REEL PLANNING
URBAN AND RURAL STRATEGIES

# LAKELAND LOCAL AREA PLAN

## BACKGROUND REPORT

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COOK SHIRE COUNCIL

**AUGUST 2017**

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# 1 INTRODUCTION

The community of Lakeland is experiencing unprecedented growth due to the expansion of the primary industry sector in recent years. A large and seasonal workforce is placing a significant demand on existing housing and the growth in the agricultural sector is expected to continue, particularly if an irrigated water supply is secured.

Services and infrastructure in the town, while just able to support the current population, will be in need of substantial upgrade and improvement to accommodate the expected population growth to meet the future needs of Lakeland, in its evolving role as a strategic agricultural service centre. Lakeland is also well placed to capitalise on its strategic location at the corner of the Mulligan Highway and the Peninsula Development Road with the expected influx of tourists to Cape York following the sealing of the Peninsula Development Road within the next 5 years.

A summary of an engineering investigation into services and infrastructure issues for Lakeland has been commissioned by Cook Shire Council as part of this local area planning process. It was undertaken by PDR SMEC Engineers and a summary is included at Section 6 of this report. The PDR report is attached in Appendix A in full.

The expansion of the urban area of Lakeland is constrained by good quality agricultural land, the major roads that run through the town and a drainage system to the west of the town. The existing town planning context established through the 2017 Cook Shire Planning Scheme identifies strategic growth options that need to be evaluated in light of these constraints and servicing options available.

This background report acknowledges the history of Lakeland and the importance of the agricultural and pastoral industries to its existence. A brief overview of the township today demonstrates the continuing role that agriculture and grazing plays in the employment of local residents.

A community meeting was held in May 2017 to discuss the opportunities and challenges for Lakeland and its growth, and the feedback has been incorporated into this document and the associated plans to the extent possible.

A draft outline of the preferred land use plan for the town is explained in Section 6. The plan identifies areas for residential expansion, consolidation of industry and commercial uses, and opportunities for short term accommodation such as housing for seasonal workers, RV parking and caravan parks.

Conceptual plans are provided showing proposed walkways and green connections through the town, as well as future road connections within the future residential expansion areas.

# 2 BACKGROUND

## 2.1 History of Lakeland

The Western Yalanji people are the first known inhabitants of Lakeland.

In the late 19th and early 20th centuries, William Lakeland was one of the earliest known explorers of the Cape York Peninsula, having an interest in prospecting, mining, gold and cattle grazing. Lakeland is named after him.

The earliest white population settled in Lakeland following the Palmer Goldrush in the late 1800s and Butcher's Hill, a large cattle property, was established to supply meat to the new population. The families of Butcher's Hill helped to found the cattle industry of Cape York.

The Butcher's Hill cattle property was purchased by a mining magnate named Clive Foyster in 1968. Clive had visions of developing Lakeland Downs, as it was then known, into a dryland and irrigated grain cropping production, integrated with cattle grazing. At its peak, in conjunction with farming, it is understood to have grazed 10,000 head of beef cattle.

Lakeland Downs evolved into a small town which housed a population of approximately 200 people, many of whom were employed in the grain storage industry and the port at Archer Point. A school was constructed by the Queensland Government.

The grain and cattle production experienced a number of big wet seasons, poor access and logistical constraints associated with the Archer Point Port. This led to financial difficulties that saw the Lakeland Downs company liquidated in 1974.

Lakeland Downs was purchased by Cyril Anderson, and GWA Pastoral was established to continue the farming operations. Grain production was again the focus for the property, however with low prices brought a change in direction for the property towards higher value crops such as peanuts, rice, sorghum, maize, bananas, pawpaw, passionfruit and coffee.

Vegetable crops were attempted in the late 1970s, however marketing challenges and conditions brought this attempt to an end fairly soon after it started.

In the 1980s, Lakeland Downs was sold in the form of freehold farms averaging about 400 hectares. Diversified cropping was undertaken and some farmers took an interest in developing teak, African mahogany and sandalwood plantations.

The population of the township remained stable, supporting the surrounding agricultural and cattle grazing industries. Its strategic location at the intersection of the Mulligan Highway and the Peninsula Development Road provided a base for workers undertaking the sealing of the Peninsula Development Road.

## 2.2 Snapshot of Lakeland Today

Lakeland today is still largely an agricultural town, with a focus on dryland production and, more recently, a focus on intensive banana production. There is still a lot of beef cattle grazing on Lakeland Downs which is expected to continue given the nature of the country.

The town is also a stop for many tourists on the way to Weipa and the Cape.

### Location

Lakeland is situated approximately 80 kilometres south west of Cooktown, in far North Queensland. It is located at the junction of the Mulligan Highway and Peninsula Developmental Road.

### Government

Lakeland is within the Cook Shire Local Government Area boundary, and is within the State electorate of Cook.

### Population

There are approximately 140 residents within 10km of town centre and an estimated 180 transient workers residing in and around Lakeland.

### Transport

There is no public transport in Lakeland. All transport and travel is by private vehicle although there is however private shuttle bus services transporting workers on the farms surrounding Lakeland to and from their accommodation.

The town is frequented by travellers and truck drivers who use Lakeland as a stopover point, using the local roadhouse or staying at the caravan park or motel.

### Culture

The Western Yalanji people are the original inhabitants of the Lakeland locality. White settlement occurred in the late 1800s, and the population today comprises less than 4% Aboriginal or Torres Strait Islander people (ABS, 2011).

The European culture of Lakeland is linked to the town's historic service centre role anchored by the road house and pub which are quintessential northern Australian features of the town, mixed with the more recent transient worker population, bringing a mix of cultures from across the world and around Australia.

### Functions

The primary function of Lakeland is as a rural industry centre, with fertile soils and successful cropping operations and widespread cattle grazing in the district. Intensive banana production has been established in response to the devastation experienced during Cyclones Yasi and Larry, both of which had serious short term adverse impacts on the banana industry around Innisfail and Tully. Lakeland is in part protected from the full impact of cyclones due to the mountain range to the east along the coast. It is also free of disease found elsewhere and is seen as a safe option for developing and growing high value crops.

The other function of Lakeland is as a stopover for tourists and truck drivers, as they travel between Cairns and the remote northern areas of Queensland. The town incorporates approximately ten businesses, including a roadhouse, hotel, caravan park and other accommodation, coffee shop/ convenience store and a fuel station.

### Industry

The agricultural area of Lakeland comprises one of the largest areas of more fertile cropping soils (and coincidentally the higher water storage soils) within Cook Shire.

While dryland farming, including corn, sorghum and peanuts, has been an integral part of the agricultural history of Lakeland, in recent years the investment in banana crops has been substantial.

There are ten horticultural producers in the area and seven graziers within 20 kilometres of the town centre (Lakeland Progress Association, 28 April 2017). There is significant opportunity for expansion of the agricultural sector around Lakeland subject to securing an irrigated water supply. Investigations into water resource options are currently underway.

Grazing of cattle is also a significant industry in the Lakeland area.

Conergy is currently constructing a large solar farm on 23 hectares immediately to the east of the town, across the Mulligan Highway. When commissioned, the Lakeland solar and storage project, will produce enough electricity to power more than 3000 homes. It will connect to Ergon's existing substation, one of the most National Electricity Market substations in Australia. Windlab and Lyon are in the concept phases of a wind farm and second solar farm, which is expected to be larger than the Conergy farm.

There is the potential for future investment in post-harvest infrastructure such as packing facilities.

### Infrastructure

The town of Lakeland is generally lacking in service infrastructure such as a sufficient town water supply and a sewerage treatment plant which are necessary to facilitate the expansion of the town. Currently, residential and commercial lots are serviced by onsite private sewerage treatment facilities. A town reservoir powered by generators provides water to the dwellings and business but it is close to capacity.

Large scale irrigation for the cropping and grazing industries is a high priority and there are initiatives underway to attract investment in, or funding for, irrigation infrastructure and programs.

The town is serviced by one school. There are no recreation facilities outside of the school, nor is there a place of worship or a cemetery. There is a sports and recreation reserve opposite the Roadhouse that is proposed to be improved to meet the needs of the community.

### Land Tenure

Lakeland comprises an extensive freehold area with significant scale agricultural and grazing holdings on lots of between 100 and 1000 hectares in size. A large proportion of this freehold land surrounding the town is high value agricultural land.

The expansion of the town is reliant on the landowners engaging with the process and agreeing to offer their land on the periphery of the town for future development.

## 2.3 Demographic Analysis

This Section of the report focuses on analysing the demographics of Lakeland and the socio-economic characteristics and trends of the region. Data was extracted from the results of the *2011 ABS Population and Household Census* to assist in this process, and the results are as follows.

The population of Lakeland has increased steadily, albeit minimally, between 2006 and the latest ABS published population estimate for 2011. As shown in the Table below, in 2006 the population who identified Lakeland as the Place of Usual Residence (including visitors) was 215 persons. The same population number 227 by 2011.

**Table 1 Place of Usual Residence and Household Size**

| | 2006 | 2010 | 2011 |
|---|---|---|---|
| **Lakeland** | | | |
| *Place of Usual Residence (Total*)* | 215 | 225 | 227 |
| *Average Household Size* | - | - | 2.2 |

*Source: ABS 2011, *Includes visitor numbers*

According to the latest population projections prepared for Cape York SA2 by the Queensland Government Statistician's Office (QGSO), the population is projected to increase at a rate of approximately 0.62% per year over 25 years. This rate has been applied to the population figures from the 2011 ABS report, indicating that the population will grow by less than 100 persons between 2011 and 2036, as shown below:

**Table 2 Estimate Resident Population**

| | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 |
|---|---|---|---|---|---|---|
| **Lakeland** | | | | | | |
| *Estimated Resident Population* | 227 | 233 | 240 | 248 | 255 | 263 |

*Source: ABS 2011, Reel Planning*

The QGSO projections are only prepared for the total Shire and not for the smaller localities. The anecdotal evidence suggests that the population growth rate in Lakeland will far exceed the projections, particularly as the population is heavily influenced by seasonal workers and meeting the needs of tourists as they pass through the town.

### Type of Housing

The Dwelling Structure of Lakeland consists of mainly occupied private dwellings, with detached housing making up the majority of the count, whilst other dwelling types, inclusive of caravans, cabins or houseboats make up the rest. All together in 2011 the Total Amount of Private Dwellings was 69.

**Table 3 Lakeland – Structure of Occupied Dwellings**

| Structure of Occupied Dwellings (%) | Lakeland | Queensland |
|---|---|---|
| Separate house | 83.6% | 78.4% |
| Semi-detached row/terrace/townhouse | 0 | 8.4% |
| Flat/unit | 0 | 11.7% |
| Other Dwelling | 16.4% | 1.3% |
| *Total* | *100%* | *100%* |

*Source: ABS 2011 Census*

Of the occupied private dwellings 46.8% were owned outright whilst 14.5% were owned with a mortgage with 17.7% of the total being rented.

### Age Structure

The Age Structure of Lakeland does not differ too dramatically from the rest of Queensland. Within Lakeland children aged 0-14 made up 11.5% of the population and 8.8% consisted of persons aged 65 years and older. The Median Age within Lakeland is 37 which is only one year older than the Median Age across Queensland. As noted earlier, the Median Age of the Indigenous community in 2011 was 44 years of age.

### Family Type

The household family composition of the Lakeland area shows that there is a slight difference between couple families with children and couple families without children. 54.8% of families comprise of couples with children, whilst 45.2% comprise couples without children. The table below shows these statistics in comparison with the rest of Queensland.

**Table 4 Family Composition, 2011**

| Family Composition | Lakeland | Queensland |
|---|---|---|
| Couple with Children (%) | 54.8% | 39.5% |
| Couple without Children (%) | 45.2% | 42.8% |
| *Total* | 100% | 82.3% |

*Source: ABS 2011 Census*

**Table 5 Median Rent and Mortgage Repayments, 2011**

| | Lakeland | Queensland |
|---|---|---|
| Median Rent ($/week) | $50 | $220 |
| Median Mortgage Repayment ($/month) | $355 | $1,733 |

*Source: ABS 2011 Population & Household Census*

### Income

At the time of the 2011 Census, Lakeland households had a median total personal income almost similar to the Queensland median income, and the median total household income was almost half the Queensland median. The significant difference may be attributed to the type of employment available in Lakeland, being manual labour as opposed to professional occupations.

**Table 6 Median Personal and Household Income, 2011**

| | Lakeland | Queensland |
|---|---|---|
| Median Total Personal Income ($/week) | $514 | $587 |
| Median Total Household Income ($/week) | $768 | $1,235 |

*Source: ABS 2011 Population & Household Census*

### Education

At the time of the 2011 Census, the education status in Lakeland comprised 21.1% of people attending an education institution, including 12.2% in primary school and 8.2% in secondary school.

### Mobility

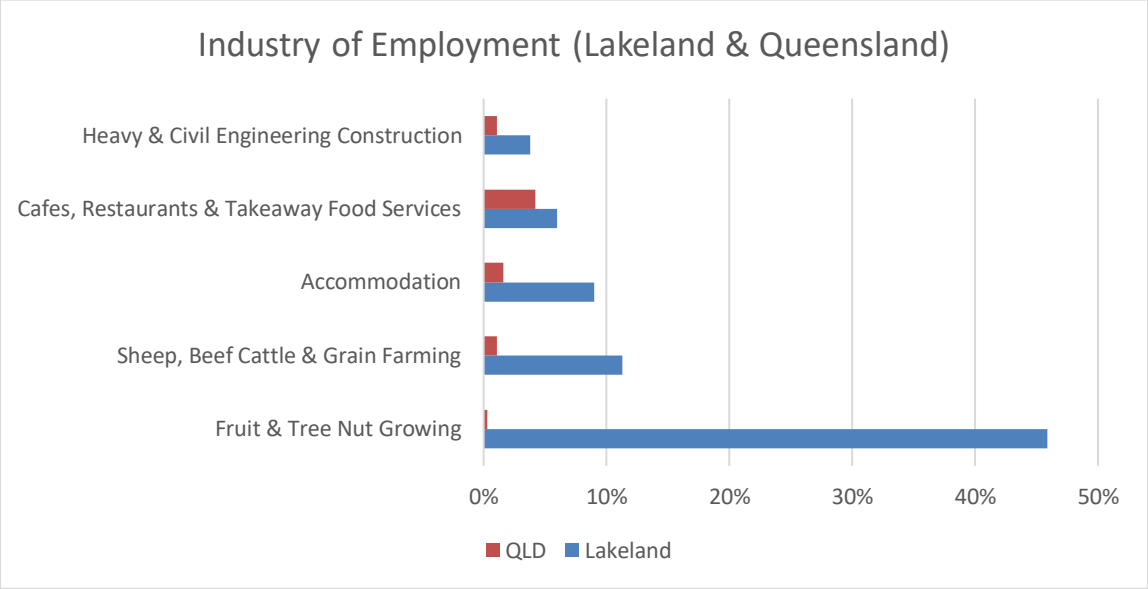
At the time of the 2011 Census, less than 5% of households had no motor vehicle, highlights the reliance on motor vehicle for travel in and around Lakeland to places of employment and other shopping and essential facilities. A quarter of households had 1 and 2 vehicles, and over a quarter had 3 or more vehicles, further highlighting the need to own or have access to motor vehicles.

## 2.4 Employment Analysis

Lakeland's employment trends at the time of the 2011 Census data show a total workforce of 136 people, of which 117 worked full time (86% of the population), while 14 people worked part time (10.3% of the population). The unemployment rate was 3.7%.

The profile of industries of employment highlights the significant role cropping and plantations play in Lakeland, with over 45% of employed people working in this industry.

**Figure 1 Industry of Employment - Lakeland and Queensland, 2011**




*Source: 2011 ABS Household and Population Census*

A further telling statistics about the composition of Lakeland is the high percentage of labourers, being 38.6% of employed people over the age of 15, compared to 10.6% in Queensland.

**Table 7 Employment by Occupation**

| | Lakeland (%) | Queensland (%) |
|---|---|---|
| Labourers | 38.6 | 10.6 |
| Managers | 23.5 | 12 |
| Machinery Operators and Drivers | 9.8 | 7.3 |
| Clerical and Administrative Workers | 7.6 | 14.7 |
| Sales Workers | 6.8 | 9.8 |
| Technicians and Trades Workers | 3.8 | 14.9 |
| Community and Personal Service Workers | 3.8 | 10.0 |
| Professionals | 3.0 | 18.9 |

*Source: ABS 2011 Census*

Managers and machinery operators and drivers are the next highest category of occupation, reflecting the type of agricultural industry that is prominent in Lakeland.

## 2.5 Role & Function

Lakeland is primarily a rural support industry town, with a secondary purpose as a tourist stop for travellers on their way to Cooktown and Cape York. The town is expected to experience higher tourist numbers in coming years as a result of Peninsula Developmental Road being sealed and allowing for access through to the Cape and remote areas of Queensland.

The town provides basic services, such as food and fuel, for residents, tourists and the surrounding rural properties. Residential uses are the primary land use in the town, with agricultural and other non-residential uses being located on the periphery of town or out of the township entirely.

The town can only partly respond to a high and constant demand for worker's accommodation, for either permanent and seasonal workers who are employed on banana farms or construction workers who are involved in the various major infrastructure projects.

# 3 TOWN PLANNING CONTEXT

## 3.1 Overview

The statutory planning context applicable to Lakeland is found in the Cape York Regional Plan and the Cook Shire Planning Scheme 2017. The Cook Shire Planning Scheme incorporates matters of State and regional interests.

## 3.2 Regional Interests

The Cape York Regional Plan (CYRP) is about striking the right balance between facilitating sustainable economic development opportunities and protecting Cape York's regionally important environmental areas. It is a key priority of the State government.

It is important to note that Lakeland is well removed from the mapped Strategic Environmental Areas.

The plan specifically provides policy direction with respect to:

1. Economic development including agriculture and the resources sector
2. Protection of significant environmental areas
3. The growth potential of the region's towns

Lakeland is identified as the only Priority Agricultural Area on Cape York. The Regional Plan seeks to protect the region's existing strategic agricultural area containing highly productive agricultural land uses.

Criteria are established in the CYRP to facilitate the co-existence of compatible resource activities with high value agricultural land uses. This is to enable opportunities for economic diversity - to ensure that Cape York develops as a resilient and prosperous region.

The Lakeland district is not under threat from competing resource activities.

Priority Living Areas provide certainty for towns in the region to grow in a manner not encumbered by the intrusion of resource activities. Included in Appendix B is the mapped Priority Living Area surrounding Lakeland.

The CYRP recognises that the agricultural industry plays an important role in the existing Cape York economy, supporting communities throughout the region. QLD's growing demand for food production means there are opportunities to build on the existing agricultural (particularly pastoral and horticultural) industries around Lakeland. The CYRP also sees opportunities for specialised products and niche marketing and local/regional branding for low weight, high-value products. Early season cropping on the Cape ensures crops ripen before their southern counterparts, providing a window of opportunity at the beginning of each season.

While the Regional Plan notes that small - scale horticulture occurs around Lakeland Downs with a focus on bananas, sorghum, melons and a range of tropical fruits. It acknowledges that as demand for the range of agricultural products and food increases the agricultural industries will make an important contribution to the growing economy on a local and regional scale.

There is a further acknowledgement in the plan that agricultural sector expansion, particularly in the southern area of the region around Lakeland Downs, will require reliable access to water and expansion of support services including transport and administrative services to meet the economic and social

needs of the region. The Lakeland district is identified as a Priority Agricultural Area in the CYRP. Refer to Appendix B for details.

The expansion of Lakeland as an agricultural services centre is consistent with the following CYRP policy objectives:

**Regional Policy 1:**
***Provide for economic opportunities and appropriate development by facilitating opportunities for land uses that contribute to diverse economic and employment opportunities in the region.***

**Regional Policy 4:**
***Protect Priority Agricultural Land Uses within Priority Agricultural Areas***

**Regional Policy 6:**
***Safeguard the areas required for the growth of towns through establishment of Priority Living Areas***

The sparseness of the region's population and the distance between communities in the region has resulted in relatively limited water supply infrastructure for communities and industry. Priority outcomes for water include improving the security and reliability of community water supplies in the region and their preparedness for future industry and population growth.

The CYRP seeks to achieve well informed planning as being necessary to ensure that the delivery of services and the release of land for development is responsive to the needs of these growing communities and is delivered in a timely and cost-effective manner.

Maintaining the liveability of the region's communities through the availability of affordable and diverse accommodation will also provide the opportunity to ensure that towns in the region attract and retain a higher proportion of workers and their families as permanent residents. The CYRP says this will have flow-on benefits for social and economic resilience and community vibrancy.

The orderly growth and development of Lakeland in response to the needs of the agricultural sector is entirely consistent with the outcomes sought by the CYRP.

## 3.3 Cook Shire Planning Scheme 2017

The Strategic framework of the Planning Scheme acknowledges the potential for population growth in Cook Shire in light of major regional and sub-regional economic development initiatives. It also sees the housing shortage in Lakeland as a key planning challenge that needs to be addressed.

In the discussion on Economic well-being of the Cook Shire, the importance of Lakeland to the economy of the Shire is acknowledged with key farming and grazing industries based on good quality agricultural land and good access to markets. Limitations with respect to water supply are noted.

It recognises the important role that Lakeland plays in the economy - cropping is well developed with an unusually high proportion of freehold land (compared to other areas of the Cape) on high quality fertile soils but with limited access to irrigation.

The following Strategic Outcome is identified in the Planning Scheme:

> *"Cook Shire's finite supply of agricultural land around Lakeland is protected from fragmentation and alienation. Development and investment that increases food production capability, improves food security and achieves value-add opportunities will be supported."*

In terms of the land use pattern, the Strategic Framework identifies that the key issues for Lakeland is the supply of residential and worker accommodation, town water and sewerage and irrigation sources.

There is a Specific Outcome targeting Lakeland which sees the promotion of development that reinforces Lakelands role as an Agri-business centre in close proximity to major agricultural production.

The town of Lakeland is included in the Township Zone under the Planning Scheme which contemplates a range of uses occurring to meet the needs of the community. The extent of this zone reflects the physical extent of the existing town. Surrounding the town land is included in the Community Facility Zone (the school, the sport and recreation reserve and the major open space area on Perfume Gully) and the Rural Zone. A copy of the zoning map is included in Appendix C.

Overlay Map OM6.4 is the planned growth areas for Lakeland under the Planning Scheme that is being reviewed as part of this planning project. The overlay mapping has been carried forward from the superseded planning scheme, and is included in Appendix C.

Finally Overlay Map OM8.5 is the Rural Land Use Overlay which sows the State mapping of good quality agricultural land around Lakeland. The overlay map is included in Appendix C.

The 2017 Cook Shire Planning Scheme contemplates the expansion of Lakeland to support the agricultural industry. This planning project looks at the preferred growth outcomes for the town and servicing needs.

# 4 CHALLENGES

## 4.1 Issues

Lakeland faces many issues which will pose a challenge to its expansion and future growth.

The two primary issues are interrelated, being a lack of accommodation for agricultural labour supply, new residents and tourists, and a lack of critical infrastructure, particularly water and sewerage, to support existing and new development. While there is a shortage of accommodation options, there is a reluctance to develop vacant land due to the costs of providing infrastructure, however if the infrastructure was provided, the accommodation would be more readily developed.

Further to the infrastructure limitations, expansion of commercial cropping is constrained by the limited amount of land with access to irrigation. Farming and grazing is a significant contributor to the Shire and regional economy and irrigation is an important factor to facilitate further growth and development.

In addition, Butcher's Hill quarry has been a good source of material for road projects and for the building and construction industry.

The developable land in proximity to the township is not zoned appropriately and in part this inhibits the growth of the town. Appropriate zoning and a commitment to infrastructure planning and its implementation, will facilitate development and investment in the town and the surrounding area. In particular, by designating land for industrial development and providing for the orderly residential expansion of Lakeland, this will establish the right framework and provide an incentive for future growth and development to occur.

## 4.2 Opportunities

The town of Lakeland, in particular its position and relative underdeveloped nature, presents an opportunity to create a plan that fosters the right sequence of growth and creates relationships between improving infrastructure, providing more and specific housing types to meet the needs of agricultural sector, increasing employment and attracting a variety of services.

The location of the town at a junction of two major highways with ample vacant land surrounding it, provides the opportunity for the town to be consolidated around its existing boundaries. Any uses that may have a negative amenity impact or frustrate the orderly development of the town can be located close to, but out of town, or on the southern side of the Peninsula Developmental Road.

The highways will be instrumental in directing tourists and freight transport companies to the town for goods and services, and there is the opportunity to increase and improve accommodation options for permanent and seasonal workers associated with the agricultural sector and tourists.

A plan for the future growth of Lakeland will protect high value agricultural and cropping land, and will avoid subdivision and non-complementary uses on agricultural land.

## 5 CONSULTATION OUTCOMES

Appendix D contains a register of community meeting attendees.

The outcomes from the initial community meeting on 4 May 2017, included the following:

| *Comment* | *Response* |
|---|---|
| The need for more housing blocks that are varied in size inclusive of lifestyle blocks (being 6-8 hectares) | Residential expansion areas are proposed in the draft plan, and would be zoned to facilitate residential development. The 2017 Cook Shire Planning Scheme makes provision for residential lifestyle blocks subject to meeting certain criteria. |
| The need for industrial blocks with reasonable access to main roads | It is proposed to retain light and service industries within the township, and locate heavy / high impact industries to the west of the town at the intersection of PDR and Honey Dam Road. |
| Growth is dependent on water – locals are concerned about what is available, especially with the possibility of additional people moving to Lakeland | The preliminary engineering investigations indicate that significant upgrades to existing infrastructure will be required to provide appropriate water supply to a growing population. |
| Concern over current issues of roads, pipes, drainage, re-sealing. | The preliminary engineering investigations indicate that upgrades will be required for roads and stormwater drainage. |
| Waste management is an issue, particularly as it relates to farms and lack of an operational waste management plan | Waste management has not been considered in the conceptual phases of this plan. |
| Concern about the type of development if land is subdivided | The planning scheme is designed to regulate and manage the type of development that occurs on land, and it is important that this draft local plan reflects the intent for the future of Lakeland. |
| Need for another caravan park to accommodate travellers | A potential site for a caravan park / short term accommodation has been proposed on the southern side of the PDR. |
| Workers accommodation located closer to town would have been more beneficial to the services in town | Additional workers accommodation facility is currently proposed on the southern side of the PDR. It is the right location in terms of being “bolted on” to the town without adversely impacting on the orderly long term growth of Lakeland. |
| Can tourists be ‘fitted’ in around the workers accommodation | Additional facilities for tourists, including RV parking and a caravan park have been provided for in the conceptual plans for Lakeland.<br>Use of workers accommodation for tourists would be considered on a case by case basis. |
| Need to encourage tourists who are passing through the town to stay for longer – tourist attractions, areas suitable for extended stays and a variety of vehicles | Additional facilities for tourists, including RV parking and a caravan park have been provided for in the draft conceptual plans for Lakeland. This will rely on private property owners to embrace the opportunity. |
| Drop off point for chemical toilets is required, in turn encouraging Lakeland as a stop off point for travellers | A proposed wastewater dump point is a priority outcome for this planning exercise. |
| | |

| | |
|---|---|
| Need a place of worships, cemetery | Land at the junction of Dawson Drive and Mulligan Highway is being considered as an appropriate location for a cemetery and place of worship. This is outside the urban area of Lakeland. |
| Wash down bay to be an information point for benefits and services available in Lakeland (road conditions, truck stop etc) | Wash down bay is expected to be removed from Lakeland. The road house or proposed tourist information centre – preferably located within Lakeland rather than on the edge of the town - will be a point of contact for travellers. |
| Cost of developing land is higher than elsewhere due to location and lack of services | Through this planning exercise, it is expected that where more appropriate land is designated for urban expansion and infrastructure is made available, investment will follow. |
| Attract variety of services such as medical, police, etc | These facilities will only come to Lakeland when population thresholds warrant it. Sufficient land is available for business and services to locate within the centre of the town. |
| Issues with accommodation for solar farm development – hotel is booked out for weeks; water supply also an issue. | Additional workers accommodation and provision of land for more short term accommodation may alleviate the situation. Infrastructure studies are a short term recommendation of this plan. |
| Retain the area of land between the house blocks behind the community hall for the Lakeland children to access the existing play ground and utilise it for future play activities, including maybe a bike park. Area may need to be fenced off to stop any vehicles entering the area. | A recreation / open space area has been proposed through and to the west of the established residential area. |
| Find suitable area close to town, maybe council land for locals to store excess equipment like containers and other items which are currently parked in house yards | A number of lots are proposed for light and service industry within the town. It is not Council's responsibility to set up private storage on public land. |
| Plan for suitable footpaths and street lighting in town and leading to the north, south and west to keep all pedestrians safe, they are all currently walking and running on the main road | A conceptual master plan has been drafted for comment, and its implementation will aim to improve pedestrian safety. |
| Include the corner on Dawson Drive and Mulligan Highway in the planning scheme, we would prefer not to see any heavy industrial zoning. We would like to keep if for a possible church site and cemetery and maybe housing and motel, council could apply for road closure of the current adjoining road reserve and the land could be used for some other community benefits. As the alternative energy projects are finalised maybe there could be an information place established for all the tourists and the area north of our current parcel of land could be utilised for the site including plenty of parking. Maybe the current developers of the alternative energy projects would support the council financially to set up the site. We think it would be nice to see it beautified to make a welcome statement approaching from the north and a nice goodbye feeling leaving Lakeland. | This comment has been taken into consideration in previous responses. |

| | |
|---|---|
| We would like to keep in mind that Lakeland could be promoted as the greenest town in Australia, especially if the dam would go ahead and it is proposed all the power required to pump the water would be generated by two turbines and the water would be gravity fed to most properties and could even be gravity fed to the Laura community. | This comment is noted and can be further incorporated into the plan as policy statements. |
| Turn Perfume Gully into a nice park for tourists and locals | A proposed open space / recreation area has been identified on the conceptual plans in the area of Perfume Gully. |

The following issues were raised during the second community meeting on 10 August 2017, and will be considered during the public notification phase of the project:

| ***Comment*** |
|---|
| Proposed pathway and crossing - sight-lines along Mulligan Highway problematic |
| Intersection (Mulligan Highway and Peninsular Development Road) sight-lines problematic |
| Funding application going in (closes in 5 days) to put welcome sign on Sport and Recreation Reserve. |
| Perfume Gully very wet |
| Linkages / walkways through drains? |
| Where will any government services be located (as the town expands and government services are provided in Lakeland)? |
| Residential development limited to only 2 – 3 people to develop land, what if they don't develop? Town stymied. |
| Should further expansion of the town occur on the high side? |
| Any provision of rural residential 10ha blocks? |
| Need for reticulated sewerage. Costs associated with adhering to EPA requirements are prohibitive and borne by individual land holders. It is hindering development / expansion of development. |
| Need for water supply to be upgraded. |

# 6 RECOMMENDATIONS

## 6.1 Conceptual Master Plan – Overview

The Brief was to develop a Landscape Master Plan for the township of Lakeland to improve visual amenity, sense of community, and to create a sense of identity, especially as the unofficial 'Gateway to the Cape'.

## 6.2 Background

Located at the junction of the Peninsula Development Road and the Mulligan Highway, Lakeland is a strategic foci from a Planning perspective. The intersection of the roads creates an important node or junction which becomes a key part of wayfinding for drivers and tourists on their journey. It is important also as drivers are forced to make a decision at junctions; to turn left, turn right, or continue straight ahead. People generally heighten their attention at such places and are more likely to take in their surrounds and create a mental image for future reference. People are also more likely to remember these places than other similar places where drivers simply drive through. For Lakeland, this has a major advantage. Any improvements to visual amenity through the addition of key visual elements are more likely to draw attention and become recognised. For residents too, improvement measures such as pathways and tree planting cannot only improve visual amenity and help create a sense of identity, but can also help improve the functionality of a place

## 6.3 Proposal

The draft Landscape Plan presents a series of plans for discussion and debate. These plans are included in Appendix E.

Plan 1 of 4 presents the concept of creating new town entry statements on the outskirts of town at 2km from the centre of town. These would be created as a combination of entry signs with associated landscape works to create an attractive setting for definition and attention. The signs could be double sided with 'Welcome to Lakeland' on the approach side, and 'Goodbye from Lakeland' on the reverse side. These can help in creating a memorable experience for visitors as it not only helps create a visual image, but it also reinforces Lakeland as a place on their journey. It provides an opportunity to promote a sense of identity by incorporating a logo and colours. The design of these entry statements should also tie onto an overall signage design strategy, so the theme can be continued into other signage elements throughout the township. The locations of the entry statements should be ground truthed to ensure they are located at appropriate spots along the approach roads into town.

Plan 2 of 4 presents an analysis of existing site uses within Lakeland. It identifies on a plan where the residences, community facilities and industrial uses are located. Whilst there is a concentration of community facilities located around the Lakeland Hotel, Coffee Shop / Service Station, and caravan park off Foyster Drive, Lakeland doesn't have a traditional main street. From a tourist / visitor perspective, it is important to understand whether the Lakeland Hotel is perceived as the centre of the town and should form the basis of a discussion, as the outcome is likely to impact how the town could be further developed and enhanced.

Plan 3 of 4 presents a Proposed Footpath Network Plan. It also identifies key attractors within Lakeland, i.e. where people are likely to walk to/from. The plan proposes 2 levels of pathways, including a 2.5m wide shared pedestrian and cycle path, and a 1.5m wide pedestrian path. Both paths provide a clear and well defined alignment for residents for definition and safety. Key crossings will need particular attention especially where the paths cross the highways.

Plan 4 of 4 is the final draft plan and presents a Preliminary Concept Plan showing how the town centre area of Lakeland could be further developed and enhanced. Presented in a graphical format, the plan identifies features such as tree planting and pathways. It also identifies a proposed location for the

Proposed 'Gateway to the Cape' Tourist Information centre. Located adjacent the highway intersection, the proposed facility should become an iconic element to attract visitors to stop. The plan also identifies a proposed location for a new significant landmark / town entry feature at the highway intersection/junction. Given the recent development of a major solar farm at Lakeland, there may be an opportunity for some type of sponsorship or representation in the element/feature. Finally, the plan presents a draft layout of the recreational park incorporating the adjacent truck set down area.

### 6.4 Preferred Land Use Intent

The draft Lakeland Local Area Plan mapping identifies the following areas / zones:

1. Context Map – surrounding area, Cook, Peninsula Developmental Road, Lakeland
2. Township Zone (Residential expansion)
3. Community Facilities (School)
4. Light and Service Industry Zone
5. Recreation and Open Space
6. Industry (Reservoir, solar farm)
7. Future Heavy Industry

Refer to Appendix F for details.

### 6.5 Township Zone (Residential Expansion)

The existing residential areas of Lakeland are at capacity, for both permanent and transient residents. The seasonal influx of workers and a constant demand by travellers for services and accommodation presents a need for future residential development and short-term accommodation.

The draft LAP proposes two new areas for future residential development, including one at the northern extent of the existing Lakeland township and one to the west of the existing township.

A site at the southern side of the Peninsula Developmental Road is proposed to be primarily a caravan park with greywater disposal facilities and space for long vehicles. The site is sufficiently close to town that visitors can avail themselves of the goods and services in town.

An additional site is proposed for RV / caravan parking at the northern side of the Peninsula Developmental Road, adjacent the hotel. This would also be the preferred site for a tourist information centre although it is freehold land and would have to be supported by the owner of that land.

The proposed urban expansion areas which are located at the periphery of the town can accommodate significant growth of the town – 3 to 4 times the current population. Infrastructure planning should have regard to a long term population of 800 permanent and short term residents. The urban expansion areas will developed in line with the provision of infrastructure and at the discretion of the property owners.

Local road infrastructure will need to be provided as road extensions from within Lakeland to the west and from the PDR through to the western lot, to facilitate future connectivity to the residential expansion lots.

### 6.6 Community Facilities

The school is currently located on the eastern side of the Mulligan Highway, outside of the town. The school will remain in its current location and the proposed LAP will retain the Community Facilities zoning for the site to allow for future development of the school and its facilities.

The site designated as Community Facilities around Perfume Gully to the west of the township, described as 23/RP860960, will be retained for environmental and public open spaces purposes. It is

proposed this land make provision for a future roadway along its northern boundary and to be zoned Environmental Management and Conservation to protect the values of the watercourse and vegetation.

Lot 20 BS230 is currently designated as Community Facilities, and is located to the south of the town. It is proposed to amend the zoning to Recreation and Open Space (as described below), to provide for a formal recreation and open space area in the town consistent with the community's vision for upgrading this land for sport and recreation purposes.

### 6.7 Commercial and Retail

The town is currently serviced by a fuel station, coffee shop and a small convenience store, all of which are contained within the Township Zone. There are light and service industry activities located in the town along Peninsula Developmental Road, also within the Township Zone.

A roadhouse is situated on the eastern side of Mulligan Highway and is currently zoned Rural.

It is proposed to amend the zoning of these particular lots to reflect the actual and preferred land uses, being Industry and Township Zones.

Any industry within the town of Lakeland should be low impact and will have limited impact on or by existing uses within the Township Zone.

The other non-residential land uses will be captured within the Township Zone, and it is anticipated this zoning will facilitate future development of similar uses to boost the goods and services offering of the town.

### 6.8 Recreation and Open Space

The Local Plan will incorporate a formalised area for recreation and open space. The proposed lot for this purpose is Lot 20 BS230, and it will be included in the Recreation and Open Space Zone.

### 6.9 Existing and Future Industrial Development

The existing industrial development in the town is in various locations, including within the town itself and to the west of the town.

It is proposed to delineate the intensity of industrial uses which are desirable in town, and the intensity which is permitted on lots separated from town.

The lots in town will accommodate light and service industry uses.

Lot 18 SP218120 is situated approximately 2km to the west of the Lakeland township along the Peninsula Developmental Road. This lot is designated for use by heavy and high impact industries.

### 6.10 Infrastructure

A review of the current and future infrastructure requirements Lakeland has been undertaken by PDR SMEC Engineers. A full copy of the Engineering Report dated 11 July 2017 is attached as Appendix A to this report.

The report investigates the existing infrastructure servicing the township, and estimates the future requirements based on a nominated population of 200 persons at present day and 800 persons within a 20 year timeframe.

The infrastructure that is considered by this investigation includes water supply, sewerage, and the road network and localised drainage.

The report finds that, although the town is not currently serviced adequately to accommodate population growth, a series of upgrades and further studies should be undertaken to facilitate the timely provision of infrastructure.

Specifically, the investigation recommends that additional water storage will be required to service the projected population in the 20 year timeframe. The additional water storage will likely comprise the construction of a new main reservoir with a preferred location to the rear of the Lakeland Roadhouse and the construction of a new groundwater bore.

The sewer network will necessarily require forward planning, and a town wide solution may include a Package Treatment Plant, which is expected to mitigate environmental health issues and enhance the viability of the town for future residential and commercial expansion. Considerations on siting the treatment facility will include the ability to gravity feed and prevailing winds in relation to the town and its planned expansion area.

Upgrades to, and repair of, the road network and stormwater drainage system will, when undertaken in conjunction with flood analysis and planning, will mitigate localised flooding issues and protect the integrity of the Lakeland road network.

A number of further studies have been recommended, including hydrogeology investigation, water supply network analysis, sewerage planning, flood study and road network study.

## 7 THE NEXT STEPS

A further community meeting was held at Lakeland on 10 August 2017 to present the preliminary findings of this study. At that meeting it was agreed the report and plans will placed on public display for a period of two weeks to formalise feedback from the community. Once this feedback is received there will be the following steps to formalise a Local Plan for Lakeland:

1. Council to consider the report and the draft planning recommendations for the town (expected at the October Council meeting)
2. Council to formally amend its planning scheme to adopt a Local Area Plan for Lakeland
3. Detailed engineering investigations on infrastructure provision to be undertaken (subject to budget considerations)

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX A – ENGINEERING REPORT

# REEL PLANNING FOR COOK SHIRE COUNCIL

# LAKELAND LOCAL AREA PLAN

# ENGINEERING REPORT

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**This report was prepared by PDR SMEC for Reel Planning Pty Ltd.**



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# 1 Introduction

## 1.1 Project Description

Lakeland is a small Township located at the intersection of the Mulligan Highway and the Peninsula Developmental Road (PDR). The Township is typically considered to be an agricultural centre with 10 horticultural producers in the area, and seven graziers located within 20km of the town centre. The Township presently has approximately 140 permanent residents, and accommodates up to 180 transient employees (backpacker/seasonal workers). However, not all persons utilise the Township utilities, with some residents currently located outside the existing water supply region. Some photos taken of the Lakeland Township are provided in **Appendix A**.

The Cook Shire Council (CSC) is preparing a Local Area Plan for the Township of Lakeland to provide guidance for the future expansion of the town. Lakeland has been identified as a location of future growth within the Cook Shire and has potential to become not only the agricultural hub of Northern Queensland, but also a tourism destination. This report has been completed to better understand the existing services/infrastructure located within the Lakeland Township, and to identify what future upgrades/expansion will be required to facilitate potential growth.

The assessment of existing infrastructure and provision of future infrastructure is based on the requirements of the Far North Queensland Region of Councils Development Manual (FNQROC), of with CSC is a member. This development manual provides a set of guidelines and outlines the requirements to provide sustainable infrastructure to adequately service Townships/cities throughout Far North Queensland.

# 2 Reticulated Water Network

## 2.1 Existing Network

### 2.1.1 Bores

The existing water supply network is generally outlined in the Lakeland Drinking Water Quality Management Plan (LDWQMP), see **Appendix B**. Lakeland is presently serviced by a total of three (3) bores with Chlorination the only treatment method. Two (Council installed) bores are central to Lakeland (Lot 1 on RP741362), with the third bore (installed by the Army) located on the edge of the PDR at the North Western boundary of Lot 2/RP744574.

The LDWQMP identifies that there were originally four bores in total (three Council installed and the Army bore), however two of the Council bores were decommissioned due to structural collapse and rust infiltration, and replaced with a single new bore (PVC casing) on the western boundary of the Council property.

The bores feed into a recently constructed ground level reservoir (0.27ML) located central to the Council bores with mains pressure being maintained by pressure pumps. The bore locations, as well as the properties currently having water supply, are shown in **FIGURE 1**. The water production by the bores is controlled through level sensors within the Main Reservoir and is activated on a demand basis to maintain specified levels.

Historical data (1st July 2016 through to 15th June 2017) supplied by CSC has provided information regarding the existing water usage by the residents of the Lakeland Township. In this period, the Average Daily (AD) consumption was 94.3kL with a Peak Daily (PD) consumption being 236kL. These figures are comparable to the FNQROC approximation of usage for a Township of 200 persons (approximate Lakeland population) which states that AD and PD to be 100kL and 225kL respectively.

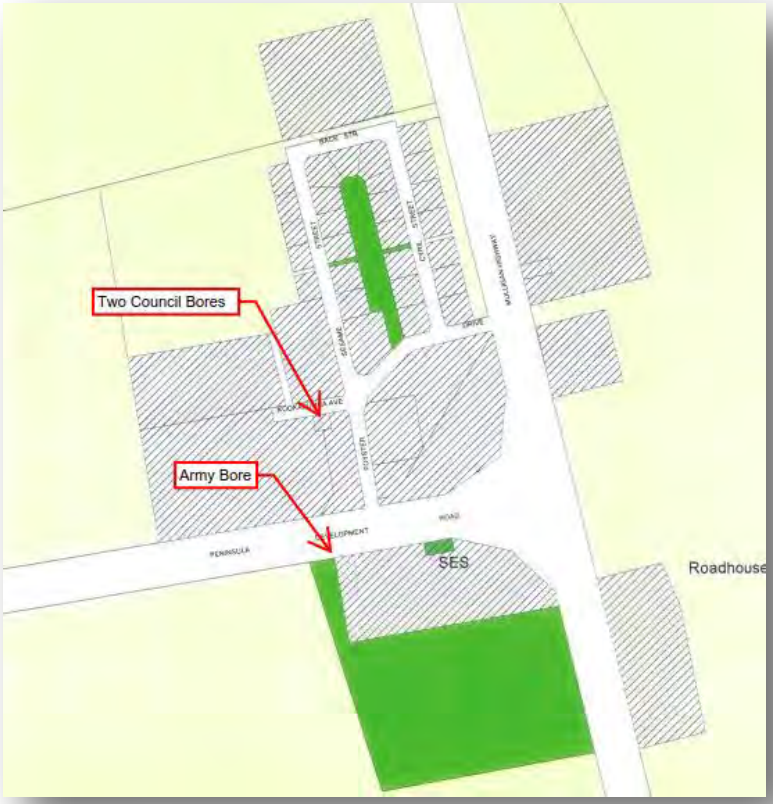


**FIGURE 1: LAKELAND WATER SERVICES PROPERTIES (SOURCE: CSC LAKELAND WATER SERVICED AREAS)**

As per information provided in the LDWQMP and advices provided by CSC, **Table 1** provides the currently available information regarding the existing water bores.

**TABLE 1: EXISTING WATER BORE DETAILS**

| Item | Unit | Quantity | Notes |
|---|---|---|---|
| Depth | m | 50 | Constructed in early 1990's with a recent new bore |
| Diameter | cm | 12.7 | 5 Inch |
| Production | L/s | 6.5 | 3L/s from Army bore, and 3.5L/s from Council |
| Casing Types | | | Steel and Plastic (new bore being PVC) |
| Cost for New | $ | 40,000 | Based on cost to sink 'West Bore' |

### 2.1.2 Water Reservoir

CSC has recently constructed a new 270kL Main Reservoir within the same footprint of the decommissioned 180kL reservoir located central to the Council bores in Lot 1/RP741362. The previous setup, as noted in the LDWQMP states that Lakeland is serviced by a Main (180kL) Reservoir, with a Secondary (elevated, 22kL) Reservoir available as standby supply for providing gravity feed to the town in the event of power failure. CSC has provided advices that both of the reservoirs outlined in the LDWQMP have been decommissioned due to degrading conditions and non-viable cost of repairs. The cost to construct the new 270kL reservoir was approximately $113,500.

In the event of power failure, continuous mains pressure is supplied to the town through an on-site generator that is re-fuelled by a contractor until power is restored to the pump network. The available details of the Water Reservoir and pressure network are provided in **Table 2**.

**TABLE 2: WATER RESERVOIR AND PUMPS DETAILS**

| Item | Details |
|---|---|
| Reservoir | 270kL |
| Network Pressure | 330kPa |
| Pressure Pumps: | Grundfos Multistage Submersible Pumps (CRE10-06) |
| Pressure Mains: | Combination of AC, uPVC, and Poly |

FNQROC requirements for sizing of a Ground Level Reservoir requires the accommodation of three days' supply of water (500L per person per day), plus provisions for emergency/firefighting storage. As the population density of Lakeland in 2017 utilising the town water supply is expected to be approximately 200 persons (including permanent and transient residents), the Township is therefore required to be serviced by a 525kL reservoir.

As this requirement is based on the emergency storage being required in the event of power failure, and due to Council having on-site generator ensuring continual supply of power to the Mains Pumps, the requirements for emergency storage can be relaxed. As such, the 270kL reservoir currently in service should be able to adequately provide the Township with the required supply, with no provision for emergency or firefighting storage.

### 2.1.3 Water Supply Network

The existing Water supply network generally consists of 100mm AC/UPVC pipes feeding off the Reservoir, with 63mm OD Poly Water Mains supplying Sesame Street, Cyril Street, and the Mulligan Highway. The Council provided network map can be seen in **Appendix C**, with a screenshot shown below in **Figure 2**.

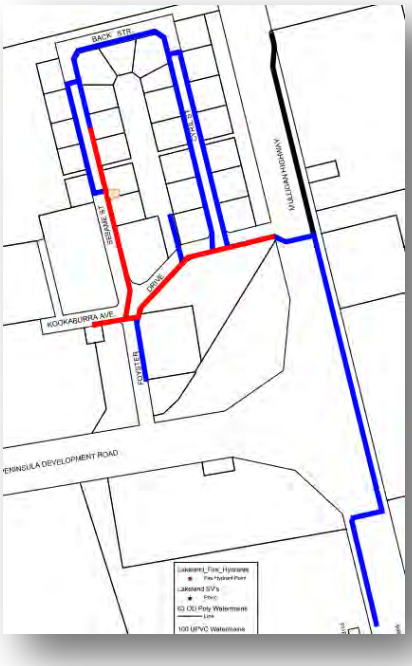


**FIGURE 2: LAKELAND WATER MAIN NETWORK WITH MAINS HIGHLIGHTED FOR CLARITY (SOURCE: CSC)**

## 2.2 Proposed Network

As per advices received from Reel Planning regarding the proposed future expansion of the Lakeland Township, it is expected that Lakeland will reach 800 residents (permanent and transient) within the 20 year design horizon (by 2037). It is recommended that the assessment of current infrastructure, and construction of future infrastructure, should be completed to account for this expected population number.

Due to the limited supply of information for the existing water main network, a full detailed analysis should be undertaken before the construction of further services, infrastructure and development is undertaken.

### 2.2.1 Water Sources

**Bores**

CSC has indicated that the 1990's Council sunk bore is intended to be decommissioned in the near future, which will reduce the capacity of the supply network by approximately 15%. CSC has suggested that a replacement bore will be sunk before decommissioning the existing, with two options provided for the location of the proposed bore being the northern end of Lot 30/RP725840, and the Lakeland Airport, as shown in **Figure 3**. A further water source has been proposed to be a dam located within Lot 7/RP867069.

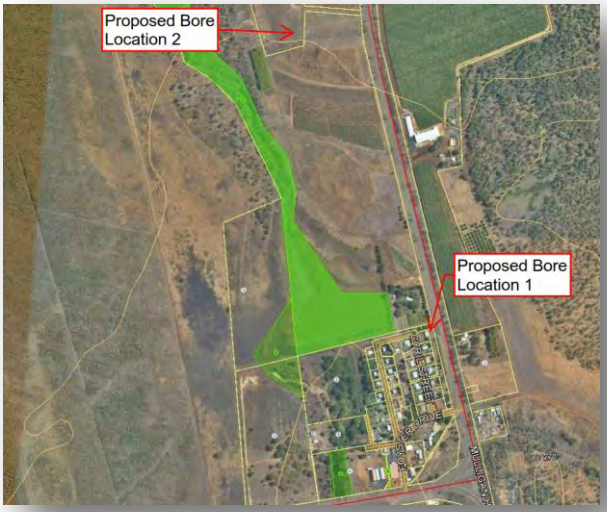


**FIGURE 3: PROPOSED BORE LOCATIONS**

Lot 30/RP725840 is a Council owned property adjacent to the Mulligan Highway. Local knowledge indicates that the northern end of this property transitions into underground basalt deposits which are understood to provide high quantities of high quality drinking water. The geological conditions at the Lakeland Airport are similar to Lot 30, however this site is an additional 1.5km (approximately) from the existing Water Reservoir location and any water main pipes will need to be located within the Mulligan Highway road reserve, which will require approval by The Department of Transport and Main Roads (TMR).

Lot 7/RP867069 is a privately owned property at the end of Hurse Road, Lakeland. The proposed dam was approximately 0.22km$^2$ in total area during August, 2015. Utilising Hurse Road and the Mulligan Highway, the dam is located approximately 9km from the Lakeland Township and the Main Reservoir. Delivering water from the dam to the reservoir would necessitate the establishment of a new pipeline, water pumps, and power supply. Due to the Township being approximately 40m higher than the proposed dam, pumping energy costs may be a limiting factor.

The average daily consumption for an 800 person town is 400kL with the annual peak daily consumption expected to be a maximum of 900kL. The existing bores have been producing approximately 6.5L/s to meet the current demand. Theoretically if pumped continuously at 6.5L/s for 20hrs/day, this would equate to the production of approximately 470kL per day. Therefore the bores may be able to, with the assistance of the adequately sized reservoir, supply the Township of Lakeland well into the future. However further testing would need to be carried out on the bores to establish recharge rates and capability if pumped continuously at these rates. Bores can be problematic when pumped continuously close to their production rates and therefore further investigations are required.

Before the finalisation of any future bore locations, comprehensive hydrogeology investigations and detailed design should be undertaken to ensure the quantity and quality of the bore water and the capability to transport to storage locations.

Similarly, before finalisation of any surface water options, comprehensive detailed investigations e.g. hydrology, geology, environmental (but not limited to these alone) would need to be completed.

**Surface Water**

SMEC is currently undertaking a feasibility study for an irrigation scheme for Lakeland agricultural land. The study has identified a number of potential large and small dam sites located within the region. A number of possibilities could be available if the scheme is constructed:

- Town water could be supplied by the scheme subject to government approvals and availability. It is noted that the town demand would only be a small proportion of that required by the irrigation scheme.
- There are a number of smaller dams that, if not utilised or constructed by the scheme, could potentially be developed for the town supply.

At the time of writing the locations of the potential dam sites are not available for public release. In any event construction of even a small dam would be a significant cost when compared to possible existing bore supplies. However further investigation into possible surface water sources can be provided once the scheme study is finalised.

### 2.2.2 Water Reservoir(s)

For an 800 person Township (20 year horizon) to be serviced in accordance with the FNQROC, and considering the provision of firefighting for residential purposes only, a 2.1ML reservoir should be constructed. The calculations undertaken to determine this reservoir size are shown in **Appendix D**.

As the FNQROC requirements for commercial firefighting (30L/s for 4hrs) are typically based around the supply of larger towns/cities, it is not considered necessary to provide firefighting capabilities to the limited commercial district of Lakeland, and that the residential supply (15L/s for 2 hrs) should be adequate. The 10 year horizon for the Township is approximated at 500 persons, which will require the provision of a 1ML Main Reservoir (approximate only, detailed sizing/design would be required).

Without comprehensive ground survey of LIDAR information for the area, an appropriate location for the ultimate Main Reservoir is unable to be determined. However, CSC has advised that the most appropriate location for the ultimate Main Reservoir would be behind the existing Lakeland Roadhouse (Lot 28/SP193139) on the premise that the land can be acquired. The only available ground level information for the area (QLD Globe kml on Google Earth) indicates that the hill at the rear of the Lakeland Roadhouse is approximately 10m above the Township, which will provide additional elevation head and capacity in the event of power failure.

The existing 270kL reservoir is intended to be utilised as a backup or intermittent source of water supply, where the bore water will be stored before being pumped to the Main Reservoir. With detailed design and additional survey information, the adequacy of locating the Main Reservoir at the rear of the Lakeland Roadhouse and the expected supply capacity can be established.

# 3 Sewer Network

The Lakeland Township does not currently have, and CSC has no immediate plans for the construction of, a reticulated sewer network. All properties within the Lakeland Township are currently serviced by on-site septic tanks.

Due to anecdotal advice on the success of sewerage treatment options within the Cook Shire, CSC has advised their preferred option is to utilise a Package Treatment Plant (PTP) for Lakeland. PTPs are able to be accurately designed, and installed to suit the intended ultimate size (staged increase in PTP capacity may be an option), layout and number of persons expected to reside in Lakeland and typically provide a cost effective solution to the treatment of the Lakeland sewerage production. Due to the natural ground levels of the Lakeland area, a possible location for the sewer network would be south of the PDR and west of the Mulligan Highway. This location would maximise opportunities for the sewer network to be gravity fed which would provide substantial cost savings to a reticulated network.

The development of any future subdivisions within the Lakeland Township will need to consider any timing overlaps of the construction of a reticulated Sewer Network. This construction will heavily influence the Subdivision design parameters and lot sizes. For properties not currently serviced by a sewer network, the property size is controlled by the provision of on-site sewerage disposal (AS/NZS 1547:2012) with septic tanks currently in use in Lakeland. Connecting a new Subdivision to a sewer network permits lot sizes to be reduced and a greater number of lots to typically be created.

Lots created in accordance with FNQROC with on-site sewerage disposal are required to have a minimum area of 2000m$^2$ which shall be wholly above Q50 Flood level, and does not include land allocated for access, or drainage and service easements.

# 4 Flooding

The existing Cook Shire Planning Scheme provides mapping on the surrounding wetlands and watercourses and flooding hazards in the Lakeland area (see **Appendix E**) with a screenshot below in **Figure 4**. The dark blue lines in **Figure 4** are locations of major rivers, with minor rivers shown as light blue.

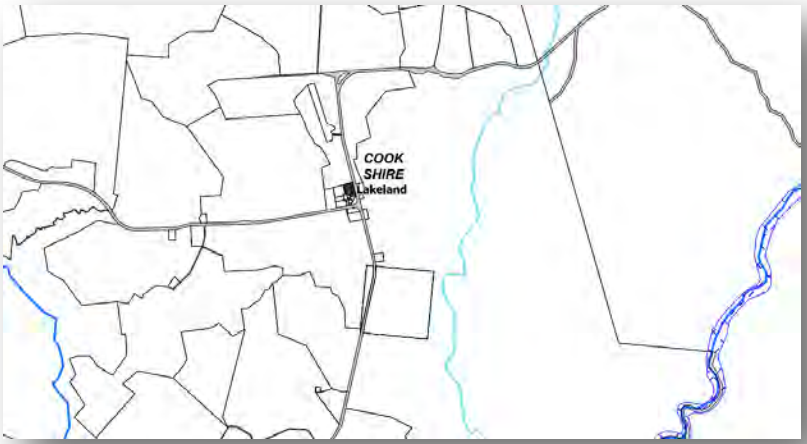


**FIGURE 4: LAKELAND MAJOR RIVERS/WATERCOURSES (SOURCE: CSC)**

As shown above, Lakeland appears relatively immune to major flooding hazards due to the potential overtopping of rivers. However, QLD Globe contours and anecdotal evidence suggest that Lakeland is considerably flat, experiencing a 20m fall in elevation over 2.8km as shown below in **Figure 5**.


**FIGURE 5: LAKELAND CONTOURS (SOURCE: GOOGLE EARTH, QLD GLOBE)**

With the supply of comprehensive LIDAR information or a detailed survey of the Lakeland Township, a localised Flood Study should be undertaken to determine the existing flooding immunity and drainage pattern of the Township.

# 5 Road Network and Localised Drainage

Lakeland is situated generally to the north west of the intersection of the Mulligan Highway and PDR. The Lakeland Roadhouse, RoadTek Maintenance Depot, and Lakeland State School are all on the eastern side of the Mulligan Highway.

The rest of the Township is serviced by Foyster Drive, acting as the 'Major Collector' road and three local access streets (Sesame Street, Slim Close and Cyril Street). The existing road network is able to properly provide access to all residents in the current situation. Further expansion of the Lakeland residential district would be expected to be carried out north west of the current dwellings and utilise Slim Close and the gazetted Kookaburra Avenue for access.

Verbal advices received from TMR recommend avoiding expansion of Lakeland on the southern side of the PDR or the eastern side of the Mulligan Highway. Additionally, TMR has indicated that there are no plans for upgrading the Mulligan Highway / PDR Intersection. It is recommended that further development of the Lakeland Township (via subdivisions of private property) is limited to the north western region, to maximise the safe accessibility of housing to existing services and minimise required interaction with the Major Arterial roads bisecting Lakeland.

A detailed assessment of the existing road pavement quality should be undertaken, as outlined in the Lakeland Progress Association Letter dated 28 April, 2017 (see **Appendix F**) as the roads are in dire need of improvement.

Further to the overall layout of the region, the Lakeland road network generally consists of bitumen sealed roads with no kerb and channel and open channel drains running parallel. The drains appear too generally flow towards the creek located west of Lakeland and onto Bullhead Creek and One Mile Creek. As development progresses and intensifies further consideration is required for kerb and channelling and underground stormwater drainage network to mitigate localised flooding and nuisance flows between residential properties.

# 6 Expected Costs for New Infrastructure

Due to the relative remoteness of the Lakeland Township from the nearest major city (3 hour drive from Cairns), the cost of construction can be hard to estimate, and therefore it is typically best to use historical data as an approximation of costs.

## 6.1 Bores

The recently sunk 'West Bore' located in the Council compound, was constructed at a cost of $37,800, however the specification and construction quality is not known. Providing the bore has adequate construction quality, it can be assumed that $40,000 per bore to be sunk is a reasonable preliminary estimate.

Regarding the provision of a new water reservoir, the variable nature of design and construction makes it hard to estimate a fixed price. However based on previous concrete reservoirs constructed in remote areas of this size a preliminary allowance of $1M/ML can be utilised. On this basis the required storage capacity of 2.1ML reservoir could be expected to be built for approximately $2M.

## 6.2 Water Supply

Due to the 10 year horizon for the Township population being 500 persons, this could allow a staged increase in Main Reservoir storage size. Within 10 years CSC could construct a 1ML Main Reservoir for approximately $1M, with a secondary and equal sized reservoir constructed to accommodate the ultimate Township population figures. As noted above, utilising the dam located on Lot 7/RP867069 would require the installation of a Pump Station at the dam including power supply, and a pipeline to deliver the dam water to the Main Reservoir. The costs associated with this undertaking can vary widely and therefore further detailed investigations are required.

## 6.3 Sewer Network

The provision of a Sewer Package Treatment Plant has been estimated to cost between $0.5M and $1M depending on the intended complexity of the Treatment Plant and the desired output water quality level (for irrigation purposes only through to drinking quality). On top of the direct costs relating to installing the PTP, CSC would have to consider the installation of gravity/reticulated sewer network to connect all existing properties (trunk sewer and house connection branches) and service any future development as required. The associated costs for this work will vary widely and should be priced at conception of any sewer installation project. As a guide, a fully reticulated Sewerage Scheme for a Township of 800 people could cost in the order of $3-$8M depending on many factors, however staging for the current requirement would see the scheme commence in the order of $3M which would be limited to construction of a network to connect the existing properties only.

# 7 Conclusion/Recommendations

Lakeland currently has a limited supply of services available within the Township which is not conducive to expansion. Therefore, it is recommended that each of the existing services are subject to a detailed review and design of upgrades to accommodate the proposed 20 year design horizon of 800 persons residing in Lakeland. Initially, the intended expansion of Lakeland should be mapped to give clear direction to the design of additional water, sewer, and stormwater services.

The existing water reticulation network, with the construction of the new 270kL Main Reservoir, is adequate to service the Lakeland Township for 2017. With the expected expansion of the town, additional water storage will need to be investigated and constructed to ultimately service the 20 year horizon population of 800 persons. This additional storage will likely comprise the construction of a new Main Reservoir(s), appropriately located at the rear of the Lakeland Roadhouse, and the construction of a new ground water bore(s) to replace the ageing bore currently located within the Council bore compound.

With expected future expansion of Lakeland, construction of a sewer network utilising a Package Treatment Plant is recommended to undergo the Concept and Detailed Design phases. Such a scheme will mitigate environmental health issues with intensified development and greatly enhance the Township's viability in attracting new residents by supporting new subdivisions and commercial properties.

A comprehensive flood analysis should be undertaken to assess the current flood immunity levels of the Township of Lakeland. This flood analysis will allow appropriate planning and development of future residential development and establish a baseline for appropriate conditioning of minimum allotment levels. Flood Planning will also provide guidance on the construction of any required infrastructure to minimise damage from flooding into the future.

Repair/upgrades of the Lakeland road network and stormwater drainage should be completed to ensure the quality of the Lakeland road network in the immediate and extended future. Kerb and channel and underground piped system should be considered to mitigate localised flooding issues and control nuisance flooding between properties. Stormwater and road upgrades should be undertaken to coincide with any proposed flood mitigation upgrades to save construction/rework costs for CSC.

PDR SMEC recommends the following studies and investigations are required in the planning stages for the growth of Lakeland:

- Hydrogeology investigation into groundwater sources
- Review SMEC Irrigation scheme study surface water options
- Water supply network analysis including reservoir
- Sewerage Planning Study
- Flood study
- Road network study including localised stormwater drainage management plan

# APPENDIX A: Lakeland Township Photos

**Photo 1: Army Bore (Located on Peninsula Development Road)**

**Photo 2: Council Water Compound and 270kL Reservoir**

**Photo 3: Sesame Street (From Foyster Drive Intersection)**

**Photo 4: Foyster Drive (From Sesame Street Intersection)**

# APPENDIX B: Lakeland Drinking Water Quality Management Plan

Cook Shire COUNCIL

# Lakeland

# Drinking Water Quality Management Plan

BLIGH TANNER

# + DOCUMENT CONTROL SHEET

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+ DOCUMENT

Lakeland Site Based DWQMP

+ JOB NUMBER

2015.521.400

+ PROJECT CONSULTANT

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| VERSION | AUTHOR | REVIEWED | APPROVED | DATE |
|---|---|---|---|---|
| V4 | Michael Lawrence | Robert Fenn | | 29 March 2016 |
| V4.1 | Michael Lawrence | Robert Fenn | Robert Uebergang | 15 April 2016 |

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# + GLOSSARY

| Term | Definition |
|---|---|
| ADWG | Australian Drinking Water Guidelines 2011 |
| CSC | Cook Shire Council |
| DERM | Former Department of Environment and Resource Management |
| DWQMP | Drinking Water Quality Management Plan |
| PHR | Public Health Regulation 2005 |
| RMIP | Risk Management Improvement Program |
| QH | Department of Health Queensland |
| WSR | Water Supply Regulation |
| WS(SR)A | Water Supply (Safety and Reliability) Act 2010 |

# 1 LAKELAND

## 1.1 Overview

Lakeland is a small community of ~100 people (41 connections) located approximately 80 km from Cooktown. The scheme is a bore scheme with 3 operational bores with chlorination as the only treatment.

*Figure 1 Location of Lakeland*


# 2 INFRASTRUCTURE –

## 2.1 Lakeland WTP

Lakeland scheme utilises multiple bores that are chlorinated prior to reticulation. As the surrounding region is quite flat, mains pressure is maintained by pressure pumps, with an overhead water tank providing contingency if power failures occur.

*Figure 2 Location of Infrastructure*


### 2.1.1 Bores

When Cook Shire took over the operation of the water supply in Lakeland, many years ago, the 3 bores, (S.W., N.E. & S.E.) were supplying the entire water needs of the community, although with little reserve capacity. Each of the Bores has limited production capabilities with N.E. & S.E. producing just over 1 L/s and S.W. producing approximately 0.6 L/s with a total of <3.0 L/s. The South East bore is now out of service and will either be re-drilled or fully decommissioned. The bore report cards for these bores contain almost no information. These bores are all in close proximity, and are believed to tap the same aquifer – the Maclean basin.

As the towns water requirements became greater in the early nineties an Engineering division of the Army sunk a bore, for the community, which was subsequently named Army Bore. This bore produces approx 3.0 L/s on its own after it was equipped by Cook Shire, thus doubling the bores capacity. The three bores are chlorinated with no other treatment. The Lakeland Water Supply now is an unmanned fully automated process, connected to SCADA, which can be controlled / monitored from Cooktown.

Note: Army bore is located next to a property that has been placed on the contaminated land register in 2005 due to historic dumping and burial of ~200 pesticide drums prior to 1992. Whilst it was initially believed some of the drums were full, Council, with EPA has undertaken investigations to determine whether this poses a risk to the water table. As shown in the water quality data, there have been no detections of any pesticide in the Army Bore, despite a number of years of testing. We have included this in the risk assessment, and will continue to monitor.

### 2.1.2 Operation

The process starts when the 180kL Lakeland Reservoir reaches the start level (1.60m) this starts the 4 Bores ( North East Bore, South East Bore, South West Bore and Army Bore) all bores pump directly into the 180kL concrete lined ground level reservoir, these continue to pump until the reservoir high level is reached (2.0m).

The terrain at Lakeland is flat, so the mains pressure is via a Grundfos Hydro MPC Booster System with 3 Grundfos CRE10-06 pumps, these are controlled to maintain the pressure to the adjustable set point, with an input from a pressure sensor, as the mains pressure drops (due to consumption) then another pumps starts, if the pressure continues to fall to the next set point then the third pumps starts, alternatively as the pressure rises pumps stop as the cut out set points are reached. As Lakeland is serviced with 3 phase power then all 3 pumps are fitted with variable speed drives thus smoothing out stops/starts, even small variations in pressure will generate a response from the duty pump. Mains pressure can be set, by an operator, and is currently set at 330 KPA this is the pressure that the Hydro Booster maintains. The duty pump alternates daily to distribute wear of the pumps.

During periods of “Loss of Mains Power” water is supplied from the overhead tank, on restoration of the mains power the float valve refills the top tank.

### 2.1.3 Disinfection

Disinfection is achieved with the dosing of sodium hypochlorite.

There are 2 chlorinators, 1 chlorine analyser and a recirculation system. The recirculation system recirculates the 180kL reservoir whilst a chlorine analyser monitors the chlorine residual, if the chlorine residual is lower than the set point then the chlorinator starts and runs until the desired level of residual is reached. This recirculation system runs 24/7 so the reservoir has the desired level of chlorine residual at any time. When the Bores start and dilutes the chlorine residual then this is picked up by the analyser and starts the chlorinator. The chlorinator has excess capacity to maintain the desired residual level.

### 2.1.4 Pressure pumps

A Grundfos Hydro MPC Booster System with 3 Grundfos CRE10-06 vertical multistage pumps supply the pressure for the reticulation mains, these are all controlled through the inbuilt PLC with input from a pressure sensor. One of the pumps becomes the daily duty pump, which runs continuously all day at a speed to maintain the set point pressure with the others cutting in and out as required, the duty pump is rotated daily to distribute wear & tear. This arrangement generally maintains mains pressure around 330 KPA. The pumps pump directly into the reticulation mains with a flow meter recording the instantaneous flow as well as the accumulated total volume.

### 2.1.5 SCADA

The SCADA was setup to monitor and operate the Lakeland plant as it’s an unmanned facility.
The SCADA shows equipment status, e.g. running, off or faulted, shows levels of most tanks, mains pressure flow rates and accumulated values, shows plant voltage and amps drawn. Trending of a lot of the parameters is also available and via password protection, operating parameters can be altered.

### 2.1.6 Reticulation Mains

The reticulation mains are A.C., UPVC or Poly, with a maximum of 330KPA available this is well within the pressure rating of the pipes (1200KPA) and consequently we have few leaks or bursts, the mains have regular scouring to promote healthy mains.
Lakeland has 41 Water Connections with a population of around 110.

All the bores are located at the edge of town, the bores are all extracting water from the McLean Basin, the closest agricultural crop are organic banana’s approximately 500m to the North East. There is a Caravan Park to the North of 3 Bores and a contractor’s yard / depot to the south.

All bores are sealed around the top with concrete, with the Bore Pipe extending approx 600mm above surface level to prevent surface water entering the bores

### 2.1.7 Detailed Process Steps

Assuming the Clean Water Reservoir is full to start with.
The pressure pumps run continuously supplying the mains pressure to the township, the duty pump runs for 24 hrs, (duty pump is rotated daily) whilst the other 2 pumps cut in / out as required these are controlled by the on board pump controller based on mains pressure i.e. If the demand suddenly increases and the pump/s currently running cannot maintain the pressure, then the mains pressure drops, this then starts the next pump in the queue, if that is still not sufficient to maintain the pressure then another will start, up till all 3 are running. Alternatively when the demand decreases the additional pumps will stop one by one until there is only the one left. The Grundfos Hydro MPC Booster Systems work extremely well with their variable speed drive motors and the ability to ramp the motors down to extremely low motor speeds with low flows. The booster systems have the ability to cut in or cut out without causing major pressure fluctuations.

Lakeland also has a high level reservoir that provides 10m head in the event that the VSD pumps are offline. The High level reservoir is a floating 22 kL Reservoir that has a pressure sensor that controls the fill level. As the reservoir is currently used only when the reticulation pumps are offline it is suspected that there is minimal renewal, which may result in stagnant water. We are investigating options for a generator at Lakeland that would allow the high level reservoir to be decommissioned. As there are also significant WHS issues with access, this is the preferred option.

As the Reservoir is drawn down by the pressure pumps, when the Reservoir level gets to 1.60m this then starts the 4 bores simultaneously. These bores all pump directly into the Clean Water Reservoir, which has been previously chlorinated, as the un-chlorinated water enters the reservoir this dilutes the chlorine residual, this is then subsequently detected by the chlorine analyser which then starts the chlorine dosing pump. The dosing pump continues to run until the chlorine residual reaches the set point; (Currently set at 0.45 mg/l) it then stops the chlorine dosing.

There is a single pump constantly recirculating water from the Clean water Reservoir with a chlorine residual analyser reading the chlorine level from the recirculated reservoir water.

Once started the bores run for anywhere between 4 – 10 hrs / day depending on demand and the season. The normal flow rates for the pressure pumps are between almost zero to 1.2 L/s, with the flow rate rarely exceeding 1.5 L/s.

The only Chemicals used for water treatment at Lakeland is Sodium Hypochlorite

*Figure 3 Catchment to tap schematic – Lakeland*

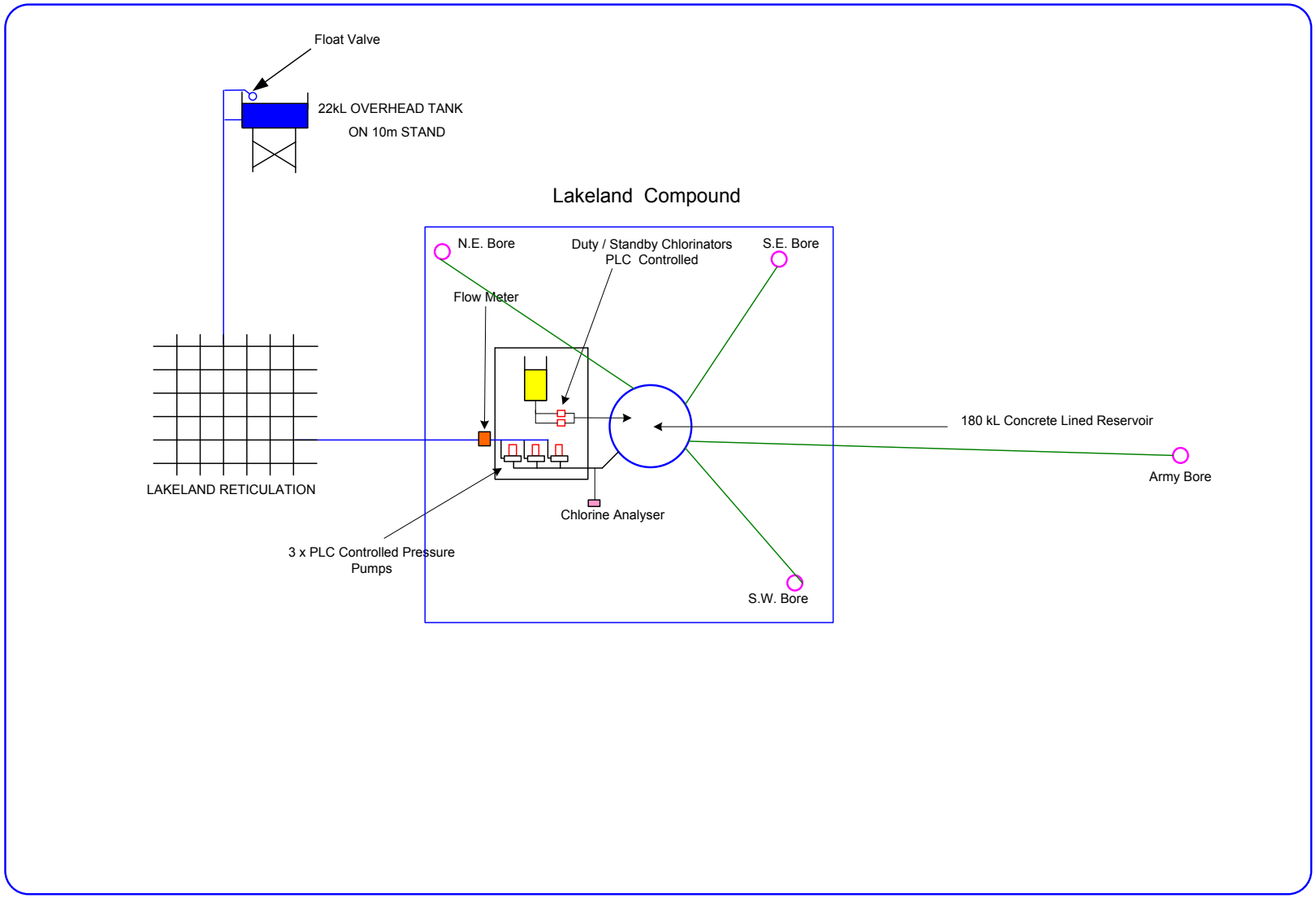


*Table 1 Infrastructure Details – Lakeland*

| **Component** | | **Lakeland** |
|---|---|---|
| Sources | Name | *Lakeland* |
| | Type | *A network of 3 operational bores* |
| | % of supply | *100* |
| | Reliability | *No supply issues from these bores since 20 years of records being held* |
| | Water quality issues | *These bores meet all ADWG guidelines apart from hardness.*<br>*Old chemical drums have been buried over 30 years ago in close proximity to Army Bore. Pesticide tests are carried out yearly with no change in results* |
| Bore head Details | Year Bores Sunk | *Army Bore – early nineties*<br>*The rest – unknown – a lot earlier* |
| | Bore Casing Size | *6"/150mm* |
| | Bore Casing material | *Class 12 PVC* |
| | Sealed to prevent surface water ingress<br><br>Sealed to prevent vermin (frogs / snakes etc.) from entering bore | *Yes, All the Bore Casings typically extend approx. 600mm above surface level*<br>*Yes, All bores sealed to prevent vermin (frogs / snakes etc.) from entering the bore. SE Bore to be redrilled or decommissioned.* |
| Sourcing Infrastructure | Type (pumped/gravity/equipped bore/etc) | *Electrical submersible pumps fitted in each Bore* |
| | Description | *Bore depth are generally less than 50 metres* |
| Are there any sources that **do not** undergo treatment prior to supply? | *No* | |
| Lakeland Treatment Plant | Process<br>Design Capacity (20 hr operation)<br>Daily flow range<br>Chemicals added<br>Standby chemical dosing facilities (Y/N)<br>Water sourced from and % | *Process comprises of chlorination only*<br>*.18 ML/d*<br>*.06 ML/d*<br>*Sodium Hypochlorite*<br>*Yes*<br>*Water is sourced 100% from the network of 4 bores* |
| | % of average day demand provided<br>% of scheme supply<br>Distribution area supplied | *100%*<br>*100%* |
| | Bypasses / Variations | *No Bypasses* |
| Are there any sources that **do not** undergo disinfection prior to supply? | *No* | |
| Disinfection | Location | *Lakeland Treatment Plant* |
| | Type | *Sodium Hypochlorite Dosing* |

| Component | | Lakeland |
|---|---|---|
| | Dose rate | *Unknown (Dosed to maintain target residual level)* |
| | Target residual levels | *.45 mg/L* |
| | Duty/standby | *Yes* |
| | Dosing arrangements | *PLC controlled with feedback from free chlorine residual analyser* |
| | Alarms | *No* |
| | Auto shut-off arrangements | *Dosing controlled by PLC via free chlorine residual analyser with control set points Dosing pumps shut down when setpoint level reached* |
| Distribution and Reticulation System | Pipe material | *A.C. UPVC & Poly* |
| | Age range | *A.C. – 30 years old, UPVC – varying 1993 onwards, Poly – 1991 onwards* |
| | Approx % of total length | *A.C. 10% UPVC 20% Poly 70%* |
| | Areas where potential long detention periods could be expected | *Poly to school and roadhouse at varying times of the year due to wet season* |
| | Areas where low water pressure (e.g. < 12 m) could be expected during peak or other demand periods) | *No areas of low water pressure at peak demand or any other time under normal conditions, the town is supplied by pressure pumps. Mains power failure will cause loss of mains pressure. Supply is then from overhead tanks to approimately 10 metres head* |
| Reservoirs A | | |
| | Name | *Lakeland Reservoir* |
| | Capacity (ML) | *0.18ML* |
| | Roofed (Y/N) | *Yes* |
| | Vermin-proof (Y/N) | *Yes* |
| | Runoff directed off roof (Y/N) | *Yes* |
| | | |
| Reservoirs B | | |
| | Name | *Lakeland Overhead Tank* |
| | Capacity (ML) | *0.022ML* |
| | Roofed (Y/N) | *Yes* |
| | Vermin-proof (Y/N) | *Yes* |
| | Runoff directed off roof (Y/N) | *Yes* |
| | | |

# 3 RISK ASSESSMENT

## 3.1 Lakeland Mitigated Risk Assessment

Following the hazard identification and unmitigated risk assessment detailed in the overarching plan, the Cooktown Scheme risk assessment was undertaken, following the same methodology. Individual process failures were considered, and the mitigated risks calculated. The risk assessment is presented below.

| Process Step | Hazardous Event | Hazards managed by same barriers | Unmitigated Risk | Primary preventive measure | Other Preventive Measures | Mitigated | | | Uncertainty | Comments | Risk Management Improvements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Consequence | Likelihood | Risk | | | Immediate (15/16 FY) | 2016/17 FY | 17/18 FY or later |
| Bores | Ingress into bore | bacteria and virus | Extreme 20 | disinfection | borehead sealed | Catastrophic | Rare | Medium 6 | Reliable | There are points of ingress and need to be sealed. Disinfection will generally mitigate though. | seal bores (silicone) | develop inspection program | |
| | Ingress into bore | protozoa | Extreme 20 | microfiltration | borehead sealed | Catastrophic | Unlikely | High 10 | Confident | need to seal and develop inspection program | seal bores (silicone) | develop inspection program | |
| | Septic contamination of aquifer | bacteria and virus | Extreme 20 | disinfection | | Catastrophic | Unlikely | High 10 | Certain | considered as whole of treatment in absence of failure | | | |
| | Contamination of aquifer through SE bore | protozoa | Extreme 25 | nil currently | | Catastrophic | Almost Certain | Extreme 25 | Reliable | Investigate options for SE, SW, NE bores for refurbishment or replacement. | seal bore head until decision on refurb/ decommission. | new bores in compound LKD 10 | |
| | Bore pump failure | Failure of supply | High 10 | restrictions | | Moderate | Possible | Medium 9 | Confident | 3 active bores, Army bore supplies bulk of water in Lakeland. | | | |
| | Aquifer contamination from buried chemical drums | Pesticides | High 12 | Annual Monitoring | | Moderate | Unlikely | Medium 6 | Estimate | Known source, but was buried pre 2005, and annual monitoring has not detected any contamination. If detected in Army Bore, may impact all other bores if same aquifer and only 180m away. | | continue to monitor | |
| Disinfection | overdose | Chlorine | High 15 | Target 0.5-1.3 mg/L critical at 4 mg/L | | Moderate | Possible | Medium 9 | Confident | SCADA monitoring, but no callouts at present | on screen alarms can be initiated | need autodialler for callouts | |
| | insufficient dose | bacteria/virus | Extreme 25 | Target 0.5-1.3 mg/L | | Catastrophic | Possible | High 15 | Confident | Dose not below 0.3mg/L for a number of years. | on screen alarms can be initiated | need autodialler for callouts (LKD 9) | install dual hypo pumps, LKD 8 |
| | chemical breakdown | chlorate | High 12 | nil currently | | Moderate | Likely | High 12 | Reliable | Will be an issue when this is a guideline value. Very little we can do about it as there is a requirement to maintain stock across summer in case of disaster. | | | |
| | ineffective disinfection due to turbidity | bacteria | High 10 | disinfection | | Catastrophic | Rare | Medium 6 | Estimate | bore water low turbidity | | | |
| Treated water storage/ Reservoirs | Ingress into reservoirs | Protozoa | Extreme 20 | Integrity and sealing | | Catastrophic | Likely | Extreme 20 | Estimate | | seal reservoirs with silicone/ expanding foam etc. | Replace Lakeland treated water reservoir LKD 2, | |
| | ingress of amoeba | amoeba | High 12 | disinfection as above items | integrity | Major | Unlikely | Medium 8 | Reliable | Disinfection maintained in reticulation. Possibly higher risk in high level reservoirs, but similarly addressed with stagnant water hazardous event below | | | |

| Process Step | Hazardous Event | Hazards managed by same barriers | Unmitigated Risk | Primary preventive measure | Other Preventive Measures | Mitigated | | | Uncertainty | Comments | Risk Management Improvements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Consequence | Likelihood | Risk | | | Immediate (15/16 FY) | 2016/17 FY | 17/18 FY or later |
| Reticulation | ingress of contaminated water | bacteria/virus | Extreme 20 | network pressure, residual disinfection | mains break procedure | Catastrophic | Unlikely | High 10 | Reliable | weekly reticulation monitoring | develop procedure to flush on low chlorine | | |
| | ingress of contaminated water | protozoa | Extreme 20 | network pressure | mains break procedure | Catastrophic | Possible | High 15 | Reliable | | develop procedure to flush on low chlorine | | |
| | stagnant water in Lakeland High level reservoir | bacteria | Extreme 20 | nil currently | | Catastrophic | Likely | Extreme 20 | Estimate | reservoir roof likely compromised, disinfection residual not monitored from high level, and floats on system, so little to no turnover | exploratory work to determine if salvageable and can be sealed, or if needs to be immediately taken offline and decommissioned | if can be sealed, install sampling point to monitor chlorine and turnover manually on low disinfection residual, generators LKD 5 | |
| | biofilm growth | opportunistic pathogens | High 15 | flushing program | | Catastrophic | Rare | Medium 6 | Estimate | disinfection maintained | | | |
| | Power failure | Failure of supply | Extreme 20 | Lakeland | | Catastrophic | Likely | Extreme 20 | Confident | 3 phase power | | Generators required to run supply LKD 5 | |
| | change in flow rate, reservoir run low, disturbing sediment in pipe | turbidity | Medium 6 | | | Insignificant | Possible | Low 3 | Confident | | | | |
| | backflow | protozoa | Extreme 20 | system integrity, backflow prevention on new installations | | Catastrophic | Rare | Medium 6 | Estimate | | | | LKD 1 Taggle meters, LAU 1 |
| System Wide | WTP Fire | Failure of supply | High 10 | DMP | | Catastrophic | Rare | Medium 6 | Reliable | | | | |
| | Cyclone | Failure of supply | High 10 | DMP | | Catastrophic | Rare | Medium 6 | Reliable | | | | |
| | operator error | any | Extreme 25 | training, experience, mentoring | | Catastrophic | Possible | High 15 | Estimate | | | Expand Excursions - Operationally Monitored Parameters table to provide more detail. | |
| | loss of knowledge | All | Extreme 25 | | | Catastrophic | Likely | Extreme 20 | Reliable | Difficult to retain staff in remote areas. Replacing staff harder, recent loss of 30 years experience. | | need to develop succession plan as knowledge of system is invested in small number of staff. Expand Excursions - Operationally Monitored Parameters table to provide more detail. | |
| | SCADA alarms not responded to | All | Extreme 25 | Operators check multiple times per day | | Catastrophic | Possible | High 15 | | SCADA has capacity to monitor, but no alarms sent to operators, limiting effectiveness | SCADA program where there is a signal, change program to give on screen alarms | after electrical upgrade, install autodailler and other instrumentation for monitoring | |
| | Missing procedures | All | Extreme 25 | SCADA limits partially mitigate. | | Catastrophic | Possible | High 15 | | need to take staff offline to write procedures to mitigate risks | | Expand Excursions - Operationally Monitored Parameters table to provide more detail. | |

# 4 OPERATIONAL PROCEDURES

In general CSC has few specific documented procedures for each process step as required under the ADWG. However, the operational limits are well defined, and actions are understood by the WTP operators. The following table forms the basis of more comprehensive operational procedures that will be developed over time.

*Table 2 Operational Limits used by operators/ SCADA.*

| Process Step / Location in System | Parameter | Operational Monitoring | Target Range | Monitoring Frequency | Operator Intervention Range | Report to Supervisor Range | Corrective Actions/ Comments |
|---|---|---|---|---|---|---|---|
| **Final Treated water** | Chlorine - Residual | Y |  <0.3 >4mg/L<br>0.3 – 0.5 and 1.3 - 4mg/L<br>0.5 -1.3 mg/L | Daily | <0.5 and >1.3 mg/L | <0.3 and >4 mg/L | Check operation of Chlorine dosing equipment<br>Check chlorine Tank Levels<br>Check Chlorine analyser<br>Increase / Decrease dose rate |

There are some documented procedures, as listed below. These include chlorination maintenance and mains break repair procedures.

*Table 3 Formal documented procedures used by CSC*

| Location | Documented procedure Name | S.O.P. No | Last Revision or Implementation | Process for implementing the procedure Activity and Frequency) | Comments |
|---|---|---|---|---|---|
| **Treatment** | Chlorine Analyser Maintenance Procedure | 0206 | 7/2011 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| **Reticulation** | Installation of New Water Mains | 0103W | 01/08/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| | Repairing of Broken Water Mains | 0100W | 23/3/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| | Repairing of Broken Water Services | 0101W | 23/3/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| | Water Mains Flushing / Scouring | 0102W | 23/3/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| | Water Sampling for Coliforms & E. coli | 0105W | 10/12/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |
| | Water Reservoirs - Cleaning | 0106W | 2/10/2012 | Distributed to Relevant staff c/w Training in the method described | This is a current Procedure |

# 5 OPERATIONAL AND VERIFICATION MONITORING

Operational monitoring is the monitoring undertaken by CSC to ensure that the water treatment barriers are operating effectively. This monitoring provides confidence that we are producing safe water. Operational monitoring is conducted by the WTP operators. Where any value exceeds the ADWG health guideline in treated or reticulated water, the Manager Water and Wastewater is immediately informed – this initiates a Medium level incident.

Verification monitoring is undertaken to ensure that the water that we supplied to our customers did meet the ADWG health guideline values. *E coli* sampling is predominantly internal, and all other monitoring is undertaken externally. Certificates of analysis are reviewed immediately upon receipt, and if a value exceeds the ADWG Health Guideline value, the Manager Water and Wastewater is informed, and the incident and emergency response activated (this is defined as a Medium level incident). Verification monitoring data is reported in our annual report.

## 5.1 Sampling Locations

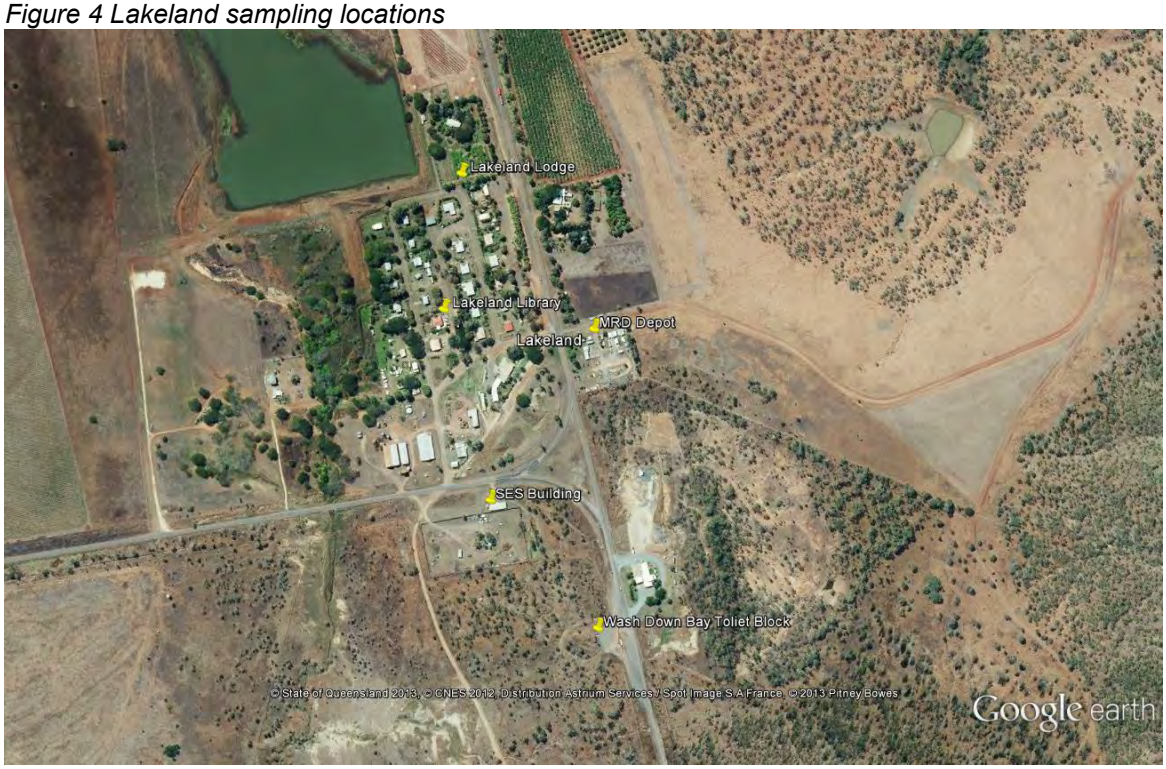
Operational monitoring occurs at a number of steps through the WTP process, and these are identified in the tables that follow.

Additionally, there are sample locations for both operational and verification monitoring that are located on the trunk main, at reservoirs, and in the reticulation network. These are detailed below.

*Table 4 Reticulation sample locations*

| Sample Location Name | Street Name | Site Chosen Because | GPS Coordinates * |
|---|---|---|---|
| SES | Peninsular Development Rd | End of the line. | 15°51'42.27"S - 144°51'21.53"E |
| MRD Depot | Cooktown Development Rd | Ease of access, Central | 15°51'32.22"S - 144°51'27.84"E |
| Lakeland Library | Sesame St | Ease of access, Central | 15°51'31.05"S - 144°51'18.66"E |
| Wash down Bay | Peninsular Development Rd | End of the line. | 15°51'49.78"S - 144°51'28.11"E |
| Lakeland Lodge | Back St | Northern end of Town | 15°51'23.10"S - 144°51'19.75"E |

*Figure 4 Lakeland sampling locations*




The above sample locations give a good cross section of the town including the dead end areas as shown in the figure below.

*Table 5 Operational monitoring*

| Process Step / Location in System | Parameter | Sampling | | | Operational Monitoring | Operational Monitoring Comments |
|---|---|---|---|---|---|---|
| | | Location | Frequency | Type | | |
| Lakeland Compound | pH | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | Bi-Monthly confirmation that the parameters are still the same as no chemicals are added to alter the composition of the water other than Sodium Hypochlorite for Disinfection |
| | Temperature | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Alkalinity | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Turbidity | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Colour | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Electrical Conductivity | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Total Dissolved Solids | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Total Hardness | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | |
| | Chlorine - Residual | Final Treated Water Sample Tap | Bi-Monthly | Grab Sample | Y | Monthly (Recorded) grab sample obtained every time staff are in Lakeland, this is at least weekly sometimes more often |
| | | On line via SCADA | Continuous | On Line | Y | Recorded Daily (these readings are taken from the SCADA each morning), on line analyser controls dosing pumps, Trended on the SCADA |
| Lakeland Reticulation | pH | Systematically alternating between the sites as listed in Table 6.2A | Bi-Monthly / Quarterly | Grab Sample | Y | Bi-Monthly confirmation that the parameters are within the guidelines |
| | Temperature | | Bi-Monthly | Grab Sample | Y | |
| | Alkalinity | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Turbidity | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Colour | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Electrical Conductivity | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Total Dissolved Solids | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Total Hardness | | Bi-Monthly / Quarterly | Grab Sample | Y | |
| | Chlorine - Residual | | Monthly | Grab Sample | Y | Monthly, additional grab sample obtained every time staff are in Lakeland, this is at least weekly sometimes more often |

*Table 6 Verification Monitoring*

| Process Step / Location in System | Parameter | Sampling | | | Verification Monitoring | Analysed By | Verification Monitoring Comments |
|---|---|---|---|---|---|---|---|
| | | Location | Frequency | Type | | | |
| **Treatment Plant Final Water** | **Physical / Chemical Analysis.** Includes parameters: pH, Electrical Conductivity, Alkalinity, Sulphate, Chloride, Ca, Mg, Na, K, Fluoride, Total Hardness, SAR, L.I., Turbidity, Colour apparent, TDS, Salinity & Silica | Final Treated Water Sample Tap | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Quarterly confirmation that the parameters are still the same as no chemicals are added to alter the composition of the water other than Sodium Hypochlorite for Disinfection |
| | *E. coli* | Final Treated Water Sample Tap | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Verified Quarterly |
| | *E. coli* | Final Treated Water Sample Tap | Weekly | Grab Sample | Y | CSC (Annan Lab) | Now using the IDEXX Colisure method of Determination |
| | Metals, Suite of 15 Includes As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Fe, Mn, V, Zn, Hg | Final Treated Water Sample Tap | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Quarterly |

| Process Step / Location in System | Parameter | Sampling | | | Verification Monitoring | Analysed By | Verification Monitoring Comments |
|---|---|---|---|---|---|---|---|
| | | Location | Frequency | Type | | | |
| Lakeland Reticulation | **Physical / Chemical Analysis.** Includes parameters: pH, Electrical Conductivity, Alkalinity, Sulphate, Chloride, Ca, Mg, Na, K, Fluoride, Total Hardness, SAR, L.I., Turbidity, Colour apparent, TDS, Salinity & Silica | Systematically alternating between the sites as listed in Table 6.2A | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Quarterly confirmation that the parameters are still the same as no chemicals are added to alter the composition of the water other than Sodium Hypochlorite for Disinfection |
| | *E. coli* | Systematically alternating between the sites as listed in Table 6.2A | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Verified Quarterly |
| | *E. coli* | Systematically alternating between the sites as listed in Table 6.2A | Weekly | Grab Sample | Y | CSC (Annan Lab) | Now using the IDEXX Colisure method of Determination |
| | Metals, Suite of 15 Includes As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Fe, Mn, V, Zn, Hg | Systematically alternating between the sites as listed in Table 6.2A | Quarterly | Grab Sample | Y | N.A.T.A. Certified Lab | Verified Quarterly |

All water samples are collected by the either the Reticulation staff, or the Water Treatment Plant operators all of which have had the appropriate training to collect water samples. Samples collected for verification are transported to Cairns by Air / Road Transport, and analysed by NATA accredited Laboratories, either Cairns Regional Council Water Quality Laboratory, or SGS Environmental Services

In the event of parameter/s being analysed as exceeding the ADWG health guidelines refer to the “Management of Incidents and Emergency Levels – Summary of Actions and Procedures”

# 6 WATER QUALITY CHARACTERISATION

Note: DWQMP reports tabulate the more recent water quality data.

*Table 7 Bore water quality details (analysed by CRC)*

| Parameter | Sampling Location | Time Period | No of samples taken in time period | Summary of results | | | Australian Drinking Water Guidelines guideline value (2011) | No of samples exceeding Australian Drinking Water Guidelines guideline value |
|---|---|---|---|---|---|---|---|---|
| | | | | Max. Value | Avg. Value | Min. Value | | |
| Arsenic | Lakeland Army Bore | July 2007 – Nov 2012 | 5 | <0.001 | <0.001 | <0.001 | 0.01 | 0 |
| Aldrin – mg/L | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.0003 | 0 |
| Dieldrin – mg/L | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.0003 | 0 |
| Endosulfan | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.02 | 0 |
| Endo. Sulphate | | | 6 | <0.00001 | <0.00001 | <0.00001 | | |
| Endrin | | | 6 | <0.00001 | <0.00001 | <0.00001 | | |
| Endosulfan | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.02 | 0 |
| Heptachlor | | | 6 | <0.00005 | <0.00005 | <0.00005 | 0.0003 | 0 |
| Heptachlor epoxide | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.0003 | 0 |
| Methoxychlor | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.3 | 0 |
| Chlordane | | | 6 | <0.00001 | <0.00001 | <0.00001 | 0.002 | 0 |

Initial and subsequent testing has not revealed any parameter to be of concern to date, however annual sampling will continue, in the future the detection of any parameters and the concentrations will determine what action will be required

*Table 8 Combined Raw and Final water quality (NATA lab)*

| Parameter | Sampling Location | Time Period | No of samples taken in time period | Summary of results | | | Australian Drinking Water Guidelines guideline value (2011) | No of samples exceeding Australian Drinking Water Guidelines guideline value |
|---|---|---|---|---|---|---|---|---|
| | | | | Max. Value | Avg. Value | Min. Value | | |
| Alkalinity | Lakeland Combined Bore Water Sampled from the Reservoir | March 2010– February 2012 | 8 | 270 | 262.5 | 250 | | |
| Calcium | | | 8 | 35 | 30.7 | 9.8 | | |
| Chloride | | | 8 | 130 | 120 | 110 | < 250 - *mg/L* | 0 |
| Colour Apparent | | | 8 | 1.6 | 1.4 | 1.0 | < 15 – *Pt/Co* | 0 |
| Electrical Conductance | | | 8 | 860 | 855 | 840 | | |
| Fluoride | | | 8 | 0.6 | .5 | .4 | < 1.5 - *mg/L* | 0 |
| Total Hardness | | | 8 | 261 | 245 | 200 | < 200 - *mg/L* | 7 |

| Parameter | Sampling Location | Time Period | No of samples taken in time period | Summary of results | | | Australian Drinking Water Guidelines guideline value (2011) | No of samples exceeding Australian Drinking Water Guidelines guideline value |
|---|---|---|---|---|---|---|---|---|
| | | | | Max. Value | Avg. Value | Min. Value | | |
| Magnesium | | | 8 | 42 | 40.75 | 38 | | |
| pH | | | 8 | 7.7 | 7.51 | 7.3 | 6.5 – 8.5 | 0 |
| Potassium | | | 8 | 1.7 | 1.56 | 1.5 | | |
| Silica - Reactive | | | 8 | 94 | 91.13 | 89 | | |
| Sodium | | | 8 | 87 | 83.25 | 80 | < 180 - *mg/L* | 0 |
| Total Dissolved Solids | | | 8 | 510 | 498.75 | 490 | < 600 - *mg/L* | 0 |
| Sulphate | | | 8 | 4.1 | 3.51 | 3.1 | < 250 - *mg/L* | 0 |
| Turbidity | | | 8 | .6 | .2 | .1 | < 5 - *NTU* | 0 |
| Aluminium - *mg/L* | | July 2008 – February 2013 | 3 | 0.030 | 0.028 | 0.026 | 0.20 - *mg/L* | 0 |
| Arsenic *mg/L* | | | 3 | 0.003 | .0017 | 0.001 | 0.01 - *mg/L* | 0 |
| Cadmium *mg/L* | | | 3 | 0.0001 | 0.0001 | 0.0001 | 0.002- *mg/L* | 0 |
| Chromium *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.05 - *mg/L* | 0 |
| Copper *mg/L* | | | 3 | 0.131 | 0.050 | 0.009 | 2.0 - *mg/L* | 0 |
| Iron *mg/L* | | | 3 | .0005 | 0.005 | 0.005 | 0.3 - *mg/L* | 0 |
| Lead *mg/L* | | | 3 | 0.002 | 0.0013 | 0.001 | 0.01 - *mg/L* | 0 |
| Manganese *mg/L* | | | 3 | 0.005 | 0.0027 | 0.001 | 0.1 - *mg/L* | 0 |
| Nickel *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.02 - *mg/L* | 0 |
| Zinc *mg/L* | | | 3 | 0.01 | 0.01 | 0.01 | 3.0 - *mg/L* | 0 |
| Mercury *mg/L* | | | 3 | 0.0001 | 0.0001 | 0.0001 | *0.001* - *mg/L* | 0 |

*Table 9 Summary of Treated Water quality details – Lakeland Final Water (Analysed by CSC - Annan Lab)*
These are sampled from the Lakeland Chlorinated water and analysed at the Annan Lab by CSC Range covered: 1/2011 – 3/2013
Chlorine Residual analysed on site

| | pH | Temperature °C | Electrical Conductivity uS/cm | Dissolved Oxygen Mg/L | Colour Pt/Co Units | Turbidity NTU | Total Dissolved Solids mg/L | Total Hardness as mg/L CaCO3 | Chlorine Residual mg/L |
|---|---|---|---|---|---|---|---|---|---|
| Count | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Max | 7.32 | 27.7 | 887 | 8.62 | 5 | .38 | 434 | 250 | .52 |
| Min | 6.95 | 19.3 | 841 | 4.18 | 0 | .09 | 411 | 241 | .37 |
| Avg | 7.10 | 23.71 | 872.3 | 6.33 | 1.33 | 0.18 | 427 | 245.1 | .45 |

A Review of the Final Treated Water data shows the Final water to be of a High Quality with only Total Hardness exceeding the guideline values

All other parameters with a guideline value are well within the guidelines. Lakeland Water whilst being a "Bore Water" is not an unpleasant water to drink, as a consequence water quality complaints are a rarity.

*Table 10 Summary of Treated Water quality details – Lakeland Reticulation (Analysed by CRC)*

| Parameter | Sampling Location | Time Period | No of samples taken in time period | Summary of results | | | Australian Drinking Water Guidelines guideline value (2011) | No of samples exceeding Australian Drinking Water Guidelines guideline value |
|---|---|---|---|---|---|---|---|---|
| | | | | Max. Value | Avg. Value | Min. Value | | |
| Alkalinity - *mg/L CaCO3* | Various Locations within the Lakeland Reticulation | April 2010 – June 2012 | 24 | 270 | 260.8 | 240 | | |
| Calcium - *mg/L* | | | 24 | 36 | 33.74 | 31 | | |
| Chloride - *mg/L* | | | 24 | 130 | 118.37 | 110 | ≤250 - *mg/L* | 0 |
| Colour Apparent - *Pt- Co* | | | 24 | 1.4 | 1.03 | 1 | ≤15 – *Pt/Co* | 0 |
| Electrical Conductance | | | 24 | 870 | 852.1 | 830 | | |
| Fluoride - *mg/L* | | | 24 | .7 | .50 | .4 | ≤1.5 - *mg/L* | 0 |
| Total Hardness - *mg/L CaCO3* | | | 24 | 260 | 236.40 | 205 | ≤200 - *mg/L* | 24 |
| Magnesium - *mg/L* | | | 24 | 42 | 37.0 | 31 | | |
| pH | | | 24 | 7.8 | 7.50 | 7.2 | 6.5 – 8.5 | 0 |
| Potassium - *mg/L* | | | 24 | 2.0 | 1.6 | 1.5 | | |
| Silica – Reactive - *mg/L* | | | 24 | 93 | 85.9 | 39 | | |
| Sodium - *mg/L* | | | 24 | 86 | 82.5 | 77 | ≤180 - *mg/L* | 0 |
| Total Dissolved Solids - *mg/L* | | | 24 | 520 | 500.0 | 470 | ≤600 - *mg/L* | 0 |
| Sulphate - *mg/L* | | | 24 | 4.0 | 3.3 | 2.8 | ≤250 - *mg/L* | 0 |
| Turbidity - *NTU* | | | 24 | 2.4 | 0.32 | .1 | ≤5 - *NTU* | 0 |
| Aluminium - *mg/L* | | March 2010 – November 2012 | 3 | .028 | 0.0263 | 0.025 | 0.20 - *mg/L* | 0 |
| Arsenic *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.01 - *mg/L* | 0 |
| Cadmium *mg/L* | | | 3 | 0.0001 | 0.0001 | 0.0001 | 0.002- *mg/L* | 0 |
| Chromium *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.05 - *mg/L* | 0 |
| Copper *mg/L* | | | 3 | 0.026 | 0.0193 | 0.014 | 2.0 - *mg/L* | 0 |
| Iron *mg/L* | | | 3 | 0.005 | 0.0043 | 0.004 | 0.3 - *mg/L* | 0 |
| Lead *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.01 - *mg/L* | 0 |
| Manganese *mg/L* | | | 3 | 0.002 | 0.0017 | 0.001 | 0.1 - *mg/L* | 0 |
| Nickel *mg/L* | | | 3 | 0.001 | 0.001 | 0.001 | 0.02 - *mg/L* | 0 |
| Zinc *mg/L* | | | 3 | 0.044 | 0.030 | 0.018 | 3.0 - *mg/L* | 0 |
| Mercury *mg/L* | | | 3 | 0.0001 | 0.0001 | 0.0001 | *0.001* - *mg/L* | 0 |

*Table 11 Summary of Treated Water quality details (Lakeland Reticulation) (Analysed by CSC)*
These are sampled from the Lakeland Reticulation, at various locations and analysed at the Annan Lab by CSC Range covered: 1/2011 – 3/2013

| | pH | Temperature °C | Electrical Conductance uS/cm | Dissolved Oxygen Mg/L | Colour Pt/Co Units | Turbidity NTU | Total Dissolved Solids mg/L | Total Hardness as mg/L CaCO3 | Chlorine Residual mg/L |
|---|---|---|---|---|---|---|---|---|---|
| Count | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 30 |
| Max | 7.52 | 34.1 | 907 | 8.32 | 11 | .6 | 448 | 260 | 1.82 |
| Min | 6.82 | 18 | 774 | 4.69 | 0 | .06 | 367 | 237 | 0.29 |
| Avg | 7.04 | 24.6 | 877.8 | 6.57 | 2.61 | .20 | 427.4 | 247.9 | 0.52 |

*Table 12 Summary of Total E. coli detected – Lakeland Scheme*

| Parameter | Sampling Location | Time Period | No of samples analysed in time period | Results | Australian Drinking Water Guidelines guideline value (2011) | No of samples exceeding Australian Drinking Water Guidelines guideline value |
|---|---|---|---|---|---|---|
| | | | | No of Samples where E.coli was Detected | | |
| Escherichia coli | Various Locations within the Lakeland Reticulation | 21/1/2009 – 20/1/2014 | 252 | 0 | Escherichia coli should not be detected in any 100 mL sample of drinking water. | 0 |

*Table 13 Summary of Lakeland Treatment Plant daily chlorine residual readings (Obtained daily from the Lakeland SCADA)*
Date Range: 01/01/2009 – 31/12/2012

| | SCADA on line Chlorine readings (mg/L) |
|---|---|
| Count | 1461 |
| Max | 2.0 |
| Min | 0.28 |
| Avg | 0.46 |
| No of samples recorded as below 0.3 mg/L | 1 (0.28) |

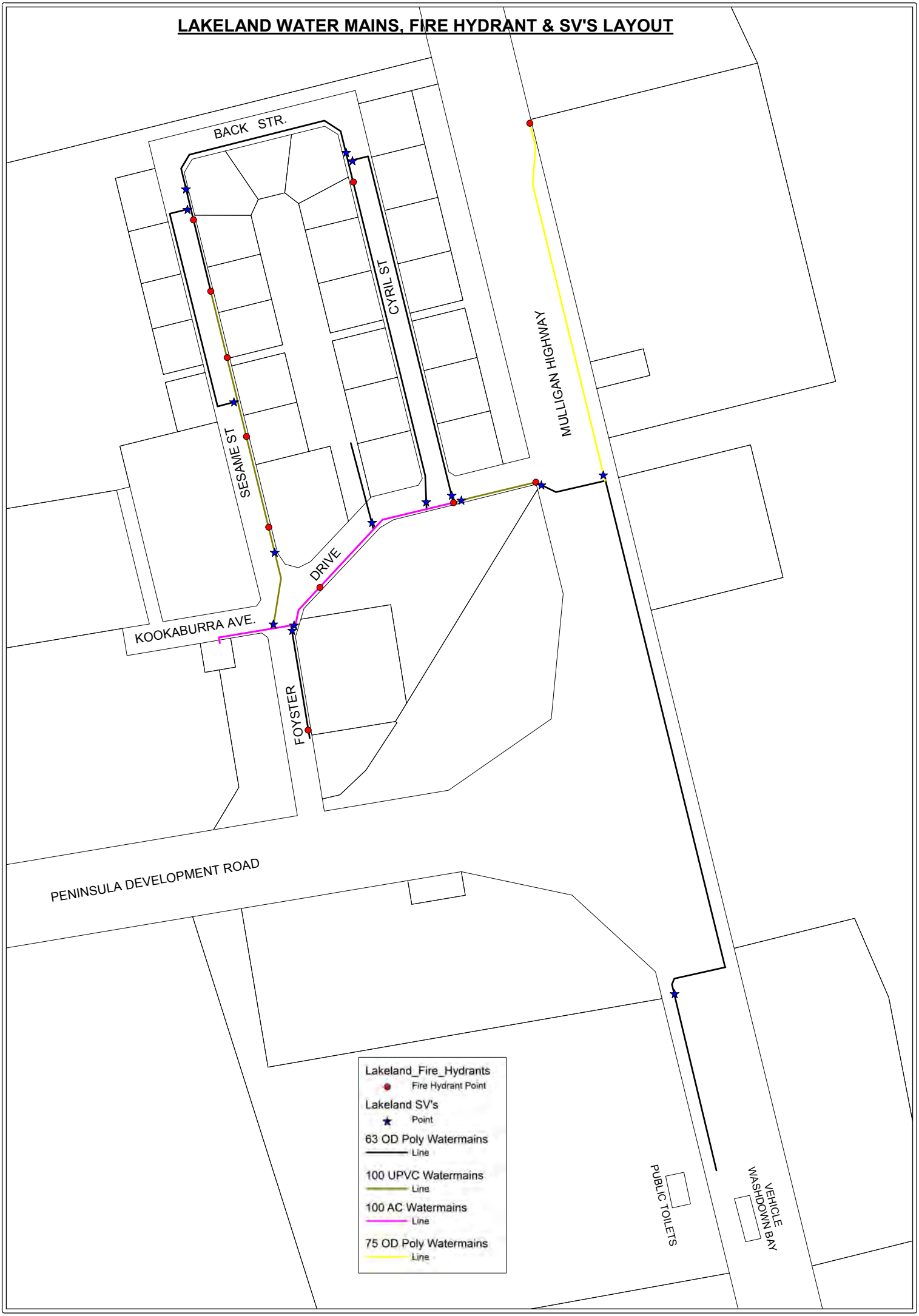
The Lakeland chlorine residual level on the SCADA is generally 0.45 - 0.46 daily if the reading is between 0.30 – 0.40 and falling (as can be seen on the chlorine dosing trends) then immediate action is taken to remedy the situation.

A Review of the reticulation water data shows the final water to be of a high, all parameters (other than total hardness) are well within the guideline values.

The Lakeland distribution water data shows nil *E. coli* detected.

# APPENDIX C: Lakeland Water Network Map

# LAKELAND WATER MAINS, FIRE HYDRANT & SV'S LAYOUT

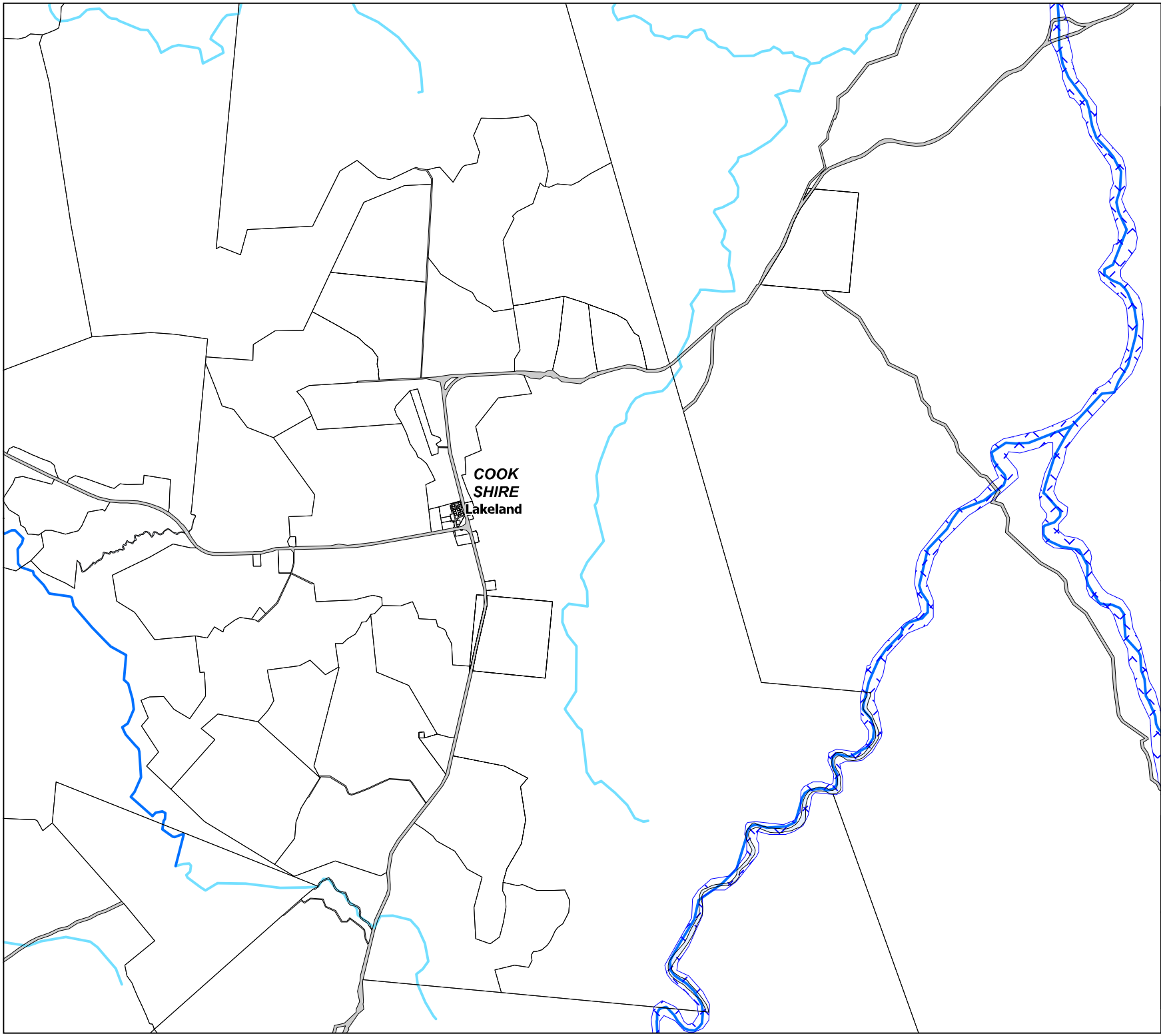


# APPENDIX D: Water Demand Calculations

Lakeland Town Water Projection

| Item | Formula | Units | 2017 | 2027 | 2037 |
|---|---|---|---|---|---|
| No. Persons | Number of | No. | 200 | 500 | 800 |
| Average Daily Consumption (AD) | =500L/person/day | L/day | 100,000 | 250,000 | 400,000 |
| Mean Day Max Month (MDMM) | =1.5 x AD | L/day | 150,000 | 375,000 | 600,000 |
| Peak Day (PD) | =2.25 x AD | L/day | 225,000 | 562,500 | 900,000 |
| Peak Hour (PH) | =1/12 x AD | L/hour | 18,750 | 46,875 | 75,000 |
| Firefighting (Residential) litres | =15L/s x 2hrs | Litres | 108,000 | 108,000 | 108,000 |
| Firefighting (Commercial) litres | =30L/s x 4hrs | Litres | 432,000 | 432,000 | 432,000 |
| Emergency Flows | =3 x AD | Litres | 300,000 | 750,000 | 1,200,000 |
| Ground Reservoir Storage | =3 x (PD-MDMM) + Max of Emergency Flows or FF Residential | Litres | 525,000 | 1,312,500 | 2,100,000 |
| Cost to Construct | = $420 per kL Storage | $ | $ 220,500.00 | $ 551,250.00 | $ 882,000.00 |

# APPENDIX E: Council Overlay Maps




# COOK SHIRE COUNCIL PLANNING SCHEME OVERLAY MAP

## Wetlands & Watercourses Overlay

**Lakeland**

**Legend**

- Wetlands
- Major River
- Other Watercourse
- Cook Shire Boundary
- Lot Boundaries
- Adjoining Local Governments
- Roads



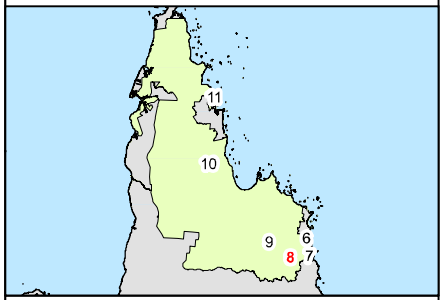
Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone 55

Scale: 1:75,000 1 cm = 750 m (A3 Print)

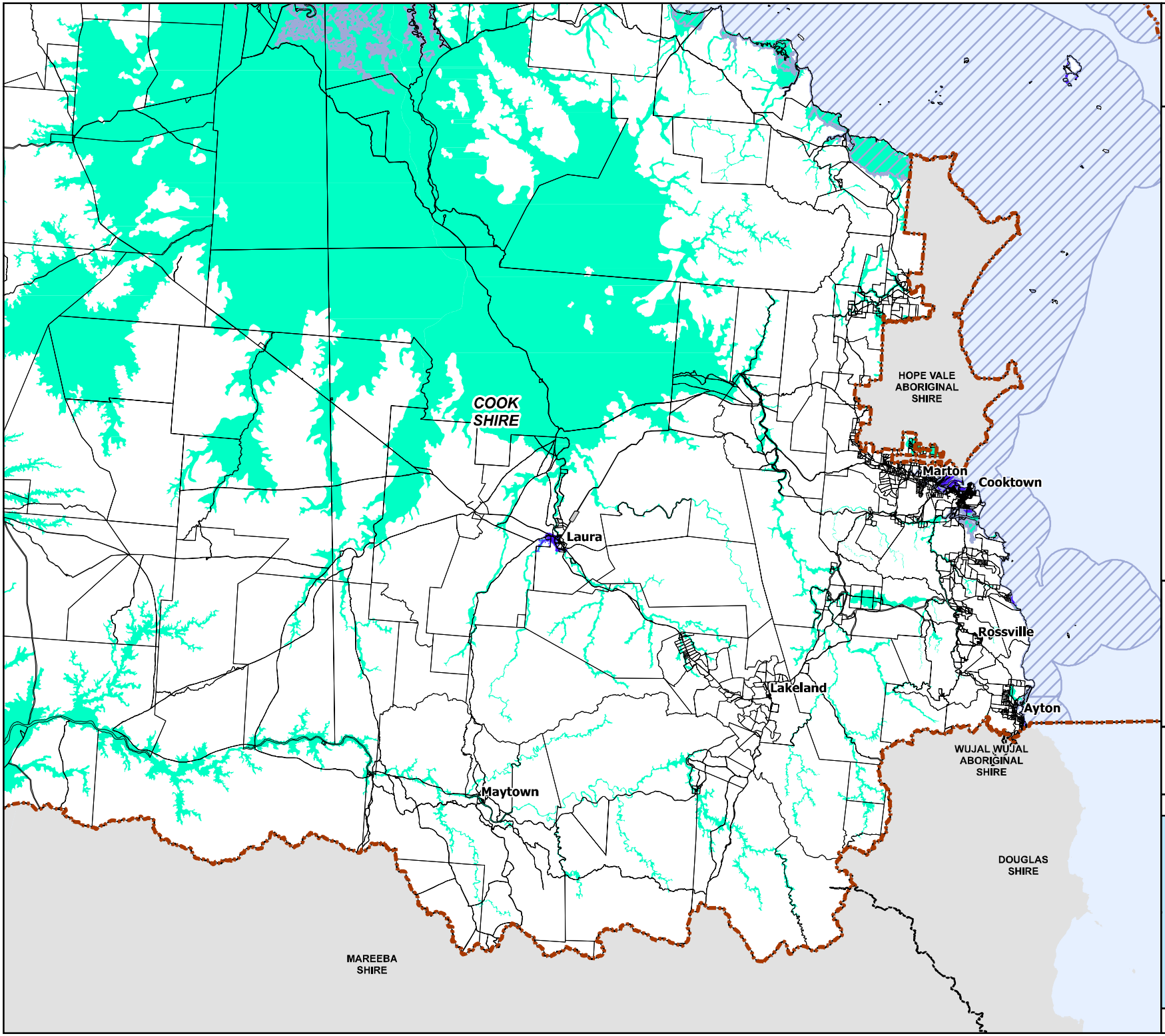
0 2 4 Km

Date: 18/04/2016

## INDEX MAP




**Overlay Map - OM12.8**




# COOK SHIRE COUNCIL PLANNING SCHEME OVERLAY MAP

## Flood and Other Coastal Hazards Overlay

### Rural Locality 5

**Legend**

- High Hazard Area
- Medium Hazard Area
- Potential Flood Hazard Area
- Erosion Prone Area*

*Note:
The Erosion Prone Area is based on data generated by the State of Queensland and is indicative only. To determine the exact extent of the Erosion Prone Area, please refer to the statutory mapping available at:
https://www.ehp.qld.gov.au/coastal/management/maps/index.html

- Cook Shire Boundary
- Lot Boundaries
- Adjoining Local Governments
- Roads



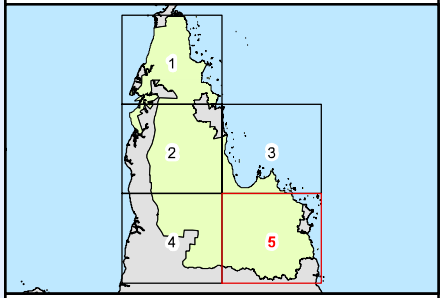
Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone 55

Scale: 1:750,000 1 cm = 7,500 m (A3 Print)

0 20 40 Km

Date: 28/04/2016

## INDEX MAP




**Overlay Map - OM5.5**

# APPENDIX F: LPA Letter dated 28 April 2017

LAKELAND PROGRESS ASSOCIATION

CONTACT US:

facebook.com/LakelandProgressAssociation
a: PMB Lakeland, via Cairns QLD 4871
e: lakeland@outlook.com.au

:

April 28, 2017

Dear Sacheen,

**RE: Lakeland Local Area Plan**

I refer to your email dated 28/04/17 regarding the upcoming workshop to be held in Lakeland on the 5th May 2017. I write on behalf of the Lakeland Progress Association & the Lakeland community.

We are pleased to hear of a meeting to discuss our local area plan and wish to provide some information prior to the meeting as the allowed 2hrs may not be sufficient to cover all topics. Please note, for your information, these issues have been raised and discussed on many previous occasions with the Cook Shire Council and the Member for Cook.

Please see below a response to the workshop topics you mentioned in your email

**1.0 Lakeland's Current Situation:**

- Significant contributors to the Shire (I believe we are second to the Government)
- 10 horticultural producers in the area
- 10 general businesses based in the town
- 7 graziers within 20km of the town centre
- Approx. 140 permanent residents (within 10km of the town centre)
- Approx. 180 transient employees residing in Lakeland (this does not include those currently working at the Solar Farm)
- First Solar farm in the region approaching construction end – opportunity for permanent staff to be employed & reside in Lakeland
- Windlab & Lyon's currently in the concept phase of wind farm & second solar farm projects (approx. 5 times the size of current solar farm)
- Feasibility study currently in progress for water infrastructure for Lakeland – the outcomes of this project will pave the way to gaining access to more water & therefore the expansion of agriculture – which also means that obviously we'll have an even higher demand for housing!
- Currently no recreational facilities in the town (we do have a site available for development but funding & water is an issue)
- Currently no cemetery or land available for a cemetery (an area which could be subdivided for a place of worship and cemetery has been identified)

**2.0 Constraints Limiting development in Lakeland**

- Access to water for the town expansion
- Sewerage infrastructure
- Town is encompassed by free-hold land therefore development of the town is reliant on landholders
- Zoning limits areas which can be subdivided and in some cases, the zoning is not accurate to the type of soil in those areas
- Requirements/cost of subdividing, cannot get your return on investment
- No incentives to subdivide
- No industrial area to allow growth

**3.0 Opportunities & Challenges for Lakeland**

**3.1 Opportunities in terms of housing, short term accom & services**

- Attracting more permanent residents and families to the area which has an obvious roll-on effect to the local businesses the school etc.
- Housing staff for 2nd solar farm/wind farm for construction & ongoing permanent positions
- Becoming the agricultural hub of North Queensland & all that goes with it
- Becoming a centre for sporting/recreational events in the cape with the development of the recreational park
- Improved medical services with the growth in population

**3.2 Challenges in terms of housing, short term accom & services**

- Currently zero housing available for anyone wanting to move to Lakeland
- Services are nil, funding & population may be hindering this?

**4.0 Ideas for Improvements to existing situation**

- Provide incentives for land owners to subdivide
- Minimise required infrastructure for subdivisions to ensure feasible
- House blocks of 1200m^2 as a minimum
- Opportunity to subdivide lifestyle blocks (within a certain distance from town) & industrial blocks (Honey dam Road would be the most suitable)
- Rezoning to allow development
- We need more support from the Cook Shire Council

There are also some additional issues that need to be addressed which we discussed in our most recent meeting:

- The quality of our town roads are in dire need of improvement & done so more frequently (no work has been done on our roads in the last 4 years)
- The town is in need of footpaths and improved street lighting as it is a huge safety issue (many people walk to work along the highway in the dark and the locals are concerned someone will be hit)
- Better coordination required between the council & main roads with regards to the town mowing – the quality of mowing has declined. Is this something that can be taken on locally??

We trust this information is of help to you. If you have any questions please do not hesitate to contact me on 0417 625 121. We look forward to discussing this further in the meeting on Thursday.

Thank you.

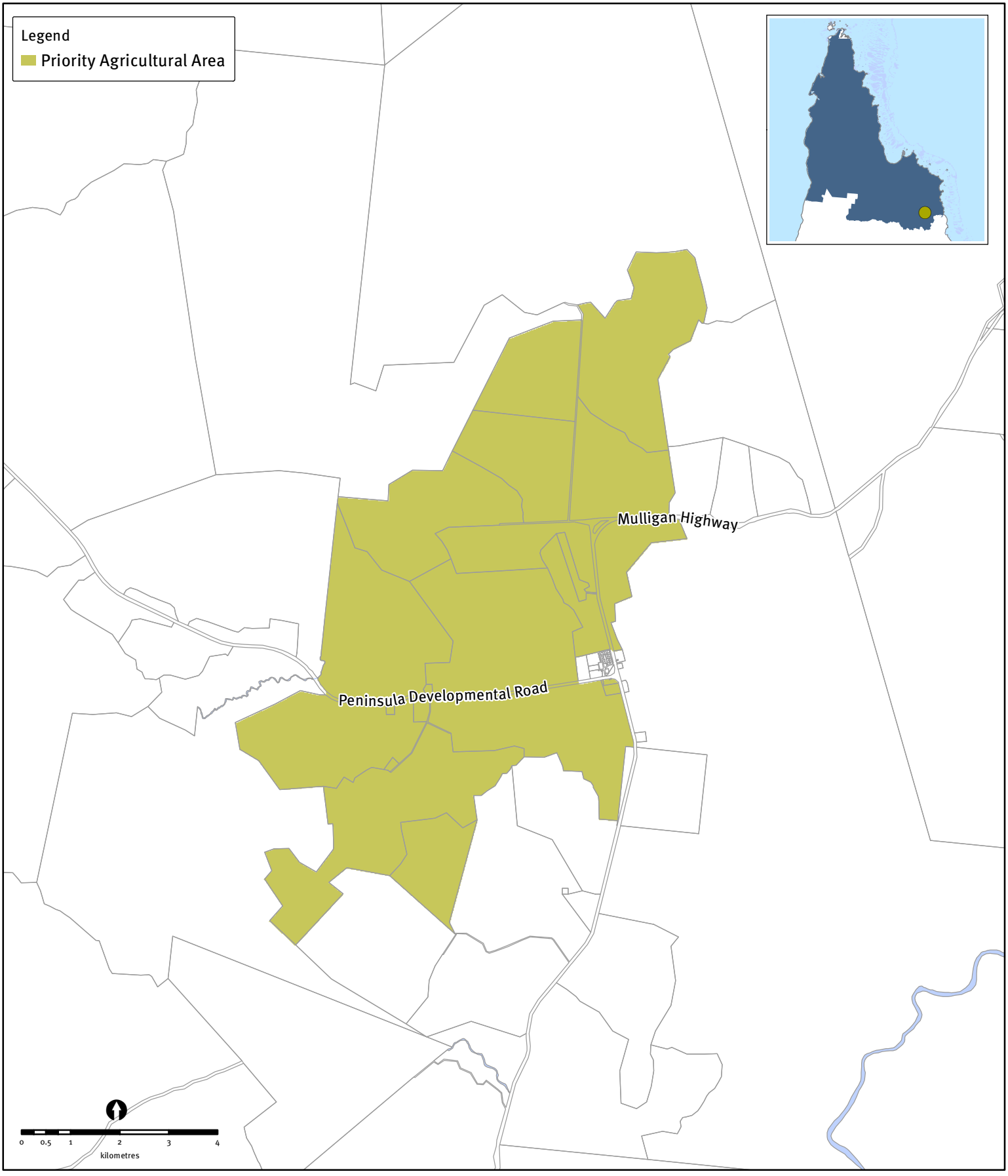
Kind Regards,

Stefanie O'Kane
*Secretary, Lakeland Progress Association*

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX B – CAPE YORK REGIONAL PLAN 2014

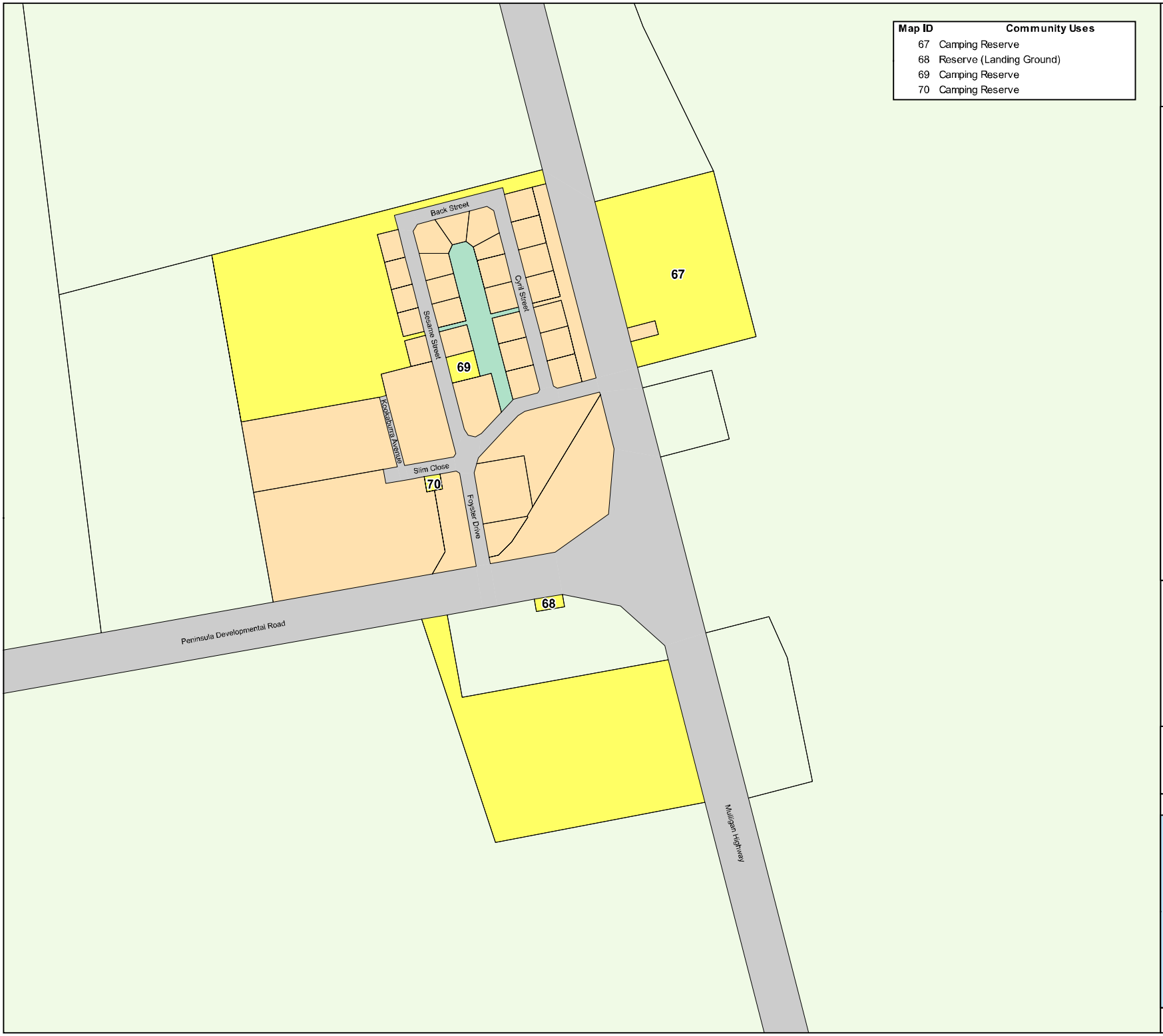
# Priority Agricultural Area
# Cape York Regional Plan



# Priority Living Area - Cook Shire - Lakeland
# Cape York Regional Plan

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX C – COOK SHIRE PLANNING SCHEME 2017




| Map ID | Community Uses |
|---|---|
| 67 | Camping Reserve |
| 68 | Reserve (Landing Ground) |
| 69 | Camping Reserve |
| 70 | Camping Reserve |

# COOK SHIRE COUNCIL PLANNING SCHEME 2017 ZONE MAP

## Lakeland

### Zones

- Low Density Residential
- Medium Density Residential
- Centre
- Community Facilities
- Environmental Management and Conservation
- Industry
- Mixed Use
- Recreation and Open Space
- Rural Residential
- Rural
- Township

Local Government Boundary
Cadastre Boundary
Adjoining Local Governments
Road
Water



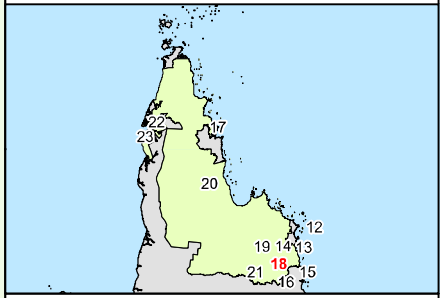
Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone 55

Scale: 1:5,000 1 cm = 50 m (A3 Print)

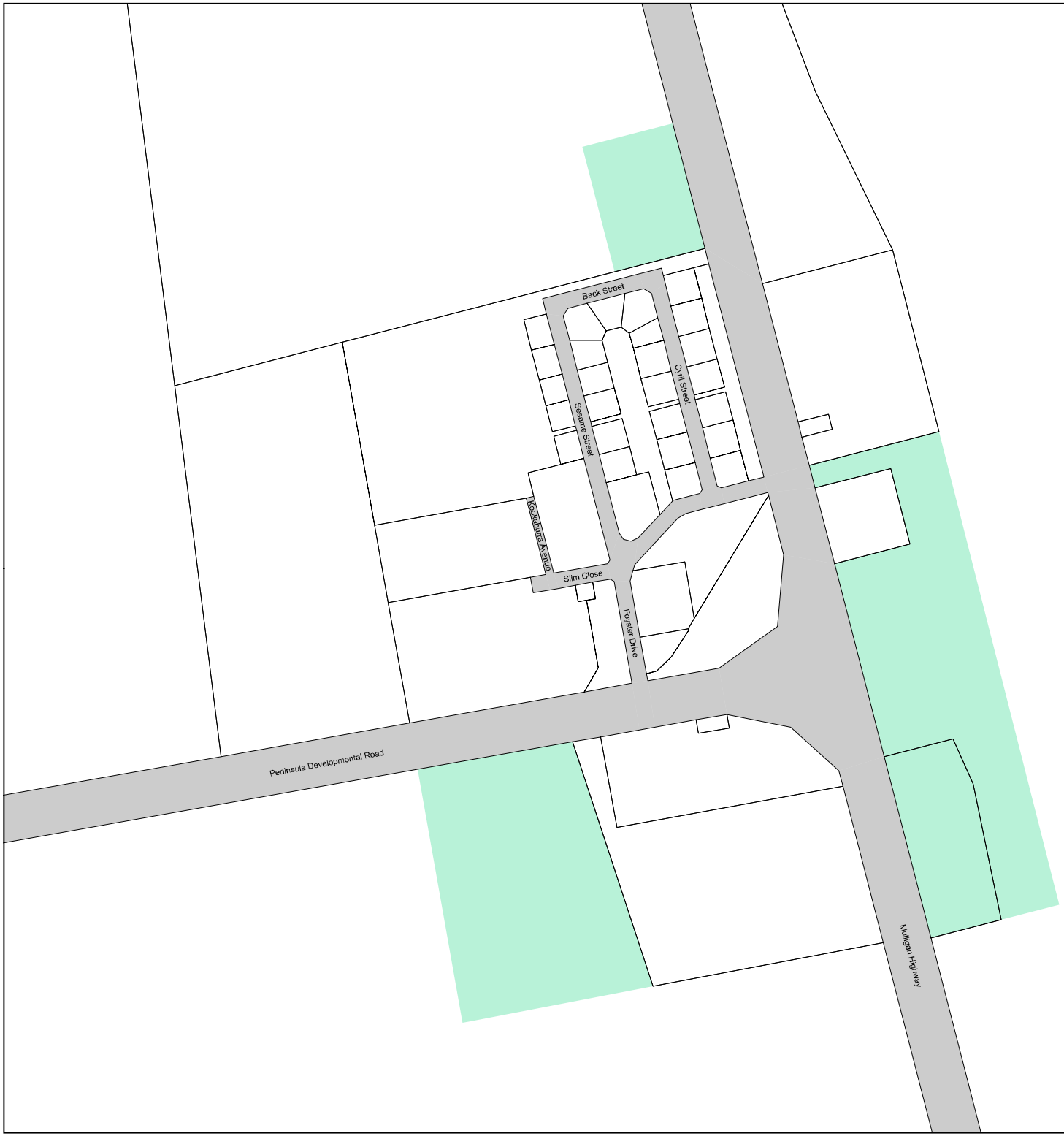
0 0.125 0.25 Km

Date: 5/01/2017

## INDEX MAP




**Zoning Plan Map - 18**




# COOK SHIRE COUNCIL PLANNING SCHEME OVERLAY MAP

## Future Urban Expansion Overlay

**Lakeland**

**Legend**

Urban Expansion

Cook Shire Boundary
Lot Boundaries
Adjoining Local Governments
Roads



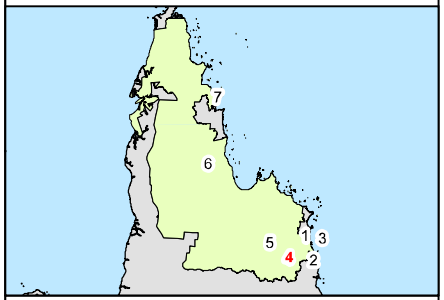
Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone 55

Scale: 1:5,000 1 cm = 50 m (A3 Print)

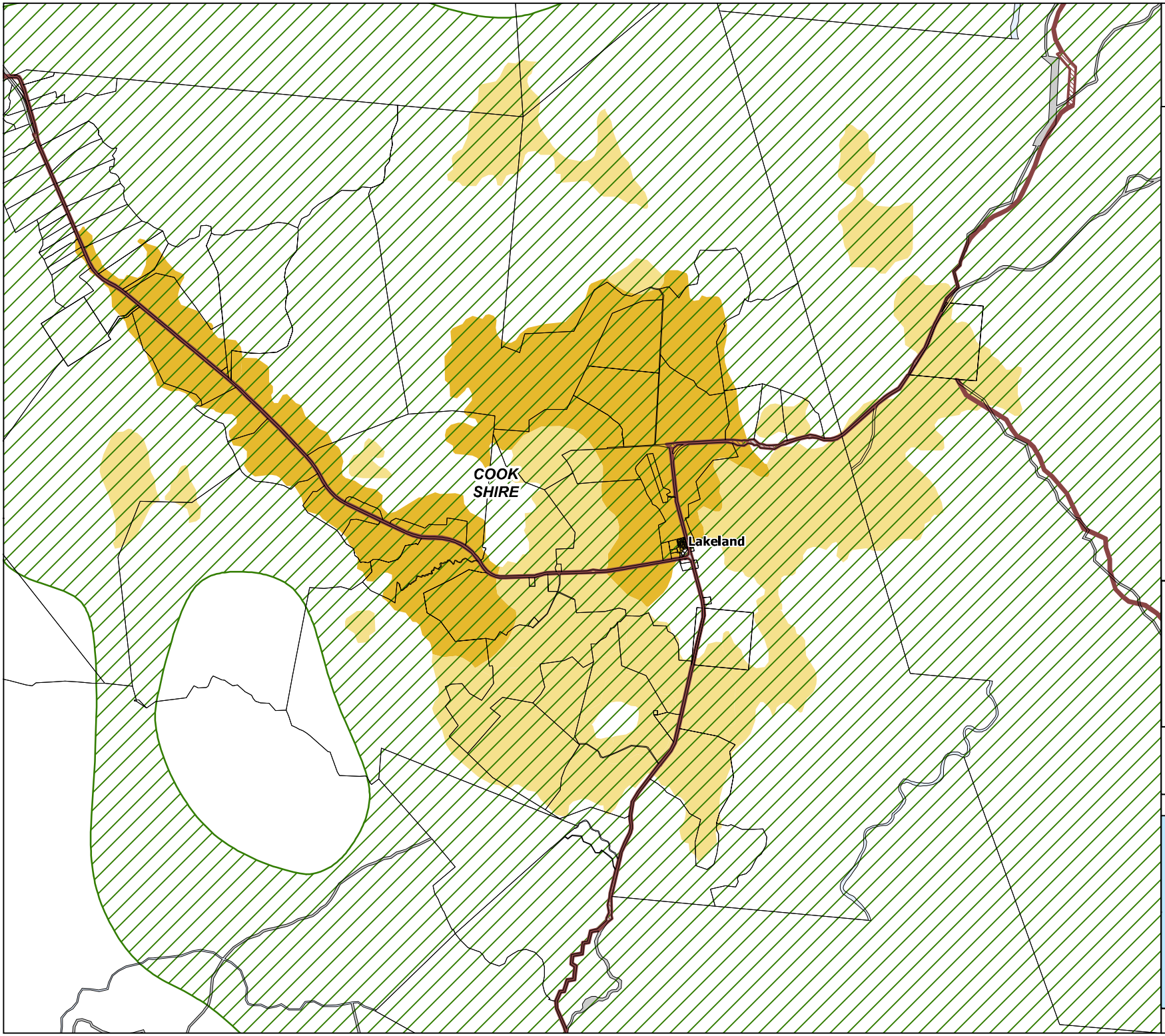
0 0.125 0.25 Km

Date: 29/04/2016

## INDEX MAP




**Overlay Map - OM6.4**




# COOK SHIRE COUNCIL PLANNING SCHEME OVERLAY MAP

## Rural Land Use Overlay

## Lakeland

### Legend

- Stock Routes
- Important Agricultural Areas
- Agricultural Land Class A
- Agricultural Land Class B

- Cook Shire Boundary
- Lot Boundaries
- Adjoining Local Governments
- Roads



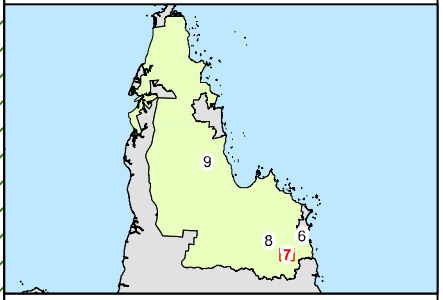
Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone 55

Scale: 1:100,000 1 cm = 1,000 m (A3 Print)

0 2.75 5.5 Km

Date: 13/04/2016

## INDEX MAP




**Overlay Map - OM8.7**

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX D – REGISTER OF COMMUNITY MEETING ATTENDEES (4 MAY & 10 AUGUST 2017)

### 4 May 2017 – Community Meeting – Lakeland Community Hall

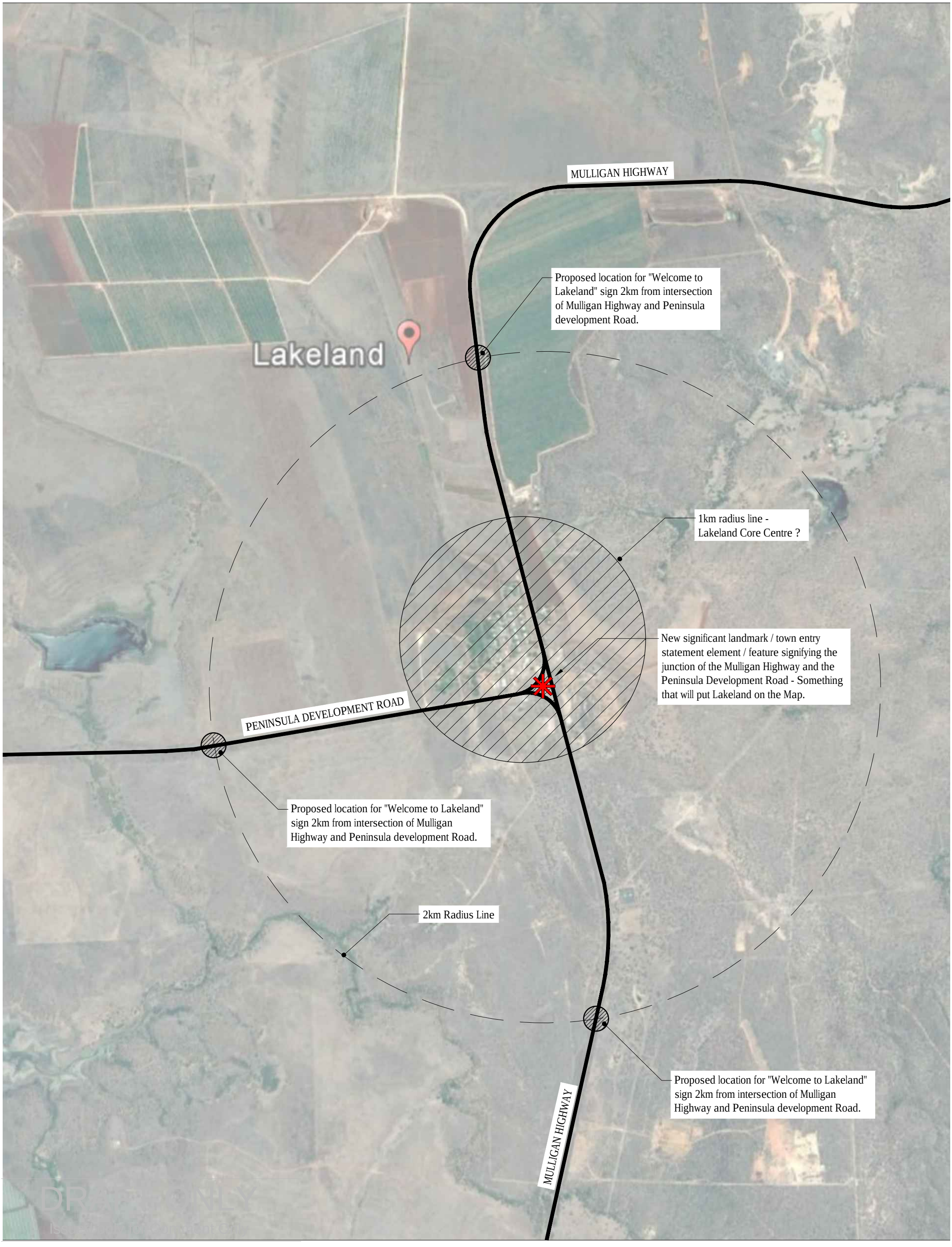
| NAME | ORGANISATION |
|---|---|
| Melissa Murchison | Conergy |
| Franziska Inderbitzin | Swiss Farms |
| Joy Marriott | Landowner |
| Stefanie O'Kane | Lakeland Progress Association |
| Ramon Samanes | U&I Town Planning |
| Tony Potter | Cape York Sustainable Futures |
| Alan Wilson | Councillor |
| Tony Vicars | Cooktown Hardware |
| Ben Bliss | |
| Maria Lorenzo | Lakeland Trading |
| Victtoria Brown | Shady Springs |
| Steve Ahlers | Landowner |
| Tuxworth | Tuxworth & Woods Carriers |
| Martin Arnold | Landowner |
| Sam Sellwood | Lakeland Hotel Motel |
| Stanley McKenzie | Landowner |
| Morsy Ibrahim | Lakeland Coffee |
| Sue Ahlers | Landowner |
| Annette Marriott | Ninda Creek |
| Malcolm McCudden | Lakeland Caravan Park |

### 10 August 2017 – Community Meeting – Lakeland Community Hall

| NAME | ORGANISATION |
|---|---|
| Wayne Russell | Landowner |
| Susie Lord | Planz Town Planning |
| William Reddie | Turalba |
| Stefanie O'Kane | Lakeland Progress Association |
| Peter Inderbitzin | Red Valley |
| Beth Bennett | Landowner |
| Gary O'Kane | Lakeland Progress Association |
| Maria Lorenzo | Lakeland Trading |
| Annette Marriott | Ninda Creek |
| Ramon Samanes | U&I Town Planning |
| Sam Sellwood | Lakeland Hotel Motel |
| Morsy Ibrahim | Lakeland Coffee House & Store |
| Dan Kerridge | Ray White Real Estate Cooktown |
| Victtoria Brown | Shady Springs |
| Joy Marriott | Mountain View Station |
| Sue Ahlers | Belleari Lakeland |
| Lynette Ensor | Landowner |
| Mary Inverardi | Landowner |
| Paul Inderbitzin | Koreen Farming |
| Shallyn Bloomfield | Home Owner |

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX E – DRAFT LANDSCAPE MASTER PLAN




NORTH

# LAKELAND LANDSCAPE MASTER PLAN

Plan 1 of 4

ENTRY STATEMENT STRATEGY PLAN

SCALE 1:20,000 @ A3

place design group.

LEGEND:

- Major Roads
- Residential
- Community Facility
- Industry

To Cooktown
77km

Mulligan Highway

Swiss Farm

Existing Flood
Detention Basin

Lakeland State School

Existing Residential

Lakeland Coffee
House & Store

Lakeland
Caravan Park

Existing Main
Roads Depot

Perfume
Gully

Lakeland
Hotel / Motel

Existing Light
Industry Land Use

Large Intersection Island.

SES Building

Lakeland
Roadhouse

Peninsula Development Road

To Laura - 62km
To Coen - 308km
To Weipa - 557km

Undeveloped
Recreational Park

Existing Toilet / Wash
Down Facilities.

To Mareeba - 190km
To Cairns - 250km

DRAFT ONLY

Issued only for Comment Only

NORTH

# LAKELAND LANDSCAPE MASTER PLAN

Plan 2 of 4

EXISTING SITE USES PLAN

SCALE 1:4000 @ A3

place
design
group.

LEGEND:

Current / Proposed Use Nodes

Proposed 2.5m wide shared pedestrian/bicycle path.

Proposed 1.5m wide pedestrian path.

Proposed Future Roads

Mulligan Highway

Lakeland State School

Future Road Connection

Proposed 2.5m wide shared pedestrian / bicycle pathway

Proposed Footpath / Pedestrian Route

Lakeland Coffee House & Store

Lakeland Caravan Park

Proposed Recreation Corridor

Perfume Gully

Future Road Connection

Lakeland Hotel / Motel

Proposed RV / Caravan Parking and 'Gateway to the Cape' Tourist Information Centre.

Proposed 2.5m wide shared pedestrian / bicycle pathway

Proposed 1.5m wide pedestrian pathway

Proposed Future Short Term Accommodation Facility

Lakeland Roadhouse

Peninsula Development Road

Undeveloped Recreational Park

Existing Toilet / Wash Down Facilities.

DRAFT ONLY

Issued only for Comment Only

NORTH

# LAKELAND LANDSCAPE MASTER PLAN

Plan 3 of 4

PROPOSED FOOTPATH NETWORK PLAN

SCALE 1:4000 @ A3

place design group.

LEGEND:

Proposed 2.5m wide shared pedestrian/bicycle path.

Proposed 1.5m wide pedestrian path.

Proposed Future Roads

MULLIGAN HIGHWAY

Lakeland State School.

Proposed location for the 'Gateway to the Cape' Tourist Information Centre - located closer to the centre of town directly adjacent rv/caravan parking and hotel.

New significant landmark / town entry statement element / feature signifying the junction of the Mulligan Highway and the Peninsula Development Road.

PENINSULA DEVELOPMENT ROAD

Proposed rv/caravan parking and carpark associated with the proposed Tourist Information Centre

Proposed Future Short Term Accommodation Facility

MULLIGAN HIGHWAY

Lakeland Roadhouse.

Recreational Park

Short term parking for trucks.

DRAFT ONLY

Issued only for Comment Only

NORTH

# LAKELAND LANDSCAPE MASTER PLAN

Plan 4 of 4

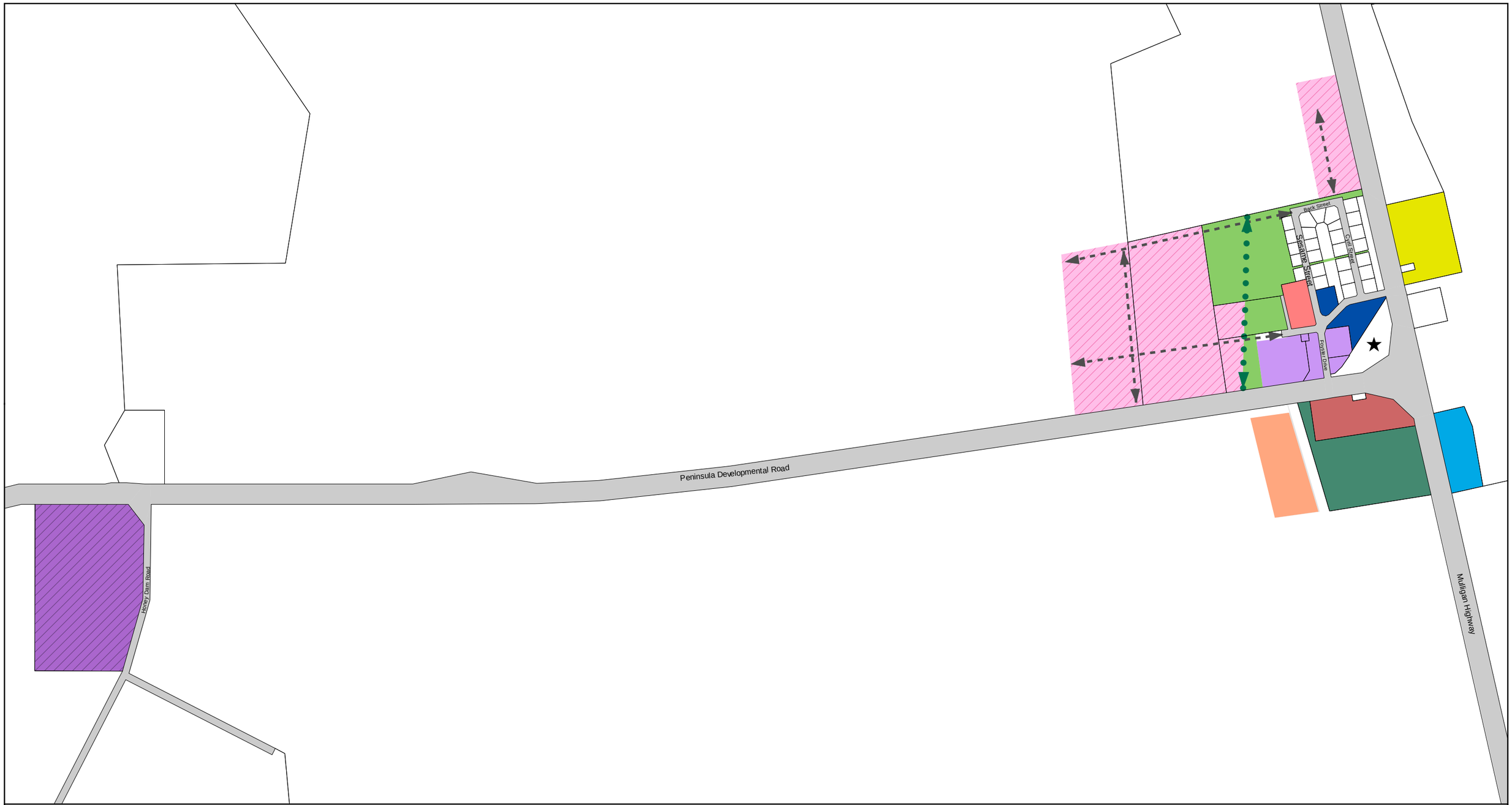
PRELIMINARY CONCEPT PLAN

SCALE 1:2500 @ A3

place design group.

REEL PLANNING
URBAN AND RURAL STRATEGIES

# APPENDIX F – DRAFT LAKELAND LOCAL AREA PLAN




# COOK SHIRE COUNCIL
# LAKELAND LAP: DRAFT LAND USE PLAN

**Draft Land Use**

- Hotel/town centre
- Residential expansion
- Light/service industry
- Future heavy industry
- Roadhouse
- Caravan park
- Short-term accommodation/caravan park/RV
- Workers accommodation
- Recreation/open space
- Recreation reserve
- School
- Gateway site
- Green corridor
- Indicative future road extensions
- Cadastral Boundary
- Road

DRAFT
Discussion purposes only

Cook Shire COUNCIL



Geocentric Datum of Australia 1994 (GDA94) - Map Grid of Australia - Zone

Scale: 1:11,000 1 cm = 110 m (A3 Print)

0 0.3 0.6 Km

Date: 4/08/2017