

January 2012

# Pilbara

planning and  
infrastructure  
framework



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## planning and infrastructure framework

Pilbara Regional Planning Committee

Western Australian Planning Commission



# Pilbara

## planning and infrastructure framework

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### Minister's Foreword

The Pilbara region is important to both Western Australia and the nation. It is an ancient place, characterised by primal, sculptured landscapes that mark the geological eras, and home to one of the oldest continuous cultures, which constructed the world's greatest gallery of rock art on the Burrup Peninsula.

Since the late 1960s, the Pilbara region's considerable mineral and hydrocarbon wealth, embedded in the land mass and off-shore under the continental shelf, has been the foundation of its prosperity and responsible for much of its urban form and infrastructure. It has, however, been influenced by the ebbs and flows of world commodity markets

and this is reflected in the nature of the region's towns and support infrastructure and its growing reliance on fly-in fly-out arrangements.

The continued sustainability of the region will no doubt be determined by the strengths of its communities; the liveability of its towns; appreciation of the region's natural and cultural values; economic diversification and self sufficiency; and the level of services the region can attract.

This will be a challenging task. Economic growth has not been achieved easily with issues such as shortages of affordable housing; a high cost of living; and inadequate services being just some of the obstacles to overcome. With climate change an issue to consider in this cyclone prone region, we are now facing challenges in sourcing secure water and energy supplies. These will require innovative responses.

The State Government's Pilbara Cities vision seeks to expand the region's resident population and to rectify infrastructure inadequacies with the development of the twin cities of Karratha and Port Hedland.

Each city will have a critical population mass to sustain higher thresholds of facilities and services. In addition, it is envisaged that Newman will expand as a sub-regional centre, and other centres, such as Onslow, will also expand and have new roles. This will involve an investment partnership between government and the private sector.

This region has great potential to become a focus for major regional development. The conservation of the region's natural and cultural heritage – both on land and offshore, is paramount. Pilbara icons such as Karijini National Park, the Burrup rock engravings and the annual Cossack art awards need to be maintained, cherished and celebrated.

This Pilbara Planning and Infrastructure Framework provides a response to many of the opportunities and challenges facing the region. It sets a basis for further, detailed planning at the local level. It also establishes unified action between state and local governments in the adoption and ongoing review of the framework.

I commend both the Western Australian Planning Commission and the Department of Planning on the development of a robust planning framework that establishes an achievable vision for progress and has the capacity to adapt to changing needs over time.

A handwritten signature in black ink that reads "John Day".

**John Day MLA**  
Minister for Planning



# Pilbara

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### Chairman's Foreword

For two years the Western Australian Planning Commission has worked closely with state and local government agencies, industry and the community to shape the Pilbara's future. The result of this collaboration is the development of a planning and infrastructure framework to guide strategic decisions about land, infrastructure and investment.

The Pilbara Planning and Infrastructure Framework builds on the Pilbara region's economic advantages and its natural and cultural endowments. It assists the building of communities by strengthening regional governance and enhancing liveability and lifestyle opportunities. Also, it facilitates the diversification of the economy and job creation by setting

aside land for major industries and sites and corridors for major infrastructure.

The Framework promotes the development of twin Pilbara cities in Karratha and Port Hedland and a sub-regional centre at Newman, which have the critical population mass to support a higher threshold of community, cultural and recreational facilities for the benefit of the region as a whole. It also seeks to strengthen local sense of place; improve connectivity between activity centres; maintain the region's natural and cultural values; and protect conservation areas.

The focus of the Framework is on the major opportunities and challenges facing the region. In doing so, it expresses the position of the Commission in addressing the region's key issues and challenges. It provides direction for regional planning and to local governments for the preparation of more detailed local planning strategies and local planning schemes.

The process to prepare the Pilbara Planning and Infrastructure Framework, under the direction of the Pilbara Regional Planning Committee, was comprehensive and included the public advertising of an endorsed draft, and consideration of the submissions received. The Framework was subsequently endorsed by the Planning Commission as a regional strategy and will be listed in State Planning Policy 1 to provide a big-picture view of the region's mid to long-term future.

In recognising the need for regional planning to address development issues as they emerge, the Framework will be subject to ongoing monitoring and regular review.

A handwritten signature in black ink, appearing to read 'Gary Prattley'.

**Gary Prattley**  
Chairman  
Western Australian Planning Commission



### Director General's Foreword

Despite its physical remoteness the Pilbara has long been a region of geological and cultural value for Western Australia and more recently it has also become the economic powerhouse of the nation.

Through its natural resources and associated global economic influence, the Pilbara is firmly set as a viable place of growth. This, with another period of significant growth on the horizon, has given rise to the need for a sound planning framework that establishes an achievable vision for progress and has the capacity to adapt to changing needs over time.

On behalf of the Western Australian Planning Commission, the Department of Planning has successfully led the collaboration to deliver a practical and sustainable planning and infrastructure framework to shape the future of the Pilbara region.

The resulting Pilbara Planning and Infrastructure Framework sets out a range of strategic planning goals, objectives and actions to address opportunities and challenges, such as the provision of adequate infrastructure to cover major resources development and population growth over the next 25 years. The Framework supports the State Government's commitment to planning for the expansion of urban centres such as Karratha and Port Hedland via the Pilbara Cities vision.

Strategies to address economic growth, environmental and heritage issues, transport, infrastructure, water resources, tourism and the emerging impacts of climate change are also identified in the framework. These will continue to be reviewed and adapted as the framework is applied over time.

Implementing the framework will not be without challenge, however, the Department is determined to ensure the provision of strong, viable and liveable communities, which embrace the region's natural and cultural values; economic diversification; and the level of services it deserves. The Department will also continue to work with the Department of State Development and the Department of Regional Development and Lands, including the Pilbara Development Commission, to help foster investment partnerships between government and the private sector.

This framework offers high level guidance to establish a more permanent population in the Pilbara region, through the creation of larger intergenerational communities, more affordable housing, greater housing choice and access to higher standards of education, health, recreation and other community services.

A handwritten signature in black ink, appearing to read 'Eric Lumsden'.

**Eric Lumsden**  
Director General  
Department of Planning

# Pilbara

planning and infrastructure framework



## Executive summary

### Vision

The Pilbara has evolved into the economic powerhouse of Australia and is on the threshold of another period of expansion.

By 2035, the region will have a resident population of more than 140 000, based on a more diverse economy that has capitalised on its competitive advantages. As part of the Pilbara Cities vision, the Pilbara will have two cities: Karratha and Port Hedland, each with a population of 50 000. These would be supported by the Newman sub-regional centre with a population of 15 000 and the major towns of Tom Price, Onslow and Wickham (Map 1).

A larger population in the region's main urban centres will support a wider range of employment opportunities; greater housing choice; higher levels of amenity; and access to higher standards of education, health, recreational and other community services. The natural and cultural heritage assets of the Pilbara, such as the coastline, Karijini and the Burrup Peninsula's rock-art galleries will be conserved, celebrated and cherished.

### Settlement

Over the next 25 years, the scale and character of Pilbara settlements will change significantly. Some will experience major expansion while others will have more modest growth and, in some cases, decline. No significant new permanent settlements are envisaged for the region. It is anticipated that fly-in fly-out will have a lesser role in the work-living equation as the level of services, facilities and general amenity increase in the cities and towns, making them more attractive places in which to live.

The region's settlement structure will experience a step change, achieving a higher threshold of housing choice and community facility provision, making them inherently more liveable places. The evolving settlement structure will be:

- |                          |  |
|--------------------------|--|
| 1. Pilbara City:         | Karratha (Karratha and Dampier), Port Hedland (Port Hedland and South Hedland) |
| 2. Sub-regional centre:  | Newman   |
| 3. Major town:           | Tom Price, Onslow, Wickham   |
| 4. Town:                 | Paraburdoo, Roebourne, Pannawonica   |
| 5. Village:              | Point Samson, Marble Bar, Nullagine, Cossack, Shellborough                     |
| 6. Aboriginal community: | (Refer to section 2.12)  |

To cater for the region's population targets and to satisfy unmet latent demand, an additional 40 900 dwellings will be needed, taking up some 2130 hectares of net residential land. The settlement housing density and form is anticipated to change greatly in each Pilbara City and major towns. This will mean more residential apartments, townhouses and other forms of medium and higher density living.

### Economic development

The Pilbara will have a robust, diverse and sustainable regional economy to service the needs of its industry and commerce effectively. This will be based on the region's competitive advantages. The region's economy will be diversified on the basis of resource industry supply chain completion in the first phase, widening in the later phases to encompass more knowledge-based industries, with an increasing capacity to export goods and services. Elements of this transition are already evident, however, significant government intervention is needed if it is to be accelerated in line with the Pilbara Cities vision. This could be in the form of a new defence base, a university sub-campus or a collaborative research institution in the region.

To achieve long-term economic viability in the region, strategies will be put in place to ensure adequate wharf-side and land-side capacity at the region's ports, strategic industrial areas and urban areas (light industrial and commercial areas). There is a need to identify suitably located campus-sites for potential large government-sponsored facilities.



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### Utility infrastructure

Most of the Pilbara's urban infrastructure was constructed in the 1960s and 1970s and is reaching the end of its functional life. These aging networks are now constraining economic productivity and impacting on the functionality of communities. There is now a strong need to upgrade and replace much of the region's infrastructure and, in turn, this will provide the impetus to look at new approaches and technologies for utility infrastructure provision.

**Water:** There is a growing supply-demand gap for schemes in coastal Pilbara – the location of the greatest future demand. Currently, Karratha and the other Nickol Bay settlements, Port Hedland and Onslow are entirely climate-dependent for their water supply.

To ensure a reliable future water source it is essential that new sources are identified and developed. Agreement has recently been reached between the State Government and Rio Tinto Iron Ore (RTIO) on the development of a 10 GLpa borefield in the Bungaroo Valley to supply RTIO's scheme water requirements in the West Pilbara.

**Table 1. Utility infrastructure priorities – 2015**

Infrastructure	Priorities
<b>Water</b>	<ul style="list-style-type: none"> <li>• Investigate the potential for expansion of the Bungaroo borefield or development of other nearby groundwater resources.</li> <li>• Investigate construction of a desalination plant to service Karratha City (Karratha/Dampier).</li> <li>• Encourage strategies that promote responsible consumption of water by industry and consumers.</li> <li>• Upgrade existing water sources – Yule and de Grey borefields – to service Port Hedland.</li> <li>• Identify a new water source – Cane River borefields, Lower Robe aquifer or an alternative – to service Onslow.</li> <li>• Identify water re-use options and opportunities.</li> <li>• Use fit-for-purpose options for dust suppression.</li> <li>• Improve planning for water services across the region.</li> <li>• Investigate development of a new water source utilising the West Canning Basin.</li> </ul>
<b>Waste water</b>	<ul style="list-style-type: none"> <li>• Upgrade Karratha Waste Water Treatment Plant.</li> <li>• Upgrade Port Hedland deep sewerage scheme.</li> <li>• Decommission the Port Hedland Waste Water Treatment Plant and augment capacity at the South Hedland Waste Water Treatment Plant.</li> <li>• Identify opportunities for reuse of treated waste water.</li> <li>• Provide waste water services to the region's aboriginal communities.</li> </ul>
<b>Energy</b>	<ul style="list-style-type: none"> <li>• Provide new power generation and transmission at Port Hedland.</li> <li>• Provide new power generation and transmission at Karratha.</li> <li>• Expand power generation at Onslow.</li> <li>• Investigate renewable energy options.</li> </ul>
<b>Waste management</b>	<ul style="list-style-type: none"> <li>• Develop a system of townsite transfer stations.</li> <li>• Investigate recycling options in service hubs.</li> <li>• Continue to monitor and identify new or upgrade existing waste management facilities.</li> <li>• Promote implementation of improved waste management practices in aboriginal communities.</li> </ul>
<b>Telecommunications</b>	<ul style="list-style-type: none"> <li>• Augment mobile phone coverage – telecommunication companies.</li> <li>• Roll out of National Broadband Network in the Pilbara.</li> </ul>

Other potential sources include:

- constructing a new desalination plant on the Burrup Peninsula;
- expanding the Yule and De Grey borefields in the case of Port Hedland;
- expanding the Cane River borefields, developing the Lower Robe aquifer or identifying another source to service future town and industrial demand for Onslow; and
- exploring options for the utilisation of the West Canning Basin.

The Framework makes provision for the conservation of these water source areas. Other identified strategies include:

- identifying fit-for-purpose options for dust suppression;
- identifying opportunities for waste water reuse; and
- raising awareness about water consumption.

**Waste water:** There is a need to provide deep sewerage facilities in all Pilbara cities and towns and to provide adequate local absorption systems in the region's villages and Aboriginal communities. Wherever feasible, waste water will be utilised for open space irrigation.

**Energy:** The Pilbara economy cannot expand without additional power generation being installed. Forecasts of demand and generation supply indicate that Horizon Power has access to sufficient generation capacity to meet its demand projections until late 2012. There is a need for a broader, integrated approach to long-term Pilbara power supply planning to ensure the region's energy supply needs can be met. A commercial approach is likely to optimise efficient investment and innovative supply options.

**Waste management:** While there is currently minimal recycling of waste in the region, the next decade will require a comprehensive waste recycling and disposal plan. It will be important to ensure that options for strategic waste transfer, collection, treatment, recycling and disposal facilities, including buffer areas, are clearly identified in local planning strategies and schemes.

**Telecommunications:** Current mobile phone coverage in the region is patchy and access to broadband is limited and slow. The anticipated increase in the Pilbara's economic activity and

population, with high expectations for fast and efficient communications, will require a major upgrade of the region's telecommunications infrastructure. The increase in mobile phone antennae will necessitate their sensitive location in urban areas and along major highways.

## Community infrastructure

The expansion of the Pilbara region's population to more than 140 000 by 2035 will require a higher threshold of facilities and services. The enhancement of these facilities and services will greatly assist the region's ability to attract and retain workers and their families.

**Health:** Hospital facilities will be expanded to meet future needs, with a focus on Port Hedland and Karratha. More general practitioner, dental and other health specialist services will be provided. There is also potential to establish a Royal Flying Doctor Service hub in Karratha, in addition to that which already operates out of Port Hedland.

**Education:** New primary schools, new and expanded high schools, expanded tertiary and further education facilities (e.g. Pilbara Institute) and one or two university sub-campuses will be developed to meet greater demand for educational services and to retain senior students in the region's schools.

**Recreation:** A number of facilities are proposed to meet the increased demand for recreation opportunities. These include: two new marinas (at Dampier and Port Hedland); upgrades to boat harbours and boat launching facilities; improved access to beaches; upgrades to the region's swimming pools; provision of fully equipped sports ovals; and indoor recreation centres.

**Community safety and support:** The changing size and composition of the Pilbara communities will require a higher level of police and court facilities and a wider range of childcare and family support facilities. It will also need more community facilities such as places of worship, and accommodation for volunteer organisations and clubs.

**Culture and entertainment:** There is a need to expand both community and commercially based places of culture and entertainment, including: theatres, cinemas, galleries and museums – particularly in Karratha and Port Hedland.

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**Table 2. Community infrastructure priorities – 2015**

Infrastructure	Priorities
Health	<ul style="list-style-type: none"> <li>• Commission the Karratha Health campus.</li> <li>• Undertake major upgrades or replacement of all current state hospital and health clinic infrastructure.</li> <li>• Investment in state health workforce housing at regional centres and small hospital sites.</li> <li>• Provide short-term patient accommodation in regional centres.</li> <li>• Expand ambulatory care services and provide appropriate physical infrastructure to support the additional capacity.</li> <li>• Progress Aboriginal health initiatives consistent with 'Closing the Gap' and other local priorities, with associated investment in physical infrastructure to support the expanded services.</li> <li>• Provide investment/incentives for private or not-for-profit health sector expansion to meet future projected demand.</li> </ul>
Education	<ul style="list-style-type: none"> <li>• Undertake further development of the Karratha Education and Training Precinct (high school and Pilbara Institute).</li> <li>• Upgrade and expand Port Hedland High School.</li> <li>• Renew infrastructure at Roebourne District High School.</li> <li>• Expand Onslow Primary School to a District High School.</li> <li>• Provide educator and administrator housing across the Pilbara.</li> <li>• Provide boarding schools in Karratha and Port Hedland to cater for remote communities.</li> </ul>
Recreation	<ul style="list-style-type: none"> <li>• Construction of a marina in Dampier.</li> <li>• Construction of a marina in Port Hedland.</li> <li>• Development of a Karratha aquatic complex (part of Karratha Leisure Centre Precinct).</li> <li>• Construction of a multi-purpose recreation facility in Port Hedland.</li> <li>• Develop a swimming pool in Onslow.</li> <li>• Expand and diversify recreation facilities to include new sports and recreation opportunities.</li> <li>• Provision for passive open space and public parks in new settlement developments.</li> <li>• Consider recreation needs in light of tourism and expansion opportunities.</li> </ul>
Community support	<ul style="list-style-type: none"> <li>• Supply of office and residential accommodation for community service workers.</li> <li>• Expansion of childcare places to meet the demands of a growing population and changing demographic profile.</li> </ul>
Culture and entertainment	<ul style="list-style-type: none"> <li>• Development of Marquee Park in South Hedland.</li> <li>• Development of an entertainment precinct in Karratha under the Karratha City of the North Plan.</li> <li>• Identify opportunities for the development of culture, the arts and cultural tourism, including Aboriginal cultural facilities, across the Pilbara.</li> </ul>

**Retail facilities:** The higher population thresholds will be able to sustain more retail facilities, particularly in Karratha and Port Hedland.

**Civic facilities:** The range of civic facilities – town halls, libraries and community centres will be expanded in the two Pilbara cities, the sub-regional centre and the major towns (Table 2):

## Transport infrastructure

To meet the Pilbara's projected expansion of economic activity and population, a transport system that provides equitable access for residents and industry; and practical, safe and affordable opportunities for intra-regional, intra-state, inter-state and international travel will be required.

**Road transport:** There is a need to develop a regional road network that provides safe all-weather connections between the region's centres of activity. Key future road transport priorities include:

- investigation of a coastal road between Karratha and Wickham;
- enhancing access at the region's ports – Dampier, Port Hedland, Cape Lambert and Anketell;
- upgrades to Newman-Marble Bar Road;
- construction of a new road between Millstream and Tom Price;
- upgrades to road pavement along heavily trafficked sections of the Great Northern and North West Coastal Highways; and
- development of viable public transport systems in the two Pilbara cities.

**Rail transport:** The region's rail system will expand from three privately-operated networks to at least five during the next decade. Ore tonnages carried by rail will increase significantly, resulting in more frequent and longer trains travelling between mine and port. Future priorities include:

- promoting multi-user rail networks;
- minimising excessive delays at road-rail grade intersections resulting from longer and more frequent ore trains; and
- investigating opportunities to carry non ore products on the region's rail networks.

**Marine transport:** Trade tonnage at the region's seaports is set to expand significantly over the next decade. There will be expanded seaport facilities at Port Hedland and Dampier and iron ore export terminals at Cape Lambert, Anketell and Cape Preston. These are supplemented by marine servicing boat harbours at Onslow (Beardon Creek) and Point Samson (Johns Creek). Future priorities include:

- facilitating berth capacity expansion;
- promoting multi-user port facilities;
- upgrading road and rail access to port areas;
- providing sufficient port related land for storage and processing; and
- providing facilities for general cargo as well as bulk commodities.

**Air transport:** Airport passenger throughput has increased significantly over the past five years, particularly at Karratha. More recently, there has been increased connectivity between the region's airports and other Australian centres, with direct flights to Brisbane, Sydney and Melbourne. In the future, there may be demand to support greater connections between the region and selected international destinations. Future priorities include:

- developing the region's four hub airports to be capable of accepting high frequency services by Code 3 jet aircraft. This will require upgrades to air-side infrastructure, terminal facilities, access and parking;
- investigating the viability of intra-regional regular passenger air services;





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**Table 3. Transport infrastructure priorities – 2015**

Infrastructure	Priorities
Road transport	<ul style="list-style-type: none"> <li>• Investigate options for Karratha to Wickham road.</li> <li>• Enhance access at the region's ports – Dampier, Port Hedland, Cape Lambert and Anketell.</li> <li>• Upgrade Newman-Marble Bar Road.</li> <li>• Upgrade the road network around Onslow to support the Ashburton North Strategic Industrial Area.</li> <li>• Upgrade the region's highways to provide safe, all-weather road connections.</li> <li>• Construct a new road between Millstream and Tom Price.</li> </ul>
Rail transport	<ul style="list-style-type: none"> <li>• Minimise excessive delays at road-rail grade intersections resulting from longer and more frequent ore trains.</li> <li>• Promote multi-user rail networks.</li> </ul>
Marine transport	<ul style="list-style-type: none"> <li>• Facilitate berth capacity expansion.</li> <li>• Promote multi-user port facilities.</li> <li>• Upgrade road and rail access to port areas.</li> <li>• Provide sufficient port-related land for storage and processing.</li> <li>• Encourage diversification of activities at the region's ports.</li> </ul>
Air transport	<ul style="list-style-type: none"> <li>• Upgrade Karratha Airport.</li> <li>• Upgrade Port Hedland Airport.</li> <li>• Investigate a new Tom Price airport to regular public transport standard to provide a gateway to Karijini National Park and Hamersley Ranges.</li> <li>• Upgrade Onslow Airport to service the Ashburton North Strategic Industrial Area and the expanded town site.</li> </ul>
Urban transport	<ul style="list-style-type: none"> <li>• Upgrade community bus services in Pilbara cities.</li> <li>• Upgrade taxi services in main towns.</li> <li>• Make provision in each city for the establishment of a bus fleet and associated infrastructure.</li> </ul>

- maintaining the integrity of flight paths to the region's airports; and
- investigating demand for connections between the region and selected international destinations.

## Natural environment

The realisation of the Pilbara Cities vision, to triple the region's resident population, coupled with the expansion of the Pilbara's mining, petroleum and industrial activities, has the potential to significantly challenge the region's natural environmental values and these will need to be managed accordingly. It is important to acknowledge the contribution these values make to the region's liveability, health, lifestyle and economy.

The Framework will build on the region's environmental values, national parks and conservation reserves. It will also provide momentum for a better understanding and respect for the natural environment; promote the conservation and protection of significant natural features; and ensure opportunities for discovery, recreation and a sense of meaning for the benefit of future generations

## Cultural heritage

With an expanded urban population, there will be a need to create better understanding, recognition and respect for the region's past and present indigenous culture; together with the cultural heritage of its early settlement, pastoral and mining activities. This will

engender a sense of continuity and general lifestyle enhancement, as well as providing attractions for tourists. Future priorities include:

- identification and protection of significant regional and local heritage places to ensure that development, in or adjacent to those places, will not compromise their cultural heritage values and significance;
- maintenance of the cultural integrity of the rock-art galleries contained within the newly declared Murujuga National Park on the Burrup Peninsula; and
- maintenance of the region's urban heritage, in particular: Cossack, Marble Bar, Roebourne, Port Hedland and Onslow.

### Development issues

The region should be developed in a timely and responsible manner that responds to the Pilbara Cities vision and creatively addresses constraints and impediments. The key development issues comprise:

**Climate change:** The projected impact of climate change will need to be considered, particularly in a region that is significantly impacted most years by cyclonic activity. This needs to be considered on a risk management basis, taking into account the susceptibility of a proposed land use and the probability that an extreme event will eventuate within a certain time scale.

**Development assessment:** To ensure that responsible development progresses in a timely manner, tracts of englobio land will need to be identified for urban expansion and industrial development. All relevant issues triggered by a proposed development will need to be identified and assessed well in advance of demand. These include: environmental impact assessment; assessment of indigenous heritage, native title agreements and identification of renewable development opportunities. There is a need to protect transmission corridors for the development of future renewable energy infrastructure.

**Basic raw materials:** As much of the proposed development associated with the Pilbara Cities will be on low-lying, flood-prone land, there will be a need to source and transport large quantities of fill material. Pragmatic strategies will need to be put in place to identify locations where large

quantities of suitable material can be excavated in an environmentally sustainable and cost effective manner.

### Implementation

The Framework has been endorsed by the WAPC as a regional strategy under the State Planning Framework.

### Governance

The Framework will guide the decision-making of relevant government agencies in the areas of:

- **Planning** – by providing the over-arching policy framework within which local governments will prepare local planning strategies and schemes.
- **Infrastructure** – by informing the Infrastructure Coordinating Committee of the WAPC when assigning priorities to infrastructure funding and development.
- **Economic development** – by informing the Pilbara Cities Office and other agencies in attracting investment to the region.

### Current and future planning work

Further work identified by the Framework includes:

- mapping storm surge and flooding;
- preparing a Port Hedland growth plan; and
- undertaking investigations for a potential Karratha-Wickham link road.

In addition, the WAPC has commenced preparation of the 'Pilbara Infrastructure Implementation Plan', which will provide more detail on infrastructure requirements for the Pilbara including responsible agencies, costs and timelines for delivery.

### Financial strategy

A funding structure will be established to finance the infrastructure priorities identified by the Framework. A number of mechanisms and funding sources will be considered.

### Monitoring and review

The Framework is a living document and its performance will be monitored and reviewed on a regular basis.

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## Map 1. Strategy Map

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## 1 Introduction

### 1.1 Purpose

The *Pilbara Planning and Infrastructure Framework* (the Framework) defines a strategic direction for the future development of the Pilbara region over the next 25 years. It 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. 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.

The Framework sets out regional planning principles, together with goals, objectives and actions to achieve these. The Framework 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. Much of this work is already underway with some of the planning work even completed, for example: the Karratha City of the North Plan (Shire of Roebourne/LandCorp, 2010).

The Framework will be particularly important for informing government on infrastructure priorities across the Pilbara and giving the private sector more confidence to invest in the region. As infrastructure capacity is now a significant inhibitor to urban development in some towns, it is imperative for the Framework to address the Pilbara's priority infrastructure needs over the next five years.

The infrastructure priorities identified in the Framework have been determined following extensive liaison with key State Government agencies, local government and other key stakeholders. Further work including the 'Pilbara Infrastructure Implementation Plan' which has already commenced, will provide more detail on infrastructure requirements for the Pilbara, including identification of responsible agencies, costings and timelines for delivery.

### 1.2 Pilbara Cities vision

The Pilbara region has become the economic powerhouse of Australia and is now on the threshold of another period of significant expansion. The

region is strategically located close to key markets in Asia (Map 2). By 2035, the region will have a resident population of some 140 000 persons, due to a more diverse economy that has capitalised on its competitive advantages (Figure 1.1) (DRDL, 2011a).

The region will have two cities: Karratha City (consisting of the Karratha and Dampier townsites) and Port Hedland City (consisting of Port Hedland and South Hedland). Each is expected to have a population of 50 000 by 2035. These major settlements will be supported by the Newman sub-regional centre (population 15 000). Other settlements (e.g. Paraburdoo, Tom Price and Onslow) will be planned to accommodate growth largely associated with expansion of the mining and oil and gas sectors.

The larger population in the region's main urban centres will support a more diversified economic base, providing a much wider range of employment opportunities. Mining and oil and gas companies will support local supply chains. Cities will have a locally based construction industry, and defence facilities, and higher education facilities that will provide significant employment opportunities.

More affordable housing and a greater housing choice, together with access to higher standards of education, health, recreation and other community services and a general improvement in amenity will result in many fly-in fly-out workers choosing to live in the Pilbara on a more permanent basis. Some will choose to retire in the region.

The Pilbara's natural and cultural heritage assets, such as its coastline, Karijini and the Burrup Peninsula's rock-art galleries, will be conserved, celebrated and cherished.

### 1.3 Planning context

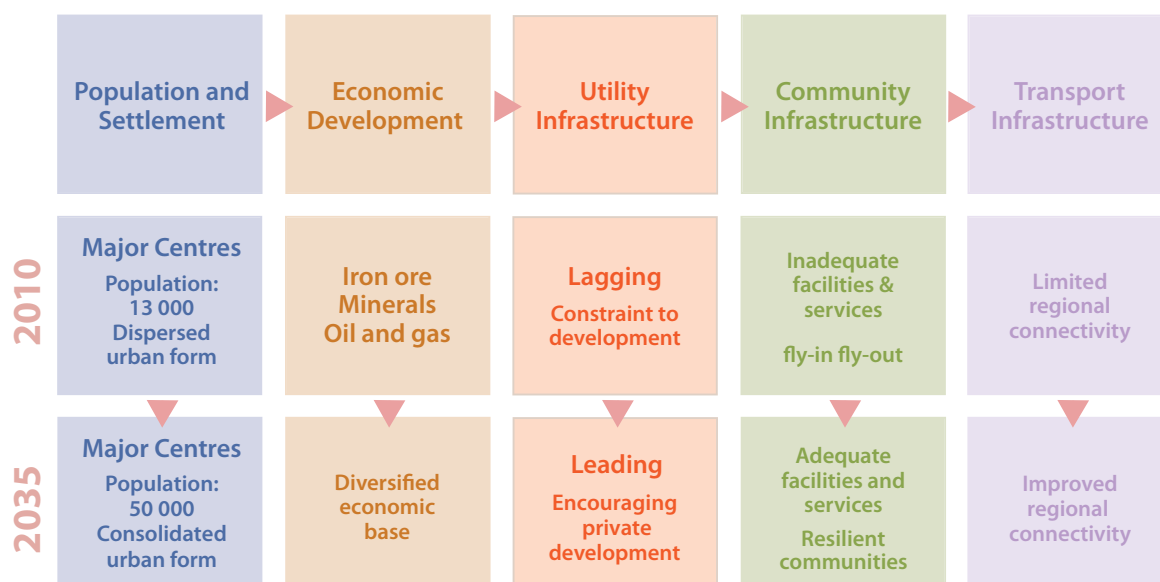
The Pilbara Planning and Infrastructure Framework sits under the State Planning Strategy (WAPC, 1997), which sets state-wide planning principles and objectives, outlines planning directions and is a context for decision-making on the growth of the state. The Framework will in turn inform the preparation of local planning strategies and schemes, with which land use and development proposals must comply (Figure 1.2).



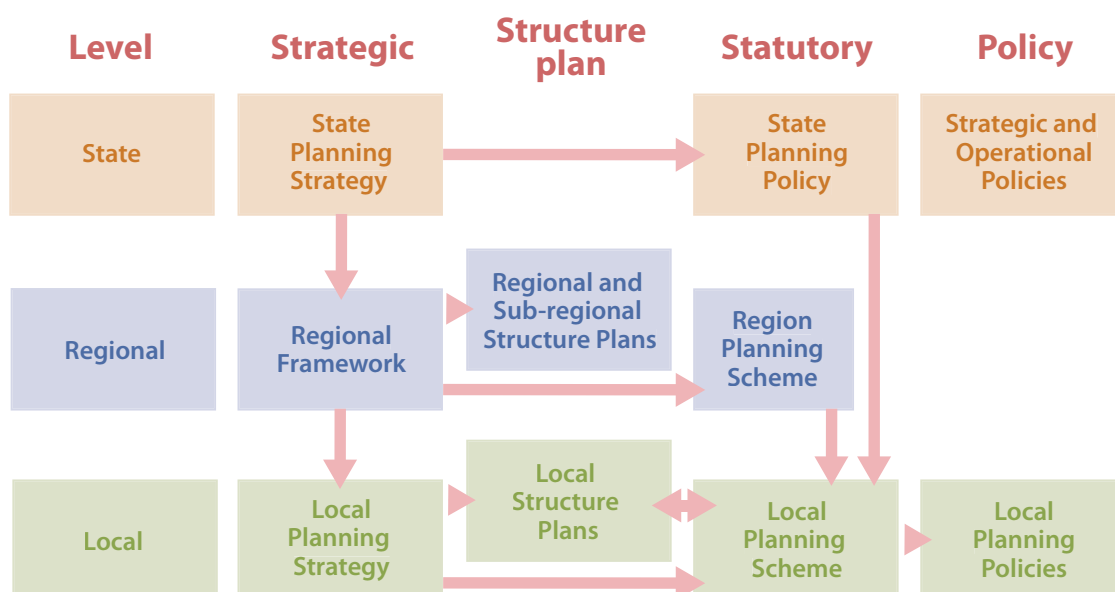
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**Figure 1.1. Pilbara Cities vision – regional transformation**



**Figure 1.2. Pilbara Planning and Infrastructure Framework – planning context**



### 1.4 Planning principles

A new version of the State Planning Strategy, which is being prepared concurrently with the Framework, seeks to refocus, rebuild and reactivate the State's regional planning capabilities. It is expected to be released in 2012.

The strategy is based on six fundamental planning principles to qualify and guide the government's planning policies, decisions and priorities. While each principle is unlikely to be met equally in each instance, the best outcome for the state's future requires that all land uses and development respond to each principle to achieve an acceptable minimum standard (WAPC, 2011a).

The principles are:

- *Community Principle: sustainable communities that meet the needs and aspirations of all Western Australians.*
- *Infrastructure Principle: co-ordinate physical and social infrastructure with development.*
- *Economic Principle: development that enhances the prosperity and general wellbeing of all Western Australians.*
- *Environment Principle: conserve the state's key natural assets and manage development according to ecologically sustainable development principles.*
- *Regional Development Principle: The managed growth of regions taking account of their unique identity, assets and competitive advantage.*
- *Governance Principle: manage the state's land use planning, resources and affairs in a way that is collaborative, accountable, equitable and responsive to the needs and drivers of Western Australia.*

The corresponding guiding principles for the Pilbara are:

- Development of two modern, progressive, vibrant, higher density cities that provide improved levels of amenity, wellbeing and quality urban design;
- Foster a prosperous economy and diverse employment opportunities based on the region's rich resources;
- Development of sustainable communities that are inclusive, accessible, healthy and safe with access to a range of employment, housing, cultural, educational and recreational opportunities;

- Provision of a high standard of infrastructure, including: interconnected transport; utility infrastructure; and community services (health and education);
- Safeguard and enhance significant natural landscape assets and cultural heritage values;
- Encouragement of sustainable well-designed development that is responsive to the region's natural environment, including its climate; and
- Development of governance structures to ensure the efficient and timely implementation of the Framework and the 'Pilbara Cities vision'.

### 1.5 Structure and content

The Framework is set out under the following sections:

**Section 1** – Introduction: establishes the purpose, vision, planning context and planning principles of the Framework and discusses its structure and related documents.

**Section 2** – Settlement: outlines the strategic direction for population growth and settlement in the Pilbara and provides objectives and actions to achieve this.

**Section 3** – Economic development: outlines the strategic direction for diversifying the Pilbara's resource focused economy and provides objectives and actions to achieve this.

**Section 4** – Utility infrastructure: concentrates on identifying priority water, power and waste water treatment infrastructure required in the next five years to facilitate growth of the Pilbara Cities.

**Section 5** – Community infrastructure: identifies priority community infrastructure required to make the Pilbara cities and towns desirable places to live.

**Section 6** – Transport infrastructure: concentrates on identifying priority transport infrastructure in the Pilbara required to improve inter and intra regional connectivity.

**Section 7** – Natural environment: provides an overview of the region's environmental assets and provides objectives and actions to ensure these are protected.

**Section 8** – Cultural heritage: provides an overview of the Pilbara's rich Aboriginal and European heritage and provides objectives and actions to ensure these are protected.

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**Section 9** – Development issues: identifies a variety of issues relevant to developing the Pilbara’s natural resources; expanding the region’s urban settlements; and provides objectives and actions to address these.

**Section 10** – Implementation: discusses the implementation streams of planning; provision of infrastructure and economic development; governance issues; and future planning work.

### 1.6 Related plans and strategies

There are a number of related plans, strategies and initiatives that, together with the Framework, are making a valuable contribution to the region’s transformation (Figure 1.3).

**Pilbara Framework Regional Profile** contains detailed information on the physical, economic, social and other aspects of the region and is supported by a series of regional maps. The first version of this document was released by the WAPC in August 2009. This has now been restructured and updated to incorporate recent developments and information.

**Regional Hot Spots series** has been prepared under the WAPC’s Urban Development Program to provide information on the availability of land for future residential, industrial and commercial development. It identifies the planning and infrastructure

coordination needed to meet demand in selected regional centres across Western Australia, including the Pilbara (WAPC, 2011a). To date, these documents have been prepared for Karratha (WAPC, 2010a), Port Hedland (WAPC, 2011b), Onslow (WAPC, 2011c), Newman and Tom Price (under preparation).

**Pilbara Infrastructure Priorities** was prepared under direction of the WAPC’s Infrastructure Coordination Committee, to inform the State Government on infrastructure priorities in the Pilbara.

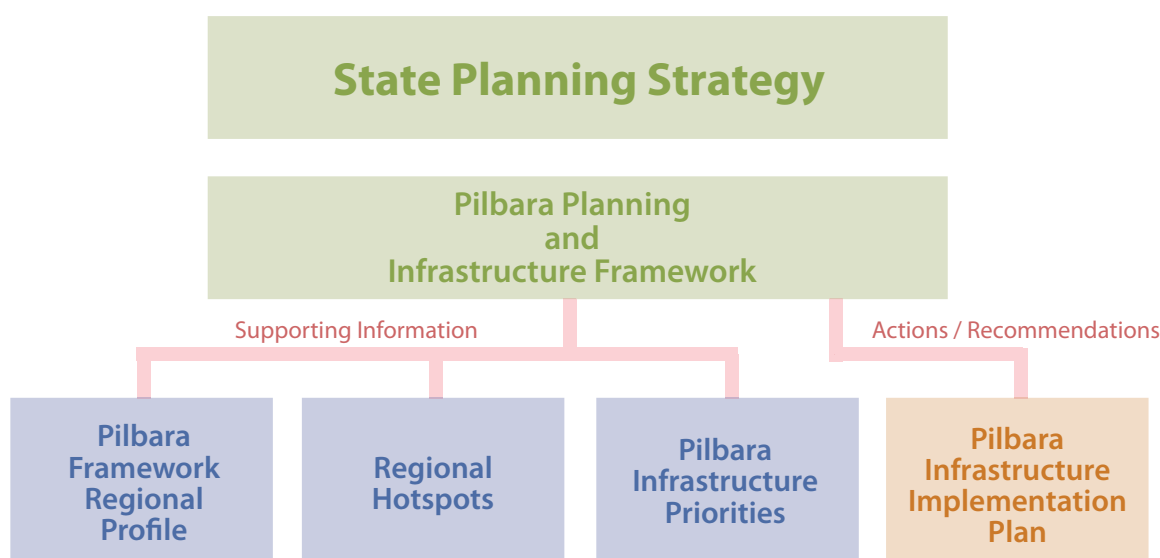
**Pilbara Infrastructure Implementation Plan** will build on ‘Pilbara Infrastructure Priorities’ and provide a comprehensive implementation plan for Pilbara infrastructure over a twenty year time frame.

#### Regional development strategies

The State’s regional infrastructure planning is aligned with a number of regional development strategies and initiatives prepared by the Pilbara Development Commission, Regional Development Australia, other government agencies and industry. These include:

- Pilbara Economic Diversification Strategy (draft) (PDC, 2011)
- The Pilbara Regional Plan (RDA, 2009)
- State Growth Outlook (CME, 2011)

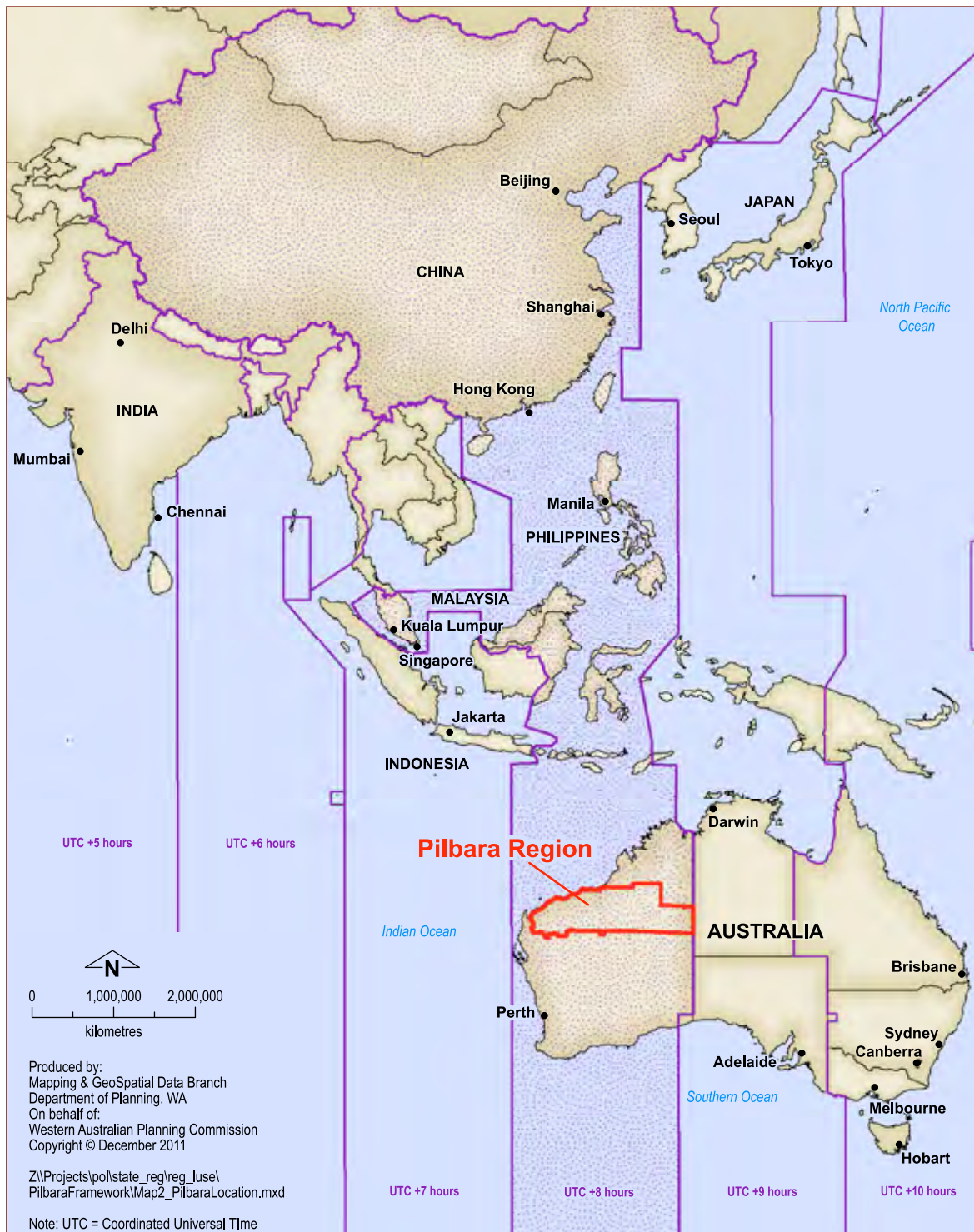
**Figure 1.3. Related Planning documents**



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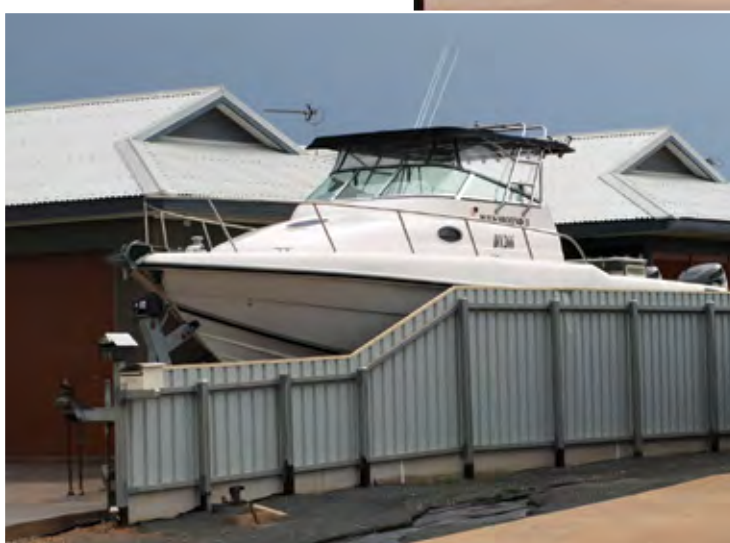
**Map 2. Location of the Pilbara in relation to regional time zones**





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## 2 Settlement

### 2.1 Strategic direction

Over the next 25 years, the scale and character of the Pilbara's settlements will change significantly in order to accommodate expected population growth. Of the existing settlements, some will experience major expansion, others will experience more modest growth and, in some, decline may occur.

The State Government's commitment to the Pilbara Cities vision has significant implications for Karratha and Port Hedland, where target populations of 50 000 are anticipated by 2035. Together with the subregional centre of Newman, these will provide the impetus for higher order facilities and services in the region. Development in other settlements will depend upon economic opportunities that may eventuate.

The desired outcome for Pilbara settlements is sustainable community building. By 2035, the Pilbara's settlements will have:

- higher rates of dwelling owner occupation;
- lower turnover rates in respect to residential occupation;

- a more normal population profile;
- higher secondary school retention rates; and
- higher rates of volunteering for community and associated activities.

Growth will generally occur at existing urban locations with only one new small settlement being investigated at Shellborough east of Port Hedland. This may become Port Hedland's 'Point Samson', providing Port Hedland residents with an additional lifestyle choice, as well as a day trip destination.

The region's future settlement pattern is represented on Map 3.

#### **Goal:**

*Culturally diverse communities living in sustainable and economically viable settlements; providing for communities that are safe, healthy and enjoyable places to live and work; and offering a wide range of quality cultural, educational and recreational opportunities.*



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### 2.2 Population growth

Population in the Pilbara has grown from a few thousand in 1966 to around 41 000 in 2006. This growth, which has been largely driven by the mining sector, has been a significant catalyst for the establishment and growth of settlements like Karratha, Port Hedland, Newman and Tom Price (Figure 2.1).

The Pilbara Cities vision includes an aspirational population growth scenario of 140 000 by 2035. It is expected that this scenario will be driven primarily by the progressive expansion and diversification of the resource sector and is based on an average annual compound growth rate (AACGR) of five per cent for the next 25 years.

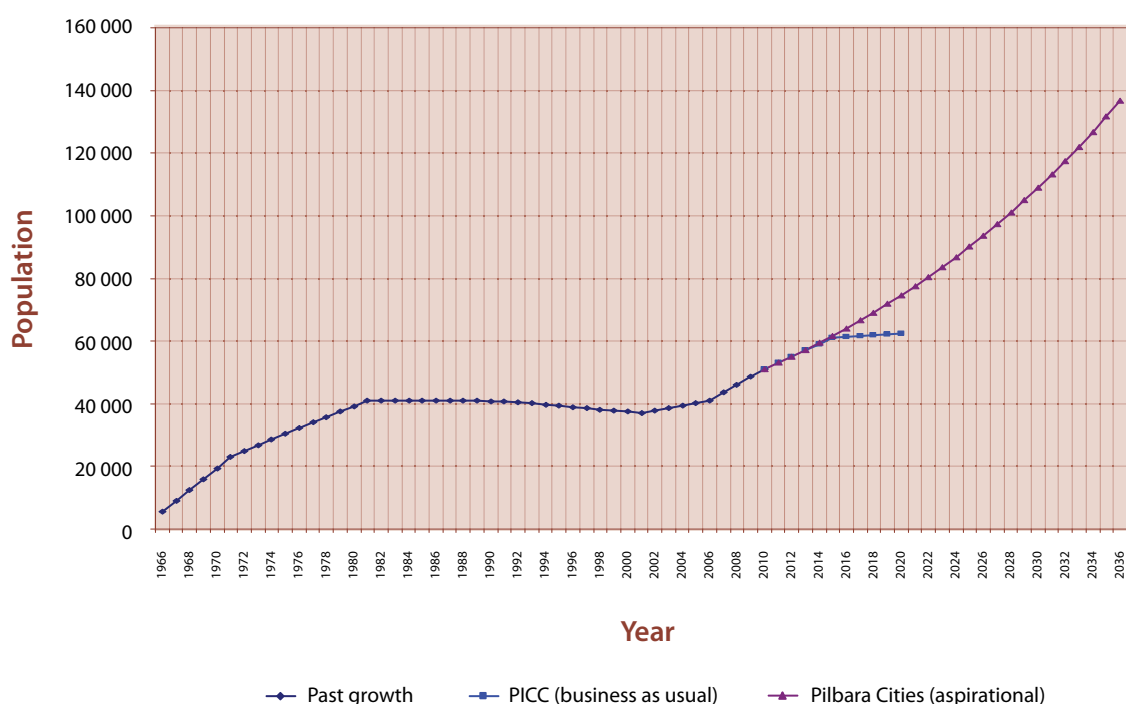
When preparing the Framework, the Pilbara Regional Planning Committee also found the 'business as usual' growth scenario prepared by Pilbara Industry's Community Council (PICC) to be a useful dataset for the short to medium-term. This data, which offers a more conservative scenario than Pilbara Cities, estimates that the Pilbara's population will increase

from 66 530 in 2010 to 96 200 in 2020 (Figure 2.2). It should be noted that the Council's figures are based on projects currently committed or at the pre-feasibility stage and for this reason the construction workforce decreases over time.

The WAPC intends to release a new edition of its WA Tomorrow publication in early 2012. This publication will provide new forecasts (as opposed to scenarios) for regions and local government areas across Western Australia, including the Pilbara, between 2011 and 2026. It is important to note that the data published in WA Tomorrow are referred to as 'forecasts' (as opposed to scenarios) that have been modelled on a probability basis from past and emerging trends in key demographic variables, such as: birth rates, death rates and net migration. The forecasts published in WA Tomorrow are inherently more conservative than the Pilbara Cities or the Pilbara Industry's Community Council's scenarios.

Figure 2.3 compares the data prepared by the Pilbara Industry's Community Council (business as usual), the 5 per cent (aspirational) AACGR under Pilbara Cities, and the forecasts presented in WA Tomorrow

**Figure 2.1. Pilbara: historical and forecast resident population growth (1966-2036)**



Source: Department of Planning (2010)

Note: Projections generated on the basis of the aspirational Pilbara Cities initiative (as extrapolated to 2035) and the Pilbara Industry's Community Council 'business as usual' data to 2020.

## Map 3. Settlement

A3

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(to be released in 2012). It is important to note that, while each of these datasets is attempting to describe what will happen in the future, each offers very different results. Both scenario models provide a clear indication of how population might grow over the time interval, given a constant rate of growth. The forecasts produced by WA Tomorrow, however, acknowledge the significant reduction in certainty as they progress into the future, which accounts for the flattening of the trend line apparent in Figure 2.3.

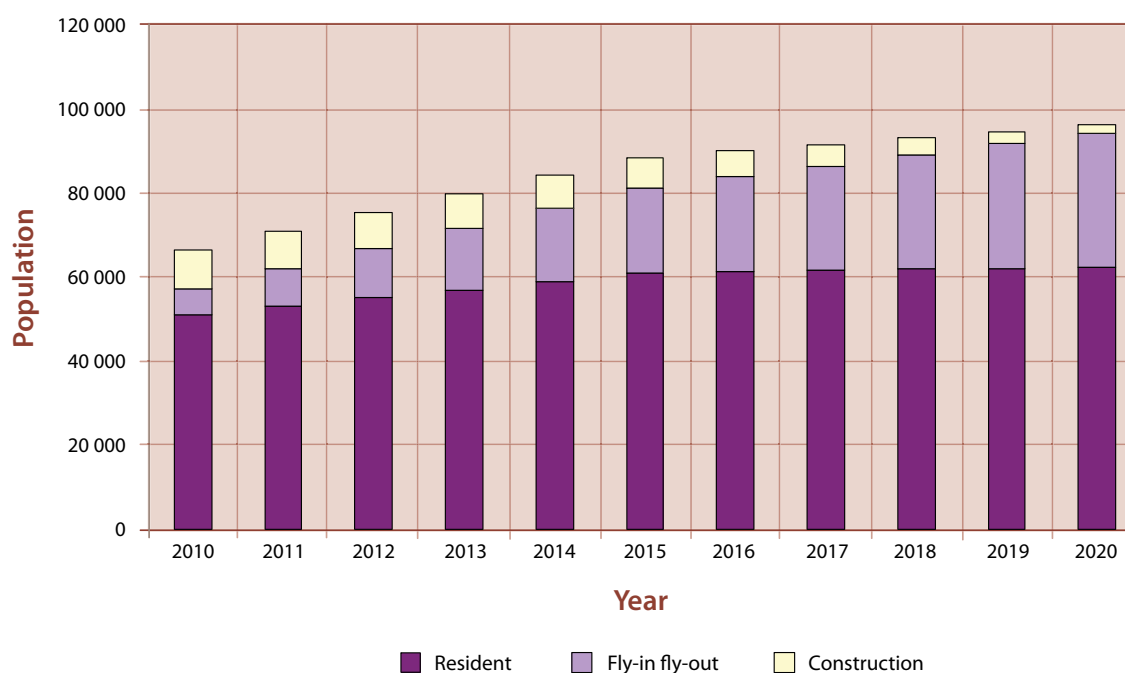
It should be noted, however, that anticipated growth, whether it be determined through forecasts or scenarios, is unlikely to be uniform across the region with some settlements and local government areas expected to grow more rapidly than others. Identifying strategies to achieve the Pilbara Cities population growth scenario form a significant part of the Framework. For example, it will be necessary to significantly diversify the economic base of the major centres and create many new job opportunities. This aspect is discussed in greater depth in Section 3.

With the expansion and diversification of the Pilbara economy, it is expected that the population age structure of the region will change over time (Figure 2.4), potentially to resemble that of Townsville-Thuringowa in North Queensland. A review of comparative Australian regions and aspirational models are provided in the supporting Pilbara Regional Profile. The broadening and deepening of the region's age-gender profile will greatly assist the Pilbara towns to become more resilient settlements. This change will have significant implications for housing and community health facilities, as the proportion of elderly residents increases.

### 2.3 Settlement hierarchy

Under the Pilbara Cities vision, the region's settlement structure will experience significant change. Karratha City (Karratha/Dampier) and Port Hedland City (Port Hedland/South Hedland) will grow to become cities of 50 000 people and Newman will grow into a subregional centre, with a population of 15 000 by 2035. It is intended that the

**Figure 2.2. Pilbara: mid-term population growth (2010-2020)**  
**Pilbara Industry's Community Council**

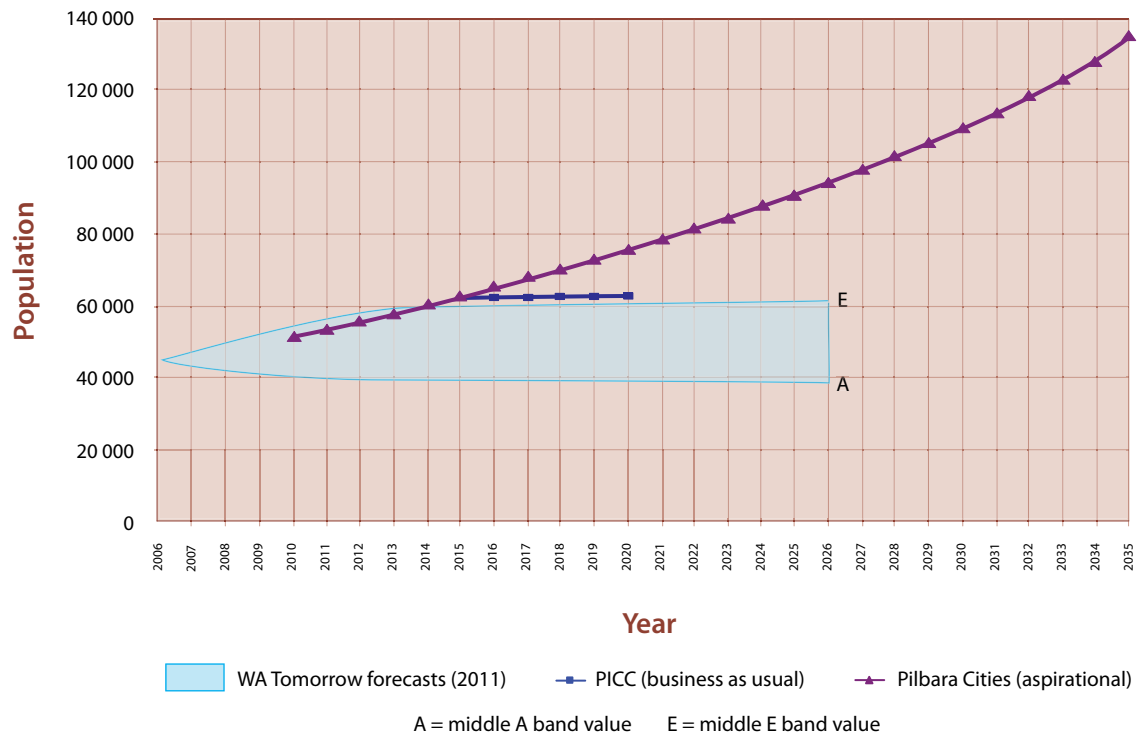


Source: Department of Planning (2010)

Note: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).



**Figure 2.3. Pilbara: historical and forecast resident population growth (2006-2035)**



Source: Department of Planning (2010)

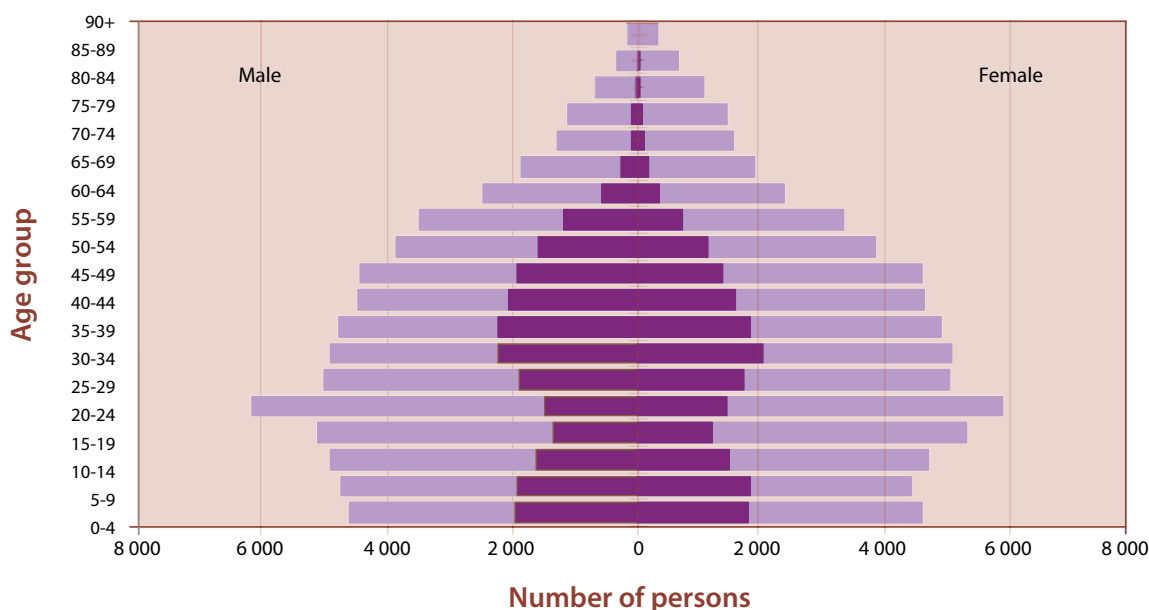
Note: the data included this figure includes - projections generated on the basis of the aspirational Pilbara Cities initiative (as extrapolated to 2035), the Pilbara Industry's Community Council 'business as usual' data to 2020 and draft WA Tomorrow forecasts (to be released in 2012).



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**Figure 2.4. Expected Pilbara population profile (2035)**



Source: ABS (2006)

Note: The population pyramid compares the existing population structure of the Pilbara (purple) with a potential future aspirational structure using Townsville-Thuringowa, North Queensland as an example (mauve).

concentration of population and supporting facilities in these regional nodes will have a positive, catalytic effect on the other settlements in their vicinity. Being in relative close proximity to higher levels of services and amenity, will in turn make them more viable and attractive places in which to live.

Some of the growth will come from fly-in fly-out workers, who choose to become permanent residents, as the level of services and facilities and general level of amenity in the Pilbara cities and towns increases.

Growth of other towns and villages will depend on mining and other activity in or in proximity to them. Onslow, for example, may triple in size if the Ashburton North Strategic Industrial Area is developed to its full potential. It may, however, only experience more moderate growth if project commencements are more subdued. The town of Pannawonica, which predominantly services Rio Tinto's workforce, is planned to be 'returned to nature' once the mine is exhausted, but may exist for considerably longer if other mines are established nearby. Tom Price may experience considerable growth if the tourism potential of Karijini National Park is fully realised.

Table 2.1 summarises the planned settlement hierarchy of the Pilbara in 2035. Populations have only been stated for Karratha City, Port Hedland City and Newman, given the uncertainty of predicting population growth in the other centres. Growth in these centres will be supported, provided it does not compete with growth in the major centres.

## 2.4 Housing

The recent resources boom (2003–2008) resulted in a housing affordability crisis that was reviewed by the Senate Select Committee on Housing Affordability in Australia during 2008. The committee summarised the main housing issues in the Pilbara as:

- slow release of residential land (due to a variety of factors, including the time required to obtain native title and environmental clearances);
- high cost of developing residential land in the Pilbara's harsh environment;
- shortage of builders, exacerbated by an inability to secure affordable housing in the region for their tradespeople;

**Table 2.1. Pilbara settlement hierarchy (to 2035)**

Function	Priorities	Target population (by 2035)	Footprint (approx. area (ha))
City	Karratha	50 000	5 000
City	Port Hedland	50 000	7 000 *
Sub-regional centre	Newman	15 000	800
Major town	Tom Price	25 000 (total all other settlements)  The population and footprint of these settlements will be largely determined by mining and oil and gas related industry in the locality	
Major town	Onslow		
Major town	Wickham		
Town	Paraburdoo		
Town	Roebourne		
Town	Pannawonica		
Village	Point Sampson		
Village	Marble Bar		
Village	Nullagine		
Village	Cossack		
Village (subject to investigation)	Shellborough		
Aboriginal communities		Refer section 2.12	
<b>Total</b>		<b>140 000</b>	

Note: The urban footprint of Port Hedland is larger than that of Karratha because it includes large tracts of strategic industrial land and areas subject to inundation.



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**Table 2.2. Short-term future housing demand in selected towns (2009-2015)**

Town	Current unmet demand (dwellings)			Future demand 2009-2015 (dwellings)			
	Apparent demand	Latent demand	Total unmet demand	Additional future demand 2009-2015		Total future demand 2009-2015	
				Low growth	High growth	Low growth	High growth
Karratha	613	918	1 531	560	1 125	2 091	2 656
Port Hedland	503	899	1 402	443	1 799	1 845	3 201
Newman	151	283	434	-45	580	389	1 014
Onslow	34	71	105	3	808	107	913
Tom Price	78	181	259	12	212	271	471
Roebourne	54	93	147	41	212	188	359
<b>Total</b>	<b>1 433</b>	<b>2 445</b>	<b>3 878</b>	<b>1 014</b>	<b>4 736</b>	<b>4 892</b>	<b>8 614</b>

Source: Department of Housing (2010)

Dwellings = permanent dwellings.

Apparent demand = includes housing waiting lists (social and GROH housing), homeless persons and overcrowding of current housing stock.

Latent demand = undersupply of affordable and appropriate housing has constrained the regions' service and construction sectors, causing them to operate below capacity.



**Table 2.3. Indicative future dwellings requirements in selected settlements (2010-2035)**

Settlement	Existing dwellings	Additional dwellings (cumulative)				
	2010	2015	2020	2025	2030	2035
Karratha-Dampier	4 950	9 320	11 170	13 390	16 050	19 230
Port Hedland	4 450	7 660	9 650	12 140	15 280	19 230
Newman	1 610	2 790	3 350	4 020	4 820	5 770
Other	1 935	4 270	5 250	6 440	7 880	9 620
<b>Total</b>	<b>12 945</b>	<b>24 040</b>	<b>29 420</b>	<b>35 990</b>	<b>44 030</b>	<b>53 850</b>

Source: ABS (2006)

Note: future dwelling data has been extrapolated using projected population data and census information.

- resource companies being prepared to pay subsidies to workers and/or pay ever increasing prices to house their workforce; and
- shortage of public and Government Regional Officers' Housing (GROH) accommodation.

These have resulted in a severe shortage of housing opportunities for lower paid occupations, particularly those that do not have housing provided as part of their employment package, including people working for subcontractors and those working in the community, retail and hospitality sectors. To address these issues, the Senate Select Committee recommended the following key strategies be implemented:

- increase competition in residential land development; and
- increase State Government expenditure on Pilbara public housing.

There has been a degree of catch-up since publication of the Committee's report, with an increased supply of residential land in the region's hotspots: Karratha, Port Hedland and Newman. Nevertheless, demand has also increased and supply remains well below demand. Key constraints to increasing the current housing stock are utility infrastructure capacity and the inability of the building industry to adequately respond to demand.

The Department of Housing, in association with the Pilbara Development Commission, has recently undertaken a housing study for Pilbara towns that assessed housing market conditions and unmet housing needs in the Pilbara towns. The study identifies a significant amount of latent demand for housing – estimated at 3878 dwellings across the region. In addition, there is an estimated demand for a further 1014–4736 dwellings by 2015, on the basis of low and high growth scenarios (Table 2.2).

Current unmet demand comprises of: social housing (478); Government Regional Officers' Housing (19); primary homelessness (25); secondary homelessness (286) and tertiary homelessness (625).

To cater for the region's population targets and satisfy unmet latent demand there will be a need for an estimated additional 40 900 permanent dwellings by 2035 (Table 2.3). This will require some 2130 hectares of net residential land.

The Pilbara's settlement housing density and form is anticipated to change significantly in the two Pilbara cities and other major towns. This will mean more residential apartments, townhouses and other forms of medium and higher density living.

In the Pilbara Cities major residential developments are underway. In Karratha, these include the new LandCorp residential subdivision at Baynton West, development of high rise apartments and service workers accommodation north of Karratha's commercial centre. In Port Hedland, current



# Pilbara

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**Table 2.4. Transient workforce accommodation by local government area (2010)**

Local Government authorities	Town-based (Single person dwellings)		Remote (Single person dwellings)		Total (Single person dwellings)		
	Current	Additional capacity	Current	Additional capacity	Current	Additional capacity	Total
Ashburton	1 679	1 597	6 477	4 040	8 156	5 637	13 793
East Pilbara	2 711	-	12 618	284	15 329	284	15 613
Port Hedland	2 838	3 610	953	300	3 791	3 912	7 703
Roebourne	6 819	3 568	4 149	197	10 968	3 765	14 733
<b>Total</b>	<b>14 047</b>	<b>8 775</b>	<b>24 197</b>	<b>4 821</b>	<b>38 244</b>	<b>13 598</b>	<b>51 842</b>

Source: Pilbara local government authorities (2010)

Dwelling = single persons units

Additional capacity = additional single persons dwellings

residential projects include: the Department of Housing's South Hedland New Living project and the LandCorp residential subdivision at Pretty Pool. In Newman, the main residential development focus is the LandCorp East Newman subdivision. Details of these developments are available in the Regional Hotspots Land Supply Updates for Karratha, Port Hedland and Newman.

### Fly-in fly-out workforce accommodation

It is recognised that the fly-in fly-out (transient) workforce is an important means of accommodating constantly changing labour requirements, particularly for specialist skills and during the construction stage of projects. It is also acknowledged that there has been a cause and effect relationship between an insufficient supply of land and accommodation, and the demand for fly-in fly-out workforce accommodation. The recent construction bulge and the shortage of housing has led to a significant increase in temporary workforce accommodation across the region (Table 2.4). This build-up has resulted in some concern within Pilbara communities. It is anticipated that there will

be a continuing reliance on transient workforce accommodation over the next decade, to service on-going and overlapping construction phases. If, however, a community building outcome is to be achieved, there will need to be less reliance on this form of accommodation in the longer-term.

It is important that short-term transient workforce accommodation is aligned with long-term planning and community outcomes. In urban situations, this type of accommodation needs to be integrated into the urban fabric rather than be segregated developments. Preference needs to be given to forms of transient workforce accommodation development, that can perform longer-term urban functions, rather than be demolished after a short life.

In remote locations there is a need for workforce villages to be developed in close proximity to mining operations, that are self-contained with high levels of amenity.

### 2.5 Urban form

Each Pilbara settlement faces its own urban design challenges and opportunities, as dictated by its physical setting and previous urban planning. The amount of land required for future urban growth will largely be a function of density and building form. In the case of the coastal towns, there is a need to address ocean frontage in a creative way, while at the same time respecting the perennial risk of storm surge and ocean inundation. In the case of the inland towns, there is a need to acknowledge the arid landscape setting with its periodic risks of flash flooding and bushfire. In many cases, there is now a need to retrofit some of the earlier urban structures to enhance liveability and assist place-making. Urban design should provide for adequate usable open spaces in new developments so that people have places to recreate.

Key urban design considerations include:

- creating well defined and cohesive settlements – setting and form;
- adopting water sensitive urban design practices;

- developing urban structures that are permeable and engender connectivity;
- developing a Pilbara design style with local variations between towns; and
- ensuring lot layout and building design is climate responsive.

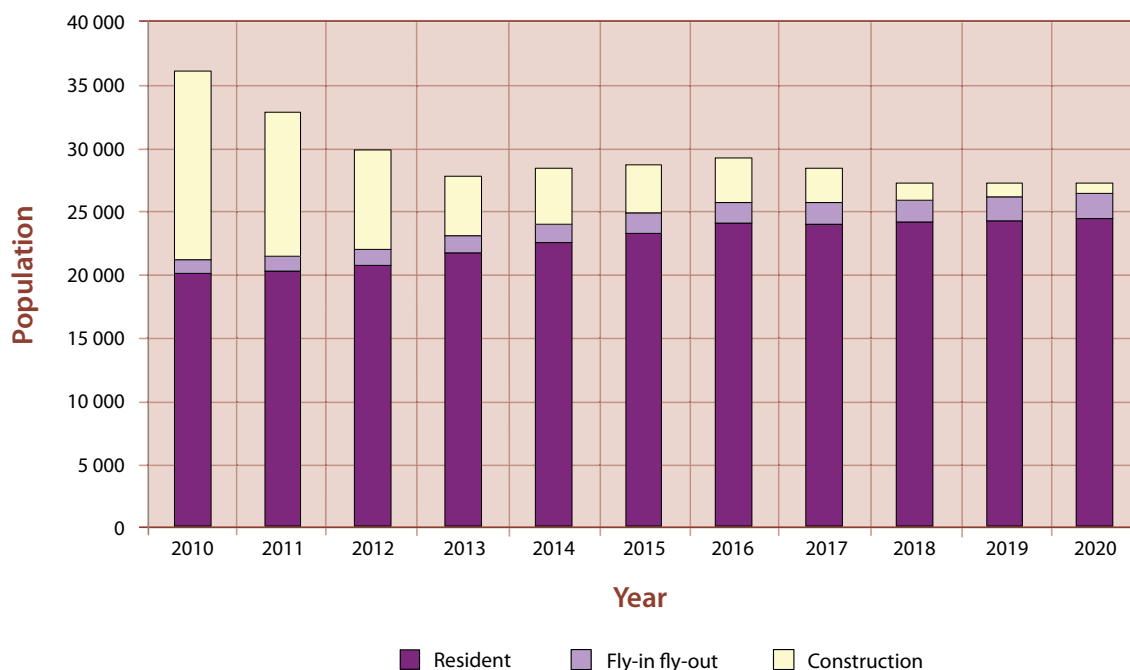
### 2.6 Karratha City

#### Future role and character

Karratha's future role is that of a Pilbara City servicing the West Pilbara. It will be the focus of a regional hub that comprises the five Nickol Bay satellite settlements of: Dampier, Roebourne, Wickham, Point Samson and Cossack. Karratha will also provide regional centre facilities and services to Onslow, Cape Preston, Anketell and Pannawonica.

Dampier Port will continue to function as the prime economic driver through the processing and export of iron ore, hydrocarbons and solar salt. The town of Dampier will continue to rely on Karratha for the majority of its community and commercial facilities

**Figure 2.5. Karratha/Dampier: mid-term population growth (2010-2020)**  
**Pilbara Industry's Community Council**



Source: Department of Planning (2010)

Note 1: Construction workforce figures reduce significantly towards 2020 as they are based on known projects only.

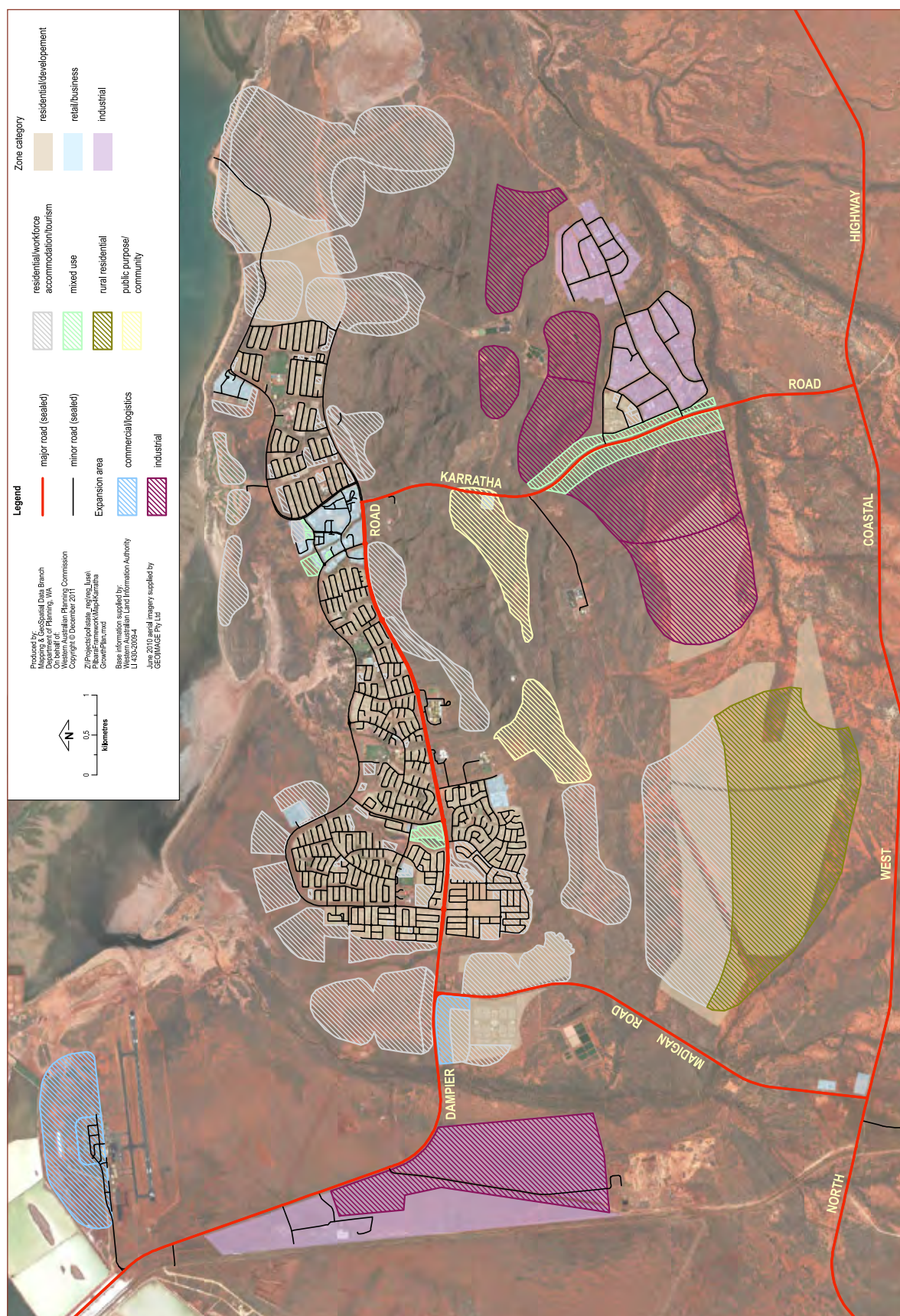
Note 2: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).



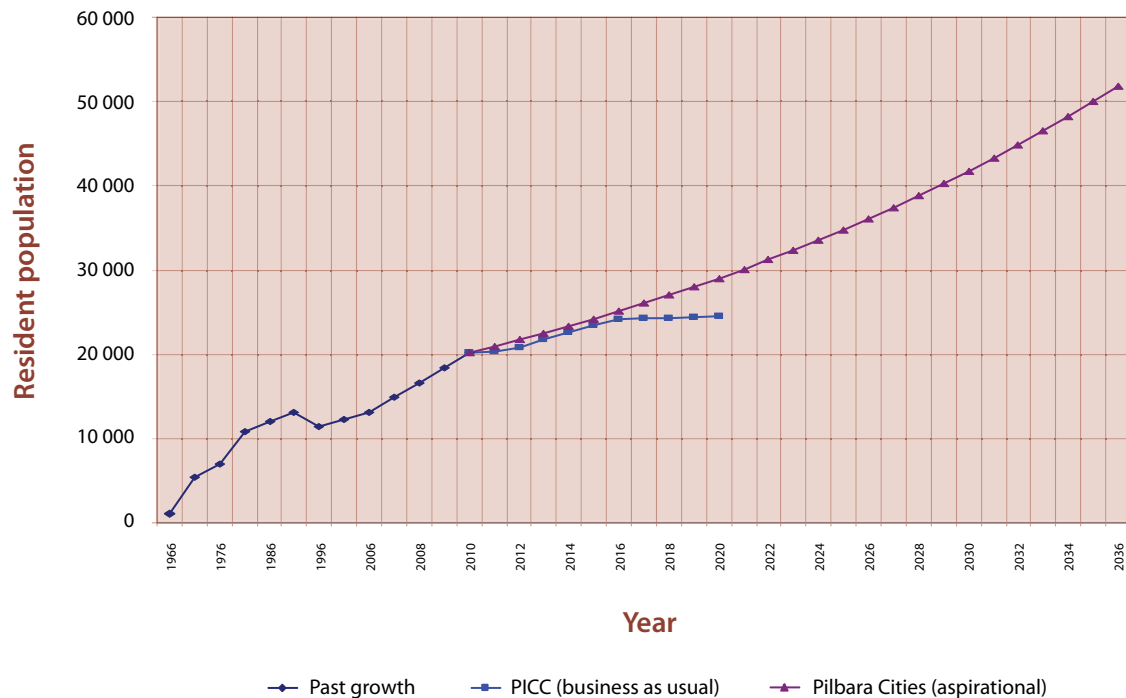
# Pilbara

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**Map 4. Karratha growth plan**



**Figure 2.6. Karratha/Dampier: historical and forecast population growth (1966-2036)**



Source: Department of Planning (2010)

Note: Projections generated on the basis of the aspirational Pilbara Cities initiative (as extrapolated to 2035) and the Pilbara Industry's Community Council 'business as usual' data to 2020.

and services. It is anticipated that the town will increasingly diversify, becoming a focus for maritime recreation and tourism as well as being a prime residential area.

Dampier was established as a mining port town in 1963 by Hamersley Iron to process and export iron ore from its operations in Paraburdoo and Tom Price. The ongoing process of townsite normalisation began in the 1980s. The Karratha townsite was gazetted in 1968 as a joint State Government-Hamersley Iron project to supplement the urban capacity of Dampier. Karratha currently functions as the service centre for the West Pilbara.

Data produced for the Pilbara Industry's Community Council estimated that the combined resident population of Karratha and Dampier to be 20 210 persons in 2010. When the transient worker population was factored in the total 'service population' (ERP plus transient workers) reached 36 390.

This data shows an increase in the residential population from 20 210 in 2010 to 24 540 by 2020 (Figure 2.5). The influence of fly-in fly-out is

anticipated to fluctuate significantly on the basis of known project activities in the area. However, current and proposed transient workforce accommodation (which totals 8145 units) would translate into a peak fly-in fly-out population of 7330 (assuming 90 per cent occupancy)

In line with the Pilbara Cities vision, the population of Karratha City is planned to expand to 50 000 people by 2035.

Figure 2.6 shows a comparison between the 'business as usual' Pilbara Industry's Community Council projections and the aspirational planned growth to deliver the Pilbara Cities vision.

It is expected that the form of residential development in Karratha City (Karratha/Dampier) will change significantly with more townhouses and other forms of higher density development. Average densities are likely to increase from R30 to R50 and maximum building heights will increase from three storeys (in Dampier) to ten or more storeys. To meet demand permanent dwelling stock is anticipated to increase from 4950 (2006) to 19 230 (by 2035).



# Pilbara

## planning and infrastructure framework

Development in Dampier will need to take into account the present and future operations of the port. The introduction of higher buildings and increased population in the town will require significant work to explore infrastructure implications and manage community expectations. Urban development will need to be in sympathy with the realities of being located next to a busy operating port.

The future footprint of Karratha to achieve the Pilbara Cities vision, has been largely determined by the Karratha City of the North Plan, prepared by the Shire of Roebourne with support from LandCorp (Map 4).

Details of Karratha's current development patterns and future potential are provided in the Regional Hotspots Land Supply Update for Karratha (WAPC, 2010), which forms part of the WAPC's Urban Development Program.





## 2.7 Port Hedland City

### Future role and character

Port Hedland's future role is as a Pilbara City to service the East Pilbara. Its pivotal location as one of the Pilbara's major ports, together with the increasing international demand for mineral resources, provides Port Hedland with a long-term security on which it can confidently diversify its economic base and provide for a higher threshold of community service provision.

Port Hedland City, which comprises Port Hedland (gazetted in 1896) and South Hedland (established in 1966), functions as the regional centre for the East Pilbara. It is functionally linked with Newman.

Data produced for the Pilbara Industry's Community Council estimated that the combined resident population of the Town of Port Hedland to be 14 624 persons in 2010. When transient worker population is factored in the estimated total 'service population' (ERP plus transient workers) was in the order of 18 650 persons.

This data shows an increase in the residential population from 18 650 in 2010 to approximately 22 000 by 2020 (Figure 2.7). The influence of fly-in fly-out is anticipated to fluctuate significantly on the basis of known project activities in the area. However, current and proposed transient workforce accommodation (which totals 2745 units) would translate into a peak fly-in fly-out population of 2470 (assuming 90 per cent occupancy).

In line with the Pilbara Cities vision, the population of Port Hedland is planned to expand to 50 000 people by 2035.

Figure 2.8 shows a comparison between the 'business as usual' Pilbara Industry's Community Council projections and the aspirational planned growth to deliver the Pilbara City.

Residential development in Port Hedland will change significantly with more townhouses and other forms of medium-density living being made available to consumers. Average densities are likely to increase from R30 to R50 and maximum building heights will increase from seven storeys (Lawson Apartments in South Hedland) to ten or more storeys. To meet demand, the stock of dwelling units is anticipated to increase from 4450 (2006) to 19 200 (2035).



The Town of Port Hedland recently commenced work on the Pilbara's Port City Growth Plan, which will replace the Land Use Master Plan - a local planning strategy that was endorsed by the WAPC in September 2008. The Pilbara's Port City Growth Plan will reconsider expansion areas for various land uses and determine appropriate residential densities throughout Port and South Hedland.

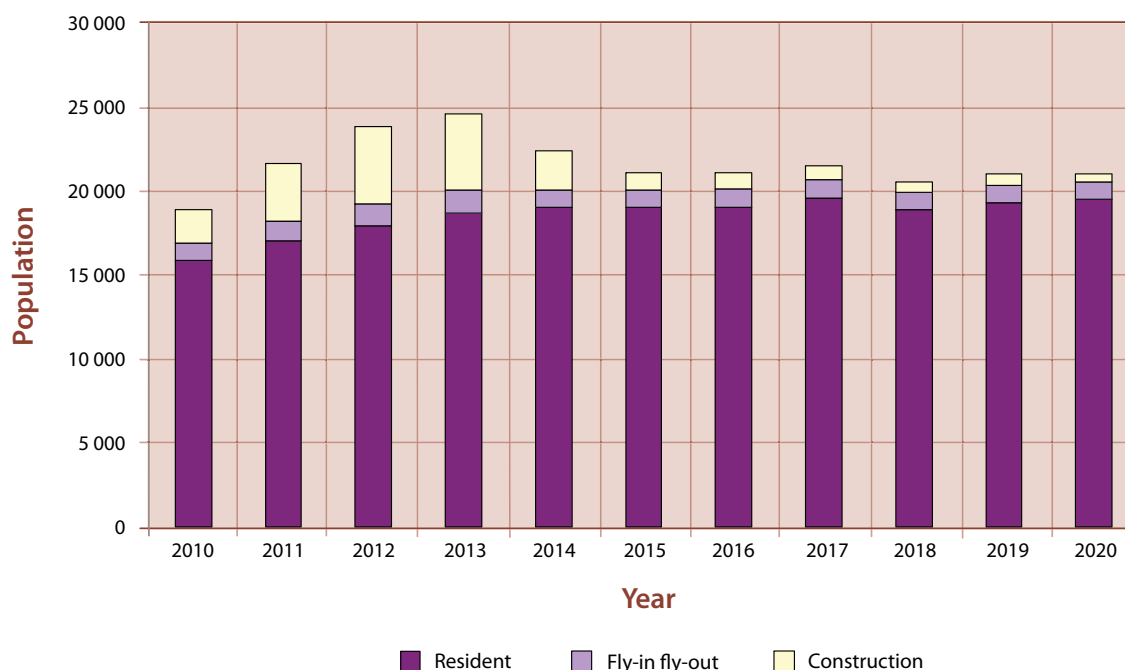
The Port Hedland Air Quality and Noise Management Plan (2010) is a comprehensive management plan for ongoing air quality and noise management in Port Hedland that has been endorsed by Government. A key land use planning recommendation from this work was the preparation of a development plan for Port Hedland, which would encourage higher density residential development away from the West End (the locality most susceptible to dust). The Pilbara's Port City Growth Plan will fulfill this requirement. Potential future urban expansion areas are shown on Map 5 and Map 6.

Details of Port Hedland's current development patterns and future potential are provided in the Regional Hotspots Land Supply Update for Port Hedland (WAPC, 2010b), which forms part of the WAPC's Urban Development Program.

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**Figure 2.7. Port Hedland: mid-term population growth (2010-2020)**  
Pilbara Industry's Community Council

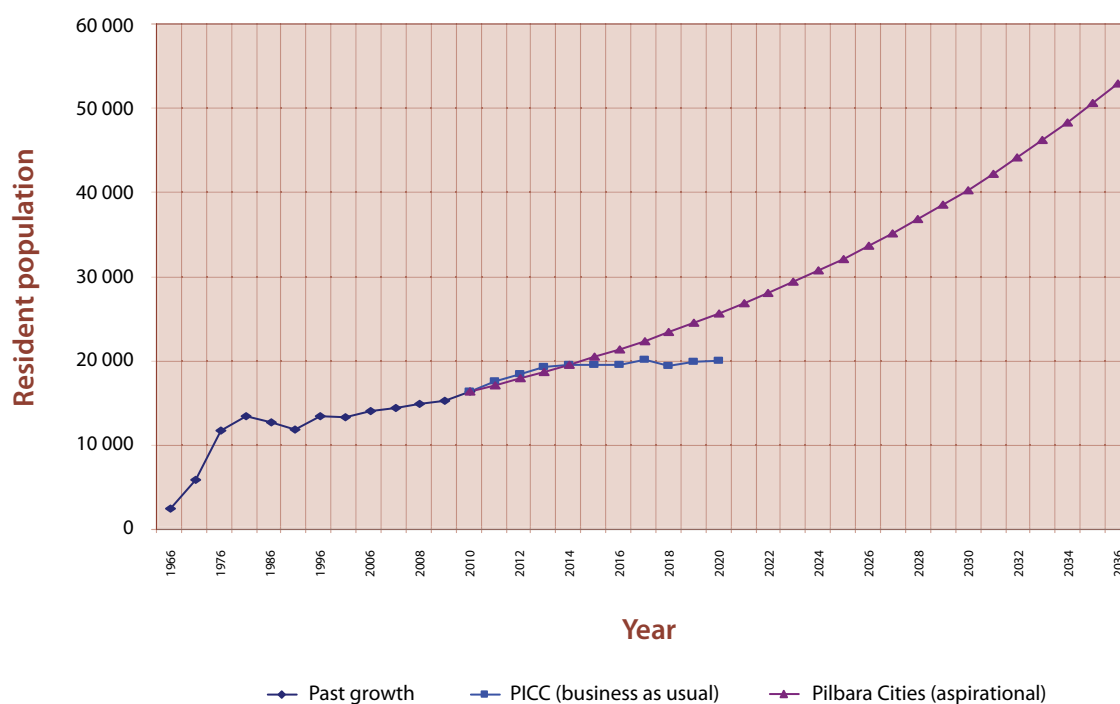


Source: Department of Planning (2010)

Note 1: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).

Note 2: Includes population growth for the Town of Port Hedland.

**Figure 2.8. Port Hedland: historical and forecast population growth (1966-2036)**



Source: Department of Planning (2010)

Note 1: Projections generated on the basis of the aspirational Pilbara Cities initiative (as extrapolated to 2035) and the Pilbara Industry's Community Council 'business as usual' data to 2020.

Note 2: Includes population growth for the Town of Port Hedland.

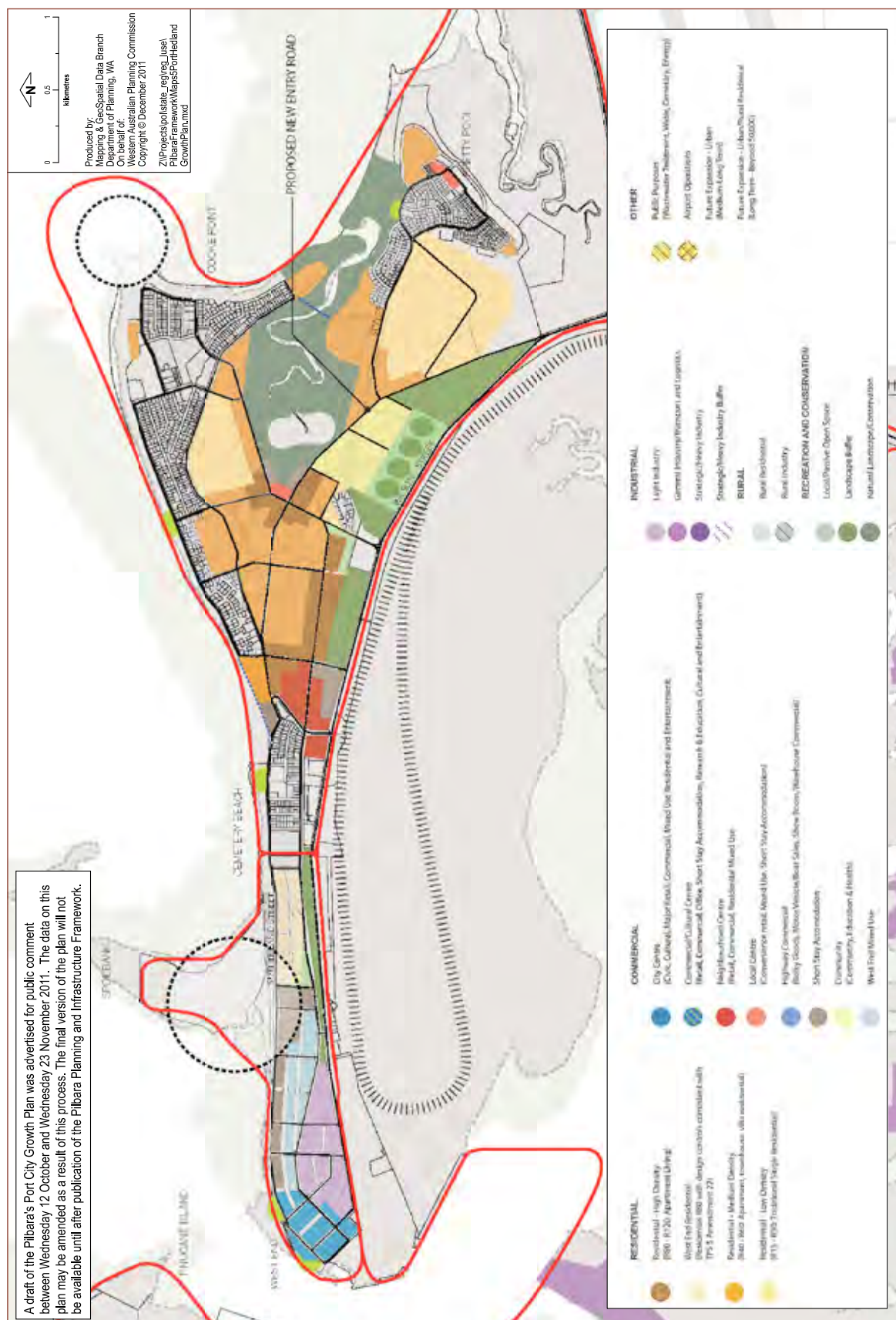
# Pilbara

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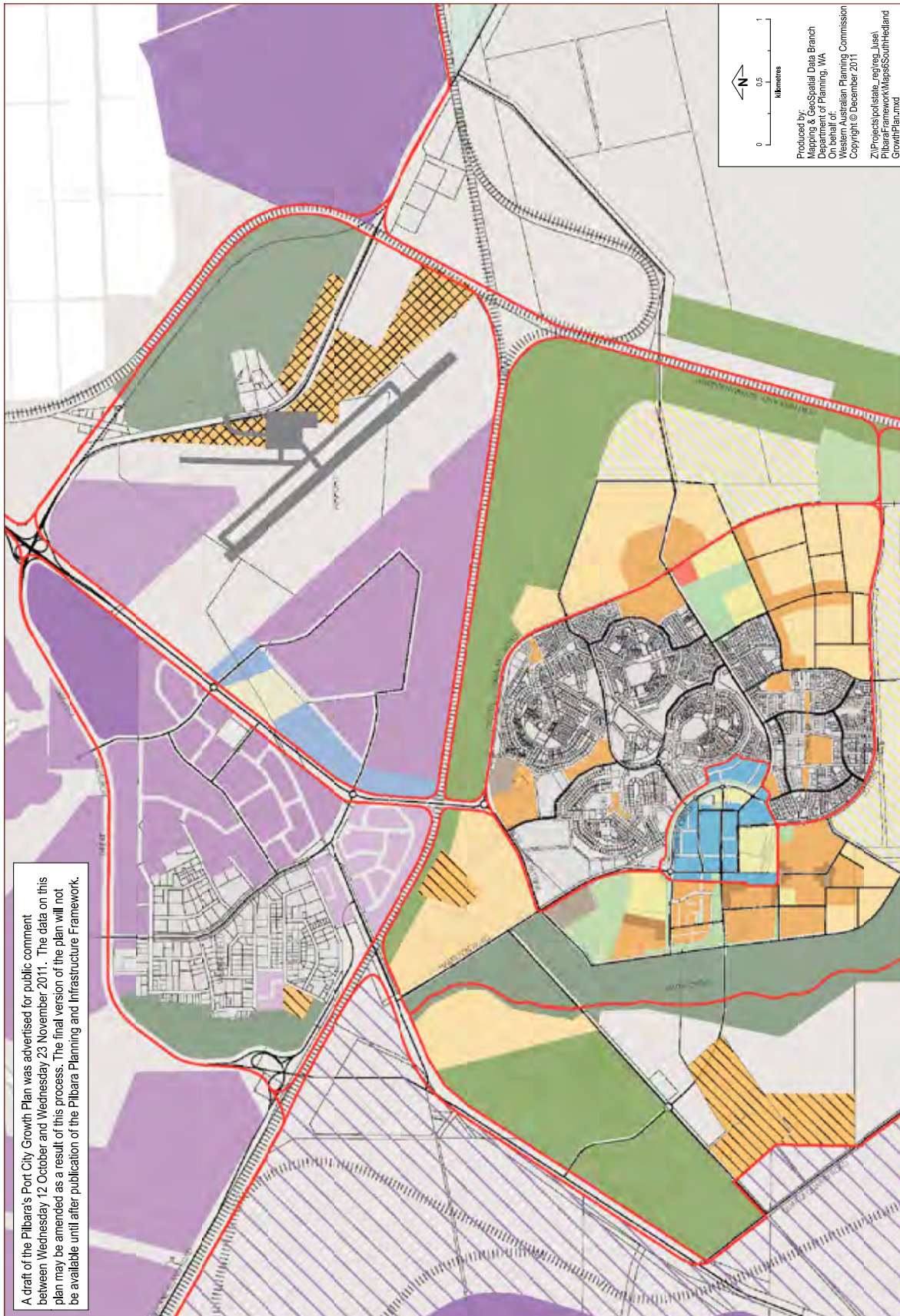


**Map 5. Pilbara's Port City Growth Plan (Port Hedland) (currently being prepared)**





**Map 6. Pilbara's Port City Growth Plan (South Hedland) (currently being prepared)**





## 2.8 Newman sub-regional centre

### Future role and character

Newman is the major service support centre for a number of mining operations, including BHP Billiton, Fortescue Metals Group and Hope Downs. In addition to its role as the mining 'hub' for the East Pilbara, Newman's future lies in its role as a sub-regional service and tourism centre. There are opportunities to develop the town as a sub-regional distribution centre, which is located strategically along the Great Northern Highway. The town also services the needs of the indigenous settlements located through the East Pilbara.

There are opportunities to develop a tourism industry (gateway to Karijini and Karlamilyi National Parks and the Canning Stock Route); supply chain completion; and a hub for a horticultural industry based on mine de-watering.

Newman was established in 1968 by Mt Newman Mining and is now BHP Billiton's 'mining hub' for its central and east Pilbara operations. Since 1982 the Newman townsite has been in the process of normalisation.

Newman's current resident population is estimated to be in the order of 6000 and this is planned to expand to 15 000 by 2035.

In addition to the resident population, Newman has an estimated transient workforce population of 2340 living in single person's quarters located in town. Current and proposed transient workforce accommodation totals some 3500 units. This equates to a peak fly-in fly-out population of 3150 (90 per cent occupancy).

The 2010 Pilbara Industry's Community Council employment and population projections anticipate an increase in the Newman residential population from 6040 in 2010 to 8290 in 2020 (Figure 2.9). The influence of fly-in fly-out is anticipated to fluctuate on the basis of known project activities in the area.

**Figure 2.9. Newman: mid-term population growth (2010-2020)**  
Pilbara Industry's Community Council



Source: Department of Planning (2010)

Note: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).

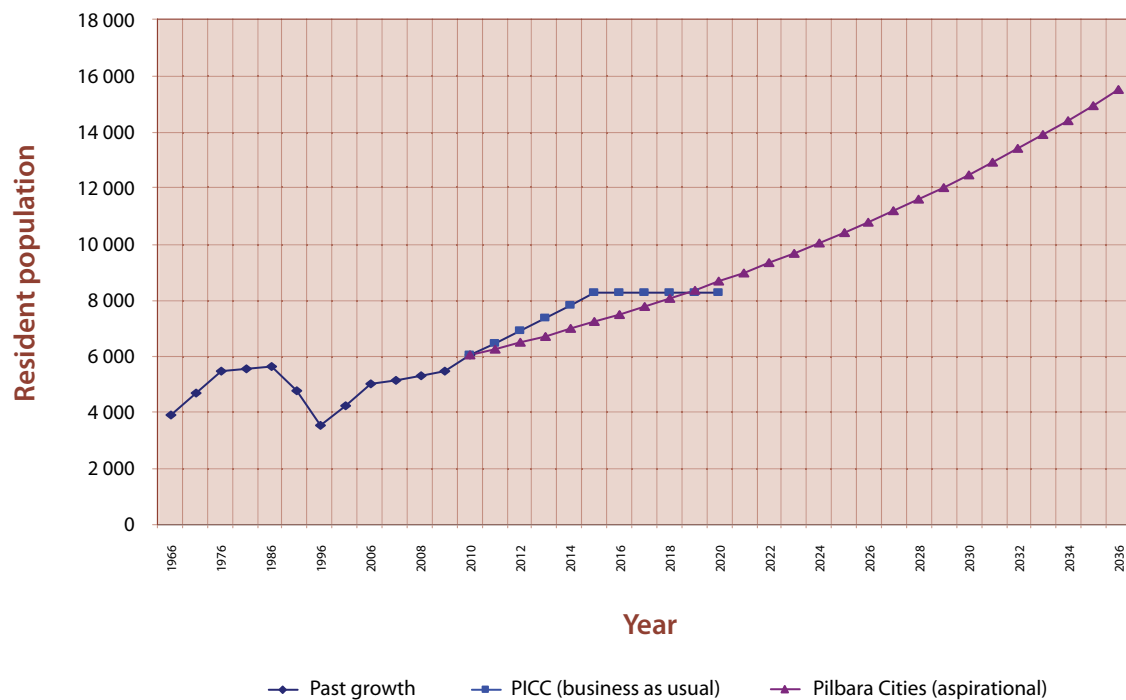
Figure 2.10 shows a comparison between the business as usual Pilbara Industry's Community Council projections and the aspirational planned growth to deliver the Pilbara Cities vision.

Residential development in Newman will tend to follow similar forms to the existing pattern. There is, however, likely to be a larger proportion of townhouses and other forms of medium-density living. Average densities are likely to increase from

R25 to R40 and maximum building heights will increase from two storeys to three storeys. To meet demand permanent dwelling stock is anticipated to increase from 1610 to 5770.

The future footprint of Newman, to achieve the Pilbara Cities vision, has been largely determined by the Newman Revitalisation Project, prepared by the Shire of East Pilbara in association with LandCorp (LandCorp, 2010) (Map 7).

**Figure 2.10. Newman: historical and forecast population growth (1966-2036)**



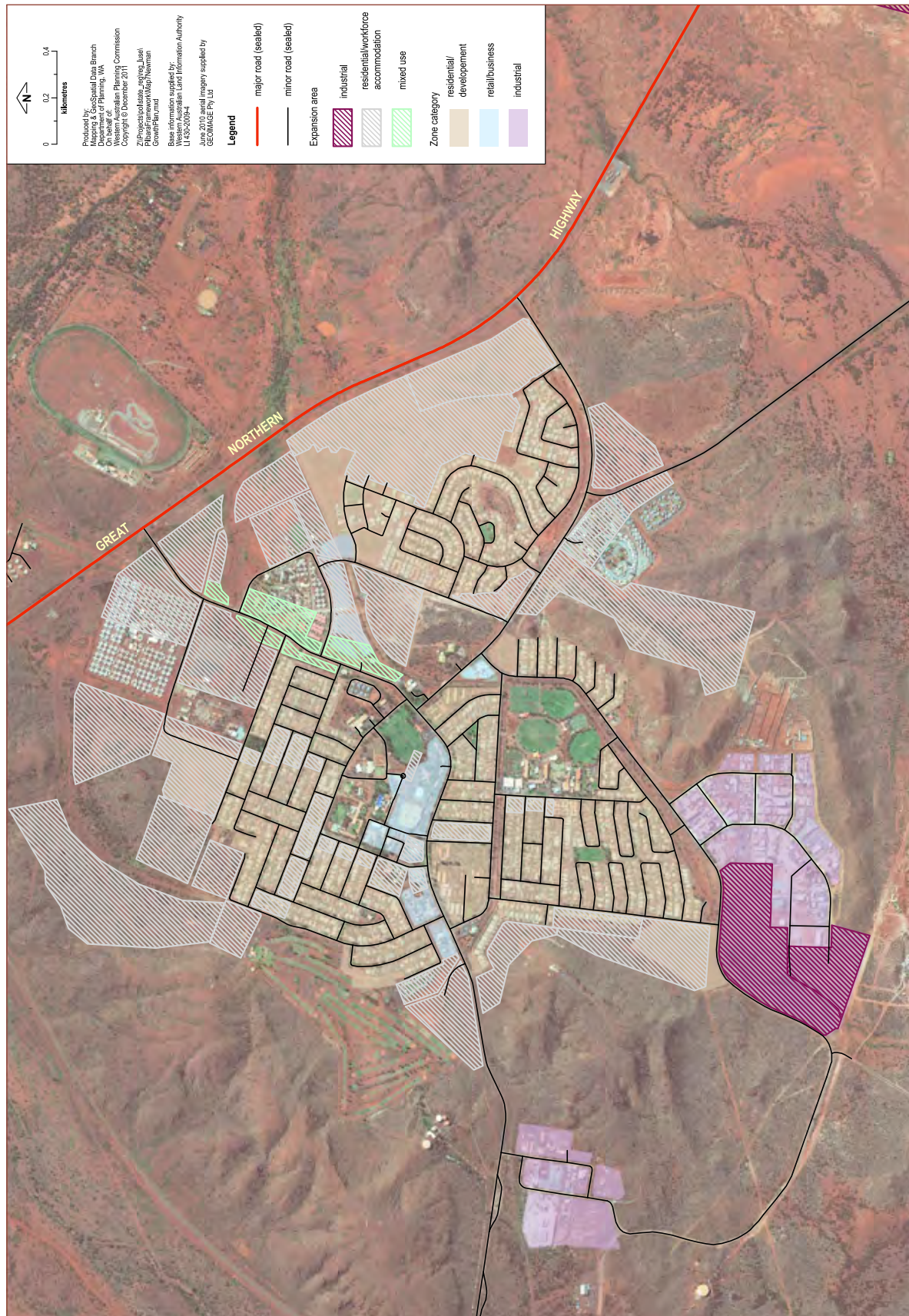
Source: Department of Planning (2010)

Note: Projections generated on the basis of the aspirational Pilbara Cities initiative (as extrapolated to 2035) and the Pilbara Industry's Community Council 'business as usual' data to 2020.

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**Map 7. Newman growth plan**





## 2.9 Major towns

### Tom Price

#### Future role and character

Tom Price will continue to function as Rio Tinto's mining 'hub' for the central Pilbara in the medium-term. In parallel with this ongoing role, there are opportunities for the further development of the town as a visitor and service hub for the Pilbara 'high country' in general and Karijini National Park in particular.

Tom Price was established as a company mining town by Hamersley Iron in 1966 and currently functions as RTIO's 'mining hub' for the central Pilbara. The town is in the process of normalisation and it is now the administrative centre for the Shire of Ashburton.

Tom Price has a recorded resident population of 2720 (ABS, 2006). The size of the town's future population is difficult to estimate with any degree of confidence. At best, it will experience a modest increase (at least in the short-term) and, at worst, it will experience a decline.

In addition to the resident population, Tom Price has an estimated transient workforce population of 760 living in single person's quarters in the town. Current and proposed transient workforce accommodation totals 1550 units, which equates to a peak fly-in fly-out population of 1390. This does not take into account the use of commercial visitor accommodation and private dwellings occupied by fly-in fly-out workers.

Residential development in Tom Price will tend to follow the existing pattern and will generally be confined to urban consolidation. To meet both current latent demand and additional demand from mining and broader economic development opportunities, there will be a need to expand the town's permanent housing stock.

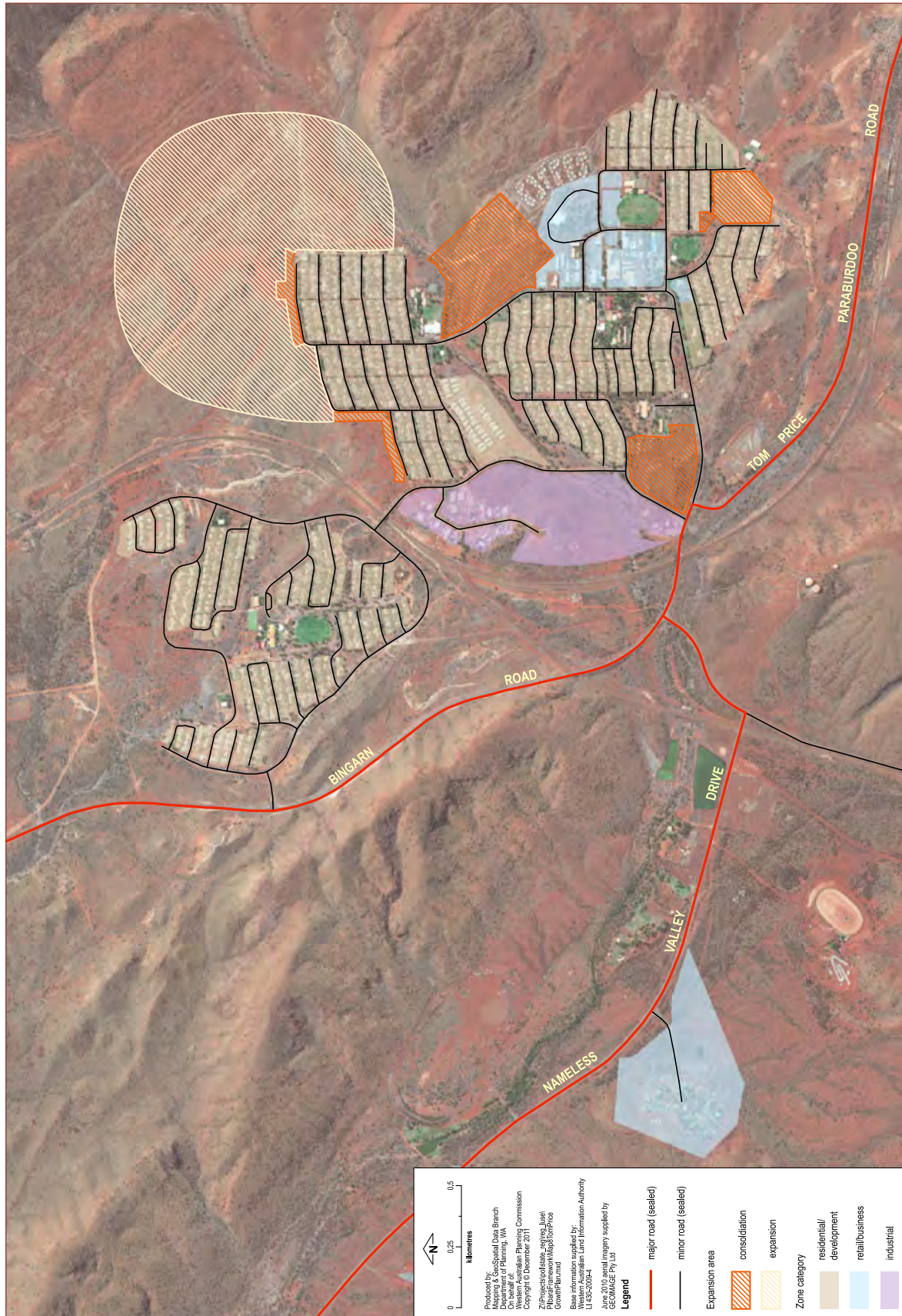
Potential residential infill areas within the existing urban footprint are shown in Map 8.



# Pilbara

## planning and infrastructure framework

**Map 8. Tom Price growth plan**





### Onslow

#### Future role and character

Onslow's future is largely dependent on the construction of processing facilities for off-shore hydrocarbons at the proposed Ashburton North Strategic Industrial Area. While a permanent workforce in Onslow is encouraged, growth will be largely dependent on the proportion of fly-in fly-out workers during the construction and operations phases. Onslow will continue to depend on Karratha for higher order community and commercial facilities.

The Onslow townsite was established at its current location in 1925. The Shire of Ashburton had its main administrative centre in the town until it relocated to Tom Price in 1990. Currently, the town's principal economic drivers are solar salt, fishing, off-shore marine servicing and tourism.

Onslow's current resident population is estimated to be in the order of 700 but this can vary due to the high mobility of the indigenous population. The town is on the threshold of a significant expansion as the locality is considered a favourable area to establish gas processing industries to monetise gas resources from the North West Shelf by production of liquified natural gas (LNG) for export to overseas markets and domestic gas for the local market. However, the upfront capital required to establish these industries and constant fluctuations in overseas demand create uncertainty in regard to the scale and timing of potential venture(s).

In addition to rooms, units and caravans occupied by fly-in-fly-out workers within the town, a number of transient workforce accommodation units have recently been constructed in the Beadon Creek area. The Shire of Ashburton, in response to the development of the Ashburton North Strategic Industrial Area, has resolved to require operational workforces, whether these be permanent or fly-in fly-out, to be located in the town site.

Residential development in Onslow will tend to follow similar forms to the existing pattern. There is, however, likely to be a larger proportion of townhouses and other forms of medium-density living. Average densities are likely to increase from R25 to R40 and maximum building heights will increase from two storeys to three storeys.

To meet demand, permanent dwelling stock is anticipated to increase from around 270 to 770. Areas for urban expansion, currently under investigation, are shown on Map 9.

The Shire of Ashburton, in consultation with the Department of Planning, has completed a townsite expansion strategy for the town (Shire of Ashburton, 2010).



# Pilbara

## planning and infrastructure framework

**Map 9. Onslow growth plan**





### Wickham

#### Future role and character

Wickham will continue as a mining port town, providing local level services to an expanded Rio Tinto Iron Ore (RTIO) Cape Lambert workforce, together with a potential workforce associated with projects in Anketell. The town will also service the smaller settlements of Point Samson, Roebourne and Cossack. Ideally, residential growth will be limited with people preferring to live in Karratha, where higher order commercial and community services are provided.

If RTIO decides to increase the population of the town, it is important that Wickham does not compete with Karratha by providing higher order services and facilities. Therefore, the provision of a faster more direct road link between the two towns is considered a high priority.

Wickham was established by Cliffs Robe River Iron Ore in 1970 to provide town-based accommodation for the Cape Lambert iron ore processing and shipment facility. Normalisation commenced in 2000. Current land tenure includes: RTIO, private and Department of Housing.

Wickham has a recorded resident population of 1823 (ABS, 2006) and has developed to be a pivotal settlement in the Roebourne-Cape Lambert area. It functions as a local service centre for the Cape Lambert industrial area, Point Samson and Roebourne. It would potentially fulfil a similar role for

a developed Cossack and Anketell. It is not expected that there will be an increase in the level of services in the foreseeable future.

Wickham is highly dependent on Karratha for higher order community and commercial facilities. Enhanced connectivity with Karratha in the form of a new coast road is an option being considered, which may have the effect of capping the town's growth prospects.

Future residential development in Wickham will tend to follow similar forms to the existing pattern, remaining largely a support town for workforce operating the port at Cape Lambert. However, there is likely to be a larger proportion of townhouses and other forms of medium density living. Average densities are likely to increase from R25 to R40 and maximum building heights will increase from two storeys to three storeys.

In addition to the resident population, Wickham (including Cape Lambert) has an estimated transient workforce population of 695 living in single person's quarters in the area. Current and proposed transient workforce accommodation totals 2020 units, which equates to a peak fly-in fly-out population of 1820 (90 per cent occupancy).

If residential development does occur in Wickham, it will tend to follow similar forms to the existing pattern. However, there is likely to be a larger proportion of townhouses and other forms of medium density living. Average densities are likely to increase from R25 to R40 and maximum building heights will increase from two storeys to three storeys.



# Pilbara

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### 2.10 Towns

The other towns in the region are Paraburdoo, Roebourne, and Pannawonica. Their current and future roles are summarised in Table 2.5 and their population and housing characteristics are summarised in Table 2.6. The growth or decline of these centres will be largely dependent on mining activity in the locality.

**Table 2.5. Pilbara town's establishment and potential future role**

Town	Establishment and current role	Future role and character
Paraburdoo	Paraburdoo was established as a company mining town by Hamersley Iron in 1971. Townsite normalisation commenced in the 1980s. Paraburdoo is wholly dependent on RTIO's iron ore extraction and processing at the Paraburdoo and Channar mines.	RTIO is committed to the on-going operation of Paraburdoo as a support centre for existing mining activity at Paraburdoo Channar and Eastern Ranges. Post mining the town would be expected to contract significantly to a core activity area. Post mining there are some opportunities for the town to act as an Aboriginal service and tourism centre.
Roebourne	Roebourne was established by pastoralists, pearlers, gold miners and traders in the 1860s. The town was gazetted in 1866. It currently faces challenges in terms of social disadvantage and service delivery. It is currently developing as an Aboriginal business and cultural centre.	Roebourne will become a vibrant town with a strong Aboriginal community business and cultural focus. This would need to be supported by economic diversification offering greater employment opportunities. This will require significant cooperation and collaboration between all levels of government, community and resource company stakeholders.  Current residential planning initiatives, include the Ngarluma Aboriginal Sustainable Housing (NASH) project and the Department of Housing's Roebourne Housing Strategy. The NASH project will have the potential to deliver 400 residential lots, four group housing sites and a commercial centre. The first stage of the project will contain 100 lots (99 single residential lots and one group housing site for 10 dwellings). The Department of Housing project will address the need to refurbish, replace and provide additional social housing dwellings in the township.
Pannawonica	Pannawonica was established in 1970 by Cliffs Robe River Iron Ore to exploit the mesa-based iron ore at Robe River. It is a closed RTIO-Robe River company town with limited community services provided by the State Government and the Shire of Ashburton.	Pannawonica's short-medium term role is that of a service centre for the existing Mesa J mine and the development of the Mesa A iron ore deposit. At the end of mine life, the most likely scenario would be the closure of the town and the reinstatement of its urban footprint to natural bushland.

**Table 2.6. Pilbara town's population and dwellings**

Town	Resident population	Dwellings	Urban use % townsite area
Paraburdoo	1 610	659	20
Roebourne	875	247	64
Pannawonica	690	273	3

Source: ABS (2006)

Note: Dwellings exclude caravans and other non permanent accommodation forms.

## 2.11 Villages

The region's villages are located at Point Samson, Marble Bar, Nullagine, Cossack and, potentially, Shellborough. The villages' current and future roles are summarised in Table 2.7. and their population and housing characteristics are summarised in Table 2.8. The growth or decline of these centres will be largely dependent on mining activity in the locality.





# Pilbara

## planning and infrastructure framework

**Table 2.7. Pilbara villages' establishment and potential future role**

Village	Establishment and current role	Potential role
Point Samson	Port Samson was initially developed as a port for the Shire of Roebourne in 1910. The town has since developed as a residential dormitory of Karratha. It also functions as one of the coastal tourist centres for the West Pilbara providing short-medium term stay facilities for families and groups working in the region.	This highly attractive location is set to attract additional high quality tourist development. However, it will be important to maintain the fishing-maritime character of the town and to generally maintain a high standard of urban design and building design. Point Samson will continue to rely on Wickham for local community services and Karratha for higher order community and commercial services.
Marble Bar	Marble Bar was established by graziers and gold prospectors in the 1880s and declared a town in 1893. Marble Bar is a small town serving the needs of the local community and mining activity in the district. It is dependent on Port Hedland for the majority of its needs.	The future role of Marble Bar is that of a tourist and local service centre providing services to the Aboriginal communities in the district, as well as the resource industry. Tourism would be based on the in-transit ('grey nomads') and special interest (prospecting/fossicking) visitor markets. Marble Bar will continue to rely on Port Hedland for higher order community and commercial facilities. Land and housing supply to meet future demand will need to be addressed.
Nullagine	Nullagine was established by graziers and gold prospectors in the 1880s. The town is beginning to capitalise on growing mining investment in the Nullagine-Newman district.	Nullagine's future role is that of a local service centre catering primarily to the needs of the district's Aboriginal community and mining activities. Development is highly constrained by the town's susceptibility to serious and extensive flooding. Land and housing supply to meet future demand will need to be addressed.
Cossack	Cossack was established in 1863 and officially declared in 1872. The town originally functioned as a port for pearling pastoral and gold prospecting activities. The original subdivision plan for the town was developed in 1866 paying scant regard to terrain and climatic conditions. It currently functions as a 'museum township'.	There is scope for the establishment of tourist facilities within Cossack for short stay tourism/rest and recreation centre for the West Pilbara, as well as providing cultural/eco-tourism experiences for local, interstate and international in-transit visitors. Ancillary to tourism and heritage, Cossack will have a limited role as a residential village.
Shellborough	Shellborough is an abandoned historic townsite to the north of Port Hedland – similar to Old Onslow.	Shellborough is to be investigated as a coastal village for Port Hedland.

**Table 2.8. Pilbara villages' population and housing**

Village	Resident population	Dwellings	Urban use % townsite area
Point Samson	274	105	46
Marble Bar	190	114	26
Nullagine	220	62	12
Cossack	4	1	n/a
Shellborough	0	0	n/a

Source: ABS (2006)

Note: Dwellings exclude caravans and other non permanent accommodation forms.

## 2.12 Aboriginal communities

### Population

Estimating the existing and future indigenous population of discrete settlements and towns is challenging, because Aboriginal people tend to be mobile, in terms of housing and living arrangements, compared to non-indigenous populations.

Populations can increase and decrease quite rapidly based on cultural or administrative factors. There is also a statistical undercount of Aboriginal populations by federal and state agencies, which is related, in part, to the higher mobility of this group.

Notwithstanding these factors, indigenous people are estimated to comprise approximately 16 per cent of the Pilbara population (ABS, 2006). This population is dispersed throughout both the larger coastal towns and smaller settlements inland. However, the majority of the population (approximately 80 per cent) live in the larger towns with the balance living in remote settlements.

Movement between settlements is often characterised by seasonal migration and habitation, often inland during the drier, cooler months and to larger coastal, and better resourced towns, during the warmer and wetter months when inland communities can become isolated and road access is restricted.

Despite migration between settlements, the Aboriginal population within the region tends to be more stable and constant than the non-indigenous population.

In addition to being relatively mobile and urban, the Aboriginal population in the Pilbara tends to be young, with almost 50 per cent being under the age of nineteen.

### Housing

Future demand for housing and other infrastructure for Aboriginal communities should be planned for in the context of:

- a young and higher than average population growth rate;
- generally larger household sizes;
- seasonal migration between settlements and towns resulting in a pattern of fluctuating population and demand for housing and housing types; and
- higher than average per capita reliance on State housing.

Community layout plans (prepared under State Planning Policy 3.2 - Planning for Aboriginal Communities and endorsed by the WAPC) provide an analysis of need and plan for existing and future demand for housing and infrastructure in aboriginal settlements. These plans are generally updated every five years and, where these have been prepared, should be consulted with regard to housing requirements for specific settlements.

### 2.13 Objectives and actions

Objectives	Actions
<b>2.1. Settlement:</b>  <b>Develop the region's settlements to be sustainable and liveable communities.</b>	<ul style="list-style-type: none"> <li>a Achieve an efficient supply of project-ready land, in a timely manner, to accommodate growth in Karratha, Port Hedland and other major urban centres, through the preparation of local planning strategies and schemes.</li> <li>b Promote areas for mixed-use and higher density residential forms in major centres by their inclusion in local planning schemes.</li> <li>c Identify areas of land for community and recreational needs in growth and redevelopment areas through zoning in local planning schemes.</li> <li>d Facilitate private sector involvement in urban land development.</li> <li>e Reflect the findings of the Port Hedland Dust Management Taskforce in the preparation of planning documents and strategies for Port Hedland.</li> </ul>
<b>2.2. Housing:</b>  <b>Provide choice, quantity, quality and affordability in housing provision.</b>	<ul style="list-style-type: none"> <li>a Continue to undertake work that focuses on accelerating land releases for housing.</li> <li>b Provide serviced residential land in identified growth areas to meet the needs of the labour market.</li> <li>c Encourage higher density residential development in Karratha and Port Hedland through the application of residential design codes.</li> </ul>
<b>2.3. Fly-in fly-out:</b>  <b>Provide for fly-in, fly-out workforces that do not adversely impact on the resident population.</b>	<ul style="list-style-type: none"> <li>a Identify appropriately located sites to accommodate fly-in fly-out workforces through the preparation of regional and local government transient workers accommodation policies.</li> <li>b Encourage urban based transient worker accommodation that is located close to commercial centres, to serve multi-purpose functions within the region's communities.</li> <li>c Support the use of on-site transient worker accommodation during the construction stage of major community, commercial and housing development projects.</li> <li>d The State, in consultation with industry and local government, to develop a specific policy relating to workforce accommodation in the Pilbara.</li> </ul>
<b>2.4. Urban form:</b>  <b>Create sustainable, well defined, cohesive settlements, with a strong sense of place and high quality urban design that is climate responsive.</b>	<ul style="list-style-type: none"> <li>a Identify ways that settlements can engender connectivity and create a sense of place.</li> <li>b Develop a Pilbara vernacular design style that is sensitive to and enhances the identity and character of settlements through the development and adoption of urban design guidelines.</li> <li>c Provide for climate responsive urban form and buildings through the development and adoption of urban design guidelines.</li> <li>d Continue to implement water sensitive urban design policies and practices.</li> <li>e Ensure provision of public open space and recreation facilities as part of subdivision.</li> </ul>

### 3 Economic development

#### 3.1 Strategic direction

The Pilbara Cities vision provides the impetus to transform the Pilbara from a mono-producer economy to one that is broader and more balanced. This transformation would be based on resource industry supply chain completion in the first phase, widening in the later phases, to encompass knowledge-based industries with an increasing capacity to export goods and services.

To achieve long-term economic viability of the region strategies will be put in place to ensure the provision of: adequate wharf-side and land-side capacity at the region's ports; 'project-ready' strategic industrial areas; and, in the townsites, sufficient zoned and serviced light industrial and commercial areas. There is also a need to identify suitable campus sites for large government-sponsored facilities.

##### **Goal:**

*A robust, diversified and sustainable regional economy that will provide sufficient employment opportunities for the Pilbara's planned population*

#### 3.2 Economic significance of the Pilbara

The importance of the Pilbara region to both the Western Australian and the Australian economy has grown considerably in recent years. While agriculture, tourism, fishing and other sectors feature, the region's economy is dominated by the extraction, processing and export of minerals and petroleum (Figure 3.1, Table 3.1 and Map 10). The region's current economic status is summarised as follows:

- North West resource production was valued at over \$45 billion in 2009, contributing to approximately 75 per cent of Western Australia's total merchandise export income.
- Approximately 300 million tonnes of iron ore were exported from the Pilbara in 2009 with a total sales value of nearly \$27 billion.
- There are \$17.7 billion of committed iron ore projects in the Pilbara.

- Australia's biggest resource initiative, the Gorgon Joint Venture LNG project is being developed at an estimated cost of \$43 billion. A further \$26.2 billion of offshore committed projects are planned to be developed in the near future.
- The petroleum sector accounted for \$16.8 billion of production in 2009.
- The Telfer Gold Mine, which produces 630 000 ounces of gold per annum, is operated by Newcrest. It is the second largest gold mine in Australia after Kalgoorlie's Superpit.
- The Pilbara has deposits of nickel, gold, copper, uranium and manganese that may be developed in the future.
- The Pilbara has the second largest solar salt fields in the world (with large commercial ventures operating out of Onslow, Dampier and Port Hedland).
- In 2008/09, Port Hedland had a throughput of 159.4 Mt and Dampier handled 141.0 Mt.
- Royalties to the State: \$2.39 billion in 2010.
- Petroleum Resource Rent Tax: \$865 million in 2008/09.

The royalties paid by companies to export Western Australia's natural resources are significant, with over \$3.8 billion collected in the 2010 financial year. All onshore mining royalties are collected by the Western Australian government while offshore oil and gas royalties are collected by both the State and Commonwealth governments.

The Pilbara region produced \$28 billion or 96 per cent of Western Australia's iron ore production in 2010. This generated approximately \$2.39 billion in royalties under either the *Mining Act 1978* or agreement acts negotiated for individual projects.

Oil and gas in the Pilbara region largely produced offshore, is the next largest contributor to wealth generating \$21.2 billion or 97 per cent of Western Australia's petroleum production (crude oil and condensate, LNG, natural gas and LPG). Petroleum generated approximately \$865 million in royalties for the State Government in 2008/09. Additional royalties have been collected by the Commonwealth government.



# Pilbara

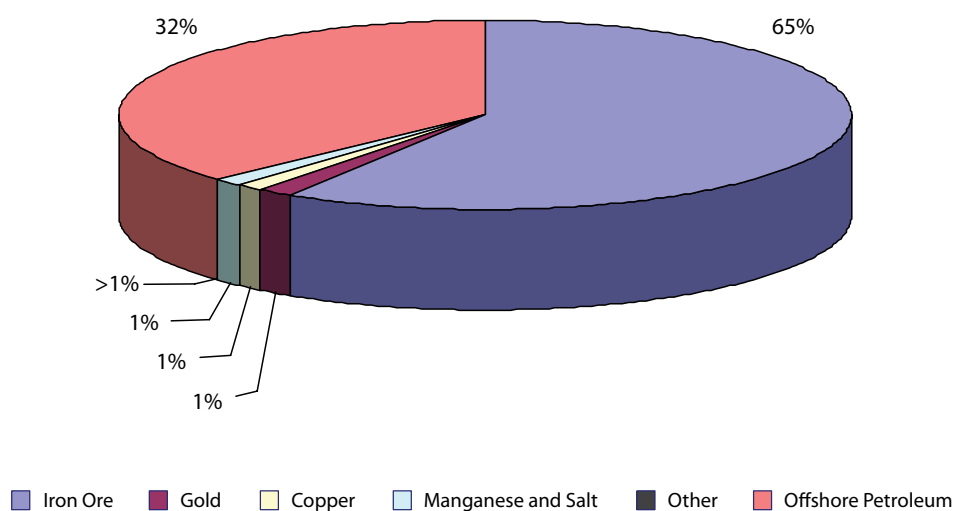
## planning and infrastructure framework

**Table 3.1. Value of Pilbara minerals and petroleum (\$million)**

Year	Off-shore Pilbara	West Pilbara	East Pilbara	Total Pilbara
2008	22 215.81	10 644.31	21 397.68	54 257.80
2009	16 772.80	9 912.73	18 882.97	45 568.49
2010	18 721.92	12 293.18	22 223.90	53 238.99

Source: Department of Mines & Petroleum (2011)

**Figure 3.1. Resource sector (commodities) as a percentage of Gross Regional Product**



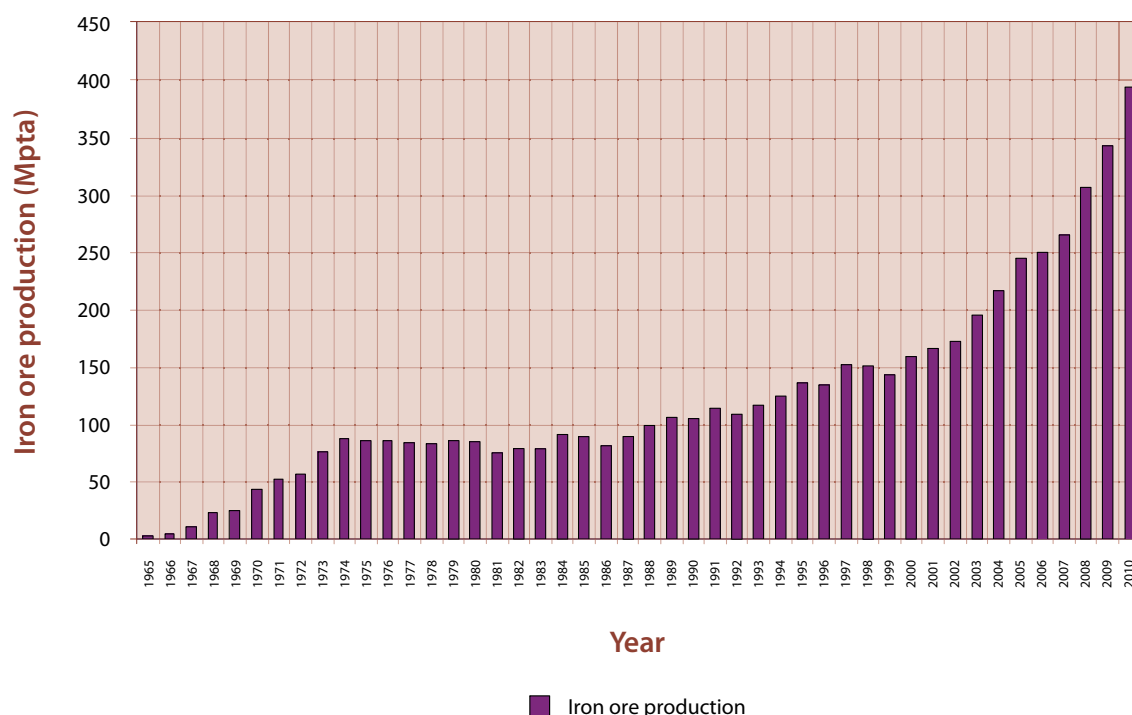
Source: Department of Mines & Petroleum (2011)



## Map 10. Economic development

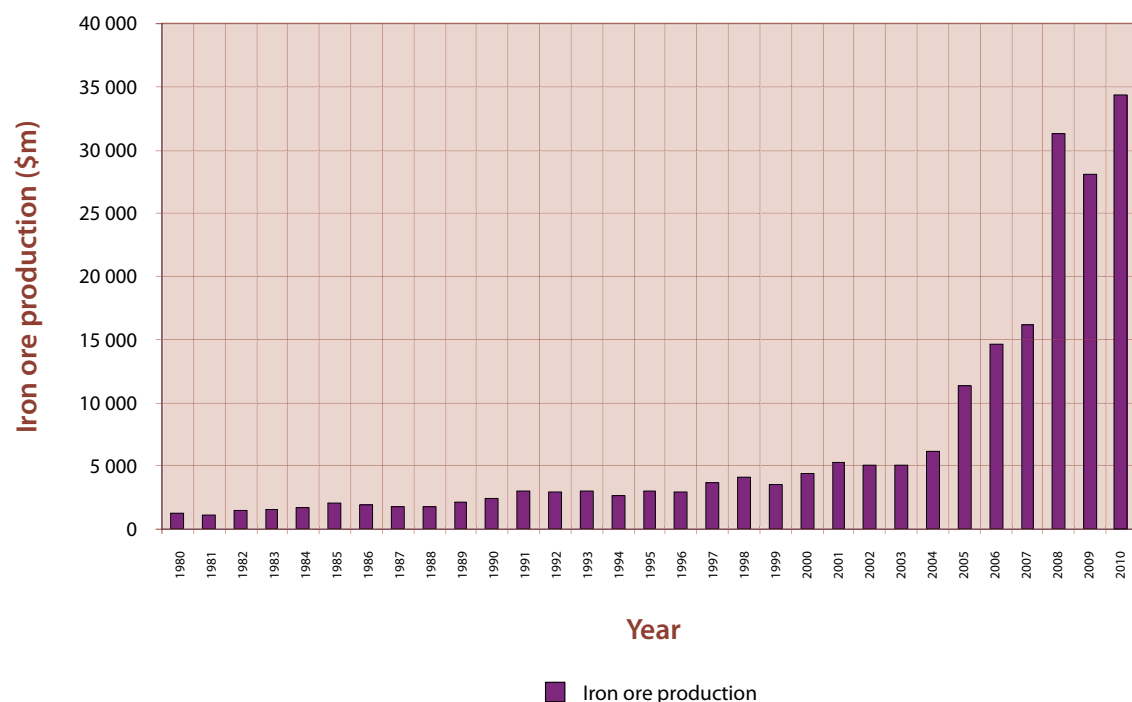
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**Figure 3.2. Iron ore production (Mtpa) (1966-2010)**



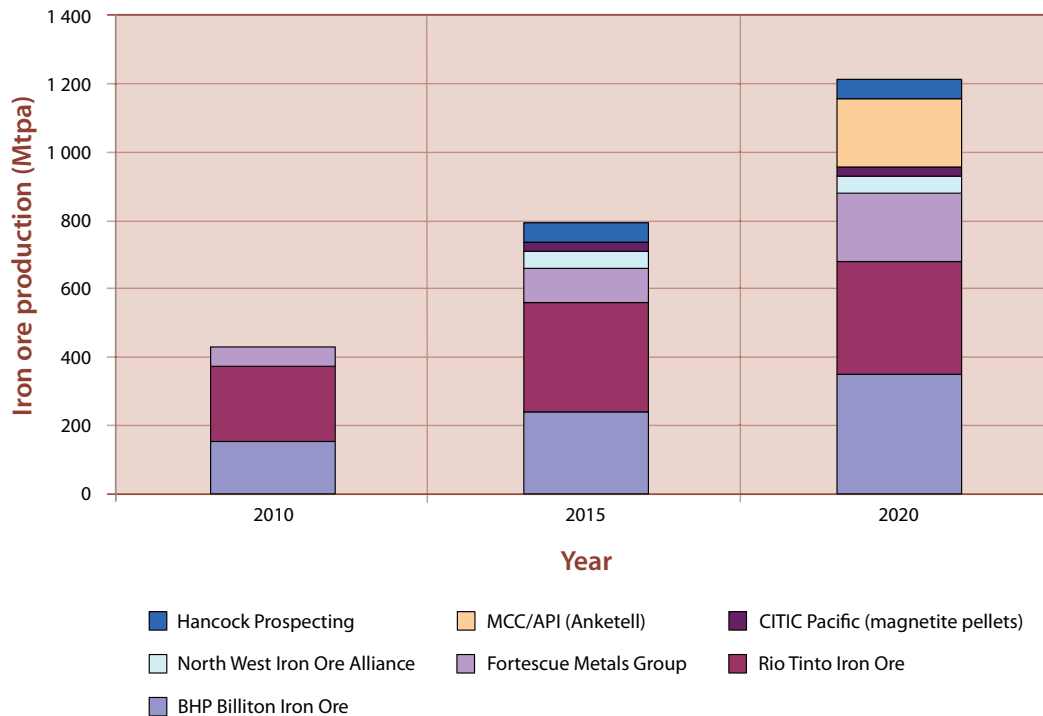
Source: Department of Mines & Petroleum (2011)

**Figure 3.3. Iron ore production value (\$m) (1980–2010)**



Source: Department of Mines & Petroleum (2011)

**Figure 3.4. Iron ore production aspirations by mine developer (Mtpa) (2010-2020)**



Source: compiled from various industry sources (2010)

### 3.3 Iron ore

The Pilbara's iron ore exports have grown from approximately 5 Mtpa in the mid 1960s to 390.7 Mt in 2010 (341 Mt in 2009) (Figures 3.2 and 3.3).

The mining and processing of iron ore in the region is experiencing major changes with the introduction of Chinese-owned companies, which has resulted in a shift in emphasis regarding iron ore product and location. Previously, the emphasis of the major mining companies was on the high yield haematite mined for the most part in the Newman and Tom Price mining hubs. Chinese interest in lower yield magnetite has resulted in the opening up of mining areas on the Pilbara coastal plain notably at Cape Preston.

Other new entrants to the Pilbara mining scene, such as Hancock Prospecting and North West Iron Ore Alliance, are beginning to make their presence felt. The development of new mining areas by new entrants will result in two new ore railway systems – one exporting through Port Hedland and the other through Anketell. Current production aspirations for iron ore are summarised in Figure 3.4.

#### Pilbara mining company growth targets:

- BHP Billiton aspires to expand to 240 Mtpa in the inner harbour at Port Hedland and an additional 100 Mtpa in the proposed outer harbour.
- RTIO anticipates an expansion from 220 Mtpa to 330 Mtpa in 2016.
- FMG is set to ramp up production to 55 Mtpa in 2011. Further expansions include: Stage 1: 120 Mtpa; Stage 2: 220 Mtpa (a new ship loading facility will be required).
- North West Iron Ore Alliance (Atlas Iron, Brockman Resources and FerrAus): aspires to a capacity of 45 Mtpa by 2013.
- CITIC Pacific anticipates a steady magnetite production of 27.5 Mtpa at Cape Preston of which 6 Mtpa are pellets.
- MCC/API/FMG - the development of a multi-user iron ore export terminal at Anketell with capacity to ship 350 Mtpa.
- Hancock Prospecting: the 55 Mtpa Roy Hill 1 mine is scheduled to come on line in 2012. This will be followed by the company's Central Pilbara project.



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Projecting future production and export of minerals is fraught with difficulty, as it is not a case of simply aggregating company growth targets. Whilst industry optimists envisage a steady growth curve, realistically, a degree of volatility should be expected over the coming decades. The increasing Chinese presence in the region may see a market share swing from the Australian majors to Chinese-owned operations, with an accompanying retarding impact on prices and royalty receipts. In addition, competition from other WA regions, such as the Mid West, is likely to have an impact on the demand for Pilbara iron ore.

### 3.4 Oil and gas resources

The development of the North West Shelf has seen a shift from an on-shore production focus on the Burrup Peninsula to new points of focus on Barrow Island and the Onslow area. Another important development has been the establishment of a fertiliser plant on the Burrup, representing a local value-add to the petroleum stream.

Trends in Pilbara oil and gas production are illustrated in Figure 3.5 and the production targets of the region's major LNG projects are summarised in Figure 3.6. On the basis of these targets, the region's LNG production is set to increase from 16.3 Mtpa to 59.2 Mtpa over the next decade – an increase of 263 per cent.

#### North West Shelf Project

The state's largest hydrocarbon export project continues to be the North West Shelf Venture operated by Woodside Petroleum, which co-owns the venture with partners BHP Billiton, BP, Chevron and Japan Australia LNG. With the completion of its fifth processing train (4.4 Mtpa capacity), the venture can produce 16.3 million tonnes of LNG per year, with export earnings in the vicinity of \$10.1 billion in 2008/09.

#### Pluto Project

The Woodside Petroleum Pluto project is set to produce LNG in 2011, with the commissioning of the first LNG processing train, which will have a capacity of 4.3 Mtpa. Woodside is planning the construction of a second and third LNG processing train at the Burrup Pluto LNG Park.

#### Gorgon Project

The Gorgon Joint Venture (principally Chevron, Royal Dutch Shell and Exxon Mobil) is developing the Gorgon Gas Fields and is on schedule to produce and export LNG at its processing plant on Barrow Island. The plant will comprise three 5 Mtpa processing trains, eventually producing 15 million tonnes of LNG per year. Production is anticipated to commence in 2014 and end between 2054 and 2074.

#### Wheatstone Project

The Wheatstone LNG and gas project is being developed by Chevron Australia. An LNG processing plant is planned to be located at Ashburton North 12 kilometres to the west of Onslow. The plant will initially comprise two LNG trains, each with a capacity of 4.3 Mtpa, together with a domestic gas plant. Supplied from the Wheatstone and other large off-shore gas fields, it will eventually have a 15 Mtpa processing capacity.

#### Ammonia and nitrate fertilisers

The Burrup Peninsula Fertiliser Plant, which began exporting in 2006, represents an important hydrocarbon sector component. The \$700 million plant has capacity to produce 0.76 Mtpa making it one of the world's largest producers of ammonia and nitrate fertilisers.

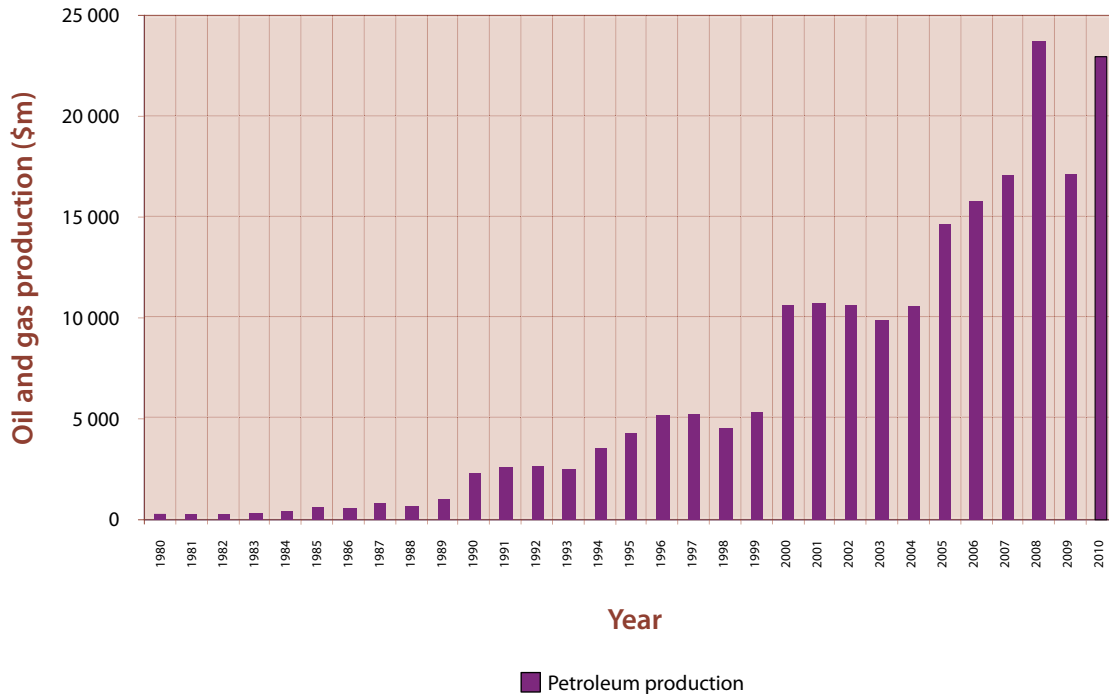
### 3.5 Other minerals

The production of gold, salt, copper, manganese and other metals are also important contributors to the resources sector in the Pilbara (4 per cent of total production value when off-shore hydrocarbons are included). Exploration work is underway at the Kintyre uranium deposit in the East Pilbara. This is considered to be a world-class deposit containing an estimated 36 000 tonnes of uranium ore.

### 3.6 Resource sector employment trends

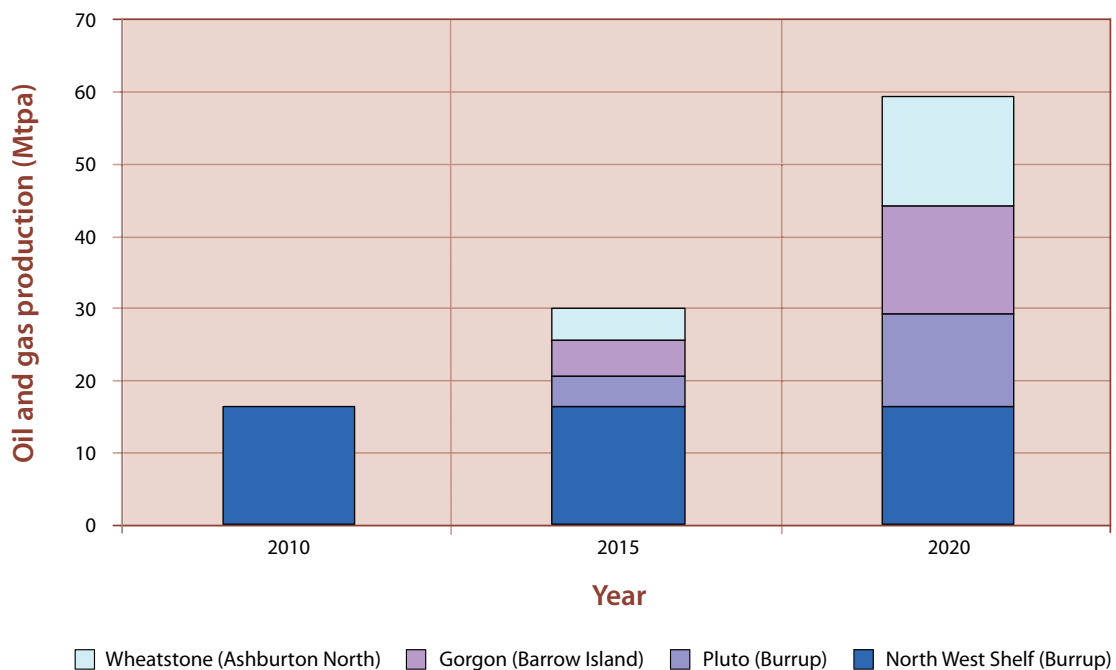
The key issue impacting on economic development is how resource production translates to employment opportunities within the region. There are a number of trends in operations management and the use of technology, that will have a significant impact on future employment in the Pilbara.

**Figure 3.5. Pilbara oil and gas production (\$m) (1980–2010)**



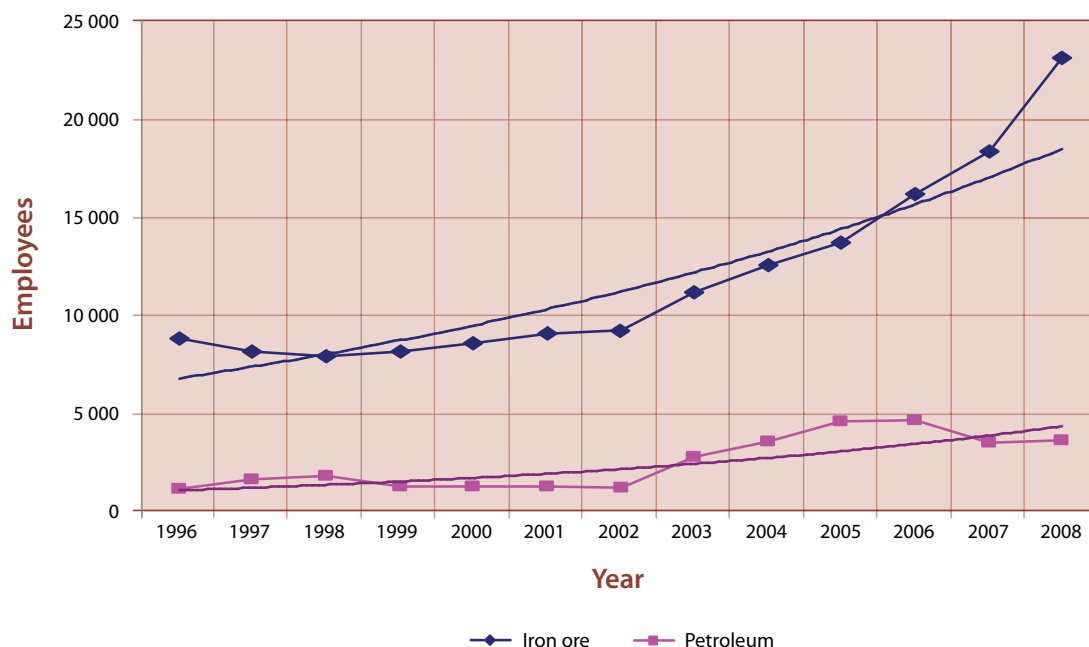
Source: Department of Mines & Petroleum (2011)

**Figure 3.6. Pilbara future oil and gas production targets (Mtpa) (2010-2020)**



Source: Compiled from various industry sources (2010)

**Figure 3.7. Employment trends - iron ore and petroleum (1996-2008)**  
**Western Australia**



Source: Department of Mines & Petroleum (2011)

Employment in the resource sector has grown considerably since 1996, particularly iron ore (Figure 3.7). However, the ratio of employment to the value of production for iron ore (employees per \$1 million production value) has seen a dramatic decline during this period, even allowing for inflation, dropping from 3.03 to 0.74 in 2008. The ratio for petroleum has experienced a more gradual decline, dropping from 0.23 to 0.16 in the same period (Figure 3.8). It is anticipated that these trends will continue in the future.

Figures 3.9 and 3.10 show the Pilbara Industry's Community Council's resource based employment projection and construction employment projections (for committed projects only) up to 2020.

### 3.7 Future employment requirements

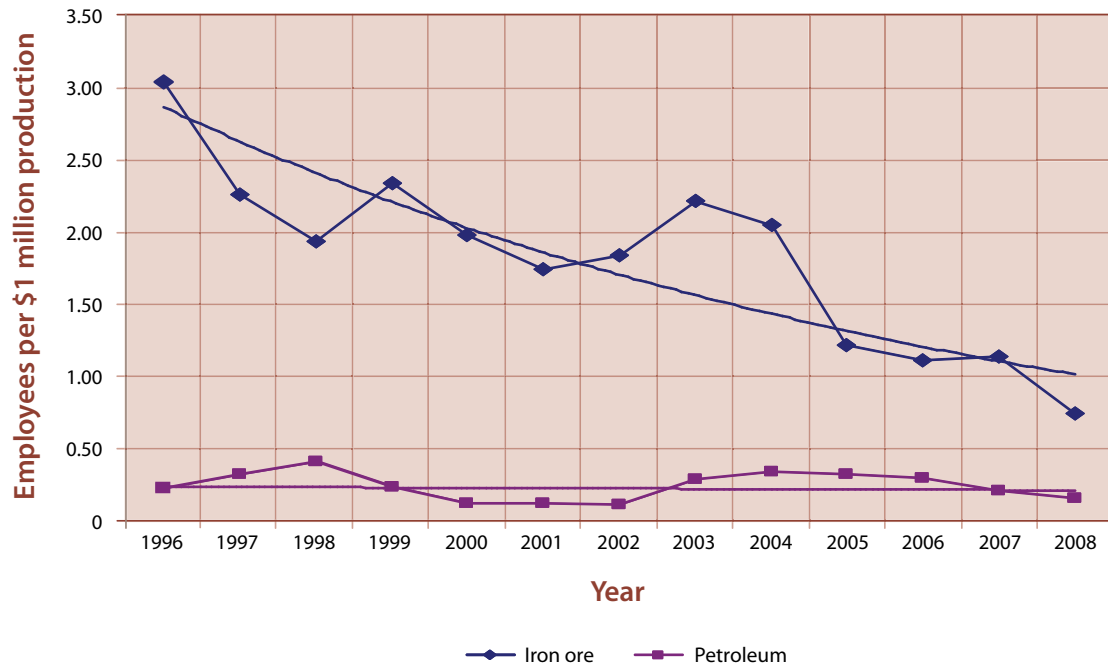
Currently, Karratha and Port Hedland have an employment base of around 5 000 persons. However, to meet the Pilbara Cities vision of having 50 000 people in both Karratha City and Port Hedland City, employment opportunities in both centres will need to grow significantly to around 23 000 by 2035 (Pracsys 2010).

Using Karratha as an example, the manner in which the population and employment relationship might develop over the next 25 years is summarised in Table 3.2 and charted in Figure 3.11.

These figures are predicated on a gradual shift to a more normalised economy and make the following assumptions:

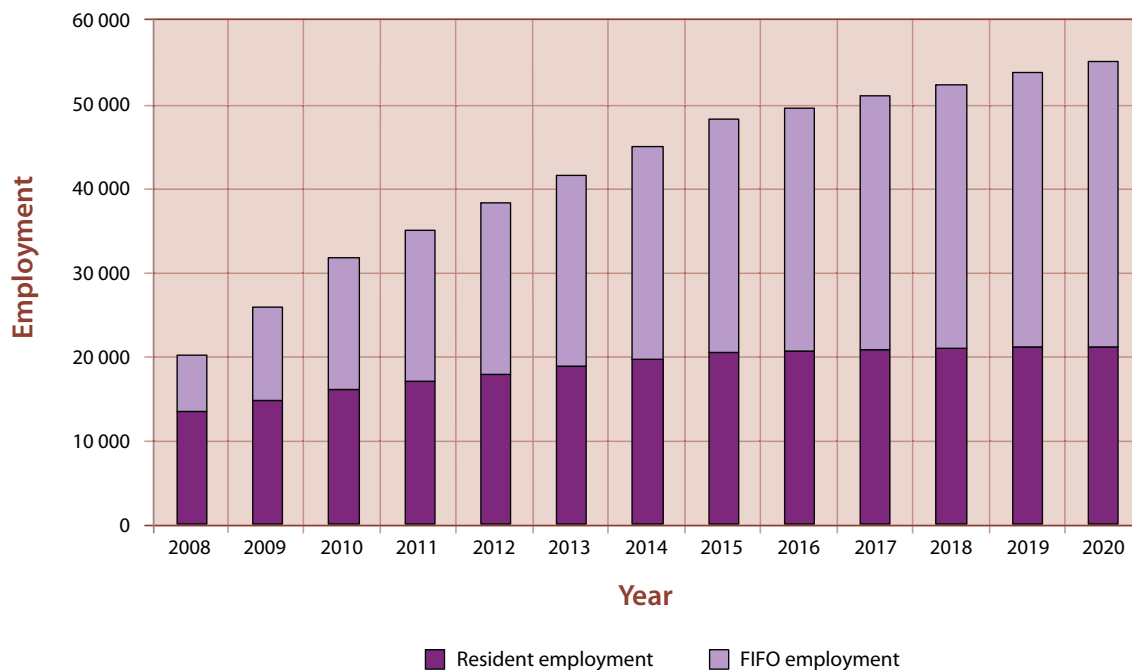
- the current workforce to resident population ratio will tend to decrease over time; and
- the 'strategic' (driver-producer) to 'service' employment ratio will tend to decrease over time.

**Figure 3.8. Employment production value ratios: iron ore and petroleum (1996-2008)**  
Western Australia



Source: Department of Mines & Petroleum (2011)

**Figure 3.9. Resource industry employment projections (2008-2020)**  
Pilbara Industry's Community Council

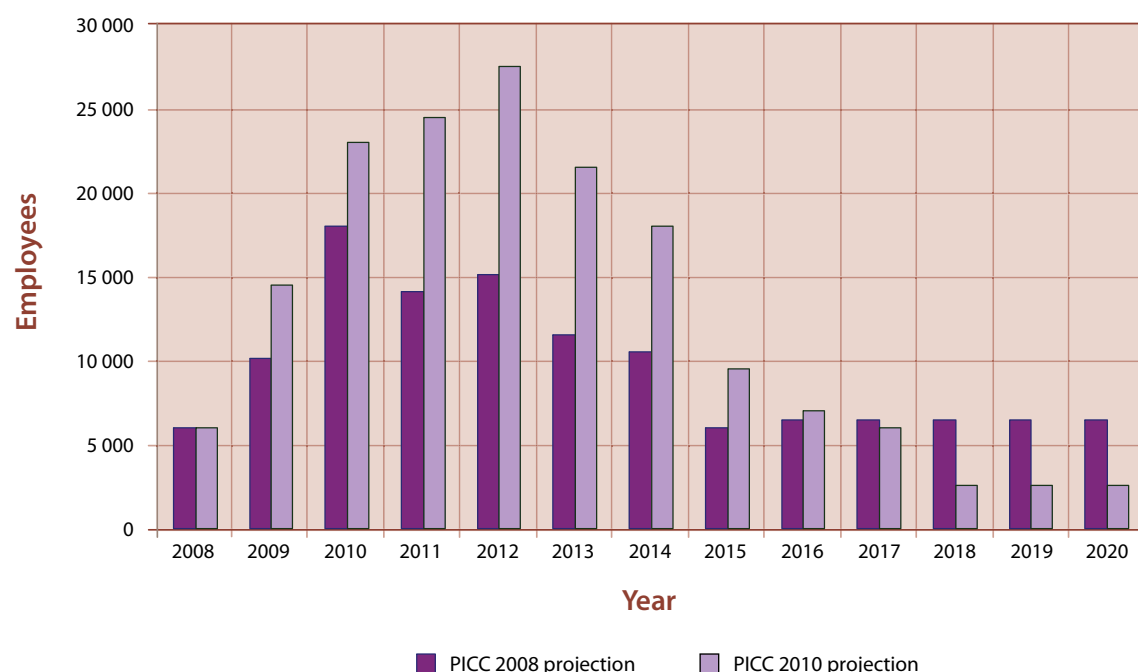


Source: Department of Planning (2010)

Note: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).



**Figure 3.10. Construction employment projections (2008-2020)**  
**Pilbara Industry's Community Council**



Source: Department of Planning (2010)

Note: This figure has been developed using data published by the Pilbara Industry's Community Council in 'Planning for resources growth in the Pilbara: revised employment and population projections to 2020' (PICC, 2010).

This means that, over time, a larger resident population would be supported by a smaller workforce and that the service employment sector would become larger than the base sector.

Figures for Port Hedland would be very similar.

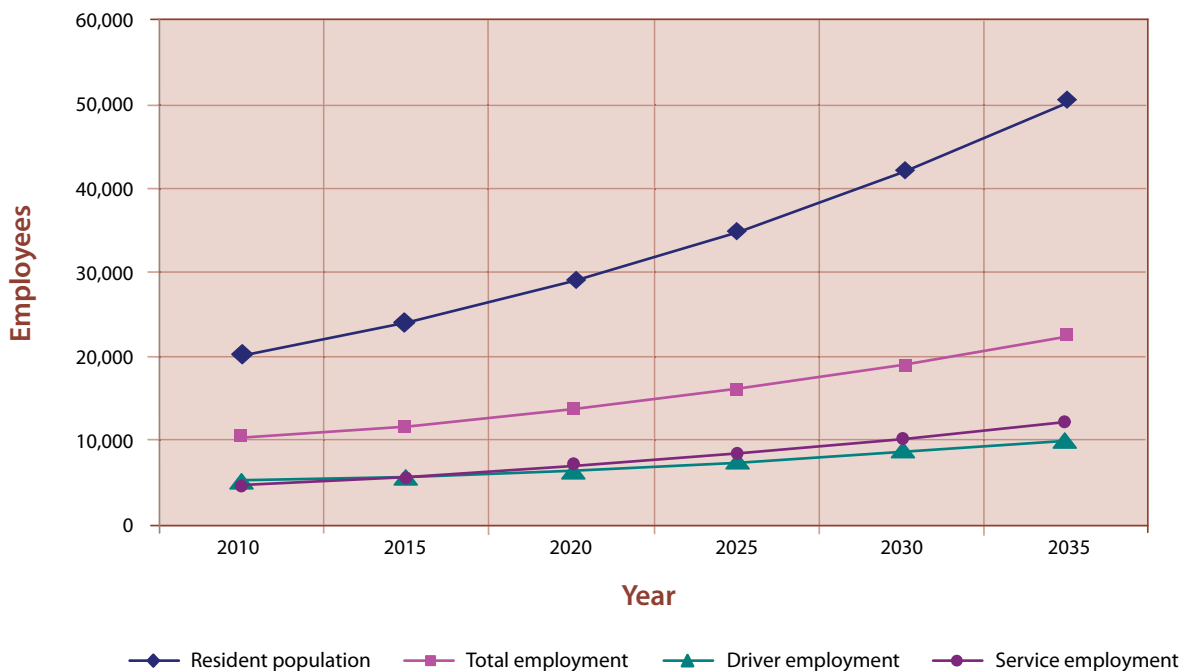
### Aboriginal engagement

According to the Pilbara Development Commission (2011a), a number of significant strategic partnerships have been established across the region, targeting and promoting indigenous economic participation and employment. The Pilbara Aboriginal Contractors Association was established in 2009 to promote, foster and support indigenous

**Table 3.2. Karratha City: current and projected population and employment growth (2010-2035)**

	2010	2020	2035
Resident population	20 210	29 036	50 000
Workforce : Resident ratio	0.52	0.47	0.45
Total employment	10 557	13 647	22 500
Base : Service ratio	0.53	0.48	0.45
Driver-producer employment	5 595	6 551	10 125
Service employment	4 962	7 096	12 375

**Figure 3.11. Karratha City: projected population and employment growth (2010-2035)**



businesses in the region. Two Regional Partnership Agreements (RPA) between government, the not-for-profit sector and industry have supported indigenous employment and business development.

There is an emerging indigenous arts industry, which is rapidly gaining national and international attention. In addition, a number of indigenous people are employed in the pastoral, tourism, land management industries and in the service sector.

There are several new housing and land projects being planned in partnership with traditional owner groups, that will provide benefits to Indigenous people. Agreements for these developments guarantee opportunities for employment and training, new housing and improved socio-economic outcomes.

### 3.8 Economic diversification

It is unlikely that the required increase in jobs will be achieved by the expansion of the minerals and petroleum sectors alone for the following reasons:

- greater use of technology will further reduce the ratio of employees to production;
- Increased use of remote control (tele-presence) capacity to control mine site operations from places like Perth; and

- continuing use of fly-in fly-out as a resource sector employment option thus retarding the employment multiplier effect on the local economy.

Therefore, for these employment targets to be realised it is essential that the economies of both cities be diversified. This will have the added benefit of making the towns less susceptible to the uncertainties of global commodity price fluctuations. Economic diversification is most likely to be achieved by identifying and making use of the region's competitive advantages, which are:

- significant reserves of iron ore and other minerals – *industrial backbone*;
- major off-shore reserves of oil and gas – *industrial backbone*;
- proximity to Asian markets – *some four billion people in the same time zone*;
- renewable energy potential – *solar, wind, wave, tidal and thermal energy*;
- raw natural beauty of the region's ranges and coastline – *tourism*;
- Aboriginal culture and heritage – *lifestyle tourism*;
- early settlement and pastoral heritage – *lifestyle tourism*; and
- mild dry winter climate – *lifestyle tourism*.

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These need to be balanced by the need to overcome some of the region's disadvantages, which include:

- relative remoteness from other Australian urban centres;
- limited local market for goods and services – externalised supply chain completion;
- high cost of production and service delivery;
- high cost of land development and housing;
- harsh summer climate (heat and cyclone hazard); and
- semi-arid landscape with low yield agricultural potential.

The primary objective must be to broaden the economy of the region from a predominantly production-export economy to a more balanced economy.

There are a number of potential economic base development models and opportunities for diversifying the region's economic base, based on its competitive advantage. For regional and urban planning purposes, employment structure is most productively analysed and projected in terms of:

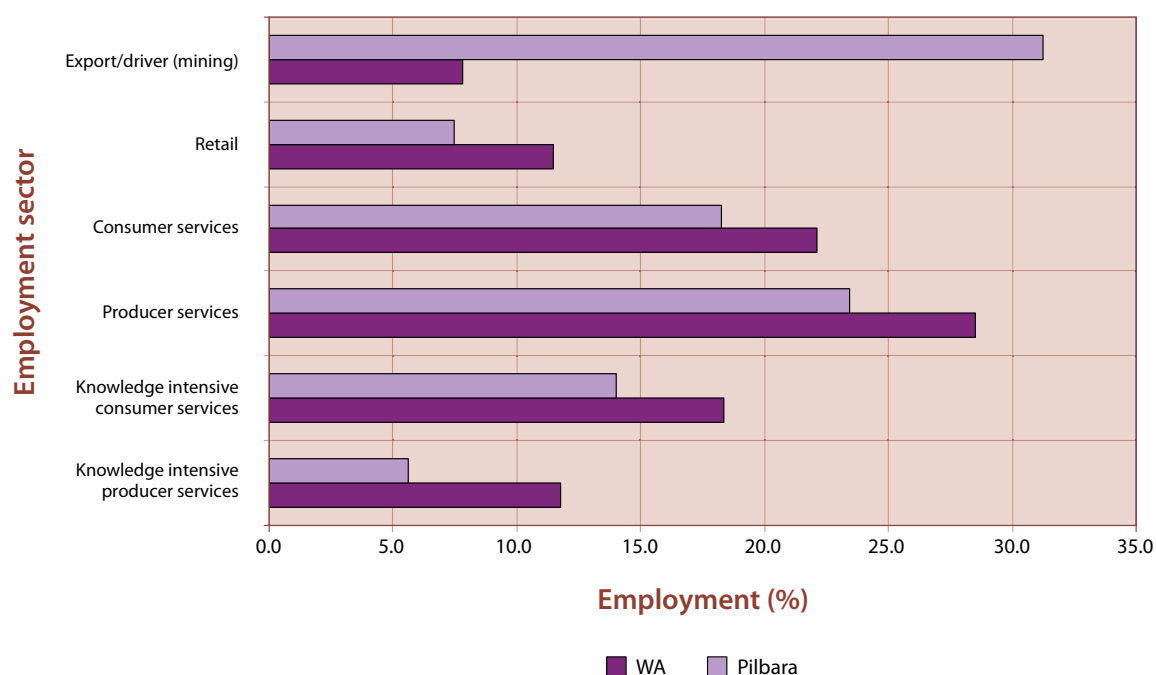
- driver/export;
- retail;
- consumer services;
- producer services;
- knowledge intensive consumer services; and
- knowledge intensive producer services.

The composition and characteristics of these groupings are outlined in Table 3.3.

The Pilbara towns are typically based on production economies, where the majority of the employment is concerned with the direct operation of mining and oil and gas projects, together with the support operations. The employment structures of the region's towns are heavily oriented towards driver/export projects and the associated producer services that support them. These sectors account for 55 per cent of the region's employment, compared to 36 per cent for WA (Figure 3.12).

Investigation of agricultural development opportunities, including the use of water resources from mine dewatering or water resources in-situ, is promoted. Development of agriculture may play an

**Figure 3.12. Comparative employment structures for Pilbara and Western Australia**



Source: Developed from ABS 2006 Census – Pilbara region and WA State employment data

**Table 3.3. Employment sectors**

Functional group	Employment groups and location considerations
Driver/export	Drivers are jobs in which the Pilbara has a comparative advantage – deemed strategic due to growth and development through exports and the inflow of funds. Driver jobs are producer services however they do occur in strategic industries such as mining, oil and gas and marine.
Retail	Retail jobs have a high transaction intensity and are driven by the needs of the local population. Retail tenancies need to locate in close proximity to their consumer catchment to facilitate the purchase of retail goods on a frequent basis. This can be daily or weekly for convenience goods and less frequently for comparison goods. Retail is generally concentrated within centres with a supermarket anchor to maximise transactions and reduce the number of consumer trips required.
Consumer services	Consumer services include: hair dressers, beauty salons, real estate agents, dry cleaning services, shoe repair, travel agents and other personal services. Like retail, consumer services have a high transaction frequency and need to locate in close proximity to their customer base, usually in or adjacent to shopping centres.
Producer services	Producer services deal directly with other businesses rather than consumers. Like retail, wholesale producer services need to locate close to the businesses they serve due to the frequency of transactions required. Examples are Coles or Woolworths distribution warehouses based in a central location in order to carry out daily delivery of goods to their supermarkets. Typical producer services include: manufacturing, construction and distribution.
Knowledge intensive consumer services	Knowledge intensive consumer services are specialist services that deal directly with consumers yet typically have a higher productivity and lower transaction frequency. These provide a skilled service to consumers that can only be acquired with higher education and training. Depending on the scale of their catchments, this type of service may choose to locate in or adjacent to a business centre with greater soft infrastructure and amenity levels. Knowledge intensive consumer services include: hospital, doctors, nurses and technicians, general practitioners, dentists, teachers and lecturers, accountants, physiotherapists, legal services and veterinarians. The governance and community service sectors tend to be included in this grouping.
Knowledge intensive producer services	Knowledge intensive producer services are businesses dealing directly with other businesses rather than consumers. Transactions are less frequent yet generally have a higher monetary value due to the intellectual property or knowledge involved. These type of businesses often locate near their client businesses, although with low transaction frequency and good communication infrastructure, they are to an extent 'footloose'. This means they can choose to locate in places with relevant physical infrastructure, high retail amenity, or soft infrastructure such as access to an education base. Examples of knowledge intensive producer services are: engineers, geologists, architects, medical scientists and computer software developers.

Source: Knight, M (2008)

important future role in regional locations that need to be identified and to assist economic diversification in the region.

A port-based common user facility (CUF) is considered important to support the establishment of regionally based value adding businesses to service the oil and gas, mining, marine, defence

and engineering construction sectors. A CUF will provide a competitive advantage to Western Australian small to medium enterprises providing maintenance services to the oil and gas sector. It will also help to create a broader economic base for the region and expand employment opportunities, all of which will benefit the community and contribute to the Pilbara Cities initiative. A positive aspect for a



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port-based CUF is that the facilities could readily be incorporated into current and planned Pilbara port and infrastructure developments.

### 3.9 Supply chain expansion

The key means of expanding the Pilbara's resource-based economy is to capitalise on that sector and to retain many of the supply chain components within the region that are currently sourced externally.

A supply chain is the network of product and service providers that provide inputs into projects and production processes, that enables companies to deliver its completed product/service to the markets they serve (Pracsys, 2010). A number of sectors with expansion potential have been identified by Pracsys in its contribution to the Pilbara Cities projects for Karratha and Newman (Table 3.4). These sectors typically comprise:

- engineering services;
- fabrication and manufacturing;
- equipment supply and management;
- field services;
- transport services;
- facilities management;
- training;
- housing; and
- accommodation and camp services.

Some of these components are provided in-house by the resource company, but the great majority are provided by a range of specialist contractor and service companies. Currently, the proportion of these supply chain components provided in the Pilbara is extremely limited, with the great majority sourced in Perth, other parts of Australia and overseas. The extent that these opportunities will be taken up, will entail a cooperative initiative between government and the private sector. The development of the off-shore oil and gas supply chain in Norway is an example of a successful supply completion partnership which has resulted in the export of components and expertise.

The key driver/producer sectors are mining, manufacturing, construction and transport.

#### Mining

It is anticipated that the expansion of the resource sector will result in employment growth, albeit at a more modest rate than in the past.

#### Manufacturing

There are opportunities for resource product value adding and supply chain completion in the local economy. Although product value adding has had a poor track record in the region (Boodarie briquette plant), a degree of manufacture value adding is occurring in the LNG/LPG sector; the development of fertiliser industries; and other component manufacturing for the resource sector, such as concrete railway sleeper manufacturing. The Sino Steel magnetite pellet project at Cape Preston represents a new value adding activity for the resource sector. Key success factors for this sector are: the build-up of a critical mass of enterprises that require and provide manufacturing services; and the supply of well-located, serviced industrial land.

#### Construction

Construction is an ongoing feature of the resource sector and will be an important component of the urban expansion envisaged by the Pilbara Cities initiative. A greater focus on supply chain completion in the region would provide enhanced employment opportunities in this sector.

#### Transport

The development of a higher population threshold, a more developed network of enterprises together with a greater emphasis on supply chain completion, would support higher levels of employment in the transport sector.

#### Net effect of supply chain expansion

While supply chain expansion is promoted, it is important to differentiate between resource-based supply chain expansion and new economic drivers and their associated supply chains. A focus on resource-based supply chain expansion would strengthen the resources specialisation of the region, however, new industries with their supply chains would aid economic diversification. Efficient supply chains and short turnaround times provide a competitive advantage to small to medium enterprises, looking at local industry participation in major resource projects. It is recognised that supply chains are now an integral part of the supply and procurement practices of major resource companies and that there is a need for stakeholders and decision-makers to collaboratively identify and promote the development of supply chain infrastructure in the Pilbara region.

**Table 3.4. Indicative resource project operations supply chains**

Type of resource project	Area of operation	Components
Mining project – conceptual	Mining	Consultancy services
		Commodities
		Maintenance
		Labour hire
		Plant hire
		Explosives
	Ore processing	Maintenance
		Plant hire
		Labour hire
		Commodities
		Equipment hire
	Planning and quality	Ground testing
		Labour hire
		Equipment hire
	Services and infrastructure	Plant and vehicle hire
		Electrical testing services
		Vehicle repairs
		Labour hire
	Capital projects	Maintenance
		Construction
		Labour hire
		Consultancy services
	Finance	Maintenance
		Accommodation
		Catering services
		Construction
		Facilities management
		Labour hire
		Consultancy services
	Human resources	Consultancy services
		Training services
		Labour hire
	Asset reliability	Consultancy services
		Training services
		Maintenance
		Labour hire
	Occupational health and safety	Consultancy services
		Labour hire

(Cont:)

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Type of resource project	Area of operation	Components
<b>Oil and gas project</b> – Woodside Woodside operations network equipment management supply chain	Equipment management	Hydraulics
		HVAC systems
		Turbines and compressors
		Fixed cranes
		Control systems
		Valves
		Metering systems
		Pumps
	Field services	Nitrogen purging
		Field campaigns
		Cathodic protection
		Painting and blasting
	Spares and consumables	Bulbs
		Spares
		Consumables
	Technical services	Engineering services
		Production chemicals
		Inspection services
		Non-destructive testing
	Professional services	Training and coaching
	Facilities management	Housing maintenance
		Apprentices and trainees

Source: Pracsys (2010)



### 3.10 Other opportunities for diversification

Potential areas for economic diversification are:

- primary production;
- tourism and hospitality;
- distribution and retail;
- community and governance;
- defence facilities;
- education and training; and
- business, media, IT and consulting.

#### Primary production

The pastoral, agriculture, horticulture and fisheries sectors of the economy may be comparatively small in production value, but tend to be more labour intensive and likely to source a greater proportion of supplies from the local economy. It is unlikely that there would be significant expansion opportunities in the pastoral sector due to stocking level limitations and loss of pastoral leases to mining.

There are a number of agriculture-based opportunities in the eastern tablelands (Newman area) utilising mine de-watering:

- pastoral – value adding to stock prior to market, based on pasture improvement;
- horticulture (mangoes, melons, tree crops);
- silviculture;
- bio-fuels;
- aquaculture (fish and seafood for the table and aquarium); and
- water bottling (functional and table mineral water).

Consideration should be given to expanding the commercial fishing industry in the Pilbara.

#### Tourism and hospitality

Tourism has the potential to be a significant economic driver in the Pilbara, which offers wide expanses of rugged, ancient and untouched natural experiences and opportunities to focus on indigenous culture. The ability of tourism to grow is constrained by both the severe lack of accommodation in the region and the relative difficulty of accessing the area.

While the remoteness and rugged beauty of the region are considered to be some of its greatest strengths, there remains the need for improved amenities in and around visitation hotspots. There is a need to upgrade and seal some of the access roads to avoid the long-term degradation of these sites and to provide opportunities for tourism-focussed developments. Short to medium-term initiatives to assist the development of the region's tourism include:

- marinas at Dampier and Port Hedland;
- new Tom Price airport as a gateway to Karijini;
- Warlu Way Drive trail development – particularly at Karijini and the Burrup;
- affordable visitor accommodation at coastal river mouth localities;
- affordable eco-friendly visitor accommodation at Millstream;
- new road construction – Karratha-Tom Price and Marble Bar-Newman;
- development of indigenous cultural tourism; and
- identification and provision of tourism routes and scenic drives.

#### Distribution and retail

The provision of higher order retail facilities in the two Pilbara cities would help stem the leakage of retail expenditure from the region, provide additional employment opportunities and, in turn, generate additional households requiring retail facilities and services. In tandem with a general increase in the quantity of retail floorspace, this would mean a retail step change in the standard of provision. For instance:

- Karratha and Port Hedland – higher order retail would potentially include a Target and Bunnings stores in addition to the existing Kmart; and
- Newman – higher order retail would potentially include a Target Country in addition to the existing Woolworths supermarket.

#### Community and governance

A greater government commitment to provide a higher level of basic services and facilities such as health, education and other community services will have significant flow-on effects for the local community.



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In addition to a heightened level of community service provision, to achieve the employment levels required to support two cities each with a population of 50 000, there may be a need to locate major government hubs in the Pilbara cities. These could include the relocation of a government function from Perth or the establishment of a major education or research facility (for example a Northern Australia Institute).

### Defence facilities

Currently, the reservist Pilbara Regiment is the only Australian Defence Force (ADF) presence in the Pilbara. Because of the growing geopolitical importance of the Indian Ocean and the need to protect Australia's vital resources on the North West Shelf, there is increasing pressure to strengthen the defence force presence in the North West. In March 2010, the Australian Strategic Policy Institute completed a strategic review of the situation, entitled: 'Our Western Front – Australia and the Indian Ocean'.

Issues of energy security, Indian Ocean regional instability and the need to protect the fundamental driver of the Australian economy for the next 50 years, inform the Australian Strategic Policy Institute's recommendation:

Industry would support the ADF markedly increasing its presence along the west coast of Australia between Perth and Darwin. This should involve:

- establishing a naval operating base in the northwest (in the longer-term this base should have facilities at least equal to those of existing bases in Darwin and Cairns);
- increasing the frequency of military exercises in the region; and
- making greater use of ADF air bases at Curtin and Learmonth.

### Education and training

The development of higher order education and training facilities, especially those that would serve the mining and oil and gas sectors, should be pursued.

### Business, media, IT and consulting

The development of a higher population threshold and a more developed network of enterprises would, in turn, support a higher level of business, media, information technology and consulting services.

### 3.11 Project-ready land

A key issue is the provision of project-ready land. Project-ready land provides greater certainty for developers and will assist with the promotion of economic growth and diversification, which will be driven by the engagement and mobilisation of four factors of production:

- availability and affordability of development-ready land;
- mobilisation of capital investment in the region;
- creation, attraction and redistribution of local employment opportunities in the region; and
- attraction of region-based entrepreneurial capability.

### Industrial land supply

There is a need for a significant amount of industrial land and facilities to support both the resource economy and the diversified economy.

### Demand for industrial land

Projecting future industrial land requirements in the Pilbara is highly problematic. Demand is not related to population growth, but rather it tends to be resource project driven and the quantities of land required can be considerable. Perhaps the best way to adequately gauge this demand is to profile potential resource projects taking account of both the construction and operational phases. The key areas of direct resource sector demand are associated with the two port authorities, together with Anketell, Newman and Onslow. Land requirements must also be assessed against infrastructure capacity, which can be substantial.

**Strategic industrial areas:** Much of this demand will be provided for in the region's strategic industrial areas (Table 3.5). The Department of State Development and Landcorp, as part of the state's Heavy Use Industrial Land Strategy, are leading detailed land use and infrastructure planning within identified Strategic Industrial Areas (SIAs) across the Pilbara, to make these areas project-ready. The aim of the strategy is to provide guidance for proponents wishing to invest in large-scale projects, which are often aligned with the resource sector, in regard to site constraints and approvals requirements. The extent and scope of required studies and investigations differ for each SIA. In general, works currently being undertaken includes

**Table 3.5. Pilbara ports and strategic industrial areas**

Port	Nearest town	Associated resources	Strategic Industrial Area	
Port Hedland	Port Hedland	Iron ore, salt, other minerals	Boodarie	3 500 ha
Cape Lambert	Wickham	Iron ore		
Anketell (proposed)	Wickham	Iron ore	Anketell	4 900 ha
Dampier	Karratha	Iron ore, LNG, salt	Burrup	6 500 ha
			Maitland	2 500 ha
Cape Preston (proposed)	Karratha	Iron ore	Cape Preston*	4 000 ha
Barrow Island		LNG		
Ashburton North (proposed)	Onslow	LNG	Ashburton North	8 000 ha

\* proposed SIA currently not zoned

Source: Department of Planning (2010); Department of State Development (2010)

**Table 3.6. Available industrial land in main urban centres**

Townsite	Existing zoned land (ha)	Developed zoned land (ha)	Available zoned land (ha)
Karratha City	638.9	362.4	276.5
Port Hedland City	1 759.6	571.0	1 188.6
Newman	52.0	45.9	24.8
Tom Price	56.6	45.4	21.5
Onslow	86.0	57.2	29.5

Source: Department of Planning (2010)

Note: Onslow industrial land excludes the town's existing strategic industrial area (490.5ha)

fatal flaw analysis of key terrestrial factors such as: Aboriginal and European heritage, flora and fauna, hydrology, geotechnical, cumulative risk-assessment, engineering investigations culminating in detailed concept and structure planning.

**Townsite industrial areas:** In addition to the needs of the resource sector for large sites outside the towns, there is significant demand for light industrial land within the main urban centres. Light industrial land sites are needed for fabrication, warehousing, servicing and business incubator units. The amount of industrial land available in each settlement is summarised in Table 3.6.

### 3.12 Objectives and actions

Objectives	Actions
<b>3.1. Encourage continuation of extraction and processing of natural resources to enhance community, economic and environmental values.</b>	<ul style="list-style-type: none"> <li>a Identify high-value and essential mineral resource areas and prevent changes in land uses from constraining future extraction.</li> <li>b Engage the community, landowners and industry in promoting and practicing sustainable natural resource management.</li> </ul>
<b>3.2. Provide for an adequate supply of industrial land in the region to meet the expanding demands of industry and its associated services and transport requirements.</b>	<ul style="list-style-type: none"> <li>a Coordinate planning and development of strategic, general and light industrial areas to accommodate the needs of industry through the preparation of regional and local strategic plans and their incorporation into local planning strategies and schemes.</li> <li>b Ensure the planning of industrial areas makes provision for appropriate transport and ancillary support activities and facilities.</li> </ul>
<b>3.3. Promote the diversification of the region's economy.</b>	<ul style="list-style-type: none"> <li>a Identify and implement projects that support the region's economic development and ensure appropriate locations are available for their timely introduction.</li> <li>b Coordinate planning and development of commercial areas to accommodate a range of business types through the preparation of regional and local strategic plans and their incorporation into local planning strategies and schemes.</li> <li>c Promote the development of start-up business (incubator) units in the region's main development areas and other measures to assist the establishment of small businesses.</li> <li>d Seek the introduction of significant government or education-based establishments, such as a military base, a university sub-campus or a collaborative research organisation and identify appropriate locations for these uses and their associated requirements in the region.</li> <li>e Work collaboratively with Tourism WA to implement the regional tourism strategy.</li> <li>f Identify opportunities to promote Aboriginal tourism and integrate it with mainstream domestic tourism.</li> </ul>



## 4 Utility infrastructure

### 4.1 Strategic direction

With the launch of the Pilbara Cities vision there is a compelling need to upgrade and replace much of the urban infrastructure within the region's settlements and provide new infrastructure to meet anticipated growth. Most of the region's urban infrastructure was constructed in the 1960s and 1970s and is now reaching the end of its functional life. Further, infrastructure capacity in the region has not increased in line with economic and population growth over the last 10 years to the extent that it is constraining economic productivity and impacting on the effective functioning of communities.

In the coming years, planning for future water supplies in Pilbara towns will take into account the need to manage reliability of supplies in a variable

climate and the step wise growth in the resource sector. There is also a need to develop a secure interconnected power generation network for the region. Pilbara Cities also provides the impetus to consider new approaches and technologies for utility infrastructure provision.

#### Goal:

*An adequate and efficient system of infrastructure that provides water, waste water, energy, waste management and communications facilities to the Pilbara, and embraces new approaches and technologies in a challenging environment.*

**Table 4.1. Pilbara current water supply scheme arrangements**

Scheme	Service provider	Towns	Scheme status
West Pilbara Water Supply Scheme	Water Corporation	Karratha Roebourne Wickham Port Sampson Cape Lambert	At capacity
	Hamersley Iron	Dampier Burrup Industrial Area	At capacity
Port Hedland Water Supply Scheme	Water Corporation	Nelson Point Finucane Island Port Hedland South Hedland Wedgefield	Near capacity
Onslow Town supply	Water Corporation	Onslow	At capacity
Nullagine Town supply	Water Corporation	Nullagine	Near capacity
Marble Bar Town supply	Water Corporation	Marble Bar	Capacity for growth
Newman Town supply	Water Corporation (water from BHPBIO)	Newman	Capacity for growth
Tom Price Town supply	Hamersley Iron	Tom Price	Capacity for growth
Paraburdoo Town supply	Hamersley Iron	Paraburdoo	Capacity for growth
Pannawonica Town supply	Hamersley Iron	Pannawonica	Capacity for growth

Source: various water infrastructure providers (2010)



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### 4.2 Water

Water use across the Pilbara falls into two distinct categories: water delivered through water supply schemes to towns and ports, and water managed through 'self supply' at mine sites. Water associated with mining falls into both of these categories and accounts for approximately 70 per cent of managed water. Most of the water used by coastal towns and for port water supply, in terms of volume, is delivered through the West Pilbara Water Supply Scheme and the Port Hedland Water Supply Scheme. Inland towns are serviced by specific local schemes (Table 4.1).

#### Current demand

Department of Water's Pilbara Regional Water Plan (2010) shows that approximately 127 GL of water a year was consumed across the Pilbara in 2008. Approximately 70 per cent of consumption relates to mining operations. This includes water taken from pits as part of de-watering operations and returned to the environment. The region's ports also consume scheme water for iron ore dust suppression, undertaken to maintain health and safety standards and for community amenity.

Household water use in the Pilbara is generally higher than that of southern parts of the state, reflecting hotter and drier climatic conditions. Residential water use represents around only 10 per cent of the total water used in the region. Water use per capita varies dramatically from town to town – between 116.8 KLpa to 612.2 KLpa compared to the Perth average per capita use of 147 KLpa (Water Corporation, 2009).

#### Current supply

In general, there is a growing infrastructure demand-supply dichotomy between the inland and coastal parts of the Pilbara. Existing schemes and networks in all coastal towns are at or near capacity, while inland towns generally have reasonably secure supplies with spare capacity to accommodate future growth.

The increasing scarcity of water resources, particularly in coastal areas, will create uncertainty for the State, the community and industry. While short-term ground water supplies may be adequate, long-term water supply requires a strategic approach to cater for growth in demand from industry and commerce.

Matching sources and supplies to meet demand, and at the same time ensuring the best water management outcomes, should form the focus of water supply planning. There will be a requirement to identify and utilise new water sources. In addition, the design and structure of housing and development will need to consider water efficiency through maximising opportunities to harness and re-use storm and waste water, as well as providing green spaces for community enjoyment. Water sensitive urban design approaches must be tailored to the climatic conditions of the Pilbara. Port facilities will continue to improve the effectiveness of water used for dust suppression. In addition, opportunities to reuse water from dewatering processes should be investigated as a 'fit-for-purpose' option.



## Map 11. Utility infrastructure

A3

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### West Pilbara Water Supply Scheme

The West Pilbara Water Supply Scheme supplies the towns and port facilities of Karratha, Dampier, Roebourne, Wickham, Point Sampson and Cape Lambert. Water for the scheme comes primarily from the Harding Dam with the Millstream Borefield being used when water is not available from the dam. In October 2010, the State Government announced a 6 GLpa desalination plant would be built to maintain security of supply.

#### Current supply

The Water Corporation currently is licensed to supply a maximum of 15 GLpa from the Harding Dam and Millstream Borefield for the West Pilbara Water Supply Scheme. The actual amount of water available depends on the water source being used. The Department of Water and the Water Corporation regard 10 GLpa as the long-term reliable supply.

The West Pilbara Water Supply Scheme supplies residential, light industry, commercial and port activities with approximately one third of the volume being used to service RTIO's port operations. Under State Agreements and associated Water Supply Agreements dating from the 1960s and 1970s, RTIO

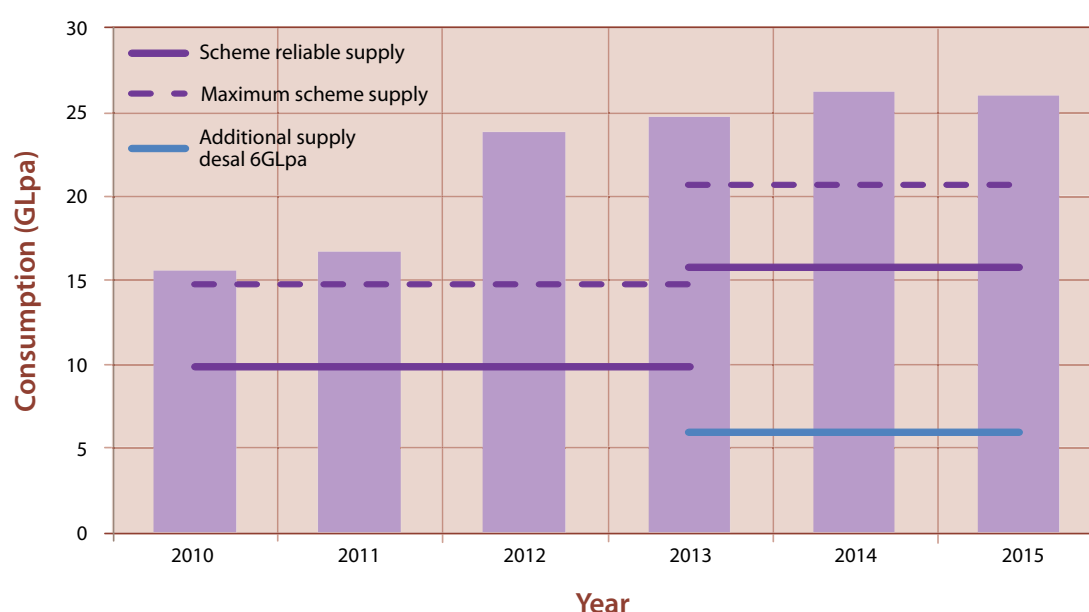
has an entitlement based on a share of reliable yield from the Millstream aquifer. RTIO has current and projected demands in excess of this share.

#### Future demand

The Department of Water, as part of its state-wide water allocation planning, has used population projections and future resource projects to calculate potential demand scenarios to 2015 for the West Pilbara Water Supply Scheme. The assumptions for the high growth scenario to achieve the Pilbara Cities vision include:

- resident population of 30 000 by 2015;
- total service population of 34 000 by 2015;
- reduction in construction workforce to 4000 between 2010 and 2015;
- average annual residential land demand of 4100 lots to 2015;
- RTIO planned expansion to 330 Mtpa by 2015;
- other Burrup water use at industry projections; and
- light industry and commercial growth at five per cent per annum.

**Figure 4.1. West Pilbara Water Supply Scheme: water requirements to meet demand (2010-2015)**



Source: Department of Water (2010)

Note: This figure has been compiled using an unpublished estimate of high growth scenario water requirements against current scheme capacity and future capacity with a new desalination source.

### Future supply

The Department of Water has outlined the following short, medium and long-term strategies regarding water supply to 2030.

#### Short-term

The proposed measures to maintain supply to 2013 are:

- enhancing efficiency and reuse programs through subdivision design;
- developing contingency arrangements in case of supply shortfall from mid 2012;
- progressing next source assessment, selection and investment; and
- confirming source decision triggers for source expansion or additional sources.

The Water Corporation is maintaining the supply scheme at maximum capacity until at least mid 2012. It will continue its water efficiency campaign, which has been operating effectively since 2003. It is undertaking a major program that targets behavioural change, retro-fitting, industrial efficiency and reducing leaks. This is part-funded through the Australian Government's National Water Security plan for cities and towns.

RTIO began managing to water efficiency targets in 2004, and has achieved significant gains through design, recycling and behavioural change – although total water use will increase in line with throughput. Landcorp and other developers have a role to support the water use efficiency direction through subdivision and housing design (such as use of grey water and capture of stormwater).

The Water Corporation has progressed a contingency plan to manage a shortfall in supply if there is no rain by mid 2012.

There is no scope to expand the West Pilbara Water Supply Scheme through borefield expansion or raising the Harding Dam. There are limited fit-for-purpose options for dust suppression close to West Pilbara ports. Individual companies are exploring the possibility of accessing additional water for dust suppression.

### Medium and longer-term

The proposed approach to maintain West Pilbara supply after 2013 is to:

- commission the new Burrup desalination plant to supply six GLpa for town supply by 2013-2014; and
- begin next source selection process and confirm source decision triggers.

A combination of sources will be needed to achieve the Pilbara Cities' aspirational targets or meet projected industry growth. Potential strategies include: utilisation of groundwater from the Bungaroo site and/or accessing alternative water sources using long distance pipeline options.

Water demand for the Pilbara Cities scenario and a possible modular approach to water supplies for the West Pilbara to 2020 are presented in the WAPC's Pilbara Infrastructure Priorities report. Water requirements to meet the high growth scenario, and supply capacity to 2015 are presented at Figure 4.1. Demand exceeds supply by 2015, however of supply from desalination, assures a reliable supply for residential growth.

### Port Hedland Water Supply Scheme

The Port Hedland Water Supply Scheme services Nelson Point, Finucane Island, Port Hedland, South Hedland and Wedgefield. The scheme draws water from borefields in the alluvial aquifers of the Yule and De Grey rivers which are also recharged by river flow.

### Current supply

Current combined source capacity from the Yule and De Grey River borefields is 13.5 GLpa with consumption at almost 10 GLpa (as at June 2010). All of the current scheme capacity (13.5 GLpa) is committed through service agreements between Water Corporation and various parties including BHP Billiton. It is anticipated that capacity will be fully utilised by 2012.



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### Future demand

The Department of Water, as part of its state-wide water allocation planning, has used population projections and future resource projects to calculate potential demand scenarios to 2015 for the Port Hedland Water Supply Scheme. The assumptions for the high growth scenario to achieve the Pilbara Cities vision include:

- resident population of 26 000 by 2015;
- total service population of 28 000 by 2015;
- construction workforce reduced to 2000 from 2010 to 2015;
- average annual residential land demand of 4100 lots to 2015;
- delivery of an integrated operation by BHP with capacity in excess of 220 Mtpa on a 100 per cent basis (with de-bottlenecking opportunities to 240 Mtpa), with first production expected from the new Jimblebar mine in 2014;
- FMG using scheme water for 55 Mtpa from 2012 to 155 Mtpa by 2015;
- Atlas, Hancock, BC Iron and Brockman Resources industry projections; and

- light industry and commercial growth at five per cent per annum.

A new source(s) is needed to meet the high growth scenario. This would need to be complemented by demand management through residential design and non potable options to manage the high growth needs for port use.

### Future supply

The Department of Water has outlined the following short, medium and long-term strategies regarding water supply to 2030.

### Short-term

The proposed approach to meet Port Hedland demand to 2012 is to:

- enhance efficiency programs through design of subdivisions;
- expand the scheme, which has the potential to supply an additional 2-6 GLpa (up to 4 GLpa from the Yule and up to 2 GLpa from the De Grey);
- facilitate fit-for-purpose options for dust suppression; and

**Figure 4.2. Port Hedland Water Supply Scheme: water requirements to meet demand (2010-2015)**



Source: Department of Water (2010)

Note: This figure has been compiled using an unpublished estimate of high growth scenario water requirements against current scheme capacity and future capacity with a new desalination source.

- continue to promote water saving options by other industries and Port Hedland's residential population.

Efficiency programs have been in place for several years and have helped to reduce per capita residential and per tonne port water consumption. The Water Corporation will continue its water efficiency campaign. It is undertaking a major program to target behavioural change, retro-fitting industrial efficiency and reducing leaks which is part-funded through the Australian Government's National Water Security Plan (2007) for cities and towns.

BHPB began a water management strategy in 2004, and has achieved significant gains in water use efficiency and recycling at the port, though total water use will increase in line with throughput.

LandCorp and other developers have a role to support the water use efficiency direction through subdivision and housing design, including design to capitalise on reuse of storm water.

The Water Corporation is planning to expand the current supply by 2 GL (possibly up to 4 GL) with new bore(s) and increased pipeline capacity from the Yule borefield. Its investigations and Department of Water assessment will be completed by early 2011. A 4 GLpa expansion would meet residential growth to 2014. The expansion of draw from the existing De Grey borefield by up 2 GL is also being considered.

As much of the future water demand is for dust suppression needs, non-potable options to service private industrial use are likely to be more viable at Port Hedland than in the West Pilbara. The Turner River aquifer is close to Finucane Island and could be developed to yield 0.4 GLpa for private non-potable port use. Other options are also under investigation. The Water Corporation and the Departments of State Development and Water are working with industry stakeholders to identify and facilitate fit-for-purpose options.

### Medium and longer-term

The proposed approach to meet Port Hedland demand after 2012 is to:

- develop a new source if current scheme expansion does not meet growth; and
- facilitate fit-for-purpose options for dust suppression.

The timing for a new source will depend on confirming the scheme expansion additional, yield from the Yule River aquifer, the De Grey Aquifer and the viability of non-potable options. Development of a next source would be triggered two to three years before confirmed demand exceeds expanded supply (probably by 2013).

There are more source options for the Port Hedland Water Supply Scheme than the West Pilbara Water Supply Scheme. A new borefield supplying up to 6 GLpa from a suitable location on the De Grey River aquifer is a possible groundwater option for a new source.

Desalination has benefits of being climate independent and requiring less pipeline infrastructure and land access. However, the Port Hedland coastline is likely to be unsuitable for a desalination plant. A bore field at the West Canning Basin, although further away than existing borefields, may provide a larger supply option. Connecting this source to major centres would require detailed investigations. It is likely to be costly, but it could result in a greater integration of the water supply network.

Water requirements to meet the high growth scenario, and potential supply capacity to 2015, are presented at Figure 4.2. High growth demand exceeds supply at 2012. Up to 40 per cent of this projected demand is for dust suppression and work on fit-for-purpose options is underway.

### Onslow Town Water Supply Scheme

The Water Corporation provides the Onslow townsite with scheme water.

#### Current supply

The Water Corporation is currently licensed to abstract 0.35 GLpa to service Onslow. Water is sourced from the Cane River alluvial aquifer. The current scheme is at capacity, which is a major impediment to ongoing development of the town. The Water Corporation will expand the current scheme to provide some additional connections. Future water demand in the Onslow area will be shaped by development of the Ashburton North Strategic Industrial Area (ANSIA) and associated growth in light industry and residential population.

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### Future demand

The town's future water demand depends on where workers from the proposed Ashburton North Strategic Industrial Area are located. The Department of Water has undertaken analysis of population projections and identified future resource projects to calculate potential (low/high) water demand scenarios for Onslow. The assumptions for these growth scenarios include:

#### Low growth:

- population increases by 30 permanent residents in Onslow by 2013 associated with operation of the BHPB's Macedon Domestic Gas Plant;
- current water service commitments fully utilised;
- no other industry commences at Ashburton North Strategic Industrial Area; and
- no other industrial growth occurs in Onslow.

The water demand would be met by Water Corporation's expansion of the current scheme allowing for up to a 50 per cent increase in current population by 2012.

#### High growth:

- commencement of BHP Billiton's Macedon project and Chevron's Wheatstone Project will require significant amount of process water at the ANSIA;
- resident population growth attributable to BHP Billiton Macedon and Chevron Wheatstone located within the Onslow townsite (approx. 25 per cent of operational work force locally based);
- BHP Billiton Macedon and Chevron Wheatstone establish operational workers accommodation for 75 per cent of their workforces in the townsite;
- additional consequential/indirect workers and families; and
- growth of industry in the town at five per cent.

Under this scenario, it is likely that by 2015, demand for town water supply would be in excess of what can be met by expansion of the current scheme and would need to be supplemented via an alternative source (i.e. desalination at an appropriate location).

#### Industrial growth at Ashburton North strategic industrial area:

The commencement of LNG processing activity at the Ashburton North strategic industrial area will have significant implications for water demand:

- BHP Billiton Macedon Domestic Gas Plant commences with a construction workforce of 300 living on site in the ANSIA by 2011;
- Chevron's Wheatstone gas plant commences with a construction workforce of 3000-5000 living on site from 2012/13; and
- Construction commences on other industries (yet to be confirmed) after 2015.





Water to service workers and industry locating in the Ashburton North Strategic Industrial Area cannot be met from the Onslow Town Water Scheme so the identification of alternative sources is required.

### **Future supply**

The water supply scheme and waste water infrastructure will be maintained under the current Water Corporation operating budget to meet all service obligations. The Water Corporation is continuing its efficiency campaign in Onslow, and is implementing a program that targets behavioural change, retrofitting, industrial efficiency and reducing leaks. For example, a short-term solution to Onslow's immediate water needs is being explored through use of grey water for the Shire's open spaces which will return around 0.1 GLpa in potable water savings.

The Department of Water has assessed that there is potential for the existing Cane River borefield to supply some additional water. However, the physical characteristics of the aquifer means that it will be low yielding, so only limited additional supply may be accessible. The Water Corporation is currently finalising its aquifer assessment, application for additional water and planning for additional infrastructure. Since the timeframe for expanding water supply is approximately 18 months, there is sufficient time for the Water Corporation to commit

to additional services to meet demand by early 2012. Along with efficiency upgrades, the scheme expansion is expected to service the water supply and waste water needs of a population increase of 50 per cent.

In addition, the State is continuing to liaise with proponents of prospective resource projects to address the issue of water supply, to meet expected industry and town site demand. Access to water to service industrial activity and residential growth in the townsite is a key issue, that will require significant coordination between the state and local governments and the proponents, if an appropriate outcome is to be achieved.

### **Inland towns**

#### **Current demand**

Water for the other main towns – Pannawonica, Newman, Tom Price, Paraburdoo, Marble Bar and Nullagine – comes from a variety of groundwater sources located near each respective town. A summary of current water use in these towns is outlined in Table 4.2.



**Table 4.2. Summary of current water use and future status of water demand and supply for inland towns**

Town	Current water use	Future status of water demand <sup>b</sup> and supply <sup>c</sup>
Newman	3.7	Estimated available water is 10.0 GLpa. Water supply aquifer is linked to mining operation bore field recharged by dewater. Population below 8 000 <sup>d</sup> at 2010 projected to 15 000 <sup>e</sup> .
Tom Price	1.0	Estimated available water is 9.82 GLpa. Water supply is linked to the Marandoo mining operation. Population 3500 <sup>d</sup> . Rio Tinto projects no growth to 2015 other sources suggest growth to 5100 <sup>d</sup> .
Paraburdoo	0.3 <sup>a</sup>	Estimated available water is 4.3 GLpa. Population 1700 <sup>d</sup> .
Pannawonica	0.1 <sup>a</sup>	Supply can be problematic depending on recharge. Estimated available water of above 0.6 GLpa. Population 727 <sup>d</sup> .
Marble Bar	0.1	Estimated available water is 0.5 GLpa.
Nullagine	0.04	Water supply comes from a combination of alluvial aquifers and fractured rock aquifers. Estimated available water is less than 0.05 GLpa, which is close to current use.

<sup>a</sup> derived from population estimates: all other town figures are recent average use from Water Corporation

<sup>b</sup> Economics Consulting Services (2008)

<sup>c</sup> Ruprecht and Ivanescu (2000)

<sup>d</sup> PICC (2010)

<sup>e</sup> Landcorp (2010)

Source: Department of Water (2010)

### Future supply

Over the next 25 years greater mining activity is likely to result in population growth in some of the Pilbara's inland towns. In Newman and Tom Price, water supplies are linked to a large mining operation and as a result, there is greater flexibility to meet increased water demand should it arise.

For the towns of Paraburdoo, Pannawonica, Nullagine, and Marble Bar town water supplies have been designed only to service town populations. Overall, there are sufficient supplies of water from existing sources to provide for growth within the inland towns. Improvements to security of supply and quality of water will need to be addressed on an ongoing basis.

## 4.3 Waste water treatment

The Water Corporation is the main provider of waste water services in the Pilbara with Rio Tinto providing services to Dampier, Tom Price, Paraburdoo, and Pannawonica. Waste water systems comprise treatment plants, disposal areas, and pipelines. Lack

of capacity in any of these components can constrain the ability to service future connections. A summary of the status of waste water treatment facilities in the Pilbara's main settlements is provided below.

### Karratha

The city's residential and commercial areas are fully serviced by deep sewerage with two waste water treatment plants operating at Karratha Hills (Waste Water Treatment Plant 1) and Gap Ridge (Waste Water Treatment Plant 2). An additional small waste water treatment plant (Waste Water Treatment Plant 3) operates adjacent to the light industrial area to cater for its needs.

The Shire of Roebourne currently uses some of the treated waste water to reticulate ovals. Disposal of the remainder is into evaporation ponds. It is anticipated that the capacity of Waste Water Treatment Plant 1 will be reached in 2012 and the capacity of Waste Water Treatment Plant 2 will be reached in 2013 on the basis of the high growth scenario. The capacities of both treatment plants

require upgrading however expansion options for treatment plant 2 are limited by its location and conflicting land uses in the Gap Ridge area.

### Port Hedland

There are two waste water treatment plants servicing Port Hedland and South Hedland. The majority of water from these plants is recycled to irrigate public open spaces and recreation facilities. Although the Port Hedland Waste Water Treatment Plant has significant capacity for growth its location presents a constraint for urban development. The South Hedland Waste Water Treatment Plant has limited spare capacity and could face additional disposal issues as it reaches capacity in 2011/2012.

In January 2011, the State Government announced that the Port Hedland Waste Water Treatment Plant would be decommissioned with the waste being pumped to the South Hedland plant. This will undergo a substantial upgrade, which will be completed by June 2014.

### Newman

The Water Corporation owns and maintains the sewerage reticulation system in Newman, which discharges to the waste water treatment plant to the north of the town, which is owned and maintained by the Shire of East Pilbara.

Recycled water is piped back to the town to water recreation areas. The Water Corporation's sewer license area includes the existing town site, but does not cover all of anticipated growth areas. There are capacity issues at some of the pump stations that need to be addressed. Currently, processing 1200 kilolitres of effluent per day, the operational capacity of the town's mechanical treatment plant is capable of servicing a daily flow of 1700 kilolitres (11 300 people) with modest mechanical upgrades. This capacity could be further increased to 2000 kilolitres per day (13 300 people) with the addition of an additional clarifier, which is a major upgrade. To cater for a population beyond 13 300 the treatment plant will need to be replicated or a new process stream added. There is room at the current site to accomplish this should it become necessary (Rowcon, 2010).

### Tom Price

Tom Price's waste water treatment system is owned and operated by Rio Tinto Iron Ore. The waste water treatment plant is now nearing capacity. A 2008 study (Voran Consultants, 2008) found that by fully utilising the capacity of the waste water treatment plant there is the potential to increase the number of equivalent residential services from 1302 to 1464 – an increase of 162. The consultants identified the main waste water constraint on future development in Tom Price to be the capacity of the 225 mm pipe from the town to the waste water treatment plant.

### Onslow

Onslow's main waste water treatment plant is located to the south of the town centre. It is expected to reach capacity on the basis of existing demand by 2011. If significant development occurs in Onslow, there will be a need to address the town's waste water service capacity. This could be achieved, either by expanding the capacity of the existing plant, or by constructing a new facility in another location, since the existing site has the potential to constrain the westward development of the town due to odour buffers. There is also a requirement to relocate the smaller waste water treatment plant, that services the Bindi Bindi community.

### Wickham

Wickham has system capacity for both treatment and disposal of waste water to accommodate anticipated growth in the town.

### Roebourne

The Roebourne Waste Water Treatment Plant has a design capacity of 300 KL/day with an average notional capacity of 325 KL/day. The plant's notional capacity can peak at 375 KL/day, when it overflows to the environment. There are plans to build additional effluent disposal ponds on the current treatment plant site to meet the needs of Stage 1 of the NASH project. The Roebourne Rejuvenation Project is envisaging a target population for the town of 2800, which would require a treatment facility with a 700 KL/day design capacity. To cater for this scale of development, it is anticipated that there will be a need to expand the treatment plant site and duplicate effluent treatment facilities.

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### Other settlements

Currently, waste water treatment is not considered to be a major issue in the other Pilbara settlements.

## 4.4 Energy

### North West Interconnected System

The majority of Pilbara communities are serviced by the North West Interconnected System (Table 4.3), which services Dampier, Wickham, Pannawonica, Paraburdoo, and Tom Price through the Pilbara Iron (Rio Tinto owned) transmission network. Horizon Power provides a transmission network that services Port Hedland, South Hedland, Karratha, Roebourne, and Point Samson. In addition, generation capacity from private sector infrastructure is fed into the interconnected network. The North West Interconnected System also supplies the operations of Rio Tinto Iron Ore and BHP Billiton Iron Ore, which also owns transmission lines around Port Hedland.

Energy demand forecasts by the Chamber of Minerals and Energy's State Growth Outlook (2011) show that that electricity demand in the Pilbara from minerals and energy is projected to reach almost 12,000 GWh (or approximately 2.2 GW) by 2015. It is anticipated that much of the additional generation capacity in the Pilbara will be met through self generation by utilising natural gas. Electricity generation is already the primary driver of domestic gas demand in the region. In line with this prediction, natural gas demand from the minerals and energy sector in the Pilbara is expected to grow by 70 PJpa by 2015.

In the future, coordinated development of the North West Interconnected System would present capital and operating efficiencies and increased opportunities for risk management, energy efficiency and renewable energy generation. However, without certainty around common user infrastructure, companies will continue to invest in self owned and operated infrastructure to meet their energy needs.

### Generation

Natural gas is the predominant fuel used for electricity generation in the Pilbara. The gas is sourced through the Dampier to Bunbury Natural Gas Pipeline and the Epic Energy Pipeline, which runs west to east from Karratha/Dampier to Port Hedland. Other major gas pipelines within the region are the Telfer gas pipeline and the Goldfields gas pipeline. Currently, there is no reticulated residential gas supply (other than bottled gas). Limited diesel back up capacity is available. Generation capacity that is connected to the North West Interconnected System is owned by Rio Tinto, ATCO and Alinta Energy.

Horizon Power initially obtained its electricity supply for the North West Interconnected System through power purchase agreements with Rio Tinto Dampier Power Station and Alinta's Boodarie Power Station. Horizon Power's power purchase agreement with Rio Tinto expired in May 2010 while the agreement with Alinta expires in December 2012. Horizon Power has entered into a power purchase agreement with ATCO to purchase 100 per cent of the output of a new 86 MW gas fuelled power station in Karratha to replace its agreement with Rio Tinto.



BHP Billiton owns and operates a 132 kV transmission line from Newman to its operations at Yandi and 'Area C' with electricity provided to the towns of Newman and these operations from power stations in Newman owned by Alinta. Although this network is in close proximity to the North West Interconnected System, it is not interconnected.

### Transmission system

The North West Interconnected System transmission system is characterised by a range of voltages. The Horizon Power component comprises 220 kV transmission line extending between Port Hedland and Cape Lambert with 132 kV transmission lines running between Cape Lambert and Karratha and Karratha to Dampier. There is a Horizon Power sub-station (132/33 kV) at Dampier that provides low capacity interconnection with RTIO's 220 kV transmission system. The range of different voltages along the network requires transformation at various points, creating capacity constraints along the supply lines.

### Isolated generation

There are a number of generators that supply townships and resource/mining projects (predominantly iron ore), which are either on the fringe of, or isolated from, the North West Interconnected System (Table 4.4).

As already noted, Newman's power is supplied by a 140 MW power station owned by Alinta in addition to its supply of power to BHP's mining operations. Horizon Power is also responsible for the Onslow system using power purchased from Onslow Electric. The potential development of a SIA at Ashburton North will have significant implications for electricity demand. Additional connections will be required to service industrial, commercial and residential uses in Onslow.

More remote settlements such as Marble Bar and Nullagine are supplied by Horizon Power through solar/diesel generators that are located in each township.

### Renewable energy

With the forecasted growth and increase in demand for energy to support a growing population in the region, renewable energy will need to be considered strategically to integrate into a 'clean' energy economy. There are significant opportunities for the development of a renewable energy sector. In particular, the region's substantial solar energy resources will need to be harnessed. A comprehensive study of all the viable renewable energy resources will need to be completed to identify the priority areas for development.

**Table 4.3. Pilbara energy generation – North West Interconnected System**

Location	Plant name	Company	Size / type	Total capacity (MW)	Commissioned
<b>Cape Lambert</b> ^		Rio Tinto	Steam turbine	105	1972
<b>Dampier</b> ^		Rio Tinto	Steam turbine	120	1970
<b>Karratha</b>	Karratha Power Station	ATCO Power	2 x 43 MW GE LM6000 PD DLE gas turbines (HEGT)	86	2010
<b>Karratha</b>	Yurralyi Maya (7 Mile)	Rio Tinto	Gas turbine	160	2010
<b>Port Hedland</b>	Boodarie	Alinta Energy	2 x 32 MW GE Frame 6B open cycle gas turbines	64	1996
<b>Port Hedland</b>	Port Hedland Power Station	Alinta Energy	3 x 32 MW GE Frame 6B open cycle gas turbines	96	1998

^ Earmarked for decommissioning

Source: Office of Energy (2010)



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**Table 4.4. Pilbara energy generation – Detached (Island) Systems**

Location	Plant name	Company	Size / type	Total capacity (MW)	Commissioned
<b>Burrup Peninsula</b>	Karratha Gas Plant	Woodside	6 off frame 5s GTG and 4 off LM6000s	240	007
<b>Burrup Peninsula *</b>	Pluto Phase 1	Woodside	4 off frame 6s GTG	160	2010
<b>Cloud Break</b>		Contract Power	Diesel generator	36	2001
<b>Cloud Break (Emergency)</b>		Contract Power	Diesel generator	2	2008
<b>Newman</b>	Iron Ore Mine	Alinta Energy	3 x 32 MW GE frame 6B open cycle gas turbines 1 x 44 MW Rolls Royce Trent open cycle gas turbine	140	1996 2009
<b>Marble Bar</b>		Horizon Power	Solar/diesel generator	0.3/1.28	2010
<b>Nullagine</b>		Horizon Power	Solar/diesel generator	0.2/0.96	2010
<b>Onslow</b>		Onslow Electric Power	Gas turbine	3.6	1999
<b>Onslow</b>		Horizon Power	Diesel generator	3 (standby)	
<b>Paraburdoo</b>		Rio Tinto	Gas turbine	120	2006
<b>Paraburdoo</b>		Rio Tinto	Gas turbine	20 (standby)	1985
<b>Telfer</b>	Telfer Gold Mine	Newcrest Mining	3 x 46 MW gas turbine/ 21 MW diesel generator	159	2005/1978
<b>Wodgina</b>		Energy Generation	Gas turbine	13.7	

\* Yet to commence operation

Source: Office of Energy (2010)

### Future capacity requirements

A 2008 industry survey, undertaken by the Chamber of Minerals and Energy, found that state-wide demand for electricity by the minerals and energy sector is projected to grow significantly over the next 5-10 years. By 2014, the growth in electricity demand in the Pilbara is anticipated to be 82 per cent of the state wide resource sector demand growth. At this stage most of the forecast growth in demand is expected to be met by self-generation rather than grid electricity.

### Key issues

Generation capacity on the North West Interconnected System grid is a significant issue requiring urgent attention. Horizon Power does not currently own or operate power stations in Karratha or Port Hedland, as it purchases power from independent power producers through power purchase agreements. This poses a risk if supply planning does not incorporate the termination of contracts, or decommissioning of third party plants. There are long lead times associated with the construction of new generation capacity.

In most electricity systems, providers rely on a major industry to commit to consuming a significant load of electricity to justify additional investment. However, in the Pilbara major industry has generally provided its own power generation and transmission infrastructure. Energy demand on the North West Interconnected System and the surrounding isolated systems is anticipated to increase, with escalating demand for minerals and resources and associated population migration into the area – both on a temporary and a residential basis.

There is currently a significant amount of under-utilised generation capacity in the Pilbara due to the number of self-generation facilities, that are not articulated to interconnected networks. If these assets could be accessed to make more efficient use of existing capacity, it is likely that less new generation investment would be required to transport the electricity to the load centres.

The Vision 2020 report by the Minerals Council of Australia (2009) noted that, although there was likely to be significant electricity demand growth in the region, the majority of this is currently expected to be met by self-generation rather than grid supply. The report also notes that a cost competitive energy market is essential for the development of the Pilbara's energy intensive resource-based industry, and that the lack of an integrated electricity system in the Pilbara inhibits efficiency. However, the realisation of an integrated electricity system would require significant investment and cooperation between multiple stakeholders, which would rely on the development of a strong commercial rationale.

There is a need for a broader integrated approach to long-term Pilbara power supply planning, to ensure that the Pilbara's energy supply requirements are able to be met. A commercial approach is likely to optimise efficient investment and innovative supply. Future energy supply options could also include the greater use of natural gas for commercial and domestic purposes in the main Pilbara towns, if it proves to be commercially feasible.

## 4.5 Waste management

Waste in the Pilbara is generated from the following sources:

- domestic land uses;
- council and works including green waste from parks and road construction; and
- commercial/industrial activities.

Local governments collect waste from ratepayers, including commercial and industrial customers, within respective townsites. A number of private waste management companies also provide services for commercial organizations, including removal of waste generated from fly-in fly-out camps and mining activities. Bulk and green waste collection services are also offered during the year in major towns (Table 4.5).

Waste facilities located at Karratha (Seven Mile), Newman, and South Hedland receive the highest amount of waste in the Pilbara (40 000-70 000 tonnes each per annum). This contrasts with substantially lower amounts of waste that is received by Onslow, Paraburdoo, and Marble Bar, all of which generate less than 10 000 tonnes per annum. Servicing growth predictions in line with the Pilbara Cities vision will mean generation of significantly more waste. This will trigger the need for upgrading existing stations or commissioning new facilities.

Unlike the Metropolitan region, the majority of waste generated in the Pilbara is generated and disposed of by the private sector. Approximately 10 per cent of the waste generated finds its way into landfills run by local government. Of the waste received into landfills, a much higher proportion is commercial and industrial or construction and demolition waste, when compared to landfill waste in Perth.

### Recycling

Newman is the only town that provides households with bins specifically for the disposal of recyclable materials via roadside collection. Rio Tinto and Cleanaway jointly manage the Dampier Community Recycling Centre, which collects and sorts paper/ cardboard, glass and aluminium for transportation to recycling centres. Another collection centre has been proposed for Wickham.

Some recycling of metals is occurring, but transportation costs are affecting the economic viability of existing operations.

The Shire of Roebourne mulches green waste for sale at its Seven Mile Waste Disposal Site. A re-use (trash and treasure) shop also operates at the Roebourne Transfer Station to promote recycling of domestic goods, while also helping minimise materials going to landfill.

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### Key issues

Current waste management operations in the region have varying standards and overall are not operated to best practice standards, with a number of sites posing possible environmental and health concerns. In particular, there is lack of appropriate facilities to properly dispose of hazardous and household chemical wastes.

Compaction of land fill is used at only one site in the region. Compaction of waste extends the life of land fill sites and also reduces settling and slumping of land fill cells, which result in increased remediation and maintenance costs.

Waste minimisation is also a critical concern and will assist in increasing the life expectancy of existing land fill sites, minimise environmental damage, reduce operational costs, and support resource recovery. However, high levels of contamination, the costs of recovery, and the generally free access by households to dump trailer waste at landfills, is an inhibiting factor to economically sustainable recycling operations. Green waste separation and treatment for use as mulch is not common place.

Increased amounts of waste can be expected across the region because of projected residential and industrial development. Of particular concern is an increase in construction and demolition materials arising from any construction boom. These materials already make up a disproportionately high segment of waste materials going to landfill across the Pilbara. Construction materials are generally more expensive in the region, because of transport and other costs, so reclaiming any materials for recycling would offer multiple benefits.

### 4.6 Telecommunications

Current mobile phone coverage in the region remains patchy with access to broadband limited and slow. This is a significant impediment to regional development in the Pilbara. A 2008 telecommunications needs assessment for Western Australia found that:

- the main population centres have good mobile telephone coverage but long stretches of main highways have very limited coverage; and
- ADSL broadband availability is limited to major towns and to within only a few kilometres of ADSL-enabled exchanges.

These findings particularly apply to the Pilbara, where telecommunications services for households and businesses in the region are generally of a lower standard than in urban locations in the south west of the state. In particular, broadband access is problematic away from the major towns, with slower and less reliable satellite broadband often the only alternative. Resources companies, close to the optic fibre cable that passes through the region, have good access to capacity for data and telephony, but at remote sites, capacity is limited.

Telstra is the dominant provider of both mobile phone and broadband services in the Pilbara region. There is limited competition and where this exists, it is usually limited to major towns. Apart from Telstra, Vodafone and Optus have limited network coverage in the region. Mobile phone reception is generally poor or non-existent along the region's major roads and at road houses.

### Future service provision

The anticipated increase in the Pilbara's population will require a major upgrade of the region's telecommunications infrastructure – phone cover and high capacity broadband.

**Mobile phone network:** It is anticipated that private telecommunications companies will continue servicing the Pilbara market, with minimal government intervention required. However, the State Government is in the process of extending remote mobile coverage along the North West Coastal Highway from Geraldton to Port Hedland by increasing the number of mobile towers. These towers will be operated by the private sector, but maintain a role in providing communications platform for emergency services and public utility providers. The State Government is planning to establish new facilities, known as Multi Function E-Centres. These centres are primarily designed for use in remote locations, such as in the Pilbara for education, law enforcement, health and emergency services.

**Broadband network:** As part of the Federal Government's National Broadband Network initiative, there is a \$250 million budget to address black spots in regional Australia. The Pilbara is likely to be a priority region given its rate of growth. As part of this initiative, there is a commitment for the rollout of backhaul services from Perth to Geraldton.

**Table 4.5. Pilbara waste management facilities**

Name	Town serviced	Owner	Category	Landfill technique	Life	Material separated for recycling
Seven Mile Waste Disposal Site	Karratha Dampier Roebourne Wickham Point Samson	Shire of Roebourne	Category 64 - Class II Putrescible Category 61 - Liquid Waste Facility	Excavation to 6m deep and fill above ground	50 years	Metal, batteries, motor, oil, gas, cylinders, re-use junk.
South Hedland Tip Site	Port Hedland South Hedland Wedgefield	Town of Port Hedland	Category 64 - Class II Putrescible Category 61 - Liquid Waste Facility	Excavation pit and fill	15 years	Metal, motor, oil, tyres, greenwaste, timber, re-use junk.
Windell Refuse Site	Newman	Shire of East Pilbara	Category 64 - Class II Putrescible Category 61 - Liquid Waste Facility	Excavation pit and fill	20 years	Paper, metal, glass, batteries, greenwaste, re-use junk.
Wickham-Roebourne Transfer Station	Roebourne Wickham Point Samson	Shire of Roebourne	Category 62 - Solid Waste Depot	N/A - temporary storage of waste material	No restriction	Metal, batteries, motor oil, gas cylinders, re-use junk.
Tom Price Refuse Disposal Site	Tom Price	Shire of Ashburton	Category 64 - Class II Putrescible	Excavation pit and fill	15 years	Metal, batteries, motor oil, tyres.
Onslow Refuse Disposal Site	Onslow	Shire of Ashburton	Category 64 - Class II Putrescible	Excavation pit and fill - valley fill	6 months	Metal, batteries, motor oil, tyres, greenwaste.
Paraburdoo Waste Disposal Site	Paraburdoo	Shire of Ashburton	Category 64 - Class II Putrescible	Excavation pit and fill	12 months	Metal, motor oil, tyres.
Deepdale Landfill	Pannawonica	Rio Tinto	Category 64 - Class II Putrescible	Excavation pit and fill	7 years	No material separation
Marble Bar Refuse Site	Marble Bar	Shire of East Pilbara	Category 64 - Class II Putrescible	Excavation pit and fill	10 years	No material separation
Nullagine Refuse Site	Nullagine	Shire of East Pilbara	Category 64 - Class II Putrescible	Excavation pit and fill	10 years	Glass, aluminium, cardboard, car bodies, bulk steel, non-ferrous metals.

Source: Pilbara local governments (2010)



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Extending the link from Geraldton to the Pilbara would allow more efficient and competitive broadband pricing. Broadband is considered essential to building new communities in the Pilbara, since without competitive broadband and mobile telephone services, they would be at a significant disadvantage, lacking the capacity to attract residents and workers. Government intervention may be needed to assist the roll out of the National Broadband Network.

The Department of Commerce is also working to facilitate the improvement of digital infrastructure within the Pilbara region. At present, major resource companies access high end communications needs via satellite linkages that provide little benefit to surrounding communities and have limitations in poor weather. It is pursuing the optimal deployment of next generation communications networks, such as the National Broadband Network to the region. Fibre optic based solutions would also foster the delivery of government and private services, such as health via digital applications that will improve social and economic outcomes. It is working with local government, industry groups and the Australian Government in pursuing the expansion of digital infrastructure and its utilisation across the Pilbara region.

Research and technological innovation is important in solving the unique local issues affecting environmental; social and health needs; and the competitiveness of the resource industry in the region. Government agencies and strategic research organisations should consider Pilbara based testing facilities and research infrastructure, where there is a direct research link to the region.

## 4.7 Conclusions

Capacity of utility infrastructure in the Pilbara is a major short-term issue, that needs to be resolved as a matter of priority. In particular, the supply of water and energy in Karratha and Port Hedland has become critical to the extent that proposed growth cannot be accommodated. In short, neither town will be able to support populations increase to 25 000 by 2020 without extensive, additional investment. Onslow, although smaller in size, is in a similar position.

### Water

**Karratha:** The existing water supply for Karratha is incapable of reliably or sustainably meeting current demand. Even under a low growth scenario, a new water source is needed. To address the issue and provide sufficient water capacity to the Karratha area between 2010 and 2020 the following is being implemented:

- development of the Bungaroo Valley Borefield by RTIO which is capable of supplying 10 GLpa;
- implementation of efficiency programs to save around 1 GLpa; and



- upgrades to the existing networks to improve quality and sustainability.

Planning is currently being undertaken to determine the likely timing and options for a further source beyond the new borefield at Bungaroo.

**Port Hedland:** All of the current scheme capacity from Port Hedland water supply scheme is already committed, through service agreements between Water Corporation and various parties. In order to meet the growing demand, Water Corporation has implemented an enhanced water efficiency program (target of around 1 GLpa savings) and is investigating expansion of the current Yule and De Grey borefields to yield up to an additional 5 GLpa (subject to approval). However, with the expected growth of Port Hedland and increased iron ore production, this is unlikely to meet predicted future demand. Options being investigated to meet this demand include:

- the West Canning Basin;
- desalination; and
- a new borefield in the De Grey River aquifer.

**Onslow:** The Onslow water supply scheme is currently at capacity. The Water Corporation is investigating the potential to extract additional water from the Cane River Borefields and potentially the Lower Robe aquifer. Beyond that, there may need to be some form of partnership with the developers of the Ashburton North Strategic Industrial Area to develop a new source to service future town and industrial demand.

### Waste water treatment

**Karratha:** Two of Karratha's three waste water treatment plants will not need upgrading in the short-term. However the third plant will need expansion to cope with the extra flows. Depending upon the magnitude of growth in Karratha a new waste water treatment plant may be required in the future. In addition, due to the high growth being proposed, the waste water treatment plant technology may need to change to accommodate those higher flows that is a move to a high technology plant. Future waste water treatment strategies should include effluent reuse system upgrades.

**Port Hedland:** The Water Corporation has an investment strategy for the upgrade of water treatment at the Port Hedland and South Hedland waste water treatment plants, that will provide for demand up until 2015. Prior to 2015 a significant

investment will be required to develop the South Hedland aerated lagoon, which will increase the scheme supply to meet demand until 2020. Relocation of the Port Hedland Waste Water Treatment Plant to South Hedland has the potential to release 1500 residential lots for development. Future waste water treatment strategies should include effluent reuse system upgrades.

### Energy

Horizon Power requires additional generation capacity to meet its maximum demand and reserve capacity requirements from 2013 onwards. It will need to secure this by either building power stations alone or in partnerships, or by establishing additional power purchase agreements to cover the estimated demand for power. Further investment in transmission infrastructure may also be required.

### Waste management

While there is currently minimal recycling of waste in the region, the next decade will require a comprehensive waste recycling and disposal plan. It will be important to ensure that options for strategic waste transfer, collection, treatment, recycling and disposal facilities, including buffer areas, are clearly identified in local planning strategies and schemes.

### Telecommunications

Coverage in the region is patchy and access to broadband is limited and slow. The anticipated increase in the Pilbara's economic activity and population, with high expectations for fast and efficient communications, will require a major upgrade of the region's telecommunications infrastructure.

## 4.8 Utility infrastructure priorities

The issues and priorities associated with planning for utility infrastructure are detailed in Table 4.6. These will be addressed in more detail in Section 4.9, which outlines specific objectives and actions, that will form the basis for the Pilbara Infrastructure Implementation Plan.

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**Table 4.6. Utility infrastructure priorities – 2015**

Infrastructure	Priorities
<b>Water</b>	<ul style="list-style-type: none"> <li>• Investigate the potential for expansion of the Bungaroo borefield or development of other nearby groundwater resources.</li> <li>• Investigate construction of a desalination plant to service Karratha City (Karratha/Dampier).</li> <li>• Encourage strategies that promote responsible consumption of water by industry and consumers.</li> <li>• Upgrade existing water sources – Yule and de Grey borefields – to service Port Hedland.</li> <li>• Identify new water source – Cane River borefields, Lower Robe aquifer or an alternative – to service Onslow.</li> <li>• Identify water re-use options and opportunities.</li> <li>• Use fit-for-purpose options for dust suppression.</li> <li>• Improve planning for water services across the region.</li> <li>• Investigate development of a new water source utilising the West Canning Basin.</li> </ul>
<b>Waste water</b>	<ul style="list-style-type: none"> <li>• Upgrade Karratha Waste Water Treatment Plant.</li> <li>• Upgrade Port Hedland deep sewerage scheme.</li> <li>• Decommission the Port Hedland Waste Water Treatment Plant and augment capacity at the South Hedland Waste Water Treatment Plant.</li> <li>• Identify opportunities for reuse of treated waste water.</li> <li>• Provide waste water services to the region's Aboriginal communities.</li> </ul>
<b>Energy</b>	<ul style="list-style-type: none"> <li>• Provide new power generation and transmission at Port Hedland.</li> <li>• Provide new power generation and transmission at Karratha.</li> <li>• Expand power generation at Onslow.</li> <li>• Investigate renewable energy options.</li> </ul>
<b>Waste management</b>	<ul style="list-style-type: none"> <li>• Develop a system of townsite transfer stations.</li> <li>• Investigate recycling options in service hubs.</li> <li>• Continue to monitor and identify new or upgrade existing waste management facilities.</li> <li>• Promote implementation of improved waste management in Aboriginal communities.</li> </ul>
<b>Telecommunications</b>	<ul style="list-style-type: none"> <li>• Augment mobile phone coverage – telecommunication companies.</li> <li>• Roll out of National Broadband Network in the Pilbara.</li> </ul>

### 4.9 Objectives and actions

Objectives	Actions
<b>4.1. General:</b>  <b>Ensure that the needs of the community and industry are well served by the provision of an adequate and efficient system of utility infrastructure that takes into account new technologies and approaches as well as 'whole-of-life' and 'whole-of-system' costs.</b>	a Undertake a 'whole-of-government' gap analysis to identify utility infrastructure needs across the Pilbara at regional and local government levels and within specific settlements.  b Prepare the Pilbara Infrastructure Implementation Plan for utility infrastructure that includes an estimate for a 'whole-of-life' and 'whole-of-system' costs.
<b>4.2. Water:</b>  <b>Provide settlements and industry with a secure supply of potable water; promote total water cycle management; and adopt water sensitive urban design principles.</b>	a Improve planning for water services across the region.  b Through the 'whole-of-government' gap analysis identify regional water utility needs in the short, medium and long-terms.  c Identify, secure and develop new water sources, including climate-independent water options for Port Hedland, Karratha and Onslow.  d Improve demand-supply imbalances to ensure that water does not pose a constraint to economic or community development.  e Improve the responsible consumption of water by industry and the community.  f Develop a fit-for-purpose and grey-water usage framework which can relieve demand on potable water sources.
<b>4.3. Waste water:</b>  <b>Minimise waste water at source and recycle where feasible.</b>	a Provide appropriate sewerage facilities and services in all Pilbara cities and towns.  b Provide adequate local absorption systems in the region's villages and Aboriginal communities.  c Decommission Port Hedland Waste Water Treatment Plant and augment capacity at the South Hedland Waste Water Treatment Plant.  d Upgrade Karratha Waste Water Treatment Plant.  e Reuse waste water to irrigate public open space.
<b>4.4. Energy:</b>  <b>Provide a sustainable, sufficient, reliable and well managed energy supply and infrastructure that meets community, industrial and commercial needs.</b>	a Facilitate the development of a framework that ensures future additional power generation and efficient management of the regional energy network.  b Develop new power generation and transmission capacity in all towns experiencing development pressures.
<b>4.5. Waste management:</b>  <b>Minimise waste and associated environmental impacts and maximising re-use and recycling through the use of best practice technology and waste disposal minimisation.</b>	a Ensure the provision of sites and buffer areas for waste transfer, collection, treatment, recycling and disposal facilities within town sites.  b Investigate the potential for consolidating and investing in larger regional waste and recycling facilities that service both industry and communities.  c Provide for improved waste management in remote aboriginal communities.

Cont:



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Objectives	Actions
<b>4.6. Telecommunications:</b>  <b>Provide affordable access to mobile phone and high speed broadband telecommunications.</b>	a Improve coverage of the mobile phone network.
	b Provide affordable access to high speed broadband networks.
	c Develop a policy for location of towers and other telecommunications structures to minimise the impact on the natural and built environment.



## 5 Community infrastructure

### 5.1 Strategic direction

The expansion of the Pilbara's population to 140 000 by 2035 will provide the impetus and motivation for establishing a higher threshold of facilities and services in the region. The enhancement of these facilities and services will assist greatly in the region's ability to attract and retain workers and their families and, thereby, build a strong sense of community.

#### **Goal:**

*Create and provide for communities that are safe, healthy and enjoyable places to live and work; and offer a wide range of cultural, educational and recreational opportunities.*

### 5.2 Health

The region's State health operations are characterised by a network of health and hospital services that work in partnership with general medical practitioners, dentists, Aboriginal community controlled health services, Pilbara Division of General Practice Royal Flying Doctor Service, St John's Ambulance Australia and other local health service providers, all playing their part in the make-up of the Pilbara health service delivery profile. The Pilbara region's main referral centre is based in Port Hedland. Karratha has the Nickol Bay Hospital and smaller hospitals and health services are located at Onslow, Newman, Tom Price, Paraburdoo, Roebourne, and a health centre at Wickham. Remote area nursing posts are operated at Marble Bar, Nullagine, Yandeyarra and Jigalong.

#### **Hospitals**

The Pilbara's hospital facilities are located in the region's main urban centres. A general overview of health reveals there are significant service gaps, reflecting difficulties in recruitment, cost-of-living, housing and wages. Staffing and associated housing issues are major constraints to delivery of medical services across the region. A new regional health campus at South Hedland became operational by November 2010. The new campus was designed to bring together the majority of health related services,

that currently are spread over several sites in both Port and South Hedland within a single facility. The new campus will be the regional health care hub for the region.

A number of health initiatives targeting the Pilbara were announced in the 2010/11 State Budget. Funding of \$150 million was allocated under Royalties for Regions to construct a new hospital in Nickol Bay as part of the redevelopment of the proposed Karratha Health Campus. Additionally, \$10 million is being provided to the current Nickol Bay Hospital to deliver a package of urgent upgrades including a boost to obstetric services and provision of more staff accommodation. A further \$2.5 million has been provided for improving general clinical and medical imaging equipment across all Pilbara hospitals.

A partnership between the State Government and major industries in the Pilbara will see an additional \$38.2 million provided over five years to fund a range of initiatives to improve:

- access
- infrastructure
- response
- service provision
- sustainability
- workforce.

Funding will also be provided for remote Aboriginal Health Clinics across the Pilbara. The selection of sites will be determined by WA Country Health Services.

#### **General practitioner and dental services**

Medical services for public hospitals are provided by resident salaried medical officers located in Port Hedland and Nickol Bay (these personnel also visit Onslow) or by private medical practitioners under contract for public patients at all other Pilbara hospitals.

The two main private providers are Prime Health Group and Kinetic Health, which service the Pilbara through locations in Karratha, South Hedland, Newman, and Wickham.

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Public dental services operate in South Hedland with private dentists operating in Port Hedland and Karratha. A mobile dental service visits schools in Dampier, Pannawonica, Paraburdoo, Roebourne, Tom Price, and Wickham and the Centre for Rural and Remote Health operates clinics at the Mawarnkarra Medical Service and the Warburton Health Service. Table 5.1 details existing and anticipated future provision of GP and private dentists in line with the Pilbara Cities population growth scenarios.

### Allied health services

Allied health services make up an important component of the health services that are provided in the Pilbara. An integral component of allied health services is community and population health, which provides programs and services including child health, school health, community nursing service, parenting education and chronic disease management.

The remoteness of communities; the isolation and separation caused by the fly-in fly-out work culture; the challenging nature of mining work; and the harsh climatic conditions, when combined, place unique pressures on the region's population. The anticipated growth in industry investment and population growth, associated with the Pilbara Cities vision, will lead to increasing demand for services.

The Pilbara Mental Health and Drug Service provides a regional service with base operations located in Port Hedland, Karratha, Newman and Tom Price with all other towns and communities being serviced on a regular visiting basis.

The increasing incidence of drug (particularly amphetamine) use and alcohol abuse has led to significant increases in inpatient numbers (and those presenting with mental health issues) over the past two-years. This is placing increasing demands on emergency departments and inpatient areas that are not adequately set up to manage such patients.

A new 14-bed Mental Health Unit is being constructed in Broome to provide acute mental health inpatient care to both the Kimberley and Pilbara regions.

### Emergency services

The WA Police and the Fire and Emergency Services Authority (FESA) work together with WA Country Health Services, the Royal Flying Doctor Service and St John Ambulance to coordinate emergency management responses across the Pilbara. This is largely coordinated through the Local Emergency Management Committee. As industry expansion draws more resident and transient populations to the region, there will be a clear need to expand existing capacity and integrate emergency services. Given the remoteness of population settlements and industry activity in the Pilbara, the provision of responsive and reliable emergency medical transport is a critical factor to ensuring a comprehensive emergency service response.

**Table 5.1. Future GP and dentist requirements by local government area**

Service hub	Current hub service population	Future hub resident population	Existing provision		Future provision	
			GPs	Dentists	GPs	Dentists
Town of Port Hedland	19 000	50 000	8	1	42	13
Shire of Roebourne	18 700	50 000	10	3	42	13
Shire of East Pilbara	6 000	15 000	3	0	13	4
Shire of Ashburton	3 190	5 500	3	0	5	1

Source: Department of Health (2010); Department of Planning (2010)

Note: Existing provision excludes FIFO practitioners. Future provision is based on national population : practitioner ratios.

The Royal Flying Doctor Service currently is based at Port Hedland (two aircraft, five medical officers, five pilots, seven flight nurses and one base administrator). Key issues faced by the service are:

- increasing numbers of Pilbara patients (mainly Hedland and Karratha) that require transport to Perth for tertiary medical care ; and
- planning for an anticipated 3-5 per cent increase in demand for its services and consideration to relocate service aircraft and crew in Karratha to cope with the significant population build-up in the West Pilbara.

St John Ambulance operates a volunteer service coordinated by a full-time community paramedic. Funding was provided in the 2010/2011 State Budget for ambulances in Marble Bar and Nullagine.

### Aboriginal health

Aboriginal communities face particular challenges to improving health outcomes as identified in the Federal government initiated 'Close the Gap' campaign. This campaign commits to closing the life expectancy gap between Aboriginal and non-Aboriginal Australians within a generation. The burden of disease incurred in Aboriginal populations remains significantly higher than for non-Aboriginal populations. The WA Country Health Service's Strategic Plan (2009a) 'Revitalising Country Health Service 2009-2012' identifies the need to improve services to Aboriginal communities and boosting Aboriginal employment opportunities, as key strategies to improving Aboriginal health outcomes.

### Approach to health service delivery

The key elements of effective health service delivery in the Pilbara are built around:

- strategic co-location of services in accessible locations around major population settlements, as well as providing access to services for residents in more remote locations;
- providing opportunities for private health sector providers to supplement public health services;
- strong emphasis on preventative health care and health promotion;
- building partnerships with external stakeholders, including industry and local and State government departments to address external factors. These influence the delivery of health services such as: provision of housing for medical personnel,

improving transport networks to access remote communities; and improving telecommunications to support greater use of telehealth and e-health capabilities; and

- implementation of appropriate e-health technology across all sites to interconnect Pilbara health services with each other and with Perth.

### Service hub future needs

The demographic and health profile of populations in the Pilbara points to some important considerations for health planning. These include:

- the relative youth of populations (the Pilbara has a higher proportion of people aged 0-14 and 25-44 years);
- lower proportion of people aged 45 years and over compared to the WA-wide profile;
- significant Aboriginal populations with more than 31 Aboriginal cultural and language groups;
- the remoteness of many settlements;
- the paucity and quality of transport routes for general public use; and
- extreme climatic conditions.

Future needs relate directly to the expected expansion of economic activity. The realisation of the Pilbara Cities vision will bring greater numbers and concentration of people to the Pilbara. This will place increasing demands on existing health infrastructure and services which will require careful forward planning by the Department of Health, in terms of infrastructure and human resource provision to meet future servicing demands.

While improving health infrastructure will be a priority for the region as increases in industry activity and populations occur in the Pilbara (Table 5.2), other important considerations will help health services meet growing demand for services. These include: greater use and investment in information technology to help provide telehealth services to overcome distance and human resource constraints; careful planning to locate health services to match settlement patterns in the Pilbara; building the capacity of Aboriginal health services by increasing the recruitment and retention of Aboriginal people as health service providers; and increasing the provision of and collaboration with private health care providers.



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**Table 5.2. Service hub future hospital needs**

Service hub	Current hub service population	Future hub resident population	Current facility upgrades	Future facility upgrades
Port Hedland	19 000	50 000	New Regional Health Campus completed	Expand Hedland Health Campus
Nickol Bay	18 700	50 000	Service planning completed business case underway	Major redevelopment for new Karratha Health Campus proposed
Newman	6 000	15 000	Service planning completed	Major redevelopment proposed
Tom Price	2 720	3 000	Service planning completed	Major redevelopment proposed
Onslow	570	2 500	Service planning nearing completion	Major redevelopment proposed

Source: Department of Health (2010)

Note: Nickol Bay Service Hub includes the settlements of Karratha, Dampier, Roebourne, Wickham, Point Samson and Cossack. The Port Hedland hub includes both Port Hedland and South Hedland.

A key further need is adequate supply of quality housing to attract and retain staff and visiting specialists to the Pilbara. There is also a recognised need on the part of WA Country Health Service, as identified in the 2009/2010 Operational Plan (WACHS, 2009b), to link alcohol, drug and mental health services and strengthen prevention and mental health promotion.

### 5.3 Education

The Pilbara currently has 39 schools attended by more than 9000 students and 600 staff. This includes a camp school in Dampier and a School of the Air in Port Hedland. Education services in the region are clustered in school networks comprising:

- Karratha network – this includes Karratha Senior High School and St Luke's College (both offering Years 8-12); Roebourne District High School; a number of public primary schools; and one Catholic primary school.
- Port Hedland network – this includes Hedland Senior High School; Pindan College (for 15, 16 and 17 year olds); a number of public primary schools; one Catholic primary school; remote public schools in the communities of Yandeyarra and Marble Bar; and independent community schools in Strelley and Warralong.

- Newman network – this includes Newman Senior High School; a number of public primary schools; remote public schools in the communities of Jigalong and Nullagine; and independent community schools in Punmu and Kunawarritji (RAWA) and Parnngurr.
- Tom Price network – Tom Price Senior High School and a number of public primary schools.

The settlements of Onslow, Pannawonica, Marble Bar, and Nullagine have combined primary and secondary schools.

The Pilbara Institute (formerly Pilbara TAFE) has a main campus in Karratha and satellite campuses in South Hedland (South Hedland and Pundulmurra campuses), Newman, Roebourne, Tom Price, Onslow, Pannawonica, Paraburdoo and the Wintamurra Training Centre at Jigalong.

The Pilbara's student population profile shows a general growth in primary school enrolments but a decline in secondary school enrolments. The retention of high school-age students is a significant issue for the region and is a function of remoteness and low threshold numbers to sustain appropriate high school facilities and curricula. As a consequence, education in Perth and other southern towns is considered by many to be superior to that received in the Pilbara. However, in many cases there is no option other than to send high school-aged children away for schooling.

As with other services, staffing and associated housing is a major constraint in the delivery of education services in the region. There is a need to include residences for teaching and support staff, as well as students in education precincts.

A number of infrastructure improvement initiatives are currently being funded presently under the Royalties for Regions program (DRDL, 2011b), with industry support to improve existing infrastructure. The Hedland Senior High School is receiving funding for an extensive upgrade, including the adjoining Hardy House. The Karratha Leisure Centre will receive funding to assist with the building of a community and sporting precinct, in association with the second stage of the Karratha Senior High School project.

The development of an education precinct at the site of the Karratha Pilbara Institute campus, represents a collaborative partnership between Karratha Senior High School, Pilbara Institute, Curtin University of Technology and Pindan College. It is anticipated that this will offer a higher threshold of secondary and tertiary education to the residents of the Nickol Bay area. A new secondary school is being built on the site and was partly in operation during 2010 for Year 11 and 12 students. The remaining students from the existing high school should be relocated to the new campus by 2012.

### Service hub future needs

The key objectives for education in the Pilbara are:

- to offer a choice of education services across public and private sector providers;
- continue the improvement and upgrade of education facilities; and
- ensure the early and timely planning for new education infrastructure to support projected population growth under the Pilbara Cities vision.

Consideration will also need to be given to providing professional and material support, such as provision of quality housing for teaching and support staff to ensure quality educators and administrators are attracted to and retained in the Pilbara.

The Department of Education has well-structured criteria to inform decision-making about building new schools or expanding existing facilities. It is anticipated that increased future demand for education facilities, in the short to medium-term,

will generally be met by augmenting existing school facilities, with demountable classrooms and associated structures. However, in the longer-term, with significant population increases anticipated in Karratha, Port Hedland and Newman, in particular, there will be a need for a significant number of new schools.

Table 5.3 provides a projection of future school infrastructure needs based on Department of Planning and Department of Education school to population ratios anticipated under Pilbara Cities population growth scenarios. To ensure that demographic changes are closely monitored and that there is flexibility in the committal of funds and liaison between the relevant agencies will be needed.

The Department of Education, in conjunction with Independent and Catholic Education, has articulated a plan to revitalise education in the Pilbara, through active participation in a Pilbara Development Commission Education Opportunities Study. Funding support for future initiatives will be sought through the Education Department budget, Royalties for Regions and industry. The plan comprises the following elements:

- 1 Giving students the skills and opportunities to excel:** Aims to lift the performance of students in all aspects of education, particularly in literacy and numeracy. State numeracy and literacy results show a large discrepancy between the achievements of students in Pilbara schools and achievements of students across the rest of Western Australia. To improve the education outcomes of students, a concerted effort across four key areas is required: gifted and talented students; senior secondary schooling; a focus on Aboriginal Education; and industry links. Scholarships for gifted and talented students; initiatives to provide students with support in senior secondary years, such as specialist coaches and staff delivering intensive programs, sister school opportunities, use of online curriculum delivery; and industry and work experience opportunities to broaden employment horizons are being considered.
- 2 Ensuring schools have excellent and committed teaching staff:** Staffing schools in the Pilbara remains one of the most difficult issues facing education. Attracting and retaining experienced high quality educators and support staff is vital in

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building an outstanding education system which is sustainable. Providing high quality housing is essential in attracting quality educators and support staff to live and work in the Pilbara. Housing demands will increase as population numbers and service demands grow under the Pilbara Cities vision. Demand will also increase as the change in kindergarten from 11 to 15 hours a week is phased in and the requirement for trained teachers in all settings with young children is established.

Initiatives will be developed to support staff. School networks will be established and supported with flexible funding and curriculum opportunities to better meet the educational needs of their local communities. Professional networking and shared professional learning opportunities will be developed to build localised expertise, teaching and learning resources and support. Identified network principals will support, liaise and advocate where needed to ensure on going support through regional office and professional learning providers.

### **3 Teaching and learning in high quality facilities:**

Already considerable work is being progressed on the Karratha Education and Training Precinct. The exploration through Country Hostels Association of a new 60 bed residential hostel

could supplement the precinct in the future for Karratha for children attending public and Catholic schools.

Boarding opportunities cater for students that come from remote pastoral leases and Aboriginal communities. This may help mitigate the trend of children being sent to Perth for further education and retain students in the Pilbara which will help build a critical mass and in turn, encourage further education investment and the attraction of quality teachers to the region.

### **4 Empowering Communities:**

Promotion of school autonomy ensures schools have the capacity to be contextually responsive to the needs of their local communities. School networks will continue to build autonomous decision making at the local level and use individual school and collective network resources to better cater for the educational needs of students at the local school level.

Opportunities for schools to identify as Independent Public Schools in the future will allow local communities to directly influence the educational direction, provision and flexibility of agendas through school planning and school council processes. Building stronger school community and network school links will ensure education in the Pilbara is responsive to contextual needs.

## **Tertiary education and training**

The current network of post-compulsory education and training services in colleges and campuses appears sufficient for the short to mid-term. More importantly, the services and partnerships offered through these facilities have both the potential and sometimes the need to change.

Tertiary, vocational education and training services have been well-established in the region, with a long history of community campuses forming the basis of the present Pilbara Institute network.

Ongoing global-scale development projects present opportunities for a wider range of courses and more participants. Focussing only on the industry-led trade and training needs, service agreements and partnerships should be expected.



### Pilbara Institute (formerly Pilbara TAFE)

The Pilbara Institute has developed a five year infrastructure plan to respond to the region's anticipated growth. The plan addresses the expected growth in apprenticeship and trainee numbers; school leavers taking up diploma and advanced diploma options; as well as training for existing workers in skills development areas. The plan's initiatives include:

- provision of an industrial skills centre at the Karratha campus;
- provision of training workshop at the Newman campus;
- upgrade and refit of the South Hedland campus;
- development of a health training centre;
- installation of an electrical and instrumentation centre;
- provision of a mechanical engineering training centre in Karratha; and
- upgrade of the Pundulmurra campus.

### Potential university sub-campus

Currently, there are continuing shifts in the strategies for provision of university education. The previous Commonwealth-supported regional models have mixed results in Western Australia, as few regional centres have population sizes of those on the east coast.

The Pilbara's tertiary education needs require clear definition before planning for regional-based and/or seamless transitions between the Pilbara Institute and university courses. There are precedents in regional Australia, however, strong emphasis should be placed on tailoring the service to meet the Pilbara's specific requirements.

Consideration needs be given to encouraging expanding access to university education in the Pilbara, particularly courses tailored to industry needs. Options may include establishing or relocating a satellite campus (such as Curtin

**Table 5.3. Pilbara education facilities: existing and potential**

Settlement	Primary schools		Senior high schools		District high schools		TAFE campuses	
	Existing	Future	Existing	Future	Existing	Future	Existing	Future
Karratha-Dampier	6	15	2	4	0	0	1	1
Port Hedland	5	15	1	4	0	0	2	2
Newman	2	4	1	1	0	0	1	1
Tom Price	2	2	1	1	0	0	1	1
Onslow	0	0	0	0	1	1	1	1
Wickham	1	1	0	1	0	0	0	0
Paraburdoo	1	1	0	0	0	0	1	1
Roebourne	0	0	0	0	1	1	1	1
Pannawonica	0	0	0	0	1	0	1	0
Point Samson	0	0	0	0	0	0	0	0
Marble Bar	0	0	0	0	1	1	0	0
Nullagine	0	0	0	0	1	1	0	0
<b>Total</b>	<b>17</b>	<b>38</b>	<b>5</b>	<b>11</b>	<b>5</b>	<b>4</b>	<b>9</b>	<b>8</b>

Source: Department of Education (2010); Department of Planning (2010)

Note 1: the Department of Planning has calculated the number of additional education facilities using population : facility ratios.

Note 2: Does not include remote and independent community schools.



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University's School of Mines based in Kalgoorlie); co-locating a campus within existing Pilbara Institute infrastructure; partnering with industry to fund a greenfields campus; and investigating new remote learning modalities and accrediting completion of industry safety programs towards formal degree qualifications. A satellite campus could play a catalytic role in fostering economic diversification opportunities in the region by providing skills and training technology and technical expertise to support the development of new industries and economic opportunities under the economic development models outlined in Section 3.

### 5.4 Recreation

The region is highly dependent on outdoor sporting and recreation activities. Due to the climate, water plays an important role in recreation facility provision – the coast and swimming pools. For example,

the Pilbara has six 50 metre swimming pools for a population that would normally justify one. Popular coastal activities include recreational fishing and diving facilitated by boat ramps in all the major coastal settlements. The popularity of coastal marine recreation is demonstrated by the Pilbara having some of the highest recreational boat ownership in Australia. Furthermore, four-wheel driving and motorbike-related outdoor activities are popular in the Pilbara, especially in inland towns.

Each town has a well-equipped and maintained sports field complex that are irrigated and well lit for evening use. In the past, the establishment of high-quality sports and recreation facilities by the resource companies was considered essential in attracting and retaining workforce and families. The region's major recreation assets are summarised in Table 5.4.

**Table 5.4. Major recreation facilities in Pilbara towns**

Settlement	Indoor sports complex	Fully lit ovals	Swimming pools		Marine facilities	
			50m	25m	Boat harbour	Boat ramp
Karratha-Dampier	1	5	1	-	1	12
Port Hedland	1	3	2	-	1	4
Newman	1	2	1	-	-	-
Tom Price	1	1	1	-	-	-
Onslow	1	1	-	-	1	3
Wickham-Cossack	-	1	-	1	1	2
Paraburdoo	-	1	1	-	-	-
Roebourne	-	1	-	1	-	-
Pannawonica	-	1	-	1	-	-
Point Samson	-	-	-	-	1	2
Marble Bar	-	1	-	1	-	-
Nullagine	-	-	-	-	-	-
Rural Pilbara	-	-	-	2	-	5
<b>Total</b>	<b>5</b>	<b>17</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>28</b>

Source: Pilbara local governments (2010); Department of Planning (2010)

Note: Karratha-Dampier includes the Burrup Peninsula



A number of recent and current initiatives have been funded under Royalties for Regions to improve and increase the number of recreation facilities in the Pilbara. Some of these initiatives include:

- construction of a multi-purpose indoor sporting and emergency evacuation centre in Onslow;
- upgrading of the lighting, training and social amenities of the Bulgarra Sporting Precinct in Karratha as well as a traffic management study to inform the design of vehicle parking for Bulgarra Oval;
- construction of the Karratha Youth and Families Space to provide an area for meeting and recreation for Karratha families and youth;
- rejuvenation of the existing JD Hardie Centre in Port Hedland to produce an expanded and multi-functional youth precinct. The redevelopment will become a modern indoor recreational facility;
- development of Marquee Park in South Hedland to construct a Level 1 district park offering high quality social and recreational opportunities to the community;
- construction of a multi-purpose sport and recreation facility in Port Hedland, which will create a focal point for organised recreational activity facilitating social interaction and provide a venue for elite indoor sport;
- construction of a new sports pavilion complex, refurbishment of the civic centre and upgrading of the outdoor courts and oval as part of the Tom Price Sporting Precinct;

- extension of Cemetery Beach Community Park in Port Hedland and provision of additional facilities;
- rejuvenation of Catrall Park in Karratha to provide a garden space for the community; and
- construction of a new community facility at the South Hedland Bowling and Tennis Club site.

### Service hub future needs

There is a priority need to provide adequate recreation opportunities by:

- taking into account the challenging climatic conditions and anticipated growth in population numbers with the emphasis on youth and family-orientated recreation options, such as: water-based recreation activities (ocean or pool); evening use of recreation facilities particularly in the summer months; and ensuring inclusion of open space/parks in the design of new housing settlements;
- expanding and diversifying the current level of recreation facility provision within the region's towns and population centres such as: motor sport facilities; race courses; and specialist sports facilities (ie. athletics facilities and synthetic hockey fields);
- providing and maintaining competition standard facilities in the region's major centres to encourage families to stay in the region for long periods; and
- exploring recreation needs in relation to tourism.

### 5.5 Community safety and support

#### Community safety

**Police services:** The Pilbara's law enforcement services are managed from the Karratha-based Pilbara District Police Complex – a recently completed facility that includes a courthouse and juvenile justice centre. There are 14 police stations and eight courthouses in the region (Table 5.5). Because of the large size of the Pilbara and the itinerant nature of much of its population, there is a relatively large police presence with some 178 sworn officers.

**Closed Circuit Television:** A Closed Circuit Television (CCTV) surveillance network is being provided in South and Port Hedland and Karratha through Royalties for Regions and industry funding to address crime and public safety issues. The networks are owned and operated by the respective local governments. Consideration should be given as

settlement populations grow to establishing and expanding CCTV surveillance networks in other large population areas to assist with improving public safety.

**Legal services:** There are presently no private or commercial legal practices operating in the Pilbara. Legal services are presently provided on a fly-in fly-out basis from Perth. There is significant demand for such services on this basis. A business opportunity exists to establish a private legal service to service the Pilbara region.

The Pilbara Community Legal Service operates as a community service from a main office in South Hedland with branch offices in Karratha, Newman and Roebourne. The service, as a community service provider, faces constraints and challenges typical to non-government organisations operating in the Pilbara. These are discussed in detail under Community Support.

**Table 5.5. Pilbara police stations and courthouses**

Settlement	Station status	Courthouse	Sworn officers
Dampier	Station	-	4
Karratha	New complex (24 hour)	Courthouse	51
Marble Bar	Station	Courthouse	3
Newman	New station	Courthouse	19
Nullagine	Station	Courthouse	3
Onslow	Station	Courthouse	5
Pannawonica	Station	in station	2
Paraburdoo	Station	in station	2
Port Hedland	Station	-	4
South Hedland	New station (24 hour)	Courthouse	54
Roebourne	Station	Courthouse	11
Tom Price	Station	Courthouse	7
Wickham	Station	-	4
Jigalong	Station	in station	2

Source: WA Police - Karratha District Office (2011)

Note: excludes Water Police (5) and Police Airwing (2)

### Roebourne Regional Prison

Located between Roebourne and Wickham, the Roebourne Regional Prison was opened in 1984. The prison manages male and female prisoners with minimum, medium and high security (short-term) status levels. The prison has a design capacity for 116 prisoners, with a work camp capacity of eight. The prison's catchment covers much of the Pilbara and Kimberly regions and manages a high proportion of Aboriginal prisoners. The prison also manages the Millstream work camp. The urban expansion in the Pilbara will require a significant expansion of this facility or the development of additional prison capacity.

### Service hub future needs

It is anticipated that the new police facilities in Karratha Port Hedland and Newman will ensure adequate community policing for the short to medium-term. In the longer-term, however, these facilities will require further upgrading and expansion. The older facilities at Tom Price and Onslow may need to be upgraded or replaced in the medium to long-term (Table 5.6).

There is a priority need to maintain community safety by:

- planning and designing neighbourhoods that are 'safe' through improved lighting, public education campaigns and urban beautification;

- allocating suitably located sites for police stations and courthouses; and
- establishing and expanding CCTV surveillance networks.

### Community support

The key issues around community support service needs in the Pilbara relate to: availability of accommodation/housing affordability; recruitment and retention of staff; and funding support in the context of the additional costs of operation in the Pilbara. The most significant community support service needed in the Pilbara is childcare.

Recent investments in expanding childcare places by government and industry has taken immediate pressure off provision of childcare places. Future planning will need to be carefully evaluated to ensure childcare facilities are planned to meet growing demand as childcare availability will have a major influence in attracting and retaining skilled workers and their families.

**Childcare:** Childcare places are highly valued by industry and the community. Childcare allows the primary care giver the opportunity to rejoin the workforce thus increasing the size of the local labour force without the need for additional housing. Family daycare is a recognised alternative to long daycare providing families with the opportunity to have their children participate in an early childhood and care program in small groups in a home environment.

**Table 5.6. Service hub community safety: current facilities and future requirements**

Service hub	Current hub population	Future hub population	Current facility upgrades	Future facility needs
Port Hedland	19 000	50 000	New police station	Expanded complex
Nickol Bay	18 700	50 000	New district police complex	Expanded complex
Newman	6 000	15 000	New police station	Upgraded police station
Tom Price	2 720	3 000	Minor upgrades	New police station
Onslow	570	2 500	Minor upgrades	New police station

Source: various infrastructure providers (2010)

Note: Nickol Bay Service Hub includes the settlements of Karratha, Dampier, Roebourne, Wickham, Point Samson and Cossack. The Port Hedland hub includes both Port Hedland and South Hedland.



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There has been considerable work in recent years to increase the number of family daycare service providers in the region. For example the Pilbara Development Commission's Kids Matter Family Daycare Program, which ran between 2006 to 2009, resulted in a significant increase in the number of licenced home-based, family daycare services and as a result the number of available childcare places.

Family daycare has the flexibility to provide a range of care options from early morning and before and after school through to overnight care for shiftworkers. Additionally recent shortages of childcare facilities have been addressed through government and industry support for new centres in Port Hedland, Karratha and Newman, as well as planned upgrading of child care centres in Dampier and Paraburdoo.

There is a growing emphasis on childcare as a form of early childhood learning rather than childminding. This has the effect of elevating carer standards in a low wage employment sector. Since staffing and associated affordable housing are major constraints on the delivery of childcare services in the Pilbara the attainment of the required levels of childcare will need to be carefully monitored and planned to achieve under the aspirational Pilbara Cities growth scenario. Opportunities to further increase the number of family daycare service providers across the region needs to be considered in the planning process.

**Non-government organisations:** The Pilbara Association of Non-Government Organisations (PANGO) represents the majority of not for profit community service organisations in the Pilbara. PANGO members provide a range of community services for the residents of the Pilbara that include: support to youth; homelessness; people with disabilities; older Australians and other groups that require housing; in-home care; counselling; drug and alcohol rehabilitation; refuge from domestic violence; and a range of other health and welfare support. Pilbara non-government organisations tend to operate out the major regional centres – Karratha Port Hedland, Newman and Tom Price – with some located in other towns and settlements. The sector employs over 400 people across the region.

In a November 2009 submission to the Australian Productivity Commission on the contribution of the not for profit sector to the Australian economy, PANGO identified key constraints on effective service delivery as being:

- the high cost of office and residential accommodation for community service organisations and workers;
- attraction and retention of skilled personnel;
- barriers to effective communication across the Pilbara, including: inadequate internet connectivity and facilities; limited air connection between the towns in the region; and the high price of airfares;
- the higher transaction costs of providing services in the Pilbara; and
- maintaining and increasing external funding sources.

**Table 5.7. Service hub future childcare: current capacity and future requirements**

Service hub	Current hub population	Future hub population	Current childcare places		Future childcare places	
			Long day	Occasional	Long day	Occasional
Port Hedland	19 000	50 000	179	0	550	90
Nickol Bay	18 700	50 000	135	35	650	100
Newman	6 000	15 000	33	26	160	30
Tom Price	2 720	3 000	36	0	40	5
Onslow	570	2 500	0	0	30	5

Source: Department of Planning (2010)

Note: Nickol Bay Service Hub includes the settlements of Karratha, Dampier, Roebourne, Wickham, Point Samson and Cossack. The Port Hedland hub includes both Port Hedland and South Hedland.

With the anticipated growth in both transient and residential population numbers there will be increasing demand for the services of community sector organisations. This will add pressure to the financial and human resource capacity of non-government organisations to maintain and expand their service provision.

### Service hub future needs

Key future needs in the community service sector are underpinned by the need to provide affordable office and residential accommodation to service provider organisations and sector employees. Expansion of services will be dependent on resolving the issue of accommodation and thus attraction and retention of personnel. The expansion of childcare services and places, in line with a growing population and changing demographic profile, is also an issue.

On the basis of the current overall ratio of long day and occasional care places to residents the potential demand for these services is summarised in Table 5.7. In the provision of future childcare facilities, it is important that:

- childcare facilities are located close to residences or workplaces; and
- residential accommodation is permitted in association with childcare facilities.

### 5.6 Culture and entertainment

Cultural and entertainment facilities are currently limited in the region. There are theatres in Karratha and Port Hedland and there was a cinema complex in Karratha which closed in 2009 due to the lack of patronage. Port Hedland, has the Don Rhodes Mining Museum and Dalgety House Museum, which presents a historical account of the impacts of European settlement on the Pilbara. There is one public art gallery and one private art gallery in Port Hedland. Newman houses the Marti Milli Art Centre and a new facility is being built in Roebourne to accommodate the Roebourne Arts Group.

The provision of cultural and entertainment facilities is important in attracting and retaining resident population. These may need to be provided, despite low population thresholds, to enhance the liveability of the region and make it more attractive to visitors.

Under the Karratha City of the North Plan it is intended to develop an entertainment precinct to enhance the vitality and vibrancy of the city centre. Restaurants, cafes, cinemas, nightclubs, bars, theatre and amusement facilities are planned. The entertainment precinct will be located in the heart of the centre of the city surrounding the proposed town square. It is envisaged that the scheme will be amended in the future to allow for the city centre to extend to the north. This will allow for an entertainment precinct to capitalise on the views over Nickol Bay to the Burrup Peninsula.

**Table 5.8. Service hub cultural facilities: current capacity and future requirements**

Service hub	Current hub population	Future hub population	Current facilities		Future facilities	
			Theatre	Cinema	Theatre	Cinema
Port Hedland	19 000	50 000	1	0	2	1
Nickol Bay	18 700	50 000	1	0	2	1
Newman	6 000	15 000	0	0	1	1
Tom Price	2 720	3 000	0	0	0	0
Onslow	570	2 500	0	0	0	0

Source: Pilbara local governments (2010); Department of Planning (2010)

Note 1: the Department of Planning has calculated the number of additional cultural facilities using population : facility ratios

Note 2: Nickol Bay Service Hub includes the settlements of Karratha, Dampier, Roebourne, Wickham, Point Samson and Cossack. The Port Hedland hub includes both Port Hedland and South Hedland.

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There is an opportunity to develop the Pilbara's unique cultural and natural heritage particularly in relation to Aboriginal culture as key tourist attractions. Some of these issues are discussed in more detail in sections 8 and 9 of the Framework.

The Pilbara Development Commission is keen to explore the potential of culture and the arts in supporting new economic activities and attracting tourism to the Pilbara. Funded by Royalties for Regions, a state-of-the-art, 140 seat cultural amphitheatre is planned to be built at Karijini Eco Retreat located in the Karijini National Park. Consideration should be given to supporting the Development Commission in undertaking a study on culture and the arts that could form the basis for developing new economic opportunities and marketing strategies to attract greater numbers of domestic and international tourists to the Pilbara.

### Service hub future needs

The anticipated growth of Karratha and Port Hedland with an associated change in their demographic profiles would support additional theatres, galleries, cinemas and other cultural and entertainment facilities. The potential future provision is indicated in Table 5.8.

## 5.7 Civic facilities

Significant civic facilities in the region's prime service hubs include civic centres and libraries. New facilities funded under Royalties for Regions include a new library and community facilities in South Hedland.

### Service hub future needs

With the planned expansion of Karratha and redevelopment of the town centre it is anticipated that the shire offices would be relocated to a more prominent location in the centre. Similarly the Port Hedland council offices may be relocated to South Hedland, where the majority of the population lives. In both Karratha and Port Hedland there may be a need for a secondary civic centre and expanded library facilities. The growth of Newman would justify an upgraded civic centre located within the revitalised town centre. As part of the revitalisation of the Tom Price town centre the Shire of Ashburton offices would be relocated to the town centre. With the anticipated expansion of Onslow the existing civic centre would need to be relocated and expanded (Table 5.9).

## 5.8 Government administration and services

Historically, government regional office headquarters have tended to be located in either Port Hedland or Karratha in an attempt to maintain a degree of service equality. Key shopfront government services, include: the Commonwealth agencies of Medicare and Centrelink; and the State agencies of: Community and Juvenile Justice; Department of Child Protection; Department of Housing; Department of Planning; Department of Transport - Licensing; and Aboriginal Legal Services. In addition to these regional centres, a range of other services are available in some of the other towns, for instance: telecentres, Australia Post and Centrelink. With the growth of the Pilbara's population there will be a need to expand all Commonwealth and State government services in the region.

**Table 5.9. Service hub civic facilities: current capacity and future requirements**

Service hub	Current hub population	Future hub population	Current facilities		Future facilities	
			Civic centre	Library	Civic centre	Library
Port Hedland	19 000	50 000	1	2	2	2
Nickol Bay	18 700	50 000	1	4	2	4
Newman	6 000	15 000	1	1	1	1
Tom Price	2 720	3 000	1	1	1	1
Onslow	570	2 500	1	1	1	1

Note: Nickol Bay Service Hub includes the settlements of Karratha, Dampier, Roebourne, Wickham, Point Samson and Cossack. The Port Hedland hub includes both Port Hedland and South Hedland.

## Map 12: Community infrastructure

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# Pilbara

## planning and infrastructure framework

### 5.9 Community infrastructure priorities

The issues and priorities associated with planning for community infrastructure are detailed in Table 5.10. These will be addressed in more detail in Section 5.10, which outlines specific objectives and actions. These will form the basis for the Pilbara Infrastructure Implementation Plan.

#### Health

Improving the range and availability of health services is a key feature of the Pilbara Cities initiative. High-quality, functional and accessible health services are essential to meet the health needs of the rapidly growing coastal Pilbara population. These are critical to supporting regional development. Investment in improved health services would also support and encourage continued investment by major industry in the Pilbara.

Following the development of the Port Hedland regional hospital the main health focus over the next five years will be the construction of the Karratha

Health Campus (Nickol Bay Hospital) in Karratha. A second priority is the development of medical staff housing on or near health campuses across the Pilbara.

Ensuring health services are provided to remote Aboriginal communities through local health clinics is also a key infrastructure need.

Improving access to health care services for residents across the Pilbara is a fundamental objective for WA Country Health Service. The lack of public transport and significant distances to deliver and access services impacts on the frequency, cost and outcomes of health care.

Access can also be enhanced via improvements in information technologies and the application of e-health initiatives, as well as improved emergency response times and retrieval capabilities.

#### Education

Improving and expanding the quality and choice of services of both public and private school facilities and attracting and retaining quality educators and administrators through providing suitable accommodation and professional support and development options will be a key focus of investment in education in the Pilbara over the short to medium-term. Improving infrastructure and planning for future population growth also remains key with the main education focus for the West Pilbara being the development of the Karratha High School and the Pilbara Institute along with planned upgrades and expansion of other education facilities.

#### Recreation

In addition to the proposed marinas at Dampier and Port Hedland, the recreation focus will be the development of an aquatic complex as part of the Karratha Leisure Centre Precinct and the development of a multi-purpose recreation facility and Marquee Park at South Hedland.

Expanding and diversifying the current level of recreation facility provision within the region's towns and population centres. Provision for passive open space and public parks in new settlement developments will need to be considered.



**Table 5.10. Community infrastructure priorities – 2015**

Infrastructure	Priorities
Health	<ul style="list-style-type: none"> <li>• Commission the Karratha Health campus.</li> <li>• Undertake major upgrades or replacement of all current state hospital and health clinic infrastructure.</li> <li>• Investment in state health workforce housing at regional centres and small hospital sites.</li> <li>• Provide short-term patient accommodation in regional centres.</li> <li>• Expand ambulatory care services and provide appropriate physical infrastructure to support the additional capacity.</li> <li>• Progress Aboriginal health initiatives consistent with 'Closing the Gap' and other local priorities, with associated investment in physical infrastructure to support the expanded services.</li> <li>• Provide investment/incentives for private or not-for-profit health sector expansion to meet future projected demand.</li> </ul>
Education	<ul style="list-style-type: none"> <li>• Undertake further development of the Karratha Education and Training Precinct (high school and Pilbara Institute).</li> <li>• Upgrade and expand Port Hedland High School.</li> <li>• Renew infrastructure at Roebourne District High School.</li> <li>• Expand Onslow Primary School to a District High School.</li> <li>• Provide educator and administrator housing across the Pilbara.</li> <li>• Provide boarding schools in Karratha and Port Hedland to cater for remote communities.</li> </ul>
Recreation	<ul style="list-style-type: none"> <li>• Construction of a marina in Dampier.</li> <li>• Construction of a marina in Port Hedland.</li> <li>• Development of a Karratha aquatic complex (part of Karratha Leisure Centre Precinct).</li> <li>• Construction of a multi-purpose recreation facility in Port Hedland.</li> <li>• Develop a swimming pool in Onslow.</li> <li>• Expand and diversify recreation facilities to include new sports and recreation opportunities.</li> <li>• Provision for passive open space and public parks in new settlement developments.</li> <li>• Consider recreation needs in light of tourism needs and expansion opportunities.</li> </ul>
Community support	<ul style="list-style-type: none"> <li>• Supply of office and residential accommodation for community service workers.</li> <li>• Expansion of childcare places to meet the demands of a growing population and changing demographic profile.</li> </ul>
Culture and entertainment	<ul style="list-style-type: none"> <li>• Development of Marquee Park in South Hedland.</li> <li>• Development of an entertainment precinct in Karratha under the Karratha City of the North Plan.</li> <li>• Identify opportunities for the development of culture, the arts and cultural tourism, including Aboriginal cultural facilities, across the Pilbara.</li> </ul>

### 5.10 Objectives and actions

Objectives	Actions
<b>5.1. General:</b>  <b>Provide a comprehensive range of accessible community, cultural, and recreational facilities and services commensurate with growing resident and fly-in fly-out population levels and taking into account the region's remoteness and the distance between its settlements.</b>	<ul style="list-style-type: none"> <li>a Undertake a 'whole-of-government' gap analysis to identify regional community infrastructure needs.</li> <li>b Prepare the Pilbara Infrastructure Implementation Plan for community infrastructure that includes an estimate for a 'whole-of-life' and 'whole-of-system' cost.</li> <li>c Ensure local planning strategies and local planning schemes incorporate suitable areas of land for community infrastructure.</li> <li>d Develop efficient methods of providing community services throughout the region, including public transport and e-communications.</li> <li>e Develop co-located multipurpose community facilities and services that can respond to changing and emerging community needs.</li> <li>f Provide for state, private or not-for-profit community service workforce housing in regional centres and major towns.</li> </ul>
<b>5.2. Health:</b>  <b>Provide a comprehensive range of accessible health services and support facilities.</b>	<ul style="list-style-type: none"> <li>a Undertake major upgrades of all current state hospital and health clinic infrastructure.</li> <li>b Commission the Karratha Health Campus.</li> <li>c Incorporate a community health service facility into the South Hedland Health Campus.</li> <li>d Expand ambulance services and provide appropriate physical infrastructure to support the additional capacity.</li> <li>e Progress Aboriginal health initiatives consistent with 'Closing the Gap' with associated investment in physical infrastructure to support the expanded services.</li> <li>f Provide investment/incentives for private or not-for-profit health sector expansion to meet future projected demand.</li> <li>g Provide for accommodation for short-stay patients and visitors at regional centres.</li> <li>h Expand existing population health services to include drug and alcohol counselling, mental health and general psychological services.</li> <li>i Invest in housing for health workers at regional centres and small hospital facilities.</li> </ul>
<b>5.3. Education:</b>  <b>Provide a comprehensive range of accessible education services and support facilities.</b>	<ul style="list-style-type: none"> <li>a Facilitate the development of the Karratha Education and Training Precinct (high school and Pilbara Institute).</li> <li>b Upgrade and expand Port Hedland High School, Roebourne District High School and Onslow Primary School (to a District High School).</li> <li>c Assess and identify training facility requirements to meet the needs of the growing population.</li> <li>d Undertake further evaluation of university sub-campus opportunities.</li> <li>e Provide for educator and administrator housing across the region.</li> <li>f Provide for boarding/hostel accommodation on, or close to, education campuses in Karratha and Port Hedland to cater for remote communities.</li> </ul>

Objectives	Actions
<b>5.4. Recreation:</b>  <b>Provide active and passive public open space and built facilities for formal and informal sport and recreation to enable community activity and healthier life styles.</b>	a Provide for adequate and well located areas of active and passive public open space in new urban developments. b Develop the Karratha Leisure Centre precinct. c Develop a swimming pool at Onslow. d Construct marinas at Port Hedland and Dampier. e Construct a multi-purpose recreation centre in Port Hedland.
<b>5.5. Entertainment and culture:</b>  <b>Provide a comprehensive range of entertainment and cultural facilities throughout the region.</b>	a Undertake a study of culture and the arts and cultural tourism opportunities in the region. b Develop an entertainment precinct in Karratha. c Develop Marquee Park in South Hedland.





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## 6 Transport infrastructure

### 6.1 Strategic direction

The Pilbara's transport infrastructure is largely a product of resource development, which had its genesis in the late 1960s. In order to extract minerals mining companies were required to provide a rail network, port infrastructure and airports. The State Government's main input to the region's transport infrastructure was the provision of roads.

The desired outcome for the Pilbara is for the development of an integrated, efficient and safe transport system that serves the needs of the community and industry. The system should provide a high degree of connectivity between the region's centres of economic activity, settlements and recreation nodes.

In the spirit of the Pilbara Cities vision, future transport infrastructure will largely be provided through partnership arrangements between the government and resource companies. It is important that transport infrastructure is a driver and facilitator of investment rather than a follower.

This section addresses the key transport modes of road, rail, marine and air (Map 13).

#### **Goal:**

*A transport system that provides safe, practical, affordable and equitable opportunities for intra-regional, intra-state, inter-state and international movement of people and goods.*

### 6.2 Road transport

The region's primary road system comprises:

- Great Northern Highway which is part of the 'National-Network'
- Karratha Tom Price Road (M65)
- Paraburdoo – Tom Price Road (M51)
- Karijini Drive (M62)
- Pannawonica Road (M50)
- Dampier Road (M46)

- Point Samson – Roebourne Road (M35)
- Burrup Peninsula Road (M9)
- Madigan Road (H55)
- Port Hedland Road (H51).

The key road transport challenges in the Pilbara are:

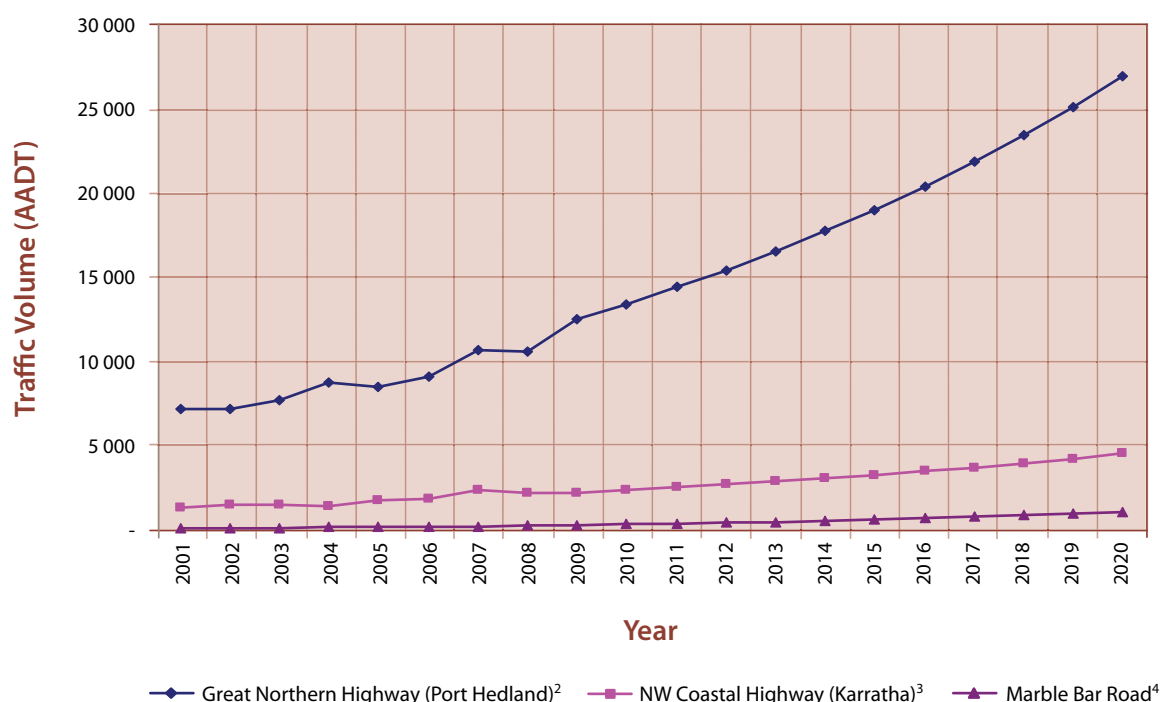
- growing pressure on the safety, efficiency and reliability of the regional road network caused by increases in overall traffic and conflict between regional resource/freight traffic and local traffic associated with townsites, particularly at peak periods;
- accommodating the predicted increase in road freight traffic;
- growing operational conflicts caused by the growth of pre-assembled, large module transport across the road network to service the needs of the resource sector;
- lack of funding for road maintenance and improvements;
- strategic issues concerning the connectivity of Pilbara towns;
- road provision still relies heavily on private investment to deliver maintenance and upgrades, usually over sections of road. Greater certainty around road funding priorities is considered essential.
- access to remote Aboriginal communities;
- reliability of the network due to flooding closures; and
- significant delays for road users at existing and future railway level crossings.

Anticipated growth in resource development, economic activity, population and tourism will generate a significant increase in transport demand, including heavy vehicle road freight. The mix of regional traffic, particularly heavy vehicles and local/tourist traffic, will potentially reduce safety and efficiency on the regional road network, as well as the amenity of the region's urban centres, if the increase in traffic is not managed appropriately.

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**Figure 6.1. Pilbara: historic and projected road traffic growth (2001-2020)<sup>1</sup>**



Source: Main Roads Western Australia (2010)

Note 1: Projections based on annual average compound growth rates (2001-2009)

Note 2: Great Northern Highway – north of Wallwork Road

Note 3: NW Coastal Highway – east of Dampier Highway

Note 4: Marble Bar Road – northern end east of Lalla Rooke Road

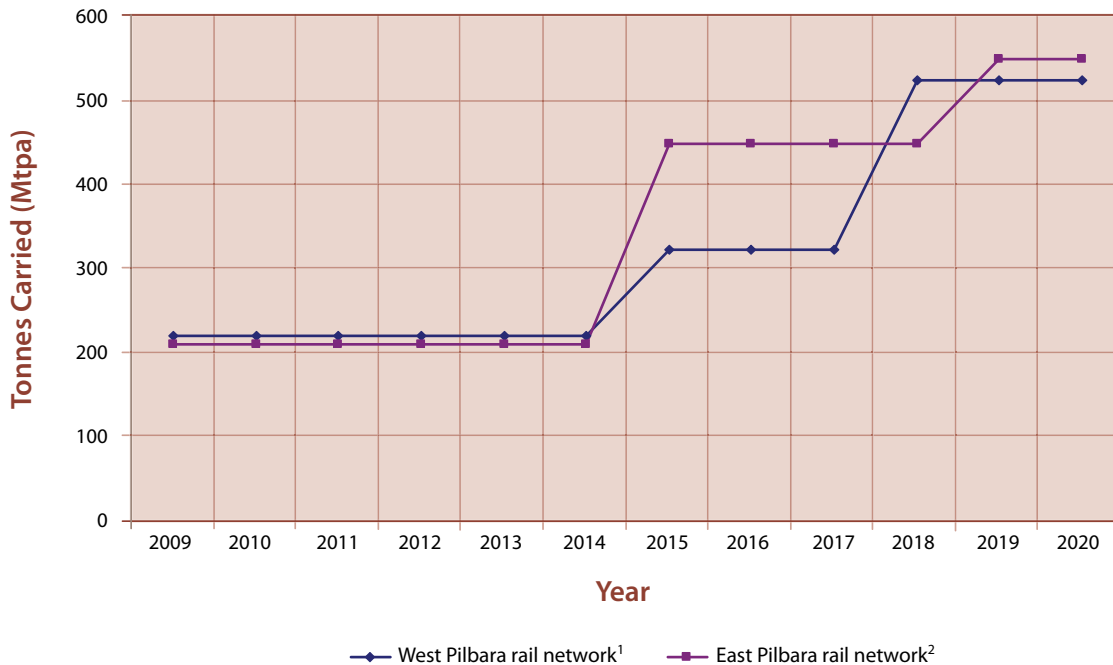
The potential increase in traffic on three of the region's major roads is indicated in Figure 6.1. These projections are based on the annual average compound growth between 2001 and 2009.

It is important to note that traffic growth is highly responsive to economic activity cycles, the development of major resource projects, urban growth and the development of recreational and tourist nodes. For instance, the development of the Anketell Strategic Industrial Area has the potential to significantly increase the traffic on the North West Coastal Highway between Roebourne and Karratha. A coastal road link is being investigated to provide a more direct connection between Anketell/Wickham and Karratha and to relieve the potential pressure on the North West Coastal Highway.

Strategies and initiatives to address these challenges include:

- achieving an appropriate road maintenance program and funding;
- maintaining road asset quality by targeted investment programs;
- implementing higher road geometry standards by adopting state wide requirements;
- taking a 'whole-of-government' approach to road planning and delivery;
- transport planning based on economic activity and population growth;
- road network assessment for 2035;
- providing access to remote communities;
- provision of grade separation at existing and future railway level crossings;
- investigation and implementation of flood mitigation measures at high risk areas on the network;

**Figure 6.2. Pilbara: rail traffic (Mtpa) projections (2009-2020)**



Source: Based on iron ore production projections from major resource companies - 2010

Note 1: West Pilbara network – Dampier, Cape Lambert and Anketell

Note 2: East Pilbara network – Port Hedland

- separation of all major roads and rail networks, particularly in townships, with high traffic volumes; and
- provision of sealed roads in the Karijini and Millstream National Parks.

### 6.3 Rail transport

The Pilbara is reputed to have the largest privately owned and operated rail network in the world. The region's existing three railway networks (operated by Rio Tinto, BHP Billiton and Fortescue Metals Group) are due to be augmented by two new railways (operated by Hancock and API/MCC). This new infrastructure will extend the region's mainline rail system from 1525 kilometres to approximately 2245 kilometres. These additional rail networks, together with planned duplications of existing networks, will result in a significant increase in iron ore tonnage carried to the region's ports: Port Hedland (East Pilbara), Dampier, Cape Lambert and Anketell (West Pilbara) (when constructed) as illustrated in Figure 6.2.

The key railway transport challenges in the Pilbara are:

- achieving multi-user access to railway infrastructure;
- unclear long-term railway capacity needs;
- preventing port access corridor bottlenecks; and
- reducing impacts on road traffic at grade crossings caused by more frequent and longer iron ore trains.

Strategies and initiatives to address these challenges include:

- monitoring demand for third party access to private company rail networks and determining the resultant impacts on the road network if access is denied;
- monitoring and evaluating future railway freight demand; and
- monitoring and evaluating conflicts at road-rail grade crossings.



### 6.4 Marine transport

The ports in the Pilbara handle tonnages far in excess of other ports in Australia and are significant globally, in terms of export bulk tonnages. Ports provide the vital link to international markets for exports. The region's ports are dominated by the export trade of commodities such as iron ore, liquid natural gas and solar salt. Currently, the region has three sea ports: Port Hedland, Dampier and Cape Lambert (Port Walcott). Detailed planning for three new Pilbara ports: Cape Preston, Ashburton North (west of Onslow) and Anketell (east of Karratha) currently is underway.

The capacity of ports to perform this function has come under greater scrutiny, as resource sector trade volumes have more than doubled over the past decade. Limitations around port access and capacity are a significant challenge in the Pilbara. Instead of just being a minerals export port, Port Hedland may be opened up to receive goods through the provision of general, bulk and freezer cargo/ container facilities.

There are a number of policy initiatives already taking place in this area, including the State Freight Management Plan and the WA Ports Review.

#### Dampier

Rio Tinto has recently completed its Port Upgrade Project at the Port of Dampier, which will increase its iron ore export capacity to 140 Mtpa. Woodside Energy has also commenced construction of its liquid natural gas plant with its first stage of dredging completed and the jetty under construction. While there are plans for additional berths, Dampier Port Authority forecasts that the port will experience severe congestion by 2014 mainly due to an increase in rig tender activity (Futures Direction International 2010). Strategic planning by the Dampier Port Authority caters for major expansions to its trade and a broadening of its function.

#### Port Hedland

The Port Hedland Port Authority has plans to construct eleven additional berths increasing its capacity to 470 Mtpa. BHP Billiton is completing its Rapid Growth Projects 5 and 6, which include further additional berths. The Department of Transport is undertaking a study for the development of a 400 Mtpa Outer Harbour off Finucane Island to meet demand for iron ore exports after 2014. A new 18 Mtpa multi-user facility at Utah Point was completed in late 2010 and Fortescue Metals Group (FMG), Hancock Prospecting and North West Iron Ore Alliance are planning other berth projects (Future Directions International 2010).

**Table 6.1. Pilbara ports current and potential capacity ('000 tpa)**

Port	Total throughput 2008/09	Total exports 2008/09	Total imports 2008/09	Potential capacity
Dampier	140 824	140 122	702	145 000
Port Hedland	159 391	158 382	1 009	488 000
Port Walcott	55 000	55 000	-	330 000
Anketell	-	-	-	350 000
Ashburton North	-	-	-	TBD
Cape Preston	-	-	-	150 000
<b>Total</b>	<b>355 215</b>	<b>353 504</b>	<b>1 711</b>	<b>1 463 000</b>

Source: Future Directions International (2010)

### Port Walcott

The Rio Tinto owned iron ore export terminal at Cape Lambert is the largest privately owned iron ore port in northern Western Australia. The port has undergone major extension works and now has the capacity to export 80 Mtpa (up from 55 Mtpa). Rio Tinto announced in July 2010 that it will increase its capacity at Port Walcott to 330 Mtpa by 2016 (Future Directions International, 2010).

### Cape Preston

The Sino Steel Project at Cape Preston owned and managed by Hong Kong based Citic Pacific Mining is currently under construction and is anticipated to commence operation in 2011. The supporting port facility will initially operate at a capacity of 28 Mtpa to be further expanded to 150 Mtpa.

### Ashburton North

The establishment of a hydrocarbon precinct at Ashburton North will require the construction of a port facility capable of exporting a range of possible products including liquid natural gas (LNG). The

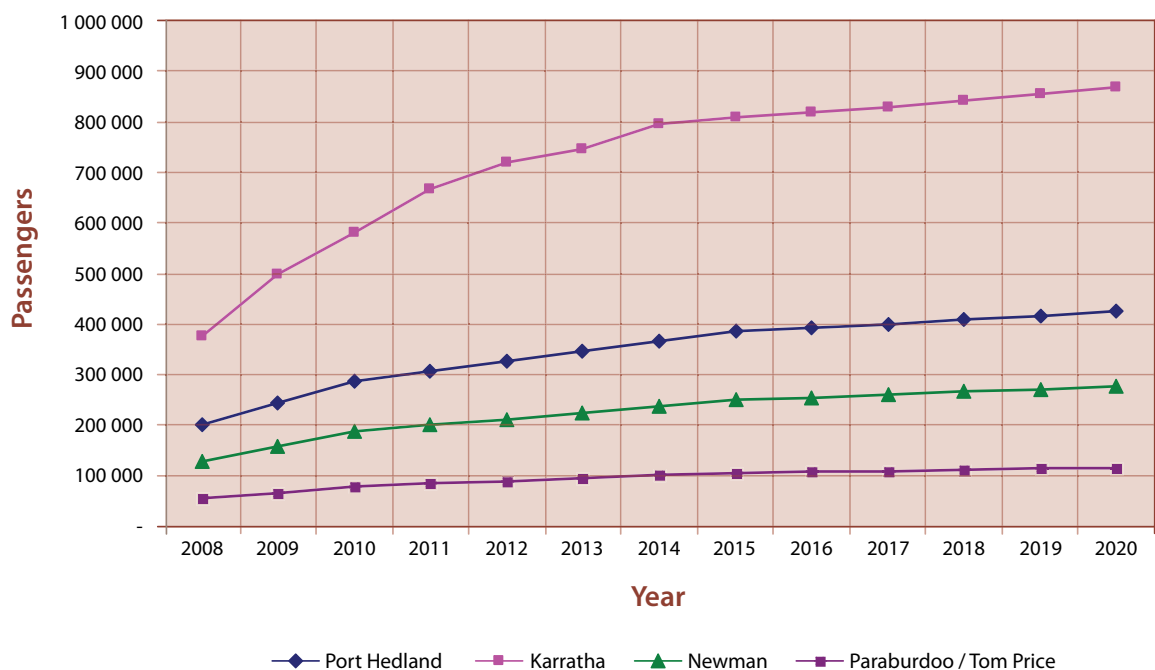
proposed port will comprise three key elements: (1) a Common Use Coastal Area (including a material offloading facility; trestle and LNG loading jetties; LNG storage tanks; high pressure gas pipelines; and infrastructure access road and utility corridor); (2) port facilities (including LNG port facilities and an additional general purpose port facility); and (3) the marine approaches (including shipping channel; berthing pocket(s) and turning basin(s); trunkline(s); and common use marine facilities).

### Anketell

In March 2010, the State Government announced plans to develop a new deep-water port at Anketell. It will ultimately have a capacity of 350 Mtpa and will provide a multi-user facility for three major resource projects: API Management's 30-40 Mtpa West Pilbara Iron Ore Project, FMG's 30-60 Mtpa Solomon Project, and China Metallurgical Group Corporation's 15 Mtpa Cape Lambert Iron Ore Project. The port is forecast to commence operations by 2015 (Futures Direction International 2010).

Table 6.1 provides a summary of current port trade together with the estimated capacity of existing port upgrades and new port facilities to be completed by 2014-15.

**Figure 6.3. Pilbara passenger projections by airport (2008-2020)**



Source: recent airport passenger data; airport master plans and population projections

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The key marine transport challenges in the Pilbara are:

- external competition (international, interstate and intra-state) for the provision of supply services to offshore exploration and production;
- providing for the needs of coastal shipping.
- maintaining the efficiency of freight corridors to ports;
- catering for the potential need to accommodate larger vessels;
- investigate options to diversifying activities at the region's ports;
- maintaining adequate berth capacity to accommodate bulk commodities and general cargo; and
- managing the impacts of support industries at the region's boat harbours.

Strategies and initiatives to address these challenges include:

- maintaining the operational integrity of the region's ports by facilitating port expansion via marine and terrestrial environmental offsets;
- maintaining adequate road rail and pipeline/conveyor corridors to the region's ports;
- monitoring and evaluating the demand for wharf-side and support bulk storage/industrial land; and
- providing facilities for general cargo, as well as bulk commodities.

### Boat harbours

The region's two boat harbours at Beadon Creek (Onslow) and Johns Creek (Point Samson) perform important off-shore servicing and marine recreation roles. Both harbours are at capacity and struggle to adequately accommodate vessels during cyclones. Support industries, associated with many of the large scale projects at various Pilbara locations, are having a major impact on the demand for access at these facilities.

## 6.5 Air transport

The Pilbara is serviced by four public jet airports (located at Karratha, Port Hedland, Newman, and Paraburdoo), three jet airports associated with resource operations (located at Barrow Island, Telfer

and Coondewanna) and numerous other airstrips. Karratha and Port Hedland can accommodate Code 4C (B737/BAe146) jets.

Airport passenger throughput has increased significantly over the past five years, particularly at Karratha. The introduction of new carriers to the region has brought an element of competition. However, the relative high cost of airfares to the Pilbara may continue to be a disincentive for people to live in the region. More recently there has been increased connectivity between the region's airports and other Australian centres with direct flights to Brisbane, Sydney and Melbourne. These trends are set to continue. The potential growth in passenger volumes at the region's airports is illustrated in Figure 6.3. The Karratha Airport Master Plan (Shire of Roebourne, 2009) anticipates a significant growth in passenger numbers much of it attributed to fly-in fly-out activity.

The key air transport challenges in the Pilbara are:

- identifying future air transport requirements;
- meeting the demand of increasing fly-in fly-out services (larger aircraft);
- providing air links between regional centres – Pilbara and adjoining regions; and
- increasing the number of international flights to overseas destinations, particularly Asia.

Strategies and initiatives to address these challenges include:

- maintaining the operational integrity of the region's airports by limiting development under existing and potential flight paths;
- providing additional customs and quarantine services at airports providing international connections;
- maintaining adequate road access to the region's airports;
- identifying and pursuing opportunities for airport sharing;
- providing for industrial development with synergies with air transport; and
- providing for industrial development with synergies with air transport.

## Map 13. Transport infrastructure

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### 6.6 Urban public transport

As Port Hedland and Karratha grow towards their target populations of 50 000, there will be a transition from a port mining town bus service system (company buses ferrying employees from home to workplace), a school bus service, and a skeletal community bus service to a Public Transport Authority-sponsored city public transport system accommodating all trip purposes and with multiple destinations. Provision will need to be made for a contractor to establish a bus fleet and to be provided with a depot and bus station.

### 6.7 Transport planning issues

Table 6.2 identifies land use planning issues that need to be considered when local governments prepare local planning strategies and more detailed structure plans.

### 6.8 Transport infrastructure priorities

The priorities associated with planning for transport infrastructure are detailed in Table 6.3. These will be addressed in more detail in Section 6.9, which outlines specific objectives and actions. These will form the basis for the Pilbara Infrastructure Implementation Plan.

**Table 6.2. Transport planning Issues**

Transport Mode	Land use planning considerations
<b>Road</b>	<ul style="list-style-type: none"><li>• New road alignments.</li><li>• Upgrades to existing roads (seal duplication).</li><li>• Treatment of high traffic intersections in region's economic hotspots.</li><li>• Transport-industry zones.</li><li>• Noise impacts.</li><li>• Air pollution (diesel).</li></ul>
<b>Rail</b>	<ul style="list-style-type: none"><li>• Corridors for new rail networks.</li><li>• Grade rail-road crossings (longer and more frequent trains &gt; longer road traffic delays at crossing barriers).</li><li>• Land-use separation – land alienation.</li><li>• Noise impacts.</li><li>• Air pollution (diesel).</li></ul>
<b>Marine</b>	<ul style="list-style-type: none"><li>• Port master plans.</li><li>• Commercial and recreational vessel conflicts.</li><li>• Road traffic generation – particularly heavy freight vehicles.</li><li>• Portside industrial land.</li><li>• Mangrove impacts.</li><li>• Water pollution and air pollution (diesel and other emissions).</li></ul>
<b>Air</b>	<ul style="list-style-type: none"><li>• Airport master plans.</li><li>• Industrial and commercial land.</li><li>• Traffic generation and parking management.</li><li>• Flight paths and noise impacts (ANEF indicators).</li></ul>
<b>Urban public</b>	<ul style="list-style-type: none"><li>• Critical population mass.</li><li>• Significant modal shift needed.</li><li>• Plan public transit networks prior to urban expansion.</li><li>• System of bus stations bus stops and depots.</li></ul>

**Table 6.3. Transport infrastructure priorities – 2015**

Infrastructure	Priorities
Road transport	<ul style="list-style-type: none"> <li>• Investigate options for Karratha-Wickham road.</li> <li>• Enhance access at the region's ports – Dampier, Port Hedland, Cape Lambert and Anketell.</li> <li>• Upgrade Newman-Marble Bar Road.</li> <li>• Upgrade the road network around Onslow to support the Ashburton North Strategic Industrial Area.</li> <li>• Upgrade the region's highways to provide safe, all-weather road connections.</li> <li>• Construct a new road between Millstream and Tom Price.</li> </ul>
Rail transport	<ul style="list-style-type: none"> <li>• Minimise excessive delays at road-rail grade intersections resulting from longer and more frequent ore trains.</li> <li>• Promote multi-user rail networks.</li> </ul>
Marine transport	<ul style="list-style-type: none"> <li>• Facilitate berth capacity expansion.</li> <li>• Promote multi-user port facilities.</li> <li>• Upgrade road and rail access to port areas.</li> <li>• Provide sufficient port-related land for storage and processing.</li> <li>• Encourage diversification of activities at the region's ports.</li> </ul>
Air transport	<ul style="list-style-type: none"> <li>• Upgrade Karratha Airport.</li> <li>• Upgrade Port Hedland Airport.</li> <li>• Investigate new Tom Price airport to regular public transport standard to provide a gateway to Karijini National Park and Hamersley Ranges.</li> <li>• Upgrade Onslow Airport to service the Ashburton North Strategic Industrial Area and expanded townsite.</li> </ul>
Urban transport	<ul style="list-style-type: none"> <li>• Upgrade community bus services in Pilbara cities.</li> <li>• Upgrade taxi services in main towns.</li> <li>• Make provision in each city for the establishment of a bus fleet and associated infrastructure.</li> </ul>



### 6.9 Objectives and actions

Objectives	Actions
<b>6.1. General:</b>  <b>Ensure that the needs of the community and industry are well served by an integrated, efficient and safe roads, air and public transport system.</b>	a Undertake a 'whole-of-government' gap analysis to identify regional transport infrastructure needs. b Prepare the Pilbara Infrastructure Implementation Plan for transport infrastructure that includes an estimate for a 'whole-of-life' and 'whole-of-system' cost.
<b>6.2. Road transport:</b>  <b>Promote a regional road network that provides safe all-weather road connections between the region's centres of activity and the rest of the state and serve the needs of the community requiring access to community services and places of employment and education.</b>	a Continue to upgrade existing highways to provide safe, all-weather road connections between the region's centres of activity and the rest of the state. b Assess and act on measures required for high traffic regional roads. c Investigate options for Karratha-Wickham road. d Identify areas in local planning strategies and planning schemes for transport industry zones. e Provide an all-weather, sealed road from Marble Bar to Newman (through Nullagine). f Construct the Millstream to Tom Price link road. g Provide an all-weather, sealed road from the Great Northern Highway to Jigalong. h Investigate a link road between Karratha and its airport. i Undertake works relating to development of the Ashburton North Strategic Industrial Area and expansion of Onslow.
<b>6.3. Rail transport:</b>  <b>Promote the rationalisation of the region's rail networks.</b>	a Promote new multi-user rail networks. b Minimise excessive delays at road-rail grade intersections resulting from longer and more frequent ore trains. c Investigate opportunities to carry non ore products on the region's rail networks.
<b>6.4. Marine transport:</b>  <b>Promote new multi-user, highly accessible port facilities.</b>	a Facilitate berth capacity expansion. b Provide for multi-user port facilities. c Upgrade road and rail access to port areas. d Provide sufficient land for on-shore storage and processing. e Investigate options for diversification of the region's ports.

Objectives	Actions
<b>6.5. Air transport:</b>  <b>Provide an efficient regional airport network that enables intra-regional, intra-state and interstate connections for passengers and freight.</b>	<ul style="list-style-type: none"> <li>a Take into account airport growth requirements and flight paths around the region's airports when undertaking land development.</li> <li>b Upgrade infrastructure (terminal facilities, access and parking) at the region's airports.</li> <li>c Investigate the viability of regular intra-regional regular passenger air services.</li> <li>d Investigate the feasibility of upgrading Onslow airport.</li> <li>e Investigate the capacity of Tom Price airport to accommodate the needs of tourism as well as mining.</li> </ul>
<b>6.6. Urban public transport:</b>  <b>Provide an equitable and efficient public transport system in the region's cities and major towns.</b>	<ul style="list-style-type: none"> <li>a Establish city public transport systems in Karratha and Port Hedland.</li> <li>b Make provision in each city for the establishment of associated infrastructure for a public transport system.</li> <li>c Upgrade taxi services in cities and main towns.</li> </ul>





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## 7 Natural environment

### 7.1 Strategic direction

The realisation of the Pilbara Cities vision to triple the region's resident population coupled with expansion of the Pilbara's mining, petroleum and industrial activities, has the potential to significantly challenge the region's natural environmental values and these will need to be managed accordingly. It is important to acknowledge the contribution these values make to the region's liveability, health, lifestyle and economy.

The Framework has the potential to build on the region's environmental values, national parks and conservation reserves. It will also provide momentum for a better understanding and respect for the natural environment; promote the conservation and protection of significant natural features; and ensure opportunities for discovery, recreation and a sense of meaning for the benefit of future generations.

#### **Goal:**

*A natural environment that is managed to protect its high conservation values and its integrity, while accommodating urban and industrial development with minimal and acceptable impacts on its natural environmental values.*

### 7.2 Pilbara's environmental significance

The Pilbara is recognised by many Western Australians as a region of high environmental significance. It is an arid region with important values extending across its rocky, marine, coastal, wetland and desert landscapes. Map 14 shows Department of Environment and Conservation-managed land and water areas, bio-geographic areas (IBRA sub-regions) and coastal sediment areas. The Pilbara has environmental features of state, national and international importance.

The region can be considered in terms of three sub-regions, which relate to groupings of bio-regions that are based on the underlying geological provinces, each with its own unique characteristics and natural heritage values. These are:

- Coastal plain and offshore islands
- Pilbara tablelands; and
- Pilbara desert country.

#### **Coastal and offshore islands**

The Pilbara coastal and marine areas include; a variety of coastal landforms; coastal waters; and offshore islands that support a diverse range of marine, vegetation and fauna. The high marine biodiversity and recreational values of the area are recognised at a national and international level, and implementation of a system of marine conservation reserves is in progress. The region contains the proposed Murujuga National Park on the Burrup Peninsula.

#### **Pilbara tablelands**

The tablelands are made up of a range of landscapes that include: the high, dissected Hamersley Range; the undulating uplands of the Chichester Range; the wide plains of the upper Fortescue and the incised gorges of the lower Fortescue; and the undulating uplands of the Ashburton. The sub-region contains two of the Pilbara's national parks – Karijini and Millstream-Chichester.

#### **Pilbara desert country**

The desert country is characterised by gently undulating uplands, supporting open hummock grasslands with scattered trees, drained by an ancient river system, comprising extensive chains of salt lakes. The region contains the state's largest national park – Karlamilyi.

### 7.3 Challenges and opportunities

The Pilbara's regional economy is one of the most important in Australia (Section 3: Economic Development). It is expected that it will continue to expand and diversify and the region's population will grow substantially (Section 2: Settlement).

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It is also expected that future development will avoid unacceptable damage to the natural environment and continue to seek opportunities for improved environmental outcomes. If growth and development are poorly managed there would be unacceptable impacts on the region's natural environment and the desirability of living in the Pilbara. These impacts would predominantly affect the Coastal plain and offshore islands and the Pilbara tablelands sub-regions.

A challenge for the planning process is to deliver strategic outcomes for the environment through identifying measures for protection and recognising the issues as early in the planning process as possible. It is noted that environmental impact assessment of specific development proposals may result in environmental requirements to ensure acceptable environmental outcomes only for particular sites (Section 9: Development Issues).

The impacts of climate change and sea level rise on the natural environment are likely to be significant and as a consequence give rise to significant challenges. Section 9 considers this from a development issue perspective. It is, however, important that the Framework also acknowledges the importance of potential climate change and the likelihood of sea level rise and extreme weather events at the broader scale on the region's natural environment, including: landscapes; habitat; biodiversity; wetlands; and water resources.

Examples of regional planning issues and associated environmental impacts are outlined below and in Table 7.1. These impacts may to some extent be mitigated by a potentially more environmentally-responsible resident population – a population that is prepared to call the Pilbara home and more likely to place a higher value on the quality of its surroundings.

### Marine and coastal impacts

- Heavy industry is changing the coastal and marine environment, both through existing and proposed expansions, for example: the expansion of port facilities at Dampier, Port Hedland and Cape Lambert and construction of new port facilities at Cape Preston, Anketell and Ashburton North. Dredging is a major activity, with significant potential impacts on marine environments.
- Marine ecosystems and valued community uses (such as recreation and fishing) may be adversely affected by a reduction in water quality due to

ballast water discharge. With Dampier and Port Hedland estimated to receive the highest ballast water loads of all ports in Australia there is a real threat to the health of marine waters in the area. The growth in use of desalination plants as a source of freshwater may have damaging effects on the surrounding marine ecosystem. The brine by-product of freshwater production is discharged into the ocean increasing salinity and temperatures in the direct vicinity of its release. These impacts are being managed in a responsible and acceptable way.

- The Pilbara flatback turtle population is specifically threatened by introduced predators and potential impacts of industrial and urban development. Development in coastal areas, including offshore islands, can result in light and disturbance impacting upon sensitive turtle nesting activities. Any new development proposals that could adversely impact turtle nesting are not likely to be considered environmentally acceptable by the Environmental Protection Authority (EPA). Specific conservation management measures are required if this breeding population is to be preserved.
- The disturbance of mangroves through clearing could adversely disturb the important function of these ecosystems to the life cycle of marine species.
- The health of marine ecosystems are also under threat from commercial and recreational fishing. Potential negative impacts, include: over exploitation of fish stocks and damage caused by trawling on the ocean floor.
- The \$50 billion Gorgon LNG project on Barrow Island, a 23 600 hectare A Class Nature Reserve, is being developed under EPA development and management guidelines. These activities, in such a sensitive environment, will need to be closely monitored.

### Terrestrial impacts

- Sixteen wetlands of national importance are listed within the Pilbara region, including river courses. These wetlands act as refuges, support populations of endemic species and are species-rich ecosystems. They could be threatened by grazing pressure, weed colonisation, changes to hydrology and water extraction for development.



**Table 7.1. Summary of Pilbara planning and associated environmental issues**

Regional planning issue	Associated environmental issues
<b>Urban expansion</b>	<ul style="list-style-type: none"> <li>• Remnant vegetation of high conservation value.</li> <li>• Buffers – industry, port (dust), waste water treatment plant, road, rail and airports.</li> <li>• Coastal setbacks, cyclonic storm surge, hazard and potential tsunami, sea level rise and inundation.</li> <li>• Threats to endangered wildlife (marine turtle nesting).</li> <li>• Potential degradation of air, land, water and marine resources.</li> </ul>
<b>Port expansion</b>	<ul style="list-style-type: none"> <li>• Impacts on mangroves, coral and marine parks.</li> <li>• Potential impacts on marine fauna (turtles and cetaceans).</li> </ul>
<b>New port sites</b>	<ul style="list-style-type: none"> <li>• Strategic assessment of potential sites, including consideration of mangrove communities, coral and marine parks.</li> <li>• Potential impacts on marine fauna (turtles and cetaceans).</li> </ul>
<b>Future infrastructure corridors</b>	<ul style="list-style-type: none"> <li>• Remnant vegetation of high conservation value.</li> <li>• Buffers and separation from sensitive land uses.</li> <li>• Spread of weeds.</li> </ul>
<b>National parks, reserves and general conservation</b>	<ul style="list-style-type: none"> <li>• Pilbara coast: regional survey of coral and mangroves as input to future port work and to address requirements for protection of mangroves and Benthic Primary Producer Habitats.</li> <li>• Rivers, regionally significant bushlands of high conservation value and linkages.</li> <li>• Increased use with population growth.</li> </ul>
<b>Strategic industrial areas</b>	<ul style="list-style-type: none"> <li>• Strategic assessment of potential sites.</li> <li>• Remnant vegetation of high conservation value.</li> <li>• Buffers – industry, waste water treatment plants, desalination plants, roads, rail and infrastructure corridors.</li> <li>• Contamination, groundwater quality, water use, and de-watering.</li> </ul>
<b>Agricultural development</b>	<ul style="list-style-type: none"> <li>• Water use – impact on environmentally significant wetlands such as Ramsar listed wetlands, water course and subterranean ecosystems.</li> <li>• Contamination, groundwater quality.</li> <li>• Remnant vegetation of high conservation value, regional ecosystems sustainability.</li> <li>• Soil degradation and erosion (salination by irrigation).</li> </ul>
<b>Renewable energy sources</b> (geothermal, solar, tidal)	<ul style="list-style-type: none"> <li>• Landscape impacts.</li> <li>• Coastal impacts.</li> <li>• Seabed impacts.</li> <li>• Weeds (from oil - crops).</li> </ul>
<b>Burrup/Dampier Archipelago</b>	<ul style="list-style-type: none"> <li>• Planning, managing and balancing industrial development.</li> <li>• Protecting the area's cultural and landscape values.</li> <li>• Planning and managing the area's tourism potential.</li> </ul>



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Unmanaged tourism uses often conflict with the total preservation of natural ecosystems as use and human traffic increase, resulting in degradation and pollution. Beaches close to townsites, such as Cleaverville, are under great pressure from recreational use while the arid environment of the Pilbara makes the rehabilitation of coastal areas difficult.

- The region is species rich in both endemic flora and fauna. There are biodiversity concerns relating to exotic species from overgrazing and, to a lesser extent, site-specific impacts of mining activities. Imported pasture species can have serious effects on biodiversity, particularly aggressive grass invaders such as buffel (*genus Cenchrus*). Major environmental weeds include parksonia, mesquite, date palms, tamarisk and ruby dock.
- There are significant water concerns including the provision of water supply for industrial purposes and to remote communities, and water pollution/river degradation from grazing and mine run-off. Mining de-watering has great potential to dramatically change aquatic ecosystems in the long-term. A significant opportunity for urban development is to deliver better water management outcomes, including the efficient use and reuse of water and improved stormwater and groundwater management consistent with the WAPC's Better Urban Water Management (2008) (also see Section 2 – Settlement).
- Industrial emissions, fire and transport create green house gases that contribute to air pollution across the region. More locally specific air quality issues arise from creation of fine particulate matter in Port Hedland and Dampier.

### 7.4 Conservation areas

In 1996, Australia recognised the importance of biodiversity conservation when the Council of Australian Governments (COAG) adopted the National Strategy for the Conservation of Australia's biological diversity. This included an objective to 'establish and manage a comprehensive, adequate and representative system or protected areas covering Australia's biodiversity'. Accordingly, Australian governments have agreed to criteria and standards that protected areas must meet to be included in the National Reserve System. Australia is working towards a target of ten per cent of bio-regions to be part of the National Reserve System.

It is generally accepted that the establishment of a formal conservation reserve system, where there is long-term statutory protection and public accountability of management, is the cornerstone for protecting areas of high conservation value in Western Australia. Terrestrial reserved areas are vested in the Conservation Commission and the Department of Environment and Conservation is responsible for their management. The management of the conservation reserves is outlined in the respective individual management plans.

Initial reservation was based largely on geomorphological attributes and most areas of high scenic values are now in national parks. More recently there has been a focus on conservation of native plants and animals. Although reserves or proposed reserves are present in all of the Pilbara sub-regions, no systematic approach has been taken to the establishment of a comprehensive, adequate and representative reserve system across the entire region. As a result the reserve system cannot be classified as biologically representative of the Pilbara.

Even though biodiversity has been a major consideration when making additions to the reserve system, land for reservation has generally been selected opportunistically through pastoral purchases/acquisition and in response to political and visitor management issues. As such, they do not always reflect the flora and fauna values that needs to be protected.

Conservation areas in the Pilbara include three national parks, a conservation park, nature reserves (including the Barrow Island Class A Nature Reserve) and marine reserves (such as Montebello/Barrow Islands Marine Nature Conservation Reserve).

The Murujuga National Park is to be established to encompass the non-industrial land on the Burrup Peninsula. This will take effect once the necessary statutory provisions are in place to enable the Murujuga Aboriginal Corporation, and the Department of Environment and Conservation to establish a joint management agreement, over the proposed national park. The national park designation will afford the area protection under Western Australian law, while also providing for joint management.

There is an intention to establish the Dampier Marine Park and Regnard Marine Management Area in the near future.

### **Karijini National Park**

With a total area of 6274 km<sup>2</sup>, Karijini National Park is Western Australia's second largest national park. It contains many spectacular features and a variety of rugged landscapes. The plateau consists of rounded hills and ranges divided by valleys and deeply incised gorges. The Banjima, Innawonga and Kurrama Aboriginal people are the traditional owners of the park. The park is gazetted for conservation, allowing for recreation while recognizing the area's strong Aboriginal heritage values. There are several major iron ore deposits that have been excluded from the Park and are the subject of State Agreements (Marandoo). The park's permanent visitors' centre was opened in June 2001. The attractive Karijini Eco-Retreat, established in 2006/07, is owned by the local Gumala Aboriginal Corporation. The Park attracted 180 000 visitors in 2008/09.

### **Millstream-Chichester National Park**

Millstream-Chichester National Park (2385 km<sup>2</sup>) comprises a landscape of rolling hills, spectacular escarpments and winding tree-lined watercourses. It contains part of the Fortescue River, where permanent pools are fed by underground springs. It includes clay tablelands and basalt ranges, and part of the Chichester Range. The park features the Millstream wetlands, which support many plants, bird and insect species, some of which are related to species in the tropical Kimberley region. The Millstream aquifer also forms part of the West Pilbara Water Supply Scheme. The Park was a focal point for the Yinjibarndi people and was an important place for inter-tribal meetings. In recent history, the park was part of the Millstream pastoral lease, which was first taken up in 1865, and operated as a sheep and cattle station until the mid 1980s. A significant attraction for Karratha-Dampier residents, the park attracted 40 000 visitors in 2008/09.

### **Karlamilyi National Park**

Karlamilyi is Western Australia's largest national park (12 837 km<sup>2</sup>) and the second largest in Australia. Located north east of Newman, most of it is arid or semi-arid desert. It is in a remote area with strong attractions for remote-area tourism. Local Aboriginal communities provide limited facilities and fuel for visitors, who can access the area by unsealed roads, which service both communities and local mining operations.

### **Dampier Archipelago**

The Dampier Archipelago comprises 42 named islands lying within a 45km radius of the port of Dampier. The Burrup (Murujuga) Peninsula, formerly a tidally-isolated island, is now joined to the mainland by infrastructure corridors and the bunds of the Dampier Salt evaporation ponds. Twenty-five islands of the Dampier Archipelago are reserved for either conservation of fauna and flora, and three are reserved for both conservation and recreation. The rest are either unvested crown lands, or held under various industrial tenures. The islands are geologically diverse, consisting of granitic, sedimentary and volcanic rocks, and overlain by much younger limestone and limesand deposits. Larger islands support diverse vegetation communities, and a diversity of mammal and reptile fauna. Smaller islands are important sea and shore bird breeding and feeding locations. Islands close to the mainland protect regionally significant mangrove stands, and some islands support marine turtle breeding sites of regional, national and international significance. There are high Indigenous cultural heritage values across the Dampier Archipelago and Burrup Peninsula, including high concentrations of rock art, recognized by National Heritage Listing. Most visitations to the islands are for recreation and a number of holiday dwellings are maintained on some islands for this purpose.

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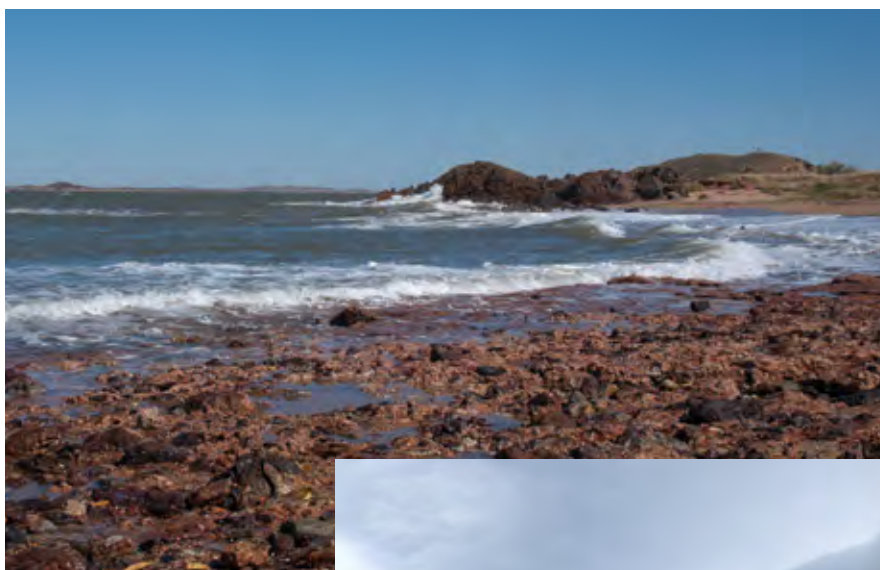
### Geoheritage

A number of internationally important fossil sites containing the oldest known fossils are reserved in the Pilbara region. These are key sites for researching the origin of life on Earth and are vulnerable to damage and the loss of their geoscientific value through inappropriate sampling. They are now protected from future impacts through reserves managed by the Geological Survey of Western Australia (a division of the Department of Mines and Petroleum).

### Public use of conservation reserves

It is anticipated that the region's national parks and reserves will sustain significantly higher levels of visitation over the next 25 years. As a consequence, there will be a growing need for upgraded and additional park and reserve infrastructure to cater for higher levels of usage.

The identification of new discrete areas for conservation needs to be considered within the context of a holistic approach to the conservation of ecological systems, as well as the social and economic impacts. There is a need to move away from a 'conservation island' approach, where the conservation of biodiversity ceases at the boundary of a national park or nature reserve. This emphasises the importance of rangelands management planning and the need for good documentation of the native plants and animals that together comprise the ecosystems. This approach must be underpinned by on-going biological surveys and monitoring to allow for better future decision-making.



## Map 14. Natural environment

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### 7.5 Objectives and actions

Objectives	Actions
<b>7.1. Conserve and manage the region's natural environmental values and maintain supporting ecological processes for future generations.</b>	a Undertake assessment of the region's flora and fauna to adequately inform future planning decisions.
	b Pursue additions to the region's reserves to support the concept of a comprehensive, adequate and representative reserve system that aims to protect flora and fauna of conservation value.
	c Maintain and enhance safe public access to the foreshore and coastal waters and ensure public access is designed and maintained to conserve coastal resources.
	d Minimise development near waterways and wetlands in locations where there is potential for environmental damage and flood risk.
	e Conduct research based on seismology, sedimentology and oceanography to evaluate the risk of a tsunami impacting the Pilbara.
	f Develop emergency response strategies should there be a realistic threat to the region.
	g Develop a region-wide plan which provides recommendations and guidance on important natural environmental matters in the Pilbara for all stages of land use planning.
	h Develop management plans that cover the region's sensitive coastal areas and complete the draft plans arising from the Pilbara marine planning process.
<b>7.2. Incorporate natural resources and all significant environmental considerations into the preparation and assessment of strategic and statutory planning proposals to achieve environmental protection and management outcomes.</b>	a Develop suitable data delivery systems on the regional natural environmental attributes so that relevant information is available at early planning stages of future development initiatives, and that this data is given due consideration in approval processes.
	b Land use strategies and plans should consider the potential impacts of climate change and sea level rise.
	c Land use strategies and plans should identify and provide for protection of areas of high conservation value and take into account sustainability targets and environmental measures to preserve environmentally significant features.



## 8 Cultural heritage

### 8.1 Strategic direction

The Pilbara has a number of important cultural heritage values and attributes that provide both challenges and opportunities for the region. Its diverse past needs to be recognised and accounted for in future planning and development.

The development of the region will provide the opportunities, momentum and rationale for recognition and conservation of the region's people, culture and history. Cultural capital is used here to refer to the knowledge and experience and social assets contained within communities and cultural groups. Protecting and managing the region's cultural capital will ensure that Aboriginal people and their culture are valued.

The pastoral and mining industries have also contributed to the cultural heritage of the Pilbara. Their contribution to the region's identity has become an important part of its cultural identity.

This Framework recognises the contribution that cultural heritage and identity values make to the region's people and communities. The Framework promotes tangible elements in the region's built form, together with the hard and soft infrastructure,

that reinforce the values and identity of the community. It also recognises these cultural values as genuine assets for the region and as a cultural capital entity. Recognition of these values and identity will help to ensure that planning and development opportunities are based on the respect of the region's cultural heritage. It will also create greater opportunities for the participation of its people in the development process, thereby ensuring a sense of community continuity and respect for cultural heritage values.

#### **Goal:**

*Recognise the importance of the cultural capital of the region and the value it provides to planning and development for the future of the Pilbara.*

### 8.2 Indigenous heritage

The Pilbara is home to many indigenous peoples and cultures that have a strong connection to country. Conservation of indigenous culture and the land, to which they have traditional custodianship, is central to the respect and recognition of the part such culture plays in the identity of the Pilbara.



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It is important in maintaining the link between the current settlement pattern and the original inhabitants throughout the region.

Development proposals need to take into account potential impacts on all elements of indigenous culture and people and ensure that Aboriginal people are included in the planning process.

It is important to acknowledge that there are Aboriginal heritage and historical sites throughout the Pilbara, from the Northern Territory border in the east to the west coast.

This Framework recognises that there are many cultural hubs throughout the region. The cultural focus will need to be broader than one or two key hubs, since the region encompasses a wide spectrum of cultures that range from the Pintupi group to the east of the region to the Thalanyji, Yindjibarndi and Banyjima groups in the coastal area around Onslow.

Consultation processes with traditional owners community and elders regarding land and resource planning must be inclusive and culturally appropriate. Discussions must be conducted with people entitled to speak for country and community. It is important to acknowledge that there are many Aboriginal community interest groups who have authority to talk for community as opposed to land. Organisations and agencies should engage with these individuals and communities at regional, sub-regional and local planning levels through a culturally appropriate engagement framework. Their desire to have their interests and responsibilities acknowledged, respected and progressed through the planning and development processes needs to be recognised.

It is important to ensure the inclusion, consultation and negotiation of Aboriginal people in all land use planning proposals relating to matters of cultural heritage significance. This process must complement other traditional owner processes, such as native title and cultural heritage activities. It is also important to recognise the legacy and contribution of Aboriginal people to communities, the economy and the environment through, for example, consultancy tourism, mining, education, arts, health and pastoral sectors.

### 8.3 Pastoral legacy

Early European settlement occurred at Roebourne and the port of Cossack. Early industry was largely pastoral, gold mining and pearling. Until the advent of iron ore mining in the 1960s, the only towns were Onslow, Roebourne, Point Samson (having replaced Cossack as the port servicing Roebourne), Wittenoom, Marble Bar, Nullagine and Port Hedland.

The pre-mining era towns provide many examples of colonial architecture of the early 1900s, with the best examples being at Cossack, Roebourne, and Marble Bar. The Pilbara region also has a rich European history associated with activities such as the pastoral industry, remote area exploration, mining, and coastal trade.

The conservation of colonial heritage in old town sites and centres such as Cossack, Roebourne, Port Hedland, Marble Bar and Onslow is very important in a region where the majority of the built form has been constructed since the late 1960s. The conservation of early European settlement will provide the current residents of the Pilbara with a sense of continuity and lifestyle enhancement, as well as attractions for tourists and provide a better understanding and respect for the past for both current and future generations. Conserving Cossack as a 'living' heritage village and restoring the old town sites of Onslow and Shellborough are tangible examples of how the region's early settlement heritage could be maintained and enhanced.

The pastoral strike of 1946 has been an important part of Pilbara and Western Australian pastoral history when indigenous workers from many cattle stations throughout Western Australia went on strike for better pay conditions. This remains an important event for the indigenous people of the Pilbara and still provides them with a strong sense of pride.

### 8.4 Mining development

Today's Pilbara settlement pattern is largely the product of mining development that had its genesis in the 1960s. This is particularly the case for the inland settlements of Newman, Pannawonica, Paraburdoo and Tom Price but also the coastal settlements of Dampier, Karratha and Wickham.

There is also a growing interest in obsolete plant and machinery associated with the mining era. There are a number of ad hoc initiatives to conserve elements of this heritage, with rudimentary railway museums in Port Hedland and Karratha and collections of diesel locomotives, haul trucks and other heavy equipment in the inland mining towns, typically located close to visitor information centres.

### 8.5 Pilbara heritage places

There are 250 places and localities of heritage significance in the Pilbara. These range from historic buildings in town sites to rural homesteads and significant natural places both on shore and off-shore (Table 8.1). They span a wide range of cultural heritage significance and value comparisons between listed 'places' are difficult to make. In total, there are 28 sites identified in the State's Register

of Heritage Places. The remaining sites are listed by local governments on their respective municipal inventories.

#### 8.5.1 Burrup rock art

The Burrup Peninsula is arguably the most significant heritage place in the Pilbara. The petroglyphs on the Burrup constitute the oldest (circa 30,000 years old) and largest rock art gallery in the world.

The Burrup Peninsula is part of a much bigger complex, namely the Dampier Archipelago, all of which has significant rock engravings dating back to the earliest human occupation of Australia. The numbers of individual examples is estimated to be well over one million.

**Table 8.1. State and local heritage places by locality**

Locality	Urban		Rural/Off-shore		Total
	Building	Place	Building	Place	
Cossack	13 (8)	2 (1)	1	1	17 (9)
Karratha-Dampier	10	2	1	9	22
Marble Bar	9 (4)	8	9	11	37 (4)
Newman	11	3	1	2	17
Nullagine	3	1	6	2	12
Onslow	13 (2)	3	5 (3)	1	22 (5)
Pannawonica	1	-	2	-	3
Paraburdoo	2	1	-	1	4
Point Samson	-	1	-	1	2
Port Hedland	39 (4)	15	7	-	61 (4)
Roebourne	20 (6)	4	12	-	36 (6)
Tom Price	12	1	-	-	13
Whim Creek	1	-	-	1	2
Wickham	2	-	-	-	2
<b>Total</b>	<b>136</b>	<b>41</b>	<b>44</b>	<b>29</b>	<b>250</b>

Source: Heritage Council WA (2010)

Note: The numbers in brackets indicate entries that are listed on State's Register of Heritage Places.



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The earliest of these engravings were created before the commencement of the last ice age, making them the oldest human images and earliest evidence of human artistic creativity in the world.

This area is currently National Heritage listed, and has the potential to become a World Heritage site and the preservation of this place is the concern of many national and international bodies.

In February 2011, the Federal Government instructed the Australian Heritage Commission to conduct an emergency review of the international heritage values of the rock art.

With the growing population in the Pilbara, there is a need for greater protection of these heritage assets from vandalism and theft. Coupled with this, there is a need for a community education campaign focusing on the uniqueness and vulnerability of these assets and the need to protect them.

### 8.6 Cultural heritage conservation

The conservation of indigenous cultural heritage is important in maintaining the link between the current settlement pattern and the original inhabitants of the region. The conservation of the

region's pastoral and mining legacy provides the resident and visitor with a link to early settlement and an understanding of the region's economic and social roots. Cultural heritage, with its foundation in the natural environment, is fundamental to the notion of sense of place and needs to be conserved for future generations.

### 8.7 Cultural heritage priorities

Future priorities for cultural heritage include:

- identification and protection of significant regional and local heritage places to ensure that development, in or adjacent to those places, will not compromise their cultural heritage values and significance;
- maintenance of the cultural integrity of the rock-art galleries contained within the newly declared Murujuga National Park on the Burrup Peninsula; and
- maintenance of the region's urban heritage in particular at Cossack, Marble Bar, Roebourne, Port Hedland and Onslow.

The development of heritage places and areas will be guided by State Planning Policy – 3.5 Historic Heritage Conservation.



### 8.8 Objectives and actions

Objectives	Actions
<b>8.1. Protect and manage the region's cultural heritage, arts including indigenous significant places, historic places, and landscapes of significance as guided by the State Planning Policy 3.5 – Historic Heritage Conservation.</b>	a Undertake a study of culture heritage in the region.
	b Maintain the cultural identity of the Burrup Peninsula.
	c Plan and develop Cossack as a 'living' heritage village.
	d Conserve and restore the Old Onslow Town site and protect its cultural landscape from the impact of industrial development.
	e Investigate the conservation of the old town site of Shellborough, to the north of Port Hedland.
	f Conserve the heritage buildings and precincts at Marble Bar, Nullagine and Whim Creek.
	g Develop mining, oil or gas museums in Karratha, Port Hedland and Newman.
<b>8.2. Create partnerships between Government, resource companies and aboriginal communities for shared ownership, responsibility and designing of strategies in relation to promoting and protecting cultural heritage.</b>	a Invest in capacity building of Aboriginal communities across the Pilbara.
<b>8.3. Create a sense of place by acknowledging the living cultures and their shared values and experiences of the various communities that have and currently inhabit the region.</b>	a Facilitate the development of Aboriginal arts and cultural centres across the Pilbara.
	b Plan and develop Roebourne in partnership with the Roebourne Rejuvenation Project.



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## 9 Development issues

### 9.1 Strategic direction

The Pilbara region will be developed in a timely and responsible manner. Development also needs to respond to the Pilbara Cities vision by the formation of a sustainable, liveable and aesthetically attractive urban form, and by creatively addressing constraints and impediments. An implementation regime will need to be put in place that delivers in a way that heeds State and Commonwealth policies and imperatives, is consultative, timely and fiscally responsible.

#### Goal

*Develop the region in a timely and responsible manner and in a way that responds to the Pilbara Cities vision, creatively addresses constraints and impediments and provides for sustainable liveable attractive and efficient urban form.*

### 9.2 Climate change

Climate change and sea level rise is an overarching consideration, when considering land use planning and development, particularly in a region that is significantly impacted by cyclonic activity. Further work is needed to better understand how the Pilbara landscapes are likely to respond to climate change and what the specific implications for management may be. This should be considered on a risk management basis that takes into account the susceptibility of a proposed land use, and the probability that an extreme event will eventuate within a certain time scale. Such concerns include:

- climatic changes and their broad-scale impact on biodiversity patterns and productivity;
- cyclonic patterns and extreme weather events;
- catchment flooding;
- water resources (availability for human usage and environmental needs);
- sea level rise and coastal inundation and the impacts on coastal resources and values, including: habitat, ports, infrastructure and communities; and
- hazards associated with fire frequency and behaviour.

Careful consideration of climate change factors is needed when assessing development proposals including offshore proposals for oil and gas development. Major proposals such as these involve long infrastructure lead times, significant amounts of private and public sector investment and result in assets intended to have a long life.

### 9.3 Development assessment

To ensure that responsible and sustainable development progresses in a timely manner, land will need to be identified for urban expansion and industrial development. All relevant issues triggered by development proposals will need to be identified and assessed well in advance of demand at the local, state and/or national level (as appropriate). These include: environmental impact assessment; assessment of Aboriginal heritage and native title agreements; and natural resource management considerations. Proposals that involve conversion of Crown land to private ownership are also subject to provisions of the *Mining Act 1978*.

#### Environmental assessment

Proponents of development proposals often need to undertake lengthy environmental impact assessments that may be subject to the requirements of State and Commonwealth legislation. Significant proposals including strategic industry need to be dealt with as early as possible in the planning process and in a strategic manner including consideration of the cumulative environmental impacts. However, limited available environmental information and data can constrain timely approvals and a more consistent and coordinated approach is needed.

Improved sharing of environmental information and the early identification of environmental issues in the region is needed together with assistance from relevant local, State and Commonwealth agencies. In addition, a more strategic approach to environmental assessment should be encouraged as early in the planning process as possible.



### **Aboriginal heritage and Native Title agreements**

Aboriginal heritage issues and native title negotiations can be significant considerations in the planning and development approvals process that can impact on development form and timing.

Reaching timely native title determination and achieving mutually satisfactory outcomes is important. The initial identification of land that is not constrained by unresolved native title claims or other cultural or environmental (or other) constraints can be a lengthy process. In addition, rezoning of that land and subsequent subdivision and development involves a number of approvals steps/processes and can involve a number of agencies and local authorities.

### **Planning approvals**

As a consequence of the resources boom, the region has experienced shortages of development-ready land to cater for the increases in population and the increase in demand for land to service and supply the mining industry.

Improving the planning approvals process through reform measures is recognised in the WAPC's Planning Makes it Happen (2009b) which is a 'blueprint' for planning reform. The 'blueprint' recognises that: 'major resource projects are the mainstay of the Western Australian economy and it is essential that the State has a supportive planning system that can expedite and facilitate these projects'. An important objective of the blueprint is to ensure lead agencies work cooperatively to streamline and fast track approvals processes.

### **Construction**

Timeliness of construction and affordability have been significant issues affected by the cost and availability of skilled labour and materials and various inter-related socio-economic factors. These need to be addressed in association with the need to facilitate diversification of the region's economy.

## **9.4 Basic raw materials**

Basic raw materials is a term to describe materials used in construction and development including sand, clay, hard rock, limestone, gravel and other construction and road building materials.

Since much of the proposed development associated with Pilbara Cities is anticipated to occur on low-lying flood-prone land there will be a need to source and transport large quantities of fill material. A ready supply of basic raw materials is important for future urban and industrial development and essential in keeping down the costs of land development and contributing to affordable housing.

To date, there has been no comprehensive regional assessment of basic raw materials, nor has the use of potential substitutes been fully explored. Reports undertaken to date, however, identify a shortage of local materials that are suitable for fill, with much of the limited sand supplies constrained by environmental and/or heritage significance considerations.

An essential requirement is a program to determine the availability of supplies and consider the cost effectiveness of using alternative sources where essential supplies are limited. It is critical that practical strategies be put in place to identify locations where large quantities of suitable material can be excavated in an environmentally sustainable and cost effective manner. Transport options may include using the ore rail network, even considering iron ore fines as fill material.

The issues associated with the identification, extraction and transport of basic raw materials will be addressed in more detail in the Pilbara Infrastructure Implementation Plan.

### 9.5 Objectives and actions

Objectives	Actions
<b>9.1. Climate change:</b>  <b>Mitigate and adapt to climate change impacts in the Pilbara. Promote the resilience of communities, development, forms of economic activity, and essential infrastructure that are resilient to the potential impacts of climate change.</b>	<ul style="list-style-type: none"> <li>a Develop measures that reduce the region's contribution to climate change and promote adaptation as a way of managing risks, addressing impacts and identifying opportunities.</li> <li>b Establish adaptation strategies to minimise vulnerability to extreme weather events, including tropical cyclones, storm surge and flooding and the range of potential sea level rises.</li> <li>c Land use planning strategies and proposals should address risk from the projected effects of climate change by avoiding areas with high exposure and vulnerability to flooding, storm surge, sea level rise, inundation and coastal erosion.</li> <li>d Develop accurate coastal mapping so that the location of coastal facilities and development takes into account coastal processes including erosion, accretion, storm surge, wave conditions, sea level rise and biophysical criteria.</li> </ul>
<b>9.2. Environmental assessment:</b>  <b>Promote strategic environmental assessment of the region's environment, particularly in areas subject to land use change and development proposals, as early in the planning process as possible.</b>	<ul style="list-style-type: none"> <li>a Prepare strategic environmental assessments of the region's environmental assets and values and address matters of local, state and national environmental significance. This should be a priority for areas subject to land use change and development proposals.</li> <li>b Promote the development, sharing and continued update of environmental data for the Pilbara.</li> </ul>
<b>9.3. Indigenous heritage and native title agreements:</b>  <b>Support timely and mutually satisfactory native title determination outcomes.</b>	<ul style="list-style-type: none"> <li>a Continue to work collaboratively with indigenous communities in the Pilbara to enhance improved community awareness of indigenous heritage.</li> <li>b Ensure assessment and determination of planning and development proposals takes into account appropriate assessment of indigenous heritage and, where appropriate, take into account relevant native title agreements, including Indigenous Land Use Agreements.</li> </ul>
<b>9.4. Planning approvals:</b>  <b>Contribute to a more efficient, flexible and simplified planning approvals system and implement the planning reform agenda to facilitate the provision of project-ready land aligning with the Pilbara Cities vision.</b>	<ul style="list-style-type: none"> <li>a Support actions to implement planning reform measures identified in the WAPC's publication <i>Planning Makes it Happen: A Blueprint for Planning Reform</i> to achieve a more efficient, flexible and simplified planning approvals system.</li> <li>b Support actions in the planning reform agenda that facilitate the provision of project-ready land.</li> <li>c Promote planning and development proposals that align with the Pilbara Cities vision.</li> <li>d Develop and adopt subdivision design and Residential Design Codes that are relevant to the region.</li> </ul>
<b>9.5. Basic raw materials:</b>  <b>Identify sources of basic raw materials and ensure that required quantities are available to meet industry and residential requirements.</b>	<ul style="list-style-type: none"> <li>a Quantify the amounts of basic raw materials needed for proposed residential and industry initiatives.</li> <li>b Identify alternatives that may be used in the place of basic raw materials where supplies are limited and in short supply, and evaluate the cost effectiveness of their use.</li> <li>c Evaluate cost effective alternatives to traditional construction techniques that minimise requirements for basic raw materials.</li> </ul>

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## 10 Implementation

The Pilbara Planning and Infrastructure Framework has been endorsed by the WAPC as a regional strategy under section B2 of the State Planning Framework (State Planning Policy 1). Strategies listed under section B2 of State Planning Policy 1 form non-statutory provisions of the State Planning Framework.

The Framework will inform the review of the State Planning Strategy, which is currently underway and guide the preparation of local planning strategies and local planning schemes across the Pilbara. When preparing local planning strategies and schemes, local governments should have regard to the objectives and actions outlined in the Framework. Decisions or recommendations of the Pilbara Regional Planning Committee and the WAPC will be guided by the Framework.

The Framework will be particularly important in informing government of infrastructure priorities in the Pilbara and in giving the private sector confidence to invest in the Pilbara. All State government agencies should have regard to the framework when preparing work plans and budgets.

The Framework acknowledges the key role of the Australian Government, that fosters a 'whole-of-government' approach to the development of regions, such as the Pilbara. A key Commonwealth agency is Regional Development Australia (RDA), which is supported by the Department of Regional Australia; Regional Development and Local Government; the Regional Australia sub-committee of cabinet; and a House of Representatives Standing Committee on Regional Australia. Service delivery is through the Regional Development Australia Fund that is capable of investing \$1.4 billion in regional Australia over five years.

### 10.1 Governance

The successful implementation of the Framework will require effective partnerships between key stakeholders with clearly defined roles and responsibilities. At a State Government level there is need for coordination between various government departments implementing the Pilbara Cities vision, as shown in the Figure 10.1.

### Planning

Future planning work to implement the Pilbara Cities vision will be largely undertaken by the four local governments when preparing local planning strategies and schemes, amendments to local planning schemes and structure plans with assistance, where necessary, from the Department of Planning.

Future planning work will be overseen by the Pilbara Regional Planning Committee of the WAPC which will:

- oversee implementation of the Framework;
- coordinate future planning work in the Pilbara;
- assist, where possible, in ensuring the prompt supply of land and housing to Pilbara communities;
- facilitate a 'whole-of-government' approach to land use planning in the Pilbara;
- identify and act on new initiatives identified in the Framework and other investigations; and
- prepare annual audits which measure the extent of implementation achieved.

The Pilbara Regional Planning Committee does not see the preparation of a region planning scheme for the Pilbara as a priority at this time, as most of the land required for future public purposes is already owned by the Crown.

### Infrastructure

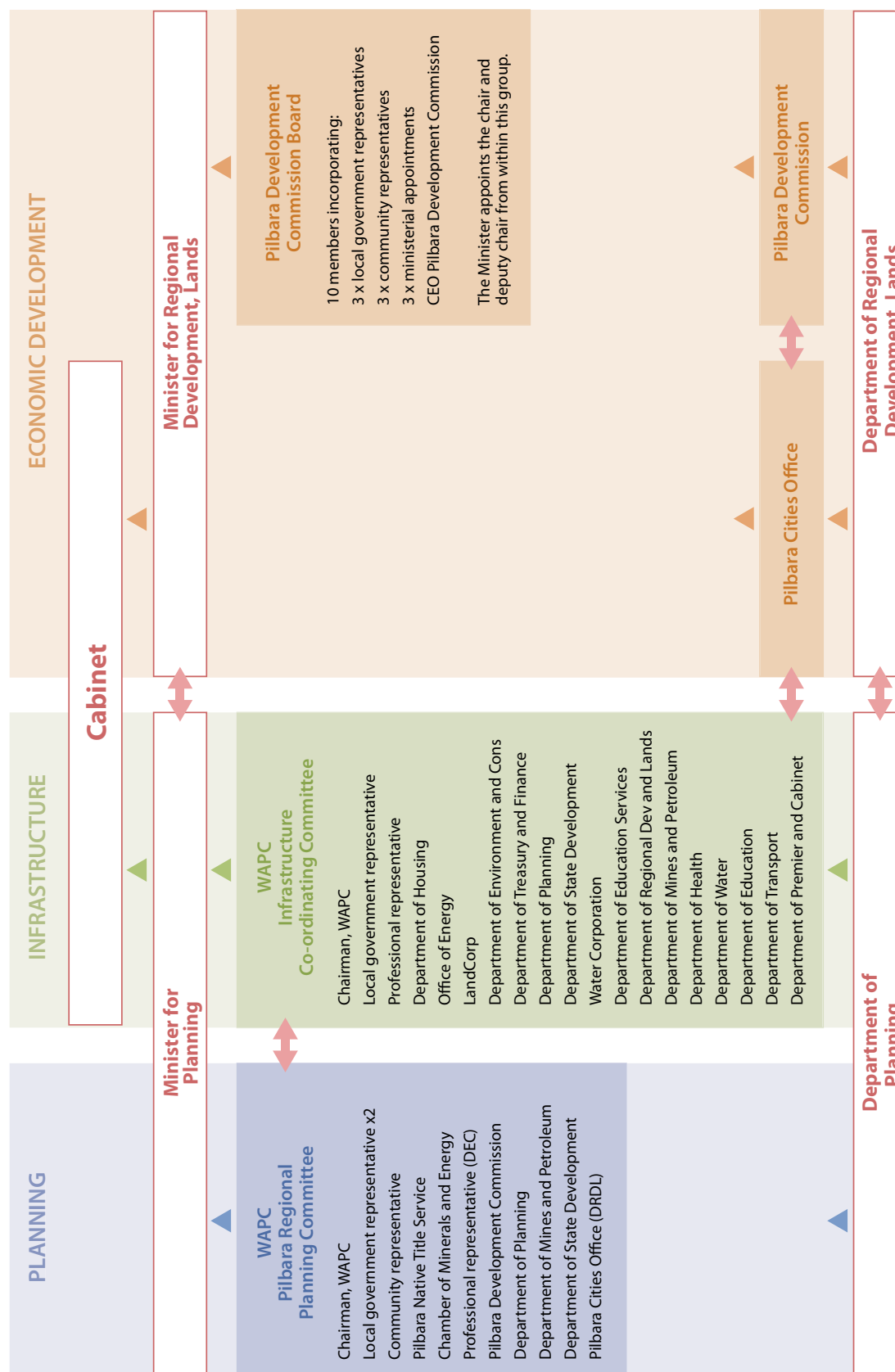
To facilitate development of land and housing in the Pilbara, it will be necessary to provide adequate utility, community and transport infrastructure. The WAPC's Infrastructure Coordinating Committee will take a lead role and, together with the relevant servicing agencies and the Pilbara Cities Office, will ensure infrastructure is provided in a timely manner.



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Figure 10.1. Implementation streams



### Economic development

A key role in implementing the Pilbara Cities vision will be attracting private investment to:

- provide a broader range of employment options;
- develop land and build affordable housing;
- expand industrial and commercial activities in the Pilbara Cities; and
- assist the funding of essential infrastructure.

### Pilbara Cities Office

The government has recently established a Pilbara Cities Office, that will work closely with the Pilbara Development Commission to attract private investment and implement the Pilbara Cities vision.

## 10.2 Future planning work

Figure 10.2 identifies important strategic and statutory land use planning work in the Pilbara and whether this has been completed, is being undertaken, is being reviewed or is yet to commence. It is acknowledged that this list is not exhaustive given that specific plans and strategies are undertaken by many different agencies to fulfil specific core business and/or legislative requirements.

During the preparation of the Framework the following priority work was identified. These tasks will be prioritised by the Pilbara Regional Planning Committee and included in future work programs.

- **Mapping storm surge and flooding**

It is important that the effects of predicted sea level rise on the main coastal settlements of Karratha, Port Hedland and Onslow are investigated and mapped. This work will be critical in informing the preferred location of future development areas in these centres and required fill levels, which will affect the economic viability of development proposals. Mapping this information at an early stage will assist in making land 'development-ready'.

- **Preparation of a Port Hedland development plan**

The Port Hedland Air Quality and Noise Management Plan, prepared by the Port Hedland Dust Management Taskforce and recently adopted by Cabinet, requires the

preparation of a development plan for the Port Hedland (as distinct from South Hedland) area.

This plan is to identify sites for proposed new development and promote a predominance of future residential development in the eastern areas of Port Hedland. The plan will give direction with regard to residential density, dwelling types and building design and prescribe additional planning controls that assist in addressing amenity issues associated with noise and dust levels. Pilbara's Port City Growth Plan, which is being prepared by the Town of Port Hedland with assistance from the State Government, will include this work.

- **Investigation of a Karratha-Wickham coastal link road**

A more direct coastal road between Wickham and Karratha will enable workers at Cape Lambert and Anketell to live in Karratha and avoid the need for major expansion and duplication of facilities and services in Wickham. The road would also open up coastal nodes for recreation.



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### 10.3 Financial strategy

To become reality, the vision for the Pilbara region will require significant funding, especially in providing utility and community infrastructure. Investment would have a dual role: responding to demonstrated demand and pump priming – providing essential infrastructure ahead of demand to encourage development.

The Pilbara Cities Office and the Department of Treasury and Finance will play a lead role in securing finance for infrastructure and development, and will need to investigate and evaluate all potential funding sources including:

- the use of public-private partnerships;
- development contributions;
- State agreements;
- betterment taxes;
- Royalties for Regions; and
- Infrastructure Australia.

### 10.4 Monitoring and review

It is intended that the Framework will be a living document regularly reviewed, updated and improved. Subsequent editions of the Framework will take into account new and updated information, review the objectives and actions and address additional important issues that have not been able to be addressed in depth, given the strict timeframe in preparing the first version of the Framework.

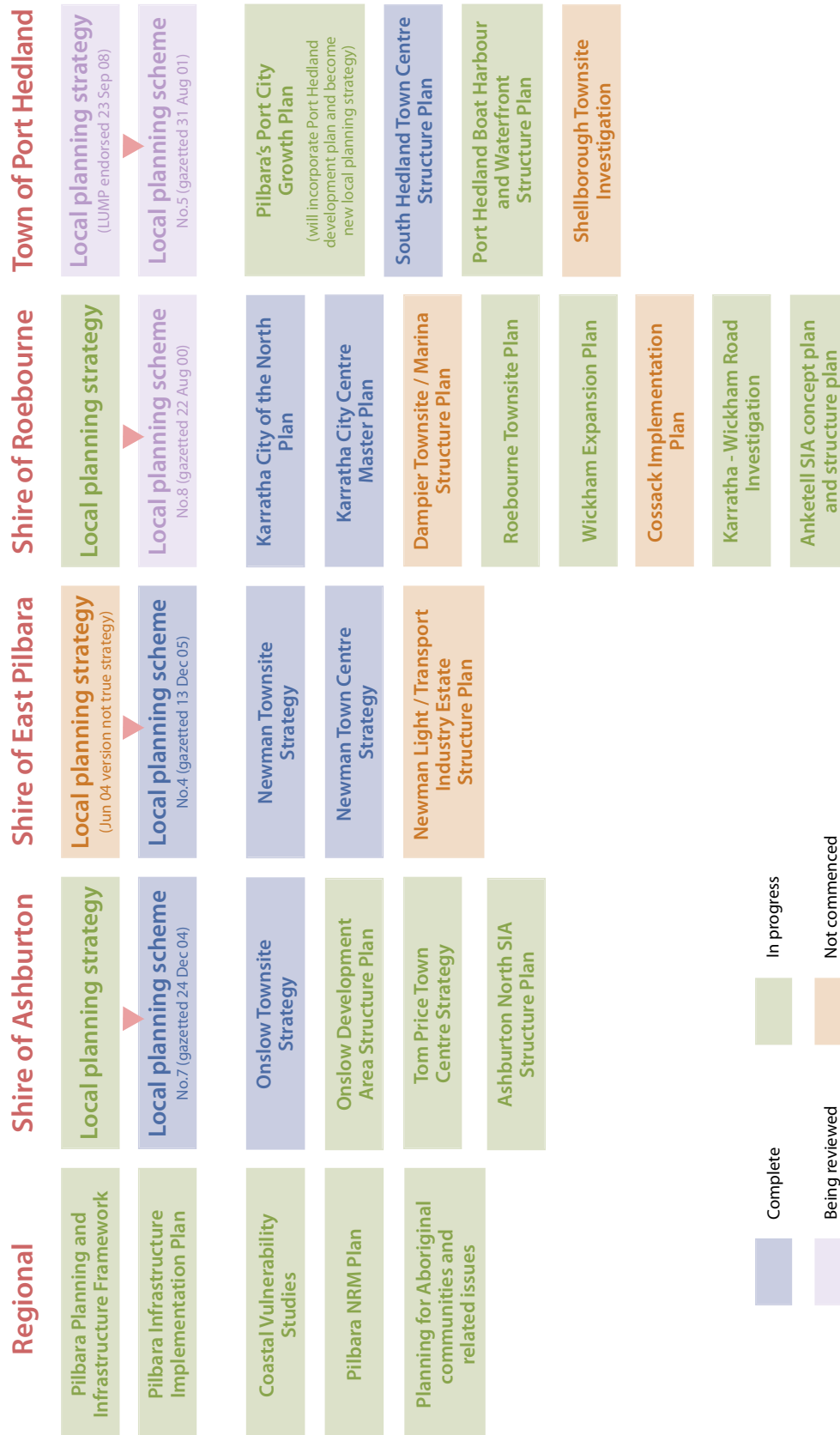
The accompanying 'Pilbara Regional Profile' will also be updated as required.

A reporting and monitoring structure will be developed, so that a report on progress in implementing the actions, contained in the Framework, can be prepared on an annual basis. Over time, this structure will include a set of indicators (in accordance with the new State Planning Strategy) to assess the effectiveness of certain actions stated in the Framework. In the context of the Pilbara, measuring growth in the various industry sectors; the number of fly-in fly-out workers; and land and housing availability will be particularly relevant.

The regularly produced Regional Hotspots Land Supply Updates will also act as a review mechanism for the Framework.



Figure 10.2. Pilbara planning work





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# Appendices

The background of the page is a faded, reddish-brown image of a coastal landscape. It shows a body of water in the foreground, a rocky coastline with some buildings or structures, and hills or mountains in the distance under a hazy sky.

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## Acronyms and abbreviations

AACGR	Average Annual Compound Growth Rate
ABS	Australian Bureau of Statistics
ABARE	Australian Bureau of Agricultural and Resource Economics
ADF	Australian Defence Force
ADSL	Asymmetric Digital Subscriber Line
ANEF	Australian Noise Exposure Forecast
ANSIA	Ashburton North Strategic Industrial Area
API	Australian Premium Iron
BHP	Broken Hill Proprietary
BP	British Petroleum
CASA	Civil Aviation Safety Authority
CCTV	Closed Circuit Television
CME	Chamber of Minerals and Energy
COAG	Council of Australian Governments
Code 4C	CASA aircraft classification – includes: B737 A320 A321 F100 EMB190
CUF	Common User Facility
DEC	Department of Environment and Conservation
DMP	Department of Mines and Petroleum
DoW	Department of Water
DoP	Department of Planning
DRDL	Department of Regional Development and Lands
DSD	Department of State Development
EPA	Environmental Protection Authority
FESA	Fire and Emergency Services Authority
FIFO	Fly-in fly-out
FMG	Fortesque Metals Group
FTE	Full time equivalent
GL	Gigalitre – one billion litres
GLpa	Gigalitres per annum
GP	General Practitioner
GROH	Government Regional Officers' Housing
GW	Gigawatt
GWh	Gigawatt hour
Ha	Hectare
HVAC	Heating, Ventilation, and Air Conditioning
IBRA	Interim Biogeographic Regionalisation of Australia
ICC	Infrastructure Coordination Committee



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ICT	Information and Communication Technology
KL	Kilolitre – one thousand litres
KLpa	Kilolitres per annum
KL/day	Kilolitres per day
kV	Kilovolt
LNG	Liquified natural gas
LPG	Liquefied petroleum gas
LUMP	Land use master plan
MCC	China Metallurgical Group Corporation
ML	Megalitre – one million litres
MRWA	Main Roads Western Australia
Mt	Million tonnes
Mtpa	Million tonnes per annum
MW	Megawatt
NASH	Ngarluma Aboriginal Affordable Housing Strategy
NBN	National Broadband Network
NRM	Natural resources management
NWIS	North West Integrated System
OoE	Office of Energy
PACC	Pilbara Area Consultative Committee
PANGO	Pilbara Association of Non Government Organisations
PDC	Pilbara Development Commission
PICC	Pilbara Industry's Community Council
PJpa	Petrajoules per annum
PTA	Public Transport Authority
RDA	Regional Development Australia
RFDS	Royal Flying Doctor Service
RPA	Regional Partnership Agreement
RPT	Regular Public Transport
RTIO	Rio Tinto Iron Ore
SIA	Strategic industrial area
SPP	State Planning Policy
TAFE	Tertiary and Further Education
TBD	To be determined
WACHS	Western Australian Country Health Service
WAPC	Western Australian Planning Commission
WWTP	Waste water treatment plant

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### Local government websites

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Shire of East Pilbara - [www.eastpilbara.wa.gov.au](http://www.eastpilbara.wa.gov.au)

Town of Port Hedland - [www.porthedland.wa.gov.au](http://www.porthedland.wa.gov.au)

Shire of Roebourne - [www.roebourne.wa.gov.au](http://www.roebourne.wa.gov.au)

### Company websites

API

[www.atlasiron.com.au](http://www.atlasiron.com.au)

BHP Billiton

[www.bhpbilliton.com](http://www.bhpbilliton.com)

Chevron Australia

[www.chevronaustralia.com](http://www.chevronaustralia.com)

CITIC Pacific

[www.citicpacificmining.com](http://www.citicpacificmining.com)

FMG

[www.fmgl.com.au](http://www.fmgl.com.au)

Hancock Prospecting

[www.hancockprospecting.com.au](http://www.hancockprospecting.com.au)

MCC

[www.mcc.com.cn](http://www.mcc.com.cn)

North West Iron Ore Alliance

[www.nwioa.com.au](http://www.nwioa.com.au)

Rio Tinto

[www.riotinto.com](http://www.riotinto.com)

Woodside

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