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Infrastructure Plan**

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Project Manager

Simon Bentley

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1.0 Planning Assumptions

Underpinning the Planning Assumptions of the Local Government Infrastructure Plan (LGIP) is the Cook Shire Council (CSC) Population and Demand Model. These Geographic Information System (GIS) models have been developed using a “bottom up” approach, allowing for the spatial allocation of population and demands (residential & non-residential) across all land parcels within the Cooktown area, and allocation across SA1 regions outside of Cooktown, from the base date of 2016 through to a realistic ultimate capacity determined for the current Planning Scheme. The base assumptions and methodologies employed to develop these models and other key inputs into the Planning assumptions are detailed below.

1.1 Population

Historical growth figures, determined using Queensland Government Statisticians Office (QGSO) estimated resident population data was used as a basis for projecting population forward between 2016 and ‘ultimate’ development across Cook Shire. This approach was chosen in preference of current QGSO population projections (2015 edition), which projected total population growth of between -137 to 301 people (low to high series projections) over the 2016 - 2036 period. These projections were considered too conservative by Council officers, and not representative of population growth currently being experienced, in addition to anticipated growth in the banana industry and solar power industry. The chosen approach is in accordance with Statutory Guideline 03/14, which states that the appropriateness of QGSO projections should be carefully considered against historical growth rates and anticipated development trends for the Local Government Area (LGA).

The average annual population increase over a 15 year historical period, was determined to be 1.46% per annum.

1.1.1 Current Population

An analysis of the current landuses in Cooktown using CSC’s existing rating database was performed and verified using quantitative analysis of satellite imagery. For SA1 regions external to Cooktown, quantitative analysis was undertaken to identify quantity of existing dwellings throughout. These classifications and analysis have been used to allocate the current population across the LGA, based on assumptions about household size, dwelling type and in some circumstances dwelling densities (**Table 1.1**).

Table 1.1. Current Population Allocations

Identified Residential Use	Population Allocation Assumption	Source(s)
Residential Dwelling	Household size – <i>varies depending on dwelling type</i>	ABS – PEP Profiles
Other Residential Uses	Density per hectare – <i>varies depending on use</i>	ABS – PEP Profiles Quantitative analysis of sample sites

Density per hectare figures for other residential uses were determined using a combination of Australian Bureau of Statistics (ABS) household size data from PEP profiles and a quantitative analysis of sample sites.

e.g. Caravan parks were assumed to have a household size equivalent to an ABS “Other Dwelling”. Quantitative analysis was used to identify a typical number of caravan sites per hectare in order to determine an assumed population density per hectare.

Current household sizes for attached, detached, and other dwelling types are shown in **Table 1.2**. These were determined following an analysis of ABS Census data for the region and have

been trended forward to 2036 based on projected changes to household size in the 2015 edition QGSO population/dwelling projections. Projections beyond 2036 have retained the 2036 household size.

Table 1.2. Household Density Assumptions

Dwelling Type	2011	2016	2021	2026	2031	2036	Ultimate
Single Dwelling	2.42	2.33	2.31	2.29	2.27	2.25	2.25
Multiple Dwelling	1.80	1.73	1.71	1.69	1.68	1.67	1.67
Other	1.94	1.86	1.84	1.83	1.81	1.80	1.80

The accuracy of the allocation of population using this approach has been verified through a comparative assessment against ABS population data within census boundaries (e.g. SA1).

1.1.2 Ultimate Population

The ultimate development potential of the draft Cook Shire Council Planning Scheme was determined through the following process:

- Determination of the developable area of the LGA using the Planning Scheme Provisions:
 - Strategic Framework and Zone Classifications;
 - Zone Codes provisions;
 - Absolute and partial constraints within the Cooktown region, including:
 - Environmental/Biodiversity areas;
 - Bushfire hazards;
 - Coastal protection;
 - Flood hazards;
 - Rural uses;
 - Heritage sites/areas;
 - Landslide/Slope hazards; and
 - Easements
 - For townships outside the Cooktown area (i.e. those allocated at an SA1 level), it is considered that the planning scheme zoning reflects known absolute site constraints
- Discussions with CSC officers to understand the realistic development trends throughout the LGA, including triggers and barriers impacting upon propensity for particular areas to develop;
- Analysis of household size projections; and
- Assumptions about land requirements for roads, parks and other services, depending on the planning scheme provisions for different zones (i.e. considerations/requirements in urban vs rural zones).

Tables 1.3 and 1.4 identify the key assumptions made in assessing the ultimate gross density of each residential zone. The application of these assumptions across the region were used in conjunctions with the other processes identified above, in order to determine the ultimate capacity of the Planning Scheme.

Table 1.3. Dwelling Composition Assumptions for Residential Uses

Planning Scheme Zone	Precinct/Intent	% Attached	% Detached
Centre		100%	0%
Low Density Residential		14%	86%
Medium Density Residential		31%	69%
Mixed Use		100%	0%
Mixed Use	MU 1	100%	0%
Rural		0%	100%
Rural Residential	Water available	0%	100%
Rural Residential	Water not available	0%	100%
Township		0%	100%

Table 1.4. Ultimate Density Assumptions

Zone	Precinct	Excluded Land - Services, Roads, etc.	Lot Size (m ²) - Attached*	Lot Size (m ²) - Detached*	Planned density - Gross (Dwellings/Ha)*
Centre		30%			29.1
Low Density Residential		30%	500	1,000	7.5
Medium Density Residential		30%	500	900	9.0
Mixed Use		30%			16.4
Mixed Use	MU 1	30%			36.3
Rural		10%	N/A	1,000,000	0.01
Rural Residential	Water available	10%	N/A	3,000	3.0
Rural Residential	Water not available	10%	600	5,000	1.8
Township		30%	N/A	1000	7

* Lot Size represents a realistic ultimate average size, based on an assessment of planning scheme provisions, market trends and preferences, and matters affecting propensity to develop.

1.1.3 Interim Population Allocation

Growth between current (base year) and ultimate populations have been allocated to each 5-year cohort using a 'gravity model' approach. Consideration was given to factors affecting propensity to develop, including:

- Location with respect to the Priority Infrastructure Area (PIA) (i.e. priority servicing area that must accommodate 10-15 years growth);
- Availability and proximity to infrastructure services;
- The likely staging of development for particular areas based on direction from CSC's planning department;
- Existence of master plans or development approvals.

1.2 Infrastructure Demand

CSC's spatial demand models express residential and non-residential demand in varying demand units. These are:

- Water Supply network - Equivalent persons (EP)
- Sewerage network - Equivalent persons (EP)
- Transport network - Vehicle trips per day (VPD)
- Parks and land for community facilities network - Persons

These units of measure have been selected as they are commonly used, and easily understood by a reader of the LGIP.

1.2.1 Residential Demand

The Residential Demands have been calculated for each network in the following manner:

- Water Supply network
 - Population at each cohort = residential EP
- Sewerage network
 - Population at each cohort = residential EP
- Transport network
 - Population at each cohort divided by applicable detached household size (Table 1.2) to determine equivalent detached dwellings
 - Demand generation of 10 trips per equivalent detached dwelling
- Parks and land for community facilities network
 - Population at each cohort

1.2.2 Non-Residential Demand

Non-Residential Demands for the Water Supply, Sewer and Transport networks have been calculated by applying EP and trip rates per hectare respectively to the developable areas available for non-residential development, derived from the population modelling process. The process for determining the existing demand utilised the landuse information developed through the population modelling process, and categorised uses into the most appropriate Planning Scheme Zone to determine generation rates (presented in **Table 1.7**).

The resultant demands have then been factored down in order to represent a reasonable level of development that currently exists on each site. The assessment used to determine these factors considers each sites characteristics with respect to current zoning, location and size, as well as recent trends within the LGA and targeted quantitative analysis, where possible.

Table 1.7. Non-Residential Demand Generation Rates by Planning Scheme Zone

Planning Scheme Zone and Precinct	Water & Sewer Demand (EP/Dev Ha)*	Transport Demand (vpd/Dev Ha)
Centre	56.25	500
Community Facilities	18	80
Industry	33.75	75
Mixed Use	45	400
Mixed Use (MU1)	56.25	500
Strategic Port Land	33.75	150

*EP's based on ultimate household size

Ultimate future demands are based on demand generation rates per hectare for each non-residential zone presented in **Table 1.7**. If existing demand calculated exceeded the future demand, the existing figures were kept constant for all demand cohorts.

Demand growth through each 5 year cohort has been applied proportionally to align with the population growth for that period.

1.3 Employment

The CSC Employment Model has been developed to provide important inputs into the LGIP, most notably the existing and future employees and future floor space requirements. The methodology for the employment modelling is detailed below.

1.3.1 Current Employment

Australian Bureau of Statistics (ABS) Census data was used to determine an existing employment profile within the Council area by employment sector for the following regions:

- Cooktown;
- Coen;
- Laura; and
- Cook Shire Council.

The employment profile is based on:

- Total population;
- Total current workforce;
- Total potential workforce (residents aged 15 and older);
- Residents who both live and work locally;
- Industry of employment by occupation;
 - For the purposes of the LGIP employment modelling, ABS industry of occupation has been re-categorised into ‘employment sectors’ in order to align with categories in the LGIP tables. Assumptions made to assign ABS employment industry into LGIP Employment Sector are detailed in **Table 1.8** below.

Table 1.8. Employment Industry Assumptions

ABS Employment Industry Category	LGIP Employment Sector	ABS Employment Industry Category	LGIP Employment Sector
Agriculture, forestry & fishing	Other	Financial & insurance services	Commercial
Mining	Other	Rental, hiring & real estate services	Commercial
Manufacturing	Industry	Professional, scientific & technical services	Commercial
Electricity, gas, water & waste services	Industry	Administrative & support services	Commercial
Construction	Industry	Public administration & safety	Community Purposes
Wholesale trade	Industry	Education & training	Community Purposes
Retail trade	Retail	Health care & social assistance	Commercial
Accommodation & food services	Commercial	Arts & recreation services	Commercial
Transport, postal & warehousing	Industry	Other services	Other
Information media & telecommunications	Commercial	Inadequately described/Not stated	Other

The following key inputs into Employment Modelling have been produced for each modelled region, using the available ABS data:

- Labour retention rate (Residents working locally ÷ total work force); and
- Job containment rate (Residents working locally ÷ local jobs available)

These attributes are identified in order to assess the employment increase as a result of growth occurring within the LGA.

1.3.2 Future Employment

The employment model assumes that labour retention, job containment, and unemployment levels are maintained throughout all projection periods.

Council officers have identified a likely increase to employment levels in the Banana industry over the forward projections, in particular around the Lakeland area. For this reason, the proportion of future employees allocated to the ‘Other’ employment category has been increased

across the Cooktown area within the model, with the remaining additional employees allocated proportionally to all other categories based on their original distribution. The 2011 employment distribution in Laura (at the time having minimal recorded employment) was not considered to provide a representative distribution for future growth, and in this case the future employment growth has been adjusted to replicate the employment distribution in Coen.

The ratio of work force to population is used to determine employment projections in each LGIP projection area for each cohort, in each employment sector. This is applied to the population projections derived from the CSC population model. The outputs of the employment model used to inform the LGIP include:

- Total current jobs within each LGIP projection area for each employment sector; and
- Additional job requirements for growth within the LGA for each projection period, distributed amongst employment sectors in accordance with the current trends
 - This is with the exception of the 'other' employment sector due to anticipated banana industry growth above, and adjustments to the employment distribution in Laura.

1.3.3 Floor Space Requirements

Floor space requirements are calculated based assumptions about floor space per employee requirements for each employment sector. The assumed floor space requirements are detailed in **Table 1.9**, and have been identified based on industry knowledge and confirmed by CSC Officers as both reasonable and appropriate for use in the LGIP. As with the employment figures, floor space outputs used in the LGIP assumption tables include:

- Total existing floor space requirements within each LGIP projection area for each employment sector; and
- Additional floor space requirements for growth within the LGA for each cohort, distributed mathematically amongst employment sectors within LGIP projection areas.

Table 1.9. Floor space assumptions by Employment Sector

Employment Sector	Floor Space (m ² /employee)
Retail	30
Commercial	30
Industry	150
Community Services	25
Other (incl. Home based business)	20

1.4 Priority Infrastructure Area Capacity

CSC's growth allocation model considers a range of factors for the distribution and take-up of available capacities across the Planning Scheme, in particular the propensity for areas to develop over time. Based on the assumptions, the modelling indicates that a population of approximately 6,000 people are realistically able to be accommodated within the Priority Infrastructure Area (PIA).

The extent of urban population growth allocated within the PIA boundary (4,200) results in a total remaining capacity for approximately 1,800 people (800 dwellings) identified at the end of the PIA period. This is considered acceptable, given that the remaining capacity at 2031 includes unused infill of approximately 1,500 people (700 dwellings) which are expected to experience a slow take up rate, and therefore this capacity is unlikely to be realised for some time.

2.0 Cost Assumptions

Unit rates used within the Schedule of Works (SoW) model have been derived using the information deemed most accurate and appropriate, which was available at the time the LGIP was being prepared. For asset costing purposes within the SoW model, valuations for all assets and networks have been indexed to the base year of the model, 2016 using the non-residential building construction Producer Price Index (PPI) data from the ABS unless otherwise noted.

2.1 Baseline Valuation

Existing asset valuations within CSC's SoW model provide an additional level of detail when compared to the standard SoW models 'baseline valuation'. The 'Base Estimate' within the CSC SoW model provides the equivalent valuation figure, however this has been built using a raw unit rate cost in addition to project owners costs (on-costs).

On costs are considered to be an essential element of the 'current replacement cost' identified within Statutory Guideline 03/14, relating to design/redesign, environmental considerations, traffic management and project management among other things, all necessary components of the cost to replace an asset. The Evans and Peck report referenced within the SoW model user manual identifies that many Council's already include on costs within their unit rates. CSC has chosen to separate these costs in order to provide additional transparency and ease of understanding within their LGIP documentation.

2.2 Water Supply & Sewerage Network

2.2.1 Water Supply / Sewer Unit Rates

Water Supply and Sewerage network unit rates are sourced from a 2017 report prepared for Council by external consultants.

Details of these calculations and inputs have been provided in the Cost Input spreadsheet provided as part of the LGIP extrinsic material. Indices

2.2.2 Cost Modifiers

In addition to the unit rates identified above, the cost modifiers listed in **Table 2.1** have also been applied as necessary to assets across the water supply and sewerage networks.

Table 2.1. Asset Cost Adjustments

Modifier	Valuation Component	Applies To	Adjustment Factor
On-Cost Allowance	Works	All existing & future assets	20%
Contingency (time based)	Works	All future assets	7.5-25%

2.3 Transport Network

2.3.1 Transport Unit Rates

Transport network unit rates are derived from 2016 asset register values maintained by CSC.

Details of these calculations and inputs have been provided in the Cost Input spreadsheet provided as part of the LGIP extrinsic material.

2.3.2 Cost Modifiers

In addition to the unit rates identified above, the cost modifiers in **Table 2.3** have also been applied as necessary, to assets across the transport network.

Table 2.3. Asset Cost Adjustments

Modifier	Valuation Component	Applies To	Adjustment Factor
On-Cost Allowance	Works	All structures & intersections	20%
Contingency	Works	All future assets	7.5-25%

2.4 Public Parks and Land for Community Facilities Network

2.4.1 Parks Unit Rates

Where no project costs are available, existing park embellishment costs have been established using costs for individual embellishment items. An audit of the current embellishments within existing parks was completed by CSC Officers. This complete embellishment list applies the individual item costs to determine a total embellishment value per park. A summary of these embellishment items and their costs has been included within the Cost input spreadsheet included within the extrinsic material.

Where no project costs were available, future park embellishment costs have been applied using the same method, using standard sets of hierarchy embellishments identified by CSC. Unit rates for land are based on a CSC estimate of \$10/m².

2.4.2 Cost Modifiers

In addition to the unit rates identified above, the cost modifiers in **Table 2.6** have also been applied as necessary to assets across the transport network.

Table 2.6. Asset Cost Adjustments

Modifier	Valuation Component	Applies To	Adjustment Factor
On-Cost Allowance	Works	All existing & future assets	10%
Time Based Contingency	Works	All future assets	7.5-25%

3.0 Network Planning

Network planning for the CSC has been undertaken over a 20 year planning horizon from the base date of the LGIP (2016). It is important to note that this does not align with the ultimate development of the Planning Scheme, which based on modelling and forecasts adopted for the LGIP, is currently anticipated to be achieved at or around 2069.

These planning horizons have been selected on the basis that they provide a rational alignment between the infrastructure planning and landuse outcomes envisaged under the CSC Planning Scheme. The considerations given to the planning of each network within the LGIP are as follows.

3.1 *Network Planning in General*

An assessment of the future growth characteristics and trends over each network's planning horizon has been performed by CSC engineers, planners and parks officers together with a review into existing network servicing capacity / adequacy through application of the Desired Standards of Service (DSS) identified within the LGIP. The population and demand models completed as a part of the LGIP project have been considered against CSC's previously completed network planning in order to reassess its appropriateness and assist in determining where planning 'gaps' may exist that need to be addressed.

3.2 *Water Supply Network*

Network planning for the water supply network has been primarily guided by discussions between CSC planners and engineers, giving consideration to anticipated growth and servicing requirements at the DSS. Water supply network planning has been undertaken to a 20 year planning horizon.

3.3 *Sewerage Network*

Network planning for the sewerage network has been guided by discussions between CSC planners and engineers, giving consideration to anticipated growth and servicing requirements at the DSS. Sewerage network planning has been undertaken to a 20 year planning horizon.

3.4 *Transport Network*

The transport network planning was performed collaboratively through discussions between CSC planners and engineers in order to determine a suitable CSC road network for the LGIP that will support the existing and future needs of the region and that will meet the community outcomes envisaged by the DSS prepared and agreed to by CSC. Transport network planning has been undertaken to a 20 year planning horizon.

3.5 *Public Parks and Community Land Network*

Network planning for the public parks and community land network has been guided by discussions between CSC planners and engineers, giving consideration to anticipated growth and servicing requirements at the DSS. Public parks and community land network planning has been undertaken to a 20 year planning horizon.

4.0 Financial Modelling Assumptions

Financial modelling inputs for the CSC LGIP SoW model are outlined in **Table 4.1** below, including brief comments and justifications around the appropriateness of the inputs used.

Table 4.1. Financial Modelling Assumptions within the CSC LGIP SoW model.

Financial Modelling Assumptions		Inputs	Comments/Justification
Model Setup	Base Year of Model	2016	To align with the Infrastructure Planning and Demand Modelling that has been prepared for the LGIP project
	Infrastructure Planning Horizon	20	20 years for all infrastructure networks. This represents the extent to which each network has been planned and alignment of infrastructure and landuse outcomes is reached.
	Demand Unit (Unit of Measure)	EP/Trips/ Persons	EP - Water/Sewer networks Trips - Transport network Persons - Parks and land for Community Facilities network
Financial Inputs	Discount Rates		
	Post-tax Nominal WACC to be applied to Expenses (WACC)	6.00%	Comprised of: 2.5% - Typical 10-year bond rate over the past 3 years; and 3.5% - Margin
	Real Post-tax Nominal WACC to be applied to Revenues (RWACC)	3.99%	The WACC Adjusted for inflation using the Fisher Equation.
	Escalations		
	Works Escalation Rate (for discounting purposes)	1.04% 2.05%	The current annual 10-yearly moving average of the NRBC PPI index (WS, Sew, PPCL), and the RBC PPI index (Transport), calculated using the same methodology as the State's 3-year PPI averages.
	Land Escalation Rate (for discounting purposes)	1.93%	The current annual 10-yearly moving average of the Brisbane CPI index, calculated using the same methodology as the State's 3-year PPI averages.
	Modelled Charge Inflation Rate	1.93%	The current annual 10-yearly moving average of the Brisbane CPI index, calculated using the same methodology as the State's 3-year PPI averages.

The LGIP SoW model has adopted a “User Pays” approach for the apportionment of infrastructure costs between the users. In addition, this calculation method also employs a discounted cashflow methodology to appropriately model the time value of money over the modelling horizon and to understand the true cost of infrastructure delivery and funding. The SoW model therefore applies the following formula in order to determine a cost per demand unit.

$$\frac{\text{Existing Infrastructure Value (\$)} + \text{NPV (Nominal) of Future Infrastructure Expenditure (\$)}}{\text{Current Demand (D)} + \text{NPV (Real) of Future Demand (D)}}$$

The Net Present Value (NPV) of future infrastructure expenditure is determined using the *Nominal WACC* (6.00%) and *Escalation Rates* (1.04%-2.05% & 1.93%), to take into account the escalation of the capital spend in the years forward of the base year.

The NPV of future demand is a proxy, used to represent future revenue from infrastructure charges. This is determined using a *Real WACC* (3.99%), which is adjusted to account for inflationary effects.

The use of these equations determines an escalating price path which is driven by the inflation rate. In this way, the contribution rate grows over time in line with other cost growth in works, land, sales and wages.

The final Cost Schedules are presented in the LGIP SoW Model.