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Northern Territory

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1. Overview

1.1. Demographics

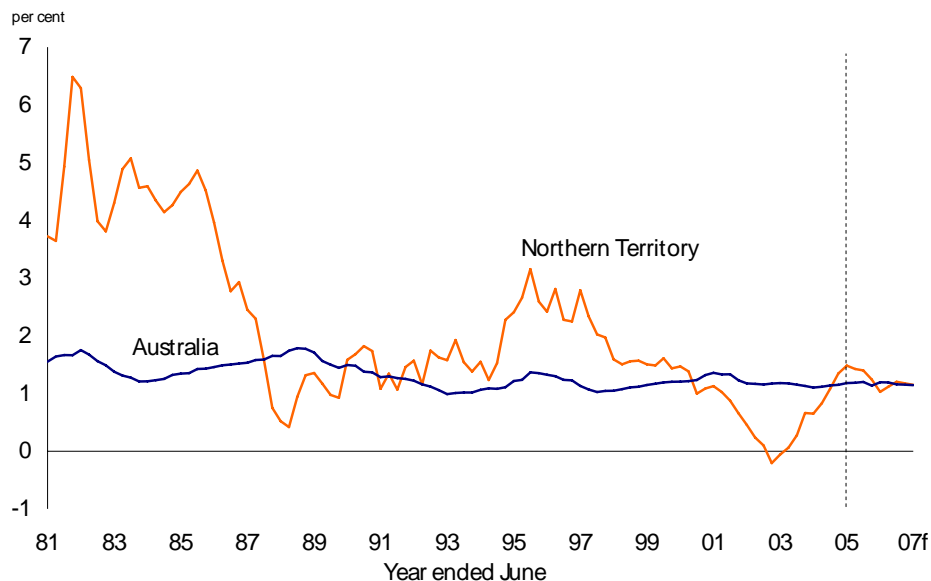
1.1.1. Territory population trends:

Territory population growth was 1.1 percent in 2004, following growth of 0.3 percent in 2003 and 0.1 percent in 2002.

In the year to December 2005, Territory estimated population growth was 2.0 percent, above the national growth rate for two consecutive years, and the second highest of all jurisdictions (behind Queensland).

Population growth in the Territory is expected to continue above the national growth rate during 2006 and 2007.

Forecast growth to December 2006 is 1.5%, easing to 1.2% for the remainder of the decade.



f = forecast

Source: Northern Territory Treasury, ABS Cat. No. 3101.0

1.1.2. Demographic characteristics:

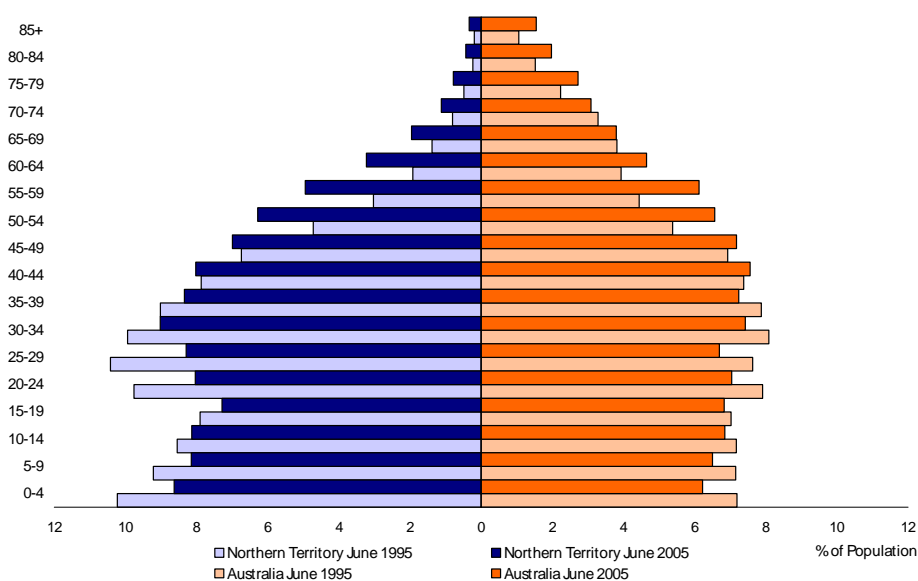
The Territory's population is the most youthful of any jurisdiction in Australia. It consistently has the largest proportion under 15 years of age and the smallest proportion aged 65 and over of any state or territory.

As at 30 June 2005, the median age of Territorians was estimated to be 30.9 years. This is almost six years below the national median age of 36.6 years.

Over the past ten years, the Territory's population has aged markedly faster than the national population. The median age in the Territory rose from 27.8 years in 1996 to 30.3 years in 2005, compared to an increase nationally from 34.0 years to 36.5 years over the same period.

The Indigenous population makes up 29 percent of the Territory's total population and is much younger than the non-Indigenous population, with a median age of 21.8 at June 2001 compared with 32.4 years for the non-Indigenous population.

At 30 June 2001 (latest available figures), the Indigenous population in the Territory was estimated to be 56,875 persons, accounting for 12 percent of the national Indigenous population of 458,520, which was 2.4 percent of Australia's total population.



Source: ABS Cat. No. 3201.0

Components of growth

Population growth consists of natural increase (births minus deaths), net overseas migration and net interstate migration. Natural increase makes the greatest contribution to growth, typically about 1.4 percentage points per annum.

The Territory is characterised by high fertility rates, particularly among the Indigenous population. Since 1986, total fertility (children per woman during lifetime) for all Territory females has fluctuated around 2.3, while nationally it has fallen from 1.9 to 1.8. In 2004, the total fertility for Indigenous women in the Territory was 2.6.

Age-standardised mortality rates, which take into account the age structure of the population, are significantly higher in the Territory (8.2 per 1000) than in any other jurisdiction and nationally (6.3 per 1000). This is largely due to the much poorer health outcomes experienced by the Indigenous population.

Overseas migration has typically made a small positive contribution to Territory population growth and, in the five years to June 2005, its average contribution to growth was 0.3 of a percentage point per annum.

The Territory's population shows greater interstate mobility than any other jurisdiction, with an estimated 21 percent of the Territory's population in 2001 not living in the Territory five years previously. Over the five years to June 2005, around 9 percent of the population moved interstate each year. Nationally, around 2 percent of the population move interstate each year.

Given the relatively stable nature of natural increase and overseas migration, change in Territory population growth is largely determined by movements in interstate migration. Over the five years to June 2005, quarterly estimates of net interstate migration ranged from a gain of 233 in the June quarter 2005 to a loss of 1160 persons in the March quarter 2003. On average, net interstate migration subtracted one percentage point from annual growth over the five-year period to June 2005.

Over the past two years there has been a significant turnaround in the Territory's net interstate migration outflows. Net interstate migration turned positive in the March quarter 2005 for the first time since December 1999. Recent improvement in net interstate migration reflects the improving prospects for the Territory economy, particularly in construction and tourism.

1.1.3. Population trends by region

Despite the Territory's low overall population density (0.15 persons per square kilometre), more than three-quarters of the Territory's population lives in urban centres. As at 30 June 2005, the Darwin region accounted for around 55 percent of the Territory's population. Alice Springs accounted for a further 13 percent, while the other main administrative centres (Katherine, Nhulunbuy, Tennant Creek and Jabiru) together accounted for about 9 percent.

Between 2001 and 2005, the Darwin region, comprising Darwin, Palmerston and Litchfield, experienced moderate population growth, with Palmerston increasing by 9.1 percent and Litchfield by 6.9 percent, compared with Darwin's 2.0 percent. The very high growth levels experienced by Palmerston between 1996 and 2001 (11.0 percent per annum) have slowed to average annual growth of 2.0 percent since 2001.

Other regional centres in the Territory experienced mixed growth results over the 2001-05 period. Jabiru, Katherine and Alice Springs fell by 1.4 percent, 0.7 percent and 0.1 percent respectively, while the populations of Nhulunbuy and Tennant Creek grew by 5.0 percent and 0.2 percent respectively. The population of the remainder of the Territory increased by 1.0 percent over the same period.

1.1.4. Conclusion

The Territory's population growth is volatile and different to the rest of Australia. The magnitude and direction of change is driven by interstate mobility. While net interstate migration figures have been more encouraging in recent quarters, there is no guarantee this trend will continue. Strong population growth will depend on

strong growth in the economy and major projects creating employment opportunities in the construction sector.

The Territory's population is unique being composed of two populations, the Indigenous and non-Indigenous populations, which exhibit very different patterns of growth. It is essential to consider both populations in forecasts of future population growth. High fertility drives growth in the Indigenous population whereas interstate migration drives non-Indigenous population growth.

Both populations are ageing and the non-Indigenous population has aged markedly in the last decade although the rate of this growth should decline in the coming decade. Increased numbers of aged people will place pressure on services.

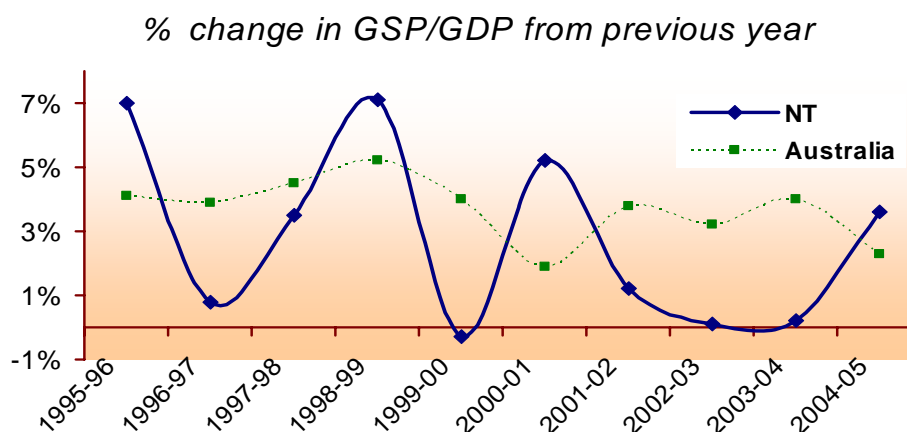
As the rest of Australia ages, there will be an increasing demand for young, skilled people. This may present the biggest threat to the Territory's population growth.

1.2. Economy

1.2.1. Economic overview

The Northern Territory economy is closely linked to the national and global economies and grew by 3.6% in 2004-05, substantially faster growth than the national average of 2.3%. The Northern Territory Gross State Product (GSP) was estimated at \$10 418 million (expressed in current prices) in 2004-05, with industry sectors directly contributing \$9 865 million.

NT economic performance



Source: ABS 5220.0

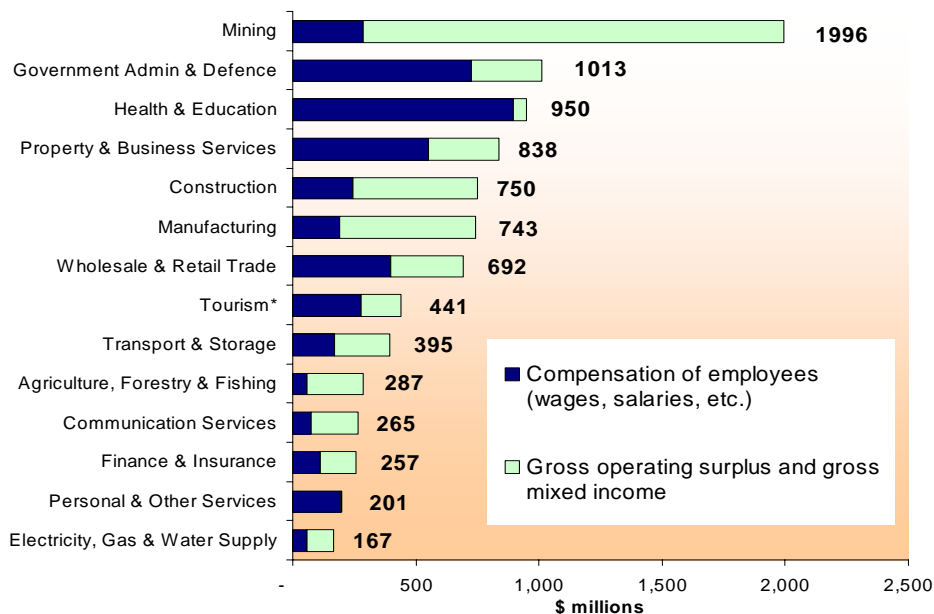
This positive growth is being driven by:

- Strong investment in resource-based projects on the back of the commodity boom including the Darwin LNG Plant and the Alcan G3 alumina refinery expansion
- A housing boom with strong housing and non-residential construction growth on the back of healthy population growth
- A large Defence expansion impacting on construction (e.g. Bradshaw Field Training Area upgrade and DHA Lyons suburb development) and increasing consumer demand by adding to the population
- Strong Tourism growth

The Northern Territory economy differs from the national average in terms of its industry make-up. Three key sectors make a proportionately larger contribution to our economy:

- Mining (including Petroleum) – the Territory is rich in resources, with significant land based mining, and sea-based oil and gas extraction operations. This sector tends to be volatile, export oriented and characterised by long lead times for development.
- Government Administration and Defence – this sector employs about 15% of the Territory’s population, with seven major defence facilities providing a stable employment base and population for the economy.
- Tourism – the Territory’s iconic nature-based tourism attractions, including Uluru-Kata Tjuta National Park and Kakadu National Park, make tourism a significant and growing industry.

NT industry value added 2004-05 (\$m)



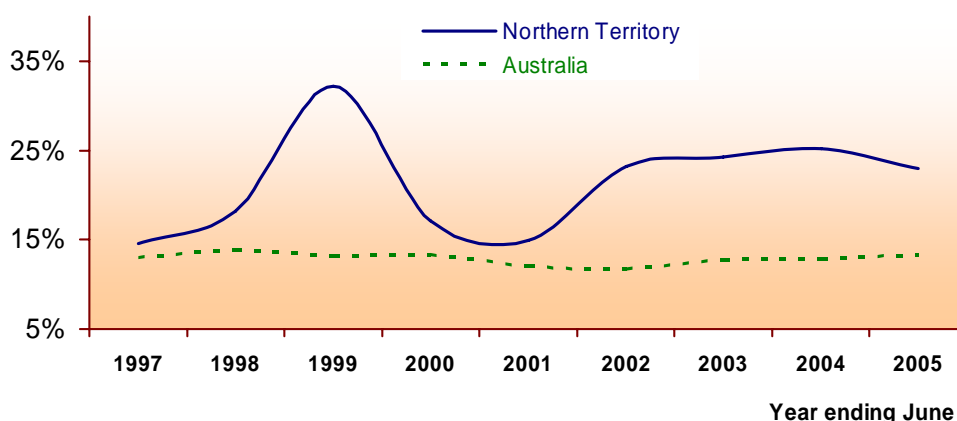
Source: ABS 5220.0

Other important sectors in the Northern Territory include Health and Education, Property and Business Services, Construction, Manufacturing and Wholesale and Retail Trade. The Agriculture, Forestry and Fisheries sector is particularly important in a regional context.

The Northern Territory economy is volatile due to its small size and the large proportion of exports, which are affected by variable global demand and prices. The domestic component of the Territory economy, including sectors such as Retail and Wholesale, Health, and Property and Business Services, while relatively small, serves to reduce volatility.

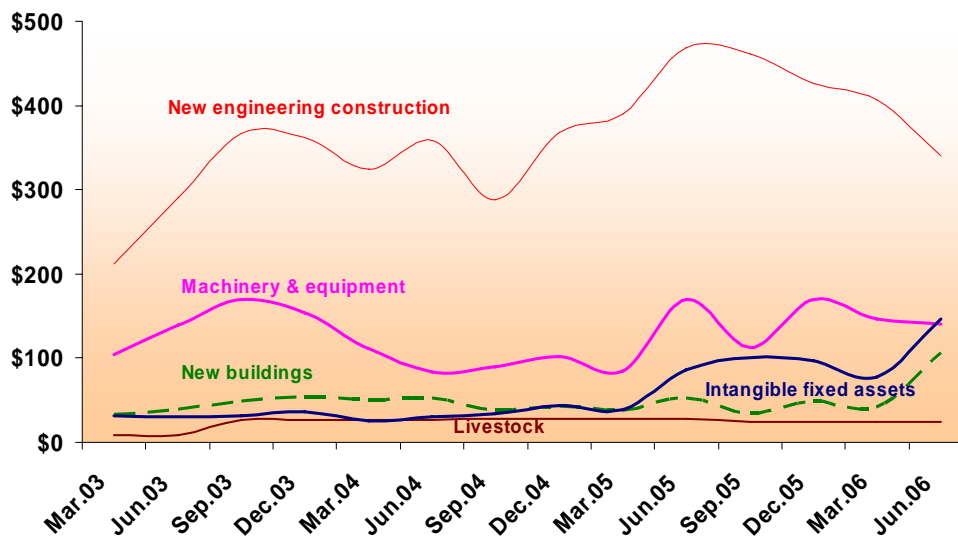
Business investment compared with Gross State Product (GSP) is well above the national average. The investments associated with major projects such as the Darwin LNG plant and Alcan G3 have been a major factor in driving business investment.

NT business investment as a proportion of GSP/GDP



Source: ABS 5220.0

NT business investment (\$m)



Source: ABS 5206.0

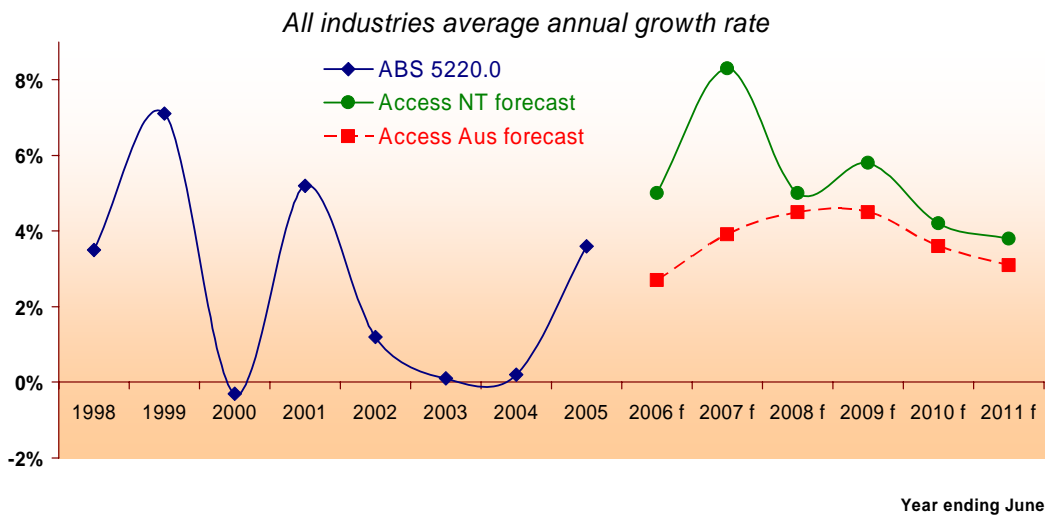
The level of Australian and Northern Territory government capital investment relative to GDP in the Territory is similar to the national average. Infrastructure investments have included the AustralAsia Railway and Defence facilities. The Northern Territory Government has been proactively attracting business investments. For example, the Darwin Waterfront and Convention Centre will further enhance Darwin's status as an emerging global city.

The Territory has had some successes in attracting private sector investment in remote areas, particularly in tourism developments in places such as Central Australia and Kakadu. However there are challenges such as availability of skilled labour, infrastructure costs, risk perceptions and occasional difficulties with access to land. As these issues are addressed, additional investment opportunities will arise in the more remote areas of the Territory, leading to regional economic development and higher incomes.

1.2.2. Economic outlook

Following strong growth in 2004-05, the medium-term outlook for the Northern Territory economy is positive. Over the five years to 2010-11 Access Economics expects Territory economic growth in excess of 5% per annum, higher than the national average.

NT economic outlook



f = forecast

Source: Access Economics September 2006 Business Outlook; Australian Bureau of Statistics 5220.0

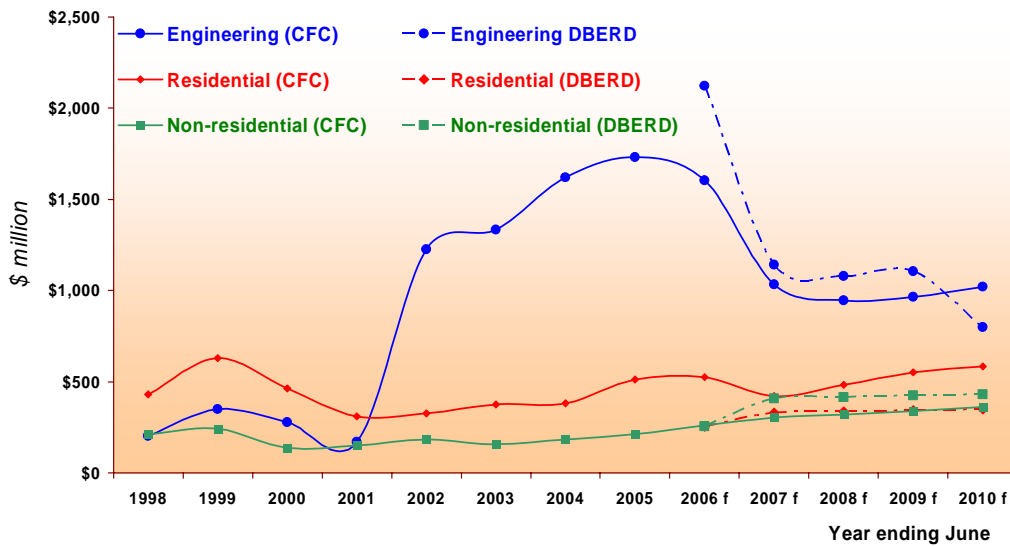
The economy is maturing with an increasing proportion of private sector investment and will continue to be driven by the resources boom and population growth:

- Global demand for our major exports, mainly mineral and petroleum commodities, is forecast to remain strong in the medium term.
- In 2004-05 the NT population increased by 1.5% to over 202 000 people. This growth is projected to continue by an average of 1.7% per annum over next 5 years, with major growth in the Indigenous population (Access Economics, September 2006 Business Outlook).

The medium-term prospects for the Construction sector are positive. Engineering construction is expected to fall next year and then steady, but still at historically high levels. Steady growth on the back of a positive population trend is expected for residential and non-residential construction activity.

From a business perspective, the Small to Medium Enterprise business outlook for the next 12 months is well above the national average.

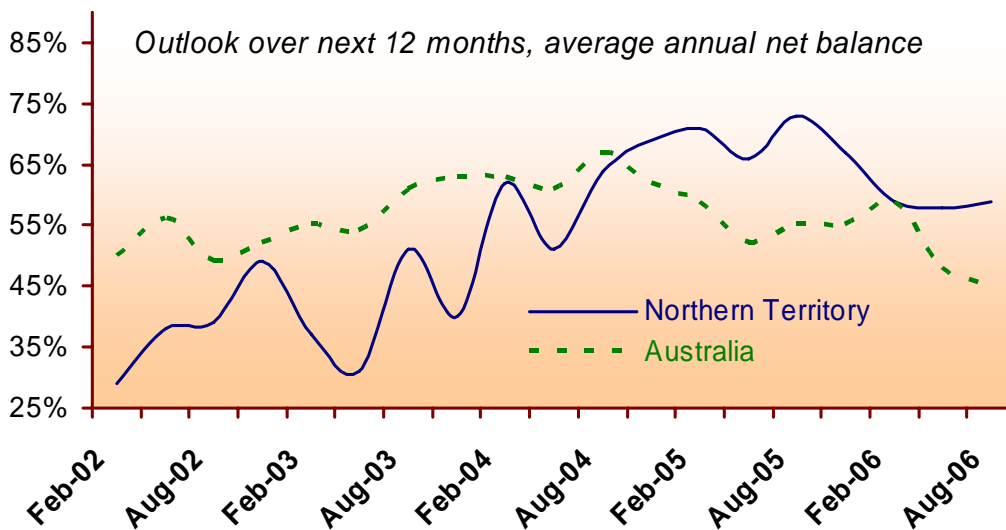
NT Construction outlook



f = forecast; CFC = Construction Forecasting Council

Source: Department of Planning and Infrastructure Construction Snapshot; DBERD calculations; Construction Forecasting Council

NT Business Confidence



Source: Sensus Business Index

Sustained strong economic growth has infrastructure implications for the Northern Territory. The growing population will increase demand for housing, retail, education and health services. In the longer term additional infrastructure will also be required including roads, power and water, hospitals and schools. Managing these implications will require careful planning.

2. Transport

2.1. Roads

2.1.1. Supply

There are approximately 36 000 kilometres of roads in the Northern Territory¹; of these, 22 000 kilometres of roads are managed by the Northern Territory Government, the balance are managed by local government bodies².

The Local Territory Roads (15 417 kilometres) includes 8 600 km of local roads in unincorporated areas managed by the Territory Government that would normally be managed by Local Government Bodies.

Road Classification	Financial Responsibility	Length of Road (km)				
		Sealed	Gravelled	Formed	Unformed	Total
National Highway	Federal/Territory	2 682				2 682
Urban Arterial	Territory	143		3		146
Rural Arterial	Territory	2 217	1 356	386	5	3 964
Local	Territory	1 515	5 333	4 666	3 903	15 417
Local Government Roads	Local	2 015	1 860	2 081	8 061	14 017
Total		8 572	8 549	7 136	11 969	36 226

The Northern Territory road network includes a wide spectrum of road types, from urban arterials with controlled access and significant daily traffic volumes to remote flat-bladed tracks with only occasional vehicle usage.

This wide spectrum reflects the diverse nature of the Northern Territory economy with large areas of low intensity activity (grazing on improved natural grasses in particular) interspersed with small areas of more intense activity (e.g. mining), and population density. Road transport must cater for both extremes.

The low level of overall development is shown in the fact that there is only 0.026 kilometres of road in the Northern Territory per square kilometre of land whereas nationally there is 0.105 kilometres of road³.

The need for Northern Territory roads to connect widely dispersed areas of population and economic activity means that Territory roads generally have low traffic densities outside of the main population centres. However, road maintenance and rehabilitation requirements remain high because of:

- The community obligation to provide minimum standards of access to remote communities.

¹ Northern Territory Budget Overview: Chapter 14, Transport and Communications, page 113

² Municipal government councils, community government councils, incorporated associations and the Local Government Association of the NT

³ Northern Territory road distances are from Northern Territory Budget Overview: Chapter 14, Transport and Communications, page 113, other road data are drawn from Austroads Road Facts 2005, geographic area data from the Australian Bureau of Statistics 2006 Australian Year Book (catalogue 1310.0)

- The intense nature of the climate from extreme wet seasons to desert inclusive, prolonged exposure to sunlight and the impact this has on bitumen (oxidation).
- The ongoing aging of the infrastructure.
- The impact of intense rainfall events associated with the summer monsoon and/or cyclones.

With the low level of development of the road network, there is an ongoing demand for extensions to the network and for upgrading, particularly to upgrade/seal dirt and gravel roads. These demands are driven by remote community access issues, pastoral, mining and tourist development. For example, the Northern Territory is currently working with the Queensland and Western Australian Governments to develop two major tourism drive routes, the Outback Way (from Winton in Queensland to Laverton Western Australia) and the Savannah Way (from Cairns in Queensland to Broome in Western Australia).

The national highways, the Barkly, Stuart and Victoria Highways, are the most important roads as they provide the only high-standard road links as part of the national road network linking adjoining States. There are other interstate road links but these are all unsealed and so can not be relied upon particularly during the monsoon season. The national highways are also key strategic national links as they provide the only high-standard east-west transport link in northern Australia.

The national highways are the main road freight routes in the Northern Territory; rural arterials are also important for movement of freight to and from remote communities, pastoral properties and businesses.

2.1.2. Demand

Demand for road transport is broadly linked to economic growth, population growth and changes in real disposable income. Total vehicle kilometres travelled have grown although this has mainly been due to a steady increase in urban kilometres.

Year	Vehicle Kilometres Travelled (millions) ⁴		
	Rural	Urban	Total
2001	764	711	1 475
2002	801	727	1 528
2003	742	736	1 478
2004	757	742	1 499
2005	751	756	1 507

Since 2004, Northern Territory demand for road freight has been affected by the introduction of rail freight services on the Adelaide to Darwin railway. Both road freight and the number of road freight vehicles declined in response to the start of freight train services, this is evidenced in the latest Survey of Motor Vehicle Usage (SMVU) data published by the Australian Bureau of Statistics⁵.

⁴ Department of Planning and Infrastructure

⁵ Australian Bureau of Statistics: Survey of Motor Vehicle Usage, catalogue number 9208.0

The following data are derived from the SMVUs for 2000, 2003 and 2005.

Growth in vehicle numbers 2000 - 2005

Vehicle type	% change
Passenger vehicles	10.0
Motor cycles	1.3
Light commercial vehicle*	12.6
Rigid trucks	13.6
Articulated trucks	-5.7
Non-freight trucks	71.7
Buses	13.2
Total	6.9

* Includes four wheel drive vehicles

Kilometres travelled 2000 - 2005

Purpose for which used:	% change
Business	-10.8
Commuting	13.6
Personal	4.9
Total	-1.5

Vehicle registrations grew for all classes other than articulated vehicles and vehicle kilometres travelled grew other than that for business travel; the declines are most likely due to the reduction in long distance truck operations with the commencement of rail operations. The general growth in passenger vehicles reflects in part the increasing tourism drive market across the network.

Despite this reduction, the demand for road transport in the Northern Territory continues to be markedly different from that in Australia as a whole, as shown in the following table of freight tonne kilometres travelled:

Freight Tonne Kilometres Travelled

Area of operation: Kilometres travelled	2000		2003		2005	
	NT (%)	Aust (%)	NT (%)	Aust (%)	NT (%)	Aust (%)
Capital city and urban	47.3	68.5	49.3	68.2	57.0	70.4
Other Intrastate	45.2	25.6	41.7	26.7	38.7	24.6
Interstate	7.5	5.9	9.0	5.1	4.3	5.0
Percent of tonne kilometres by articulated vehicle	90.9	77.0	93.9	75.7	84.4	77.2

A much higher proportion of Northern Territory travel occurs in regional areas and articulated vehicles (including road-trains) make up a much larger share of freight tonne kilometres and vehicle kilometres travelled. For Australia as a whole, urban areas dominate the kilometres travelled whereas they are much less important in the Territory.

The dominance of articulated vehicles, particularly road-trains, and the relative importance of regional transport demand, has significant implications for the supply of roads in the Northern Territory:

- The Territory must maintain high quality regional road links, including the national highways.
- These roads must be designed to cater for and facilitate the safe operation of road-trains.

The following table shows several other important aspects of Northern Territory road usage:

Demographic comparison, NT - Australia

	NT	Australia
Population Density (persons per square kilometre) ⁶	0.1	2.6
Road Usage (Vehicle kilometres travelled per kilometre of road) ⁷	46	237
Per capita vehicle ownership ⁸ (vehicles per person)	0.51	0.63

The table shows:

- Northern Territory has a very low population density. Consistent with this, the Northern Territory has the lowest level of road usage (vehicle kilometres travelled per kilometre of roads).
- Despite the low population and road use densities, average per capita vehicle ownership in the Northern Territory is similar to that occurring nationally; this shows that road transport is as important to the overall functioning of the Territory society and economy as it is nationally.

Further to this, the Northern Territory Auslink submission drew attention⁹ to the key link between the availability of good quality transport links and capital investment. Increased investment is required by most enterprises to increase productivity; this in turn requires access to reliable all-year-round transport links for the uninterrupted movement of inputs and outputs.

Without reliable transport links, capital investment becomes more risky. For almost all of the inland parts of the Northern Territory, roads provide these transport links and other than the national highways, these links are all subject to prolonged closure during wet periods. In the Top End, this means many areas are isolated for several months during the wet season.

⁶ Derived from Austroads: Roadfacts 2006, Table 8.1

⁷ Derived from Austroads: Roadfacts 2006, Table 2.3; Northern Territory road length from Northern Territory Budget Overview: Chapter 14, Transport and Communications, page 113

⁸ Vehicle numbers drawn from Austroads Road Facts 2005, population data from the Australian Bureau of Statistics release 3101.0, Australian Demographic Statistics

⁹ Northern Territory Government: "Auslink – Northern Territory Comments on Auslink Green Paper", February 2003, page 11

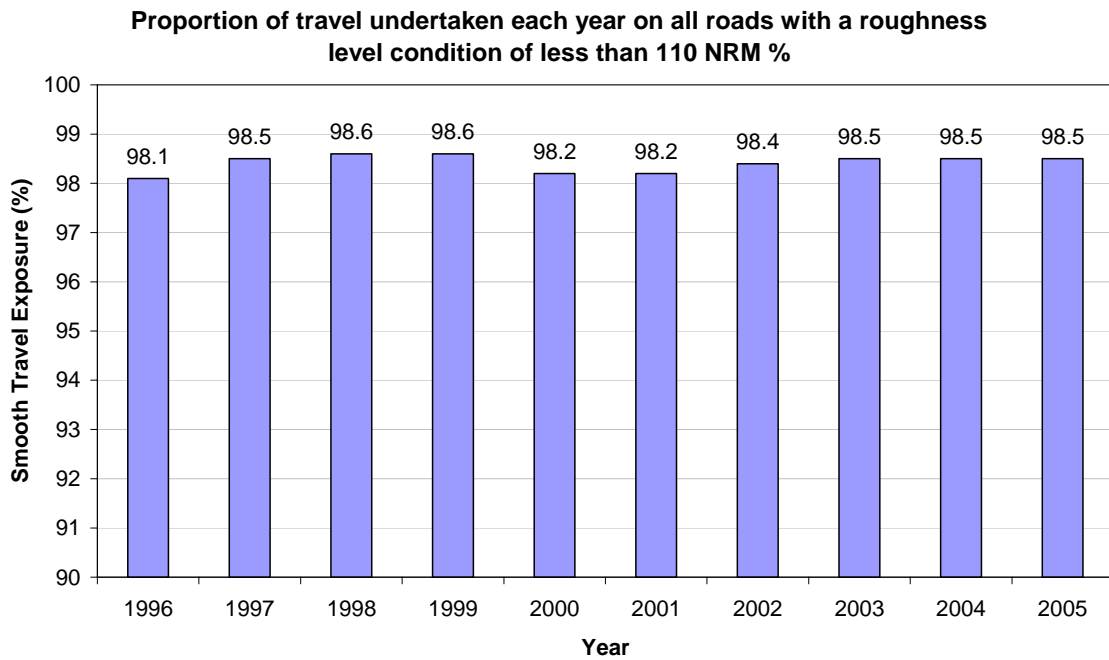
2.1.3. Performance

The Northern Territory uses the smooth travel exposure indicator to monitor the condition of the road network. The indicator represents the proportion of travel undertaken each year on roads with surface roughness less than either of the defined levels of 110 NRM (NAASRA Roughness Meter). A roughness level that is less than 110 NRM will normally provide acceptable travel conditions.

The following graph shows the smooth travel exposure indicator for national highways within the Territory and sealed roads maintained by the Northern Territory. The graph shows that road surface conditions for these roads have been maintained at high levels.

The Government is seeking to maintain the current standard of the road network and to this end the annual road maintenance budget for Northern Territory roads has been increased in recent years and, in 2006/07 is \$36 million (excluding national highways). Funding levels on the Auslink Network in 2006-07 were \$15.59m.

With increasing demand, aging pavements and significant cost escalation over recent years, the maintenance expenditure will need to increase significantly in future years.



The Northern Territory has the highest fatality rate¹⁰ of any jurisdiction. A new Road Safety Strategy was launched in 2004 with the aim of reducing road fatalities by 40% by 2010. The lack of progress towards achieving this goal prompted the Northern Territory Government to recently announce the end to open speed limits on Territory roads.

2.1.4. Investment

Funding for Northern Territory roads comes from four sources¹¹:

- Australian Government funds under Auslink: These are provided to maintain the national highways, to fund the Black Spots program and to assist with key regional linkages. The Roads to Recovery program was incorporated into Auslink from 2004.
- Northern Territory Government funds: These are provided to maintain Northern Territory roads, including local roads in unincorporated areas.
- Financial Assistance Grants: These are provided by the Australian Government to local government councils and governing bodies. Northern Territory community and local government bodies have received \$12 – 13 million annually in recent years under this program.
- Roads to Recovery funds: The Australian Government provides funds direct to local government bodies and to the Northern Territory Government for roads in unincorporated areas. Under this, the Northern Territory Government will receive \$16 million for roads in unincorporated areas. This Northern Territory Government component has been increased to \$20m with the \$4m Supplementary Program in 2006-07.

Total funding for the Northern Territory under Auslink for 2004/05 to 2008/09 is shown in the following table:

Auslink Program	2004/05 to 2008/09 \$million
National Projects ¹	185.2
Roads to Recovery ³	38.9
Improving local roads	9.0
Strategic Regional	4.5
Black Spot	2.7
Total Auslink	240.3
Untied Local Roads Grants ²	60.6

1: Includes projects continuing on from former National Highway and Roads of National Importance Programs

2: Estimate

3: Supplementary R2R Program.

The major road priorities in 2006/07 are:

- A major program of upgrading for the beef roads targeting the primary feeder roads for the pastoral industry.
- Sealing of the Mereenie loop road particularly for the tourism industry.
- Sealing Litchfield Park Road.
- Progressing the major flood immunity project on the Victoria Highway (being funded under the Auslink program).
- Ongoing repairs and maintenance.

¹¹ Auslink webpage: Auslink Funding for the Northern Territory

Northern Territory Government roads expenditure on capital works and repairs and maintenance (excluding Auslink) ¹² is as follows:

Year	Capital (\$m)	Repairs and Maintenance (\$m)	Disaster Maintenance (\$m)
2000-01	18.8	26.5	11.6
2001-02	14.4	24.1	10.4
2002-03	16.1	24.6	2.3
2003-04	17.3	28.8	5.5
2004-05	29.7	29.3	3.4
2005-06	27.6	32.1	4.6
2006-07 (budgeted)	22.7	35.9	10.8

Figures are sources from Northern Territory Government Budget Paper 4 reported end of year approved budget figures. Actual expenditures may vary slightly.

Figures are inclusive of Program Delivery.

2.1.5. Planning, Development & Regulation

Planning – Overall development planning priorities for the Northern Territory are set out in the Economic Development Framework¹³, the Framework was the outcome of a Territory wide public consultation process in November 2005 involving Government, business, unions and the community.

The Department of Planning and Infrastructure consults widely with other Government agencies and road user groups as to road upgrading and maintenance priorities.

The Department also maintains a network of vehicle count stations which provide information on traffic volumes for each road. These data sets are used to help determine road development and upgrading priorities, in particular to help identify emerging bottlenecks. The Department undertakes Transport Modelling in urban centres as part of the long term arterial planning for the road network. Integration of Land Use Planning and Transport needs is a primary objective of the Department and the Department maintains a high level liaison with planning agencies.

The Bureau of Transport and Regional Economics has published projected traffic levels for each of the Auslink corridors¹⁴ to 2025. The forecast increase in traffic volumes for the three Northern Territory corridors (Adelaide – Darwin, Brisbane – Darwin and Darwin – Perth) will not cause significant capacity issues. The main section of concern will be Katherine – Darwin where traffic volumes are expected to continue to grow. However, this can be addressed by building additional overtaking lanes and four-lane, divided road sections.

¹² Department of Planning and Infrastructure

¹³ Northern Territory Government: "Moving the Territory Ahead: Northern Territory Economic Development Framework" 2005

¹⁴ Bureau of Transport and Regional Economics: "Demand Projections for Auslink Non-urban Corridors: Methodology and Projections", Working Paper 66, Commonwealth of Australia, 2006

Development – As already noted, overall development planning priorities for the Northern Territory are set out in the Economic Development Framework, the road network planning complements this. The Territory is also an active participant in the national Auslink transport planning process.

Major long term developments are currently being progressed:

- Auslink: Planning for three Auslink corridors are currently being progressed in consultation with other Governments: Adelaide – Darwin, Brisbane – Darwin and Darwin – Perth. The planning work currently being undertaken will lead to investment projects in the National Land Transport Plan beyond the current 2004-05 to 2008-09 Auslink Programme.
- Repairs and maintenance (R&M): Following extensive modelling of future road repair and maintenance requirements, the Government has increased expenditure for Territory roads; the modelling showed annual R&M outlays will need to be progressively increased to address growing demands arising from increased costs (significant escalation over the last three years) and increased road usage.
- Beef roads: In response to concerns about the state of the beef roads, the Government has committed to an \$11 million upgrading program.
- Tourist Development Roads. The Territory Government has committed upgrading programs for sealing of the West MacDonnell's (Mereenie) Loop and Litchfield Park Roads at costs in excess of \$60 million.

In addition to these, the Government has an ongoing program of monitoring road standards and usage. This includes the use of traffic count stations and computer modelling of urban traffic flows.

Policy & Regulation – The Department of Planning and Infrastructure is responsible for developing and administering policy regarding access to and use of the Northern Territory road network. The key pieces of legislation involved in this are:

- *Control of Roads Act*
- *Motor Vehicles Act*
- *Traffic Act*

In addition, road projects must comply with the requirements of other Northern Territory (and Australian) legislation; particularly those concerning environmental and heritage matters.

2.1.6. Summary

The key challenges for the road network are to:

- maintain the existing road network in the face of the aging infrastructure and competing demands for Government funds; along with this,
- address emerging key capacity issues (for example traffic volumes and flood immunity), upgrade and further develop the network in support of other Government initiatives and priorities; and
- work to facilitate a continual reduction in the road-toll towards national goals.

2.2. Airports

2.2.1. Supply

The major Northern Territory airports, those catering for jet aircraft operations and interstate flights, are located at Darwin, Alice Springs, Ayers Rock, Nhulunbuy and Groote Eylandt. These airports are all privately operated with Darwin being a Joint User with the Department of Defence. In 2005-06 Darwin airport handled 1 099 000 domestic and 334 000 international passengers.

2.2.2. Demand

Tourism is a major driver for the Darwin, Alice Springs and Ayers Rock airports whilst mining activity supports the Nhulunbuy and Groote Eylandt airports.

2.2.3. Performance

In general the Northern Territory's major airports have the capacity to meet current and future demand. Ayers Rock airport is expected to be upgraded this decade to allow wide body aircraft operations.

2.2.4. Investment

Except for a minor contribution by Defence at Darwin airport, all the major airports are funded by private sector investment.

2.2.5. Planning, Development & Regulation

The Commonwealth leased airports at Darwin and Alice Springs are subject to the master planning regime under the *Airports Act*.

Development – Key airport development initiatives underway and planned (including maintenance programs).

Planning is underway to upgrade Ayers Rock airport for wide body aircraft operations.

Commonwealth leased airports are not subject to State/Territory planning which may provide for inappropriate non aviation development on airports.

2.2.6. Summary

Commonwealth security requirements for Alice Springs airport are in excess of that normally required. Check bag screening is likely to add an additional cost of \$30 per passenger which will disadvantage the destination's tourism attraction.

2.3. Marine Infrastructure - Port of Darwin

2.3.1. Supply

The Port of Darwin is Australia's northern gateway, located at latitude S12° 28', longitude E130° 50', is a naturally occurring deep water port. It is well positioned at the Top End of the Northern Territory where it is geographically Australia's closest port to the ASEAN region and is 'Australia's Northern Gateway Port'.

The Darwin Port Corporation presently operates the East Arm and City Wharves in the Port of Darwin and offers facilities and services to commercial shipping. The Darwin Port Corporation facilities predominantly serve the following shipping and cargo market segments:

- Livestock exports
- Dry bulk imports & exports
- Offshore oil and gas production and exploration services
- Petroleum, LNG and other bulk liquids, (privately owned and operated)
- Container and general cargo
- Cruise ships
- Visiting Naval vessels

The Port of Darwin is the supply, service and distribution centre for the nearby Timor Sea oil and gas reserves. Ongoing major exploration and production activity in this region is responsible for considerable cargo volumes through the Port, this is anticipated to increase significantly.

The Port exports more live cattle than any other Australian port.

The Port includes Australia's second LNG hub shipping 3.5 million tonnes per annum from the gas terminal.

The Darwin Port Corporation also operates facilities for non-trading vessels, this segment includes research, fishing and pearling vessels.

The commissioning of the state-of-the-art Darwin Industry Fuel Terminal in the East Arm Development Area, with its pipeline connections to East Arm Wharf, in September 2005 enabled the cessation of bulk fuel imports over the Darwin Wharves. Fuel for the Naval Fuel Installation continues to be brought in over the Iron Ore Wharf

Through a regime of Community Service Obligations the Darwin Port Corporation is also responsible for provision of marine industry support services, development and management of the Darwin Wharf Precinct for tourism and recreation, and provision of port and reception facilities for cruise and naval vessel visitations. The most important facilities provided for these sectors are:

- Stokes Hill Wharf; mainly used for fishing and tourism operators.
- Fort Hill Wharf cruise ship terminal.

- Iron Ore Wharf, mainly used for naval vessels.
- Mooring Basin and Fisherman's Wharf.
- A Roll On/Roll Off (RORO) facility retained primarily by the Navy

With the relocation of commercial vessel operations to East Arm, there is increasing interest in the development of Darwin Wharf Precinct for the non-commercial vessel sector as part of the broader redevelopment of the Precinct.

The Darwin City Wharf area is being redeveloped as part of the Darwin City Waterfront redevelopment. The 25 hectares of foreshore land is being redeveloped to provide for significant public space, community facilities, plus commercial, residential and tourism development. The centrepiece will be a world-class convention and exhibition centre with seating for 1 500 people and 4,000sqm of exhibition space. The initial \$100m investment is expected to be completed by 2007 with an ongoing \$600m redevelopment programme continuing over the next 10-15 years.

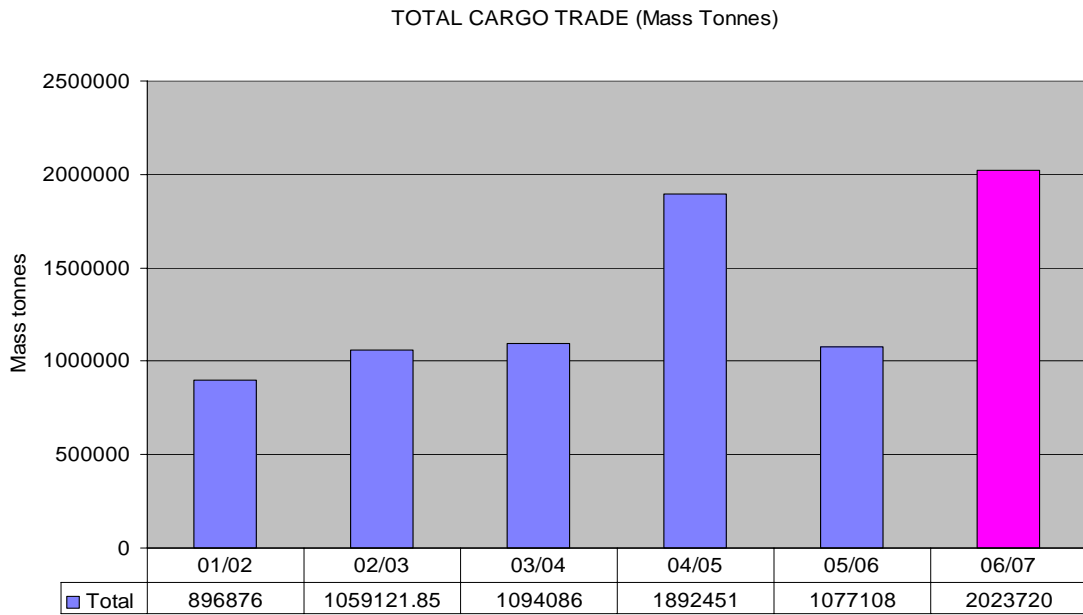
The city wharves will remain as working facilities for visiting international cruise and naval vessels as well as alternative berths for some commercial shipping.

Military support. The Darwin Naval Base within HMAS Coonawarra is contiguous with the Darwin Port Corporation administrative area. Darwin is the busiest naval port in Australia, with 4-5 ship movements per day, including patrol boats, compared to 5-7 per week in other Australian naval ports.

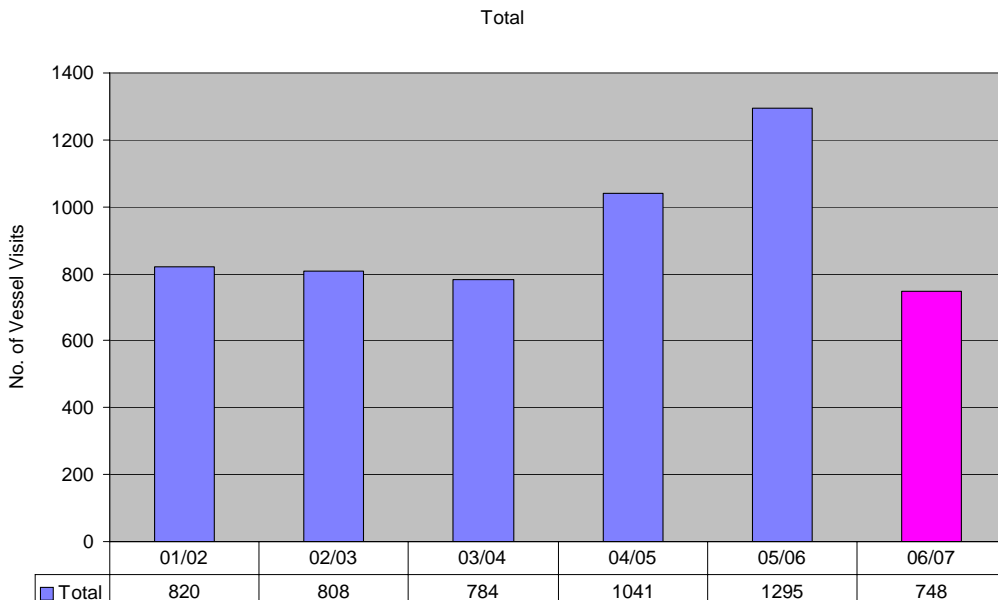
A RORO facility is maintained by Darwin Port Corporation at Fort Hill Warf primarily for Navy use.

The Naval Fuel Installation Facility at Stokes Hill Wharf and the F76 military refuelling system to Iron Ore Wharf are both systems critical to the RAN's operations and exercises and an incentive for visiting foreign naval ships, in particular those of the United States Navy. The economic value of visiting warships to Darwin is very significant.

2.3.2. Demand



The 2005-06 year in terms of total trade was a year of rationalisation for the Darwin Port Corporation in which trade returned to total trade levels pre 2004-05 of just over 1 million tonnes per annum. In 2004-05 the port managed an unprecedented level of project cargo activity related to Timor Sea oil and gas developments including construction of the Darwin LNG plant, Bayu Undan offshore platforms and the 500km Bayu Undan to Darwin subsea pipeline which realised a record trade of 1,892,451 tonnes that did not continue into 2005-06.



The 2006-07 year ahead will see the total tonnage increase on the back of dry bulk exports from the OM manganese Bootu Creek mine and liquid bulk import and

export for the Natural Fuels Australia biodiesel plant. These major projects will have a significant influence on the Darwin Port Corporation trade. However, it is expected that the level of imports of domestic petroleum products, the continued recovery of the livestock export trade, project cargo imports and the ramping up of landbridge trade on the AustralAsia trade route will all contribute to a projected total cargo trade in 06/07 of 2.024 million tonnes.

Vessels calling at the Darwin Port Corporation facilities are categorised into 'trading' and 'non-trading' vessels. Trading vessels are normally commercial vessels carrying cargo or passengers. They include rig tenders, tankers, livestock carriers, bulk cargo vessels, car carriers, container and general cargo vessels, barges and cruise vessels. The non-trading vessels normally include naval vessels, research and pleasure craft, fishing and fishing supply vessels and pearling industry support vessels.

The Port of Darwin had a busy year in 2004-05 and it was anticipated that 2005-06 would see an adjustment in the peak activity and a reduction in vessel calls across the oil and gas sectors as well as the number of container and general cargo vessels. This did eventuate with rig tender calls were down by 96 calls and container and general cargo calls were down 16 calls. It was further anticipated that the reduction in calls may be compensated to a point by an increase in dry bulk vessel calls for the commencement of manganese exports and the first calls of the LNG carriers for the Darwin LNG plant. Since the first LNG carriers arrival in January 2006 there were 15 calls during the year with vessels now arriving on a weekly basis. However due to a delayed start to manganese exports only one vessel was recorded. The doubling of barge numbers is due not only to a dramatic increase in barge activity in the area servicing the oil and gas and the regional communities but also due to a change in the recording of the vessels activity.

The increase in cruise vessel calls is mainly due to the adventure cruise vessel "Orion" undertaking a season of 17 cruises based out of Darwin across the top end and Eastern Indonesia. The popular cruise line will return in 2006-07 for an extended season of nineteen cruises ex Darwin.

Visiting navy ships continue to be a major economic significance to local business. There has been an elevated level of naval ship visits since 1999 as a consequence of the United Nations response to the violence in East Timor. There is a demand for improved infrastructure in relation to the conduct of exercises such as Exercise Talisman Sabre 09.

There are 748 trading vessel calls projected for 2006-07 with the level of activity in a number of sectors remaining static during the year including oil and gas support, livestock and container and general cargo. Increases in dry bulk exports vessel calls as the manganese exports ramp up to full production and increases in tanker activity as Natural Fuels Australia commences production may see some movement in vessel call numbers above those projected.

Territory Iron has signed an agreement in principle whereby Freightlink will provide services to carry iron ore by rail from their Frances Creek siding to Darwin for export to China. The development of the Frances Creek iron ore deposits is expected to increase the export of bulk materials over East Arm Wharf by 1.5 million tonnes per annum.

2.3.3. Performance

The Darwin Port Corporation has maintained port pricing levels with the last CPI price increase in July 2003 and no significant pricing increases for a considerable period prior.

The Port of Darwin experiences minimal or no berth congestion and is located in a greenfield site with considerable scope for expansion.

A recent survey of external stakeholders indicated that all are satisfied with the infrastructure and its performance in facilitating cargo transfer.

2.3.4. Investment

The Darwin Port Corporation is a Government Business Division of the Northern Territory Government. The Corporation was established under the Darwin Port Corporation Act 1999. The \$210m investment in port facilities at East Arm and the Port of Darwin has been funded by the NT Government.

East Arm Bulk Export Facility. Further investment in the East Arm Bulk Export Facility including \$24m for dry bulk handling equipment and \$14m for bulk fuel pipelines and fire safety system on East Arm Wharf has been funded by a mixture of Darwin Port Corporation cash reserves, loan borrowings and Northern Territory Treasury appropriations.

Significant repairs and maintenance programs for the Port of Darwin facilities are also funded by the same mix of resources.

2.3.5. Planning, Development & Regulation

Planning

The Darwin Port Corporation has a Charter of Operations that was developed in line with the requirement for all Government Business Divisions to establish the same.

Corporate Business Plan. The Darwin Port Corporation has clearly established goals, objectives and strategies appropriate to the operation of the Port and that they are documented and used as management tools.

The Corporate Plan is revised annually to reflect the strategic objectives and governance arrangements.

The Port Development Plan. *The Port Development Plan* is 'nested' within the *East Arm Development Area Master Plan* to maintain the strategic planning focus for the area. This document was first produced under the administration on the Board of Directors of the Darwin Port Corporation in January 2000. It was subsequently updated in June 2002 and May 2005 to reflect new governance arrangements and current Port planning thinking.

The Plan established short (2005-2010), medium (2010-2015) and long term (2015-2020) planning timeframes.

The short term proposals particularly address the completion of wharf extensions, the establishment of bulk liquids and then bulk solids handling capability at East Arm. This is complementary to the withdrawal of commercial operations to allow the Darwin City Waterfront Development to proceed which will see a focus on cruise shipping and naval vessel visits at the City Port. Infrastructure associated with the establishment of an LNG Plant at Wickham Point has also been completed with the commencement of LNG carrier operations in the Port of Darwin in January 2006.

The plan is intended to be used as a guide to Corporation staff and Port users in providing a co-ordinated effort in achieving the strategic development proposals. It is recognised that the plan will require regular review as strategic goals are achieved and the nature of shipping operations and trade through the Port change with time.

Development

There are a number of key seaport development initiatives either under way or in the planning and or required in the near future for the Port of Darwin to maintain responsible development and delivery of the master plan proposed for the port:

- \$24m East Arm Bulk Export Facility. The dramatic rise in demand in the resources sector and the availability of the AustralAsia railway has driven the development of some previously marginal bulk resource developments along the central Australian rail corridor. These developments require efficient and cost effective port facilities to export the product to the demand markets.

The Darwin Port Corporation has been developing options in conjunction with a number of bulk exporters for bulk material receipt, stockpiling and shiploading at the East Arm facilities in the Port of Darwin. The Darwin Port Corporation has developed a \$24m bulk materials handling facility at East Arm including an 850m rail spur, 1,500TPH rail bottom dump station, stockpiles, haul roads and a 2,000TPH travelling gantry shiploader on the East Arm berth. The shiploader will be capable of loading 75,000 tonne deadweight ships and have a throughput capacity of about 3 million tonnes per annum.

The Darwin Port Corporation's pioneer customer is OM Manganese exporting 650,000 tonnes of manganese per annum with Territory Iron expected to come on line with 1.5m tonnes per annum of iron ore in mid 2007.

The Darwin Port Corporation is also negotiating with a number of bulk exporters interested in utilising the new facilities in the Port of Darwin and exporting for a port closer to the final demand markets;

- extension of the bulk liquids pipeline racks;
- expression of Interest to develop 7 hectares of port hardstand;
- relocation of private shipping operators from the City Port to East Arm;
- ongoing land reclamation / creation program of a further 28 hectares at East Arm;
- expanded undercover storage;
- expansion of the bulk material handling facility including overland conveyors;
- \$4.5m cruise ship terminal at Fort Hill Wharf;
- enhanced refuelling facilities at East Arm Wharf;

- berth depth maintenance dredging program;
- dredging of approach channels for a minimum depth of 15m;
- replacement pilot boat;
- reinstate Iron Ore Wharf for use by Defence;
- second container crane;
- Port Complex development;
- Port Security upgrades;
- doubling the 2006 length of East Arm Wharf to the master plan length of 1500m;
- an additional or replacement RORO facility will be required to support naval activities and to accommodate the heavier Abrams tanks and this has been the subject of discussions between Defence and Darwin Port Corporation.

The current investment in new port facilities at East Arm wharf is in the vicinity of \$250m. The planned expansion of the facility to achieve the proposed master plan would require a similar or larger scale investment in the short to intermediate term.

Significant investment will also continue to be required at the City Port to maintain facilities for Australian and International Defence forces and the booming northern Australian Cruising industry.

Policy & Regulation –

- Policy and regulatory conditions that affect seaport infrastructure planning and development (e.g. private, public sectors, PPPs).

Without limiting the generality of policy and regulation port stakeholders are required as a minimum to duly and punctually comply with the provisions of:-

- *Planning Act (NT)*
- *Darwin Port Corporation Act (NT) and Regulations;*
- *the Building Code and the Building Act and Regulations;*
- *the Dangerous Goods Act (NT) and Regulations;*
- *the Work Health Act (NT) and Regulations;*
- *Marine Pollution Act;*
- *Waste Management and Pollution Control Act (NT) and Regulations;* and
- All Australian Standards relating to the permitted use.

2.3.6. Summary

The Port of Darwin's strategic geographic location is fundamental in the significant trade growth through the port in recent times. The port facilities at East Arm are connected to the national rail network through the AustralAsia Railway. The establishment of international landbridging, bulk minerals and bulk liquids trades associated with the operation of the Adelaide to Darwin Railway further supports Government's vision of establishing Darwin as a regional transport and logistics centre and an integral part of the development of the AustralAsia Trade Route.

The Darwin Port Corporation is managing a new era of unprecedented development in the Port of Darwin. The Corporation is a trade facilitator with a strong commercial focus on the development potential offered by new developments.

The Port of Darwin facility is new and over the next few years will require major investment before it realises its full potential. A number of very major issues remain unresolved and are the subject of current planning studies.

2.4. Marine Infrastructure - Other Ports

2.4.1. Supply

A number of ports in the Northern Territory have been developed privately, in particular by mining companies operating in remote areas. In addition to these major port facilities, the Northern Territory Government maintains 14 barge landings at coastal and island communities where road access is unreliable or unavailable (these barge landings are located on aboriginal land and so are not owned by the Government). The Government also owns a small public wharf at Gove (see following table)

For mainland communities, the barge landings were developed because an adequate transport service to the communities could be provided by barge (and aircraft) at a far lower cost than the development of all-weather road access to these communities.

The following table provides information about each of these ports:

Operator	Location	Berth Capacity		Other
		Water Depth	Wharf	
Perkins	Darwin Harbour	Tidal access only	3 berths with ramp access and capable of standing along side	Perkins operate local and international shipping services from their base in Darwin, the base covers 11 hectares
	Gove	Tidal access only	Wharf and 500 tonne capacity ramp	Perkins lease a 7 hectare site
	Groote Eylandt	Tidal access only	Ramp for barge access	Perkins sublease an area for their operations
Conoco Phillips	Darwin Harbour		1435 metre long trestle jetty	Load out facility for LNG
Origin Energy	Darwin Harbour		Moorings and subsea pipeline discharge facility	Facility for import of LPG
Sylvatech	Port Melville Tiwi Islands	7 metres at low tide	60 metre earth-backed wharf	Wharf is used to load export logs for Sylvatech and mineral sands for Matilda Minerals

Alcan	Gove	13.6 metre at low tide 10.0 metres at low tide 5 metres minimum	225 metre long T head wharf for loading bauxite and alumina and for discharging fuel and caustic soda General cargo wharf Light cargo wharf and boat ramp	The Alcan private wharf is operated at part of the mining lease covering the Alcan bauxite mine and alumina refinery Wharf and ramp managed by Perkins (as noted above)
GEMCO	Groote Eylandt	11.0 metres at low tide	T head jetty for loading manganese and discharging fuel tankers, 2 berths	The GEMCO private wharf is operated at part of the mining lease covering the GEMCO manganese mine.
McArthur River Mining (MRM)	Bing Bong in the Gulf of Carpentaria	4,5 metres at low tide	Land backed wharf and 40,000 tonne capacity storage shed	The MRM port operates as part of the mining lease held by the company. MRM operates the vessel Aburri (3,000 tonne capacity) to take concentrate from the wharf to bulk tankers anchored 20 miles offshore.
Barge landings	Coastal and island communities	Tidal access only	Nil	The Northern Territory Government does not own the barge landings as they are all on Aboriginal land, but the Government does maintain them.
Australian Navy	Darwin Naval Base	Not known		The RAN operates facilities in Darwin harbour at the Darwin Naval Base, HMAS Coonawarra.

2.4.2. Demand

The cost of building new port facilities is such that any new port development outside of Darwin is only likely to occur in response to a major commercial development such as a new mine or processing plant.

For such developments, the port facilities are likely to be provided by the companies involved in the development because such facilities are an essential part of the capital investment required for their developments. The Government has carried out the preliminary design of a port facility and industrial estate at Glyde Point on the Gunn Point Peninsula and a strategic environmental impact assessment is under way. Then necessary investment is likely to exceed \$400m and its development would depend on natural gas being brought to shore in sufficient quantity to attract a foundation customer.

Innovative port developments can be expected in order to help minimise capital costs and environmental impacts. For example, the export port (Bing Bong) operated by the McArthur River Mining Pty Ltd is small and uses a small ocean-going vessel to transfer concentrate to larger vessels moored offshore. While operating costs are higher, this arrangement cost much less to build than a port capable of handling ocean going vessels (and has a far smaller footprint).

In the absence of such a major development, other cargo will be transported by rail and road to the nearest available public port. The reliability and low cost of land transport makes this an economic proposition.

The demand for barge-landings stems from the remoteness of Aboriginal communities, particularly those in Arnhem Land because of the lack of alternative transport options. If alternatives, such as reliable roads, were available; the barge-landings would not be required.

Northern Territory coastal destinations are attracting an increasing level of interest from the international luxury yacht sector as safe uncrowded destinations supported by reliable service, supply and maintenance facilities in Darwin. To further increase the attractiveness of the Territory to this sector, construction of a dedicated floating pontoon wharf system is desirable. This will support the establishment of a luxury charter vessels basing in Darwin as opposed to just passing through.

Increased levels of yacht visitation support marine fabrication and repair businesses as well as providing significant flow on to regional tourism locations (such as Kakadu and Uluru) by using Darwin as the gateway to land based activities. The rapid increase in super yacht numbers globally and especially in the South East Asian region adds weight to this proposal. It is noteworthy that China and Taiwan are now significant manufacturers and exporters of super yachts.

The absence in Darwin of a Common User Facility (CUF) to facilitate the growth in services, construction and maintenance to off shore oil gas and mining sectors is a major impediment. Development of such a facility would support the ability of Territory companies to bid for future commercial opportunities to build and maintain, repair large modular units which are becoming common in operations throughout the region. A CUF would require a large all tide heavy duty lift and barge load out facility backed by a serviced lay down area. The current East Arm Development Area Master Plan is able to accommodate the development of a CUF but reclamation costs will be significant.

2.4.3. Investment

Investment decisions regarding the private ports are the responsibility of the companies concerned; no information is available about the future plans, if any, for these Northern Territory private ports.

The Northern Territory maintains 14 barge landings; there are no plans to increase the number of such facilities or to upgrade them; they are “fit-for-purpose”.

2.4.4. Performance

No public information is available about the performance of the private ports and such data are not relevant to the operation of the barge-landings.

2.4.5. Planning, Development and Regulation

The Northern Territory Government has long-term plans for the development of new port facilities in the Darwin Area; Glyde Point (north-east of Darwin) has been selected for possible long-term development as a port, particularly for gas-based industrial development. Glyde Point was selected from a number of alternative port locations and various studies have been carried out at the site including investigations and modelling of port design options.

New port facilities have been built in the Northern Territory in recent years, the Darwin Port Corporation has built the new East Arm Wharf in Darwin Harbour, Alcan built a major new wharf as part of the expansion of its Gove alumina plant while ConocoPhillips built a new jetty for the export of LNG in the Darwin Harbour.

New port developments would be subject to both Australian and Northern Territory legislative requirements.

The operation of private ports is controlled by the companies concerned; they are responsible for decisions regarding capacity and future development. These ports are also subject to both Australian and Northern Territory legislative requirements.

Private port operations are also subject to the third party access provisions (Part IIIA) of the Trade Practices Act. Third party access to existing private ports has been an issue elsewhere in Australia (for example, for the iron ore export ports in the Pilbara) and, if it arose in the Northern Territory, would be dealt with under the provisions of Part IIIA.

Public ports are generally not subject to Part IIIA.

Future planning for the barge-landings is, to some extent, impacted by any plans to extend or upgrade local road networks. There are no current plans to extend the number of landings.

While the Navy does not plan to base further assets in Darwin, Defence needs are a major driver of new infrastructure inside the Darwin Port area and elsewhere. Development of an industrial estate at Glyde Point linked to East Arm Port by a rail spur would be able to serve Robertson Barracks.

2.4.6. Summary

Other than the major port facility in Darwin harbour, the Northern Territory Government owns a small public wharf in Gove and has plans for the long-term development of a new port at Glyde Point.

Several private ports also exist around the Northern Territory coast, the provision of infrastructure at these ports, and the use of this infrastructure, is the responsibility of the companies concerned.

2.5. Rail

2.5.1. Supply

The Alice Springs to Darwin railway was opened in January 2004 thus completing the second transcontinental link in Australia, the Adelaide to Darwin railway. The Tarcoola to Alice Springs railway was opened in 1980 and replaced the old sub-standard narrow gauge from Marree to Alice Springs.

Five general freight train services are operated to and from Darwin each week by Freightlink while Great Southern Railway operates two return trips each week by The Ghan passenger train. Both the freight train and passenger train services operate between Adelaide and Darwin.

Freightlink freight trains cater primarily for container freight but also provide for wagon load (such as required for specialized freight such as LPG) and “piggyback” transport for road vehicles. The latter has been trialled to test the logistics of anticipated future use for the movement of military vehicles and, more recently, for the transport of fuel tankers to Alice Springs from Darwin and Adelaide.

Freight and passenger terminals are provided at Alice Springs (the existing terminal), Tennant Creek, Katherine and Darwin. The freight terminal at Darwin is owned and operated by Freightlink. The terminal at Alice Springs is owned and operated by Pacific National, those at Katherine and Tennant Creek are operated by FCL Transport.

In addition, bulk manganese ore is loaded at siding near Bootu Creek and railed to Darwin for export and a new siding is expected to be constructed near Frances Creek for iron ore.

Train services are permitted to operate up to the following limits¹⁵:

a) Freight Service

(i) Northgate to Alice Springs

21 tonne axle load at up to 110 km/h

(ii) Alice Springs to Darwin

¹⁵ Freightlink website – Track Access webpage

23 tonne axle load at up to 115 km/h

b) Passenger Service

(i) Northgate to Darwin

19 tonne axle load at up to 115 km/h

Maximum permissible train length is 1 800 metres and the whole route is capable of handling double-stacked containers.

2.5.2. Demand

Growth in the demand for rail freight services is linked to four main factors:

i. Northern Territory economic growth: The Northern Territory economy is currently undergoing a period of rapid growth primarily related to major resource based projects¹⁶. While the two main recent projects, the Alcan expansion and the Darwin LNG plant, are now largely completed; several new or proposed projects should continue to provide the basis for continued economic growth for the next few years¹⁷.

These developments should provide an impetus for continued growth in the demand for transport services.

ii. Resource based projects: In addition to the broad economic multiplier effects of resource projects, these projects also generate demand for transport of inputs (such as fuel, explosives and grinding media) to and outputs from the project itself.

The railway benefited from this in 2006 with the commencement of exports of manganese from Bootu Creek near Tennant Creek. Further expansion of demand is expected in 2007 with the commencement of iron-ore production from the redeveloped Frances Creek mine near Pine Creek.

Other sources of increased freight are expected to emerge over the next few years.

iii. New types of freight services: During 2006, Freightlink extended the use of "piggybacking" (the transport of road vehicles on rail flat wagons¹⁸) to include the movement of oil tankers from Darwin and Adelaide to Alice Springs. Prior to then, piggybacking had primarily been used by Freightlink for the movement of military vehicles the Australian Defence Force continues to use the railway regularly each year for this purpose. A spur line to Robertson Barracks may prove to be desirable.

The introduction of piggybacking provides a means for Freightlink to attract additional freight from all-road to road-rail.

iv. International developments: Landbridging freight volumes are currently quite small but the potential remains for this to increase, primarily to service niche markets.

¹⁶ NT Treasury "Budget Paper No. 2 Fiscal and Economic Outlook" Chapter 8 Economic Overview

¹⁷ These include the Darwin Waterfront project, the proposed McArthur River mine expansion, the Browns Project at Batchelor and the Blacktip offshore gas development.

¹⁸ Piggybacking was previously used by the former Commonwealth Railways and Australian National Railways on train services across the Nullarbor and to Alice Springs.

2.5.3. Performance

At present, there are no publicly available performance measures for train operations on the Adelaide to Darwin railway. The Bureau of Transport and Regional Economics is working with the Australian Railway Association to develop rail performance indicators for the east – west and east coast north – south corridors where data confidentiality is not an issue (because of the large number of operators)¹⁹.

However, the Darwin railway is in direct competition with road-transport using triple road-trains which are among the most efficient road freight vehicles operating in Australia. As a result, Freightlink is under continual competitive pressure to perform.

2.5.4. Investment

Freightlink is currently planning for the construction of a siding at Frances Creek for the commencement of iron ore production in 2007. The company has also recently taken delivery of 25 wagons designed for “double-stack” operations.

The existing track infrastructure (including crossing loops and stations) is appropriate for the current number of train services, additional capacity, including crossing loops, can be expected to be built as these become necessary in response to increased demand for train services. Defence needs may support a spur line to Glyde Point if a Defence port facility is developed there and Robertson Barracks.

2.5.5. Planning and Regulation

The Adelaide to Darwin railway operates under Northern Territory and South Australia regulatory regimes:

Third Party Access: Arrangements for access to the Tarcoola-Darwin railway are provided under the AustralAsia Railway (Third Party Access) Code which is a Schedule to the AustralAsia Railway (Third Party Access) Act 1999 which was enacted by both the Northern Territory and South Australia.

The access regime in the Code has been certified as an effective State regime in accordance with section 44N of the *Trade Practices Act 1974*²⁰.

Rail Safety: Companies involved in the rail industry (provision of rail infrastructure, rail services and maintenance and train operators) must be accredited under Northern Territory and/or South Australian Rail Safety Acts.

There is an urgent need to rationalise the current multiple rail regulatory environments existing across Australia if the national rail system is to develop and operate effectively.

¹⁹ Personal advice provided by BTCE staff

²⁰ Essential Services Commission of South Australia website – Tarcoola – Darwin Railway

2.6. Intermodal Facilities

2.6.1. Supply

“The movement of people and freight often requires more than one mode of transport ... Transfers between the various modes of transport are an everyday occurrence ... The scale of transfer can range from small ... to large scale.”²¹

From a national and strategic perspective, the most important intermodal transfer terminals in the Northern Territory are listed in Table 2.1 and 2.2 below. While no single terminal in the Northern Territory is large when compared to similar interstate terminals, they are of great strategic importance given the large areas served by them and the lack of readily available alternatives.

After a period of consolidation following the opening of the AustralAsia Railway, the major national freight operators have shown renewed interest in establishing freight and distribution centres in Darwin. Toll is currently developing a \$5m Stage 2A freight facility for a major customer with a further stage being planned to support the initial \$10m distribution facility that opened in May 2004. Two other national freight operators are commencing construction within the Darwin Business Park and a further three national operators are looking to take advantage of the strategic location of the park adjacent to the rail terminus and East Arm Wharf.

The strategic location and the commissioning of the Darwin Industry Fuel Terminal generated a ‘spin-off’ in the establishment of Natural Fuels biodiesel production facility and interest in similar projects including a condensate processing facility.

²¹ Northern Territory Transport Overview, Northern Territory Department of Infrastructure, Planning and Environment, 2003, page 74

Table 2.1: Intermodal terminals of National and Strategic Significance, FREIGHT

Freight	Terminal	Manager/Operator	Task & Strategic Role
	Darwin Port	Darwin Port Corporation	International national and regional road – sea and rail – sea freight transfers of general and bulk freight
		Freightlink/P&O	International national and regional sea – rail freight transfers
		Perkins Shipping	International national and regional sea – road and sea – rail freight transfers
		Origin Energy	International sea – road transfer of LPG
	Darwin Industry Fuel Terminal	Vopak Terminals Darwin Pty Ltd	International, national and regional sea – road and sea fuels and bulk liquids transfers
	Katherine Freight Terminal	FCL	National and regional rail – road freight transfers
	Tennant Creek Freight Terminal	FCL	National and regional rail – road freight transfers
	Berrimah Freight Terminal	Freightlink	National and regional rail – road freight transfers
	Alice Springs rail terminal	Pacific National	National and regional rail – road freight transfers

Table 2.2: Intermodal terminals of National and Strategic Significance PASSENGER

Passenger	Terminal	Manager/Operator	Task & Strategic Role
	Darwin International Airport	Northern Territory Airports Pty Ltd	International, national and regional air – road passenger transfers
	Alice Springs Airport	Northern Territory Airports Pty Ltd	National and regional air – road passenger transfers
	Darwin Railway Station	Great Southern Railway	Rail – road terminal facilities for The Ghan
	Alice Springs Railway Station	Great Southern Railway	Rail – road terminal facilities for The Ghan

2.6.2. Demand

The demand for intermodal transfers is generally determined by developments in other sectors of the economy. Existing intermodal terminals can usually be expanded incrementally in response to general economic growth.

However; major expansions, such as those brought about by additional new projects (for example, a new mine), often require the development of new facilities. These may:

- Involve significant private sector finance.
- Be required within short timeframes to meet the requirements of specific projects (for example, the need to have bulk cargo handling facilities at a port ready to cater for the start of production from a new mine).

The larger the scale of the intermodal transfer, the more likely that the companies involved will seek to own/lease the infrastructure required (or have a significant level of operational control) in order to minimize the risks of disruption to their operations. For example, mining companies with relatively small volumes of production are likely to accept the use of common-user facilities provided at intermodal terminals (such as ports) but as volumes increase, companies are increasingly likely to seek direct investment and control. At major airports, the main airlines usually operate with their own terminals or lease space within third party provided terminals.

To date, most demand at the intermodal terminals listed in Table 1 has been at a scale that has not required dedicated facilities (except at Darwin and Alice Springs Airports). For example, the common user East Arm Bulk Export Facility at the Port of Darwin is currently being used for the export of manganese and is expected to be used for other mineral exports including iron ore in 2007.

2.6.3. Investment

The following intermodal projects have been recently completed or announced:

- East Arm Bulk Export Facility: New facilities have been introduced to handle increased mineral tonnages and for petroleum fuels.
- Darwin Airport: Upgraded parking and passenger drop-off facilities.
- Cruise ship terminal: A new cruise ship terminal is planned for Darwin port.

2.6.4. Performance

No national performance monitoring programs currently include any of the terminals listed in Table 1 and there are no publicly available data on the overall performance of intermodal terminals. For example, the Bureau of Transport and Regional Economics publication, *Waterline*, only deals with the port-side performance of the major container ports in Australia and not with the land-side or with the movement of cargo through the terminal itself.

The Bureau is currently working with the Australian Railway Association to develop performance indicators for rail but this will not address intermodal performance.

However, given the competitiveness of the transport sector, most intermodal terminals must operate at high levels of efficiency or face considerable criticism, possibly financial penalties and loss of business for poor performance. Furthermore, for road – rail freight terminals, efficient operation is very important because direct road freight is a viable alternative option for much of the freight handled.

2.6.5. Planning, Development and Regulation

The Government has had in place for many years long term land use planning strategies to ensure the appropriate land and infrastructure is available for the development of intermodal facilities at key points on the transport network. Implementation of these plans involves a mixed private and public sector investment, most often in response to the demand generated by new resource development and transport innovation.

Following the decision to build the East Arm Wharf and to transfer the bulk of commercial shipping operations from the Darwin Wharf Precinct, the Government took action to ensure the hinterland, including the former Trade Development Zone, would be available for intermodal facilities, and other strategic port, rail, transport and industry uses. The terminus of the AustralAsia Railway is in this location, which is distant from residential areas.

The East Arm Development Area is largely excluded from the surrounding municipalities of Darwin, Palmerston and Litchfield and for which the Consent Authority under the *Planning Act* is the Minister for Planning and Lands. The Minister is aided in his deliberations by a high-level interdepartmental advisory group. Pursuant to the *Planning Act*, the area is administered under the *East Arm Control Plan 1998* and where the predominant land use zoning is DV – Development the purpose of which is:

To facilitate the development of major strategic industries including gas based, road, rail or port related industries.

The zone provides land for major industrial development that is of strategic importance to the future economic development of the Territory.

Developments will be assessed having regard to, amongst other things, their environmental impact and the effect on surrounding development by reason of the processes involved, the method of manufacture or the nature of materials used, produced or stored.

The East Arm Development Area incorporates the following:

- East Arm Wharf
- East Arm Bulk Export Facility
- Berrimah Rail Freight Terminal
- Darwin Rail Passenger Terminal
- Darwin Industry Fuel Terminal
- Darwin Business Park

- Private sector rail and road transport services
- Private sector operated small and barge wharves
- Emerging private sector manufacturing and fabrication industries
- Oil and gas exploration and production support services
- Biodiesel Production plant.

As well as the Darwin Port Corporation, the Government has established the Land Development Corporation that assumed the land and assets of the former Trade Development Zone Authority. The charter of the Corporation, which extends throughout the Territory, includes:

- To develop the land of the Corporation for use by industrial businesses
- To promote the use of the Corporation's land by industrial businesses
- To provide services, facilities and general assistance to facilitate the establishment and conduct of industry on the land of the Corporation
- To carry out or facilitate other activities associated with the management of the Corporation's land and its use by industrial business, including commercial and recreational activities and activities relating to heritage and environmental conservation.

The Darwin Business Park is operated by the Land Development Corporation the focus of which is to provide intermodal exchange between rail and road transport. The Darwin Industry Fuel terminal is also located on land owned by the Corporation.

Serviced land in the East Arm Development Area is primarily owned freehold by the Darwin Port Corporation and the Land Development Corporation. Generally, land will only be released by these statutory authorities on a leasehold basis to maintain the strategic intent of the Area. While there is privately held land in the Hudson Creek locality, development remains subject of the provisions of the *East Arm Control Plan 1998*.

Development in the East Arm Development Area is subject to the appropriate level of environmental assessment and a current project is to develop an environmental management system in accordance with Australian Standards that will provide a more transparent system and ease the regulatory burden on new entrants.

3. Gas

3.1.1. Overview

Natural gas is a strategic energy resource for the Territory economy and will play a key role in its future growth and diversity.

Based on the 1300 km Amadeus Basin to Darwin pipeline, the natural gas sector is expanding with the development of:

- Bayu Undan gas field in the Timor Sea;
- Bayu Undan – Darwin 500 km sub sea pipeline
- Darwin LNG plant at Wickham
- Blacktip gas field in the Bonaparte Gulf with its 120 km sub sea pipeline connecting with the 300 km Bonaparte gas pipeline to the Channel Island Power Station.

Further large scale development is likely in coming years, principally from the development of large, discovered gas reserves in the Timor Sea.

The Timor Sea region and various onshore petroleum basins are relatively unexplored and offer great potential for further natural gas discoveries and development.

Natural gas currently serves as a fuel for electricity generation and is refrigerated for export as liquefied natural gas (LNG) and in some contexts provides a competitive energy source for mining and mineral processing projects.

Future expansion in LNG production is likely to dominate expansion in the gas industry in the short to medium term.

From 2009, gas supply from the Blacktip gas field (along with its associated processing and pipeline infrastructure) will take over from the Mereenie and Palm Valley gas fields in supplying gas for electricity generation by the Territory's Power and Water Corporation.

The planned conversion of the Alcan Gove alumina plant to gas will provide a significant increase in natural gas consumption from 2009 depending on the future of the PNG gas pipeline.

Future growth in natural gas consumption will in part be driven by development of:

- gas processing/manufacturing industries such as petrochemicals, fertilisers and synthetic liquid fuels; and
- mining and mineral processing industries.

In addition to natural gas, liquefied petroleum gas (LPG) provides a supplementary fuel supply to:

- households for domestic use via bottled gas distribution in major population centres; and

- hotels and other commercial establishments via a limited reticulation system within the Darwin CBD.

Liquefied Petroleum Gas (LPG) is imported by a receiving and storage terminal at Channel Island near Darwin. Relocation of this facility is being considered due to security and safety concerns given its proximity to Channel Island Power Station.

A proposed 50,000 barrel per day condensate processing facility at the Darwin Business Park near the Port of Darwin would produce LPG as a by-product. The quantities produced would exceed the Territory's current demand, particularly for butane. As a result imports would cease and the surplus over current demand would be either be exported by sea, consumed via increasing demand, or burnt as fuel for power generation.

3.1.2. Supply

Natural gas is produced from both on and off-shore fields. Historically, most production has been from the Palm Valley gas field and the Mereenie oil and gas field, both in the Amadeus Basin of central Australia.

In 1983 natural gas started flowing from the Palm Valley gas field to Alice Springs and in 1986 together with the Mereenie field started supplying gas to Tennant Creek, Katherine and Darwin. Additional off take points have since been added and are supplied from these fields, including the 333km lateral to supply gas for the McArthur River Mine.

Supply from the Amadeus Basin gas field has become more costly and difficult to extract and the current contracts are due to expire over the next few years.

From the beginning of 2009 the Blacktip field in the Joseph Bonaparte Gulf will takeover as the main field supplying Power and Water Corporation's gas needs for power generation. Blacktip will also have limited capacity to supply other small gas customers. Around 800 petajoules (PJ) has been contracted and will be delivered in line with demand which is projected to start at 20-25 PJ/yr and peak at over 30 PJ/yr.

Beyond 2009, the Amadeus Basin fields will be capable of supplying 'tail gas' to other customers via existing infrastructure. Such supply, however, will be subject to finding sufficient markets for the fields to remain operationally and financially viable.

In late 2005, the Bayu-Undan field was connected to the Darwin LNG plant via a 502 km offshore pipeline. The 3.4 trillion cubic feet (Tcf) of publicly estimated reserves for this field are contracted to supply 3 million tonnes per annum (Mtpa) of LNG to two Japanese utilities for a period of 17 years. There are reports that Bayu-Undan's reserves are significantly higher than 3.4 Tcf. Additional reserves, however, are likely to be dedicated to LNG production, increasing production at the plant to capacity (3.7 Mtpa) and extending the period of supply beyond 17 years. Gas is currently produced at the rate of approximately 175 PJ/yr.

In mid 2005 PNG Gas project signed a heads of agreement for the supply of 43 PJ/yr of gas to Alcan's Gove alumina plant from 2009. The future of the PNG gas pipeline to Australia is now in some doubt. If the pipeline project does not proceed then Alcan faces a strong financial incentive to seek another source of gas supply for conversion from fuel oil.

The Timor Sea contains several medium to large gas fields which underpin the potential for future development of gas infrastructure and gas processing industry onshore. The largest fields include Sunrise (7.7 Tcf), Evans Shoal (6.6 Tcf) and Caldita, a 2005 discovery, which is yet to be appraised but with multi-Tcf potential. In addition, the Abadi gas field (5+ Tcf) in Indonesian waters has onshore LNG in Australia as one of its development options. Evans Shoal has a high carbon dioxide content that appears to preclude development using current technology. Smaller fields in the Timor Sea include the Petrel and Tern fields west of Darwin with combined reserves estimated at 1.4 Tcf. These fields have been discovered for several decades but remain undeveloped. Proposed development of Blacktip may improve the prospects for monetarising these fields via a gas hubbing arrangement utilising the Blacktip platform.



High LNG prices have spawned a new exploration era in the Timor Sea with natural gas as a specific target, rather than oil or wet gas. This exploration is likely to see the discovery of more gas fields and, eventually, further infrastructure development.

Typically, however, upstream owners of large offshore reserves are focused on LNG investment and not interested in third party natural gas sales.

Gas Producers:

Current

- Bayu-Undan 'wet' gas field - Bayu-Undan Joint Venture (ConocoPhillips 56.72%, Eni Australia 12.04%, Inpex 10.52%, Santos 10.64%, Tokyo Electric Power Company 6.72% and Tokyo Gas Company 3.36%).
- Amadeus Basin fields - Mereenie (Santos 65%, Magellan 35%) and Palm Valley (Magellan 52%, Santos 48%) produce at a combined rate of approximately 20 PJ/yr. The majority of this gas is produced by the Mereenie field.

Proposed

- Blacktip gas field – Eni Australia (100%).
- PNG Gas - several fields unitised for the project (ExxonMobil 39.4%, Oil Search 37.2%, AGL 10%, Nippon Oil 3.4%, MRDC - PNG landholders 3%, Santos may take 7% of the project).

Gas Transmitters:

Current

- Bayu-Undan Joint Venture owns and operates the 502 km, 660mm diameter pipeline between the Bayu-Undan field and the Darwin LNG plant.
- The 1512 km Amadeus Basin to Darwin Pipeline is owned by a consortium of financial institutions and leased to Australian Pipeline Trust (APT). NT Gas a subsidiary of APT operates the pipeline and its laterals, including the 333 km, 168mm Daly Waters to Macarthur River lateral.
- Origin Energy operates the Investra owned 146 km, 219mm Palm Valley to Alice Springs pipeline which commenced operation in 1983.
- Compressed Natural Gas (CNG) is compressed at Brewer Estate, south of Alice Springs, for road transport to Yulara for power generation. The CNG infrastructure is owned by Kleenheat. Yulara power station was previously fuelled by LNG liquefied at a mini LNG plant located at Brewer Estate and owned by Energy World Corporation.

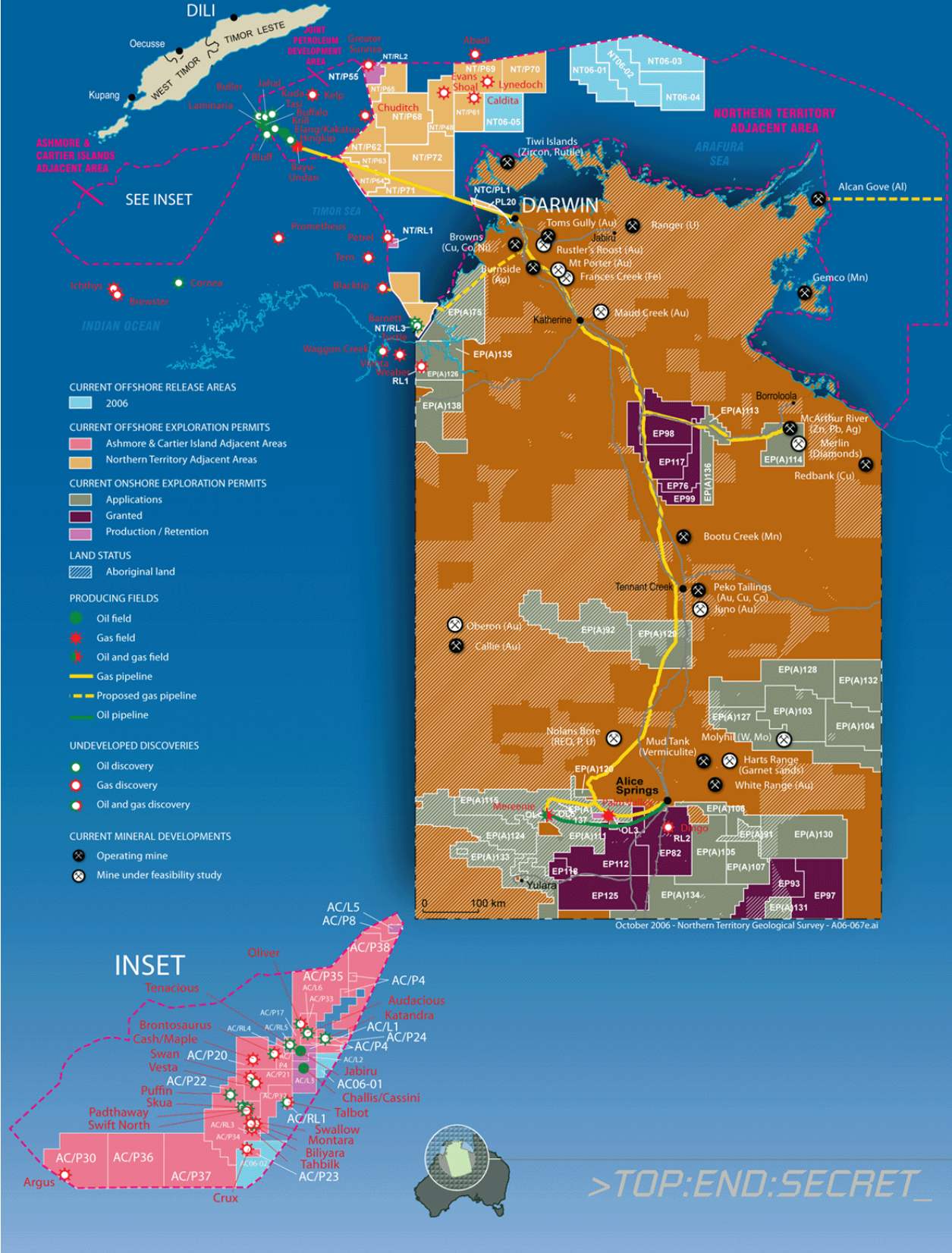
Under Construction/Committed

- Blacktip pipeline to shore and processing plant near Wadeye – Eni Australia.
- Bonaparte Pipeline from Wadeye to Cosmo Howley – Australian Pipeline Trust (APT).

Proposed

- PNG gas pipeline lateral from Weipa to Gove – Australian Pipeline Consortium (50% AGL, 50% Petronas – participation under review)
- Most future gas pipelines onshore are like to involve Indigenous equity participation.

Petroleum and Mining Operations and Developments



Distributors & Retailers:

There are two small distribution pipelines connected to the main Amadeus Basin to Darwin Pipeline:

- Darwin City Gate to Berrimah near Darwin (19 km, 168mm), owned by NT Gas, a subsidiary of Australian Pipeline Trust; and
- Alice Springs to Brewer Estate (10 km, 114mm), owned by Energy World Corporation.

Reticulation of gas to retail customers is also limited with small scale reticulation to:

- the Berrimah region near Darwin owned and operated by NT Gas; and
- the industrial and commercial areas of Alice Springs owned by Envestra and operated by Origin Energy.

3.1.3. Demand

A key driver of natural gas demand is the development of large gas-intensive resource industry, particularly LNG. Demand for power generation is an order of magnitude lower than current LNG demand and generally increasing in line with economic growth. Commercial and general industry sources nearly all of its stationary energy from electricity. Other resource projects vary in their stationary energy demand. Most existing and proposed projects have a small gas or electricity demand but some could have significant demand exceeding the entire current demand for power generation (e.g. Alcan Gove gas conversion).

Darwin LNG currently consumes 175 PJ/yr but this could increase to 215 PJ/yr with when full capacity on Train 1 is reached.

The large undeveloped gas reserves of the Timor Sea are expected to lead to significant expansion of LNG production over the coming years and exploration could provide further impetus for expansion. Recent LNG market conditions mean that LNG projects can readily find markets at profitable prices. At least one new LNG train is expected in the next few years and up to three new trains are possible in the medium term, based on current reserves. Each new train could be the same size as the existing plant (3.7 Mtpa, 215 PJ/yr) or larger (e.g. 5Mtpa, 290 PJ/yr).

On the back of LNG developments, the Territory Government has aspirations for securing gas-intensive processing industries such as petrochemicals, fertilisers and synthetic liquid fuels which would draw additional gas demand. These industries have a range of gas demand from tens of petajoules per year, up to the same magnitude as large LNG plants.

Conversion of Alcan Gove's alumina plant to natural gas (43 – 50 PJ/yr) will provide a substantial boost to gas demand although the timing is uncertain at this stage.

A range of mining and mineral processing projects are likely to be developed in coming years but typically these have a modest gas demand (1 – 5 PJ/yr). Any mineral processing industries that involve electro-winning, however, would have more substantial demand.

One of four planks in the Territory's 'Gas Onshore' policy is providing gas to the national grid. High LNG prices relative to the price of gas in interstate markets have set back the timeline for this objective based on offshore reserves. Large onshore gas discoveries arising out of proposed exploration campaigns may, however, be suited to piping interstate.

3.1.4. Performance

Despite significant gas reserves, and a major pipeline some twenty years old, the Territory's gas infrastructure is relatively underdeveloped and immature. This immaturity arises out of the size and nature of the gas energy market. Maturity will be reached when there is sufficient diversity in gas suppliers and associated infrastructure to create a competitive gas market.

Recent growth due to construction of the pipeline between the Bayu-Undan field and the Darwin LNG plant has added substantially to the stock of infrastructure but illustrates the tendency of such projects to be self-contained and not deliver gas or spare capacity to supply third party demand. Future large scale development may suffer from this same constraint.

The existing Amadeus Basin to Darwin pipeline and its associated off takes and lateral pipelines has served the Territory well. The limitation recently and in the period leading up to the commissioning of the Blacktip gas field in 2009 is availability and deliverability of gas from the Amadeus Basin fields.

The Territory faces a boom in petroleum exploration and development in coming years that could increase the size and diversity of gas supply sources and infrastructure. This should deliver tangible improvements in the performance of gas infrastructure in meeting the demands for growth and diversification of the NT economy.

3.1.5. Investment

Investment in gas pipeline infrastructure is almost solely a role for the private sector. The Territory Government will consider requests for strategic investment involvement where such investment can deliver benefits to the wider community.

Typically the role of Government is to foster a positive economic environment and provide the regulatory framework for the private sector to invest and operate its business in a manner consistent with a market based economy whilst satisfying environmental and safety standards.

The magnitude of major gas investments is generally such that the Territory Government's financial capacity to influence investment decisions is relatively limited. This is reinforced by fiscal arrangements whereby the Australian Government is the recipient of significant tax revenues from major resource projects but the States and Territories are financially responsible for the provision of public infrastructure.

3.1.6. Planning, Development & Regulation

Development of gas reserves and gas processing industry is a key priority for the Territory Government to meet higher level objectives to expand and diversify the NT economy. The Government's gas development policy has four planks: LNG for export; gas for onshore power generation and major resource projects; gas based manufacturing; and gas for the national grid.

The major new developments proposed are (details provided above):

- Blacktip Gas field, pipeline to shore, gas processing plant and the Bonaparte pipeline;
- Lateral pipeline from PNG gas pipeline from Weipa to Gove.

Development of the second LNG train at Wickham Point is expected within a few years based on existing approvals and several potential supply sources. Further LNG trains are likely to follow Train 2.

The Territory Government is promoting the establishment of downstream gas industry in addition to LNG and has set aside land for an industrial estate and port at Glyde Point, a greenfields site north-east of Darwin. The Wickham Industrial Estate on the Middle Arm Peninsula includes the Darwin LNG plan at Wickham Point and further land could be made available the downstream gas industry. This site is close to a range of existing infrastructure including road access, rail, power, water and the Darwin Port. BOC Pty Ltd proposes to build a helium extraction facility within the Darwin LNG site using the vent gases from the LNG process.

Regulation of gas infrastructure development and operation in Commonwealth waters is largely controlled by the Australian Government legislation but administered by the NT Government on an agency basis.

Regulation of gas infrastructure development and operation in NT Waters and onshore is largely controlled by NT legislation.

Aspects of this regulation include licensing, safety, environmental approvals and planning approvals.

A further notable aspect of gas regulation is the national gas access regime which regulates the conditions and tariffs for third party access to gas pipelines. The regime aims to overcome the problems that might arise from natural monopoly characteristics of gas pipelines.

Of particular importance to the Territory are the provisions in the regime for greenfields pipeline developments. These provisions allow for pipelines to be covered by specific access conditions and tariff charges for period of up to 15 years. They provide incentive for pipeliners to invest in spare pipeline capacity upfront rather than optimising capacity to meet the immediate needs of foundation customers only.

3.1.7. Conclusions

Summary of key issues and challenges:

- Gas infrastructure, although historically small, has undergone a significant expansion recently and faces the prospect of further major additions in

coming years, largely driven by LNG developments but aided by the development of Blacktip and the conversion of Alcan Gove to gas.

- Sufficiency of existing onshore supply sources for power generation and general industrial use is an issue in the period leading up to commissioning of the Blacktip field and associated infrastructure in 2009.
- Exploration, both on and offshore, provide an exciting outlook for discovery and future development of supply sources and infrastructure.
- The owners of large offshore gas reserves, however, are likely to be firmly focused on development for LNG only. Availability of gas to third parties from these large developments is likely to be an issue, especially for industries with high gas demand. In particular, it should be noted that attracting third party gas industries requires gas to be available, at a competitive cost, and to be offered in a timeframe that allow proponents to develop a viable investment proposal.
- The multi-field large scale development potential of the Timor Sea gas reserves raises the issue of co-operative development to capture the benefits of economies of scale, shared facilities and field sequencing. Australia has a history of 'one field, one customer' development of remote gas fields.
- Economies of scale are particularly important in regard to gas pipeline capacity. Pipeline developers can provide spare capacity in pipelines at a marginal cost well below the average unit cost for foundation customers. Until recently the gas access regime discouraged provision of spare capacity. The regime has now been modified but the proof of new pipelines providing spare capacity will be the yardstick for measuring success of the changes.
- Connection to the Eastern Australian gas grid is one of four planks in the Territory Government's Gas Onshore Policy. Such connection would provide a larger market for developing Timor Sea gas but would also provide market outlets for future onshore discoveries, as well as increasing the competition in the NT gas market. A particular benefit of a gas pipeline connection to the interstate market is the two way trade in gas that can develop. This trade can transcend the physical limitations of pipelines (i.e. gas traded > physical capacity). The high value of gas as a LNG feedstock and the relatively low gas price in Eastern Australian markets at present suggests that a pipeline connecting the Territory to the Eastern Australian gas grid is a few years away.

4. Electricity

4.1.1. Supply

The Territory, like other Australian States and Territories, has undergone significant restructuring in the electricity supply industry. However, unlike Victoria and South Australia where complete privatisation has occurred, the majority of electricity in the Territory is generated and distributed by a Government Owned Corporation (GOC) the Power and Water Corporation (PWC) known as PowerWater.

PWC provides electricity, water supply and sewerage services to more than 73,000 customers across the Northern Territory's 1.3 million square kilometres.

PWC became the Northern Territory's first GOC under the *Government Owned Corporations Act 2001* on 1 July 2002, and is licensed in the Northern Territory electricity market as a generator, network provider, system controller and retailer.

Gas supplies are purchased for electricity generation at the four major centres of Darwin, Katherine, Tennant Creek and Alice Springs through the PWC wholly owned subsidiary, Gasgo Pty Ltd.

PWC has power purchase agreements with two Independent Power Producers (IPPs) which operate in regulated systems: EDL NGD (NT) Pty Ltd (Pine Creek Power) and Central Energy Power Pty Ltd (Brewer). Overall, about 43MW of capacity is currently available from these IPPs.

The majority of electricity generated for distribution within the Darwin-Katherine System is produced at the Channel Island Power Station (CIPS). Tennant Creek and Alice Springs networks are islanded from the Darwin-Katherine network and utilise their own local generation (the Tennant Creek Power Station and the Ron Goodin Power Station).

The remainder of the electricity market is characterised by a large number of small capacity, isolated generation plants, for example the Yulara network.

Large industrial consumers such as Alcan, Gemco, and ERA generate and distribute their own electricity.

Electricity consumption in the Territory has increased over the past four to five years. This trend is expected to continue, as there is currently an industrial and residential boom in the Darwin region. The sales and the growth trend over recent times are summarised in Table 4.1.

Table 4.1: PWC Electricity Sales

Financial Year	Sales (MWh)	Growth (%)
2002	1,431,904	
2003	1,538,053	7.41
2004	1,548,560	0.68
2005	1,571,788	1.50
2006	1,601,842	1.91

Generation supply

Supply of electricity in the Territory's regulated power systems is predominantly provided by PWC, either from its own sources or under the terms of power purchase agreements it has with a number of IPPs. At the regional level, about 80% of all generation capacity in the Territory's regulated networks is installed in the Darwin-Katherine system, with the bulk of this capacity located at CIPS. The remaining 20% of generation capacity is installed in the Alice Springs and Tennant Creek regulated systems.

PWC is also responsible for the provision of power services to remote indigenous communities and townships that are not connected to the regulated power system. Some of these areas include Yulara, Borroloola, Timber Creek, Daly Waters, Newcastle Waters, Elliot, Ti-Tree and Kings Canyon. The generation capacity associated with these rural areas has not been included in this report.

The Territory's generation facilities, consisting mainly of gas and liquid fuel driven turbines, are summarised in Table 4.2.

Table 4.2: Power Facilities in Regulated Systems 30 June 2006

Region / Power Station	Operator	Capacity (MW)	% of Total
Darwin-Katherine Regulated System:			
Channel Island ⁽¹⁾	PWC	253.70	
Berrimah	PWC	30.00	
Katherine	PWC	21.30	
Pine Creek	IPP	34.10	
LMS Shoal Bay	IPP	1.10	
Total		340.20	78
Tennant Creek Regulated System:			
Tennant Creek	PWC	16.65	
Total		16.65	4
Alice Springs Regulated System:			
Ron Goodin	PWC	62.60	
Brewer	IPP	8.51	
Total		71.11	18
Total Regulated Systems		427.96	100

(1) The capacity rating for Channel Island includes ice cooling.

Networks supply

By strict definition, the Territory does not have any Transmission Network Service Providers, as the highest voltage of transmission is 132 kV. However for the Territory's unique situation, 33 kV and above is treated as a Transmission Network.

The Transmission Network Service Providers distribute the electricity from the Generators to the distribution Network Service Providers who distribute electricity to

the customers. The PWC is both the Transmission and Distribution Network Service Provider in the Territory.

There are three major regulated networks that comprise the Territory's major transmission and distribution networks, which are based upon geographic delineation, namely the Darwin-Katherine system, the Alice Springs system and the Tennant Creek system. The systems are all independent of each other.

Transmission (33 kV and above). There are several transmission lines that comprise the Transmission Network in the Northern Territory, these are summarised in Table 4.3.

Table 4. 3: Composition of PWC's transmission networks 30 June 2006

Transmission (33kV & above)	Length Installed (km)
132kV Overhead	340
66kV Overhead	314
66kV Underground	17
33kV Overhead	56

The backbone of the transmission system in the Territory consists of:

- Two 132 kV overhead lines from the CIPS to Hudson Creek Terminal Station (HCTS);
- One 132 kV line to Katherine; and
- Associated substations and switchyards.

The thermal capacity of the lines between CIPS and HCTS are approximately 266 MVA each.

The firm capacity of these lines has been reached with the existing generating capacity installed at CIPS. Any increase in generation capacity at CIPS will require additional transmission line capacity. Being only a spur line, the 132 kV line between CIPS and Katherine has a relatively low level of reliability, but this is countered by the provision of Pine Creek Power Station (PCPS) and Katherine Power Station (KPS) in the southern section of the line.

The thermal capacity of the 132 kV circuit from HCTS to Katherine is approximately 70 MVA, however voltage regulation issues restrict this thermal capacity to approximately 34 MW when delivering from south to north. This restricts the ability for KPS or PCPS to supplement the Darwin network in the event of a major failure at CIPS.

Distribution (22/11kV and below). PWC currently own and operate the entire distribution system in the Darwin-Katherine, Tennant Creek and Alice Springs Systems. The distribution network supplies in excess of 73,000 customers, who utilise in excess of 1,600 GWh's of electricity per annum. Outside of Darwin, the

supply/customer density is very low, resulting in a sparse network. The distribution system in the Territory is summarised Table 4.4.

Table 4.4: 2005 Composition of the PWC's distribution networks 30 June 2006

Distribution (22/11kV & below)	Length installed (km)
HV Overhead	2,972
HV Underground	604
LV Overhead	1,740
LV Underground	1,671

Distributors and retailers

PWC is the sole retailer of electricity in the Territory. No competition exists at the retail level. NT Power Group was the owner and operator of the Mount Todd Power Station, and was also a competing retailer. However, this company has ceased all operations in the Territory in 2002.

4.1.2. Demand

Electricity is consumed by individuals in households, by service organisations such as hospitals, schools and government administration, and by commercial entities in offices, shops, manufacturing, agriculture and mining. The quantity of electricity consumed is determined by the number and type of electricity-using appliances and the rate at which they are used. Since data at this level of detail is not generally available, the general level of demand for electricity is usually assessed by focusing on its relationship with measures of economic activity and demographic change and movements in relative prices.

Economic and demographic conditions are a primary driver of electricity demand. As economic activity increases and population levels rise, both the stock of electricity-using equipment and the rate of utilisation increases.

Conditions in the NT economy are principally influenced by three factors: global economic conditions and their link to resource development and the commodity price cycle, government spending on defence and infrastructure projects, and the performance of the tourist sector in attracting domestic and overseas visitors.

Economic and demographic conditions are currently strong and are expected to remain relatively buoyant over the medium term. The current NT Treasury forecast is for growth of 4.5% per annum in the five years for the Northern Territory economy. However, a portion of this growth is being driven by offshore activity, which will not translate directly to demand for electricity.

Since PWC currently conducts its business wholly within the Northern Territory it has broadly based its electricity forecast on an assessment of the aggregates of economic and demographic conditions.

On average the growth in the demand for electricity in the Territory is in the range of one percent to three percent. However, it may be that three percent growth or more will be experienced, depending upon the economic climate and the direction of the oil and gas industry.

Other factors that influence the demand for electricity included potential developments such as;

- establishment of gas related industries;
- the expansion of Gove alumina plant;
- Darwin City waterfront redevelopment;
- establishment of new mines;
- construction activity within the housing sector; and
- changes in the affordability of air-conditioning.

4.1.3. Performance of Generation

Generators are usually large, stand-alone items of equipment that produce a uniform output (bulk electricity) and can be added in separate 'lumps' of capacity. With some exceptions, the adequacy of generation capacity is relatively simply expressed by comparing supply capacity with maximum demand (actual or expected). Once the reserve margin falls below a reliability-based critical level, additional capacity is required.

PWC adopts the deterministic approach to ensure that there is adequate generation capacity to meet the current and future demand. The range of issues and contributing factors that PWC considers for decisions to be taken on the augmentation of power generation in the Territory include but are not limited to the following:

Capacity and maximum demand:

- Maximum demand growth. The 10 year average annual maximum demand growth in Darwin is 2.23% and Alice Springs 2.85%. The review of timing of capacity increments will be based on a compromise figure of 2.5% for both centres.
- Capacity increments. The rule of thumb for interconnected power systems was that no individual generator should be rated more than 10% of system maximum demand. Both Darwin-Katherine and Alice Springs are significantly in excess of this benchmark now, at 20% and 23.5% respectively. The operating regime of small spinning reserve margins, automatic load shedding on loss of a larger generator, and starting of additional plant to cover the loss and allow reconnection of loads, is established practice, and currently supports the higher unit ratings. An intermediate maximum unit capacity increment of 15% for future developments has been adopted.
- Network impacts. Proposals to develop new generation sites, or expand existing sites, need joint consultation with Networks Division and System Control, to identify and plan for optimal connection strategies for the maximisation of system security. In the case of Alice Springs, existing risk associated with the switchboards used for generator and feeder connection is being addressed in parallel with generation upgrading.
- Reliability criterion. The usual criterion for an island system would be N-1 or N-2, in which N-x denotes the capacity margin above maximum demand, for

the failure of the largest unit of generation in the system (N-1), or the two largest units (N-2). In considering risk factors that could take out combinations of units, N-2 is the recommended criterion for all major cities and towns. For Darwin and Katherine the N-1 unit is 48MW and N-2 is 96MW. For Alice Springs, the N-1 unit 11.7MW and N-2 is 21.7MW.

Reliability of fuel supply:

- Current practice is to install sufficient dual fuel or diesel backup generators to enable the total load to be supplied with liquid fuel if there is a failure in gas supply. Pipeline supplied gas has been inherently reliable in all centres, with the exception of the event of 17 Dec 2004, when a lightning strike caused the emergency shut-off valve to CIPS to shut. There is no reason to consider that reliability levels will decrease in future.

Overall in relation to the Generation adequacy and performance levels, employing the N-2 reliability criterion indicates that additional capacity is required in both Darwin and Alice Springs within the next two years, and this is currently being planned. An additional 35MW unit is programmed for commissioning in Darwin by the end of 2007, and additional capacity for Alice Springs is scheduled for 2008. It is expected that current performance levels can be maintained in the interim.

4.1.4. Performance of Network

Network service is delivered through an integrated system of network elements with a design aspect (topology), hierarchy and spatial dimension. Depending on network configuration, reliability may be dependent on single network elements, such as high voltage transmission and distribution lines, transformers and substations, or shared across several elements where the network is meshed.

Network planners have developed two broad methods for assessing the level of reserve capacity required for network elements – the probabilistic Reliability Assessment Planning method and the deterministic N-x approach.

Reliability Assessment Planning (RAP) is based on the assumption that the network is designed to meet a system peak that is only a few hours long, with the probability of a fault during this peak being very small. The RAP methodology allows network equipment to be overloaded for short periods while load transfers are arranged, following a breakdown of a piece of network equipment. It tends to lead to higher levels of capacity utilisation, and may come at the expense of reduced reliability.

Deterministic N-x method. PWC adopts the deterministic approach to ensure that there is adequate network capacity to meet the current and future demand. The method is simpler to apply and its consequences for reliability clearer. The N-x planning standard applied to network asset categories will naturally heavily influence the level of network reliability. PWC adopts the N-1 criterion across the board for this purpose and to identify projects to be placed on the capital investment program.

PWC are investigating the adoption of the N-2 criterion in critical situations such as supply to the Darwin Central Business District (CBD) and Palmerston. PWC recognised that Darwin CBD and the whole of Palmerston have been essentially supplied by one zone substation each. PWC are constructing two additional substations, to ensure security in supply.

PWC recognises that adopting the more onerous N-2 criterion adds significant costs to the business but increases network reliability, especially for the most critical parts of the network.

In addition to the above, PWC are subject to the regulatory and institutional arrangements principally determined by the provisions of the *Electricity Reform Act* (Reform Act) and the *Electricity Networks (Third Part Access) Act* (Networks Act).

Power system planning and reliability are addressed in three separate parts of the regulatory framework:

1. under the Reform Act, power system reliability, safety and security, including energy balancing, are the responsibility of the System Controller; supervision of the power system takes place under the provisions of a technical code developed by the System Controller and approved by the regulator – the Utilities Commission (UC);
2. the Access Code places an obligation on network providers to plan and develop their networks according to good electricity industry practice; the UC is responsible for enforcing compliance with the Access Code; and;
3. the Reform Act gives the UC overall responsibility for advising the Regulatory Minister on the performance of the power system and its capacity to reliably meet supply requirements into the future.

The Technical Code defines power system reliability to include a provision that the network has adequate transmission capacity to meet reasonably foreseeable future customer demand and a contingency path to allow the credible outage of N-1.

In addition to the operational responsibilities for power system reliability, the regulatory framework requires network providers to undertake network planning and development that complies with 'good electricity industry practice'.

There are no simple aggregate measures of network adequacy that can be used to indicate future reliability. Rather, prospective network reliability typically is assessed in terms of the management, planning and investment processes used by the network provider to identify and respond to existing and emerging capacity constraints.

Indices currently used by distributors to quantify reliability are:

- System Average Interruption Duration Index (SAIDI) — this measures the total minutes interrupted per year divided by the total number of customers.
- System Average Interruption Frequency Index (SAIFI) — this measures the total number of customer interruptions per year divided by the total number of customers.
- Customer Average Interruption Duration Index (CAIDI) is a measure of how many minutes on average each customer can expect to be off supply per outage and is a general indication of electricity supply reliability.

The SAIFI and SAIDI measures for PWC for the 2006 financial year are presented in Table 4.5.

Table 4.5: Network Supply Reliability 30 June 2006

Electricity Supply Reliability	Achievement 05/06
Network Interruptions SAIFI ⁽¹⁾	
Darwin	5.0
Katherine	5.9
Tennant Creek	0.1
Alice Springs	3.0
Network Interruptions Duration SAIDI ⁽²⁾	
Darwin	231
Katherine	271
Tennant Creek	3
Alice Springs	107

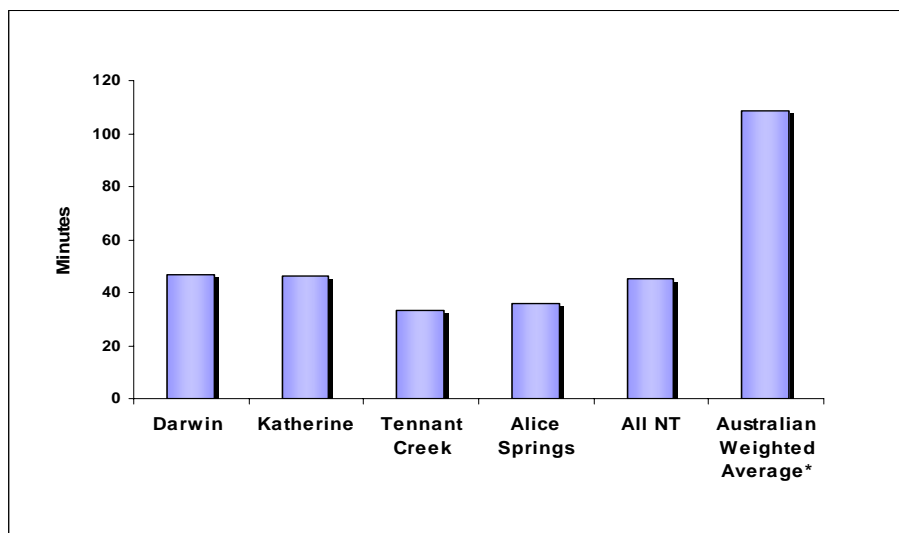
(1) Average number of times customer supply is interrupted per annum.

(2) Average outage duration in minutes each customer can expect to be off supply per annum.

To date PWC has achieved relatively good system reliability outcomes. However, improvements in electricity network performance Territory wide continue to be a priority for PWC. The harsh conditions of the Territory create an extremely challenging environment in which to provide a reliable electricity supply.

The problems created by lightning, storms, bats and fast vegetation growth cause power outages at a higher frequency than that experienced by other states and territories. Despite this, the service and response provided by PWC has resulted in the duration of outages being significantly less than the national average.

The following graph indicates PWC's performance over the past 12 months compared with the national average.

Figure 4.1: CAIDI 30 June 2006

* ESAA Report – Electricity Gas Australia 2006

Placing the transmission, sub-transmission and distribution networks underground will only serve to decrease the system outage frequency. PWC are retro-fitting rural lines that have pin insulators with post insulators to further reduce outage frequency.

Efforts to reduce the incidence of outages are presently underway, including the Nightcliff Undergrounding Project, replacement of oil-filled HV circuit breakers, and construction of the Frances Bay and Archer Zone Substations.

In addition to the above, the UC published a Northern Territory Electricity Standards of Service Code effective from 1 January 2006. The code, which is made under s24 of the *Utilities Commission Act*, will only apply to PWC for the foreseeable future.

The Code establishes minimum standards of reliability, quality and customer service in the NT electricity supply industry. The Code also puts into place arrangements for the monitoring and reporting of standards of service. The initial minimum standards will be those that prevailed during the year before the commencement of the Reform Act.

While the code does not currently include any incentive or penalty arrangements, other than the publishing of achievements against standards and moral suasion, there is potential to introduce such mechanisms as price control adjustments or customer compensation.

4.1.5. Investment

PWC is facing a number of major capital investment decisions in the short to medium term to meet demand growth and to ensure continued generation and network reliability.

From time to time, PWC and the Northern Territory Government agree to jointly fund capital projects, which are either not commercial, or only partly commercial. Under these circumstances PWC funds the commercial portion of the projects and these amounts are included in the Capital Investment Program. These projects recently include the Nightcliff undergrounding and the Dundee Beach transmission line.

4.1.6. Planning

Generally, the future direction of the electricity infrastructure is one of consolidation and improvement of existing systems. The infrastructure presently installed is generally adequate for the present load.

There is an opportunity to reinforce the adequacy of the existing system in readiness for future growth. The short-term and long term strategies are outlined below:

Generation – short term. During the last year PWC entered into an agreement to extend the IPP capacity provided from Pine Creek station by 7.5MW. The additional capacity will be available until June 2008. As a result, maximum capacity on the Darwin-Katherine system increased to 340.2MW.

At Alice Springs one unit of 3.9MW and one unit of 10.1MW were added at Ron Goodin Power Station, increasing capacity on the system to 71MW.

Capacity at Tennant Creek increased to 16.65MW with the addition of one unit of 4MW capacity.

Generation – long term. The future direction of the generation sector is one of expansion and consolidation. This consolidation is achieved through augmentations and efficiency improvements to the existing power stations.

Increased network security is best achieved through the provision of generation capacity in new locations to supply the system in the event of a major failure at Channel Island Power Station.

Transmission and Distribution – short term. The major planning focus is the maintenance of the existing infrastructure and construction of additional zone substations and associated 66kV sub-transmission lines. This will ensure that supply is available to all customers both existing and future, including new industrial and residential subdivisions.

Transmission and Distribution – long term. The future direction of the transmission and distribution sector is to cater for new load areas as the network spreads, and improve the security of the network for customers.

The construction of new zone substations and alternate feeders to isolated areas by PWC will provide higher levels of redundancy within the network to smaller customers. This will serve to reduce outage duration and frequency.

4.1.7. Development

Generation

Darwin: the new Weddell Power Station will see a generating unit of 35MW installed and commissioned by the end of 2007, with a second unit of the same capacity planned for 2010. This will be at a new site to provide diversity by avoiding additional augmentation at Channel Island Power Station.

Alice Springs: capacity augmentation is planned by re-powering of the existing power station in a continuing program that will see old small capacity units retired and replaced by larger modern units, commencing in 2008.

Tennant Creek: an additional 3MW of modern fast start standby diesel capacity is being installed that will allow the retirement of 5 units totalling 6.5MW of old and inefficient diesel plant.

Networks

PWC is planning to construct five new zone substations and associated 66kV sub-transmission lines in the next five years. These zone substations are:

- Frances Bay
- Archer
- East Arm
- Marrakai, and

- Lee Point.

4.1.8. Policy & Regulation

The electricity industry in the Territory operates within regulatory and institutional arrangements principally determined by the provisions of the:

- *Electricity Reform Act (Reform Act)* and
- *Electricity Networks (Third Part Access) Act (Networks Act)*.

The legislation provides for competition in the generation and supply of electricity to contestable end-use customers, who currently comprise 40% of the market, supervised by an economic regulator – the Utilities Commission. Four industry activities are recognised:

- electricity generation
- electricity trading and retail sales,
- network operation and
- system control.

Each activity requires a licence, issued by the Commission. Electricity is traded between market participants on a bilateral basis, which creates a requirement for residual energy balancing in the event that aggregate physical transfers into and out of the power system do not match. Network access conditions are regulated by an Access Code, which forms a schedule to the Networks Act.

4.1.9. Conclusions

Additional generation plant is required in most power stations within the next decade to replace existing dated plant and to cater for increased load growth. Augmentation of generation plant is regularly undertaken at all Territory power stations to maintain reliability and reduce the likelihood of major outages from single-point failures.

Generation Capacity for the Darwin-Katherine System is primarily positioned in one location (CIPS). New plant is being located at other sites to reduce the consequence of any generation loss at CIPS. A failure on the gas line or any other major failure can result in a significant loss of available capacity for the Darwin area of the network.

Continued significant expenditure is required on major distribution and transmission network assets to ensure increased reliability of supply to customers.

5. Water

5.1.1. Supply

The Power and Water Corporation (PWC) is the key water and sewerage services provider in the Northern Territory. It supplies water and sewerage services to the Territory's four major urban areas of Darwin, Katherine, Tennant Creek and Alice Springs. PWC also supplies water and wastewater services to a number of rural and remote communities in the Territory.

The Northern Territory's potable water supply system consists of source extraction from dams, rivers and bores. Raw water undergoes treatment and testing, and is then subsequently stored in various ground level and elevated reservoirs before being distributed to the customer.

There is approximately 2000 kilometres of water pipeline servicing 4 major and 12 minor urban centres.

Darwin's water supply has three water sources. Darwin River Dam is the most important source in that it accounts for around 90% (110 ML/day) of the water supplied by PWC to Darwin for potable use. The reservoir is recharged during the monsoonal wet season (November to April) and is drawn down through the dry season (May to October). The combined McMinns and Howard East borefields contribute some 10% of supply to Darwin, comprising a total of six bores, with a capacity of around 25 ML/day. Manton Dam could provide a back-up supply if required.

Transmission is managed between four supply zones being Palmerston (including rural areas), Karama, Casuarina and Stuart Park. In Darwin, the only treatment required is achieved through adding chlorine (for disinfection) and fluoride (for dental health).

Katherine's water supply is reliant on two sources; the Katherine River supply drawn from Donkey Camp Pool, and the bores from the Tindal Aquifer located at the Katherine Water Treatment Plant (KWTP). The current KWTP capacity is approximately 25 ML/day. The softer water from the Katherine River and the harder groundwater from the bores are blended together to produce a good quality water supply. Treatment in Katherine is achieved through chemical coagulation, sedimentation, filtration, fluoridation and chlorination. Katherine distribution system comprises of 3 reservoirs which provide pressures within the system. Due to the layout of Katherine, the town reticulation is divided into 2 pressure zones each served from different tanks Katherine East and Katherine zones.

Table 5.1 shows that apart from Darwin and Katherine, most other centres rely almost exclusively on groundwater, particularly in central Australia.

Table 5.1: Regional Locations and Water Source

Location	Source
Alice Springs	Bore water
Borroloola	Bore water
Darwin	Surface water (Darwin River Dam) + Bore water (10%)
Katherine	Surface water (Katherine River) + Bore water (20%)
Tennant Creek	Bore water
Yulara	Bore water

Tennant Creek's water supply is drawn from 15 production bores located in the Kelly Well, Kelly Well West and Cabbage Gum borefields. These bores pump to the Cabbage Gum pump station (maximum borefield capacity of 12.1 ML/day). At the Cabbage Gum Pump Station, groundwater is directed to a 0.5 ML collection tank prior to transmission pumping to Tennant Creek. The Tennant Creek System is not chlorinated. Bore operation is controlled through a telemetry system remotely or from the pump station. Potable water is then transferred from Cabbage Gum to two elevated ground level storage tank sites (One tank hill on the east of Tennant Creek and Two Tank Hill on the west of Tennant Creek).

Potable water for Alice Springs is currently extracted from 17 bores spread over a distance of about four kilometres. The maximum daily extraction and transfer capacity of the potable water system is between 80 to 90 ML/day. Water from bores is pumped into an 8ML collection tank at Temple Bar Pump Station. As in Tennant Creek the only treatment required is chlorination. Booster pumps at the Temple Bar Pump Station deliver water through rising mains to elevated ground level storage tanks and the town reticulation network.

At Yulara, there are 5 bores (3 diesel bores and 2 electric bores). The water source is highly saline and a Reverse Osmosis Treatment plant is utilised to reduce the Total Dissolved Solids (TDS) from the water. Chlorination occurs as residual disinfection treatment. Yulara operate a potable water supply system for domestic use and a non potable system for toilet flushing and fire fighting.

5.1.2. Demand

The current population of the Territory is approximately 200,000 people. About 145,000 people reside in the four main population centres of Darwin/Palmerston, Katherine, Tennant Creek and Alice Springs. A further 15,000 people reside in 12 minor urban centres located along main transport corridors, tourist centres and mining areas, The remaining 40,000 people are predominantly Indigenous, and reside in approximately 70 larger communities and over 550 smaller outstation communities and pastoral properties which are scattered across the more remote areas of the Northern Territory.

Current population growth is estimated to be around 1.5 percent. It is forecast that by 2030, the Territory will need to provide services for an additional 30,000 or more people in the Darwin area and 12,000 people in regional areas.

PWC provides potable water, non-potable water for rural stock and irrigation use, and wastewater services to the majority of the population.

Table 5.2: Water customer base

Potable Water		
Grouping	Population Served (no.)	Services Connected (no.)
Darwin Region (PWC)	100,000	30,000
Other Licensed Areas of the NT (PWC)	60,000	13,000
Remote (IES)	40,000	524
Total	200,000	40,750

Source: Power and Water Corporation 2006

Table 5.3: Customer Types and usage as percentage of total

Customer types	% of services	% usage
Residential	80.8	49.7
Commercial/ industrial	15.7	33.2
Government	3.4	17.1

Source: Power and Water Corporation 2006

The majority of urban and non-urban customers for the Territory are domestic customers and are considered high users of water in relation to other domestic users in the country. About 19% of services in the Territory are commercial users consisting of small industrial users, and medium to large retailers, including government installations.

The Federal Government, through the Department of Defence, has ownership of several military establishments and facilities; the major being Larrakeyah Barracks, HMAS Coonawarra, RAAF Base Darwin, Defence Establishment Berrimah, Robertson Barracks, the Bradshaw and Mount Bundy Field Trainings Areas, the Delamere Bombing Range, and the Joint Facility at Pine Gap, Alice Springs.

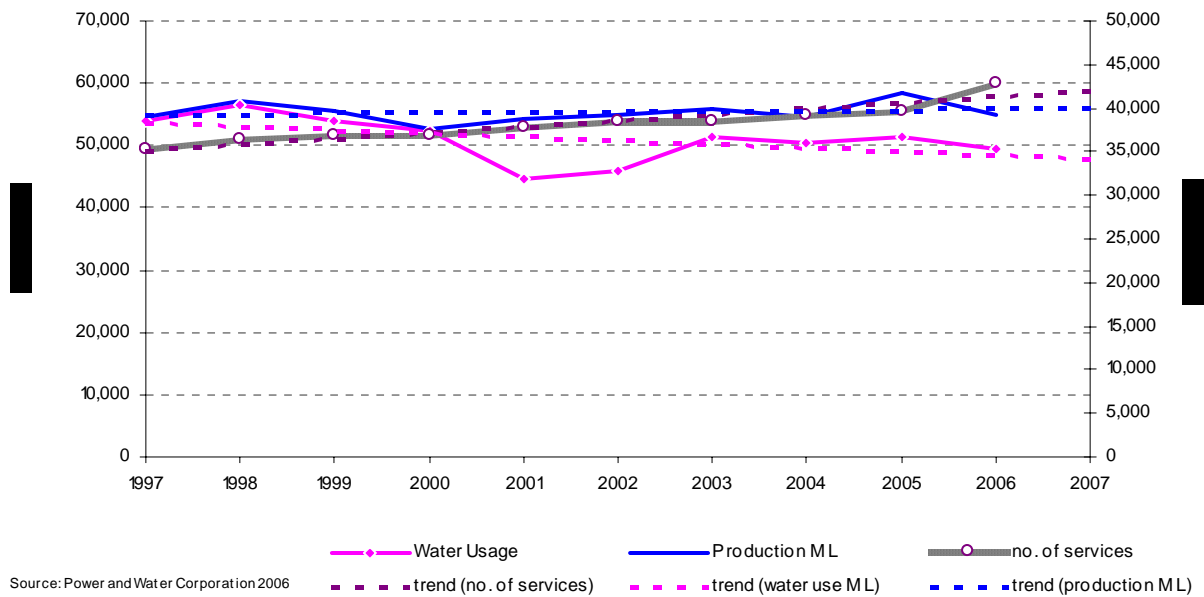
Through the Department of Environment and Heritage, the Federal Government has the responsibility for maintaining the infrastructure within Kakadu and Uluru Kata Tjuta National Parks, including that of the Mutitjulu Indigenous community.

Water and wastewater infrastructure related to these facilities may utilise adjacent public infrastructure, or in many cases, are separate systems. While technically independent of the Northern Territory legislative requirements, these facilities generally comply with prevailing Territory guidelines.

The Federal Government, through the Department of Family and Children's Services, also has direct responsibility for the provision of funding for essential services to communities on Indigenous lands. These communities include Indigenous urban living areas attached to urban centres.

Chart 5.1

Total Water Production and Consumption



The annual average residential consumption per property is approximately 440 kilolitres which is almost twice the national average. The majority of domestic users are within the Darwin urban region which accounts for approximately 78 percent of urban consumption. The consumption of water can be significantly affected by weather patterns in any one year. For example, the prolonged wet season in 2006 caused a significant reduction in demand for water.

5.1.3. Performance

Water Quality

Catchment protection is the first, and the most important, barrier for protecting water quality. To ensure good quality water, no development or public access is allowed into the main catchment areas. PWC continues to focus on catchment protection for surface waters in Pine Creek, Katherine and Darwin as well as groundwater sources throughout the Territory. PWC has been working with the Pine Creek Community Council and local landholders to manage access to Copperfield Dam and its catchment. Unrestricted access of feral animals and stock are potential risks to water quality in the reservoir. In close cooperation with the Council, it is planned to construct a fence surrounding the catchment and install signs early next year.

A cornerstone of PWC's commitment to drinking water quality is the Framework for Management of Drinking Water Quality, a key component of the 2004 Australian Drinking Water Guidelines. While PWC has primary responsibility for the provision of safe drinking water through the Water Supply and Sewerage Services Act, a number of government agencies are also involved. DHCS has a key role in applying the Australian Drinking Water Guidelines for drinking water quality and in monitoring compliance with those guidelines in the interest of public health.


The Department of Primary Industry, Fisheries and Mines independently analyses water samples we provide to its laboratories in Darwin and Alice Springs. The Department of Planning and Infrastructure (DPI) has a major role in protecting water

quality through land use planning. The Northern Territory Environmental Protection Agency regulates pollution control and therefore also has a significant role in protecting water quality. It is only through the coordination and cooperation of all of these agencies that the water quality objectives of all Territorians will be achieved and maintained now and in the future.

Table 5.4: Water Quality barriers in major and minor centres

	Catchment Protection	Detention in reservoirs/aquifers	Bore head Integrity	Alternative sources of supply	Coagulation filtration or membrane filtration	Disinfection	Storage tank integrity and cleaning	Maintenance of positive pressure in reticulation	Backflow prevention in reticulation	Disinfection residual at customer tap
Adelaide River										
Alice Springs										
Batchelor										
Borrooloola										
Cox Peninsula								NA	NA	
Daly Waters										
Darwin Groundwater										
Darwin Surfacewater			NA							
Elliot										
Katherine Groundwater										
Katherine Surfacewater			NA							
Kings Canyon										
Larrimah										
Mataranka										
Newcastle Waters										
Pine Creek Groundwater										
Pine Creek Surface Water			NA							
Tennant Creek										
Timber Creek										
Ti Tree										
Yulara										

Source: Water Quality Report 2005

Notes:  indicates only a partial barrier  indicates full barrier NA-not applicable

Water Asset Performance

Table 5.5 shows PWC's water services infrastructure at a glance.

Table 5.5: Water Infrastructure

Region	Principal Resource Type		Distribution		
	Surface Water	Ground Water	Pump Stations	Water Mains (km)	Tanks
Darwin	1	6	25	1,267	20
Katherine	1	2	3	165	3
Tennant Creek	0	15	1	158	3
Alice Springs	0	17	3	425	4

Source: Power and Water Corporation

5.1.4. Investment

Major investment in water supply is dominated by augmentation at the source of distribution. Continued development of Darwin and its surrounds for residential, commercial and industrial purposes is forecast and requires investment across the network to support this growth. The capital investment to support this growth is in the source, transmission, storage and reticulation components. For the Darwin Region, in particular the projected growth areas are the Darwin CBD, Palmerston and the Northern Suburbs.

Total capital expenditure for 2005–2006 including contributions to capital works amounted to about 2 percent of capital asset value. In addition to capital expenditure, a further 4.8 percent of capital asset value was spent in 2005–06 on administration, operation, repairs and maintenance across the Northern Territory.

Factors influencing the rate of investment in renewals include the age of the system, the condition of the system and previous expenditure on renewals. Renewal programs vary from business to business, and vary in complexity from a reactive approach (repairs are affected when a failure occurs), through to more proactive programs based on a risk assessment of the critical nature of a failure, and an assessment of the condition of the asset.

PWC is required by the Utilities Commission to prepare and update asset management plans on an annual basis, as part of the water supply and sewerage licence requirements.

5.1.5. Planning, Development & Regulation

Planning and Development

Unlike other Australian Capital cities, Darwin has not had to impose water restrictions yet; however PWC has started introducing demand management initiatives and water recycling to help reduce the pressure on our water supplies.

With respect to water quality, PWC continues to adopt a risk assessment approach for determining the level of treatment appropriate for a community. All communities in the Northern Territory are entitled to have access to good quality water, and it will continue to use key components within the Australian Drinking Water Guidelines in taking a proactive approach to ensuring the safety of water supplies.

Policy and Regulation

The provision of water and sewerage services to licensed areas is carried out under the terms of the Territory *Water Supply and Sewerage Services Act*.

The standards for the provision of water and sewerage services to remote communities and outstations are specified in the document Environmental Health Standards for Remote Communities in the Territory, which was prepared by the Department of Health and Community Services for the Territory Government Environmental Health Task Group.

Water resources, including both surface water and groundwater, are administered under the *Water Act* by the Natural Resources division of DPI. Under the *Water Act*, water resources may be designated to an area known as a water control district. The allocation and usage of water resources within a water control district are

subject to a prescribed allocation plan, and may include specific conditions including licensing under the *Water Act*.

There are six water control districts in the Territory, covering resources in the vicinity of Darwin, Katherine, Gove, Tennant Creek, Ti-Tree and Alice Springs.

Any bore constructed for the extraction of groundwater requires a licence issued by the Controller of Water Resources. The application requires the specification of the intended use and estimated volume of water to be extracted, however subsequent monitoring or reporting of extraction rates is only generally required for bores delivering more than 15L/s. As a result of such uncontrolled groundwater extraction, some areas are currently considered to be at risk of over use and excessive draw down.

Extraction of surface water from natural water bodies also requires a licence issued by the Controller of Water Resources. As for groundwater extraction, the application requires identification of intended use and estimated consumption.

All groundwater and surface water extractions are recorded by PWC and reported on a monthly basis.

Water and Sewerage Asset Management Plans

The Asset Management Plans (AMPs) are provided annually to the Utilities Commission as per the PWC's licence requirement, and the AMPs outline the water and sewerage systems at all PWC commercial centres throughout the Northern Territory. The AMP's also describe where they are located, the performance of these systems on a broad scale, and the activities undertaken in order to maintain, replace, and monitor these assets.

The AMPs focus is on the management of assets with a system-wide perspective, each covering individual regions of Darwin, Katherine, Tennant Creek and Alice Springs, as well as including minor centres within these regions. It covers the following areas:

- Capital Investment Strategic Plan
- Renewal and Replacement
- Asset Maintenance Plan

AMPs also include asset life cycle and risk management principles together with demand management, growth planning and increasing service reliability.

Intergovernmental Agreements

The Intergovernmental Agreement, of which the Northern Territory is a signatory, outlines the objectives, outcomes and agreed actions to be undertaken by governments across Australia to achieve a nationally compatible system for managing water resources as well as achieve optimum social, economic and environmental outcomes to the nation's water needs.

Part of this reform includes efficient management of existing water resources, increased use of recycled water, best practice water pricing, and environmentally sustainable outcomes.

5.1.6. Issues

Demand Management

- Even though the Northern Territory is not undergoing drought conditions as in other parts of Australia, PWC has continued to focus on water conservation initiatives such as demand management, leakage reduction and recycled water use, and alternative water sources to alleviate increasing system demand.
- Significant reduction in water loss has been achieved in Darwin through improved metering and active leakage control using the latest acoustic technology. Progress continued with the Soil Aquifer Treatment and reuse scheme in Alice Springs. The project aims to achieve environmental outcomes through rehabilitation of the Ilparpa Swamp and its ecosystem, and supporting a long-term framework to reduce non-potable demand on the Amadeus Basin groundwater.

Fire Management Plan

- PWC continues to collate and analyse information on fire activity in the Darwin River Dam and Manton Dam catchments. The success of the catchment fire management plan implemented in 2003-2004 has been limited because of the continued uncontrolled burning from illegal incursions into the catchment area. The plan will continued to be reviewed and revised after the coming wet season.

Cabomba Weed

- A new risk, the noxious aquatic weed Cabomba (*Cabomba Caroliniana*), was detected downstream of Darwin River Dam. Procedures have been put in place for preventing the spread of Cabomba into the catchment streams and reservoir itself. PWC has erected signs around the catchment and are investigating more effective ways to control illegal access and improve catchment surveillance.

Water Quality

- Maintaining water quality in a proactive manner is essential to the provision of a Safe water supply. Monitoring for indicators in strategic locations reduces the risk of water quality failures. The introduction of a program to install booster chlorinators at strategic locations has assisted in maintaining high water quality.
- Other areas require more innovative methods for maintaining water quality. The township of Tennant Creek is opposed to the use of continuous chlorination in their system so alternative methods are being employed to reduce risk in this area.

Groundwater Management

- In 2005, a risk assessment was undertaken to determine the impact of septic tank systems potentially contaminating groundwater in the McMinns /

Howard East area. The study highlighted the need to establish a 400m Exclusion Zone and a further 200m Active Management Zone around all PWC production bores. PWC continues to work with the Department of Natural Resources, Environment and the Arts, the Department of Health and Community Services and local land developers in this area to ensure supplies are protected.

6. Sewerage

6.1.1. Supply

The Sewerage System comprises of the collection of waste water from customers via the sewerage collection system comprising of pipes, pump stations and rising mains. Sewage is then treated in wastewater treatment facilities where it is treated and the effluent disposed as waste discharge or re-used for irrigation purposes.

Table 6.1: Wastewater Infrastructure

Region	Treatment facilities	Pumping stations	Mains (km)	Licensed discharge sites
Darwin	7	45	680	6
Katherine	1	12	75	1
Tennant Creek	1	4	38	1
Alice Springs	1	9	221	1

Source: Power and Water Corporation

Approximately 1,000 kilometres of sewer services support 4 major and 12 minor centres. All major towns and cities of the Northern Territory are provided with a standard sanitary sewerage collection system. The sewerage system comprises of various size sewers of various ages and materials including Vitrified Clay (VC), Polyvinyl Chloride (PVC), unlined concrete, Asbestos Cement (AC), High Density Polyethylene (HDPE) and reinforced pre-cast concrete.

Sewerage Pump stations are used where the geographical constraints make the use of gravity systems unviable or uneconomical. These pump stations comprise of a rising main which transports sewage to the receiving main hole often hundreds of meters away from the pump station. These rising mains are pressure mains.

Treatment is achieved by a number of different processes. These include lagoons, chemically assisted sedimentation, and the activated sludge process. Effluent discharge is subject to quality and other licensing requirements of the Controller of Natural Resources.

Sewage effluent is re-used on a limited basis in Darwin, Pine Creek, Katherine, and Alice Springs. The first stage of the Darwin Sewerage Strategy currently being implemented by PWC, will improve the quality of effluent discharged to the harbour. The stage involves the diversion of sewage from the Larrakeyah outfall and diverts it to the Ludmilla wastewater treatment facility. Later stages of the Darwin Sewerage Strategy may increase the amount of sewage effluent re-use in Darwin. All sewage effluent re-used in the Northern Territory is in accordance with the National Health and Medical Research Council Guidelines for re-use of sewage effluent and is also subject to approval by Chief Health Officer (CHO).

The existing Darwin Region Sewerage System comprise of six sewage collection, treatment and disposal systems serving an existing population of about 100,000 EP (Equivalent Persons): Larrakeyah, Ludmilla, Berrimah, Leanyer, Palmerston, and Humpty Doo. Pump stations throughout the network transport collected sewage from low-lying areas to treatment ponds. This primary effluent is then disposed to Darwin Harbour via a shallow outfall near East Point. Smaller oxidation ponds are

operated in Berrimah, Palmerston and Humpty Doo. East Arm Wastewater Treatment facility has been established specifically to treat high retention time sewage for heavy industrial areas of East Arm. This system is operated as part of the Berrimah wastewater treatment facility at this stage.

Treatment in Katherine is by Waste Stabilisation Ponds (WSP) or lagoons comprising 6 separate ponds (2 facultative and 4 maturation) with evaporation/storage basins. The ponds have a design treatment and disposal capacity 10,000 EP. General sewage flows under gravity from house to a collection sewer that in turn gravitates to a network of 12 pump stations that delivers sewage to the treatment plant via a rising main system. Sewerage treatment is undertaken adjacent the Katherine River downstream and to the west of the township. Effluent is disposed through evaporation and reuse through spray irrigation of pasture during the dry season while during the wet effluent is diverted to the river during high flows for immediate dilution and dispersal.

The sewerage treatment system for Tennant Creek utilises a set of 13 ponds, comprising 1 primary pond, 3 secondary ponds and 9 evaporation ponds. The sewerage collection system comprised a gravity collection and trunk sewer arrangement that delivers sewage to the treatment plant. The design capacity of the ponds is in the order of 4500 EP. There are four pump stations delivering directly to the network trunk sewers. The sewerage collection network serves the population with several additional gravity collection system extensions to the north of the network. Predominantly the Tennant Creek network comprises 300mm to 525mm diameter trunk systems, all of which are concrete, while the collection network comprises 150mm and 225mm sewers of which the 150mm sewers are of PVC while the 225 mm sewer are concrete.

The sewerage treatment system in Alice Springs is comprised of a series of facultative, oxidation and maturation ponds located in the Commonage Road area known as Ponds A, B and C. The ponds have a design treatment and disposal capacity of around 33,595 EP. A 450mm nominal diameter concrete trunk sewer services the Central Business District and central area residential developments. This sewer is designed to discharge to the treatment ponds under gravity. A trunk sewer of 825mm nominal diameter provides an outlet for the newer developing areas of Sadadeen, Larapinta and Northern Alice Springs. Due to the depth and grade of the 850mm sewer, incoming flow is pumped to the treatment lagoons. Combined effluent from Ponds B and C are conveyed for disposal through Pond A using evaporation ponds, pumping for reuse and controlled discharge to Ilparpa Swamp.

6.1.2. Demand

The number of sewerage services in the Territory has increased steadily in line with population growth and increased developments. At the same time, the volume of sewage treated has remained steady, and is showing a downward trend which indicates that current infrastructure has managed to keep pace with demand. Demand management initiatives on the Water Supply may be contributing to less water being wasted but more significant is the work being done to prevent infiltration into the sewerage system through relining and maintenance.

There is a need to address removal of Black and Grey Water and solid waste from visiting foreign naval ships and other international ships at Stokes Hill, Fort Hill and Iron Ore wharfs and disposal in accordance with AQIS requirements.

Chart 6.1

Volume of Sewage Treated

Source: Power and Water Corporation 2006



Table 6.2: Wastewater Services

Grouping	Population Served	Properties connected
Darwin Region (PWC)	100,000	30,000
Other Licensed Areas of the NT (PWC)	60,000	16,000
Remote (IES)	40,000	420
Total	200,000	46,420

Source: Power and Water Corporation

6.1.3. Performance

Treatment and Disposal

Disposal of sewage or treated effluent to the environment is governed by the *Water Act*, and administered by the Environment Protection Agency (EPA) division of the Office of Natural Resources, Environment and the Arts (NRETA). Whilst most effluent discharges operate under the terms of a licence issued by the NRETA, under the terms of the *Water Act*, the terms of the licences do not generally specify effluent quality limitations, although, various licence conditions include a requirement for testing and reporting of certain effluent quality parameters.

Table 6.3

Major Treatment Facilities in the Northern Territory							
Location	Treatment Type	Discharge to			Reuse Type		
		Ocean Outfall	Inland Water Body	Estuary	Atmosphere Evaporation	Irrigation	Process Water
Adelaide River	WSP		☆				
Alice Springs	WSP						
Batchelor	WSP						
Borrooloola	WSP						
Berrimah	WSP						
Humpty Doo	WSP						
Katherine	WSP		☆				
Katherine	WSP						
Kings Canyon	WSP						
Larrakeyah	Primary Maceration						
Leanyer/Sanderson	WSP						
Ludmilla	Chemical Assisted Sedimentation						
Northlakes	DAP ² + Microfiltration + Chlorination						
Palmerston	WSP						
Pine Creek	WSP						
Tennant Creek	WSP						
Yulara	Activated Sludge						

☆ Wet Season Only

² Dissolved Air Flotation (DAF)

WSP Waste Stabilisation Ponds

Source: Power and Water Corporation

Guidelines for minimum detention times are also provided by the Department of Health and Community Services where effluent is discharged off site, and impose additional criteria where there is any re-use of effluent.

The disposal of sewage sludge from treatment plants, grease trap wastes, septic tank sludge and solid waste components of sewage is governed by the Waste Management and Pollution Control Act, which is also administered by NRETA. Grease trap and septic sludge is generally disposed of to treatment plants in the vicinity, or buried in landfill or leaching trenches.

Sludge removed from pond systems is generally buried in landfill. Sludge from the Ludmilla Primary Sedimentation Plant in Darwin is incinerated or dumped to landfill adjacent to the plant.

The majority of non-coastal communities in the Territory have no access to permanent running water-courses for disposal of effluent. Hence, the objective of these regional urban and remote community treatment systems is generally to dispose of all effluent on-site. This is normally accomplished by the use of a combination of evaporation and infiltration from ponds, and land surface application by spray or flood irrigation.

For systems where complete on-site disposal is achieved, there is no applicable effluent quality requirement for treatment. However, a minimum 30 day detention is deemed to be required prior to disposal by land irrigation. Coastal communities including Darwin and Palmerston generally dispose of effluent to estuarine mangroves, with or without some intervening natural watercourse.

Complete on-site disposal is generally possible only in arid areas with appreciable net monthly evaporation throughout the year. However, such systems have been adopted in other areas for disposal of at least the Dry Season effluent. In such cases, formal release of effluent from ponds or informal disposal of effluent to watercourses via runoff from irrigated areas is then often required during the Wet Season.

Recycling

The National Guidelines for Use of Reclaimed Water (2000) defines different types of reuse, and the monitoring, controls and recommended microbiological water quality for the specific applications. In 2005-2006, PWC provided about 1900 million litres of reclaimed water, or about 10% of the total wastewater treated. The following table summarises where PWC supplied reclaimed water and how it was used.

Table 6.4

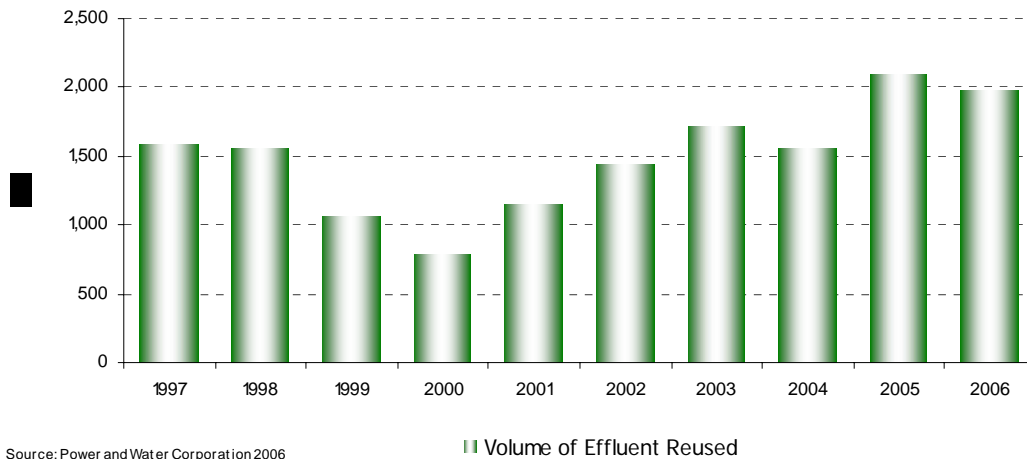
Power and Water Reclaimed Water Scheme			
Location	Application	Reclaimed Water Type ¹	Volume (ML)
Northlakes	Darwin Golf Course	Municipal with uncontrolled public access	301
Marrara Sports Complex	Sports ovals	Municipal with controlled public access	95
Humpty Doo	Natural vegetation	Agriculture: Non-human food chain	24
Pine Creek	Sports oval corridor	Municipal with controlled public access	0
Katherine	Cattle feed-lot	Agriculture Food production, Pasture and fodder for cattle	229
Alice Springs Blatherskite Park	Open spaces/sports ovals	Municipal with controlled public access	937
Alice Springs WSPs	Tree lot	Agriculture: Non-human food chain	39
Kings Canyon	Tree lot	Agriculture: Non-human food chain	23
Yulara	Tree lot	Agriculture: Non-human food chain	205

1. As per definitions in the *National Guidelines for Use of Reclaimed Water* (2000)

A system using tertiary treated effluent from the Alice Springs plant is currently under development. It is intended that this project will use aquifer storage and retrieval of treated effluent for re-use.

Chart 6.2

Volume of Effluent Reused



6.1.4. Investment

Sewerage investment in the Northern Territory is dominated by works associated with the Darwin Sewerage Strategy (DSS). The DSS is based on catering for future growth in the central Darwin area as well as achieving improved environmental outcomes. Similar upgrading requirements to meet discharge license provisions and improved environmental outcomes are required at other sites.

Potential for growth in the Darwin CBD and surrounding Larrakeyah/Stuart Park and Parap areas remain significant with a continuation of high density residential in-fill development. Significant investment in new infrastructure to serve the growth in demand is currently occurring. A large part of this investment program is the replacement of aged and inappropriate infrastructure systems. Continued upgrade and expansion of the Treatment Plant at Ludmilla is required to cater for demand growth in the CBD area and to enable diversion of effluent from Larrakeyah. Treatment expansion investment is also required at the Leanyer/Sanderson ponds to enable increased demand growth in the northern suburb's area.

Total capital expenditure spent for 2005–2006 including contributions to capital works amounted to 4.4 percent of capital asset value. In addition to capital expenditure, a further 8 percent of asset value was spent in 2005–06 on administration, operation, repairs and maintenance across the Territory.

It can be anticipated that renewal expenditures will need to increase as the systems age.

6.1.5. Planning, Development & Regulation

Planning and Development

Wastewater collection systems are generally of adequate capacity and fair condition. The exception is for older systems, particularly in Darwin, where there is an ongoing program of sewer rehabilitation, which includes CCTV inspection, sewer relining, house connection and sewer replacement and manhole rehabilitation. This program has achieved some reduction in wet weather flows in several major catchments. Most wastewater systems in the Territory are only required to provide a moderate level of treatment. Accordingly, most systems operate within current conformance guidelines. Increasing community awareness and concern with water quality will result in the imposition of tighter effluent discharge standards, especially in the major urban areas.

PWC pumping stations in major centres are generally of adequate capacity and level of maintenance. However, stations in remote communities can be subject to frequent blockages due to high solids load resulting from inappropriate disposal of solids to the sewer system. Lack of skilled operating staff in remote areas can also result in an inadequate level of fault detection and poorly planned and executed operating and maintenance regimes. Progressive upgrading of pumping stations is occurring throughout the system, however improved reliability in remote communities with high level of extraneous solids in wastewater is difficult to achieve.

Wastewater stabilisation ponds systems remain an appropriate technology for the climatic and socio-economic conditions encountered in the Territory. PWC is constantly looking at ways to better control nutrients and suspended solids discharged to the waterways. This will require substantial investment in higher levels of treatment for most catchments. This is particularly important where on-site or other acceptable disposal options are not feasible. Wastewater treatment in the Darwin region and some regional urban and remote communities are constantly being monitored. The existence of sewage and primary treated effluent outfalls within Darwin Harbour mitigated by high dilution factors available due to tidal movements is one area of concern. Current effluent management in Alice Springs results in undesirable levels of discharge to Iparpa Swamp. Action is being taken to minimise this problem.

Sewerage system blockages and overflows are higher in remote communities than in Darwin and the regional urban centres. This is due to increased system abuse by customers and longer response times for repairs to systems, without ready access to materials, spare parts and skilled staff. Extreme wet weather flows, which result in infiltration and stormwater inflows to the sewer system, remain a concern across all areas in the Top End.

New pump stations installations include a storage facility to capture sewage overflows in the event of a power outage or failure in the pump station control system. Generally the storage is sufficient to allow operators to repair or put in place remedial actions prior to overflows to the environment occurring.

Federal Government funding has also been sourced to improve infrastructure for the Territory's Indigenous urban living areas (town camps) in the near future, under the Connecting Neighbours Program. The objective is to hand over responsibility for operating and maintenance of these on-site systems to PWC.

Policy and Regulation

The discharge of liquid wastes, including sewage or treated effluent, to the environment comes under the jurisdiction of the Water Act and requires a licence under the Act. The issue and administration of licences are carried out by the Office of Environment and Heritage, as the delegate of the Controller of Water Resources. Licence conditions are at the discretion of the NRETA on a case-by-case basis. They generally require some quality monitoring and reporting, and have limited timing of discharge to ensure adequate dilution flows are present. This is the case in regard to effluent discharge to the Katherine River from Katherine wastewater stabilisation ponds. The licence conditions do not necessarily impose any specific limitations on the quality of effluent discharged.

With the relatively recent appointment of the EPA in the Northern Territory it is anticipated that the quality of effluent being discharged will be monitored more closely and within stricter guidelines than before.

The disposal of solid waste, including sewage sludge, is required to meet the conditions of the Waste Management and Pollution Control Act, which is also administered by the NRETA. Re-use of onsite wastewater must be performed in accordance with the requirements of the Department of Health and Community Services Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. All PWC reuse schemes are individually reviewed and approved by the Department of Health and Community Services.

Water and Sewerage Asset Management Plan

The Sewerage Asset Management Plan assesses current infrastructure and operational performance utilising public health considerations, customer service, regulatory and commercial performance indicators and providing a systematic and dynamic basis for the planning, management and operation of the business. This has the same management component as Water services asset management plan but the emphasis is on service reliability, minimising sewerage outflows, improving and maintaining effluent quality and minimising odour complaints.

6.1.6. Issues

Water Reuse in Alice Springs

- Community involvement and awareness of wastewater issues is a high priority for PWC. Ongoing community awareness and consultation is necessary so that people understand matters associated with wastewater and reclaimed water reuse, help minimise impacts of wastewater disposal by adhering to regulations associated with trade waste and stormwater disposal, and improve their confidence in the way PWC treats and disposes of wastewater and reuses reclaimed water.
- PWC is working hard to identify innovative and cost-effective solutions that will enable safe reuse of water and minimise environmental impacts. The Water Reuse in the Alice Project has involved a significant program of

community awareness and involvement. It is involve in a number of public presentations and open days at key sites and actively encouraged and welcomed community involvement in the environmental approval process associated with this project, and will continue to do so.

Darwin Harbour Regional Plan of Management

- PWC has participated extensively in the preparation of the Darwin Harbour Regional Plan of Management including providing public presentations. PWC fully supports the Darwin Harbour Regional Plan of Management, in particular the intent to improve the understanding of the region's environment and the protection and enhancement of freshwater, estuarine and marine water quality especially through a hydro-dynamic modelling process. Successful catchment management, to reduce the impacts of sewage and stormwater on Darwin Harbour, depends upon appropriate strategies. Successful strategies should focus on key contaminants and on priorities for management, which should be based on the measurement of the major inflows.

Chemical Sedimentation Trials, Ludmilla Wastewater Treatment Plant

- As part of the Darwin Harbour Regional Plan of Management, PWC has embarked on a plan to further improve the quality of treated effluent released into the harbour from the Ludmilla Wastewater Treatment Plant. Laboratory studies have already been performed, indicating the potential for ferric sulphate to be highly effective in improving the quality of wastewater. A full-scale trial is now being implemented at the treatment plant with the aim of assessing the potential benefits of this treatment technology.

Developing Useful Indicators and Rapid Detection Techniques for Monitoring Recycled Water

- This project, through the Cooperative Research Centre for Water Quality and Treatment, aims to assess the occurrence of pathogens in biofilms in reclaimed water distribution systems. The outcomes of the research will provide information that will reduce the risk of reclaimed water systems.

7. Telecommunications

7.1.1. Supply

The Northern Territory has two distinct supply side market segments. Broadly, the telecommunications market is split into metropolitan areas, which include the major regional centres and secondly the remote communities throughout the Territory.

Whilst the towns on the backbone between Alice Springs and Darwin, and some minor regional communities are well serviced with capacity delivered over fibre optic cable, the rest of the Northern Territory generally suffers from poor service either through lack of equipment at the community service point or because the network infrastructure is at capacity. Capacity problems occur due to the nature of the technology servicing the remote areas of the Northern Territory.

Supply is tempered in the remote areas by the size of the market available and associated revenues when offset against potential income. Because of this the provision of any telecommunication services into remote areas of the Northern Territory, since deregulation in 1998, has been entirely driven by the regulatory obligations placed on the incumbent provider. Market pressures are unlikely to drive large scale terrestrial infrastructure developments in the remote areas of the Territory.

The Australian Government has a policy of “infrastructure based competition”. This regime “encourages efficient investment in competitive infrastructure and services between as many service providers as possible” providing “firms the capacity to innovate and have greater control over their costs.” Where infrastructure based competition fails, “retail based competition” is intended to fill the gap.

The Northern Territory has demonstrated near total failure of this policy in remote areas.

The Northern Territory is the last jurisdiction with a single infrastructure provider delivering interstate connectivity. The lack of competitive interstate supply eliminates wholesale competition. Whilst the impact of this, under current regulation, does not significantly inhibit general consumer product pricing, it does inhibit the competitive range of product and services available. The high price of ‘backhaul’ limits the competitive capacity of major telecommunication service providers. This limits new SME investors or new telecommunication providers entering into the market in the Territory. With no competition in backhaul, costs remain high.

Telstra is by far the predominant infrastructure provider throughout the Northern Territory. Optus invested significantly in the Darwin metropolitan area and in major regional centres, for the provision of mobile telephony, as a direct result of servicing the Northern Territory whole of government telecommunications contract over a five year period.

Of all communities (318) in the Northern Territory with a population greater than 20, 12% have access to ISDN and 11% have access to mobile telephony. The majority of these communities have a population of more than 200. Nevertheless there are only approximately 50% of communities with a population greater than 200 that have access to ISDN and mobile telephony. Only one of these communities has access to ADSL.

7.1.2. Demand

The demand for telecommunication services in the Northern Territory are typically driven by the developments in the more populous areas of Australia. As the demand for higher and higher broadband speeds encourage the development of applications that take advantage of enhanced capacity, the applications drive the need for higher speed service, typically some years later.

Recent developments have indicated there is substantial latent demand for telecommunications services throughout the Northern Territory. In late 2004, a new 155Mbps link to Nhulunbuy (Gove) was commissioned and has provided the capacity to deliver ADSL services to Nhulunbuy and mobile service to some communities on the line to Darwin. The infrastructure was at capacity within 18 months.

This is one example where infrastructure has been upgraded and the take up of services far exceeds expectations by providers. Without the “infrastructure based competition” for backhaul there is no real reason for a provider to invest in new infrastructure. This means the current infrastructure is stretched to the limit with the result that new services such as mobile telephony and/or ADSL services cannot be installed in regions as the backhaul capability is at capacity.

A number of remote communities, with predominately Indigenous populations have obtained mobile telephony services over the last two years. These communities have demonstrated substantial and sustained take up of pre-paid mobile phones. In some communities the anecdotal evidence is the take up is near saturation. Access to corroborating evidence is difficult to obtain for the remote areas of the Northern Territory as information from the incumbent provider is often classified as commercial in confidence or is not easily accessible or not gathered for these remote areas.

Nevertheless, much of the existing infrastructure is older technology that in today’s terms has limited capacity and will not meet even the most modest of the expected demand requirements, with the exception new installations of standard telephone services, for which the demand is expected to be very low in remote communities.

7.1.3. Performance

As implied, the infrastructure related performance issues in the major communities on the backbone from Alice Springs to Darwin and the larger regional communities serviced by optic fibre are minimal. All issues in these areas are related to the lack of competition, in the wholesale area primarily, which results in limited effective competition in the retail market segment.

The remote areas generally suffer from a lack of capacity either because infrastructure is based on outdated technology which limits the capability of the service provided, such as HCRC Swing, or because the capacity in otherwise capable infrastructure is exhausted and unable to meet the existing demand.

The remote areas of the Northern Territory require significant network infrastructure upgrades to meet the expected demand for services into the near future and beyond.

7.1.4. Investment

The Northern Territory Government is not in a position to fund the large scale infrastructure investments required to catch up to the standards enjoyed in other regional, rural and remote areas of the rest of Australia some years ago.

The Northern Territory is reliant on private sector investment and Australian Government interventions. It is unlikely that private sector investment will eventuate at the levels required, unless investment is encouraged through subsidised Australian Government intervention programs.

The Connect Australia program is likely the last large scale Australian Government investment program in telecommunications for many years to come. To achieve telecommunication services on a par with similar jurisdictions, the Northern Territory will need to receive investments far in excess of the typical per capita proportion of 1% to 2% of the available Connect Australia funding.

Existing regulatory obligations will only serve to maintain the current levels of service; it will not drive the competitive infrastructure investment needed to provide the equitably priced products and services to the community.

7.1.5. Planning, Development & Regulation

The Northern Territory Government has a Remote Area Telecommunication Strategy endorsed by cabinet in 2003. The strategy targets infrastructure upgrades to 115 remote communities, with a population greater than 100. The plan calls for upgrades which will allow these communities to have access to mobile telephones and broadband services on an equitable basis with the rest of Australia by 2008. The plan recognises that the funding required to achieve the upgrade will need to come from the Federal Government.

There is still a need to drive development in under serviced area such as remote and very remote communities. This development will be driven predominantly by the market except in areas where the market fails. Where the market fails the Federal Government should then drive the Next Generation Networks.

7.1.6. Summary

The key issues for the Northern Territory are:

- Lack of competition in the wholesale market. A competitive large capacity interstate telecommunications link (fibre optic cable) would provide the beginnings of a competitive market;
- Much of the infrastructure in remote areas and communities is at capacity or is outmoded technology. Large scale strategic investment in terrestrial infrastructure is the only solution that will provide a long term resolution and competitive pricing for the consumer;
- Appropriate products aimed at Indigenous communities to ensure equitable access to telecommunications services. Pre-paid mobile phone services are the telephony product of choice for Indigenous communities and a significant larger number of sites need to be installed; and

- Equitably priced broadband service and supported community access points are required in remote and predominately Indigenous communities, to provide the access to economic opportunities beyond the limits of the communities themselves.

8. Employment

8.1.1. Supply and demand

The Northern Territory labour market, along with the rest of Australia, is experiencing skill shortages in many occupations across all industries, in particular construction. The issue in the NT is exacerbated by the fact that not only is it experiencing skill shortages but actual labour shortages as well.

The NT is currently experiencing near record low unemployment. The latest released figures by ABS display an unemployment rate of 3.0% and a participation rate of 70.1%. The NT unemployment rate has more than halved during 2006, from 6.4% in January to 3.0% this month²². The unemployment rate in the NT continues to decline and is anticipated to fall again in November. Low unemployment is being driven by strong employment growth over the long-term.

The number of employed people in the NT increased in October to 103,000 people, which is a record level of employment in the NT. There are signs that the upward trend in employment is slowing, likely due to a low availability of people to take up jobs as opposed to a drop in demand.

Newspapers vacancy advertisements are currently increasing for the NT and are higher than at the same period last year. This trend is also supported by recent surveys, which have indicated that businesses in the NT are intending to expand their workforce in the latter months of 2006²³.

Design resources in the NT are reasonable to support the base building and engineering load but would be overcommitted if it did not rely on interstate resources for large or complex engineering.

There are no tertiary educational facilities catering for a five year architecture degree and several branches of engineering. It is exceedingly difficult and expensive to recruit professionals into the Territory.

8.1.2. Implications for infrastructure

The Northern Territory does not currently have the labour force it requires to deliver its infrastructure at reasonable cost and it has not had this for some time. The nature of Territory construction is to be 'lumpy' owing to the large size of individual projects relative to the industry turnover. This has made it extremely difficult to develop a stable Territory-based labour force because there is no continuity.

Most major projects such as the railway or gas plant rely extensively on importing labour interstate, for some trades exclusively so. It has become the tradition to import some specialist trades such as welders on a seasonal basis even to cope with the base construction load excluding major projects. Most of the existing gas plant was prefabricated outside of the Territory as will anticipated extensions to this.

²² Labour Force, Australian Bureau of Statistics, 9/11/2006, Catalogue 6202.0

²³ Business Index – Small and Medium enterprises, Sensis, August 2006: Manpower Employment Outlook Survey Australia October – December 2006, Manpower, September 2006

The current construction activity is at an unprecedented high and is expected to remain high or higher for at least five years. The cost of labour in the Territory is a significant obstacle to continued development.

There is considerable interest in construction and design resources to locate in the Territory but only if assurance of continuity can be assured.

8.1.3. Investment

In 2006/07, the Northern Territory Government will invest over \$60 million in training delivery and other programs, with an increased focus on apprenticeships and traineeships, particularly in skill shortage areas.

- **Apprenticeships and Traineeships.** The NTG provides Registered Training Organisations in the NT and interstate with funding to train apprentices and trainees.
- **Employer Incentives.** For the third consecutive year, the NTG has allocated a substantial amount of funding for employer incentives to encourage them to take on additional apprentices and trainees.
- **Apprentice/Trainee Incentives – Workwear/Workgear Bonus** This incentive aims to help apprentices and trainees with the costs they incur buying work wear, safety gear and other work related necessities such as tools, during the first year of their apprenticeship or traineeship.
- **Buildskills.** The aim of the program is to up-skill and/or re-skill existing workers of all ages in the building, construction, automotive, mining, hospitality industries and other areas of skills shortage and/or labour demand.
- **Workready.** The Workready program assists secondary school students to become work ready and make the transition from school to work. Students engage in a school based apprenticeship or traineeship as well as the Northern Territory Certificate of Education.
- **NT Occupation Shortage List and Eligible Skills Shortage Trades List.** The Northern Territory Occupational Shortage List (OSL) is produced each year and identifies occupations of a skilled, semi-skilled and un-skilled nature experiencing shortages in the NT. The Eligible Skills Shortage Trades List (ESSTL) is derived from the OSL. The ESSTL informs incentive allocation for the Skill Shortage Trades Employer Incentive Scheme and the allocation of Workwear/Workgear funding to apprentices.
- **Pre-Employment Programs.** NT Department of Employment, Education and Training (DEET) purchases specific industry training for unskilled or semi-skilled people to enable them to gain essential skills that will lead to increased opportunities to take up and successfully complete an apprenticeship/traineeship or gain skilled employment.
- **VET in Schools.** VET in Schools provides students with training that meets their needs and is in areas of NT industry economic development priority, including skill shortage areas.
- **Careers Expo.** DEET holds Careers Expo's each year in the five major regional centres.
- **Try-A-Trade.** Try-A-Trade is an annual event held in Darwin and gives school students a "hands-on" opportunity to try aspects of different trades.

This exposure to trades assists students to determine if a trade career is what they want.

- **School-Based Apprenticeships and Traineeships.** School-Based Apprenticeships and Traineeships enable students to gain a national vocational education and training qualification while they continue their school studies to gain their Northern Territory Certificate of Education.
- **Labour Demand Modelling.** The DEET works with major project proponents and industry sectors generally, to assist in determining their future labour force requirements and to provide advice as to the possibility of locally available labour.

