TREATED WATER DISTRIBUTION SYSTEM EVALUATION

SECTION 8

For the purpose of this study, the 1989 Area Structure Plan prepared by Associated Engineering Alberta Ltd., design criteria is adopted. The following is an extract from the 1989 report:

- Peak Day = 1.8 x average day
- Peak Year = 1.5 x peak day (2.7 x average day).

8.1 PROJECTED FUTURE WATER CONSUMPTION

The future water consumption used in this report for the preliminary design of waterworks components is 450 L/c/d (100 igpcd).

In the analysis of preliminary design of the waterworks system the following population densities were used:

- Residential 36 ppha (15 ppac)
- Commercial and Light Industrial 25 eqppha (10 eqppac)

8.2 FIRE FLOWS

Fire flow rates and duration of fire flows are in accordance with the 1981 Guide to Recommended Practice for water Supply and Public Fire Protection of the Fire Underwriter Survey.

The fire flow rates and duration of the fire used in this report are:

- Residential Area 76 L/s (1,000 igpm)
- Institutional Area 114 L/s (1,500 igpm)
- Multi-Family Area 167 L/s (2,200 igpm)
- Commercial Area 200 L/s (2,600 igpm)
- Industrial Area 233 L/s (3,100 igpm)

Duration of fire in hours are:

Fire Flow Rates	Duration in Hours
167 L/s (2,200 igpm) or less	2.0
220 L/s (2,600 igpm)	2.5
233 Ll/s (3,100 igpm)	3.0

8.3 EXISTING WATER DISTRIBUTION SYSTEM

The water distribution system is modeled using Cybernet, an AutoCAD add-in program that calculates pressure network using the built-in numerical

KYPIPE2 computational algorithms.

The Town's existing water distribution system is entered in the Cybernet program. The pipes are connected using nodes. Node's property includes its elevation and consumption demand.

The pipe diameter, length/pipe material and roughness coefficient are also entered to the model.

The following Roughness coefficient © value) is used:

- Cast Iron (C.I.) = 110
- Ductile Iron (D.I.) = 120
- Asbestos Cement (A.C.) = 110
- Plastic (PVC) = 130
- Poly (P.E.) = 135

The C value used in case is taken from other models having the same material and approximately about the same age.

The model was run to depict the normal daily operation of the Town's water distribution system. From the plant's record, the pump at the water treatment plant (WTP), one pump runs from 8:30 a.m. to about 5:00 p.m. The water elevation at the remote reservoir during pump start is 635.00 m, which is 78% full. The pump supplies the Town's consumption

and also to fill the reservoir. It shuts down when the reservoir level reaches 92% full, which will be at around 5:00 p.m.

By using the Extended Period Simulation (EPS), the model was calibrated to behave and match the existing operating conditions over a 48 hour window. Based on the model, the average day consumption is lower than projected in the 1989 report. Using the fire flow demand at the specific land use areas, the model indicated several fire flow deficient areas.

The areas are (shown in Figure 8.1):

.1 Along Balsam Road N.E.; and South of Tamarack Road.
.2 At the intersection of 12th Avenue N.E. and 7th Street N.E.
.3 Industrial Site - along 10th Avenue N.W. between 3rd Street N.W and 8th Street N.W.
.4 The main supply to Woodland Place.
.5 At the intersection of 6th Avenue N.E. and 4th Street N.E. (C.J. Schuster School).
.6 At 9th Street N.E. cul-de-sac.
.7 At McBeak apartments.
.8 Along 3rd Street S.W. (west side of Sawridge Plaza).
.9 Westside of Northwest Inn.
.10 At 12th Avenue S.W. (northside of Sawridge Hotel).

The model is calibrated to have the peak hour occur at 21:00 hour (9:00 p.m.). The peak hour factor is 3.0 (the 1989 report used 1.5 times the Peak Day or 2.7 times the average day (1.8 x 1.5)).

To meet the fire flow, the Town has to initiate a watermain replacement/upgrading program. Below is the list of upgrading or improvements required (as shown in Figure 8.2):

.1 Along Balsam Road N.E. and South of Tamarack Road:
- provide a new 400 mm watermain along Main Street and Tamarack Road N.E. to connect the existing 350 mm HDPE pipe to the existing 200 mm D.I. at Balsam Road.
- replace the existing 200 mm D.I. with 300 mm diameter pipe along Balsam Road between Birch Road N.E. and 4th Street N.E.

.2 At the Intersection of 12th Avenue N.E. and 7th Street N.E.:

- upgrading the existing 250 mm diameter to 300 mm diameter along Birch Road N.E. between 3rd Street N.E. and 7th Street N.E.

.3 Industrial Site - along 10th Avenue N.W. between 3rd Street N.W. and 8th Street N.W.:

- provide a new 400 mm diameter watermain from the existing 350 mm HDPE south of airport to the northwest corner of 10th Avenue N.W. Replace the existing 150 mm diameter with 400 mm along 10th Avenue N.W. from 3rd Street N.W. to 8th Street N.W.
- replace a section of existing 150 mm diameter with 300 mm diameter on 8th Street N.W. (approximately 200 m).
- replace a section of existing 150 mm diameter with 300 mm diameter on 8th Street N.W. (approximately 160 m).

.4 The main supply to Woodland Place:

- replace the existing 150 mm diameter supply with 200 mm diameter main.

.5 At the intersection of 6th Avenue N.E. and 4th Street N.E. (C.J. Schuster School):

- replace existing 150 mm diameter main with 200 mm diameter from Main Street to 4th Street N.E.

.6 At the 9th Street N.E. Cul-de-Sac:

- install a 150 mm diameter from eastside of hospital to Cul-de-Sac.

.7 At McBeak Apartments:

- extend existing 150 mm diameter along 8th Street N.W. to connect to existing 150 mm diameter on 6th Avenue N.W. (40 m).
- replace existing 150 mm diameter along 8th Street N.W. between 2nd and 3rd Avenue N.W. with 200 mm diameter (approximately 180 m).

.8 Along 3rd Street S.W. (westside of Sawridge Plaza):

- install a 300 mm diameter under the railway tracks from 2nd Avenue N.W. to 3rd Street S.W. (approximately 200 m).
- replace existing 200 mm diameter with 300 mm diameter along 6th Avenue S.W. between Main Street and 3rd Street S.W. (approximately

220 m).

- replace existing 150 mm diameter with 300 mm diameter along 3rd Street S.W. (approximately 100 m).

.9 Westside of Northeast Inn:

- cross-connect the existing 150 mm diameter and 400 mm diameter mains.

.10 At 12th Avenue S.W. (northside of Sawridge Hotel):

- replace existing 150 mm diameter with 300 m diameter on 12th Avenue S.W. approximately 150 m long.

8.4 ULTIMATE SYSTEM

The computer model is also used to analyze the ultimate development scenario. This scenario was established in the 1989 report. The land south of Highway No. 2 would be developed. This development has plan for 243 ha of residential area; six schools with student population of 4,470 persons; 106 ha of industrial site; Neighborhood Commercial will take up 2.5 ha and 17 ha for Highway Commercial.

Due to the steep terrain south of the Highway, the report proposed to separate the system into a two zone system. This will provide a more manageable pressure to the consumers.

Part of the new development, south of Highway No. 2 will be serviced by the existing system. Other parts of the new development, further south, higher than 600 m contour elevation will be served by a completely new system, or Zone 2.

The new system will have a new reservoir on the southwest corner of the study area. A new pumping station is required to boost pressure form the reservoir. This reservoir is filled by a 300 mm supply main extended from the existing system just north of Highway No. 2.

A second pumping station is proposed at the existing remote reservoir. It will have a dedicated feedline from the reservoir to the pumphouse. Water from this reservoir will be boosted to supply Zone 2. Zone 2 system is also connected to the existing system at two locations. Each location has a pressure reducing valve to prevent Zone 1 from experiencing too much pressure.

The model was ran to simulate Peak Hour Flow using the existing pumps and a proposed system head at the pumphouses in Zone 2. All three pumps were turned on during the Peak Hour run. The proposed head at the new pumphouses was set at 600 m or 61 psi above the highest ground elevation in Zone 2.

It was found that the existing pumps were able to handle the Ultimate Peak Day demand. The proposed head at the new pumphouses would be adequate at 660 m hydraulic head. The proposed pipe diameter is shown in Figure 8.2. The pipe will be adequate to provide Peak Hour and more importantly, will be able to satisfy the fire flow demand during Peak Day (see appendix on Fire Flow report).

8.5 CHLORINE RESIDUE

Based on the model, the residual chlorine in the system is depleted before it reaches the remote reservoir. Therefore, during the off pump period (after 5:00 p.m.), the remote reservoir will be feeding zero residual chlorine back into the system.

In order to alleviate this problem, a chlorine injector can be installed at the remote reservoir. Water entering the reservoir will be dosed with chlorine.