

Policy 11: Land Development Guidelines

Section 4

4.0 Water Reticulation – Design Requirements

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4.1 Introduction

These Guidelines provide:

- Council's minimum standards for developments encompassing Traditional Potable water reticulation including any works required to join with existing and adjoining Traditional Potable water reticulation systems;
- Council's minimum standards for developments encompassing Dual water reticulation of both Potable and Recycled water including any works required to join with existing and adjoining Dual water reticulation systems;
- Council's minimum standards for Trunk Water Supply systems covering both Potable and Recycled water supplies including any works required to join with existing and adjoining Trunk Water Supply systems.

Potable water is defined as drinking water complying to the **NH&MRC Guidelines**.

Recycled water is defined as Non-Potable water complying to the **Queensland Recycled Water Guidelines** for Class A+.

Dual Reticulation is defined as a water supply system consisting of both Potable water mains and Recycled water mains.

For details on the different formats of water supply systems refer **Section 4.2.3.3 – Flow Parameters**.

These Guidelines are a collation of **Sections 4.2 and 4.3** of the **2005 Guidelines** and now include Trunk infrastructure guidelines.

The design of Council's Dual Reticulation system has changed from the format shown within the Pimpama Coomera Interim Guidelines and replicated within the 2005 Land Development Guidelines.

With acceptance by the Queensland Fire and Rescue Services of the use of Class A+ Recycled water for Fire Fighting purposes, and with the Queensland Government's regulations controlling the provision of this product, the format of Dual Reticulation will now be based on the Recycled Class A+ system providing for Fire Flows and the other approved uses, refer **Section 7** with the Potable system providing only Domestic demands and approved commercial/ industrial uses.

4.2 Design Requirements

4.2.1 General

Traditional Potable water reticulation mains are defined as mains of 100 mm to 300 mm diameter used to convey potable water to properties. These main sizes are specific to the Traditional Potable systems within the City.

Dual Reticulation water mains are defined as:

- Recycled water system mains of 100 mm to 300 mm diameter; and
- Potable water system mains of 63mm to 300mm diameter; where
- both of these types of mains are used to convey a water product to properties.

It is to be noted that Dual Reticulation Potable water mains are different sizes and materials to the Traditional Potable water reticulation mains.

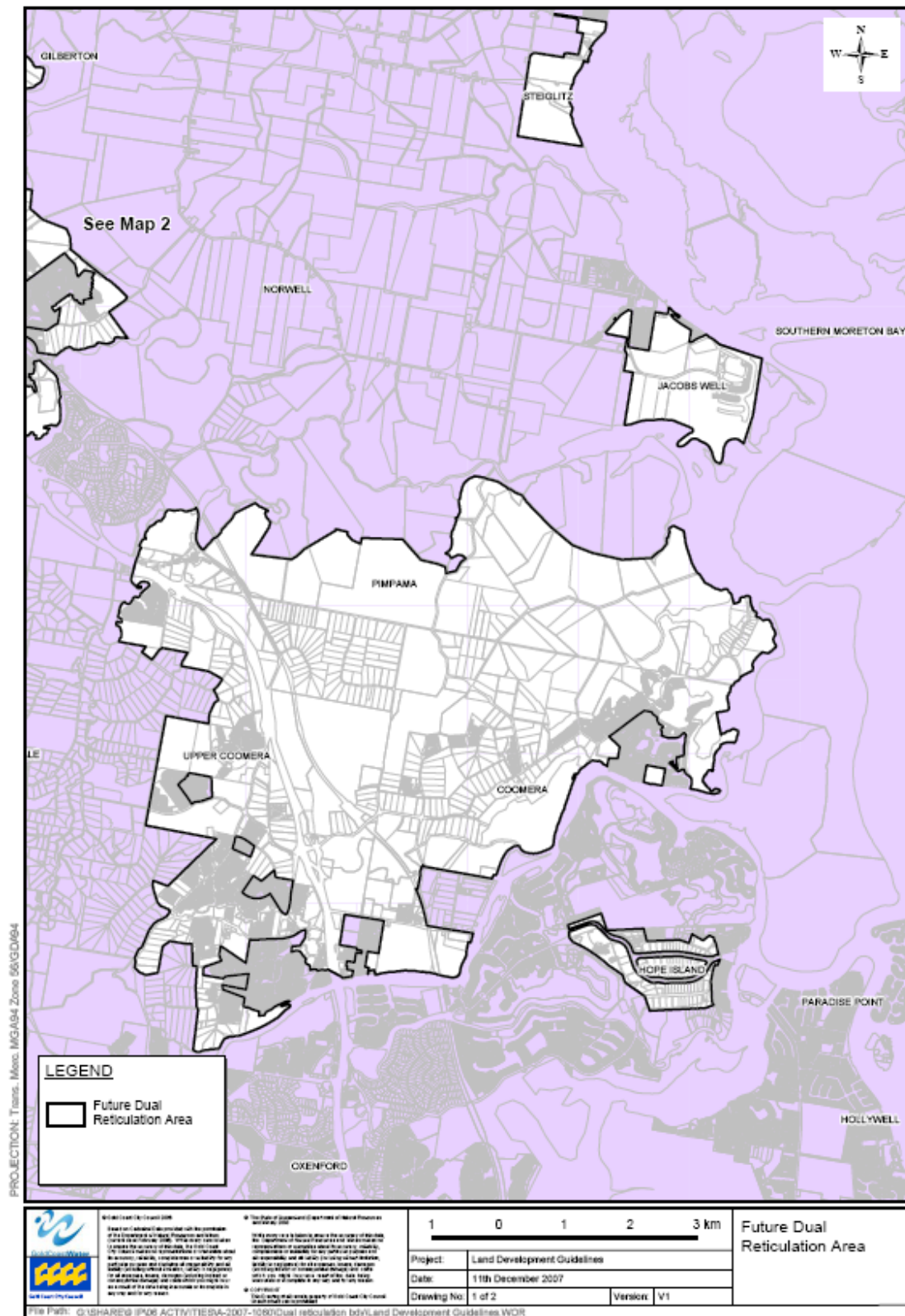
To assist in the determination and assessment of properties that are served or to be served by Dual Reticulation, a set of maps showing the future Dual Reticulation areas have been included on the following pages. These maps shall be used with **Overlay Map OM25 – Future Water Innovation**.

Trunk water system mains for both Potable and Dual supplies are generally defined as mains of 300mm and larger diameter. The design and construction of Trunk (Headworks) mains within the Gold Coast City shall be co-ordinated by Council.

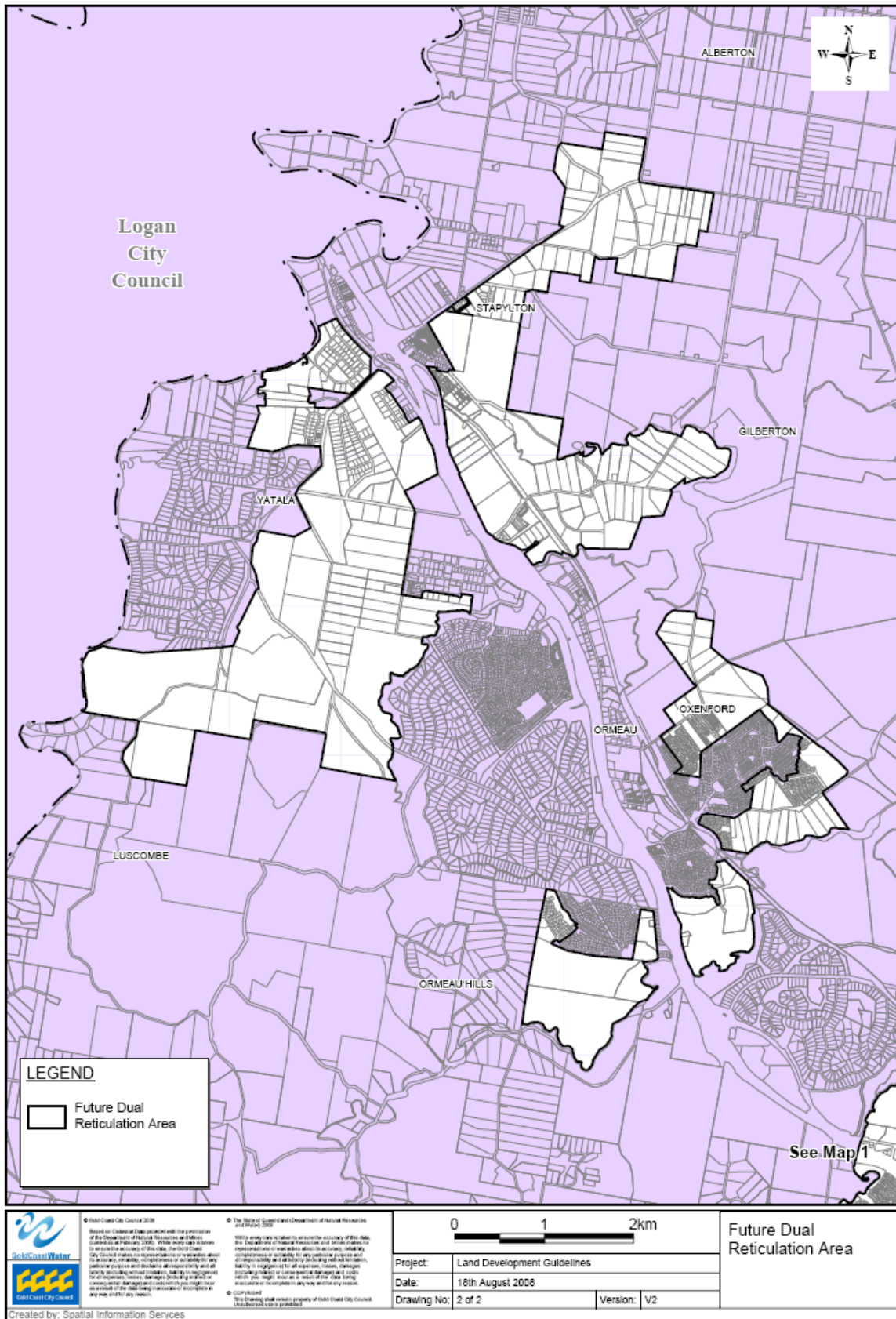
All water supply system mains shall be designed and certified in accordance with the following provisions:

- Council's general criteria as set out in these Guidelines and **Council's Standard Specifications and Drawings** that are based on the Desired Standards of Service; and
- the current **Department of Natural Resources and Water Planning Guidelines for Water Supply and Sewerage Schemes**; and
- for general guidance on infrastructure elements not contained within Council's documents, the criteria contained within the **WSAA Water Supply Code of Australia – WSA 03-2002** and the associated supplement on **Dual Water Reticulation Systems** may be used for guidance;
- the designer shall note the **Queensland Workplace Health and Safety – Guide to the Workplace Health and Safety Obligations of Designers of Structures** and the design shall include the required Safety Design Report.

Council's Development Guidelines, Standard Specifications and Standard Drawings shall take precedence over the Department of Natural Resources and Water Planning Guidelines and the WSA Water Supply Code and Drawings and its Dual Water Reticulation Supplement.



Map 1 – Future Dual Reticulation Area



Map 2 – Future Dual Reticulation Area

4.2.2 Aim

The aim of this Guideline is to provide developers and their Consultants with Council's general criteria to ensure that:

- Potable water is adequate in quality, pressure and volume of flow for household purposes and firefighting purposes where required;
- Recycled water at Class A+ is adequate in quality, pressure and volume of flow for household purposes and firefighting purposes where provided;
- all water supply schemes conform with Council's goals and objectives as summarised in **Section 2.2 – Preliminary Developmental Layout** of the **Land Development Guidelines**;
- the reliability, safety and effectiveness of Council's water supply is maintained;
- water supply infrastructure is of adequate quality to minimise maintenance costs; and
- water losses are minimised through the use of appropriate Pressure and Leakage Management installations.

4.2.3 Network Analysis

Prior to proceeding with the detailed design of reticulation mains, the Consultant shall liaise with Council to ascertain whether a network analysis (to determine the optimum size of the internal mains) is required by Council as part of the design submission for the development.

Trunk water system mains detailed design shall include a network analysis as a part of the design submission to Gold Coast Water. The parameters of the network analysis shall be defined following discussions with Council.

Where a network analysis is to be provided, the analysis shall be completed by the Consultant following discussions with Council and shall be based on the following specific criteria.

4.2.3.1 Supply Point Information Provided by Council

- a) Estimated present pressure or the Hydraulic Grade Line (HGL) at supply point or nearest node.
- b) Worst case pressure or the Hydraulic Grade Line (HGL) during the life of the development.
- c) Maximum pressure where applicable.
- d) For developments with Dual Reticulation, until a recycled water supply system (both reticulation and trunk mains) has been constructed, the only nominal supply point for the recycled system shall be a Standard Cross Connection as detailed in Council's **Standard Drawing N° 08-06-114**. This standard cross connection shall be located clear of property service off takes and probable driveway locations. The cross connection valve shall be covered by a Class B 600mm manhole cover and surround that is coloured lilac and the actual connection tees and connection valve shall be painted red.
- e) Consultants shall ensure that only the minimum number of cross connections necessary to serve the development is installed. Generally only ONE (1) standard cross connection shall be supplied for each development unless the development network modelling determines additional standard cross connections are required. Council shall be consulted for information regarding cross connection needs and locations.

4.2.3.2 Population Estimates

Council's Planning Scheme documents are being revised and as such population estimates shall be based on the densities set out in either Council's '**Our Living City – Gold Coast Planning Scheme Policies**' **Policy 3A – Policy for Infrastructure Water Supply Network Developer Contributions** or Council's '**Our Living City – Gold Coast Planning Scheme**' **Part 8 – Infrastructure**, as appropriate unless noted otherwise by a specific planning approval.

4.2.3.3 Flow Parameters

Council's Standards of Service for Traditional Potable systems, Dual Reticulation systems and Trunk Infrastructure for both systems are based on the following scenarios:

- Case 1: Potable water only (Traditional Reticulation areas)
- Case 2: Potable water plus rainwater tanks (Infill Development areas)
- Case 3: Potable and Recycled water Dual Reticulation (Greenfield Scenario One)
- Case 4: Potable and Recycled water Dual Reticulation water and rainwater tanks (Greenfield Scenario Two)

Table 4.2–A provides the Potable water criteria and **Table 4.2–B** provides the associated Recycled water (Class A+) criteria used within the above Case scenarios.

Table 4.2–A Potable Water Supply Average Day Demand and Peaking Factors

Item ³	Design Criteria	Property Type	Case	L/ET/day = AD	Peaking Factors (PW5)		
					MDMM	MD	MH
PW 1	Distribution System ¹	RSF Residential Single Family	Case 1	880	1.23	1.49	4.22
			Case 2	616	1.75	2.12	6.03
			Case 3	484	1.14	1.31	2.67
			Case 4	352	1.34	1.54	3.14
		RMF Residential Multi-Family	Case 1	880	1.14	1.31	2.67
			Case 2	792	1.27	1.45	2.97
			Case 3	616	1.14	1.31	2.67
			Case 4	440	1.43	1.63	3.34
		Commercial/ Public	Case 1	880	1.06	1.12	2.32
			Case 2	880	1.06	1.12	2.32
			Case 3	440	1.06	1.12	2.32
			Case 4	440	1.06	1.12	2.32
		Industrial	Case 1	880	1.06	1.12	1.54
			Case 2	880	1.06	1.12	1.54
			Case 3	792	1.06	1.12	1.54
			Case 4	792	1.06	1.12	1.54
		Tourist	Case 1	880	1.59	2.26	5.43
			Case 2	792	1.76	2.51	6.03
			Case 3	616	1.59	2.26	5.43
			Case 4	440	1.99	2.83	6.79
		Irrigation	Case 1	880	1.15	1.37	2.40
			Case 2	880	1.15	1.37	2.40
			Case 3	220	1.15	1.37	2.40
			Case 4	220	1.15	1.37	2.40
PW 2	Treatment		Case 1	800			
			Case 2	560			
			Case 3	440			
			Case 4	320			
PW 3	Source of Supply		Case 1	800			
			Case 2	560			
			Case 3	440			
			Case 4	320			

Notes:

- 1** The design of Dual Reticulation Potable PE mains shall be based on the details shown within Table 4.2–C.
- 2** Refer to Table 4.2–B for definitions of Property Types and Peaking Factors.
- 3** Refer to the Standards of Service for all Item definitions.

Table 4.2–B Recycled Water Supply Average Day Demand and Peaking Factors (Class A+)

Item	Design Criteria	Property Type ¹	Case	L/ET/day = AD	Peaking Factors (RW5)		
					MDMM	MD	MH
RW 1	Distribution System ¹	RSF Residential Single Family	Case 3	396	1.33	1.70	6.12
			Case 4	396	1.53	1.93	6.60
		RMF Residential Multi-Family	Case 3	264	1.21	1.45	2.67
			Case 4	264	1.33	1.59	2.67
		Commercial/ Public	Case 3	440	1.08	1.18	2.32
			Case 4	440	1.13	1.24	2.32
		Industrial	Case 3	88	1.08	1.18	1.54
			Case 4	88	1.13	1.24	1.54
		Tourist	Case 3	264	1.86	2.83	5.43
			Case 4	264	2.38	3.43	5.43
		Irrigation	Case 3	660	1.22	1.53	2.40
			Case 4	660	1.35	1.71	2.40
RW 2	Treatment		Case 3	360			
			Case 4	360			
RW 3	Source of Supply		Case 3	360			
			Case 4	360			

Notes:

- 1
 - RSF** Residential Single Family – Village, Park Living and Detached Dwelling Domains
 - RMF** Residential Multi Family – Residential Choice Domain
 - COM** Commercial – Integrated Business, Local Business and Fringe Business Domain
 - IND** Industrial – Industry 1, Industry 2, Extractive Industry and Marine Industry Domains
 - TOR** Tourist – Tourist and Residential Domain
 - PUB** Public – Public Open Space Domain
 - IRR** Irrigation
 - GEN** General – Community Purpose Domain
- 2
 - AD** Average Day Demand
 - MDMM** Mean Day Maximum Month Demand
 - MD** Maximum Day Demand
 - MH** Maximum Hour Demand
- 3
 - MH** Sourced from diurnal patterns for MD

4.2.3.4 Pressure Parameters

a) Minimum Service Pressure (excluding fire fighting):

Table 4.2–C

Minimum Pressure	Potable – 22 metres head. Recycled – 17 metres head direct from reservoir. Recycled – 20 metres head within Demand Management Area.
Minimum Pressure Location	In the main at the property boundary.
Minimum Pressure Network Condition (for modelling from a reservoir)	Reservoir Minimum Operating Level (MOL) and system demand to be MH. Minimum operating level is the greater of the following: <ul style="list-style-type: none"> ▪ 15% of storage height; or ▪ top of emergency storage being the greater of 0.5 ML or 4hrs MDMM demand in zone. Liaise with Gold Coast Water to confirm minimum pressure constraints. MH and MDMM shall be confirmed by Gold Coast Water prior to design.

b) Maximum Service Pressure:

Table 4.2–D

Maximum Pressure	Potable 80 metres head ¹ Recycled 75 meters head ¹ .
Maximum Pressure Location	In the main at the property boundary.
Target Maximum Pressure	Potable – 55 metres head at the property boundary. Recycled – 50 metres head at the property boundary.
Maximum Pressure Network Condition (for modelling from a reservoir)	Based on reservoir level at 95 percent of top water level.

Note 1: *Where the pressure in a main exceeds 700 kPa, Council shall require the installation of Pressure Reducing Valves (PRV) that may (at Council’s discretion) include telemetry control. Prior to proceeding with any design, Council shall be provided with details of the area affected and the number of lots involved. PRV installations where approved by Council shall be installed to the general details contained in Council’s Standard Drawing No 08-06-120.*

4.2.3.5 Fire Fighting Parameters

Table 4.2–E

Network Pressure	12 metres head in the main at the nearest hydrant point.
Fire Flow Residential Lot	15 L/s for 2 hrs. 7.5 L/s for 2 hrs for Small Communities (See Note 1).
Fire Flow Industrial or Commercial Lot	30 L/s for 4 hrs. 15 L/s for 4 hrs for Small Communities (See Note 1).
Background Demand	<u>Residential</u> – 2/3 Maximum Hour (MH) (not less than AD) with positive residual pressure at MH. <u>Non-Residential</u> – MH for localised Commercial/Industrial and 2/3 MH for water supply zone. Worst case scenario should be used. MH shall be confirmed by Gold Coast Water prior to design.
Reservoir Level	MOL, refer Subclause 2.3.4 a) for Network Condition.
Number of Fires	Single residential fire or single commercial/industrial fire. Liaise with Gold Coast Water to confirm minimum pressure constraints.
Location of Fires	n/a

Note 1: *Gold Coast Water defines Small Communities as rural/park residential developments built prior to 2000, and any development provided after 2009 where a specific planning approval has been given.*

The application of Fire Flows shall be as follows:

- Traditional Potable systems shall be designed with Fire Flows.
- Dual Reticulation systems 2003-2008 designed with Fire Flows in both mains for DN100 and larger sizes.
- Dual Reticulation systems after June-December 2008 are designed with Fire Flows only in Recycled System mains.

4.2.3.6 Storage Parameters

Table 4.2–F

Ground Level Storage Capacity (kL)	Capacity = Operating Volume + Emergency Storage. <u>Operating Volume</u> - 3(MD-MDMM). MD = confirmed by Gold Coast Water prior to design. <u>Emergency storage</u> - Greater of 4 hours MDMM demand or 0.5 ML whichever is the greater. In zones where the service area is < 350 ET, the emergency storage can be reduced to 150 kL. All Capacities shall be confirmed by Gold Coast Water prior to design.
Elevated Storage Capacity (kL)	Capacity = Operating Volume + Fire Storage. <u>Operating Volume</u> - Water Supply zones where 8 hours x MH is less than or equal to MDMM demand the Operating Volume = 2 hours x MH. Water Supply zones where 8 hours x MH is greater than MDMM demand the Operating Volume = 6(MH-(MDMM/12)). <u>Fire Storage</u> – 150kL. All Capacities shall be confirmed by Gold Coast Water prior to design.

4.2.3.7 Pump Parameters

Table 4.2–G

Duty Pump serving Ground Level Reservoir	MDMM demand over 20 hrs. MDMM shall be confirmed by Gold Coast Water prior to design.
Duty Pumps serving Elevated Reservoirs	$(6 \times \text{MH} - \text{Operating Volume}) / (6 \times 3600)$ in L/s.
Standby Pump Capacity	Capacity to match the largest single unit pump capacity.

4.2.3.8 Pipeline Parameters

Table 4.2–H

Pipe Capacity – Bulk Distribution Mains	MDMM in 24 hrs/ day for gravity mains. MDMM in 20 hrs/ day for pumped mains. MDMM shall be confirmed by Gold Coast Water prior to design.
Pipe Capacity – Zone Trunk and Reticulation Mains	Minimum Service Pressure criteria or Fire Fighting requirements, whichever is the more critical condition.
Friction Equation	Hazen-Williams.
Maximum Velocity	2.5 m/s.
Maximum Headloss	Refer WSAA Code.

4.2.3.9 Dual Reticulation Potable Main Sizing

To align with the new design format for Fire Flows within the Class A+ system, Council nominates that the sizes of Dual Reticulation Potable supply mains shall be DN63 and DN110 in PE 100 polyethylene pipe materials and DN150 and larger Dual Reticulation Potable supply mains shall be either DICL or PVC pipe materials.

Mains in these size ranges shall not be provided with any designed fire flows or standard hydrant off takes. General mains maintenance access, Fire Services access to the system for Potable (Health) water and commercial customer standpipe access shall be carried out using flushing valves with Storz hose couplings.

To facilitate the easy integration of the new Dual Reticulation Potable water main system for smaller developments and to permit Council a degree of safety in design flows for this new system, an Empirical table for pipe sizing is provided below at **Table 4.2 – I**.

Table 4.2 – I Number of Lots Serviced per Pipe Diameter

Nominal size of Potable main @ PN16 pipe	Nominated capacity of main for Residential Single Family Domain Lots (ETs) (Single supply point only)
PE100 – 63 OD at 51mm ID	14 ET
PE100 – 110 OD at 89mm ID	50 ET
DICL/ PVC – DN150	250 ET

Notes:

- 1** Mains larger than DN63 include the identified ET capacity of the smaller mains.
- 2** Modelling of the network may increase nominated capacities.
- 3** Pipes larger than DN150 shall be designed to the details within Section 4.2.3.3.

4.2.3.10 Headloss Calculations

For headloss calculations, the Hazen-Williams formula is generally used. The formula is:

$$H = L \times \left(\frac{100,000 \times Q}{0.359 \times C \times D^{2.63}} \right)^{1.852}$$

Where:

- H = headloss in metres
- L = total length in metres
- Q = flow rate in litres per second
- D = diameter in mm
- C = Hazen-Williams factor

Maximum C Value – Treated Water (Potable and Recycled)			
Mains Diameter (mm)	C Value	Mains Diameter (DN mm)	C Value
< or = 110 PE	120	250 & 300 DI	110
100 DI	100	250 & 300 PVC	110
100 PVC	100	375 to 600	120
150 & 200 DI	110	Greater than 600	125
150 & 200 PVC	110		

The above values take into account losses for pipe fittings such as bends, valves, tees, reducers, crosses, etc. and the effect of pipeline ageing.

4.2.4 Water Supply Schematic Plan

Where Council requires a Schematic Plan based on the Network Analysis as defined in **Section 4.2.3** the plan shall include the following:

- a) Layout of mains, together with the development layout.
- b) Key to network analysis, eg. node points, elevation, demand.
- c) Size and type of mains, indicated graphically and distinguished by colour and/or line type.
- d) Design parameters – number of lots, number of ET, design flows.
- e) Legend of Domain types (ie. Residential, Industrial Precincts, etc.).
- f) Supply points and pressure or Hydraulic Grade Line (HGL) as supplied by Council.
- g) Location of pumps, pressure reducing valves and reservoir Top Water Level (TWL) and volume where applicable and a listing of proposed easements and land to be dedicated to Gold Coast Water.
- h) Limit of water district serviced by the reticulation or trunk mains.
- i) Proposed contours for the entire development, at minimum 5m intervals.
- j) Consideration for connection to adjoining and/or future developments as directed.
- k) Valve layout including standard cross connections.

The network analysis shall be based on the flow and pressure parameters in **Section 4.2.3.3** and **4.2.3.4**. The results of the network analysis shall be supplied on printed A4 sheets or as directed by Council and shall include the residual pressure and HGL at each node in addition to the flow rate and minimum/ maximum velocities in each pipe section.

For remote developments an analysis of the need for re-chlorination shall be carried out, refer to **Section 4.2.22**.

4.2.5 Trunk Mains

Trunk mains are those major components of Council's **Potable and Recycled Water Supply Scheme** deemed necessary to provide services on a regional and district basis. They are generally referred to as Headwork's mains and are outlined in Council's Planning Scheme documents. The design and construction of these trunk mains within Gold Coast City shall be co-ordinated by Council.

It is a mandatory Council requirement that no property service connections will be allowed from trunk mains 375mm diameter or larger. In such cases a separate reticulation main shall be provided to service the development.

All trunk main designs and any main design of 250mm diameter and larger shall provide a plan and a long section of the proposed installation.

4.2.6 Pipe Sizes, Type and Class

The type and class and colour of pipe shall comply with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

4.2.6.1 General

All mains that cross a roadway or are located within the roadway shall be Ductile Iron or Steel pipe. The Ductile Iron or Steel pipe shall extend a minimum of 1.0 metre past the kerb when leaving the roadway.

The exception to the above roadway requirement is for PE100 materials where Council permits fully welded PE100 mains at DN63 and DN110 to **cross** a roadway without a change in material type. PE mains with service connection off takes or flushing points are not permitted to be located within the roadway.

In non-urban situations, mains that are constructed parallel to the road centreline and located within the unpaved (eg. no asphalt) road shoulder are permitted to have service connection off takes and shall be Ductile Iron.

The actual size of mains shall be determined as set out in **Section 4.2.3** of these Guidelines.

All main designs of 250mm diameter and larger shall provide a plan and a long section of the proposed installation.

Pipes of the size, type and class which do not comply with Council Standard Specifications, ie. river crossing (polyethylene) may only be used with the written approval of Council. Where an alternative main material is approved for use, the engineering drawings shall detail the jointing method and joint test methods and any other construction requirements, which are not as per Council Standard Specifications.

a) Traditional – Potable Reticulation Systems

Traditional Potable reticulation mains shall be coloured blue and be of the following diameters: 100 mm, 150 mm, 200 mm, 250 mm and 300 mm.

For traditional Potable reticulation mains, the minimum allowable size for any reticulation main in residential precincts shall be 100 mm and for industrial and commercial precincts 150 mm. The industrial and commercial 150mm main shall be directly available to each allotment from Council's standard verge allocation ie. the main is located on the same side of the roadway as the allotment.

Council will permit the last few allotments of a residential *cul-de-sac* end to be provided with a blue coloured 63mm OD PE100 main that is located after a hydrant to the details shown within Council's **Standard Drawing N° 08-06-002**.

b) Dual Reticulation – Potable Reticulation Systems

Dual Reticulation Potable PE mains shall be coloured blue or black with blue stripes and shall be of the following diameters in a PE 100 material: 63mm and 110mm.

Dual Reticulation Potable mains for the remainder of the system shall be coloured blue and be a DICL/ PVC material in DN150, DN200, DN250 and DN300.

c) Dual Reticulation – Recycled Reticulation Systems

Recycled water reticulation mains shall be coloured purple and be of the following diameters in a DICL/ PVC material: 100mm, 150mm, 200mm, 250mm and 300mm.

For Recycled Water Reticulation mains the minimum allowable size for any reticulation main in residential precincts shall be 100 mm and for industrial and commercial precincts 150 mm. The industrial and commercial 150mm main shall be directly available to each allotment from Council's standard verge allocation, ie. the main is located on the same side of the roadway as the allotment.

Council will permit the last few allotments of a residential *cul-de-sac* end to be provided with a purple coloured 63mm OD PE100 main that is located after a hydrant to the details shown within Council's **Standard Drawing N° 08-06-002**.

d) Trunk Systems

Trunk system mains for either Traditional Potable or Dual Reticulation systems shall be appropriately coloured and be of the following diameters: 300mm, 375mm, 450mm, 525mm, 600mm, 750mm, 900mm and larger sizes as determined by Council.

Trunk main pipe types shall be selected based on the results of a Geotechnical, Corrosion Potential and Pressure Potential investigation and any proposed pipe system shall be approved by Council prior to final design.

4.2.6.2 Surge and Fatigue Analysis

Where identified by the network analysis (refer **Section 4.2.3**), the source of any significant pressure surges in the system shall be identified and remedial measures specified. Where plastic pipes are to be used in mains affected by any significant pressure variations (ie. after a pump), a surge analysis of the system shall be undertaken. The surge analysis shall be undertaken for the full range of variations to determine the magnitude of the surge pressure and the amplitude and number of the cyclic loadings for a design life of 50 years at PNI6 for the system. This shall be achieved through re-rating the pipe class for both surge and fatigue in accordance with the manufacturer's recommendations.

For guidance on surge and fatigue analysis refer **Water Supply Code of Australia (WSA) 03-2002, Section 3.5 Design for Surge and Fatigue**.

4.2.7 Property Service Connections

Council requires that all allotments, premises and premises groups within a water service area make a connection to Council's appropriate Water Supply system. The service shall be designed and installed to provide all necessary flows to all fixtures and end use points as detailed in **Section 7**.

a) General

A Property Service is defined as a short pipe installed for connecting premises to a service providers infrastructure (Traditional Potable main or Dual Reticulation mains) including any necessary boxes, lids, valves, fittings and water meters (Potable and Recycled).

Property services may be single service pipework or twin service pipework subject to lot layout and specific design of the development.

Service conduits shall be provided under all roads to accommodate current and future DN25 to DN63 domestic property service connections in accordance with Council's **Standard Drawing N^{os} 08-06-001 to 08-06-003, 08-06-108 and 08-06-109**.

The property service shall be located as follows:

- to match the common boundary of lots to be serviced;
- provided through service conduits across roads and verges (refer above);
- aligned at 90° (+ or – 5) to the reticulation main within the footpath verge directly opposite the property being serviced.

The property service shall be connected to the water main and water meter box in accordance with Council's **Standard Drawing N^{os} 08-06-108 and 08-06-109**.

In all Domains, ENERGEX services shall be located at alternate boundaries to the water property services and to the hydrant.

However in Park Living Domains, Council may consider other locations.

It is the Consultants responsibility to ensure that the various formats for the services and conduits (as detailed below) are clearly shown in the Engineering Drawings and do not conflict with other underground Public Utility services.

Council requirements are detailed on Council's **Standard Drawing N^o 05-02-601**.

b) Property Service Conduit

For residential Detached Dwellings, Park Living and Duplex Sites with Class 1 buildings (refer BCA), a 100mm diameter PVC Class 12 property service conduit allowing for a maximum of two (2) property services per conduit shall be provided.

In cases where two (2) Duplex Sites adjoin each other (ie. four (4) dwellings), either four (4) 100mm diameter conduits shall be provided so that each conduit can support two (2) single property services or two (2) 100mm diameter conduits shall be provided so that each conduit can support two (2) twin property services.

It is required for corner duplex allotments that the conduits and services provided shall be located 1000mm off the edge of the driveway crossover, generally off-centre of the long roadway boundary.

For all other Residential, Commercial and Industrial Domains (other than Extractive Industry) that do not have the main available on the allotment side of the roadway shall provide a 150mm diameter PVC Class 12 property service conduit, allowing for two (2 x DN63) PE property water services per conduit, shall be provided.

Council permits the provision of potable water and a recycled water property service (either single or twin) within a single 100mm diameter property service conduit, refer **Clause 4.2.6** of these guidelines for mandatory pipe colour coding details.

Larger domestic and Fire systems water services shall be installed, by open trenching where needed, at the time of allotment building development.

c) Property Service Connection

i) New Mains

For all new 63mm to 300mm diameter water mains, a 20mm minimum ID property service shall be provided for each residential allotment, by the Developer, to support the different system water uses identified in **Section 7**.

Such services shall be provided for all Detached Dwellings and Park Living lots and for all Duplex (Dual occupancy) dwellings, ie. for Traditional Potable systems two (2) service connections per Duplex lot, in accordance with details shown on Council's **Standard Drawing N° 08-06-108** and for Dual Reticulation systems two (2) recycled water service connections and two (2) potable water service connections per Duplex lot, in accordance with details shown on Council's **Standard Drawing N° 08-06-109**.

Council now permits the provision of either a single or a twin property water service.

For traditional Potable water systems:

- a single service shall be a minimum of DN25 PE;
- a DN32 PE twin service up to 20.0 metres in length is permitted from the 20mm ID ball valve at the main up to the splitter tee with DN25 PE to be used from the splitter tee up to the water meter box pipe connection. Services over 20.0 metres in length shall be an individual single service.

For Dual Reticulation water systems:

- a single service shall be a minimum of DN25 PE;
- a DN32 PE twin service up to 20.0 metres in length is permitted from the 20mm ID ball valve at the main up to the splitter tee with DN25 PE to be used from the splitter tee up to the water meter box pipe connection. Services over 20.0 metres in length shall be an individual single service.

The property service connection to the main shall consist of either a ductile iron main fitting (similar to ready tap) or for Poly mains an electrofusion tapping saddle.

These connection points shall be provided with a control valve that is either a ball valve connected to the ductile iron tapping fitting for DI or PVC mains or an electrofusion tapping saddle that has an integral cutter and control valve for PE mains.

Ductile iron main fittings (similar to ready tap) that support water service off takes for 150mm, 200mm, 250mm and 300mm diameter DI and PVC water mains that only have a single tapping port, shall be provided with DR brass components that support the following:

- a minimum 20mm ID ball valve for each property serviced;
- a maximum of 4 (four) property services per fitting as either single or twin property water services;
- sized to ensure the hydraulic capacity to individual lots meets the design criteria (depending on zoning, lot configuration and service type);
- the remainder of the water supply property service connection from the main tap ball valve shall be as previously described above.

The DN25 and DN32 water service pipe in PE80B or PE100 material shall be solid Purple coloured for the Recycled water systems and Black with blue stripes for Potable water systems.

Where multiple recycled and potable property service conduits are necessary in developments with allotments fronting roads declared under the **Transport Infrastructure Act**, approval in writing of the multiple property service conduit format, shall be obtained from Main Roads. Alternatively, if approval is not obtained for these conduits, then a traditional water supply 'Rider' main or a dual reticulation water supply 'Rider' main as appropriate shall be provided on the alternate side of the road reserve. The Rider main or mains may be provided as a PE main where Fire Flows are available in the main on the other road side verge.

For residential Detached Dwellings, Park Living and Duplex Sites with Class 1 buildings (refer **BCA**), the water service shall also consist of the Twin meter Box set up as appropriate for Traditional Potable supplies or for Dual Reticulation supplies. Following the installation of the Twin Meter Box by the Contractor and during the On Maintenance process, the Twin meter Box shall have the Water Meters installed by Council at the cost of the Developer.

For all other Domains, a complete Property Service connection that includes the meter installation and tapping of the main shall be installed by the Council at the time of the building application and at the cost of the applicant.

ii) Existing Mains – All Products

Where a development fronts an existing water main, provision for property service connections shall be as follows:

- **Across Road (Long) Connection** – a suitably sized service conduit shall be provided for each dwelling/ allotment at the cost of the Developer. The complete Property Service connection that includes the meter installation and tapping of the main shall be installed by the Council at the time of the building application at the cost of the applicant.
- **Footpath Verge (Short) Connection** – the complete Property Service connection that includes the meter installation and tapping of the main shall be installed by the Council at the time of the building application at the cost of the applicant.

In addition to the above, Council requires that a path box be provided within the footpath at any existing main water service off take as detailed in Council's **Standard Drawing N^{os} 08-06-105** and **08-06-302**.

iii) Trunk Mains

No property service connections are permitted to a Trunk main.

4.2.8 Alignment of Mains

a) General

Council requires the alignments of mains to focus on the Goals identified in **Section 2.2.1** of the **Land Development Guidelines** and in particular 'Convenience' for the operation and maintenance of the provided infrastructure.

The acceptance of the installation of mains within roadways and verges excludes the placement within the roadway or verge of any asset element that is above the level of the roadway or footway or verge surface. Where an asset element is above the level of the ground then it shall be located within a parcel of land that is either an easement or is a lot in Fee Simple dedicated to Gold Coast Water.

b) Reticulation Systems

The alignment of water mains shall comply with the following criteria:

- as detailed in Council's **Standard Drawing N^o 05-02-005** and generally parallel to the Real Property Boundary;
- mains shall extend approximately 1 metre past the common boundary of the last 2 (two) properties serviced (refer Council's **Standard Drawing N^o 08-06-001**);
- Recycled water supply mains shall be located closest to the Real Property Boundary with the Potable water main located closest to the roadway (refer Council's **Standard Drawing N^o 08-06-002**);
- where Recycled water systems are provided, then the designer's attention is drawn to Council's **Standard Drawing N^o 05-02-005** that shows an allocation width of 1800mm for these systems.

Any proposed amendments to the above water main alignment criteria must be formally approved by both Council and the relevant Public Utility Authority.

Industrial and commercial allotments across the road from the main shall be provided with a shared hydrant and off take tee that is located at the prolongation of the common side boundary and within the verge allocation on the same side of the roadway as the allotments. The hydrant and off take tee shall connect to the 150mm main by a valve and tee and road crossing to the details shown on Council's **Standard Drawing N^o 08-06-003**.

Mains located through or within Water Sensitive Urban Design features shall be protected from maintenance functions associated with the Water Sensitive Urban Design facility.

Reticulation mains shall not be located in private property except for dedicated Link Mains that are identified as necessary from the Network Hydraulic Model. Where a Main is located within private property, an Easement shall be provided, refer to **Section 4.2.25** and the main shall be valved at each end of the easement and no service connections are permitted on the main within the easement.

Attention is drawn to Council's Policy document, *Building Near or Over Council Water, Sewer and or Stormwater Services* within Section 7.7 of these Guidelines.

It is a mandatory Council requirement that common trenching for water and sewerage with any other utility is not permitted.

c) Trunk Systems

Trunk mains shall be located in road reserves or within land under the control of Council where an Easement shall be provided. Trunk mains may be located within private property or Council property within an easement only where there is no other alignment available.

The alignment of Trunk Mains shall be defined after the following preliminary activities have been carried out:

- detailed engineering survey of the corridor of interest with particular reference to existing Utility services;
- correspondence with all Utility Service authorities concerning existing and future underground services in the corridor of interest;
- environmental impact assessment for both construction and future maintenance requirements of the proposed location. Environmental impact assessment should include proposed mitigation measures;
- pot holing of existing services to eliminate any confusion as to location;
- proposed Easement needs.

The alignment shall be specifically approved by Council prior to detailed design and shall provide clear definition of proposed access to appurtenances such as Air Valves and Scours focussing on the WH&S of all maintenance personnel.

Common trenching for water and sewerage together with any other utility is not permitted.

Where the main is to be located within an easement, the Easement shall be of sufficient width to allow both initial construction activities and future maintenance activities. Where access along the line of the easement is not practical, such as at creeks and cliffs, additional access easements from a roadway to the pipe easement shall be provided. Easement plans shall be provided to Council for Council approval.

d) State-Controlled Roads

Mains within a State-controlled road shall be located in accordance with the requirements of the Queensland Department of Main Roads.

Enveloper pipes with a grouted in main shall be provided for mains either crossing or within these road carriageways.

Where not provided within an enveloper pipe, bedding shall be as shown on Council's **Standard Drawing N^{os} 08-06-101 to 08-06-103**.

e) Council-Controlled Roads

- open cut trenching of existing road pavement is not permitted unless specifically approved by Council in writing;
- the designer shall consult with public utility providers to ensure there is no known conflict with existing or future services;
- the designer shall consult with transport planning to ensure there is no known conflict with future road upgrades;
- non-standard alignments are not permitted unless specifically approved by Council in writing.

4.2.9 Deflections of Mains

Where deflections are approved by Council, the following shall apply:

- only appropriate ductile iron fittings shall be used for DICL or PVC pipes;
- deflection of reticulation PE mains may be carried out through gradual deflection of the pipe or by set angle electrofusion fittings;
- deflection of flexible joints shall be to the tolerances permitted by the manufacturer;
- Council will not permit uPVC pipes to be 'bent' to maintain alignment or PVC pipe sockets to be joined to ductile iron spigots;
- steel mains shall be deflected via prefabricated deflections. Where this is not possible or practical, the Developer may request the approval of Council to use on-site deflections. If approval is given, then in all cases steel mains shall be deflected to the format and tolerances permitted by the manufacturer.

4.2.10 Depth and Cover to Mains

a) General

The maximum and minimum cover to mains shall be in accordance with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

Where the cover to water mains does not comply with Council's Standard Specification then the written approval of Council shall be obtained prior to the lodgement of the engineering drawings. The drawings will detail the cover, pipe type and class as well as the construction requirements, which are not as per Council's Standard Specification.

b) New Mains

Where a stormwater main or other conflicting utility service may force the water main to be located outside of Council's minimum or maximum cover requirements, ie. travel under the conflicting service, then the consultant shall provide a specific sectional view for each instance where the main is proposed to be laid under a conflicting service as a part of the design submission to Council.

c) Existing Mains

i) Existing Verge Locations

Where a roadway is provided over the top of an existing main or where a major service such as a storm water main interferes with the existing main, then the section of existing main under the road crossing or near the interfering service shall be replaced with a section of ductile iron water main as the road crossing and laid in accordance with Council's **Standard Specification SS2**.

Where the surface levels are increased or decreased over a section of existing main then those sections of existing main shall be replaced by a new main at Council's standard cover in accordance with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

ii) Existing Roadway Locations

For existing mains that are not Ductile Iron or Steel mains (ie. Non-metallic mains), where any form of Development extends or upgrades or changes surface levels of a roadway over the top of these types of existing main or where a major service such as a storm water main interferes with the existing main, then the section of existing main under the Development works or near the interfering service shall preferably be relocated at the alignments shown in Council's **Standard Drawing N° 05-02-005** and shall be replaced with a section of ductile iron or steel main as appropriate that is laid in accordance with Council's **Standard Specification SS2**.

For existing mains that are Ductile Iron or Steel mains and the surface levels are increased or decreased over a section of existing main then those sections of existing main shall be relayed or replaced at Council's standard cover in accordance with Council's **Standard Specification SS2**.

d) Clearance Between Mains

i) Horizontal

The minimum horizontal clearance between pipe side extremities for pipes of the same 'Utility' use (eg. water/ water) shall be equal to the Outside Diameter of the largest main in accordance with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

A solid or physical trench separation distance of 300mm minimum shall be maintained between the trenches for pipes of different 'Utility' use, eg. power/ water, sewerage/ water.

ii) Vertical crossing

The minimum vertical clearance between mains shall be a clear 150mm.

4.2.11 Hydrants and Flushing Points

a) Hydrants

Hydrants shall be provided on Traditional Potable reticulation mains.

Hydrants shall be provided on Class A+ Recycled Water reticulation mains within Dual Reticulation systems.

Hydrants shall be designed in accordance with Council's **Standard Drawing N° 08-06-123**. Where the main will not be extended (eg. *cul-de-sac* end) a hydrant bend, riser and hydrant with a removable top and internal assembly (to provide a clean bore for high velocity flushing) shall be installed.

Where residential battle-axe lots are created, all battle-axe lot driveways shall have a hydrant located directly in front of the driveways common side boundary and on the same side of the roadway as the driveway. Battle-axe allotment building envelopes shall preferably be within 40 metres of a hydrant. Where this is not achieved, the design submission shall detail the fire protection methodology proposed for the battle-axe allotments building envelope.

Hydrants shall be spaced at a maximum of 80 metres and located as shown within Council's **Standard Drawing N° 08-06-001**. Hydrants shall not be located within road pavements.

b) Flushing Points

Flushing points shall be provided on Potable Water supply reticulation mains within Dual Reticulation systems.

Flushing Points shall be spaced at a maximum of 160 metres at every second Hydrant and shall be located as shown within Council's **Standard Drawing N° 08-06-002**. Flushing Points shall not be located within road pavements.

Flushing Points are not designed to provide Fire Flows as defined within **Clause 4.2.3.5**. They are to provide a maintenance facility for Council and as well a point for metered standpipe access to the Potable water system for commercial use by Council customers and for Health-Water uses by Fire Fighting personnel.

4.2.12 Service Valves

a) Reticulation Systems – Traditional Potable

Valves, as detailed within **Section 4.2.4 – Water Supply Schematic Plan**, shall be provided at all branches, tees, crosses, river crossings, major roadway crossings and railway crossings.

Stop valves shall be spaced at maximum multiples of 50 Property blocks and at a minimum of one per roadway with the stop valve located at the commencement of the main in accordance with Council's **Standard Drawing N° 08-06-122**.

Intermediate valves or section valves shall be provided at not greater than 100 Property block groups and at a maximum of 500m intervals.

In staged developments, valves shall be installed at the termination of work for each stage in accordance with Council's **Standard Drawing N° 08-06-122**.

Valves shall be located adjacent to common allotment boundaries and/or the tangent points of allotment boundary truncations and shall not be located in road carriageways.

All valves shall be provided with thrust restraint either directly within the flange attached main or directly at the valve.

b) Reticulation Systems – Dual Reticulation

Unless directed otherwise by Council, red coloured Sluice Valves shall be provided between all Standard Cross Connections in accordance with Council's **Standard Drawing N° 08-06-114**. The engineering drawings shall detail the number, location and type of cross connections to be installed.

Please refer to **Section 4.2.12 a)** for all other valve requirements for Dual Reticulation systems.

c) Trunk Systems

Trunk Service Valve installations shall be approved by Council and shall be located on the Trunk main as follows:

- at a maximum spacing of 1500m;
- to isolate sections of the main for the purpose of draining the main. Each isolated section shall contain at least one scour valve and all necessary air valves to prevent vacuum conditions during emptying;
- down stream of all branch mains 300mm and larger;
- on all branch mains off-the-trunk main and as close to the trunk main as possible;
- on both sides of a river crossing, a major roadway or a railway.

Sluice valves shall be used on all mains 600mm and smaller. Butterfly valves shall generally be used on all mains 600mm and larger.

Sluice valves may be buried or located within a reinforced concrete valve pit. Butterfly valves shall be installed within a reinforced concrete valve pit in accordance with Council's **Standard Drawing N° 08-06-116** Valves shall not be located within road pavements.

4.2.13 Scour Valves and Air Valves

a) Reticulation Mains

Unless specifically required by Council, scour valves and air valves are generally not required in reticulation systems.

Notwithstanding the above, Council requires that scour valves and air valves be installed where water services, flushing points or hydrants are not installed at regular intervals on reticulation mains. Scour Valves shall be installed at low points as shown on Council's **Standard Drawing N° 08-06-117** and Air Valves shall be installed at high points within a suitably sized concrete pit similar to that shown on Council's **Standard Drawing N° 08-06-118** and **08-06-119**. Scour valves and air valves shall not be located within road pavements.

The general design criterion for air valves is set out in **WSAA Water Supply Code**.

b) Trunk Mains

Scour valves and air valves shall be provided on trunk mains and installed to the requirements of Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

Scour valves shall be located at all significant low points with generally one scour valve between adjacent service valves. At creek and river crossings the scour tee and the scour outlet shall be installed at a level equal to or just higher than the average or mean water level in the creek or river.

All air valves shall allow air in and out of the main and be connected to the main by a tee fitting with an appropriate gate, butterfly or sluice valve that is fixed to the tee.

Small orifice air valves (25mm to 40mm) shall be provided at minor crests such as an IL difference of up to 10 metres.

Large orifice air valves (50mm and larger) shall be provided at all major crests and shall be sized so that they are capable of allowing sufficient air into the main during emptying of the section of main using the associated scour valve in the fully open position with a pressure drop across the air valve limited to 20kPa.

4.2.14 Pressure Reducing Valves

Where the pressure in a reticulation main exceeds 700 kPa, Council shall require the installation of a Pressure Reducing Valve (PRV) that may (at Council's discretion) include telemetry control.

Prior to proceeding with any design, Council shall be provided with details of the area affected and the number of lots involved. PRV installations where approved by GCW shall be installed to the general details contained in Council's **Standard Drawing N° 08-06-120**.

Boundary Valves for Pressure managed areas shall be to the details contained in Council's **Standard Drawing N° 08-06-115**.

Where PRV's are required on a Trunk main, a specific design is required. Direction on the size, type and number of PRV's as well as the design of the associated valve chamber shall be obtained from Council prior to proceeding with any design.

4.2.15 Valve Chambers

Water supply system valve chambers for either Pressure Reducing Valves or Trunk main Section Valves shall be designed to meet the criteria particular to the specific ground conditions and mains configuration applicable to the installation/ development.

All valve chambers shall be concrete, have light weight lids where possible or hinged DI covers where Class B conditions apply and shall generally be in accordance with the details shown on Council's **Standard Drawing N° 08-06-116**. The design of the pit shall incorporate pit drainage to the stormwater system.

Valve chamber cover slabs shall be provided with lift points to allow easy removable of the Pre-cast concrete cover slab.

Valve and their associated valve chambers shall not be installed in road carriageways.

Valve chambers are not required for reticulation service valves.

4.2.16 Mains Swabbing Facilities

a) General

Entry pits shall be constructed at high and low points with adjacent scours at low points wherever possible. The actual location of mains swabbing pits shall depend on the location of existing pits in the system and shall be determined by Council at the time of approval of the development.

The location of swabbing pit sluice valves should be opposite common property boundaries between 5m to 25m either side of the swabbing pit. Swabbing chambers shall be located at approximately 1000 metre intervals unless approved otherwise by Council.

b) 100mm and 150mm Diameter Mains

Council requires that for 100mm and 150mm diameter mains the mains swabbing facilities shall be provided as detailed on Council's **Standard Drawing N° 08-06-123** and Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

c) 225mm Diameter and Larger Mains

Council requires that for all mains 225mm diameter and larger, mains swabbing chambers shall be provided as detailed on Council's **Standard Drawing N° 08-06-121** and Council's **Standard Specification SS2 - Water Supply Mains and Associated Works**.

4.2.17 Main Terminations

4.2.17.1 Dead Ends

Temporary ends of reticulation mains that are to be extended in future stages shall be designed in accordance with Council's **Standard Drawing N° 08-06-122** as appropriate. End plugs are not acceptable.

Permanent end of mains at the head of *culs-de-sac* and the end of lines shall be designed in accordance with Council's **Standard Drawing N° 08-06-123** as appropriate.

4.2.17.2 Water Quality Testing Facilities

Water quality testing facilities, such as hydrants and flushing points on reticulated mains, shall be provided to facilitate the initial certification and acceptance of the main in accordance with Council's **Standard Drawing N° 08-06-123** as appropriate. Alternative testing facilities supported by a detailed submission may be approved by Council.

Notwithstanding the above, water quality testing facilities shall be provided at all main ends and at minimum intervals of 500 metres.

4.2.18 Pipe Anchorage

4.2.18.1 Thrust Blocks

For mains with Working Pressures of less than 800kPa, thrust blocks designed to withstand testing pressure of 1350kPa shall be provided at all points within the reticulation system where thrust will develop, ie. bends, tees, tapers, valves, dead ends, etc. Please refer to Council's **Standard Drawing N^o 08-06-105 to 08-06-107** for standard thrust restraint formats complying with the above design criteria.

Council may approve alternative methods of restraining thrust in mains subject to Council's assessment of preliminary engineering design. Where alternative thrust restraint is approved, 'As Constructed' details of the type and location shall be provided.

Polyethylene mains do not require thrust management within the main as the construction of these mains utilise electrofusion joints and approved mechanical joints for valves. Thrust restraint at the transition of the PE main to the DICL/ PVC system shall be provided, refer to Council's **Standard Drawing N^o 08-06-113**.

Thrust blocks and bulkheads shall be designed so that they do not encroach on other utility allocations or service corridors.

For mains with a Working Pressure greater than 900kPa or where the conditions defined in Council's Standard Drawings are exceeded, the following design criteria for calculation of thrust shall apply.

Bends	$R = 1.54 \times 10^{-5} \times H \times D^2 \times \sin(\theta/2)$
Tees	$R = 0.77 \times 10^{-5} \times H \times D^2$
Tapers	$R = 0.77 \times 10^{-5} \times H \times (D_1^2 - D_2^2)$
Dead end	As for Tees
Valve	As for Tees
R	resultant force in kilonewtons
H	total head in metres
D	external pipe diameter in mm
θ	angle of bend in degrees

Thrust block sizes shall be calculated using the following safe bearing loads for horizontal loadings. Mains of DN375 and larger will require geotechnical investigation to determine the Safe Bearing Load (SBL) of the native soils.

Running sand, mud, muck, etc.	0	kPa
Soft clay	50	kPa
Medium clay, sandy loam	100	kPa
Sand and gravel, hard clay	150	kPa
Sand and gravel, cemented with clay	200	kPa
Rock	240	kPa

For vertical downwards bearing loads, the above safe bearing loads may be doubled.

For vertical upwards thrust, a concrete block must be installed with a weight of at least 1.2 times the resultant thrust (refer vertical bend detail on Council's **Standard Drawing N^o 08-06-105**).

For mains of DN375 and larger, steel reinforcing bars shall be provided in the concrete block of sufficient area to support that part of the concrete block below the horizontal centreline of the pipe.

Calculation of required bearing area may be made using the following formula:

Bearing area	=	R/ SBL
Bearing area	=	area in square metres
R	=	resultant force in kilonewtons (calculated)
SBL	=	safe bearing load, ie. soft clay 50 kPa

Thrust blocks shall not impede the migration of ground water seepage through the trench bedding, refer details of diversion drains on Council's **Standard Drawing N^o 08-06-104**.

All valves shall be provided with thrust restraint either directly at the valve by straps or legs or by flanges and a short DI pipe with a puddle flange and thrust block across the trench.

4.2.18.2 Bulkheads

Bulkheads are partitions built across the trench that retain the pipe to prevent longitudinal and lateral movement particularly on steeper slopes.

Bulkheads shall be located in accordance with the details shown on Council's **Standard Drawing N° 08-06-101**.

4.2.18.3 Diversion Drains

Diversion drains shall be provided where the natural transfer of ground water from the trench into the surrounding ground will not provide sufficient drainage. Diversion drainage shall be connected to a suitable stormwater system in accordance with the details shown on Council's **Standard Drawing N° 08-06-104**.

Diversion drains must not allow water from the trench to enter the road pavement.

4.2.19 Location Marking for Valves, Hydrants, Fittings, etc.

Where developments contain kerb and channel, the location of all hydrants, flushing points, service valves, water main road crossings and other fittings such as air valves and scours, shall be marked in the kerb and on the pavement in accordance with Council's **Standard Drawing N°s 08-06-126** and **08-06-127**.

For direct buried valves, hydrants and flushing points with surface box systems, the lids and concrete surrounds shall be painted or coloured by manufacture in accordance with the details shown on Council's **Standard Drawing N°s 08-06-126** and **08-06-127**.

All hydrants shall be provided with blue pavement markers (cats eyes) in addition to the other marking requirements for these items.

Potable water surface box surrounds shall be square or rectangular.

Recycled water surface box surrounds shall be circular.

Where water mains are constructed in areas where no kerb and channel is required or available, marker posts and pavement markings shall be installed in accordance with Council's **Standard Drawing N° 08-06-126** and **08-06-127**.

Where different water mains are constructed within the same footpath or allocation space then marker posts clearly designating the different product systems or pressure zones shall be installed in accordance with Council's **Standard Drawing N° 08-06-126**.

Conduits and property services shall be marked in accordance with Council's **Standard Drawing N°s 08-06-108** and **08-02-109**.

4.2.20 Pump Stations

4.2.20.1 Reticulation General

Reticulation Pump Stations may convey either Potable or Recycled water, but not both products together within the one Pump Station building, ie. Stations shall be separate.

The provider of the Station is responsible for the supply and installation of all equipment and materials associated with the in-ground pump station. This includes pumps, electrical cabinet and associated wiring, pressure or level control, internal pipework and telemetry. Elements of the pump station that are above ground such as the switchboard, are required to be located within an easement or within a lot in Fee Simple dedicated to Gold Coast Water.

Council requires that for each pump station, the location and road access to the station be shown on the engineering drawings in accordance with Council's **Standard Drawing N° 08-06-131**. This is to allow safe crane access to the installed pumps and pipework. For stations located directly within the verge, the pump station covers shall be protected with removable bollards where access by public vehicles can occur.

The engineering submission shall include the associated reservoir details and details of the electrical and telemetry interface of the pump station and its reservoir.

Where pump stations are not readily accessible from a public road, particular attention to the following criteria is required:

- vehicle access and site manoeuvrability;
- access road cross section and drainage shown to legal point of discharge;
- width of land required for access road;
- dedication of land for pump station and access road to Council in fee simple;
- landscaping.

Standard water reticulation pump stations shall be designed in accordance with Council's **Standard Drawing N^{os} 08-06-129 to 08-06-132** including completion of the required Tables of Dimensions.

Where during the preliminary discussion phase, Council has approved the design and construction of a non-standard water supply pump station, full design details of the pumps and pump stations shall be provided. The criteria stated above for standard pump stations shall also apply.

Where dimension 'D' exceeds 1300mm (length of individual cover), refer Council's **Standard Drawing N^{os} 08-06-129 and 08-06-130**, the design Consultants shall submit an alternate design for the covers to Council for consideration prior to any detailed design.

The noise emitted by individual and/or the sum of all infrastructure elements shall conform with the current Noise Protection provisions of the **EPA**.

4.2.20.2 Trunk General

Trunk Pump Stations may convey either Potable or Recycled water but not both products together within the one Station, ie. Stations shall be separate.

Delivery pump station designs shall cover the building design and location, the pumps and motors (each capable of station duty), valves and pipework and metering, crane access and function, electrical cabinet and associated wiring, surge control, noise control and telemetry. The station and its access shall be on land provided to Council in fee simple.

Locating Pump Stations in Parks and 'green' areas should only be considered if it can be shown by an economic and environmental assessment that no other suitable site is available. Further, should a park location be chosen, the design must be undertaken in consultation with the park asset custodian.

The design of the pump station shall compliment the amenity of the local area and shall detail the following:

- vehicle access and site manoeuvrability;
- access road cross section and drainage shown to legal point of discharge;
- width of land required for access roadway;
- landscaping for all sites and security fencing where directed by Council;
- noise attenuation to comply with regulations;
- structural design of the building.

The Consultant shall submit a design report and associated recommendations for consideration by Council prior to any detailed design. As a minimum the report shall include:

- results of geotechnical investigation;
- environmental impact assessment for both construction and future maintenance requirements of the proposed location. Environmental impact assessment should include proposed mitigation measures;
- pump hydraulic operation and performance characteristics and type;
- preliminary layout plan and external elevations;
- access road arrangements;
- advantages and disadvantages and cost-benefits of options;
- valving and metering arrangements;
- preliminary surge analysis and details of surge control devices;
- power supply arrangements and location details of transformers (where needed);
- requirements for works and site tests;
- crane functionality and maintenance vehicle access;
- recommended work method statements;
- recommended Inspection and Test Plans.

4.2.20.3 Pump Design

Pumps shall be sized from the parameters as set out in **Section 4.2.3.7**.

4.2.20.4 Mechanical and Electrical Design

The design of the mechanical and electrical facilities, including electrical cabinet, telemetry and associated wiring shall be carried out by the Consultant to the requirements of Council and the relevant electrical authority.

All works are to be carried out in accordance with Council's current specifications as follows:

- **Standard Specification SS2 - Water Supply Mains and Associated Works;**
- **Standard Specification SS12 – General Requirements for Electrical Installations;** and
- **Standard Specification SS14 – General Requirements for Mechanical Installations.**

4.2.20.5 Specific Council Requirements

Water reticulation pump station light weight aluminium covers shall be externally coated with an Anti-slip protective coating system in accordance with Council's **Standard Drawing N° 08-06-130**.

The design of the mains associated with pump stations shall include a surge and fatigue analysis as set out in **Section 4.2.6.2**.

Within Council's **Standard Specifications SS12** and **SS14** are specific requirements for Asset Numbering, 'As Constructed' drawings, Operating and Maintenance Manuals, Asset Valuations and other specific asset information such as physical attributes, locations and ratings.

Gold Coast Water's procedures **SD-22 Asset Hierarchy and Numbering Definition** and **SD-23 Asset Creation Requirements** are available from Gold Coast Water.

At the completion of the design of the civil, mechanical and electrical facilities, the Consultant is required to submit the following for approval prior to commencement of any work on the station:

- pump curves and schedules of technical details for the selected pumps (3 copies) as nominated in the specification;
- the design drawing of the control cabinet including schematic drawings detailing components to be installed as well as telemetry drawings and radio survey report where required (3 copies);
- an ENERGET application for power, fully completed, for signing by Council as the owner of the station;
- engineering drawings of pumps, motors, pipework, valves, flowmeter, surge control devices, etc.;
- print outs of water hammer analysis used in the design of any surge control devices;
- architectural and engineering drawings of delivery pumping station building including road access and stormwater and fencing;
- all drawings and data correctly defining Asset details in accordance with Gold Coast Water's procedures **SD-22 Asset Hierarchy and Numbering Definition** and **SD-23 Asset Creation Requirements**.

The developer/ contractor will be responsible for obtaining all necessary permits and approvals including the driveway crossing permit and for the payment of all fees associated with the pump station fit out, including those for power.

4.2.20.6 Testing and Commissioning

Prior to the station being Commissioned, the Consultant shall provide to Council a report of all works tests and site tests carried out to confirm that the pump station performs in accordance with the Design Report for Delivery stations and in accordance with the Engineering Submission for Reticulation stations. The submission from the consultant shall include a commissioning plan. Following approval of the works tests, site tests and commissioning plan by Council, the station may be commissioned by the contractor and Council following payment of the appropriate fee.

4.2.20.7 Operations and Maintenance Manuals

During the commissioning process, and prior to acceptance of the pumping station, refer **Section 9.4.2 c)**, Council will be presented with three (3) sets of the Operations and Maintenance Manuals for the station.

4.2.20.8 Alternative Water Pumping Stations

While Council has no approved design criteria for alternate water pumping stations, proposals may be considered on the basis of best management practice.

The Consultant shall submit an initial report and associated recommendations for consideration by Council prior to any detailed design.

As a minimum the report should include:

- reason for and cost-benefits to Council of an alternative water pumping system;
- approved connection points to the existing system;
- water supply schematic plan as per **Section 4.2.4** of these Guidelines;
- maintenance issues.

Subject to Council's assessment of the Consultants initial report and prior to any detailed design, Council may engage an independent Consultant to act for Council in assessing the initial report and to recommend suitable system parameters.

In addition, the independent Consultant will audit for compliance with Council's Construction Procedures as per **Section 9** of the Guidelines.

As the proposal is not in accordance with Council's nominated Standard formats for water pumping stations, all costs associated with the engagement of the independent Consultant shall be at the Developer's expense.

Notwithstanding **Section 9** of the Guidelines the 'On Maintenance' period for alternative water pumping station shall be twelve (12) months from the 'On Maintenance' date.

4.2.21 Reservoirs

4.2.21.1 General

In general, major reservoirs are constructed as a part of headwork's infrastructure. Where it is necessary to construct a high level reservoir or temporary reservoir to service the requirements of a particular development, the reservoir will be located as shown on the Water Supply Schematic Plan referred in **Section 4.2.4**. Unless approved otherwise, Council shall undertake the construction of all reservoirs.

Where Council permits a development to provide the reservoir, it shall be constructed in accordance with Council's **Standard Specification SS11 – Specification for Construction of Concrete Reservoirs**.

The Developer is responsible for the supply and installation of all equipment and materials associated with reservoirs. This includes pumps, electrical equipment and associated wiring, system controls and internal pipework, flow monitoring, telemetry control monitoring, access roadways, security fencing, the reservoir site dedicated to Gold Coast Water as a lot in Fee Simple, connection point stormwater management, under drains and water quality test points.

4.2.21.2 Preliminary Design

The Consultant shall submit a preliminary design report and associated recommendations for consideration by Council prior to any detailed design. As a minimum the report shall include:

- results of geotechnical investigation;
- environmental impact assessment for both construction and future maintenance requirements of the proposed location. Environmental impact assessment should include proposed mitigation measures;
- preliminary layout plan and external elevations;
- top water level (m AHD), depth and diameter;
- access road general arrangements;
- structural concepts and details of concrete components;
- valving, metering and pipework arrangements;
- overflow, scour and stormwater arrangements;
- power supply and telemetry arrangements and location details of Transformers where needed;
- advantages and disadvantages and cost-benefits of options;
- requirements for works and site tests;
- maintenance access, functionality, site security and maintenance vehicle security.

Reservoirs shall be sized under the parameters set out in **Section 4.2.3.6** as either elevated storage or ground level storage as approved by Council.

Network analysis shall be provide that shows compliance to **Section 4.2.3** for the reservoirs size and for the supply and delivery pipework.

4.2.21.3 Reservoir Design

Council requires that for each reservoir the location and road access shall be shown on the engineering drawings. Locating Reservoir(s) in Parks and 'green' areas should only be considered if it can be shown by an economic and environmental assessment that no other suitable site is available. Further, should a park location be chosen, the design must be undertaken in consultation with the park asset custodian.

The design of the reservoir complimenting the amenity of the local area shall detail the following:

- vehicle access and site manoeuvrability for full reservoir perimeter;
- access road at 4.0 metres wide, access road grade at 16% maximum, cross sections and drainage to legal point of discharge;
- landscaping and security fencing;
- inlet and outlet pipework and metering format;
- overflow, scour and stormwater management to the legal point of discharge;
- under drains for leakage detection;
- floor, footing and wall design and wall/ floor joint format;
- steel roofing system;
- roof level safety and access facilities;
- telemetry control and monitoring;
- the dedicated crane set-up locations for use of access hatches;
- work method statements;
- inspection and Test Plans;
- dedication of land for reservoir and access road to Council in fee simple.

The engineering submission shall include the associated pump station details and details of the electrical and telemetry interface of the pump station and reservoir and the Design Safety Report.

4.2.21.4 Testing and Commissioning

Prior to the reservoir being Commissioned, the Consultant shall provide to Council a report of all works tests and site tests carried out to confirm that the reservoir performs in accordance with the Design Report for the reservoir.

The submission from the consultant shall include a commissioning plan.

Following approval of the works tests, site tests and commissioning plan by Council, the station may be commissioned by the contractor and Council following payment of the appropriate fee.

The Consultant shall provide to Council a report of all works tests and site tests and commissioning procedures to confirm that the reservoir performs in accordance with the Design Submission for the reservoir.

4.2.21.5 Operations and Maintenance Manuals

During the Commissioning process and prior to acceptance of the reservoir, refer **Section 9.4.2 c)**, Council will be presented with three (3) sets of the Operations and Maintenance Manuals for the reservoir.

4.2.22 Re-Chlorination Station

Developments more than 2.0 kilometres from the existing reticulation system and supplied by a dedicated main, shall carry out an analysis of residual disinfectant levels throughout the proposed reticulation network.

The analysis shall be carried out by the developments consultant to the format recommended within the **Cooperative Research Centre (CRC) for Water Quality and Treatment manual on Disinfection Management – Implementing Tools for Optimising Disinfection**, refer <http://www.waterquality.crc.org.au/>.

Discussions with Council's Water Quality representative will allow determination of the required parameters and acceptable Disinfection Management Tool for the analysis.

Where a re-chlorination station is to be provided, it shall be provided within a lot in Fee Simple dedicated to Gold Coast Water.

4.2.23 Aerial Crossings

4.2.23.1 Bridge Crossing

The preferred location for water main bridge crossings is within the service allocation area of the pedestrian walkway.

The water main(s) location shall be considered in conjunction with other services (ie. sewerage rising mains, Energex, telecommunications and gas) where applicable.

A general arrangement drawing showing the service allocations within the bridge footpath shall be submitted to Council for approval prior to detailed drawings commencing.

In general the following points should be considered:

- adequate horizontal clearance between services to allow construction and maintenance;
- water mains shall be Ductile Iron in accordance with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works** and any addenda;
- installation formats shall support ongoing easy maintenance;
- air valves shall be sited to minimise vandalism;
- designed generally in accordance with **Option 4** of the **WSAA Standard Drawing WAT-1312**;
- the main shall be fixed to the bridge beams or slabs by SS316 straps and bolts and shall not be sand embedded;
- the main shall be designed to allow for thermal longitudinal movement of the bridge structure;
- thrust restraint shall be by flanged pipework and anchor blocks at each bridge abutment;
- public safety and restriction of access shall be designed for, refer **WSAA Standard Drawing WAT-1311**.

The design shall show that maintenance of the water main or mains shall not impact on adjoining services and that WH&S obligations can be met.

The design shall be certified that the provided water mains will have no effect on the bridge.

4.2.23.2 Aqueduct Crossings

In general the following points should be considered:

- adequate horizontal clearance between services to allow construction and maintenance;
- water mains shall be Ductile Iron in accordance with Council's **Standard Specification SS2 - Water Supply Mains and Associated Works** and any addenda;
- installation formats should support ongoing easy maintenance;
- air valves shall be sited to maximise maintenance access and minimise vandalism;
- designed generally in accordance with the **WSAA Standard Drawing WAT-1310**;
- public safety and restriction of access shall be designed for, refer **WSAA Standard Drawing WAT-1311**;
- the main shall be fixed to the piers by SS316 straps and bolts;
- the main shall be designed to allow for thermal longitudinal movement of the pipeline;
- thrust restraint shall be by flanged pipework and anchor blocks at each side of the crossing.

The Aqueduct shall be within a parcel of land that is either an Easement or within a lot in Fee Simple dedicated to Gold Coast Water.

4.2.24 Works by Council

All works to live water mains (including connections and disconnections) shall be made by Council at the Developers expense.

The contract for the works shall make provision for adequate liaison with Council regarding Council's scheduling of the works.

All requests for works to Council's live mains shall be in writing and include design details of the work required (refer **Section 9.2.2 i**) of the Guidelines).

The Contractor is responsible for any 'as constructed' data associated with works to live water mains (including connections and disconnections).

4.2.25 Easements

An easement in favour of Council shall be provided by the Developer as follows:

- a) Over all mains within private property including residential lots, parks and reserves, industrial and commercial sites and within group title developments.
- b) Easements shall be 3.0 metres wide minimum for reticulation mains up to DN200 and 6.0 meters wide minimum for all mains up to DN600 and 8.0 meters wide minimum for trunk mains larger than DN600. For each additional main co-located within the easement an additional 3.0 meters minimum shall be provided.

The width and format of an easement shall recognise any physical constraints for access and maintenance including the depth and size of the asset, disjointed access due to allotment formats and topographical features preventing continuous travel along the easement. In poor soils where thrust blocks can become very large, the design of the main and the easement shall be such that the thrust block is contained wholly within the easement.

The width of the easement shall be at the discretion of Council.

Council is supportive of Contractual agreements between the Contractor and the land owner for the temporary use of lands to provide suitable construction corridors adjacent to the easement.

4.2.26 Engineering Drawings

The information to be detailed on the water main drawings is set out in **Section 8.2.3 b**).

Generally the scales for water main drawings shall be 1:10; 1:500; 1:2000, etc. and multiples thereof.

Longitudinal Sections at a scale of 1:1000 Horizontal and 1:100 Vertical shall be provided for all 300 mm diameter and larger water mains and may be required for smaller size mains where existing and proposed service conflicts exist.

Generally, consultants shall comply with the requirements of **Section 8.2.4** and furthermore complete the **Engineering Drawing – Application** checklist as required by **Section 8.2.5** of these Guidelines. The addition requirements of Pumping Stations and Reservoirs shall be included in the design submission.

4.2.27 Specification

The specification for water supply systems shall conform with the technical requirements of Council **Standard Specifications SS2, SS11, SS12 and SS14** as appropriate and any addendums.

4.2.28 Alternate Approved Materials

Council may approve acceptable alternative materials or products to those nominated within the Standard Specification.

Any such approval will be in the form of an 'Approval of Use' letter nominating the proposed alternate item and its interaction with the Land Development Guidelines, Standard Specification and Standard Drawings.

Council maintains a register of those items that have been provided with an Approval of Use.

4.2.29 Submission of Engineering Drawings/ Job Specification

The submission of Engineering Drawings/ Job Specification shall comply with **Section 8.2.7** of the Guidelines.

4.2.30 Construction Procedures

All construction procedures including testing and certification shall comply with Council **Standard Specification SS2** and **Section 9** of the Guidelines.

4.2.31 'As Constructed' Requirements

All 'as constructed' requirements shall comply with **Section 10** of the Guidelines and any addendums.