EXECUTIVE SUMMARY

The Town of Sexsmith is located approximately 16Km north of Grande Prairie on Highway 2. The Town has experienced exceptional residential growth in the recent years and is expected to experience further growth in the next several years. The Town annexed additional areas in 2007 to accommodate future growth. The rapid growth of the Town increases the need to expand the Water and Wastewater systems. Morrison Hershfield has developed this Water and Wastewater Master Plan to address the current and future expansion needs of the Town.

The current Town boundary has 1,294 ha of land and a further area of one half mile beyond the existing boundary is included in the master plan study resulting in a total area of approximately 2,713 ha. Morrison Hershfield identified growth areas and developed a Land Use Plan in consultation with Aquatera and the Town of Sexsmith. The Land Use Plan provides 5, 10 and 20-year growth envelope within the study area of the Town. The Land use along with some key criteria and assumptions has been used as a basis for developing this master Plan. It is estimated that the existing Town boundary can support approximately 40 years of growth, and the study area can support a total population of around 43,575, approximately up to year 2108. The Ultimate Study area is very large in relation to the expected growth and it would be unrealistic to plan for the Ultimate or Full Build scenario. The report recommends a phased approach for infrastructure planning.

Water Systems

The existing water system was first reviewed. The existing water distribution system has areas that do not meet the fire demands of the town. Deficiencies were identified (Refer to Figure 2.3) and cost estimates for improving fire flows to about 90% of the Town were provided. The report recommends exploring alternative fire suppression systems for the remaining areas with insufficient fire flow coverage. Alternatively, upgrades or additional improvements could be carried out to improve fire flow and coverage in those areas if funds are available. The additional capital cost for this upgrade is provided as an optional cost for the Town to make an appropriate decision.

Morrison Hershfield developed a computer model of the water distribution system for the future 5, 10, 20 year and Ultimate Phase growth envelopes. The report reviewed the fire flow standards of the Town. The current fire flow standard 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.

The existing reservoir is found to have adequate capacity to serve the next 20-year population growth (Population of 4,128) of the Town. However the existing infrastructure limits the ability of the existing distribution system to expand. Morrison Hershfield recommends an alternative by creating new pressure zones to utilise the capacity of the existing reservoir. Under this proposal the existing distribution system is retained as an independent Zone (Zone 6) serving the existing developed

areas of the Town exclusively. An additional Zone (Zone 7) would be created by installing additional pumps in the existing pumping station supplying separate distribution ring mains. This Zone would serve the needs of the Town up to 2027 utilising the capacity of the existing reservoir to the full extent. New Zone (Zone 8) should be created by 2027 with a new reservoir and pumping station to serve the growth beyond 2027. Using this approach, the asset life of the existing reservoir is maximised and a major investment is deferred for the next 20 years.

A water distribution system was developed to service the areas defined by the various development envelopes. 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 where infrastructure would not be oversized to handle any areas beyond the 20 year envelope.

It is recommended that the water system 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 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 this study 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.

The computer model developed identifies the strategic ring mains and pumps required for supporting the areas within the 5, 10, 20 year and Ultimate phase developments. The strategic ring mains are conceptual at this stage and the purpose of the strategic ring mains is to provide a skeleton infrastructure for the Town to support future growth. It is envisaged that individual developers would construct the ring mains as and when developments take place. The report provides preliminary cost estimates for strategic planning purpose.

Wastewater Collection Systems

Morrison Hershfield has developed a computer model of the Wastewater distribution system for the future 5, 10, 20 year and Ultimate Phase growth envelopes. Several scenarios for the purpose of establishing inflow and infiltration were analysed in the model such as: 0.1 l/s/ha, 2 year 4 hour storm, 5 year 4 hour storm, 10 year 4 hour storm, 25 year 4 hour storm, 25 year 24 hour huff storm and storm data of July/03/2004. Sewers were sized based on the 25 year 4 hours huff storm, which appeared to cause the highest peak infiltration & inflow contribution. The wastewater treatment facility is sized based on infiltration flows calculated from the empirical value of 0.1 l/s/ha plus inflow from sag manholes for 60 days of the year and dry weather flows for the remainder. It is recommend that a flow-monitoring program be established to measure the actual inflow and infiltration for the Town. This data can then be used to calibrate the Wastewater model.

The wastewater collection system was first designed to service the entire study area using conventional criteria. A second scenario was then developed utilizing a low pressure sewer system 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. Wastewater infrastructure would not be oversized to handle any areas beyond the 20 year envelope.

It is recommended that the wastewater system 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 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.

For the 5, 10, 20 year and Ultimate growth areas, a skeleton infrastructure comprised of strategic sewer gravity and force mains are proposed. At this point it is recommended that mains be sized to handle flows to the 20-year development envelope. It is envisaged that individual developers will construct the major infrastructure as and when development takes place. Preliminary cost estimates are provided in the report.

In the long term, it is recommended that the Town and Aquatera consider implementing a Low Pressure Sewer system for the fringe areas (outside the current boundary limits) to minimise the infrastructure costs. This involves residents pumping sewage to a common carrier force main.

Wastewater Treatment System

The existing lagoon system was evaluated for compliance with Alberta Environment's standard and guidelines for municipal works. The exiting anaerobic cells, facultative cell and storage cells also reach their capacity around 2012, depending on population growth, requiring upgrading. This study explores four alternative approaches for sewage treatment to cater for future growth.

- Option 1: Conventional Lagoon expansion. This option involves expanding the existing lagoon system to provide additional capacity for future flows. The major disadvantage with this option is the requirement for a large area or footprint and the associated set back requirements and environmental constraints. Construction of a large open lagoon facility may not go favourably with the public. Conventional Lagoon is not a feasible option especially in the long term

- Option 2: Aerated Lagoon Conversion. Under this option the existing lagoon facility can be utilised and this has the least capital cost for the medium term. Under this proposal the discharge consent needs to be changed from once a year to twice a year thus requiring at least 6 months storage. However somewhere around 2027, depending on growth rates, the existing storage cells will not have adequate capacity to provide 6 months storage, and the storage cell needs to be expanded requiring additional land area. This creates the similar

problems associated with lagoon expansion. The Aerated lagoon conversion is the best solution for the medium term but it is not a feasible solution in the long term.

- Option 3: Mechanical treatment system. An MBR plant is proposed as a suitable mechanical treatment system for the Town as it provides a relatively good quality final effluent generally suitable for re-use. The mechanical treatment option requires continuous discharge. This is a major disadvantage since there is no watercourse in the immediate vicinity of the Town to offer the 1:10 dilution recommended by Alberta Environment. The nearest major water body is the Wapiti River at Grande Prairie. This would involve constructing approximately 30Km of pipeline to Grande Prairie.

- Option 4: Alternatively a regional system similar to the water system could be created by pumping the sewage from Sexsmith to the Wastewater Treatment Plant at Grande Prairie. The cost of upgrading the Wastewater treatment plant at Grande Prairie needs to be considered. In the long term (2027 and beyond) this is the only cost effective option.

- Option 5: This is a hybrid option in which Option 2 is implemented during the five-year development phase, and then expanded to handle the 20-year growth projections. The logic of this option is to defer the major capital expense associated with the outfall pipeline to Grande Prairie and the Wapiti River for the next 20 years. At this stage the population and growth in Town might justify the implementation of Option 4.

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.

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. These charges are established to allow Aquatera to recover their portions of the total infrastructure investments needed.

As discussed in the study, 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.