Summary Report

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Regional District of Kitimat-Stikine

Lakelse Lake/Jackpine Flats Stage 3 Liquid Waste Management Plan

October 2007

Executive Summary

1 INTRODUCTION

To resolve concerns regarding human-based pollution potentially negatively impacting the water quality in Lakelse Lake, the Regional District of Kitimat-Stikine (RDKS) has undertaken the development of a three-stage Liquid Waste Management Plan (LWMP) for the Lakelse Lake/Jackpine Flats area. In general, the purpose of the LWMP is to define sewage issues and problems, identify and evaluate options, and prepare an action plan for implementation.

In the study area, increased weed growth (perhaps due to nutrients from wastewater) and the fact that many of the septic systems around the lake are within the 1 in 200 year flood plain and/or the 30 m minimum setback distance from the lake, prompted action by the RDKS to complete a LWMP. In addition, there was growing concern about the impact of humans and farm animals residing in the Jackpine Flats area having the potential to pollute drinking water wells in the Jackpine Flats area as well as pollute two creeks that feed Lakelse Lake. Since the Provincial Park wastewater treatment facilities were also in need of upgrade, consideration was to be given to including the Park in any RDKS wastewater treatment initiatives.

The quality of Lakelse Lake is important because of the recreation and fish and wildlife values, as well as the fact that some area residents use the lake as a source for drinking water. As a result, the three-stage LWMP process was initiated in October 2003, with Stage 1 completed in February 2005 and Stage 2 completed in February 2007. Stage 3 of the LWMP was initiated in March 2007.

This report summarizes the findings and recommendations that have developed out of the Stage 3 tasks outlined at the end of Stage 2. Stage 3 has involved investigations and writing of several discussion papers. These discussion papers have been presented to and reviewed by RDKS staff, a technical advisory committee and a public advisory committee. The Stage 3 tasks include the following:

- Confirmation of areas for cluster, communal and on-site treatment based on Stage 2 results.
- Updating of previous cluster and communal treatment cost estimates including discharge alternatives.
- Estimation of the cost of Private-Private and Private-Public on-site treatment management programs.
- Review of RDKS planning components and schedule related to the LWMP strategy.
- Development of an equitable capital and operational cost recovery scheme with/without Parks.
- Development of a proposed implementation schedule.

2 STAGE 3 LWMP RECOMMENDATIONS

Based on the information developed in the Stage 3 discussion papers, the following recommendations are put forward for consideration and action:

1. Changes to bylaws, i.e. lots sizes for septic systems and land use regarding numbers and types of animals.

2. Changes to the minimum design standards for Jackpine Flats septic systems.

3. Development of a specified service area bylaw for the study area, including consideration of an education program, a water quality monitoring program, wastewater collection and treatment and a septic system management program complete with a multi-tiered parcel tax-based fees system.

4. Implementation of an educational program regarding well head protection and septic system operation.

5. Implementation of a water quality monitoring and data management system.

6. Septic system management plan including location mapping and a servicing and inspection program.

7. Implementation of the 1st Avenue sewer system starting with a pre-grant application preliminary engineering study to refine and tighten cost estimates.

8. Implementation of the cluster-type septic systems starting with a pre-grant application preliminary engineering study to refine and tighten cost estimates.

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1 Introduction

Lakelse Lake is located south of Terrace, on the eastern margin of the Coast Range Mountains. Thirteen small creeks feed the lake. Some of the larger tributary streams are Williams Creek, Hatchery Creek (also known as Granite Creek), Scully Creek (also known as Schulbuckhand Creek), Furlong Creek, Clearwater Creek, and hotsprings. Lakelse Lake drains via Lakelse River into the Skeena River. Lakelse Lake and neighbouring areas are used for residential, commercial and recreational purposes. The Lakelse watershed is a significant habitat for rearing fish due to its shallow and warm waters. Jackpine Flats is a rural residential subdivision located approximately 5 km to the north-northeast of the north end of Lakelse Lake. The area is located between or beside Sockeye Creek and Williams Creek and groundwater from the area ultimately drains into Lakelse Lake via these two creeks.

The RDKS initiated the three-stage LWMP for the Lakelse Lake/Jackpine Flats study area because of concerns regarding domestic wastewater potentially impacting the water quality in Lakelse Lake. The concerns are based on the fact that most, if not all, residences in the study area are on septic systems and that some of these systems may be causing environmental problems. Many septic systems around the lake are within the 1 in 200 year flood plain and/or a 30-metre minimum setback distance from the lake. The lake is experiencing increased algal and weed growth, perhaps due to nutrients (nitrogen and phosphorus and/or fecal contaminants, including fecal coliforms from wastewater). In addition, there are concerns about the humans and animals residing in the Jackpine Flats area potentially degrading groundwater quality in the area and Sockeye and Williams Creeks that drain into Lakelse Lake. The discharge of nutrients, to the ground and surface waters may also have the potential to cause problems with fish toxicity and/or drinking water source contamination.

The focus of this LWMP has been to assess the impact of human habitation, including the Provincial Park facilities, and their attendant wastewater discharges, on the quality of the ground and surface waters in the Lakelse Lake/Jackpine Flats area and to develop a plan of action to prevent or mitigate any such impacts. Stage 1 was completed in February 2005. Stage 2 was completed in February 2007. Stage 3 was initiated in March 2007. This report summarizes the findings and recommendations that have developed out of the Stage 3 tasks outlined at the end of Stage 2.

Figure 1 shows the areas around Lakelse Lake that have been selected for potential wastewater treatment improvements.

FIGURE 1 – SITE CLASSIFICATION

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2 Stage 3 Tasks

At the end of Stage 2, several tasks were laid out for completion as part of Stage 3 of the LWMP process. Recommendations for Stage 3 tasks include the following:

- Investigate the means to implement some form of wastewater treatment or septic system management for all areas around Lakelse Lake at the same cost per lot regardless of whether that lot remains on on-site septic or is served by a cluster-type septic treatment or a communal wastewater collection and treatment system.

- A schedule should be developed in Stage 3 for achieving the compliance of non-complying septic systems, i.e. a five year grace period to allow alternative treatment systems to be selected and implemented around the Lake and in Jackpine Flats.

- In conjunction with senior government, i.e., Ministry of Health and Ministry of Environment, a means of ensuring compliance within the five year period, such as a septic system auditing program and the use of the Sewerage System Regulation to condemn or fine non-complying properties, should be investigated for implementation.

- Develop and formalize requirements for improved wastewater treatment in the Jackpine Flats area including the Sewerage System Regulation's requirement for Type 2 (secondary treatment) or slow percolation septic tank disposal fields in the Jackpine Flats through the passing of a bylaw that outlines the RDKS's requirements, even if the requirements are beyond guidelines in the new Sewerage Regulation Standard Practises Manual.

- Implement a larger minimum lot size for Lakelse Lake properties remaining on septic, e.g. 3000 m^2 minimum instead of the current 1700 m^2, in a revised land use Bylaw, in order to ensure that the septic systems have a higher likelihood of being sustainable.

- Promote communal wastewater treatment for the 1st Avenue area, including Kreston and Kroyer Streets, on the east side of the Lake. This would take many lots out of the inappropriate flood plain and/or surface water setbacks situations that they are in now and decrease the potential for pollution of the Lake.

- Encourage Parks to partner with the RDKS in the development of a 1st Avenue community sewer and wastewater treatment in order to further improve the treatment of the Parks wastewater. This would alleviate the need for the Park to take down hectares of trees to provide an improved wastewater treatment and disposal system of their own.

- Encourage the development of a cluster treatment system, for the septic systems along Beam Station Road to the west of Mailbox Point, and for specific areas in the vicinity of DL 5137 and DL 5138 on the west side of the Lake.

- Continue mapping the location of septic tanks and water wells in the Jackpine Flats area to ensure that drinking water wells are protected from pollution from septic tanks and/or animals on the properties.

- Continue sampling selected wells in the Jackpine Flats area to ensure that there is no change to the current situation, i.e., very little if any septic tank impacts on the ground water.

- Consider implementing an on-site treatment management program for the septic systems in the study area, based on either the Private-Private model that is used by the Capital Regional District or a Private-Public model in which the RDKS would provide contracted inspection and pump-out services at a fixed cost on a regular, e.g., once per three or four year, basis.

In addition to the above, Michael Rosen, MCIP, of Michael Rosen & Associates, Planners, put forward the following recommendations for consideration:

- Develop an OCP for the Jackpine Flats/Lakelse Lake area
- Develop a separate bylaw re: keeping of animals (targeted for Jackpine Flats)
- Amend Bylaw 57 re: minimum lot size, preventing creation of narrow lots
- Develop Lakeshore Development Guidelines
- Institute a “Siting and Use” permit system
- Develop a Subdivision Servicing Bylaw with minimum standards and requirements

3 Summary of Five Discussion Papers

As part of the Stage 3 work, five discussion papers were prepared. Summaries of the discussion papers follow. Complete discussion papers are appended to this report.

3.1 DISCUSSION PAPER NO. 1 – COMMUNAL WASTEWATER TREATMENT EFFLUENT DISPOSAL OPTIONS

During Stages 1 and 2 of the LWMP, the option of servicing many of the properties along 1st Avenue, on the east side of Lakelse Lake, with a pressure sewer system was put forward as a viable solution to the existing septic tank systems and their problems. Collected wastewater would be pumped to a treatment plant located near the Highway end of Lakelse Lake Lodge Road. The treatment plant that was conceptualized was a membrane-bioreactor with ultraviolet disinfection. This combination of treatment processes would produce a very high quality effluent that would meet the Ministry of Environment's Municipal Sewage Regulation unrestricted reuse, reclaimed water, standards. Technically, treated effluent of this quality could be disposed of or reused in many ways, including stream flow augmentation and irrigation of crop lands and golf courses. However, having an effluent that can technically be discharged to ground or surface waters without concern for impacts, does not mean that these alternatives are immediately acceptable to the public. Discussion Paper No. 1 included a review of disposal options and the potential for reuse. For the 1st Avenue communal treatment plant effluent, three effluent disposal options were investigated. These include discharge to ground, discharge to Granite Creek, and discharge to Lakelse Lake via a submerged outfall.

The disposal of the high quality treated effluent to Granite Creek would be via a short outfall pipe into the creek. The effluent from the treatment plant would be mixed with the flow in the creek through the use of several small diffusers (short riser pipes with special one-way flow valves). Based on the expected quality of the effluent and the degree of mixing and turbulence in the creek, it is very likely that a short distance downstream from the outfall, it will not be possible to find any influence on the creek water quality from the effluent, at least during most flow conditions and especially under high flow conditions. Under extremely low flow conditions, monitoring and sampling might show a small influence on the water quality. The main concern about this disposal option would be the perception that the effluent would negatively impact the fish in the creek. The second concern would be about pathogens in the creek and on the beaches adjacent to the mouth of the creek. Based on our expectations of the effluent quality, it would most likely meet the Province's guidelines for aquatic life and recreational water contact sports even before it is mixed with the creek water. The cost to construct a Granite Creek discharge would very likely be the least cost of the three options.

Ground disposal of the treated effluent would involve one of two sub-options: via a subsurface system or via a rapid infiltration basin. Both disposal methods would result in a "plume" of treated effluent that would flow towards the lake, mixing with the existing groundwater as it flows. The property owners down gradient from the ground discharge would likely have concerns regarding the wastewater treatment effluent discharge on their well water quality. While such concerns are valid, it should be noted under the current scenario these

properties currently discharge comparatively very poor quality septic tank effluents with very high pathogen contents to the groundwater. Under the current situation, anyone with a drinking water well in that area is taking a health risk if well waters are not properly disinfected before consumption. It is likely that collecting and treating the wastewaters from the 1st Avenue area and then discharging the treated high quality effluent to the ground could actually be an improvement to the existing situation. Disinfecting well water would still be prudent but the disinfection efforts required to meet the required pathogen kills would be easier to achieve than under the existing situation. The cost of developing either a sub-surface disposal system or a rapid infiltration basin system would likely be higher that a direct discharge to Granite Creek, but much less costly than an outfall directly into the Lake.

The discharge of treated effluent to Lakelse Lake via an outfall would potentially result in effluent being discharged into a thermodynamic "trap". For most of the year, the 10°C to 18°C effluent is warmer than the water temperature in the deepest parts of the lake, even in the hottest months of the year. As a result, the effluent will initially rise away from the outfall due to its lighter density, and as it rises, it will mix with the lake water and, at some point, well below the lake surface, the temperature will be the same as the natural lake water and the effluent will stop rising. This is the "trapping" depth. Based on the target effluent quality prior to discharge, with a dilution from the outfall diffusers likely in the 1:100 range, it would likely be impossible to sample the water at the trapping depth and determine that there is any difference between that water sample and anywhere else in the Lake with respect to pathogens, phosphorus or any other chemical or biological parameter. Ice formation will most likely not be impacted by the effluent discharge. In the winter, while the effluent plume will still rise and mix based on thermodynamic buoyancy, it may not be completely trapped below the bottom of the ice. Construction of an outfall would be the most expensive option of the three reviewed in this discussion paper.

The quality of the proposed 1st Avenue service area wastewater treatment plant effluent would make effluent reuse a possibility. The possibilities for reuse include: toilet flushing and lawn irrigation, forestry irrigation, and golf course irrigation. Toilet flushing would require the creation of a reclaimed water distribution system and special considerations for plumbing within the buildings. Similarly, the same water could be used to irrigate private lawns. While both of these are technically possible, there would be concerns by the public about the health and safety of such systems. Forestry irrigation would require creation of a reclaimed water pipeline to a nearest forestry area where the water could be sprayed out into the trees with the benefit being increased rate of growth during the relatively dry summer months. During the winter, such irrigation would be of no benefit or problematic. Golf course irrigation would be a seasonal effluent reuse and would require the development of a golf course nearby.

By having a treatment plant capable of producing a high quality effluent that could be used in an unrestricted reuse situation, the likelihood of a real impact from discharge to Granite Creek, the ground or Lakelse Lake is very low. Nevertheless, the selection of the actual disposal method and location will be influenced by public perception and opinion. For the purposes of this planning exercise, it was expedient to simply choose the most costly option, the Lake outfall, and then use the cost of that option in the discussion of the financing of the implementation of the LWMP.

3.2 DISCUSSION PAPER NO. 2 – POTENTIAL COST RECOVERY METHODS

The proposed wastewater treatment program will have costs related to the initial construction, as well as the on-going day-to-day costs of operating and maintaining the facility. Discussion Paper No. 2 investigated potential cost recovery methods that could be used to support the overall wastewater treatment improvements program. Programs such as infrastructure grants could cover some of the capital costs. However, there will still be a portion of the capital cost and all of the operation and maintenance costs that will have to be paid for directly by the users of the system. There are several means by which the cost of repaying capital, borrowing interest, and operation and maintenance costs may be funded. These include assessment-based fees, flat rate fees, water meter-based user fees, and combinations of the above.

Assessment-based fees would be based on the value of the property, as shown on the tax roll, and would be proportional to the value of the property. The RDKS would simply require the total amount to be paid for the year, the total assessment, and the individual property assessments. Barring delinquent payment of fees, the use of assessment-based fees guarantees that the required funding will be available to cover the annual facility costs. The disadvantages of this system include potential lack of equitability and the lack of incentive to decrease wastewater generation. Since fees are based on property assessments, it is assumed that the assessed value of a home and the ability to pay taxes or fees is related. This is often not the case.

Flat rate systems are sometimes called parcel taxes. As with assessment-based fees, the flat rate system would be very easy for the RDKS to administer. All the RDKS requires are the total amount to be paid out over the year and the total number of connections to calculate what each parcel should pay. The flat rate system offers no incentives to generate less wastewater, and does not address inequitability. A home with two users still pays the same as a home with ten users. When the complication of commercial users comes into effect, the flat rate system really breaks down because the number of users in a commercial establishment in RDKS can be substantial. This would potentially lead to the need for a multi-tier flat rate system that would have residential users pay one flat rate and commercial users paying another flat rate.

Flow-based fees are typically an attempt at sharing the costs of the treatment plant on an equitable basis. Since monitoring wastewater flows is typically not easy and is expensive, it is more common to simply use water meter flow data as a surrogate for wastewater flow data. While flow-based fees might seem to solve the problems of inequitability, they don't in the case of seasonal users and, in particular, summer seasonal users. Although the amount of flow that these users generate may be small in total volume, the time at which they demand the service occurs exactly at the same time as the peak wastewater generation period. The other potential problem with a flow-based user fee program is that it can promote water conservation. While this is normally a good thing, from a revenue generation viewpoint, water conservation and wastewater flow decreases mean that there could be a shortfall of revenue in a given year.

All the cost recovery methods described above would work, at least to some degree. However, each method has some inherent inequitability issues. As a result, it may be better to use a combination of methods, which would alleviate most inequitability and decrease the possibility of having a revenue short fall. This could be a parcel tax to cover the fixed costs and a user-fee to cover the operating costs.

3.3 DISCUSSION PAPER NO. 3 - OVERALL LAKELSE LAKE WASTEWATER SYSTEM OPTIONS AND COSTS

At the end of Stage 2 of the LWMP process, it was concluded that efforts would be made to manage the wastewater from around the entire perimeter of Lakelse Lake. This was to include some wastewater collection and treatment and management of the on-site systems that were not on some form of collection system. Some of the areas currently on on-site treatment, i.e. septic tanks, would remain on septic tanks but would be included in a RDKS-organized septic tank management system designed to maintain the working condition of these systems. Other areas currently on septic tank systems would be converted to cluster-type treatment systems with septic tank effluent pumps (STEP system) pumping through a small diameter (100 mm) force main to a cluster-type septic tank system situated well away from the Lake, out of the flood plain. Other areas, such as the 1st Avenue area on the east side of Lakelse Lake, would be put on a communal system with STEP system tanks and pumps pumping the settled wastewater to a communal treatment plant as discussed in Discussion Paper No. 1 above. All lots around Lakelse Lake, even those not on the shoreline, would be included in this program.

Six different management scenarios were developed and discussed in Discussion Paper No. 3. In all cases, having a 1st Avenue collection and treatment system was a given condition. The six scenarios were based on "Yes/No"-type answers to three questions.

- Management of septic systems? Yes or No?
- Level of the cluster treatment? Minimal or medium?
- Is the Park included? Yes or No?

The six scenarios investigated were as follows:

1. Scenario 1 - Management of septic systems, minimal level of clusters, 1st Avenue system with the Park considered.
2. Scenario 2 - Management of septic systems, minimal level of clusters, 1st Avenue system with the Park excluded.
3. Scenario 3 - Management of septic systems, medium level of clusters, 1st Avenue system with the Park considered.
4. Scenario 4 - Management of septic systems, medium level of clusters, 1st Avenue system with the Park excluded.
5. Scenario 5 - No septic system management, medium level of clusters, 1st Avenue system with the Park considered.
6. Scenario 6 - No septic system management, medium level of clusters, 1st Avenue system with the Park excluded.

Within these six scenarios, the capital costs of the various sized cluster treatment and/or communal treatment systems were developed on the basis of previous cost estimates for specific number of lots (for cluster systems) or flows (for communal systems), updated as required, and then fit to curves as a function

of the number of lots or flow, for interpolation between specific data points. This procedure is sufficient for planning purposes and the direct comparison of options but will not be suitable for ultimate budgeting purposes.

Annual operation and maintenance costs were based on "rule-of-thumb" percentages or flat rates for the various system components, as provided below:

- Communal treatment plant operation and maintenance (O&M) = 5% of capital
- Sewer system for communal system = 1% of sewer system cost
- STEP system O&M = 2% of capital
- Cluster systems including STEP systems and sewer system = 2% of capital
- Management of on-site systems = $150 per lot (assuming one system per lot)

As shown in Table 1, the overall total capital costs (without grants) ranged from approximately $5.52 million to about $8.21 million. Without grants, the capital cost per lot averaged between about $19,250 to about $20,800 based on only the lots receiving cluster or communal treatment, in the particular scenario, sharing the capital cost equally. This is still less than upgrading individual lots to Type 2 (secondary treatment). With a two-third grant, which individuals could **not** receive, the capital cost per lot would be between about $6,500 to $7,000 or about $525 to $670 per year (based on a 20 year, 5% amortization of one third of the capital cost). In the three scenarios that include the Park, the per lot equivalent for both capital and O&M costs is less than the same scenario, but with the Park excluded, because of the increase in equivalent lots when the Park is included. For the O&M costs, the amount ranged from about $595 to about $670 per lot per year, for totals of approximately $1,100 to $1,220 per year. STEP system maintenance would be additional.

3.4 DISCUSSION PAPER NO. 4 - ESTIMATED COSTS OF OPERATING A SEPTIC SYSTEM MANAGEMENT PROGRAM

Septic tanks are the main component of a Type 1 on-site wastewater treatment system. It is important that these tanks are properly maintained if the septic systems are to function on a sustainable basis. One of the main components of the proposed LWMP is a program that will help manage the operation of the septic tank systems within the study area including around Lakelse Lake and in Jackpine Flats. The main components of this program will include the following:

- An education program regarding the location and operation of septic systems and drinking water wells. This program will be conducted through twice-yearly educational flyer mail outs.
- A surface water and well water monitoring program to monitor conditions in the Lakelse Lake, Williams Creek, Sockeye Creek, and in the groundwater in Jackpine Flats. This program would be based on annual sampling to identify any trends in water quality deterioration that may occur.
- A program, administered by the RDKS that would have the septic tanks on all lots in the study area pumped out and inspected once every three years, regardless of usage. This would help to ensure that the operation of both the septic tanks and disposal fields that remain and the septic tanks used in the STEP-based systems are in good operating order.

Table 1 Summary of Lakelse Lake Wastewater Management Options with "Management" Lots out of the costing

Scenario	Management of Septic Systems?	Level of Clusters	Park included?	No. of Equivalent Lots	No. of Communal or Cluster Lots	No. of Management Lots	Capital Cost (no grants)	Capital Cost/lot (no grants)	Annual O&M estimate	Annual O&M per lot*	Annual Capital Cost per lot (c/w 2/3 grant)	Total per lot per year
1	Yes	Minimal	Yes	495	344	151	$ 6,612,300	$ 19,222	$ 204,462	$ 594	$ 514	$ 1,108
2	Yes	Minimal	No	417	266	151	$ 5,522,300	$ 20,761	$ 176,095	$ 662	$ 555	$ 1,217
3	Yes	Medium	Yes	495	422	73	$ 8,208,300	$ 19,451	$ 236,382	$ 560	$ 520	$ 1,080
4	Yes	Medium	No	417	344	73	$ 7,118,300	$ 20,693	$ 218,966	$ 525	$ 553	$ 1,078
5	No	Medium	Yes	422	422	0	$ 8,208,300	$ 19,451	$ 236,382	$ 560	$ 520	$ 1,080
6	No	Medium	No	344	344	0	$ 7,118,300	$ 20,693	$ 208,016	$ 605	$ 553	$ 1,158

* Cluster and Communal lots only. Septic tank (Type 1 and STEP system tank) maintenance in addition to this for all lots in the study area.

**- Assuming 2/3rd Grant, 5%, 20 yr

The septic system management program could be based on the "Public-Private" model discussed previously in Stage 2 of the LWMP. In this model, the ownership and responsibility for the maintenance and repair of septic systems would remain with homeowners. However, the RDKS would provide a service that would coordinate the once-per-three year pump-out and inspection of the septic tanks and, as necessary, the disposal fields.

A conceptual budget, based on servicing 625 septic tanks (Type 1 and STEP tanks) in the study area was developed and will be further refined at the time of program implementation. At this point in the process, it is anticipated that the average annual cost to the septic tank owners will be in the order of $120 to $125 per year per septic tank (including the STEP tanks but excluding the cost of cluster or communal wastewater treatment for those that receive that service). A review of the Private-Private model, where the homeowners would arrange the pump-outs and inspections and RDKS would only do the record keeping, has a cost of about $120 per year per septic tank.

3.5 DISCUSSION PAPER NO. 5 - PROPOSED LWMP IMPLEMENTATION PLAN

The Lakelse Lake/Jackpine Flats LWMP has resulted in the intent to implement programs that will help protect the water quality in Lakelse Lake. The two main components of the LWMP are a septic system management program and development of communal and cluster treatment systems to take the most vulnerable and potentially highest pollutant source septic systems off ground disposal. To get to those programs, a number of items need to be implemented. This list includes the following:

1. Changes to bylaws, i.e. lots sizes for septic systems and land use regarding animals.
2. Changes to the minimum design standards for Jackpine Flats septic systems.
3. Development of a specified service area bylaw.
4. Implementation of an educational program regarding well head protection and septic system operation.
5. Implementation of a water quality monitoring and data management system.
6. Septic system management plan including location mapping and a servicing and inspection program.
7. Implementation of the 1st Avenue sewer system.
8. Implementation of the cluster-type septic systems.

This management system should be implemented via the Specified Service Area Bylaw very soon after the approval of the LWMP.

The 1st Avenue sewer system will take several years to fully implement. The following steps will be required:

1. Preliminary investigation of the sewer alignment.
2. Location of the existing septic tanks to determine whether they will need to be replaced and/or moved to be used in the STEP system.

3. Preliminary engineering study to determine a more accurate cost estimate for the grant submission.
4. Submission of a funding grant application to the Provincial and/or Federal governments along with the cluster systems.
5. Once the grant has been received (likely several months between submission and success), environmental impact studies for the creek crossings will be required.
6. This would be followed by detailed design of the sewer and treatment systems.
7. Phased tendering and construction, starting with the 1st Avenue south area and the new treatment plant.
8. Continued tendering and construction moving northward to encompass the entire 1st Avenue sewer catchment area.

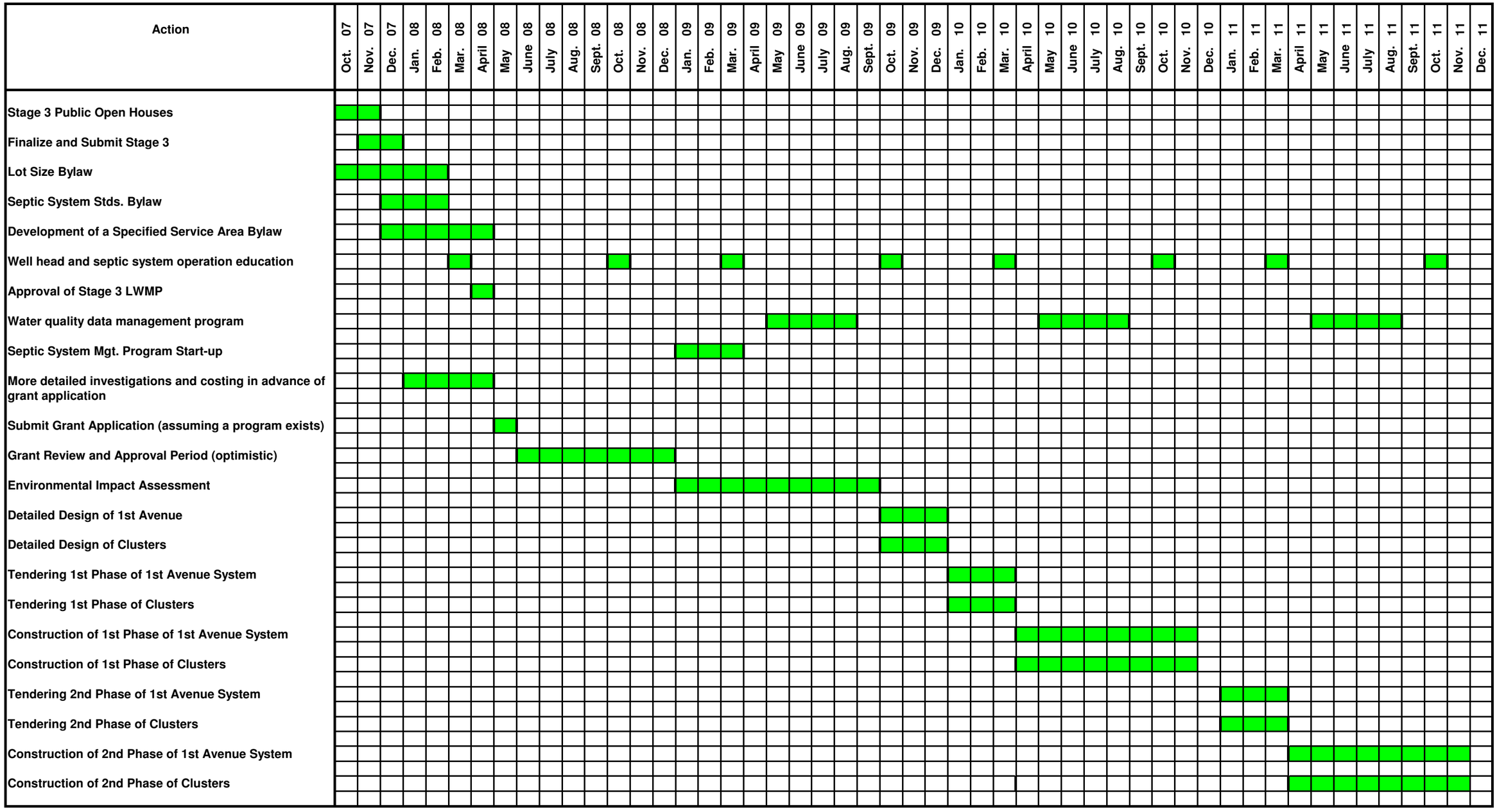
The cluster systems will primarily be on the west side of Lakelse Lake. They will need to be implemented over several years as well. The following steps will be required:

1. Preliminary investigation of the sewer alignment(s) and communal septic system locations.
2. Location of the existing septic tanks to determine whether they will need to be replaced and/or moved to be used in the STEP system.
3. Preliminary engineering study to determine a more accurate cost estimate for the grant submission.
4. Submission of a funding grant application to the Provincial and/or Federal governments along with the 1st Avenue system.
5. Once the grant has been received (likely several months between submission and success),), environmental impact studies for the creek crossings will be required.
6. This would be followed by detailed design of the sewer and the communal septic systems.
7. Phased tendering and construction, starting with Beam Station Road area.
8. Continued tendering and construction moving eastward and northward to encompass all of the identified cluster system areas.

Based on the above, one example overall implementation plan is shown in Figure 2.

Figure 2 starts with completion of the Stage 3 process at the end of 2007. There is still a significant amount of work to prepare enough detail for an infrastructure grant application in 2008. Once the grant is approved, allowance is required for environmental impact studies for all the creek crossings that will be involved in the sewering component of implementation. This would be followed by detailed design, tendering and construction of the first Phases of the 1st Avenue system and the initial cluster/communal systems in 2010. The proposed implementation schedule ends with completion of Phase 2 of the 1st Avenue system and Phase 2 of the cluster/communal septic systems in late 2011.

Figure 2 Proposed Lakelse Lake/Jackpine Flats LWMP Implementation Plan Schedule



4 Overall Summary and Recommendations

A LWMP is undertaken in three stages. The RDKS has completed Stages 1 and 2. Stage 1 involved identifying both, existing liquid waste management systems and available options for managing liquid wastes. Stage 2 evaluated the management options developed in Stage 1. This stage, Stage 3, uses the information developed in both Stages 1 and 2 to help refine costs and develop an implementation plan for the LWMP.

Stage 3 confirmed areas for cluster, communal, and on-site treatment based on Stage 2 and updated previous cluster and communal treatment cost estimates, including discharge alternatives. Cost estimates for private-private and private-public on-site treatment management programs were also developed. The RDKS planning components and schedule related to the LWMP strategy was reviewed and an equitable capital and operational cost recovery scheme with/without Parks was developed along with an implementation schedule.

The two main components of the RDKS LWMP involve a septic system management program and development of communal and cluster treatment systems to take the most vulnerable and potentially highest pollutant source septic systems off ground disposal. In order to be effective the following items are recommended:

1. Changes to RDKS bylaws, i.e. lots sizes for septic systems and land use regarding animals.

2. Changes to the minimum design standards for Jackpine Flats septic systems.

3. Development of a specified service area bylaw for the study area, including consideration of an education program, a water quality monitoring program, wastewater collection and treatment and a septic system management program, complete with a multi-tiered parcel tax-based fees system.

4. Implementation of an educational program regarding well head protection and septic system operation.

5. Implementation of a water quality monitoring and data management system.

6. Septic system management plan including location mapping and a servicing and inspection program.

7. Implementation of the 1st Avenue sewer system starting with a pre-grant application preliminary engineering study to refine and tighten cost estimates.

8. Implementation of the cluster-type septic systems starting with a pre-grant application preliminary engineering study to refine and tighten cost estimates.