Redlands Water and Waste

Sewerage Collection System Priority Infrastructure Plan

March 2007

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Contents

List of Tables

Table of Acronyms

Description	Acronym
Average Day Demand	ADD
Desired Standards of Service	DSS
Equivalent Person	EP
Equivalent Tenement	ET
Flow Control Valve	FCV
Geographic Information Systems	GIS
High Level Zone	HLZ
Infrastructure Charges Schedule	ICS
Litres per Second	L/s
Low Level Zone	LLZ
Max Day (also known as Peak Day)	MD or PD
Mean Day Max Month	MDMM
Max Hour (also known as Peak Hour)	MH or PH
Megalitres per Day	ML/d
Non Revenue Water	NRW
North Stradbroke Island	NSI
Planning Information and Forecasting Unit	PIFU
Pressure Reducing Valve	PRV
Pumping Station	PS
Redlands Planning Scheme	RPS
Redlands Shire Council	RSC
Redlands Water and Waste	RWW
Southern Moreton Bay Island	SMBI
Water Services Association Australia	WSAA
Water Supply Zone	WSZ
Water Treatment Plant	WTP

1. Introduction

This report details Redland Shire Council's Sewerage Collection System Priority Infrastructure Plan and replaces the existing Sewerage Headwork's Policy. The document provides the basis upon which infrastructure contributions for sewerage collection and treatment services for the Redland Shire.

The Priority Infrastructure Plan for Redland Shire Council is prepared in accordance with the "Infrastructure Charges Schedules: Incorporating Worked Examples and Sample Calculations" published in October 2004 by the Queensland Department of Local Government, Planning Sport and Recreation.

The Sewerage collection components of a Priority Infrastructure Plan generally:

- identifies the sewerage priority infrastructure areas;
- includes the plans for sewerage trunk infrastructure;
- states the assumptions about the projected population growth on which the plan is based;
- states the desired standards of service;
- identifies infrastructure included in the plan; and
- states the infrastructure charges schedules.

1.1 Infrastructure Agreements and Structure Plans

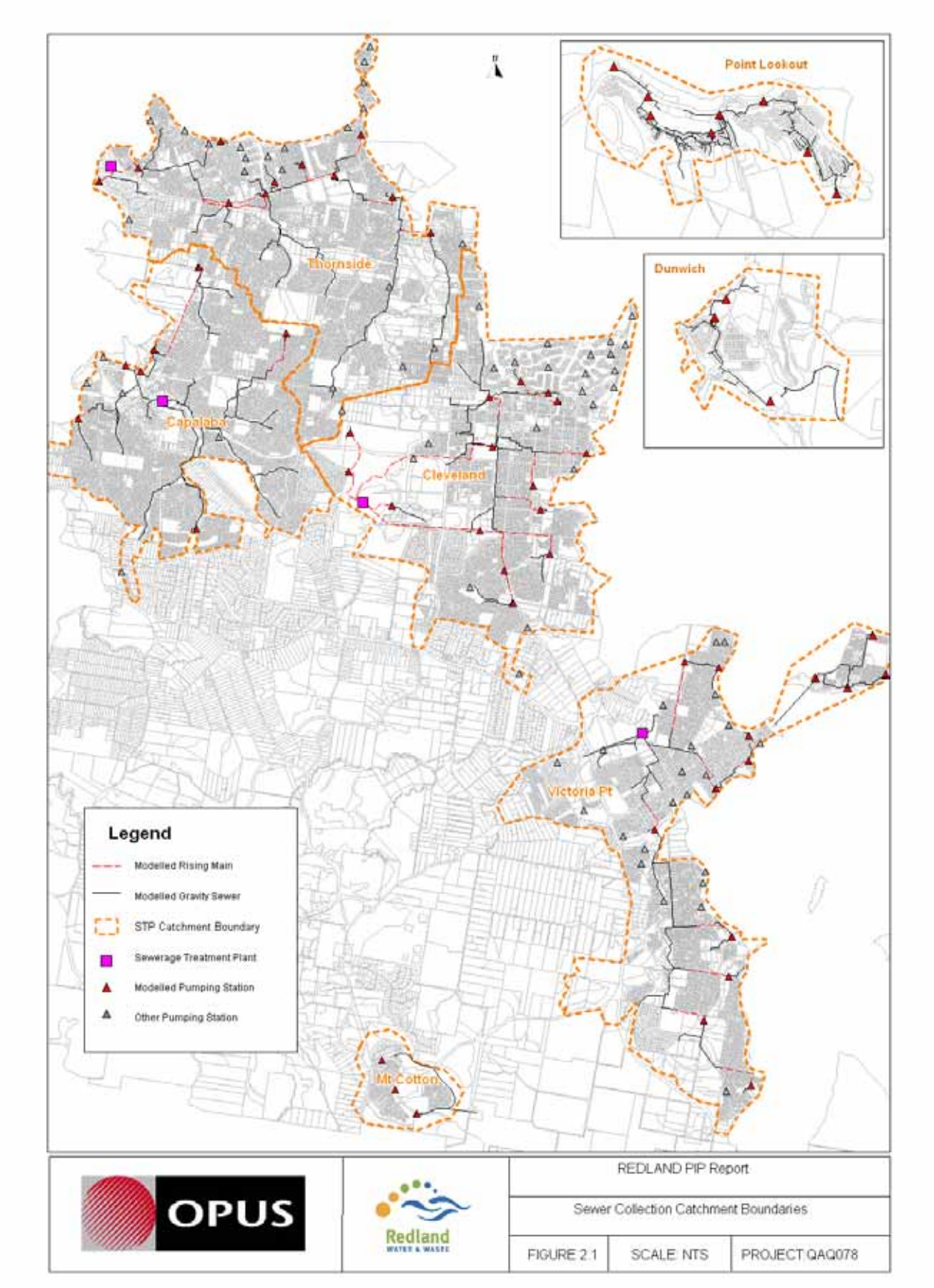
The sewerage infrastructure charges determined in this report only apply to customers that do not have an existing infrastructure agreement in place such as the Mt Cotton Infrastructure Agreement.

For Structure Plan Areas, additional charges maybe applied to account for the additional trunk infrastructure for alternate disposal treatments.

2. Service Catchments

Redland Shire has a Priority Infrastructure Area in which it is responsible to supply trunk infrastructure to allow for growth to develop within the shire. The sewer system consists of the seven discrete catchments based on areas contributing to the Sewerage Treatment Plant (STP). Figure 2.1 illustrates the Sewerage Catchment Boundaries which are:

- Capalaba,
- Cleveland,
- Victoria Point,
- Thorneside,
- Mt Cotton,
- Dunwich, and
- Point Lookout.


Point Lookout
Dunwich
Thornside
Capalaba
Cleveland
Victoria Pt
Mt Cotton
Legend
Modelled Rising Main
Modelled Gravity Sewer
STP Catchment Boundary
Sewerage Treatment Plant
Modelled Pumping Station
Other Pumping Station
OPUS
Redland
WATER & WASTE
REDLAND PIP Report
Sewer Collection Catchment Boundaries
FIGURE 2.1
SCALE NTS
PROJECT QAQ078

3. Projected Population Growth

Redland Shire is expected to undergo rapid population expansion with the ultimate population to be achieved around the year 2025. The residential population was staged to include 2008, 2013, and 2018 planning horizons.

Detached residential properties identified by billing data for existing conditions were assigned 2.8 persons per dwelling and multi family residential properties were assigned 1.8 persons per dwelling based on information provided by PIFU. An occupancy rate of 1.6 persons per dwelling was assigned to residential properties on the Southern Moreton Bay Islands. The occupancy rate has been decreasing over time and it is expected that at ultimate conditions the occupancy rate for residential properties will be 2.7 persons per dwelling and Multi Family residential properties were assigned 1.7 persons per dwelling. The occupancy rates were based on information provided by RSC planning advisors.

3.1 Serviced Population Growth - Sewerage Collection

The existing contributing population is estimated to be 129,136 EP including a residential component of 117,973 equivalent persons. The ultimate contributing population is estimated to be 175,474 EP including a residential component of 158,155 equivalent persons. Table 3-1 shows the growth of serviced population to ultimate. Note unsewered areas, such as Southern Moreton Bay Islands are not included in the population projection. There is a minor variation between the forecasts used for water supply and wastewater planning and the population forecast for the Shire. This is due to the transient tourist population that is experienced during peak summer period and a conversion of non-residential properties to an equivalent population to forecast future non-residential discharge.

Table 3-1 : Sewerage Collection System Population Growth

Land Use Category	2006	2008	2013	2018	Ultimate (2025)
Residential					
Urban Residential	101,365	106,037	116,327	124,308	132,921
Medium Residential	14,715	16,484	20,064	22,291	24,498
Low Density Residential	1,190	996	912	823	738
Residential Sub Total	117,272	123,516	137,305	147,422	158,156
Non-Residential					
Commercial	3,736	4,008	4,930	5,542	8,269
Industrial	1,738	1,793	2,102	2,389	3,124
Irrigation	0	0	0	0	0
Open Space	0	0	0	0	0
Public	2,791	2,873	3,127	3,736	4,864

Land Use Category	2006	2008	2013	2018	Ultimate (2025)
Rural	0	0	0	0	0
Tourism	465	468	592	747	1,161
Non-Residential Sub-Total	8,730	9,124	10,754	12,403	17,409
Grand Total	126,002	132,634	148,058	159,824	175,564

4. Desired Standards of Service

4.1 Sewerage Standards of Service

The *Desired Standards of Service Review – Sewerage* prepared by MWH and dated 1 August 2006 defines the adopted standards of service for the Redland water supply system. A summary of the design criteria used for sizing infrastructure is shown in Table 4-1.

Table 4-1 : Summary of Sewerage System Design Criteria

Item	Description	Design Criteria
Sewage Loading		
1	Average Dry Weather Flow (ADWF)	250 L/EP/d
2	Peak Wet Weather Flow(PWWF)	5 x ADWF Based on Section 5.3 of the QDNRM Guidelines.
Gravity Sewer Design		
3	Flow calculation approach	Manning's Equation
4	Manning's 'n'	0.013
5	Minimum Velocity @ PDWF	0.7m/s Based on Table 5.15 of QDNRM Guidelines.
6	Maximum Velocity @ PWWF	2.5m/s
7	Depth of Flow @ PWWF – Existing system	At least 1.0 m below MH cover level and no spillage through overflow structures
8	Depth of Flow @ PWWF – New sewers	Design for pipe full capacity
Pumping Station Design		
9	Wet Well Operational Volume (excluding emergency storage)	$\frac{0.9 \times Q}{N}$ Where N = 12 for < 30 kW N = 8 for 30 < kW < 50 N = 5 for > 50kw
10	Emergency Storage	4 hours of ADWF
11	Single Pump Capacity	C1 x ADWF where >1,000 EP 5x ADWF where <1,000EP
12	Total Pumping Capacity	5 x ADWF
Rising Main Design		
13	Flow Equation	Hazen Williams
14	Friction Factors	110 for diameters ≤ 300 mm 130 for diameters > 300 mm

Item	Description	Design Criteria
15	Minimum Velocity (on a Daily Basis)	0.75 m/s
16	Preferred Minimum Velocity (all pumps)	1.0 m/s
17	Maximum Velocity	2.5 m/s

Table 4-2 : Population Densities

Land Use	Adopted Density (ET)
Centre (Major, District, Neighbourhood, Local, SMBI, Pt Lookout)	As Based on water billing data, due to variance.
Commercial Industry (per gross hectare)	15
General Industry (per gross hectare)	20
Irrigation/Open Space (per gross hectare)	3.7
Low Density Residential (per lot - 2000m^2 average)	1.25
Medium Density Residential (per gross hectare)	30
Park Residential (per lot - 6000m^2 average)	1.5
Public/Government (per gross hectare)	15
Rural Non-Urban (per lot)	1.5
Tourist Industry (per gross hectare)	15
Urban Residential (per gross hectare)	10

Table 4-3 : Adopted Wastewater Generation factors

Land Use Category	Wastewater Generation Factor
Urban Residential	1.0
Medium Density Residential	1.0
Park Residential	0
Low Density Residential	0
General Industry	0.9
Commercial Industry	0.9
Tourist Industry	0.9
Public/Government	0.9
Schools	0.7
Hospitals	0.8
Irrigation/Open Space	0

Appendix A details the conversion factors to Equivalent Tenements (ET) for several different land use types.

5. Plans for Trunk Infrastructure

Plan for Trunk Infrastructure is presented in the *Derivation of Water Supply and Sewerage Infrastructure Charges* dated February 2007.

5.1 Definition of Trunk Infrastructure

In order to calculate Infrastructure Charges, trunk infrastructure that is managed by Council needs to be defined. Sewerage infrastructure collects wastewater from each property, and transports the wastewater to treatment plant facilities for final disposal and/or reuse. The sewer trunk infrastructure required to provide this service is generally defined by the following:

- Sewer Mains:
  - Mainland and SMBI - Sewer mains with a combined nominal diameter of 300 mm and above.
  - NSI - Sewer mains with a combined nominal diameter of 225 mm and above
- All rising mains within the network
- All reuse transport mains
- All Pumping stations within the network
- Sewage treatment plants.

The sewerage infrastructure charges determined in this report only apply to customers that do not have an existing infrastructure agreement in place such as the Mt Cotton Infrastructure Agreement.

5.2 Distribution of Costs

The sewerage collection trunk infrastructure is separated into the catchment that they service. The five mainland catchments include Capalaba, Cleveland, Victoria Point, Thorneside and Mt Cotton. There are two catchments Dunwich and Point Lookout which are located on North Stradbroke Island. The sewerage collection ICS Zone boundaries can be seen in Figure 5.1. The sewerage infrastructure charges determined in this report only apply to customers that do not have an existing infrastructure agreement in place such as the Mt Cotton Infrastructure Agreement.

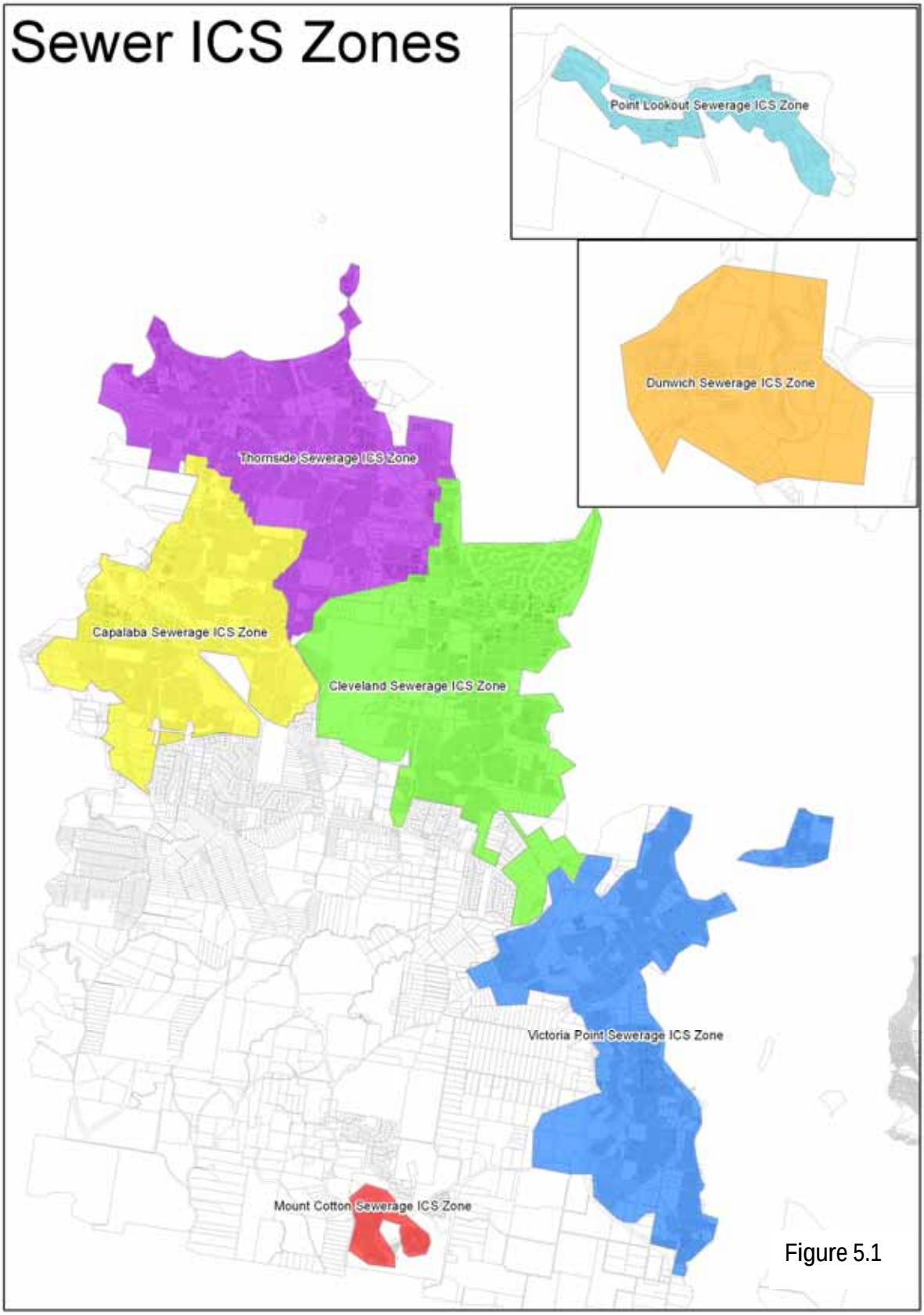

Sewer ICS Zones
Point Lookout Sewerage ICS Zone
Dunwich Sewerage ICS Zone
Thornside Sewerage ICS Zone
Capalaba Sewerage ICS Zone
Cleveland Sewerage ICS Zone
Victoria Point Sewerage ICS Zone
Mount Cotton Sewerage ICS Zone

Figure 5.1

6. Infrastructure Charges Schedule

The infrastructure Charges Schedules are presented in the *Derivation of Water Supply and Sewerage Infrastructure Charges* dated February 2007.

6.1 Valuation of Existing Infrastructure

The existing sewerage collection and treatment infrastructure is valued at $233,429,940. Table 6-1 shows the breakdown of this valuation.

Table 6-1 : Existing Sewerage Collection Infrastructure Valuation

Sewerage Collection System	Existing Valuation	Length (km)	No. of Assets
Rising Mains	$66,143,465	57	-
Gravity Sewers	$85,261,971	69	-
Reuse Mains	$4,062,972	7	-
Pumping Stations	$32,144,400	-	123
Treatment	$140,214,100	-	7
Total Cost	$327,826,909		

6.2 Valuation of Future Infrastructure

The future additional sewerage collection and treatment infrastructure is valued at $88,090,363. Table 6-2 shows the breakdown of this valuation.

Table 6-2 : Future Sewerage Collection Infrastructure Valuation

Sewerage Collection System	Future Additional Valuation
Rising Mains	$5,161,800
Gravity Sewers	$1,919,800
Pumping Stations	$11,969,300
Treatment	$79,206,600
Total Cost	$98,257,500

6.3 Administration and Financing Costs

RWW manages the infrastructure charges which consist of the administration of the charge including a three yearly review of the planning and population forecasts. The administration of the charge will require two full time equivalent staff.

The future works to be constructed by RWW will be funded using the available developer contributions collected and through borrowings. It is expected that 50% of the value of future works will be financed through borrowings. As such the charge is based on the full cost of the trunk infrastructure plus the interest cost of the borrowed amount.

The administration cost is calculated as the total administration costs divided by the sum of the ultimate water supply and sewerage equivalent persons. The calculated value is $14 per EP. The financing cost has been calculated using the same method and is $21 per EP. As such, the total on-costs is a flat fee of $35 per EP or $98 per ET

7. Infrastructure Charges Calculations

7.1 Methodology

The calculation of infrastructure charges have been undertaken based on the "Infrastructure Charges Schedules: Incorporating Worked Examples and Sample Calculations" published in October 2004 by the Queensland Department of Local Government, Planning Sport and Recreation.

7.2 Calculations

Table 7-1 show the calculations to obtain the Infrastructure Charges. In general each ICS zone's total ultimate valuation is divided by the zone's total ultimate equivalent population giving the infrastructure charge per equivalent person. The sewage treatment costs are evenly distributed over the entire network. No government subsidies of any type have been taken into account during the calculation of these charges. The calculations are as follows:

$$\text{Sewerage Collection Infrastructure Charge} = \frac{\text{Existing Sewerage Collection Infrastructure} + \text{Future Sewerage Collection Infrastructure}}{\text{Total Equivalent Population}} * 2.7 \text{ EP / ET}$$

$$\text{Sewerage Treatment Infrastructure Charge} = \frac{\text{Existing Sewerage Treatment Infrastructure} + \text{Future Sewerage Treatment Infrastructure}}{\text{Total Equivalent Population}} * 2.7 \text{ EP / ET}$$

The Infrastructure Charges are calculated as the rate for residential detached dwellings. A conversion factor is used to calculate the equivalent charge for alternate developments.

Table 7-1 : Sewerage Collection and Treatment Charges Calculation

Zone	Existing Collection Infrastructure	Future Collection Infrastructure	Existing Treatment Infrastructure	Future Treatment Infrastructure	Admin & Finance Cost ($/EP)	Ultimate EP	Collection Cost ($/EP)	Treatment Cost ($/EP)	Total Cost Including Admin & Finance Costs ($/EP)	Collection Cost ($/ET)	Treatment Cost ($/ET)	Total Cost Including Admin & Finance Costs($/ ET)
Capalaba ICS Zone	$25,569,604	$165,900	$26,622,100	$12,458,500	$35	29,662	$868	$1,318	$2,220	$2,343	$3,557	$5,994
Cleveland ICS Zone	$49,528,800	$7,040,000	$33,721,400	$4,973,600	$35	46,644	$1,213	$830	$2,077	$3,274	$2,240	$5,609
Dunwich ICS Zone	$1,709,228	$98,900	$4,414,200	$4,432,900	$35	1,864	$970	$4,746	$5,751	$2,619	$12,815	$15,529
Mt Cotton ICS Zone	$10,631,277	$1,016,500	$15,449,600	$693,500	$35	5,520	$2,110	$2,924	$5,070	$5,697	$7,896	$13,688
Pt Lookout ICS Zone	$6,290,600	$1,419,000	$7,724,800	$23,703,100	$35	3,710	$2,078	$8,471	$10,584	$5,611	$22,872	$28,577
Thorneside ICS Zone	$54,108,996	$2,045,100	$22,110,200	$21,895,800	$35	47,572	$1,180	$925	$2,140	$3,187	$2,498	$5,779
Victoria Point ICS Zone	$39,774,303	$4,133,700	$30,171,800	$11,049,200	$35	40,592	$1,082	$1,015	$2,132	$2,921	$2,742	$5,757

7.3 Example

Base sewerage contributions are based on the apportionment of establishment costs for the sewerage network by ultimate equivalent persons (EP) and ultimate equivalent tenements (ET).

Existing (2006) and ultimate EP and ET demand assumptions are contained in the Redland Water and Waste Water Supply Planning Report, February 2007 which can be located in the extrinsic material.

The process used to determine base infrastructure contribution for sewerage is outlined below.

Step 1: Determine the minimum ET demand (generated by the development proposal) by the Wastewater ET conversion factor contained in Appendix A Table 1. This calculation establishes total sewerage ET demand. For development with more than one land use type, ET demand for each land use is multiplied by the associated ET conversion factor separately, and then totalled to establish the total ET demand.

Consider a proposed development zoned Commercial Industry in the Capalaba ICS Zone which is 5 hectares including 0.5 hectare of parkland. Since the end use is not clearly identified, the conversion factor from Table 1 of Appendix A is used. The number of ET for this development would be:

(5 – 0.5) X 12.50 = 56.25 ET

Step 2: The base Wastewater infrastructure contribution is then calculated by multiplying the total ET demand from Step 1 above by the total Including Administration and Finance Cost per ET contained within Table 7-1 according to the applicable ICS zone.

For a development with a total ET demand of 56.25 ET in the Capalaba ICS zone, the total including Administration and Finance Cost would be:

56.25 X $5,994 = $337,162.50

Appendix A - Conversion Factors to Equivalent Tenements

Table 1 is to be used when the actual use of the proposed development has not been determined. For developments in which the actual use is known and will increase the demand on the sewerage system adopt Table 2.

Table 1 – ET Conversion Factors for Water Supply & Sewerage

Types of Uses	ET Conversion Factor	
	Water	Wastewater
Centre (Major, District, Neighbourhood, Local, SMBI, NSI)	As determined by local government	
Commercial Industry (per gross hectare)	12.50	12.50
General Industry (per gross hectare)	12.50	12.50
Medium Density Residential (per gross hectare)	30.00	30.00
Park Residential (per lot – 6,000m^2 average)	1.50	0.00
Low Density Residential (per lot – 2,000m^2 average)	1.25	1.25
Rural Non-Urban (per lot)	1.50	0.00
Urban Residential (per gross hectare)	10.00	10.00

NOTE: Gross hectares include all land within the development excluding parkland only.

Table 2 - ET Conversion Factor for Uses Resulting in Increased Demands or Loads

Types of Uses	ET Conversion Factor	
	Water	Wastewater
Aged Persons and Special Needs Housing		
(1) (1 bedroom)	0.33	0.33
(2) (2 bedroom)	0.57	0.5
(3) (3 bedroom)	0.76	0.63
(4) Hostel (per person)	0.28	0.33
(5) Nursing Home (per bed)	0.31	0.35
Apartment Building (per unit)	0.53	0.68
Bulky Goods Showroom (per 100m^2 floor area)	0.14	0.2
Child Care Centre (per child)	0.04	0.03
Commercial Office (per 100m^2 floor area)	0.13	0.17
Community Facility - Welfare Premises (per lot)	0.64	0.4
Display and Sale Activity (per 100m^2 floor area)	0.48	0.2
Dual Occupancy (per unit)	0.53	0.68

Types of Uses	ET Conversion Factor	
	Water	Wastewater
Dwelling House (per lot)	1	1
Education Facility		
(1) Primary School (per pupil)	0.035	0.03
(2) Secondary School (per pupil)	0.05	0.05
Garden Centre (per 100m^2 site area)	0.48	0.2
General Industry - Concrete Batching Plant (per 100m^2 site area)	0.28	0.06
General Industry (per 100m^2 floor area)	0.1	0.07
Health Care Centre (per 100m^2 site area)	0.21	0.3
Heavy Industry (per 100m^2 floor area)	4.5	6.18
Hospital (per bed)	0.93	0.93
Hotel (per 100m^2 floor area)	0.8	1.15
Indoor Recreation Facility		
(1) With shower facilities (per 100m^2 floor area)	0.45	0.6
(2) No shower facilities (per 100m^2 floor area)	0.06	0.07
Marine Services (per 100m^2 floor area)	0.1	0.07
Mobile Home Park (per site)	0.34	0.5
Multiple Dwelling (per unit)	0.53	0.68
Outdoor Recreation Facility (per 100m^2 floor area)	1.06	1.3
Refreshment Establishment (per 100m^2 floor area)	2.05	2.87
Retail Warehouse (per 100m^2 floor area)	0.14	0.2
Service Station (per 100m^2 floor area)	1.36	0.4
Shop		
(1) Over 6000m^2 floor area (per 100m^2 floor area)	0.42	0.57
(2) 200m^2 - 6000m^2 floor area (per 100m^2 floor area)	0.34	0.4
(3) Under 200m^2 (per 100m^2 floor area)	0.28	0.4
Small Lot House (per lot)	1	1
Tourist Accommodation - Caravan Park (per site)	0.34	0.5
Tourist Accommodation - Motel (bedroom)	0.23	0.32
Vehicle Depot		
(1) cars (per 100m^2 floor area)	0.06	0.03
(2) trucks (per 100m^2 floor area)	0.8	0.6
Vehicle Repair Premises (per 100m^2 floor area)	0.11	0.12
Veterinary Surgery (per lot)	0.48	0.4
Warehouse - Freight Depot (per 100m^2 floor area)	0.39	0.4

Types of Uses	ET Conversion Factor	
	Water	Wastewater
Warehouse (per 100m^2 floor area)	0.04	0.01

Note: The conversion factor to equivalent tenement for other uses that are not listed in Table 2 will be determined by a competent consultant engaged by the developer. The consultant is to be approved by the Local Government and the determination of the ET conversion factor is to be undertaken in consultation with the Local Government.