CAPRICORN MUNICIPAL DEVELOPMENT GUIDELINES

WATER SUPPLY NETWORK

D11

DESIGN GUIDELINES

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Keeping the Capricorn Municipal Development Guidelines up-to-date

The Capricorn Municipal Development Guidelines are living documents which reflect progress of municipal works in the Capricorn Region. To maintain a high level of currency that reflects the current municipal environment, all guidelines are periodically reviewed with new editions published and the possibility of some editions to be removed. Between the publishing of these editions, amendments may be issued. It is important that readers assure themselves they are using the current guideline, which should include any amendments which may have been published since the guideline was printed. A guideline will be deemed current at the date of development approval for construction works.

GENERAL

D11.01. SCOPE

D11.01.01. This Guideline sets out the requirements for the design of the NON-TRUNK infrastructure water supply network to achieve the Desirable Standards of Service in accordance with requirements of the Planning Act, the Water Supply (Safety and Reliability) Act and the Plumbing and Drainage Act. For any TRUNK infrastructure, refer to the Water Service Provider. ***Authority***

D11.01.02. The following order of priority for interpretation of documents will apply: (Please note that reference to a Guideline or Standard, is reference to the latest version of the relevant document, unless specifically a version number is specifically stated) ***Order of Priority***

1. CMDG D11 Water Supply Network - Design & Construction Guideline
2. CMDG Standard Drawings
3. Water Reticulation Code of Australia WSA 03-2011
4. Water Service Providers Policies, as applicable
5. AS_3500 Part 1
6. AS_2566 Buried Flexible Pipelines
7. AS_2032 Installation of PVC pipe systems
8. AS_2033 Installation of polyethylene pipe systems
9. Department of Energy and Water Supply, Planning Guidelines for Water Supply and Sewerage, March 2014
10. Department of Environment and Natural Resources, Planning Guidelines for Water Supply and Sewerage, 1991 and 1992.

D11.02. OBJECTIVE

D11.02.01. All premises in the Water Supply Service Area are to be connected directly and separately to the water supply network. ***Direct and Separate Service***

D11.02.02. The water supply non-trunk network is to provide to the consumer a reliable reticulated potable water supply to meet the quality, pressure and flow demands imposed upon it by both the consumers and firefighting requirements. ***Water Supply***

D11.02.03. The Desired Standards of Service (DSS) are determined and displayed by each Water Service Provider. These Guidelines provide acceptable solutions to meet a range of DSS. ***Desired Standards of Service***

D11.02.04. Optimisation of lifecycle cost, including capital, operation, maintenance, decommissioning and replacement, is to be considered in the design and construction of all water infrastructure. ***Lifecycle Cost Efficiency***

D11.03. DEFINITIONS

D11.03.01. Water Service Provider means the entity responsible for providing the water supply services is in accordance with the Water Supply (Safety & Reliability) Act. The Water Service Provider for each of the participating Councils is as follows:

Service Provider

Table D11.03.01 Water Service Providers

Local Government	Water Service Provider
Banana Shire	Banana Shire Council
Central Highlands Regional	Central Highlands Regional Council
Gladstone Regional	Gladstone Regional Council
Isaac Regional	Isaac Regional Council
Livingstone Shire	Livingstone Shire Council
Maranoa Regional	Maranoa Regional Council
Rockhampton Regional	Fitzroy River Water

D11.03.02. Trunk infrastructure is defined in the Planning Act and involves a list of assets as identified by the Water Service Provider. In general, trunk infrastructure is not determined by asset size, but function. The function of trunk infrastructure is to serve a catchment or zone that is significant to the function/service of the network. Also, trunk infrastructure is not non-trunk infrastructure. In practice, trunk infrastructure is the bulk supply, treatment and transfer of potable water via: dams, treatment plants, high lift pump stations, trunk mains, and reservoirs.

Trunk

D11.03.03. No individual connections are permitted to Trunk Infrastructure.

D11.03.04. Non-trunk infrastructure is defined in the Planning Act and involves internal works and/or external works and/or safety and efficiency of the network. For water supply networks, the efficiency of the network means to avoid duplication of assets by sizing assets for the service area by a network analysis. In practise, non-trunk infrastructure is: property connections, reticulation water mains, distribution mains, localised booster pump stations.

Non-Trunk

D11.03.05. EP means Equivalent Person.

Equivalent Person

D11.03.06. ET means Equivalent Tenement.

Equivalent Tenement

D11.03.07. PVC* means pipe material of Polyvinyl Chloride (Modified (MPVC) and Oriented (OPVC)) and composites.

PVC*

D11.03.08. PE* means pipe material of Polyethylene in accordance with CMDG Purchase Specifications listed in Annexure D11B.

PE*

D11.03.09. DICL means ductile iron for pipes and fittings in accordance with CMDG Purchase Specifications listed in Annexure D11B.

Ductile & Cast Iron

D11.03.10. Premises is a building or other structure; or land, whether or not a building or structure is situated on the land.

Premises

D11.03.11. Property Water Service is the pipe work between the Main Tap (ferrule) and the Property Point of Connection. This pipe work will be an asset of the Water Service Provider

Property Service Line

D11.03.12. The outlet of the Water Service Provider's Water Meter marks the Property Point of Connection.

Property Point of Connection

D11.03.13. Capricorn Municipal Development Guideline purchase specifications for products and materials shall apply except where modified herein.

Purchase Specifications

D11.03.14. The Water Service Providers purchase specifications, as modified from time to time, shall be used in preference to the Water Services Association of Australia purchase specifications. These are available on the Capricorn Municipal Development Guidelines website (www.cmdg.com.au). Where Water Service Providers have not developed a purchase specification then the Water Services Association of Australia purchase specifications for products and materials shall apply, as modified by the relevant constraints of the guideline.

D11.04. MATERIALS

D11.04.01. DICL pipe is to comply with AS 2280 and have a pressure rating of PN35. Fittings are to have a pressure rating of 1200 kPa working pressure.

Ductile Iron

D11.04.02. Polyethylene piping is to be in accordance with the CMDG Purchase Specification listed in Annexure D11B.

Poly Pipe

D11.04.03. Steel pipes and fittings shall be externally coated with a fusion bonded polyethylene coating to AS 4321 (Sintakote or equivalent) and internally cement lined and manufactured in accordance with AS 1579.

Steel Pipe

D11.04.04. All ductile iron pipes and cast/ductile iron fittings shall be wrapped, taped and sealed completely with polyethylene sleeving 0.25mm thick. Sleeving material shall be in accordance with the CMDG Purchase Specifications listed in Annexure D11B.

Wrapped DI Sleeving

D11.04.05. Pipe colour and/or marking and/or sleeving colour shall be blue.

Pipe Colour

D11.04.06. Flanges are to be in accordance with the CMDG Purchase Specifications listed in Annexure D11B. Flanges are AS 4087 PN16, unless required otherwise through pressure calculations and/or by the relevant Water Service Provider.

Flanges

D11.04.07. Isolation Valves are to comply with the CMDG Purchase Specification listed in Annexure D11B.

Sluice Valves

D11.04.08. Non-return valves shall be full-bodied swing flap type manufactured in accordance with AS 4794 and CMDG Purchase Specification listed in Annexure D11B.

Non Return Valves

D11.04.09. Spring Hydrants shall be provided in accordance with CMDG Purchase Specification listed in Annexure D11B.

Spring Hydrants

D11.04.10. Tapping bands shall be provided in accordance with CMDG Purchase Specification listed in Annexure D11B.

Tapping Bands

D11.04.11. Covers and Frames for access chambers are AS3996 Class B for non-trafficable locations and Class D for trafficable locations.

Covers and Frames

D11.04.12. Bolts in above ground uses shall be hot dip galvanised in accordance with AS1214, or 316 Stainless Steel. ***Galvanised Bolts***

D11.04.13. Bolts in below ground uses, bolts shall be grade 316 stainless steel with nuts and washers grade 304 stainless steel wrapped with an approved tape consisting of synthetic fibre open weave cloth impregnated with saturated hydro-carbons, such as "Denso" tape, applied in accordance with the manufacturer's written instructions. Bolts to be protected with anti-seize lubricant before installation. If required by Table D11.04.01, the entire fitting shall be sleeved with polyethylene sleeving in accordance with Australian Standard AS 3680 - Polyethylene Sleeving for Ductile Iron Pipe. ***Stainless Bolts***

Table D11.04.01: Sleeving of fittings

Water Service Provider	Sleeving of fittings required
Banana Shire	No
Central Highlands Regional	No
Gladstone Regional	Yes
Isaac Regional	No
Livingstone Shire	No
Maranoa Regional	No
Rockhampton Regional	No

D11.04.14. Pipe bedding material shall be coarse bedding sand or other Local Government approved source. In the absence of any specific approval the following specifications shall apply: ***Bedding Material***

a) Consist of hard durable inert grains of washed river, marine or dune sand or hard rock sand or a blend of these naturally occurring sand types;

b) Have a grading which complies with Table D11.04.02 Granular Material Grading;

c) Have resistivity greater than 1500 Ohm.cm2 when tested in accordance with AS1289.4.4.1

d) Have a pH in the range 5-9 when determined in accordance with AS1289.4.3.1;

e) Be free from noxious weeds as proclaimed by the relevant regulators; and

f) Be free from dangerous chemicals as proclaimed by the relevant regulators.

g) Not to be Acid Sulphate, nor be obtained from location with potential to develop into Acid Sulphate Soil.

Table D11.04.02 Granular Material Grading

Sieve Size (mm)	Mass of Sample Passing (percent)	
	Grade A	Grade B*
6.7	100	
4.75	95-100	100
2.36	85-95	90-100
1.18	65-80	85-100
0.6	50-70	70-100
0.3	30-50	50-100
0.15	5-12	0-40
0.075	3-8	0-5

*Taken from Table G3 of AS/NZS 2566.2-2002

D11.05. HYDRAULIC DESIGN

D11.05.01. The hydraulic design capacity calculations shall be in accordance with AS2200 – Design Charts for water supply and sewerage. ***Hydraulic Standards***

D11.05.02. Colebrook-White roughness coefficient typical is 0.3mm or equivalent. ***Hydraulic Parameters***

D11.06. PLANNED SERVICE AREA

D11.06.01. The planned service area, hydraulic capacity and component sizing shall be as approved by the Water Service Provider via a Water Supply Network Analysis. Software used by consultants for Water Supply Network Analysis must be compatible with that use by the relevant Council. A list of the software used by each of the participating Councils has been provided below.

Table D11.06.01 Water Supply Network Analysis Software

Council	Software Used
Banana Shire	
Central Highlands Regional	
Gladstone Regional	InfoWater
Isaac Regional	H2OMAP
Livingstone Shire	INFOWORKS
Maranoa Regional	WATER GEMS
Rockhampton Regional	WATER GEMS

D11.06.02. The design of the water supply non-trunk network will take into consideration all external demands that are presently acting on the system or are likely to do so in the future. The Water Service Provider must be contacted to ascertain these external demands, point of connection to existing reticulation and operating parameters. ***External Demands***

D11.06.03. Water mains shall be extended to the boundaries of the development site with a flushing point where the water main is intended to service an existing and future stage or other development. An acceptable solution is for a hydrant plus capped (thrusted) stub to be provided at the development/stage boundary. ***Connectivity to future area***

D11.06.04. The hydraulic capacity shall be sufficient to allow current and planned (including staging) service area of all allotments, to be serviced directly and separately with the Desired Service Standard of the Water Supply Service Provider. The intention of this clause is to ensure that network design includes the maximum development allowable under the respective planning schemes for the Local Government. For example this may include allowance for future duplex / unit development and development of adjoining or nearby land identified by master planning.

Desired Standard of Service

D11.06.05. Where the entire area of any allotment cannot achieve the Desirable Service Standards (that is, part of the allotment is higher than the defined building pad level or mean lot level whichever is higher), a plan showing the serviced area should be produced, and the Local Government or water Supply Service Provider approval sought before proceeding. Covenants confirming the area cannot be serviced by water supply or Community Title may be required.

Covenants

D11.06.06. Water mains shall be interconnected wherever practical to:

- Eliminate dead ends,
- Maintain hydraulic efficiency; and,
- Maintain supply in the event of maintenance shut-down of a street.

Looped mains are permitted in cul-de-sacs and in accordance with CMDG Standard Drawings.

Looped Mains

D11.07. DESIGN DEMANDS

D11.07.01. The AD (Average Day) consumption and peaking factors for the relevant local government shall be as provided in Table D11.07.01 – Design Demands:

Average Day Demands

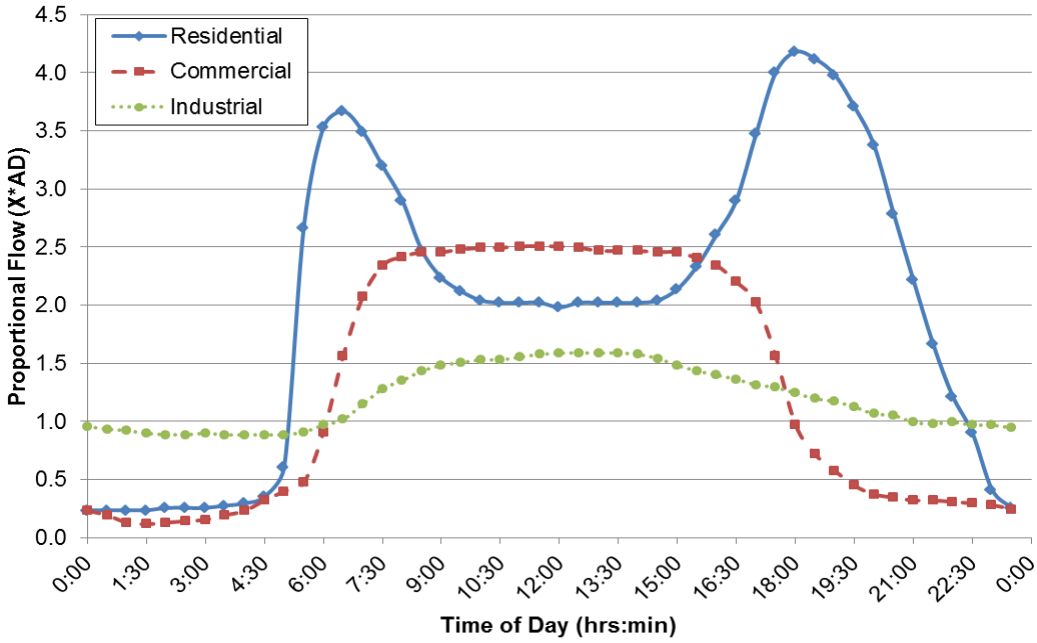
Table D11.07.01 Design Demands

Local Government	Average Daily Consumption (AD)		Mean Day Max Month (MDMM)	Max Day (MD)	Max Hour (MH)
	L / EP / d	L / ET / d			
Banana Shire	650		1.5xAD	2.25xAD	1/12xMD
Central Highlands Regional		2500	1.6xAD	1.85xAD	1/12xMD
Gladstone Regional	312	810	1.5xAD	2.25xAD	1/12xMD
Isaac Regional	650	1620	1.5xAD	2.25xAD	1/12xMD
Livingstone Shire		1350	1.4xAD	1.89xAD	1/12xMD
Maranoa Regional	650	1300	1.7xAD	2.30xAD	1/12xMD
Rockhampton Regional	500		1.4xAD	1.89xAD	1/12xMD

D11.07.02. Figure D11.07.01 below represents the Maximum Day (MD) diurnal half-hourly demand pattern for the Gladstone Region (refer Appendix D for complete flow data). This diurnal pattern is an example, to be used only when Council specific water demand information is not available.

Diurnal Demand Pattern

Figure D11.07.01 Diurnal Demand Pattern – Maximum Day (GRC Example)



D11.07.03. A minimum design pressure head for Domestic Demands alone, for each Water Service Provider as presented in Table D11.07.02 Minimum and Maximum Pressures, shall be provided during the MH (maximum hourly maximum day) on third consecutive Maximum Day consumption at the defined building pad level or at the mean lot level, whichever is the highest elevation. For clarity when carrying out water network analysis the node levels must comply with the details in Table D11.07.02.

Minimum Pressure Domestic Demands

D11.07.04. The maximum design pressure shall not be exceeded. The maximum desirable design pressure for each local government is outlined in Table D11.07.02. Where, practical, pressure reducing valves or other network design measures shall be utilised to achieve this requirement.

Maximum Pressure

Table D11.07.02 Minimum and Maximum Pressures for Network Design

	Minimum Pressure at the Node	Node Level for Design	Maximum Desirable Pressure	Absolute Maximum Pressure
Banana Shire	22 m	Finished surface/ street elevation at the main location, building pad level or at the mean lot level, whichever is the highest	50 m	80m
Central Highlands Regional	22 m		50 m	80m
Gladstone Regional	25 m (in main)* 20m (in main – constant flow network)	Finished surface/ street elevation at the main location	50 m (reticulation network)	80 m
Isaac Regional	22 m	Finished surface/ street elevation at the main location, building pad level or at the mean lot level, whichever is the highest	50 m	80m
Livingstone Shire	22 m		50 m	80m
Maranoa Regional	20 m		50 m	80m
Rockhampton Regional	22 m		50 m	80m

* In all design instances it is required that there is a minimum of 22m at the water meter

D11.07.05. Firefighting requirements shall be in accordance with Table D11.07.03 Fire Fighting Requirements

Table D11.07.03 Fire Fighting Requirements

	Residual pressure at most disadvantaged hydrant (m)	Flow	When fire flow is applied
Banana Shire	TBA	TBA	TBA
Central Highlands Regional	TBA	TBA	TBA
Gladstone Regional	Refer to Planning Guidelines for Water Supply and Sewerage		
Isaac Regional	TBA	TBA	TBA
Livingstone Shire	12m	15L/s for 2h for low and medium density residential 30L/s for 4 hours for high density residential and commercial / industrial.	MHMD
Maranoa Regional	12m	15L/s for 2h for low and medium density residential 30L/s for 4 hours for high density residential and commercial / industrial.	MHMD
Rockhampton Regional	12m	15L/s for 2h for low and medium density residential 30L/s for 4 hours for high density residential and commercial / industrial.	MHMD

D11.07.06. Flow velocities for domestic demands, should not exceed 2.0 m/s. ***Max Flow Velocity***

D11.07.07. The maximum allowable head loss in any main is as detailed in Table D11.07.04 Maximum Head Loss. This is to be determined using flow rates applicable at MHMD (Maximum Hour, Maximum Day). Reservoir filling mains are to be assessed during a fill cycle. ***Head Loss***

Table D11.07.04 Maximum Head Loss

Local Government	Maximum Head Loss
Banana Shire	no specific requirements
Central Highlands Regional	no specific requirements
Gladstone Regional	5m / 1,000m (Gladstone Network) 10m /1,000 m (Other networks)
Isaac Regional	no specific requirements
Livingstone Shire	no specific requirements
Maranoa Regional	no specific requirements
Rockhampton Regional	no specific requirements

D11.07.08. Design EP's are calculated based on development type. Refer to the relevant local government Planning Scheme documents for the equivalent demands for each development type. In the absence of Local Government specific information, refer Annexure D11C for default equivalent demand values. ***Equivalent Demands***

D11.08. ALIGNMENT, CLEARANCES, TENURE & EASEMENTS

D11.08.01. All water supply works will require written evidence of appropriate tenure rights. In general, all properties associated with the water supply works shall be required to be identified in any Operational Works application. ***Tenure***

D11.08.02. Written approval shall be obtained from the registered owners of each of the affected property(s) affected by water construction works, by the Developer and submitted to the Water Service Provider. ***Consent of Owner***

D11.08.03. All water mains are normally located within road reserves and parallel with existing local road reserves/property boundary/pathways (including at corner truncations). The alignment for all water mains shall be in accordance with Table D11.08.01 Water Main Alignment. The designer shall check that the water mains do not conflict with other utility services and/or locate the water mains to the satisfaction of the Local Government road manager. Refer to CMDG Standard Drawing CMDG-R-100 for typical water main alignment. ***Urban / Rural Alignment***

Table D11.08.01 Water Main Alignment

	Alignment
Banana Shire	Water mains shall be on a **2.5m** alignment (measured from the property boundary)
Central Highlands Regional	Water mains shall be on a **2.5m** alignment (measured from the property boundary)
Gladstone Regional	Water mains shall be on a **1.5m** alignment (measured from the property boundary), and shall be located on the opposite side of the residential road reserve to underground electricity supply.
Isaac Regional	Water mains shall be on a **2.5m** alignment (measured from the property boundary), and shall be located on the opposite side of the residential road reserve to underground electricity supply. Refer to CMDG Standard Drawings CMDG-R-0100 AND CMDG-R-0101.
Livingstone Shire	Water mains shall be on a **2.5m** alignment (measured from the property boundary), and shall be located on the opposite side of the residential road reserve to underground electricity supply. Refer to CMDG Standard Drawings CMDG-R-0100 AND CMDG-R-0101.
Maranoa Regional	Water mains shall be on a **2.5m** alignment (measured from the property boundary)
Rockhampton Regional	Water mains shall be on a **2.5m** alignment (measured from the property boundary), and shall be located on the opposite side of the residential road reserve to underground electricity supply. Refer to CMDG Standard Drawings CMDG-R-0100 AND CMDG-R-0101.

D11.08.04. All service crossing angles shall be as per Table D11.08.03 following

Table D11.08.03 Service Crossing Angle

Water Service Provider	Service Crossing Angle
Banana Shire	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Central Highlands Regional	90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Gladstone Regional	Between 45 degrees and 90 degrees.
Isaac Regional	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Livingstone Shire	
Maranoa Regional	
Rockhampton Regional	

D11.08.05. In central business districts, commercial and industrial zones, a water main on each side of the road reserve is required

Non-Residential Alignment

D11.08.06. Where water mains are to be located within and parallel with existing dedicated Main Road Reserves, the designer shall locate the water mains to the specifications of the Transport and Main Roads manager in accordance with public utility plant. Refer to relevant sections of Transport Infrastructure Act.

Main Roads Alignment

D11.08.07. Where a pipeline crosses a Department of Transport and Main Roads controlled road, Railway Line, creek or involves features under the control of any Authority/Corporation, the affected work shall be carried out in accordance with the requirements of that Authority/Corporation. It shall be the Contractor's responsibility to complete written notification to the Authority/Corporation of the intention to carry out the work.

Crossings

D11.08.08. The minimum horizontal and vertical clearance to all other crossover underground services shall be 100mm.

Perpendicular Clearances

D11.08.09. For local alignment deviations, the minimum horizontal clearance to all parallel underground services shall be 300mm clearance provided the other services have marker tape and mechanical protection as defined by AS 3500.

Parallel Clearances

D11.08.10. It shall be the Superintendent's responsibility to identify the existence of utility services including "Dial Before You Dig' and/or contact with all Utility Service Providers. The location of existing utility services shall be confirmed by the Contractor by 'Dial Before You Dig' and/or contact the Utility Service Providers and by pot-holing prior to excavation.

Dial Before You Dig

D11.08.11. Water mains in private allotments are not permitted without written consent from Council. Where water mains are required to be installed in areas other than road reserves, an easement shall be provided in accordance with Table D11.08.04. The easement should be centrally located over the water main, unless co-located with other public utility then similar road alignments should be provided.

Easements

Table D11. 08.04 Minimum Width of Easement over Water Mains

Local Government	Required Easement Width
Banana Shire	5.0m
Central Highlands Regional	5.0m
Gladstone Regional	10.0m
Isaac Regional	5.0m
Livingstone Shire	5.0m
Maranoa Regional	5.0m
Rockhampton Regional	5.0m

D11.09. WATER MAINS

D11.09.01. Pipeline installation in general is to be in accordance with AS 2032, AS 2033, AS 2566.2 and AS 3500 unless noted otherwise. Refer also to CMDG Standard Drawings. ***Pipe Installation***

D11.09.02. All water mains shall be PVC*, PE or DICL, unless otherwise approved by the Water Service Provider. ***Material***

D11.09.03. The following table outlines approved water main materials and classes for each Local Government. Ductile Iron pipe is required where stated in Table 11.09.02 Use of Ductile Iron Pipe for Road and Creek Crossings. ***Pipe Material***

Table D11.09.01 PVC* Minimum Water Main Pipe Classes

Local Government	MPVC	OPVC	DICL	PE
Banana Shire	Class 16	Class 16	PN35	PE100 PN12.5
Central Highlands Regional	Class 12	-	PN35	PE100 PN12.5
Gladstone Regional	Class 16	Class 16 (Material Class 450)	PN35	PE100 PN12.5
Isaac Regional	Class 16	Class 16 (Material Class 450)	PN16	PE100 PN12.5
Livingstone Shire	Class 16	Class 16 (Material Class 450)	PN35	PE100 PN16
Maranoa Regional	Class 16	Class 16	PN35 for Road Crossings & Aerial PN20 - general works	PE100 PN12.5
Rockhampton Regional	Class 16	Class 16 (Material Class 450)	PN35	PE100 PN12.5

Table D11.09.02 Use Of Ductile Iron Pipe For Road And Creek Crossings

Local Government	Ductile Iron Pipe for Road Crossing	Ductile Iron Pipe for Aerial Creek Crossing	Ductile Iron Pipe for Buried Creek Crossing
Banana Shire	Yes	Yes	-
Central Highlands Regional	Yes	Yes	Yes
Gladstone Regional	Yes	Yes	Yes
Isaac Regional	Yes	Yes	No (use poly)
Livingstone Shire	No	Yes	Yes
Maranoa Regional	Yes	Yes	Yes
Rockhampton Regional	No	Yes	Yes

D11.09.04. The minimum water main size shall be 100mm nominal diameter (DN) in residential areas and minimum 150mm DN in industrial/commercial areas, with the exception of 63OD poly in residential cul-de-sac loop-mains, if permitted by the Water Supply Service Provider. In all cases, pipe sizes and residual pressures shall be designed to cater for firefighting flows. ***Minimum Pipe Size***

D11.10. COVERS

D11.10.01. The minimum depth of cover to be provided for water mains and water service conduits shall be in accordance with Table D11.10.01 below. Cover under roads to be measured from the adjacent kerb or edge of gravel or edge of pavement. ***Cover***

D11.10.02. Lesser cover may be permitted at a localised situation, subject to special protection of the pipeline to the satisfaction of the Water Supply Service Provider. This may involve: DI pipe section, and/or cement stabilized sand and/or cover slab as approved in the drawings shall be constructed in accordance with CMDG Standard Drawings. ***Reduced Cover***

Table D11.10.01: Varied Depth Of Cover To Water Mains And Water Service Conduits

Location of Pipe	PVC*	DI
1. Areas **not** subject to vehicular loading:	600mm	300mm
2. Areas subject to vehicular loading:		
a) not in roadway	600mm	450mm
b) in sealed roadway	900mm#	600mm#
c) in unsealed roadway	900mm#	750mm#

Or 100mm below subgrade whichever is greater

D11.10.03. Marker Tape in accordance with the CMDG Purchase Specification in Annexure D11B shall be used over all water mains. Tape to 'raised to surface' at all valve and hydrant locations, with tape 'wrapped around' fitting. ***Marker Tape***

D11.10.04. Joint deflections shall be in accordance with AS2032 and AS2033. Unnecessary joint deflections shall be kept to an absolute minimum to limit "form" pressure losses. Changes in direction shall be effected by the appropriate fitting. ***Joint Deflections***

D11.10.05. PVC* pipes shall not be laid to a radius. ***Curved Pipe***

D11.10.06. PE pipe shall be laid in accordance with manufacture's specification. At cul-de-sac's the horizontal curvature shall be no less than 60 outside pipe diameters.

D11.10.07. Joint deflections shall be in accordance with AS 2032 and AS 2033. Joint deflections shall be kept to an absolute minimum to limit "form" pressure losses. Changes in direction shall be effected by the appropriate fitting. ***Joint Deflections***

D11.10.08. All pipes shall have a minimum length of 2.5 pipe diameters spacing between edges of socketed fittings. ***Minimum Pipe Length***

D11.10.09. Valves are required to be installed in a flanged arrangement with Tees as required by Table 11.10.02 Valves and Tees Instalment Arrangement. If the valve location is within paved roads, the designers shall gain approval from the relevant authority, for an acceptable location of the valve. ***Valve Locations***

Table D11.10.02 Valves and Tees Instalment Arrangement

Local Council	Flanged Valves and Tees	Valves per Tee
Banana Shire	Yes	
Central Highlands Regional	Yes	
Gladstone Regional	Yes	3
Isaac Regional	Yes	3
Livingstone Shire	No	2 (both downstream legs)
Maranoa Regional	Yes	3
Rockhampton Regional	No preference	2 (both downstream legs)

D11.11. FIRE HYDRANTS AND ISOLATION VALVES

D11.11.01. Hydrants shall be located at lot boundaries. ***Hydrant Locations***

D11.11.02. Hydrants shall not be located in road pavement or driveways.

D11.11.03. For urban areas, fire hydrants shall be at maximum 80m spacing for all non-trunk water supply network mains and no more than 20m from the furthest property frontage in a cul-de-sac. ***Urban Spacing***

D11.11.04. For rural and park residential allotments where fire flow is provided, hydrants shall be located at 80m or every second property boundary, whichever is the greater. Either option must be located at a RP boundary. For Gladstone Regional Council customers supplied via constant flow network are not provided with a fire service. ***Rural Spacing***

D11.11.05. In cul-de-sacs, the fire hydrant and isolating valve shall be provided in accordance with CMDG Standard Drawings. ***Cul-De-Sac Hydrant***

D11.11.06. Spring hydrant bodies, tees and risers shall be 100mm size flanges in accordance with AS4087 and in accordance the CMDG Purchase Specifications listed in Annexure D11B. ***Hydrant Size***

D11.11.07. In all areas, the 'high' and 'low' point of the mains are to be co-located with hydrants to allow for air and water scouring as required. ***Scour Points***

D11.11.08. Dead ends - temporary and permanent shall have a fire hydrant (flushing) connected to the 'duckfoot' fitting. ***Flushing Point***

D11.11.09. Isolation valves (below ground sluice valves) are to be placed to minimise disruption and/or maintain supply to water consumers during water maintenance incidents in parts of the network. In addition to the above, isolation valves are to be spaced generally in accordance with Table D11.11.02 below. ***Valve Location***

Table D11.11.02 Isolation (Stop) Valve Spacing Criteria

Water main size (DN)	Number of property service connections (nominal) between valves	Maximum spacing (m)
≤150	40	300*
200-300	100	750
≥375	150	1000

*In rural areas, the maximum spacing shall be 500m.

D11.11.10. Isolation Valves should be located opposite property boundary truncations or at RP boundaries or as per alignment standard drawing CMDG-W-20.

D11.11.11. Refer Table D11.10.02 Valves and Tees Instalment Arrangement for the minimum number of isolation valves that must be provided at each tee within each Council area. Refer to CMDG Standard Drawing CMDG Standard Drawings. ***Valves at Tees***

D11.11.12. Socketed ended valves may be used on straight lines remote (more than 2 pipe lengths) from intersections or bends. ***Valves on 'straights'***

D11.11.13. Isolation Valves shall preferably not be located under road pavement, or driveways. If the valve location is within paved roads, the designers shall gain approval from the relevant authority, for an acceptable location of the valve. ***Valves and Roads***

D11.11.14. Where reflux valves or pressure reducing valves are required in the reticulation network they shall be located in accordance with the specific requirements of each Water Service Provider. ***Special Valves***

D11.11.15. Hydrant and valve boxes shall be an approved cast iron (trafficable areas) and pre-cast concrete surround or polyethylene (box and surround) (other areas). The surrounds are to be finished at ground surface level and provided in all locations. Refer CMDG Standard Drawing CMDG-W-061.Materials used are to be in accordance with the CMDG Purchase Specifications listed in Appendix B. ***Hydrant Box & Valve Box***

D11.12. VALVE COVERS AND FRAMES

D11.12.01. The contractor shall construct, around each valve and hydrant, a chamber of the type and to the details shown on the CMDG Standard Drawings.

D11.12.02. All concrete works shall comply with the CMDG Specifications for MINOR CONCRETE WORKS C271. ***Minor Concrete Works***

D11.12.03. Covers and frames shall not be warped or twisted. Refer to the CMDG Purchase Specifications listed in Annexure D11B. ***Tolerances***

D11.12.04. Covers shall be finished flush with the surface in roadways, footpaths and paved surfaces. Elsewhere, covers shall be finished 25mm above the surface of the ground, in a manner designed to avoid as far as possible, the entry of surface water. ***Flush Finish***

D11.13. VALVE / HYDRANT MARKERS

D11.13.01. For open space areas, gravel pavements and sealed roads without kerbing, marker posts shall be provided at all hydrants, sluice valves, air valves and scour valves in accordance with CMDG Standard Drawings. ***Marker Posts***

D11.13.02. In areas with sealed pavements, fire hydrants, sluice valves, air valves and scour valves adjacent to roads shall be provided with reflective markers in accordance with CMDG Standard Drawings. ***Reflective Markers***

D11.13.03. Kerb painting, for identification of valves and hydrants, is to be provided in accordance with Table D11.13.01 Kerb Painting for Valves and Hydrants: ***Kerb Painting***

Table D11.13.01 Kerb Painting Valves and Hydrants

Local Government	Kerb Painting (for valve and hydrants)
Banana Shire	Not Required
Central Highlands Regional	Not Required
Gladstone Regional	The kerb is to be painted (white – valves, yellow – hydrants) in the location perpendicular to the asset. Painted area is to be 300mm wide.
Isaac Regional	The kerb is to be painted (blue – valves, yellow – hydrants) in the location perpendicular to the asset. Painted area is to be 300mm wide.
Livingstone Shire	Not Required
Maranoa Regional	The kerb is to be painted (blue – valves, yellow – hydrants) in the location perpendicular to the asset. Painted area is to be 300mm wide.
Rockhampton Regional	Not Required

All paint colouring to comply with AS 2700 - Colour Standards for General Purposes.

D11.13.04. All pavement markers shall comply with the CMDG Specification for PAVEMENT MARKINGS C261. ***Pavement Marking***

D11.14. THRUST BLOCKS & ANCHOR BLOCKS

D11.14.01. Thrust blocks and Anchor blocks shall be provided at any point where unbalanced forces resulting from internal pressures will occur, such as: isolation valves, bends, tees, end caps, enlargers and reducers. ***Location***

D11.14.02. Investigations shall be carried out to identify the bearing capacity of the natural ground conditions and enable to correct sizing of thrust blocks. ***Bearing Capacity***

D11.14.03. The thrust blocks bear against undisturbed material normal to the direction of thrust resulting from internal pressures over a bearing area not less than that shown on CMDG Standards Drawings. ***Thrust Blocks***

D11.14.04. The Contractor shall provide temporary thrust facilities adequate to restrain the pipe when under test. ***Temporary Anchorage***

D11.14.05. Where a main is installed at a grade of 1 in 6 or steeper, concrete anchor blocks shall be provided in accordance with CMDG Standards Drawings. ***Steep Grade***

Table D11.14.01 Anchor Block Frequency

Slope	Frequency of Anchor Block
1 In 5 To 1 In 6	Every 4th Pipe
1 In 4 To 1 In 5	Every 3rd Pipe
1 In 3 To 1 In 4	Every 2nd Pipe
Greater Than 1 In 3	Every Pipe

D11.14.06. Concrete works shall comply with CMDG Standards Drawings. A minimum concrete Grade N25 is to be used. ***Concrete***

D11.15. PROPERTY WATER SERVICES, WATER CONDUITS

D11.15.01. Property Water Service and Point of Connection shall be installed at the time of water main installation in accordance with the relevant CMDG Standard Drawing and Table D11.15.01 relevant to the Water Service Provider. ***Water Services***

Table D11.15.01 Property Point of Connection Location ***Location of Point of Connection***

Local Council	Point of Connection Location
Banana Shire	Below ground – in the footpath
Central Highlands Regional	Above ground – in the property (no greater than 500mm from the front and side boundary)
Gladstone Regional	Below ground – outside property (no greater than 500mm from the front and side boundary)
Isaac Regional	Below ground – outside property (no greater than 500mm from the front and side boundary)
Livingstone Shire	Below ground – in the footpath
Maranoa Regional	Below ground – outside property(no greater than 500mm from the front and side boundary)
Rockhampton Regional	Below ground – in the footpath

D11.15.02. Water main tapping points (tapping bands) on PVC* pipe shall not be located closer than 2.5 pipe diameters from the outer edge of any fitting or another service connection. ***Tapping Points***

D11.15.03. Main taps (ferrules) shall have an inspection shaft (IS) towards the surface in accordance with Table D11.15.02 Main Tap Inspection Shaft Requirements relevant to the Water Service Provider. Inspection shaft installations must be cast iron squat type boxes. Plastic boxes are not permitted. Refer CMDG Standard Drawings. ***Main Tap Inspection Shaft***

Table D11.15.02 Main Tap Inspection Shaft Requirements

Local Government	Main Tap Inspection Shaft required
Banana Shire	No
Central Highlands Regional	No
Gladstone Regional	Yes
Isaac Regional	No
Livingstone Shire	Yes
Maranoa Regional	No
Rockhampton Regional	Yes

Conduits

D11.15.04. Water Conduits under roadways shall be minimum SN 8 PVC and of a minimum 100mm diameter bore. Conduits shall be sealed each end with Abelflex (or equivalent).

D11.15.05. Where a concrete footpath is constructed on the verge and the water service connection is not being installed at the time of construction the conduit shall extend under the full extent of the concrete footpath.

D11.15.06. Water Conduits shall be installed under all roads to service the following:

a) Landscaped traffic islands & medians.

b) Water service connections.

c) Parks and Open Space.

Alignment

D11.15.07. Water Conduits shall be installed at 'property boundary to property boundary' alignments, as shown in CMDG Standard Drawings. The maximum deviation from perpendicular is in accordance with Table D11.15.03 Water Service Crossing Angle, unless otherwise specifically required by the road reserve manager.

Table D11.15.03 Water Service Crossing Angle

Local Government	Service Crossing Angle
Banana Shire	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Central Highlands Regional	90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Gladstone Regional	Between 45 degrees and 90 degrees.
Isaac Regional	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Livingstone Shire	
Maranoa Regional	
Rockhampton Regional	

Marker Plaque

D11.15.08. A marker plaque (marked "w") shall be placed in the kerb when wet, where the conduit crosses the kerb. Refer CMDG Standard Drawings for marker plate details.

Cover

D11.15.09. Minimum cover to conduits shall be the greater of 600mm nominal cover or 100mm below subgrade.

Residential Water Service Line Size

D11.15.10. The minimum residential service line size is shown in Table D11.15.04 Residential Service Line Size.

Table D11.15.04 Residential Service Line Size

Local Council	Residential Service Line Size
Banana Shire	32mm ID / 40mm OD in all situations
Central Highlands Regional	Short Single – 20mm ID / 25mm OD Short Dual, Long Single and Long Dual – 25mm ID / 32mm OD
Gladstone Regional	32mm ID / 40mm OD in all situations
Isaac Regional	Short Single – 20mm ID / 25mm OD Short Dual, Long Single and Long Dual – 25mm ID / 32mm OD
Livingstone Shire	32mm ID / 40mm OD in all situations
Maranoa Regional	Short Single – 20mm ID / 25mm OD Short Dual, Long Single and Long Dual – 25mm ID / 32mm OD
Rockhampton Regional	32mm ID / 40mm OD in all situations

D11.15.11. The minimum industrial service line size is shown in Table D11.15.05 Industrial Service Line Size, or as required by the Registered Water Service Provider

Industrial Water Service Line Size

Table D11.15.05 Industrial Service Line Size

Local Council	Minimum Industrial Service Line Size
Banana Shire	32mm ID / 40mm OD
Central Highlands Regional	25mm ID / 32mm OD
Gladstone Regional	50mm ID / 63mm OD
Isaac Regional	32mm ID / 40mm OD
Livingstone Shire	32mm ID / 40mm OD
Maranoa Regional	25mm ID / 32mm OD
Rockhampton Regional	32mm ID / 40mm OD

D11.15.12. In cul-de-sacs, property services shall be connected to the poly ring main in order to generate flow within the loop. A maximum of 5 services shall be taken off the poly loop.

Cul-de-sac

D11.16. TRENCHES & EXCAVATIONS

D11.16.01. Trench width, depth, foundations, stability and safety assessments shall have Notes on the Operational Works Drawings.

Trench Notes

D11.16.02. Stabilised and compacted trench foundation is required in soft (typically less than 50kPa bearing capacity) or unstable or over-excavated ground conditions.

Stabilised Foundation

D11.16.03. Control measures shall meet current environmental requirements.

D11.16.04. The minimum clear width of trench (inside internal faces of timbering or sheet piling, if used) to a height of 150mm above the top of the pipe shall be 100mm each side of the pipe, as shown in AS2566.

Min Trench Width

D11.16.05. The maximum width of trench from the base of the trench to 150mm above the top of the pipe shall be the outside diameter of the pipe plus 600mm unless detailed otherwise on the Approved Operational Works drawings. ***Max Trench Width***

D11.16.06. In waterlogged ground, de-watering shall be undertaken to reduce the water level below pipe level until sufficient backfill is placed to prevent pipe flotation. ***De-watering***

D11.16.07. For sites where ground level settlement is expected, a specialised design is required. ***Settlement***

D11.16.08. The Contractor shall leave a clear space of 600mm minimum between the edge of any excavation and the inner toe of spoil banks. No excavated materials shall be stacked against the walls of any building or fence without the written permission of the owner of such building or fence. Topsoil from excavations shall be kept separate and utilised to make good the surface after backfilling. ***Excavated Material / Trench Clearance***

D11.16.09. Where a trench is excavated across a paved surface, the width of the trench shall be kept to a minimum. Bitumen and concrete surfaces shall be carefully cut by saw cutting or other approved means, so as to provide a neat straight line free from broken ragged edges. ***Trenching Under Pavement***

D11.16.10. All excavations shall be carried out to a depth of not less than 100mm below the underside of the pipe barrel and socket or coupling. ***Excavation Depth***

D11.16.11. The Contractor shall adequately support all excavations as the works proceed. When withdrawing supports, the Contractor shall exercise every precaution against trench collapse by means of intermediate shoring, planking or props. Backfilling shall be performed simultaneously with the withdrawal of supports ***Trench Support***

D11.16.12. Where approved by the relevant authority under boring under paving, kerb and gutter or other improved surfaces in lieu of trenching, backfilling shall be so carried out as to restore full support to those surfaces. The Contractor shall remain responsible for the repair of the improved surfaces, if subsequently damaged due to subsidence of the backfill, until the end of the Defects Liability Period. ***Under Boring***

D11.16.13. In the event of any trenching, the Contractor shall provide erosion control measures in accordance with EPA specifications and requirements. ***Erosion Control***

D11.16.14. The safety of the general public shall be considered in the preparation of the site safety plan for the works and must meet the current requirements of Workplace Health and Safety Legislation. In urban areas, at completion of work each day, all trenches are to be backfilled. Where this requirement is unavoidable, Temporary Fencing Panels are to be utilised. All such installations shall be to the satisfaction of the Water Service Provider, including adequate size, strength and satisfactorily illuminated. ***Public safety***

D11.17. LAYING AND JOINING OF PIPES

D11.17.01. All pipe components shall be prepared and installed in accordance with the manufacturer's specifications, unless otherwise specified in this document. ***Manufacturers Specifications***

D11.17.02. Before being laid, all pipes, fittings, valves, etc. shall be cleaned and examined by the Contractor. ***Examination***

D11.17.03. The Contractor shall ensure that the interior of the pipeline is clean and free from obstructions. Approved plugs shall be used to prevent foreign matter entering sections of pipeline which are left uncompleted overnight. ***Cleaning Plugs Overnight***

D11.17.04. The Contractor shall take all necessary precautions to prevent flotation of pipes during laying, backfilling and initial testing. Any temporary supports shall be removed prior to completion of backfilling. ***Flotation***

D11.17.05. Joints in pipelines shall be flexible rubber ring joints or mechanical joints (either fixed flange, or bolted gland, or welded type). The joint type shall be as shown on the 'As-Constructed' Drawings. ***Joint Type***

D11.17.06. For pipes with rubber ring joints, spigots and sockets shall be clean and dry. After making the joint, a feeler gauge shall be used to check that the rubber ring has rolled in evenly, and if not, the pipe shall be withdrawn and the joint remade. ***Rubber Ring Joint***

D11.17.07. Gibaults shall be elongated and centred, with type 316 stainless steel bolts. The entire gibault shall be sleeved with an approved proprietary product complying with the CMDG Purchase Specification listed in Annexure D11B. ***Gibaults***

D11.17.08. Only the lubricant specified by the pipe manufacturer and or fitting manufacturer shall be applied. ***Lubricant***

D11.17.09. Pipes shall be cut as needed to suit closing lengths, to remove damaged pipe or fittings or to remove sockets if necessary when jointing a socketed fitting. Only pipes which have been appropriately identified for cutting suitability shall be utilised. All cutting shall be performed in accordance with the pipe manufacture's specification. ***Cut Pipes***

D11.17.10. For field cuts, only an approved mechanical pipe cutter shall be used. All field cuts shall achieve a 'square cut' finish. ***Pipe Cutting***

D11.17.11. Any pipes cut in the field shall have their ends prepared in accordance with the manufacturer's written instructions. ***End Preparations***

D11.17.12. A witness mark shall be utilised on the pipe at the length specified by the manufacturer from the end of the pipe. Scoring of *PVC pipes shall not be permitted. Where spigots and sockets are not made by the same manufacturer, reference shall be made to the socket manufacturer for the correct marking depth. ***Witness Mark***

D11.17.13. Where *PVC pipes are to be joined to pipes of another material, the joints shall be made an approved adaptor coupling shall be used. ***Jointing Different Materials***

D11.17.14. Flexibly jointed pipelines for mains with gradual changes in alignment or grade shall be laid with the joint being deflected after it has been made. The manufacturer's written recommendations in respect of maximum deflection for each joint shall be complied with provided that no joint shall be deflected to such an extent as to impair its effectiveness. ***Joint Deflections***

D11.17.15. Deflection within a pipe length is not permitted. ***Pipe Deflection***

D11.18. BACKFILL AND COMPACTION

D11.18.01. Compacted (95 per cent of the standard maximum dry density of the bedding material in accordance with AS1289.5.7.1) underlay bedding sand for pipes and fittings shall be a minimum depth of 100mm. ***Bedding Underlay***

D11.18.02. Flooding of non-cohesive material shall be considered as an acceptable method of compacting bedding underlay material.

D11.18.03. Compacted (95 per cent of the standard maximum dry density of the bedding material in accordance with AS1289.5.7.1) overlay bedding sand for pipes and fittings shall be a minimum depth of 150mm. ***Bedding Overlay***

D11.18.04. Material for the side support and bedding overlay of the pipe shall comply with the pipe bedding material. The material shall be compacted in layers of not more than 150mm thickness to 95 per cent of the standard maximum dry density of the bedding material used when determined in accordance with AS1289.5.7.1. ***Compaction of Bedding***

D11.18.05. Other than under roads, the remainder of the excavation may be backfilled with excavated material. The backfill shall be compacted as specified in the drawings and specification. Flooding of cohesive material shall NOT be permitted as a means of compacting backfill under roads. ***Backfill Compaction***

D11.18.06. Under roads, backfill shall comprise of approved roadbase material, sand or stabilised sand. Refer CMDG Standard Drawings for trench backfill details. ***Backfill under roads***

D11.18.07. Backfilling and compaction shall be carried out without damaging the pipe or its external coating or wrapping or producing any movement or deflection of the pipe.

D11.19. RESTORATION OF SURFACES

D11.19.01. Pavements, lawns and other improved areas shall be cleaned and left in the same order as they were at the commencement of the works. Lawns shall be restored with turf cut and set aside from the original surface and/or with commercially available turf. ***Original Condition***

D11.19.02. All restored surfaces shall be maintained in the condition to which they are restored until the expiry of the Defects Liability Period applicable to those surfaces. ***Defects Liability Period***

D11.19.03. Immediately the backfilling of a trench excavated through a pavement has been completed, the pavement shall be temporarily restored. Where the trench crosses bitumen or concrete pavement, a pre-mixed asphaltic material shall be used for such temporary restoration. Temporary restoration shall be maintained by the Contractor until final restoration is carried out. Final restoration of the pavement shall be carried out to restore the pavement and its sub-base to no less than the original condition. Final restoration may include, if required, the removal of temporary restoration. ***Temporary Pavement Restoration***

D11.19.04. Backfill (non-roads areas) shall be placed sufficiently high to compensate for expected settlement and further backfilling shall be carried out or the original backfill trimmed at the end of the Defects Liability Period in order that the surface of the completed trench may then conform to the adjacent surface. ***Settlement***

D11.19.05. Where, within public or private property, the reasonable convenience of persons will require such, trenches to be levelled off at the time of backfilling. Any subsequent settlement shall be made good by the Contractor, as required by placing additional fill.

D11.19.06. Surplus material shall be removed and disposed of, to areas arranged by the Contractor. ***Surplus Material***

PUMPING STATIONS

D11.20. GENERAL

D11.20.01. The utilisation of pump stations within reticulation networks is acceptable in accordance with Table D11.20.1 Use of Pump Stations in Reticulation Network.

Table D11.20.1 Use of Pump Stations in Reticulation Network

Local Government	Reticulation Pump Stations permitted within reticulation network
Banana Shire	TBA
Central Highlands Regional	Yes
Gladstone Regional	No
Isaac Regional	Yes
Livingstone Shire	Yes
Maranoa Regional	Yes
Rockhampton Regional	Yes

Pump Stations

D11.20.02. The design pumping capacity and pump type is to be nominated by the Water Service Provider for the planned loading, according to the planning horizon and staging plan. Typically, the pump type is centrifugal. Water Service Provider should be consulted prior to design to determine specific requirements.

Pump Capacity

D11.20.03. All pump stations are to be provided with a duty / stand-by pumping arrangement with automatic controls to alternate all pumps between duty and stand-by functions. Stand-by pump/s must be sized to meet the maximum demand of the duty pump/s.

Land Tenure

D11.20.04. The pump station must be located on a freehold parcel of land to be transferred the Water Service Provider, at 'Plan Sealing' stage of the development.

Property Clearance

D11.20.05. Pump stations are to be located with minimum clearances from property boundaries and habitable dwellings in accordance with Environmental Protection (Noise) Policy 2008.

Noise

D11.20.06. Pump stations are to be designed and operated to meet the requirements of the Environmental Protection (Noise) Policy 2008. Refer Schedule 1 of the aforementioned policy Acoustic quality objectives (maximum dB), measured at the receptor, for different neighbouring development types. A design statement, certified by a suitably qualified person, must be provided to demonstrate compliance with this requirement.

Incoming Feed

D11.20.07. The incoming water feed must be high reliability via a designated gravity trunk main or reservoir.

D11.20.08. Trunk feed main to be designed to have excess capacity (150% of pump flow) to feed the pump station with minimum feed pressure

D11.20.09. Pump inlet pipework to be sized to meet required net suction pressure of the pumps at ultimate design flowrate.

D11.20.10. Refer to CMDG Standard Drawings for a standard pump station layout.

D11.21. POWER DESIGN

D11.21.01. Each pump station shall be designed for Primary and Secondary Power Supply. The Primary Power Supply shall be the Electricity Provider. The Secondary Power Supply as nominated by the Water Service Provider, typically either mobile generator, fixed on-site generator, Uninterruptable Power Supply (UPS) or a second independent supply from the Electricity Provider. ***Power Supply***

D11.21.02. The nominated Secondary Power Supply shall be incorporated into the switchboard, conduits, service poles, etc., even if a Secondary Power Supply is not required at the particular stage. ***Secondary Power***

D11.21.03. Electrical design shall comply with purchase specifications available on Council specific pages at www.cmdg.com.au. ***Electrical Specification***

D11.22. CONTROL AND TELEMETRY DESIGN

D11.22.01. Each pump station shall be connected to the Water Service Provider's telemetry monitoring system. ***Telemetry***

D11.22.02. A radio desk top survey must be conducted at the developers cost to determine the best signal path for the telemetry communication to occur.

D11.22.03. Where directed by the Water Service Provider, telemetry and control shall comply with the standard design and purchase specifications. ***Telemetry Specification***

D11.22.04. Refer to Water Service Provider for design requirements for water hammer and dynamic stresses. ***Water Hammer***

PIPELINE INSPECTION AND TESTING

D11.23. INSPECTION

D11.23.01. All pipes, fittings and components are to be inspected and approved by a Registered Professional Engineer, Queensland, and / or relevant Water Services Provider approved inspector.

D11.23.02. Inspections are to be in compliance with Operational Works Permit conditions, CMDG Works Inspections or Water Services Providers specific contract documents. ***Inspection***

D11.23.03. Inspection schedule, inspector contact, notifications, fees, and workplace safety procedures are to be recorded at the pre-start safety meeting for the works. ***Schedule***

D11.24. TESTING OF PIPELINES

D11.24.01. The testing of pipelines and affixed components is to be undertaken in accordance with Table D11.24.01 Testing Procedures for Infrastructure.

Table D11.24.01 Testing Procedures for Infrastructure

Local Government	Testing Method
Banana Shire	As per the requirements of D11.24
Central Highlands Regional	As per the requirements of D11.24
Gladstone Regional	As per the requirements of Annexure D11E.
Isaac Regional	As per the requirements of D11.24
Livingstone Shire	As per the requirements of D11.24
Maranoa Regional	As per the requirements of D11.24
Rockhampton Regional	As per the requirements of D11.24

D11.24.02. Mains shall be pressure tested to detect excessive leakage and defects in the pipeline including joints, thrust and anchor blocks.

D11.24.03. Pipelines shall be tested in sections as soon as practicable after each section has been laid, jointed and backfilled, provided that:

a) All joints are required to be exposed and inspected for defects and pressure texted before being backfilled. If the contractor wishes to backfill the joints prior to the testing then it is at their own risk.; and ***Inspection prior to Backfill***

b) The pressure testing shall not be commenced earlier than seven days after the last concrete thrust or anchor block in the section has been cast. ***Timing***

D11.24.04. For the purpose of this sub-clause, a section shall be defined as a length of pipeline which can be effectively isolated for testing, e.g. by means of main sluice valves ***Section Definition***

D11.24.05. Pressure testing shall not be carried out during wet weather unless otherwise approved by Water Service Provider. ***Wet Weather***

D11.24.06. During pressure testing, all field joints which have not been backfilled shall be clean, dry and accessible for inspection. ***Field Joints***

D11.24.07. During the pressure testing of a pipeline, each sluice valve shall sustain at least once, the full test pressure on one side of the valve in closed position with no pressure on the other side for at least 15 minutes. ***Sluice Valves***

D11.24.08. Before testing a pipeline section, it shall be cleaned to the satisfaction of the Superintendent and filled slowly with water, taking care that all air is expelled. Purging of air from rising mains shall be promoted by opening air valves. In order to achieve conditions as stable as possible for testing by allowing for absorption, movement of the pipeline and escape of entrapped air, the section shall be kept full of water for a period of not less than 24 hours prior to the commencement of the pressure testing. ***Filling with Water***

D11.24.09. The hydrostatic test pressure which shall be applied to each section of the pipeline shall be such that at each point of the section the test head shall be equal to or greater than the pressure rating of the pipe specified or shown on the Drawings, but shall not exceed same by more than 20 per cent. The minimum test pressure shall be 1250kPa. ***Test Pressure***

D11.24.10. The specified test pressure shall be maintained as long as required, while the whole section is examined, and in any case not less than 15 minutes. ***Duration of Test***

D11.24.11. The pressure testing of a section shall be considered to be satisfactory if: ***Satisfactory Test Requirements***

a) there is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component;

b) there is no visible leakage; and

c) There is no loss of pressure in the 15 minute test period.

D11.24.12. Any failure, defect, visible leakage, which is detected during the pressure testing of the pipeline (even if the test is a pass) or during the Defects Liability Period shall be made good by the developer. ***Rectification***

D11.25. CLEANING, FLUSHING AND DISINFECTION

D11.25.01. The testing of pipelines and affixed components is to be undertaken in accordance with Table D11.25.01 Cleaning, Flushing and Disinfection for Infrastructure.

Table D11.25.01 Cleaning, Flushing and Disinfection for Infrastructure

Local Government	Testing Method
Banana Shire	As per the requirements of D11.25
Central Highlands Regional	As per the requirements of D11.25
Gladstone Regional	As per the requirements of Annexure D11E.
Isaac Regional	As per the requirements of D11.25
Livingstone Shire	As per the requirements of D11.25
Maranoa Regional	As per the requirements of D11.25
Rockhampton Regional	As per the requirements of D11.25

D11.25.02. Cleaning, flushing and disinfection shall be carried out in three (3) stages on all newly laid mains and water services:

a) Preliminary Flushing

b) Chlorination

c) Final flushing

Except on acceptable short sections, where swabbing has been approved.

D11.25.03. The water main shall be flushed prior to chlorination so that a minimum velocity of 0.76m/sec is obtained in the main. Where possible scour valves and hydrants shall be used for this purpose. The quantity of water used, must be 20% more than the calculated volume of the main to be flushed, to ensure full flushing is achieved. ***Flushing Velocity***

D11.25.04. Sodium hypochlorite solution (10% available chlorine) or other approved chlorine-bearing agent shall be used for chlorination of the main. The agent shall be added as a water mixture. The dose of chlorine shall be 20mg/L or to achieve a free chlorine value of 5mg/L whichever is greater. ***Chlorine Dose***

D11.25.05. When the main is completely filled with chlorinated water, the section shall be closed and a contact period of 24 hours allowed. In the process of chlorinating, ***24 Hour Contact***

valves, hydrants and other appurtenances in the newly laid pipe section shall be operated while the pipeline is filled with the chlorinating agent. No direct connection of the newly laid main is permitted to the existing system, until the new main has been appropriately flushed.

D11.25.06. The preferred point of application of the chlorine-bearing water mixture is at the beginning of the pipeline extension or any valved section of it and through a cock inserted in a tapping band or a hydrant. The required dose is added as each section of the main is filled. In a new system, application of chlorine may be made at an elevated tank, standpipe or reservoir providing these are properly cleaned first and with due allowance for the volume of water in the tank, standpipe or reservoir.

Point of Application

D11.25.07. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremes. Care should be taken in disposal as the solution is aggressive and toxic. De-chlorination may be required prior to discharge.

Flushing

D11.25.08. Swabbing of water mains consists of foam which is inserted into the water main and using the water pressure and flow, pushed through to the main discharge point to remove deleterious material. Swabbing of new mains is to be carried out when required by the Water Service Provider and in accordance with Section 18 of WSAA's Water Supply Code of Australia (V3.1).

Swabbing

D11.25.09. Testing for residual chlorine in the newly laid main is required once the flushing is completed. The free chlorine residual shall be in the range of 0 – 2.0 mg/l.

Chlorine Testing

D11.25.10. If the residual chlorine levels are outside the desired range then the flushing and sterilization process shall be recommenced until the required levels are reached.

D11.25.11. Bacteriological testing is required on all new mains following satisfactory completion of swabbing/flushing and pressure testing in accordance with Table D11.25.02 Bacteriological Testing of Water Mains and as follows:

Bacteriological Testing

a) Scour past the sampling point.

b) Engage a Recognised Testing Laboratory accredited for the test to collect representative water samples from the test section of the water main.

c) Dispose of testing water in accordance with the relevant environmental Regulator and/or Water Agency requirements.

Table D11.25.02 Bacteriological Testing of Water Mains

Local Government	Bacteriological Testing Required
Banana Shire	Yes
Central Highlands Regional	No
Gladstone Regional	Yes in accordance with Annexure D11E.
Isaac Regional	Yes
Livingstone Shire	Yes
Maranoa Regional	Yes
Rockhampton Regional	No

D11.25.12. Sections of new water main, subject to bacteriological testing in accordance with Table D11.25.02 Bacteriological Testing of Water Mains will be accepted if:

a) The test results fall within the water quality parameter limits specified in the Table D11.25.03 Water Quality Parameter Limits; or

b) The water quality parameter test results in the test section of water main are no worse than the water quality parameter test results measured by testing an influent sample of existing mains water, provided that the influent sample was collected by the NATA registered laboratory at the same time as water sample from the test section of water main was collected.

Table D11.25.03 Water Quality Parameter Limits

Water quality parameter	Unit	Acceptable range
pH	-	6.8 - 8.5*
Chlorine (free)	mg/L	0 - 2.0
Total Coliform count	cfu/100mL	0
Faecal Coliform count or E.Coli count	cfu/100mL	0
Heterotrophic Plate count	cfu/mL	0 - 10

* for cement mortar lined mains an upper level pH of 9.2 is acceptable

D11.26. DEFECTS / MAINTENANCE PERIOD

D11.26.01. The satisfactory performance, repair and maintenance of all assets, infrastructure and its components, constructed, installed and/or purchased by the developer is the responsibility of the developer during the Defects Liability (Maintenance) Period. The relevant Water Service Provider is responsible to approve the necessary rectification works, the cost of defect rectification works are the sole responsibility of the developer, in consultation with the Water Service Provider. ***Defects Liability Period***

D11.27. CONNECTION TO EXISTING WATER NETWORK

D11.27.01. The connection of all new water mains or additional infrastructure to the existing water network shall be made by the Water Service Provider staff at the developers cost. ***Connection to existing Network***

DOCUMENTATION

D11.28. NON-TRUNK WATER SUPPLY NETWORK

D11.28.01. Master Plans are required to be submitted to, and approved by the relevant Council, as part of any Development Application submission. ***Masterplan***

D11.28.02. Master Plans must comply with all requirements of CMDG.

D11.28.03. The proposed water supply network and facilities detailed design, including calculations shall be submitted to the Water Service Provider, and if required to the Local Government for approval as part of the Operational Works application. ***Operational Works Approval***

D11.28.04. The Drawings (digital format and 'A3' size RPEQ signed hardcopy) shall show to scale: ***Drawings***

a) Plan: contours, alignment of water mains, sizing of water mains, pipe materials, valves, hydrants, fittings, thrust blocks location, water service conduits, property connection points, pumping stations, existing and proposed allotment contours and boundaries, and electricity services, sample thrust block size, compaction.

b) General arrangement of pumping stations with site plan; concrete outlines; number, make, model and details of pumps; inlet and outlet pipework details and levels; pump cut in; cut out and alarm levels; switchboard location; pumping station access details.

c) A drawing note at each connection 'Connection to the existing network to be carried out by Water Service Provider, at the developer's costs'.

d) Drawing Notes shall include: pipe Class, pipe colour, connection to existing system, Dial Before You Dig,

D11.28.05. Detail plans shall be drawn to a scale of 1:1000 or as approved otherwise by the Water Service Provider. ***Drawing Scale***

D11.28.06. The operational works submission must be accompanied by design calculations relating to water pumping stations including: ***Design Calculations***

- Design Statement regarding noise levels;
- Design flow calculations (including plan of identified catchment area); and
- Pump selection including pump curve with proposed duty point.

D11.28.07. At the Pre-start Meeting and during construction, the Superintendent and Contractors must have and work to up-to-date Approved Operational Works Drawings on-site plus a copy of the Operational Works Decision Notice and any attached conditions.

D11.28.08. If any CMDG drawings are specifically referenced in the drawing package, the CMDG drawings shall be attached in the drawing package. It is the designers' responsibility to check and obtain the most up to date copies of the standard drawings from the CMDG website at the time of submission. ***Use of CMDG Drawings***

D11.28.09. CMDG Standard Drawings (or part thereof) are not to be replicated in the submitted drawings. However, any deviations (slight or significant) from CMDG standards and drawings must be shown on the submitted drawings, RPEQ certified and Council approved prior to construction.

D11.29. AS CONSTRUCTED DETAILS

D11.29.01. As constructed data shall be submitted to the Water Service Provider showing the asset location and attributes of pipelines, fittings, valves, hydrants, all pumping station details together with operating and maintenance manuals. Refer to standard drawing CMDG-W-020 for an example layout. ***As Constructed Works***

D11.29.02. Refer to the Capricorn Municipal Development Guidelines web site www.cmdg.com.au for further information on the applicable Local ***Web Site***

Government's As Constructed data submission requirements. These will appear within the 'As Constructed' tab.

ANNEXURE D11A

D11.30. QUALITY CONTROL AND TESTING

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
MANDATORY TESTING				
Siting and Excavation	Geometry	1 line	1 per line	Survey
Testing of Pipelines	Pressure testing	1 line	1 per line	As specified in Section D11.24
	Bacteriological Testing			As specified in Section D11.25
AUDIT TESTING – IF ORDERED BY WATER SERVICE PROVIDER				
Materials Supply	Material Quality - Supplier's documentary evidence and certification of:			
	- MPVC Pipes	1 contract	1 per contract	*AS1477* Series 2
	- Ductile Iron Pipes	1 contract	"	AS/NZS 2280 and AS2129
	- Copper Pipe	1 contract	"	AS1432
	- Polyethylene Pipe	1 contract	"	AS4130
	- Sluice Valves Material	1 contract	"	AS/NZS 2638 and AS2129
	- Non Return Valves	1 contract	"	AS4794
	- Spring Hydrants	1 contract	1 per contract	AS/NZS 2280 or AS3952
Bedding	Material Quality - Grading	1 contract	1 per contract per source	AS2032
Thrust and Anchor Blocks	Refer Construction Specification C271			
Concrete Encasement	Refer Construction Specification C271			
Chamber Covers and Frames	Geometry	1 cover/frame	1 per cover/frame	Survey
Backfill and Compaction	Compaction	1 line	1 per 2 layers max 100m^2	AS1289.5.7.1

ANNEXURE D11B

D11.31. PURCHASE SPECIFICATIONS

Specification Code	Description
PS-1	Cover & Frames for Access Chambers – Water Supply & Sewerage
PS-2	Precast Water Access Chamber Components
PS-3	Ductile iron pressure pipe
PS-4	Polyethylene pressure pipe
PS-5	PVC pressure pipe
PS-6	PVC sewer pipe fittings
PS-7	Polyethylene sleeving for pipes
PS-8	Domestic on-site sewage pump station
PS-9	Detectable marker tape for pipelines
PS-10	Tapping bands for pipelines
PS-11	Air valves for water supply purpose
PS-12	Brass gate valves, brass globe valves & brass non-return valves
PS-13	Butterfly valves for general purpose
PS-14	Gate valves for general purpose
PS-15	Single detector check valve
PS-16	Metal seated sluice valves
PS-17	Resilient seated sluice valves
PS-18	Stainless steel globe valves
PS-19	Sewerage vent pole
PS-20	Cast iron fittings for pipelines
PS-21	Spring Hydrant Valves for Waterworks Purposes
PS-22	Electromagnetic Water Meters
PS-23	Battery Powered Electromagnetic Water Meters
PS-24	Cast Iron Gate Valves for General Purposes
PS-25	Non-Return Valves – Swing Check & Tilting Disk
PS-26	Marker Posts
PS-27	Pavement Markings
PS-28	Gaskets
PS-29	Single Detector Check Valve

ANNEXURE D11C

D11.32. TYPICAL LOADINGS PER DEVELOPMENT TYPE

The EP's per development type are to be in accordance with each Council's Developer Contribution Policies. Where these policies do not provide sufficient information, the EP's given in Table D11.32.01 can be used as a guide. Refer also to relevant Adopted Infrastructure Charges Resolution for the Local Government.

Table D11.32.01 Design EP's Per Development Type

Planning Areas	Unit	EP per Unit
Residential Areas	Lot	3
Accommodation Building, Multi-unit dwelling, Aged care accommodation, duplex	Dwelling Unit	2.5
Group Housing	Gross hectare	120
Local Commercial (Garden Centre, Shop, Take away food store, Vet)	Gross hectare	75
Educational Institutions	Student	0.2
Hospitals / Nursing homes	Bed	2.5
Public Open Space	Gross hectare	10
Other High Density Commercial (Cinema, Major Shopping Outlet, Nightclub, Service Station)	Gross let-able floor space, 10,000 square meters	500-800
Industrial Areas	Gross hectare	56
Environmental Protection Areas	N/A	Nil
Community/Recreation Uses	Gross hectare	56

Development Type/class	Equivalent Persons / Connection
<u>Single Family Dwelling</u>	
Lot > 1500m^2	4.0
Lot 1101m^2 to 1500m^2	3.7
Lot 901 m^2 to 1100m^2	3.4
Lot 401m^2 to 900m^2	3.1
Lot < 400m^2	2.5
<u>Multi Unit Accommodation</u>	
Units > 3 Bedrooms	0.4 + 0.6 / Bedroom
Units = 3 Bedrooms	2.2
Units = 2 Bedrooms	1.6
Units < 2 Bedrooms	1.0
<u>Caravan Parks</u>	
Van Site / Camping Site	1.2
<u>Shops/Offices</u>	
Per 90 m^2 GFA	1.0

NOTES:

a) Based on 3.0 Equivalent Persons / Equivalent Tenement (EP/ET), with 1 ET equivalent to a single residential dwelling on a standard size allotment (401m^2 to 900m^2).

b) For undeveloped land equivalent populations shall be calculated in accordance with the maximum allowable population density in the Planning Scheme.

c) No development shall reduce the existing service levels below the requirements contained in section D11.07 or existing service levels which are currently below the standards as set in section D11.07.

ANNEXURE D11D

D11.33. DIURNAL WATER DEMAND PATTERN (GLADSTONE REGION)

The following represents the Maximum Day (MD) diurnal half-hourly demand data for the Gladstone Region.

Maximum Day Half-Hourly Diurnal Water Demand Data				
Time	Residential	Commercial	Industrial	School / Park
0:00	0.235	0.23	0.955	0.23
0:30	0.235	0.192	0.932	0.179
1:00	0.235	0.128	0.92	0.128
1:30	0.235	0.115	0.896	0.115
2:00	0.255	0.128	0.884	0.128
2:30	0.255	0.141	0.884	0.141
3:00	0.255	0.153	0.896	0.153
3:30	0.275	0.192	0.884	0.179
4:00	0.294	0.23	0.884	0.23
4:30	0.353	0.32	0.884	0.32
5:00	0.608	0.396	0.884	0.396
5:30	2.668	0.473	0.908	0.486
6:00	3.531	0.908	0.967	0.908
6:30	3.668	1.56	1.015	1.56
7:00	3.492	2.071	1.147	2.084
7:30	3.197	2.34	1.278	2.34
8:00	2.903	2.416	1.35	2.417
8:30	2.472	2.455	1.433	2.455
9:00	2.236	2.455	1.481	2.468
9:30	2.119	2.48	1.505	2.468
10:00	2.04	2.493	1.529	2.468
10:30	2.02	2.493	1.529	2.493
11:00	2.02	2.506	1.553	2.506
11:30	2.02	2.506	1.576	2.506
12:00	1.981	2.506	1.588	2.506
12:30	2.02	2.493	1.588	2.493
13:00	2.02	2.467	1.588	2.481

Maximum Day Half-Hourly Diurnal Water Demand Data				
Time	Residential	Commercial	Industrial	School / Park
13:30	2.02	2.467	1.588	2.468
14:00	2.02	2.467	1.576	2.468
14:30	2.04	2.455	1.541	2.468
15:00	2.138	2.455	1.481	2.442
15:30	2.334	2.403	1.433	2.404
16:00	2.609	2.34	1.397	2.34
16:30	2.903	2.199	1.361	2.212
17:00	3.472	2.02	1.314	2.02
17:30	4.002	1.56	1.29	1.56
18:00	4.178	0.972	1.242	0.972
18:30	4.119	0.716	1.194	0.729
19:00	3.982	0.575	1.17	0.575
19:30	3.707	0.447	1.123	0.435
20:00	3.374	0.371	1.063	0.371
20:30	2.785	0.345	1.051	0.358
21:00	2.217	0.32	0.991	0.32
21:30	1.667	0.32	0.979	0.307
22:00	1.216	0.307	0.991	0.294
22:30	0.902	0.294	0.967	0.294
23:00	0.412	0.281	0.967	0.281
23:30	0.255	0.243	0.943	0.243

ANNEXURE D11E

D11.34. TESTING REGIME (GLADSTONE)

GRC Standard Operating Procedure – Water Main Commission Process

GLADSTONE
REGIONAL COUNCIL

Site: Gladstone Region

Type of Document: Standard Operating Procedure

Document Title: Water Main Commissioning Process

Document No:

Document Status					
Date	Revision	Description	Author	Approved	To be revised
13/05/2016	A	First Draft	BM - DC		
7/06/2016	A	Reviewed	DC - DP		
23/08/2016	B	Updated	S. Gorle		
24/08/2016	B	Reviewed	B. Reck		

1 Purpose

This document describes the process for connecting a new water main into existing GRC infrastructure

2 Scope

This procedure is to be used by all GRC staff and contractors.

3 Definitions

Term	Definition
GRC	Gladstone Regional Council
NATA	National Association of Testing Authorities Australia
CMDG	Capricorn Municipal Development Guidelines
WSA	Water Supply Association of Australia

4 Associated Documents

- CMDG D11
- WSA 03-2002 - Part 3

5 Pressure Testing Procedure

Pressure testing is to be conducted after trench filling and compaction, and not before any concrete has cured for a minimum of 7 days. If any results are unsatisfactory, detect and rectify any faults, and re-test. Repeat to rectify and re-test until satisfactory results are achieved. Regardless of results, any visible or detectable leaks or blockages are to be rectified. (As per WSA 03 Section 19.4)

Polyethylene water mains are to be tested in accordance with WSA 01 - 2001.

Step	Action	Responsibility	Comments
1.	Engage a Recognised (NATA) accredited contractor to perform the testing of the water main.		Unless approved otherwise within contract conditions
2.	Determine system test pressure (STP).	Determined in accordance with WSA 03 Clause 19.4.2 based upon the design pressure (DP) so that: DP < STP < 1.25 x DP	The STP is chosen that: **A.** at the highest point in the test section, STP > DP **B.** at the lowest point in the test section, STP = 1.25 x DP
3.	Determine maximum allowable loss.	Determined in accordance with WSA 03 Clause 19.4.3. Maximum allowable loss (L/h) = $(0.14 \times d_i \times L_p \times H) / 1000$	Where: d_i = internal pipe diameter, (mm) L_p = length of water main under test, (km) H = average value of test head, (m)
4.	Use a test rig that has two calibrated pressure gauges.	Each gauge shall have a range of 0-2500 kPa and shall have a current calibration certificate. Both gauges shall read within ±5% of test head, and ±5% of each other.	The gauge recording the lower of the two readings shall be used.

5.	Blank flanges or caps to be installed at each end of the test section.	Do not test against closed valves into the existing network. Temporarily strut and anchor mechanical ends that are not load resistant in order to withstand the test pressures without movement.	**NOTE:** **A.** Inform all personnel of the loading limits of the temporary fittings and supports. **B.** Adopt a maximum test length of 1km unless otherwise permitted by the Superintendent.
6.	Fill the test section with water.	Slowly fill the section with water from a water truck or GRC-issued metered standpipe fitted with certified backflow device ensuring that air has been completely expelled. Base the rate of filling on a maximum velocity of 0.05 m/s.	**NOTE:** **A.** Clean the section before filling. **B.** Allow between 3 and 24 hours for the test water temperature to stabilise and dissolved air to vent from the system. **C.** Fill cement-lined pipes 24 hours prior to testing to allow for saturation of the lining.
7.	Pressurise the line to 75% of the STP.	Leave for a minimum of 12 hours.	Preliminary pressurisation is intended to: **A.** Stabilise the water main by allowing most the time-dependent movement to occur; **B.** Achieve saturation in absorbent materials; **C.** Allow pressure-dependent increase in volume of flexible pipes prior to primary testing.
8.	Steadily raise the pressure to the STP.	Only perform if no visible leaks are present after the previous step.	
9.	Maintain test pressure for 4 hours.	Measure and record, at half hour intervals the quantity of water added in order to maintain pressure during the testing period.	
10.	Visually inspect the line for leaks.	If a leak is suspected but not visible, use aural or electronic assistance.	
11.	Depressurise the test section.	Do not remove temporary supports until the section has been depressurised.	
12.	Dispose of test water.	Dispose in accordance with the relevant environmental Regulator and Water Agency requirements.	

13.	Acceptance.	The pressure test results on a section of water main will be accepted if:	**A.** There is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component; **B.** There is no visible leakage; **C.** The measure loss rate for the relevant test period of the pressure testing does not exceed the maximum allowable loss rate as determined in accordance with Clause 19.4.3; **D.** For polyethylene water mains, compliance with the requirements of Clause 2.13.5 of WSA 01 -2001 is achieved for all mains except property services, which shall also comply with Clause 2.13.4
14.	Sign Off.	Once testing is completed, a GRC member to sign off on Pressure Test.	
15.	Connection.	Once sign off is completed, GRC will connect the pipe work to the infrastructure unless otherwise stated in the contract in agreement.	

END OF PROCEDURE

6 Chlorination Procedure

To ensure newly constructed water mains are safe to connect to existing GRC water mains during the process of chlorinating, no direct connection of the newly laid main is permitted to the existing system, until the new main has been appropriately flushed and disinfected.

Step	Action	Responsibility	Comments
1.	Blank flanges or caps to be installed at each end of the test section.	Unless signed off by certified water engineer and GRC approve this action, do not test against closed valves.	**NOTE:** The new pipe work is not to be connected to GRC infrastructure.
2.	Install scouring point.	To be at the lowest point	Through a scouring "TEE".
3.	Install injection point.	To be at the highest point	Through either: • Hydrant "TRR"; or • Tapping bands
4.	Install additional sampling point(s)	If required at extremeties of water main to ensure that chlorination dosing rates are consistent throughout main	Through either: • Hydrant "TRR"; or • Tapping bands
5.	Flush water main.	Ensure that a minimum velocity of .076m/sec is obtained in the main	The quantity of water used, must be 20% more than the calculated volume of the main to be flushed, to ensure the full flushing is achieved. This can be done by pumping water into the injection point on the main using a water truck or filling via a GRC issued metered standpipe fitted with certified backflow device. Tested backflow device will be provided by contractor with certificate to be submitted to GRC before use.

6.	Add chemicals.	Sodium hypochlorite solution (10% available chlorine) or other approved chlorine bearing agent shall be used for chlorination of the main. The agent added as a water mixture. Chlorine dose shall be 20mg/L or greater, to achieve a free chlorine value of 5mg/L whichever is greater	Use a potable water truck or GRC issued metered standpipe fitted with certified backflow device to inject the chlorinated water into the new water main at the injection point, flushing out of the scouring point Once the required chlorination water levels have been achieved, close the scour and injection point's. **NOTE:** Ensure all environmental guidelines are followed.
7.	A contact period of 24 hours with the main completely filled with chlorinated water.	Valves, hydrants and other appurtenances in the newly laid pipe section, shall be operated while the pipeline is filled with the chlorinating agent	**NOTE:** Pressure testing can be completed at this stage (Refer Pressure Testing Procedure)
8.	24 hours following chlorination	All treated water shall be thoroughly flushed from the newly laid pipeline at its extremes.	Due to environmental impact, care to be taken when disposing of the solution. De-chlorination may be required prior to discharge.
9.	Bacteriological testing	Following satisfactory completion of swabbing/flushing and pressure testing, **bacteriological testing** is required on all new mains (As per table D11.20.01)	**A.** Scour past the sampling point. **B.** Engage a Recognised (NATA) Testing Laboratory accredited for the test to collect and test representative water samples from the test section of the water main (water main is to be flushed through the injection point and out the scouring point). **C.** Dispose of testing water in accordance with the relevant environmental Regulator and/or Water Agency requirements.
10.	Acceptance	Sections of new water main, subject to bacteriological testing in accordance with Table D11.20.01 will be accepted if:	**A.** The test results fall within the water quality parameter limits specified in the CMDG Table D11.20.02: or **B.** Water quality parameter test results in the test section of water main are no worse than the test results measured by testing a sample of existing mains water, provided that the sample was **analysed** by the NATA registered laboratory at the same time as water sample from the test section of water main was collected.
11.	Sign off	Once testing is completed, a GRC member to sign off on Chlorination test	
12.	Flushing and Connection	Once signed off is completed, GRC will flush then connect the pipe work to the existing infrastructure.	Test for residual chlorine Free chlorine residual to be in the range: 0 – 2.0 mg/l.

Water Quality Parameter Limits & Water quality parameter Unit Acceptable range (As per CMDG Table D11.20.02)		
Water quality parameter	**Unit**	**Acceptable range**
PH	-	6.8 - 8.5
Chlorine (free)	mg/L	2
Total Coliform count	cfu/100mL	0
Faecal Coliform count or E Coli count	cfu/100mL	0
Heterotrophic Plate count	cfu/mL	10

END OF PROCEDURE