7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Infrastructure Investment Planning

The report identifies the capital cost required for the current, 5, 10, 20 and Ultimate development needs of the Town. It is important to plan for the capital cost requirements of the 5, 10 and 20 year development phases. It would be unrealistic to invest in the Ultimate development phase due to the long-term horizon (over 100 years). For infrastructure planning purposes the split of off-site costs need to be agreed between the Town of Sexsmith and Aquatera to enable each party to develop an investment strategy. The exact cost sharing mechanism between Aquatera and the Town of Sexsmith is not clear at present time. Further discussions between Aquatera and the Town of Sexsmith are required to develop cost sharing mechanisms to determine how future infrastructure projects will be funded. From preliminary discussions with the Town of Sexsmith and Aquatera, the following assumptions are made:

- The Town would seek Provincial and Federal funding as much as possible for all infrastructure requirements
- Aquatera is likely to fund the wastewater treatment system upgrades and one major sewage lift station and force main feeding the lagoon.
- It is assumed that the Town would seek funding from developers for the water system distribution pipelines and sanitary sewer pipes (gravity and force mains) and all other lift stations.
- The water system pumping stations, reservoir upgrades and new facilities are included in Aquatera's cost.

As a general recommendation, the Town should work towards updating their Municipal Development Plan and Land Use Bylaws. It is important to note that developments should be encouraged in an orderly fashion considering the Water and Wastewater infrastructure limitations. Random developments scattered throughout the Town/Study area will result in unsustainable infrastructure costs for the whole community. The Town should also require that area structure plans be prepared from all future developers to confirm that the individual developments are compatible with the Town's overall Municipal Development and Land Use Plans.

7.2 Water and Wastewater Systems

7.2.1 Overview

Water distribution and wastewater collection systems were developed to service the areas defined by various development envelopes. Both systems were first designed to service the entire study area using conventional criteria. A second scenario was then developed utilizing

trickle feed water delivery and low pressure sewer systems to service the fringe area (the area between the current town boundary and the study boundary) as a way to reduce the main sizes and supporting infrastructure. A third scenario was then developed to service only out to the 20 year development envelope. Water and wastewater infrastructure would not be oversized to handle any areas beyond the 20 year envelope.

It is recommended that the water and wastewater systems focus on serving up to the 20 year projected growth area envelope. This recommendation is based primarily on the fact that the potential holding capacity of the lands within the 20 year development envelope are calculated at 9,500 people which significantly exceeds the projected 20 year population growth. The cost of constructing infrastructure sized to service lands out to the study boundary is excessive and would create a heavy financial burden for the current populations with no benefits until well beyond 30 years. Although the report comments on infrastructure needs beyond the 20 year horizon out beyond the Town limits to the Study Boundary, this data should be considered as information only for future consideration.

7.2.2 Recommended Water System Improvements

The following are recommended to upgrade the water system to serve the current developments and future developments within the 20-year envelope. Costs noted include all costs which are ultimately split between Aquatera, the Town of Sexsmith and developers of the lands.

2007- Current Development Phase / Local improvements

- Replace 150 mm and 100mm pipeline by 300 mm pipeline and provide additional 4 hydrants as shown in Figure 2.3. This upgrade would provide the recommended fire flows to 80% of the Town and the recommended hydrant coverage to service 90% of the town. The cost of this upgrade is estimated to be approximately **$759,850**

- In order to achieve 100% fire flow and hydrant coverage, around 1,000m of smaller diameter pipes need to be replaced plus 1,500m of additional pipe work and hydrants need to be provided. The cost of this additional work is estimated as approximately **$1,131,000**. The additional investment may not be justifiable considering the benefits offered to few properties. The Town should investigate alternative options such as Sprinkler system to affected properties.

- The current fire flow standard of 95 l/sec is sufficient for the Residential dwellings of the Town, but is not adequate for the commercial and institutional properties. However considering the current composition of the Town (which is predominantly residential), it may not be cost effective to enforce higher fire flow standards as this will result in an overall increase in infrastructure cost (storage and distribution cost). Instead alternative fire suppression systems such as Sprinklers or Fire ponds could be specified to the commercial and institutional properties. The fire flow standards need to be reviewed over the next five years when better visibility of developments in growth areas is available.

2012 – Five Year Development Phase

- Move to create pressure Zone 7 by installing new distribution pumps, and transmission mains. It is recommended that the existing back wash pumps that are no longer used be replaced with the new distribution pumps. Additional ring mains would be required to create a loop around the five-year growth envelope. Refer to Figure 2.5. The capital cost required at this phase is estimated as **$9,466,210**

2017 - 10 Year Development Phase

- Provide additional ring mains and install additional distribution pumps. Refer to Figure 2.6. The capital cost required at this phase is estimated as **$6,115,785**.

2027 - 20 Year Development Phase

- Construct additional ring mains required for this phase. Refer to Figure 2.10. The capital cost required at this phase is estimated as **$3,079,765**.

Comments on the Ultimate Development Phase

It is not advisable to budget for this phase since the full build-out or Ultimate Development would only takes place in approximately 2108. This is too long horizon for any infrastructure planning purpose. The Capital cost provided is only an indication of the extent of the investment required to service the whole study area. The new Zone 8 needs to be created by 2027 and this requires additional land (approximately 2 ha) for the new reservoir and pumping station. The reservoir however should be constructed in stages. The Town can initiate procurement of the additional land in the next five years if developments are expected outside the 20-year envelope identified in this report. It is in the interest of the Town to allow developments to take place in an orderly fashion and within the 20-year envelope as far as possible.

It is recommended that the Town/Aquatera investigate trickle feed system on the fringe areas identified in Figure 2.9. This would reduce the operating costs of the Zone 8 pumping system. It should be noted that the fringe areas will not get the fire flows if trickle feed system is implemented and alternative fire suppression system need to be stipulated to those areas.

7.2.3 Recommended Wastewater Collection System Improvements

The following are recommended to upgrade the sewer system to serve the current developments and future developments within the 20-year envelope. We have based our recommendation on Option 3 which sizes the system for flows up to the 20-year development envelope. This study does not recommend oversizing the trunk mains to handle lands beyond the 20 year development envelope at this time. Costs noted include all costs which are ultimately split between Aquatera, the Town of Sexsmith and developers of the lands.

2007- Current Development Phase / Local improvements

- It is recommended that Aquatera implement a flow-monitoring program to establish the inflow and infiltration levels for the town. A permanent installation of flow meters is recommended at the inlet pipes at all three existing lift stations. The program should start at the Heritage Park LS which receives the entire waste water flow from town. By comparing the flow against water consumption and rainfall data, we can establish both baseline dry weather flow and infiltration/inflow during storm events. The flows generated within the sub catchments served by the other two lift stations can then be tabulated and the I & I figures from each catchment compared. It may then be possible to narrow down a particular area of the Town that is causing the greatest amount of inflow and infiltration. Temporary flow monitors could then be placed in some specific pipes within the targeted area in order to identity which areas, if repaired, would provide the most benefit. This data is also required to calibrate the wastewater model. A provisional sum of **$50,000** is provided.

- Another **$50,000** is provided for miscellaneous upgrades to the Heritage Lift Station.

2012 – Five Year Development Phase

- At this phase critical gravity sewers need to be installed to provide the Town with a framework to discharge all future flows. At this phase two new lift stations are proposed to collect sewage and pump in to the major gravity sewers. Refer to Figure 3.3. The capital cost estimated for upgrade of the Sewage Collection System at this phase is **$5,918,968.**

2017 10-Year Development Phase

- Construct additional gravity sewers and force mains required for this phase. Refer to Figure 3.6. The capital cost required at this phase is estimated as **$1,210,950**

2027 20-Year Development Phase

- Construct additional gravity sewers and force mains required for this phase. Refer to Figure 3.9. The capital cost required at this phase is estimated as **$2,632,939**

Comments on the Ultimate Development Phase

As with the water system, it is not advisable to budget for this phase since the full build-out or Ultimate Development would only takes place in approximately 2108. This is too long horizon for any infrastructure planning purpose. The Capital cost provided is only an indication of the extent of the investment required to service the whole study area. It is in the interest of the Town to allow developments to take place in an orderly fashion and within the 20-year envelope as far as possible.

It is recommended that the Town/Aquatera investigate a low pressure sewer system on the fringe areas. Low Pressure (LP) sewer systems allow the gravity sewer trunks into which

they ultimately discharge, to be reduced in size as the LP system reduces the peak flow rates and eliminates the I&I flows.

7.2.4 Recommended Wastewater Treatment System Improvements

Four treatment options are discussed in this report. The option recommended includes converting the existing conventional lagoon system to an aerated lagoon discharging twice a year to the local water course. Refer to Appendix E for further system details. This option will service the Town to the 20-year projected population horizon and provides time for Aquatera to validate the flow, infiltration etc, and to re-evaluate options once better visibility of future developments and population growth factors are available. A regional option may prove to be the best solution for the long term.

7.3 Infrastructure Charges

The Infrastructure Charge methodology currently used by Aquatera appears to be a fair system in comparison to other forms of Offsite Infrastructure charges as it reflects the water usage to some degree. These charges are established to allow Aquatera to recover their portion of the total infrastructure investments needed.

As discussed earlier, three scenarios or options were explored and are summarized in Table 7.1. It can be seen that the cost per capita becomes excessive in the first two options leading to the recommendation to limit planned investment in water and wastewater infrastructure to the 20 year development envelope (Option3).

In accordance with Aquatera's existing Infrastructure Charge policy, the water system is a single utility that benefits all users. The water charge is therefore uniform for all users. Effective January 1 2009, the minimum water infrastructure charge is $3,275.00 for single family residential and $5,823.00 for all other land uses.

A total wastewater investment by Aquatera of $2,735,282.00 is needed when inflated to the time the work is needed. It appears that minimum infrastructure charges for wastewater of $4,954.00 per residential lot and $8,808.00 for all other land uses are needed to cover the capital cost of wastewater infrastructure over the 20 years. The proposed infrastructure charges in this scenario anticipate that Infrastructure costs will be fully recovered in approximately 15 years (2022) and begin to accumulate capital to cover initial planning and engineering preparation for the next expansion of the wastewater system beyond the end of the 20-year period.

It is recommended that the Infrastructure Charge policies be re-evaluated when detailed development and Area Structure Plans become available in the future.

Table 7.1: A Comparison of Aquatera's Cost Share for the Three Development Options

YEAR	2007	2007 to 2012	2012 to 2017	2017 to 2027	Ultimate	20 Yr Total	Ultimate Total
Pop	2,178	2,650	3,072	4,128	43,575	4,128	43,575
Pop Net Growth		472	422	1,056	39,447	1,950	41,397
Option 1 - Full Grown Development Include Fringe Areas							
Total	100,000	3,604,751	2,122,500	4,075,275	88,370,200	9,902,526	98,272,726
Cost per Capita		7,849	691	987	2,028	5,078	2,374
Option 2 - Trickle Feed and Low Pressure System in Fringe Areas							
Total	100,000	3,148,776	2,122,500	4,075,275	81,870,200	9,446,551	91,316,751
Cost per Capita		6,883	691	987	1,879	4,844	2,206
Option 3 - 20 Year Growth Envelope Only							
Total	100,000	759,200	2,122,500	n/a	n/a	2,981,700	n/a
Cost per Capita		1,820	691	n/a	n/a	1,529	n/a