



# **Rural Servicing Guidelines**

for

Low-Pressure Sanitary Sewer System

and

Trickle Feed Water Distribution System

Adopted:

March, 2005

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)
12. *Capital Cost Recovery for Rural Water Servicing Policy and the Rural Water Servicing Plans [In Progress]*

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).

## **Rural Servicing Guidelines**

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## Section 1 SUBMISSION STANDARDS

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### 1.1 Design Drawings

#### 1.1.1 General

All detailed engineering plans submitted for review and approval must comply with the specifications stated herein.

### 1.2 Drawing Practices

#### 1.2.1 Geodetic Datum

Surveys and plans are to be conducted utilizing North American Datum NAD83 (Adopted).

#### 1.2.2 Scales

Plans will be drawing to the following scales:

- a) Overall Plan 1:1000
- b) Plan / Profile (plan above profile) 1:500 Horizontal and 1:50 Vertical
- c) Typical Cross Sections and Details To a Scale that clearly illustrates the section or detail

#### 1.2.3 Additional Requirements

Further requirements are as outlined in Section 11 of ADCM

### 1.3 Additional Drawings for Rural Service Area

#### 1.3.1 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.

#### 1.3.2 Combined Utilities Plan

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

## Section 2

### LOW-PRESSURE SANITARY SEWER SYSTEM

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#### 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.

#### 2.1 Estimating Average Sewage Flows

- 2.1.1 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.
- 2.1.2 In determining residential flows a minimum of **3.2 persons per household** (or unit) shall be used unless otherwise determined by Aquatera.
- 2.1.3 See Section 19 of ADCM for sewage generation rates for multi-family residential, commercial and industrial developments

#### 2.2 Pipe Sizing

- 2.2.1 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.
- 2.2.2 Section 19 of ADCM for the requirement of minimum pipe size.

#### 2.3 Lift Station

- 2.3.1 The storage of a lift station shall be designed to have a minimum cycling time of ten (10) minutes plus the storage required at the pump shutoff water level.
- 2.3.2 The minimum of the daily detention storage capacity will be the greater value in cubic meter per day from the following equations:

$$\text{Eq. 1: Domestic ( WWF + I/I )} = 0.275 \text{ cu.m/c/d} \times 3.2 \text{ c/unit} \times \text{No of Units} + 18.15 \text{ cu.m./ha/d} \times \text{Area (ha)}$$

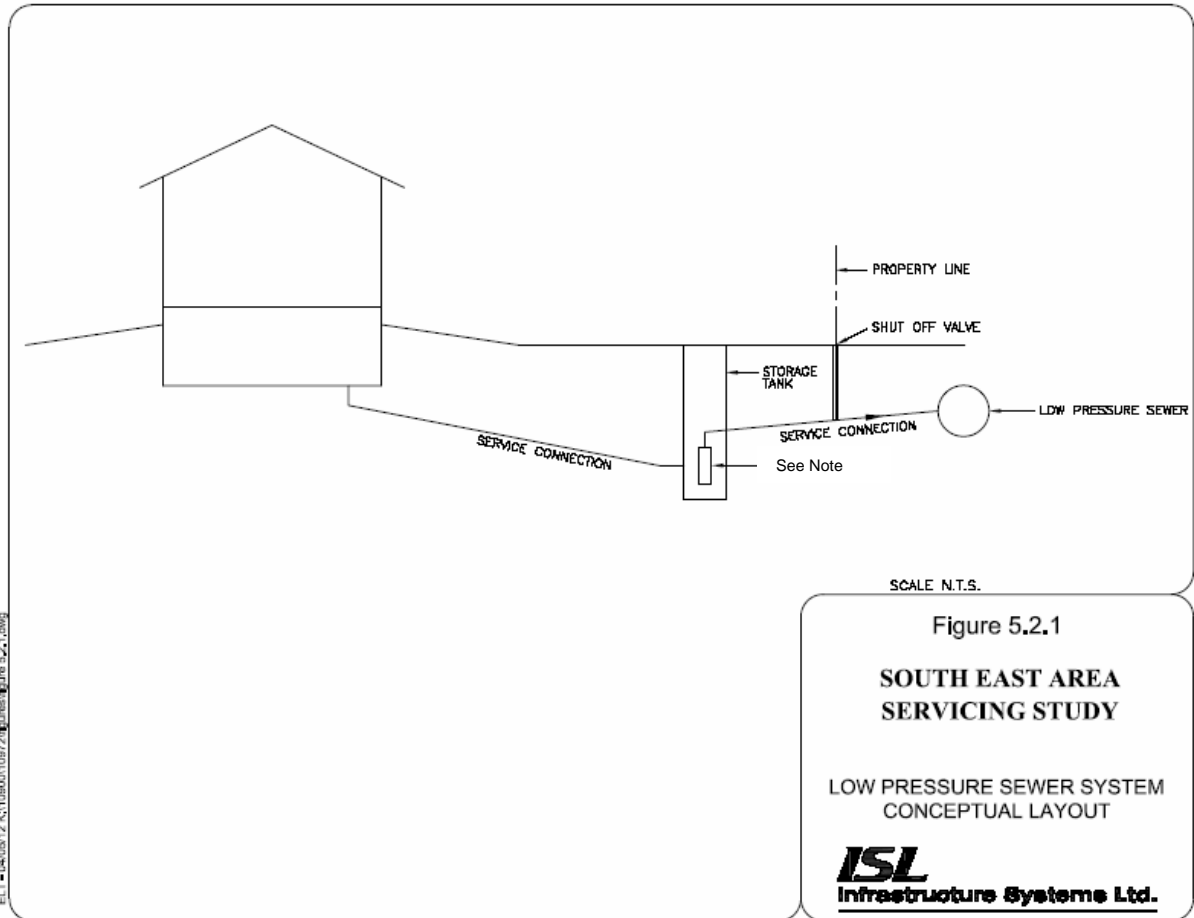
$$\text{Eq. 2: Domestic ( Empirical )} = 1.6 \text{ cu.m/unit} \times \text{No of Units}$$

- 2.3.3 An appropriate backup power Genset shall be installed and bypass pumping facilities shall be provided at the lift station for emergency pumping during power failure.

## Section 2 LOW-PRESSURE SANITARY SEWER SYSTEM

### 2.4 On Site Requirements

The Developer and the Developer's Engineer are responsible to ensure that a site will be properly designed and equipped with holding tank, power, pump and backflow devices, see Schematic Diagram of Basic Conceptual Basic Requirements in Applying Low Pressure System, excerpted from Areas SE of City of Grande Prairie - Servicing Study Report (ISL 2004)



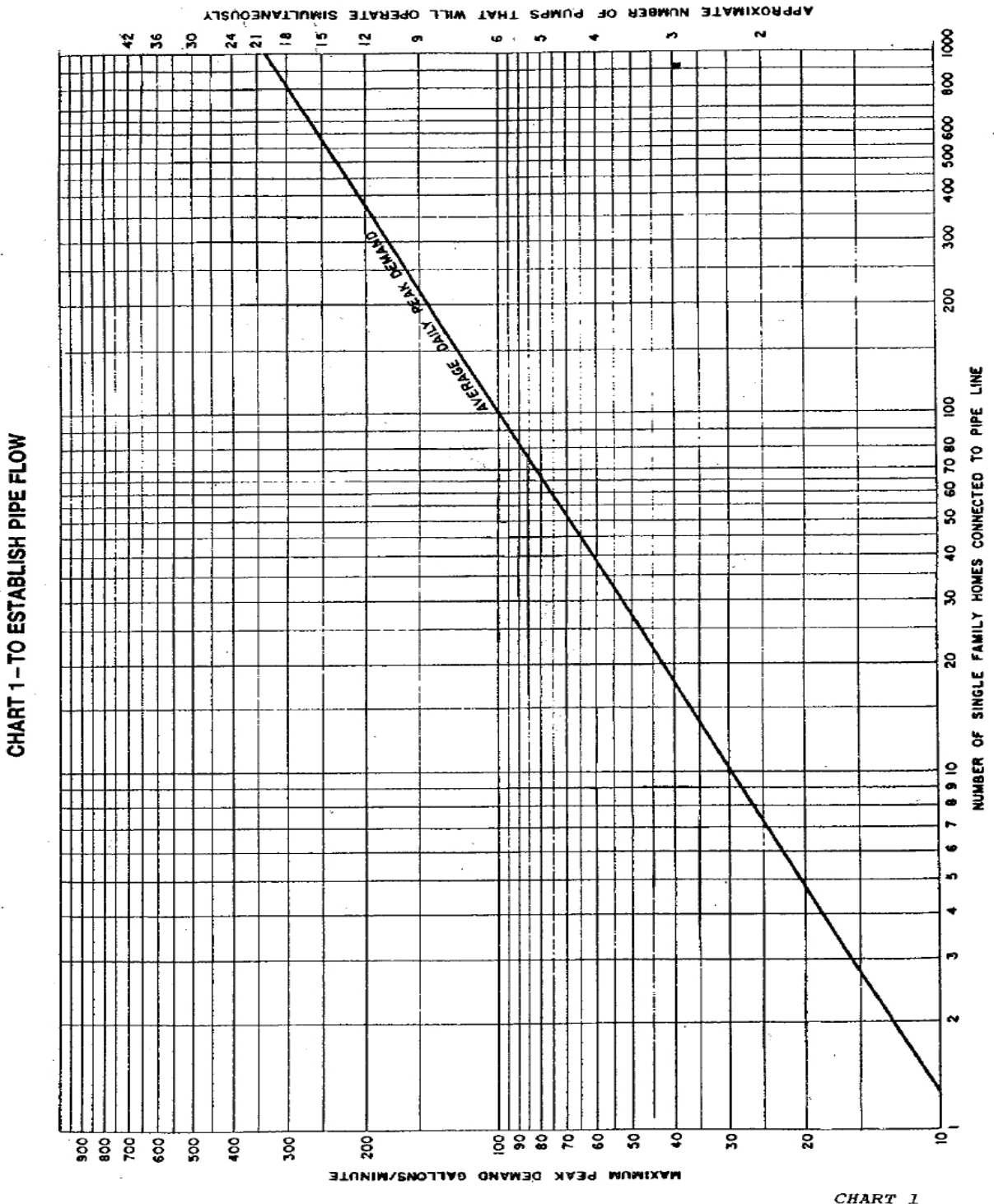
**Note:**

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

## Section 2 LOW-PRESSURE SANITARY SEWER SYSTEM

### 2.5 Low Pressure Sewer System

2.5.1 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.



## Section 2

### LOW-PRESSURE SANITARY SEWER SYSTEM

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

#### **2.7 Service Connections**

##### **2.7.1 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.

##### **2.7.2 Details**

- a) Sanitary sewer service pipe shall be **40 mm, DR 15.5** polyethylene pipe, and Series 160 Municipal tubing.
- 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) Curb Stops 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.

#### **2.8 System Installation**

##### **2.8.1 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.

##### **2.8.2 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 .
- 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 97% of Standard Proctor Density, unless otherwise approved.

## Section 2

### LOW-PRESSURE SANITARY SEWER SYSTEM

- 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.

#### 2.9 Inspection and Testing

- 2.9.1 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 ASTM F2164-02. The Developer 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 Developer shall provide evidence that the gauges used are accurate.
- 2.9.2 **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.**
- 2.9.3 **A hydrostatic test pressure of 1.5 times the rated pressure of the pipe at the lowest point in the system main shall be applied.**
- 2.9.4 Pressurize pipe to required test pressure over a 3-hour period and hold required test pressure for an additional hour to allow for pipe expansion and stretching prior to the leakage test.
- 2.9.5 For jointed pipe only, the leakage test period shall be for **2-hour duration**. Amount of make-up water (leakage) required to return the pipe to required test pressure shall not exceed the allowance given in the following table.

#### Field Testing of Low Pressure Sewer Systems at 900 kPa ( 130 psi )

Nominal Pipe Size Mm	Allowance for Expansion ( Leakage ) ( Litres per 100 Joints ) 2 Hour Test
50	2.34
75	3.50
100	4.66
150	7.00
200	9.34

- 2.9.6 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.

## Section 3

### TRICKLE FEED WATER DISTRIBUTION SYSTEM

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#### System Design Overview

Consideration of the Water distribution and transmission systems shall be in accordance with the [Capital Cost Recovery for Rural Water Servicing Policy and the Rural Water Servicing Plans.](#)

Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to 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.

#### 3.1 Estimating Flow Demand

- 3.1.1 A water demand of **4.0 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.
- 3.1.2 In determining residential flows, a minimum of **3.2 persons per household** (or unit) shall be used unless otherwise determined by Aquatera.
- 3.1.3 See Section 25 of ADCM for water demand rates for multi-family residential, commercial and industrial developments

#### 3.2 Pipe Sizing

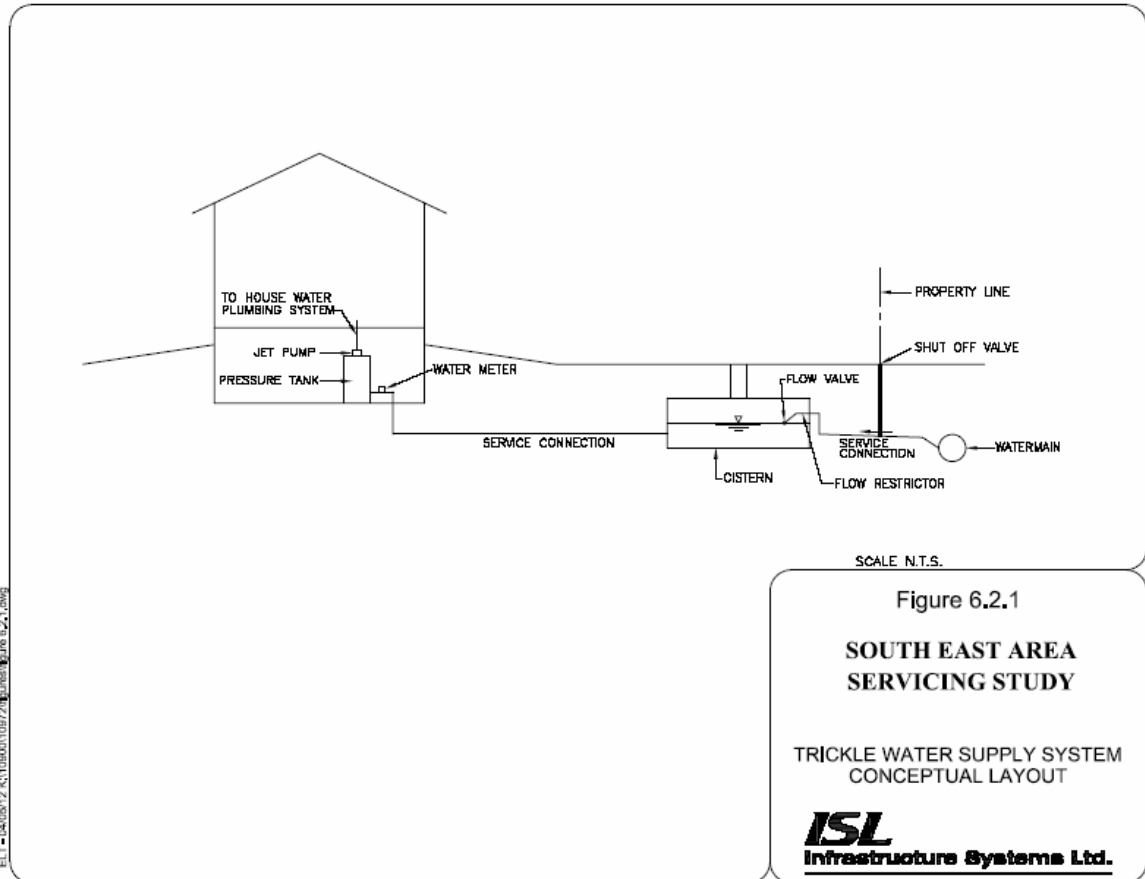
- 3.2.1 A report from the Developer's Engineer must be prepared to ensure that pipe sizing is calculated in consideration of the topography and the population projections of the service area.
- 3.2.2 Section 25 of ADCM for the requirement of minimum pipe size.

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

## Section 3 TRICKLE FEED WATER DISTRIBUTION SYSTEM

### 3.4 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 of Conceptual Basic Requirements in Applying Trickle Water Supply System, excerpt from Areas SE of City of Grande Prairie - Servicing Study Report (ISL 2004)



### 3.5 Service Connections

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

3.5.1 Water service pipe shall be **25 mm**, Series 160 Municipal tubing certified potable water. Water service pipe shall conform to Type "K" soft copper AWWA C800 c/w brass compression coupling, Kytex or approved equivalent.

3.5.2 Main connections shall be made by means of a tee saddle or tapping tee. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE

## Section 3

### TRICKLE FEED WATER DISTRIBUTION SYSTEM

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pipng. Services to be in one piece, no mechanical connections permitted between main connection and service valve.

- 3.5.3 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.

### 3.6 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.

#### 3.6.1 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 .
- 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 97% 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.

#### 3.6.3 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**.

#### 3.6.4 Inspection and Testing

- a) Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the Aquatera representative in

## Section 3

### TRICKLE FEED WATER DISTRIBUTION SYSTEM

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accordance with the ASTM F2164-02. The Developer 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 Developer shall provide evidence that the gauges used are accurate.

- a.1 The water distribution system may only be charged through one valve. **Only one (1) valve** may be operated during pressure and leakage testing as well.
  - a.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.
  - a.3 The Developer will be required to give 24-hour notice to the Aquatera representative.
  - a.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 Aquatera along the main at high points within a profile.
  - a.5 When the line has been filled and most of the air expelled, time should be allowed for the remaining air and water to reach a constant temperature.
  - a.6 The test section may be pressured through an air relief valve or a tap may be installed in the line. After testing, the pipe shall be abandoned at the Developer's expense to the satisfaction of Aquatera.
  - a.7 The mains or section of mains shall be subject to a pressure of not less than **1035 kPa ( 150 psi )**. Test sections shall **not exceed 450 m** of main.
- b) Leakage 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 reaction or thrust block has been cast with high early strength cement, or at least **seven (7) days** after the last concrete reaction or thrust block has been cast with standard cement. The duration of each test shall be **two (2) hours**.
- c) The allowable leakage for PVC pipe material shall be determined by the following formula:

c.1 
$$L = \frac{N \times D \times P^{0.5}}{128,320} \quad \text{For PVC Pipe}$$

Where: L = allowable leakage in L/hr    D = pipe diameter in mm  
 N = total no of joints                    P = test pressure in kPa

## Section 3

### TRICKLE FEED WATER DISTRIBUTION SYSTEM

- c.2 Leakage allowance for new construction for materials of other than PVC or ductile iron shall be in accordance with the applicable AWWA standard.
  - c.3 Each fitting bell shall be counted as ½ coupling. Pipe couplings shall be counted as 1, regardless of type of joint.
  - c.4 **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.**
  - c.5 Each section between valves shall be brought to test pressures with the valves closed, to test the valves under pressure. Test pressure shall be held without loss for two (2) minutes before opening the valve and releasing the pressure into the next section.
- d) The allowable leakage for High Density Polyethylene (HDPE) pipe material shall be determined by the following procedures and tables:
- d.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.
  - d.2 A hydrostatic test pressure of **1.5 times** the rated pressure of the pipe at the lowest point in the system main shall be applied.
  - d.3 Pressurized pipe to require test pressure over a **3-hour period** and hold required test pressure for an additional hour to allow for pipe expansion and stretching prior to the leakage test.
  - d.4 For jointed pipe only, the leakage test period shall be for **2-hour duration**. Amount of make-up water (leakage) required to return the pipe to required test pressure shall not exceed the allowance given in the following table.

**Field Testing of High Density Polyethylene Pipe (HDPE)  
Water Systems at 1035 kPa ( 150 psi )**

Nominal Pipe Size mm	Allowance for Expansion (Leakage) ( Litres per 100 Joints ) 2 Hour Test
50	2.50
75	3.76
100	5.02
150	7.52
200	10.02
250	12.54
300	15.04
350	17.54
400	20.04
450	22.56

- d.5 Total time under test pressure must not exceed 8-hours, including the time required to pressurize, stabilize, hold test pressure, and

## Section 3

### TRICKLE FEED WATER DISTRIBUTION SYSTEM

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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.

- e) Prior to the initial acceptance of the water system, water mains are to be disinfected in accordance with AWWA C651 continuous feed method. 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 be remained valved off until such time as the bacteria sample results are approved.
  - e.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.
- f) 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.