Technical Memorandum No. 2

REGIONAL DISTRICT OF KITIMAT-STIKINE

KITIMAT-STIKINE

Lakelse Lake – Jackpine Flats Stage 2 LWMP

Further Investigations of Water Supply Options

June 2005

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

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Regional District of Kitimat-Stikine
Stage 2 LWMP

Further Investigations of Water Supply Options

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1 Introduction

Stage 1 of the Lakelse Lake-Jackpine Flats liquid waste management plan (LWMP) included a cursory look at using piped water supplies to solve "issues" related to the potential that septic tank systems may be contaminating water supplies on the east side of Lakelse Lake. In general, these water supply solutions included provision of piped water supply to the specific areas on east side of Lakelse Lake. This technical memorandum carries on from Stage 1 on this issue and includes a more in-depth evaluation of the costs of these piped water systems.

2 Water Supply Scenarios

There are four water supply scenarios for which cost estimates have been prepared. These scenarios include the following:

2.1 Option 1

Option 1 involves building a water treatment plant at a location on Lakelse Lake Lodge Road, to the west of Highway 37, and east of Kreston Street. Option 1 includes two sub-options depending on the area to be serviced, Option 1A and Option 1B.

2.1.1 Option 1A

In Option 1A, the treatment plant would service 1st Avenue North and South, and the Lakelse Lake Provincial Park campground. Currently, this area would include approximately 354 service connections, and service a population of 1,245 people. At a water consumption rate of 300 L/capita/day, this would require an average daily water supply capacity of about 370 m^3/day. This area is projected to grow to 645 service connections in the future, with a population of approximately 1,935 and a water demand of approximately 580 m^3/day. In this option, the water lines would be in the 50 mm to 100 mm diameter range and every connection would be provided with a cistern to buffer flow demand with flow supply. There would be no provision for supplying fire flows.

2.1.2 Option 1B

Option 1B would include the areas serviced in Option 1A, and also service the area north of the Provincial Campground and Water Lily Bay Resort, all from one water treatment plant location (located on Lakelse Lake Lodge Road). In order to service these two additional areas, it would be necessary to build a water supply main approximately 4 km long from the treatment plant along Highway 37 and a second water pumping station.

Currently, the two new areas would add about 48 service connections and a population of 200 people. The required current water supply capacity for Option 1B is estimated at about 434 m^3/day. At the extreme, these areas are projected to grow to 1404 service connections in the future, with a population of approximately 4250 and a future water demand of approximately 1275 m^3/day. As with Option 1A, water lines in Option 1B would be in the 50 mm to 100 mm diameter range and every connection would be provided with a cistern (to buffer flow demand with flow supply). There would be no provision for supplying fire flows.

2.2 Option 2

Option 2 services all the areas included in Option 1B discussed above. However, instead of doing this from one treatment plant with a four kilometre supply main along Highway 37, Option 2 would include elimination of the four kilometre main with substitution of a second water treatment plant to service the Provincial Campground North and Water Lily Bay Resort areas. Option 2 would also require the construction of a second lake intake structure for the second treatment plant. The southern areas (1st Avenue, Lakelse Lake Provincial Park) would be serviced as per Option 1A. As with Options 1A and 1B, water lines in Option 2 would be in the 50 mm to 100 mm diameter range and every connection would be provided with a cistern (to buffer flow demand with flow supply). There would be no provision for supplying fire flows.

2.3 Option 3 – Fire Flows

Option 3 includes servicing all areas from a single water treatment plant (as in Option 1B), but also includes increased water supply to provide fire flows. The required fire flow for an area of this type (low density residential, wood frame construction) is approximately 4,000 L/min (approximately four standard insurance underwriters firestreams). This flow rate must be maintained for at least 1.5 hours, requiring a total storage volume of 360 m^3. To provide this flow, a reservoir will be constructed at the treatment plant to supply the entire volume necessary. A larger pump station and water mains, e.g. 150 mm or 200 mm vs. 75 mm or 100 mm, will also be required. With this larger size of distribution piping, the individual cisterns of Options 1A, 1B and 2 would eliminated. Hydrants would be provided at regular intervals to provide the connections for supplying the fire flows.

3 Costs

The costing for the four scenarios described above was done for both "current" and future populations and flows to show what the range of costs might be. In doing so, previous Stage 1 costs were updated, as required. For example, to reflect increases in the cost of pipe and installation, installed pipe prices were increased from $100/m to $120/m for 50 mm diameter pipe and from $120/m to $150/m for 100 mm diameter pipe for Options 1A, 1B and 2. For Option 3, with 150 mm diameter pipe and tees, crosses, valves and hydrants, etc., the pipe costs were increased from $200/m to $250/m. For future flows, an extra 2000 m of distribution pipe was added to the cost of pipe for the options that include the area north of the Provincial Park campground, i.e. Options 1B, 2 and 3.

For both the current and future flows, Options 1A, 1B and 2 include the cost of individual cisterns. However, for Option 3, with fire flows, these cisterns are eliminated because the higher supply flow rates means supplying normal water consumption directly from the pipe will not be limited as with the smaller diameter pipes of Options 1A, 1B and 2.

For the current flows, each of the four options would have a water treatment plant with only one water treatment train and no back-up generator set. As a result, to provide some supply security, one day's storage in a concrete reservoir was assumed and costed. In contrast, for the future flows, multiple treatment trains would be provided, providing some redundancy and, thereby, decreasing the risk of not having any treatment during a equipment failure. Furthermore, a stand-by generator was assumed for each of the treatment plants. As a result, the storage requirements were decreased (based on hours of supply).

All of the water treatment was assumed to be provided by pre-engineered packaged water treatment plants, in this case, the US Filter Waterboy™ packaged water treatment plant, as shown in Figure 1. For the current flows, single treatment trains of the appropriate capacity were assumed. For the future flows, multiple trains were assumed. In all cases, the treatment plants were assumed to be installed in buildings located near to Highway 37 (to help with the supply pressure head requirements).

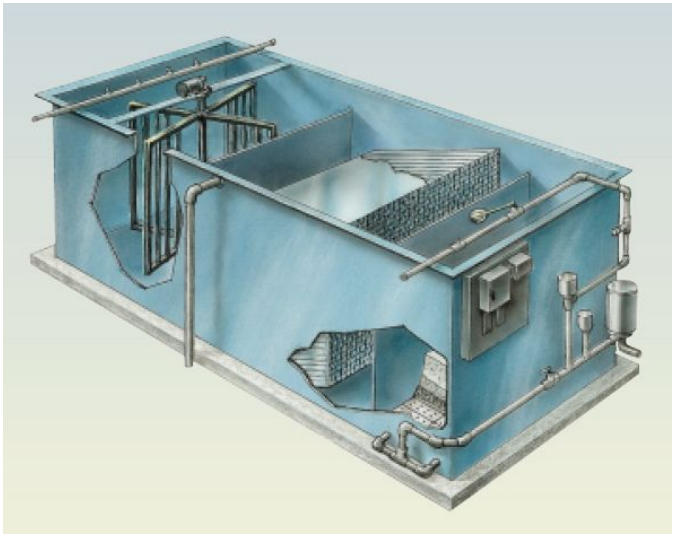

Figure 1: A cut-away of the an example US Filter Waterboy packaged water treatment plant

The resulting costing summary is presented in Table 1 for both the current and future flows.

Table 1
Regional District of Kitimat-Stikine
Lakelse Lake Liquid Waste Management Plan
Water Supply Options Summary

Water Treatment for Current Population

Option	Description	South Areas[1]				North Areas[2]				Combined Cost			
		Number of Households	Estimated Population	Total Cost	Cost per Household	Number of Household	Estimated Population	Total Cost	Cost per Household	Number of Household	Estimated Population	Total Cost	Cost per Household
1A	One Treatment Plant Servicing South Areas	354	1245	$2,832,000	$8,000								
1B	One Treatment Plant Servicing All Areas									402	1445	$4,197,000	$10,400
2	Separate Treatment Plants Servicing North and South	354	1245	$2,832,000	$8,000	48	200	$1,162,000	$24,200				
3	Fire Flow - All Areas Serviced									402	1445	$5,887,000	$14,600

Water Treatment for Projected Future Population

Option	Description	South Areas[1]				North Areas[2]				Combined Cost			
		Number of Households	Estimated Population	Total Cost	Cost per Household	Number of Household	Estimated Population	Total Cost	Cost per Household	Number of Household	Estimated Population	Total Cost	Cost per Household
1A	One Treatment Plant Servicing South Areas	645	1935	$3,869,000	$6,000								
1B	One Treatment Plant Servicing All Areas									1,404	4249	$6,950,000	$5,000
2	Separate Treatment Plants Servicing North and South	645	1935	$3,869,000	$6,000	759	2314	$2,988,000	$3,900				
3	Fire Flow - All Areas Serviced									1,404	4249	$7,933,000	$5,700

Notes
1. "South" Area includes 1st Avenue North and South and Lakelse Lake Provincial Park
2. "North" Area includes Provincial Campground North and Water Lily Bay Resort

From Table 1, it may be seen that for the current flows, the Option 1A individual household capital costs ($8000) would be less than the Option 1B costs ($10,400/household) due, in part to the cost of the 4 km supply main to the area north of the Provincial Park and the relatively low current number of homes in that area. This fact also shows up in Option 2 when the Option 1A area remains at $8000/household but the Provincial Park north area increases to $24,200/household because of the relatively few number of households in that service area at the current time. For Option 3, with the capability of providing fire flows, the current per household cost would be approximately $14,600 or approximately $4200 over the Option 1B cost. These extra costs would have to be compared to the annual savings in insurance rates to see whether the pay-back period would be reasonable.

Also from Table 1, it may be seen that for the future flows, the Option 1A individual household capital costs ($6000) would now be more than the Option 1B costs ($5000/household) due, in part to the higher number of future service connections in the area north of the Park. This fact also shows up in Option 2 when the Option 1A area remains at $6000/household but the Provincial Park north area decreases to $3,900/household because of the relative high number of households in that service area in the future. For Option 3, with the capability of providing fire flows, the future per household cost would be approximately $5,700 or approximately $700 over the Option 1B cost of $5,700. This minor extra cost would have to be compared to the annual savings in insurance rates to see whether the pay-back period would be reasonable.

4 Conclusions

Based on the above analysis and the information presented in Table 1, it would appear that piped water supply does is not affordable at the present time. The current number of connections is too low to share the cost to the point where the cost would be affordable without grants. Furthermore, going to a system that would supply fire flows to the current east side of Lakelse Lake would seem to add significant cost to already high capital costs. However, this situation could change in the future.

In the future, if there were as many connections as have been assumed in this analysis, piped water supply becomes more affordable on a per household-equivalent basis. Furthermore, with a differential of only $700 between a system that would service the east side of Lakelse Lake (with minor exceptions) for domestic water supply only and for a system that would also be capable of providing both domestic water supply and fire flows, it would seem that selecting the fire flow-capable system would be the correct choice to make.

In the interim, it would appear that the issues of drinking water contamination need to be addressed via attacking the causes of the contamination, i.e. failing septic tank systems, not by supplying piped drinking water.

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