



Mareeba Shire Council Local Government Infrastructure Plan

Mareeba Shire Council

Background Information for Water Supply and Sewerage Networks

IH133800-0000-NW-RPT-0001 | 2

16 June 2018

PWK04311



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Project No: IH133800
Document Title: Background Information for Water Supply and Sewerage Networks
Document No.: IH133800-0000-NW-RPT-0001
Revision: 2
Date: 16 June 2018
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Client No: PWK04311
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File Name: \\msc.local\userdata\UserProfiles\robertb\Desktop\IH133800-0000-NW-RPT-0001_Water and Sewer Rev2.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
A	01/11/2017	Draft Document	KLM	PSD	
0	17/04/2018	Final Issue – updated following MSC review	KS	APA	
1	25/05/2018	Updated with revised Schedules	KS	APA	
2	14/06/2018	Updated to address review comments	KS	PSD	

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Appendix A. Network Maps

Appendix B. Demand Generation Rate Confirmation

1. Preliminary

This report provides the background information for the Water Supply and Sewerage Networks to support the development of the Mareeba Shire Council Local Government Infrastructure Plan (LGIP).

The report outlines:

1. The definition of trunk infrastructure (Section 2);
2. The service catchments (Section 3);
3. The demand assumptions and conversions (Section 4);
4. Catchment demands (Section 5);
5. The Desired Standards of Service (DSS) (Section 6);
6. Network planning and modelling (Section 7);
7. Network costings and valuation methodology (Section 8);
8. Schedules of work (Section 9); and
9. Source and supporting documents (Section 10).

2. Definition of Trunk Infrastructure

Table 2.1 : Definition of trunk infrastructure outlines the definition of trunk infrastructure for the Water Supply and Sewerage networks. The trunk infrastructure identified in the maps or text of the plans for trunk infrastructure (PFTI) is also considered trunk infrastructure.

Table 2.1 : Definition of trunk infrastructure

Network	Definition of Trunk Infrastructure	Exclusions (non-trunk infrastructure)
Water Supply	Land or works for: <ul style="list-style-type: none"> • Bulk water storage and collection systems (dams, intake pump station, bores, weirs etc); • Raw water mains; • Water treatment facilities; • Water storage facilities (e.g. Reservoirs) • Water mains; • Pumping stations located on water mains; • Chlorination equipment located on water mains; • Meters, valves, control and monitoring systems located on water mains; and • Fire fighting devices located on 150 mm diameter or above water mains. 	<ul style="list-style-type: none"> • All other infrastructure not listed in column 2; • Temporary pump stations and water mains; • Privately owned systems; and • Development infrastructure internal to a development or to connect a development to external infrastructure network.
Sewerage	Land or work for: <ul style="list-style-type: none"> • Sewage treatment plant systems; • Gravity sewers; • Rising mains; • Pumping stations; • Emergency storage; • Monitoring and control systems (meters, SCADA and alarm systems); • Sewage treatment plant effluent disposal and re-use systems. 	<ul style="list-style-type: none"> • All other infrastructure not listed in column 2; • Temporary pump stations and rising mains; • Onsite effluent systems; • Privately owned system; and • Development infrastructure internal to a development or to connect a development to external infrastructure network.

3. Service Catchments

3.1 Water Supply Service Catchments

There are four (4) service catchments for the Water Supply network:

- Chillagoe;
- Dimbulah;
- Kuranda; and
- Mareeba.

3.2 Sewerage Service Catchments

There are two (2) service catchments for the Sewerage network:

- Kuranda; and
- Mareeba.

4. Demand Generation Rates

The Water Supply and Sewerage networks demand generation rates used in the development of the assumptions based demand model are provided in Table 4.1, Table 4.2 and Table 4.3.

Table 4.1 — Existing and Projected Residential Water Demand Generation Rates by Locality

Locality	Network Demand (EP / dwelling)				Network Demand (EP / net dev hectare)	
	2016	2021	2026	2031		
Chillagoe	1.9	1.83	1.74	1.65	15.75	15.75
Dimbulah	1.6	1.83	1.74	1.65	15.75	15.75
Kuranda	2.4	2.14	2.07	2.00	15.75	15.75
Mareeba	2.4	2.14	2.07	2.00	15.75	15.75

Table 4.2 — Existing and Projected Residential Sewerage Demand Generation Rates by Locality

Locality	Network Demand (EP / dwelling)				Network Demand (EP / net dev hectare)	
	2016	2021	2026	2031		
Chillagoe	No reticulated sewer network				NA	NA
Dimbulah	No reticulated sewer network				NA	NA
Kuranda	2.4	2.14	2.07	2.00	15.75	15.75
Mareeba	2.4	2.14	2.07	2.00	15.75	15.75

The water supply and sewerage demand generation rates have been determined based on the persons per household for each area as documented in the population model that supports the planning assumptions.

Table 4.3 — Non-residential Demand Generation Rates by use from MSC Planning Scheme Table 4.2.11.1.1 and Table 4.2.11.2.1

Land Use	Network Demand (EP / net dev hectare)		Network Demand (EP / 100m ² GFA)	
	Water Supply	Sewerage	Water Supply	Sewerage
Commercial	277	277	1	1
Office	277	277	1	1
Industry	47	47	0.03	0.03
Community	31.7	31.7	0.03	0.03

The Non-residential network demand generation rates (EP/hectare) were adopted based on a combination of the historical rates nominated in on Mareeba Shire Council Planning Scheme Table 4.2.11.1.1 and Table 4.2.11.2.1.

5. Network Demands

The network demands have been determined to directly align with the planning assumptions developed for the 2016 LGIP.

The methodology for calculating the demands included:

- Identifying all properties (both residential and non-residential) within the applicable catchment
- Extracting from the planning assumptions model the assumed development on each lot at 5-year interval starting 2016 as base year and up to 2031.
- Multiplying the assumed development by the appropriate demand generation rates according to the use designated in the planning assumptions model.
- Aggregating the demands by catchment and over time.

It is important to note that whilst the water supply and sewerage system demands are consistent with the planning assumptions, they are based on projected dwellings and assume full occupancy. Therefore, some larger infrastructure items such as treatment plants cannot be sized purely on the assumptions based demand model. More detailed assessments reflecting local conditions and diurnal observed flows would be required for such purposes.

The catchment based summary of water supply demand is provided in Table 5.1 and the catchment based summary of sewerage network demand is provided in Table 5.2.

Table 5.1 — Existing and projected demand for the water supply network

PIA locality/ Service Catchment	Water supply network demand (EP)				
	2016	2021	2026	2031	Ultimate
CHILLAGOE	193	201	209	217	268
DIMBULAH	379	393	409	426	621
KURANDA*	1,991	2,066	2,154	2,242	2,817
MAREEBA**	9,212	9,562	9,967	10,371	10,623
Total PIA	11,769	12,213	12,733	13,250	14,329

Table 5.2 — Existing and projected demand for the sewerage network

PIA locality/ Service Catchment	Sewerage network demand (EP)				
	2016	2021	2026	2031	Ultimate
CHILLAGOE	193	201	209	217	268
DIMBULAH	379	393	409	426	621
KURANDA*	1,991	2,066	2,154	2,242	2,817
MAREEBA**	9,212	9,562	9,967	10,371	10,623
Total PIA	11,769	12,213	12,733	13,250	14,329

6. Desired Standards of Service (DSS)

The desired standard of service (DSS) details the standards that comprise an infrastructure network most suitable for the local context. The desired standard or service is supported by the more detailed network design standards included in planning scheme policies, legislation, statutory guidelines and other relevant controlled documents about design standard identified below.

Table 6.1 outlines the DSS for the Water Supply network.

Table 6.1 : Desired Standard of Service (DSS) for the Water Supply network

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
Reliability / Continuity of Supply	All development receives a reliable supply of potable water, with minimal interruptions to their service.	<ul style="list-style-type: none"> • Mareeba Shire Council Water and Wastewater Customer Service Standard • All sections of the reticulation network shall receive a residual pressure of at least 22 m during the ‘maximum hour’ demand and the system should be capable of supplying water for six (6) consecutive ‘maximum hours’. • The system should have sufficient capacity to refill all reservoirs from empty to full within 5 days of continuous operation during ‘average day’ demand conditions. • Each reservoir in the system should have a net positive inflow, and should be capable of continuous operation during ‘mean day maximum month’ demand conditions. • FNQROC Development Manual, as amended. • Wet Tropics Management Plan 1998. • No reservoir should “fail” during 3 days of Peak Day demand
Adequacy of Supply	<p>All development is provided with a water supply which is adequate for the intended use.</p> <p>Minimum static pressure (meters head) and/or flow (liters/second) at connection.</p>	<ul style="list-style-type: none"> • Water Supply Code of Australia – Water Services Association of Australia as amended by Council. • Planning Guidelines of Water Supply and Sewerage – Department of Energy and Water Supply. • The reticulation system should be capable of providing simultaneously

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
		<p>a fire fighting flow of 30 L/s for 4 hours in commercial areas and 15 L/s for 2 hours in residential areas.</p> <ul style="list-style-type: none"> • During fire fighting demands the residual pressure at any point in the reticulation network should not drop below 12 m. • The Average Daily consumption and peaking factors for the design of Water Supply Schemes shall be as follows: <ul style="list-style-type: none"> ➤ Average Daily Consumption (AD) 500 litre/person/day ➤ Mean Day Maximum Month (MDMM) 1.50 x AD ➤ Peak Day (PD) 2.25 x AD ➤ Peak Hour (PH) 1/12 x PD ➤ The maximum head in the reticulation system should be limited to below 60 m.
Quality of Supply	Provide a uniform water quality in accordance with recognised standards which safeguards community health and is free from objectionable taste and odour.	<ul style="list-style-type: none"> • National Health and Medical Research Council Australian Drinking Water Guidelines 2011 Version 3.4
Environmental Impacts	<p>Provide water supply infrastructure that:</p> <ul style="list-style-type: none"> • Minimises energy use. • Minimises greenhouse gas emissions. • Complies with Environmental Management Strategies and Plans. • Provides for system operation and monitoring in accordance with recognized standards. 	<ul style="list-style-type: none"> • Compliance with all environmental licenses and environmental management plans under the <i>Water Act 2000</i> and the <i>Environmental Protection Act 1994</i>. • Water Supply Code of Australia – Water Services Association of Australia as amended by Council. • Planning Guidelines of Water Supply and Sewerage – Department of Energy and Water Supply. • FNQROC Development Manual, as amended. • Wet Tropics Management Plan 1998.
Pressure and Leakage Management	The water supply network is monitored and managed to maintain the reliability and adequacy of supply and to minimize environmental impacts.	<ul style="list-style-type: none"> • Mareeba Shire Council Water and Wastewater Customer Service Standard.

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
		<ul style="list-style-type: none"> • System Leakage Management Plan (<i>Chapter 3, Part 3, Division 1A Water Act 2000</i>). • A.S.C. System Loss Management Plan.
Infrastructure Design / Planning Standards	Design of the water supply network will comply with established codes and standards.	<ul style="list-style-type: none"> • Water Services Association of Australia – WSA 03 – 2011 – Water Supply Code of Australia • Australian Drinking Water Guidelines – National Health and Medical Research Council • Planning Guidelines for Water Supply and Sewerage – Department of Natural Resources and Water • FNQROC Development Manual, as amended.

Table 6.2 outlines the DSS for the Sewerage network.

Table 6.2 : Desired Standard of Service (DSS) for the Sewerage network

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
Reliability	All lots have access to a reliable sewerage collection, conveyance, treatment and disposal system.	<ul style="list-style-type: none"> • Mareeba Shire Council Water and Wastewater Customer Service Standard. • The “Average Dry Weather Flow” (ADWF) shall be limited to 275 L / EP / day. • The design flow adopted shall be limited to (4 x ADWF). • The sewer capacity at design flow should not exceed 0.75 x diameter of sewer. • FNQROC Development Manual, as amended.
Quality of Treatment	Ensures the health of the community, and the safe and appropriate level of treatment and disposal of treated effluent.	<ul style="list-style-type: none"> • Compliance with all environmental licenses and environmental management plans under the <i>Water Act 2000</i> and the <i>Environmental Protection (Water) Policy 1997</i>.

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
		<ul style="list-style-type: none"> • Queensland <i>Water Quality Guidelines 2006</i> – Environmental Protection Agency. • National Water Quality Guidelines – National Water Quality Management Strategy.
Environmental Impacts	The environmental impacts of the sewerage network are minimized in accordance with community expectations.	<ul style="list-style-type: none"> • Compliance with all environmental licenses and environmental management plans under the <i>Water Act 2000</i> and the <i>Environmental Protection (Water) Policy 1997</i> • Mareeba Shire Council Water and Wastewater Customer Service Standard.
Inflow / Infiltration	Ensure infiltration and inflow in the sewerage collection and transportation system remains within industry acceptable limits.	<ul style="list-style-type: none"> • Compliance with all environmental licenses and environmental management plans under the <i>Water Act 2000</i> and the <i>Environmental Protection (Water) Policy 1997</i>
Effluent Re-use	Reuse effluent wherever possible.	<ul style="list-style-type: none"> • Compliance with all environmental licenses and environmental management plans under the <i>Water Act 2000</i> and the <i>Environmental Protection (Water) Policy 1997</i> • <i>Guidelines for Sewerage Systems – Reclaimed Water – February 2000</i> • <i>Queensland Water quality guidelines for recycled water schemes - November 2008</i>
Infrastructure Design / Planning Standards	Design of the sewerage network will comply with established codes and standards.	<ul style="list-style-type: none"> • Section D7 Sewerage System Design Guidelines of the Development Manual Planning Scheme Policy. • Department of Natural Resources Planning Guidelines for Water Supply and Sewerage. • Water Services Association of Australia – WSA – 02 – 2014 – Sewerage Code of Australia

Measure	Planning Criteria (qualitative standards)	Design Criteria (quantitative standards)
		<ul style="list-style-type: none">• Water Services Association of Australia – WSA – 04 – 2005 – Sewerage Pumping Station Code of Australia.• FNQROC Development Manual, as amended.

7. Network Planning and Modelling

The Mareeba Shire Council water supply system service mainly the catchment of Chillagoe, Dimbulah, Kuranda and Mareeba. However, reticulated sewerage system is limited to the townships of Kuranda and Mareeba only. Council has developed a fit for propose model for both water supply and sewerage systems. The water supply network model was developed using the EPANET software package and is based on GIS data, reservoir and pump station details.

For the relatively smaller sewerage network modelling, a Microsoft Excel based model has been developed. The process of developing the water supply and sewerage network model, the model input, variables, outcome based on 5 years interval demand forecast and infrastructure establishment cost estimating procedure for water and sewerage infrastructure is documented in Mareeba Water & Wastewater Investigations, Network Modelling and Determination of Plans for Trunk Infrastructure Report (SKM, January 2011). Modelling helped to identify the new infrastructure as well as upgrade of the existing infrastructure to continue to support the community growth in each service catchment and maintain the desired standard of service. In addition, the Council has identified the old infrastructure that require replacement due to their age, current condition and new requirements. Section 8 provides the list of identified projects in Priority Infrastructure Area that are in Council's Plans for Trunk Infrastructure and their delivery timeline.

8. Network Costings and Valuation Methodology

Future capital projects are estimated using past capital project actual construction costs, quoted prices and unit rates where applicable. Estimates are created in the broader context of Council's capital works program framework and project periodization tool (PPT). It is recognized projects are inherently uncertain and that for the purposes of capital works project planning, that there will be incomplete or sometimes unavailable project scope information on which to base the project estimates. Estimate reliability will progressively improve throughout the project life cycle as a result of systematic review and associated approval processes. The sow model has escalated the establishment costs to the base year of 2016.

It is acknowledged that some projects contain an element of asset renewal. This has been considered at the project level and a portion of the total cost allocated to renewal, and consequently removed from the total value of the trunk works detailed in the Schedule of Works tables.

9. Schedules of Works

Table 9.1 — Water Supply network schedule of works

Map reference	Trunk infrastructure	Estimated timing	Establishment cost
WAT - 01	Searry Road, Mareeba. Metered Water Standpipe Access Upgrade.	2019	\$100,000
WAT - 02	Design and install clear water pump set, Dimbulah Water Treatment Plant. Subject to options analysis.	2019	\$60,000
WAT - 03	Chillagoe Water Treatment Plant. Install generator.	2019	\$50,000
WAT - 04	Rankin Street, Mareeba. Water Main Replacement (Uncommitted: subject to obtaining grant funding).	2019	\$1,250,000
WAT - 05	Replace existing reservoirs in Chillagoe with new 500KL prefabricated steel reservoir (Uncommitted: subject to obtaining grant funding).	2019	\$800,000
WAT - 06	Mareeba Water Treatment Plant. Replace Alum Dosing System with Aluminium Chloride Hydrate (ACH) flocculant.	2019	\$80,000
WAT - 07	Mareeba Reticulation Depot Shed Replacement.	2019	\$100,000
WAT - 08	Upgrade Mareeba town water booster station, including water main upgrades.	2020	\$3,900,000
WAT - 09	New Mareeba Spare Transfer Holding Lagoon Pump.	2020	\$12,000
WAT - 10	Kuranda Water Treatment Plant new 500KL storage tank.	2020	\$820,000
WAT - 11	Upgrade Mareeba Water Treatment Plant High Lift Pumps.	2020	\$1,050,000
WAT - 12	Mareeba WTP Backwash Water Treatment Project	2020	\$170,000
WAT - 13	Mareeba Backwash Recycle Water Pump new spare.	2020	\$12,000
WAT - 14	Replace Kuranda Water Treatment Plant Generator.	2020	\$180,000
WAT - 15	Kuranda Water Treatment Plant Clear Water Pump Station Staged Pumps Renewal	2020	\$210,000

Map reference	Trunk infrastructure	Estimated timing	Establishment cost
WAT - 16	Mareeba WTP Clearwater Reservoir Roof Refurbishment	2020	\$600,000
WAT - 17	Chillagoe Town bore 2 pump station renewal	2020	\$25,000
WAT - 18	Chillagoe Town bore 1 pump station renewal	2020	\$25,000
WAT - 19	Mareeba Water Treatment Plant - Construct concrete flow meter pits (Upgrade).	2021	\$30,000
WAT - 20	Third Kuranda Myola Road Reservoir.	2022	\$1,200,000
WAT - 21	Wylandra Water Booster Pump Station/Extra Variable Speed Drive.	2021	\$60,000
WAT - 22	Mareeba WTP Security Fence.	2021	\$40,000
		Total	\$10,774,000.00

Table 9.2 — Sewerage network schedule of works

Map reference	Trunk infrastructure	Estimated timing	Establishment cost
SEW - 01	Upgrade Barang St Pump Station (Subject to grant funding)	2019	\$900,000.00
SEW – 02A	Kuranda Pump Station, New standby generator (Honey House) (Upgrade)	2019	\$40,000.00
SEW – 02B	Kuranda Pump Station, New standby generator (Myola 4) (Upgrade)	2019	\$40,000.00
SEW – 03A	Mareeba Pump Station, New standby generator (Palm Close)	2019	\$40,000.00
SEW – 03B	Mareeba Pump Station, New standby generator (Ceola Drive)	2019	\$40,000.00
SEW – 04A	Kuranda Pump Station, New standby generator (Upgrade) (Kullaroo)	2020	\$20,000.00
SEW – 04B	Kuranda Pump Station, New standby generator (Upgrade) (Arara)	2020	\$20,000.00
SEW – 05A	Mareeba Pump Station, New standby generator (Industrial)	2020	\$20,000.00
SEW – 05B	Mareeba Pump Station, New standby generator (Yarrabee)	2020	\$20,000.00
SEW – 06A	Kuranda Pump Station, New standby generator (Upgrade) (Thoree,)	2021	\$20,000.00

Map reference	Trunk infrastructure	Estimated timing	Establishment cost
SEW – 06B	Kuranda Pump Station, New standby generator (Upgrade) (Myola 3)	2021	\$20,000.00
SEW – 07A	Mareeba Pump Station, New standby generator (Amaroo)	2021	\$20,000.00
SEW – 07B	Mareeba Pump Station, New standby generator (Godwin)	2021	\$20,000.00
SEW – 08A	Mareeba Pump Station, New standby generator (The Edge)	2022	\$20,000.00
SEW – 08B	Mareeba Pump Station, New standby generator (Prestige Gdns)	2022	\$20,000.00
SEW – 09A	Kuranda Pump Station, New standby generators (Upgrade) (Railway)	2023	\$20,000.00
SEW – 09B	Kuranda Pump Station, New standby generator (Upgrade) (Barron Falls Rd.)	2023	\$20,000.00
SEW – 10A	Mareeba Pump Station, New standby generator (River Gdns)	2023	\$20,000.00
SEW – 10B	Mareeba Pump Station, New standby generator (Lifestyle Resort.)	2023	\$20,000.00
		Total	\$1,340,000.00

10. Source and Supporting Documents

Mareeba Shire Council Local Government Infrastructure Plan – Background Information on Population Assessment, February 2018

Mareeba Shire Council Water and Wastewater Customer Service Standard, November 2014

Mareeba Shire Council Planning Scheme, July 2016

Tablelands Regional Council, *Mareeba Shire Planning Scheme Priority Infrastructure Plan Assumptions and Priority Infrastructure Area*, 2011

Queensland Government, Department of Energy and water Supply, Water Quality Guidelines for Recycled Water Schemes, November 2008

Tablelands Regional Council Priority Infrastructure Planning - Report on Establishment costs for PFTI and Economic Analysis for Completion of Mareeba, Atherton & Eacham Priority Infrastructure Planning (RPS, May 2011)

Mareeba Water & Wastewater Investigations, Network Models and PFTI (SKM, January 2011)

Appendix A. Network Maps

Appendix B. Demand Generation Rate Confirmation