



IMAGE SOURCE: CAPE YORK WEEKLY

**LAKELAND MASTER PLAN &
INFRASTRUCTURE PLAN (2023)**
LAKELAND
JANUARY 2024



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IMAGE SOURCE: CAIRNS ATTRACTIONS



PART A

MASTER PLAN

LAKELAND MASTERPLAN

PROUDLY FUNDED BY THE QUEENSLAND GOVERNMENT'S LOCAL GOVERNMENT GRANTS AND SUBSIDIES PROGRAM (2022-2024)

LAKELAND WATER AND WASTEWATER PLANNING

PROUDLY FUNDED BY THE QUEENSLAND GOVERNMENT'S BUILDING OUR REGIONS ROUND 6 GRANT PROGRAM

1.0 EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

The Lakeland region has experienced a significant expansion of agricultural activities and related industries in recent years. This growth has placed a significant 'now' demand for housing and accommodation within the township for not only more permanent residents, but also to accommodate the many temporary residents which reside in the region for parts of the year. Presently however, there is minimal opportunity to meet this demand, with a limited housing supply and in particular, inadequate service infrastructure available to support an expanded township.

In addition to current pressures, Lakeland has also been identified as a suitable location for the expansion of the agricultural sector within northern Australia, in particular if a long term, reliable water supply could be secured. Should this occur, there will be an additional need for service and industries to support the agricultural sector and to meet the essential and convenience needs of a growing community. For these reasons, the residents of Lakeland have, for some time now, expressed concerns around this lack of housing and infrastructure to meet not only current, but also the future growth demands of the township.

To address both the current and future needs of the Lakeland township, Urban Sync, working in collaboration with Cook Shire Council and several other important stakeholders, have prepared the 'Lakeland Masterplan and Infrastructure Plan 2023'. The aim of the masterplan is to identify the main constraints and deliver opportunities that have been tested to facilitate and address the future planning and infrastructure needs of the township. In doing so, the masterplan will focus on the orderly and logical growth of the township. This will in turn, create a framework to encourage decision making and to address the immediate, medium term, and long-term growth of the township and in doing so, deliver on the shared vision for Lakeland.

The masterplan establishes three (3) scenarios,

being the low, medium and high growth scenarios. Due to the influence temporary residents have on the township, all three (3) scenarios include and accommodate growth in this portion of the township's 'population'. The population projections for the three (3) scenarios varies considerably, with the low growth scenario including a population of 454, the medium growth scenario a population of 2484 and the high growth scenario a population of 4,400.

The low growth scenario will seek to address some of the immediate and short-term constraints being faced by the township, although in doing so, assumes that current water allocations and infrastructure (i.e., bores) will be utilized and that no new 'trunk' water or sewer infrastructure is provided. In contrast, the medium growth scenario is based on an alternative irrigation scheme being provided to the township and for this reason, includes a significant expansion to the townships' existing urban area and the provision of a significant amount of new infrastructure. The high growth scenario is intrinsically linked to a catalytic infrastructure project such as the Palmer River Dam proceeding. As such and similarly to the medium growth scenario, significant expansions to the townships' existing urban area and infrastructure provision are required to service the projected population for the high growth scenario.

The true growth potential of the Lakeland township is unlikely to be fully realized unless key infrastructure and to a lesser extent, planning related challenges are suitably addressed. As such, the most beneficial growth scenario will essentially be guided by natural population growth and the timing of infrastructure provision over the short to medium term. That said, to assist in addressing some of the immediate concerns surrounding housing provision and general development progression within the township as well as support the growth of the township in the short-term, it is the recommendation of this masterplan that the low growth scenario, inclusive of the key land use and infrastructure recommendations, as well as the suggested changes to the Planning Scheme

that have been proposed as part of this scenario, be adopted and be actioned via an amendment to the current Planning Scheme.

Due to the viability of the medium growth scenario and its links to the provision of infrastructure which will be one of, if not the key catalyst to realising any tangible growth in the town, the recommendations, both land use and infrastructure, as well as the suggested changes to the Planning Scheme outlined in the masterplan for this scenario should not be abandoned. Instead, they should be retained as the key framework to address the medium to longer terms needs of the township and for inclusion within a future Planning Scheme, on the proviso that the township grows sufficiently over the short to medium term. To do this, population increases and/or building approvals should be monitored closely to ensure that, if required, the need to transition towards the medium growth scenario and/or provide infrastructure upgrades is identified early. To ensure there is an adequate amount of time available to plan, acquire funding and obtain all required approvals, investigations into transitioning towards the medium growth scenario should occur when the population in the township reaches approximately 350 persons.

It is not recommended to pursue the high growth scenario in any way shape of form, as, until more certainty surrounding the commencement of a catalytic piece of regional infrastructure is provided, it is premature to plan for such an outcome. For this reason, the HGS is not a viable option that warrants further consideration at this time.

PROJECT VISION STATEMENT:

"A COMMUNITY BUILT ON GOOD QUALITY AGRICULTURAL LAND, SURROUNDED BY UNIQUE NATURAL ENVIRONMENT AND OFFERING A GREAT LIFESTYLE THAT'S FAMILY-FRIENDLY WITH DIVERSE EMPLOYMENT AND BUSINESS OPPORTUNITIES".

FIGURE 1: CONTEXT DIAGRAM

2.0 BACKGROUND

BACKGROUND

Lakeland with its vast areas of basalt soils and its history in cropping, cattle, grazing and other agricultural industries is known as a major agricultural centre for Far North Queensland (Cumplings Economics 2023). The community of Lakeland has been for some time, experiencing significant growth pressures due to the expansion of agricultural activities and related industries.

This growth is expected to continue, and exponentially so if a reliable, irrigated water supply is secured. For example, according to a recent economics report, the population of the Lakeland Region could increase to 8,800 people over the next 20 years should key infrastructure projects such as the Palmer River Dam proceed (Cumplings Economics 2023).

With this population growth, there will be the need for service and light industries to support the agricultural sector, as well as retail, commercial, health, social services and emergency development to meet the essential and convenience needs of the community. Services and infrastructure in the township are also in need of substantial upgrade and improvement to accommodate the expected population growth to meet the future needs of the community.

This is exacerbated by a large and seasonal workforce which has resulted in many seasonal workers being housed on farms where they work, away from the township. For this reason, residents of Lakeland have, for some time now, expressed concerns around a lack of housing and infrastructure to meet current demands, while acknowledging that planning is required and infrastructure put in place to allow the town to grow, potentially at a significant scale. The ability for the township to grow has also been challenged by current town planning requirements and inadequate infrastructure provision.



PHOTO: TRIP ADVISOR



PHOTO: CAPE YORK WEEKLY



PHOTO: EXPLOR OZ



PHOTO: DESTINATION CAPE YORK



PHOTO: CAIRNS POST



PHOTO: RED VALLEY FARMS



PHOTO: PUMP INDUSTRY MAGAZINE



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PHOTO: TRIP ADVISOR. LAKELAND COFFEE



PHOTO: EXPLORE COOKTOWN & CAPEYORK. KARLENE SHEPHARD



PHOTO: RDA TROPICAL NORTH QUEENSLAND

3.0 CONTEXT

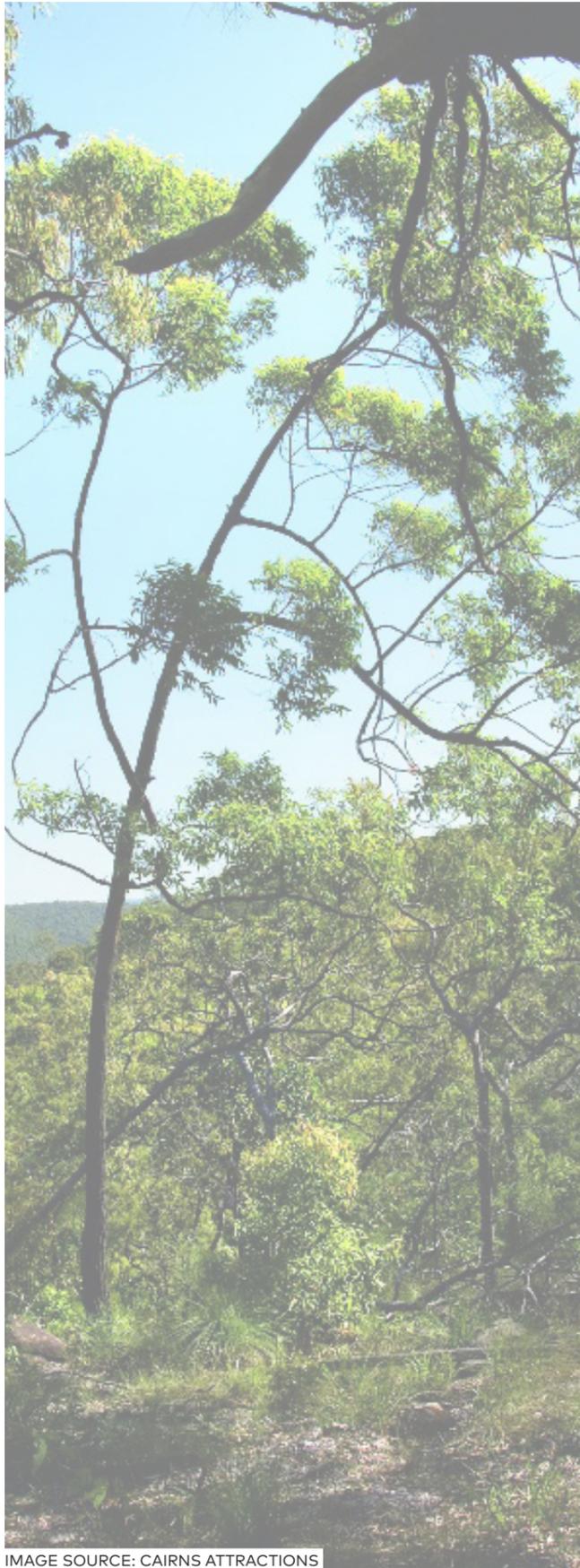


IMAGE SOURCE: CAIRNS ATTRACTIONS



FIGURE 2: FNQ CONTEXT DIAGRAM

CONTEXT

Lakeland is an agriculturally based region approximately 170km north-west of Cairns and approximately 60 kilometres south-west of Cooktown at the junction of the Peninsula Developmental Road and the Mulligan Highway. The township was first established in the late 1800s to service the needs of those attracted by the Palmer River Goldfields. Today, horticulture which takes advantage of the very fertile volcanic soils is the towns key driver and while bananas are the main crop, many others have been trialled and are grown to varying degrees.



4.0 POPULATION

POPULATION GROWTH

Table 1 identifies the recorded census data for the Lakeland Statistical Area over the past three (3) census'. This table highlights that the Lakeland Statistical Area grew by approximately 6.34% between 2011 to 2016 and approximately 2.26% more recently, between 2016 to 2021. As such, although the population has continued to grow within the Lakeland SA over the past ten (10) years, the rate at which this growth is occurring has slowed recently.

CENSUS DATE	RECORDED POPULATION (ABS DATA)
2021	333
2016	299
2011	227

TABLE 1: SUMMARY OF ABS CENSUS DATA FOR LAKELAND (ABS -ALL PERSONS QUICKSTATS 2011,2016 & 2021)

PERMANENT RESIDENTS

The 2021 census identified that 333 people resided in the Lakeland statistical region (ABS, 2023). The 'Lakeland Local Area Plan Background Report' prepared in 2017 by Reel Planning identified that the township of Lakeland had a population of approximately 140 residents. Due to the constraints relating to service infrastructure and housing supply that have affected the township since 2017, it is not anticipated that there has been any tangible population growth in the township since this report was issued. For the purposes of establishing a population 'benchmark' for the Lakeland township, this masterplan assumes that the population of the township remains at approximately 140 persons. This would in turn mean that there are approximately 193 people residing in the region.



IMAGE SOURCE: COOKTOWN & CAPEYORK

4.0 POPULATION

TEMPORARY RESIDENTS

A large seasonal workforce is required to service the agriculture sectors in the Lakeland region. This results in a large number of temporary residents calling the Lakeland area home for parts of the year. Census data, however, is based on a persons' place of usual 'permanent' residence, with overseas visitors who live in another country and/or those that are visiting Australia for less than one year being excluded from the census (ABS, 2023). This means Census data however, exclude seasonal workers (i.e. temporary residents). That said, temporary residents form an important component of Lakeland's population and community profile and while it is acknowledged that temporary residents are unlikely to reside in Lakeland for the entire year, they must be accounted for when determining the 'true population' of Lakeland.

The most suitable way to determine the approximate, temporary resident population of Lakeland is based on the 'workforce accommodation' approvals which are in effect at the time of writing this masterplan. Based on information provided by Council, there are several such approvals in effect, with these approvals supporting a total of approximately 431 temporary residents, comprised of 91 within the township and 340 within the region (see **Figure 3**).

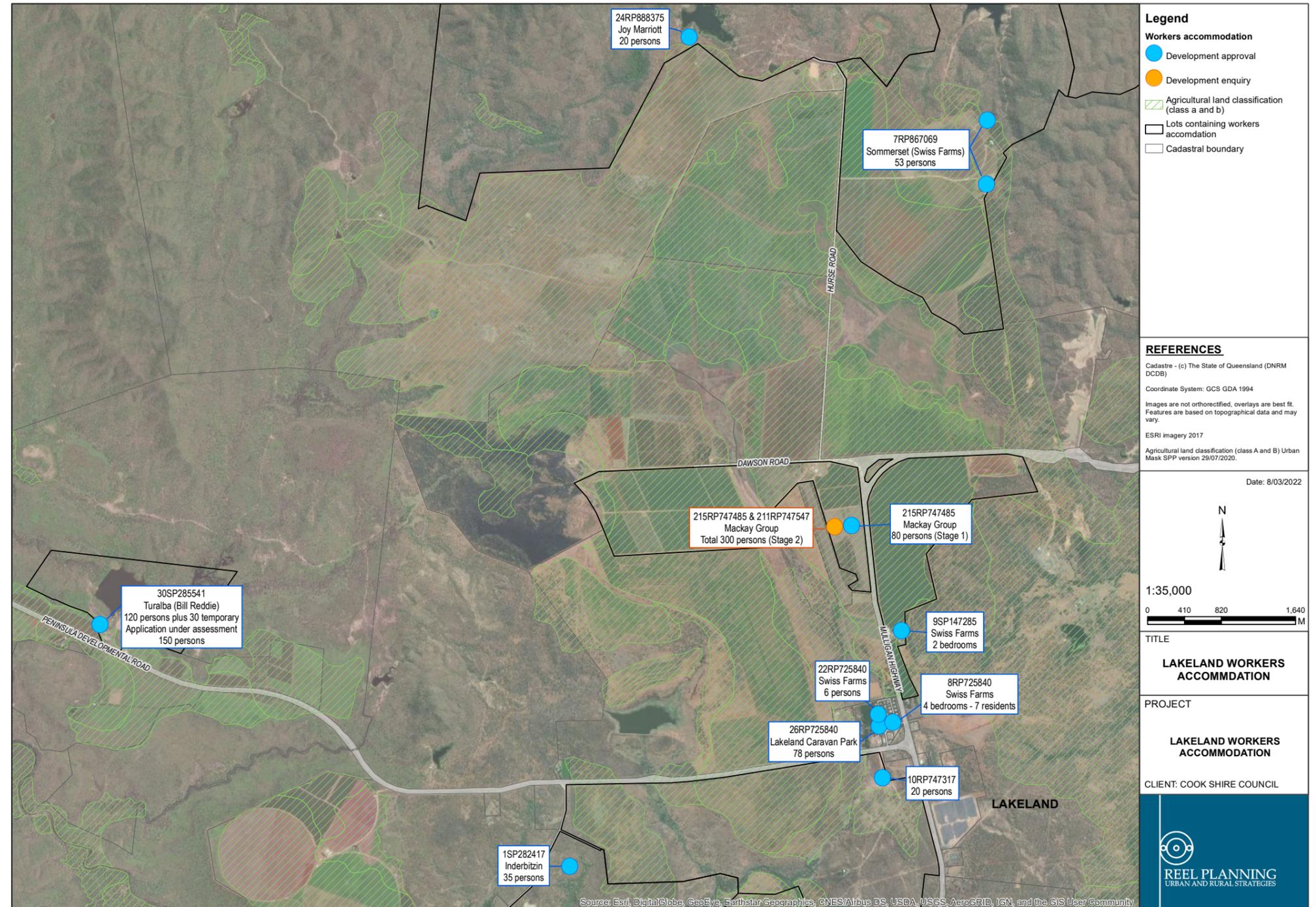


FIGURE 3: TEMPORARY RESIDENTS APPROVALS (SOURCE: REEL PLANNING, 2017)

TOTAL POPULATION

When considering both permanent and temporary residents, it is estimated that at any one time, the Lakeland region could accommodate a maximum of 764 persons, with approximately 231 residing in the township and approximately 533 in the region (see **Table 2**).

TOTAL POPULATION	POPULATION COMPOSITION	POPULATION SPECIFICS
764	Township = 231	140 permanent + 91 temporary
	Region = 533	193 permanent + 340 temporary

TABLE 2: TOTAL POPULATION - LAKELAND

5.0 PLANNING FOR GROWTH

GROWTH SCENARIOS

Given the varying factors influencing growth within the Lakeland township and for the purposes of this masterplan, three (3) potential growth scenarios have been developed. These scenarios provide an estimate of the likely population growth under varying planning 'pressures' and to inform the most suitable strategy for the future urban expansion of the township under different scenarios and for a planning horizon of twenty (20) years. Specifically, these scenarios include a 'low growth scenario' (LGS) based on no further access to irrigation being provided, a 'medium growth scenario' (MGS) based on some alternative form of irrigation being provided (or an increase in current irrigation methods), and finally, a 'high growth scenario' (HGS) based on the Palmer River Dam proceeding which would provide an ample irrigated water supply.

HIGH GROWTH SCENARIO

BASED ON: PALMER RIVER DAM PROCEEDS
AMPLE IRRIGATED WATER SUPPLY

MEDIUM GROWTH SCENARIO

BASED ON: AN INCREASE TO CURRENT IRRIGATION EXTENT
ADDITIONAL IRRIGATED WATER SUPPLY SECURED

LOW GROWTH SCENARIO

BASED ON: NO CHANGES TO CURRENT IRRIGATION EXTENT
NO ADDITIONAL IRRIGATED WATER SUPPLY SECURED

IMAGE SOURCE: PUMP INDUSTRY MAGAZINE

5.1 HIGH GROWTH SCENARIO

The HGS is based on a catalytic, regional infrastructure project such as the Palmer River Dam proceeding. This project would provide an ample irrigated water supply to the entire region which is likely to generate significant growth in the agricultural sectors and in turn, in population growth.

Data provided from Regional Development Australia (RDA) provides evidence-based population projections for the Lakeland region should the Palmer River Dam proceed. This data identifies that based on an input-output analysis; the proposed Palmer River Dam would result in approximately \$366 million of additional agricultural production value to the Cook Shire Council Local Government Area (LGA). Using population ratios analyses, the data establishes that within approximately twenty (20) years from the commencement of the Plamer River Dam, the total population of the Cook Shire Council LGA could be 14,000 people, with the Lakeland region potentially reaching a population of between 7,300 – 8,800 people (Cummings Economics, 2023). The data provided by the RDA did not specifically include/ identify temporary residents. There are also inherent complexities in planning for a population 'range'. Therefore, to reduce complexity and ensure a suitable level of flexibility is afforded to the HGS so that temporary residents can be suitably accommodated, the higher end of the RDA population estimate for Lakeland (8,800) will be used for the purposes of the HGS.

The RDA data identifies that of the 8,800 people who will reside in the Lakeland region under the HGS, approximately 50% of these people will reside in the town of Lakeland, with the other 50% residing in the region. Using this evidenced based approach, the HGS will utilize a population distribution of 50% within the region and 50% within the town.

The service infrastructure assumptions used for the HGS are based on the findings of the infrastructure plan (see Part B). Under the HGS, all potable water required for the town will be sourced from the Palmer River Dam, although a large amount of new 'trunk' water infrastructure such as large scale water reservoirs, pumping infrastructure and water treatment plants will all be required under the HGS. A sewerage scheme will also be required to be implemented in the HGS due to the increased population and the corresponding need to remove onsite effluent disposal for health and environmental reasons.

Table 3 outlines the projected population under the HGS.

HIGH GROWTH SCENARIO			
	PROJECTED POPULATION		
	TOTAL POPULATION	COMPOSITION	POPULATION CHANGE
EXISTING	764	Township = 231 Region = 533	N/A
MEDIUM TERM (10 YEARS) – 2033	4,400	Township = 2,200 Region = 2,200	Township = +1,969 Region = +1,667
LONG TERM (20 YEARS) – 2043	8,800	Township = 4,400 Region = 4,400	Township = +4,169 Region = +3,867

TABLE 3: POPULATION PROJECTIONS FOR THE HGS.



5.2 MEDIUM GROWTH SCENARIO

The MGS is based on an alternative irrigation scheme/supply becoming available which would allow for the expansion of irrigated cropping in the region, although not to the extent that is envisioned to occur under the HGS. The MGS, therefore, includes a projected population less than that of the HGS. The following assumptions will be used for the MGS.

In the absence of detailed data and/or specifics in relation to an adopted irrigation scheme, no specific 'growth rate' is established for the MGS. Instead, the MGS uses a 'best-fit' estimate to establish the projected population (permanent and temporary residents), being the 'middle ground' between the LGS and HGS. The development of land and the upgrading of physical infrastructure within the town that would be triggered under this scenario would support an increased proportion of the population choosing to live within the town, as opposed to the region. However, it is unlikely that the population distribution would differ significantly from that evidenced based distribution identified in the HGS. Based on this assumption, under the MGS, 50% of the total population will reside within the town and 50% within the region.

The service infrastructure assumptions used for the MGS are based on the findings of the infrastructure plan (see Part B). In relation to water and in addition to utilizing current water allocations and water infrastructure, the MGS also includes:

- The provision of new 'trunk' water infrastructure i.e., water reservoirs and pumping capacity;
- An expansion of the existing bore field i.e., on the Council owned Lot 210 on SP172665 and/or at the Airport (where flow rates are better); and
- An increase in the existing water allocation for the town.

The MGS will also require a sewerage scheme to be implemented to allow for increased land density and to address health and environmental issues via the elimination (or reduction) of onsite effluent disposal options.

Table 4 outlines the projected population under the MGS.

MEDIUM GROWTH SCENARIO			
	PROJECTED POPULATION		
	TOTAL POPULATION	COMPOSITION	POPULATION CHANGE
EXISTING	764	Township = 231 Region = 533	N/A
SHORT TERM (5 YEARS) - 2028	1,522	Township = 761 Region = 761	Township = +530 Region = +228
MEDIUM TERM (10 YEARS) - 2033	2,666	Township = 1,333 Region = 1,333	Township = +1,102 Region = +800
LONG TERM (20 YEARS) - 2043	4,968	Township = 2,484 Region = 2,484	Township = +2,253 Region = +1951

TABLE 4: POPULATION PROJECTIONS FOR THE MGS.



5.3 LOW GROWTH SCENARIO

The LGS will seek to address some of the immediate and short-term constraints currently being faced by the township, although will include only minor amounts of growth in comparison to that envisioned for the MGS and HGS. The LGS provides a structure for 'low growth' as if the 'status quo' is maintained, where organic growth at a similar rate to that evidenced within the region over the past five (5) years, being approximately 2% per year, will be used. Due to the low amount of growth and in contrast to the HGS and MGS, increases to both the permanent and temporary residents will be identified in the LGS. It is considered reasonable for the purposes of the LGS that this 2% growth rate is applied to both permanent and temporary residents.

The current distribution of the people in Lakeland is approximately 30% in the township and 70% in the region. Under current arrangements, it is expected that the current 'donut effect' would continue with future growth occurring predominantly in the region. However, the LGS will seek to in part, rectify and address the current donut effect by ensuring that all future population growth can be more easily facilitated in the township. This will result in a minor shift of the population from the region back towards the township. Based on this assumption, under the LGS, 40% of the total population (permanent and temporary) will reside within the township and 60% within the region. It is for this reason why there is a slight decline in the population of the region over the short-term.

The LGS will utilize current water allocations and water infrastructure (i.e., bores) within the township and does not include the provision of any new 'trunk' water infrastructure (extensions to existing reticulated water infrastructure to service new developments is assumed). The infrastructure plan (see Part B) supports this approach with upgrades to existing water infrastructure not being required until the population of the township reaches approximately 430 persons. In relation to sewer, the cost benefit for a sewerage scheme would be challenging to support under the LGS (due to the low population numbers and the high capital cost associated with such a scheme) and as such, the LGS does not include the provision of any new 'trunk' sewer infrastructure.

Table 5 outlines the projected population under the LGS.

LOW GROWTH SCENARIO			
	PROJECTED POPULATION		
	TOTAL POPULATION	COMPOSITION	POPULATION CHANGE
EXISTING	764	Township = 231 Region = 533	N/A
SHORT TERM (5 YEARS) - 2028	844	Township = 338 Region = 506	Township = +107 Region = -27
MEDIUM TERM (10 YEARS) - 2033	932	Township = 373 Region = 559	Township = +142 Region = +26
LONG TERM (20 YEARS) - 2043	1,135	Township = 454 Region = 681	Township = +223 Region = +148

TABLE 5: POPULATION PROJECTION FOR LOW GROWTH SCENARIO



6.0 URBAN EXPANSION

URBAN EXPANSION

The projected populations for the three (3) growth scenarios establish a baseline to plan for the required urban expansion under each scenario. However, to accommodate the growth identified under each scenario, suitable areas of land for urban expansion is required to be identified. Through the lens of land use and infrastructure availability, this section of the report will identify the preferred area/s for urban expansion.

PHYSICAL AND STATUTORY CONSTRAINTS

A desktop assessment was undertaken to identify physical and statutory constraints in the area around the township. This assessment included detailed searches of the relevant Local and State Government constraints mapping and in turn, identified the applicable 'development constraints' which need to be considered as part of any future urban expansion of the township (see **Figure 4**). This assessment highlighted that the areas to the north, south, east and west of the township are constrained in parts by Good Quality Agricultural Land (GQAL) and areas to the north-east, east and south-east are constrained by vegetation and other environmental constraints. Accordingly, there is a limited amount of unconstrained land around the township which can be used for urban development.

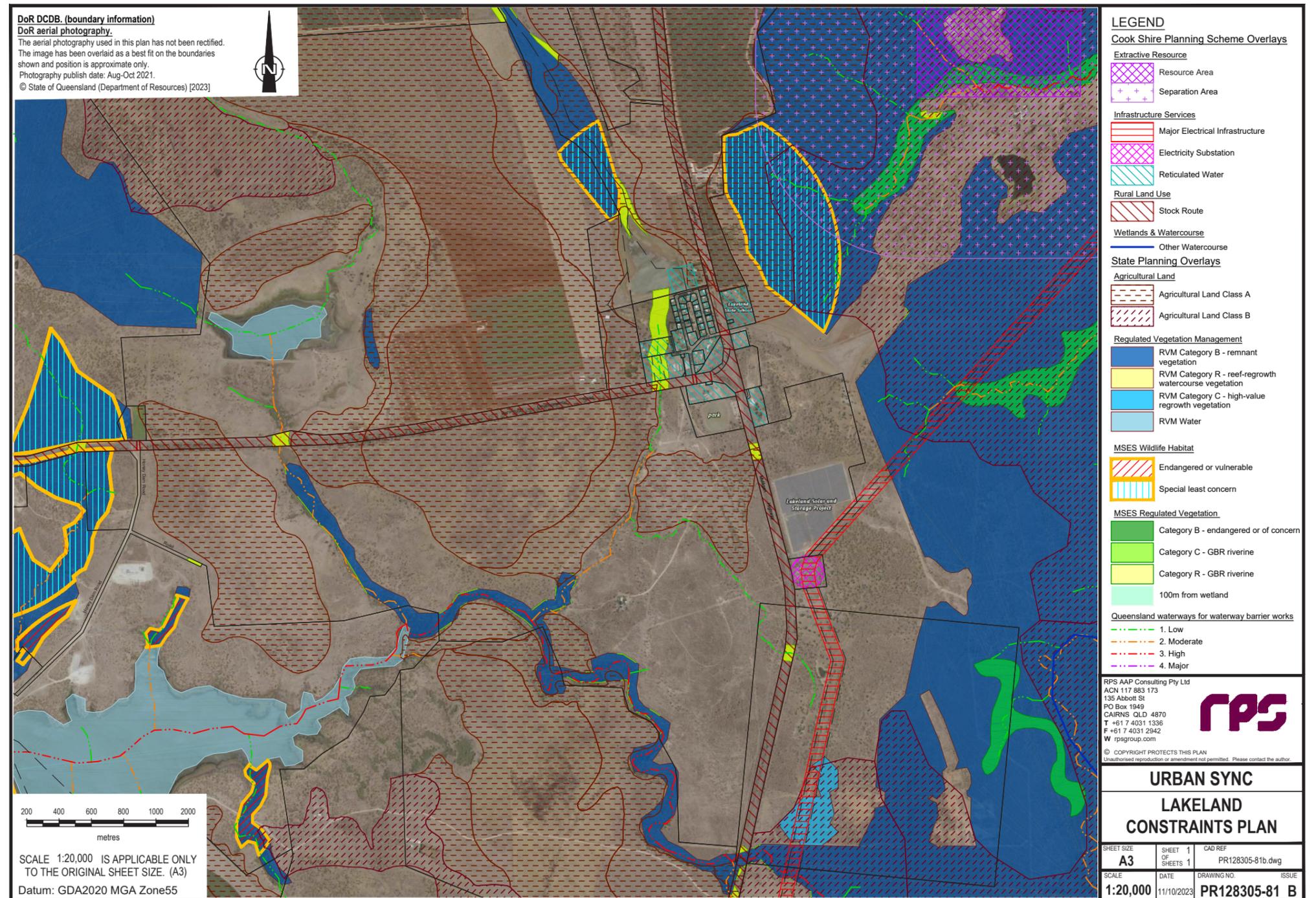


FIGURE 4: CONSTRAINTS MAPPING (SOURCE: RPS 2024)



IMAGE SOURCE: DOMAIN

6.1 COMMUNITY EXPECTATIONS

Potential urban expansion areas have also been influenced by the community feedback and the 'future growth map' that was established through the consultation conducted by AEC Group Limited in September 2022 (see **Figure 5**). This earlier and extensive community feedback identified several key 'planning' considerations that the community wanted considered as part of any future growth of the township, with these considerations being:

- Protection of GQAL;
- Expansion of the town 'away' from the highways (which must remain in-place);
- Development of public space surrounded by commercial and higher density residential areas;
- Protection of future residential areas from spray drift; and
- Avoidance of industry activities being established adjacent to farm dams.

OTHER CONSIDERATIONS

A number of other matters were carefully considered when identifying the most preferred area/s for urban expansion. These included:

- The location of the existing township;
- The location of key community infrastructure such as the school and areas of open space;
- Existing infrastructure locations and capacities;
- The potential expansion of the solar farm; and
- The tenure of land i.e., Lot 13 on BS132 was not included due to its reserve status.

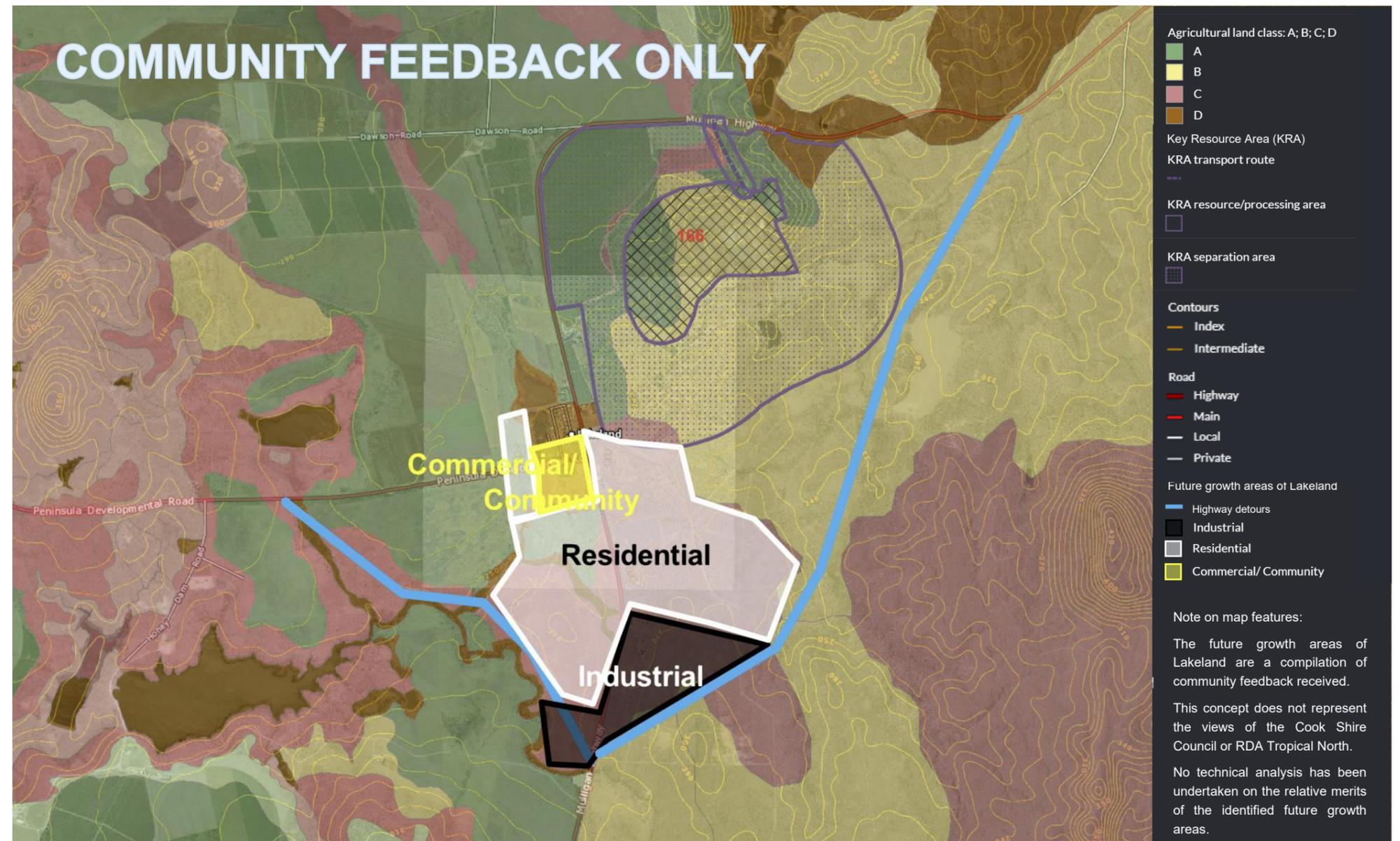


FIGURE 5: COMMUNITY FUTURE GROWTH MAP – SEPTEMBER 2022 (SOURCE: AEC GROUP, 2022)



IMAGE SOURCE: LOCALISTA

6.2 TARGET GROWTH AREAS

With the above key 'planning' considerations in mind, the methodology for the establishment of the most suitable area/s for urban expansion supports the growth of Lakeland to the south, south-east and south-west of the existing township on the generally, unconstrained areas of land. The established 'target growth area' totals approximately 261 hectares in area (see **Figure 6**).

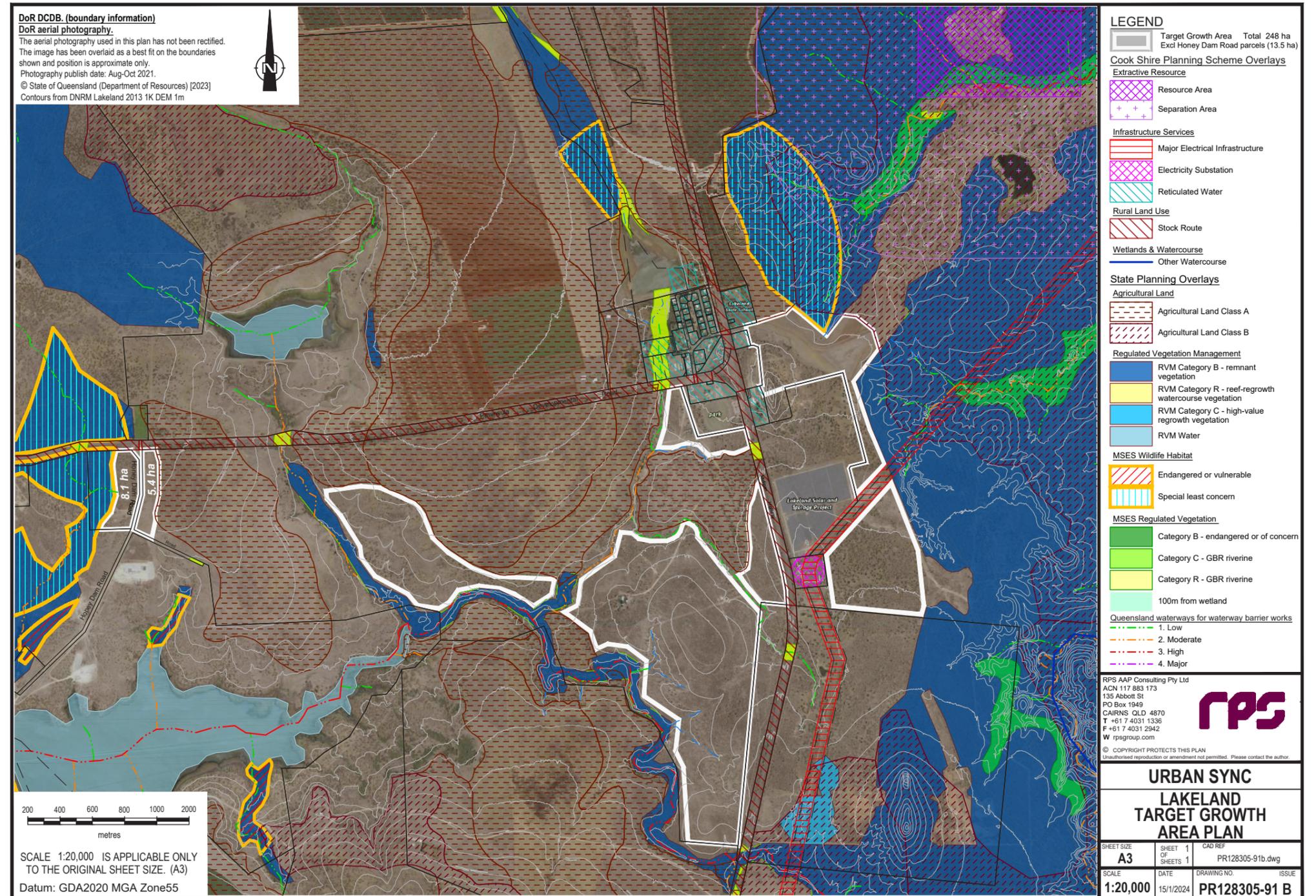


FIGURE 6: TARGET GROWTH AREAS (SOURCE: RPS 2023).



IMAGE SOURCE: KENNEDY RURAL

7.0 LAND USE-REQUIREMENTS

LAND-USE REQUIREMENTS

An assessment of all relevant data to support the identification of land requirements for the masterplan was undertaken with a particular focus on two (2) reports prepared by Cummings Economics for the Lakeland Irrigation Scheme being coordinated by Regional Development Australia (RDA). The reports included the 'Lakeland Irrigation Area Scheme Social Implications' and the 'Lakeland Irrigation Area Scheme Economic Development Implications'. The review of these reports was undertaken as it was fit for purpose and delivered the overall objectives that the masterplan is trying to achieve. They also contained the most relevant available information that would support the assessment. Other, alternative approaches were considered, although deemed not suitable in this instance due to the lack of supporting technical reports.

The 'Lakeland Irrigation Area Scheme Economic Development Implications' report utilized an empirical approach to identifying the 'scale of services' that might be generated in Lakeland should the Palmer River Dam proceed i.e., what is assumed under the HGS. Specifically, this report identified Ingham and Renmark as comparable towns of similar agricultural production and population levels to Lakeland under the HGS. In other words, the 'land identification requirements' for non-residential land uses were determined based on towns with a similar population and with similar levels/types of agricultural production. This 'comparable towns' methodology is considered the best 'fit for purpose methodology' for this masterplan and as such, comparable towns will be identified and used to provide a benchmark to identify the amount of land needed for centre, mixed use (MU) and industry zones in both the MGS and HGS.

To establish this benchmark, towns within Queensland that were of a similar size and agricultural base were selected for each scenario. Next, the amount of land included in each non-residential planning scheme zone of the comparable towns was calculated via aerial imagery (all calculations were approximate). The land requirements for the MGS and HGS were then calculated as the 'midpoint' between the areas of land identified in each of the comparable towns. For example, if the first comparable town has six (6) hectares of centre zoned land and the second comparable town had eighteen (18) hectares of center zoned, the 'midpoint' of twelve (12) hectares would be the amount of centre zoned land required.

LOW GROWTH SCENARIO

The LGS identifies an additional 223 persons in the township, with this increase consisting of 134 permanent residents and 89 transient residents. Due to such a small increase in population, a formal comparative analysis of other, similar sized towns was not required to determine the land area requirements for the LGS. Rather, land use requirements for future growth will be accommodated via more qualitative methods.

MEDIUM GROWTH SCENARIO

The MGS has a projected population of approximately 2,484 within the town. Using a similar methodology to that applied in the 2023 Cumming Economics Report, two (2) rural towns within Queensland were identified with Malanda and Home-Hill being selected as 'best-fit' comparative towns to help provide context to the land use requirements for the MGS. These towns were selected due to their similar populations to that which is projected for the MGS with Malanda (suburb and locality) having a population of 2,000 people (ABS Census 2021). Similarly, Home-Hill has a population of 2,712 people (ABS Census, 2021).

HIGH GROWTH SCENARIO

The HGS has a projected population of approximately 4,400 within the town. The 2023 Cumming Economics Report identifies Ingham and Renmark as towns of comparative profile and population. Using a similar methodology applied in the 2023 Cumming Economics report and due to Renmark not being located in Queensland, Stanthorpe was identified as an additional 'best-fit' comparative town within Queensland for the HGS. According to recent census data, Ingham has a population of 4,455 and Stanthorpe has a population of 5,286 (ABS Census 2021).



PHOTO: PUMP INDUSTRY MAGAZINE



PHOTO: CAIRNS POST



PHOTO:TROPICAL NORTH QUEENSLAND



PHOTO: RDA TROPICAL NORTH QUEENSLAND

7.1 LAND AREA REQUIREMENTS

NON RESIDENTIAL (CENTRE, INDUSTRY AND MIXED USE LAND AREA REQUIREMENTS)

HIGH GROWTH SCENARIO

Table 6 provides the land area requirements for the two (2) comparable towns of Ingham and Stanthorpe and identifies the approximate land area requirements needed for the centre, industry and MU zoning designations under the HGS.

HIGH GROWTH SCENARIO			
ZONE	TOTAL AMOUNT OF LAND (HA)		
	EXISTING (APPROXIMATE)		PROJECTS
	INGHAM (SA2)	STANTHORPE (SA2)	LAKELAND (TOWNSHIP)
CENTRE ZONE	37.83	14	26
INDUSTRY ZONE	106.34	47	77
MIXED USE ZONE	16.44	13	15

TABLE 6: CENTRE, MIXED-USE AND INDUSTRY LAND AREA REQUIREMENTS FOR THE HGS.

MEDIUM GROWTH SCENARIO

Table 7 below provides the land area requirements for the two (2) comparable towns of Malanda and Home Hill and identifies the approximate land area requirements needed for the centre, industry and MU zoning designations under the MGS.

purposes of the MGS, approximately six (6) hectares of MU zoned land will be provided (this is approximately half the amount of center zoned land being provided under this scenario which is the same ratio applied to the HGS).

Note: While the comparable towns did not include any MU zoning designations, a MU zone will be included in the MGS to ensure this scenario is able to be aligned with the LGS and HGS. For the

MEDIUM GROWTH SCENARIO			
ZONE	TOTAL AMOUNT OF LAND (HA)		
	EXISTING (APPROXIMATE)		PROJECTS
	MALANDA (SAL)	HOME HILL (UCL)	LAKELAND (TOWNSHIP)
CENTRE ZONE	6	18	12
INDUSTRY ZONE	12.84	32	23
MIXED USE ZONE	0	0	0

TABLE 7: CENTRE, MIXED-USE AND INDUSTRY LAND AREA REQUIREMENTS FOR THE MGS.



PHOTO: RED VALLEY FARMS

7.2 LAND AREA REQUIREMENTS

NON RESIDENTIAL (COMMUNITY FACILITIES AND RECREATION AND OPEN SPACE LAND AREA REQUIREMENTS)

COMMUNITY FACILITIES LAND AREA REQUIREMENTS

As the area of land required for community uses can vary considerably, it is impossible to identify an accurate figure for the amount of land that would be required for community uses under each scenario. Moreover, community facilities zoned land is usually identified on zoning maps AFTER such land uses are established. For these reasons, the community facilities land requirements in all three (3) scenarios will be limited to the 4.3ha of existing community facilities within the township i.e., the school, Lot 27 on RP744396 and existing infrastructure. However, to cater for future growth of these activities and to allow flexibility in their location, the land requirements for the centre zone in both the HGS and MGS will be increased by 15% so these land uses can be established generally, in or near the centre of the town. Once established, the allotments can be re-identified as being included in the community facilities zone under subsequent Planning Scheme amendments and/or as part of a new Planning Scheme.

There is already an oversupply of center zoned land in the LGS. As such, there is no need to further increase the centre land area requirements in the LGS to cater for community uses.

RECREATION AND OPEN SPACE LAND AREA REQUIREMENTS

The amount of Recreation and Open Space zoned land that is needed can reasonably be based on existing recreation/open space areas, population, and catchment areas, as outlined in the Desired Standards of Service in all Queensland Planning Schemes. In this instance, the existing areas that will be included in the Recreation and Open Space zone for all three (3) scenarios will include:

- Perfume Gully;
- Waterway and/or drainage areas in Lot 217 on BS151, Lot 4 on BS151 and Lot 210 on SP172665;
- The existing central park; and
- All of Lot 30 on RP725840, Lot 23 on RP860960 and the sports oval

The Planning Scheme and specifically, **Table 4.4.5.2**, determines the need for new/additional Recreation and Open Space (ROS) needs through population and catchment areas. Using this table and due to the presence of a large amount of existing Recreation and Open Space land, only minor amounts of additional ROS land are required under the three (3) scenarios. Due to this low demand, an allowance for ROS land has been made in the calculation of residential land requirements and for this reason, no new/additional ROS land is required to be identified under any of the scenarios.



7.2 LAND AREA REQUIREMENTS

RESIDENTIAL

Residential land area requirements will be accurately calculated using very tangible statistics such as the projected population in each scenario (including permanent and transient workers), the number of persons per household and the approximate size of the allotment/density to be provided to each zone.

EXISTING

To put the proposed expansion areas within each of the scenarios into context, **Figure 7** below identifies the current Planning Scheme 'Future Land Use Intent' map for Lakeland.

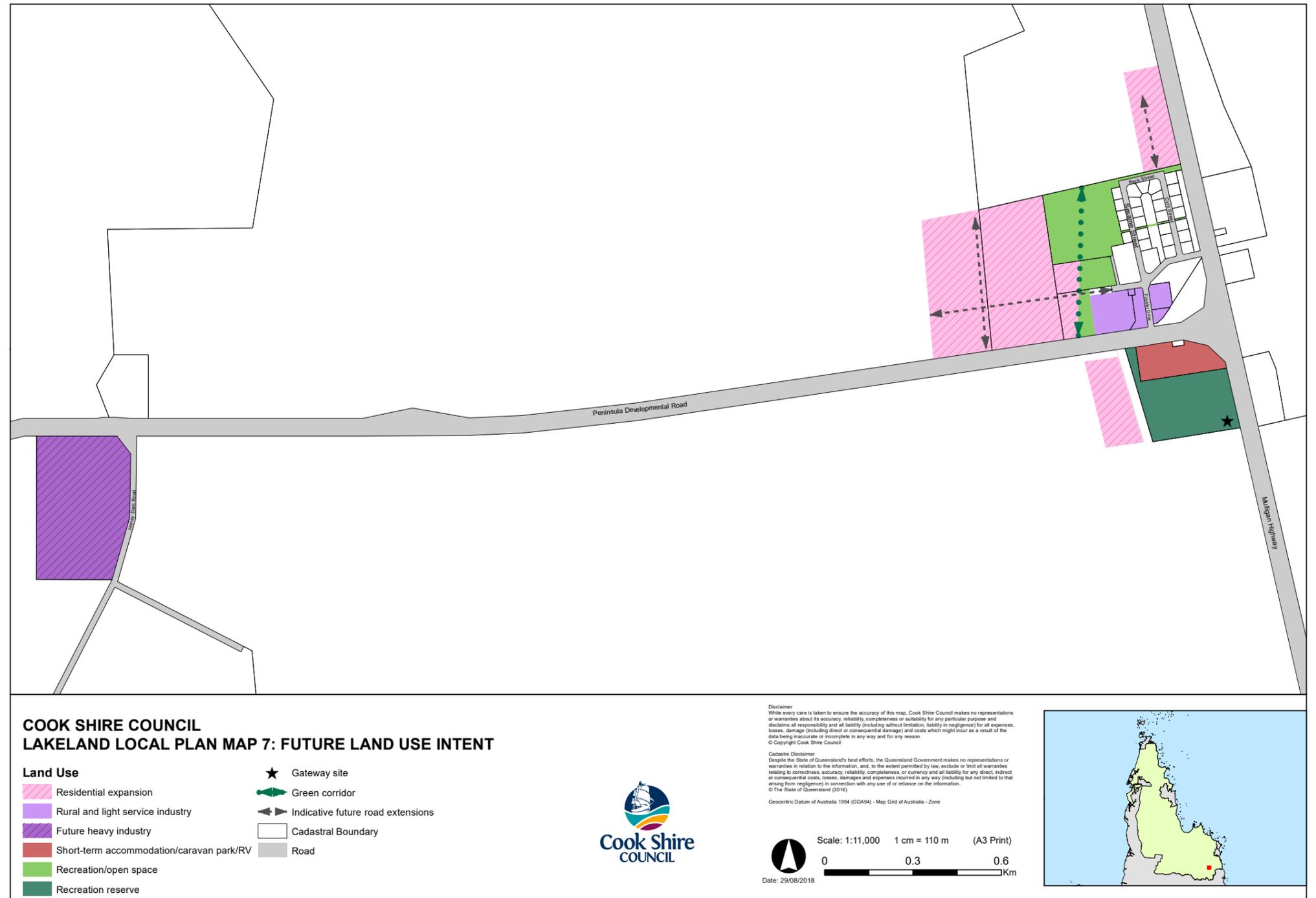


FIGURE 7: LAKELAND FUTURE LAND USE INTENT MAP (SOURCE: COOK SHIRE COUNCIL, 2024).

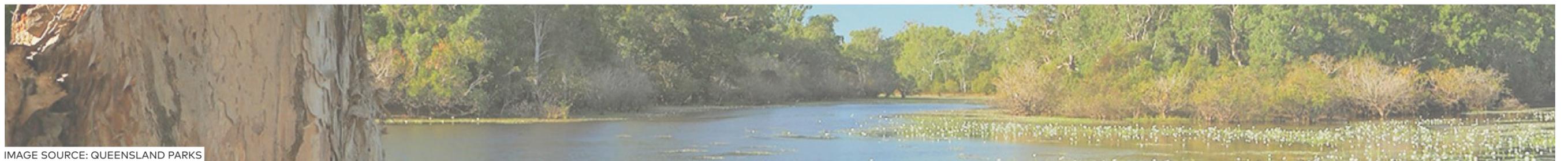


IMAGE SOURCE: QUEENSLAND PARKS

7.2.1 HIGH GROWTH SCENARIO

LAND-USE REQUIREMENTS - RESIDENTIAL

HIGH GROWTH SCENARIO

Table 8 identifies the total number of people, total number of dwellings, densities and approximate land area requirements for each residential zone under the HGS.

HIGH GROWTH SCENARIO

BASED ON:
PALMER RIVER DAM
PROCEEDS

AMPLE IRRIGATED
WATER SUPPLY

HIGH GROWTH SCENARIO						
ZONE	TOTAL NUMBER OF PEOPLE	PEOPLE PER DWELLING	TOTAL DWELLINGS	DENSITY REQUIREMENTS (DU/HA)	AREA REQUIRED (ALLOTMENTS ONLY) IN HA	TOTAL AREA REQUIRED (HA)
Low Density Residential Zone	1,813	2.5	725	12.5 (800m ² lots)	58	69.6
Medium Density Residential Zone	1,493	2.5	597	12.5 – 37.5	25.8	32.3
Mixed Use Zone	748	2.5	299	12.5 – 37.5	12.9	15.5
Rural Residential Zone	439	2.5	175	2.5 (4,000 m ² lots)	70.2	87.7
Total	4,4931	2.5	1,796	N/A	166.9	205.1

TABLE 8: SUMMARY OF POPULATION SIZE FOR COMPARATIVE TOWNS UNDER THE HIGH GROWTH SCENARIO.

IMAGE SOURCE: REAL COMMERCIAL

7.2.2 MEDIUM GROWTH SCENARIO

LAND-USE REQUIREMENTS - RESIDENTIAL

MEDIUM GROWTH SCENARIO

Table 9 identifies the total number of people, total number of dwellings, densities, and approximate land area requirements for each residential zone under the MGS.

MEDIUM GROWTH SCENARIO						
ZONE	NUMBER OF PEOPLE	NUMBER OF PEOPLE PER DWELLING	NUMBER OF DWELLINGS	DENSITY REQUIREMENTS (DU/HA)	AREA REQUIRED (ALLOTMENTS ONLY) IN HA	TOTAL AREA REQUIRED (HA)
Low Density Residential Zone	1,198	2.5	479	12.5 (800m ² lots)	38.3	47.9
Medium Density Residential Zone	780	2.5	312	25	12.5	15.6
Mixed Use Zone	268	2.5	107	12.5 – 37.5	4.7	5.64
Rural Residential Zone	253	2.5	101	2.5 (4,000m ² lots)	40.4	50.5
Total	2,499	2.5	999	N/A	95.9	119.64

TABLE 7: SUMMARY OF POPULATION SIZE FOR COMPARATIVE TOWNS UNDER THE MEDIUM GROWTH SCENARIO.

MEDIUM GROWTH SCENARIO

BASED ON: AN INCREASE TO CURRENT IRRIGATION EXTENT

ADDITIONAL IRRIGATED WATER SUPPLY SECURED



IMAGE SOURCE: REALESTATE.COM

7.2.3 LOW GROWTH SCENARIO

LAND-USE REQUIREMENTS - RESIDENTIAL

LOW GROWTH SCENARIO

The LGS will result in an additional 223 persons residing in the township with this increase including approximately 134 permanent residents and approximately 89 additional temporary residents. The additional 89 temporary residents will be housed in the MU zone. This leaves the 134 extra permanent residents needing to be accommodated under the LGS. **Table 10** below identifies the total number of people, total number of dwellings, densities, and approximate land area requirements for the additional permanent residents required to be housed under the LGS.

LOW GROWTH SCENARIO						
ZONE	NUMBER OF PEOPLE	NUMBER OF PEOPLE PER DWELLING	NUMBER OF DWELLINGS	DENSITY REQUIREMENTS (DU/HA)	AREA REQUIRED (ALLOTMENTS ONLY)	TOTAL AREA REQUIRED (HA)
Low Density Residential Zone	156	2.5	62	5 (2,000m ² lots)	12.5ha	15.6ha
Rural Residential Zone	115	2.5	46	2.5 (4,000m ² lots)	18.4ha	20.4
Total	271	2.5	143	N/A	30ha	36ha

TABLE 6: SUMMARY OF POPULATION SIZE FOR COMPARATIVE TOWNS UNDER THE HIGH GROWTH SCENARIO.

LOW GROWTH SCENARIO
 BASED ON: NO CHANGES TO CURRENT IRRIGATION EXTENT
 NO ADDITIONAL IRRIGATED WATER SUPPLY SECURED

IMAGE SOURCE: LAKELAND

7.3 SETTLEMENT PATTERN MAPS

HIGH GROWTH SCENARIO

Table 11 summarises the land area requirements required for each zone in the HGS. What is evident from **Table 11** is that with a footprint of 333ha, the HGS cannot be fully accommodated within the approximately 261ha target growth area and as such, the HGS will result in the loss of some GQAL. Due to the amount of land required for the HGS, it is not considered providing higher residential densities would have resolved this matter and as such, no changes to the residential densities have been proposed to try and reduce the footprint of the HGS (this could be further considered should the HGS be required).

Figure 8 identifies the settlement pattern map for HGS. It is noted here that due to the complexities in planning for multiple scenarios that include a wide range of population projections, it is impossible to suitably align multiple settlement pattern maps. For this reason, the settlement pattern map for the HGS is indicative only and is more so for the purposes of identifying the total area needed for this scenario, rather than identifying the preferred and/or specific locations for each zoning designation.

ZONE	TOTAL AREA REQUIRED (HA)
Centre	30
Mixed-Use (Residential)	15.5
Mixed-Use (Non-Residential)	16.9
Industry	77.5
Low Density Residential	72.5
Medium Density	32.3
Rural Residential Zone	87.7
Total Lakeland Local Plan Area	333.7

TABLE 11: SUMMARY OF LAND AREA REQUIREMENTS FOR ALL ZONES UNDER THE HGS.

Legend

Gross Area (Ha)	Zone
30	Centre
32.3	Medium Density Residential
72.5	Low Density Residential
77.5	Industry
32.4	Mixed Use
87.7	Rural Residential

Total area (excl. existing) **332.4Ha**

Note - Gross Area above is exclusive of existing non-vacant lots. The master plan allows 20% of gross area to be taken up by roads, drainage and open space. All areas provided are rounded to the nearest 1,000m².

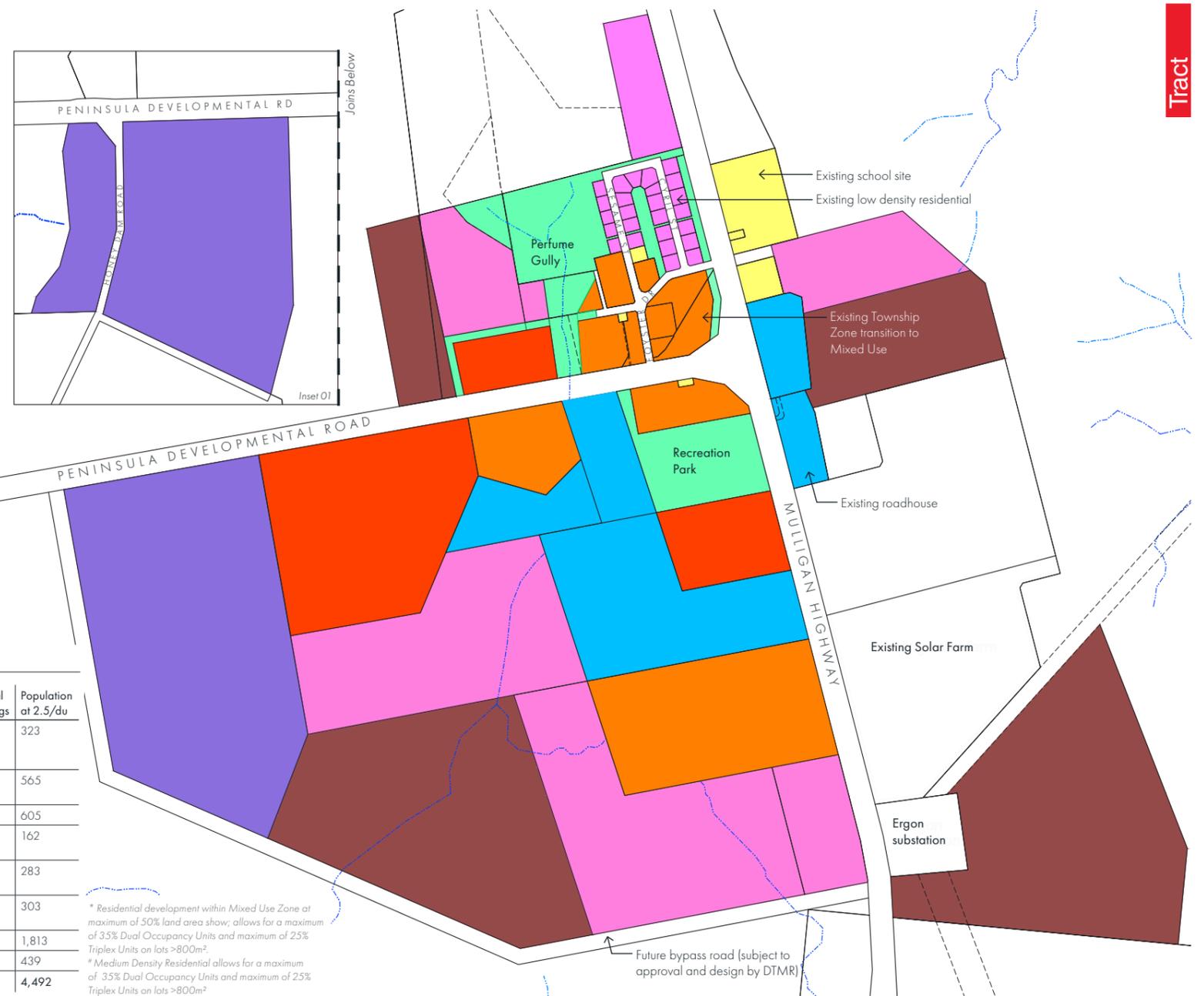
Residential Lot Mix and Yield Calculations

Zone	Minimum Lot Sizes	Density (du/Ha)	Sale-able Area (Ha)	Potential Dwellings	Population at 2.5/du
Medium Density Residential* - Single Dwellings	800m ²	12.5	10.3	129	323
MDR - Dual Occupancy Units	801m ²	25	9	226	565
MDR - Triplex Units		37.5	6.5	242	605
Mixed Use* - Single Dwellings	800m ²	12.5	5.2	65	162
Mixed Use - Dual Occupancy Units	801m ²	25	4.5	113	283
Mixed Use - Triplex Units		37.5	3.2	121	303
Low Density Residential	800m ²	12.5	58	725	1,813
Rural Residential	4,000m ²	2.5	70.2	175	439
TOTAL			167	1,797	4,492

* Residential development within Mixed Use Zone at maximum of 50% land area show; allows for a maximum of 35% Dual Occupancy Units and maximum of 25% Triplex Units on lots >800m².
 * Medium Density Residential allows for a maximum of 35% Dual Occupancy Units and maximum of 25% Triplex Units on lots >800m².

Drawing Title	Project Name	Drawing No.	Revision	Date	Drawn	Checked	Project Principal	Scale
Settlement Pattern - High Growth Scenario	Lakeland LAP	723-0083-00-P-02-DR01	08	21.12.2023	VA	PN	MH	1:10,000 (A3)

FIGURE 8: HGS SETTLEMENT PATTERN MAP (SOURCE: TRACT, 2023).



Tract

HIGH GROWTH SCENARIO

BASED ON:
PALMER RIVER DAM
PROCEEDS

AMPLE IRRIGATED
WATER SUPPLY

7.3 SETTLEMENT PATTERN MAPS

MEDIUM GROWTH SCENARIO

Table 12 summarises the land area requirements required for each zone in the MGS. What is evident from Table 12 is that with a footprint of 162.4ha, from an 'area' perspective, the MGS could be fully accommodated within the identified target growth areas (except for the additional industrial zoned land at Honey Dam Road). However, this would not have resulted in a compact urban form i.e., the town would have been 'long and skinny' and fragmented. As a result, the proposed expansion areas for the MGS have extended out of the target growth areas onto GGAL, in particular to the west of the town, although this is solely to provide a more compact, walkable urban form. It is not considered providing higher residential densities would have resolved this matter and as such, no changes to the residential densities have been proposed to try and reduce the footprint of the MGS (this could be further considered should the MGS be required).

Figure 9 provides the settlement pattern map for MGS which reflects where the land area requirements for each zone will be located. It is noted here that the zoned areas shown in **Figure 9** are at this stage, indicative only. The final locations for each zone would be determined as part of the Planning Scheme amendment/adoption process which would be required before this settlement pattern map was formally adopted into the current or included as part of a future Planning Scheme.

ZONE	TOTAL AREA REQUIRED (HA)
Centre	13.8
Mixed-Use (Residential)	5.64
Mixed-Use (Non-Residential)	5.96
Industrial	23
Low Density Residential	47.9
Medium Density	15.6
Rural Residential Zone	50.5
Total Lakeland Local Plan Area	162.4

TABLE 12: SUMMARY OF LAND AREA REQUIREMENTS FOR ALL ZONES UNDER THE MGS.

Legend

Gross Area (Ha)	Zone
13.8	Centre
15.6	Medium Density Residential
47.9	Low Density Residential
23	Industry
11.6	Mixed Use
50.5	Rural Residential

Total area (excl. existing) **162.4Ha**

Note - Gross Area above is exclusive of existing non-vacant lots. The master plan allows 20% of gross area to be taken up by roads, drainage and open space. All areas provided are rounded to the nearest 1,000m².

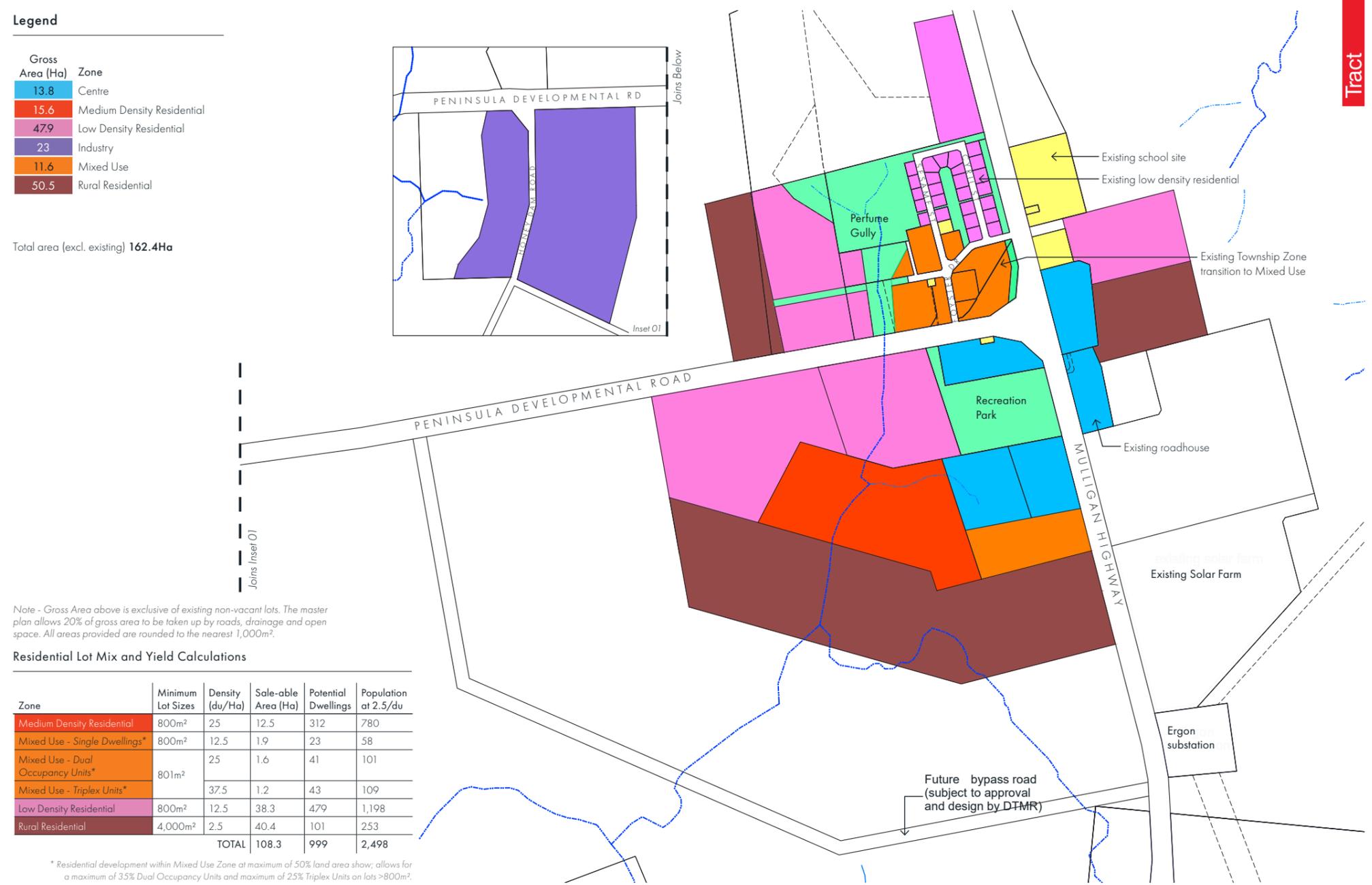
Residential Lot Mix and Yield Calculations

Zone	Minimum Lot Sizes	Density (du/Ha)	Sale-able Area (Ha)	Potential Dwellings	Population at 2.5/du
Medium Density Residential	800m ²	25	12.5	312	780
Mixed Use - Single Dwellings*	800m ²	12.5	1.9	23	58
Mixed Use - Dual Occupancy Units*	801m ²	25	1.6	41	101
Mixed Use - Triplex Units*		37.5	1.2	43	109
Low Density Residential	800m ²	12.5	38.3	479	1,198
Rural Residential	4,000m ²	2.5	40.4	101	253
TOTAL			108.3	999	2,498

* Residential development within Mixed Use Zone at maximum of 50% land area show; allows for a maximum of 35% Dual Occupancy Units and maximum of 25% Triplex Units on lots >800m².

Drawing Title	Project Name	Drawing No.	Revision	Date	Drawn	Checked	Project Principal	Scale
Settlement Pattern - Medium Growth Scenario	Lakeland LAP	723-0083-00-P-02-DR02	04	30.11.2023	VA	PN	MH	1:10,000 (A3)

FIGURE 9: MGS SETTLEMENT PATTERN MAP (SOURCE: TRACT, 2023).



MEDIUM GROWTH SCENARIO

BASED ON: AN INCREASE TO CURRENT IRRIGATION EXTENT

ADDITIONAL IRRIGATED WATER SUPPLY SECURED

7.3 SETTLEMENT PATTERN MAPS

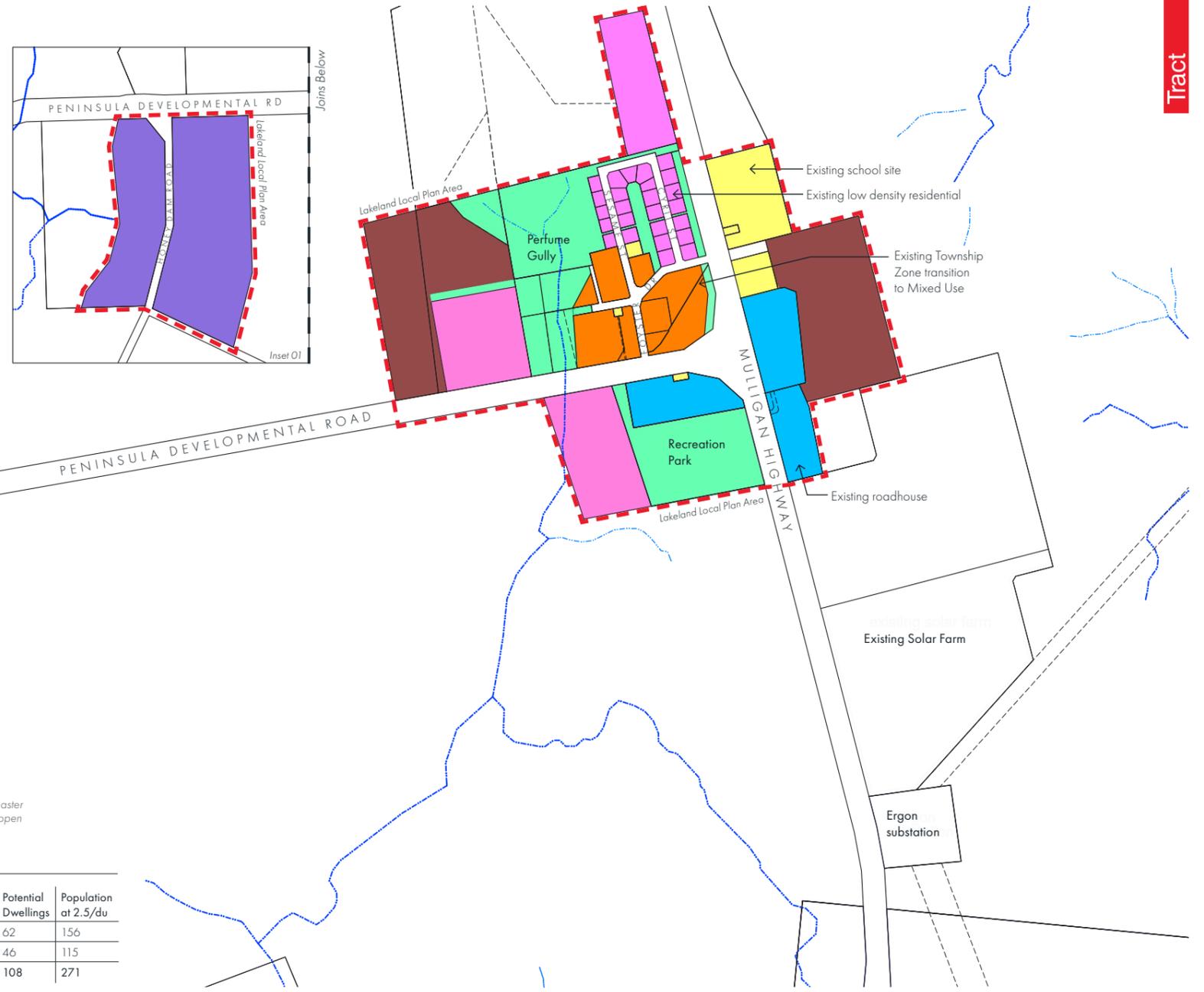
LOW GROWTH SCENARIO

Table 13 summarises the land area requirements required for each zone in the MGS. What is evident from **Table 13** is that with a footprint of 67.1ha, the LGS could be fully accommodated within the identified target growth areas and avoid the loss of any GQAL (except for the industrial zoned land at Honey Dam Road). However, similarly to the MGS, this would have resulted in a fragmented urban form. As a result, the proposed expansion areas for the LGS have extended out of the target growth areas onto GQAL to provide a more compact, walkable urban form.

Figure 10 provides the settlement pattern map for LGS which reflects where the land area requirements for each zone will be located.

Legend

Gross Area (Ha)	Zone
6.1	Centre
15.6	Low Density Residential
18	Industry
7	Mixed Use
20.4	Rural Residential
- - - Lakeland Local Plan Area 119Ha	
Total area (excl. existing) 67.1Ha	



Note - Gross Area above is exclusive of existing non-vacant lots. The master plan allows 20% of gross area to be taken up by roads, drainage and open space. All areas provided are rounded to the nearest 1,000m².

Residential Lot Mix and Yield Calculations

Zone	Minimum Lot Sizes	Density (du/Ha)	Sale-able Area (Ha)	Potential Dwellings	Population at 2.5/du
Low Density Residential	2,000m ²	5	12.5	62	156
Rural Residential	4,000m ²	2.5	18.4	46	115
TOTAL			30.9	108	271

Drawing Title	Project Name	Drawing No.	Revision	Date	Drawn	Checked	Project Principal	Scale
Settlement Pattern - Low Growth Scenario	Lakeland LAP	723-0083-00-P-02-DR03	04	30.11.2023	VA	PN	MH	1:10,000 (A3)

FIGURE 10: LGS SETTLEMENT PATTERN MAP (SOURCE: TRACT, 2023).

ZONE	TOTAL AREA REQUIRED (HA)
Centre	6.1
Mixed-Use	7
Industrial	18
Low Density Residential	15.6
Rural Residential Zone	20.4
Total Lakeland Local Plan Area	67.1

TABLE 13: SUMMARY OF LAND REQUIREMENTS FOR ALL ZONES UNDER THE LGS.

LOW GROWTH SCENARIO

BASED ON: NO CHANGES TO CURRENT IRRIGATION EXTENT

NO ADDITIONAL IRRIGATED WATER SUPPLY SECURED

7.3 SETTLEMENT PATTERN MAPS

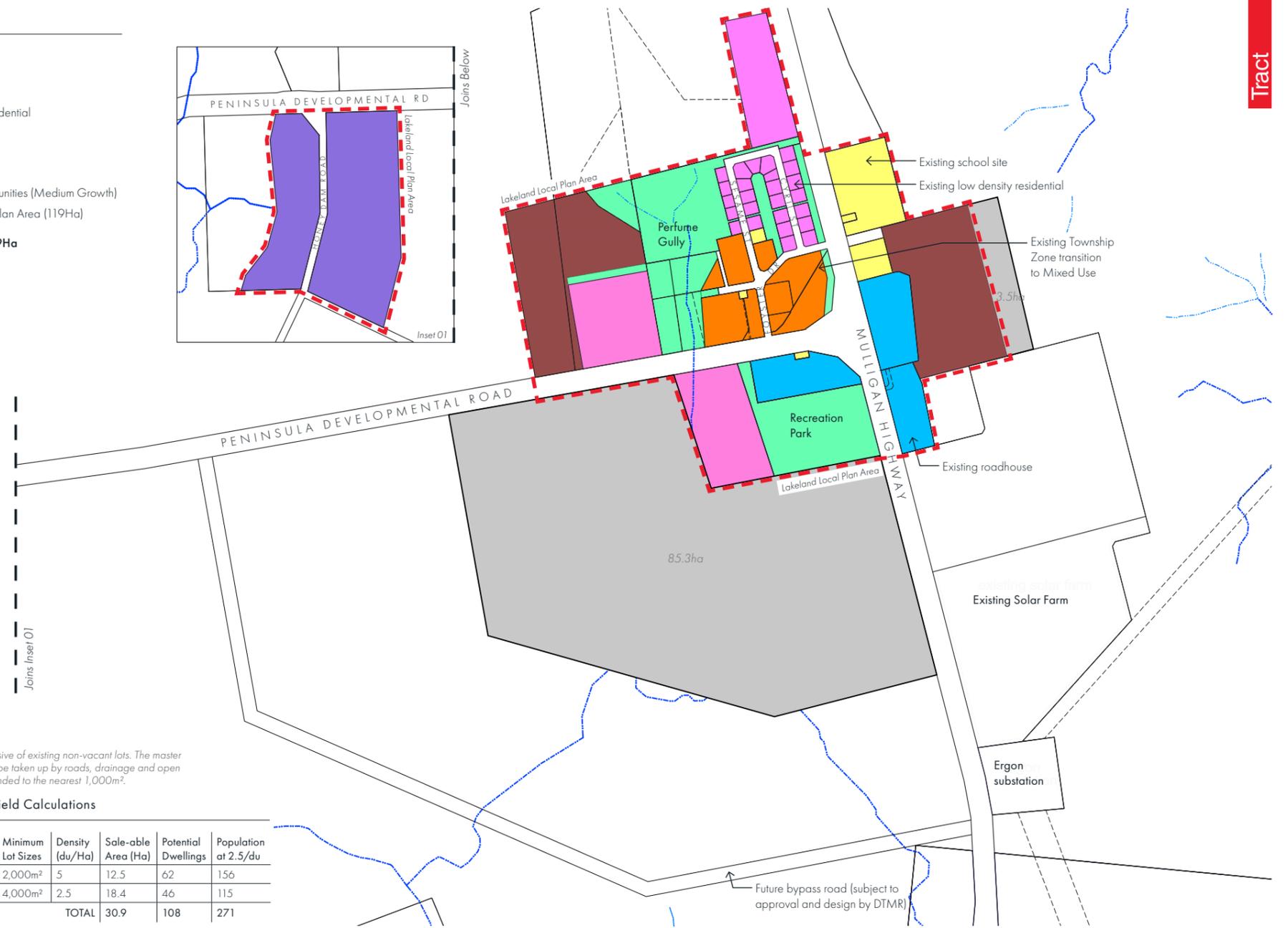
LOW GROWTH SCENARIO

Figure 11 identifies the land that will be included in an 'Emerging Communities' Zone under the LGS. The land to be zoned Emerging Communities will include all the zoned areas identified in the MGS that are located outside of the LGS. By including these areas within the Emerging Communities Zone as part of the LGS, it ensures this land is preserved for future urban purposes and in doing so, ensures the viability of the MGS should it be implemented at some time in the future.

Legend

Gross Area (Ha)	Zone
6.1	Centre
15.6	Low Density Residential
18	Industry
7	Mixed Use
20.4	Rural Residential
88.8	Emerging Communities (Medium Growth)
- - - Lakeland Local Plan Area (119Ha)	

Total area (excl. existing) **155.9Ha**



Note - Gross Area above is exclusive of existing non-vacant lots. The master plan allows 20% of gross area to be taken up by roads, drainage and open space. All areas provided are rounded to the nearest 1,000m².

Residential Lot Mix and Yield Calculations

Zone	Minimum Lot Sizes	Density (du/Ha)	Sale-able Area (Ha)	Potential Dwellings	Population at 2.5/du
Low Density Residential	2,000m²	5	12.5	62	156
Rural Residential	4,000m²	2.5	18.4	46	115
TOTAL			30.9	108	271

Drawing Title	Project Name	Drawing No.	Revision	Date	Drawn	Checked	Project Principal	Scale
Settlement Pattern - Low Growth Scenario	Lakeland LAP	723-0083-00-P-02-DR03	05	21.12.2023	VA	PN	MH	1:10,000 (A3)

FIGURE 11: EMERGING COMMUNITIES SETTLEMENT PATTERN MAP (SOURCE: TRACT, 2023).



Tract

8.0 STAKEHOLDER ENGAGEMENT

A stakeholder consultation strategy was created and endorsed by Cook Shire Council, prior to the commencement of engagement. It was a key goal to understand the views, resources and constraints of stakeholders and their interests in the project and to ensure transparent and collaborative approaches to including stakeholder influence and input into the project. A variety of internal (government) and external (community) stakeholders were engaged, with varying levels of interest and influence over the planning process of the masterplan. Following the stakeholder engagement period, a Stakeholder Engagement Report was produced. The Stakeholder Engagement Report outlines the consultation process undertaken specifically for the masterplan and the objectives and findings of stakeholder consultation between the State and local government, and the community.



9.0 OPEN SPACE STRATEGY

The Open Space Strategy (OSS) was prepared in association with the masterplan and focused on strategically investigating and identifying an overall approach to linking and connecting the current and potential recreation opportunities within the town. The OSS provides a high-level overview of what future greenspaces within the township could look like under the LGS and MGS and the key features that could be provided within each greenspace area. Specifically, the open space strategy focuses on three (3) key areas, being Perfume Gully (including existing parkland areas within the township), the existing recreation park and new link parks to the south of the PDR



SHELTERS AND SEATING FOR GROUPS



NATURE PLAY



CULTURAL AND HISTORICAL SIGNAGE



CREEK BED CHARACTER



INCORPORATING NATIVE FLORA



NATURE INSPIRED PLAYGROUND

LEGEND

- - - Open space areas
- - - Waterways
- - - Easements
- Cadastral boundaries

CONTEXT PLAN



FIGURE 12: OPEN SPACE STRATEGY- CONTEXT PLAN

9.0 OPEN SPACE STRATEGY

PERFUME GULLY DRIVE



FIGURE 13: OPEN SPACE STRATEGY- PERFUME GULLY DRIVE

PROPOSED PERFUME GULLY AMENITY

-  **Tree planting areas:** increase canopy cover and diversity including locally endemic species and bird attracting trees
-  **Wetland planting areas:** improve waterway health and capacity by incorporating appropriate grasses and groundcovers to stabilise the edges
-  **Seating areas:** provide bench seating for individuals and small groups with opportunities for natural shade
-  **Play area:** small playground including nature play elements
-  **Feature garden:** educational and sensory experience incorporating native species including variety of textures, scents, foliage and blooms to add interest and provide information about traditional indigenous uses where relevant
-  **Public restrooms:** incorporate opportunity for parents' room and changing places for persons with a disability
-  **Signage:** wayfinding and informative signs located to improve legibility and provide educational opportunities

RECREATION PARK



FIGURE 14: OPEN SPACE STRATEGY- RECREATION PARK

PROPOSED RECREATION PARK AMENITY

-  **Tree planting areas:** increase canopy cover and diversity including locally endemic species and bird attracting trees
-  **Bike park:** Training area for various skill levels, and short agility track incorporating jumps
-  **Seating areas:** provide bench seating for individuals and small groups with opportunities for natural shade
-  **Play area:** small playground including nature play elements
-  **Signage:** wayfinding and informative signs located to improve legibility and provide educational opportunities



9.0 OPEN SPACE STRATEGY

GREEN LINKS



PROPOSED GREEN LINKS AMENITY

-  **Tree planting areas:** increase canopy cover and diversity including locally endemic species and bird attracting trees
-  **Seating areas:** provide bench seating for individuals and small groups with opportunities for natural shade
-  **Signage:** wayfinding and informative signs located to improve legibility and provide educational opportunities

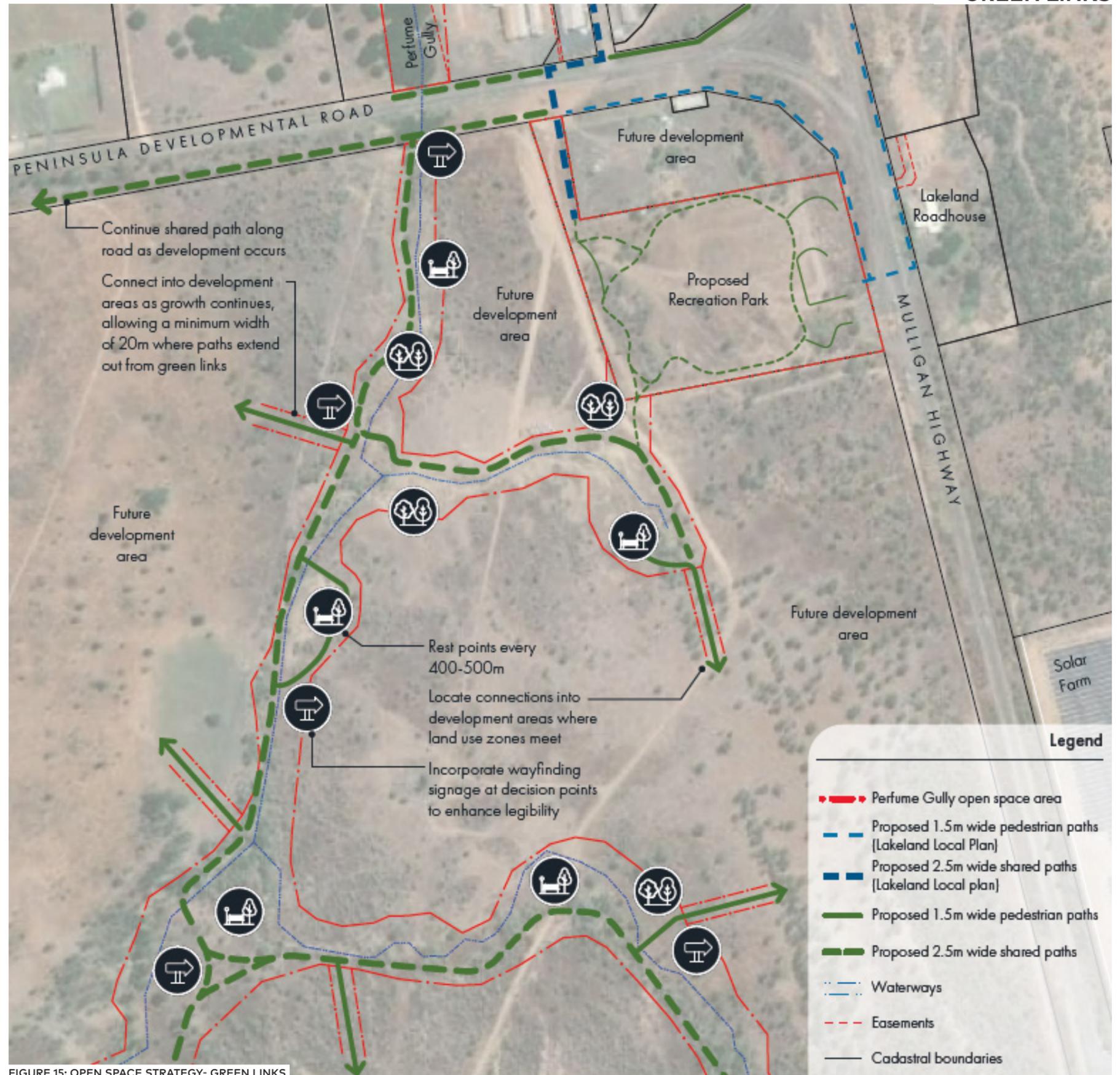


FIGURE 15: OPEN SPACE STRATEGY- GREEN LINKS

10.1 OPTIONS ANALYSIS

HIGH GROWTH SCENARIO

The HGS caters for approximately double the projected population growth of the MGS with a population of 4,400 (an increase of 4,169 people), including transient workers. To accommodate this growth, significant expansions to the township area have been proposed. Specifically, some 205 hectares of land has been allocated for future residential growth of permanent and temporary residents which could, dependent on configurations and density uptake, accommodate 1,796 dwellings. Significant increases in centre, industrial and mixed-use zoning designations have also been proposed under the HGS to accommodate this growth.

The HGS will require improvements to both water and sewerage services beyond existing allocations and infrastructure to service the identified population growth. Under the HGS, reticulated water is proposed to be provided from the Palmer River dam and upgrades are therefore slightly different to that identified under the MGS. Works, services and upgrades for sewerage are however, generally akin to those identified under the MGS, albeit at a higher capacity to support a greater population.

This scenario has the potential to transform Lakeland into a critically important regional hub for the Cape and FNQ areas. However, it is based on a large irrigation scheme, such as the Palmer River Dam proceeding which requires significant public investment and government policy adoption. Given the element of 'uncertainty' on investment and funding, combined with the timeframe for approvals and construction of any such infrastructure, this scenario may not provide a fit-for-purpose strategy for the short or medium terms. As such, the HGS is perhaps, most prudent to adopt once there is certainty that the Palmer River Dam (or any such equivalent) will proceed, and this could take the form of an amendment to the Planning Scheme at that time to include this scenario and/or be included into a new, future Planning Scheme.

ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Provision of additional suitably 'zoned' land for residential and non-residential expansion;
- Addressing the growth of the town over the longer term;
- Provision of suitable residential densities;
- Changes to the Planning Scheme to better facilitate development;
- Clear identification of the area intended to house workforce accommodation within the township;
- More reliable water supply (and improved quality of water); and
- Improved environmental and health benefits because of reticulated sewage being provided.

DISADVANTAGES:

- High capital costs associated with the provision of all required infrastructure.

HIGH GROWTH SCENARIO

BASED ON:
PALMER RIVER DAM
PROCEEDS

AMPLE IRRIGATED
WATER SUPPLY

IMAGE SOURCE: TROPICAL NORTH QUEENSLAND

10.1 HIGH GROWTH SCENARIO

RECOMMENDATIONS – LAND USE

- Should the Palmer River Dam (or equivalent) proceed:
 - Undertake detailed investigations in relation to the expected population growth and servicing demands/requirements i.e., undertake economic impact assessments to accurately determine the amount of residential industrial and center zoned land that MAY be required;
 - In consultation with these detailed investigations, reassess the settlement pattern maps for the HGS and make zoning changes as required to ensure an accurate zoning map for the town is provided;
 - Identify changes to the Planning Schem that would be required; and
 - Look to implement ALL works identified in the OSS as required.
- Undertake detailed investigations to identify the works and costs required to provide the infrastructure necessary to service the town of Lakeland and use these findings to update the LGIP Planning Scheme; and
- Expand the PIA and Lakeland LPA to include all urban areas identified in the updated settlement

pattern maps/zoning maps; and

- Implement the above into a new Planning Scheme.

RECOMMENDATIONS – INFRASTRUCTURE

NECESSARY:

- Expand the reticulated water supply network to service all new development;
- The need for water treatment systems would be dependent on the quality of water being sourced from the Dam;
- Elevated reservoirs are required for water security to meet emergency needs and pressure requirements. These can be located on Lot 13 on BS132 where there is sufficient elevation to provide required head pressures. Sizing of reservoirs should at least be able to cater for emergency flows volumes subject to a risk assessment;
- Seek funding for the provision of a PSTP and land acquisition for effluent irrigation to allow for the provision of reticulated sewerage into all new development (location TBC);
- A MCGS system is recommended for

implementation for the sewerage network. The MCGS is recommended on the basis that high levels of rock are present within the township and growth areas. Whilst it may not completely avoid the need for rock excavation it will certainly minimise it; and

- To support the MCGS, install a PSTP with detention pond capacity and irrigation land for disposal of treated effluent. Council will need to negotiate acquisition of any parcels of land which are not owned or in control of Council. Once a parcel of land has been identified for acquisition, it is recommended that further testing be undertaken to confirm more detailed soil types for suitability of irrigation of treated effluent. The PSTP and detention would ordinarily be

collocated with the irrigation area.

OPTIONAL:

- Implement an effluent reuse scheme to utilise treated effluent to irrigate the football oval. This will have the added benefit of freeing up underground water allocation for potable water consumption. Reuse of the treated effluent is an option, but the regulator will always require availability of land area for irrigation should the reuse option cease to exist; and
- Consideration should be given to implementing a biosolids treatment facility and reuse scheme which would also receive biosolids from Cooktown Sewage Treatment Plant for processing. This would minimise transportation costs for Council as they currently dispose of the biosolids at the Mareeba landfill. However the viability of such a scheme needs to be further considered along with removal of contaminants.



IMAGE SOURCE: KENNEDY RURAL

10.2 OPTIONS ANALYSIS

MEDIUM GROWTH SCENARIO

The MGS has the potential to transform Lakeland into an important regional hub for the Cape and Far North Queensland (FNQ) areas. Similarly, to the LGS, the MGS could also assist in addressing some of the immediate challenges facing the township in the short-term, but due to the additional need for services and a greater population, goes further than the LGS and in doing so, would allow for the orderly growth of Lakeland over the medium to long term.

The MGS, therefore, caters for a much higher population than that of the LGS with a projected population of 2,484 (an additional 2,253), including temporary workers. To accommodate this growth, significant expansions to the township area have been proposed. Specifically, some 120 hectares of land has been allocated for future residential growth of permanent and transient residents which could, dependent on configurations and density uptake, accommodate 1,000 dwellings. Significant increases in centre, industrial and mixed-use zoning designations have also been proposed under the MGS to accommodate this growth.

The MGS will require improvements to both water and sewerage services beyond existing allocations and infrastructure to service the identified population growth with upgrades and additional allocations of water required once the population reaches 700EP. Based on generally linear growth, under the MGS the town would reach a population of 700EP after about five (5) to six (6) years. To realize the density requirements outlined for the MGS, it will also be essential that reticulated sewage be provided to the town. As such and in contrast to the LGS, to realize the full potential of this scenario, the infrastructure upgrades identified below will need to be enacted upon. That said, this scenario is potentially the most 'efficient' option for growth of the three (3) scenarios included in this report as it allows for a more moderate increase in population growth and more allowance for associated services to accommodate the needs of this increased population growth.

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Provision of additional suitably 'zoned' land for residential and non-residential expansion;
- Addressing the growth of the town over the medium to longer term;
- Provision of suitable residential densities;
- Changes to the Planning Scheme to better facilitate development;
- Clear identification of the area intended to house workforce accommodation within the township;
- More reliable water supply (and improved quality of water); and
- Improved environmental and health benefits because of reticulated sewage being provided

DISADVANTAGES

- High capital costs associated with the provision of all required infrastructure.

MEDIUM GROWTH SCENARIO

BASED ON: AN INCREASE TO CURRENT IRRIGATION EXTENT

ADDITIONAL IRRIGATED WATER SUPPLY SECURED



IMAGE SOURCE: PUMP INDUSTRY MAGAZINE

10.2 MEDIUM GROWTH SCENARIO

RECOMMENDATIONS – LAND USE

- Reassess growth, demands and needs in the town prior to the commencement of the next Planning Scheme. If growth has been experienced and it is evident that the township requires the release of further land for population growth and/or services, adopt the MGS as part of the next Planning Scheme i.e.:
 - Implement changes to the zoning maps of the Planning Scheme for Lakeland;
 - Expand the PIA and Lakeland LPA to include all urban areas identified in the settlement pattern maps for the MGS scenario;
 - Implement changes to the Planning Scheme to better facilitate development in the town; and
 - Look to implement further improvement to the 'Recreation Park' identified in the OSS (and if budget allows for it, some improvements to Perfume Gully);
- Undertake detailed investigations to identify the works and costs required to provide the infrastructure necessary to service the town of Lakeland (generally as detailed below) and use these findings to update the Local Government Infrastructure Plan (LGIP) within the Planning Scheme.

RECOMMENDATIONS – INFRASTRUCTURE

NECESSARY:

- Expand the reticulated water supply network to service all new development;
- Prior to reaching capacity i.e., at least five (5) years prior and when the population of the township reaches approximately 350 people (permanent and temporary) commence preparations for equipping the bore on Lot 201 on SP172665;
- The existing underground water allocation is sufficient for the MGS for the short term only. If growth progresses beyond 700EP, explore the options for seeking approval to increase the underground water allocation and install an additional bore at the Airport;
- Install a water treatment plant to remove hardness, scale and silica. These are aesthetic issues only and do not affect health. Whilst this may be considered optional for smaller populations, with increased demand serviceability and consumer satisfaction will become more apparent for Council thereby placing a greater emphasis on requiring water treatment. This can proceed at any stage subject to funding and without any statutory approval required with exception of a possible MCU under the planning

scheme. This may depend on the location. A preferred location that could be considered is Lot 201 on SP172665 beside the 250kL reservoir, but it is recommended this lot be master planned in the first instance;

- Undertake monthly sampling of raw water from existing water source bores and existing bore located on Lot 201 on SP172665. The results will provide all year raw water quality data should Council wish to proceed to install a water treatment plant to remove aesthetic hardness/ scaling issues;
- Elevated reservoirs are required for water security to meet emergency needs and pressure requirements. These can be located on Lot 13 on BS132 where there is sufficient elevation to provide required head pressures. Sizing of reservoirs should at least be able to cater for emergency flows volumes subject to a risk assessment;
- Seek funding for the provision of a PSTP and land acquisition for effluent irrigation to allow for the provision of reticulated sewerage into all new development (location TBC);
- A MCGS system is recommended for implementation for the sewerage network. The MCGS is recommended on the basis that high levels of rock are present within the township and growth areas. Whilst it may not completely avoid the need for rock excavation it will certainly

minimise it; and

- To support the MCGS, install a PSTP with detention pond capacity and irrigation land for disposal of treated effluent. Council will need to negotiate acquisition of any parcels of land which are not owned or in control of Council. Once a parcel of land has been identified for acquisition, it is recommended that further testing be undertaken to confirm more detailed soil types for suitability of irrigation of treated effluent. The PPSTP and detention would ordinarily be collocated with the irrigation area.

OPTIONAL:

- Implement an effluent reuse scheme to utilise treated effluent to irrigate the football oval. This will have the added benefit of freeing up underground water allocation for potable water consumption. Reuse of the treated effluent is an option, but the regulator will always require availability of land area for irrigation should the reuse option cease to exist; and
- Consideration should be given to implementing a biosolids treatment facility and reuse scheme which would also receive biosolids from Cooktown Sewage Treatment Plant for processing. This would minimise transportation costs for Council as they currently dispose of the biosolids at the Mareeba landfill. However, the viability of such a scheme needs to be further considered along with removal of contaminants.



IMAGE SOURCE: EXPLORE OZ

10.3 OPTIONS ANALYSIS

LOW GROWTH SCENARIO

The LGS supports a population increase of 223 people within the township (including transient workers) and from a planning perspective, seeks to provide the framework to assist in addressing some of the immediate challenges facing the township through not only, the provision of additional zoned land, but also having this land under the ownership of a higher amount of land owners.

To accommodate the growth identified under this scenario, some 36ha of land has been allocated for future residential growth of permanent residents which could, dependent on configurations and density uptake, accommodate 143 dwellings. A mixed-use zone has also been proposed to generally, replace the township zone and identify the preferred location for all types of workforce accommodation within the township under the LGS. Centre and industrial zoned land has also been included in the LGS to accommodate the necessary services and industry to support the increased population.

The infrastructure plan generally supports the level of growth in the LGS using current infrastructure servicing arrangements with no essential upgrades necessary until the very back end of this scenario, when some works to the existing bores will be required to realize the full amount of growth envisioned under this scenario. There is however, no reticulated sewerage proposed as part of this scenario which will limit growth and restrict density in LDR zoned areas. Accordingly, some investment in a small, reticulated sewerage system would help better realize the outcomes of this scenario (and the MGS and HGS), while simultaneously providing far reaching environmental and health benefits. For this reason, some infrastructure upgrades are recommended to be implemented as part of the LGS.

Note: It may be that some form of capital investment from Council is required to trigger any form of meaningful development under the LGS. This MAY be in the form of a reticulated sewer network to ensure a higher density can be achieved when land is developed, or it could be a contribution towards a formalized intersection from the PDR (or similar).

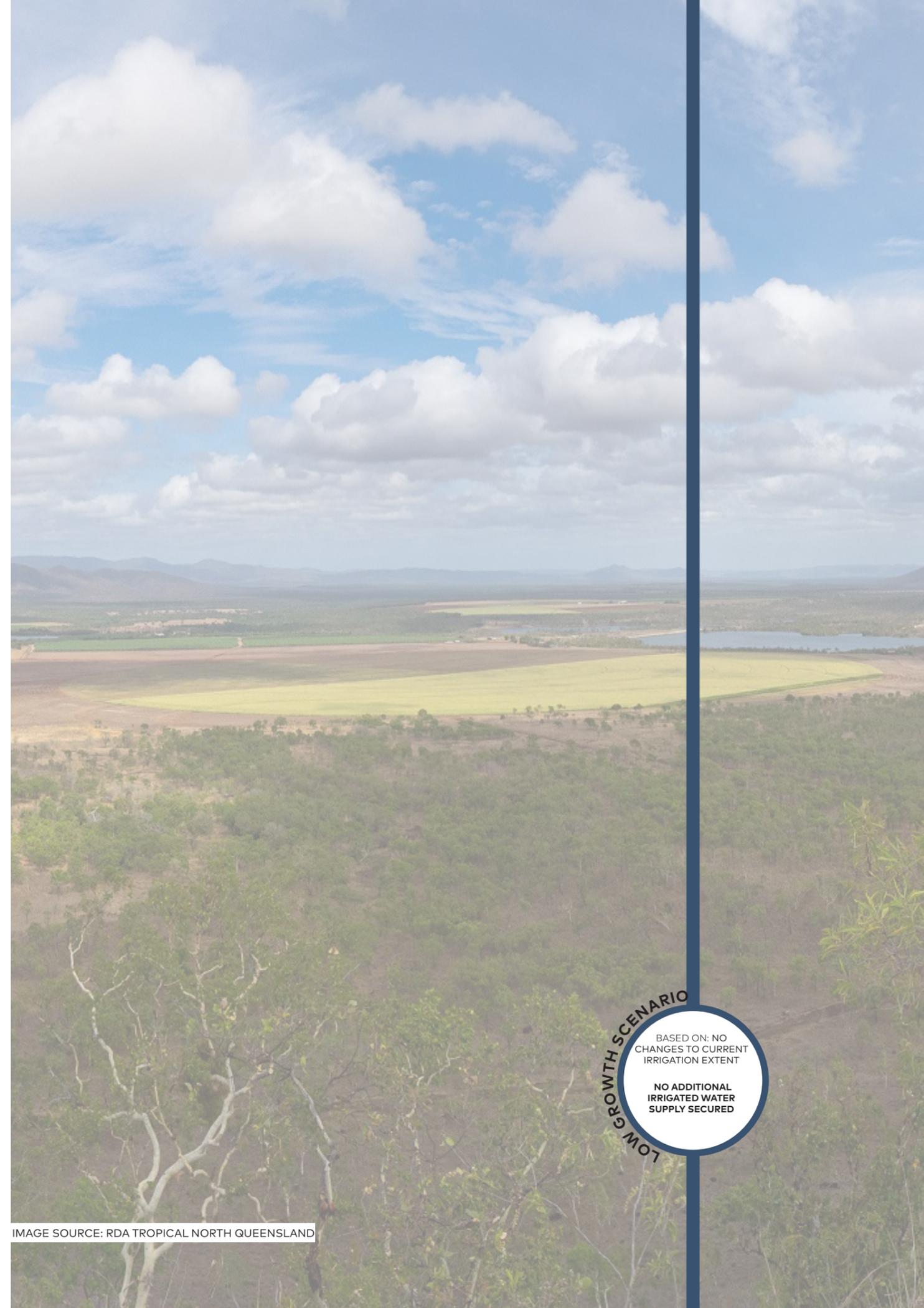
ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Provision of additional suitably 'zoned' land for residential expansion;
- Inclusion of additional suitably 'zoned' land for residential expansion on multiple 'growth fronts' (with this land under the ownership of multiple land owners);
- Changes to the Planning Scheme to better facilitate development;
- Clear identification of the area intended to house workforce accommodation within the township; and
- Minimal upfront capital costs regarding infrastructure.

DISADVANTAGES:

- Growth and expansion of the township is still somewhat limited;
- Multiple 'growth fronts' will need to be carefully managed through the Development Application (DA) process to ensure the efficient provision of infrastructure (if multiple DA's are in fact submitted);
- Large lots (2,000m² minimum) are required for all future residential expansion which has the potential to result in an efficient use of land and compromise the MGS (and the HGS should it occur); and
- Continued reliance on on-site effluent resulting in the lasting potential for health and environmental concerns.



LOW GROWTH SCENARIO

BASED ON: NO CHANGES TO CURRENT IRRIGATION EXTENT

NO ADDITIONAL IRRIGATED WATER SUPPLY SECURED

IMAGE SOURCE: RDA TROPICAL NORTH QUEENSLAND

10.3 LOW GROWTH SCENARIO

RECOMMENDATIONS – LAND USE

INFRASTRUCTURE:

NECESSARY:

- Implement changes to the zoning maps of the Planning Scheme for Lakeland;
- Expand the Priority Infrastructure Area (PIA) and Lakeland Local Plan Area (LPA) to include all urban areas identified in the settlement pattern maps for the LGS;
- Identify all zoned land in the MGS that is located outside of the Lakeland LPA as 'emerging community' in the LGS;
- Implement changes to the Planning Scheme Table of Assessment (TOA) to better facilitate workforce accommodation being in the township;
- Implement other changes to the TOA and the Planning Scheme as a whole to better facilitate development in the township;
- Allow the subdivision of land in the LDR zone at 2,000m² (if suitably supported by effluent reporting and testing). However, building envelopes must be approved as part of any such subdivision to restrict development to 'half' of the lot, thus allowing the efficient future re-subdivision of these lots down to 800m²-1,000m² (once reticulated sewer is provided); and
- Make the subdivision of land in the LDR zone where lots are proposed at less than 2,000m² and no reticulated sewer is proposed, impact assessment to make it very clear subdivision into smaller lots is not supported until reticulated sewer is provided.

Note: Population increases and building approvals should also be monitored closely to ensure that, if required, the need to transition towards the MGS and/or provide infrastructure upgrades is identified early. To ensure there is an adequate amount of time available to plan, acquire funding and obtain all required approvals, investigations into transitioning towards the MGS should occur when the population in the township reaches approximately 350 persons.

OPTIONAL:

- Implement SOME of the improvement to the 'Recreation Park' identified in the OSS;

RECOMMENDATIONS – INFRASTRUCTURE

NECESSARY:

- Expand the reticulated water supply network to service all new development;
- The existing bores are capable of supplying almost the entire LGS (430 persons), although will be at capacity prior to the full realisation of the LGS. As such, upgrades will be required at some time in the future. In this regard, Council own a viable bore on Lot 201 on SP172665 which could be easily equipped for minimal cost to support growth up 700EP. Council should monitor demand and prior to reaching capacity i.e., at least five (5) years prior, commence preparations for equipping the bore on Lot 201 (when the population of the township reaches approximately 350 persons) It is expected these works should commence when the population in the township reaches approximately 350 persons.
- Undertake monthly sampling of raw water from existing water source bores and the existing bore located on Lot 201 on SP172665. The results will provide all year raw water quality data should Council wish to proceed to install a water treatment plant to remove aesthetic hardness/scaling issues; and
- Install a 250kL emergency storage tank including water main integrated into the system to be located on Lot 201 on SP172665. Prior to installation, undertake master planning of Lot

201 to determine the highest and best uses for the balance of the land.

OPTIONAL:

- Installation of a water treatment plant to remove hardness, scale and silica is optional as this is only an aesthetic issue. This can proceed at any stage subject to funding and without any statutory approval required with exception of a possible MCU under the Planning Scheme. This may depend on the location. A preferred location that could be considered is on Lot 201 on SP172665 beside the 250kL reservoir, but it is recommended this lot be master planned in the first instance;
- Seek funding for the provision of a package sewage treatment plant (PSTP) and land acquisition for effluent irrigation to allow for the provision of reticulated sewerage into all new development (location TBC). Funding and implementation of a full sewerage scheme under the LGS may be a challenging prospect for Council due to the relatively low population ratio to capital cost making the cost benefit of such a scheme limiting. However, decisions on funding should not only be made on cost alone, but on health, environmental and future development concerns from onsite disposal of effluent;
- In the event Council are successful at obtaining funding, a modified conventional gravity sewerage (MCGS) system is recommended for implementation. The MCGS is recommended on the basis that high levels of rock are present within the township and growth areas. Whilst

it may not completely avoid the need for rock excavation it will certainly minimise it;

- To support the MCGS, install a PSTP with detention pond capacity and irrigation land for disposal of treated effluent. Council will need to negotiate acquisition of any parcels of land which are not owned or in control of Council. Once a parcel of land has been identified for acquisition, it is recommended that further testing be undertaken to confirm more detailed soil types for suitability of irrigation of treated effluent. The PSTP and detention would ordinarily be collocated with the irrigation area;
- Implement an effluent reuse scheme to utilise treated effluent to irrigate the football oval. This will have the added benefit of freeing up underground water allocation for potable water consumption. Reuse of the treated effluent is an option, but the regulator will always require availability of land area for irrigation should the reuse option cease to exist; and
- Consideration should be given to implementing a biosolids treatment facility and reuse scheme which would also receive biosolids from Cooktown Sewage Treatment Plant for processing. This would minimise transportation costs for Council as they currently dispose of the biosolids at the Mareeba landfill. However, the viability of such a scheme needs to be further considered along with removal of contaminants.



IMAGE SOURCE: QLD GOV

10.4 RECOMMENDATIONS

SUMMARY AND RECOMMENDATION

The true growth potential of the Lakeland township is unlikely to be fully realized unless key infrastructure and to a lesser extent, planning related challenges are suitably addressed. As such, the most beneficial growth scenario will essentially be guided by natural population growth and the timing of infrastructure provision over the short to medium term. That said, to assist in addressing some of the immediate concerns surrounding housing provision and general development progression within the township as well as support the growth of the township in the short-term, it is the recommendation of this masterplan that the low growth scenario, inclusive of the key land use and infrastructure recommendations, as well as the suggested changes to the Planning Scheme that have been proposed as part of this scenario, be adopted and be actioned via an amendment to the current Planning Scheme.

Due to the viability of the medium growth scenario and its links to the provision of infrastructure which will be one of, if not the key catalyst to realising any tangible growth in the town, the recommendations, both land use and infrastructure, as well as the suggested changes to the Planning Scheme outlined in the masterplan for this scenario should not be abandoned. Instead, they should be retained as the key framework to address the medium to longer terms needs of the township and for inclusion within a future Planning Scheme, on the proviso that the township grows sufficiently over the short to medium term. To do this, population increases and/or building approvals should be monitored closely to ensure that, if required, the need to transition towards the medium growth scenario and/or provide infrastructure upgrades is identified early. To ensure there is an adequate amount of time available to plan, acquire funding and obtain all required approvals, investigations into transitioning towards the medium growth scenario should occur when the population in the township reaches approximately 350 persons.

It is not recommended to pursue the high growth scenario in any way shape of form, as, until more certainty surrounding the commencement of a catalytic piece of regional infrastructure is provided, it is premature to plan for such an outcome. For this reason, the HGS is not a viable option that warrants further consideration at this time.



IMAGE SOURCE: TRIP ADVISOR

11.0 TOWN CENTRE CONCEPT

The town centre concepts were prepared in association with the masterplan and considered practical town centre improvements within the street network and town centre. Specifically, the concepts provide a high-level overview of existing key streets may be able to function within a town centre context and provided street-scape improvements such as signage, improved pedestrian connectivity and amenity, capital works projects and integration with existing/previously identified works. We note also that While the works reference 'town centre', they do not apply to centre zoned land. Instead, they are proposed to be located within and adjacent to the proposed mixed use zone north of the PDR as this area currently has the function of a 'town centre' and connects the existing residential and commercial area of Lakeland.



WELCOME SIGNAGE



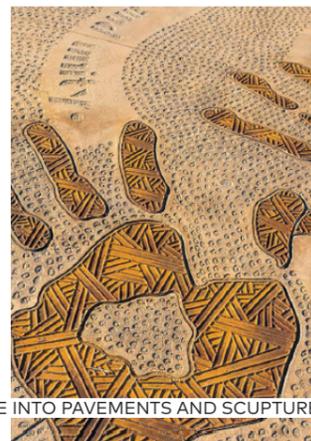
AWNINGS AND PLANTING ALONG STREET



WAYFINDING



INCORPORATING ART & CULTURE INTO PAVEMENTS AND SCULPTURE



SHARED PATHS CONNECTING COMMUNITY

LEGEND

- Town Centre (existing)
- Town Centre growth area
- Waterways
- Easements
- Cadastral boundaries

CONTEXT PLAN

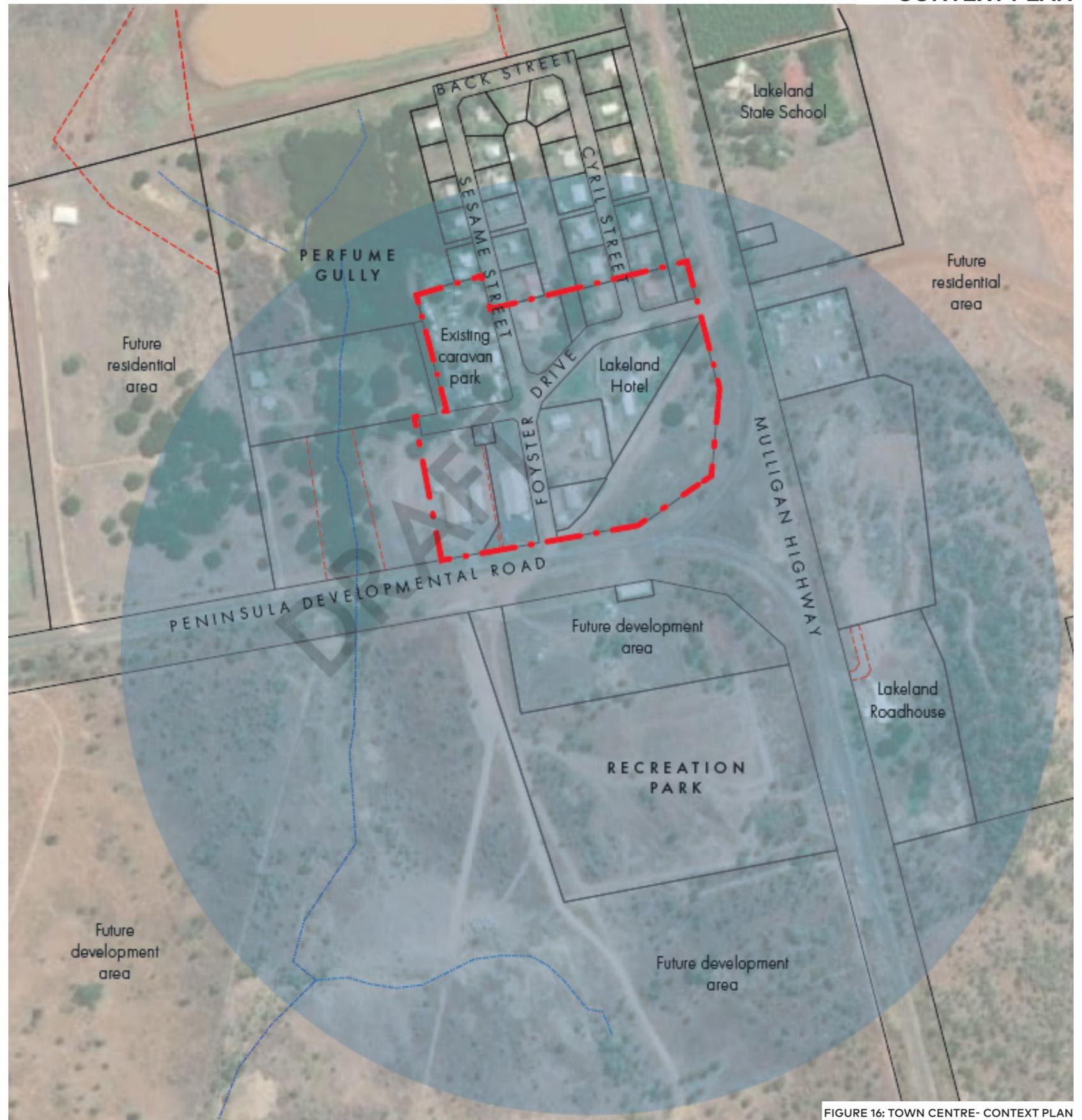


FIGURE 16: TOWN CENTRE- CONTEXT PLAN

11.0 TOWN CENTRE CONCEPT

PROPOSED STREETScape AMENITY

- 
Street tree planting: increase canopy cover and diversity including locally endemic species and bird attracting trees

- 
Shared zone: encourage pedestrian activity and shopfront engagement with a shared traffic zone, allowing for seamless movement within the core area and increasing accessibility

- 
Street furniture: provide lighting continuously along Foyster Drive, linking through Slim Close to Perfume Gully, to increase safety and visibility (particularly within the proposed shared zone), incorporate seating into streetscape at key locations to allow for rest points and increase occupancy for longer time periods, consider waste bins, bicycle racks and drinking fountains where appropriate

- 
Key sites: visually and physically central to the Foyster Drive precinct, the identified sites will be instrumental in driving activity and town centre uses - the development of these sites should consider uses and characteristics that benefit Lakeland and promote the identity of the town centre

- 
Active edges: opportunities for visual and physical connections between the streetscape and businesses will influence the activity and atmosphere of Foyster Drive, uses should enable movement as well as lingering in the precinct such as footpath dining and retail - awnings over footpaths are essential to maintain comfort in the streetscape for all users

- 
Signage: wayfinding signs located to improve legibility

- 
Artwork or sculpture: opportunities to connect the history and culture of Lakeland with the community can be visually represented through street art and/ or sculpture, allowing the town centre to be shaped by local community members and creators

FOYSTER DRIVE



FIGURE 17: TOWN CENTRE- FOYSTER DRIVE



IMAGE SOURCE: CAIRNS ATTRACTIONS



PART B

INFRASTRUCTURE PLAN

1.0 WATER SUPPLY

CURRENT WATER CONSUMPTION

Estimates of historical population and current population for Lakeland have been applied to determine the historical and current consumption rates for litres/person/day (L/p/d). These rates ranged from low 400 L/p/d to more recently 450 L/p/d. Based on the most recent consumption figures the rate of 450 L/p/d has been adopted for future water supply demand scenarios. Whilst FNQROC Development Manual recommends 500L/p/day, Council considers that 450L/p/day is reasonable based on past usage and given that all Councils are required to be managing and limiting consumption through modern day demand management procedures.

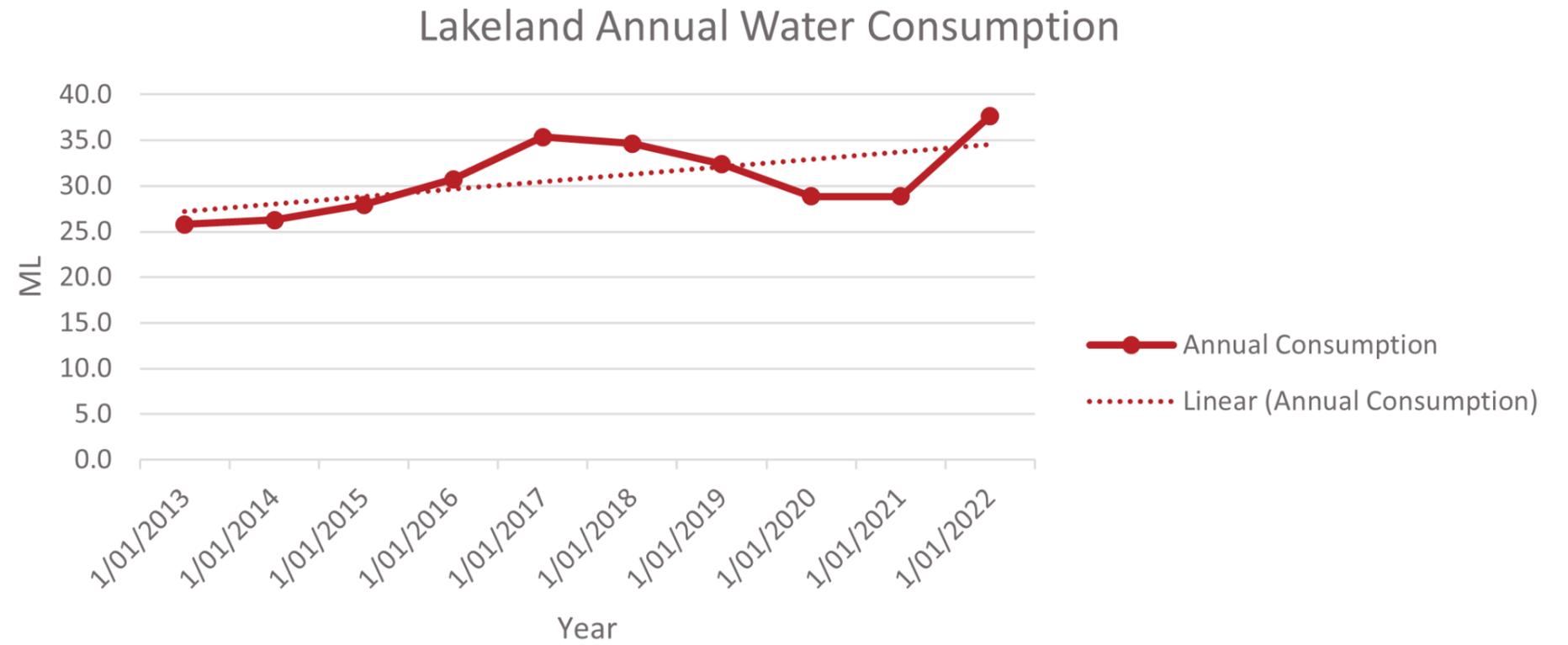


FIGURE 18 - TOTAL ANNUAL WATER CONSUMPTION PER YEAR

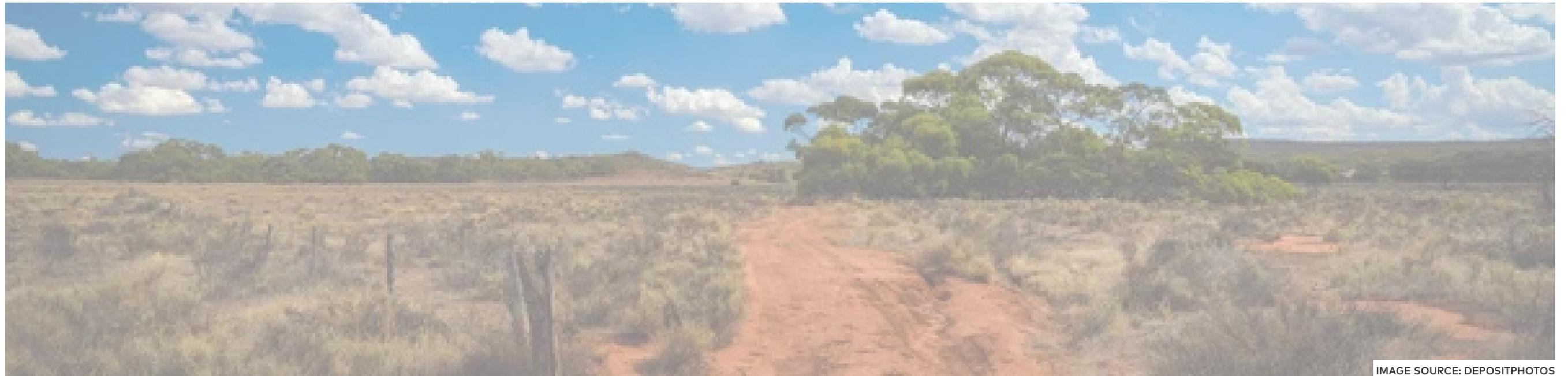


IMAGE SOURCE: DEPOSITPHOTOS

1.1 PROPOSED WATER SUPPLY INFRASTRUCTURE BASED ON DEMAND SCENARIOS

Based on the preceding adopted consumption of 450 L/p/d the following demand scenarios have been developed with corresponding infrastructure requirements:

TABLE 14: LOW GROWTH SCENARIO WATER SUPPLY DEMAND

LGS	FORMULA	SHORT TERM (KL)	MEDIUM TERM (KL)	LONG TERM (KL)
AVERAGE DEMAND, AD (KL/D)	=Population x demand	114.8	126.9	126.9
MEAN DAY MAXIMUM MONTH, MDMM (kL/d)	=1.5 x AD	172.1	190.4	190.4
PEAK DAY, PD (KL/D)	=2.25 x AD	258.2	285.5	285.5
PEAK HOUR, PH (KL/HR)	=1/12 x PD	21.5	23.8	23.8
FIREFIGHTING (RESIDENTIAL)	=15L/s x 2hrs	108	108	108
EMERGENCY FLOWS	=3 x AD	344	381	381
GROUND RESERVOIR STORAGE[^]	=3 x (PD-MDMM) + Max of Emergency Flows or FF Residential	602	666	666
ELEVATED RESERVOIR	=6 x (PH-MDMM/12) + Firefighting storage	151	156	156
			(L/s)	
TREATED WATER PUMPS FEEDING GROUND LEVEL RESERVOIR STORAGE	=MDMM over 20 hours	2.0	2.2	2.2
RETICULATION BOOSTER PUMP STATION	=PH + fireflow	21	22	22
TREATED WATER PUMPS FEEDING ELEVATED LEVEL RESERVOIR STORAGE	=(6 x PH - reservoir operating volume)/6 x 3600	2.0	2.2	2.2
			(ML/year)	
ANNUAL CONSUMPTION	=AD*365	41.9	46.3	46.3

[^] TO BE DETERMINED FROM RISK ASSESSMENT BUT REPRESENTS THE MAXIMUM THEORETICAL VOLUME. CAN LIKELY BE REDUCED TO EMERGENCY FLOWS AS A MINIMUM.

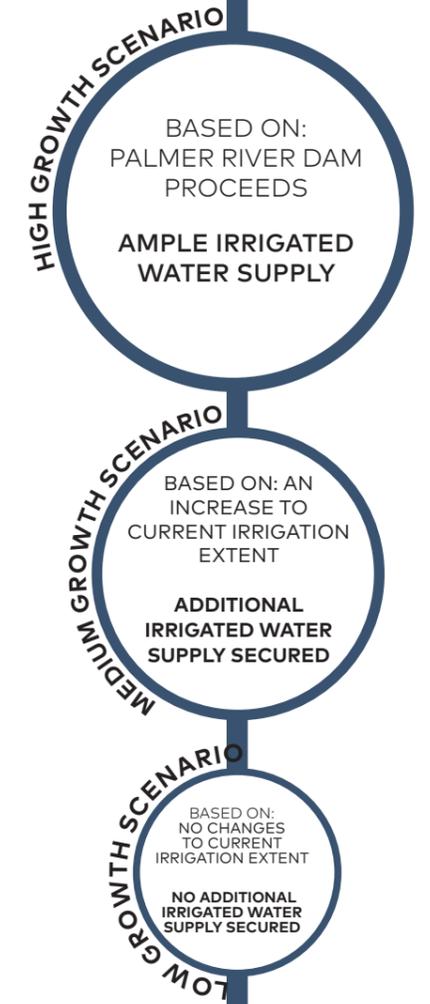


TABLE 15: MEDIUM GROWTH SCENARIO WATER DEMAND

MGS	FORMULA	SHORT TERM (KL)	MEDIUM TERM (KL)	LONG TERM (KL)
AVERAGE DEMAND, AD (KL/D)	=population x demand	342.5	599.9	1117.8
MEAN DAY MAXIMUM MONTH, MDMM (kL/d)	=1.5 x AD	513.7	899.8	1676.7
PEAK DAY, PD (KL/D)	=2.25 x AD	770.5	1349.7	2515.1
PEAK HOUR, PH (KL/HR)	=1/12 x PD	64.2	112.5	209.6
FIREFIGHTING (RESIDENTIAL)	=15L/s x 2hrs	108	108	108
EMERGENCY FLOWS	=3 x AD	1027	1800	3353
GROUND RESERVOIR STORAGE[^]	=3 x (PD-MDMM) + Max of Emergency Flows or FF Residential	1798	3149	5868
ELEVATED RESERVOIR	=6 x (PH-MDMM/12) + Firefighting storage	236	333	527
			(L/s)	
TREATED WATER PUMPS FEEDING GROUND LEVEL RESERVOIR STORAGE	=MDMM over 20 hours	5.9	10.4	19.4
RETICULATION BOOSTER PUMP STATION	=PH + fireflow	33	46	73
TREATED WATER PUMPS FEEDING ELEVATED LEVEL RESERVOIR STORAGE	=(6 x PH - reservoir operating volume)/6 x 3600	9.1	18.9	38.7
			(ML/year)	
ANNUAL CONSUMPTION	=AD*365	125.0	218.9	408.0

[^] TO BE DETERMINED FROM RISK ASSESSMENT BUT REPRESENTS THE MAXIMUM THEORETICAL VOLUME. CAN LIKELY BE REDUCED TO EMERGENCY FLOWS AS A MINIMUM.

TABLE 16 - HIGH GROWTH SCENARIO WATER DEMAND

MGS	FORMULA	MEDIUM TERM (KL)	LONG TERM (KL)
AVERAGE DEMAND, AD (KL/D)	=population x demand	990.0	1980.0
MEAN DAY MAXIMUM MONTH, MDMM	=1.5 x AD	1485.0	2970.0
PEAK DAY, PD (KL/D)	=2.25 x AD	2227.5	4455.0
PEAK HOUR, PH (KL/HR)	=1/12 x PD	185.6	371.3
FIREFIGHTING (RESIDENTIAL)	=15L/s x 2hrs	108	108
EMERGENCY FLOWS	=3 x AD	2970	5940
GROUND RESERVOIR STORAGE[^]	=3 x (PD-MDMM) + Max of Emergency Flows or FF Residential	5198	10395
ELEVATED RESERVOIR	=6 x (PH-MDMM/12) + Firefighting storage	479	851
		(L/s)	
TREATED WATER PUMPS FEEDING GROUND LEVEL RESERVOIR STORAGE	=MDMM over 20 hours	17.2	34.4
RETICULATION BOOSTER PUMP STATION	=PH + fireflow	67	118
TREATED WATER PUMPS FEEDING ELEVATED LEVEL RESERVOIR STORAGE	=(6 x PH - reservoir operating volume)/6 x 3600	33.8	71.6
		(ML/year)	
ANNUAL CONSUMPTION	=AD*365	361.4	722.7

* NO DEMANDS HAVE BEEN ASSUMED FOR SHORT TERM GROWTH AS THE HIGH GROWTH SCENARIO IS IN THE EVENT OF THE PALMER RIVER DAM SCENARIO BEING IMPLEMENTED WHICH WILL RESULT IN IMMEDIATE INCREASE IN POPULATION GROWTH TO AT LEAST THE MEDIUM-TERM SCENARIO.

[^] TO BE DETERMINED FROM RISK ASSESSMENT BUT REPRESENTS THE MAXIMUM THEORETICAL VOLUME. CAN LIKELY BE REDUCED TO EMERGENCY FLOWS AS A MINIMUM.

1.2 PROPOSED WATER NETWORK INFRASTRUCTURE

PRESSURE PUMP SYSTEM AND RESERVOIR

Council have indicated the current Lakeland arrangement is working adequately and they have not had any issues with the pressure pumping system. It is acknowledged for small communities the current arrangement would suffice however if the MGS or HGS were to be realised then it is suggested that ground and elevated reservoirs be incorporated into the scheme. This could be a combination of a larger ground storage with a smaller elevated reservoir or both ground and elevated storage combined and provided at the appropriate elevation for pressure.

A review of available LiDAR indicates 2 possible locations where it may be suitable for an elevated reservoir taking into account existing development and possible future development:

- Small mountain outcrop behind the Roadhouse
- Larger mountain located 3 kms to south of township on Lot 13 on BS132

The available elevation for each site was found to be RL 280 for the Roadhouse site and RL 317 for the larger mountain range site. Ground level elevations within the existing and future township range from RL 250 up to RL 270. The Water Supply guidelines including FNQROC recommend minimum head pressures to be supplied at the consumer boundary of 22m. Therefore, the Roadhouse site would not be suitable as it does not provide sufficient elevation when accounting for system losses i.e. 8m to 28m available head. The larger mountain range site can provide a minimum of 42m of head allowing for system losses. A combined ground and elevated reservoir could be located at the larger mountain range site. Depending upon the growth scenario realised for example, the HGS reservoirs could be constructed in 2 stages with the first 3ML reservoir installed to accommodate medium term and then for the long term another 3ML could be installed. These volumes are based on the minimum requirement of Emergency Flow volume only. Any combination ranging from 1ML capacity could be adopted for MGS with another added for the long term.

It should be noted for the LGS across all terms

including the current population, the existing 250kL ground level reservoir is below that required under the Guidelines and FNQROC. It is recommended that an additional 100kL tank be installed or 130kL for the long term based on the minimum of Emergency Flow volume only. If only the LGS is realised, then this reservoir could be located on Council's newly purchased lot to the west of the existing township.

Refer **Figure 19** for locations.

PROPOSED PUMPING NETWORK AND TREATMENT

Pumping equipment and treated water systems servicing the reservoirs is recommended to be sized in accordance with the capacities already outlined. Water treatment systems are expected to consist only of disinfection with dosing Sodium Hypochlorite or UV irradiation. All bore water quality results from surrounding bore records indicate that water generally meets the NH&MRC guidelines for potable use with a minor aesthetic exceedance for hardness/silica which is only slightly above the guideline value. Council's current system of Sodium Hypochlorite dosing is considered most suitable, however if desired water treatment could be deployed to remove hardness/silica to within the aesthetic requirement.

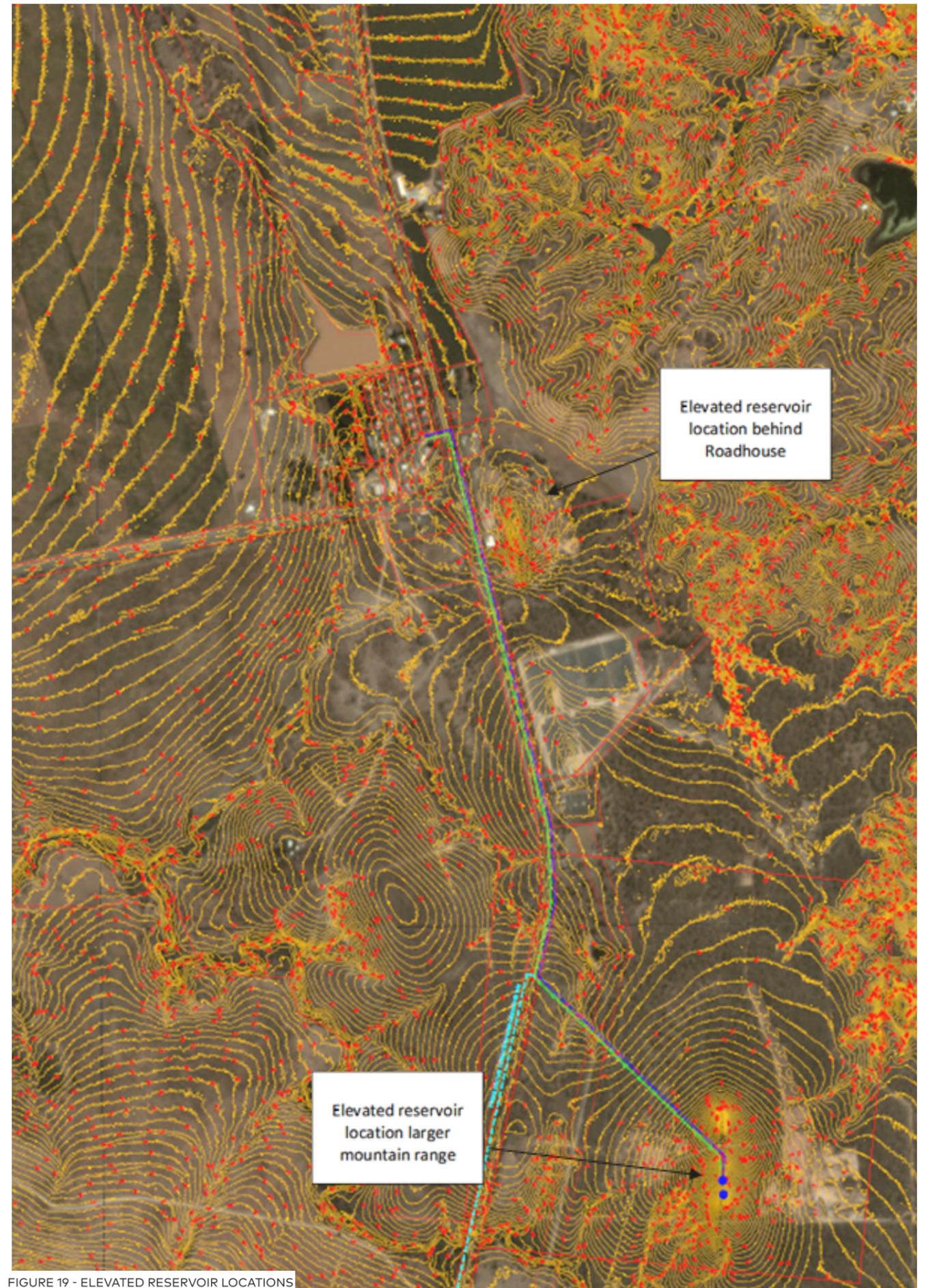


FIGURE 19 - ELEVATED RESERVOIR LOCATIONS

1.3 WATER SUPPLY OPTIONS INVESTIGATED

BORES

LOT 201 ON SP172665

Two bores would be required in addition to the existing to meet the 9.25 L/s 10-year target. This is the closest potential site to the town, with a distance to the existing reservoir of 245-580m depending on bore positioning, minimising required pipework. Elevation is similar to the town, meaning pumping is likely required.

Testing of the existing bore on Lot 210 on SP172665 (Bore RN148018) has been conducted, comprising a 48 hour pump test and chemical/E. coli testing. Test results of pumping suggests this bore has a rated yield of 2.5L/s. The depth extends to 34.5m as this was sufficient for the previous domestic use. It is anticipated that deeper bores within the same lot would have a higher flow rate.

Standing Water Level at the time of investigation was 2.0m, compared to 4.0m when the bore was first drilled in 2009. A stepped drawdown pump test was conducted, where the bore was pumped at 1.3L/s until drawdown rate started to level off after 3 hours, flow rate was increased to 2.0L/s for 1 hour until drawdown rate started to level off again. From this point, the bore was pumped at the rated 2.5L/s until a total test time of 48 hours was reached. Bore recovery was then measured until a standing water level of 2.22m was reached. The results of the testing are shown in **Figure 20**.

Chemical testing found the borewater to be safe for human consumption as outlined in **Table 6**. Comments are based on the Guidelines provided in Australian Drinking Water Guidelines (2022). Based on the above testing, the water within Lot 210 on SP172665 is suitable for human consumption and a pump rate of 2.5 L/s is suitable for the existing bore RN148018.

BORE SUMMARY

With the existing bore on Lot 210 on SP172665 testing at 2.5L/s, Council has immediate capacity with pump installation and associated infrastructure as shown in **Table 17**:

Note: Council's current groundwater license allocation is 114ML/year. This gives Council the ability to support a population growth up to approximately 700 people (at 450L/p/d) which is just under three times the current population. This caters for the long term LGS and the short term MGS.

With installation of a bore at the airstrip, it is possible that yield could be supplied between 120-240ML/year giving a total between all bores which could support the MGS to medium term and long term subject to gaining approval to increase water allocation.

BORE	RATE (L/S)	16H PUMP	18H PUMP
EXISTING EAST	1.5	31,536,000	35,478,000
EXISTING WEST	1.5	31,536,000	35,478,000
LOT 210	2.5	52,560,000	59,130,000
TOTAL		115,632,000	130,086,000

TABLE 17 - SUMMARY OF BORE CAPACITY

DAM IN EASEMENT C RP741359 – BULLHEAD WATER LICENSE ZONE

Based on the above parameters the safe yield has been estimated at approximately 70ML/year which could support a population of approximately 430 people.

The following significant constraints apply to this option:

- No existing water allocation is available to Council for the taking of water. Council would have to acquire an existing allocation from another user within the Bullhead water license zone. There is

an existing farmer which does have approval to take water from the dam. Therefore, the above yield would be substantially impacted by this take.

- Water quality may be issue given the upstream catchment largely contains agricultural operations. The catchment has the potential to discharge sediment and pesticides to the storage. Further consideration and testing of the water would be required as well as establishing tenure over the catchment which precludes operations where harmful chemicals are used. Sediment runoff could however be managed and overcome.



FIGURE 20 - DAM LOCATED IN EASEMENT C ON RP741359

2.0 SEWERAGE

WASTEWATER TREATMENT

GENERAL

Council have expressed their preferred solution as conventional wastewater treatment and to irrigate to land based on the following reasons:

- They are successfully operating other similar schemes within the Shire. Standardisation and commonality in operation and maintenance is fundamental to all Local Government operations.
- Council's experience with the Ponds at Laura is not favourable.
- As land would have to be acquired for the Treatment Plant, a small footprint is preferred due to the cost of acquisition.
- Given the uncertain future growth scenarios proposed, it is preferred to install a plant which can easily be staged and then upgraded to accommodate accelerated growth.
- Need to limit odours as a priority with use of modern technology.

On this basis it is recommended to adopt the preferred solution of utilising a PTP and explore options to irrigate to land for disposal.

PTP TREATMENT STANDARDS AND DISCHARGE RELEASE LIMITS

(b) Package Treatment Plant Capacity

The PTP is recommended to be designed for the following capacities based on the Medium and Long Term Growth scenarios:

MEDIUM GROWTH SCENARIO	FORMULA	SHORT TERM (ML/D)	MEDIUM TERM (ML/D)	LONG TERM (ML/D)
AVERAGE DRY WEATHER FLOWS (ADWF)	=population x generation	0.2	0.4	0.7
WET WEATHER FLOWS (WWF) FOR PLANT TREATMENT	=3 x ADWF	0.6	1.1	2.0
PLANT HYDRAULIC CAPACITY	=5 x ADWF	1.0	1.8	3.4

TABLE 18 - PACKAGE TREATMENT PLANT CAPACITY FOR MEDIUM GROWTH SCENARIO

HIGH GROWTH SCENARIO	FORMULA	MEDIUM TERM (ML/D)	LONG TERM (ML/D)
AVERAGE DRY WEATHER FLOWS (ADWF)	=population x generation	0.6	1.2
WET WEATHER FLOWS (WWF) FOR PLANT TREATMENT	=3 x ADWF	1.8	3.6
PLANT HYDRAULIC CAPACITY	=5 x ADWF	3.0	6.1

TABLE 19 - PACKAGE TREATMENT PLANT CAPACITY FOR HIGH GROWTH SCENARIO



IMAGE SOURCE: QUEENSLAND PARKS

2.1 EFFLUENT IRRIGATION AREA

IRRIGATION CONSIDERATIONS

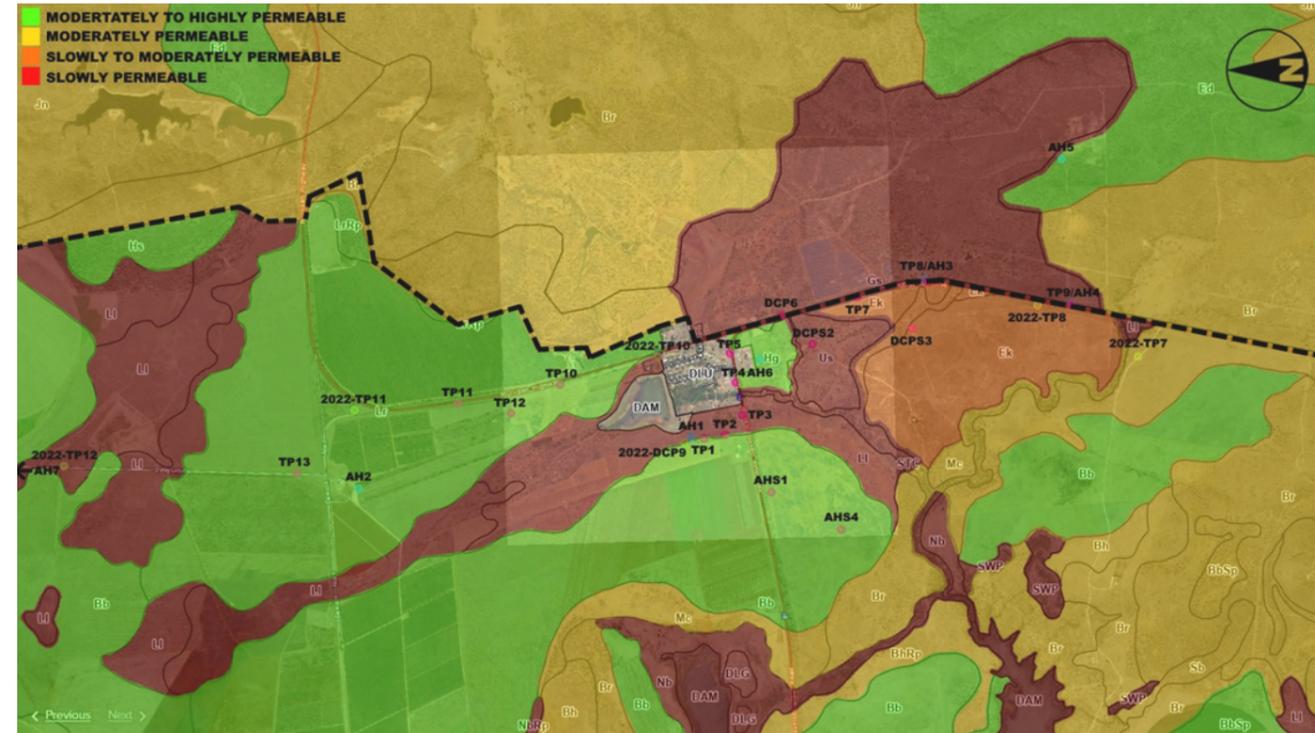


FIGURE 23 - MODELLED TOWN ZONING DURING MEDIUM GROWTH SCENARIO

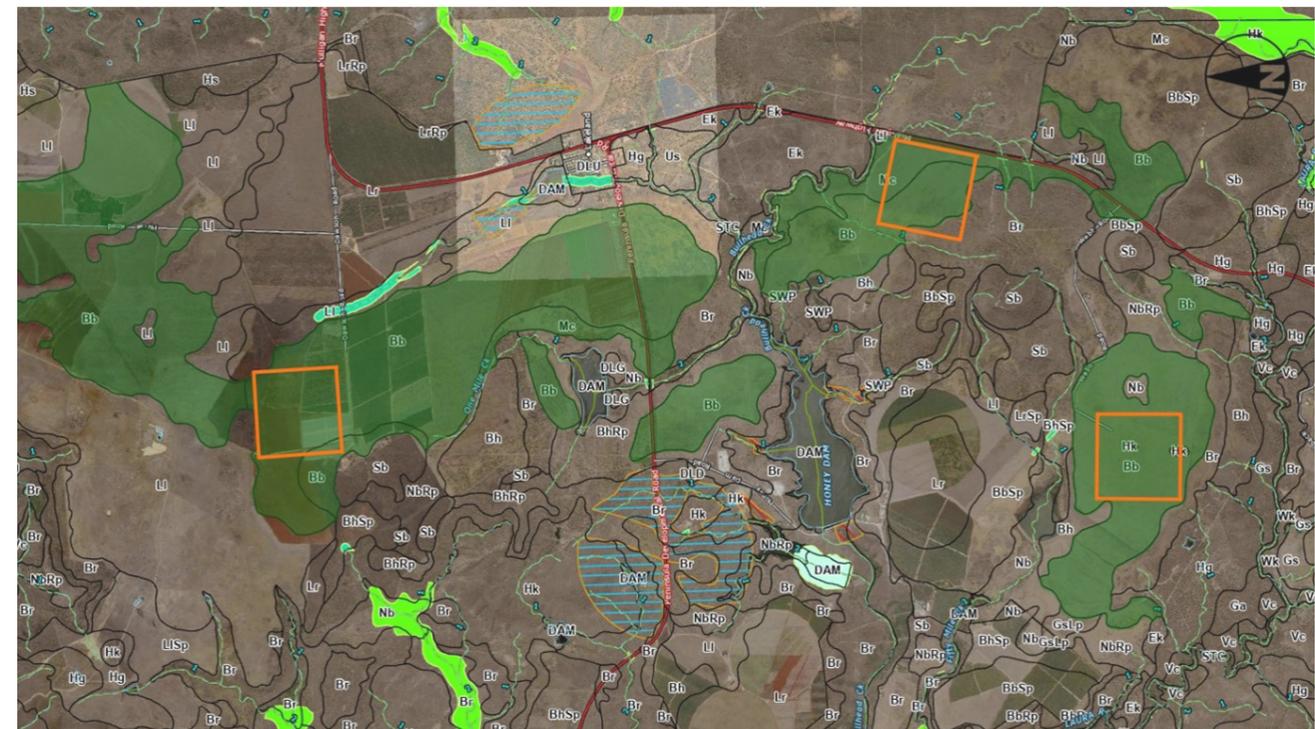


FIGURE 22 - BLACKBURN AND MACLEAN SOILS (DARK GREEN), INCLUDING 1,000 X 1,000M SQUARES, WATERCOURSES AND MSES

FIELD WORK

OTHER REGIONS

Soils and agricultural land suitability of the Lakeland District, North Queensland (DoR, 2021) and Soils of Lakeland Downs (DPI, 1994) provide soil mapping and descriptions around the Lakeland region, including qualitative descriptions of permeability for major soil types. An image combining these two maps (preferencing 2021 mapping where available) and colour coded for described permeability is provided as **Figure 23**.

As can be seen, the region immediately south of the town including Lot 13 on BS132 is considered Slowly or Slowly to Moderately permeable, which is consistent with observed conditions and testing.

AH7 was undertaken to the north of town along Hulse Road, within an area mapped as Blackburn soil. It contained red Sandy Clayey SILT / Sandy Silty CLAY to termination depth at 0.5m. Permeability testing indicated a Ksat of 0.4 m/d. The soil profile here can be considered a Category 4 Clay

Loam. Table M1 of AS 1547-2012 On-site domestic wastewater management provides a Design Irrigation Rate of 3.5 mm/day for a domestic system in these soils, however commercial/public service systems typically use a much more conservative value due to scale. This 3.5mm/day loading therefore acts as a theoretical maximum.

The testing and modelling of Blackburn and neighbouring Maclean soil types indicates that is the most suitable for effluent irrigation around the Lakeland area. Blackburn and Maclean soil locations around the town are shown in **Figure 22**. For visual reference, three areas of 1,000m x 1,000m, or 1,000,000m² are shown. Also shown are watercourses in blue and Matters of State Environmental Significance (MSES) in lime green and blue hatch. It is noted that the northern and southern areas could be accommodated with a simple square or rectangle similar to what is shown, while the central area would need to be distorted to maintain setbacks from watercourses. Excluding watercourses, Blackburn soils generally do not overlap with MSES zones.

Legend

Gross Area (Ha)	Zone
13.8	Centre
15.6	Medium Density Residential
429	Low Density Residential
23	Industry
11.6	Mixed Use
50.5	Rural Residential

Total area (excl. existing) 162.4Ha

Residential Lot Mix and Yield Calculations

Zone	Minimum Lot Sizes	Density (du/Ha)	Sale-able Area (Ha)	Potential Dwellings	Population at 2.5/du
Medium Density Residential	800m ²	25	12.5	312	780
Mixed Use - Single Dwellings*	800m ²	12.5	1.9	23	58
Mixed Use - Dual Occupancy Units*	801m ²	25	1.6	41	101
Mixed Use - Triplex Units*		37.5	1.2	43	109
Low Density Residential	800m ²	12.5	38.3	479	1,198
Rural Residential	4,000m ²	2.5	40.4	101	253
TOTAL			108.3	999	2,498

* Residential development within Mixed Use Zone at maximum of 50% land area show, allows for a maximum of 3.5% Dual Occupancy Units and maximum of 25% Triplex Units on lots >800m².



Settlement Pattern - Medium Growth Scenario

Lakeland LAP

723-0083-00-P-02-DR02 04 30.11.2023 VA PN MH



2.1 EFFLUENT IRRIGATION AREA

MEDLI MODELLING

Modelling of a generalised scenario with irrigation to a Blackburn soil region was undertaken using the MEDLI v2.5 software package. The first element of this was determining appropriate pond and irrigation area sizing to minimise or avoid pond overflows. Given the highly seasonal rainfall at Lakeland, with significant rainfalls from December to March and minimal rain outside this period, pond sizing must account for heavy rainfalls during this period. This includes both the capture of rainwater by ponds and lack of irrigation during rainfall periods. **Table 20** shows the result of a MEDLI multi-run which determines overflow volumes based on different pond and irrigation area sizing. This modelling is based on the recommended maximum 1mm/day irrigation during the medium growth, long term scenario, with a 3m deep pond and no irrigation on days with greater than 10mm rainfall. Orange shading indicates as close to zero overflow and outside the accuracy of the model. Pink shading indicates results which are not economical due to surfacer areas of the pond becoming too large allowing too much collection of rainwater.

		POND VOLUME (m ³)								
		70,000	80,000	90,000	100,000	110,000	120,000	130,000	140,000	150,000
IRRIGATION AREA (M2)	600,000	89,031	92,721	96,265	99,856	103,494	107,180	110,564	114,321	117,722
	700,000	58,286	61,975	65,520	69,110	72,748	76,435	79,818	83,575	86,977
	800,000	27,541	31,231	34,775	38,366	42,004	45,690	49,073	52,830	56,232
	900,000	3,568	4,708	5,998	8,263	11,675	15,308	18,640	22,344	25,694
	1,000,000	917	539	527	528	533	856	1,365	2,026	2,621
	1,100,000	637	306	292	269	191	34	132	24	0
	1,200,000	413	194	97	147	69	0	86	0	0
	1,300,000	213	148	0	94	0	0	40	0	0
	1,400,000	98	102	0	48	0	0	0	0	0

TABLE 20- ANNUAL OVERFLOW VOLUMES BASED ON MEDIUM GROWTH, 1MM/DAY IRRIGATION

It can be seen that increasing pond volume decreases the required irrigation area to avoid overflow, however maintaining no more than 1mm/day irrigation results in an average of approximately 0.5mm/day over the year. Medium growth scenarios limiting to 1.5mm/day and 2mm/day are provided as **Tables 21 and 22**.

		POND VOLUME (m ³)								
		40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
IRRIGATION AREA (M2)	500,000	31,975	35,684	39,321	42,914	46,603	50,148	53,738	57,376	61,062
	600,000	5,928	3,409	2,981	3,568	4,708	5,998	8,263	11,675	15,308
	700,000	2,735	1,496	1,061	762	407	396	342	252	72
	800,000	1,274	856	595	413	194	97	147	69	0
	900,000	679	421	220	139	125	0	71	0	0
	1,000,000	312	163	102	29	56	0	3	0	0
	1,100,000	199	83	3	0	0	0	0	0	0
	1,200,000	121	60	0	0	0	0	0	0	0

TABLE 21- ANNUAL OVERFLOW VOLUMES BASED ON MEDIUM GROWTH, 1.5MM/DAY IRRIGATION

		POND VOLUME (m ³)								
		40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
IRRIGATION AREA (M2)	500,000	3,557	1,884	1,336	917	539	527	528	533	856
	600,000	1,274	856	595	413	194	97	147	69	0
	700,000	529	309	178	98	102	0	48	0	0
	800,000	226	90	27	0	10	0	0	0	0
	900,000	121	60	0	0	0	0	0	0	0
	1,000,000	83	31	0	0	0	0	0	0	0
	1,100,000	63	6	0	0	0	0	0	0	0
	1,200,000	44	0	0	0	0	0	0	0	0

TABLE 22 - ANNUAL OVERFLOW VOLUMES BASED ON MEDIUM GROWTH, 2MM/DAY IRRIGATION

2.1 EFFLUENT IRRIGATION AREA

MEDLI MODELLING

Tables 23 to 25 provide the corresponding data for the 20 year HGS..

Based on Talsma-Hallam permeameter testing, it is believed that 2mm/day maximum irrigation may be achievable. Determining the optimal sizing between pond volume and irrigation area will require selection of a treatment system and costing of construction and land acquisition, however the above numbers may be used for concept designs once a growth rate is apparent.

		POND VOLUME (m ³)								
		130,000	140,000	150,000	160,000	170,000	180,000	190,000	200,000	210,000
IRRIGATION AREA (M2)	1,400,000	55,332	58,953	62,625	65,916	69,662	73,233	76,793	80,125	84,021
	1,500,000	25,028	28,596	32,216	35,454	39,148	42,892	46,176	49,458	53,304
	1,600,000	5,365	6,697	7,451	9,114	10,693	13,375	16,213	19,425	23,324
	1,700,000	1,405	1,420	1,280	1,664	1,637	2,391	2,905	4,063	4,551
	1,800,000	990	954	957	712	145	488	197	495	515
	1,900,000	696	690	730	502	60	365	151	298	94
	2,000,000	464	486	505	305	0	243	105	131	18
	2,100,000	276	369	374	110	0	195	59	49	0
	2,200,000	148	313	257	0	0	149	13	0	0

TABLE 23- ANNUAL OVERFLOW VOLUMES BASED ON HIGH GROWTH, 1MM/DAY IRRIGATION

RECOMMENDATIONS FOR IRRIGATION

Due to the presence of shallow rock, the originally considered Lot 13 on BS132 is not considered suitable for effluent irrigation.

Lot 211 on RP747574 (Airport) and Lot 20 on BS230 (Sporting Field) may be suitable for effluent irrigation, however the available area is minimal and effluent irrigation is not in line with present site use cases. As such, this may be considered where beneficial for the land use (e.g. watering sporting field) but will not allow for disposal of significant volumes in medium or high growth scenarios.

Should town growth indicate that reticulated sewerage is required, Council can enter discussions to acquire a suitable parcel of land based on estimated population growth.

		POND VOLUME (m ³)								
		90,000	100,000	110,000	120,000	130,000	140,000	150,000	160,000	170,000
IRRIGATION AREA (M2)	1,000,000	14,242	16,035	18,525	21,599	25,028	28,596	32,216	35,454	39,148
	1,100,000	5,430	3,701	2,769	2,419	2,297	2,763	3,182	4,102	4,505
	1,200,000	3,464	2,335	1,648	1,413	990	954	957	712	145
	1,300,000	2,125	1,776	1,060	963	571	580	617	404	22
	1,400,000	1,330	1,275	599	615	276	369	374	110	0
	1,500,000	785	832	294	439	101	290	198	0	0
	1,600,000	419	460	169	262	33	221	59	0	0
	1,700,000	244	272	55	153	0	152	0	0	0
	1,800,000	165	192	0	84	0	83	0	0	0

TABLE 24 - ANNUAL OVERFLOW VOLUMES BASED ON HIGH GROWTH, 1.5MM/DAY IRRIGATION

		POND VOLUME (m ³)								
		60,000	70,000	80,000	90,000	100,000	110,000	120,000	130,000	140,000
IRRIGATION AREA (M2)	700,000	30,572	33,811	37,407	41,046	44,521	48,234	51,759	55,332	58,953
	800,000	13,299	10,112	7,740	6,287	4,754	4,273	4,704	5,365	6,697
	900,000	8,035	5,883	4,230	3,464	2,335	1,648	1,413	990	954
	1,000,000	4,635	3,379	2,386	1,770	1,598	899	825	464	486
	1,100,000	2,925	2,095	1,437	964	977	367	497	148	313
	1,200,000	1,893	1,359	756	419	460	169	262	33	221
	1,300,000	1,163	807	435	211	238	22	130	0	129
	1,400,000	795	535	193	119	147	0	38	0	37
	1,500,000	617	388	136	84	86	0	0	0	0

TABLE 25 - ANNUAL OVERFLOW VOLUMES BASED ON HIGH GROWTH, 2MM/DAY IRRIGATION

3.0 WATER AND SEWERAGE RETICULATION INFRASTRUCTURE

SEWERAGE RETICULATION INFRASTRUCTURE

Based on the geotechnical investigation ground conditions may be problematic due to the presence of rock at shallow depths. Basaltic rock at depths ranging from 1.3m to 2m was present throughout the township and proposed township to the south. It was also determined as hard rock and would be difficult/costly to excavate. Medium depths to rock would increase the cost of a conventional sewerage system due to rock excavation. However some of the systems listed in the above table which are suitable for difficult ground conditions to give shallow grade for pipes are not recommended due to the location of Lakeland which is somewhat remote. Systems such as vacuum, pressurised and variable grade sewers are not recommended on this basis. Common effluent drainage system also does not offer any advantage as it still relies on gravity of pipes systems and therefore will lead to rock excavation.

Therefore a modified conventional gravity system may offer the following advantages:

- Due to the presence of rock being variable to 2m depth, pipe grading is possible but to shallow depth limits
- Once depth limits are reached, lifting stations can be installed to maintain shallow depth of pipes. Lift stations are similar to pump stations but are

generally smaller, self-contained and or package proprietary systems. They are located generally to receive and pump smaller catchment areas to lift them to another part of the reticulation for gravity. Pump stations are larger, receive/pump large volumes of effluent and are at the end of line incorporating backup pumps, power and emergency storage.

- Lift stations would still be centralised and maintained wholly by Council.
- Small parts of the system could be hybrid augmentations in more difficult situations to incorporate individual household macerating pump installations to common rising mains i.e., pressure sewerage collection. However this is recommended to be avoided due to concerns raised previously and it may be better to simply incur additional cost for rock excavation for these localised areas.

Further detailed investigation is required to optimise any sewerage collection system, but this would be done once funding has been obtained for any proposed scheme.

4.0 STATUTORY APPROVALS SEWERAGE

APPROVALS SUMMARY

Approvals summaries:

Water Bores

- Drilling new bores - Assessable development under the planning scheme if it does not comply with the conditions of 'not assessable'.
- Relocating Underground Water Entitlements – Application for relocation of existing entitlements required.
- Obtaining Additional Underground Water – Currently precluded but possible. May be problematic and requires special consideration.
- Obtaining Additional Surface Water – Currently precluded but possible. May be problematic and requires special consideration.
- Water Treatment – Possible Material Change of Use (MCU) under the planning scheme. No ERA license required.

Sewerage

- Package Treatment Plant including land irrigation of effluent – EA, ERA 63(1) and MCU under the planning scheme.
- Sewage Pump Stations – ERA63(2)



IMAGE SOURCE: LAKELAND HOTEL

5.0 INFRASTRUCTURE RECOMMENDATIONS FOR THE FUTURE

WATER SUPPLY

WATER SUPPLY

It is recommended that Council proceed with expansion of the existing bore field based on the following:

- Council already has a viable bore on Lot 210 on SP172665 which could be easily equipped for minimal cost to support growth up 700EP. An application for approval to use the bore on Lot 210 on SP172665 will be required.
- Install 130kL emergency storage tank and integrated into the system to be located on Lot 210 on SP172665.
- Council already has underground water allocation up to 114ML/year and is only using approximately one third of this allocation to service existing needs for potable water use. However, note Council are also using part of the allocation for migration of the sports oval given a total use of up to half of their allocation.
- The existing allocation is able to support the LGS for the long term and the MGS for the short term.
- If growth proceeds beyond 700EP, without the Palmer River Dam proceeding, then it is recommended that Council explore the options for seeking approval to increase the underground water allocation and install additional bore at Airport.

- Installation of a water treatment plant to remove hardness, scale and silica is optional as this is only an aesthetic issue. This can proceed at any stage subject to funding and without any statutory approval required with exception of a possible Material Change of Use under the planning scheme. This may depend on the location. A preferred location that could be considered is Lot 210 on SP172665 beside the 130kL reservoir, but it is recommended this Lot be master planned in the first instance. It is also recommended to undertake monthly sampling of raw water from existing water source bores and existing bore located on Lot 210 on SP172665. The results will provide all year raw water quality data should Council wish to proceed to install a water treatment plant to remove aesthetic hardness/scaling issues.
- In the event the Palmer River Dam proceeds then any increase in water capacity can be obtained from this source.
- For the medium term of the MGS and above, it is recommended that elevated reservoirs be located on Lot 13 on BSB132 where there is sufficient elevation to provide required head pressures. Sizing of reservoirs should at least be able to cater for emergency flows volumes subject to a risk assessment.
- Expand the water supply pipeline network as

required. It is recommended that any existing asbestos pipe in the network should be prioritised for replacement as soon as possible.

Note: The commissioning of the Dam at Bullhead Creek in the easement is not preferred due to the constraints previously mentioned such as Council's lack of any approval to take surface water and possible water quality issues from upstream agricultural land use located within the catchment.

SEWERAGE

It is recommended that Council implement a new sewerage scheme as follows:

- To allow the existing township to expand and minimise health and environmental concerns, a modified conventional gravity sewerage (MCGS) system is recommended for implementation. The MCGS is recommended on the basis that high levels of rock are present within the township and growth areas. Whilst it may not completely avoid the need for rock excavation it will certainly minimise it.
- To support the MCGS, install a Sewage Package Treatment Plant (PTP) with detention pond capacity and irrigation land for disposal of treated effluent. Council will need to negotiate acquisition of any parcels of land which are not owned or in control of Council. Once a parcel of land has been identified for acquisition, it is recommended that further testing be undertaken

to confirm more detailed soil types for suitability of irrigation of treated effluent. The PTP and detention would ordinarily be collocated with the irrigation area.

- Reuse of the treated effluent is an option, but the regulator will always require availability of land area for irrigation should the reuse option cease to exist.



IMAGE SOURCE: LAKELAND HOTEL

6.0 PRELIMINARY CONSTRUCTION COSTS

Table 25 provide a summary of costs for each scenario. These costs are order of magnitude costs and are subject to detailed investigation and design. The costs do not include any of the following:

- Land acquisition costs
- Legal costs
- Compensation costs

Note: Costs are cumulative. For example, the HGS costs include the costs of the works already done in the LGS and MGS and assumes any works would be done in a staged manner rather than all at once.

GROWTH SCENARIO	WATER SUPPLY AND RETICULATION PRELIMINARY COST	SEWERAGE SYSTEM AND RETICULATION PRELIMINARY COST
LOW	\$2M	\$16.1M
MEDIUM	\$14.2M	\$25.6M
HIGH	\$19.3M	\$35.9M

TABLE 25 – ORDER OF MAGNITUDE PRELIMINARY CONSTRUCTION COSTS

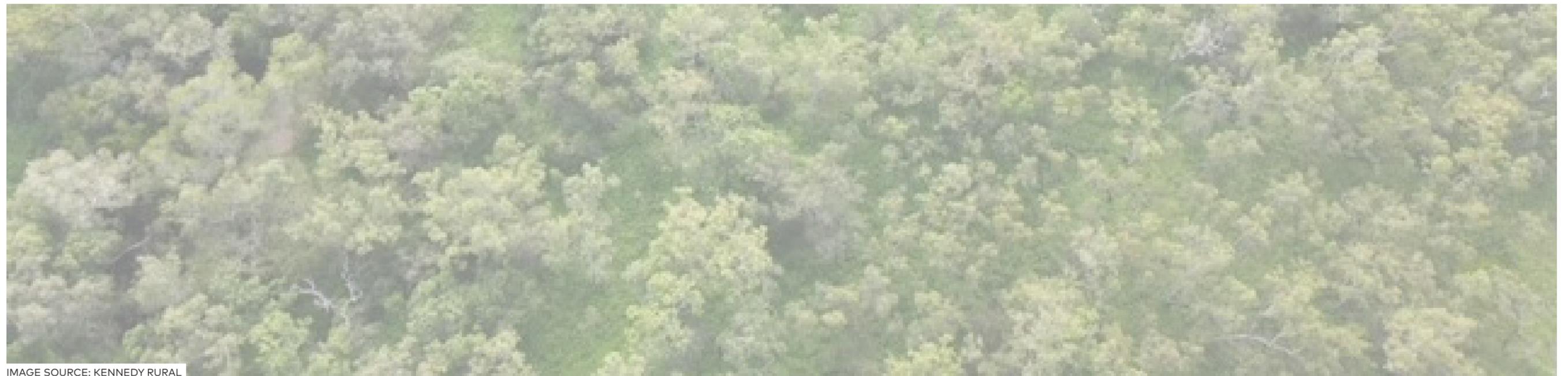


IMAGE SOURCE: KENNEDY RURAL

CONCLUSION

Urban Sync have been engaged by Cook Shire Council to prepare a masterplan and through its sub-consultants, an infrastructure plan for the township of Lakeland. The aim of the 'Lakeland Masterplan and Infrastructure Plan 2023' is to facilitate and address the future planning and infrastructure needs of the township. In doing so, the masterplan seeks to guide the expansion of the township and provide a pathway towards attracting people to visit, work and live in Lakeland for not only the decades to come, but also critically, address the short-term needs of the township.

The masterplan establishes three (3) growth scenarios, being the low growth scenario (LGS), medium growth scenario (MGS) and high growth scenario (HGS). Due to the influence 'seasonal workers' have on the township, all three (3) scenarios include and accommodate growth in this portion of the population. The LGS includes a projected population within the township of 454 and as such, will seek to address some of the immediate and short-term constraints being faced by the township, although in doing so, assumes that current water allocations and infrastructure (i.e., bores) will be utilized AND that no new 'trunk' water or sewer infrastructure is provided. This is due to existing water sources and allocations being able to almost service this entire scenario.

In contrast, the MGS is based on an alternative irrigation scheme/supply becoming available and for this reason, includes a projected population within the township of 2,484. The MGS, therefore, focuses on the medium to longer term growth of the township. To service this demand, significant expansions to the townships' existing urban area are required, while expansions to the existing bore field and an increase in the existing water allocation would also be required once the townships population reached approximately 700 persons. The provision of a reticulated sewer network would also be required to realize the population growth envisioned under the MGS. As such, the MGS triggers the need for not only upgrades to existing water infrastructure and location, but also the provision of a significant amount of new water and sewer infrastructure. The HGS is intrinsically linked to a catalytic infrastructure project such as the Palmer River Dam proceeding and includes a projected population within the township of 4,400. Similarly, to the MGS, significant expansions to the townships' existing urban area are required as is the provision of a significant amount of new water and sewer infrastructure.

While the most suitable growth scenario will essentially be guided by natural population growth and the timing of infrastructure provision over the short to medium term, the masterplan provides two (2) viable growth scenarios. Given the immediate needs of the township, it is the recommendation of the masterplan that the LGS, inclusive of its key land use and infrastructure recommendations be adopted as a matter of urgency and as part of an amendment to the current Planning Scheme. As part of this amendment, it is suggested that the proposed changes to the Planning Scheme identified in the masterplan to facilitate the LGS also be adopted. Due to the viability of the MGS and its links to the provision of key infrastructure upgrades which will be one of, if not the key catalyst to realise real growth of the town, the recommendations, both land use and infrastructure, as well as the suggested changes to the Planning Scheme associated with the MGS should not be abandoned. Instead, this masterplan recommends the MGS be retained as the key framework for changes/inclusion within a future Planning Scheme should the township grow over the short-term and in order to address the medium to longer terms needs of a growing Lakeland.



IMAGE SOURCE: LAKELAND HOTEL

