI) is used to assess the likelihood of an event occurring (as with the example provided in the CHRMAP guidelines). This assumes that the probability of a coastal hazard event occurring is the same each year. This is not necessarily the case when considering the effects of climate change and the increase in sea level rise over time, which underpins the future planning scenarios assessed in this study. The notion also implies that impacts such as erosion will be event based, occurring over short time periods with long lasting effects. While this is often the case, erosion also occurs gradually over long time periods and this is likely to be associated with a rising sea-level.

Assessment of likelihood has, therefore, been based on the probability of a coastal process hazard impacting an asset or group of assets, over the given planning period. The likelihood scale applied is presented in Table 3-1.

Table 3-1 Likelihood scale

Rating	Likelihood	Probability
Almost Certain	It is very likely that the hazard will impact the asset during the timeframe	80-100% probability of occurring over the timeframe
Likely	It is likely that the hazard will impact the asset during the timeframe	60-80% probability of occurring over the timeframe
Possible	It is as likely as not that the hazard will impact the asset during the timeframe	40-60% probability of occurring over the timeframe
Unlikely	It is unlikely that the hazard will impact the asset during the timeframe	20-40% probability of occurring over the timeframe
Rare	It is very unlikely that the hazard will impact the asset during the timeframe	0-20% probability of occurring over the timeframe

3.1.1 Coastal Erosion and Inundation

The likelihood of erosion and coastal inundation events impacting each of the assets or groups of assets for each planning timeframe has been determined and is presented in Table 3-2. This assessment is based on the coastal process setback lines, but has also factored in coastal engineering understanding about coastal processes and how the setback lines are derived.

Table 3-2 Likelihood of assets being affected by coastal erosion and inundation at Onslow

Vulnerability Timeframe	Asset ¹	Planning Timeframe			
		Present Day	2040	2070	2110
2015	On-ground infrastructure at Onslow Jetty	Unlikely	Likely	Almost Certain	Almost Certain
	Onslow Back Beach picnic area	Possible	Likely	Almost Certain	Almost Certain
	Front Beach / Sunrise Beach	Possible	Likely	Almost Certain	Almost Certain
	Seawall	Possible	Likely	Almost Certain	Almost Certain
2040	Seaview Drive near 12 Mile Creek / 4 Mile Beach	Rare	Rare	Unlikely	Possible
	Assets adjacent to crest of seawall (bins, shade structures, benches)	Rare	Unlikely	Possible	Likely
	Shire of Ashburton Offices at the intersection of Second Ave & McGrath Rd	Rare	Unlikely	Likely	Almost Certain
	Aboriginal community on Second Ave	Rare	Unlikely	Likely	Almost Certain
2070	Western half of Ian Donald Blair Memorial Walkway	Rare	Unlikely	Likely	Almost Certain
2110	Intersection of Seaview Drive and Back Beach Road	Rare	Possible	Likely	Almost Certain
	Eastern end of Ian Donald Blair Memorial Walkway	Rare	Rare	Unlikely	Possible
	Lot 381 (at the top of the hill at Beadon Point).	Rare	Rare	Unlikely	Possible
	Second Ave	Possible	Likely	Almost Certain	Almost Certain

¹ Assets are listed at first impact horizon only and assumed to remain impacted at future time horizons

3.1.2 Fluvial Inundation

The likelihoods of assets being affected by fluvial inundation (Table 2-2) have been broadly categorised to allow a general assessment of the consequences, this is further described in Section 3.2. For inundation, the percentage of assets affected for each future scenario has been directly translated to the probability scale (Table 3-1). This provides a very general likelihood that any one asset might be influenced by flooding for a particular scenario (see Table 3-3). Obviously certain assets will be more prone to inundation than others due to location and topography within the predicted inundation zone. To assess each asset individually would require more detailed investigation of the assets susceptibility to flooding including assessment of floor levels and quantity surveying. As this is beyond the scope of this assessment, this more general approach has been applied.

Table 3-3 Likelihood timescale for assets vulnerable to fluvial inundation in Onslow

Asset Type		Planning Timeframe			
		Present Day	2040	2070	2110
100 yr ARI		48% ²	53%	53%	70%
	Housing, Buildings & Property	Possible	Possible	Possible	Likely
	Parks & Recreation Grounds	Possible	Possible	Possible	Likely
	Public Infrastructure (fencing, light poles, playgrounds etc)	Possible	Possible	Possible	Likely
	Car parks	Possible	Possible	Possible	Likely

	Roads/Footpaths	Possible	Possible	Possible	Likely
	Sheds	Possible	Possible	Possible	Likely
500 yr ARI		61%	66%	74%	83%
	Housing, Buildings & Property	Likely	Likely	Likely	Almost Certain
	Parks & Recreation Grounds	Likely	Likely	Likely	Almost Certain
	Public Infrastructure (fencing, light poles, playgrounds etc)	Likely	Likely	Likely	Almost Certain
	Car parks	Likely	Likely	Likely	Almost Certain
	Roads/Footpaths	Likely	Likely	Likely	Almost Certain
	Sheds	Likely	Likely	Likely	Almost Certain

²Percentage of assets affected by inundation (Table 2-2)

3.2 Consequence

WAPC (2014) defines consequences as the impact of erosion and storm surge inundation occurring to the existing assets in the future, taking into consideration the asset value. A consequence rating considers the impact on the social, economic and environmental value of the asset. Additionally, the adaptive capacity and vulnerability of an asset are also considered when determining its consequence rating. Consequence ratings for this study are given in Table 3-4, which are derived from AS 5334-2013.

This assessment assumes that the present day (2015) assets are exposed to the future hazard without any intervention or risk mitigation implementation in the future.

The effect of coastal erosion and fluvial inundation should be assessed separately as their impacts on a given asset are different. Coastal erosion typically causes permanent damage, such as the undercutting and collapsing of foreshore infrastructure. Inundation, however, may result in the short term flooding of an asset but it may maintain its use once flooding subsided.

Table 3-4 Consequence ratings (based on AS 5334-2013)

Rating	Social	Economic	Environment
Catastrophic	Loss of life and serious injury. Large long-term or permanent loss of services, employment wellbeing, finances or culture (e.g. > 75% of community affected), international loss, no suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances >\$5 million	Permanent loss of flora and fauna (no chance of recovery) with national impact.
Major	Serious injury. Medium term disruption to services, employment wellbeing, finances or culture (e.g. < 50% of community affected), national loss, very limited suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > \$2 - \$5 million	Long-term loss of flora and fauna (limited chance of recovery) with regional impact.
Moderate	Minor injury. Major short term or minor long-term disruption to services, employment wellbeing, finances or culture (e.g. < 25% of community affected), regional loss, limited suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > \$100,000 - \$2 million	Medium-term loss of flora and fauna (recovery likely) with regional impact.
Minor	Small to medium disruption to services, employment wellbeing, finances or culture (e.g. < 10% of community affected), local loss, many suitable alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances > \$10,000 - \$100,000	Short-term loss of flora and fauna (strong recovery) with local impact.
Insignificant	Minimal short term inconveniences to services, employment, wellbeing, finances or culture (e.g. < 5% of community affected), neighbourhood loss, many alternative sites exist.	Permanent loss or damage to property, plant and equipment, finances < \$10,000	Negligible to no loss of flora and fauna (strong recovery) with local impact.

3.2.1 Coastal Erosion and Inundation

In general, the consequence of erosion on a particular asset is fixed, regardless of the timeframe. This is the case for the consequences defined for many of the assets listed in Table 3-5. In cases where a set of assets have been grouped for assessment, the consequence may change over various timeframes, if more of the assets within the group are expected to be affected as the coastal hazard advances. For example, various public assets adjacent to the seawall have been grouped, and are expected to be impacted at varying timeframes due to varied distance from the shoreline. The case is similar for areas such as beaches, which might display some loss of beach over shorter timeframes, compared to complete or substantial beach loss over longer timeframes – a more severe consequence.

Table 3-5 Consequence ratings for assets vulnerable to coastal erosion in Onslow over time

Vulnerability Timeframe	Asset	Consequence of Erosion			
		Present Day	2040	2070	2110
2015	On-ground infrastructure at Onslow Jetty	Insignificant	Moderate	Moderate	Major
	Onslow Back Beach picnic area	Insignificant	Minor	Moderate	Moderate
	Front Beach / Sunrise Beach	Insignificant	Minor	Moderate	Major
	Seawall	Insignificant	Minor	Moderate	Major
2040	Seaview Drive near 12 Mile Creek / 4 Mile Beach	Major	Major	Major	Major
	Assets adjacent to crest of seawall (bins, shade structures, benches)	Insignificant	Insignificant	Minor	Minor
	Shire of Ashburton Offices at the intersection of Second Ave and McGrath Rd	Major	Major	Major	Major
	Aboriginal community on Second Ave	Moderate	Moderate	Major	Major
2070	Western half of Ian Donald Blair Memorial Walkway	Minor	Minor	Minor	Minor
2110	Intersection of Seaview Drive and Back Beach Road	Moderate	Moderate	Moderate	Moderate
	Eastern end of Ian Donald Blair Memorial Walkway	Minor	Minor	Minor	Minor
	Lot 381 (at the top of the hill at Beadon Point)	Moderate	Moderate	Moderate	Moderate
	Second Ave	Moderate	Moderate	Moderate	Moderate

3.2.2 Fluvial Inundation

More severe consequences into the future due to more extreme events and future higher sea-levels are likely to retard present day drainage patterns resulting in higher flood levels and longer ponding times. Present day infrequent events will become more frequent in future. This is reflected in the consequences defined in Table 3-6, with higher consequence ratings for the second half of the century, under the assumption that drainage infrastructure is not upgraded.

Table 3-6 Consequence ratings for assets vulnerable to fluvial inundation in Onslow over time

100 yr ARI	Asset Type	Planning Timeframe			
		Present Day	2040	2070	2110
	Housing, Buildings & Property	Moderate	Moderate	Major	Major
	Parks & Recreation Grounds	Insignificant	Insignificant	Minor	Minor
	Public Infrastructure (fencing, light poles, playgrounds etc)	Insignificant	Insignificant	Minor	Minor

Car parks	Insignificant	Insignificant	Minor	Minor
Roads/footpaths	Minor	Minor	Moderate	Moderate
Sheds	Insignificant	Insignificant	Minor	Minor
500 yr ARI				
Housing, Buildings & Property	Moderate	Moderate	Major	Major
Parks & Recreation Grounds	Insignificant	Insignificant	Minor	Minor
Public Infrastructure (fencing, light poles, playgrounds etc)	Insignificant	Insignificant	Minor	Minor
Car parks	Insignificant	Insignificant	Minor	Minor
Roads/footpaths	Minor	Minor	Moderate	Moderate
Sheds	Insignificant	Insignificant	Minor	Minor

4 Risk Evaluation

The risk evaluation and ranking process utilises the outcomes of the risk analysis process. The likelihood and consequence defined for assets, under each scenario, are combined to derive a risk level. The risk level for each combination is presented in the Risk Priority Matrix (Table 4-1), taken from the CHRMAP guidelines (WAPC, 2014).

Table 4-1 Risk Priority Matrix (adapted from WAPC 2014)

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	H	H	E	E	E
Likely	M	H	H	E	E
Possible	L	M	H	E	E
Unlikely	L	L	M	H	E
Rare	L	L	M	H	H

This risk level then guides the preliminary assessment of the risk acceptability and the urgency of required action (Table 4-2). This will help to prioritise multiple identified risks within the study area. The evaluation also provides a mechanism to compare the residual risk after a preferred adaptation option is theoretically implemented. For example, a present risk may be “extreme but after the implementation of an adaption option ‘X’ the risk level is re-evaluated and reduces to “medium”. This residual risk rating will be assessed in the next phase of work (Element 6 in Figure 1-1).

Table 4-2 Risk levels and tolerances (example from WAPC 2014)

Risk Level	Action Required	Acceptance/Tolerance
Extreme (E)	Immediate action required to eliminate or reduce risk to acceptable levels.	Unacceptable
High (H)	Immediate to short-term action required to eliminate or reduce risk to acceptable levels.	Tolerable / Unacceptable
Medium (M)	Short to medium term action to reduce risk to acceptable levels, or accept risk.	Tolerable
Low (L)	Accept risk.	Acceptable

4.2 Coastal Erosion

The risk level for each of the identified assets at risk due to coastal erosion and inundation, for each planning timeframe, has been assessed. The results of this assessment are presented in Table 4-3. There is a general increase in risk level over the planning timeframes with predicted sea level rise and the higher probability of an extreme event occurring or having occurred. These factors also increase the potential consequences of coastal impacts, compounding the overall risk levels.

Table 4-3 Risk levels for assets predicted to be under impact from coastal erosion under 2015 timeframe

Asset	Risk Level			
	Present Day	2040	2070	2110
On-ground infrastructure at Onslow Jetty	Low	High	Extreme	Extreme
Onslow Back Beach picnic area (low risk)	Low	High	Extreme	Extreme
Front Beach / Sunrise Beach	Low	High	Extreme	Extreme
Seawall	Low	High	Extreme	Extreme
Seaview Drive near 12 Mile Creek / 4 Mile Beach	High	High	High	Extreme
Assets adjacent to crest of seawall (bins, shade structures, benches)	Low	Low	Medium	High
Shire of Ashburton Offices at the intersection of Second Ave and McGrath Rd	High	High	Extreme	Extreme
Aboriginal community on Second Ave	Medium	Medium	Extreme	Extreme
Western half of Ian Donald Blair Memorial Walkway	Low	Low	High	High
Intersection of Seaview Drive and Back Beach Road	Medium	Medium	High	High
Eastern end of Ian Donald Blair Memorial Walkway	Low	Medium	High	High
Lot 381 (at the top of the hill at Beadon Point).	Medium	Medium	Medium	High
Second Ave	Medium	Medium	Medium	High

4.3 Fluvial Inundation

The risk ratings determined for each general asset group under the various planning timeframes and ARI rainfall events are presented in Table 4-4. Again we see a general increase in risk rating over the planning timeframes, as the intensity of rainfall events is predicted to increase.

Table 4-4 Risk levels for assets predicted to be under impact from inundation under 2015 timeframe

Asset Type		Planning Timeframe			
100 yr ARI		Present Day	2040	2070	2110
	Housing, Buildings & Property	High	High	Extreme	Extreme
	Parks & Recreation Grounds	Low	Low	Medium	High
	Public Infrastructure (fencing, light poles, playgrounds etc.)	Low	Low	Medium	High
	Car parks	Low	Low	Medium	High
	Roads/footpaths	Medium	Medium	High	High
	Sheds	Low	Low	Medium	High
500 yr ARI					
	Housing, Buildings & Property	High	High	Extreme	Extreme
	Parks & Recreation Grounds	Medium	Medium	High	High
	Public Infrastructure (fencing, light poles, playgrounds etc.)	Medium	Medium	High	High
	Car parks	Medium	Medium	High	High
	Roads/footpaths	High	High	High	Extreme
	Sheds	Medium	Medium	High	Extreme

4.4 Discussion

Risk Assessment Discussion Notes....this will need to be confirmed/updated once we are happy with the analysis and evaluation process:

- Style and inputs to the risk assessment. Where it has been tailored.
- Discussion around those assets that are at 'high' and 'extreme' risk, and their potential adaptive capacity and therefore vulnerability i.e. if they are built/fixed structures then a higher level of consideration needs to be given relative to those that are 'low'. Their adaptive capacity is limited, and vulnerability is increased.
- The risk of assets to coastal hazards needs to be reduced by implementing adaptation or mitigation strategies (risk management).

5 Risk Management Options

Planning for risk adaption or treatment involves the identification, development and evaluation of options suitable for mitigating the potential impacts of each coastal hazard that requires treatment, as determined in the risk assessment process.

In this CHRMAP the identified risk management and adaption options will be assessed against numerous criteria to evaluate which option or combination of options will be the most suitable. The criteria include:

- Potential benefits;
- Effectiveness;
- Costs, both initial and ongoing – this combines with other criteria to give an idea of economic effectiveness and cost-benefit;
- Equity implications;
- Potential risk creation and negative environmental effects;
- Practicality;
- Reversibility / Adaptability;
- Implementation timing;
- Design life; and
- Acceptance (community, stakeholders, regulators).

While cost-benefit criteria will be important, some criteria are difficult to quantify, so all criteria will be included in the overall analysis (often referred to as multi-criteria analysis, or MCA).

Risk management options should also be assessed in terms of their restriction on future planning and risk management opportunities. Options that allow for a wide range of future strategies are considered more favourably. State Planning Policy No.2.6 (2013) utilises this philosophy, recommending adaptation planning on a preferential basis of avoid, managed retreat, accommodate and protect (Figure 5-1).

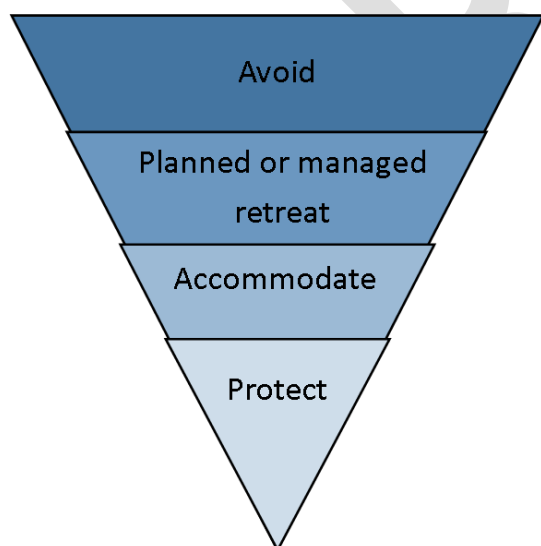


Figure 5-1 WAPC preferential planning hierarchy

Adaptation planning is a somewhat cyclical process, moving through assessment of the preferred options until suitable mitigation is achieved. The CHRMAP management and adaptation plan employs the following steps:

- Determine possible adaptation options for each risk;

- From this list, select at least one option, if possible more, using the preferential basis described above;
- Evaluate whether the selection or selections mitigate the identified risk to a tolerable or acceptable level;
- If necessary, select another option and re-assess whether risks are tolerable; and
- Assess the effectiveness of the new adaptation option(s) compared with the identified success criteria.

5.2 Risk Management & Adaptation Options

The basic characteristics of the risk management and adaptation options relevant to the study area are discussed below. Risk management and adaption options aim to mitigate risk and vulnerability through one or more of the following actions:

- Avoiding the risk
- Removing the risk
- Changing the likelihood
- Changing the consequences
- Increasing adaptability
- Transferring or accepting the risk

'Avoid' and 'managed retreat' options are the preferred options for new and existing developments. 'Accommodate' options aim to re-design existing infrastructure to mitigate potential impacts as they occur. 'Accommodate' options may also be employed for new developments, when there is no practical option to avoid or retreat from coastal hazards. 'Protect' options are often considered the last line of defence and are the least favourable options. These options aim to protect an asset from coastal hazards by preventing the hazard from reaching the asset. They range from 'soft' options such as beach nourishment to hard structures such as seawalls. Hard protection options can potentially reduce beach amenity, can cause negative impacts to the adjacent coastline and are generally expensive.

Table 5-1 again outlines the assets at risk of coastal erosion and inundation within the study area, and allocates them a code for reference in Table 5-2 and further analysis. Table 5-2 proposes the various coastal hazard adaptation options for the Town to consider for implementation as part of Element 6 in Figure 1-1.

Table 5-1 Assets predicted to be at risk from coastal process hazards

Vulnerability Timeframe	Asset Code	Assets at Risk
Present Day		
	1	On-ground infrastructure at Onslow Jetty
	2	Onslow Back Beach picnic area
	3	Front Beach / Sunrise Beach
	4	Seawall
2040		
	5	Seaview Drive near 12 Mile Creek / 4 Mile Beach
	6	Assets adjacent to crest of seawall (bins, shade structures, benches)
	7	Shire of Ashburton Offices at the intersection of Second Ave and McGrath Rd
	8	Aboriginal community on Second Ave
2070		
	9	Western half of Ian Donald Blair Memorial Walkway
2110		

	10	Intersection of Seaview Drive and Back Beach Road
	11	Eastern end of Ian Donald Blair Memorial Walkway
	12	Lot 381 (at the top of the hill at Beadon Point).
	13	Second Ave

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Table 5-2 Risk Management Options (adapted from WAPC, 2014)

Option Code	Option Category	Option Name	Description	Preliminary Considerations (MCA, CBA)	Potential Assets Affected ³	Proposed Actions/Triggers
AV	Avoid	Avoid	Locating/re-locating assets outside of hazard zone	Financial resources will not be required for management and adaptation. Should be implemented wherever possible and practical, and considered every time an asset is repaired or renewed.	12	Significant investment
MR1	Managed Retreat	Accept and repair losses	Assets are left unprotected and loss is accepted following hazard event. Repairs may be implemented for public safety, and asset is retreated outside hazard zone, or in the case of beaches/vegetation, as natural recession occurs.	Save the financial resource for better use. Usually applied to low value assets. Viable where available land allows retreat to maintain beach width.	2, 3, 5, 6, 9, 10, 11, 13	Undertake economic and safety assessment to determine which assets should be left on an economic and safety basis. Repair or remove after hazard results in damage.
MR2	Managed Retreat	Relocate outside of hazard zone	Assets located in the hazard zone are relocated or destroyed. Applied to assets of low value where it is impractical to re-design to withstand hazard impacts.	Allows low value assets to be retained until such time as relocation is necessary. Often coincides with asset replacement, which enables cost of relocation to be shared with cost of replacement, reducing overall cost in present and future planning.	2, 5, 6, 7, 8, 9, 10, 11, 12, 13	Design for lifecycles and expected risk, then monitor. Move low value structure when 'at risk'.
MR3	Managed Retreat	Prohibit further development	Allows continued use of the current infrastructure until such time that impacts arise, but prohibits the development of further infrastructure as the area/asset is known to be vulnerable	Foreshore reserve seaward of the 2110 hazard line should remain council land, thus significant economic development should be prohibited so as not to limit future adaptation options.	1, 7, 8, 10, 12, 13	Potentially maintain all land seaward of the 2110 coastal hazard line as Shire land.
AC1	Accommodate	Notification on title	Indicates to current and future landholders that an asset is likely to be affected by coastal hazards over the planning timeframe. Helps owners to make informed decisions about level of risk they are/may be willing to accept and that risk management and adaptation is likely to be required at some stage.	This option allows vulnerability of an asset to hazards to be conveyed to existing and future owners. One means of implementing that is low cost, is through decision making for subdivision and development.	7, 8, 12	
AC2	Accommodate	Emergency plans and controls	Implement plans for asset that are at risk of coastal erosion due to severe weather. Have procedures in place for before, during and after the events for safety.	This has low financial cost and with a high benefit to public safety. Does not benefit to the asset itself, but increased safety reduces the overall consequences of the	1, 7, 9, 10, 11, 12, 13	Develop practical plans, if haven't already done so.

Option Code	Option Category	Option Name	Description	Preliminary Considerations (MCA, CBA)	Potential Assets Affected ³	Proposed Actions/Triggers
			E.g. signage barrier to prevent access.	hazard.		Implement upon severe weather warnings.
AC3	Accommodate	Re-design to withstand impact	Where avoiding or relocating are not an option, re-design to withstand impacts e.g.....	Retains existing assets in locations but reduces consequences of hazards. High principle cost, low ongoing costs. Results in extended design life.	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	Significant investment inside the coastal hazard zone.
AC4	Accommodate	Dune care program	Development of a long term program for revegetation and rehabilitation of the dune system.	Low principle and ongoing costs. Small increase in adaptive capacity through some additional buffering. May slow long term recession.	2, 5, 6, 7, 8, 9, 10, 11, 12, 13	Implement now and monitor throughout lifetime
PR1	Protect	Beach Nourishment or Replenishment	Replacement of sand on upper beach face and dunes to re-establish the sandy beach and provide a sediment supply. Generally utilised in conjunction with other methods for sand retention.	High ongoing costs, particularly if available sand is located at some distance. Available sand also needs to be suitable to destination conditions i.e. sand that is finer than existing may be lost more quickly.	3, 5, 6, 7, 8, 12, 13	Investigate potential sand sources. Undertake when erosion threatens significant assets, but before situation is critical.
PR2	Protect	Seawall	Construct small seawall in front of asset or along length of coastline to protect it from coastal hazards. This may need to be accompanied by beach replenishment/renourishment.	High initial cost. Change nature and appearance of coast. Protect land (and associated assets), not the beach itself, thus needs to be accompanied by renourishment/replenishment, which adds to ongoing costs.	2, 5, 6, 7, 8, 10, 12, 13	Most economic if included in original design. Investigate seawall only if absolutely necessary.
PR3	Protect	Groyne	Construct shore normal groynes along the beach to capture sediment and protect the shoreline and assets behind.	Very high initial costs. Effective if designed properly. Can result in significant ongoing costs and negative environmental impacts in adjacent areas due to the high variability of longshore sediment transport. Reduces beach amenity.	3, 5, 6, 7, 8,	Monitor and investigate if absolutely necessary.
DN	Do Nothing	No prohibitions or development regulations	No limitations on development or controls on adaptation planning. Assumes all risks are accepted at their present level.	No initial cost, but potentially very large costs in the future. May lead to increased development and thus future costs when hazards occur whilst also restricting option for future mitigation or retreat. Not recommended.	All	Implement now.

³ See Figure 5-1

5.3 Discussion

Planning timeframes need to be considered when considering adaptation options. Assets will need to be monitored over time and potentially no action taken until the risk level becomes intolerable. Relocation can occur as part of future town planning schemes.

General notes:

- On-ground jetty infrastructure: ownership/responsibility
- Onslow Back Beach picnic area: (MR1)
- Front Beach/Sunrise Beach: high initial adaptive capacity
- Existing seawall: determine actual extent of seawall and potentially upgrade (AC2) as this protects Second Ave and Shire Offices etc.
- Seaview Drive near 12 Mile Creek/4 Mile Beach: monitor until such time as action is required, relocate (MR2)
- Assets adjacent to seawall: low value assets; accept loss and relocate or relocate before lost (MR2)
- Shire of Ashburton Offices (2nd Ave x McGrath rd): establish condition of existing seawall (PR2), relocate – has potentially already been relocated closer to town on second ave (MR2)
- Aboriginal Community: prohibit further development in that area (MR3), put in place emergency plans (AC1), protect by extending existing seawall (PR2)
- Western IDB Memorial Walkway: MR1-MR2, AC3
- Intersection Seaview Drive x Back Beach rd: monitor until such time as action is required, relocate (MR2)
- Eastern IDB Memorial Walkway: MR1-MR2, AC3
- Lot 381: Avoid new development (AV), design to withstand impacts (AC2)
- Second Ave: MR1-MR2, AC2, AC3

Element 6 of the study involves the Implementing Risk Management & Adaptation Plan (Figure 1-1). This will delve into which of the above options is best suited to the town site of Onslow under predicted coastal hazard situations.

6 Conclusions

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7 References

Standards Australia Ltd, 2009, *Australian Standard Risk Management Principles and Guidelines*, AS/NZS ISO 31000:2009. Sydney, Australia

Cardno, 2016a, *CHRMAP for the Onslow Coast: Coastal Hazard Assessment*. Prepared for the Shire of Ashburton

Cardno, 2016b, *CHRMAP for the Onslow Coast: Key Issues Paper*. Prepared for the Shire of Ashburton

WAPC, 2013, *State Planning Policy No. 2.6: State Coastal Planning Policy*. Under the Planning and Development Act 2005. Western Australia

WAPC, 2014, *Coastal Hazard Risk Management and Adaptation Planning Guidelines*. Perth, Australia

Standards Australia Ltd, 2013, *Climate change adaptation for settlements and infrastructure – A risk based approach*, AS 5334-2013. Sydney, Australia

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Client: Taylor Burrell Barnett

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Draft report	V1	HL	SSh	Electronic	30 June 2016
Final report	V2	HL	SSh	Electronic	16 November 2016

Essential Environmental

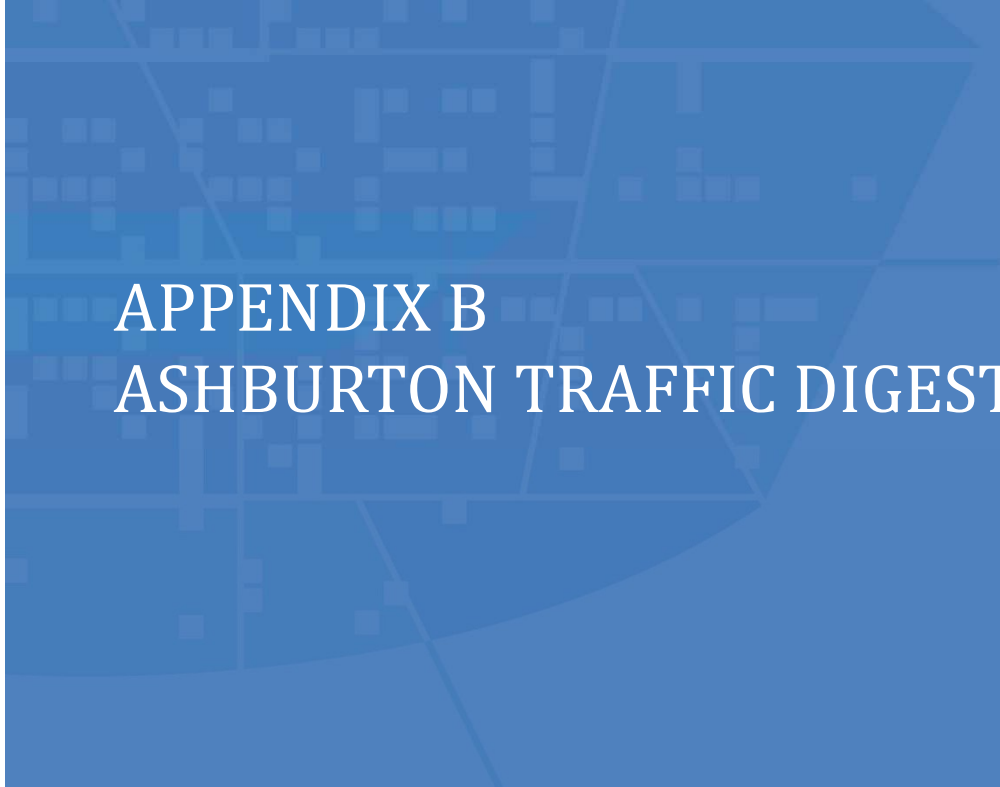
land & water solutions

622 Newcastle St Leederville 6007

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e: info@essentialenvironmental.com.au

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A stylized, semi-transparent map of Ashburton is located in the top-left corner of the page. The map shows a network of roads and streets in a light blue color against the darker blue background of the cover.

APPENDIX B ASHBURTON TRAFFIC DIGEST



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Ashburton Traffic Digest

2009/10 - 2014/15



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Information Sheet

Traffic Digest

Overview

This report summarises the average number of vehicles and heavy vehicles travelling at locations within Western Australia. Traffic volumes and percentage of heavy vehicles are provided for the latest available six years.

Main Roads undertakes traffic counting throughout Western Australia. Strategic locations are monitored on a continuous basis and are referred to as Network Performance Sites (NPS). Sampling of the wider network is performed using portable equipment over a short period. Although many Local Government roads are counted the focus is on providing information about the State road network.

Using the report

The traffic volumes in this report are expressed as the average number of vehicles at each location on a typical weekday (Monday to Friday) for the metropolitan area, and a typical day (Monday to Sunday) for regions outside the metropolitan area.

Where sufficient information is available from continuous monitoring sites the short term samples can be adjusted to remove the effect of seasonal variation.

If multiple counts have occurred at the same location within a given year, for example before and after a network change, only the latest count is used.

The count type may vary at the location between axle counts and classification counts. Axle counts record the number of axle hits at a site divided by two. This method gives an indicative number of vehicles, assuming all vehicles have only two axles. Locations where axle counts are used are those where there is very little freight movement.

Classification counts detect the axle configuration of each vehicle and determine the type of vehicle being counted (using the [AustRoads 1994 Classification Scheme](#)). This method of counting gives the actual number of vehicles at the location and can be identified in the report by the presence of a value in the right column of each year. This value is the proportion of heavy vehicles (which include buses, trucks and road trains). Speed information can also be obtained from these collections.

Changes to the road network may affect traffic volumes. For example, the extension of a freeway or closure of a road may affect traffic behaviour on surrounding roads. To assist in identifying these a list of major network changes is included at the end of the report. This list is not exhaustive and is predominantly changes to roads managed by Main Roads Western Australia (known as state roads).

Public holidays are excluded and vehicles numbers are rounded to the nearest ten. All years reported are financial years, commencing 1 July and ending 30 June. The State is divided for reporting using [Main Roads regions](#) or Local Government boundaries.

Further information

If you require further information please email reportingcentre@mainroads.wa.gov.au or telephone 08 9323 4653 (9am to 5pm, Monday to Friday)



Information Sheet

Traffic Digest

Report Sample

South West		2004/05	2005/06	2006/07
Road Name	Location			
Peelwood Pde	N of Old Coast Rd			
Pemberton Northcliffe Rd	S of Vance Hwy			
	N of Rifle Range Rd			
	N of Richardson Rd			
Penn St	W of South Western Hwy	370 5.0	420 4.6	400 5.5
Peppermint Grove Rd	E of Old Coast Rd			200 13.2
Perup Rd	E of South Western Hwy		1 730 4.5	1 740 5.6
Phillips St	E of Hampton St		660 3.3	
Piavanini Rd	S of Coastfields Rd	300 12.4		
Pinjara Rd	E of Mandurah Rd	19 865	25 770	22 030
	E of Lakes Rd			
	W of Rio Grande Av		21 000 3.9	
	E of Riverside Rd		19 710	
	E of Ronlyn Rd		19 280 5.0	17 110 7.0
	W of Webster St		19 670 4.9	
	W of Tankin Cr		19 960 5.9	
	E of Tankin Cr		19 130 6.0	
	At Ravenswood Bridge		12 580	11 130 8.5
	E of Flagstaff Rd		12 510 6.9	12 920 5.9
	E of Jolly Rambler Bvd		11 550 6.1	
	W of George St		8 860 8.1	9 630 7.8
	W of Ghall St			
	W of Anstruther Rd		2 820 17.2	2 550 18.0
	E of Anstruther Rd			
	W of Mandurah Rd			
Pinjara Williams Rd	S of South Western Hwy	2 090 3.8		
	S of Gatter St		9 940 3.2	
	E of Napier Rd			
	W of Seap Rd	2 760 7.0	2 410 6.5	2 050 8.0
	E of Farley Rd			
	W of Nanga Brook Rd		10 020	6 610 3.5
	E of Nanga Brook Rd		7 930	
	E of Plant Access Rd			
	W of Bannister Mandong Rd			10 670 10.8
	E of Bannister Mandong Rd			
	N of Sherry Rd			14 120 8.4
Pollard Rd	W of Bannister Rd		750 4.1	690 7.9
Prinsep St	N of Roelands Lake King Rd		3 870 2.9	
Pritchard St	W of South Western Hwy		3 150 5.4	3 450 6.1
Beach Rd	W of Jan			
Beela Rd	E of Sou	2 110 10.5	2 680 11.6	2 680 11.4
Binningup Rd	W of Ol		1 660 4.3	
			1 510 18.2	
Blackwood Av	N of Ell		3 510 2.6	3 840 3.8
Blackwood Rd	S of Sou	2 710 7.8	3 090 5.8	1 450 6.0
				3 500 8.2

Seasonal Adjustment

Years with this symbol cannot be adjusted to remove the effect of seasonal variation. The volumes reported are from samples taken over a short period and may not represent typical behaviour.

Continuous Monitoring

Network Performance Sites (NPS) provide continuous monitoring, 24 hours a day, 7 days a week.

Percentage of Heavy Vehicles

Classification counts record the composition of the traffic and the percentage of heavy vehicles is shown on the report where a count of this type has been used.

Traffic Statistics

The traffic volumes can be calculated to represent the average number of vehicles on a weekday (Monday to Friday, M-F) or daily (Monday to Sunday, M-S).

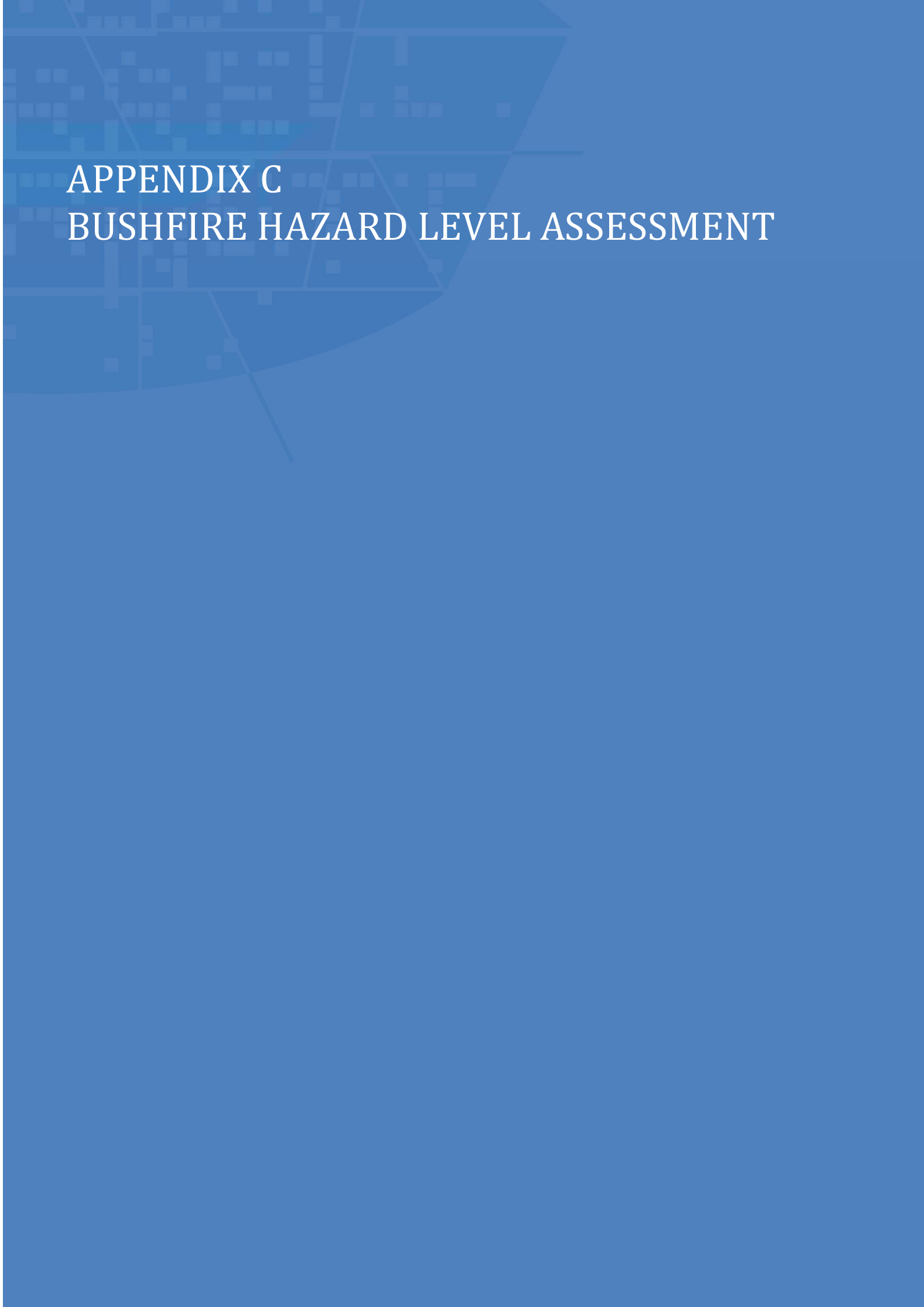
Ashburton

Road Name	Location	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
A							
Ansia Access Rd	W of Onslow Rd NPS				720 43.9	810 52.8	610 55.6
B							
Bingarn Rd	S of Nanutarra Rd		270 27.5		280 37.6		350 35.4
	N of Rubbish Tip Rd (Tom Price)	260 31.4					
	S of Killawarra Dr		700 17.9		730 22.5		780 25.1
G							
Great Northern Hwy	S of Yandi Mine Access Rd		800 52.3		830 58.6		820 52.8
	S of Karijini Dr NPS	500 54.4	540 49.7	660 61.3	770 57.6	720 58.6	
	S of Munjina Rd	480 51.8			870 59.5		530 67.3
	N of Munjina Rd		510 51.6		770 56.8		
K							
Karijini Dr	W of Great Northern Hwy NPS	240 30.7	250 33.6	310 43.0	340 43.4	310 43.1	290 42.6
	W of Juna Downs Rd		270 42.9		360 43.0		
	E of Hamersley Mount Bruce Rd		320 34.1		420 41.8		420 29.8
	W of Hamersley Mount Bruce Rd		320 40.1		440 33.6		410 35.9
	E of Paraburdoo Tom Price Rd	490 32.4	490 35.3		680 38.8		520 34.2
M							
Mine Rd	S of Bingarn Rd		2 430 21.2		3 420 20.3		3 090 18.3
	W of West Rd		3 180 17.1		3 490 22.7		3 160 22.6
Munjina Rd	W of Great Northern Hwy		90 11.7		160 48.6		90 40.9
N							
Nanutarra Rd	E of North West Coastal Hwy NPS	80 27.5	90 26.0	100 26.5			130 25.9
	E of Onslow Mount Stuart Rd	90 25.5					
	W of Ashburton Downs Rd	110 16.5		90 29.9			
	W of Tom Price Rd	110 20.0	110 24.8	80 29.0	120 26.8		140 20.6
	N of Paraburdoo Tom Price Rd	30 17.2	30 22.7		30 24.3		50 21.3
	W of Nameless Valley Dr		140 20.7		450 35.2		200 25.7
	W of Karratha Tom Price Rd		220 34.5		250 24.7		280 34.9
	E of Tom Price Railway Rd				110 56.0		110 35.6
North West Coastal Hwy	W of Burkett Rd					500 37.9	
	N of Burkett Rd		400 35.5	480 45.1	520 36.8	620 29.7	
	S of Nanutarra				530 21.5	510 35.8	
	S of Nanutarra Rd						560 34.2
	N of Nanutarra Rd				460 44.3		
	S of Onslow Rd NPS	380 39.8	340 41.2	380 43.6	500 40.4	430 47.1	410 45.7
	S of Yarraloola Rd	390 34.2		590 46.5	580 38.9		520 37.9
	N of Pannawonica Rd	590 34.6		570 46.7	630 43.5		790 30.6
O							
Onslow Rd	W of Mount Minnie Station Rd	100 20.9		210 37.7	380 54.3		
	S of Twitchin Rd NPS				430 58.9	450 69.4	280 59.5
	N of Twitchin Rd	190 14.6		550 38.2	730 35.2		940 23.1
	N of Ansia Access Rd NPS				710 27.5	770 30.2	630 35.6
	N of Onslow Airport Rd						1 250 23.1

Ashburton

Road Name	Location	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
P							
Pannawonica Millstream Rd	At Mount Enid Rail Crossing			140 14.6			
Pannawonica Rd	E of North West Coastal Hwy	170 23.0		260 27.3	230 29.0		310 42.5
Paraburdoo Rd	E of Nanutarra Rd	90 24.6			100 27.2		110 26.9
S							
Second Av	E of Third St					1 910 13.4	
	W of Beadon Creek Rd					1 850 11.2	
T							
Tom Price Paraburdoo Rd	W of Rocklea Rd		640 15.8		700 15.7		600 17.2
	S of Karijini Dr	530 24.0	570 25.4		640 26.9		
	N of Karijini Dr	930 29.4	940 22.4		1 180 22.9		910 21.7
	S of Mine Rd		960 25.2				1 040 26.7
Towera Rd	S of North West Coastal Hwy	60 24.4					
Twitchin Rd	W of Onslow Rd				130 43.6		

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APPENDIX C BUSHFIRE HAZARD LEVEL ASSESSMENT



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Shire of Ashburton Local Planning Strategy Bushfire Hazard Level Assessment

August 2017

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Executive summary

The Shire of Ashburton is preparing a local planning strategy to guide future land use and development across the Shire, in particular the townsites of Onslow, Tom Price and Paraburdoo. Areas within and around these townsites are within a designated bushfire prone area.

Bushfire risk is a key planning issue in Western Australia. State Planning Policy No. 3.7 Planning in Bushfire Prone Areas and the Guidelines for Planning in Bushfire Prone Areas sets out the framework to manage bushfire risk within planning processes and decisions. Local planning strategies integrate consideration of bushfire risk through a bushfire hazard level assessment.

A bushfire hazard level assessment was undertaken for all investigation and infill areas identified in the draft Shire of Ashburton Local Planning Strategy to consider how bushfire risk may influence future development. The assessment was undertaken in accordance with the methodology prescribed in the technical appendices to the Guidelines for Planning in Bushfire Prone Areas.

Potential townsite expansion areas in Tom Price, Paraburdoo and Onslow are influenced, for the most part, by a moderate bushfire hazard level. Whilst pockets of extreme hazard level were modelled and mapped within Tom Price, the small size and spatial extent of these areas makes it unlikely that they would present an extreme hazard in reality.

The assessment considers that future planning and development of investigation and infill areas can, subject to design, successfully address the identified bushfire hazard, demonstrated by anticipated compliance with bushfire protection criteria set out in technical appendices to the Guidelines for Planning in Bushfire Prone Areas. The nature of development and associated clearing of vegetation will reduce the hazard level for the majority of development areas, and with appropriate planning for access, services, and layout, future development will be able to achieve at least the minimum standards for bushfire exposure in line with state policy.

The role of a local planning strategy is to provide an effective local planning framework to address key issues in local planning processes and decisions. The state policy framework regarding bushfire risk is very well developed, and applies clearly to local planning applications and decisions. Therefore, the Shire of Ashburton Local Planning Strategy does not require additional policy responses to address bushfire risk, as it is adequately dealt with at the state level. Minor modifications to the draft bushfire actions in the draft local planning strategy are recommended to reflect the bushfire hazard level assessment and refine strategic responses.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the report.

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Appendices

- Appendix A – Draft Strategy Plans
- Appendix B – Field observations
- Appendix C – Bushfire protection criteria

1. Proposal details

1.1 Introduction

The draft Shire of Ashburton Local Planning Strategy articulates the Shire's goals for land use and development and the justification and context for future review of the local planning scheme. The local planning strategy provides strategic land use plans for the townsites of Onslow, Tom Price and Paraburdoo, outlining spatial strategies and investigation areas for future urban expansion.

The Onslow, Tom Price and Paraburdoo townsites and surrounds include land within a designated bushfire prone area (see Figure 1, Figure 2 and Figure 3). In line with State Planning Policy No. 3.7 Planning in Bushfire Prone Areas (SPP3.7) and the Planning in Bushfire Prone Areas Guidelines (WAPC, 2015), a bushfire hazard level assessment is necessary to inform the local planning strategy, and ensure that areas of new land use and intensification in bushfire prone areas appropriately consider bushfire hazard.

Appendix A includes strategy plans from the draft local planning strategy that identify those areas planned for urban expansion or intensification of development.

1.2 Purpose of this report

This report provides a bushfire hazard level assessment for future investigation and infill areas identified on the Shire of Ashburton Local Planning Strategy town site strategy plans for Tom Price, Onslow and Paraburdoo. This report assesses bushfire recommendations of the local planning strategy against the bushfire protection criteria set out in technical appendices to the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2015). The report makes recommendations for how the local planning strategy should respond to bushfire risk.

This report provides a technical appendix to Part 2 of the Shire of Ashburton Local Planning Strategy.

The objectives of the bushfire hazard level assessment are:

- To undertake a bushfire hazard level assessment for those area(s) being considered for urban expansion or intensification of development; and
- To identify those areas with a moderate or extreme hazard rating, that require a more detailed analysis before any development / subdivision occurs.



LEGEND

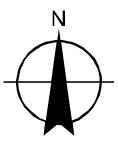
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- Bushfire Hazard Level Assessment Area
- Bushfire Prone Areas

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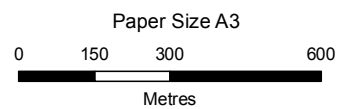
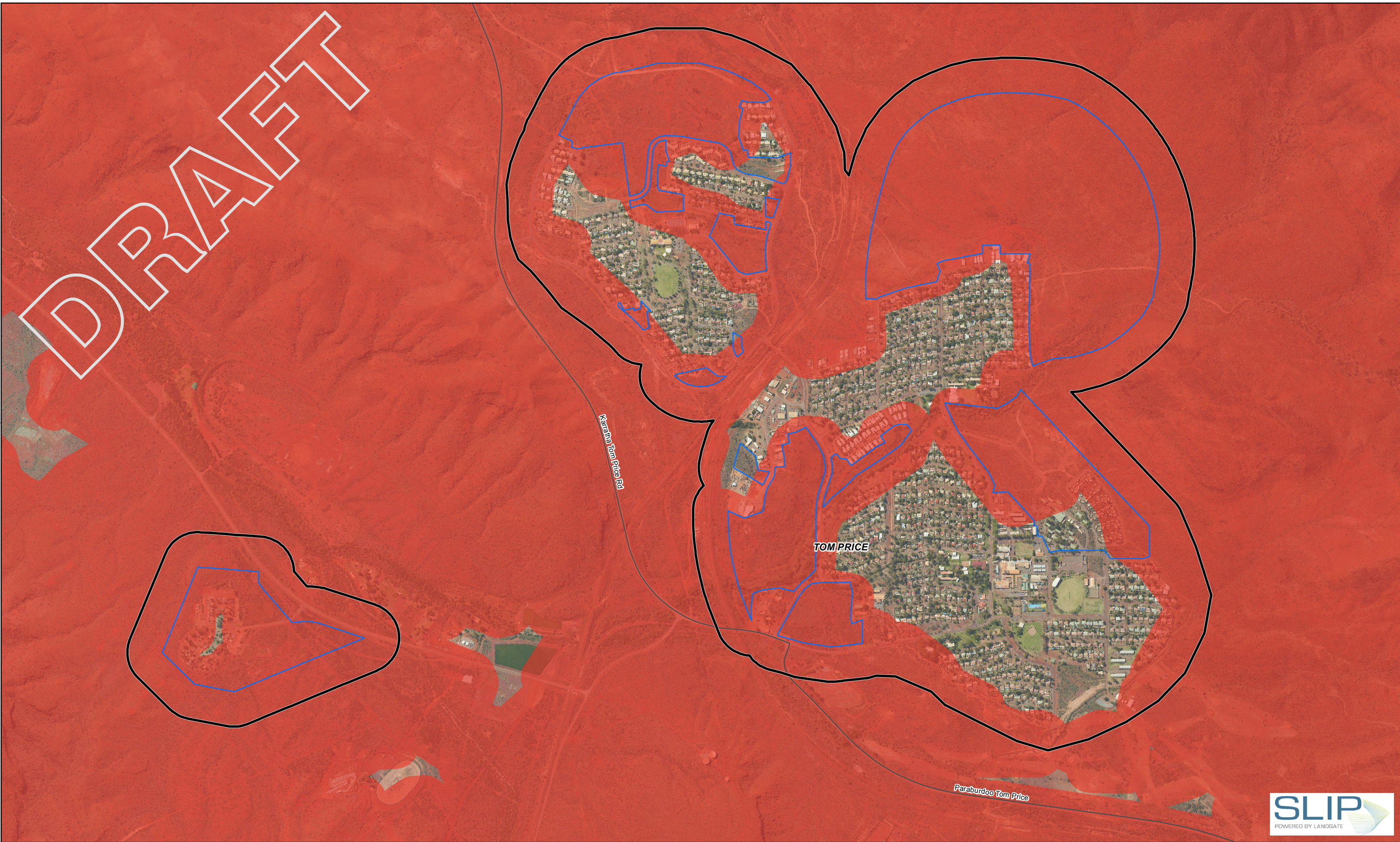
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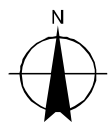
Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment
Onslow
Bushfire Prone Areas

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Figure 1



Map Projection: Transverse Mercator
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- State Road
- Investigation Area
- Bushfire Hazard Level Assessment Area
- Bushfire Prone Areas



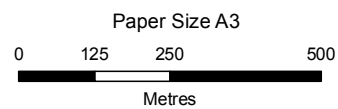
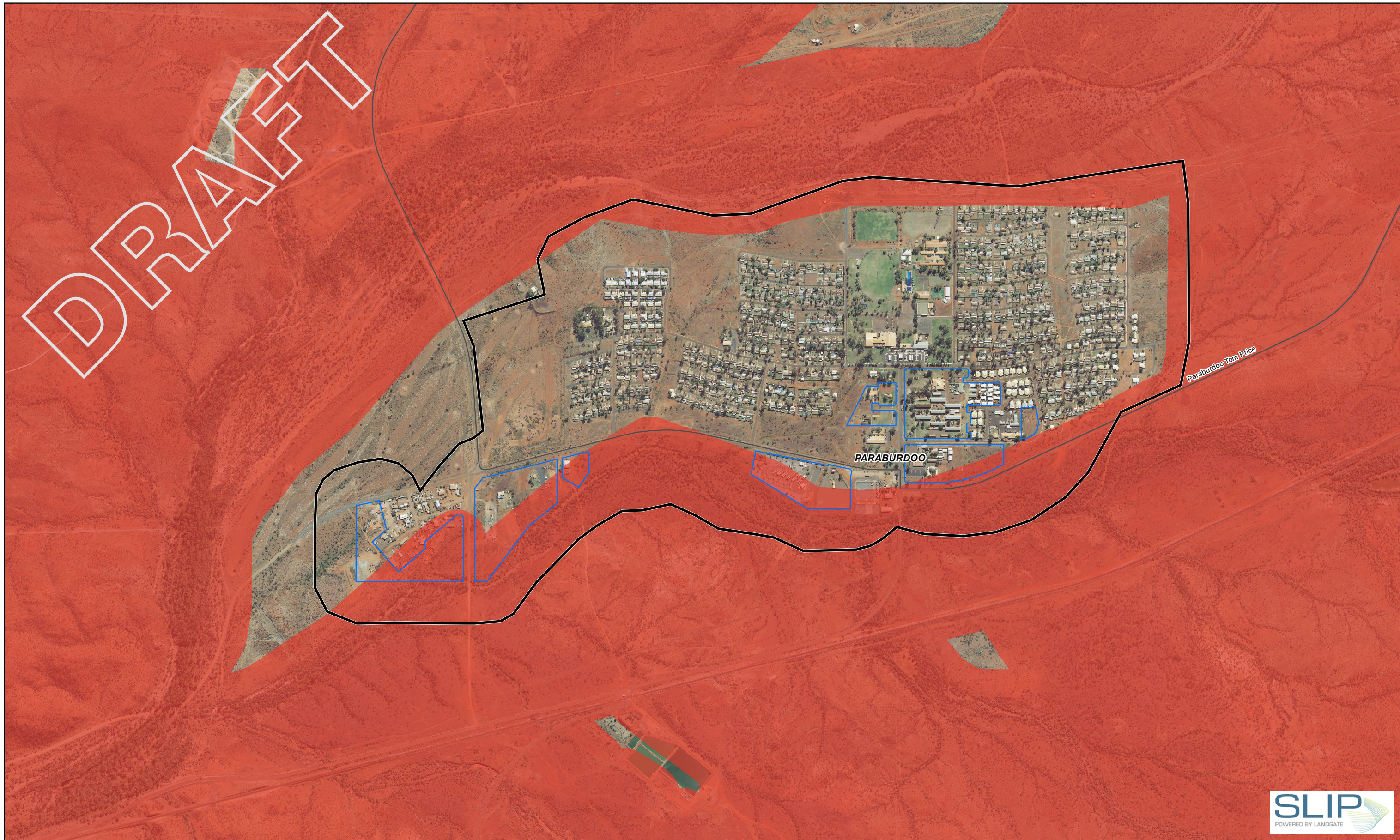
Shire of Ashburton
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Tom Price
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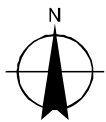
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Date	09 Aug 2017

Figure 2

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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50



LEGEND

- State Road
- Investigation Area
- Bushfire Hazard Level Assessment Area
- Bushfire Prone Areas



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

Paraburdoo Bushfire Prone Areas

Job Number	61-36178
Revision	B
Date	09 Aug 2017

Figure 3

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1.3 Scope and limitations

This report has been prepared by GHD for the Shire of Ashburton and may only be used and relied on by the Shire of Ashburton for the purpose agreed between GHD and the Shire of Ashburton as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than the Shire of Ashburton arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by the Shire of Ashburton and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has not been involved in the preparation of the Shire of Ashburton Local Planning Strategy and has had no contribution to, or review of the Shire of Ashburton Local Planning Strategy other than in the Shire of Ashburton Local Planning Strategy Bushfire Hazard Level Assessment. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the Shire of Ashburton Local Planning Strategy.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by site access and the location of public viewpoints. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

The vegetation classifications in this document are for the purpose of indicative broad bushfire hazard levels only. The classifications should not be used for any other purpose, and should not be used as the basis of determining bushfire attack levels (BAL) or BAL contour maps for any sites.

2. Bushfire Hazard Level Assessment

2.1 Methodology

The bushfire hazard level assessment was undertaken in accordance with Appendix 2 of the Guidelines for Planning in Bushfire Prone Areas (as amended).

The bushfire hazard level assessment area was determined as all future investigation areas identified in the draft local planning strategy, with a 150 metre buffer. This area was modified slightly in some locations to incorporate additional, nearby bushfire prone land, or clipped where the study area overlapped with significant waterways and ocean.

Vegetation in the study area was classified in accordance with Table 2.3 of AS3959-2009 (as amended) and the Visual Guide for Bushfire Risk Assessment in Western Australian (Department of Planning, 2016). The classification of vegetation was based on interrogation of the most recently available aerial photography, verified by numerous field assessment points.

Consistent with the broad-brush nature of a bushfire hazard level assessment, the most appropriate vegetation classification was determined for contiguous stands of vegetation that broadly share similar structures and anticipated fire behaviour, although some minor variability may be recorded at individual assessment points across the sites. Any variation in vegetation within stands that would result in a higher hazard level was individually mapped (e.g. a minor area of low shrubland within a larger grassland area may not be separately mapped, however any areas of scrub would be). Being a broad-brush assessment, the classification took a conservative approach in relation to defining vegetation classes. Future assessments of bushfire attack level which look at smaller extents of vegetation may result in lesser classifications.

Mapped vegetation classes were combined with slope analysis based on available contour data to model the appropriate bushfire hazard level. In line with AS3959, effective slope was calculated over 100 metres, to smooth out short variations in slope/land undulation that would not influence bushfire hazard level.

2.2 Onslow Townsite

2.2.1 Vegetation Classification Mapping

Vegetation across the Onslow area reflects grassland and shrubland vegetation classifications described in AS3959. The vegetation classes are described in Table 1. Figure 4 illustrates the broad distribution of vegetation classes across the bushfire hazard level assessment area.

Appendix A provides field observations and identification of vegetation class for the 46 assessment points analysed in Onslow.

Table 1 Vegetation Classes – Onslow Townsite

Vegetation class	Representative photo
Class G - Grassland All grassland forms, including situations with shrubs and trees, if the overstorey foliage cover is less than 10 percent (AS3959, Table 2.3) Landscape dominated by spinifex grasses, with occasional (foliage cover less than 10 percent) low shrubs. Some locations with scattered trees and larger shrubs.	
Class C - Shrubland Shrubs <2m high; greater than 30 percent foliage cover. Understoreys may contain grasses. (AS3959, Table 2.3) Landscape dominated by spinifex grasses, with varying density (greater than 10 percent, up to 40 percent in some areas) of low shrubs. Some locations with scattered trees and larger shrubs.	



LEGEND

○

Assessment Point

—

Local Road

□

Investigation Area

□

Bushfire Hazard Level Assessment Area

Vegetation Classification

■

Class C - Shrubland

■

Class G - Grassland

0200400800

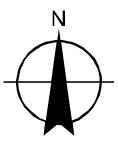
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Paper Size A3

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 50



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

Onslow
Vegetation Classes

Job Number	61-36178
Revision	A
Date	09 Aug 2017

Figure 4

2.2.2 Bushfire hazard level mapping

Bushfire hazard level in Onslow is predominantly influenced by vegetation classification; however there are small areas across the townsite where a slope greater than 10 degrees influences hazard level.

Figure 5 provides the modelled bushfire hazard level for Onslow Townsite. The townsite is located within a landscape reflecting a moderate bushfire hazard that will influence areas of development abutting areas of remnant vegetation.

The bushfire hazard level assessment methodology set out in the Planning in Bushfire Prone Areas Guidelines is a very broad-brush definition of hazard levels, and the actual hazard and anticipated bushfire behaviours based on vegetation characteristics within the defined hazard levels may vary.

In line with the bushfire hazard level assessment methodology, any areas within 100 metres of vegetation classified as a moderate or extreme level have been mapped as moderate. This takes into account radiant heat and ember attack that would be experienced by development in close proximity to bushfire prone vegetation. In line with AS3959, any development within 100 metres of most vegetation types is anticipated to experience some level of radiant heat and ember attack. However, for lower threat/intensity vegetation classes – in particular the grassland and low shrubland vegetation classes identified in Onslow – 100 metres is likely to be overstating the actual hazard. AS3959 identifies development at a distance greater than 50 metres from these low threat vegetation classes as BAL-LOW, meaning there is insufficient risk to warrant specific bushfire requirements beyond 50 metres from the lower level bushfire prone vegetation.

The specific nature of the low shrubland and spinifex grassland areas in and around Onslow will have similar fuel loads and fire behaviour (wind driven), despite being classified as separate classes according to Table 2.3 in AS3959. As a result, whilst shrubland areas are classified as Class C in this assessment on the basis of a shrub overstorey in excess of ten percent, these low shrublands would exhibit similar fire behaviour to grassland types, and are more aligned with the grassland assumptions set out in the detail of AS3959. This does not influence the determination of bushfire hazard (as both vegetation classes reflect a moderate hazard level) however should be considered in any future site level assessments undertaken in response to detailed bushfire risk and exposure.



LEGEND

Local Road

Bushfire Hazard Level Assessment Area

Investigation Area

Bushfire Hazard Level

Low

Moderate

Extreme

Paper Size A3

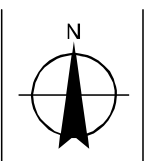
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Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 50



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

Onslow
Bushfire Hazard Level Assessment

Job Number 61-36178
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Date 09 Aug 2017

Figure 5

2.3 Tom Price

2.3.1 Vegetation classification

Vegetation within Tom Price reflects grassland and low shrubland vegetation classes, with increasing density and height of vegetation occurring with wetter conditions along drainage lines. This generates ribbons of scrub and open woodland, with small pockets of forest where the scrub understorey occurs with larger trees along the river.

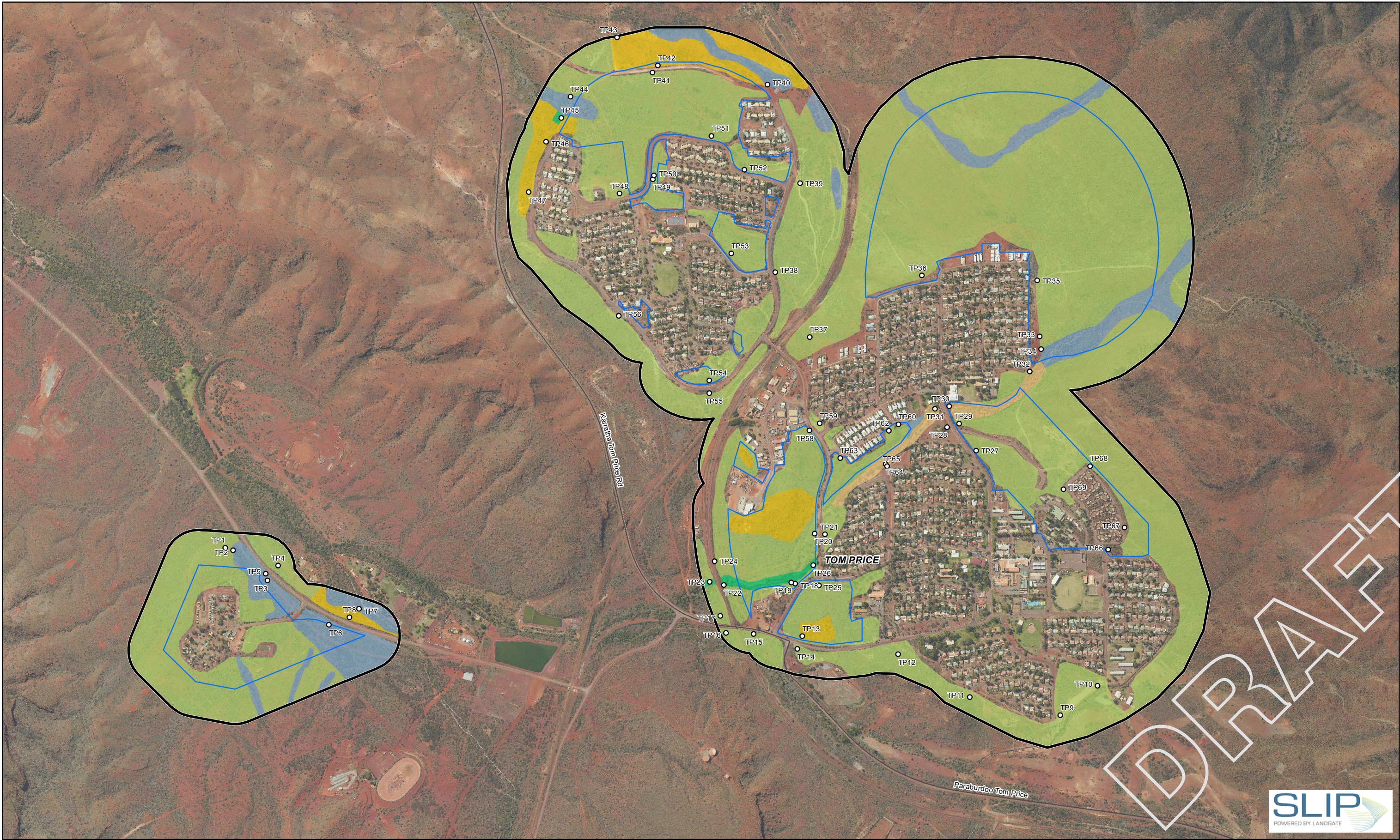
Table 2 describes the vegetation classes that occur in the area. Figure 6 illustrates the distribution of vegetation classes across the bushfire hazard level assessment area. Appendix A provides field observations and identification of vegetation class for 69 site locations assessed across Tom Price.

Table 2 Vegetation Classes – Tom Price Townsite

Vegetation class	Representative photo
Class G - Grassland All grassland forms, including situations with shrubs and trees, if the overstorey foliage cover is less than 10 percent (AS3959, Table 2.3) Landscape dominated by spinifex grasses, with occasional (foliage cover less than 10 percent) low shrubs. Some locations with scattered trees and larger shrubs.	
Class C - Shrubland Shrubs <2m high; greater than 30 percent foliage cover. Understoreys may contain grasses. (AS3959, Table 2.3) Landscape dominated by spinifex grasses, with varying density (greater than 10 percent, up to 40 percent in some areas) of low shrubs. Some locations with scattered trees and larger shrubs.	

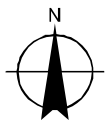
Vegetation class	Representative photo
Class D - Scrub Shrubs greater than 2 m high; 10-30% foliage cover with a mixed species composition (AS3959, Table 2.3) Taller shrublands, with foliage cover of 15 to 20% over grasses. Associated with greater water availability in and around drainage lines and watercourses.	
Class B - Woodland Open Woodland B-06 Trees 10-30 m high; 10-30% foliage cover dominated by eucalypts. (AS3959, Table 2.3). Linear areas of trees over a highly degraded, grassland understorey. Foliage cover ~10%. Associated with watercourse areas.	

Vegetation class	Representative photo
Class A – Forest Open Forest A-03 Trees 10-30m high: 30-70% foliage cover (may include understorey of low trees and tall shrubs or grass) (AS3959, Table 2.3) Linear areas with trees over a multi-tiered understorey of shrubs, grass and reeds. Associated with river.	



Paper Size A3
0 150 300 600
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Assessment Point
- State Road
- Investigation Area
- Bushfire Hazard Level Assessment Area

Vegetation Classification

- Class A - Forest
- Class B - Woodland, Open Woodland (06)
- Class C - Shrubland
- Class D - Scrub
- Class G - Grassland



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

Tom Price
Vegetation Classes

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Figure 6

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2.3.2 Bushfire hazard level

Bushfire hazard level in Tom Price is influenced by vegetation classification. Figure 7 provides the modelled bushfire hazard level for Tom Price.

The townsite is located within a landscape reflecting, in general, a moderate bushfire hazard that will influence development abutting remnant vegetation. Smaller areas of extreme hazard occur as a result of more intense vegetation types and areas of higher slope.

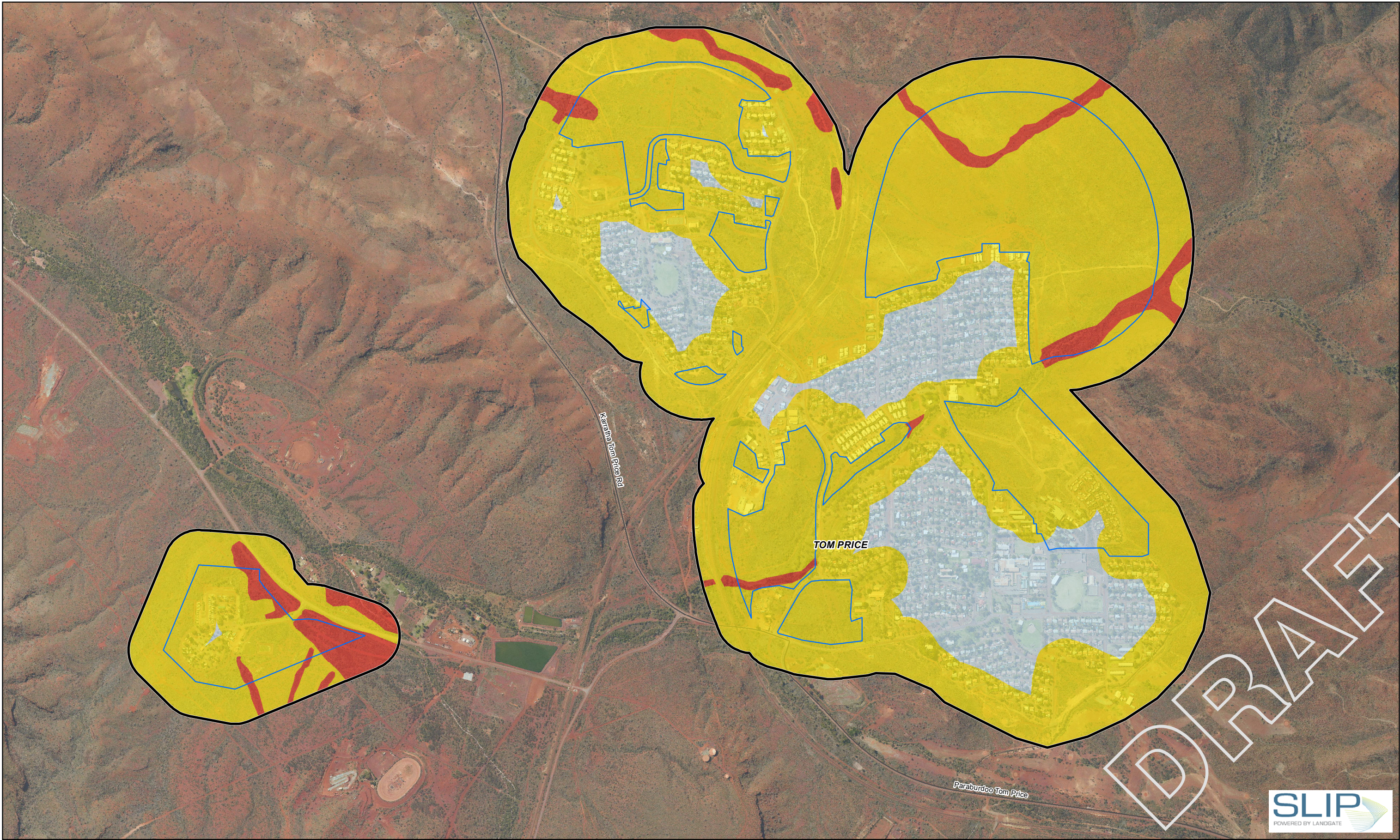
The bushfire hazard level assessment methodology set out in the Planning in Bushfire Prone Areas Guidelines is a very broad-brush definition of hazard levels, and the actual hazard and anticipated bushfire behaviours based on vegetation classifications within the defined hazard levels may vary.

Areas of extreme hazard mapped through and near the townsite result from increased density and height of vegetation with watercourses and drainage lines. Being restricted to narrow areas associated with watercourses, the extent of these scrub, woodland and forest areas would be insufficient to generate the maximum fire behaviour generated by AS3959 modelling assumptions, and therefore will not result in the fire behaviour expected of larger, contiguous areas of those vegetation classes. Whilst mapped as extreme in line with the bushfire hazard level assessment methodology, the ribbons of extreme hazard are not of a spatial extent that would generate that risk in reality.

In line with the bushfire hazard level assessment methodology, any areas within 100 metres of vegetation classified as a moderate or extreme level have been mapped as moderate. This requirement takes into account radiant heat and ember attack that would be experienced by development in close proximity to bushfire prone vegetation. In line with AS3959, any development within 100 metres of most vegetation types is anticipated to experience some level of radiant heat and ember attack. However, for lower threat/intensity vegetation classes – in particular the grassland and low shrubland vegetation classes identified in Tom Price – 100 metres is likely to be overstating the actual hazard. AS3959 identifies development at a distance greater than 50 metres from these low threat vegetation classes as BAL-LOW, meaning there is insufficient risk to warrant specific bushfire requirements beyond 50 metres from the lower level bushfire prone vegetation.

The specific nature of the low shrubland and spinifex grassland areas in and around Tom Price will have similar fuel loads and fire behaviour (wind driven), despite being classified as separate classes according to Table 2.3 in AS3959. As a result, whilst low shrubland areas are classified as Class C in this assessment on the basis of a shrub overstorey in excess of ten percent, these low shrublands would exhibit similar fire behaviour to grassland types, and are more aligned with the grassland assumptions set out in the detail of AS3959. This does not influence the determination of bushfire hazard (as both vegetation classes reflect a moderate hazard) however should be considered in any future site level assessments undertaken in response to detailed bushfire risk and exposure.

Any areas of extreme bushfire hazard within investigation areas are anticipated to be cleared to facilitate development.



2.4 Paraburdoo

2.4.1 Vegetation classification

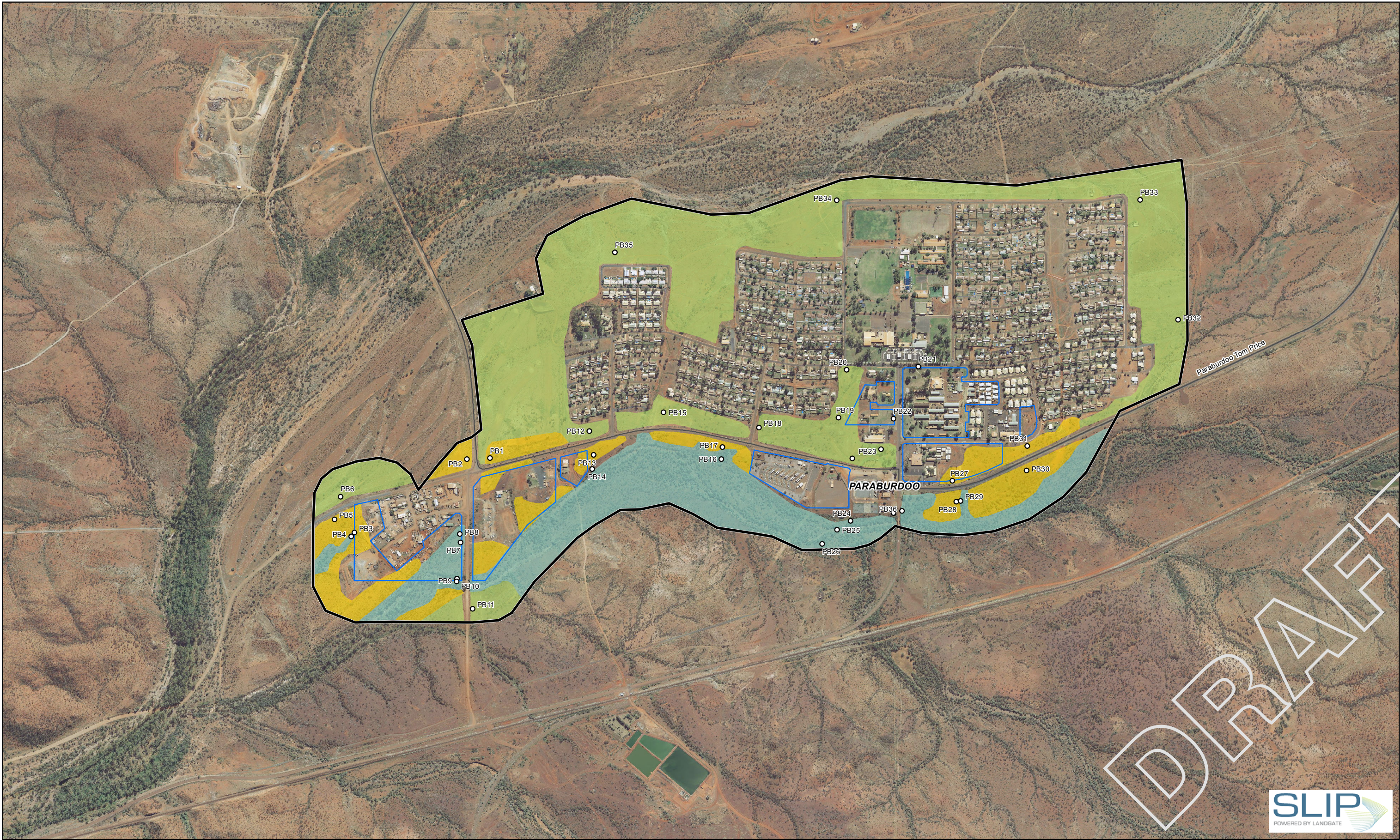
Vegetation across the Paraburdoo bushfire hazard level assessment area reflects grassland and shrubland vegetation classifications described in AS3959, with areas of low woodland associated with a drainage line to the south of the town. Table 3 describes the vegetation classes that occur in the area. Figure 8 illustrates the distribution of vegetation classes across the bushfire hazard level assessment area. Appendix A provides field observations and identification of vegetation class for 38 site assessment points.

Table 3 Vegetation Classes – Paraburdoo Townsite

Vegetation class	Representative photo
Class G - Grassland All grassland forms, including situations with shrubs and trees, if the overstorey foliage cover is less than 10 percent (AS3959, Table 2.3) Landscape dominated by spinifex grasses, with occasional (foliage cover less than 10 percent) low shrubs. Some locations with scattered trees and larger shrubs.	
Class C - Shrubland Shrubs <2m high; greater than 30 percent foliage cover. Understoreys may contain grasses. (AS3959, Table 2.3) Landscape characterised by spinifex grasses, with varying density (greater than 10 percent, up to 40 percent in some areas) of low shrubs. Some locations with scattered trees and larger shrubs.	

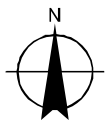
Vegetation class	Representative photo
Class B - Woodland Low Woodland B-07 Low trees and shrubs 2-10 m higher. Often have a grassy understorey or low shrubs (AS3959, Table 2.3). Low trees (5 to 8 metres) over grassland and low shrubland in areas associated with watercourse/drainage line to the south of Paraburdoo.	

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Paper Size A3
0 125 250 500
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- Assessment Point
- State Road
- Investigation Area
- ▭ Bushfire Hazard Level Assessment Area

Vegetation Classification

- Class B - Woodland, Low Woodland (07)
- Class C - Shrubland
- Class G - Grassland



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

Paraburdo Vegetation Classes

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Figure 8

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2.4.2 Bushfire hazard level

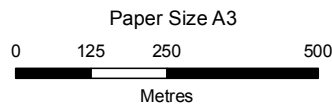
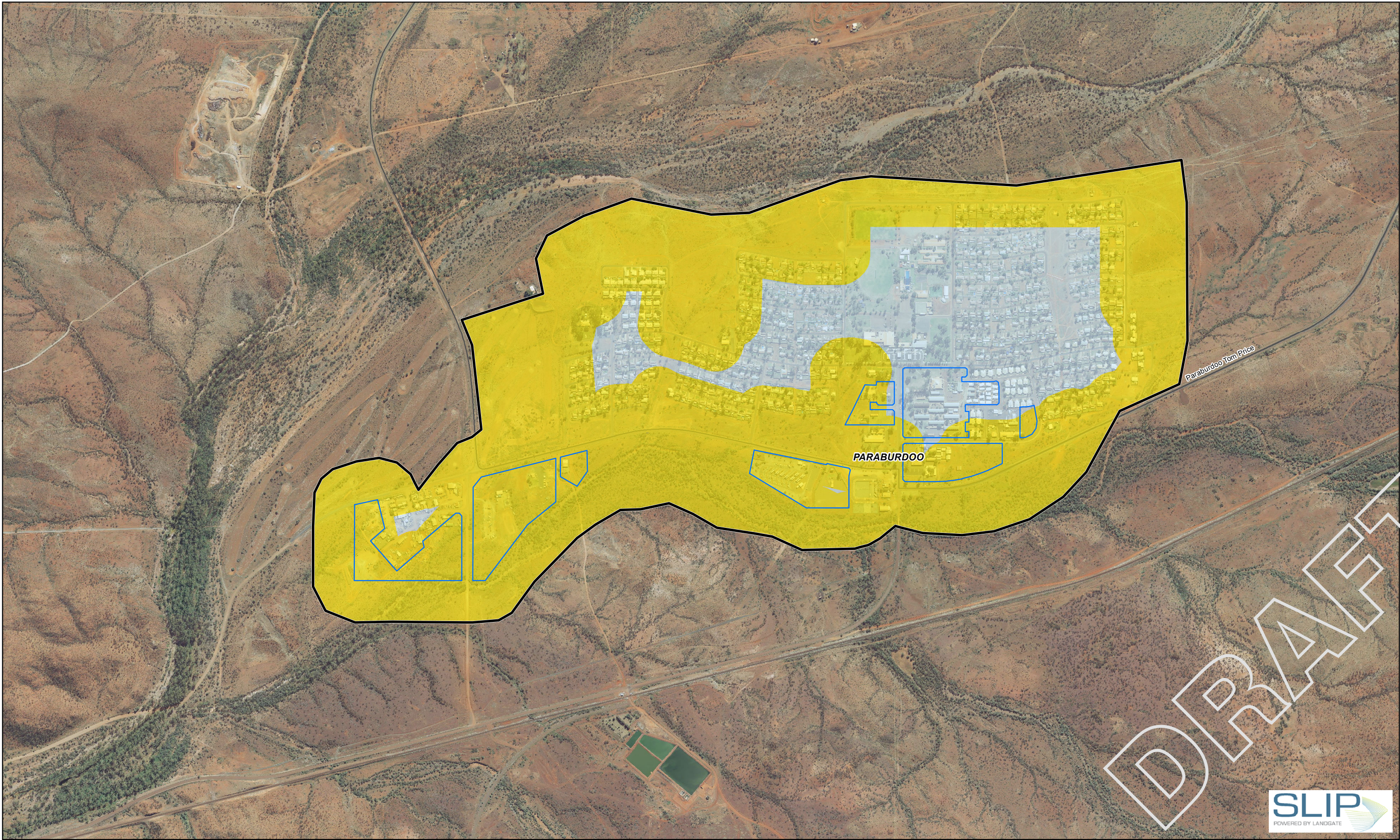
Bushfire hazard level in Paraburdoo is solely influenced by vegetation classification. Figure 9 provides the modelled bushfire hazard level for Paraburdoo Townsite.

The townsite is located within a landscape reflecting a moderate bushfire hazard that will influence development abutting remnant vegetation.

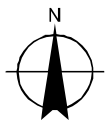
The bushfire hazard level assessment methodology set out in the Planning in Bushfire Prone Areas Guidelines is a very broad-brush definition of hazard levels, and the actual hazard and anticipated bushfire behaviours based on vegetation classifications within the defined hazard levels may vary.

In line with the bushfire hazard level assessment methodology, any areas within 100 metres of vegetation classified as a moderate or extreme level have been mapped as moderate. This requirement takes into account radiant heat and ember attack that would be experienced by development in close proximity to bushfire prone vegetation. In line with AS3959, any development within 100 metres of most vegetation types is anticipated to experience some level of radiant heat and ember attack. However, for areas adjacent to lower threat/intensity vegetation classes – in particular the grassland and low shrubland vegetation classes identified around Paraburdoo – 100 metres is likely to be overstating the actual hazard. AS3959 identifies development at a distance greater than 50 metres from these low threat vegetation classes as BAL-LOW, meaning there is insufficient risk to warrant specific bushfire requirements beyond 50 metres from the lower level bushfire prone vegetation.

The specific nature of the low shrubland and spinifex grassland areas in and around Paraburdoo will have similar fuel loads and fire behaviour (wind driven), despite being classified as separate classes according to Table 2.3 in AS3959. As a result, whilst shrubland areas are classified as Class C in this assessment on the basis of a shrub overstorey in excess of ten percent, these low shrublands would exhibit similar fire behaviour to grassland types, and are more aligned with the grassland assumptions set out in the detail of AS3959. This does not influence the determination of bushfire hazard (as both vegetation classes reflect a moderate hazard level) however should be considered in any future site level assessments undertaken in response to detailed bushfire risk and exposure.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



LEGEND

- | | | | |
|------------|--------------------|-------------|------------------------------|
| State Road | Investigation Area | Survey Area | Bushfire Hazard Level |
| | | | Low |
| | | | Moderate |
| | | | Extreme |



Shire of Ashburton
Ashburton Bushfire Hazard
Level Assessment

**Paraburdoo
Bushfire Hazard Level Assessment**

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Figure 9

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3. Shire of Ashburton Local Planning Strategy

3.1 Compliance with bushfire protection criteria

The future development of investigation areas will result in a reduction of bushfire hazard level, as vegetation is cleared and replaced with low threat development. However, outer areas will continue to be influenced by bushfire risk from vegetation in the surrounding landscape. Future development will have to demonstrate compliance with bushfire protection criteria set out in technical appendices to the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2015).

Bushfire protection criteria assist decision makers assess proposed bushfire risk management measures in strategic planning proposals, subdivisions, or development applications in bushfire prone areas. The criteria relate to four key elements: location, siting and design, vehicular access and water.

The specific performance principles and acceptable solutions for these elements are provided in Appendix B. The majority are matters for design at subsequent planning stages, and will be a component of investigating the suitability of areas for development through local structure plans. In the absence of design, it is not possible to assess these criteria at the level of a local planning strategy. In accordance with SPP 3.7 and associated bushfire planning guidelines, local structure plans and subdivision applications will be assessed against the bushfire protection criteria, and design will need to meet the acceptable solutions, or provide an alternative solution in response to the performance principles. This would be undertaken within the preparation of a bushfire management plan, informed by a more detailed, site specific investigation of bushfire exposure, such as bushfire attack level (BAL) contour maps.

Table 4 presents the performance principles from the bushfire protection criteria, and identifies the expectation for future development in meeting the criteria in later planning proposals.

Generally, based on a moderate bushfire hazard level and the nature of vegetation, all investigation and infill areas are considered capable of meeting the bushfire protection criteria with future design locating access and public open space to achieve access requirements and sufficient asset protection zones to any areas of residual bushfire risk. Provision of reticulated water will meet criteria regarding water supply. Additional care will be required in the detailed planning of some residential infill areas in Tom Price with extensions to the existing road network, and potentially additional managed open space, required in the southeast of town to ensure suitable access and asset protection zones.

Table 4 Compliance with Bushfire Protection Criteria

Element	Location	Siting and design of development	Vehicular access	Water
	The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low, or a BAL-29 or below, and the risk can be managed. For unavoidable development in areas where BAL-40 or BAL-FZ applies, demonstrating that the risk can be managed to the satisfaction of the Department of Fire and Emergency Services and the decision-maker.	The siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire threat that applies to the site. That it incorporates a defensible space and significantly reduces the heat intensities at the building surface thereby minimising the bushfire risk to people, property and infrastructure, including compliance with AS 3959 if appropriate.	The internal layout, design and construction of public and private vehicular access and egress in the subdivision/ development allow emergency and other vehicles to move through it easily and safely at all times.	The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for firefighting purposes.
Onslow				
Urban Investigation Areas	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Transient Worker Accommodation & Short Stay Accommodation	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Future Industry / Mixed Business	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Tom Price				
Urban Investigation Areas	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Residential Infill Areas	Expected to meet the criteria. Current BHL is moderate.	May meet the criteria subject to further investigation and design.	May meet the criteria subject to further investigation and design.	Expected to meet the criteria.
Transient Worker Accommodation & Short Stay Accommodation	Should meet the criteria depending upon the design. Some areas of extreme hazard are located in this area, however are likely to be cleared to facilitate development.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Future Industry / Mixed Business	Should meet the criteria depending upon the design. Some areas of extreme hazard are located in this area, however are likely to be cleared to facilitate development.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Paraburdoo				
Urban Investigation Areas	Expected to meet the criteria. Current BHL is moderate.	Expected to meet the criteria.	Expected to meet the criteria.	Expected to meet the criteria.
Transient Worker Accommodation & Short Stay Accommodation	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.
Future Industry / Mixed Business	Expected to meet the criteria. Current BHL is moderate.	Should meet the criteria depending upon the design.	Should meet the criteria depending upon the design.	Expected to meet the criteria.

3.2 Recommended strategies and actions

Table 5 presents the draft planning strategies and actions set out in the draft Shire of Ashburton Local Planning Strategy. These have been reviewed in line with the bushfire hazard level assessment.

Table 5 Bushfire strategies and actions from draft Local Planning Strategy

Strategies	Actions
Bush Fire Risk 1. Promote the appropriate management of bush fire risks to Townsites and Aboriginal communities. 2. Promote appropriate management of bush fire risks to remote camps, tourism sites and pastoral homesteads. 3. Identify improvements to the road network to ensure that vehicle access and egress is available and safe during a bushfire event.	Bush Fire Risk 1. Ensure future planning and development within Bush Fire Prone Areas meets the requirements of State Planning Policy 3.7: <i>Planning in Bushfire Prone Areas</i> and the <i>Guidelines for Planning in Bushfire Prone Areas</i> . 2. For existing developed areas that have an extreme BHL, implement risk management measures that help reduce the risk to 'low' to 'moderate'. 3. Prior to rezoning land identified for a future change in use or intensification of use/ development, a BHL assessment shall be undertaken and, where there are areas identified as 'moderate' to 'extreme', a Bushfire Management Plan shall also be prepared. 4. Consider the location of fire service access routes in semi-rural areas around townsites and emergency management.

In line with this bushfire hazard level assessment, some modifications to the draft actions are appropriate to better reflect the hazard levels determined.

Action 1 is an appropriate planning response to the bushfire hazard in the key townsites. The role of a local planning strategy is to provide an effective local planning framework to address key issues in local planning processes and decisions. The state policy framework regarding bushfire risk is very well developed, and applies clearly to local planning applications and decisions. Therefore, the Shire of Ashburton Local Planning Strategy does not require additional policy response to address bushfire risk, as it is adequately dealt with by the existing policy framework. Whilst this bushfire hazard level assessment has modelled bushfire hazard in some areas outside the bushfire prone area mapping, development controls set out in the state planning framework should only be applied to areas within the designated bushfire prone area. In some instances, the bushfire hazard level assessment methodology results in a defined hazard level that overstates the actual bushfire hazard for developed areas within Onslow, Tom Price and Paraburdoo. It would be unnecessary and onerous to apply the policy framework to areas outside the designated bushfire prone areas, even if this assessment has mapped a moderate bushfire hazard level for the land.

With respect of Action 2, no existing developed areas were identified as having an extreme bushfire hazard level, although some areas in Tom Price are located near to small areas of extreme hazard. The spatial extent and small size of the mapped extreme hazard areas means that, in reality, the overall hazard presented to existing development is likely to be of a moderate level. Therefore, Action 2 may not be necessary in the local planning strategy. Overall bushfire risk to existing development in the townsites should be managed through ongoing fuel management activities, such as maintaining firebreaks and land management, and through continual review and updating of emergency management plans and procedures, including

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planning for emergency and fire access. Any redevelopment of these areas would consider risk in accordance with SPP3.7 and deemed provisions within the Shire of Ashburton Local Planning Scheme.

Action 3 may be considered redundant, as the bushfire hazard level assessment has been undertaken. It would be beneficial, instead, to confirm the need for more detailed understanding of likely bushfire exposure for individual development areas. In line with SPP3.7, structure plans for investigation areas should develop a bushfire attack level (BAL) contour map – taking into account areas to be cleared for development, locations of future roads and open spaces. This will determine the residual bushfire exposure risk to future development, enable detailed consideration of the bushfire protection criteria, and identify the need for any future construction standards in line with AS3959.

Action 4 presents an appropriate recommendation to enhance emergency access in semi-rural areas, however it is not clear as to what the mechanism for this action would be. It is recommended that a specific mechanism – such as an emergency management plan – be identified to more clearly articulate the project necessary for delivery to achieve the desired action.

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4. Conclusion

Potential townsite expansion areas in Tom Price, Paraburdoo and Onslow are influenced, for the most part, by a moderate bushfire hazard level. Whilst pockets of extreme hazard level were modelled and mapped within Tom Price, the small size and spatial extent of these areas makes it unlikely that they would present an extreme hazard in reality. The moderate hazard influencing the towns will have implications for future planning.

Assessment of the urban investigation and infill areas against the relevant bushfire protection criteria of the Planning in Bushfire Prone areas Guidelines suggests that, subject to design, these areas can be developed in accordance with the requirements of State Planning Policy 3.7, the guidelines, and all supporting appendices. Subsequent strategic planning for the expansion areas will need to consider appropriate services provision, vehicular access, and site design to meet state policy requirements.

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Appendices

Appendix A – Draft Strategy Plans

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LEGEND

Paraburdoo Townsite Boundary

Urban

Commercial

Industry

Community / Public Purpose

Rural

Landscape

Public Open Space

Railway

District Road

Neighbourhood Road

Residential Infill Areas

Town Centre

Tourism

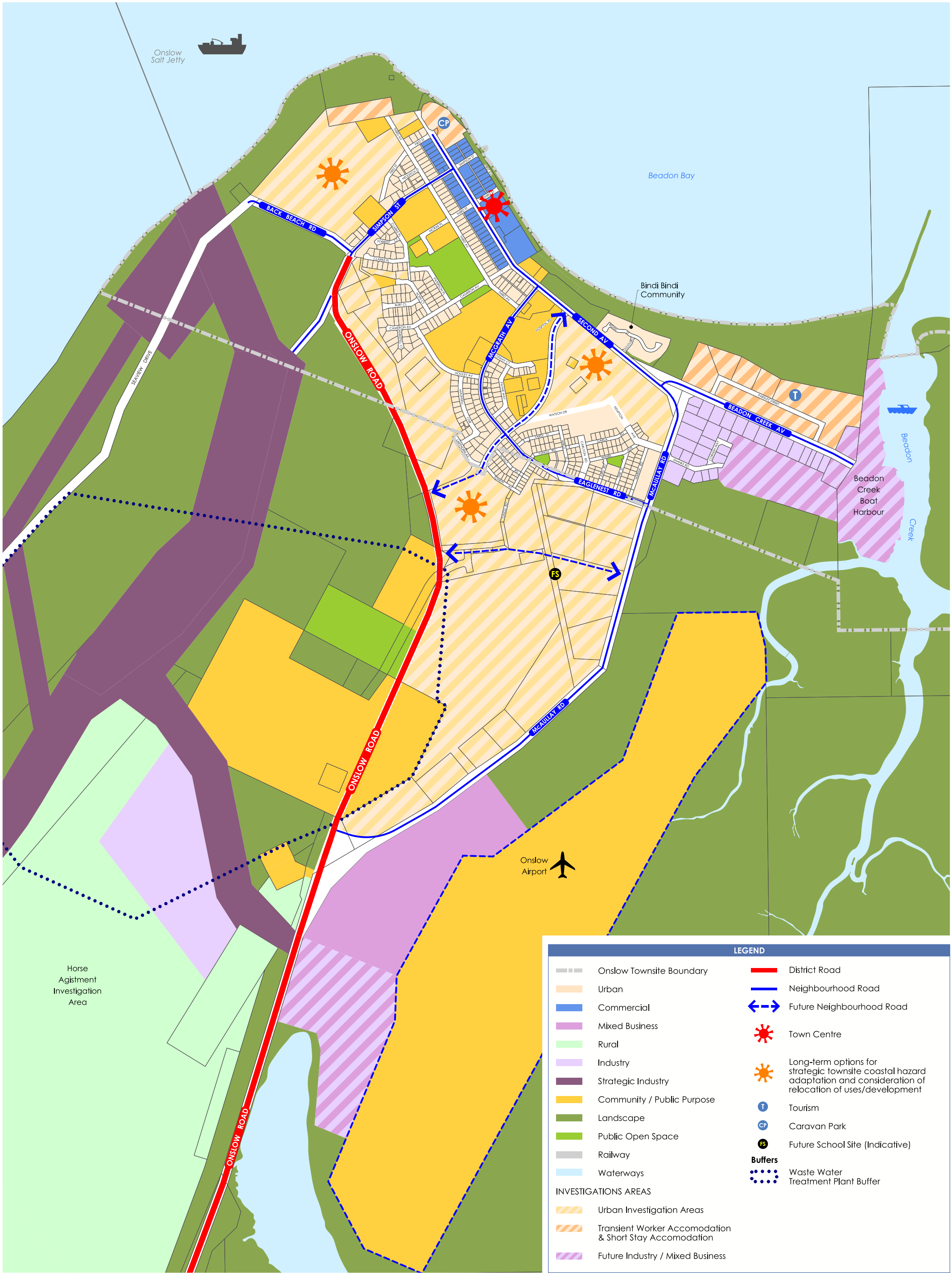
Caravan Park

INVESTIGATION AREAS

Urban Investigation Areas

Transient Worker Accommodation & Short Stay Accommodation

Future Industry / Mixed Business



Appendix B – Field observations

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PPOINT_ID	VEG_CLASS	NOTES
Onslow1	G	E facing photo, 85% cover, no foliage
Onslow2	C	PO - S; H = <1.0m; GC = 20%; Other: some grass, salt marsh
Onslow3	C	1. PO - SE; 2. Shrubs (saltbush) with grass - 40% saltbush foliage, 3. Grass, 4. <0.8m
Onslow4	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 90% grass 10% shrub, 4. Foliage cover = <10%, 5. Dominant height = <1.0m
Onslow5	G	1. Photo facing- SW, 2. Dominant veg - Grass, 3. Ground cover = 70% grass 5% shrub 25% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow6	G	1. Photo facing- N, 2. Dominant veg - Grass, 3. Ground cover = 80% grass 5% shrub 15% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow7	G	1. Photo facing- ESE, 2. Dominant veg - Grass, 3. Ground cover = 75% grass 5% shrub 20% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow8	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 85% grass 5% shrub 10% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow9	G	1. Photo facing- E, 2. Dominant veg - Grass, 3. Ground cover = 85% grass 5% shrub 10% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow10	C	1. Photo facing- S, 2. Dominant veg - Scrub, 3. Ground cover = 5% shrub 95% soil, 4. Foliage cover = <5%, 5. Dominant height = <0.5m
Onslow11	G	1. Photo facing- ENE, 2. Dominant veg - Grass, 3. Ground cover = 85% grass 5% shrub 10% soil, 4. Foliage cover = <5%, 5. Dominant height = <1.0m
Onslow12	G	1. Photo facing- ESE, 2. Dominant veg - Grass, 3. Ground cover = 70% grass 10% shrub 20% soil, 4. Foliage cover = 5-10%, 5. Dominant height = <1.0m
Onslow13	C	1. Photo facing- NE, 2. Dominant veg - Shrubs, 3. Ground cover = 25% shrub <5 tree 70% soil, 4. Foliage cover = <25%, 5. Dominant height = 1.0-1.5m
Onslow14	G	1. Photo facing- W, 2. Dominant veg - Grass, 3. Ground cover = 65% grass 15% shrub 20% soil, 4. Foliage cover = 10-15%, 5. Dominant height = <1.0m
Onslow15	G	1. Photo facing- NNE, 2. Dominant veg - Grass, 3. Ground cover = 60% grass 20% shrub 20% soil, 4. Foliage cover = 20%, 5. Dominant height = <1.0m
Onslow16	G	1. Photo facing- SE, 2. Dominant veg - Grass, 3. Ground cover = 10% grass 15% shrub 15% soil, 4. Foliage cover = 20%, 5. Dominant height = <1.0m
Onslow17	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 45% grass 10% shrub 45% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow18	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 35% grass 25% shrub 40% soil, 4. Foliage cover = 25%, 5. Dominant height = <1.0m
Onslow19	G	1. Photo facing- NE, 2. Dominant veg - Grass, 3. Ground cover = 35% grass 20% shrub/tree 45% soil, 4. Foliage cover = 15%, 5. Dominant height = <1.0m
Onslow20	G	1. Photo facing- SSE, 2. Dominant veg - Grass, 3. Ground cover = 55% grass 10% shrub 35% soil, 4. Foliage cover = 5-10%, 5. Dominant height = <1.0m
Onslow21	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 40% grass 5% shrub 55% soil, 4. Foliage cover = <5%, 5. Dominant height = <0.5m
Onslow22	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 45% grass 15% shrub 40% soil, 4. Foliage cover = 10-15%, 5. Dominant height = <1.0m
Onslow23	O	1. Photo facing - SSE. Now developed
Onslow24	G	1. Facing- ESE, 2. Dominant veg - Grass, 3. GC = 55% grass 20% shrub & tree 25% soil, 4. Foliage cover = 20% (in gully), 5. Dominant height = <1.0m

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PPOINT_ID	VEG_CLASS	NOTES
Onslow25	G	1. Photo facing- S, 2. Dominant veg - Grass, 3. Ground cover = 85% grass 5% shrub 10% soil, 4. Foliage cover = 5%, 5. Dominant height = <1.0m
Onslow26	C	1. Photo facing- WSW, 2. Dominant veg - Shrubs, 3. Ground cover = 40% shrubs 10% grass 50% soil, 4. Foliage cover = 30%, 5. Dominant height = <1.0m
Onslow27	C	1. Photo facing- SSW, 2. Dominant veg - Shrubs, 3. Ground cover = 40% grass 35% shrub 25% soil, 4. Foliage cover = 30-40%, 5. Dominant height = 1.5m
Onslow28	G	1. Photo facing- SSW, 2. Dominant veg - Grass, 3. Ground cover = 45% grass 15% shrub 40% soil, 4. Foliage cover = 10-15%, 5. Dominant height = <1.0m
Onslow29	C	1. Photo facing- W, 2. Dominant veg - Shrubs, 3. Ground cover = 25% shrub 10% Grass 65% soil, 4. Foliage cover = 20%, 5. Dominant height = <1.0m
Onslow30	G	1. Photo facing- NE, 2. Dominant veg - Grass, 3. Ground cover = 70% grass 10% shrub 20% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow30	G	1. Photo facing- N, 2. Dominant veg - Grass, 3. Ground cover = 85% grass 5% shrub 10% soil, 4. Foliage cover = 5%, 5. Dominant height = <0.5m
Onslow31	G	1. Photo facing- NNE, 2. Dominant veg - Grass, 3. Ground cover = 65% grass 15% shrub 20% soil, 4. Foliage cover = 15%, 5. Dominant height = <1.0m
Onslow32	G	1. Photo facing- NE, 2. Dominant veg - Grass, 3. Ground cover = 45% grass 20% shrub 35% soil, 4. Foliage cover = 15-20%, 5. Dominant height = <1.0m
Onslow33	G	1. Photo facing- NW, 2. Dominant veg - Grass, 3. Ground cover = 90% grass 5% shrub 5% soil, 4. Foliage cover = 5%, 5. Dominant height = <0.5m
Onslow34	G	1. Facing - SW, 2. Dominant veg - Grass, 3. Ground cover = 80% grass 10% shrub & tree 10% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow35	G	1. Photo facing- ESE, 2. Dominant veg - Grass, 3. Ground cover = 40% grass 15% shrub 45% soil, 4. Foliage cover = 10-15%, 5. Dominant height = <1.0m
Onslow36	G	1. Photo facing- NNE, 2. Dominant veg - Grass, 3. Ground cover = 45% grass 10% shrub 45% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow37	G	1. Photo facing- SW, 2. Dominant veg - Grass, 3. Ground cover = 55% grass 5% shrub 40% soil, 4. Foliage cover = 5%, 5. Dominant height = <1.0m
Onslow38	G	1. Photo facing- NNW, 2. Dominant veg - Grass, 3. Ground cover = 75% grass 15% shrub 10% soil, 4. Foliage cover = 10-15%, 5. Dominant height = <1.0m
Onslow39	G	1. Photo facing- NNE, 2. Dominant veg - Grass, 3. Ground cover = 40% grass 10% shrub 50% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow40	G	1. Photo facing- E, 2. Dominant veg - Grass, 3. Ground cover = 80% grass 10% shrub 10% soil, 4. Foliage cover = 10%, 5. Dominant height = <1.0m
Onslow41	G	Non-accessible. 1. PF - S to W, 2. DV - Grass, 3. GC = 45% grass 30% shrub 35% soil, 4. FC = 20-25%, 5. DH = <1.0m
Onslow42	G	1. PF - ESE, 2. DV - Grass, 3. GC = 50% grass 15% shrub 35% soil, 4. FC = 10%, 5. DH = <1.0m
Onslow43	G	1. PF - WSW, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5-10%, 5. DH = <1.0m
Onslow44	C	1. PF - SE, 2. DV - Shrubs, 3. GC = 20% grass 25% shrub 55% soil, 4. FC = ~20%, 5. DH = <1.0m. Other - borderline grassland
Onslow45	C	1. PF - ESE, 2. DV - Grass, 3. GC = 40% grass 30% shrub 30% soil, 4. FC = ~25%, 5. DH = <1.0m. Other - borderline shrubland in places
PB1	C	1. PF - NNE, 2. DV - Shrubs, 3. GC = 35% grass 20% shrub 10% trees 35% soil, 4. FC = ~25%, 5. DH = 1.0-1.5m. Other - some shrub ~2.0m & trees >5m

PPOINT_ID	VEG_CLASS	NOTES
PB2	C	1. PF - NNW, 2. DV - Shrub, 3. GC = 15% grass 15% scrub 70% soil, 4. FC = 10%, 5. DH = <1.0m. Other - some shrub ~2.0m
PB3	C	1. PF - ESE, 2. DV - Shrub, 3. GC = 60% grass 15% scrub 35% soil, 4. FC = 10%, 5. DH = 1.0-1.5m. Other - some shrub ~2.0m
PB4	B	1. PF - SSE, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 20%, 5. DH = ~8.0m. Other - tree line along edge of polygon
PB5	C	1. PF - SW, 2. DV - Shrub, 3. GC = 25% grass 15% shrub 60% soil, 4. FC = 10%, 5. DH = 1.5-2m. Other - some shrub >2.0m
PB6	G	1. PF - N, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.5-2m. Other - some trees 5-10m
PB7	C	1. PF - W, 2. DV - Shrub, 3. GC = 20% grass 10% shrub 70% soil, 4. FC = 5-10%, 5. DH = 1.5m. Other - some shrub >2.0m
PB8	B	1. PF - WSW, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 15%, 5. DH = ~8.0m. Other - tree line along edge of polygon
PB9	B	1. PF - NW, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 20%, 5. DH = ~8.0m. Other - along river band, river bed sparse grass & shrub
PB10	B	1. PF - W, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 20%, 5. DH = ~8.0m. Other - along river band, river bed sparse grass & shrub
PB11	G	1. PF - E, 2. DV - Grass, 3. GC = 15% grass 10% shrub 75% soil, 4. FC = <5%, 5. DH = <0.5m. Other - looks previously cleared
PB12	G	1. PF - W, 2. DV - Grass, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB13	C	1. PF - SW, 2. DV - Shrub, 3. GC = 5% grass 15% shrub 80% soil, 4. FC = 5%, 5. DH = 1.5-2.0m. Other - sparse shrub 2.0-4.0m occasional tree 5-10m
PB14	B	1. PF - S, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 20%, 5. DH = 5m. Other - riverbank vegetation, some taller trees 10-15m
PB15	G	1. PF - NE, 2. DV - Grass, 3. GC = 40% grass 5% shrub 55% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB16	B	1. PF - SW, 2. DV - Tree, 3. GC = 50% grass 10% shrub 40% soil, 4. FC = 10%, 5. DH = ~8.0m.
PB17	O	Showing transition to woodland/scrub
PB18	G	1. PF - ENE, 2. DV - Grass, 3. GC = 40% grass 5% shrub 55% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB19	G	1. PF - NNW, 2. DV - Grass, 3. GC = 40% grass 5% shrub 55% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB19	G	1. PF - ESE, 2. DV - Grass, 3. GC = 35% grass 5% shrub 60% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB20	G	1. PF - SE, 2. DV - Grass, 3. GC = 35% grass 5% shrub 60% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB21	G	1. PF - SSE, 2. DV - Grass, 3. GC = 90% grass 10% soil, 4. FC = 5%, 5. DH = Occasional tree 10-20m, parkland
PB22	O	1. PF - W, 2. DV - Grass, 3. GC = 90% grass 10% soil, 4. FC = 5%, 5. DH = Occasional tree 10-20m, parkland
PB23	G	1. PF - SW, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
PB24	B	1. PF - WSW, 2. DV - Tree, 3. GC = 50% grass 10% shrub 40% soil, 4. FC = 20%, 5. DH = ~6.0m.
PB24	B	1. PF - SW, 2. DV - Tree, 3. GC = 45% grass 15% shrub 40% soil, 4. FC = 15%, 5. DH = ~8.0m.
PB25	B	Riverbed view - 5m post
PB26	B	1. PF - ENE, 2. DV - Tree, 3. GC = 45% grass 15% shrub 40% soil, 4. FC = 10%, 5. DH = ~5.0m.

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PPOINT_ID	VEG_CLASS	NOTES
PB27	C	1. PF - NE, 2. DV - Shrub, 3. GC = 40% grass 15% shrub 45% soil, 4. FC = 5-10%, 5. DH = 1.5m. Other - scattered shrub 2.0m+ and trees 5m+
PB28	C	1. PF - SW, 2. DV - Shrub, 3. GC = 40% grass 20% shrub 40% soil, 4. FC = 5-10%, 5. DH = 1.5m. Other - some scattered shrub 2.0m+ and trees 5m+
PB29	B	1. PF - SS, 2. DV - Tree, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 20%, 5. DH = 10m+m. Other - follows drainage
PB30	C	1. PF - S, 2. DV - Shrub, 3. GC = 20% grass 25% shrub 55% soil, 4. FC = 15%, 5. DH = 1.5-2.0m. Other - some shrub 2.0m+ and trees 5m+
PB31	C	1. PF - NE, 2. DV - Shrub, 3. GC = 40% grass 15% shrub 45% soil, 4. FC = 5%, 5. DH = <0.5m. Other - some shrub 2.0m+ and trees 5m+, borderline grassl
PB32	G	1. PF - N, 2. DV - Grass, 3. GC = 50% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = <1.0m. Other - some shrub 2.0m+
PB33	C	1. PF - SE, 2. DV - Shrub, 3. GC = 25% grass 25% shrub 50% soil, 4. FC = 10%, 5. DH = <0.5m. Other - small shrub mostly, some shrub 2.0m+
PB34	G	1. PF - NNE, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = <1.0m. Other - possible shrubland, some shrub 2.0m+
PB35	C	1. PF - SE, 2. DV - Shrub, 3. GC = 40% grass 20% shrub 40% soil, 4. FC = 10-15%, 5. DH = 1.0-1.5m. Other - some trees 2.0m+
PB36	B	1. PF - SE, 2. DV - Tree, 3. GC = 50% grass 10% shrub 40% soil, 4. FC = 20%, 5. DH = ~6.0m. Other - some trees 10m+
TP1	G	1. PF - SW, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m
TP2	D	1. PF - ESE, 2. DV - Scrub, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 30%, 5. DH = 7-8m. Other - some trees 10m+, follows roadside drainage
TP3	D	1. PF - W, 2. DV - Scrub, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 20%, 5. DH = 7-8m. Other - some trees up to 10m
TP4	G	1. PF - NNW, 2. DV - Grass, 3. GC = 55% grass 5% shrub 40% soil, 4. FC = 5%, 5. DH = 1.0m. Other - bordered by veg similar to TP3, previously cleared?
TP5	D	1. PF - NW, 2. DV - shrub, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 20%, 5. DH = ~5-6m. Other - typical roadside vegetation
TP6	D	1. PF - NW, 2. DV - shrub, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 15%, 5. DH = ~5-6m. Other - typical roadside vegetation
TP7	D	1. PF - E, 2. DV - shrub, 3. GC = 35% grass 10% shrub 55% soil, 4. FC = 15-20%, 5. DH = ~5-6m. Other - aligns waterway, woodland?
TP8	C	1. PF - SW, 2. DV - Shrub, 3. GC = 40% grass 30% shrub 30% soil, 4. FC = 30%, 5. DH = 2.0m. Other - dense roadside shrubland
TP9	G	1. PF - NE, 2. DV - Grass, 3. GC = 35% grass 5% shrub 60% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
TP10	G	1. PF - NE, 2. DV - Grass, 3. GC = 35% grass 5% shrub 60% soil, 4. FC = 5%, 5. DH = 0.5m. Other - sparse shrub 1.5-4m occasional tree 10-15m
TP11	G	1. PF - NW, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub/trees 2-10m
TP12	G	1. PF - NW, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some scrub/trees 2-10m
TP13	D	1. PF - NW, 2. DV - Scrub, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 10%, 5. DH = ~7m. Other - trees 10m+
TP14	G	1. PF - NW, 2. DV - Grass, 3. GC = 60% grass 10% shrub 30% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some scrub/trees 2-10m, bordered by scrub
TP15	G	1. PF - SW, 2. DV - Grass, 3. GC = 70% grass 5% shrub 25% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, bordered by shrub

PPOINT_ID	VEG_CLASS	NOTES
TP16	C	1. PF - SW, 2. DV - Shrub, 3. GC = 70% grass 20% shrub 10% soil, 4. FC = 15%, 5. DH = 3.0m. Other - some shrub /trees 5-10m
TP17	G	1. PF - NW, 2. DV - Grass, 3. GC = 70% grass 5% shrub 25% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, bordered by shrub
TP18	G	1. PF - N, 2. DV - Grass, 3. GC = 70% grass 5% shrub 25% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, upper river bank
TP19	A	1. PF - NNW, 2. DV - Trees, 3. GC = 60% grass 30% shrub 10% soil, 4. FC = 50%, 5. DH = 10m+. Other - dense river veg, grass/reeds, understory 5m+
TP20	G	1. PF - SW, 2. DV - Grass, 3. GC = 80% grass 5% shrub 15% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, scrub/woodland aligns river
TP21	G	1. PF - NNE, 2. DV - Grass, 3. GC = 70% grass 5% shrub 25% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, scrub/woodland aligns river
TP23	B	1. PF - SW, 2. DV - Trees, 3. GC = 80% grass 10% shrub 10% soil, 4. FC = 10%, 5. DH = 10m+. Other -river veg, grass/reeds,possible grassland with tree
TP24	C	1. PF - ENE, 2. DV - Shrub, 3. GC = 45% grass 15% shrub 40% soil, 4. FC = 10-15%, 5. DH = 2.0-3.0m. Other - some shrub /trees 5-10m
TP22	A	1. PF - NNW, 2. DV - Trees, 3. GC = 60% grass 30% shrub 10% soil, 4. FC = 50%, 5. DH = 10m+. Other - dense river veg, grass/reeds, understory 5m+
TP25	G	1. PF - S, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m,
TP26	A	1. PF - WNW, 2. DV - Trees, 3. GC = 50% grass 40% shrub 10% soil, 4. FC = 60%, 5. DH = 10m+. Other - dense river veg, grass/reeds, understory 5m+
TP27	G	1. PF - NE, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, rocky outcrops
TP28	O	PF - W, parkland
TP29	G	1. PF - NE, 2. DV - Grass, 3. GC = 45% grass 5% shrub 50% soil, 4. FC = 5%, 5. DH = 1.0m. Other - some shrub /trees 2-10m, rocky outcrops, same as TP27
TP30	B	1. PF - ENE, 2. DV - Trees, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 10%, 5. DH = 10m. Other - river bank veg, rock river, grass banks,tall trees
TP31	B	1. PF - SW, 2. DV - Trees, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 10%, 5. DH = 10m. Other - river bank veg, rock river, grass banks,tall trees
TP32	B	1. PF - NE, 2. DV - Trees, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 10%, 5. DH = 6-8m. Other - river bank veg, rock river, grass banks, scrub?
TP33	G	1. PF - NE, 2. DV - Grass, 3. GC = 65% grass 5% shrub 30% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 1.5-5m
TP34	D	1. PF - ESE, 2. DV - Scrub, 3. GC = 60% grass 20% shrub 20% soil, 4. FC = 15%, 5. DH = 5m
TP35	G	1. PF - NE, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP36	G	1. PF - NNW, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP37	G	1. PF - N, 2. DV - Grass, 3. GC = 45% grass 10% shrub 45% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP38	G	1. PF - NE, 2. DV - Grass, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP39	G	1. PF - E, 2. DV - Grass, 3. GC = 60% grass 10% shrub 30% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP40	D	1. PF - NE, 2. DV - Grass, 3. GC = 60% grass 20% shrub 20% soil, 4. FC = 15%, 5. DH = 5.0m. Other - sparse shrub/scrub 0.5-5m, shrubland

PPOINT_ID	VEG_CLASS	NOTES
TP41	G	1. PF - SSW, 2. DV - Grass, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m
TP42	G	1. PF - NE, 2. DV - Grass, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, borderline shrubland
TP43	C	1. PF - SE, 2. DV - Shrub, 3. GC = 60% grass 20% shrub 20% soil, 4. FC = 10%, 5. DH = 3.0m. Other - sparse shrub/scrub 3-5m
TP44	D	1. PF - W, 2. DV - Scrub, 3. GC = 70% grass 20% shrub 10% soil, 4. FC = 20-30%, 5. DH = ~7m. Other - possible woodland, some trees 5-10m
TP45	A	1. PF - N, 2. DV - Trees, 3. GC = 60% grass 30% shrub 10% soil, 4. FC = 30%, 5. DH = 7-8m. Other - dense river veg, understory 5m+, maybe scrub?
TP46	C	1. PF - S, 2. DV - Shrub, 3. GC = 40% grass 20% shrub 40% soil, 4. FC = 5%, 5. DH = 2.0m. Other - sparse shrub/scrub 3-5m, looks recently burned
TP47	C	1. PF - NNW, 2. DV - Shrub, 3. GC = 40% grass 20% shrub 40% soil, 4. FC = 5%, 5. DH = 2.0m. Other - sparse shrub/scrub 3-5m, looks recently burned
TP48	G	1. PF - NE, 2. DV - Grass, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m
TP49	A	1. PF - S, 2. DV - Trees, 3. GC = 70% grass 20% shrub 10% soil, 4. FC = 30%, 5. DH = 7-10m. Other - dense river veg, understory 5m+, maybe scrub
TP50	D	1. PF - NE, 2. DV - Scrub, 3. GC = 70% grass 20% shrub 10% soil, 4. FC = 10%, 5. DH = 3-5m. Other - possible shrubland, some trees 5-10m
TP51	G	1. PF - NE, 2. DV - Grass, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m
TP52	G	1. PF - ENE, 2. DV - Grass, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m
TP53	G	1. PF - NNE, 2. DV - Grass, 3. GC = 45% grass 10% shrub 40% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub 1.5-4m occasional tree 10-15m
TP54	C	1. PF - N, 2. DV - Shrub, 3. GC = 60% grass 15% shrub 30% soil, 4. FC = 5%, 5. DH = 2-3m. Other - sparse shrub/scrub 3-5m, grassland?
TP55	C	1. PF - N, 2. DV - Shrub, 3. GC = 60% grass 15% shrub 30% soil, 4. FC = 5%, 5. DH = 2-3m. Other - sparse shrub/scrub 3-5m, grassland?
TP56	G	Burned
TP58	G	1. PF - SW, 2. DV - Shrub, 3. GC = 50% grass 15% shrub 35% soil, 4. FC = 10%, 5. DH = 1.5-2m. Other - sparse scrub 2-4m occasional tree 10m
TP59	G	1. PF - E, 2. DV - Trees, 3. GC = 50% grass 5% shrub 45% soil, 4. FC = 10%, 5. DH = 10-15m. Other - typical street side trees
TP60	D	1. PF - S, 2. DV - Scrub, 3. GC = 80% grass 10% shrub 10% soil, 4. FC = 30%, 5. DH = 7m. Small patch of forest, further south scrub
TP62	G	1. PF - SE, 2. DV - Grass, 3. GC = 80% grass 5% shrub 15% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m
TP63	G	1. PF - S, 2. DV - Grass, 3. GC = 80% grass 5% shrub 15% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub/scrub 0.5-5m, some trees 5-10m
TP64	B	1. PF - N, 2. DV - Trees, 3. GC = 70% grass 10% shrub 20% soil, 4. FC = 10%, 5. DH = 15m. Other - river woodland, sparse understory, mostly grass
TP65	G	PF - ENE, Parkland, cleared, grass
TP66	B	1. PF - E, 2. DV - Trees, 3. GC = 60% grass 10% shrub 30% soil, 4. FC = 10%, 5. DH = 10m
TP67	G	1. PF - E, 2. DV - Grass, 3. GC = 40% grass 10% shrub 40% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub 1.5-4m occasional tree 10-15m
TP68	G	1. PF - NNE, 2. DV - Grass, 3. GC = 40% grass 10% shrub 40% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub 1.5-4m occasional tree 10-15m
TP69	G	1. PF - W, 2. DV - Grass, 3. GC = 40% grass 10% shrub 40% soil, 4. FC = 5%, 5. DH = 1.0m. Other - sparse shrub 1.5-4m occasional tree 10-15m

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Appendix C – Bushfire protection criteria

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ELEMENT 1: LOCATION

Intent: To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.

PERFORMANCE PRINCIPLE

The intent may be achieved where:

P1

The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low, or a BAL-29 or below, and the risk can be managed. For unavoidable development in areas where BAL-40 or BAL-FZ applies, demonstrating that the risk can be managed to the satisfaction of the Department of Fire and Emergency Services and the decision-maker.

ACCEPTABLE SOLUTIONS

To achieve compliance with this Element using an acceptable solution, the following acceptable solution (A1.1) must be met

A1.1 Development location

The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL-29 or below.

EXPLANATORY NOTES

Land is most suitable for land use intensification where hazard levels are low. Where there is an extreme bushfire hazard or requirement for use of BAL-40 or BAL-FZ construction standards, the land is not considered suitable for development unless it meets the definition of minor or unavoidable development.

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ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

Intent: To ensure that the siting and design of development minimises the level of bushfire impact.

PERFORMANCE PRINCIPLE

The intent may be achieved where:

P2

The siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire threat that applies to the site. That it incorporates a defensible space and significantly reduces the heat intensities at the building surface thereby minimising the bushfire risk to people, property and infrastructure, including compliance with AS 3959 if appropriate.

ACCEPTABLE SOLUTIONS

To achieve compliance with this Element the following acceptable solution must be met.

A2.1 Asset Protection Zone (APZ)

Every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements:

- **Width:** Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29) in all circumstances.
- **Location:** the APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes).
- **Management:** the APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones'. (see Schedule 1).

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

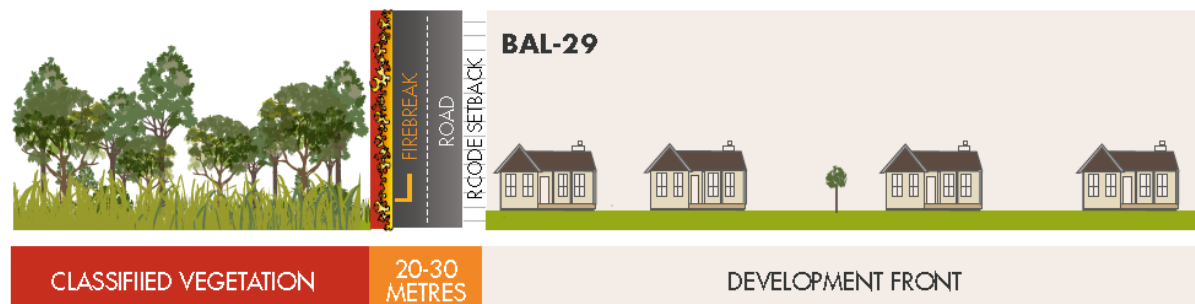
Figure 13: Separation distance required where no additional construction standards are proposed

In the absence of additional construction standards a minimum separation distance of 100 metres between buildings and the hazard must be provided in order to protect them from burning debris, radiant heat and direct flame contact



Figure 14: A reduced separation distance may necessitate increased construction standards

It may be possible to reduce the minimum distances, for example by increasing the construction standard of the building – in this example the building would need to be constructed to BAL-29



ELEMENT 3: VEHICULAR ACCESS

Intent: To ensure that the vehicular access serving a subdivision/development is available and safe during a bushfire event.

PERFORMANCE PRINCIPLE

The intent may be achieved where:

P3

The internal layout, design and construction of public and private vehicular access and egress in the subdivision/development allow emergency and other vehicles to move through it easily and safely at all times.

ACCEPTABLE SOLUTIONS

To achieve the intent, all applicable 'acceptable solutions' must be addressed.

A3.1 Two access routes

Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents/the public at all times and under all weather conditions.

A3.2 Public road

A public road is to meet the requirements in Table 4, Column 1.

A3.3 Cul-de-sac (including a dead-end road)

A cul-de-sac and/or a dead end road should be avoided in bushfire prone areas. Where no alternative exists (i.e. the lot layout already exists and/or will need to be demonstrated by the proponent), the following requirements are to be achieved:

- Requirements in Table 4, Column 2;
- Maximum length: 200 metres (if public emergency access is provided between cul-de-sac heads maximum length can be increased to 600 metres provided no more than eight lots are serviced and the emergency access way is no more than 600 metres); and
- Turn-around area requirements, including a minimum 17.5 metre diameter head.

A3.4 Battle-axe

Battle-axe access leg should be avoided in bushfire prone areas. Where no alternative exists, (this will need to be demonstrated by the proponent) all of the following requirements are to be achieved:

- Requirements in Table 4, Column 3;
- Maximum length: 600 metres; and
- Minimum width: six metres.



ELEMENT 3: VEHICULAR ACCESS

PERFORMANCE PRINCIPLE

ACCEPTABLE SOLUTIONS

A3.5 Private driveway longer than 50 metres

A private driveway is to meet all of the following requirements:

- Requirements in Table 4, Column 3;
- Required where a house site is more than 50 metres from a public road;
- Passing bays: every 200 metres with a minimum length of 20 metres and a minimum width of two metres (i.e. the combined width of the passing bay and constructed private driveway to be a minimum six metres);
- Turn-around areas designed to accommodate type 3.4 fire appliances and to enable them to turn around safely every 500 metres (i.e. kerb to kerb 17.5 metres) and within 50 metres of a house; and
- Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes.
- All-weather surface (i.e. compacted gravel, limestone or sealed).

A3.6 Emergency access way

An access way that does not provide through access to a public road is to be avoided in bushfire prone areas. Where no alternative exists (this will need to be demonstrated by the proponent), an emergency access way is to be provided as an alternative link to a public road during emergencies. An emergency access way is to meet all of the following requirements:

- Requirements in Table 4, Column 4;
- No further than 600 metres from a public road;
- Provided as right of way or public access easement in gross to ensure accessibility to the public and fire services during an emergency; and
- Must be signposted.

A3.7 Fire service access routes (perimeter roads)

Fire service access routes are to be established to provide access within and around the edge of the subdivision and related development to provide direct access to bushfire prone areas for fire fighters and link between public road networks for fire-fighting purposes. Fire service access routes are to meet the following requirements:

- Requirements Table 4, Column 5;
- Provided as right of ways or public access easements in gross to ensure accessibility to the public and fire services during an emergency;
- Surface: all-weather (i.e. compacted gravel, limestone or sealed)
- Dead end roads are not permitted;
- Turn-around areas designed to accommodate type 3.4 appliances and to enable them to turn around safely every 500 metres (i.e. kerb to kerb 17.5 metres);
- No further than 600 metres from a public road;
- Allow for two-way traffic and;
- Must be signposted.

ELEMENT 3: VEHICULAR ACCESS

PERFORMANCE PRINCIPLE

ACCEPTABLE SOLUTIONS

A3.8 Firebreak width

Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level as prescribed in the local firebreak notice issued by the local government.

Table 4: Vehicular access technical requirements

TECHNICAL REQUIREMENTS	1 Public road	2 Cul-de-sac	3 Private driveway	4 Emergency access way	5 Fire service access routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	N/A	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5
*Refer to E3.2 Public roads: Trafficable surface					

ELEMENT 4: WATER

Intent: To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

PERFORMANCE PRINCIPLE

The intent may be achieved where:

P4

The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for fire fighting purposes.

ACCEPTABLE SOLUTIONS

To achieve the intent, all applicable 'acceptable solutions' must be addressed.

A4.1 Reticulated areas

The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.

A4.2 Non-reticulated areas

Water tanks for fire fighting purposes with a hydrant or standpipe are provided and meet the following requirements:

- Volume: minimum 50,000 litres per tank;
- Ratio of tanks to lots: minimum one tank per 25 lots (or part thereof);
- Tank location: no more than two kilometres to the further most house site within the residential development to allow a 2.4 fire appliance to achieve a 20 minute turn-around time at legal road speeds;
- Hardstand and turn-around areas suitable for a type 3.4 fire appliance (i.e. kerb to kerb 17.5 metres) are provided within three metres of each water tank; and
- Water tanks and associated facilities are vested in the relevant local government.

A4.3 Individual lots within non-reticulated areas (Only for use if creating 1 additional lot and cannot be applied cumulatively)

- Single lots above 500 square metres need a dedicated static water supply on the lot that has the effective capacity of 10,000 litres.

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Revision	Author	Reviewer		Approved for Issue		
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