



# Katherine Land Use Plan 2014





Citation:

Northern Territory Planning Commission (2014) *Katherine Land Use Plan*. Darwin, Australia.

First Published 2014

Amended 2016

© Northern Territory Planning Commission

Northern Territory Planning Commission

GPO Box 1680

DARWIN NT 0801

Email: [ntpc@nt.gov.au](mailto:ntpc@nt.gov.au)

Website: [www.planningcommission.nt.gov.au](http://www.planningcommission.nt.gov.au)

## Foreword



Exciting opportunities for Katherine and the region are numerous. Whether it is growth industries such as mining, tourism or agriculture; tapping in to the local cultural activities and the arts; or partnerships with the defence facilities at nearby RAAF Tindal, Katherine will play a critical role in the development of the Northern Territory over the next decades. But to ensure these opportunities become reality there must be a plan.

The Katherine Land Use Plan is an important document that sets out the vision for Katherine and the strategic directions to guide its growth.

The new Northern Territory Planning Commission identified the need of a new Land Use Plan for Katherine very soon after its establishment. We moved quickly to review existing studies and work done by the Department of Lands, Planning & the Environment and immediately engaged with the Katherine Town Council and other key stakeholders.

In 2013, a discussion paper was distributed and exhibited during the Katherine Show to maximise community understanding of the future growth of Katherine. Forums were also conducted which provided an opportunity for a very diverse range of people and organisations to contribute their knowledge and views.

We very much appreciate the input to the preparation of this Plan from the many stakeholders and members of the Katherine community.

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

**Hon. Gary Nairn AO**

Chairman

## Executive Summary

The Katherine Land Use Plan positions the town to respond to potential growth in mining, tourism and agribusiness sectors in a way that meets the needs of the residents and protects valued environmental and productive assets.

The goal of the land use plan is a framework to manage growth and guide the interpretation of the NT Planning Scheme.

### Residential

Demand for residential land will depend on the rate of population growth and on the influence of changing demographics, particularly high migration and increasing proportion of 'lone person' households and Indigenous residents, and high rates of homelessness.

Urban residential growth will be accommodated on undeveloped land adjoining Katherine East and to a small degree on infill or redevelopment within the original town.

Rural lifestyle lots of varying sizes will be provided outside the urban area. The intensity of development depends on proximity to facilities and services, the availability of service infrastructure, the capability of the land and the amenity of established areas.

### Commercial

The existing commercial hub on Katherine Terrace comprises a diverse mix of commercial activities and is the focus of many community and business interactions in the town. However, the Katherine commercial hub is entirely within the predicted flood extent and this has restrained the redevelopment of commercial uses.

A site off the Stuart Highway in Katherine East adjacent to the Katherine Research Station has been identified for a neighbourhood centre to accommodate immediate demand for a large format supermarket and associated small retail outlets. Commercial and retail activity within the Katherine commercial hub may relocate to Katherine East over time.

The possible future heavy vehicle bypass and a southern extension of Chambers Drive with a link to Giles Street have the potential to address some aspects of the traffic management on Katherine Terrace. The incorporation of flood protection measures in building design will also assist in meeting the challenges of further development of the centre.

A site in the later stages of the Katherine East urban area has been identified to accommodate long term retail and commercial development.

### Industrial

Currently zoned but undeveloped industrial land will accommodate estimated demand, subject to engineering solutions to protect areas on the fringes of the floodplain and to provide necessary infrastructure.

Future development of an integrated transport hub adjacent to the railway will have a major role in supporting the horticulture, agriculture and mining sectors.

### Agriculture / Horticulture

A focus of the land use plan is the identification and protection of prime agricultural land resources for that use. Sites with potential to support more intense horticultural activities have been identified and will be subject to further investigation.

Potential localities for rural lifestyle lots have been identified within the context of the protection of land with capability to accommodate primary production.

## **Community Facilities**

Community facilities in Katherine are generally sufficient to meet the needs of existing residents. Future detailed planning for the Katherine East residential area will guide the siting, size and timing of future facilities.

A potential location for a future health precinct has been identified in Katherine East to accommodate a new hospital in the event future investigations establish that flood mitigation infrastructure to protect the existing facility is not feasible or economically viable.

A site is also identified in the Katherine East industrial area to accommodate continued growth of emergency services in Katherine.

## **Transport**

Chambers Drive is identified on the land use plan as a proposed road and will be progressively extended as development continues.

Possible road links, including one from the Stuart Highway to the existing hospital and another extending Chambers Drive to the south, will be influenced by and inform future investigations and land use decisions.

## **Infrastructure**

Electricity, water and sewer networks will require upgrades to cater for additional load generated by development in accordance with the land use plan.

The land use plan establishes a framework for future development to facilitate efficient, equitable, cost effective and accountable ways of successfully delivering infrastructure.

## **Environmental Management**

There are a number of environmental assets that make a significant contribution to the amenity of Katherine, including the Katherine River and its tributaries, significant vegetation communities, wildlife habitats, and features associated with the Tindall Limestone and National Parks.

Preliminary mapping of Priority Environmental Management Areas has informed planning for future land use and will provide a framework to inform future decisions in relation to specific developments.

## Contents

Foreword.....	iii
Executive Summary .....	iv
1. INTRODUCTION .....	1
1.1 Purpose .....	2
1.2 Regulatory Context .....	2
1.3 Strategic Directions.....	3
2. LAND USE STRUCTURE.....	5
2.1 Residential.....	5
2.1.1 Urban.....	8
2.1.2 Rural Lifestyle lots.....	9
2.2 Commercial.....	12
2.3 Industrial.....	13
2.4 Agriculture / Horticulture.....	14
2.5 Community Facilities.....	15
2.6 Transport .....	16
2.7 Utilities.....	16
2.8 Environmental Management .....	17
References.....	20
Appendix A – Context and Evaluation of the Planning Base .....	21

## List of Figures

Figure 1: Land Use Structure .....	6
Figure 2: Inset Land Use Structure.....	7
Figure 3: Priority Environmental Management Areas.....	19

# 1. INTRODUCTION

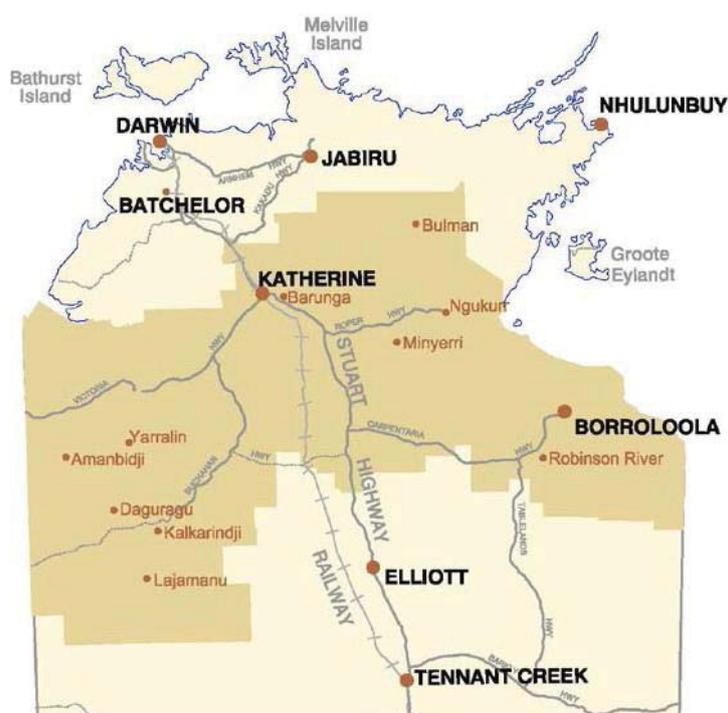
Katherine, the fourth largest settlement in the Northern Territory, is located 312 km south of Darwin on the Katherine River. The river, named 'Katherine' by explorer John McDouall Stuart when he passed through the region in 1862, has been a major influence on the growth and form of the town.

For thousands of years, the land in and around Katherine has been home to the Jawoyn, Wardaman and Dagoman Aboriginal people, many of whom continue to live in both the region and the town.

Initial European settlement in Katherine was influenced by infrastructure crossings of the river. The original township, consisting of a shanty pub and a repeater station on the Overland Telegraph Line, was established in 1872 where the line crossed the river at Knotts Crossing. The completion of the original railway bridge was the catalyst for the establishment of the town at its current location on the eastern levee of the river in 1926.

Military activity in and around the town during World War II, including the 101<sup>st</sup> Australian and 121<sup>st</sup> General Hospitals and the Australian Army Katherine Area Headquarters directly and significantly influenced the development of Katherine.

Katherine's origins are still important today. River crossings of the major transport links continue to contribute to the strategic importance of the town as a service centre for a vast region of 336 000 km<sup>2</sup> extending from the Western Australian border in the west to the Queensland border in the east. In addition to the historical role of the town in providing services to the agricultural and pastoral industries, there is an increasing focus on regional support for mining, transport and construction industries, tourism, defence, health services and Aboriginal communities.



The Defence establishment at RAAF Base Tindal, tourism associated with the river and its spectacular Gorge, primary industries including agriculture, horticulture and mining in and around Katherine have all had, and continue to have, direct and significant influences on the growth of the town.

The Land Use Structure establishes the framework for future development of land uses to accommodate projected growth and will inform and guide decisions about development.

Appendix A presents the context and the evaluation of the planning base which influenced the determination of the land use structure.

## 1.1 Purpose

The Katherine Land Use Plan has been prepared by the Northern Territory Planning Commission to establish a strategic framework for future development. The aim of the plan is to position the town to respond to opportunities for growth while improving well-being and protecting valued environmental and productive assets in the locality.

The strategic location of the town, on major transport routes linking the Northern Territory to the rest of Australia, strengthens the role of the town as a service centre for a wider region. The plan recognises the increasing importance of the role of Katherine as a regional service centre and as a significant tourist destination.

The plan is based on optimistic predictions of the potential for expansion in the mining sector in the Top End of the Northern Territory and for growth in the immediate region's tourism, agribusiness and Defence sectors.

The plan brings together views of residents and stakeholders following consultation in July 2013. Directions for the growth of Katherine have been identified within the context of constraints and opportunities and the needs of existing and future residents.

The Katherine Land Use Plan will protect the potential for growth within the context of challenges associated with the natural and economic environment and community needs and aspirations. The benefit of the plan will be its ability to inform and guide decisions about development. To enhance these benefits, the plan also includes a suite of objectives to inform and guide decisions about development.



## 1.2 Regulatory Context

The use and development of land in Katherine is regulated by the *Planning Act (NT)* and the *Northern Territory Planning Scheme*.

Part 2 of the Planning Scheme provides planning principles and associated framework drawings. The Katherine Land Use Framework Plan and principles are associated in this part.

Policies and planning concepts may be included in the Planning Scheme through documents incorporated under Schedule 2. The Katherine Land Use Plan is a policy document included under Schedule 2 of the Scheme. Principles and planning concepts are provided at Chapter 2 of the Plan as objectives and a land use structure.

Guideline can also be included in the Planning Scheme as referenced documents incorporated under Schedule 3. A map on page 19 of this Plan showing “Priority Environment Management Areas – Katherine” is included as a referenced document under Schedule 3.

Information regarding the social and economic context and key land use issues to be considered in relation to the Plan is provided at Appendix A.

Zoning maps included with the Planning Scheme identify provisions relevant to land use within each zone. As a policy document under the Scheme, the Katherine Land Use Plan will guide future amendments to land use zones to reflect policy.

### 1.3 Strategic Directions

The Katherine Land Use Plan draws on a range of Northern Territory Government strategies and plans.

A blueprint, *Framing the Future*, developed by the NT Government, supports its vision for the next 3 years, guides decision making and assists in maximising new and evolving opportunities within the Territory, Northern Australia and with Asian neighbours.

The four strategic goals of the draft of *Framing the Future* are A Prosperous Economy, A Strong Society, A Balanced Environment and A Confident Culture.

Preparation of a Katherine Land Use Plan is a specific priority of *Framing the Future*. A number of other objectives identified in the blueprint are also relevant to a policy intended to guide future development of Katherine including:

- an economy that unlocks the potential of regions and encourages new investment and growth in pastoral, resources, energy, agriculture, parks, tourism and construction sectors
- a strong society that engages and encourages participation through well-designed services focused on outcomes and improved long-term capacity of Territorians to contribute to society and the economy
- an environment supported by processes that provide opportunities for use, preservation and protection of the environment through measures that prevent and mitigate environmental impact while maximising opportunity
- a confident culture that recognises our people and our communities are significant contributors to our prosperity by creating opportunities to build supportive connections between Territorians using sport, recreation, arts and cultural events, facilities and venues.

The Katherine Land Use Plan also draws on initiatives of other Government agencies including:

- **Department of Housing** – *Real Housing for Growth* which establishes the potential for partnerships between the Territory Government and the housing industry to deliver new affordable dwellings.
- **Department of Primary Industry and Fisheries** – the lead agency in the Ord Development Project, a significant agricultural development for the region.
- **Department of Land Resource Management** – particularly its role in managing water allocation, conservation and biodiversity management, land clearing and soil management.
- **Department of Community Services** – improves the quality of life for Indigenous Territorians.

- **Tourism NT** – *Tourism Vision 2020: Northern Territory's Strategy for Growth* which provides an essential blueprint for the tourism sector, uniting the efforts of industry and Government through an agreed set of strategies, actions and a 2020 target aimed at delivering a \$2.2 billion visitor economy by 2020.
- **Australian Government Department of Defence** – the mutually supportive relationship between RAAF Base Tindal and the Katherine community, and the contributions to the local economy.

This work across Government agencies assists the Northern Territory Planning Commission in its role of preparing strategic plans and planning policies to ensure that the planning system facilitates sustainable economic growth, protects environmental, cultural and heritage assets and connects people.

## 2. LAND USE STRUCTURE

The Katherine Council area is the focus of the Katherine Land Use Structure. It has been prepared taking account of the known resources and constraints of the Council area while recognising the significant role of the town as a service centre for a vast region.

The Land Use Structure at Figure 1 and Figure 2 identifies the distribution of land uses to accommodate future growth. The associated objectives and concepts provide further detail to guide future development and the interpretation of the provision of Northern Territory Planning Scheme.

The structure for future land use is based on optimistic prospects for growth recognising the benefits of a planned response to such growth should it eventuate.

The preparation of detailed concepts and area plans for future development of specific localities will be subject to further investigations and community consultation.

### 2.1 Residential

#### Key Residential Objective

- To promote safe, convenient, sustainable and healthy living environments that meet the full range of needs and preferences of a diverse community.

The volatility of predictions for growth common to small communities combined with changing characteristics of the Katherine population make quantifying demand for residential land required to accommodate growth complicated. Characteristics with potential to significantly influence demand include:

- high levels of local migration suggesting interest in rural lifestyle lots
- increases in 'lone person' households and corresponding decreases in 'couple family with children' households
- likely continuing increases in the proportion of Indigenous residents
- high rates of homelessness.

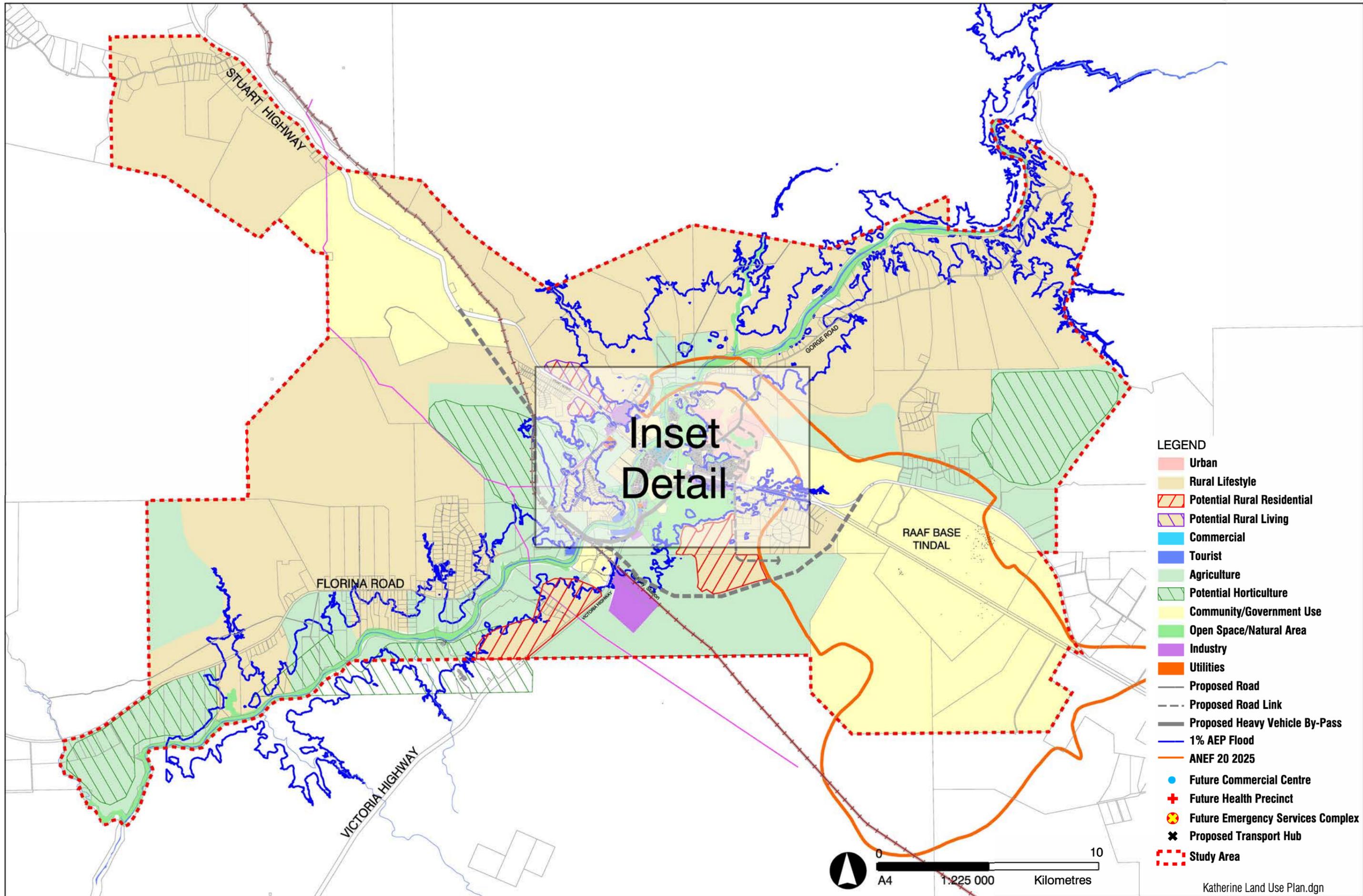
The adopted scenario for growth estimates that Katherine's population will grow to a total of 12 437 by 2026, an increase of 2470 above the 2011 population of 9967.

A breakdown of these forecasts across the various residential sectors shows that to accommodate growth through to 2026 will require an estimated 81ha of land for urban residential purposes and an additional 180ha for land for rural lifestyle lots (rural, rural living and rural residential).

This indicative demand for residential land is based on a number of assumptions, including:

- the demand for residential land will match population growth
- the current mix of housing types will continue and be reflected in demand
- the existing 3127 dwellings in Katherine in 2011 reflect the amount of land in Katherine
- the existing distribution of land within the various zones will continue.

These assumptions do not take account of existing vacant lots or changing characteristics of the population which are likely to increase demand for a range of more intense residential accommodation. Within that context, the identified need for 81ha of urban residential land has the potential to accommodate residential development well beyond 2026.





Should future development establish the validity of information suggesting an increasing demand for smaller rural lifestyle lots, the identified need for an additional 180ha of land for rural lifestyle lots also has the potential to accommodate demand well beyond 2026.

The Land Use Plan also considers the availability of additional land to accommodate higher growth in the event accelerated growth occurs in the region.

## 2.1.1 Urban

### Key Urban Residential Objectives

- To enhance the economic viability of infrastructure connections by locating future urban residential development in close proximity to established areas.
- To minimise the impacts of aircraft noise by locating urban residential development outside the 20 ANEF noise exposure contour associated with the RAAF Base Tindal.
- To prioritise residential areas for development in a manner that ensures ongoing supply of lots to meet market needs.
- To encourage a diverse range of dwelling types and sizes through appropriate subdivision design (including varying lot sizes) to cater for changing demographics (including increased single person households and an aging population) and to increase affordability and short-term accommodation.
- To increase dwelling densities in close proximity to the central business district and other community services.

The demand for urban residential land can be satisfied using undeveloped land in areas adjoining the existing Katherine East residential area. Benefits of development in this locality include:

- continuation of the existing urban form
- proximity to existing infrastructure, including water, sewerage, power, local road network and open space
- the availability of Crown land.

Of the 320ha of Crown land available with development potential subject to detailed land capability assessment, approximately 100ha are within Zone FD (Future Development). Native title has been acquired for residential subdivision purposes over 52ha of this land. Potential yield from this land is some 400 lots which will accommodate an additional 1400 residents. Identification of additional land required to accommodate future growth will inform ongoing negotiations with the Northern Land Council in relation to the native title claim over the remainder of the Crown land.

In addition to the Crown land, 27ha of the freehold land currently occupied by the Katherine Research Station are surplus to requirements and can be made available for future development. Development of this land has potential to provide an additional 240 lots and accommodate an additional 700 people.

A further 155ha of private freehold land adjoining the Crown land also has potential for future urban residential development.

The land within Zone FD (Future Development) provides for the initial expansion of residential areas. Rezoning of additional vacant Crown land, land within the Katherine Research Station and privately owned land further to the north will be required to accommodate growth in the longer term. Future rezoning will consider the need for provision of appropriately located sites for multiple dwellings and medium density development particularly in association with activity centres including the existing central business area and the potential future hospital and commercial area in Katherine East.

More detailed area plans, prepared in consultation with the community, will guide the location, form and timing of future development beyond areas where native title interests have been acquired.

A priority in the identification of appropriate land to meet future demand for urban housing is consideration of the 1% AEP flood level. However, appropriate redevelopment of existing lots in Katherine which are at risk of flooding also provide an opportunity for increasing housing supply. While the construction cost of infill or redevelopment in established areas is likely to be higher because of required design and siting measures to address the risk of flooding, the option may appeal to some because of the availability of cheaper land and the local amenity of established areas. Although significant infill or redevelopment is likely to be constrained by the capacity of existing infrastructure, some development has the potential to optimise the use of existing infrastructure.

While the identification of sites for future residential development will assist in increasing opportunities for the market to respond to population growth and associated housing specific proposals for the provision of affordable housing or temporary accommodation are beyond the scope of a land use plan. The concept of a visitor park similar to the Apmere Mwerre Visitor Park in Alice Springs is being considered to meet the need for short term accommodation. Such a facility has the potential to provide secure, low cost accommodation in a range of formats for people visiting Katherine to access sporting or cultural events, shopping, medical or other services or to avoid climate hazards associated with the wet season. A visitor park may also be of benefit to health and education providers in the delivery of key services.

Factors that will be considered in identifying an appropriate location for such a facility include:

- access to transport
- proximity to recreation facilities (e.g. sports fields, show grounds)
- connections to water and waste disposal
- public health and safety
- protection from natural hazards, including floods and bushfires.

## 2.1.2 Rural Lifestyle lots

### Objectives in identification of opportunities for Rural Lifestyle Lots

- To preserve land with high and medium capability for agriculture for those activities within the context of competing rural living and rural residential use.
- To preserve and enhance the natural resources, biodiversity and heritage values of a locality.

### Key Rural Lifestyle Objectives

- To maintain or enhance the amenity of established localities.
- To minimise potential risks from natural hazards including flooding and sink holes.
- To require detailed land capability assessment of the site to accommodate the intended future uses and to identify infrastructure required to minimise any potential detrimental impacts on natural resources, particularly groundwater.

The consistent uptake in recent years of 2ha rural living lots suggests ongoing demand for such lots while the historic trends suggests there is likely to be continued demand for 8 ha rural lots. Anecdotal evidence indicates an emerging demand for smaller rural residential lots with a minimum area of 4000m<sup>2</sup>.

The land use plan responds to interest in rural lifestyle lots identifying locations with the potential to provide a variety of lot sizes and establishes principles which will guide future consideration of proposals to zone land to facilitate development.

Given that rural lifestyle lots are usually provided by development of private freehold land, future development will depend on the response of individual developers to the changing market.

There is a distinction between the purposes of each of the rural lifestyle zones which influences the appropriate location for such development.

At one end of the spectrum rural residential lots provide for residential use outside the urban area with an emphasis on the protection of residential amenity. At the other end of the spectrum larger rural lots provide for a range of activities with the larger lots intended to facilitate the separation between potentially incompatible land uses. In between these two extremes of rural lifestyle lots are the 2 ha rural living lots which also provide for a range of rural land uses including rural living and agriculture and horticulture subject to consideration of the impacts of potential activities on rural living amenity.

Although established rural and rural living areas are considered by some to provide opportunities for further subdivision, experience suggests existing residents in these areas are often passionate about the amenity they associate with the particular lot size in their locality. There may be potential for further subdivision in established areas in situations where a number of land owners are desirous of such development, appropriate integrated local road networks and necessary infrastructure can be provided, and the expectations of future residents in relation to the amenity can be managed.

### Rural Residential

While there may be issues with further subdivision of existing lots in established areas, smaller rural residential lots have the potential to satisfy the aspiration of some seeking a rural lifestyle. The relatively small size of rural residential lots requires connection to reticulated water and power and the intensity of development and associated population suggests proximity to services and facilities available in the urban areas is desirable.

Sites adjacent to the Stuart Estate immediately to the north of Katherine and land on the opposite side of the Stuart Highway (some of which is currently included in Zone RL (Rural Living)) have potential for future development for rural residential purposes, subject to detailed land capability assessment and provision of reticulated water. The extension of reticulated water supplies to serve rural residential development in either of these localities would contribute to establishing the economic viability of services to support other development to the west of Katherine River, particularly the Emungalan Road industrial area.

Land on the southern side of the Stuart Highway has low capability for agriculture and although the land on the northern side of the highway has moderate and high capability, the area is limited and the proximity to existing rural living development may impose limitations on potential future agricultural or horticultural activities.

In the event of faster population growth or changing preferences create an additional demand for rural residential development, alternate sites could be considered within the context of proximity to urban services, availability of the necessary infrastructure, land capability and the protection of the amenity of established rural and rural living areas.

## Rural Living

Notwithstanding that rural living areas are intended to provide for rural living and a range of rural activities, care in the location of these areas is needed to avoid the creation of constraints on the use of land with high or medium capability for horticulture or agriculture. A balance is needed between the protection of the economic viability of primary production and interest in rural living lots.

The utilisation of onsite water supply and waste disposal on rural living lots requires consideration of the availability of an appropriate potable water supply and the risk of pollution of groundwater resources. These considerations are particularly important in the Katherine region where increases in unregulated stock and domestic use of groundwater may have implications for the quantity of groundwater available to existing and potential future users and the pollution risks associated with sink holes and direct pathways may have implications for water quality.

Existing unsubdivided land with Zone RL (Rural Living) north of the Emungalan industrial area provides the opportunity for subdivision to meet demand in the short to medium term. To meet demand in the medium to long term there is potential for future extension of this rural living area. Other potential sites include land to the south of Uralla Road and on the northern side of the Victoria Highway to the west of the railway.

Although these areas all require detailed evaluation of land capability and, in the case of the Uralla Road site, consideration of the potential for groundwater flooding, they all have potential for future development to meet demand for rural living lots. In the event of additional future demand, alternate localities can be considered within the context of land capability with a particular focus on the protection of agricultural or horticultural productivity and minimising potential land use conflicts.

## Rural

Historic trends suggest there is likely to be ongoing demand for larger rural lots where the size provides a degree of freedom from impacts on or from activities on adjoining lots.

There are substantial areas within Zone R (Rural) which are undeveloped and have the potential to meet future demand. In identifying appropriate locations for future rural lot subdivision it is important that prime agricultural land resources are protected in the interests of the ongoing contribution of primary industry to the economy of Katherine.

While land with low capability for agriculture in relative proximity to facilities and services in the urban area have potential for more intense rural living and/or rural residential development there is land along Florina Road to the west of Cossack Road which could accommodate future rural subdivision without detrimentally impacting on existing or future agricultural uses.

## 2.2 Commercial

### Key Commercial Objectives

- To maintain the existing business centre on Katherine Terrace to enhance its role in fostering community cohesion.
- To incorporate flood mitigation design features into future development within the existing centre to minimize the impacts of flooding.
- To incorporate a neighbourhood centre in Katherine East to meet the current demand for a supermarket.
- To provide small scale convenience facilities within the Katherine East urban area to meet the convenience needs of local residents.
- To incorporate a site in Katherine East to provide for a second commercial centre in the long term.
- To encourage good design in buildings and adjacent public / private spaces to maximise strong and vibrant public realm outcomes.

The current retail and commercial hub of Katherine, located between Katherine Terrace and Fourth Street, includes a diverse mix of commercial activities including a supermarket, discount department store, cafes, offices, petrol stations and hotels. The range of uses within the centre means it is the focus of many community and business interactions.

Vacant and underdeveloped lots within the existing centre provide opportunities for infill development which will assist in maintaining its role as the cultural and commercial hub of the town and contribute to enhancing a vibrant public realm. The possible alternate heavy vehicle route and a southern extension of Chambers Drive with a link to Giles Street have the potential to address some aspects of the traffic management on Katherine Terrace. Such a link provides an alternate to Katherine Terrace for local residents travelling from south to north or east and vice versa and will provide access to land in the Railway Terrace locality to accommodate a multifunction facility providing for passenger transport activities and the short term parking of caravans. The incorporation of flood protection measures in building design within the existing town centre will also assist in meeting the challenges of further development of the centre.

However, the centre is situated wholly within the predicted flood extent, which presents challenges to redevelopment of land, particularly in relation to engineering solutions and the affordability of flood proofing and insurance premiums.

The location of sites for a neighbourhood centre and a second commercial centre in Katherine East provide options for commercial development to service the needs of the town, without increasing exposure to flood, and builds community resilience to the natural hazard through the capacity to provide essential supplies during and after a flood event.

The Land Use Structure identifies a site on Chambers Drive in the extension of Katherine East for a second commercial centre in the long term. The Chambers Drive site will be readily accessible to all residents and to the many tourists visiting Katherine Gorge, will minimise the impacts of additional local traffic on the Stuart Highway and create potential synergies with the future health precinct. This site, however, will likely not be required until a time in the future when the surrounding residential development and future hospital precinct begin to develop.

An analysis of retail and commercial needs in 2015 identified an existing undersupply of retail and commercial floor space of some 5000 square metres to accommodate a large format supermarket and small specialty retail. Therefore a site off the Stuart Highway in Katherine East adjacent to the Katherine Research Station is also identified in the Land Use Structure for a neighbourhood centre that can accommodate a supermarket and specialty retail in the short

term, whilst providing a flood resilient commercial location that will ensure supplies are available to residents during a flood event.



## 2.3 Industrial

### Key Industrial Objectives

- To provide appropriately serviced industrial land in a timely, efficient and equitable manner.
- To encourage a range of lots sizes to meet the differing needs of the transport and mining services sector and industries serving the needs of local residents.
- To protect industrial zones and uses from encroachment by adjoining uses with potential to limit industrial development or expansion.
- To locate industrial uses that will generate significant traffic, such as transport depots, on appropriately located land integrated with transport networks.
- To design industrial development to avoid adverse effects on the health and amenity of occupiers of land in adjoining zones.
- To limit the development of non-industrial uses within industrial zones.

Based on population projections and key drivers for growth, particularly the transport and warehousing sector and mining services, a further 22ha of industrial land will be required to meet demand for industrial land up to 2026.

Development of even some of the currently undeveloped land within existing industrial zones has the potential to accommodate this estimated demand. Resubdivision of the existing unused grain facility on Chardon Street at Katherine East has the potential to meet demand in the short term. In the longer term there is potential for private development of land between the existing industrial area and Bicentennial Road to provide opportunities for further industrial use subject to investigations into the engineering solutions required to protect this area on the fringes of the floodplain from the risk of flooding.



The strategic location of the Emungalan Industrial area in relation to interstate transport routes and the availability of substantial areas suitable for large scale development make it an ideal location for further development of transport and agribusiness activities. Provision of reticulated water will be required to support further development in this locality. This land use plan, which articulates the potential for future development in this locality of a range of land uses, will inform further investigations into the required infrastructure and potential cost sharing arrangements.

The land adjacent to the passenger terminal and freight depot on the Adelaide to Darwin Railway will provide a supply of flood free and strategically located industrial land. Development of an integrated transport hub incorporating a range of lots sizes adjacent to the railway will have a major role in supporting the growth and competitiveness of the wider region's horticulture and agriculture sectors, as well as the mining sector. Finalisation of tenure negotiations will enable investigation of infrastructure requirements and ultimately development of this significant site.

## 2.4 Agriculture / Horticulture

### Key Agriculture/Horticulture Objectives

- To protect land with high capability for agriculture and horticulture included within Zone A (Agriculture) or Zone H (Horticulture) by limiting further subdivision unless detailed and site specific land capability assessment establishes the economic viability of proposed development on smaller lots.
- To protect agricultural and horticultural activities from encroachment of sensitive use including rural lifestyle lots.

It is important that prime agricultural land resources are protected for their intended purposes and that rural lots are sited to support this objective. The stated intention of the Zone A (Agriculture) in the NT Planning Scheme is that the land should be used for agriculture purposes across different sized lots, depending on the capability of the land for viable agricultural activities. In some instances agriculture will be viable because of the economies of scale across large expanses of land, while in other situations viability will be associated with high land capability and resultant high production output. Importantly, potential areas for rural lots should not involve land that has high or medium agricultural capability or impact on adjacent land that does have higher capability.

The NT Planning Scheme does not establish minimum lot sizes for land within Zone A (Agriculture) instead establishing that lots sizes are dependent on the capability of the land for commercially viable agriculture. In the Katherine region 150ha is generally considered to be required to support a viable business unit. Smaller lots may be economically viable in localities characterised by high land capability for agriculture.

Based on land capability and access to water, existing infrastructure and distance from sensitive uses, four areas have been identified as having potential for inclusion within Zone H (Horticulture) the purpose of which is to accommodate more intense horticulture. Collectively these areas span approximately 8400ha.

Further site investigations will be necessary to refine the boundaries of these areas and identify appropriate buffers and/or setbacks to provide protection for adjoining land uses.

Further investigations will also be required to establish appropriate lot sizes to sustain economically viable horticulture in the Katherine region. The NT Planning Scheme establishes a minimum lot size of 25ha (all unconstrained) for land within Zone H (Horticulture) but initial investigations in relation to horticulture in the Katherine region suggest a minimum size of 40ha may be required to establish a viable small business. Lots of this size would also provide cost effective assembly of allotments into larger holdings should an enterprise require multiple adjacent or sub-adjacent sites.

## 2.5 Community Facilities

### Key Community Facilities Objectives

- To maintain a high standard of community service provision by identifying sites for:
  - a health precinct on Chambers Drive in Katherine East
  - an emergency service complex adjacent to the Katherine East industrial area
  - additional schools, child care centres and other community facilities as part of more detailed planning for expansion of the Katherine East Residential area.

The majority of the existing community facilities in Katherine are sufficient to meet the immediate needs of residents of both the town and the broader region although there are constraints associated with the location of some of these facilities within the 1% AEP flood level and/or limitations on future expansion.

A site is identified for a future health precinct on Chambers Drive within the Katherine East urban area and a site for a complex to accommodate a range of emergency services is identified within the Katherine East industrial area.

Detailed area plans for the future expansion of Katherine East urban area will guide the siting, size and timing of the future health precinct and additional facilities, including schools, to serve the increased local population. This detailed planning will involve consultation with Defence to address any potential conflicts between military aircraft and emergency medical flights.

## 2.6 Transport

### Key Transport Objectives

- To minimise the impacts of heavy vehicles on the urban areas particularly the town centre.
- To improve facilities for tourist coach operators and public transport.
- To enhance the integration of road and rail transport through development of a transport hub.
- To provide a safe and convenient pedestrian and cycle network within future urban areas.

Details of an efficient transport network to serve future development in and around Katherine will depend on the impacts of the proposed heavy vehicle bypass on existing networks.

Bicentennial Road and a link to a new bridge adjacent to the existing rail bridge across the Katherine River are identified as components of a future heavy vehicle bypass around Katherine. The alignment from the bridge to the Stuart Highway to the north will be subject to further evaluation of the route. A possible long term extension to the bypass connecting the Stuart Highway immediately to the west of RAAF Base Tindal is also identified.

Construction of the extension of Chambers Drive through to Gorge Road will depend on the identification of funds. The economic viability of this important link will be enhanced by the construction of sections of the road in association with the expansion of the urban residential area on vacant Crown land and development of rural lifestyle lots on private freehold land.

A number of other identified potential road links will depend to some extent on the outcome of future investigations or land use decisions. For example if flood mitigation investigations suggest it is possible to address the risk of flooding at the existing hospital, a flood free link will be required from the Katherine East residential area and areas to the east of Katherine to the hospital. Another possible link is the southern extension of Chambers Drive to the Victoria Highway. The need for this link will depend to some extent on the outcome of current investigations into local traffic and pedestrian management issues on Katherine Terrace and the future need for public transport facilities.

## 2.7 Utilities

### Key Objectives in relation to utilities

- To provide adequate and efficient utilities to serve future growth.
- To develop appropriate mechanisms to ensure equitable contributions from developers to the cost of necessary augmentation and extension of utilities.

Development in accordance with the land use plan will require upgrading of utility networks.

Upgrading of the existing 22kv electricity network will be required to increase capacity of supply and meet supply reliability criteria. Augmentation work is likely to be required at the Katherine Zone Substation and further development at Katherine East and in rural areas will require a Switching or Zone Substation and transmission system line extensions. Work on the design work for necessary upgrades of infrastructure will depend on capital contributions from proponents/developers in accordance with Capital Contribution policies.

Water and sewer infrastructure will also require major network upgrades to cater for the additional load generated by development in accordance with the land use plan. In addition to upgrades to trunk services, distances from available storage or pump stations may also require substantial upgrades to these components of the network.

The *Planning Act (NT)* includes provisions which establish a framework for service authorities (including the Government, local government and Power and Water) to prepare plans requiring contributions towards the provision of infrastructure. At present the *Katherine Municipality Developer Contribution Plan* prepared by the Katherine Town Council requires developer contributions for local roads and stormwater drainage.

The land use plan will establish a framework to inform efficient, equitable, cost effective and accountable ways of successfully delivering infrastructure and assist in establishing the economic viability of individual developments.

## 2.8 Environmental Management

### Key Environmental Management Objective

- To protect the conservation, heritage and landscape values of the Katherine Region and to minimise the impacts of future land use on these values.

Environmental management in and around Katherine is important for a number of reasons, including the protection of land and water resources, the conservation of significant vegetation communities and wildlife habitats, and the maintenance of amenity.

In addition to ecological communities considered to be threatened and requiring management and preservation to maintain population structure and function, other areas of high environmental value include the Katherine River and tributaries, National Parks and other sites of Conservation Significance. These areas must be considered in determining future distribution of land uses to accommodate growth to ensure development occurs in locations and in a manner that minimises potential impacts on these values.

Environmental features requiring particular consideration in Katherine include:

- general vegetation communities identified as significant, including riparian, wetland, rainforest and specific habitat of threatened species such as the Gouldian Finch
- mapped rainforest patches
- threatened plant and animal species
- existing known sinkholes and other features within the Tindall Limestone, including caves, towers, springs, pavements and canyons
- National Parks and Reserves
- drainage lines.

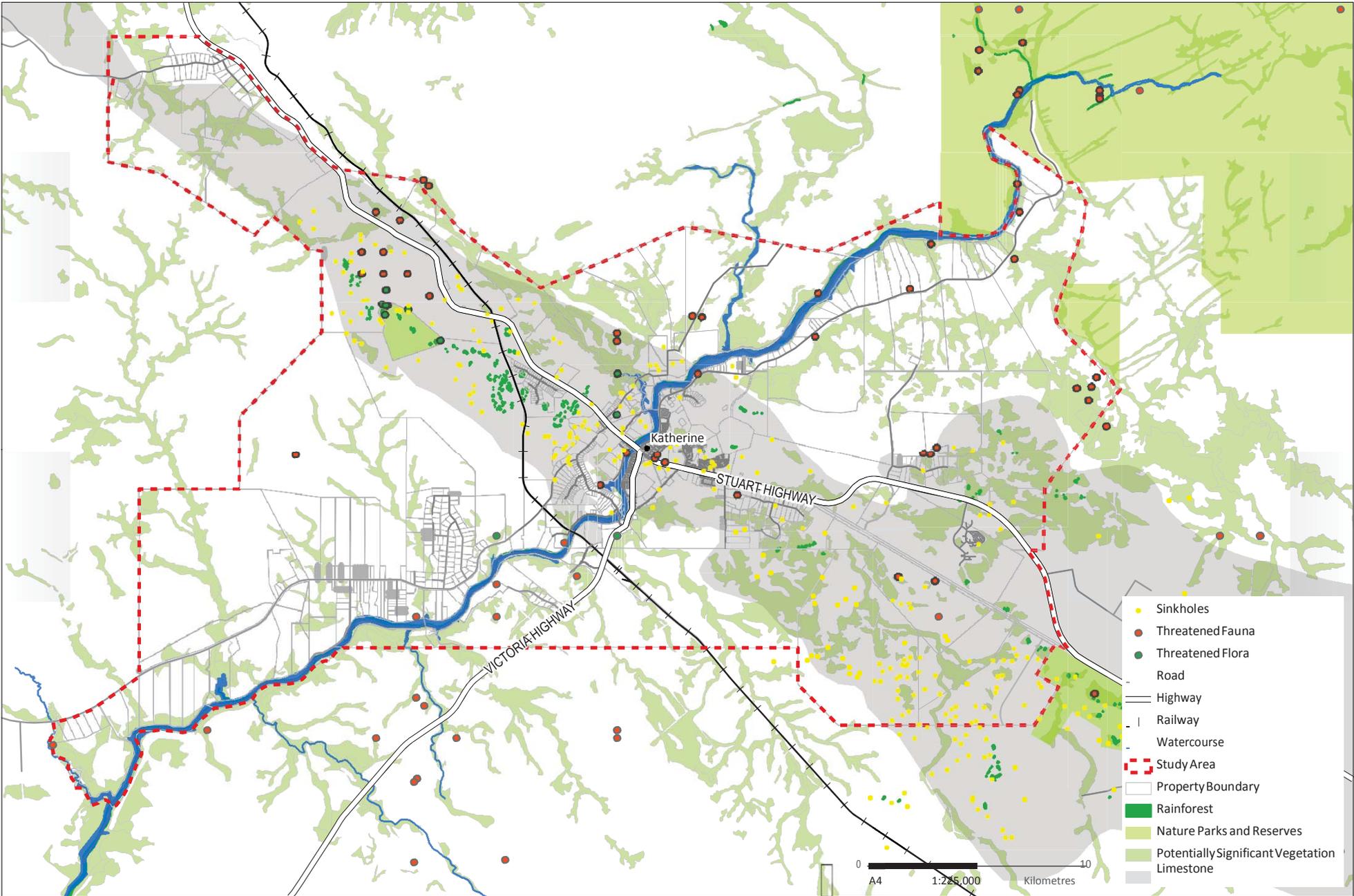


Preliminary mapping of these features informed the planning for future land use in Katherine and establishes a framework to inform future decisions in relation to proposed development. Requirements for future applications to include a detailed evaluation of the environmental significance of priority environmental areas will minimise the potential for subdivision and subsequent use of land to adversely impact on environmental values identified in the evaluation.

Figure 3 identifies Priority Environmental Management Areas which will provide for:

- protection of land and water resources
- conservation of significant vegetation communities and wildlife habitats
- maintenance of amenity
- maintenance of access and usage for recreation and tourism.

Figure 3: Priority Environmental Management Areas



## References

Department of the Chief Minister 2014, *Framing the Future*, NT Government, Darwin.

Department for Housing 2013, *Real Housing for Growth*, NT Government, Darwin.

Katherine Town Council 2010, *Katherine Municipality Developer Contribution Plan*, Katherine Town Council, Katherine.

Northern Territory 2007, *Northern Territory Planning Scheme*, NT Government, Darwin.

MacroPlan Dimasi 2015, *Katherine Town Centre, Retail and Commercial Analysis*, MacroPlan Dimasi, Brisbane.

Department of Lands, Planning and the Environment 2015, *Katherine Region Flood Mitigation Advisory Committee Report*, NT Government, Darwin.

Tourism NT 2013, *Tourism Vision 2020: Northern Territory's Strategy for Growth*, NT Government, Darwin.

# Appendix A – Context and Evaluation of the Planning Base



# Contents

1. OVERVIEW .....	1
1.1 Population and Demographics.....	1
1.2 Economic Profile.....	2
1.3 Existing Land Use.....	3
2. GROWTH PROSPECTS .....	5
2.1 Key Drivers for Growth / Land Use Change .....	5
2.2 Population Projections.....	6
3. LAND USE PLANNING ISSUES.....	7
3.1 Land Resources.....	7
3.2 Water Resources .....	10
3.3 Natural Hazards.....	13
3.3.1 Flooding.....	13
3.3.2 Sink Holes.....	17
3.4 Ecological Values .....	17
3.5 Cultural Heritage and Tourism.....	19
3.5.1 Indigenous Cultural Heritage Values.....	19
3.5.2 Heritage Values.....	19
3.5.3 Tourism .....	19
3.6 Infrastructure .....	20
3.6.1 Transport.....	20
3.6.2 Utilities .....	24
3.6.3 Waste Management .....	29
3.6.4 Communications.....	29
3.7 Land Tenure.....	29
3.8 Land Uses .....	30
3.8.1 Housing.....	30
3.8.2 Commercial.....	33
3.8.3 Industrial .....	35
3.8.4 Agriculture and Horticulture .....	36
3.8.5 Community Facilities .....	37
4. REFERENCES .....	39

## List of Figures

Figure 1: Katherine (Town) Estimate Resident Population 2001-2012 .....	1
Figure 2: Katherine Employment Profile 2011.....	2
Figure 3: Future Growth of Katherine .....	6
Figure 4: Land Capability for Agriculture/Horticulture.....	8
Figure 5: Soil Drainage.....	9
Figure 6: Water Aquifers - Tindall, Oolloo and Jinduckin.....	11
Figure 7: Flooding 1% AEP Extent .....	14
Figure 8: Inset Flooding 1% AEP Extent.....	15
Figure 9: Transport Networks and Connectivity .....	22
Figure 10: Aircraft Noise Contours Surrounding RAAF Base Tindal.....	23
Figure 11: Electricity Networks .....	26
Figure 12: Water Networks.....	27
Figure 13: Sewer Network.....	28
Figure 14: Land Subject to Native Title Claim .....	31

## List of Tables

Table 1: Water Allocation and Utilisation – Tindall Aquifer 2012-2013.....	12
Table 2: Water Allocation and Utilisation – Oolloo Aquifer 2012-2013 .....	12

# 1. OVERVIEW

The town of Katherine is strategically located to benefit from economic development across a vast region. Expansion of mining and growth in tourism, agribusiness and defence all have potential to enhance the role of Katherine as a regional service centre and support future growth within the town.

This overview summarises those elements of the natural, built and socio-economic environment that influence the land use structure that establishes a framework for growth.

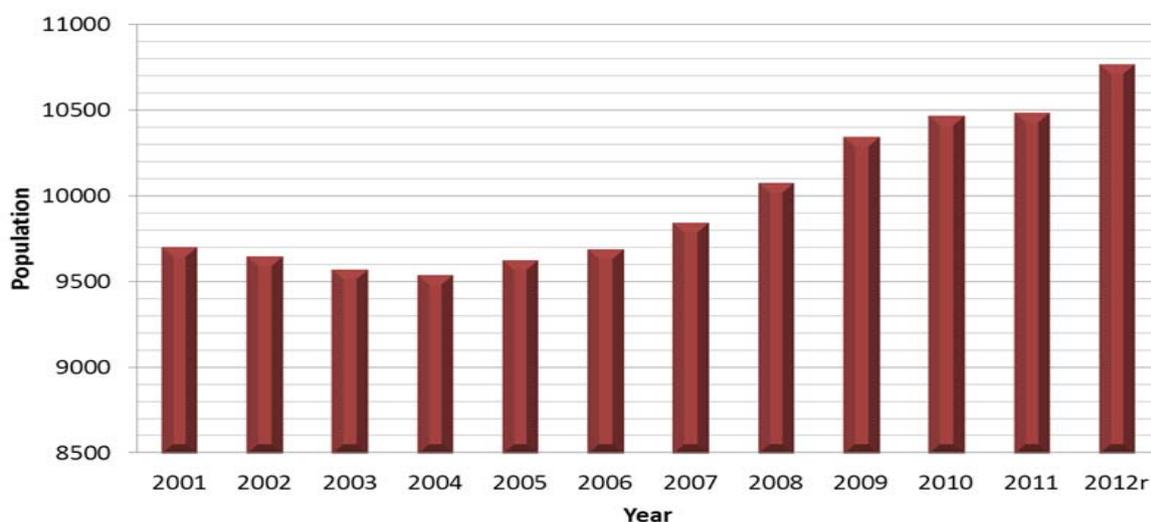
## 1.1 Population and Demographics

The Australian Bureau of Statistics (2013) estimated the population of the Katherine Local Government Area in 2012 to be 10 766<sup>1</sup>. The estimated resident population from 2001 to 2012 is shown at Figure 1. The role of Katherine as a tourist destination and a service centre for the wider Katherine region is reflected in the extra 1501 temporary residents in the town on census night in 2011.

Key characteristics of the Katherine population include:

- a relatively young population (median age of 31 - similar to the NT but low compared to the Australian average of 37 years)
- a high and increasing proportion of Indigenous people (23% in 2001 to 26% in 2011 - likely due to ongoing inward migration of Indigenous people from surrounding areas).

**Figure 1: Katherine (Town) Estimate Resident Population 2001-2012**



Source: ABS 2013

Demographic data from 2011 indicates high levels of mobility within the town and from interstate. Approximately 17% of the population had moved residences but remained in Katherine since 2006 and almost a quarter of the population moved from interstate. The mobility within the town may reflect changing preferences such as a move to rural living properties and the interstate migration is likely due to Defence personnel posted to RAAF Base Tindal and an increase in non-Defence jobs in the town.

<sup>1</sup> Estimated resident populations are official estimates of the Australian population which the ABS publishes annually. The estimates are based on census counts by place of usual residence (excluding short-term overseas visitors in Australia) with an allowance for net census undercount, to which the number of Australian residents estimated to have been temporarily overseas at the time of the census are added. Estimated resident population is therefore different to the census population figures.

Characteristics of household structure in Katherine are changing. ‘Couple family with children’ households decreased from 43% in 2001 to 34% in 2011, while ‘lone person’ households increased from 18% to 23%. Despite these changes there has not been an increase in units or semi-detached dwellings, rather an increase in separate houses from 61% of the total to 74% in 2011. The transient nature of the population and difficulties in accessing affordable housing or short term accommodation are likely contributors to the high proportion of ‘caravan, cabin or houseboat’ dwellings and of people ‘sleeping out’.

The high proportion of persons employed in the public administration and safety sector, which includes Defence, have a distorting influence on ABS statistics in relation to household income and median home loan repayments and rents.

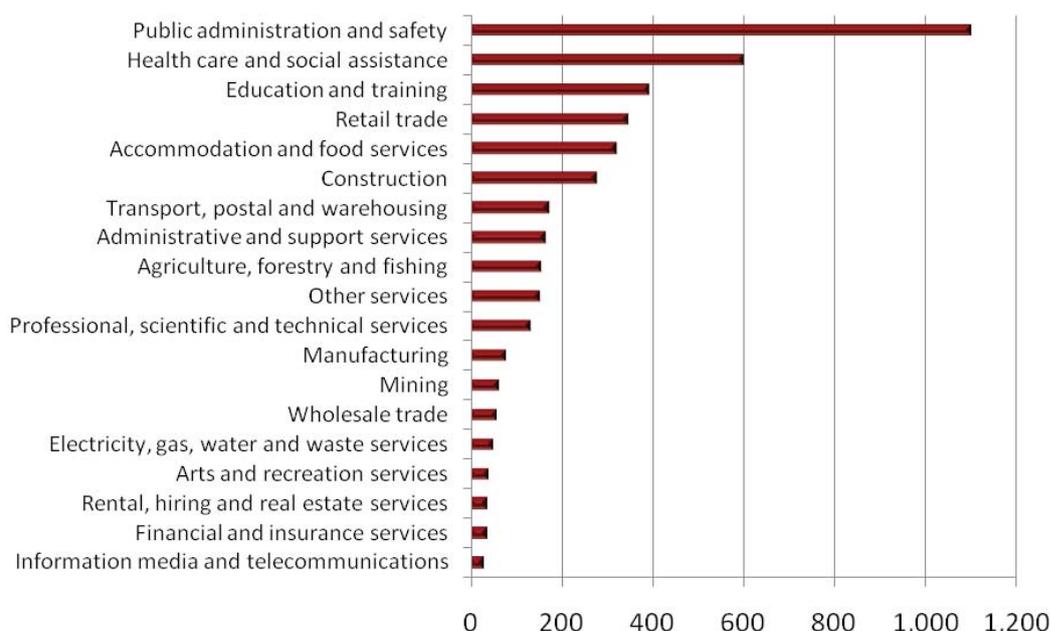
Median household income is higher in Katherine than in the NT despite a higher proportion of households earning less than \$600 per week compared with the rest of the NT. Median home repayments and rents in Katherine are lower than the NT. Financial assistance provided to Defence personnel to privately rent or purchase a home is possibly undervaluing the median mortgage and rental repayments.

## 1.2 Economic Profile

In 2011 (the latest available data) around a quarter of the people employed in Katherine were employed in the public administration and safety sector, including public administration (458 people) and Defence (522 people).

The health/social assistance and education/training sectors also employed a significant number of people and grew by 30% between 2006 and 2011. Retail, construction and accommodation/food services collectively employed 22% of Katherine’s workforce in 2011 and along with agriculture, forestry and fishing experienced growth (ABS 2011). The employment profile is shown in Figure 2.

**Figure 2: Katherine Employment Profile 2011**



Source: ABS 2011

Katherine, as a regional service centre for the wider region, is directly affected by economic development in the region with indirect employment in the town associated with the provision of support services. Not surprisingly, as the major service centre in the region, Katherine has a large proportion (67%) of the region's total workforce.

Katherine contributes approximately half (\$688m in 2011) of the Katherine region's economic output to the Northern Territory Gross State Product. Katherine's economy grew by 17% between 2006 and 2011, from \$576 million to \$688 million. In comparison, the Northern Territory economy grew by 20% over the same period from \$15 079 million to \$18 086 million (DRD 2013).

Growth patterns in economic sectors in Katherine are generally consistent with the region and Territory as a whole. Significant growth sectors, in terms of their economic contribution to Gross Regional Product, include agriculture, forestry and fisheries, manufacturing and other services. Sectors that have declined in value include administration and support services, and public administration.

A review of current trends and possible major developments has identified that the key sectors likely to positively impact on the town's growth include mining and resources, Defence, tourism, agriculture, horticulture, transport and infrastructure.

### 1.3 Existing Land Use

The land use pattern in Katherine is significantly influenced by the site of the original town on the elongated levee of the Katherine River and the constraints to expansion associated with the river to the west and the flood channel to the east. The late 1970s saw the establishment of both residential and industrial uses north and south of the Stuart Highway to the east of the flood channel.

The early business centre was located along Katherine Terrace/Stuart Highway. Increasing local population and a reduction in reliance on passing trade saw business development expand onto the streets north of Katherine Terrace.



Prior to the establishment of industry at Katherine East, the Victoria Highway and the Emungalan locality to the north of the river were the foci of industrial development.

Urban residential areas are generally low density with some pockets of medium density development. Rural lifestyle lots are dispersed in various locations around the urban areas, particularly along Florina Road, Zimin Drive and Edith Farms Road. More recent rural lifestyle development has been at Stuart Estate to the north of the river and to the east of Uralla Road and Quarry Road to the south of the river. A number of developments catering specifically for Indigenous residents are located on the fringe of the urban area and within rural areas.

The importance of tourism to the economy is reflected in the significant number of tourist accommodation facilities located on the highways and Gorge Road, in the town centre and in association with attractors including Springvale Homestead and Nitmiluk National Park.



While the floodway between the original town and Katherine East is a constraint to expansion of the urban area, it creates opportunities for formal and informal sport and recreation facilities proximate to residential areas.

Katherine provides a range of education, community and health services to residents of the town, the broader region and to visitors.

Schools are generally located within residential neighbourhoods. The Katherine Town Centre Campus of Charles Darwin University is located on Second Street and the Katherine Rural Campus is to the north of town on the Stuart Highway.

The Katherine Hospital is located to the north of town. The Wurli-Wurlinjang Health Service is an Aboriginal Community Controlled Health organisation which provides holistic services to Indigenous clients and is located on Third Street.

## 2. GROWTH PROSPECTS

Predictions of demographic trends in small communities are inherently erratic and volatile, particularly when the potential for growth is linked to a range of opportunities in an associated region.

The degree to which predictions coincide with actual future growth depends, to an extent, on the validity of the assumptions on which the predictions are based.

Documentation of the assumptions that underpin the forecasts of future growth of Katherine provides a starting point for future revision should circumstances change.

Basing forecasts on an optimistic view in relation to assumptions allows prudent planning for high growth, while establishing an appropriate framework to respond to actual growth in the short to medium term.

### 2.1 Key Drivers for Growth / Land Use Change

Demographic and economic factors likely to influence the future growth of Katherine include:

- Expansion of mining and resource development that has the potential to foster ongoing growth of the town as a service centre and as a 'dormitory' or residential base for the workforce associated with mining operations in the immediate locality.
- Although the introduction of the Joint Strike Fighter to replace the F/A 18 Fighter Aircraft is unlikely to have any significant impact on personnel stationed at RAAF Base Tindal, the construction of new base facilities towards the end of this decade is likely to provide a short term boost to the economy.
- Continued development of horticulture and agriculture in the immediate Katherine locality and throughout the wider region will have a strong economic impacts on the town as well as support regional industries associated with the strategic location of the town in relation to key freight routes and transport services including rail, road and air.
- Tourism is also likely to continue to provide potential for economic growth.

These economic drivers will influence the land required to meet the future needs of Katherine's residents, visitors, businesses and industry.

Recent demographic information suggests outward migration is being offset by increased migration to the town from surrounding regions. This is resulting in an increased proportion of the population being Indigenous and a boost to the youth population. This trend is likely to continue and projections suggest the Indigenous proportion of the population may increase by around 2% or more over the period 2010 – 2025, depending on rate of ongoing Indigenous migration from the surrounding region.

Continued growth in the town's Indigenous and youth population will lead to an increased demand for community services particularly in health and education.

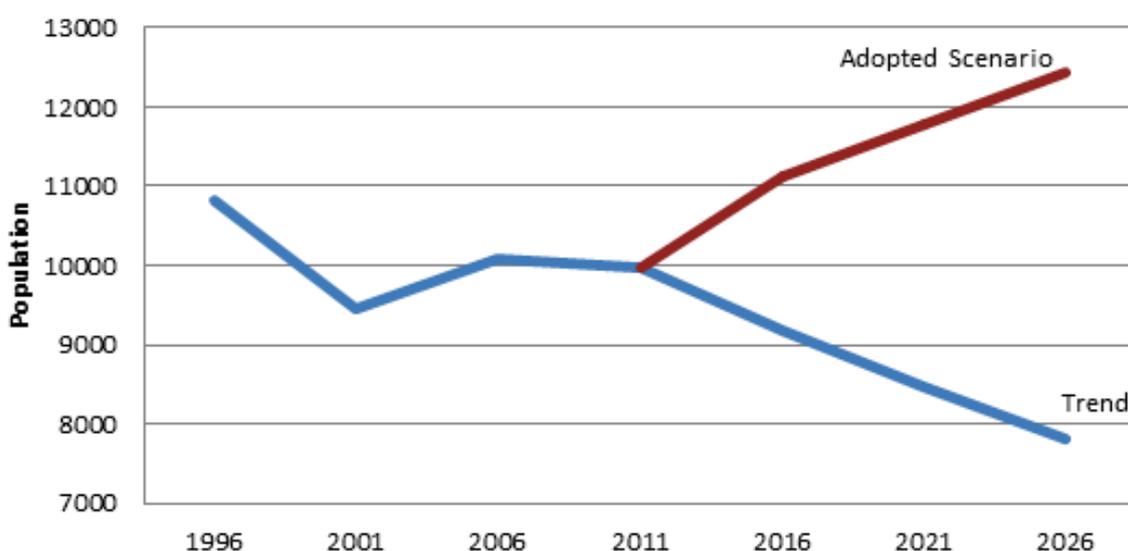
## 2.2 Population Projections

Evaluation of the land and services required to accommodate growth needs to take account of identified economic drivers and demographic trends, Northern Territory Government population forecasts and an understanding of recent growth in the town and the region.

To reflect the potential volatility of predictions for future growth, the Katherine Land Use Plan adopts the Northern Territory Population Forecasts adjusted to reflect the potential for an additional 350 residents in 2016 associated with mining activity and the compounding effect of these additional people after 2016. Adoption of this scenario for land use planning purposes ensures that should optimistic growth eventuate, investment can occur in accordance with the plan in a timely manner.

Figure 3 identifies recent population trends and the adopted scenario for future growth.

Figure 3: Future Growth of Katherine



Source: Department of Lands Planning and the Environment 2013

Under this scenario it is estimated that Katherine's population will grow by around 1.65% per annum to 2026, resulting in a total population of 12 437 people or an increase in population of 2470 above the 2011 population of 9967.

The land use plan also considers the availability of land to accommodate higher predictions in the event of accelerated economic growth.

### 3. LAND USE PLANNING ISSUES

Natural and physical attributes of the landscape and infrastructure, in particular road and rail crossings of the river, have influenced and will continue to significantly influence the shape of Katherine.

Another significant influence on the town is its historic and ongoing role as a meeting place for residents and people from pastoral properties and Indigenous communities across the region. This diversity contributes to the unique culture of the community and underpins aspirations for economic growth, social cohesion and protection of key environmental assets.

This section summarises the major influences on future development and explores their implications.

#### 3.1 Land Resources

Land resource information has informed the mapping of agricultural capability of land and soil drainage. Although there are some discrepancies between the two assessments used to compile the information because of differences in scale, the mapping of classes of capability, based on the physical properties of land and soils, provides a useful indication of land suitability to guide the determination of future land use.

Detailed investigations will be required to determine specific development potential at the scale of an individual property. The three classes of agricultural capability identify the likely suitability of land for dryland or irrigated cropping. The general characteristics of the classes identified at Figure 4 are:

- high capability – well-drained, moderately deep to deep, relatively stable soils with slopes <2% and containing very minor or no rock outcrop capable of supporting irrigated cropping
- moderate capability – soils with some limitations for irrigated cropping including rock outcrop, gentle slopes, erodible and/or very shallow soils
- low capability - soils with severe physical constraints to irrigated cropping including potentially poor drainage, abundant rock outcrop, excessive slopes, and erodible and/or very shallow soils.

Soil drainage, a term that describes local soil wetness conditions likely to occur in most years, is affected by internal soil properties and external landscape factors. Although there is often overlap with flooding, soil drainage is a separate consideration particularly in relation to the suitability of land for rural lifestyle and urban land uses. The soil drainage mapping at Figure 5 identifies areas with potential constraints associated with soil drainage.

#### Implications for Land Use Planning

The substantial areas around Katherine that have high capability for agriculture contribute to the potential for ongoing and increasing contributions of the agribusiness sector to economic growth in Katherine.

Identification of areas with low agricultural capability, particularly in locations readily accessible to urban areas, has the potential to respond to demand for rural lifestyle lots and minimise the potential for an ad hoc approach to rezoning for such development to detrimentally impact on future agribusiness development. Identification of areas with high horticulture capability and the introduction of Zone H (Horticulture) would also provide a degree of protection for this valuable resource.

Figure 4: Land Capability for Agriculture/Horticulture

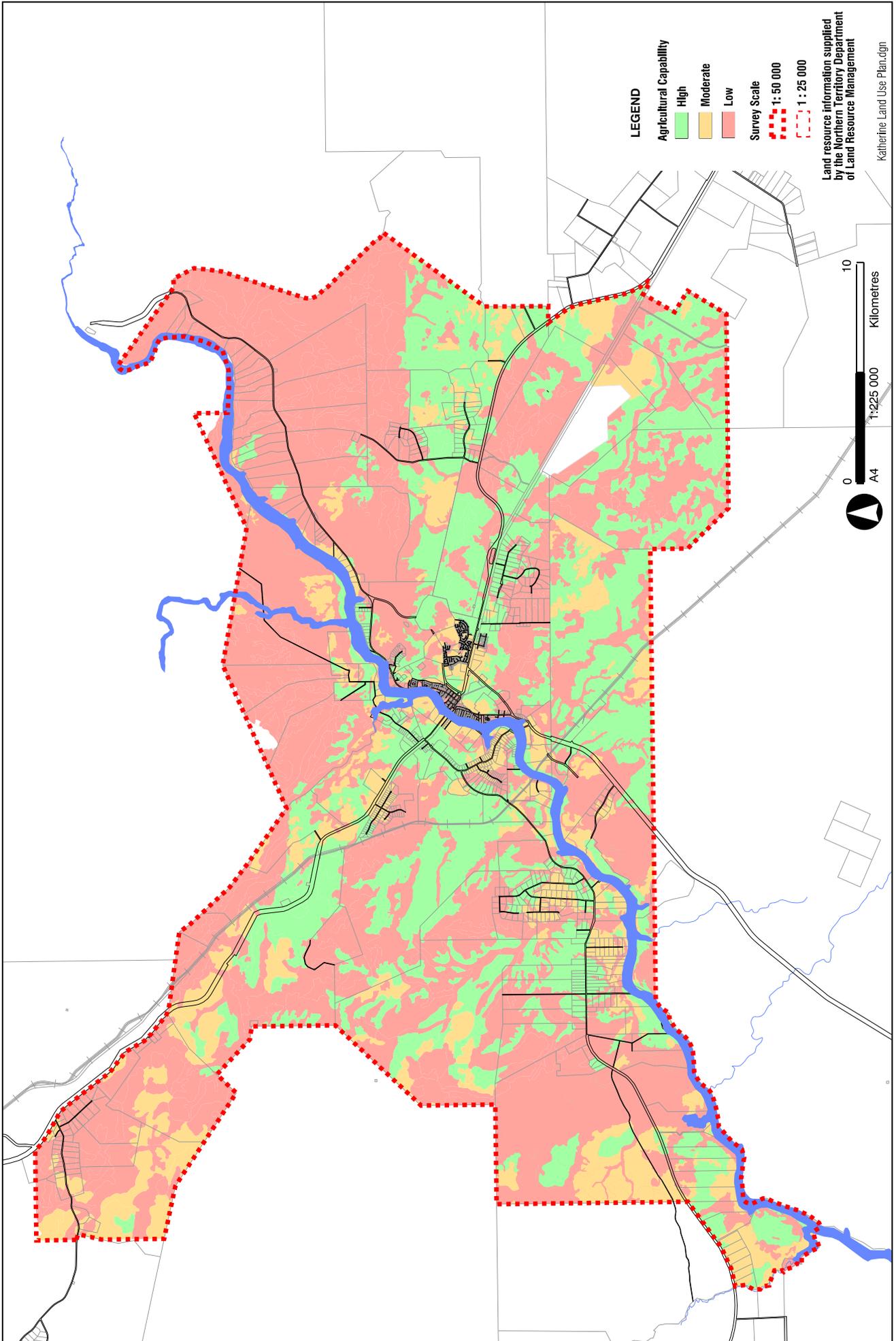
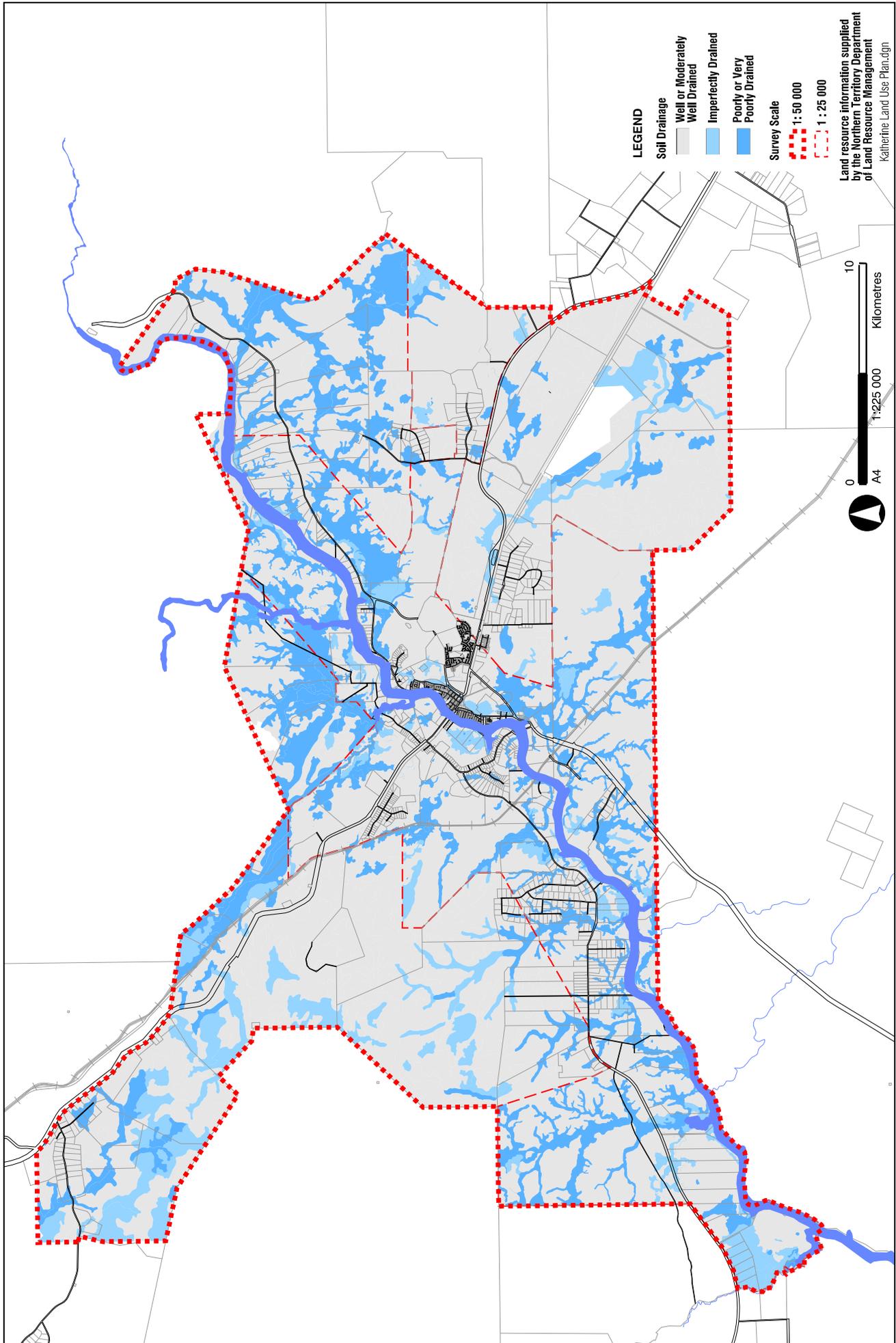




Figure 5: Soil Drainage



Soil drainage can be an environmental, health, social and cultural issue for a number of land uses. Considerations include:

- potential impacts on the operation of traditional absorption based septic systems
- the transmission of soil borne diseases
- constraints on lifestyle because of saturation or inundation of soil and land.

Consideration of soil drainage issues is particularly important to the identification of appropriate locations for rural lifestyle lots that rely on on-site water supply and waste disposal.

## 3.2 Water Resources

The ongoing availability and supply of quality water is important both for reticulated and on-site domestic supply, and for horticultural and agricultural production. Water sources around Katherine include the Tindall Limestone Aquifer, the Jinduckin Formation and to a lesser extent surface waters including the Katherine River. The Ooloo Aquifer to the south east of the town is also drawn on for horticulture and agriculture in that locality. The extent of these aquifers is identified at Figure 6.

The *Water Act (NT)* provides for the development of water allocation plans to manage water resource in areas characterised by competing demands, high use and high ecological and social values. These plans may determine:

- the extent to which ground and surface water can be allocated between consumptive and non-consumptive uses
- the amount of the water allocated for different consumptive uses
- strategies to sustainably allocate water each year
- a framework for the trading of water between parties on a temporary or permanent basis.

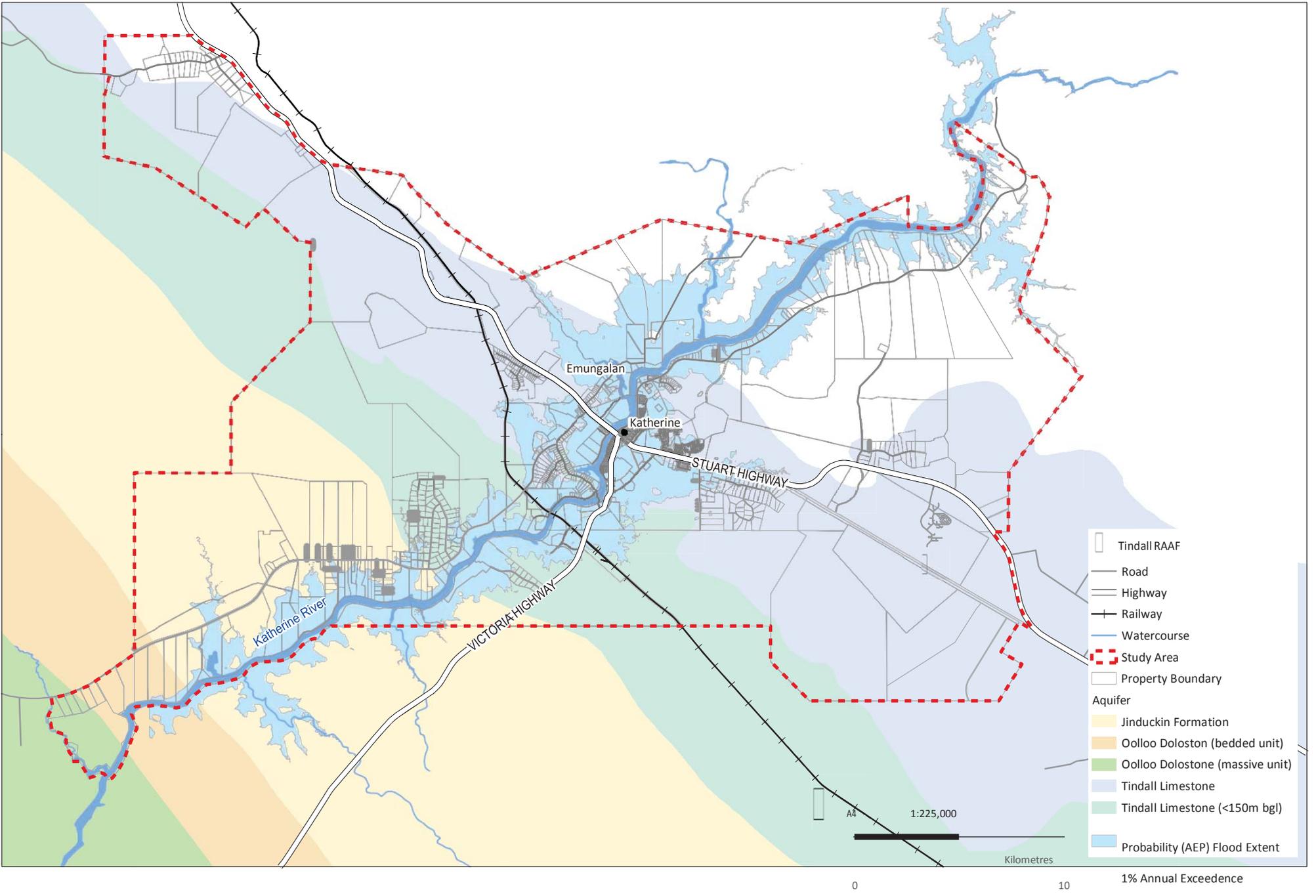
The *Water Allocation Plan for the Tindall Limestone Aquifer (Katherine) 2009 – 2019 (2009)* and the *Draft Water Allocation Plan for the Ooloo Aquifer*, manage water resources around Katherine.

The declared *Water Allocation Plan for the Tindall Limestone Aquifer (Katherine)* fully allocates the aquifer with current maximum licensed entitlements totalling 35 378ML/y. It should be noted that the total maximum licensed entitlement is less than 35 378ML in poor rainfall years (eg. in very dry years maximum total extraction would be limited to as little as 4340 ML). In the 2012 - 2013 water accounting year 9832 ML was used representing approximately 28% of the maximum possible entitlement. The *Water Allocation Plan for the Tindall Limestone Aquifer (Katherine)* allows water extraction licences in this aquifer to be traded.

The *Draft Water Allocation Plan for the Ooloo Aquifer* indicates that the maximum extraction from the southern zone of this aquifer, in the vicinity of Katherine is 2000 ML/y. At this stage this aquifer is not fully allocated. Current maximum licensed entitlement in this zone of the Ooloo Aquifer is 16 265 ML/y. In the 2012 - 2013 water accounting year approximately 12% or 1 936 ML of the total maximum annual licensed entitlement was used. Trading is provided for in the *Draft Water Allocation Plan for the Ooloo Aquifer*, but trading cannot occur before the plan is finalised and declared.

Table 1: Water Allocation and Utilisation – Tindall Aquifer 2012-2013 illustrates the allocation and utilisation of the Tindall Aquifer and Table 2 illustrates the allocation and use of the Ooloo Aquifer.

Figure 6: Water Aquifers - Tindall, Oolloo and Jinduckin



**Table 1: Water Allocation and Utilisation – Tindall Aquifer 2012-2013**

<b>Tindal Aquifer 2012-13</b>	<b>Licensed Volume (ML)</b>	<b>Licensed Volume Utilised (available for trading) (ML)</b>	<b>Unutilised Volume (available for trading) (ML)</b>	<b>Licensed Volume Utilised (% )</b>
Total Allocation	35 378	9 832	25 546	28
Agriculture/Horticulture	30 130	8 023	22 107	27
Public Water Supply	4 076	741	3 335	18
Industry	1 078	50	50	95

Source: Department of Land Resource Management 2013

**Table 2: Water Allocation and Utilisation – Ooloo Aquifer 2012-2013**

<b>Draft Ooloo Aquifer 2012-13 (Southern Zone)</b>	<b>Licensed Volume (ML)</b>	<b>Licensed Volume Utilised (potentially available for trading) (ML)</b>	<b>Unutilised Volume (potentially available for trading) (ML)</b>	<b>Licensed Volume Utilised (% )</b>
Total Allocation	16 265	1 936	14 329	12
Agriculture/Horticulture	16 265	1 936	14 329	12

Source: Department of Land Resource Management 2013

Water trading allows licence holders to sell all or part of their water extraction licence, should they desire to do so for reasons such as a change of business plan, changes of crops, or water savings through the adoption of more efficient irrigation practices. Equally, investors may buy water from the market and utilise it in locations that are suited to higher and better uses that create long-term sustainable economic development outcomes for the community. Selling and buying of water extraction licences by mutual agreement between trading parties is simply referred to as the water trading market. Such markets are at their earliest infancy in the Northern Territory, and only two trades have occurred in the Tindall Limestone Aquifer (Katherine).

While it provides water of poorer quality than either the Tindall Limestone Aquifer or the Ooloo Aquifer, the Jinduckin Formation also provides water supplies for irrigated agriculture in the Katherine region. Water extraction licences for the use of water from the Jinduckin Formation are not, however, covered by a water allocation plan and, therefore, cannot be traded. Currently licensed entitlements for extraction from the Jinduckin Formation (for irrigation) are up to 2244ML/yr in total.

Water supplies for irrigated agriculture are also drawn from the Katherine River with licensed entitlements totalling 2761 ML/y. This irrigation is generally limited to the immediate riparian river corridor. As is the case for licences drawing from the Jinduckin Formation, the surface water extraction licences are not tradeable.

## Implications for Land Use Planning

Opportunity for re-distribution of licensed water entitlements through the operation of the water trading market is an important consideration in the identification of an appropriate framework for future land uses. Trading of water entitlements has the potential to support future development of currently undeveloped land that has a high horticultural capability.

The challenge is the protection of potential future agribusiness within the context of pressure for rural lifestyle lots. Protection of the potential for agriculture requires consideration of not only land capability and the availability of water but also the need for separation from encroaching incompatible land uses. Such uses include rural lifestyle lots where future residents may be sensitive to everyday agricultural activities including machinery noise, dust and odour.

Another issue associated with the development of rural lifestyle lots around Katherine is the potential impact of further rural stock and domestic use of groundwater water resources. Allocations for unlicensed rural stock and domestic water use are made in the *Water Allocation Plan for the Tindall Limestone Aquifer (Katherine) 2009 – 2019* and the *Draft Water Allocation Plan for the Ooloo Aquifer*. Expansion of rural lifestyle lot development, beyond the levels anticipated in either of these water allocations plans, carries the consequence that reductions in current allocations for other use, including irrigated agriculture and horticulture, may need to be considered in order that total water extraction remains within sustainable limits.

## 3.3 Natural Hazards

### 3.3.1 Flooding

The location of Katherine on the floodplain of the Katherine River means that flooding is a significant risk and influence on development. The largest flood, which occurred in 1998, inundated almost all residential, commercial and industrial properties in the original town area but had minimal effect on the Katherine East area.



Katherine Terrace during 1998 flood (Source: ABC Northern Territory Historical Flood Photos)

Figure 7: Flooding 1% AEP Extent

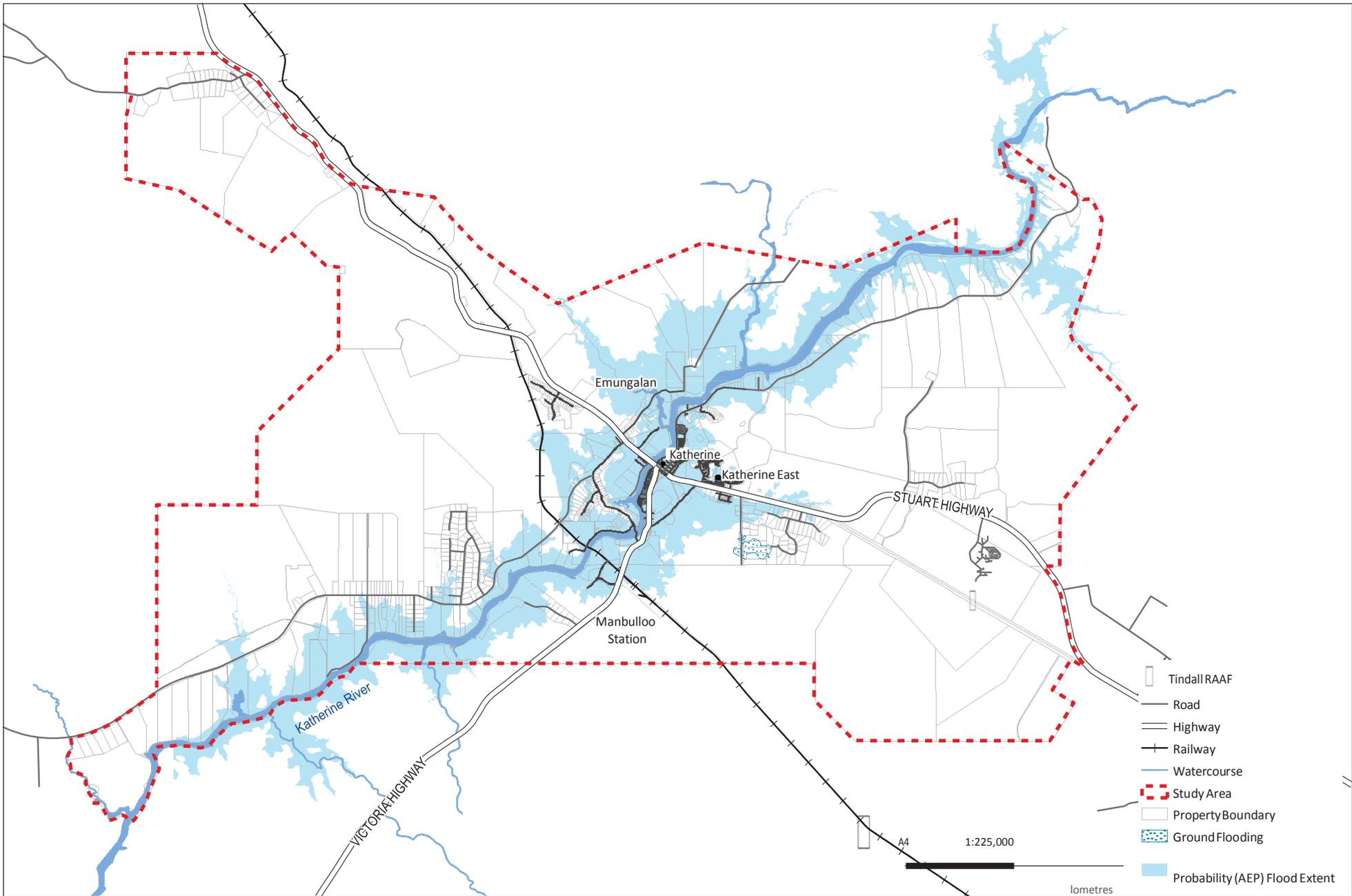
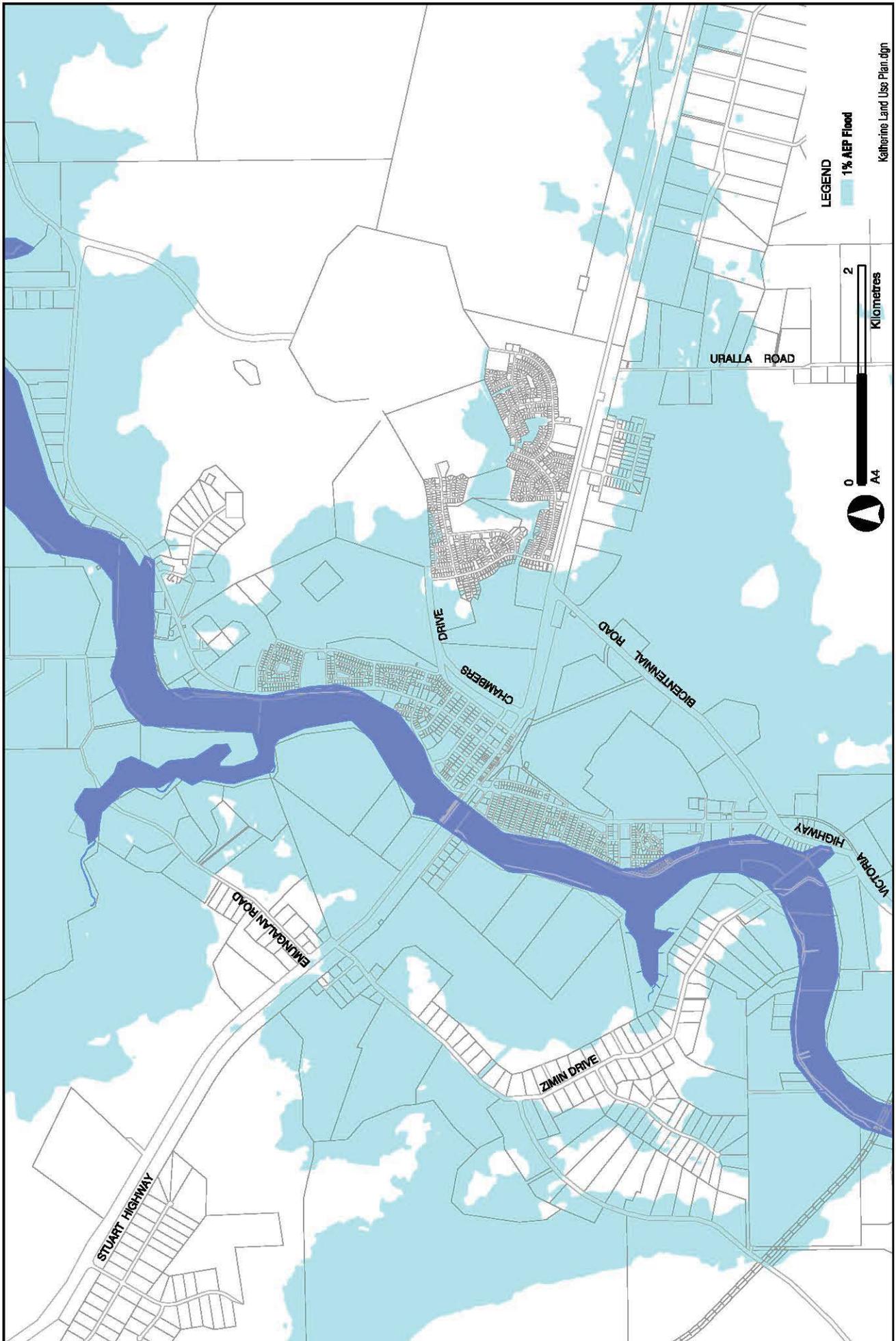


Figure 8: Inset Flooding 1% AEP Extent



The subsequent *Katherine Flood Study (NRETAS 2000)* utilised data from recorded and historical floods (the earliest dating back to 1897) to develop a flood and floodplain model to reproduce observed flood behaviour. The flood model also informed a flood forecast model to predict the height and timing of flood peaks at the Katherine Railway Bridge. This flood model estimated the 1998 flood occurrence as one in 155 years, under common terminology. The model also estimated the peak flood heights in the flood plain for various Annual Exceedence Probability (AEP).

The Northern Territory adopts the 1% AEP flood extent and floodway, which is equivalent to a 1 in 100 year flood, as the basis of land use planning. This means that in any given year there is a 1% chance a flood of that magnitude could occur. Figure 7 identifies the 1% AEP and Figure 8 is an inset of the central town area. Detailed flood peak contours of the 1% AEP and the Probable Maximum Flood (which is more than 3 m higher than the 1% AEP at the Katherine River Bridge) are available from the Department of Land Resource Management.

In addition to surface flooding, certain areas around Katherine are affected by ground water flooding during periods of high rainfall. The Tindall Limestone aquifer fills to overflowing, restricting downward drainage and saturating soils and causing groundwater flooding.

Construction of a major drain to the Katherine River provides a degree of protection from what is colloquially known as 'Lake Hickey', an area between the Stuart Highway, Zimin Drive and Florina Road which has the potential to be inundated when high water table levels occur in association with floodplain inundation.

Ponding of overflowing groundwater and drainage flooding has also been known to create a temporary lake at the southern end of Uralla Road. Other areas, affected to a lesser extent, include to the south west of the Katherine East industrial area, Bicentennial Drive and the Tindal Creek floodplain near the Stuart Highway.



Lake formed by groundwater flooding in a shallow depression at Uralla Road (Source: NRETAS Flooding from Sinkholes & Local flooding in Katherine – Wet 2003/04)

### **Implications for Land Use Planning**

The Council of Australian Government's (COAG) *National Strategy for Disaster Resilience* advocates a coordinated resilience based approach to disaster management with a collective whole-of-nation responsibility (COAG 2011). The definition of a resilient community is one which has in place land use planning systems and building control arrangements that reduce, as far as is practical, community exposure to unreasonable risks from known hazards and

implements suitable arrangements to protect life and property. A key recommendation of the National Disaster Insurance Review, which forms part of the National Strategy, is to improve the availability and affordability of flood insurance.

Possible responses to the risks associated with flooding which would accord with the national agreement and the insurance review include:

- limiting intensification of land use within the 1% AEP and locating new development above that level
- adopting protection measures such as levee banks
- adopting appropriate design responses on an individual site basis to address flood risk.

The construction of levee banks to protect the entire town would require major investigation to establish the economic viability of such an approach and the potential impacts on flood heights in other areas. An alternative would be small local levees to provide protection to areas located at minor risk of low level flooding. An appropriate policy framework may encourage the necessary investigation of opportunities for local levees in association with design responses to provide protection and create opportunities for development.

### **3.3.2 Sink Holes**

The Tindall Limestone Formation which underlies Katherine consists of soluble, karstic rock. The dissolving of this limestone creates an abundance of naturally occurring sinkholes.

Analysis in the Katherine region (Karp 2002) identified more than 280 sinkholes distributed randomly across the Tindall Limestone. New sinkholes continue to develop naturally over time and human activities such as urban development, agriculture and industry have increased the rate of sinkhole formation in some areas due to changes to surface flow regimes and surface ponding of water.

#### **Implications for Land Use Planning**

The karstic rock which underlies Katherine and the associated potential for sinkholes presents numerous engineering, environmental and planning problems.

Sinkholes constitute an environmental hazard for reasons of safety and as a groundwater contamination pathway. The potential for creation of contamination pathways is particularly important in Katherine given the significance of the groundwater resources.

Trigger mechanisms for the formation of or acceleration of sinkhole collapse include surface flow regime change due to urban development, water ponding due to road or subdivision construction, leaky water and sewer lines, major floods (e.g. 1998) and land clearing for agriculture.

In the absence of risk based mapping of areas at higher risk of developing sink holes, the random nature of their existence and the extent of the area affected limits consideration of the risk as a definitive influence on the future distribution of land uses. The risks and precautions or engineering responses needed to minimise the risks require detailed consideration on a site by site basis prior to the design of development.

### **3.4 Ecological Values**

The Katherine area supports National Parks, Sites of Conservation Significance and a wide range of fauna, flora and ecological communities, some of which are considered to be threatened and requiring management and preservation to maintain population and community structure and function.

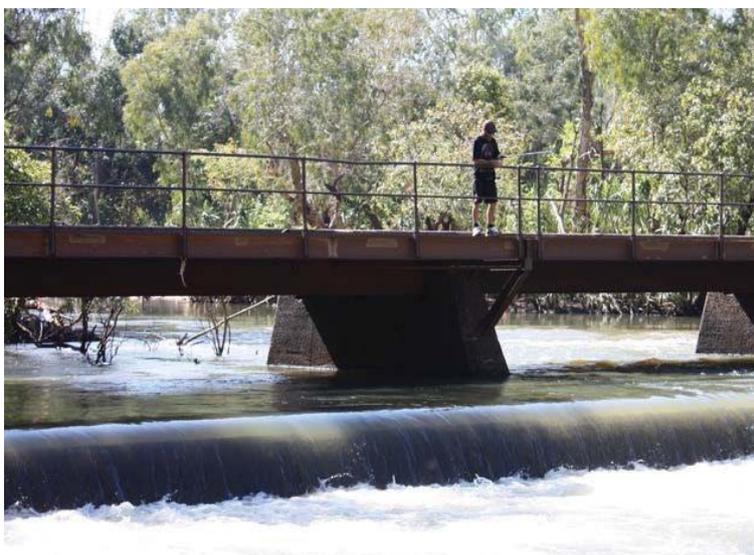
Several Matters of National Environmental Significance (MNES) are potentially present around Katherine. These include one Threatened Ecological Community (Arnhem Plateau Sandstone Scrubland Complex), seven bird species, five mammal species, one reptile and one shark species (Freshwater Sawfish). These matters require stewardship to avoid significant impacts that would trigger protection measures under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

Several species listed under the *Territory Parks and Wildlife Act 2000 (NT)* as threatened in the Northern Territory have been identified as potentially occurring in the Katherine area. Of particular importance is the land snail endemic to the monsoon vine thickets (dry rainforest) of the landscape on the Tindall Limestone Formation. Habitat protection is needed to assist in the conservation of this and other threatened species.

National Parks and Nature Parks located within and around Katherine include:

- Nitmiluk (Katherine Gorge) National Park, located approximately 17km northeast of Katherine, owned by the Jawoyn Aboriginal Land Trust and jointly managed with the Parks and Wildlife Commission.
- Kintore Caves Nature Park, located approximately 10km northwest of the town centre, managed by the Parks and Wildlife Commission.
- Cutta Cutta Caves Nature Park, located approximately 20km south east of the town centre, managed by the Parks and Wildlife Commission.

The Western Arnhem Plateau Site of Conservation Significance, an area recognised as containing special biodiversity values, overlaps most of the area of Nitmiluk National Park to the north of Katherine.



### Implications for Land Use Planning

Sites of potential ecological value, including Matters of National Environmental Significance, threatened species, national and nature parks and Sites of Conservation Significance do not impose additional regulatory or legislative requirements or control on management and use of land. However, identification of potential sites of significance provides a guide to the planning for future land use and highlights the need for more detailed information to inform management activities that may be required to avoid creating significant impacts.

## 3.5 Cultural Heritage and Tourism

The Katherine community is influenced by its history and the cultural diversity of both the town and the broader region. Development which focuses on arts and culture makes a significant contribution to the prosperity of Katherine through support for business, and the attraction of professionals and visitors to the region.

Cultural amenities and places of cultural significance enrich lives and provide a sense of connection for locals and visitors alike. Cultural amenities provide community engagement opportunities which assist in ameliorating the effects of isolation, build a sense of place and contribute to maintaining a healthy and cohesive community. These amenities include arts centres, festival venues and community centres. The Katherine Strategic Arts Plan outlines the features of a viable community engaged in cultural activities.

The **Godinymayin Yijard Rivers Arts and Culture Centre** is a cross-cultural enterprise and meeting place for the Katherine region that is the result of over 12 years of planning and development.

The Arts and Cultural Centre, officially opened on 14 July 2012, includes a gallery and display space, a shop and a multi-purpose performance and meeting space and represents a diversification of the economic base of the town.

### 3.5.1 Indigenous Cultural Heritage Values

The site of the town has long been an important meeting place for the Indigenous people of the region and continues to be a place of traditional convergence, creating opportunities for benefits from the growing cultural tourist market.

Art centres and festivals throughout the Katherine region are viewed as significant contributors to cultural maintenance, enabling the rich cultural heritage to be shared with the world. Growing evidence suggests cultural tourists stay longer and spend more money at their destination than other tourists. Economic benefits flow to the operators of facilities and artists, and to providers of cultural services.

Aboriginal sacred sites are natural features of the landscape that are significant according to Aboriginal tradition. They are irreplaceable heritage places protected under the *Sacred Sites Act (NT)*. Numerous sacred sites and previously restricted work areas exist in various locations in the Katherine region. The Aboriginal Areas Protection Authority is responsible for overseeing the protection of Aboriginal sacred sites and advises accordingly.

### 3.5.2 Heritage Values

There are ten places in Katherine that are declared as heritage places under the terms of the *Heritage Act (NT)*. They include Springvale Homestead, Emungalan Cemetery and Kintore Caves Nature Park.

The *Heritage Act (NT)* also automatically protects all Aboriginal archaeological places and objects. Previous survey work has identified many Aboriginal archaeological sites in the Katherine area. In areas which have not been completely urbanised, there is a moderate to high likelihood of finding more sites, depending on the particular situation.

### 3.5.3 Tourism

The Katherine region is known as a nature and culture destination. Attractions include Nitmiluk National Park, Hot Springs, cultural amenities including the Godinymayin Yijard Rivers Arts and Cultural Centre and festivals including the Katherine Festival and the Barunga Festival, one of Australia's longest running cultural festivals.

The leisure market in the region is primarily a drive market, with the majority of domestic visitors driving into the region. In recent years visitation to the Katherine region, and to the rest of the Territory, has been challenged because macro-economic events such as the global economic downturn and a strengthening Australian dollar have fuelled rapid outbound domestic travel.

In 2012-13 there were 210 000 visitors to the Katherine region<sup>1</sup>. The majority of these (86%) were domestic visitors and over half (57%) were holiday visitors. The total expenditure in the region for this period was \$128 million. Looking forward, the Australian dollar has retreated from its highs of the past few years, which should refresh interest in domestic tourism and the drive market.

Recent new tourism product in the region, particularly Cicada Lodge, has provided a new element to experiences offered in the region. This new product opens the region to a new consumer market and will also contribute to reinvigorating the general tourism trade and interest in the region.

*Tourism Vision 2020* outlines a vision to grow the Territory visitor economy at 3.1% per annum, increasing visitor expenditure by \$535 million from 2011-12 and supporting an estimated 4300 new jobs. If the Katherine region shares equally in this growth, visitors could reach 276 000 by 2020-21.

### Implications for Land Use Planning

Future land use planning establishes a framework to encourage artistic expression and cultural exchange. Cultural values improve quality of life and strengthen the tourism economy. The identification and appropriate management of places of cultural significance is essential for the on-going sustainability of cultural practice and heritage conservation in the Katherine region.

This includes the conservation of Aboriginal archaeological places, noting that the location and nature of all such sites is not known at this time. The identification of Aboriginal sacred sites is necessary during the planning for any development. An authority certificate issued by the Aboriginal Areas Protection Authority is required to enable sacred site clearance.

## 3.6 Infrastructure

### 3.6.1 Transport

Katherine is at the cross roads of Northern Australia with connections to Western Australia, South Australia and Queensland via the Stuart, Victoria and Barkly Highways which are all national roads. Analysis of traffic data indicates that there is sufficient capacity within the road network for current levels of traffic although there are issues associated with:

- marked variations in volume with average daily flows almost doubling during dry season months of June, July and August
- heavy (freight) vehicles and tourists blending with local traffic.

These issues are particularly significant on Katherine Terrace / Stuart Highway as this road functions as a national highway, the town's main commercial street and as a local road link between urban areas of Katherine. The management of traffic and pedestrian interactions on Katherine Terrace was subject to a recent investigation undertaken with input from both the Department of Transport and the Katherine Town Council. The recommendations from this report will inform future action to address local traffic management in association with development of the town centre.

<sup>1</sup> Tourism Research Australia, International and National Visitor Surveys.

Heavy vehicle by-pass options for Katherine have been subject to investigation and consultation over the last few years to identify a solution that would be acceptable to all stakeholders. Concepts developed were short to medium term options where the main objective was to remove heavy vehicles from Katherine Terrace, while still retaining only one Katherine River bridge crossing. Generally the community has not been supportive of the options developed and recently it has become clear that the construction of a short term option is not viable.



Current Government policy is to minimise access points onto the Stuart Highway to maintain the function of this national highway. While service roads may be considered in some circumstances, design requirements to provide safe access to the highway will limit their use.

Chambers Drive currently extends from the Stuart Highway adjacent to the town centre through to the northern side of the Katherine East residential area and will be progressively extended as the urban area expands. Ultimately, connection to Gorge Road will provide an alternate access to Katherine Gorge (Nitmiluk) and a flood proof evacuation route for local residents.

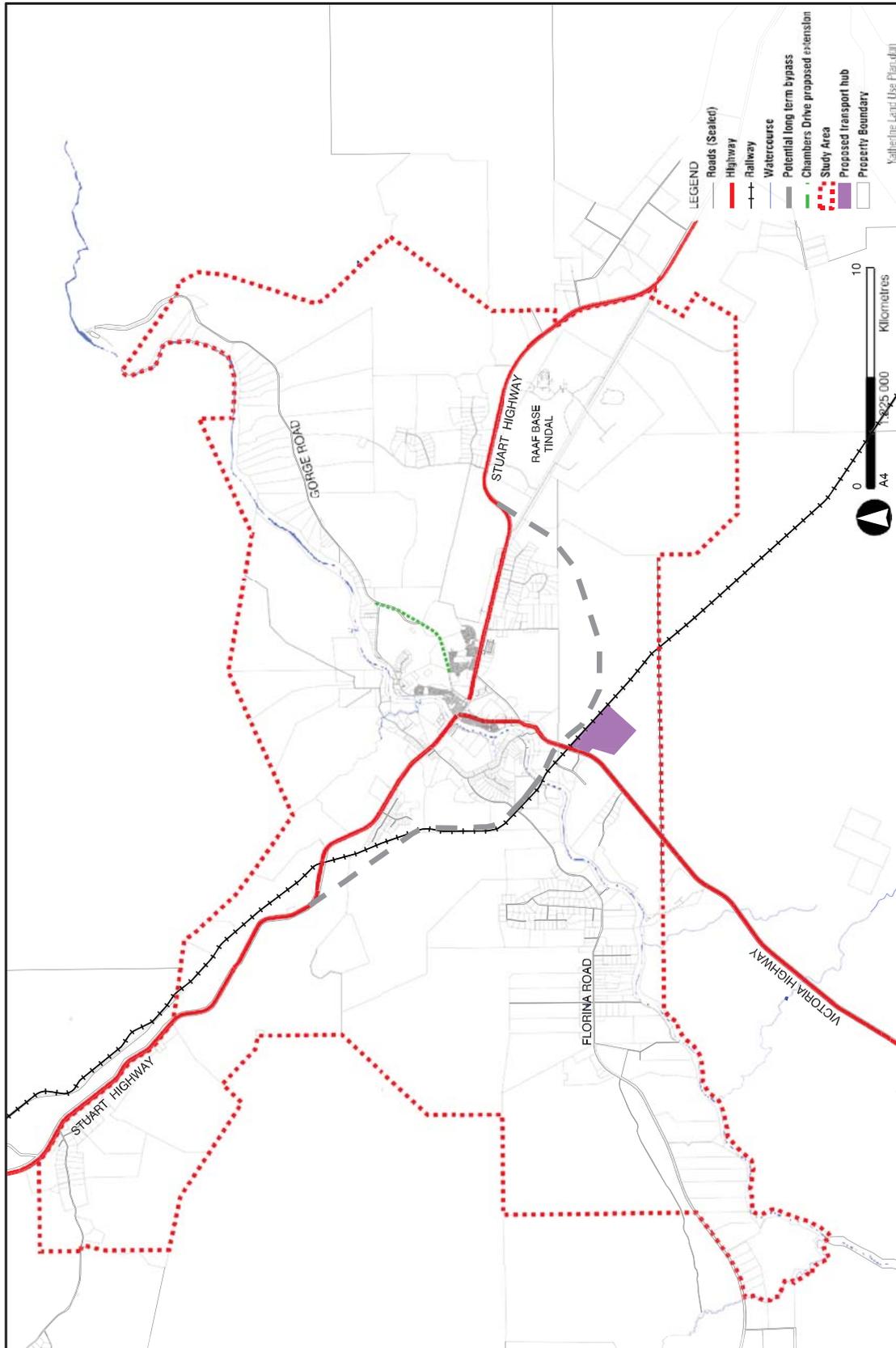
The Adelaide to Darwin Railway passes to the south and west of Katherine. A station, serving the iconic Ghan passenger service, and a freight depot for the loading and unloading of goods, is located approximately 5.5 km south of the town on the Victoria Highway. There are currently six return freight services a week between Adelaide and Darwin, one or two passenger services each way (depending on the season) and 24 bulk trains a week between mine sites and the Port of Darwin.



The existing rail network has limited spare capacity. If established, a transport hub adjacent to the railway would service the Ord River Stage 2 scheme, with producers trucking goods to Katherine to transfer on to rail for delivery to southern markets. Further impetus for the transport hub will come from the pastoral (cattle) and mining industries and the expansion of the region's own horticulture production.

The Katherine Tindal Civilian Airport is located 15 km south of town on the Stuart Highway and operates under a working agreement with RAAF Base Tindal. It is a strategically important airbase which supports Australian Defence Force operations and exercises in the north of Australia. The agreement allows for joint use of the airfield by civil and military aircraft and Katherine is overflowed by both civil and military aircraft.

Figure 9: Transport Networks and Connectivity

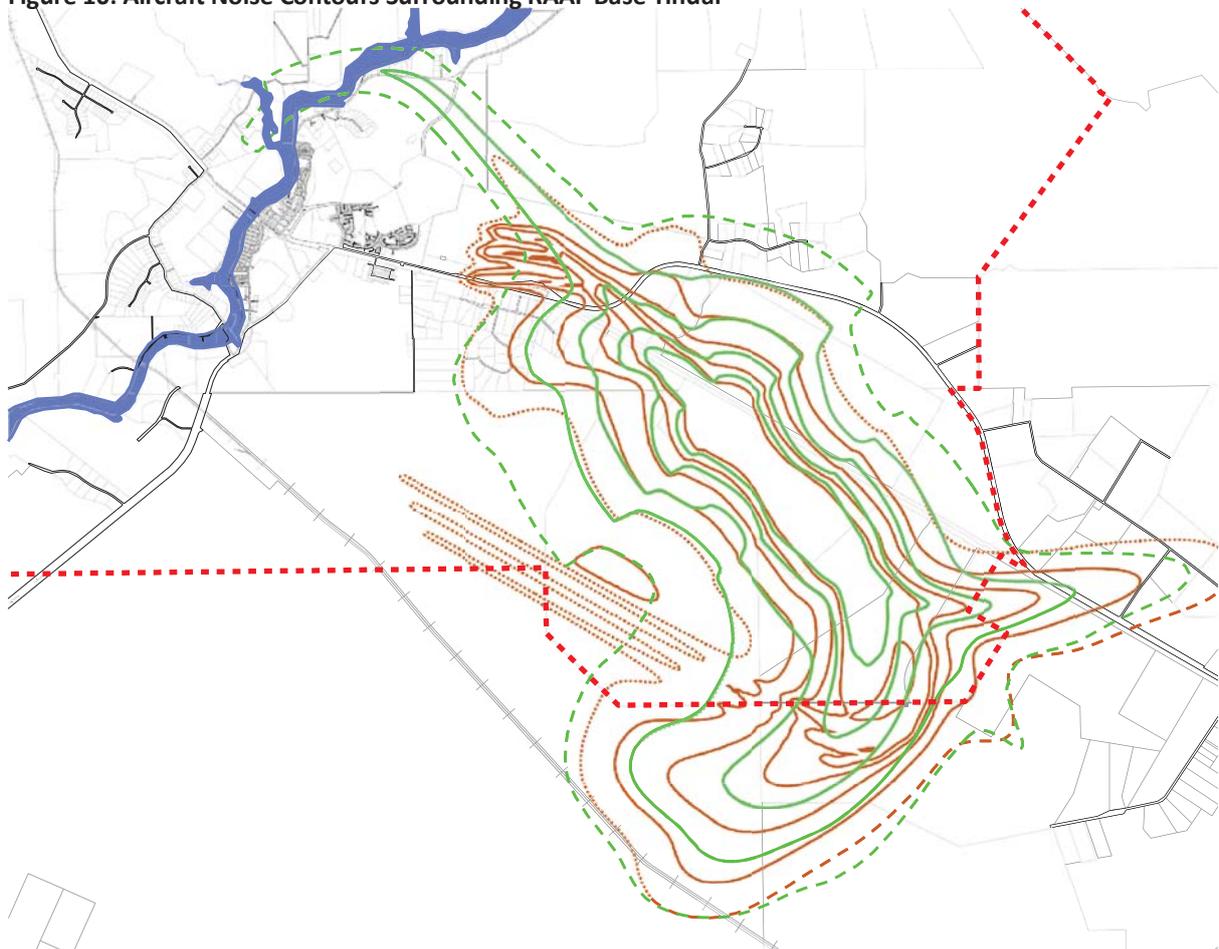


The level of military flying activity is expected to increase into the future, with a potential increase in aircraft traffic and noise exposure. There is also the potential for an increase in civilian aircraft activity associated with the companies which use the airport as a base for operational services throughout the region.

Areas around RAAF Base Tindal will be exposed to aircraft noise which may impact on quality of life for future residents, with respect to indoor and more particularly the outdoor use of their land. These impacts can be a source of complaints and while Defence makes efforts to minimise community aircraft noise exposure it cannot readily modify activities due the establishment or intensification of noise-sensitive development in proximity to the base.

The Australian Noise Impact Exposure Forecast (ANEF) system uses contours to show where cumulative aircraft noise may adversely affect land uses. RAAF Base Tindal is planned to be one of the main operating bases for the Joint Strike Fighter (JSF) aircraft which will be deployed from the 2020s. The modifications of flight paths and noise impacts associated with new aircraft are identified on an Australian Noise Exposure Concept (ANEC) map which shows what the ANEF map will look like under a future scenario. Figure 10 identifies the existing ANEF contours and the ANEC prepared for RAAF Base Tindal and the likely noise exposure levels and contours for the year 2025, taking account of the changes to the fleet and flying operations associated with the introduction of the JSF aircraft. Although future training requirements may necessitate amendment to the noise contours associated with operations at the Base, the existing ANEF and ANEC provide an appropriate guide for land use planning purposes. More detailed planning at a later date can take account of future changes to noise contours and other potential encroachment issues including the threat of birdstrike through wildlife-attracting land uses.

**Figure 10: Aircraft Noise Contours Surrounding RAAF Base Tindal**



## Implications for Land Use Planning

The strategic position of Katherine at the intersection of major transport networks creates opportunities for industrial activity that meets the needs of significant economic development throughout the region. The challenge is to maximise the capacity to respond to these opportunities while minimising the potential impacts of growth in heavy vehicle activity on the amenity and safety of the urban area.

While investigations to identify a short term option for a bypass of the main street of Katherine have not been successful, the identification of a longer term option which would incorporate a new bridge is required. Identification of an interim route within the context of a long term route will provide a framework for future development to ensure interim development does not constrain the long term provision of a by-pass and also establish an appropriate location for a second bridge with the potential to serve both an interim and a long term option.

Consideration is currently being given to the potential for upgrading of Bicentennial Drive as Stage 1 of a future bypass within the context of a planning study to identify a suitable long term alignment.

Road infrastructure requirements will depend on economic growth in Katherine and the broader region and will be informed by future analysis of local traffic issues that may develop as growth occurs.

A noise assessment report was prepared for RAAF Base Tindal (2009) for future aircraft movements as a result of the planned Joint Strike Fighter (JSF) deployment concludes that it is unlikely JSF movements will have a significant impact on most people living around the base. However, some areas immediately to the south and west of RAAF Base Tindal and adjacent to the Katherine River northwest of the Base will be more exposed to aircraft noise under the ANEC contours. In particular, land further west of the base at Collins Road south of the Stuart Highway and at Lansdowne Road immediately to the north of the base and areas to the northwest of the base between Katherine River and Gorge Road will experience an increase in noise.

In terms of frequency, 1 to 8 single JSF aircraft noise events may be perceptible outdoors on average days in most parts of Katherine. This represents a similar or slightly improved scenario compared with the current aircraft noise environment in Katherine. Mitigating factors, including the design of flight paths to concentrate potential noise impacts in unpopulated areas, scheduling of the majority of JSF flights during the daytime between Monday and Friday, restricting flying to 45 weeks of the year, and flying in pairs to reduce the number of individual noise events will help to reduce aircraft noise impacts in and around Katherine.

The current and potential noise environments will be taken in to account in the development of land use options for Katherine, particularly for any proposed Rural Residential or Rural Living zones in proximity to the RAAF Base or within the ANEF or ANEC contours.

### 3.6.2 Utilities

The Power and Water Corporation (PWC) provides electricity, water and sewerage services in Katherine.

The town's electricity needs are met by the Darwin-Katherine transmission network, which links the Katherine Power Station and additional generation capacity in Darwin. The electricity network is identified at Figure 11. Gas is provided to the Katherine Power Station from the Darwin to Alice Springs pipeline that passes to the west of Katherine alongside the railway but there are no domestic gas connections available from the pipeline.

Katherine is served by a potable water network consisting of a series of distribution and reticulation mains. Water, sourced from the Katherine River at Donkey Camp and two bores in the Tindall Aquifer, is treated at a water treatment plant in the Morris Road facility. Between 25% and 40% of Katherine's reticulated water supply comes from groundwater although during the wet season there is a higher reliance on this source (around 30%) and following heavy rain or flood events the river is often too turbid for use and the bores provide 100% of supply. The extent of the water network is identified at Figure 12.

Wastewater from Katherine is conveyed to the treatment plant south of the town on the east bank of the Katherine River via a mixed network of rising and gravity mains. The current urban footprint of Katherine generally reflects the extent of reticulated water supply and sewerage, although some industrial areas are not serviced by a water supply with sufficient pressure to meet demand and fire fighting requirements. The extent of the sewer network is identified at Figure 13.

There is limited potential for further development in some peri-urban areas, particularly the Emungalan industrial area, because of the lack of water services or the lack of capacity. In the case of the Emungalan area, upgrades are required to trunk mains and there is a possible need for an additional river crossing.

Rural lifestyle lots outside the urban footprint are generally provided with reticulated power but rely on on-site water supply and waste disposal. This requires landowners to source water from bores which increases the demand on the resource. As existing water allocation plans are based on an allocation to non-regulated stock and domestic use, any significant increase in such use associated with rural lifestyle lots will need to be factored into future water allocation planning processes.

The development of rural lifestyle lots around Katherine should also consider potential risks to groundwater quality associated with wastewater management and disposal. This is a particularly significant consideration in the Katherine region where there is the potential for sinkholes to provide direct pathways for contamination to affect groundwater resources. Investigations by the Power and Water Corporation identify the majority of the town falls within the potential capture zone of the production bores at Morris Road. It is reasonable to infer that private bores in the aquifer are subject to the same risk of contamination. Poorly constructed or decommissioned bores can also act as short-circuit pathways for contamination.

### Implications for Land Use Planning

Urban land uses require reticulated water supply. As a consequence, orderly and economic growth will be influenced by the availability and capacity of existing reticulation networks and storage with benefits to urban expansion into areas contiguous with existing developed areas.

More intense rural lifestyle development (rural residential lots at a minimum of 4000m<sup>2</sup>) will also require connection to reticulated water as lots are not of sufficient size to provide the required separation between bores and on-site waste disposal systems. An issue for land developers and Power and Water Corporation is the equitable allocation of costs associated with the necessary infrastructure. Identification of a number of potential contributors to the costs of the infrastructure has the potential to establish the necessary economies of scale. In the case of the Emungalan areas, the development of rural residential lots may establish the economic viability of the reticulated water supply required to support further industrial development.

Figure 11: Electricity Networks

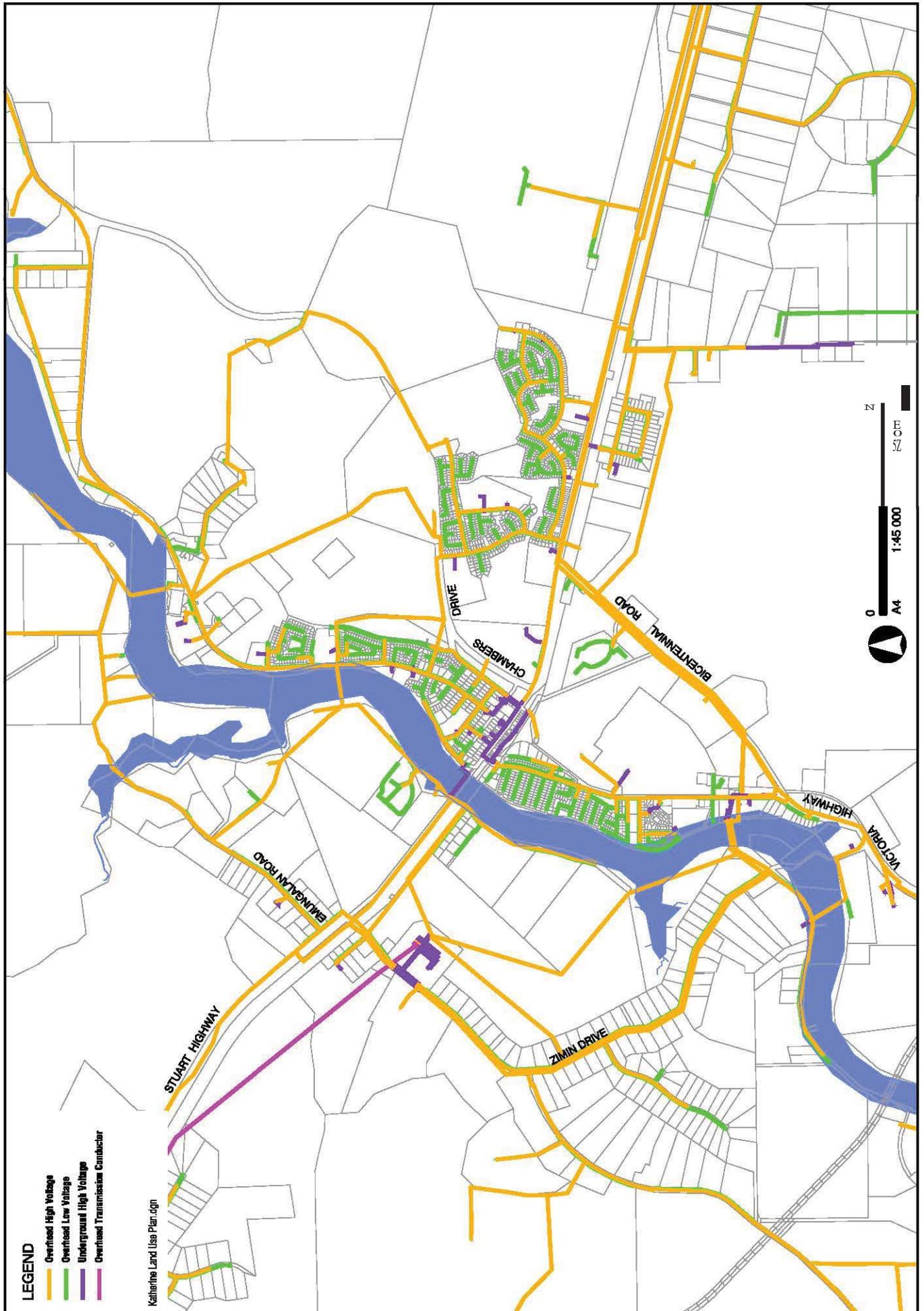


Figure 12: Water Networks

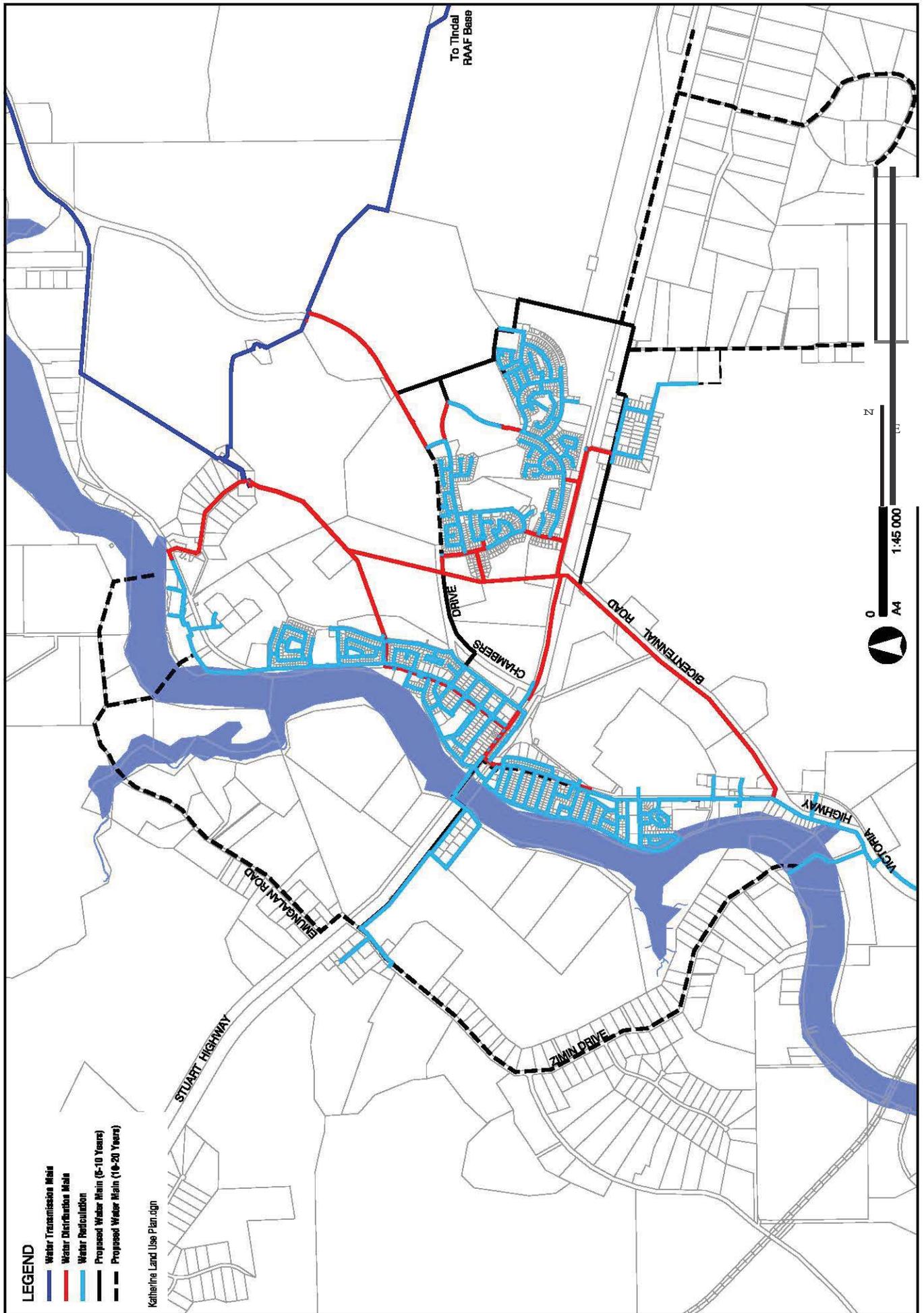
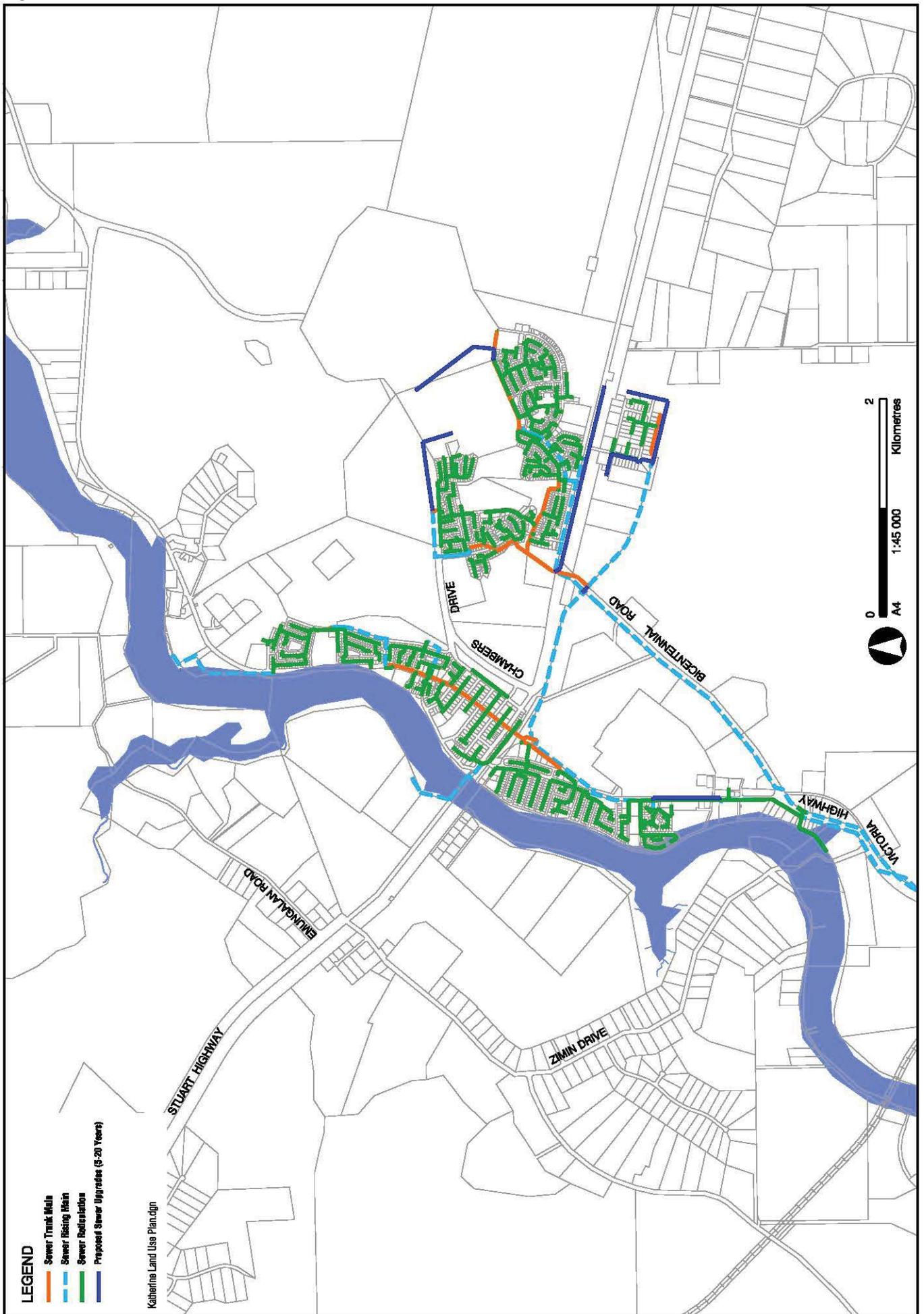


Figure 13: Sewer Network



Although reticulated sewerage provides the best mitigation of risk to groundwater in localities characterised by sinkholes, septic tanks may be utilised for domestic sewage disposal on rural and rural lifestyle lots larger than 2ha, subject to site specific land capability assessment. To minimise the risk of pollution of groundwater, land capability assessment should include detailed evaluation of existing sinkholes, the potential for changed drainage regimes to result in further sinkhole development or activation and the location of existing or decommissioned bores.

Upfront site specific assessment of land capability and risk due to sinkholes should be considered ahead of rezoning and subdivision to minimise potential impacts.

### **3.6.3 Waste Management**

The Katherine Town Council Waste Transfer Station and landfill, situated on Novis Quarry Road to the south of town, accepts household, domestic, industrial and green waste, and is accessible in all weather.

Although this facility has capacity for between 20 and 50 years, depending on the uptake of recycling and reinvestment in onsite facilities, its location on the floodplain is an issue.

Local Councils across the Katherine region are currently investigating options for a Regional Management Plan. Consideration of an alternate land fill site in Katherine, outside the floodplain will be one of the issues considered in that investigation. Other key influences on the selection of a site will include the location of the Tindal RAAF Base (to avoid bird strike), minimising the potential for pollution of groundwater and the urban interface.

### **3.6.4 Communications**

The National Broadband Network cable is situated alongside the railway line and there are various local fibre optic cables including alongside the Stuart Highway and Florina Road.

## **3.7 Land Tenure**

The majority of land in the Katherine region is either private freehold or Aboriginal Freehold (Commonwealth) Title held by Aboriginal Land trusts with substantial areas of vacant Crown land in close proximity to the urban areas.

Two native title claimant applications under the *Native Title Act (Cth)* affect land in and around Katherine. One claim is to much of the vacant Crown land within the town as well as four parcels outside the town boundary, including part of the Katherine River Corridor. The other claim covers Lot 1348 on Chardon Street in the industrial area. The claims were lodged by the Dagoman, Jawoyn and Wardaman people in 1999 and 2000 respectively. The claimants are legally represented by the Northern Land Council. The extent of the land under claim is shown at Figure 14.

The Katherine native title claims are currently scheduled for a determination in the Federal Court. This determination will essentially establish whether native title exists in the claim areas, the nature and extent of native title rights and interests, and the identity of the native title holders. A determination will also establish a prescribed body corporate to manage the native title on behalf of any successful claimants.

Under the *Native Title Act (Cth)*, the Territory has the capacity to extinguish native title either through an Indigenous Land Use Agreement or by acquisition.

## Implications for Land Use Planning

Vacant Crown land offers opportunities for Government initiated but privately funded urban development. To facilitate development in Katherine the Territory has, in accordance with the *Lands Acquisition Act (NT)*, acquired all native title rights and interests (if any) in parts of the claim area for future residential and industrial development in Katherine East. Part of that land acquired for residential development has recently been released to the market.

Freehold land outside the immediate urban area is the focus of the private development of rural lifestyle lots. As the reactions of individual landowners to market forces vary, development of privately owned freehold tends to be more haphazard.

Where development of land or the roll out of infrastructure involves multiple landowners, including private land owners, government organisations and native title holders, there may be substantial commercial and equity issues to resolve. Resolution of such issues can result in delays in the release of land for development. To avoid potential delays, it is beneficial to identify appropriate locations for long term growth to inform the negotiation and resolution of native title issues and to inform the planning of the necessary infrastructure.

## 3.8 Land Uses

The pattern of existing land use, which reflects historic responses to constraints and opportunities, influences opportunities for future development.

### 3.8.1 Housing

A significant component in positioning Katherine as a town that responds to growth opportunities will be suitable accommodation for residents attracted by that growth.

Katherine's current urban housing stock is predominantly single dwellings. Eighty four percent (84%) of the zoned land is within Zone SD (Single Dwelling Residential), 5% is within Zone MD (Multiple Dwelling Residential) and 1% is within Zone MR (Medium Density Residential).

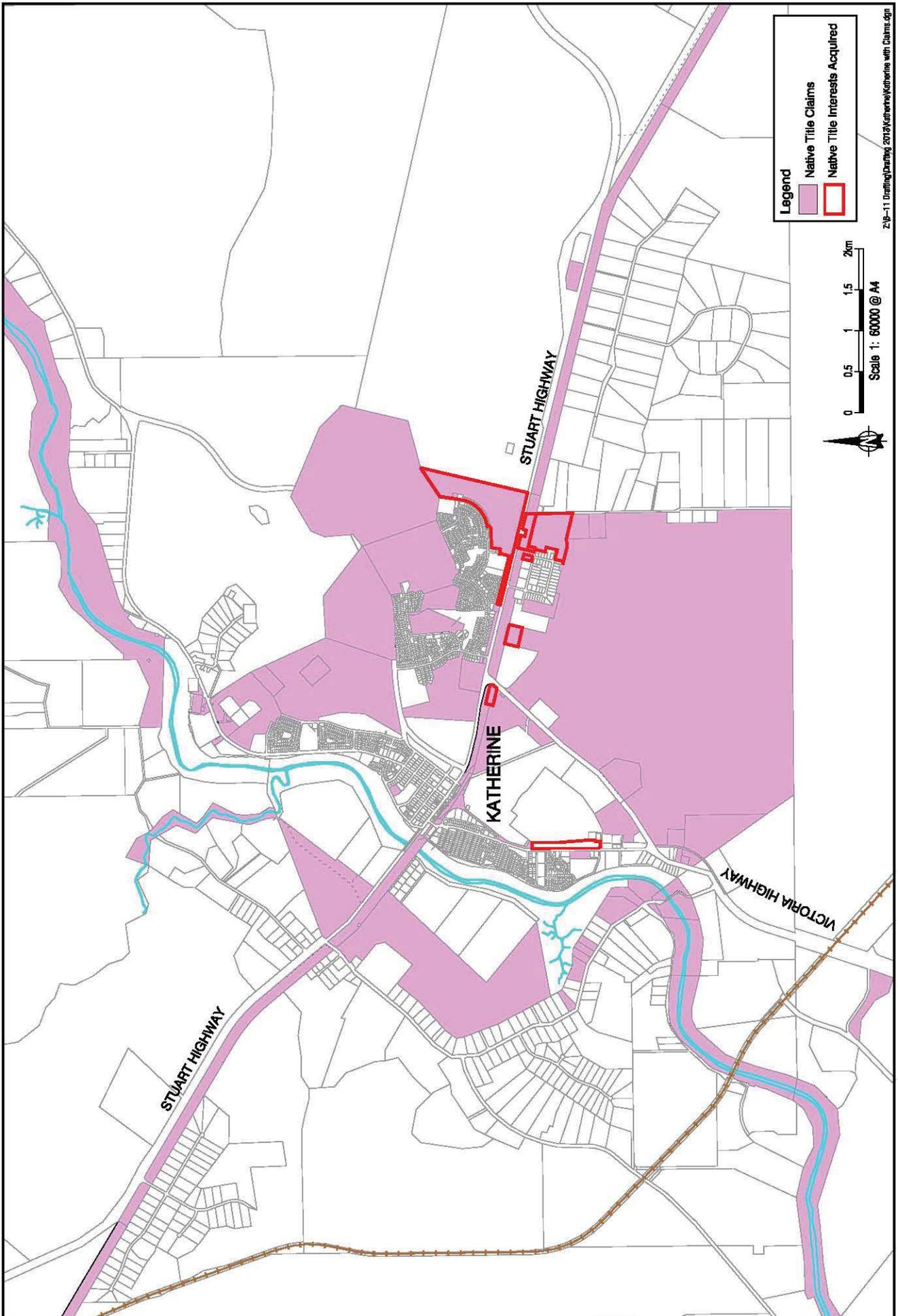


Demand is increasing for rural lifestyle lots and this demand is currently being met by the 10% of zoned land within Zone RL (Rural Living) and extensive areas within Zone R (Rural). There is no Zone RR (Rural Residential) in the Katherine area.

Changing demographics and workforce profiles, particularly the variety of family structures and sizes and the high incidence of short to medium term employment are generating demand for different types of housing.

Defence personnel stationed at RAAF Base Tindal are housed in Defence accommodation on the base or at Katherine East. Some families or members with partners choose to live on the base because of limited exposure to perceived adverse social issues while others prefer to live in the town due to proximity to civilian workplaces, shops and recreation areas. Although normal Defence policy is that single personnel live off base and receive a subsidy to assist with the cost of rent, many single personnel stationed at RAAF Base Tindal live in single accommodation on the base rather than in town. While the shortage of suitable unit accommodation in Katherine is one of the issues influencing this preference, the other consideration is the proximity of on base accommodation to the workplace.

Figure 14: Land Subject to Native Title Claim



The past decade has seen a marked increase in house prices in Katherine reflected in June quarter 2013 median price of \$365 000 for houses and \$259 000 for units. In comparison, in Darwin the median house price was \$612 000 and the unit price was \$464 000. Vacant residential lots in Katherine East are available for prices in the low \$100 000. Contrary to the local perception, data suggests the average price of constructing a house in Katherine in 2010 was \$270 000 which was 15% cheaper than the Northern Territory average (ABS 2010).

Information provided by stakeholders, which accords with demographic data, suggests:

- housing is available in Katherine but that it does not always meet the requirements of some specific sectors of the market
- unsatisfied demand is more apparent in the rental market than owner occupied
- a need for options for singles and aged people and for quality apartments
- demand for smaller rural lots than the 8 ha lots currently available.

An ongoing issue in Katherine is the undersupply of housing for transient residents including backpackers, temporary workers and visitors from the regions. Suitable temporary or short-term housing or other facilities are needed to provide appropriate accommodation.

The ABS revised the definition of homelessness for the 2012 census as a person who does not have suitable accommodation and their current living arrangements is in a dwelling that is inadequate or has no or short non-extendable tenure or does not allow control of or access to space for social relations<sup>1</sup>.

Estimates of homelessness based on this definition show that the rate of homelessness in Katherine is 1516 per 10 000 persons which is more than double the NT average rate and 30 times the national rate. The 2011 Census shows a total of 2702 homeless persons in the Katherine region. In addition to being higher than national rates the homelessness rate in Katherine is also more marked amongst the Indigenous community.

The Walpiri Transient Camp and Miali Brumby are town camps in Katherine which provide accommodation for transient Indigenous people. Three camps outside Katherine provide both permanent and temporary accommodation as well as cultural, recreational and social facilities.

### Implications for Land Use Planning

Existing residential and rural lifestyle zones within the NT Planning Scheme provide opportunities for the market to respond to changing demographics and provide a variety of residential accommodation.

The release of Crown land in Katherine East and the identification of a framework for future development will encourage developers to respond in both the short and medium terms to apparent demand and provide:

- additional medium density development to accommodate the increasing proportion of 'lone person households' and single Defence personnel
- appropriate accommodation for visitors and transient residents accessing short and medium term employment opportunities
- appropriate aged accommodation
- a range of appropriately service rural lifestyle lots
- opportunities for the Government, non-government, Indigenous and private sectors to respond to the significant unmet demand for social housing.

The likely increase in short and medium term employment associated with economic growth opportunities in the region, including future development at RAAF Base Tindal and various

<sup>1</sup> Auditor General for the Northern Territory, March 2013 Report to the Legislative Assembly, sourced for Census of Population and Housing 2011.

potential mining projects, create both a constraint and opportunity for residential development. While the potential demand may establish the economic viability of an appropriate short stay accommodation facility, if such a facility is not developed there will be increasing pressure on the rental market and existing short term accommodation in Katherine.

Although policy in relation to social housing is outside the scope of a land use plan, the identification of appropriate localities for future residential development will encourage increased market choice. This in turn has the potential to provide a context for consideration of approaches to address the demand for social housing.

An approach which has been implemented in Alice Springs may also assist in addressing these issues in Katherine. The Apmere Mwerre Visitor Park in Alice Springs caters for short term visitors and assists in addressing homelessness, overcrowding in town camps and a lack of visitor accommodation.

### 3.8.2 Commercial

The existing central business area in Katherine extends from Katherine Terrace to Fourth Street and supports a range of uses including retail, commercial offices, community facilities and tourist related uses and, increasingly, residential units serving both residents and visitors. Local convenience retailing is provided by local centres, one in Katherine East and others in association with tourist related facilities in various locations.

The location of the existing business area makes it readily accessible from all existing and potential future residential areas.



#### Implications for Land Use Planning

Although there are a number of challenges associated with the ongoing role of the existing business centre as the primary focus of business activity in Katherine there are also some benefits to maintaining its function as the primary activity centre for the town.

*Creating Places for People – an urban design protocol for Australian cities* is a collaborative commitment to best practice in urban design involving business, community and professional organisations and all three levels of Australian government. Although focused on capital cities, the protocol recognises that regional cities and towns, such as Katherine, can benefit from encouraging better urban planning and design. Key design principles relating to people and places include:

- enhancing the local economy, environment and community
- connected, both physically and socially
- diversity of options and experiences

- sustainable, enduring and resilient
- comfortable and welcoming
- vibrant, with people around
- feeling safe
- enjoyable and easy to walk and cycle around.

Within this context the existing centre has a role in fostering community cohesion, supporting economic development and generating the critical mass of business and patrons to support and contribute to the creation of a strong public realm and better urban environmental outcomes.



Challenges associated with the future development in the existing centre include flooding, the movement of heavy vehicles on Katherine Terrace (Stuart Highway) and the availability of convenient car parking.

In the longer term it is possible a heavy vehicle bypass will address issues associated with these vehicles on Katherine Terrace. In the short term, town centre or public realm design initiatives may assist in minimising the effects of heavy vehicle movement and also assist in addressing issues around convenient car parking.

It is recognised that engineering options to address the major issues of flooding impacting on commercial buildings are costly and this may contribute to underinvestment in retail in the centre. The Land Use Structure identifies a site in Katherine East adjacent to the Katherine Research Station for a neighbourhood centre to accommodate the current demand for retail. The Land Use Structure also identifies a site on Chambers Drive in the extension of Katherine East for a second commercial centre in the long term.

### 3.8.3 Industrial

Existing industrial development in Katherine is located at Katherine East, on Pearce Street and the Victoria Highway in Katherine South and in the Emungalan locality north of the river.



Future demand for industrial land is expected to be associated with continued activity in the transport and warehousing sector and the likely increase in mining services.

Undeveloped land within existing industrial zones at Katherine East, the Emungalan locality and adjacent to the Adelaide to Darwin Railway have potential for future development to meet demand for land for industrial purposes.

The older industrial areas in Katherine South are particularly susceptible to flood risk and, given the location of some of this land within the flood way (ie floodwater with a depth of more than 2 m), the potential for intensification of industrial activities in this locality is limited.

The Katherine East locality, which accommodates a range of industrial activities with a focus on smaller scale more intense activities, is on the fringes of the area inundated by the 1% AEP flood.

The proximity of the Emungalan industrial locality to interstate transport networks and the availability of larger sites have encouraged the development of transport and agribusiness activities. Much of this locality is outside the 1% AEP flood level but more intense development or expansion of industrial activities is constrained by the lack of service infrastructure. The land adjacent to the Katherine Rail Passenger Terminal and freight depot provides an option for a future supply of flood free and strategically located industrial land. The focus of the interest in this site is on the potential for development of an integrated transport hub to support ongoing growth and competitiveness of the both local and the wider region's mining, horticulture and agricultural sectors. This site is currently part of the Manbullo Pastoral Lease and development in the short term is constrained by both the need to acquire the land and any native title interests, and for extension of necessary service infrastructure.



### Implications for Land Use Planning

Much of the land within existing industrial zones in Katherine is constrained to varying degrees by flood risk, land tenure or lack of the necessary service infrastructure. However accessibility of these areas from major transport networks and their separation from potentially conflicting land uses suggest benefits to ongoing protection of potential for further industrial development. This is particularly the case given there are potential strategies which would address constraints.

Although the size of buildings within the Emungalan industrial area is currently constrained by the lack of a suitable water supply to meet fire fighting requirements, there is potential for provision of a reticulated supply to address these constraints. The need for reticulated water to serve existing industrial development at Emungalan is also a consideration in determining potential for expansion of industrial activities and for other land uses in this locality. An increase in number of users of a reticulated water supply would provide opportunities for cost sharing arrangements for the necessary extension and augmentation of the infrastructure.

While the fringes of the Katherine East industrial area are subject to risk of flooding, undeveloped or underutilised sites within this locality have the potential to accommodate more intense use. Although the extent of expansion of this area onto currently zoned industrial areas will require investigation of the engineering required to mitigate the risk of flooding, this locality has the potential to accommodate significant expansion in industrial development.

The Katherine East industrial area is well suited for general industry activities and should be protected for these uses. Non-industrial activities such as retail and offices should be encouraged to establish on appropriately zoned commercial land rather than on land within this and other industrial areas.

### 3.8.4 Agriculture and Horticulture

Katherine is surrounded by areas of good quality agricultural land including some of the best agricultural soils in the Northern Territory. This land supports the production of horticulture crops including mangoes, melons, citrus, and sandalwood, with emerging interest in cassava and bananas. Dryland cropping and cattle farming is also widespread in the area.

Production of mangoes in the Northern Territory is forecast to grow to supply approximately 80% of Australia's overall production in the coming years, on the back of increased investment, higher yields, and efficiencies in production. Future quarantine freedom designation around Katherine has the potential to minimise the logistics of export of mangoes to off shore markets.

Horticulture and agriculture contributed approximately \$144 million to the region's economy in 2011 – 2012 (DRD 2013). The growth and diversification of horticulture and agriculture in the area is important for sustaining agribusiness in Katherine and strengthening the region's competitiveness through increased investment in infrastructure and freight logistics.

### Implications for Land Use Planning

The potential for horticulture and agriculture to make an ongoing and increasing contribution to economic growth is an issue of particular importance in the Katherine region given the availability of land with a high capability for such development and water availability (through trading).

The challenge is the protection of potential for future agribusiness in the longer term within the context of pressure for rural lifestyle lots. This requires consideration of the capability of the land, the availability of water and the need for appropriate separation from encroaching potentially incompatible land uses. Such uses include rural lifestyle lots where future residents attracted to such lots because of the rural setting may be sensitive to agricultural activities

including crop spraying and the generation of dust, odours or machinery noise.

Identification of those areas with low agricultural capability, particularly when they have ready access to the urban areas, for rural lifestyle lots of varying sizes would minimise the potential for an ad hoc approach to rezoning for such development detrimentally impacting on future agribusiness development.

A further level of protection of the potential for agribusiness would be achieved through the identification of areas particularly suited to intense horticulture and introduction of Zone H (Horticulture). More specific site appraisal will be required to define boundaries of land that should be protected for future horticulture purposes. Investigations will also be required to establish reasonable and effective buffers where incompatible uses adjoin (e.g. RAAF Base Tindal).

### **3.8.5 Community Facilities**

As an important regional centre in the Northern Territory, Katherine has, and will continue to have, a role in providing a range of community facilities and services to residents and visitors to both the town and the broader region. There are a range of education, health, and community services including crisis and counselling, family and child care, housing, income support, rehabilitation and general support and welfare services.

The education needs of primary and secondary students in the town are met at five primary schools two high schools and a special school. These facilities, with the exception of the special school, have the capacity to accommodate growth or expand to cater for significant population growth. The potential expansion of the Kintore Street School to cater for middle and senior students is constrained by the existing site.

In addition to education facilities catering for residents of the town, Katherine School of the Air provides distance education services and the Katherine Group School Office services 13 remote schools across the broader region.

The Katherine Campus of the Charles Darwin University (CDU) consists of the Katherine Rural and the Katherine Town Centre campuses. The rural campus encompasses a working cattle property and is used for agricultural related training. The role of the facility has recently been expanded and it now offers alternate training options including Community Services, Conservation and Land Management, Trades Training, Civil Construction, Business, Horticulture and Sport and Recreation. The CDU Katherine Town Centre campus is a major hub for higher education and Vocational Education students located in Katherine.

The Katherine Hospital has a total of 60 overnight beds and provides a comprehensive range of clinical, diagnostic and support services including 24 hour accident and emergency care, obstetrics and gynaecology, general surgical, medical and paediatric care, elective surgery, renal dialysis and other health services. Renovations to Katherine Hospital Emergency Department were completed in 2011 and a partnership between Flinders University and the Northern Territory Government will see construction of a new building for training purposes on the hospital site. Plans are progressing for a renal facility on Casuarina Street and investigations are continuing in relation to a 50 bed alcohol assessment and treatment facility.

The Wurli-Wurlinjang Health Service, an Aboriginal Community Controlled Health Organisation, provides holistic health services to Indigenous clients and visitors living in and around Katherine. A wide range of effective, culturally appropriate health care services are provided to over 4 500 Indigenous residents of communities in the Katherine area and an additional 7 000 Indigenous people who live in over 25 remote communities in the region are counted as occasional clients. The headquarters of the Wurli-Wurlinjang Health Service is on Third Street but a number of services and programs operate from separate clinics in various locations around Katherine.

The Police Fire and Emergency Complex in Katherine East, established in the late 1980s, recognised the benefits of collocation of these services. Growth of each of these services to meet increasing demands associated with growth in the town and the region means that the existing complex no longer adequately accommodates these services. As the capacity of the site to accommodate future growth is limited a review of options to accommodate these services and the St John Ambulance Service is currently located within the 1% AEP flood level, is required.

### Implications for Land Use Planning

Although facilities at the existing Katherine Hospital are sufficient to meet immediate and short term future needs, they suffer from the historical drawback of being located on the flood plain. Options to deal with the flooding at the hospital include relocation of the facility or construction of a levee to prevent flooding of the hospital and/or the whole or part of the town.

Identification of a site for a new health precinct in Katherine East will provide for future construction of a range of facilities including a hospital, incorporating emergency and acute care facilities, and ancillary medical services in the event future investigations establish that flood protection of the existing facility is not feasible. A site of a similar size (10.6 ha) to the existing hospital would be required.

Future detailed planning for urban expansion at Katherine East will provide an appropriate site for the future relocation of the Kintore Street Special School above the 1% AEP to enable construction of an expanded facility.

The availability of land adjacent to the existing Wurli-Wurlinjang facilities on Third Street would provide the cost effective opportunity to consolidate existing and proposed services in a single location. The central location will provides readily accessible services to the Aboriginal people of Katherine and those who visit from the broader region. An appropriate design response will be required for further development to minimise the risk of flooding.

Requirements for facilities to accommodate continued growth in police, fire, emergency and ambulance service will be informed by detailed analysis of potential for future growth, rationalisation of existing facilities and integration of a future complex with existing activities.

## 4. REFERENCES

- Australian Bureau of Statistics 2010, *National Regional Profile NT 2006-2010*, ABS, Canberra.
- Australian Bureau of Statistics 2011, *Basic Community Profile Katherine LGA, Table B44: Industry and Employment by Occupation*, ABS, Canberra
- Australian Bureau of Statistics 2013, *Population Estimates by Local Government Area, Table 7*, cat no. 3108.0, ABS, Canberra.
- Council of Australian Governments 2011, *National Strategy for Disaster Resilience*, Commonwealth of Australia, COAG, Canberra.
- Department of Infrastructure and Regional Development 2011, *Creating Places for People: An urban design protocol for Australian cities*, Commonwealth Department of Infrastructure and Regional Development, Canberra.
- Department of Natural Resources, Environment, The Arts and Sport 2009, *Water Allocation Plan for the Tindall Limestone Aquifer(Katherine) 2009-2019*, NT Government, Darwin.
- Department of Natural Resources, Environment, The Arts and Sport 2000, *Katherine Flood Study*, Nt Government, Palmerston.
- Department of Natural Resources, Environment, The Arts and Sport 2012, *Draft Water Allocation Plan for the Ooloo Aquifer*, NT Government, Darwin.
- Department of Regional Development 2013, *Katherine Region Economic Profile*, NT Government, Darwin.
- Karp, D. 2002, *Land Degradation Associated with Sinkhole Development in the Katherine Region, Technical Report No 11*, Department of Infrastructure, Planning and Environment, NT Government, Darwin.
- Tourism NT 2013, *NT Tourism Vision 2020: Northern Territory's Strategy for Growth*, NT Government, Alice Springs.