

Armidale

Regional Council

ENGINEERING DESIGN & CONSTRUCTION CODE SPECIFICATION CODE D11

WATER SUPPLY DESIGN AND CONSTRUCTION SUPPLEMENT TO WATER SUPPLY CODE OF AUSTRALIA WSA 03-2011

Amendment Record for Development and Design Manual

This Specification is Council’s supplement of the WSA Water Supply Codes.

Armidale Regional Council acknowledges the following documents which have been drawn upon for the creation of this document:

- Tas Water – Supplement to Water Supply Code of Australia WSA 03-2011
- SEQ WS&S D&C code – Amendment to Water Supply Code of Australia (WSA03-2011 V3.1)
- GWM Water – Design and Construction Standards Manual
- Barwon Water – Supplementary information to the WSAA Water Supply Code Of Australia
- Toowoomba Regional Council – Addendum to the Water Supply Code of Australia WSA 03-2011
- Yarra Valley Water – Water Design Principle, Version 2.0-2009)

Details are provided below outlining modifications to addendum clauses.

The amendment code indicated below is ‘A’ for additional script ‘M’ for modification to script and ‘O’ for omission of script. An additional code ‘P’ is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date

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INTRODUCTION

Armidale Regional Council (ARC) has adopted the Water Supply Services Association's Water Supply Code 2011 as the standard for water supply development design and construction. This supplementary document should be read in conjunction to WSA 03 – 2011.

The WSA Code and this supporting documentation essentially provides "deemed to comply" solutions for the creation of ARC's reticulation water assets. ARC's input should be sought if an innovative opportunity is being considered.

The clause and table numbers given in this supplement correspond with the clause and table numbers given in the Water Supply Code of Australia, WSA 03 – 2011.

ACKNOWLEDGEMENT OF AUS-SPEC

Armidale Regional Council acknowledges that the Water Services Association of Australia (WSAA) water supply and sewerage codes address requirements for planning, design and construction of water and sewerage network infrastructure. These documents together with Armidale Regional Council's Supplements will provide sufficient information to designers and planners to proceed with their developments design and construction.

Armidale Regional Council also acknowledges Aus-SPEC as a document which delivers a contract documentation system that can incorporate the water agencies requirements and the WSAA Codes technical requirements. AUS-SPEC comprises a series of standard contract documents and specifications, checklists and guidance notes which can assist contractors with their documentations on quality assurance, construction and contractual aspects. Armidale Regional Council encourages contractors, planners and designers to employ this Supplement and WSA Water Supply Code as well as Aus-SPEC documents to provide a comprehensive and high quality service.

Although, Armidale Regional Council has not identified noticeable contradiction where the two codes (WSA and Aus-Spec) overlap, this supplement plus WSA Water Supply Code shall precede all other codes and standards where the inconsistencies were noted. The designers and planners shall seek advice from the Armidale Regional Council to resolve any conflict.

WATER SUPPLY AND CONSTRUCTION D11

PART 0: GLOSSARY OF TERMS, ABBREVIATION AND REFERENCES

I Glossary of Terms

The council	Armidale Regional Council
ARC	Armidale Regional Council
Water Agency	Armidale Regional Council

II Abbreviation

ABBREVIATION	INTERPRETATION
ARC	Armidale Regional Council
ET	Equivalent Tenement

PART 1: PLANNING AND DESIGN

1.2.2 Scope and Requirements

Replace with the following.

(d) Armidale Regional Council (ARC) does not allow use of pressure booster pumps in the reticulation system. Use of any pressure booster pump in the system should be approved by the Council prior to concept design.

1.2.5.1 Designer’s Needs and Responsibilities

Add the following.

The developer is responsible for obtaining ARC’s written approval for deviations from Water Supply Code (WSA 03-2011) and this supplement.

ARC can provide advice on any specific requirements to the developer/designer. The developer/designer shall, at the beginning of the development, establish from ARC the ability of existing water infrastructure to service the land development proposal.

If a staged development is proposed the designer shall provide an indicative overall concept plan of the development at the time of submitting the first stage to ARC for approval.

1.2.5.2 Requirements to be Addressed

Add in additional requirement,

- (n) Underground services conflicts, e.g. NBN lines.

1.2.6 Design Life

Amend Table 1.2 as follows.

Item	Water Mains	Reservoirs	Pumps	Valves	SCADA
Expected design life, years	100	100	30	30	15

Table 1.2 – Typical Design Lives

2.1 General

For details of Armidale’s water supply system planning, including demand forecasting, definition of supply zones and system configuration refer to Armidale Regional Council Water and Sewage Development Strategy Study 1995 which can be requested from the Council.

Developers are required to be consistent with the ARC published Water Supply Study.

2.2.2 Extending/Upgrading an Existing Water Supply System

Add the following.

All the actions shall be documented by the developer/designer. ARC may be able to undertake some of the actions for the developer/designer at suitable fee.

The developer/designer shall provide details of the proposed extension/upgrade in the early phases of the design. In particular existing and future customers to ARC to allow it to be “trialed/ modelled” in ARC’s network analysis model and determine its impact on the existing water reticulation system.

2.2.4 Non-drinking Water as Drinking Water Substitution

Replace with the following.

ARC does not accept the ownership of non-drinking water infrastructure but will accept the reduction in drinking water demand. If a dual water system is being considered, the developer shall seek approval from ARC.

2.3.3.1 General

Add the following.

The actual demand value(s) used in the design shall be authorised by ARC.

2.3.3.3 Non-residential

Add the following.

The designer shall consult ARC for available options where a maximum flow rate is required in excess of what can be allocated from the reticulation system. On-property storage is not accepted unless approved by ARC.

2.3.4.2 Peak Day Demand

Replace with the following.

Peak day demand for Armidale shall be calculated from,

$$PDD= 2.2 \times \text{Average day demand}$$

Average Day Demand (per ET)	610 (L/day)
Peak day Factor	2.2

2.3.4.3 Peak Hour Demand

Replace with the following.

Peak hour demand for Armidale shall be calculated from,

$$PHD = 2 \times \text{Average hour demand (on peak day)}$$

Average Hour Demand (per ET)	25.4 (L/hr)
Peak Hour Factor	2.2

For Armidale diurnal water demand pattern refer to *Attachment 2: Armidale Diurnal Demand Factor*.

2.4 System Configuration

Add items below to the factors that should be considered for mains layout,

- (c) Main location to allow easy access for repairs and maintenance and standard footpath allocation.
- (f) Staged construction by using smaller initial mains – if approved by ARC.

ARC may issue an indicative layout plan with functional design requirements for the project. System configuration shall be approved by ARC.

2.5.2 Network Analysis

Replace 2nd paragraph with the following.

Where the input capacity is less than the total peak day demands, systems will require analysis over a period of consecutive days (design period) to ensure adequate pressure and operating/reserve storage.

2.5.3.2 Maximum Allowable Service Pressure

Add the following.

ARC may require the properties connected to the distribution mains to install and maintain Pressure Limiting Valves (PLV) on service connections.

2.5.3.3 Minimum Service Pressure

Table 2.3 modified as follows.

Pressure	Application	
	Residential	Industrial / Commercial
Maximum Allowable Service Pressure	800 kPa (80m head)	800 kPa (80m head)
Desirable Maximum Service Pressure	500 kPa (50 m head)	500 kPa (50 m head)
Desirable Minimum Service Pressure	200 kPa (20 m head)	250 kPa (25 m head)
Desirable Minimum Static Pressure	300 kPa (30 m head)	300 kPa (30 m head)

Table 2.3: Service Pressure requirement

2.5.3.4.2 Limiting High Average Service Pressure

Replace with the following.

Where large portions of a network will be subject to pressures above 80 m head, ARC will also set a maximum value for an average service pressure to reduce potential system leakage. Typically this would apply when pressure can be reduced by relatively simple infrastructure measures and at reasonable incremental cost e.g. PRVs.

2.5.3.4.3 Ensuring a Suitable Range of Service Pressure

Add the following.

ARC uses minimum static head to define the reservoir’s supply zone. The minimum acceptable static head is 30 m at the property connection. The designer shall consider the property elevation for achieving the Desirable Minimum Pressure. The designer shall use the water level in the reservoirs (at 2/3FSL) to calculate the static head at the property.

2.5.3.4.3.1 New Clause: Minimum Static Pressure

A reservoir zone should have a minimum static pressure of 30m at the highest point (i.e. the house which is at the highest elevation in the supply zone).

A pumped zone should have a minimum static head from the supply reservoir of 10m at the highest point on the peak hour of a 95%ile day. This is to ensure that there are positive pressures within the zone should a break down or power failure occur at the pump station.

Reservoir	2/3 FSL	FSL	Reservoir	2/3 FSL	FSL
Lynland Park	1145.050	1146.10	Northwest Low Level	1042	1044.35
Gungurru	1057.38	1058.08	St Patrick’s	1124.07	1126.07
Toadolla	1043.05	1043.05	Garibaldi No.1	1043.61	1044.76
North Hill	1081.208	1082.76	Water Treatment Plant - N	1046.67	1048.47
Northern High level –Link Rd	1081.160	1082.71	Southern High level-NW	1093.25	1094.80

Table 2.5.3.4.3.1: Reservoirs FSL and 2/3 FSL

In-line booster pumping stations are generally not permitted and any proposal that requires such is to be discussed and approved by ARC.

2.5.3.4.3.2 New Clause: Maximum Static Pressure

Typically, the maximum static pressure is observed at the lowest point in a water supply zone as follows,

- Reservoir Zones = Top water level – ground level
- Pressure Management Zones = Maximum PRV setting – ground level
- Pumped Zones = (Pump grade at zero flow – ground level) or (Pump grade at duty point – ground level) + surge allowance of 15m (whichever is higher).

2.6.3 Water Age

Item (c) is not applicable. Consult ARC before using this option.

2.6.4 Disinfection of Developments

Replace with the following.

More than 2.0 kilometres from the existing system shall carry out a modelling analysis of residual disinfection levels in the format recommended by the Cooperative Research Centre for Water Quality and Treatment within the manual on Disinfection Management – Implementing Tools for Optimising Disinfection.

If disinfection plants are required as part of the distribution and reticulation system, they shall be located so as to ensure an adequate disinfection contact time and suitable residual prior to water delivery to properties. The disinfection plants should be constantly monitored with telemetry system.

2.8.2.3 Service Related Factors

Add the following items,

- (i) Heating unit for electrical motors.
- (j) Availability of land for the pump station.
- (k) Effect on nearby properties (noise, odour, etc.).

2.8.3 Concept Design

Add to item (a),

- (iv) Peak hour demand (or greater, e.g. fire fighting) for pressure boosting pumping stations.
- (v) Consideration for fire fighting flows as per Clause 3.1.5.

Add the following.

(c) A standby pump unit is to be provided in addition to the one or more duty units, with automatic controls to alternate all pumps between duty and standby functions. A standby pump is required in all pump stations.

(e) Design shall address the maintenance of the pump station as part of the concept design.

2.9.1 Storage Capacity

Add the following to specify.

Reserve Storage shall cater for system component failure and fire fighting requirements.

The minimum capacity for any surface service reservoir shall be one (1) full day supply at peak day demand plus additional reserve storage equal to the greater of 1/3 full day supply at peak demand or 150kL i.e. minimum reservoir capacity = $\max(1.33PD, 1PD + 150kL)$.

The size of the service reservoir should then be rounded up to the nearest 50 kL (e.g. 353 kL will be rounded up to 400kL).

The reservoir should be located at an elevation such that the water level when the reservoir is 1/3 full provides not less than the minimum allowable service pressures at the customers services under peak demand conditions (Table 2.3 of this Supplement) and the wall height shall be a minimum of 4.0m.

Reservoirs are to be designed as part of an overall system and are to be located at elevations consistent with other reservoirs within the same pressure zone.

When designing the service reservoir, consideration shall be given to the need for a drainage easement and associated piping for reservoir overflows and scouring/flushing.

All surface reservoirs shall be roofed (concrete or aluminium cladding and purlins with 316SS columns). Unless otherwise approved, all tanks shall be concrete designed and constructed in accordance with the requirements of AS3735-2001 Concrete Structure Retaining Liquids.

The design of any service reservoir; in particular confined space access and egress, must be undertaken in consultation with ARC.

Elevated and standpipe reservoirs will be considered by ARC on a case by case basis.

2.10 Trenchless Technique for Pipe Laying

Consult ARC before use.

2.12 System Review

Amend as follows.

(g) Disinfection residuals in the system meet Australian Drinking Water Guidelines.

(i) Minimum and maximum velocity should be as per clause 3.1.6.4.

3.1.2 Minimum Pipe Size

Amend Table 3.1 as below.

ZONING/DEVELOPMENT	MINIMUM PIPE SIZE (DN)	
	Cast iron outside diameter series	ISO series
Low and medium density residential	100	125
High density residential (≥ 4 storeys)	150	180
Multiple developments of high density residential (≥ 8 storeys)	200	250
Industrial and commercial and Institutional	150	180

*Smaller pipe sizes are not allowed. For ARC’s preferred pipe sizes refer to Clause 4.1.

Table 3.1: Minimum pipe sizes for particular developments

3.1.3 Empirical Sizing of Reticulation Mains

Table 3.2 is for guide only.

Nominal size of main DN		Capacity of main (single direction feed only)			
Cast iron outside diameter series	ISO series	Residential (lots)	Rural residential (lots)	General/ light industrial (ha)	High usage industrial (ha)
100	125	40	10	N/A	N/A
150	180	160	125	23	N/A
200	250	400	290	52	10
250	315	650	470	84	24

Table 3.2: Empirical guide for pipe sizing

3.1.5 Fire Flows

Replace paragraph one with the following.

The water supply system shall be designed for fire fighting capability as per Australian Standard AS2419.1-2005 fire hydrant installations- System design, installation and commissioning and NSW Water Directorate Fire Flow Guideline - 2011.

Location	Fire Flow Provision	Residual Pressure
Residential	10 l/s	150KPa
Non-Residential	20 l/s(two 10 l/s hydrant)	150kpa

Table 3.1.5: Fire fighting requirement – adopted from NSW Water Directorate Fire Flow Guidelines

3.3.1 Gravity Systems

Amend the first sentence as follows.

For gravity systems, the PN of pipes and fittings shall be not less than the design pressure and a minimum of PN12 for general operational needs.

3.5 System Test Pressure

Amend the following.

(b) (ii) The test acceptable pressure is 120m.

3.6.4 Fatigue De-rating of Plastics Pipes and Fittings

Amend the following.

GRP pipes are not accepted by ARC. Replace Table 3.3 with table below.

Pipeline system items	Guideline
PVC pressure pipes	PIPA Guideline POP101 : PVC pressure pipes—Design for dynamic stresses
PE pressure pipes	PIPA Guideline POP010A : Polyethylene pressure pipes—Design for dynamic stresses
PE fusion fittings	PIPA Guideline POP010B : Fusion fittings for use with polyethylene pressure pipes—Design for dynamic stresses
GRP pipes and fittings	GRP pipes are not accepted by ARC

Table 3.3: Methods for design of plastics pipes and fittings for dynamic stresses

3.8 Pipeline Components Minimum Pressure Class

At the end of the clause, insert the following.

The minimum pressure class for water supply pipes and fittings shall be PN12. Designers may consider PN 16(on a material supply cost basis).

4.1 General

Add the following.

Armidale Regional Council accepted pipe types for water reticulations are,

(a) Ductile iron (PN 35).

- (b) High Density Polyethylene (HDPE) of Material Type PE 100 (PN 12.5) – DN 63 for property service road crossings and DN125 and DN180 at cul de sac curves and bored road crossings only. Refer to Standard Drawings.
- (c) Steel pipes for pipe sizes greater than DN300.
- (d) PVC-O Series 2, Class 12 and 16.

PVC-M and PVC-U shall not be used without ARC's prior approval.

GRP pipes are not permitted.

For other pipe materials consult ARC. Where it is proposed to use a new material the developer will be required to show that the material proposed conforms as follows:

- Pipe is suitable to meet pressure requirements at the proposed location;
- Has the minimum required pressure rating of PN12, SDR 11;
- Is compatible with Ductile Iron fittings;
- Fatigue and/or cyclical load testing indicates the material will meet a minimum 50 year design life;
- Will not be adversely effected, in terms of shape and strength by construction loading;
- Installation method to manufacturers induction for minimum 50 year design life; and,
- Compiles with a relevant Australian Standard.

4.2.3 Water Supply Mains – Non-drinking Water

Add the following.

Non-drinking water is not supplied by ARC. Designer shall consult ARC before considering the option.

4.3.2 Sizes and Configuration

Amend the following.

- (a) Pre-tapped connectors are not required.
- (c) Direct tapping is permitted.

4.4 PVC Pipeline System

Amend the following.

ARC accepts PVC series 2 ONLY. PVC-M and PVC-U shall not be used without ARC's approval.

- (a) Pre-tapped connectors are not permitted. Mechanical tapping band will be used where tapping is required.

4.5 PE Pipeline System

Add the following.

Material Type PE 80 is not accepted. ARC's preferred PE pipe sizes are DN 63, DN 125 and DN180.

Change items (a) and (b) as follows.

- (a) Mechanical tapping saddles are used for tapping to PE pipes.
- (b) Direct tapping of all reticulation sized mains is permitted.

Add new item as below.

- (f) Maxi flanges are recommended to be used for PE pipe connections to DI/CL pipes.

4.7 GRP Pipeline System

Add the following.

GRP pipeline shall not be used without approval of the ARC.

5.1.1 Design Tolerance

Add the following.

Horizontal alignment shall be referenced to MGA.

5.1.2 Levels

Add the following.

A longitudinal elevation shall be included on the Design Drawings for all water mains and shall show future road and drainage design level.

5.1.4.1 General

Add the following.

An environmental impact assessment shall be completed during the investigations stage.

5.2.1 Layout of Water Mains

Add the following.

Dead end and reduced size reticulation mains are not accepted by ARC.

5.2.3 Link Mains

Add the following.

Link mains shall be in a pathway dedicated to Council, not in a private property.

5.2.4 Reduced Size Mains

Add the following.

Reduced size mains are not permitted without permission of ARC.

The design in Figure 5.2 is not accepted. The hydrant is not close enough to safe guard the lots at the end of the cul-de-sac.

5.4.1 General

Add the following.

Water mains should be located in the road reserve as shown in ARC's Standard Drawing 030-063. Water mains are not preferred to be constructed longitudinally under a concrete footpath. Water mains must be constructed in accordance with the following.

- Where an existing main or new main to be extended in residential developments (development in General Residential R1 and Low Density Residential R2) or commercial and industrial development, water mains are to be extended across the entire frontage of each lot.
- Land zoned other than the above requires the water main to be extended a minimum 6.0m past the side boundary and clear of any proposed or existing driveway.

Replace (C) with

(C) Suitably sized easements are required for all water supply pipe lines in private properties.

5.4.2.3 Location in Carriageway

Replace the first sentence with the following.

If there is no space available in the footpath, the water main may be located in the carriageway, only with written approval of the ARC. See also Clause 5.4.3.

5.4.2.4 Location in Roundabouts and Bus Bays

Replace the first sentence with the following.

Mains shall not be laid through roundabout intersections or bus bays. The mains shall be deviated around the roundabout intersection and bus bays.

5.4.3 Location in Other than Dedicated Public Road Reserves

After the first paragraph insert the following.

Where the water main is located on private property, written approval of the landowner is required and an easement shall be provided.

5.4.4 Location of Water Mains – Water Mains in Easement

Insert the following at the end.

Water mains in private property in easements are generally not permitted and shall not be utilised to achieve capital cost minimisation where satisfactory routes in roads are available and viable, this adversely affects Council's access and ongoing maintenance requirements. When allowed, the developer shall be responsible for all costs associated with the acquisition of easements that are required for the development. In addition, water mains in easements shall be Ductile Iron Cement Lined (DICTL) Class PN 35 Rubber Ring Jointed pipes.

5.4.5 Dual Water Supply Systems

Add the following.

For dual water supply consult ARC.

5.4.9.1 General

Add the following.

It is council's preference that all water main road crossings are installed by under bore unless it is impractical to do so. Council should be consulted prior to submission of crossings design. Bore logs shall be submitted for any under bores. Water main road crossings for mains greater than 150mm must be sleeved in accordance with ARC Std DWG 020-044. Nominal DN100 and DN150 mains may be installed without a sleeve across a road under the following conditions.

- DN125 or DN180 High Density Polyethylene (HDPE) of Material Type PE 100 (PN 16, SDR 13.6) shall be used.
- The minimum cover under a road is to be 600mm.
- Maximum length of under bore without sleeve is to be 15m unless otherwise approved.
- The under bore is to be installed at a constant grade and a bore log with a minimum of four points across the road with reduced levels to confirm constant grade is to be submitted to council as part of the acceptance process. Where low or high points are created Council will consider whether the under bore is acceptable or will be required to be redone.

- The size of the bore hole is to be limited in size to avoid potential consolidation of the road and movement of the water main. Bore sizes shall not be larger than 150mm and 200mm for DN 125 and DN180 respectively.
- The depth, location and orientation of the mains to be interconnected on both sides of the street must be confirmed prior to undertaking the under bore. The under bore road crossing is to meet where practical, the interconnecting mains at 90 degrees without bending the PE pipe. Vertical bends to interconnect are to be avoided and will only be accepted where to achieve minimum cover across the road results in a level differential between the new and existing mains.

5.4.11 Crossing of Creeks or Drainage Reserves

Insert the following at the end of the clause.

It is the responsibility of the developer to determine from the relevant Regulatory Authority (e.g. NSW Fisheries) the design requirements for crossing rivers, creeks, drainage reserves and designate water courses.

5.4.13 Water Mains in Conjunction with Landscaping and/or Other Development

Items (a) and (c) shall be replaced with the followings.

(a) Access – the main shall be located so as to provide adequate access for operation and maintenance activities. Access shall not be restricted by permanent structures. Ready access shall be maintained to current and likely future service connections, hydrants, valves and other fittings such as scours and air valves. Clear access shall be provided to surface fittings.

(c) Encasement and protective slab can be considered after consultation with ARC.

5.4.14 Water Mains on Curved Alignments

Amend as follows.

Option (a) PE system shall be used for curved alignments. Where DICL or PVC pipes are used then Option (c) is required.

The use of pre-tapped connectors is not permitted.

5.4.15 Location Markers

Insert the following at the end of the clause.

Markers shall be durable.

5.4.16.2 Mains

Replace the second paragraph by the following.

Detectable marking shall be specified for installation above all buried non-metallic pipes.

5.4.16.3 Property Services

Amend as follows.

Only Type A copper pipes shall be used for property services. PE pipe shall be used for property service road crossings.

5.6 Shared Trenching

Delete DN225 from the Table 5.3.

5.8 Rider Mains

Replace the second paragraph with the following.

A rider main will be required where a distribution or feeder main of DN200 and above already, or will exist in the road reserve. No tapping permitted off any water main DN200 and above.

5.9 Connection of New Mains to Existing Mains

Replace second and third paragraph with the following.

All works on the existing reticulation system shall be considered as “live works” and will be carried out by ARC or their designated agent at the developer/contractor’s cost. These works shall be clearly delineated on the Design Drawings and shown in sufficient detail such that the works can be readily constructed. The connection point to the existing system shall be located to minimize disruption of supply to customer and be subject to ARC’s approval. Refer Fig 5.6 and 5.7 for typical connection details.

5.10.2 Temporary Ends of Water Mains

Insert the following at the end of the clause.

Flushing bend and flushing assembly are not accepted to replace a standard hydrant.

5.10.4 Flushing Point

Flushing points are not permitted.

5.11.1 General

Insert the following at the end of the clause.

Property service road crossings shall be 63mm polyethylene pipe PN 12.5 to service a maximum of two (2) properties.

5.11.2 Connections to Water Mains

Amend the table 5.4 as below. See also Clauses 4.3.2, 4.4 and 4.5.

PIPE TYPE	SIZES					
	Single service			Split service serving 2 to 4 properties		
	Pipe		Drilling/Tapping Hole Size mm	Pipe		Drilling/Tapping Hole Size mm
	DN	ID1 mm		DN	ID1 mm	
Copper-Type A	20	16.3	20	-	-	-
	25	22.2	25	25	22.2	25
	32	28.6	50	32	28.6	50
	40	34.9	50	40	34.9	50
	50	47.6	50	50	47.6	50

Table 5.4: Residential Property Service Pipe/ Connection Sizes

5.11.3 Services, Outlets and Meters

All the text shall be replaced with the following.

Property services shall be located at a point such that meter assembly is located 500mm inside the front and side of property boundary and 500mm from the driveway. The location of the property service shall be coordinated with the design of other services.

ARC prefers all underground utility service road crossings of formed public roads to be under road bored unless

existing services prohibit this form of construction. Justification for road crossings by open trenching should be provided prior to approval. Any such trenched road crossing must be reinstated in accordance with the Armidale Regional Council Engineering Code.

Split property services shall be provided for services crossing road carriageways wherever practicable with the common pipe of the split services positioned to service:

- (a) Two properties on adjoining lots; and
- (b) Two properties on the same lot in the case of duplex lots.

Meters shall be installed above ground and have plastic cover on top.

Delete Figure 5.9. Refer to ARC standard drawing 020-040 for typical split service main. A cast Iron “W” Box is required to be installed on every road carriageway crossing in accordance with the ARC Std. DWG 020-040 to access the TPFNR if required for maintenance.

Council requires all developer/applicant to provide property service connections up to the path cock for each lot in green-field subdivisions subject to the following further requirements.

- Property service connection needs to be provided in accordance with ARC Std DWG 020-038 and 020-039. In addition, connection needs to be square-drive TPFNR and the meter cock must be lockable to prevent water theft until the meter is fitted.
- Excavation for mains connection and property service pipe to be left open for inspection and approval by Council.
- Water main pressure test shall be carried out after the installation of property service pipes.
- Each lot to have a single service connection in DN20.

A Water meter will be required to be installed at the building stage.

5.12.4 Clearance from Structures and Property Boundary

The text in the clause shall be replaced by the following.

Council will not approve the construction of any structure or change of ground level over a water main that will prevent or hamper constructing, reconstructing, maintaining, repairing, cleaning or gaining access to the pipelines or easement. Footing of a structure outside the easement but within the zone of influence that will super-impose a load on an existing/proposed water main shall be extended below the invert of the pipe.

The minimum offset from property boundaries shall be in accordance to the table 5.12.4.

Pipe Size	Clearance
< DN100	0.6 m
≥DN 100 - <DN 300	1.0 m
≥ DN 300	2.0 m

Table 5.12.4: Property Clearance

5.12.5.2: Clearance Requirements

Water mains shall be located with sufficient clearance to structures to allow for maintenance and operation activities and provide protection against damage from pipeline bursts.

Utility (Existing or proposed service)	Minimum horizontal clearance mm		Minimum vertical clearance ¹ mm
	New main size		
	≤DN 200	>DN 200	
Water mains ² >DN 375	600	600	300
Water mains ≤DN 375	300 ³	600	150
Gas mains	300 ³	600	500 ⁴
Telecommunication conduits and cables	300 ³	600	150
Electricity conduits and cables	500	1000	2254 & 7
Stormwater drains	300 ³	600	150 ⁴
Sewers – gravity	1000/600	1000/600	500 ⁴
Sewers – pressure	1000	1000	500
Sewers – vacuum	300	600	500
Kerbs	150	600 ⁶	150 (where possible)

Table 5.5: Clearances between water mains and underground services

Amend Note 4 of Table 5.5 as follows,

- Water mains (including water services and fire hydrant offtakes) should always cross over sewers, stormwater drains, gas mains and electrical conduits unless written approval is obtained from ARC. For cases where there is no alternative and the water main must cross under other services, the design shall nominate an appropriate trenchless construction technique in accordance with Clause 5.5 or other water main construction and protection treatment (i.e. SCL water main with concrete encasement), effectively joint-free (i.e. fully welded PE) in the vicinity of other services.

5.12.6.1 General

Insert the following to the end of clause.

Consult ARC for using joint deflection on pipes ≥ DN 300.

5.12.6.3 Vertical Deviation of Water Mains

Insert the following at the end of clause.

Scour facility shall be provided at the low points under vertical deflection.

5.12.6.4 Curving of Pipes to Avoid Obstruction

Refer also to Clause 5.4.14.

5.13 Disused or Redundant Pipelines

Add the following in the item (e).

- Also refer to Clause 11.5.2.

6.2 In-line Pressure Booster Pumping Station

Booster pumps are not permitted. If an exception is negotiated with Council, pumps shall be designed for the entire catchment, not just only for the subject development. Cost of installing and commissioning booster pumps will not be offset against the water contribution the development will be required to pay in accordance with the Council's Development Servicing Plan for water. Booster pumps are not part of the Council's lead-in scheme. The use of individual pressure boosting pumps in property service systems are not permitted in any areas.

6.2.1 Planning Criteria

Add item below,

- (d) Other customers as nominated by the Water Agency e.g. educational institution

6.2.2.4 Due Diligence Requirements

The item (b) shall be replaced with the following.

- (b) The pump station shall be equipped with a fixed generator in case of main power supply interruption. A mobile generator is not permitted.

6.2.2.6 Maintainability

Add items below:

- (f) Consider vehicular access to the pump building.
 (g) Incorporate crane in the building to facilitate the pumps movement.

6.2.2.9 Site Selection

Amend item 4 as follows.

4. Road reserve – Subject to Road Authority's written approval.

6.2.2.15 Security

Add the following at the end.

Protection treatments shall include,

- Security alarm
- Fire alarm
- Security fencing and signage
- Remote monitoring

6.2.2.19 New Clause: Architecture

Architectural design of the pump station's building shall be consistent with existing pump stations. Refer to Attachment 3 for the photos of the existing pump stations.

6.2.3.1 General

Amend items as follows,

- (c) Handover and training.
 (f)(ii) Work As Constructed drawings, including electrical wiring drawings.

6.2.3.3 Commissioning

Insert at the end of the clause.

A representative of ARC will participate in the commissioning and will elect to record an independent set of test results for evaluation.

6.2.4.1 Modelling

Insert at the end of the clause.

Also read Clause 6.2.1. item (ii).

6.2.5.2 Connection to the Network

Insert at the end of the clause.

Modelling shall establish the impact of the booster on suction side of the booster, including change to pressure and number of properties affected.

6.2.5.7 Booster Set and Pump Selection

Amend the sixth the paragraph as follows.

All pumps shall be fitted with flow meter and temperature sensors for no-flow protection.

And add the item below at the end,

(x) Net Positive Suction Head at maximum flow.

6.2.5.10 Site Specification

Amend the item (j)

(j) Building structure (see Clause 6.2.2.19),

And add the item below to the list,

(m) Independent power.

6.2.8.2 Security of Supply

The text in the clause is replaced with the following.

The designer shall include Emergency on-site generation as an alternative power supply.

6.2.11.2 Software

Add the following at the end of second paragraph.

ELPRO is ARC's nominated systems integrator.

7.1 General

Delete PVC-M and PVC-U from the table. PVC-M and PVC-U shall not be used without ARC's approval.

7.4.2 Pipe Cover

Replace Table 7.2 with the Table below.

LOCATION	MINIMUM COVER mm (< DN300)	MINIMUM COVER mm (≥ DN300)
Non-trafficable areas	600	1000
Trafficable areas		
- Driveways in industrial/commercial areas	600	1000
- Carriageways and verges of sealed local roads	600	1000
- Carriageways and verges of major roads	750	750
- Carriageways and verges of motorways	1200	1200
- Carriageways and verges of unsealed roads	750	1000
Embankments	750	1000

Table 7.2: Minimum cover requirement

Also add the following.

If existing water mains are found to have cover less than minimum specified in the table 7.2 above, in any proposed development, either by changing the ground level or by changing the use, the developer is required to achieve minimum specified cover.

The Water Agency may increase the depth of cover to avoid conflicts and support other services.

7.5.1 General

Replace the first sentence with the following.

Unless otherwise specified, a geotechnical assessment shall be made of all the proposed routes for all pipe sizes

7.6.1 General

Add the following as a first sentence of the clause.

ARC shall be consulted and its approval obtained for any concrete encasement and/or alternative pipe protection proposal.

7.6.2 Requirements

Amend item (a) (i) in the last paragraph as below.

(i) each end of the encased sections for all main sizes

7.6.3.1 General

See Clause 7.6.1.

7.9.2.2 Concrete Thrust Blocks

Add the following.

The text and the table 7.3 shall not be used. ARC's Standard Drawing 020-046 contains minimum thrust areas for concrete blocks in case of stiff clay generally found in Armidale. If soil is found to be weaker or stronger than stiff clay, designer shall increase or decrease the thrust area using the formula contained in the clause 7.9.2.1 and calculated bearing capacity.

7.9.2.4 Timber and Recycled Plastics Thrust Blocks

Timber and recycled plastic thrust blocks shall not be used.

7.9.5 Restrained Elastomeric Seal Joint Water Mains

Add the following.

ARC shall be consulted and its approval obtained for the use of restrained seal joints.

7.9.6.5 PE Mains

Insert the following as the first paragraph.

Fully restrained PE pipe system does not generally require the use of anchorage. The restrained system may be provided through welded joints, restrained couplings or flanges. The need for anchorage shall be assessed by the designer (i.e. ends of mains or transition between different pipe materials.)

Insert the following to the end of the clause.

The transition areas shall be restrained with concrete thrust restraints. Push-on PVC or DICL directly connecting to PE without appropriate restraints on the transition area is not permitted.

7.10 Bulkheads and Trench Stops

Delete Figure 7.21. Bulkheads are not necessary adjacent to the kerb and gutter shoulder of sealed carriageways.

8.1.2 Valve Siting Principles

Amend item (b) as follows,

b) Ready access to valves shall be allowed to enable their safe operation. Account shall be taken of traffic and other site peculiarities. Valves and hydrants shall not be installed in roadways where an alternate location is available.

And add item (e) below to the list,

e) At intersecting mains at intersections, valves are to be located level with the end of the property boundary splay of the adjacent property of the adjoining road. Variance from this arrangement will be permitted only with the approval of Armidale Regional Council. The intention is to prevent interference of the valve and its thrusting by other service authorities at a later date who may need to trench across the main.

8.1.5 Plastic Identification Covers

Replace Table 8.1 with table below.

Valve description	Colour
Closed valve	White
Open valve	Red
Dialysis	Blue
Non-drinking water	Purple

Table 8.1 Colour coding of spindle cap plastics covers

8.2.2.2 Gate Valves

The clause has been re-written as follows. .

All valves shall be clockwise closing. End connections shall be socket/spigot or flange jointed and anchorage shall be in accordance with Clause 7.9.

A valve chamber shall be provided for all geared gate valves.

Figures for hydrant and stop valve installation (8.2, 8.3, 8.31, 8.32, 8.34) shall be replaced by ARC standard drawings 020-041 and 020-042.

Gearing shall be provided for:

- (a) PN 16 valves of size > DN 375; and
- (b) PN 21, 25, and 35 valves of sizes \geq DN 400.

Valves with integral bypass may be considered for DN 375 and smaller.

Add note below to figure 8.5 and 8.6:

Note 2: A neoprene pad is to be placed between the concrete plinth and the base of the stop valve to accommodate expansion and contraction of the varying materials.

The depth of the main shall not be locally increased as this would necessitate scouring at the low point. The design shall consider the minimum cover required for the valve spindle. The designer may consider increasing the surface level, where possible, to achieve the minimum cover requirement.

8.2.3 Stop Valves for Transfer/Distribution Mains

Amend the last line of the first paragraph with the following.

Stop valves are required on either side of a bridge, road, motorway, creek or railway crossing.

8.2.4 Stop Valve for Reticulation Mains

Replace Table 8.2 with table below.

Water main size DN	Number of property services (nominal) connected	Maximum spacing m
≤ 150	40	200
200-300	100	750
375	150	1000

Table 8.2: Stop valve spacing criteria

Where a single water service is to be provided for multi-unit developments or critical developments (e.g. hospitals, institutional) beyond the nominal maximum number shown in Table 8.2, a valving arrangement for two-directional supply (Refer to Figure 8.14) shall be provided at the connection point.

8.2.7.1 General

See Clause 8.1.2 and also Notes on Figure 8.2.

Flange is the preferred connection type if anchored with other fittings.

8.2.7.2 Arrangement 1

See also Clause 5.9.

8.2.7.6 Arrangement 5

See also Figure 5.7.

8.3.2 Automatic Inlet Valves (AICV)

Hydraulic actuated valves are preferred. Float valves are not permitted.

8.4.5 Air Valves Location

Figure 8.24 shall be replaced by ARC Standard Drawing 020-042.

8.6.2 Design

The Non-Return Valve in Figure 8.25 is required.

8.6.5 Scour Location

Add items below,

- (f) The scour shall point to downstream of the drainage line, not upstream.
- (g) Pump scour is not generally permitted.

8.8.4 Hydrant Types

Add to clause.

Screw Hydrants, Pillar Hydrants and L-type hydrants are not permitted on Council's main.

8.8.5 Hydrant Installation

Amend item (c) as follows.

- (c) Other locations specified by ARC, e.g. CBD, critical customers.

8.8.7 Hydrant Size

Add to clause.

DN80 flanges and DN80 hydrant risers are required by ARC.

8.8.8 Hydrant Spacing

Add to clause.

Hydrants spacing in Armidale has changed from 60m to 70m. Maximum hydrant spacing for Armidale Regional Council area is,

Agency	Residential areas	Commercial and industrial areas	CBDs	Rural areas
Armidale Dumaresq Council	70	70	70	120

Table 8.8.8: Fire hydrants spacing

In rural areas the hydrant should be installed within 20meters of driveways.

8.8.9 Hydrant Location

Add to clause.

Distance from bottom of the cover to the top of the hydrants should not exceed 150mm and not be less than 80mm.

Figures 8.31 to 8.34 shall be replaced by ARC Standard Drawing 020-041 and 020-042.

Hydrants are to be located at ±200mm from dividing property boundary.

8.10.2 General

Add to clause.

Use of recycled plastic covers is encouraged where practicable.

8.10.4 Installation Requirements

Add to clause.

The hydrants and stop valves covers should open in direction of the main. Figures 8.35 to 8.37 shall be replaced by ARC Standard Drawings 020-041 and 020-042.

8.11.3 Pavement Markers

Add to clause.

Blue reflective marker shall be used on the roads for the hydrants.

8.11.4 Kerb Marking

Add to clause.

Refer also to ARC's Standard Drawing 020-047 for road crossing marker plate.

9.1 General

Add item below to list.

(o) Engineering work, including investigation, design, construction and operation is to be supervised and certified by professional engineer or competent person approved by the Water Authority.

9.2.6 Water Mains >DN 300

Add item below to the list,

(d) Location of deflected joints.

9.4 Recording of Work as Constructed Information

Amend the last paragraph as follows.

Recording of as-constructed information may be facilitated using suitably accurate GPS co-ordinates at key as-constructed points.

PART 2: CONSTRUCTION

11.1 General

Add the following.

Engineering work, including investigation, design, construction and operation is to be supervised and certified by professional engineer or competent person approved by the Water Authority.

11.4.1 General

Add the following.

Give 7 days' notice prior commencement of work to customers who will be affected.

11.5.1 Protection of Other Services

Add the following after the first sentence of the first paragraph.

ARC is not part of 'Dial Before You Dig (DBYD)'. For ARC's underground services information, contact the Council directly.

Add the following as a last paragraph.

The contractor shall be responsible for any damage they cause to existing services. If the contractor damages any existing services, they shall arrange for the relevant service authority to make good such damage and the cost thereof shall be borne by the contractor. If in the opinion of the Council, the failure or damage causes an emergency situation, then the remedial action may be taken by the Council at the cost of the contractor.

11.5.2 Disused / Redundant Water Mains

Add item below,

In case of asbestos cement (AC) pipes:

(f) Refer to Water Directorate 'Cutting, Handling and Disposal of AC Pipe Guidelines – 2008'.

11.5.5.3 Protection of Adjacent Lands and Vegetation

Insert the following at the end of the third paragraph. ,

Record a video of the pre-construction condition of the site to be utilized during the restoration phase.

11.5.5.4 Control of Water Pollution

Add item below,

(iv) (f) Regularly clean any erosion and sedimentation of construction

11.10 Survey Mark

Add the following.

Maintain all state and territory survey marks (including SSM, PM and property survey mark).

12.2 Delivery Inspection of Products and Materials

Add the following.

The superintendent's representatives shall submit conformation reports on the material compliance.

12.6 Supply of Water to the Works

Add the following.

Due to the potential of contamination to the water supply system by backflow, fit a WaterMark certified testable backflow prevention device or air gap so as to be visible on the tanker (vehicle) at all times when drawing water from hydrants/fireplugs. Refer to ARC's application procedure.

Do not use water from private source or metered supply without written permission of the owner.

12.8.2 Valves

Add the following.

All stop valves shall be clockwise closing.

12.8.8 New Clause: Flange Connection

ARC recommends Australian Standard 2129 Table D flanges to be utilised for new works and Table E flanges to be utilised for maintenance.

13.3.2 Protection of Roots

Replace second and third paragraph with the following.

All excavation works required in the Tree Protection Zone (TPZ) should be performed in accordance to AS4970-2009. Approval shall be sought from ARC where required in accordance with the Council's Development Control Plan. ARC shall be consulted prior to any excavation work in public trees TPZ areas and the trees status shall be checked against Heritage listed or Significant Tree records.

13.12 Surplus Excavated Material

Add the following.

Excavated material that is not used on site shall be disposed in accordance to Waste Regulation 2005 and POEO Act 1997. No excavated material shall leave the site without classification.

15.1.2 Dual Water Supply Areas

Add the following.

Consult ARC before design and construction of dual water supply.

15.1.4 Laying

See also Clauses 5.4.14 and 5.12.6.

Insert the following after second paragraph.

Each water main which is being extended from or connected to shall be exposed prior to laying the new water main. This is to ensure the new water main will be connected at right angles and aligned with the existing main. No joint deflection or additional fittings will be accepted in the final connection.

Insert the following before the last paragraph.

In the case of PE system, PE has a relatively high co-efficient of thermal expansion. When long lengths of welded pipe are being installed in warm weather, the excavation backfill shall be placed as soon as practicable. This will allow the pipe to cool to ambient temperature and contract fully before making lateral connection or tying-in to an existing network.

15.2.3 Curving of Pipe

See also Clause 5.4.14.

15.8 Tapping of Mains, Property Services and Water Meters

Add the following as a first sentence.

Only ARC is permitted to tap the mains for property services. Consult ARC where tapping is required.

Replace item (c) with the following.

(c) Maintain a minimum 500mm between tappings, and from a tapping and the end of pipe, Tees and other fittings.

15.13.3 New Clause: Distance between Fittings

Distances between adjacent socketed fittings shall be separated by a straight length of minimum length of 600 mm.

15.15 Bored Pipes under Roads, Driveways and Elsewhere

Amend the second paragraph as follows.

Where practicable, use a continuous pipe under road carriageway. Where impracticable, limit jointing to a single lockable joint beneath the road carriageway.

15.19 Flanged Joints

See also Clause 4.3.6 and Figure 4.1.

17.1.1.1 Trafficable Areas

Delete items (i), (ii), (iii). Council prefers all underground utility service road crossings of formed public roads to be under road bored unless existing services prohibit this form of construction. Justification for road crossings by open trenching should be provided prior to approval. Any such trenched road crossing must be reinstated in accordance with the Armidale Regional Engineering Code.

Use Select Fill as fill material. Refer to Roads and Maritime Services (RMS) material specification "QA Specification 3071- Selected Material for Formation" for Select Fill specifications.

19.3.2.4 Frequency and Location of Tests

Add the following.

For trenches located in a trafficable zone, conduct one test in each 300mm layer of fill for each 50 lineal metres of water main or part thereof.

For trenches located in a non-trafficable zone, conduct one test in each 900mm layer of fill for each 100 lineal metres of water main or part thereof.

19.7.2 Test Procedure

Amend the item (b) with the following.

(b) Engage a Recognised Testing Laboratory accredited (or as approved by the Water Agency) for the test to collect representative water samples from the test section of the water main.

22.1 General

Replace second, third, fourth and fifth paragraph with the following.

Connections to existing water mains are only conducted by Armidale Regional Council. The developer shall consult ARC where connection to existing water mains is required and give a minimum of 10 working days of notice before a connection is to proceed, where UPCIC is appropriate. Where shut down of the existing main is required, give 28 days

of notice.

Replace the last paragraph with the following.

When shutting down of mains is required for connection, fire hazard needs to be considered e.g. reschedule connection if shutting down of mains is required in bush fire prone area when The Bush Fire Danger Ratings has been declared as "Extreme or Catastrophic".

23.1 Restoration: General

Add the item below.

Undertake weed control measure at the time of restoration to avoid weed growth on the area.

Add the following in the end.

Following Seed Mixtures shall be used for restoration whenever required.

"Footpath mix" seed (30% Perennial Rye grass HE, 30% Creeping red fescue HE, 30% Spider fescue HE, 10% Bermuda couch) shall generally be used including in the locations specified below:

Passive parks and reserves

Active parks (sports fields)

Lawns

Footpath areas where there is no risk of invasion into adjacent "designer turf" lawns

Drainage channels

Embankments

Excavations

HE refers to 'High endophyte' seed.

And where there is a risk of invasion into residential properties that have "designer lawns", "Speedy Green" turf mix (33% Perennial rye grass HE, 33% creeping red fescue HE, 33% Spider fescue HE) shall be used.

23.2 Pavements

Add the following.

Road crossing utility trenches are to be sealed within 24 hours. Where an AC seal is required to match the existing road pavement, a temporary flush seal of the pavement may be applied in the first 24 hours and the permanent AC seal within 14 days. A minimum of 40mm of AC shall be installed in the resurfaced trench.

23.4 Grassed

Add the following.

Top soil minimum depth is 150mm.

24 Work As Constructed Details

Add the following.

Include details of all redundant pipes in Work As Constructed drawings. Drawings shall be provided in PDF format, the pdf file shall be a plot of actual size, metric and 600 DPI. A hard copy shall be provided on paper as well, with both the electronic and hard copy to include a certification by the Supervising Engineer and the Surveyor.

Asset attribute data is to be captured for all assets created. Data is to be presented in a spreadsheet.

Work As Constructed plans shall show items below,

- (a) Cadastral information including streets, street names, lot boundaries and numbers and easement locations;
- (b) New water mains diameter (DN), material type, pressure class (PN), diameter, series (PVC);
- (c) List of new fittings sizes, material types and pressure class, and their location;
- (d) New water main location (offset) from property boundary;
- (e) Redundant mains;
- (f) ARC's Development Application number;

- (g) Diagrammatic SCHEME of pipe fitting arrangements;
- (h) Water service sizes, material and entry points for each lot; and,
- (i) Location of service conduits.

25 New Clause: Hold Points and Witness Points

Attachment 1 provides reference for Hold Points and Witness Points – adopted from Aus-Spec “1341 Water Supply – Reticulation and Pump stations (Construction)”.

APPENDIX B EQUIVALENT PIPE SIZES FOR COMMONLY USED MATERIALS

Replace Copper Type B with Type A as per AS1432.

Remove pipe material PVC –M and PVC-U and the pipe sizes PVC 225, PE 90, PE 110, PE 160 and PE 280 from the table as these are not permitted.

Add a new note 5 as following.

PVC pipes shall be PVC-O Series 2 minimum PN12.5 with spigot and socket rubber ring joints. PE pipe shall be PE 100 minimum PN12.5.

ATTACHMENT 1: HOLD POINTS AND WITNESS POINTS

Use tables below as a reference for Hold Points and Witness Points (Aus-SPEC 1341).

Give notice so that the inspection may be made of the following:

Summary of Hold Points

Clause title/ Item	Requirement	Notice for inspection	Release by
MATERIALS			
General			
Authorised products and materials	Submit for approval alternative products and materials.	2 weeks before ordering	Superintendent
EXECUTION			
Establishment			
Excavation near underground services – Public utilities within the excavation for water supply systems	Approval from relevant Authority for the method of excavation.	1 week	Superintendent
Excavation near underground services – Marking	Locate and mark existing underground services	3 working days	Superintendent
Excavation near underground services – Protection of other services	Give notice of any interference to the works caused by an existing service and submit a proposed work method statement.	1 week	Superintendent
Excavation for water supply systems			
General – Confirm surrounding soil type with design	Confirm surrounding soil type with design.	1 week	Superintendent
General – Excavation across improved surfaces	Approval from the land owner prior to commencing any excavation across improved surfaces	1 week	Superintendent
Support of excavation - Trench instability	Submit for approval the proposal to provide adequate permanent stability of the ground affected by trenching	1 week before relevant action	Superintendent
Bedding for pipes			
Trench floor preparation	Test for bearing capacity > 50 kPa	3 working days	Superintendent
Pipe laying, jointing and connecting			
Wrapping of ductile iron pipelines	Rectify any damage to sleeving before backfilling trench	2 working days	Superintendent
Welding of PE pipeline	Welders trained by a Registered Training Organisation and endorsed by PIPA for relevant welding method.		Superintendent

Clause title/ Item	Requirement	Notice for inspection	Release by
Electrical requirements for pump stations			
General - Electrical safety and earthing	Test for defects and submit a certificate of safety declaration.	1 week	Superintendent
Electrical installation	Submit for approval underground cabling requirements.	2 weeks	Superintendent
Practical completion of pump station - Demonstration	Demonstrate that pump station is in working order by testing and commissioning.	3 working days	Water Agency - Superintendent
Practical completion of pump station - Operating and Maintenance Manuals	Obtain approval of the Operating and Maintenance Manuals	1 week before operating	Water Agency - Superintendent
Embedment and backfill			
Pipe embedment and support	Present the laid and jointed pipes for approval prior to the commencement of trench backfilling	2 working days	Superintendent
Embankment fill	Submit proposal for construction of embankments	1 week	Superintendent
Acceptance testing			
General - Unsatisfactory test	Rectify any faults even when results are compliant	1 week	Superintendent
Connections to existing water mains			
General - Verify on site measurements	Submit a proposal to adjust work to fit the connection to the existing as required.	3 working days	Superintendent
General - Connection and/or charging the new mains	Submit request to charge the new mains	5 working days	Water Agency - Superintendent
Restoration of surfaces			
General - Original condition requirement	Restore progressively and as soon as possible after the section of works is completed	2 working days	Superintendent

Summary of Witness Points:

Clause title/ Item	Requirement	Notice for inspection
MATERIALS		
General		
Compliance with manufacturers recommendations	Inspect material and products at time of delivery.	2 working days
Pipes and fittings		
General - Certification	Provide product or material certification prior to delivery to the works	3 working days
Valves and hydrants		
General - Certification	Provide product or material certification prior to delivery to the works	1 week
EXECUTION		
Establishment		
General – Set out	Confirm the set out locations immediately prior to construction.	3 working days
General – Crossings authority approvals	Approval from relevant Authority and payment of fees.	2 weeks
Temporary drainage during construction	Approval from appropriate Authority for any discharge to sewers, stormwater drains or watercourses.	2 weeks
Excavation for water supply systems		
Inadequate foundation material - Notice	Give notice of any area of the foundation that may contain inadequate foundation material	1 week
Inadequate foundation material - Rock foundation	Excavate for an additional depth. Backfill and compact the additional excavation.	1 week
Trench excavation – Trench size for pipelines	Conformance with documentation	1 week
Trench excavation – Trench widths	Method for approval	1 week
Pipe laying, jointing and connecting		
Installation of pipes	Submit and provide ITP	1 week
Under pressure cut-in connection to pressure pipes ≥ DN 80	Clean and inspect pipe and give notice if badly corroded or damaged.	3 working days
Thrust and anchor blocks and restrained joints	Give notice if the allowable bearing pressure of the ground and the design pressure of the pipeline differ from actual pressures on site	1 week
Welding of steel pipelines	Submit proposal for approval	1 week
Electrical requirements for pump stations		
General – Approval of electrical products and materials	Submit proposal for all equipment for approval	2 weeks
Pre-commissioning of pump stations	Test and prepare the pump station in and submit pre-commissioning record.	3 working days
Commissioning of pump	Give notice of the intention to	5 working days

Clause title/ Item	Requirement	Notice for inspection
station - Notification of commissioning	undertake commissioning	
Commissioning of pump station - Commissioning	Test and commission and submit completed commissioning record sheet	2 working days after operation
Acceptance testing		
General - NATA	Provide NATA certified test results for all testing	2 working days progressive
General - Notice	Give notice for compaction testing, hydrostatic pressure testing, block testing and water quality testing	3 working days progressive
Visual inspection - Requirement	Inspect for compliance with the documents	2 working days
Visual inspection - Verify products and materials	Provide purchasing records	3 working days
Connections to existing water mains		
General – Acceptance testing	Complete acceptance testing to the satisfaction of the Water Agency	Prior to connection to existing mains
Restoration of surfaces		
Backfill - Disposal of surplus material	Submit for approval surplus material proposal	2 working days progressive

ATTACHMENT 2: ARMIDALE DIURNAL DEMAND FACTOR

Diurnal demand factor for residential areas:

Time	All Days		
	Ave	Max	Min
0:00	0.95	1.03	0.84
0:30	0.85	0.95	0.74
1:00	0.75	0.86	0.66
1:30	0.66	0.81	0.58
2:00	0.58	0.73	0.49
2:30	0.51	0.62	0.44
3:00	0.46	0.59	0.41
3:30	0.42	0.56	0.36
4:00	0.39	0.51	0.32
4:30	0.37	0.51	0.29
5:00	0.36	0.52	0.30
5:30	0.33	0.48	0.25
6:00	0.30	0.39	0.19
6:30	0.27	0.34	0.18
7:00	0.28	0.38	0.14
7:30	0.36	0.55	0.17
8:00	0.63	0.97	0.15
8:30	1.10	1.61	0.31
9:00	1.56	2.10	0.62
9:30	1.81	2.21	1.05
10:00	1.85	2.08	1.50
10:30	1.81	2.16	1.58
11:00	1.71	2.10	1.45
11:30	1.60	1.93	1.31
12:00	1.50	1.91	1.25
12:30	1.40	1.73	1.20
13:00	1.29	1.65	1.06
13:30	1.19	1.49	0.94
14:00	1.12	1.31	0.90
14:30	1.08	1.25	0.89
15:00	1.05	1.23	0.89
15:30	1.01	1.16	0.89
16:00	0.98	1.12	0.87
16:30	0.95	1.08	0.83
17:00	0.94	1.07	0.81
17:30	0.95	1.08	0.83
18:00	1.00	1.11	0.89
18:30	1.10	1.23	1.01
19:00	1.24	1.36	1.14
19:30	1.34	1.45	1.25
20:00	1.39	1.50	1.31
20:30	1.40	1.53	1.28
21:00	1.35	1.50	1.16
21:30	1.29	1.44	1.11
22:00	1.23	1.39	1.05
22:30	1.17	1.30	0.96
23:00	1.10	1.20	0.91
23:30	1.02	1.11	0.88
0:00	1.00	1.00	1.00

ATTACHMENT 3: PUMP STATIONS BUILDINGS



Gungurru pump station



Link Road pump station



Ross Street pump station



Water Treatment Plant pump station



Garibaldi pump station



UNE pump station

ATTACHMENT 4: STANDARD DRAWINGS

- 020-038 20mm and 25mm Standard Water Service Connection Detail
- 020-039 32mm, 40mm and 50mm Water Service Connection Detail
- 020-040 Water Service Road Crossing Standard Detail
- 020-041 Standard Stop and Scour Valve Installation Detail
- 020-042 Standard Hydrant and Double Air Valve Installation Detail
- 020-043 Watermain Construction at Cul-De-Sac Head Typical Treatment
- 020-044 Bored Watermain Road and Creek Crossing Details
- 020-045 Aerial Crossings Aquaduct
- 020-046 Watermain Thrust Block Details
- 020-047 Watermain Marker Plates

ATTACHMENT 5: DOCUMENT IMPROVEMENT REQUEST

Document Improvement Request			
ARC's Supplementary Manual to WSA 03 – 2011 Version 3.1			
From: Name:			
Position/Title:			
Section/Company:			
Address:			
Email:			Phone:
Signature:			Date
To: Manager Water Services, Armidale Regional Council			
Email: Council@armidale.nsw.gov.au			
SUGGESTED IMPROVEMENT			
Part	Clause	Page no.	Proposed Improvement and Justification