Background information for

Stormwater Network for the

Sunshine Coast Council

Local Government Infrastructure Plan

14 March 2017

1.0 Preliminary

This report provides the background information for the Stormwater Network, to support the development of the Sunshine Coast 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).

2.0 Service Catchments

2.1 Stormwater Quality Network

Planning for the Sunshine Coast Council Stormwater Quality Network has been based on one service catchment for the region. The one service catchment philosophy has been derived from the assumption that while developers provide treatment for their respective developments, the resident and tourist population associated with growth will move around the region visiting other services, tourist attractions and amenity areas placing additional external demand throughout the region. To determine and locate appropriate treatment methods across the one service catchment, 58 treatment catchments were used in the modelling process.

Figure 1 below indicates the extent of the service catchment for the region and identifies the 58 treatment catchments used to determine treatment methods and locations.

Figure 1: Stormwater Quality Network Service Catchment and Treatment Catchments

2.2 Stormwater Capacity Network

There is currently only one service catchment within the region which satisfies the definition outlined in Section 5.0 Definition of Trunk Infrastructure.

3.0 Demand Assumptions and Conversions

A demand base year of 2011 was used for the planning of the stormwater network. This year was consistent with the population data used for council's 2014 Planning Scheme and these figures were summed to provide a regional total. These figures were extrapolated to a demand year of 2031 for the network's planning horizon and aligns with the ABS Census years.

Table 1 below shows the demand increases assumed for the stormwater network's one service catchment between 2011 and 2031.

Table 1: Existing and Projected Demand for the Stormwater Network

Service Catchment	Existing and Projected Demand				
	2011 (Base Year)	**2016**	**2021**	**2026**	**2031** (Planning Horizon)
Regional Population (people)	254,713	298,233	335,580	374,439	412,849
Total Demand (impervious ha)	9,265	9,520	9,738	9,966	10,191

The following assumptions were made to establish a framework:

- The Total Demand for each of the 58 treatment catchments was determined by applying a fraction impervious to the land uses within each catchment;
- That the regional growth impacts on impervious areas (to be serviced by trunk infrastructure) can only influence the increase in the current impervious area by a maximum of 10%;
- That increased usage of commercial, community parks (open space/amenity) and industrial land uses would place the greatest pressure on receiving waters and as such represented the areas with the greatest demand for treatment. Areas for tourism were also considered. These four factors were used to prioritise and rank the 58 catchments according to their need for treatment;
- There is a shortfall in the current network infrastructure to manage demand, and this shortfall will be addressed over time; and
- The construction of infrastructure to meet the increase in demand progresses over time and usually lags the development (demand).

The base year for the costing of the network is June 2015.

4.0 Desired Standards of Service

The Desired Standards of Service (DSS) for the Stormwater Network is provided in **Table 2**. These standards have been derived from Council's Planning Scheme, in particular Planning Scheme Code 9.4.6: Stormwater Management and Planning Scheme Policy SC6.14: Planning Scheme Policy for Development Works.

Table 2: Desired Standard of Service for the Stormwater Network (Quality and Capacity)

Desirable Performance Outcomes		Desirable Design Criteria	
PO1	**Frequent (low) flow management, waterway stability and sediment transport** Protection of waterway stability and ecological low flows through implementation of appropriate discharge regimes.	DC1	Stormwater discharges are managed to achieve the waterway stability objective and the frequent (low) flow management objective consistent with the intent of the Planning Scheme Policy for development works.
PO2	**Protection of environmental values** Protection or enhancement of the environmental values and water quality objectives[1] of receiving waters or buffer areas.	DC2	As a minimum requirement, treatment measures contribute to achieving the stormwater pollutant load reduction objectives specified in the Planning Scheme Policy for development works.
PO3	**Integration** Well integrated into the natural and built environment.	DC3	Trunk Stormwater infrastructure must be delivered on land owned or managed by Council, preferably on land that has an existing drainage purpose. In addition the location of infrastructure must be consistent with the intent of the planning scheme policy for development works.
PO4	**Natural processes and materials** Treatment measures utilise natural processes and materials wherever practicable.	DC4	Treatment measures are designed to be consistent with the intent of the Planning scheme policy for development works.
PO5	**Health, safety and aesthetic hazards** Stormwater infrastructure is designed to eliminate or minimise health, safety and aesthetic hazards.	DC5	Risks associated with insect breeding, odour and public safety are minimised by designing treatment systems consistent with the intent of the Planning Scheme Policy for development
PO6	**Non-Worsening** Stormwater infrastructure must meet design standards[2] and must not worsen the characteristics of flooding or problem drainage and must discharge to a legal point of	DC6	Stormwater drainage must be designing in accordance with the Planning Scheme Policy for development works
PO7	**Maintenance costs** Treatment measures are designed to minimise maintenance, renewal and adaptation costs and the requirement for specialised equipment or maintenance techniques.	DC7	Design achieves acceptable maintenance, renewal and adaptation costs for the project life[3] consistent with the intent of the Planning Scheme Policy for development works.

[1] Water quality objectives are prescribed in Schedule 1 of the Environmental Protection (Water) Policy 2009.

[2] Design Standards for (urban) stormwater drainage infrastructure are prescribed in the Queensland Urban Drainage Manual (2013)

[3] Project life is a minimum of 50 years, unless the asset is proposed to be decommissioned in a shorter period.

5.0 Definition of Trunk Infrastructure

The definition of trunk infrastructure for the stormwater network is outlined in **Table 3** below.

Table 3: Stormwater Network Trunk Infrastructure (Quality and Capacity)

Stormwater Network	Definition	Example	Exclusions
Quality	Council nominated infrastructure that will provide improvements to the overall water quality objectives, assessed at a regional level.	Infrastructure may include wetlands, stormwater quality treatment devices, waterway and riparian zone bank stabilisation and protection.	Typically, stormwater quality treatment responsibilities conditioned on development do not replace trunk works.
Capacity	Infrastructure servicing infill development identified in a Master Drainage Study (or plan) for council delivery and endorsed by Council at the recommendation of the stormwater network LGIP planner.	Infrastructure may include pipes, channels, detention basins (and other forms of flood storage)	Stormwater Capacity infrastructure responsibilities conditioned on development do not replace trunk works

6.0 Network Planning and Modelling

6.1 Stormwater Quality Network

The planning of the Stormwater Quality Network has been undertaken using a fit-for-purpose spreadsheet model, developed by a Civil Engineer with RPEQ accreditation.

The premise behind the model is that the need for future treatment in a catchment equates to the treatment demand (based on the landuse/impervious area) less the existing treatment already provided. The demand varies over the planning horizon in line with growth.

The model considers a range of treatment methods which have a treatable impervious area applied to them. This determines the quantity of treatment methods for each treatment catchment. A range of quality treatment methods are considered and include physical (such as GPTs), biophysical (such as bioretention and wetlands) and riparian rehabilitation (such as bank stabilisation works).

6.2 Stormwater Capacity Network

Council commissioned SMEC to undertake planning for the Stormwater Capacity Network through the preparation of a *Master Drainage Study for Toral and Jorl Court, Buderim (2016*). In this area the number of properties has intensified from low/medium density residential to unit and small lot housing projects. Network capacity planning was undertaken to address capacity issues and ensure a holistic and equitable approach could be implemented within the catchment.

The stormwater capacity network and future works were determined applying standard industry practices for hydrologic and hydraulic analysis in TUFLOW. The future items for the stormwater capacity network are limited to this catchment at this stage.

7.0 Network Costings and Valuation Methodology

7.1 Existing Network Costings

7.1.1 Stormwater Quality

The replacements costs of the existing constructed stormwater quality trunk network were determined by identifying assets which meet the definition of trunk infrastructure in council's asset register and GIS system and then applying appropriate unit rates sourced from Cardno (2015) and Water by Design (2014).

7.1.2 Stormwater Capacity

There are no previous Master Drainage Studies (or plans) completed and constructed by Council to meet the definition in **Table 3: Stormwater Network Trunk Infrastructure (Quality and Capacity)** for Stormwater Capacity. Therefore, there is no existing network to cost for stormwater capacity in the LGIP.

7.2 Future Network Costings

7.2.1 Stormwater Quality

The establishment costs of future infrastructure have been developed using the unit rates described in Section 7.1 Existing Network Costings and utilising factors to account for:

- Construction costs associated with a brownfield environment; and
- Additional base costs which occur in the first two years of the three-year delivery cycle.

The network model is also used to inform Council's Capital Works Program and includes allowances for planning and design costs. To avoid duplication of these costs, the factor (1.2) applied in the Sunshine Coast Council Schedule of Works Model has been removed from the costings listed in **Table 4: Stormwater Network Schedule of Works** of **Section 8.0 Schedules of Work.**

Additional costs to account for cyclic network planning and annual field monitoring have also been included. These costs have been included to ensure network planning is at its most current, reflecting the latest on-the-ground opportunities and treatment best practice. The annual field monitoring costs give council the opportunity to identify any performance issues within the network which may be remedied through future network planning.

7.2.2 Stormwater Capacity

Concept cost estimates for future infrastructure have been developed by SMEC (2016). These estimates were based on 2016 costs and are outlined in **Table 4: Stormwater Network Schedule of Works** of **Section 8.0 Schedules of Work.**

8.0 Schedules of Work

The schedule of works for the Stormwater Network is provided in **Table 4** below.

Works beyond the planning horizon of 2031 to Ultimate) have been included to demonstrate the works required to meet Sunshine Coast Council's DSS outlined in **Table 2: Desired Standard of Service for the Stormwater Network (Quality and Capacity).**

Table 4: Stormwater Network Schedule of Works

Map Reference	Trunk Infrastructure	Estimated Timing (Construction Year)	Establishment Cost (SOW Base Cost)
SWQ15_007	Coochin Ck, LGIP Stormwater, (Caralan Way Wetland)	2017	$ 83,333.33
SWQ15_011	Future SW LGIP Planning - South	2017	$ 41,666.67
SWQ15_012	Future SW LGIP Planning -North	2017	$ 41,666.67
SWQ15_050	Caloundra (Otranto St) GPT, LGIP Stormwater (formerly Tooway Ck)	2017	$ 135,714.29
SWQ15_059	Maroochydore (Forth Avenue) LGIP GPT	2017	$ 366,666.67
SWQ15_060	Maroochydore (Cornmeal Pde), LGIP GPT	2017	$ 366,666.67
SWQ15_062	Petrie Ck Catchment, Riparian LGIP	2017	$ 125,000.00
SWC16_001	Toral Drive MDS Stage 1	2018	$ 546,666.67
SWC16_005	Toral Drive MDS Stage 3,7	2018	$ 586,957.88
SWC16_011	Priority MDS Nambour 1	2018	$ 41,666.67
SWC16_017	Priority MDS Maroochydore 1	2018	$ 41,666.67
SWC16_021	MDS First, Second, Third and Fourth Avenue Caloundra	2018	$ 41,666.67
SWC16_026	MDS Mill Street Landsborough	2018	$ 41,666.67
SWQ15_005	Caloundra (Arthur Street), LGIP GPT	2018	$ 294,642.86
SWQ15_006	Russell St LGIP Wetland	2018	$ 435,000.00
SWQ15_023	Moffat Beach (Grigor Street), LGIP Stormwater	2018	$ 135,714.29
SWQ15_042[4]	Duckholes Creek LGIP Sediment Basin\Wetland	2018	$ 517,738.10
SWC16_002	Toral Drive MDS Stage 2A	2019	$ 349,428.63
SWC16_003	Toral Drive MDS Stage 2B	2019	$ 326,861.50
SWC16_004	Toral Drive MDS Stage 2C	2019	$ 145,422.38
SWC16_009	Priority MDS Kings Beach 1	2019	$ 41,666.67
SWC16_012	Priority MDS Nambour 2	2019	$ 41,666.67
SWC16_018	Priority MDS Maroochydore 2	2019	$ 41,666.67
SWC16_022	MDS Second Avenue Coolum Beach	2019	$ 41,666.67
SWC16_024	MDS Greber Road, Beerwah	2019	$ 41,666.67
SWQ16_006	Future SW LGIP Planning - South	2019	$ 41,666.67
SWQ16_007	Future SW LGIP Planning -North	2019	$ 41,666.67

[4] Map SQN45 shows two locations as project being delivered at two locations, either side of Caloundra Road.

Table 4: Stormwater Network Schedule of Works

Map Reference	Trunk Infrastructure	Estimated Timing (Construction Year)	Establishment Cost (SOW Base Cost)
SWQ15_053	Fishermans Rd Industrial Precinct LGIP GPT + Wetland	2019	$ 418,452.38
SWQ15_057	LaBalsa Park LGIP Carpark Biopods	2019	$ 113,630.83
SWQ15_058	Mountain Ck (Tilapia Court) LGIP Wetland and Riparian	2019	$ 570,535.36
SWQ15_066	Robertson Drive Park Bioretention	2019	$ 203,796.55
SWQ15_086	Coondibah Creek Riparian Works	2019	$ 140,714.17
SWC16_019	Priority MDS Maroochydore 3	2020	$ 41,666.67
SWQ15_054	Montville, Russell Family Park Carpark Sediment Runoff LGIP (Bitumise or Swale)	2020	$ 83,333.33
SWQ16_088	Meridan Fields Sportsground WSUD	2020	$ 2,232,142.86
SWQ16_102	Cordellia St park LGIP Bioretention	2020	$ 320,683.81
SWC16_010	Priority MDS Kings Beach 2	2021	$ 41,666.67
SWC16_013	Priority MDS Nambour 3	2021	$ 41,666.67
SWC16_014	Priority MDS Nambour 4	2021	$ 41,666.67
SWC16_023	MDS Marjorie Street, Mooloolaba	2021	$ 41,666.67
SWQ16_065	Sunjewel Blvd Playground (Snowdrop Avenue) LGIP Wetland	2021	$ 535,714.29
SWQ16_068	Kolora Park Sediment Basin	2021	$ 535,714.29
SWQ16_069	Kolora Park Riparian Works	2021	$ 282,738.10
SWQ16_090	Fraser Park LGIP GPT	2021	$ 395,238.10
SWQ16_092	Kings Place Park LGIP Bioretention	2021	$ 215,773.81
SWQ16_094	June Blanck Park LGIP Bioretention	2021	$ 329,613.63
SWC16_007	Toral Drive MDS Stage 5	2022	$ 385,595.88
SWC16_020	Priority MDS Maroochydore 4	2022	$ 41,666.67
SWC16_025	MDS Nichols Avenue, Beerwah	2022	$ 41,666.67
SWQ16_002	Alexandra Headland (Alexandra Parade), LGIP GPT	2022	$ 523,809.52
SWQ16_003	Alexandra Headland (Alexandra Parade), LGIP GPT	2022	$ 523,809.52
SWQ16_008	Future SW LGIP Planning - South	2022	$ 41,666.67
SWQ16_009	Future SW LGIP Planning -North	2022	$ 41,666.67
SWQ16_040	Petrie Ck Catchment, Riparian LGIP (south of Unitywater Nambour STP and Nambour Showground)	2022	$ 446,428.57
SWQ16_077	Melody Court Park LGIP GPT	2022	$ 163,809.52
SWQ16_089	Clarke Place Park LGIP GPT	2022	$ 163,809.52
SWQ16_104	Cumberland Way LGIP Riparian	2022	$ 95,238.10
SWC16_006	Toral Drive MDS Stage 4	2023	$ 247,163.00
SWC16_008	Toral Drive MDS Stage 6	2023	$ 681,990.75
SWQ16_029	Golden Beach (Gregory and Burke St), bioretention	2023	$ 223,809.52

Table 4: Stormwater Network Schedule of Works

Map Reference	Trunk Infrastructure	Estimated Timing (Construction Year)	Establishment Cost (SOW Base Cost)
SWQ16_030	Kings Beach and Amphitheatre Precinct, LGIP bioretention	2023	$ 163,809.52
SWQ16_087	Wallum Gardens, Peony Circuit, Little Mountain LGIP Wetlands	2023	$ 1,004,464.29
SWQ16_095	Moss Day Park LGIP Veg Channel/Riparian	2023	$ 94,207.38
SWQ16_074	Sunbird Chase Park LGIP Bioretention	2024	$ 2,232,142.86
SWQ16_010	Future SW LGIP Planning - South	2025	$ 41,666.67
SWQ16_011	Future SW LGIP Planning -North	2025	$ 41,666.67
SWQ16_016	Kings Beach (Levuka Avenue), LGIP Stormwater	2025	$ 306,845.24
SWQ16_026	Maleny LGIP Riparian	2025	$ 148,809.52
SWQ16_033	Doonan Creek Corridor LGIP Riparian	2025	$ 282,738.10
SWQ16_037	Caloundra West (Wheeler Cresent) LGIP GPT	2025	$ 163,809.52
SWQ16_039	Maroochydore LGIP GPT	2025	$ 523,809.52
SWQ16_059	Andrea Ahearn Park/Cooroora St LGIP Veg Infiltration Trench	2025	$ 535,714.29
SWQ16_100	Lakeshore Avenue Park LGIP Wetlands	2025	$ 494,791.07
SWQ16_005	Kings Beach (Esplanade Headland), LGIP Stormwater	2026	$ 306,845.24
SWQ16_028	Caloundra West (Mark Road), bioretention	2026	$ 223,809.52
SWQ16_041	Petrie Ck Catchment, Riparian LGIP	2026	$ 446,428.57
SWQ16_066	Wilgan Place Bushland Reserve Riparian Works	2026	$ 148,809.52
SWQ16_067	Wilgan Place Bushland Reserve Sedimention Basin	2026	$ 180,952.38
SWQ16_075	Technology Drive Linear Park LGIP GPT	2026	$ 306,845.24
SWQ16_096	Glenbrook Downs Park LGIP Veg Channel	2026	$ 451,162.50
SWQ16_097	Sheen Court Park LGIP Swale/Natural Channel	2026	$ 223,028.72
SWQ16_060	Quota/Eleanor Shipley Park LGIP Bioretention	2027	$ 535,714.29
SWQ16_098	Forestwood Drive Park LGIP Bioretention	2027	$ 408,296.13
SWQ16_099	McArthur Park LGIP Bioretention	2027	$ 1,395,089.29
SWQ16_001	Alexandra Headland (Alexandra Parade), LGIP GPT	2028	$ 523,809.52
SWQ16_012	Future SW LGIP Planning - South	2028	$ 41,666.67
SWQ16_013	Future SW LGIP Planning -North	2028	$ 41,666.67
SWQ16_021	Lower Maroochy River Catchment, LGIP GPT	2028	$ 395,238.10
SWQ16_047	Petrie Ck Catchment, LGIP GPT	2028	$ 395,238.10
SWQ16_051	Friendship Park Bioretention	2028	$ 215,773.81
SWQ16_054	Cornmeal Catchment LGIP GPT	2028	$ 523,809.52
SWQ16_101	Kuluin Neighbourhood Park LGIP Riparian	2028	$ 322,916.67
SWQ16_018	Lower Maroochy River Catchment, LGIP GPT	2029	$ 395,238.10
SWQ16_022	Lower Maroochy River Catchment, LGIP GPT	2029	$ 395,238.10

Table 4: Stormwater Network Schedule of Works

Map Reference	Trunk Infrastructure	Estimated Timing (Construction Year)	Establishment Cost (SOW Base Cost)
SWQ16_042	Petrie Ck Catchment, Riparian LGIP	2029	$ 446,428.57
SWQ16_046	Petrie Ck Catchment, LGIP GPT	2029	$ 395,238.10
SWQ16_052	Cornmeal Catchment LGIP GPT	2029	$ 523,809.52
SWQ16_103	Lineman Ave LGIP Biorention	2029	$ 494,642.86
SWQ16_058	Coolum LGIP GPT	2030	$ 306,845.24
SWQ16_004	Caloundra (Dingle Avenue),LGIP Stormwater	2030	$ 395,238.10
SWQ16_049	Petrie Ck Catchment, LGIP GPT	2030	$ 395,238.10
SWQ16_076	St Vincents Court Park LGIP Vegetated Infiltration	2030	$ 535,714.29
SWQ16_091	Petrie Creek LGIP GPT	2030	$ 395,238.10
SWQ16_093	Siverwood Drive Park LGIP Bioretention	2030	$ 250,929.52
SWQ16_019	Lower Maroochy River Catchment, LGIP Riparian	2031	$ 446,428.57
SWQ16_020	Lower Maroochy River Catchment, LGIP GPT	2031	$ 395,238.10
SWQ16_023	Lower Maroochy River Catchment, LGIP GPT	2031	$ 395,238.10
SWQ16_024	Lower Maroochy River Catchment, LGIP GPT	2031	$ 395,238.10
SWQ16_050	Petrie Ck Catchment, LGIP GPT	2031	$ 395,238.10
SWQ16_061	Mooloolah Coastal Creeks LGIP Sediment Basin	2031	$ 523,809.52
SWQ16_035	Regional Trunk Stormwater Outfall Monitoring	2024	$ 1,333,333.33
SWQ16_014	Future SW LGIP Planning - South	2031	$ 125,000.00
SWQ16_015	Future SW LGIP Planning -North	2031	$ 125,000.00
SWQ16_017	Lower Maroochy River Catchment, LGIP GPT	2031	$ 135,714.29
SWQ16_025	Lower Maroochy River Catchment, LGIP Riparian	2031	$ 446,428.57
SWQ16_027	Alexandra Healand (Mari Street) LGIP Stormwater	2031	$ 2,232,142.86
SWQ16_032	Cornmeal Creek Corridor LGIP Riparian	2031	$ 535,714.29
SWQ16_038	Marcoola (Airport Drive) LGIP GPT	2031	$ 294,642.86
SWQ16_043	Petrie Ck Catchment, LGIP GPT	2031	$ 392,857.14
SWQ16_044	Petrie Ck Catchment, LGIP GPT	2031	$ 392,857.14
SWQ16_045	Petrie Ck Catchment, LGIP GPT	2031	$ 392,857.14
SWQ16_048	Petrie Ck Catchment, LGIP GPT	2031	$ 392,857.14
SWQ16_057	Cornmeal Catchment LGIP GPT	2031	$ 523,809.52
SWQ16_064	Lower Mooloolah River LGIP Riparian	2031	$ 446,428.57
SWQ16_070	Cornmeal Creek LGIP GPT	2031	$ 523,809.52
SWQ16_071	Lamerough Creek LGIP GPT	2031	$ 392,857.14
SWQ16_072	Lower Maroochy River Estuary LGIP GPT	2031	$ 294,642.86
SWQ16_084	Petrie Creek LGIP GPT	2031	$ 392,857.14
Total (to 2031)			**$ 45,142,398.96**

Table 4: Stormwater Network Schedule of Works

Map Reference	Trunk Infrastructure	Estimated Timing (Construction Year)	Establishment Cost (SOW Base Cost)
SWQ16_031	Paynters Creek, Woombye, LGIP Riparian	>2036	$ 119,047.62
SWQ16_034	Obi Obi Creek Corridor LGIP Riparian	>2036	$ 267,857.14
SWQ16_053	Cornmeal Catchment LGIP GPT	>2036	$ 523,809.52
SWQ16_055	Cornmeal Catchment LGIP GPT	>2036	$ 523,809.52
SWQ16_056	Cornmeal Catchment LGIP GPT	>2036	$ 523,809.52
SWQ16_062	Lower Mooloolah River LGIP GPT	>2036	$ 392,857.14
SWQ16_063	Lower Mooloolah River LGIP Riparian	>2036	$ 446,428.57
SWQ16_073	Maroochy Coastal Creeks LGIP GPT	>2036	$ 392,857.14
SWQ16_078	Mooloolah River Estuary LGIP GPT	>2036	$ 392,857.14
SWQ16_079	Mooloolah River Estuary LGIP GPT	>2036	$ 392,857.14
SWQ16_080	Mooloolah River Estuary LGIP Wetland	>2036	$ 2,232,142.86
SWQ16_081	Mooloolah River Estuary LGIP GPT	>2036	$ 294,642.86
SWQ16_082	Mountain Creek LGIP GPT	>2036	$ 392,857.14
SWQ16_083	Mountain Creek LGIP GPT	>2036	$ 392,857.14
SWQ16_085	Petrie Creek LGIP GPT	>2036	$ 294,642.86
SWQ16_086	University Creek LGIP GPT	>2036	$ 294,642.86
Total (to Ultimate)			**$ 53,020,375.15**

9.0 Source and Supporting Documents

CARDNO, (2015), *Roads and Stormwater Infrastructure Unit Rates*

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Sunshine Coast Council, 2016, *Stormwater Quality Demand Model* (SWQ Demand rev14.xlsm, EDDIE document management system revision 18.)

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