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WESTERN DOWNS REGIONAL COUNCIL

Background Information for

Water Supply & Wastewater Networks for the

Western Downs Regional Council

Local Government Infrastructure Plan

27 April 2016

1. Preliminary

This report provides the background information for the Water Supply and Wastewater Networks, to support the development of the Western Downs Regional Council Local Government Infrastructure Plan (LGIP).

The report outlines:

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

2. Service catchments

The Service Catchments cover the urbanised centres of the Western Downs Region as shown on the following plans:

- Water Supply - LGIP-W-01 to LGIP-W-06
- Wastewater - LGIP-S-01 to LGIP-S-06

3. Demand assumptions and conversions

3.1 Base Year

The base year for the LGIP is 2016. The valuation of the existing trunk system has been derived from the 2014 valuation data and escalated in the SOW model to the base date.

3.2 Planning Horizon

The planning horizon for the water and wastewater network infrastructure for the LGIP is to 2031.

3.3 Demand Estimation Methodology

3.3.1 Water Supply

Water supply demand is based on an estimation of Equivalent Persons (EPs).

To estimate demand the current (2014) water billing data was analysed and correlated to the population and areas of non-residential land use (commercial and light industrial). As non-residential connections can be easily identified through a different connection size and aerial photography, reasonably accurate usage rates can be assigned.

Based on the available data the current usage per EP for the urban centres is as follows (note that analysis was not undertaken for Jandowae so 'average' values were used):

Table 3.1 - Water Usage

Centre	2014 Population (including non-resident workers on shift)	Water Usage Per Capita Demand (L/day)
Chinchilla	6,315	440
Dalby	11,925	341
Miles	1,480	397
Wandoan	560	635
Tara	955	456
Jandowae	1090	300

Residential water usage figures were then used to determine residential EP figures. Similarly, non-residential usage was used to determine the EP equivalents for non-residential uses by dividing the water usage by the residential EP rate. Future demands were determined in a similar fashion using information from water network planning models.

3.3.2 Wastewater

As wastewater flows are not monitored for separate residential /non-residential use, the estimation of wastewater demand was based on analysis of the overall sewer flows entering the treatment plant and the associated water usage. Based on the flow analysis, it was determined that the overall proportion of sewer flows to water usage was approximately 75%. Given that residential water use has a significant component of 'outdoor' use, the following assumptions were made for the analysis:

- Residential - 70% of water disposed to sewer
- Non-residential - 90% of water disposed to sewer

Table 3.2 - Wastewater usage

Centre	Wastewater / EP (L/day)
Chinchilla	213.9
Dalby	226.4
Miles	261.4
Wandoan	330.4
Tara	199.8
Jandowae	225.0

To estimate wastewater EP's involved collating the water use for the respective residential and non-residential uses (in areas that are sewered) and dividing this figure by the above rates. For future growth, information from wastewater network models was used and is based on the assumption that all future growth in these centres will be sewered.

3.4 Demand Estimates

Based on the above methodology and the using the population growth forecasts adopted by Council, the estimated demand figures for the water supply and wastewater systems are as follows:

Table 3.3 — Existing and projected demand for the water supply network

LOCATION		2014	2016	2021	2026	2031
		Water Supply Demand Expressed in Equivalent Persons (EP's)				
Tara	Residential	955	963	982	983	1062
	Non-Residential	681	688	704	720	733
	Total	**1636**	**1650**	**1686**	**1703**	**1795**
Dalby	Residential	11925	11959	12045	12537	13180
	Non-Residential	1538	1546	1566	1586	1820
	Total	**13463**	**13505**	**13610**	**14123**	**15000**
Miles	Residential	1480	1589	1862	2135	2318
	Non-Residential	206	208	213	252	291
	Total	**1686**	**1798**	**2075**	**2387**	**2609**
Wandoan	Residential	560	561	564	566	630
	Non-Residential	247	248	252	255	263
	Total	**807**	**809**	**815**	**821**	**893**
Jandowae	Residential	1090	1090	1090	1090	1090
	Non-Residential	165	165	165	165	165
	Total	**1255**	**1255**	**1255**	**1255**	**1255**
Chinchilla	Residential	6315	6402	6620	6838	7352
	Non-Residential	1650	1686	1776	1866	2006
	Total	**7965**	**8088**	**8396**	**8704**	**9358**
TOTAL	**Residential**	**22325**	**22564**	**23163**	**24149**	**25632**
	Non-Residential	**4488**	**4541**	**4676**	**4844**	**5278**
	TOTALS	**26813**	**27106**	**27838**	**28993**	**30910**

Table 3.4 — Existing and projected demand for the wastewater network

LOCATION		2014	2016	2021	2026	2031
		Wastewater Demand Expressed in Equivalent Persons (EP's)				
Tara	Residential	891	834	875	919	998
	Non-Residential	736	743	760	777	791
	Total	**1627**	**1577**	**1635**	**1697**	**1790**
Dalby	Residential	11130	10870	11270	11742	12385
	Non-Residential	1661	1670	1691	1712	1735
	Total	**12791**	**12540**	**12961**	**13454**	**14120**
Miles	Residential	1381	1468	1767	2036	2219
	Non-Residential	223	225	230	236	240
	Total	**1604**	**1693**	**1998**	**2272**	**2460**
Wandoan	Residential	523	354	421	529	593
	Non-Residential	267	268	272	276	284
	Total	**790**	**622**	**693**	**804**	**876**
Jandowae	Residential	981	981	981	981	981
	Non-Residential	165	165	165	165	165
	Total	**1146**	**1146**	**1146**	**1146**	**1146**
Chinchilla	Residential	5894	5143	5824	6417	6931
	Non-Residential	1057	931	1045	1144	1230
	Total	**6951**	**6074**	**6869**	**7561**	**8161**
TOTAL	**Residential**	**20800**	**19650**	**21138**	**22624**	**24107**
	Non-Residential	**4108**	**4002**	**4163**	**4310**	**4445**
	TOTALS	**24908**	**23652**	**25302**	**26935**	**28553**

It is noted that some centres experience a decline in EP's in the short term from 2014 levels. This reflects the changes (loss) of non-resident workers that were required during the construction phases of the local energy industries.

3.5 Conversions

The following figures are used to convert EP's to Equivalent Tenements (ET's) or floor space:

Table 3.5 - EP Conversion

Land use	EP Conversion	Notes
Detached House	2.5 EP / ET	Although existing density is 2.7 per house, it is anticipated that new housing will have a lower density
Unit / Townhouse	1.7 EP / ET	Based on an assumption of generally 2-bedroom units
Commercial	1 EP / 150m^2 GFA	Assumed that building includes some food / catering business.
Industrial	1 EP / 300m^2 GFA	Assumed that light industry will predominate. Lot size generally 2000 to 4000 m^2 with building occupying 25% and water usage similar to residential.

4. Desired standards of service

The desired standards of service for the water supply and wastewater systems are shown in the following tables. In general the standards have been set based on Water Services Association of Australia codes and standards.

4.1 Water Supply Standards of Service

Table 4.1 - Standards of Service - Water

Water Treatment	
Treated Water Quality	In accordance with Australian Drinking Water Quality Guidelines
Network performance	
Minimum Network Pressure	16m
Maximum Network Pressure	60m (> 60m requires QFRS consultation)
Maximum Velocity	2 m/s
Network Reservoir Capacity at 3 consecutive days of MDMM demand	All reservoirs to have a positive net inflow at the end of each day
Ground level reservoir	3 x (MD – MDMM) + Emergency Storage
Elevated reservoir	6 x (PH – 1/12 MDMM)+150kL fire storage In supply zones where 8xPH is less than or equal to MDMM the following equation is used (2xPH)+150kL fire storage
Fire Flow performance	
Application of Fire Analysis	Background Demand highest of 2/3 PH or AD
Maximum (fire flow) Velocity	4 m/s
Minimum Residual Pressure at Hydrant	12m
Residential Property <= 3 storeys	15L/s for 2 hrs
Residential Property > 3 storeys	30L/s for 4 hrs
Commercial/Industrial Property	30L/s for 4 hrs

4.2 Wastewater Standards of Service

Table 4.2 - Standards of Service - Wastewater

<table>
<tr><td colspan="2"></td></tr>
<tr><td>Treated Wastewater Quality</td><td>In accordance with Department of Environment and Heritage Protection license requirements</td></tr>
<tr><td colspan="2">General</td></tr>
<tr><td>Peaking Factors – Peak dry Weather Flow (PDWF) and Peak Wet Weather Flow (PWWF)</td><td>In accordance with “Planning Guidelines for Water Supply and Sewerage” (Department of Energy & Water Supply, 2013)</td></tr>
<tr><td colspan="2">Pumping Stations & Rising Mains</td></tr>
<tr><td>Detention Time
Minimum Velocity

Maximum Velocity
Maximum allowable pump starts

Emergency relief storage (ERS)</td><td>Maximum 6 hours
Preferred - 1.5m/s, absolute min. – 0.9 m/s
3.5 m/s
8 or 90% of manufacturer’s recommendation (whichever lower)
The pumping station shall be designed to ensure no dry weather overflows. ERS to contain 4 hours ADWF</td></tr>
<tr><td colspan="2">Gravity Mains</td></tr>
<tr><td>Minimum velocity (PDWF)
Maximum velocity (PWWF)
Depth of flow @ PWWF
Absolute minimum grade</td><td>Self-cleansing velocities (0.7 – 0.8 m/s)
3 m/s
70% pipe depth
<table>
<tr><th>Diameter</th><th>Grade 1 in ‘x’</th></tr>
<tr><td>150</td><td>200</td></tr>
<tr><td>225</td><td>300</td></tr>
<tr><td>300</td><td>400</td></tr>
<tr><td>375</td><td>600</td></tr>
</table></td></tr>
</table>

5. Definition of trunk infrastructure

5.1 Water Supply

Passive Assets

- Mains greater than 100mm diameter. However, in some smaller urban centres 100mm diameter mains perform a ‘trunk’ function (e.g. connection from the treatment plant to the reservoir). It should be noted that the identification of these sized mains in the existing trunk system in no way confers ‘trunk’ status on all mains of this size.
- Raw water mains (of any size) supplying treatment plants

Active Assets

- Treatment plants including associated mechanical equipment
- Water sources including Bores
- Treated water reservoirs
- Pumping stations (including raw water and network)
- Re-chlorination facilities
- Associated monitoring and control systems

5.2 Wastewater

Passive Assets

- Gravity mains greater than 150mm diameter. However, in some smaller urban centres 150mm diameter mains perform a 'trunk' function, particularly when downstream of a pumping station rising main discharge point. It should be noted that the identification of these sized mains in the existing trunk system in no way confers 'trunk' status on all mains of this size.
- Rising mains (of any size).

Active Assets

- Treatment plants including associated mechanical equipment
- Effluent disposal mains
- Pumping stations
- Odour and corrosion control systems
- Associated monitoring and control systems

The general basis for selection of these criteria is that the items are likely to service more than a single development.

6. Network planning and modelling

Network modelling has been undertaken for the water supply and wastewater networks for all of the urban centres in the Western Downs Region. Some centres were studied in 2011, others in 2014 and some have only recently been assessed.

The general methodology used in undertaking the modelling was as follows:

1. Development of the base (existing) model from GIS information and as-constructed data.
2. Determination of current demand based on water billing data, treatment plant production/ flows and other field data. Estimation of future demand based on population and other growth projections.
3. Calibration of the base model using available flow information, sewage pumping station drawdown data, fire hydrant flow testing, reservoir level information etc.
4. Assessment of existing system capacity/performance and identify required augmentations.
5. Assessment of the impact on the system for future growth scenarios and identification of the necessary augmentations.
6. Cost estimation for proposed system augmentations.

Modelling is undertaken for a range of scenarios including a base (existing network) case and cases covering anticipated population/demand growth. For each case, the modelling work includes identification of the system augmentations required to cater for the estimated demand.

7. Network costings and valuation methodology

7.1 Passive Assets

Costings for both the existing and future network passive assets (pipes) were calculated based on unit rates used for asset valuation exercises in June 2014 (refer *Infrastructure Services Audit Committee Report 2014 Asset Management Annual Review* (WDRC, June 2014)).

Costings for future passive assets were based on the unit rates used for asset valuation exercises factored for appropriate on-costs and contingencies. The on-cost rates applied were as follows:

- Master Planning - 2%
- Survey & Design - 8%
- Project Management & Contract Administration - 5%

Total **15%**

Contingency amounts used were as per the Statutory guideline and were dependent upon the timeframe for project delivery.

7.2 Active Assets

Costings for existing active assets (pumping stations, treatment plants, reservoirs etc.) were calculated based on asset valuation figures for June 2014 (refer *Infrastructure Services Audit Committee Report 2014 Asset Management Annual Review* (WDRC, June 2014)).

Costings for new active assets were based on cost estimates undertaken as part of technical studies or capital works planning.

7.3 Proportion Renewal

For new assets each item was assessed to determine the proportion of the work related to meeting existing demand.

8. Schedules of work

Table 8.1—Water supply network schedule of works

Map reference	Trunk infrastructure	Estimated timing	Gross Value (incl. on-costs & contingency)	Proportion Renewal
W1501	Trunk main for new reservoir	2015	$1,303,141	0%
W1602	Main between existing 150 mm main in Dawson Street to hydrant in McNulty Street	2016	$28,640	0%
W1801	Miles Water Treatment Plant Stage 1 Augmentation	2018	$3,500,000	0%
W2101	New Miles reservoirs for pressure zone	2021	$1,000,000	0%
W2304	Miles - New GAB Bore	2023	$1,400,000	0%
W2601	Miles - Extend main	2026	$26,262	0%
W1605	Chinchilla - New main from new WTP to Colamba St Tower	2016	$2,535,666	0%
W1606	Chinchilla - Water Treatment Plant Stage 1 Augmentation	2016	$12,400,000	0%
W1607	Chinchilla - Raw Water Pumping Station & Main	2016	$3,900,000	0%
W1608	Chinchilla - New reservoir at WTP	2016	$2,400,000	0%
W1802	Chinchilla - Extend main	2018	$22,503	0%
W1803	Chinchilla - Extend main	2018	$118,653	0%
W1804	Chinchilla - Extend main	2018	$22,503	0%
W1805	Chinchilla - Extend main	2018	$135,019	0%

Table 8.1—Water supply network schedule of works

Map reference	Trunk infrastructure	Estimated timing	Gross Value (incl. on-costs & contingency)	Proportion Renewal
W1901	Chinchilla - Warrego Highway Cross Connection near Short Street	2019	$14,320	0%
W2004	Chinchilla - Water Treatment Plant Stage 2 Augmentation	2020	$5,000,000	75%
W2301	Chinchilla - Warrego Highway near Carmichael Street	2023	$15,319	0%
W2302	Chinchilla - Slessar Street Main Upgrade. 500m from Wambo Street along Slessar St.	2023	$109,424	0%
W1609	Tara - Milne Street FC2	2016	$43,984	0%
W1610	Tara - Wilson Street FC1-1 - from Sara Street along Surat Developmental Road	2016	$94,104	0%
W2005	Tara - New main along Fry Street	2020	$20,457	0%
TOTAL			**$34,089,995**	

Table 8.2—Sewerage network schedule of works

Map reference	Trunk infrastructure	Estimated timing	Gross Value (incl. on-costs & contingency)	Proportion Renewal
S1601	Dalby - Upgrade of SPS 1 pump and wet well capacity	2016	$679,720	80%
S1602	Dalby - Upgrade of SPS 2 pump and wet well capacity	2016	$424,820	80%
S1603	Dalby - Upgrade of SPS 5 pump and wet well capacity	2016	$128,850	80%
S1604	Wandoan - Upgrade of SPS 1 pump and wet well capacity	2016	$128,850	80%
S1605	Chinchilla - North / Park Streets	2016	$31,235	0%
S1606	Chinchilla -Malduf / Price Streets	2016	$23,426	0%
S1801	Chinchilla -SPS F	2018	$492,900	0%
S1802	Chinchilla -Gormleys Rd to STP	2018	$796,580	0%
S2101	Chinchilla -Railway / Canaga Streets	2021	$47,654	0%
S2401	Chinchilla -Colamba / Chinchilla Streets	2024	$28,321	0%
S2402	Wandoan Effluent Disposal	2024	$3,400,000	75%
S1607	Tara - Benn Street	2016	$82,070	0%
S2001	Miles Sewerage Treatment Plant Augmentation	2020	$8,050,000	50%
S2301	Miles Evaporation Pond Augmentation	2023	$200,000	0%
S1608	Chinchilla Sewerage Treatment Plant Augmentation	2018	$11,400,000	75%
TOTAL			**$25,914,426**	

9. Source and supporting documents

The reference documents relating to water supply and wastewater networks used in the development of the LGIP are as follows:

Table 9.1 - Reference Documents

Item	Title	Author	Date
1	Water and Wastewater Infrastructure Planning Analysis Report - Dalby	SKM	June 2011
2	Water and Wastewater Infrastructure Planning Analysis Report - Miles	SKM	June 2011
3	Water and Wastewater Infrastructure Planning Analysis Report - Wandoan	SKM	June 2011
4	Chinchilla Water Network Planning Report	WDRC	February 2015
5	Chinchilla Sewer Network Planning Report - DRAFT	WDRC	April 2015
6	Chinchilla Potable Water Treatment Plant Upgrade Report	SMEC	January 2013
7	Chinchilla Wastewater Treatment Plant Upgrade: Planning Report	Parsons Brinckerhoff	June 2014
8	Tara Township Water and Sewer Network Planning Report - DRAFT	WDRC	June 2015
9	Infrastructure Services Audit Committee Report 2014 Asset Management Annual Review	WDRC	June 2014
10	Sewerage Asset Management Plan	WDRC	Sept 2011
11	Water Asset Management Plan	WDRC	Sept 2011