CAPRICORN MUNICIPAL DEVELOPMENT GUIDELINES

SEWERAGE SYSTEM

D12

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.

DESIGN NETWORK

D12.01. SCOPE

D12.01.01. This Guideline sets out the requirements for the design and construction of the NON-TRUNK infrastructure sewerage network to achieve the Desirable Standards of Service in accordance with requirements of the Sustainable Planning Act, the Water Supply (Safety and Reliability) Act, and the Plumbing and Drainage Act. ***Authority***

D12.01.02. For any TRUNK infrastructure, refer to the Sewerage Service Provider.

D12.01.03. 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 D12 Sewerage Design and Construction Guideline
2. CMDG Standard Drawings
3. Gravity Sewerage Code of Australia WSA 02-2014
4. Sewage Pumping Station Code of Australia WSA 04-2005
5. Pressure Sewerage Code of Australia WSA 07-2007
6. AS/NZS 3500 Plumbing and Drainage
7. AS/NZS 2566.1 Buried Flexible Pipelines – Structural Design
8. AS/NZS 2566.2 Buried Flexible Pipelines – Installation
9. AS2032 Installation of PVC pipe systems
10. Department of Environment and Natural Resources, Planning Guidelines for Water Supply and Sewerage

D12.02. OBJECTIVE

D12.02.01. The Desired Standards of Service (DSS) are determined and displayed by each Local Government and/or Sewerage Service Provider (SSP). These Guidelines provide acceptable solutions to meet a range of DSS. Designs that do not comply with an acceptable solution shall require a functional design, be RPEQ certified, and supported by design references and calculations. ***Direct and Separate Service***

D12.02.02. All premises in the Sewerage Service Area are to be connected directly and separately to the sewerage network ***Direct and Separate Service***

D12.02.03. The sewerage network is to transport sewage from domestic, commercial and industrial properties using gravity flow pipes and, where this is uneconomic, by pumping, to the treatment plant. The sewerage reticulation system shall be designed to minimise the number of pump stations. ***Sewerage System***

D12.02.04. Special Sewerage Arrangements, Designs and Vacuum and Low Pressure systems are not approved within the scope of this guideline. Refer to the relevant Sewerage Service Provider. The sewerage network is to provide a holistic solution to the greater community, through the efficient construction, operations and maintenance of the Sewerage Systems. This solution is achieved through the adherence to Master Plans.

D12.02.05. The sewerage network is to provide a holistic solution to the greater community, through the efficient construction, operations and maintenance of centralised Sewerage Systems. This solution is achieved through the adherence to Master Plans. ***Master Plans***

D12.02.06. Master Plans are required to reflect a holistic approach of achieving the Least Life Cycle costs for the relevant Council.

D12.03. DEFINITIONS

D12.03.01. Sewerage Service Provider means the entity responsible for providing the sewerage services in accordance with the Water Supply (Safety &Reliability) Act. The following Table D12.03.01 outlines the Sewerage Service Provider for each local government area.

Service Provider

Table D12.03.01 Sewerage Service Provider

Local Council	Sewerage 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

D12.03.02. The ultimate planned service area, staged service area, hydraulic capacity and component sizing shall be as approved by the relevant Sewerage Service Provider via a Sewerage Network Analysis.

D12.03.03. Trunk infrastructure is defined in the Sustainable Planning Act and involves a list of assets as identified by the Local Government. In general, trunk infrastructure is not determined by asset size, but function and limited access. 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 limited access, bulk catchment collection and treatment of sewage via:

Trunk

- Trunk gravity mains,
- Pump stations,
- Rising mains,
- Treatments plants, and
- Effluent re-use.

D12.03.04. Non-trunk infrastructure is defined in the Sustainable Planning Act and involves internal works and/or external works required for the safety and efficiency of the network. For sewerage 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:

Non-Trunk

- Access property connections,
- Reticulation gravity sewer mains,
- Reticulation collector mains,
- Excluding low pressure pump stations and vacuum systems.

D12.03.05. EP means Equivalent Person.

Equivalent Person

D12.03.06. ET means Equivalent Tenement. ***Equivalent Tenement***

D12.03.07. PVC* means pipe material of Polyvinyl Chloride (Modified (MPVC) and Oriented (OPVC)) and composites. ***PVC* / PE****

D12.03.08. PE* means pipe material of Polyethylene in accordance with CMDG Purchase Specifications listed in Annexure D12B.

D12.03.09. A 'premises' is a building or other structure; or land, whether or not a building or structure is situated on the land. ***Premises***

D12.03.10. Property Connection Junction is the junction 'not at grade' between the Sewer Main and the Property Connection Branch. ***Property Connection Junction***

D12.03.11. Property Connection Branch is the pipework between the Property Junction and the Property Point of Connection. This pipework will be an asset of the Sewerage Service Provider. ***Property Connection Branch***

D12.03.12. Property Point of Connection is the point where the private sanitary drainage connects to the Service Provider's Sewerage Network. The IO (Inspection Opening) usually marks the Property Point of Connection. ***Property Point of Connection***

D12.03.13. The Sewerage Service Providers purchase specifications, are available on the Capricorn Municipal Development Guidelines website (www.cmdg.com.au). Where Sewerage 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. ***Purchase Specifications***

D12.04. MATERIALS

D12.04.01. DICL pipe is to be in accordance with the purchase specifications listed in Annexure D12B. Refer to Table D12.04.01 Cement Lining Type for the cement lining type relevant to each local Government area. ***Ductile Iron (DI)***

Table D12.04.01 Cement Lining Type

Local Government	Cement Lining type for sewerage
Banana Shire	Calcareous (Hydroline CA or equivalent)
Central Highlands Regional	Normal
Gladstone Regional	Calcareous (Hydroline CA or equivalent)
Isaac Regional	Normal
Livingstone Shire	Normal
Maranoa Regional	Normal
Rockhampton Regional	Normal

D12.04.02. All ductile iron pipes and cast/ductile iron fittings shall be wrapped, taped and sealed completely with polyethylene sleeving 0.25mm thick. Wrapping shall be carried out in accordance with the pipe manufacturer's recommendations. ***DI Protective Wrapping***

D12.04.03. PVC pipe is to be in accordance with the purchase specifications listed in Annexure D12B. ***PVC****

D12.04.04. PE* means pipe material of Polyethylene in accordance with CMDG Purchase Specifications listed in Annexure D12B. ***PE****

D12.04.05. Pipe colour and/or sleeving colour shall be: cream or grey for raw sewage, lilac for treated effluent reuse. ***Pipe Colour***

D12.04.06. Flanges are to be in accordance CMDG Purchase Specifications listed in Annexure D12B. ***Flanges***

D12.04.07. Precast sewerage access chambers components are to be in accordance with CMDG Purchase Specifications listed in Annexure D12B. ***Precast Access Chambers***

D12.04.08. Covers and Frames for access chambers are to be in accordance with CMDG Purchase Specifications listed in Annexure D12B. ***Covers and Frames***

D12.04.09. External to a sewerage wet well, structural steelwork, ladders, brackets, covers etc. shall be abrasive blast cleaned to AS 1627 Class 3 and hot dip galvanised to AS 4680. Within a wet well environment all components shall be 316 Stainless Steel with the exception of the covers to wet wells and valve pits which shall be aluminium to reduce lifting weight for maintenance personnel. ***Structural Steelwork***

D12.04.10. Bolts in above ground uses shall be hot dipped galvanised in accordance with AS/NZS 1214, and as acceptable in a Local Government, refer to Table D12.04.02 Galvanised Bolts in Above Ground Uses. ***Galvanised Bolts***

Table D12.04.02 Galvanised Bolts in Above Ground Uses

Local Government	Above Ground Galvanised Bolts
Banana Shire	Approved
Central Highland Regional	Approved
Gladstone Regional	Not approved
Isaac Regional	Approved
Livingstone Shire	Approved
Maranoa Regional	Approved
Rockhampton Regional	Approved

D12.04.11. Bolts in below ground uses shall be grade 316 stainless steel with nuts and washers grade 304 stainless steel. All bolts to be protected with anti-seize lubricant before installation. If required by Table D12.04.03, 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 D12.04.03 Sleeving of Fittings

Local Government	Sleeving of Fittings Approval
Banana Shire	No
Central Highland Regional	No
Gladstone Regional	Yes
Isaac Regional	No
Livingstone Shire	No
Maranoa Regional	No
Rockhampton Regional	No

D12.04.12. 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 D12.04.04;

c) Have resistivity greater than 1500 Ohm.cm2 when tested in accordance with AS 1289.4.4.1

d) Have a pH in the range 5-9 when determined in accordance with AS 1289.4.3.1;

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.

Table D12.04.04 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

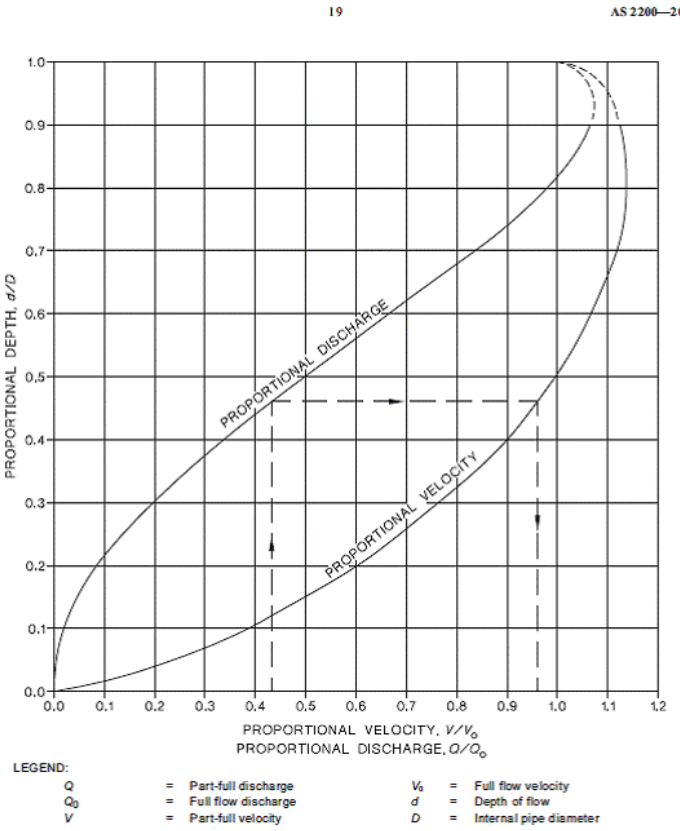
*Taken from Table G3 of AS/NZS 2566.2-2002

D12.05. HYDRAULIC DESIGN

D12.05.01. The hydraulic design capacity calculations shall be in accordance with AS2200 – Design Charts for water supply and sewerage. ***Hydraulic Standard***

D12.05.02. Colebrook-White roughness coefficient typical is 1.6mm, the proportional velocity and discharge for a part-full pipe is typically 1.13 and 0.9 respectively. Refer AS2200 Chart 13, as shown below in .Figure D12.05.01 Hydraulic Parameters. ***Hydraulic Parameters***

Figure D12.05.01 Hydraulic Parameters



D12.06. PLANNED SERVICE AREA

D12.06.01. Software used by consultants for Sewer Reticulation 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 in Table D12.06.01 Sewer Reticulation Network Analysis Software below. ***Software – Network Analysis***

Table D12.06.01 Sewer Reticulation Network Analysis Software

Council	Software Used
Banana Shire	
Central Highlands Regional	
Gladstone Regional	H2OMAP / SWMM
Isaac Regional	
Livingstone Shire	SWMM
Maranoa Regional	SEWERGEMS
Rockhampton Regional	SEWERGEMS

Note: SWMM5 is freely available online via the USEPA.

D12.06.02. The design of the sewerage 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 Sewerage Service Provider must be contacted to ascertain these external demands, point of connection to existing reticulation and operating parameters. ***External Demands***

D12.06.03. Sewer mains shall be extended to the boundaries of the development site where the sewer main is intended to service existing and/or future development. An acceptable solution is for an access chamber to be provided at 1.5m short of the boundary with a capped stub extending to the property boundary. ***Connectivity to future area***

D12.06.04. The depth of sewer mains shall be sufficient to allow current and planned service area and all allotments, to be serviced directly and separately. Refer to Sewerage Service Provider approved Strategic Plan assumptions. ***Sewer Main Depth***

D12.06.05. Property Connection Junction Depth shall not exceed 3m unless otherwise specifically approved by the SSP. ***Property Connection Junction Depth***

D12.06.06. Where the whole area of any allotment cannot be serviced by a gravity Point of Connection, a plan showing serviced area should be produced, and the Local Government and Sewerage Service Provider approval sought before proceeding. Building pad covenants shall be provided for the serviced area where it is less than the whole area of the allotment. ***Point of Connection Depth***

D12.07. DESIGN LOADING

D12.07.01. The Average Dry Weather Flow (ADWF) is to be calculated using an allowance in litres/day/equivalent person as provided in Table D12.07.01. This figure includes allowance for dry weather infiltration/Inflow ***Design Flows***

D12.07.02. Design EP's are calculated based on development type. Refer to the relevant local government Planning Scheme documents / Infrastructure Charges policies for the equivalent demands for each development type. In the absence of Local Government specific information, refer Appendix C for default equivalent demand values. ***Equivalent Demands***

Table D12.07.01 Design Average Dry Weather Flow (ADWF)

Council	Design ADWF	EP/ET
Banana Shire	200 L/d/EP	
Central Highlands Regional	250 L/d/EP	
Gladstone Regional	225 L/d/EP	2.6
Isaac Regional	250 L/d/EP	2.7
Livingstone Shire	540 L/d/ET	2.7
Maranoa Regional	200 L/d/EP	2.7
Rockhampton Regional	540 L/d/ET	2.7

D12.07.03. The ADWF diurnal hourly flow pattern ratios are as per Figure D12.07.02 ADWF Diurnal flow ratios and Table D12.07.03. Sewer Weekly Curves. ***Diurnal Pattern***

Table D12.07.02 Sewer Weekly Curves

	Residential	Business	School
Sun	100%	20%	0%
Mon	100%	100%	50%
Tues	100%	100%	50%
Wed	100%	100%	50%
Thurs	100%	100%	50%
Fri	100%	100%	50%
Sat	100%	20%	0%

Figure D12.07.01 ADWF Diurnal flow ratios

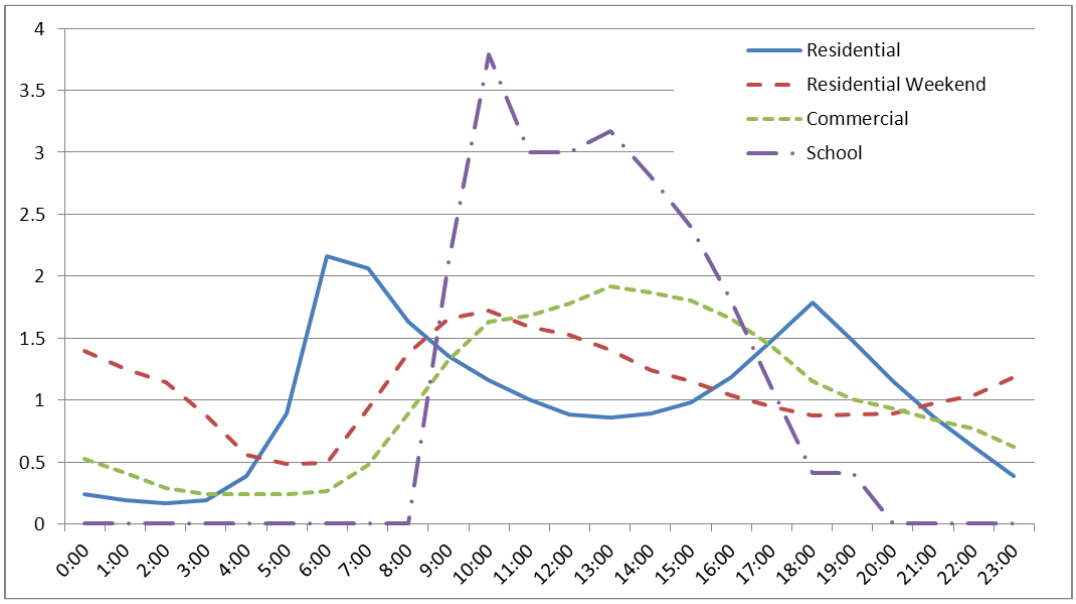


Table D12.07.03 Design Average Dry Weather Flow (ADWF)

Time	Residential	Residential Weekend	Commercial	School
0:00	0.24	1.4	0.528	0
1:00	0.192	1.25	0.408	0
2:00	0.168	1.143	0.288	0
3:00	0.192	0.875	0.24	0
4:00	0.387	0.558	0.24	0
5:00	0.889	0.486	0.24	0
6:00	2.16	0.489	0.264	0
7:00	2.06	0.932	0.48	0
8:00	1.629	1.381	0.888	0
9:00	1.356	1.659	1.32	2.112
10:00	1.163	1.72	1.632	3.792
11:00	1.005	1.592	1.68	3
12:00	0.885	1.525	1.776	3
13:00	0.855	1.404	1.92	3.168
14:00	0.89	1.24	1.872	2.808
15:00	0.977	1.155	1.8	2.4
16:00	1.182	1.041	1.656	1.8
17:00	1.479	0.947	1.44	1.104
18:00	1.787	0.879	1.152	0.408
19:00	1.479	0.88	1.008	0.408
20:00	1.153	0.895	0.936	0
21:00	0.864	0.972	0.84	0
22:00	0.624	1.038	0.768	0
23:00	0.384	1.188	0.624	0

D12.07.04. The Peak Dry Weather Flow (PDWF) shall be 2.5 times ADWF. ***PDWF***

D12.07.05. The Wet Weather Flow (WWF) shall be 5 times ADWF. The flow pattern is a constant flow for 24hrs. ***WWF***

D12.07.06. Screened overflow pits are required, for loadings greater than WWF (5ADWF) capacity, to prevent overflow into buildings and public health exposure locations. Refer to Risk Assessment and Compliance with Environmental Duty of Care responsibilities under environmental legislation ***Residual Overflows***

D12.07.07. Design EP's are calculated based on development type. Refer to the relevant local government Planning Scheme documents / Infrastructure Charges policies for the equivalent demands for each development type. In the absence of Local Government specific information, refer Appendix C for default equivalent demand values. ***Equivalent Demands***

D12.08. TENURE, EASEMENTS, ALIGNMENT & CLEARANCES

D12.08.01. All sewerage works will require written evidence of appropriate tenure rights. In general, all properties associated with the sewerage works shall be required to be identified in any Operational Works application. ***Tenure***

D12.08.02. Written approval shall be obtained from the registered owners of each of the affected property(s) affected by sewer construction works, by the Developer and submitted to the Sewer Service Provider. ***Consent of Owner***

D12.08.03. 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. ***Access Approvals***

D12.08.04. Where sewer mains are to be located within and parallel with existing local road reserves, the designer shall check that the sewer mains do not conflict with other utility services and locate the sewer mains to the satisfaction of the Local Government road manager. Refer to CMDG Standard Drawings for sewer alignment in these instances. There may be a need for additional verge width and hence additional road reserve width where sewer mains are located in road reserves. ***Local Road Reserve***

D12.08.05. Where sewer mains are to be located within and parallel with existing dedicated Main Road Reserves, the designer shall locate the sewer 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 Road Reserve***

D12.08.06. All sewerage infrastructures within private allotments shall be required to be covered by an easement as shown in Table D12.08.01 Minimum Width of Easements Over Sewer Mains unless otherwise approved by the Sewerage Service Provider. ***Easements***

D12.08.07. An access easement is required to be created between every chamber and the closest public reserve land.

D12.08.08. The easement shall be centrally located over the sewer main where possible.

Table D12.08.01 Minimum Width of Easements over Sewer Mains

Local Government	Required Easement Width
Banana Shire	Minimum 4.0m, with the formula being twice the depth of the sewer line with the sewer line located centrally in the easement
Central Highlands Regional	4.0m
Gladstone Regional	4.0m with the sewer main to be located within a central zone in the easement which is at least 1m from the edge of the easement.
Isaac Regional	4.0m with the sewer main to be located in the centre of the easement
Livingstone Shire	4.0m
Maranoa Regional	Minimum 4.0m, with the formula being depth of the sewer line minus 1.0m plus the offset from the property boundary
Rockhampton Regional	4.0m

Alignment

D12.08.09. Sewer Mains shall preferably be located as stated in Table D12.08.02 Sewer Main Alignment. Where sewer mains are located adjacent to roofwater drainage the alignment shall be 2.00m.

Table D12.08.02 Sewer Main Alignment

Local Government	Preferred sewer location	Within Properties		*Within Road Reserve*
		Alignment Front & Rear Boundaries	Alignment from side Boundaries	
Banana Shire	Within Properties	1.5m	1.0m	1.8m
Central Highlands Regional	Within Properties	2.0m	2.0m	1.8m
Gladstone Regional	Road Reserve	2.0m	2.0m	2.4m
Isaac Regional	Within Properties	2.0m	2.0m	1.8m
Livingstone Shire	Within Properties	2.0m	2.0m	1.8m
Maranoa Regional	Within Properties	2.0m	2.0m	1.8m
Rockhampton Regional	Within Properties	2.0m	2.0m	1.8m

Perpendicular Crossing

D12.08.10. All crossings of roads, watercourses, etc. shall be designed to minimise the crossing length. The desirable alignment is perpendicular to the road or watercourse alignment.

Perpendicular Clearances

D12.08.11. The minimum vertical clearance to all other crossover underground services shall be 300mm desirable. Check previous changes.

Horizontal Clearance

D12.08.12. For local alignment deviations, the minimum horizontal clearance to all parallel underground services shall be 300mm desirable clearance provided the other services have marker tape and mechanical protection as defined by AS3500.

Building Clearances

D12.08.13. Clearance from existing buildings (any protrusions) to be in accordance with the Sewerage Service Providers “Build Over Sewer” policy and the Queensland Development Code.

D12.08.14. Sewer shall be located no closer than 10m to any large and/or invasive plant species. ***Tree Clearances***

D12.08.15. 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***

D12.08.16. All service crossing angles shall be as per Table D12.08.03 Service Crossing Angle. ***Crossing Angles***

Table D12.08.03 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	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Maranoa Regional	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.
Rockhampton Regional	Between 45 degrees and 90 degrees. If this cannot be achieved then mechanical protection or greater clearances may be required.

D12.09. ACCESS CHAMBERS

D12.09.01. Access Chamber locations (on gravity sewer mains) shall be at every change of direction, change of grade, sewer main junctions except where horizontal and vertical curves are permitted in accordance with Table D12.10.04. Where possible, access chambers should be located above Q100 flood level. ***Access Chamber Locations***

D12.09.02. Access Chamber maximum spacing shall be in accordance with Table D12.09.03 for the relevant Local Government. ***Spacing***

D12.09.03. All gravity sewer mains shall have an Access Chamber located at the upper reach of the line, except where the last reach is less than 90m, these gravity sewer mains may be constructed with a lamphole access chamber or Maintenance Shaft (where approved by the relevant Sewerage Service Provider as per Table D12.09.04). Refer CMDG Standard Drawings. ***Upper Reaches***

D12.09.04. Access Chamber numbering shall be ascending, progressing upstream. Convention is manhole # / line #. ***Access Chamber Numbering***

D12.09.05. Circular Access Chamber Internal Diameters shall be in accordance with Table D12.09.02. Rectangular Access Chamber shall have a minimum 600mm dimension opening. For more than 3 connecting lines the Sewerage Service Provider may require a larger access chamber internal diameter than specified in Table D12.09.02. ***Internal Diameters***

D12.09.06. The minimum drop measurement across the Access Chamber base shall be in accordance with Table D12.09.01, Minimum Drop Through Chamber CMDG Standard Drawings. ***Base Drop***

Table D12.09.01 Minimum Drop through Chamber

Angle	Minimum Drop through Chamber (mm) *
90 - 112°	40
112 - 125°	40
125 - 140°	40
140 - 150°	20
150 - 170°	20 (Y Pattern)
Straight	20

D12.09.07. Access Chamber bases incorporating changes of flow direction greater than 90 degrees are not permitted unless specific approval is given by the relevant Sewerage Service Provider. ***Flow Angle Change***

D12.09.08. Drop Inlets to Access Chambers are indicated in CMDG Standard Drawings. The maximum number of internal drop inlet pipes is as per CMDG Standard Drawings. ***Drop Inlets***

Table D12.09.02 Access Chamber Minimum Diameter

Sewer Size (mm)	Minimum chamber internal diameter (mm) *
150 – 300	1050
375 and larger	1500

* for up to 3 connecting lines

Table D12.09.03 Access Chamber Maximum Spacing

Local Council	Sewer Mains 150 – 300 mm diameter Maximum Spacing (m)	Sewer Mains 375mm diameter and larger Maximum Spacing (m)
Banana Shire	90 m	150 m
Central Highlands Regional	90 m	150 m
Gladstone Regional	120 m	120 m
Isaac Regional	90 m	150 m
Livingstone Shire	120 m	150 m
Maranoa Regional	90 m	120 m
Rockhampton Regional	90 m	150 m

Table D12.09.04 Approved use of maintenance shafts and Lampholes

Maintenance Shafts and Lampholes

Local Council	Maintenance Shafts	Lampholes
Banana Shire	Not Approved	Not Approved
Central Highlands Regional	Approved*	Approved
Gladstone Regional	Not Approved	Not Approved
Isaac Regional	Not Approved	Not Approved
Livingstone Shire	Approved*	Approved
Maranoa Regional	Not Approved	Approved
Rockhampton Regional	Not Approved	Approved

* Subject to item 4 below

Maintenance Shafts

D12.09.09. Where approved by the relevant Sewerage Service Provider in Table D12.09.04, Maintenance Shafts in accordance with AS/NZS 4999, may be used for sewer mains to minimise the number of closely spaced Access Chambers required for change of direction/slope. Maintenance Shafts are NOT to replace access chambers required at gravity sewer main junctions or maximum spacing.

Precast Chambers

D12.09.10. Precast access chambers in accordance with AS 4198, are preferred over cast in situ access chambers. Refer to CMDG Standard Purchase Specification and CMDG Standard Drawings.

Pre-Cast Components

D12.09.11. Generally, precast access chambers shall be made up with components consisting of a fibreglass base section, concrete shaft sections of section lengths such as to minimise the number of joints required, a concrete cone section (or converter slab for shallow depths), cover and surround. Make-up Rings may be used between cone sections and surrounds to make up height differentials. Use of precast conical access chamber bases (Humes "Supabowl" or approved equivalent) are permitted in accordance with Table D12.09.05 Use of Precast Conical Access Chamber Bases.

Table D12.09.05 Use of Precast Conical Access Chamber Bases

Local Government	Precast Conical Access Chamber Bases
Banana Shire	Not approved
Central Highlands Regional	Approved
Gladstone Regional	Not approved
Isaac Regional	Not approved
Livingstone Shire	Approved
Maranoa Regional	Approved
Rockhampton Regional	Approved

D12.09.12. The installation of all precast access chamber components shall be in accordance with the manufacturers' recommended procedures and requirements.

D12.09.13. Concrete work shall comply with the CMDG Construction Guideline MINOR CONCRETE WORKS C271, in relation to the supply and placement of concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection. ***Concrete Work***

D12.09.14. Cement used in Cast-In-Situ Access Chambers shall be Type SR to AS 3972. ***Cement Type***

D12.09.15. Step irons shall NOT be provided in Access Chambers. ***Step Irons***

D12.09.16. Covers and frames shall be in accordance with AS3996 and Appendix B CMDG Purchase Specification. The Unit Load Classification shall be either Class B within private property and no vehicle loadings or Class D for all vehicle loadings and all outside private property and all Maintenance Shafts. ***Covers and Frames Class***

D12.09.17. Rectangular access covers and frames shall only be considered where the total chamber depths is less than 600mm. ***Rectangular Covers***

D12.09.18. Access Chamber covers shall be finished in accordance with Table D12.09.06 Access Chamber Finished Surface Level. ***Cover Levels***

Table D12.09.06 Access Chamber Finished Surface Level

Location	Access Chamber Finished Level
Roads, Footpaths	Flush with surface
Private Property	75mm above finished earthworks level
Floodways	As directed by Local Government
Elsewhere	Covers shall be finished minimum 50mm to a maximum 100mm above the surface of the ground, in a manner designed to avoid as far as possible, the entry of surface water

D12.09.19. Covers and Frames fastening (bolt down) are required as per the following Table D12.09.07. Use of Bolt Down Covers. ***Bolt Down Covers***

Table D12.09.07 Use of Bolt Down Covers

Local Council	Use of Bolt down covers
Banana Shire	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level.
Central Highlands Regional	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level.
Gladstone Regional	Not Approved. Access Chambers shall be located to have FSL 100mm above 1% AEP where possible.
Isaac Regional	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level.
Livingstone Shire	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level
Maranoa Regional	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level.
Rockhampton Regional	Required for Access Chambers below 10% AEP flood level, and below Highest Astronomical Tide (HAT) level.

D12.09.20. The 3 immediate access chambers downstream of a rising main discharge are to be coated as a discharge access chamber.

D12.09.21. Discharge access chambers shall be in accordance with Table D12.09.08. The level of the sewer rising main inlet into the Discharge Access Chamber shall be at the same level as the outlet pipe to avoid turbulence. Discharge Access Chambers shall be installed with an air vent unless otherwise approved by the Sewerage Service Provider. Refer to CMDG Standard Drawings. ***Discharge Access Chambers***

Table D12.09.08 Discharge Access Chambers Coatings

Local Government	Discharge Access Chamber Requirements
Banana Shire	Fabricated polyethylene type or approved equivalent with integral benching, bottom, top, access neck and pipe stubs; OR Concrete epoxy coated (Parchem or equivalent products).
Central Highlands Regional	
Gladstone Regional	
Isaac Regional	
Livingstone Shire	Fabricated polyethylene type or approved equivalent with integral benching, bottom, top, access neck and pipe stubs. Concrete epoxy coated (Parchem or equivalent products) may be used for refurbishing existing concrete access chambers only.
Maranoa Regional	Fabricated polyethylene type or approved equivalent with integral benching, bottom, top, access neck and pipe stubs; OR Concrete epoxy coated (Parchem or equivalent products)
Rockhampton Regional	

D12.09.22. Tolerances for lateral and vertical deviations from the design position of access chambers shall be in accordance with the tolerances for deviations of pipelines (Refer Section D13 Laying and Jointing of Pipe). Longitudinal deviations (i.e. chainage) from that position shall not exceed 300mm. ***Tolerances***

D12.10. SEWER MAINS

D12.10.01. All gravity and rising sewer mains shall be in accordance with Table D12.10.01. ***Material***

Table D12.10.01 Sewer Main & Fitting Material Type

Local Council	Gravity Mains – 150mm and 225mm	Gravity Mains 300mm and greater	Rising Mains
Banana Shire	PVC RRJ in 3m lengths	To be determined by Sewerage Service Provider	PVC Class PN 16 or DI PN35
Central Highlands Regional	PVC RRJ in 3m lengths		PVC Class PN 16 or DI PN35
Gladstone Regional	PVC RRJ in 3m lengths	Ductile Iron PN35 (Tyton Extreme or equivalent)	PVC Class PN 16 Ductile Iron PN35 (Tyton Extreme or equivalent) PE 100 PN12.5
Isaac Regional	PVC RRJ in 3m lengths	To be determined by Sewerage Service Provider	PVC Class PN 16 or DI PN35
Livingstone Shire	PVC RRJ in 3m lengths		PVC Class PN 16 or DI PN35 or PE 100 PN12.5
Maranoa Regional	PVC RRJ in 3m lengths		PVC Class PN 16 or DI PN35 or PE 100 PN12.5
Rockhampton Regional	PVC RRJ in 3m lengths		PVC Class PN 16 or DI PN35

D12.10.02. All PVC* gravity sewer mains shall be minimum Class SN8 with heavier classes applicable for deeper sewer mains in accordance with the manufacturers requirements. ***Pipe Class***

D12.10.03. The minimum grade of gravity sewer mains shall be in accordance with Table D12.10.02 Minimum Grades of Sewer Mains. ***Minimum Grades***

Table D12.10.02 Minimum Grades of Sewer Mains *

Sewer Size (mm)	Minimum Grade	Percentage %
150	1:150	0.65
225	1:290	0.34
300	1:420	0.23
375	1:570	0.17
450	1:730	0.13
525	1:900	0.11
600	1:1000	0.10
675	1:1200	0.08
750	1:1500	0.06

* The minimum grade of gravity sewers (larger than 225mm diameter) must ensure that a slime stripping velocity is achieved.

D12.10.04. The depth of a reticulation sewer main is to be a maximum of 3.5m to invert of pipe. ***Maximum Depth***

D12.10.05. Unless otherwise specified on the drawings, the minimum depth of cover to be provided for gravity sewer mains and sewer rising mains shall be as listed in Table D12.10.03 (all depths from finished surface). Cover under roads to be measured from the adjacent kerb or edge of gravel or edge of pavement. ***Cover***

Table D12.10.03 Minimum cover of Sewer Mains

Location of Pipe		Gravitation Mains & Rising Mains	
		Non-Rigid (Inc. PVC*)	DI
1.	Areas **not** subject to vehicular loading:	600 mm	300mm
2.	Areas subject to vehicular loading:		
	a) not in roadway	600 mm	450mm
	b) in sealed roadway	900 mm	600mm
	c) in unsealed roadway	900 mm	750mm

D12.10.06. Pipeline installation in general is to be in accordance with AS/NZS 2032, AS/NZS 2033, AS/NZS 2566.1, AS/NZS 2566.2 and AS/NZS 3500 unless noted otherwise. ***Installation***

D12.10.07. Where pipelines are connected to large structures (e.g. sewage pump stations or 1500mm diameter Access Chambers) or where excessive differential movement might occur, then connection by means of 600mm long pipes and two flexible joints is required (rocker pipe). The first joint being at or within 150mm of the face of the structure. ***Flexible Joints***

D12.10.08. Where flexible joints cannot be made with cut pipes, the Contractor shall select pipes from the various lengths provided in order to make the second

joint within 300mm of the position shown on the drawings. Foam cores shall be provided for future connections.

D12.10.09. Where permitted in accordance with Table D12.10.04, long radius sweep bends are permitted for horizontal and vertical change of alignment of sewers subject to the following requirements: ***Bends in Pipe***

i. Maximum change of direction at each bend of 45 degrees;

ii. Maximum of 2 bends between access chambers; and

iii. Maximum access chamber spacing still apply.

Table D12.10.04 Use of Horizontal and Vertical sewer bends

Local Council	Horizontal Sewer Bends	Vertical Sewer Bends
Banana Shire	Not approved	Not approved
Central Highlands Regional	Not approved	Not approved
Gladstone Regional	Not Approved	Not approved
Isaac Regional	Not Approved	Not Approved
Livingstone Shire	Approved	Approved
Maranoa Regional	Not approved	Not approved
Rockhampton Regional	Not approved	Not approved

D12.10.10. Sewer mains laid on grades greater than 1 in 6 shall be provided with concrete anchor blocks. Refer to CMDG Standard Drawings. Anchor block is required behind each socket. The nominal size of the anchor block is to be shown on the drawings. ***Scour Stops***

D12.10.11. Use of inverted syphons is NOT permitted. ***Inverted syphons***

D12.10.12. The rising main shall be sized to allow free movement of the largest sphere diameter that can pass through the pump impeller. ***Rising Main Minimum Diameter***

D12.10.13. Scour valves shall be installed at significant low points in the sewer rising main in accordance with the relevant standard drawing. Air valves shall be installed at critical high points in the sewer rising main. Grading of the sewer rising main shall be carried out to minimise the number of air valves and scour valves. Refer CMDG Standard Drawings. ***Air Valves and Scour Valves***

D12.10.14. Diameter of the sewer rising main to be selected to achieve: ***Self-Cleansing Velocity***

- Self-cleansing velocity of the main (the recommended minimum velocity for smaller pressure mains (<300mm) is 0.7m/s;
- The maximum velocity during WWF is 2.0 m/sec; and
- Friction head shall be minimised to achieve an economic balance between capital and operating costs.

D12.11. VENTING

D12.11.01. Vents shall be installed, as required by the Sewerage Service Provider. Refer to CMDG Standard Drawings. Proprietary odour unit vents may be considered by the Sewerage Service Provider. ***Vent***

D12.11.02. Corrosion and odour study/model is to be utilised to identify proposed locations of vents. ***Atmospheric Study***

D12.11.03. A vent may be utilised to manage excessive odour discharge to atmosphere. Typically this is most likely required at the bottom of a long steep line where a hydraulic jump may occur in the flatter pipe section. ***Discharge Access Chamber***

D12.12. TRENCHES & EXCAVATIONS

D12.12.01. Trench width, depth, foundations, and stability are to be recorded as Notes on the Operational Works Drawings. ***Trench Notes***

D12.12.02. Stabilised and compacted trench foundation is required in soft (typically less than 50kPa bearing capacity) or unstable or over-excavated ground conditions. ***Stabilised Foundation***

D12.12.03. 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 structure or fence without the written permission of the owner of such structure or fence. Topsoil from excavations shall be kept separate and utilised to make good the surface after backfilling. ***Excavated Material / Trench Clearance***

D12.12.04. 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***

D12.12.05. 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 the pipe, as shown in AS/NZS 2566.1 and AS/NZS 2566.2. ***Min Trench Width***

D12.12.06. 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. ***Max Trench Width***

D12.12.07. 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, to provide a neat straight line free from broken ragged edges. ***Trenching Under Pavement***

D12.12.08. 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, until the end of the Defects Liability Period. ***Under Boring***

D12.12.09. 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***

D12.12.10. For sites where ground level settlement is expected, a specialised design is required. ***Settlement***

D12.12.11. The Contractor shall adequately support all excavations as the works proceed. When withdrawing supports, the Contractor shall exercise every precaution against slips or falls by means of intermediate shoring, planking or props. Backfilling shall be performed simultaneously with the withdrawal of supports. ***Trench Support***

D12.12.12. In the event of any trenching, the Contractor shall provide erosion control measures in accordance with EPA specifications and requirements. ***Erosion Control***

D12.12.13. Control measures shall meet current environmental requirements.

D12.12.14. 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***

D12.13. LAYING AND JOINTING OF PIPES

D12.13.01. All pipe components shall be prepared and installed in accordance with the manufacturer's specifications, unless otherwise specified in this document.

D12.13.02. Before being laid, all pipes, fittings, valves, etc. shall be cleaned and examined by the Contractor.

D12.13.03. The Contractor shall provide and use approved drag scrapers or "detectors" to ensure that the interior of the pipeline is clean and free from obstructions.

D12.13.04. Approved plugs shall be used to prevent foreign matter entering sections of pipeline which are left uncompleted overnight. Plugs must be removed and accounted for, prior to commencement of works on each day.

D12.13.05. The laying of pipelines shall commence at the lower end of the line and sockets shall face uphill.

D12.13.06. 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. ***Cleaning***

D12.13.07. Joints in pipelines shall be flexible rubber ring joints (either roll-on rubber ring or skid type), mechanical joints (either fixed flange, gibault or bolted gland type) or welded (in the case of PE*.The joint type shall be as shown on the 'As-Constructed' Drawings. ***Plugs Overnight***

D12.13.08. For pipes with rubber ring joints, spigots and sockets shall be clean and dry. ***Laying Direction***

D12.13.09. Rubber ring joints shall be installed in accordance with the manufacturer's specifications. ***Flotation***

D12.13.10. 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. ***Joint Type***

D12.13.11. Only the lubricant specified by the pipe manufacturer and or fitting manufacturer shall be applied. ***Rubber Ring Joint***

D12.13.12. Pipes may 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. ***Lubricant***

D12.13.13. For field cuts, only an approved mechanical pipe cutter shall be used. All field cuts shall achieve a 'square cut' finish. ***Cut Pipes***

D12.13.14. Any pipes cut in the field shall have their ends prepared in accordance with the manufacturer's written instructions. ***Pipe Cutting***

D12.13.15. Where pipes are cut in the field, a witness mark shall be made on the pipe at the length specified by the manufacturer from the end of the pipe. Scoring of ***End Preparations***

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.

Jointing Different Materials

D12.13.16. Where PVC* pipes are to be joined to pipes of another material, the joints shall be made as follows:

a) For jointing PVC* spigot to PVC* socket or PVC* socket to PVC* spigot, an approved PVC* adaptor shall be used. The joints in both instances shall be made using a ring conforming to AS1646.

b) For jointing PVC* socket to ductile iron spigot, an approved adaptor coupling shall be used.

D12.13.17. Gravity pipelines shall be constructed to the tolerances specified hereafter:

a) The maximum horizontal deviations to either side from the design axis of a pipeline shall be 50mm for all sizes of pipes.

b) For vertical deviations from the design grade of pipelines of any diameter and grade, the following alternative methods A and B apply. Refer to Table D12.13.01 Vertical Construction Tolerances for which alternatives apply to each local government:

Table D12.13.01 Vertical Construction Tolerances

Local Council	Vertical Construction Tolerances
Banana Shire	Alternative A
Central Highlands Regional	
Gladstone Regional	Alternative B
Isaac Regional	Alternative A
Livingstone Shire	Alternative A
Maranoa Regional	
Rockhampton Regional	

Alternative A

a) Any one pipe in a length between two access chambers or a dead-end and an access chamber, shall be placed so as to have a fall from the higher to the lower access chamber or a fall from the dead-end to the access chamber.

b) No affected section shall be more than 6m long, only if it complies with the above restrictions and that there is an overall fall in the section of pipe.

c) The invert level shall not deviate from the design grade line by more than 10mm, and only if it complies with the above restrictions and that there is an overall fall in the section of pipe.

Alternative B

The invert level shall not deviate from the design grade line by more than 5mm as long as it achieves the minimum grade.

Joint Deflections

D12.13.18. Flexibly jointed pipelines for rising mains with gradual changes in alignment or grade shall be laid with the joint being deflected after it has been made. Table D12.13.02 shows the allowable pipe deflection for each Sewerage Service Provider. 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.

Table D12.13.02 Pipe Deflections

Local Government	Allowable pipe deflection for rising mains
Banana Shire	100% of manufacturers recommendations
Central Highlands Regional	
Gladstone Regional	75% of manufacturers recommendations
Isaac Regional	100% of manufacturers recommendations
Livingstone Shire	
Maranoa Regional	
Rockhampton Regional	

D12.13.19. Deflection within a pipe length is not permitted. ***Pipe Deflection***

D12.13.20. In all locations other than urban road reserves with a constructed road, marker posts at changes of direction and at such chainages that the location of the main is marked at least once each 250 metres, shall be provided as shown on CMDG Standard Drawings. ***Marker Posts on Rising Mains***

D12.14. ANCHOR BLOCKS

D12.14.01. Concrete anchor blocks shall be installed where the main is installed at a grade of 1 in 6 or steeper. Concrete anchor blocks shall be provided on the pipe barrel behind the socket at each pipe joint and in accordance with CMDG Standard Drawings.

D12.14.02. The Contractor shall provide thrust blocks to 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 Standard Drawings.

D12.14.03. Concrete works shall comply with the CMDG Construction Guideline MINOR CONCRETE WORKS C271.

D12.14.04. The Contractor shall provide temporary anchorages adequate to restrain the pipe when under test.

D12.15. PROPERTY CONNECTION BRANCH & POINT OF CONNECTION

D12.15.01. Property Connection Junctions, Property Connection Branch and Point of Connections shall be installed in accordance with CMDG Standard Drawings. The connection chainage is to be shown on the design drawings. ***Property Connection***

D12.15.02. Property Junction Connection direct into a trunk sewer main may only be used with the specific approval of the Sewerage Service Provider. ***Trunk Connection***

D12.15.03. Property Connection Junctions are 'Not At Grade Junctions' as defined by AS 3500. This means that the Connection Branch invert level is to be at the non-trunk sewer main obvert level or higher. Junction 'at grade' may only be used with the specific approval of the Sewerage Service Provider. ***Not at Grade Junction***

D12.15.04. Where a non-trunk sewer main lies within an adjoining allotment, the Property Connection Branch is to extend a distance of 1.5m into the allotment from the property boundary, to be serviced with a Property Point of Connection. For battle-axe allotments, the Property Point of Connection may be located within the access, then pre-laying of private sanitary drainage shall extend along the access to a point 1.5m within the main part of the allotment. ***Property Connection Branch***

D12.15.05. Each Property Connection Junction chainage is to be measured from the centre of the downstream Access Chamber. ***Junction Chainages***

D12.15.06. The invert level of the non-trunk sewer main at the Property Connection Junction chainage shall be sufficient to service any ground level on the allotment, and shall consider the probability of any adverse cut & fill ground level changes, at building stage. An acceptable solution is the calculation of the most adverse distance and fall combination using a 1:40 grade, less 0.5m for cover and special fittings. ***Junction Depth***

D12.15.07. Property Connection Junctions located at the depth of greater than 2.0m from finished surface level shall have a WSAA approved heavy duty reinforced fibreglass junction. ***Heavy Duty Junctions***

D12.15.08. Property Connection Junction preferred location in a non-trunk sewer main shall be in accordance with Table D12.15.01 Property Connection Junction preferred location. ***Junction Locations***

Table D12.15.01 Property Connection Junction Preferred Location

Local Government	**Acceptable Solution for Property Connection Junction Location into non-trunk sewer main.**
Banana Shire	Access Chamber where possible
Central Highlands Regional	Access Chamber where possible, can connect into a Lamphole
Gladstone Regional	Non trunk sewer main
Isaac Regional	(a) Non-trunk Sewer Main; or (b) Lamphole and Access Chamber.
Livingstone Shire	(a) Non-trunk Sewer Main; or (b) Lamphole and Access Chamber; (c) Not direct into any trunk sewer main.
Maranoa Regional	Access Chamber where possible

D12.15.09. Property Connection Branch size shall be a minimum 100mm diameter for residential and 150mm diameter for commercial / industrial. ***Branch Sizes***

D12.15.10. The desirable maximum Property Connection Branch length shall be 3.0m. ***Branch Lengths***

D12.15.11. Property Point of Connection shall be a finished with a cap on the Property Connection Branch at Operational Works construction stage. This will allow some level options for the plumbing stage connection of sanitary drainage. At plumbing stage an Inspection Opening shall be fitted by the plumber at the Point of Connection. ***Capped Branches***

D12.15.12. Property Point of Connection should generally be located at the lowest corner of the allotment, 1.5m upstream of the allotment boundary (where provided direct to a non-trunk sewer main) or to an access chamber. The Property Point of Connection shall not be located closer than 1.0m to a roofwater line. ***Location***

D12.15.13. Property Point of Connection invert level is to be sloped higher than the Property Connection Junction invert level, shall be sufficient to service any ground level on the allotment, and should consider the probability of any adverse cut & fill ground level changes, at building stage. An acceptable solution is the calculation of the most adverse distance and fall combination using a 1:40 grade, less 0.5m for cover and special fittings. ***Point of Connection level***

D12.15.14. The position of each Property Service Point of Connection shall be clearly marked by the Contractor on completion of backfilling, the marking shall be as per Table D12.15.02 Marking Location of Property Connection and Connection and CMDG Standard Drawings. ***Marker Stake***

Table D12.15.02 Marking Location of Property Connection

Local Government	Method of Marking Property Connection Location (pre-site development detail)
Banana Shire	**Type 1:** Star picket driven into the ground adjacent to the riser and finished 500mm above the surface of the surrounding ground and finished with a PVC safety cap. The star picket shall be connected to an underground identification tape.
Central Highlands Regional	**Type 1:** Star picket driven into the ground adjacent to the riser and finished 500mm above the surface of the surrounding ground and finished with a PVC safety cap. The star picket shall be connected to an underground identification tape.
Gladstone Regional	**Type 1:** Contractor to loop yellow marking tape around end of house connection branch during backfilling. 25mm diameter grey conduit (2m long) to be installed on top of the cap.
Isaac Regional	**Type 1:** Star picket driven into the ground adjacent to the riser and finished 500mm above the surface of the surrounding ground and finished with a PVC safety cap. The star picket shall be connected to an underground identification tape.
Livingstone Shire	**Type 1:** Star picket driven into the ground adjacent to the riser and finished 500mm above the surface of the surrounding ground and finished with a PVC safety cap. The star picket shall be connected to an underground identification tape.
Maranoa Regional	**Type 2:** Property Service PVC capped riser is extended 1m above finished ground surface.

D12.15.15. The identification tape shall be tied to the riser and held in a vertical position during backfilling. The top end of the tape shall be spiked by the identification star picket immediately upon completion of backfilling. ***Tape Position***

D12.15.16. Water seals (boundary traps) are to be provided to property connections for odour control only if required by the Sewerage Service Provider. ***Boundary Traps***

D12.15.17. Crossover sanitary drains (at an angle of greater than 45˚ to the easement axis) are permitted within an easement. ***Sanitary Drains in Easements***

D12.16. BACKFILL AND COMPACTION

D12.16.01. 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***

D12.16.02. Flooding of non-cohesive material shall be considered as an acceptable method of compacting bedding underlay material.

D12.16.03. 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***

D12.16.04. 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 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***

D12.16.05. Backfill for all precast access chambers shall be placed and compacted evenly around the access chamber to a level 300mm above the top of the highest incoming pipe and for the full width of the excavation. If necessary, the Contractor shall import and compact non-cohesive granular material. ***Chamber Backfill***

D12.16.06. Other than under roads, the remainder of the excavation shall 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***

D12.16.07. Flooding of cohesive material shall NOT be permitted as a means of compacting backfill under roads.

D12.16.08. Backfill around risers shall be sand compacted to the top of the socket or coupling on the highest branch off the riser, for the full width of trench and for a minimum distance of 500mm upstream and downstream of the riser. ***Riser Backfill***

D12.16.09. Under roads, backfill shall comprise of approved roadbase material, sand or stabilised sand. Refer to CMDG Standard Drawings for trench backfill details. ***Backfill under roads***

D12.16.10. 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. ***Product Care***

D12.17. RESTORATION OF SURFACES

D12.17.01. Pavements, lawns and other improved areas shall be cleaned and left in the same order as they were at the commencement of the works. ***Original Condition***

D12.17.02. Lawns shall be restored with turf cut and set aside from the original surface and/or with commercially available turf to the Sewer Service Providers satisfaction. ***Lawn Reinstatement***

D12.17.03. 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***

D12.17.04. 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***

D12.17.05. Backfill (non-road 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. ***Temporary Pavement Restoration***

D12.17.06. 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. ***Settlement***

D12.17.07. Works undertaken in brownfields area (built-up development), restoration is required to be in accordance with any specific requirements of the Sewerage Service Provider. ***Brownfield Restoration***

D12.17.08. Surplus material shall be lawfully removed and disposed of, to areas arranged by the Contractor. ***Surplus Material***

PUMPING STATIONS

D12.18. PUMPING STATIONS GENERAL

D12.18.01. Pump stations shall be designed in accordance with the following criteria and relevant CMDG Standard Drawings. ***Standard Drawings***

D12.18.02. The following criteria are intended to further clarify and compliment Sewage Pumping Station Code of Australia WSA 04-2001. The Sewerage Service Provider should be consulted prior to design to determine specific requirements for pumps, electrical, switchboard, site security and telemetry. Arrangements for supply of electrical switchboard shall be determined by Sewerage Service Provider. ***Consultation***

D12.18.03. The Sewerage Service Provider will supply and install electrical and telemetry equipment for the Sewage Pump station at the developers cost. ***Electrical and Telemetry***

D12.19. LOCATION

D12.19.01. Pump station shall be located as far as possible away from existing or proposed habitable dwellings. Table D12.19.01 Minimum Setback for Sewage Pump Stations shows the minimum setbacks applicable. ***Location***

Table D12.19.01 Minimum Setback for Sewage Pump Stations

Local Government	Minimum setback for Sewage Pump Stations from habitable dwellings
Banana Shire	30m
Central Highlands Regional	
Gladstone Regional	50m – measured from edge of wet well to property boundary
Isaac Regional	30m
Livingstone Shire	
Maranoa Regional	

D12.19.02. Pump stations shall be located on freehold land to be transferred to the Sewerage Service Provider, at 'Plan Sealing' stage of the development. ***Land Tenure***

D12.19.03. The general arrangement of the site must maximise operator safety and operability. This includes assessment of items such as trip hazards, heating, slippery surfaces, accessibility, etc. ***General Site***

D12.19.04. Typical area of land required for the sewage pump station (excluding any access laneway) would be 20m x 20m for a dual well site.

D12.19.05. The top of slab, electrical pits and base of switchboard must be located 200mm above the 1% AEP flood level or storm surge level. ***Floor Immunity***

D12.19.06. Driveway for the pump station shall be in the form of a sealed industrial access (concrete, asphalt, etc.) and shall have a minimum sealed width of 3.0m. ***Driveway***

D12.19.07. A turnaround area shall be provided for Sewerage Service Provider's service vehicle with a minimum concrete hard stand area 4.0m x 3.0m adjacent to the pump well access lids. ***Turnaround***

D12.19.08. The top slab of the pump well shall be 150mm min above the surrounding ground level and the surrounding ground shall be shaped to fall away from the pump station. ***Finished Level***

D12.19.09. A 1.8m high chainmesh security fence shall be provided around the boundary, unless directed differently by the Sewerage Service Provider. ***Fence***

D12.19.10. The general arrangements for a sewage pump station are to be in accordance with the CMDG Standard Drawings.

D12.20. DESIGN CRITERIA – PUMPS AND WET WELLS

D12.20.01. The design pumping capacity and pump type is to be nominated by the Sewerage Service Provider for the planned loading, according to the planning horizon and staging plan. Typically, the pump type is to be centrifugal and capable of passing a 75mm sphere. ***Design Capacity***

D12.20.02. Duty/standby pumping shall be provided in accordance with Table D12.20.01 Sewage Pump Duty. ***Pump Duty***

Table D12.20.01 Sewage Pump Duty

Local Government	Sewage Pump Duty Requirements
Banana Shire	2 pumps required. 1 pump operates at PDWF, and 2 pumps together operate at WWF. #
Central Highlands Regional	
Gladstone Regional	2 pumps required. Each pump sized to operate at WWF
Isaac Regional	2 pumps required. 1 pump operates at PDWF, and 2 pumps together operate at WWF. #
Livingstone Shire	
Maranoa Regional	

Typically if the duty point is chosen as the two pumps operating to meet the nominated WWF loading for 1.5m/sec, then this usually achieves the minimum scouring velocity of one pump (PDWF) operation.

D12.20.03. Depending upon the characteristics of the catchment area, size of pump station and associated rising main, grinder pumps may be permitted, with the specific approval of the Sewerage Service Provider. ***Grinder Pumps***

D12.20.04. The minimum wet well internal diameter shall be 3000mm.in accordance with Table D12.20.02 Wet Well Internal Diameter. ***Well Diameter***

Table D12.20.02 Wet Well Internal Diameter

Local Government	Minimum wet well internal diameter (mm)
Banana Shire	TBA
Central Highlands Regional	TBA
Gladstone Regional	3000
Isaac Regional	TBA
Livingstone Shire	2400
Maranoa Regional	2400

Ladders

D12.20.05. Wet wells shall not be provided with ladders unless specifically directed by the Sewerage Service Provider. If required, ladders shall be in accordance with AS 1657. Retractable handgrip stanchions, refer AS 1657 Fig 5.2, are preferred.

Detention Time

D12.20.06. At full design loading, the detention time of the wet well and rising main should not be more than two hours during daytime (6:00am to 6:00pm) to reduce the generation of hydrogen sulphide. Detention time may be calculated using the formula:

$$T = \frac{\left(0.025Q_p + 0.218Ld^2\right)}{Q_a}$$

Where:

T = Detention Time (hours)
Q_p = Pump Capacity (L/s)
L = Pressure Main Length (m)
d = Pressure Main diameter (m)
Q_a = ADWF (L/s)$T = \frac{(0.025Q_p+0.218Ld^2)}{Q_a}$

Pump Starts

D12.20.07. Pump Stop and Start Level may be calculated using the formula:

$$V = \frac{900Q_p}{S}$$

Where:

V = Volume between pump stop & start level (L)
Q_n = Pump capacity (L/s)
S = Allowable number of starts per hour

D12.20.08. To reduce the septicity at wet well and pressure main recommended number of starts per hour is between 5 and 10 during the daytime. (Maximum 10 or 90% of manufacturers recommended number, whichever is lower.)

D12.20.09. Valve pits shall be located in accordance with Table D12.20.03 Valve Pit Location.

Table D12.20.03 Valve Pit Location

Local Government	Valve Pit Location
Banana Shire	External to the wet well, attached to the wet well structure to prevent differential movement.
Central Highlands Regional	
Gladstone Regional	External to the wet well, separate to the pump well structure.
Isaac Regional	External to the wet well, attached to the wet well structure to prevent differential movement.
Livingstone Shire	
Maranoa Regional	
Rockhampton Regional	

D12.20.10. Wet wells shall have an internal corrosion resistant protective coating, if required by the Sewerage Service Provider. See Table D12. 1009.57 Discharge Access Chambers Coatings for suitable products. ***Protective Coating***

D12.20.11. Provision of well washers is to be in accordance with Table D12.20.04 Well Washers. ***Wet Well Washer***

Table D12.20.04 Well Washers

Local Government	Provision of Well Washers
Banana Shire	An approved automatic wet well washer connected to potable supply via a backflow prevention device shall be provided.
Central Highlands Regional	
Gladstone Regional	
Isaac Regional	
Livingstone Shire	
Maranoa Regional	
Rockhampton Regional	

D12.20.12. Pumps shall be mounted on stainless steel guides with a fixed discharge bend – free standing pumps are not permitted. Lifting chains shall be stainless steel. ***Guides and Lifting Chains***

D12.20.13. Where septicity control is required by the Sewerage Service Provider, the preferred method is by dosing with proprietary sewage conditioning agents. ***Septicity Control***

D12.20.14. All incoming sewer mains shall flow into one inlet access chamber, which will then have ONE inlet line flowing into the pump station. ***Incoming Pipes***

D12.20.15. An inlet valve is required on the inlet pipe. The inlet valve is to be located internal to the wet well. ***Inlet Valve***

D12.20.16. The maximum depth of the inlet pipe invert is 3.5m. ***Maximum Inlet Depth***

D12.20.17. Each sewage pump station shall have a screened overflow pit in accordance with CMDG Standard Drawings. The overflow level shall be for inflows greater than the planning horizon WWF (5ADWF). Compliance with Environmental Duty of Care responsibilities under environmental legislation. ERA 63 – meet code of conduct specifications. ***Screened Overflow***

D12.20.18. Vent poles or proprietary odour units must be provided, if required as a result of the odour assessment, and approved by the Sewerage Service Provider. ***Vents***

D12.20.19. The wet well must be designed to counteract buoyancy and supporting design calculations are to be provided. ***Buoyancy***

D12.20.20. Flow meters are required to be installed in the pumping station valve pit, and connected to Council's SCADA system. A second flow meter may be required at the rising main discharge point depending on the outcomes of a risk assessment. ***Flow meters***

D12.21. EMERGENCY STORAGE / STANDBY GENERATOR

D12.21.01. The standard emergency storage capacity of the pump station shall be in accordance with Table D12.21.01 Emergency Storage. Where the required storage cannot be met then additional on-site emergency storage wells must be provided.

Table D12.21.01 Emergency Storage

Local Government	Emergency Storage Requirement	Calculation method for Emergency Storage Capacity
Banana Shire **Central Highlands Regional**	4 hours Average Dry Weather Flow (4xADWF) [#1]	Volume of wet well plus upstream network capacity (pipes and access chambers) below overflow level.
Gladstone Regional	4 hours Average Dry Weather Flow based on the design capacity of the pump station (4xADWF)[#,2,3] For Upgrades To Existing Pump Stations: If the Sewerage Service Provider determines that the above requirement would be financially or socially onerous (ie due to large land acquisitions being required), then 4 hours Average Dry Weather Flow of the immediate gravity catchment (4xADWF)[#,4,5] may be accepted.	Volume of wet well or other immediate upstream emergency storage devices between the duty pump start level and the overflow level. Upstream network capacity is excluded.
Isaac Regional **Livingstone Shire** **Maranoa Regional** **Rockhampton Regional**	4 hours Average Dry Weather Flow (4xADWF) [#1]	Volume of wet well plus upstream network capacity (pipes and access chambers) below overflow level.

[#1] *An absolute minimum of two hours Average Dry Weather Flow (2xADWF) emergency storage may be provided subject to completion of a satisfactory risk assessment and subject to provision of an on-site generator Secondary Power Supply*

[#2]. *A risk assessment must be approved by the Sewerage Service Provider and must be cognisant of sensitive public health and environmental duty of care legislative responsibilities, quality of electricity supply and operational plant of the relevant Sewerage Service Provider.*

[#3]. *Pump stations with larger flows (duty pump capacity is more than 50L/s) shall be provided with an on-site Secondary Power Supply, even if it complies with emergency storage capacity. Pump stations of less than 45 kW shall not be provided with standby generators unless the duty pump capacity is more than 50L/s. For pump stations less than 45kW alternative secondary power supplies such as UPS may be considered.*

[#4]. *All major upgrades to existing pump stations are to meet these criteria. An upgrade to an existing pump station is considered major when the upgrade will involve expenditure in excess of whichever is greater of either:*

- *70% of the replacement value of pump station (as documented in the Council asset management system); or*
- *$164,000 (note that this figure is relevant as of 1 January 2015 and will increase by 3% as of 1 January thereafter or until the EHP code is reviewed).*

[#5]. *Existing pump station refers to pump stations constructed prior to 1 January 2012.*

Risk Assessments

D12.21.02. A risk assessment must be approved by the Sewerage Service Provider and must be cognisant of sensitive public and environmental health duty of care legislative responsibilities, quality of electricity supply and operational plant of the relevant Sewerage Service Provider. The risk assessment will address the need for on-site Secondary Power Supply, e.g. generators, ups, batteries.

D12.21.03. Pump stations with larger flows (pump capacity is more than 50L/s) shall be provided with an on-site Secondary Power Supply, even if it complies with emergency storage capacity. ***Secondary Power Supply***

D12.22. POWER DESIGN

D12.22.01. Each sewage pump station shall be designed for Primary and Secondary Power Supply. The Primary Power Supply shall be the Electricity Provider as nominated by the Sewerage Service Provider. The Secondary Power Supply as nominated by the Sewerage Service Provider, typically either mobile generator or fixed on-site generator or a second independent supply from the Electricity Provider, including alternate means as approved by the Sewerage Service Provider. ***Power Supply***

D12.22.02. 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***

D12.22.03. Electrical design shall comply with purchase specifications available on Council specific pages at www.cmdg.com.au. ***Electrical Specification***

D12.23. CONTROL AND TELEMETRY DESIGN

D12.23.01. Each pump station shall be able to be connected to the Sewerage Service Provider's telemetry monitoring system. ***Telemetry***

D12.23.02. A radio desk top survey must be conducted at the developers cost to determine the best signal path for the telemetry communication to occur.

D12.23.03. Telemetry and control shall comply with purchase specifications available on the Council specific pages of www.cmdg.com.au. ***Telemetry Spec***

D12.24. WATER SERVICE & SERVICE METER * BACKFLOW PROTECTION

D12.24.01. All sewage pumping stations shall have an adequate water supply for cleaning & washdown sprays purposes. ***Water Supply***

D12.24.02. A metered water service shall be arranged with the Registered Water Service Provider. Refer to CMDG Standard Drawings. ***Metered Water Service***

D12.24.03. The water service shall be protected from contamination due to backflow by the installation of a registered break tank or reduced pressure zone device in accordance with the Plumbing & Drainage Act and AS 3500. ***Backflow Prevention***

D12.24.04. All internal water plumbing is regulated under the Plumbing & Drainage Act and requires all necessary applications and fees for Compliance Permits and Certificates. ***P&D Act Regulated Work***

ASSET INSPECTION AND TESTING

D12.25. INSPECTION

D12.25.01. All pipes, fittings, access chambers and components are to be inspected by a Registered Professional Engineer, Queensland, and / or relevant Sewerage Services Provider approved inspector, as well as an authorised Inspection method, as specified in Table D12.25.01 Inspection Requirements for Completed Sewer.

Table D12.25.01 Inspection Requirements for Completed Sewer

Local Government	Method of Inspection for Completed Sewer Mains
Banana Shire	Visual inspection
Central Highlands Regional	CCTV and visual inspection
Gladstone Regional	CCTV and visual inspection
Isaac Regional	Visual inspection / CCTV if required by Council
Livingstone Shire	Visual inspection / CCTV if required by Council
Maranoa Regional	CCTV and visual inspection
Rockhampton Regional	Visual inspection / CCTV if required by Council

D12.25.02. Inspections are to be in compliance with Operational Works Permit conditions or CMDG Works Inspections.

D12.25.03. Inspection schedule, inspector contact, notifications, fees, and workplace safety procedures are to be recorded at the pre-start safety meeting for the works. ***Schedule***

D12.25.04. For CCTV, flushing of the system must be completed and the CCTV procedure must be completed when all other tests have been completed. A digital copy of the CCTV footage and the consultant's assessment report is to be submitted to the Sewerage Service Provider as part of the certification of the pipe system. ***CCTV***

D12.26. TESTING GENERAL

D12.26.01. All Sewer Mains and Access Chambers shall be subject to testing as soon as practicable after construction, backfilling, concrete curing, and cleaning.

D12.26.02. Sewer Mains or Access Chambers failing any test shall be repaired and the test repeated. The process of testing, repair of defects and retesting shall continue until a satisfactory test is obtained. If an asset fails twice, the repair / replacement methodology is to be submitted to the Sewerage Service Provider for approval before the works are undertaken. ***Repair and Retest***

D12.26.03. All lines shall be clear and free from soil, slurry, liquids and other foreign substances at the time of initial and acceptance testing. ***Cleaning***

D12.26.04. The Contractor shall provide temporary thrust equipment resulting from internal test pressures at temporary caps. ***Temporary Thrust***

D12.27. TESTING OF GRAVITY SEWER MAINS

Low Pressure Air Test

D12.27.01. All gravity sewer mains shall be tested with approved procedures for each Sewerage Service Provider and whether testing is to be carried out by a NATA accredited body are highlighted in Table D12.27.01 Testing Requirements for Gravity Sewer. Vacuum testing is only accepted for gravity sewer mains as per the following Table D12.27.01 Testing Requirements for Gravity Sewer.

Table D12.27.01 Testing Requirements for Gravity Sewer

Local Government	Low Pressure Air Testing of gravity Sewer Mains	Hydrostatic Testing of Gravity Sewer Mains	NATA Accreditation	Vacuum testing for Gravity sewer mains as per AS 2566
Banana Shire	Approved	Approved	No	Not Approved
Central Highlands Regional	Approved	Approved	No	Not Approved
Gladstone Regional	Approved	Approved	Yes	Approved
Isaac Regional	Approved	Approved	No	Not Approved
Livingstone Shire	Approved	Approved	Yes*	Approved
Maranoa Regional	Approved	Approved	No	Not Approved
Rockhampton Regional	Approved	Approved	No	Not Approved

* provided the entire contributing network is tested.

Method

D12.27.02. The **low pressure air testing** procedure shall be as follows:

a) Each section of the sewer main to be air tested shall be plugged at each end, one plug containing an air hose (and isolating valve) connection. Care shall be taken to ensure that the force, due to pressure on the plug, is not taken by the pipe joint, but is taken by struts bearing on the plug.

b) An air hose from a compressor shall be connected, and the pressure raised as quickly as possible to 30 kPa.

Retest

c) The 30 kPa air pressure shall be held constant for a minimum of three (3) minutes, to stabilise temperatures. Before closing the isolating valve, the pressure shall be sufficiently raised above the 30 kPa pressure, so that when the isolating valve is fully closed, the test pressure in the sewer main is maintained at or just above this 30 kPa pressure.

d) When the isolating valve on the air supply is closed, then the elapsed time shall be measured for the sewer main test pressure to drop by 5kPa from the starting pressure.

e) If the elapsed time for the test pressure to drop by 5kPa, is less than 3 minutes, then test shall be deemed to have failed.

f) Repairs and retesting shall be carried out until the low pressure air test is passed

D12.27.03. The **hydrostatic testing** procedure shall be as follows: ***Hydrostatic Test***

a) Hydrostatic testing shall be in accordance with AS 3500.2:2003 Section 13.2 except that the sewer main shall be subject to 3m minimum and 5m maximum head.

D12.27.04. The test gauge shall be minimum 150mm face diameter, and shall be certified to be correct by an approved testing authority. ***Test Gauge***

D12.27.05. Tests on sewer mains shall be carried out with the Property Connections constructed so that the Property Connection Branches are tested at the same time as the sewer main, with all Inspection Openings sealed, and lines capped. ***Property Connections***

D12.28. TESTING OF ACCESS CHAMBERS

D12.28.01. Each Access Chamber shall be tested. The test should be undertaken soon as practicable after the Access Chamber is constructed and the Access Chamber cover surround fitted. Table D12.28.01 Testing of Access Chambers outlines the normal methods of testing accepted by Sewerage Service Providers. Low pressure air test or vacuum testing in accordance with AS 2566 may be agreed with the Sewerage Service Provider as an alternative.

Table D12.28.01 Testing of Access Chambers

Local Government	Method of testing of Access Chambers	NATA Accreditation
Banana Shire	Hydrostatic testing in accordance with the procedure outlined below.	No
Central Highlands Regional		
Gladstone Regional	Vacuum Testing in accordance with AS 2566 **OR** Hydrostatic testing in accordance with the procedure outlined below.(Vacuum to be utilised in locations of high water table)	Yes
Isaac Regional	Vacuum Testing in accordance with AS 2566 **OR** Hydrostatic testing in accordance with the procedure outlined below.	Yes
Livingstone Shire		
Maranoa Regional	Hydrostatic testing in accordance with the procedure outlined below.	No
Rockhampton Regional	Vacuum Testing in accordance with AS 2566 **OR** Hydrostatic testing in accordance with the procedure outlined below.(Vacuum to be utilised in locations of high water table)	Yes

D12.28.02. **Hydrostatic Test:**

1. The hydrostatic test shall be made by plugging all pipe openings in the walls and then by filling the Access Chamber with water to the lowest point on the top of the Access Chamber cover surround. The plugs shall be positioned in the pipes as near as practicable to the internal face of the Access Chamber. ***Method***

2. The Access Chamber will be filled with water and then left for 24 hours allowing an adequate period for absorption. ***Absorption***

3. The Access Chamber shall be refilled and the loss of water during the following 3 hours will be measured. The hydrostatic test on the Access Chamber will be considered satisfactory provided the level does not drop more than 30mm in the 3 hours. ***Duration***

4. The plug of the outlet shall be fitted with a suitable isolating valve for emptying the Access Chamber on satisfactory completion of the test. ***Emptying***

5. Repairs and retesting shall be carried out until the hydrostatic test is passed. ***Retest***

D12.29. TESTING OF SEWER RISING SEWER MAINS

D12.29.01. Sewer Rising Mains shall be water pressure tested to detect excessive leakage and defects in the pipeline, including joints, thrust blocks and anchor blocks. Compressed air or vacuum testing is not accepted for pressure sewer mains. ***Water Pressure Test***

D12.29.02. Pipelines shall be tested in sections as soon as practicable after each section has been laid, jointed, backfilled and cleaned, provided that 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. ***Curing Time***

D12.29.03. 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 isolating valves or caps. ***Section Definition***

D12.29.04. Water pressure testing shall not be carried out during wet weather unless otherwise approved by the Sewerage Service Provider. ***Wet Weather***

D12.29.05. During the water pressure testing of a pipeline, each isolating 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. ***Isolation Value Test***

D12.29.06. The water pressure test procedures which apply to Sewerage Service Providers shall be as identified in Table D12.29.01 Water Pressure Testing of Rising Mains.

Table D12.29.01 Water Pressure Testing of Rising Mains

Local Government	Method of testing of Rising mains	NATA Accreditation
Banana Shire	Water Pressure Testing in accordance with the procedure outlined in D.12.29.07 below.	No
Central Highlands Regional		
Gladstone Regional	Water Pressure Testing as per WSA-07 (PE mains) and WSA-04 (Other materials).	Yes
Isaac Regional	Water Pressure Testing in accordance with the procedure outlined in D.12.29.07 below.	No
Livingstone Shire		Yes
Maranoa Regional		No
Rockhampton Regional		

D12.29.07. Water Pressure Testing Procedure:

(a) The pipeline section shall be filled slowly with water, taking care that all air is expelled. Purging of air from rising mains shall be promoted by opening air valves. ***Filling with water***

(b) 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 water pressure testing. ***Absorption Period***

(c) The maximum water test pressure which shall be applied to the lowest part of each section of the pipeline shall be 1250kPa. ***Test Pressure***

(d) The water 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***

(e) The pressure testing of a section shall be considered to be satisfactory if: ***Results***

i. There is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component; and
ii. There is no visible leakage; and
iii. There is no loss of pressure in the 15 minute test period.

D12.29.08. Any failure, defect, and/or visible leakage, which is detected during the pressure testing of the pipeline shall be repaired and retested.

D12.29.09. Testing of Poly welds is to be in accordance with WSA-07 Clause 18.3.

D12.30. CLEANING OF SEWERS

D12.30.01. Before the sewers, manholes and property connections are accepted they shall be cleaned to remove all clay, sand and other materials. ***Cleaning***

D12.30.02. All water plus materials used in the flushing of the reticulation system shall under no circumstances be discharged into existing sewers downstream of construction. All lines shall be inspected after flushing and will not be accepted until they present a clear barrel, free from any obstruction. ***Remove Flushing Water***

D12.31. DEFECTS / MAINTENANCE PERIOD

D12.31.01. 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 Sewerage Service Provider's responsible to approve the necessary rectification works, the cost of defect rectification works are the sole responsibility of the developer, in consultation with the Sewerage Service Provider. ***Defects Liability Period***

D12.32. CONNECTIONS TO EXISTING SEWERAGE NETWORK

D12.32.01. The connection of all new sewer mains, access chambers or Property Connections to the existing sewerage network shall be made by the Sewerage Service Provider staff at the developers cost. ***Connection to Existing Network***

DOCUMENTATION

D12.33. SEWERAGE NETWORK

D12.33.01. Master Plans / Network Analysis are required to be submitted and approved by the Sewerage Service Provider as part of any development application submission. These plans must show the proposed finished surface levels over the entire site, the location and pipe diameter of the proposed reticulation system, the location of any pump stations and rising mains required and the connection points to the existing reticulation network.

D12.33.02. The proposed sewerage network design, including calculations shall be submitted to the Sewerage Service Provider, and if required to the Local Government for approval as part of the Operational Works application.

D12.33.03. The Drawings shall show to scale:-

a) Plan: contours, alignment of sewer mains, sizing of sewer mains, access chambers, valves, pumping stations, existing and proposed allotment contours and boundaries, and services, Property Connection Junction chainage, access chamber numbering, sample thrust block size, compaction.

b) Longitudinal section drawing of each sewer main will display the existing and finished surface, size, class and grade of sewer mains and rising mains, access chamber location, access chamber size (diameter), invert level of the inlet and outlet of the access chamber, deflection angle of the outlet pipe, type of pipe and crossing services. Property Connection Junction chainage, Property Connection Branch type, Point of Connection invert level.

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

d) Drawing Notes shall include (but not be limited to): pipe class, pipe colour, connection to existing system and Dial Before You Dig.

Drawing Scale

D12.33.04. Detail plans shall be drawn to a scale of 1:1000 and longitudinal sections to a horizontal scale of 1:1000 and a vertical scale of 1:200 or as approved otherwise by the Sewerage Service Provider. Refer to standard drawing CMDG-S-010.

Up To Date Drawings

D12.33.05. At the Pre-start Meeting and during construction, the Superintendent and Contractors must have up-to-date Approved Operational Works Drawings on-site plus a copy of the Operational Works Decision Notice and any attached conditions.

Use of CMDG Drawings

D12.33.06. If any CMDG drawings are specifically referenced in the drawing package, a copy of 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.

D12.33.07. 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.

D12.34. PUMPING STATION

D12.34.01. Prior to commencement of the manufacture of any pumps and control equipment, four (4) copies of the following shall be submitted to the required Sewerage Service Provider for review. ***Review***

a) Switch and Control gear Assemblies - Proposed fully dimensioned manufacturing details, general arrangement (showing internal/external details) and foundation/gland plate details.

b) Common Control – Complete circuit diagram and description of operation.

c) Schedule of Equipment - Completed as to the equipment to be provided.

d) Other Engineering drawings as required to fully describe the proposed equipment.

D12.34.02. Drawings shall be on “A3” size. ***Drawings***

D12.34.03. The Drawings shall show to scale:

- General arrangement of pumping stations with site plan;
- Concrete outlines;
- Number, make, model and details of pumps;
- Inlet and outlet pipe work details and levels;
- Pump cut in, cut out and alarm levels;
- Switchboard location;
- Pumping station access details.

D12.34.04. Pump Station Operating Condition Report must be provided to the Sewerage Service Provider during the Development Application submission phase. The report shall address all the activities and conditions referenced in Department of Environment and Heritage Protection guidelines - Model Operating Conditions ERA 63 - Sewage Treatment. It shall have a conformance table, easy showing how the conditions have been identified and assessed. ***ERA 63***

D12.34.05. The operational works submission must be accompanied by design calculations relating to sewage pumping stations including: ***Design Report***

- Buoyancy calculations;
- Wet well structural certification;
- Design flow calculations (including plan of identified catchment area);
- Pump selection including pump curve with proposed duty point and rising main characteristics;
- Emergency storage calculation;
- Design assumptions including wet well control volume, rising main detention time etc.
- Switchboard Loadings

D12.34.06. Drawings shall be on -"A3" size. All symbols used shall conform to AS 1102 and all wires and terminals shall be numbered. ***Electrical Standard***

D12.34.07. Review, assessment or approval of the drawings by the Sewerage Service Provider shall not relieve the Developer of the responsibility of complying with this Specification. ***Responsibility***

D12.35. AS CONSTRUCTED DETAILS

D12.35.01. As constructed data shall be submitted to Sewerage Service Provider showing the asset location and attributes of pipelines, access chambers and junctions, all pumping station details together with operating and maintenance manuals. Details shall include the size, type, levels, grade of pipelines, access chamber location, types and cover details, pump details, switchboard equipment details and station structural details.

As Constructed Works

D12.35.02. Refer to the Capricorn Municipal Development Guidelines web site www.cmdg.com.au for further information on the applicable Local Government's As Constructed data submission requirements. These will appear within the 'As Constructed' tab.

Web Site

ANNEXURE D12A

D12.36. QUALITY CONTROL, INSPECTIONS AND TESTING

Table D12.36.01

ACTIVITY	KEY QUALITY VERIFICATION REQUIREMENTS	MAXIMUM LOT SIZE	MINIMUM TEST FREQUENCY	TEST METHOD
INSPECTIONS				
Gravity Sewer Mains and Property Services	Prior to backfilling			
Sewer Rising Mains	Prior to backfilling			
Thrust blocks	Prior to backfilling			
Access Chambers	Base and benching			
Sewage Pump Station	(a) Prior to placement of wet well floor concrete (b) Valve pit starter bars (c) (If applicable) Pre-fabricated well installation (d) Switchboards			
On-Maintenance Liability Period	Prior to acceptance by Council			
Off-Maintenance Liability Period	After 12 months (minimum) from On-Maintenance Notice and Prior to release by Council			
MANDATORY TESTING				
	Key Quality Verification Requirements	**Maximum Lot Size**	**Minimum Test Frequency**	**Test Method**
Siting and Excavation	Geometry	1 line/ structure	1 per line/ structure	Survey
Gravity Sewer Mains and Property Services	(a) CCTV Inspection (If Applicable) (b) Compressed Air Testing		all all	D12.19
Access Chambers	Hydrostatic Testing or Vacuum Testing (Refer D12.20)		each access chamber	D12.20
Sewer Rising Mains	Hydrostatic Pressure Testing		All	
Sewage Pump Station	(a) Hydrostatic Testing (b) Practical Completion Commissioning Tests		each	
Backfill and Compaction Sewer > 2m deep and road crossings	Compaction Compaction	Trafficable - 50m of sewer trench Non-trafficable – 100m of sewer trench Access Chambers or	1 per 300mm of fill 1 per 900mm of fill 1 at 1m depth within 300mm of structure	AS1289.5.7.1

Sewer < 2m deep		Maintenance shaft 1 contract	As directed by Local Government	AS1289.5.7.1
Materials Supply	Material Quality - Supplier's documentary evidence and certification of:			
	- PVC Pipes	1 contract	As directed by Local Government	AS 1477
	- Ductile Iron Pipes	1 contract	As directed by Local Government	AS 2280 and AS 2129
	- Poly Pipe	1 contract	As directed by Local Government	AS/NZS 4130
	- Precast Access Chambers	1 contract	As directed by Local Government	AS 4198
Bedding	Material Quality - Grading	1 contract	1 per contract per source	Q103
AUDIT TESTING – IF ORDERED BY COUNCIL				
Materials Supply	Material Quality - Supplier's documentary evidence and certification of:			
	- uPVC Pipes	1 contract	As directed by Local Government	AS1477
	- Ductile Iron Pipes	1 contract	As directed by Local Government	AS2280 and AS2129
	- Precast Access Chambers	1 contract	As directed by Local Government	AS4198
Bedding	Material Quality - Grading	1 contract	1 per contract per source	Q103
Concrete Bedding	Refer C271 Minor Concrete Works			
Laying and Jointing of Pipes, Access Chambers, Structures	Geometry	1 line	1 per line	Survey
Thrust and Anchor Blocks	Refer C271 Minor Concrete Works			
Concrete Encasement	Refer C271 Minor Concrete Works			
Cast-in-situ Access Chambers	Material Quality - Tri-Calcium Aluminate Content	1 contract	1 per contract per source	AS3972
	- Fineness Index	1 contract	1 per contract per source	AS3972
	- Minimum Cement Content	1 contract	1 per contract per source	AS3972

ANNEXURE D12B

D12.37. 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 D12C

D12.38. 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 D12.38.01 Design EP's per Development Type can be used as a guide. Refer also to relevant Adopted Infrastructure Charges Resolution for the Local Government.

Table D12.38.01

	Unit	ET	EP
Accommodation			
Residential - detached dwelling	lot	1	2.6
Residential - Apartment/Unit/duplex			
1 Bedroom	unit	0.5	1.3
2 Bedroom	unit	0.8	2.08
3+ Bedroom	unit	1	2.6
Caravan Park - Van Site	site	0.8	2.08
Caravan Park - Tent Site	site	0.3	0.78
Hostel Accommodation	bed	0.5	1.3
Motel	room	0.6	1.56
Aged Care Accommodation (full service nursing home)	bed	1.1	2.86
Retirement Village			
1 Bedroom	unit	0.6	1.56
2 Bedroom	unit	0.9	2.34
3 Bedroom	unit	1.3	3.38
Education			
Child Care Centre	staff & pupils	0.1	0.26
Education – Primary School	staff & pupils	0.1	0.26
Education – Secondary School	staff & pupils	0.2	0.52
Education – Tertiary Institution	staff & pupils	0.2	0.52
Commercial			
Central Business	ha	21.3	55.38
Commercial Premises	100 sqm GFA	0.8	2.08
Shop	100 sqm GFA	0.9	2.34
Fast Food Services	100 sqm GFA	3.5	9.1
Food Services	100 sqm GFA	2	5.2
Hotel	100 sqm GFA	1.2	3.12
Major Shopping Development	100 sqm GFA	0.7	1.82
Medical Centre	100 sqm GFA	0.7	1.82
Restaurant	100 sqm GFA	1.6	4.16
Service Station	100 sqm GFA	0.8	2.08
Industrial			
Heavy Industry	ha	28.1	73.06
Light Industry	ha	28.1	73.06
Other			
Crematorium	100 sqm GFA	0.8	2.08
Hospital	bed	1.4	3.64
Place of Worship	100 sqm GFA	0.4	1.04
Public Building	100 sqm GFA	0.7	1.82