2020 Section 100
Rural Servicing Design and Construction Manuals

for

Section 101
Submission Standards

and

Section 102
Low-Pressure Sanitary Sewer System

and

Section 103
Trickle Feed Water Distribution System

FOREWORD

This manual is intended to provide information to Developers, Engineering and Geotechnical Consultants, Contractors, Utility Companies, City of Grande Prairie and County Departments regarding standards governing design, preparation, and submission of plans and specifications for construction of trickle feed water distribution systems and low-pressure sanitary sewer systems, in the Rural Service Area of the County of Grande Prairie and South Peace Region.

Unless otherwise stated in these Standards, all design criteria, materials, installation and testing shall be in accordance with the most recent editions and most stringent requirements of the following:

1. Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems
2. Municipal Safety Codes
3. Municipal Government Act
4. Water Act
5. Public Lands Act
6. County of Grande Prairie - Design and Construction Manuals
7. County of Grande Prairie - Levies Policy and Bylaw
8. Town of Sexsmith- Levies Policy and Bylaw
9. South East Area Servicing Study
10. North Industrial Park Servicing Study
11. Aquatera Utilities Inc - Design and Construction Manuals (ADCM)

This manual, as well as the latest editions of the documents listed above, outlines the requirements for the design and construction of any project within the Rural Service Area of Aquatera Utilities Inc (AUI).

In general, if there is any conflict between the documents list above, the highest standard or requirement shall prevail, unless otherwise approved by Aquatera.

It is the Developer's or their engineering consultant's responsibility to obtain, at their cost, copies of the above documents from the appropriate authorities.

Aquatera Utilities Inc - Rural Servicing Guidelines will be made available on the Aquatera webpage or for hardcopy purchase at a cost of $ 20.00, (GST included).

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All detailed engineering plans submitted for review and approval must comply with Aquatera Section 1

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101.3.1 Drainage Basin

An Overall Drainage Basin Plan is required in the vicinity of the Sanshed (Sanitary Catchments) and Watershed and all associated roadways,

showing **0.5 m** contours, existing overland drainage routes, and flood plains / ponding areas.

101.3.2 Combined Utilities Plan

An Overall Combined Utilities Plan is required in the vicinity of the Sanshed and Watershed.

SECTION 102 - LOW PRESSURE SANITARY SEWER SYSTEM - (See also section 50)

System Design Overview:

The sanitary sewer system shall be of sufficient capacity to service the ultimate population and development projection for the service area. The flows and factors outlined in the following sections shall be used in the design of low pressure sanitary sewer system.

The Developer and the Developer's Engineer are responsible to ensure that the infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice. Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to Aquatera (AUI), the jurisdictional municipality (JM) and Alberta Environmental Protection (AEP) for review and approval prior to construction. The letter report shall include the design parameters and design calculations for sizing and rating the lines.

102.1 Estimating Average Sewage Flows

102.1.1 A sewage generation rate of **275 L/capita/day** for a low pressure sewer system with **no infiltration rate** shall be used, unless otherwise determined by Aquatera. The disposal rate will be dependent upon the disposal system capacity.

102.1.2 In determining residential flows a minimum of 3.2 persons per household (or unit) shall be used unless otherwise determined by Aquatera.

102.1.3 See Section 9 of ADCM for sewage generation rates for multi-family residential, commercial and industrial developments

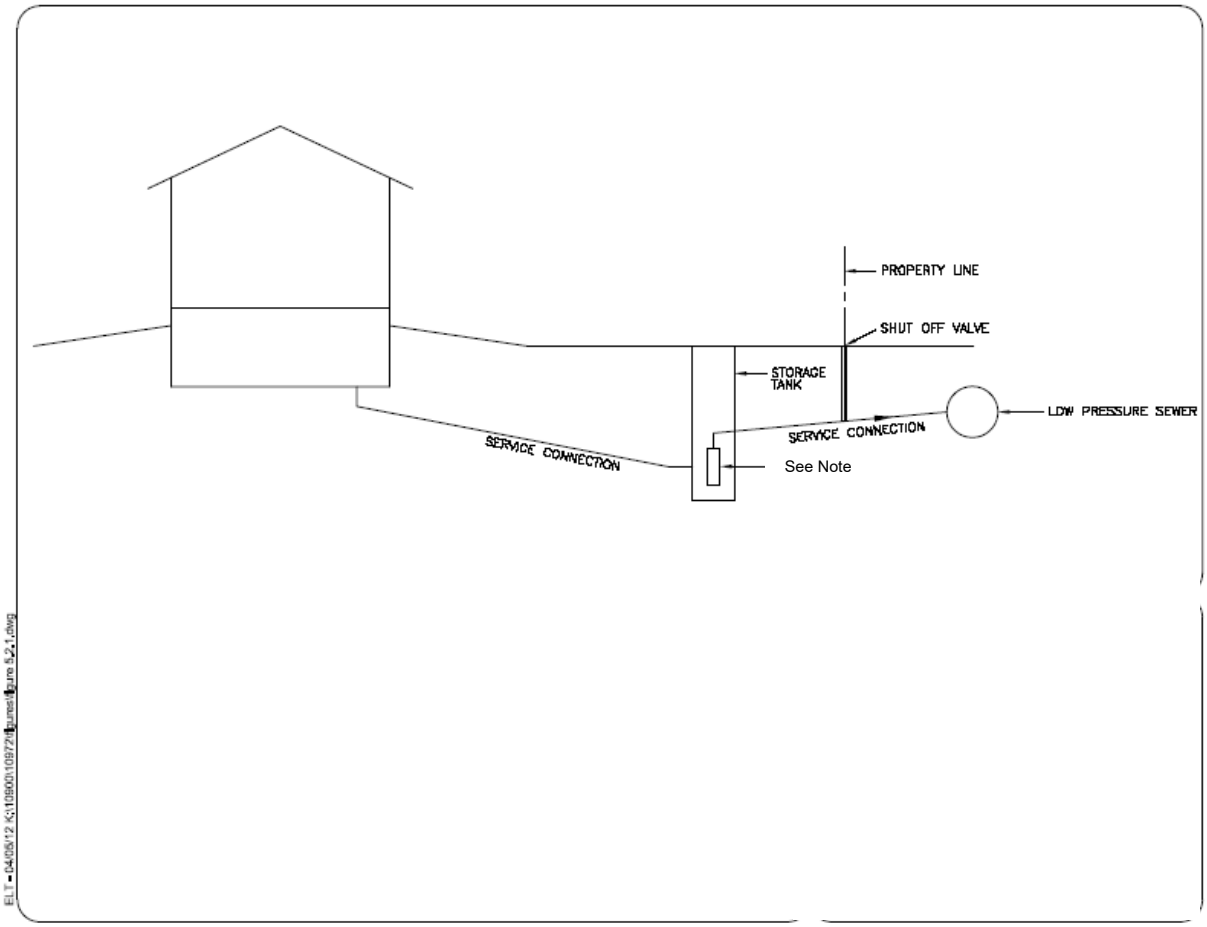
102.2 Main Pipe Sizing and Material

102.2.1 A report from the Developer's Engineer must be prepared to ensure that pipe sizing is calculated in consideration of the topography and the population projections of the service area.

102.2.2 Low pressure sanitary pipe shall be a minimum DR 11 HDPE for mains 100mm and smaller, and a minimum DR 17 HDPE for mains larger than 100mm.

102.3 On Site Requirements

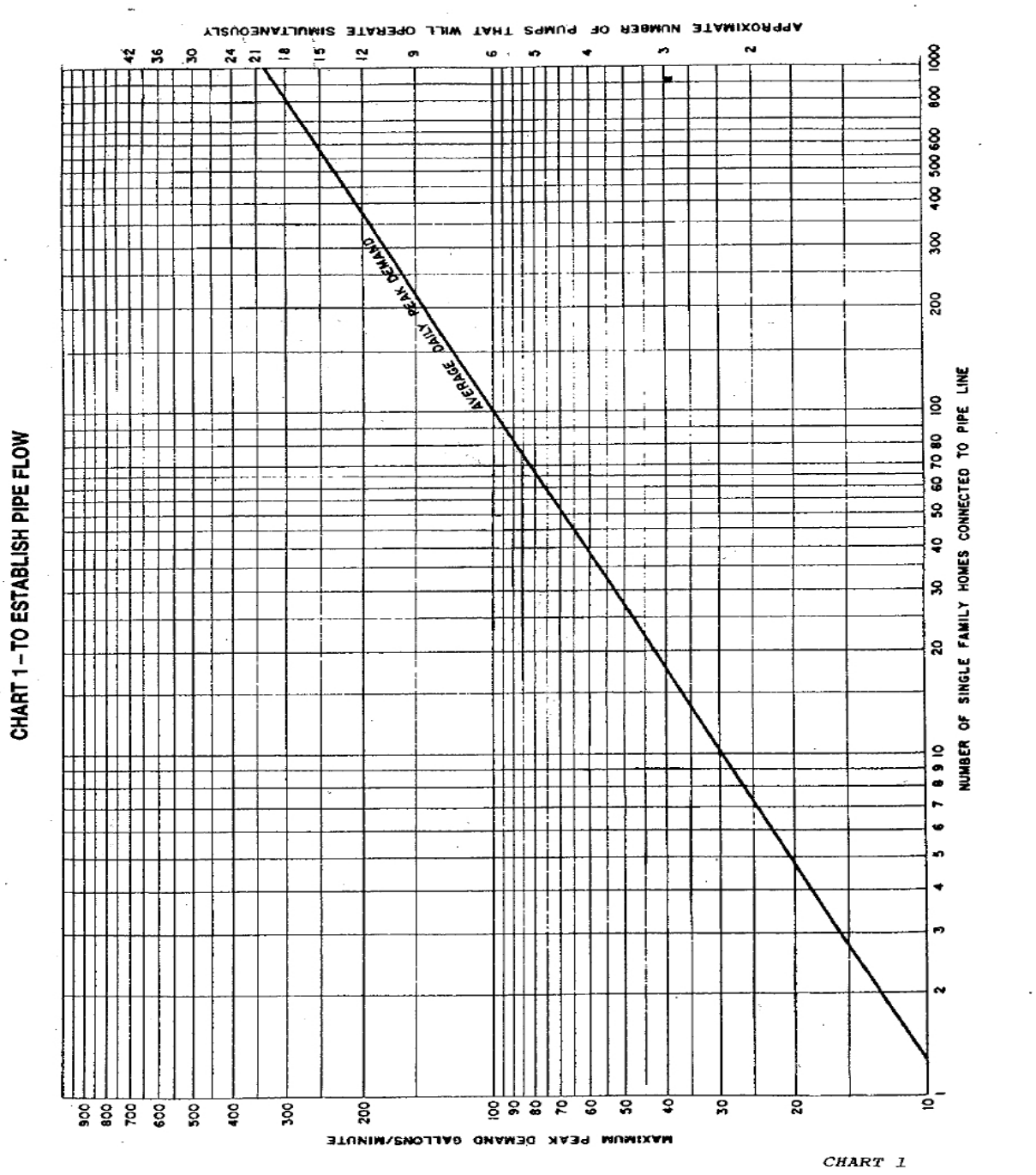
The Developer and the Developer's Engineer are responsible to ensure that a site will be properly designed and equipped with holding tank, power, pump and backflow devices.



Note:
Lot owner has to provide a two compartment septic tank and is responsible for all suspended solid waste disposal through pump truck services.

102.4 Low Pressure Sanitary Sewer System

102.4.1 Flow to be determined for multiple units on the basis of the number of units and a chart to establish the design flow, the chart is provided by Engineering Pump Systems Ltd. and was developed using data collected from existing low pressure sewer systems.



102.5 All system materials including fittings and valves shall be in accordance with applicable Aquatera Standards.

102.6 Service Connections

102.6.1 General

a) Each lot must have a separate service.

b) Curb stops marked "**SEWER**" shall be installed **0.5 m** outside the private property line, or as approved by Aquatera.

102.6.2 Details

a) Sanitary sewer service pipe shall be **40 mm**, **DR11** HDPE pipe.

b) Main connections shall be made by means of fused in-line tees or saddles. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE piping. Services to be in one piece, no mechanical connections are permitted between main connection and curb stop.

c) Pack joint curb stops shall conform to AWWA C800 similar to the Ford model B77 or approved equivalent suitable for HDPE and shall be located such that they do not conflict with driveway locations.

d) Minimum depth of cover shall be 2.75 m from finished grade over top of pipe.

Including where pipes cross under ditch bottoms.

102.7 System Installation

102.7.1 General

The system installation standards are intended to address key points only and are not to be considered as a substitute for a detailed set of construction specifications to be prepared by the Developer's Engineer.

102.7.2 Trenching, Bedding and Backfilling

a) All trenching and backfilling shall be completed in strict conformance with Occupational Health and Safety and any other applicable regulations.

b) It is the Developer's responsibility to insure that his Consultants and Contractors are familiar with the **" Call Before You Dig - Guidelines for Safe Excavations in Alberta "** document provided by Alberta One Call **.**

(Aquatera is not a member of Alberta One Call. Contact Aquatera at 780-882-7800 for locates)

c) If unsuitable soil conditions (ie. organics, high moisture content, rock, etc.) are encountered, the method for dealing with these conditions shall be assessed by a qualified Professional Engineer commissioned by the Developer, and a letter report submitted to Aquatera.

d) Class "B-1" bedding as depicted on the Detail Drawing shall be used for all sewer mains in suitable soil conditions. If unsuitable pipe foundation conditions exist, the design for a special pipe foundation and bedding shall be prepared by a qualified Professional Engineer and submitted to Aquatera.

e) In all new subdivisions it shall be the Developer's responsibility to ensure that utility trenches are adequately compacted. All trench backfill shall be compacted to 98% of Standard Proctor Density, unless otherwise approved.

f) A two (2) year warranty on trench settlement shall be required in all areas where open cut methods were employed.

g) If compaction standards cannot be achieved because of abnormal weather or wet ground conditions, Aquatera's representative may at his sole discretion establish a more appropriate standard for the individual case on receipt of an acceptable proposal from the Developer's engineer.

102.7.3 Tracer Wire

All underground non-metallic pressure pipe systems shall be installed with a continuous tracer wire. For open trench, tracer wire shall be a minimum 12 gauge, solid copper wire with plastic coating, attached to the piping system every 3 m with PVC tape. The wire shall terminate above ground at every valve box and air release valve. The wire shall be of sufficient length to allow the wire to be uncoiled and extended 0.3m above ground.

For augured pipe and directional drilling, a minimum of 12 gauge copper cladded high strength steel wire shall be used.

Where spliced-in connections occur, a manufacturer approved water-tight direct bury connector shall be used to provide electrical continuity.

The contractor/consultant shall provide a tracer wire report to Aquatera confirming lines were able to be located with locating equipment. (see form in section 91)

Tracer wire installation shall be considered complete and acceptable when Aquatera can locate the underground infrastructure using locating equipment.

102.7.4 Sewer

For non-jointed pipe (fused pipe) only mechanical fittings shall have thrust blocking.

102.8 Inspection and Testing

102.8.1 Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the Aquatera representative in accordance with the latest edition of ASTM F2164. The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and expansion-leakage losses. The Contractor shall provide evidence that the gauges used are accurate. No direct connections between water distribution and sanitary systems will be allowed.

102.8.2 **Expel air from collection system, by slowly filling main with water. High points must have automatic air / vacuum relief valves to vent air when filling and be closed when pressure is applied.**

102.8.3 **A hydrostatic test pressure of 1.0 times the rated pressure of the pipe at the lowest point in the system main shall be applied.**

102.8.4 a) Gradually increase pressure in the test section to the required test pressure. Add make-up water to compensate for expansion as necessary to maintain maximum test pressure for 4 hours.

b) Test pressure must be stabilized (no pressure loss) before the final hour of the test starts.

c) Reduce test pressure by 10 psi and monitor pressure for 1 hour. Do not increase pressure or add make-up water. The test will be deemed to pass if no visible leakage is observed and pressure during the 1 hour test phase is within 5% of the reduced 1 hour test pressure

102.8.5 Total time under test pressure must not exceed 8-hours, including the time required to pressurize, stabilize, hold test pressure, and depressurize. If test is not accepted due to leakage or equipment failure, test section must be permitted to "relax" for 8-hour period prior to the next testing sequence

102.8.6 Tracer wire installation shall be considered complete and acceptable when Aquatera can locate the sanitary pipe systems using locating equipment.

102.8.7 Marker Posts

a) Marker posts shall be installed so that operation of either a valve key or CC key, can be turned without obstruction.

b) All marker posts shall be painted green for sanitary infrastructure.

c) Marker posts may be wood for on-site sanitary infrastructure.

d) Off-site marker posts shall be a 63mm diameter x 2600mm steel post.

102.9 Caveat

102.9.1 Caveat Registration

a) All new development phases require caveat registration on each proposed lot within the subdivision. Proof of land title registration must be provided prior to subdivision endorsement. Failure to do so may delay issuance of the CCC.

b) The caveat document shall state all tank and pump info./specifications.

c) Only effluent pumps are allowed in Aquatera's system (no grinder pumps)

d) A minimum two stage tank is required.

102.9.2 Existing lots

a) Each individual lot owner shall sign an agreement with Aquatera prior to account/service activation.

102.10 Low Pressure & Forcemain Sanitary Sewer Cleaning

102.10.1 Sanitary sewer cleaning (new installation)

a) At time of construction, Consultants/contractors shall provide proof that all newly installed forcemain and low pressure sanitary sewer pipes have been cleaned, Using either water turbidity 10 NTU or less, video inspection or pigging.

SECTION 103 - Trickle Feed Water Distribution System

System Design Overview

Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to Aquatera, and the jurisdictional municipality and Alberta Environmental Protection for review and approval prior to construction. The letter report shall include the design parameters and design calculations for sizing the lines based on allowable restricted flow at minimum residual pressure of **70 kPa (10 psi) at a cistern with proper design storage capacity** on each lot, which could be set back significantly from the road and at a higher elevation. Fire protection shall only be incorporated into a Rural Water System if required by the appropriate jurisdiction and adequate flows are demonstrated for intended use.

103.1 Estimating Flow Demand

103.1.1 A water demand of **2.0 L/min/unit** restricted flow feeding into **an on site cistern with proper storage capacity** for a trickle feed system shall be used for a single residential application, unless otherwise determined by Aquatera.

103.1.2 In determining residential flows, a minimum of 3.2 persons per household (or unit) shall be used unless otherwise determined by Aquatera.

103.1.3 See Section 8 of ADCM for water demand rates for multi-family residential, commercial and industrial developments

103.2 Main Pipe Sizing and Material

103.2.1 A report from the Developer's Engineer must be prepared to ensure that pipe sizing is calculated in consideration of the topography and the population projections of the service area.

103.2.2 Trickle feed water distribution pipe shall be minimum DR 11 HDPE for mains

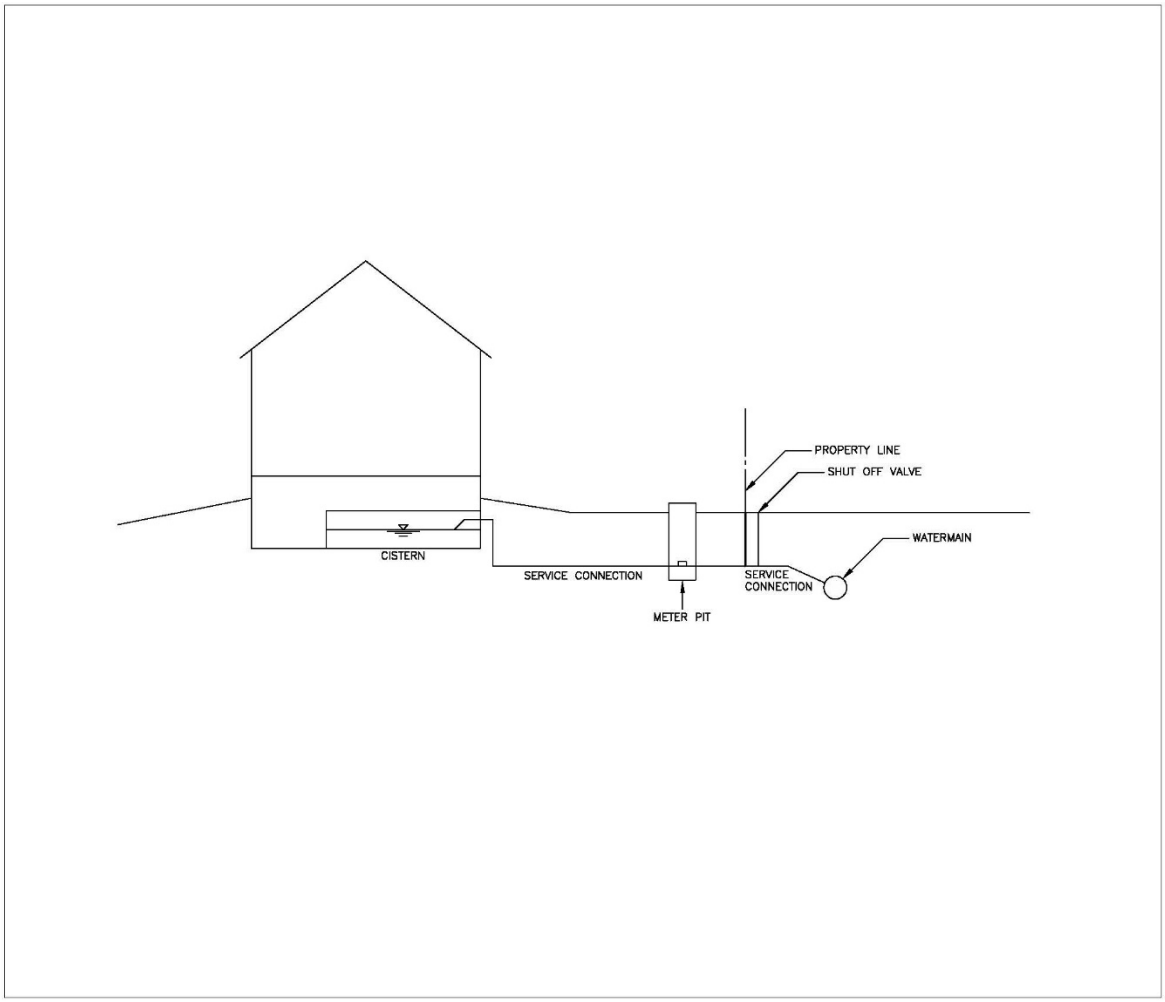
103.2.3 A valve shall be installed between the water main and all permanent air release valves.

103.3 All system materials including fittings and valves shall be in accordance with Aquatera Standards.

103.3.1 Main connections shall be made by means of a fused saddle or fused inline tee. All fittings and joints must be assembled by electro fusion or butt fusion for all HDPE piping. No mechanical connections are permitted.

103.4 On Site Requirements

The Developer and the Developer's Engineer are responsible to ensure that a site will be properly designed and equipped with shut off valve, flow restrictor, cistern, float valve, power, water meter and pressure tank, see Schematic Diagram.



103.5 Service Connections

Each lot must have a separate service. The water meter is to be located inside the meter lift.

103.5.1 Water service pipe shall be **25 mm** DR11 HDPE certified for potable water.

103.5.2 Service connections shall be made by means of a fused saddle or fused inline tee. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE piping. Services to be in one piece, no mechanical connections permitted between main connection and service valve.

103.5.3 Pack joint curb stops shall conform to AWWA C800 similar to the Ford model B77 or approved equivalent suitable for HDPE and shall be located such that they do not conflict with driveway locations.

103.5.4 Minimum depth of cover shall be **2.75 m** from finished grade to the top of pipe. All goosenecks shall be made in a horizontal position.

103.6 System Installation

The system installation standards are intended to address key points only and are not to be considered as a substitute for a detailed set of construction specifications to be prepared by the Developer's Engineer.

103.6.1 Trenching, Bedding and Backfilling

a) All trenching and backfilling shall be completed in strict conformance with Occupational Health and Safety and any other applicable regulations.

b) It is the Developer's responsibility to insure that his Consultants and Contractors are familiar with the " Call Before You Dig - Guidelines for Safe Excavations in Alberta " document provided by Alberta One Call .

(Aquatera is not a member of Alberta One Call. Contact Aquatera at 780-882-7800 for locates)

c) If unsuitable soil conditions (ie. organics, high moisture content, rock, etc.) are encountered, the method for dealing with these conditions shall be assessed by a qualified Professional Engineer commissioned by the Developer, and a letter report submitted to Aquatera.

d) Class "B-1" bedding as depicted on the Detail Drawing shall be used for all water mains in suitable soil conditions. If unsuitable pipe foundation conditions exist, the design for a special pipe foundation and bedding shall be prepared by a qualified Professional Engineer and submitted to Aquatera.

e) In all new subdivisions it shall be the Developer's responsibility to ensure that utility trenches are adequately compacted. All trench backfill shall be compacted to 98% of Standard Proctor Density, unless otherwise approved.

f) A two (2) year warranty on trench settlement shall be required in all areas where open cut methods were employed.

g) If compaction standards cannot be achieved because of abnormal weather or wet ground conditions the Aquatera's representative may at his sole discretion establish a more appropriate standard for the individual case on receipt of an acceptable proposal from the Developer's engineer.

103.6.2 Tracer Wire

Tracer wire shall be installed on all water mains and services. For open trench, tracer wire shall be a minimum 12 gauge, solid copper wire with plastic coating, attached to the piping system every 3 m with PVC tape. The wire shall terminate above ground at every valve box and air release valve. The wire shall be of sufficient length to allow the wire to be uncoiled and extended 0.3 m above ground.

For augured pipe and directional drilling, a minimum of 12 gauge copper cladded high strength steel wire shall be used.

Where spliced-in connections occur, a manufacturer approved water-tight direct bury connector shall be used to provide electrical continuity.

The contractor/consultant shall provide a tracer wire report to Aquatera confirming lines were able to be located with locating equipment. (see form in section 91)

Tracer wire installation shall be considered complete and acceptable when Aquatera can locate the underground infrastructure using locating equipment.

103.6.3 Installation of Anodes

a) Anodes and leads shall be installed on valves, and cast or ductile iron fittings as depicted on the Detail Drawings.

b) Connection of the anode lead shall be by Cad welding. The connection point shall be then coated with Polyken primer and tape.

c) A minimum of **2.0 L** (0.5 gallon) of water is to be poured on each **2.3 kg** (5 lb) anode and **3.0 L** (0.75 gallons) on **5.5 kg** (12 lb) anode to initiate the anode operation. An alternative is to soak the above anodes in water for a minimum of **10 minutes**.

103.6.4 Water

For non-jointed pipe (fused pipe) only mechanical fittings shall have thrust blocking.

103.6.5 Inspection and Testing

a) Prior to acceptance of the water system and before pressure testing, a 5 ntu turbidity flushing test will be performed in conjunction with achieving velocities

as per AWWA standards. If velocities cannot be achieved for turbidity tests, it is the responsibility of the contractor/consultant to find alternative means of flushing/cleaning the pipe. Alternative methods shall be submitted to Aquatera for approval a minimum of 1 month prior to initial flushing.

b) Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the Aquatera representative in accordance with the latest revision of ASTM F2164. The Contractor shall provide all necessary labour, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and leakage losses. The Contractor shall provide evidence that the gauges used are accurate. Meter lifts are not to be included as part of the subdivision pressure test.

b.1 The water distribution system shall be charged through an Aquatera supplied meter cart. Contact Aquatera to schedule the meter cart installation, or operation of the boundary valve if the meter cart is not available.

b.2 Prior to the start of pressure and leakage, chlorination and bacteria testing, the Developer's consultant will be required to provide a plan outlining how the testing is to be accomplished. The plan must include the sequence of valve turning, sections of water main to undergo pressure and leakage testing, how chlorination is to be accomplished, and locations where chlorine residual and bacteria tests are to be taken. Testing will not be allowed to proceed until the above is approved by the Aquatera representative.

b.3 The Developer will be required to contact Aquatera to schedule an appointment with an Aquatera representative.

b.4 The system shall be filled with water slowly and air bled off at each air release blow-off location. The Developer is required to provide automatic or manual air releases, as specified by the Developer's Engineer along the main at high points within a profile.

b.5 When the line has been filled and the air is expelled, time should be allowed for the remaining air and water to reach a constant temperature.

b.6 The test section may be pressured through an air relief valve or a tap may be installed in the line. After testing, the air relief valve or tap shall be abandoned at the Developer's expense to the satisfaction of Aquatera.

c) Pressure tests shall be made only after completion of services, partial or complete backfill, and a minimum of 24 hours after the pipe has been filled with water. No test shall be applied until at least 36 hours after the last concrete thrust block has been cast with high early strength cement, or at

least **seven (7) days** after the last concrete thrust block has been cast with standard cement.

d) **No mains shall be charged and no pressure and leakage tests shall be permitted between October 15th to April 15th inclusive, unless approved by Aquatera.**

e) The pressure test for High Density Polyethylene (HDPE) pipe material shall be determined by the following procedures:

e.1 Expel air from distribution system, by slowly filling main with water. High points must have automatic air/vacuum relief valves to vent air when filling and be closed when pressure is applied.

e.2 A hydrostatic test pressure of **1.0 times** the rated pressure of the pipe at the lowest point in the system main shall be applied.

e.3 a) Gradually increase pressure in the test section to the required test pressure. Add make-up water to compensate for expansion as necessary to maintain maximum test pressure for 4 hours.

b) Test pressure must be stabilized (no pressure loss) before the final hour of the test starts.

c) Reduce test pressure by 10 psi and monitor pressure for 1 hour. Do not increase pressure or add make-up water. The test will be deemed to pass if no visible leakage is observed and pressure during the 1 hour test phase is within 5% of the reduced 1 hour test pressure

e.4 Total time under test pressure must not exceed 8-hours, including the time required to pressurize, stabilize, hold test pressure, and depressurize. If test is not accepted due to leakage or equipment failure, test section must be permitted to "relax" for 8-hour period prior to the next testing sequence.

f) Prior to the initial acceptance of the water system, water mains are to be disinfected in accordance with AWWA C651 continuous feed method (Refer to Section 91.4.3.iv). Procedural method of disinfection including chlorine concentration calculations and contact times are to be submitted to the Aquatera representative for acceptance. The contactor shall be responsible for the water samples and provide all testing results to Aquatera. The water main shall remain off until such time as the bacteria sample results are approved.

f.1 Under Alberta Environmental Protection standards and regulations, super chlorinated water used for disinfection of the system cannot be directed into a ditch drainage system or open water body. De-chlorination will be required before being discharged into the environment.

g) Prior to initial acceptance of the water system and the system put into service, a 2 ntu turbidity flushing test will be performed in conjunction with achieving velocities as per AWWA standards.

h) Prior to initial acceptance of the water system and the system put into service, bacteriological testing shall be carried out on all water mains and acceptable test results achieved.

i) Tracer wire installation shall be considered complete and acceptable when Aquatera can locate the water distribution systems using locating equipment.

103.6.6 Marker Posts

a) Marker posts shall be installed so that operation of either a valve key, CC key or blow off stand pipe, can be turned without obstruction.

b) All marker posts shall be painted blue for water infrastructure.

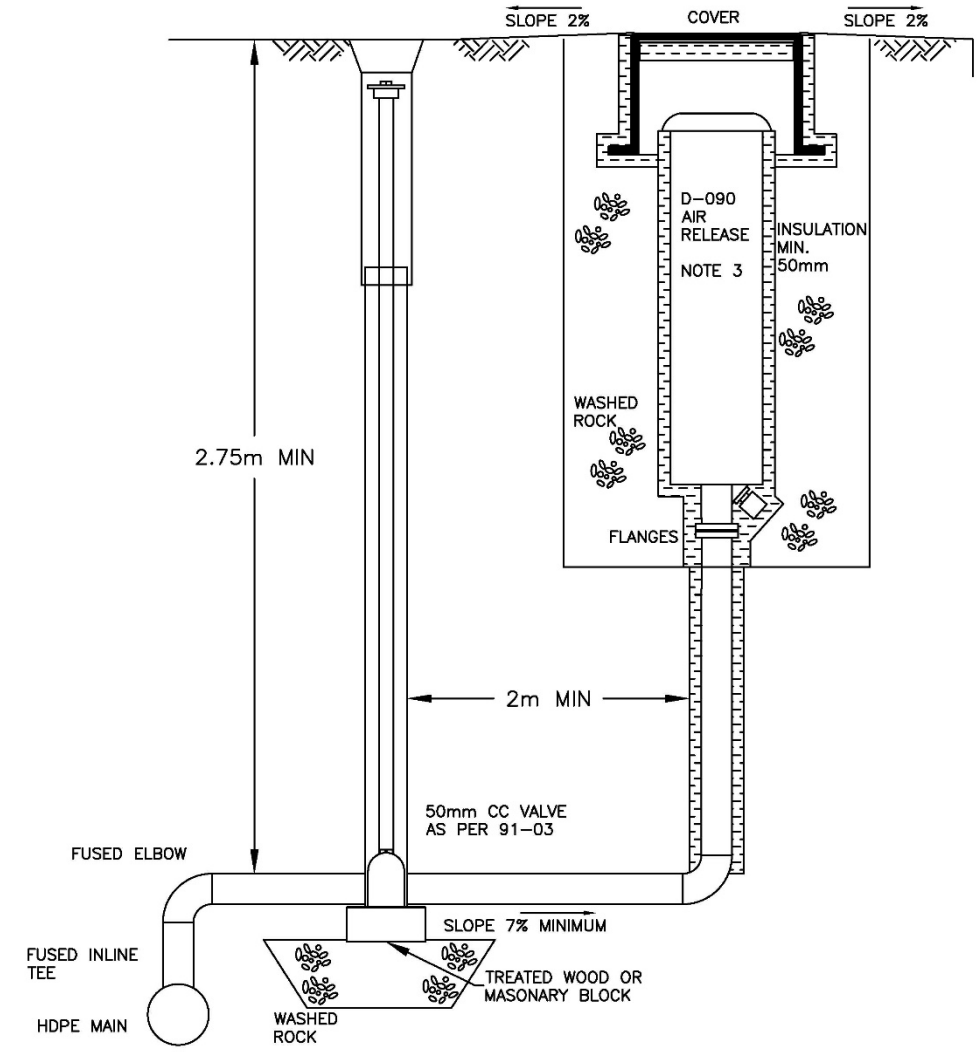
c) Marker posts may be wood for on-site water infrastructure.

d) Marker posts for Off-site infrastructure and meter pits shall be a 63mm diameter x 2600mm steel post.

103.6.7 Signs

a) Air release signs shall be installed to indicate the location of an air release chamber or fitting.

b) Utility crossing signs shall be installed to indicate the location of a water or sanitary sewer line crossing under a road or railway.



NOTES:
1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2) ALL PIPE IS HDPE DR-11 AND FUSED UNLESS OTHERWISE NOTED.
3) INSTALLATION AS PER MANUFACTURERS SPECIFICATIONS, SIZE VARIES.
4) MINIMUM AIR RELEASE FRAME AND COVER SHALL BE A PLASTIC LANDSCAPE BOX WITH A 10" DIAMETER.

Revisions				
Date	Details			
22/11/17	ADDED INSULATION TO DETAIL & NOTE 4 TS			

WEST AQUA AIR RELEASE DETAIL			Standard Detail 100-1
Approved by –	Date 11/02/16		
Checked by Brad Vall C.E.T.	Scale N.T.S.		
Drawn by Troy Smith	Permit Number –		File Number