CEDAR LANE WATER SYSTEM

FEASIBILITY STUDY

SALT SPRING ISLAND, BC

Prepared by: **Gary Hendren, AScT**
Local Services Engineering Coordinator

Richard H. Edwards, PEng
Design Engineer

Capital Regional District

October 2006

CHAPTER 1 – INTRODUCTION

1.1 AUTHORIZATION

The Capital Regional District (CRD) was approached by the Cedar Lane Waterworks District in February 2005 to complete a cursory review of their water system with respect to the potential upgrade costs for the Improvement District (ID) to become a water local service of the CRD. The cost estimate was then used in a February 2005 grant application for funding through the British Columbia Community Water Improvement Program.

The Province of British Columbia approved the project and in November 2005 pledged a two thirds grant on the $475,000 project, subject to the ID becoming a water local service of the CRD.

In June 2006 the CRD received authorization from the ID to proceed with the preliminary design report necessary to calculate the capital and operational costs that would be associated with the ID becoming a water service of the CRD. The cost of this report was estimated at $5,000, which the ID agreed to fund.

1.2 SCOPE

This report is a preliminary technical review of the infrastructure and operation of the Cedar Lane water system. Work was carried out to assess the system condition capacity and performance and to assess those areas of the water system that do not meet the typical standards of the CRD. The cost for water system infrastructure improvements and the costs for operating and maintaining the utility to CRD standards were summarized as a total annual cost and on an annual unit cost basis which residents of the ID area would expect to pay as a CRD service.

Subsequent to the final report, residents of the Cedar Lane ID may elect to be poled to determine whether they favour a proposal to create a new water local service under the CRD and to have the CRD carry out upgrade works proposed in the study. The residents, however, may wish to receive the report for information only, to be used as a guide to budgeting for improvements to their water system. This decision may be influenced by the availability of provincial funding which offers to pay two thirds of the eligible capital costs for the works as outlined, should residents support conversion of the ID to a new CRD service.

1.3 STUDY AREA

The Cedar Lane Waterworks District is a small community of 38 lots along Cedar Lane, Mansell Road and Kangro Road located approximately 1.5 kilometers north of Ganges on Salt Spring Island. *Figure 1* shows the local service area.

The zoning for the area is *rural residential.* There are existing homes on 36 of the 38 properties, the majority are year-round residents.

The climate is cool Mediterranean, experiencing a mean annual precipitation of approximately 760mm (30 inches). The community is located in an undulating area with elevations between approximately 70 metres and 40 metres.

CHAPTER 2 – EXISTING WATER SYSTEM

2.1 GENERAL

The Cedar Lane Waterworks District has developed since the early 1970's, based upon five wells, two of which are connected to the system. There are approximately 950 metres of 100 mm (4 inch) asbestos cement (AC) and 350 metres of 50 mm (2 inch) PVC mains, three fire hydrants, two standpipes, a 12,000 imperial gallon (Igal) steel reservoir and a booster pump station with multiple hydropneumatic tanks. (see Figure 2.

2.2 SOURCE

The original system drilled five wells, three of which were initially used. Table 1 provides information on their initial capacities.

Table 1 – Cedar Lane Well Information

Well #	Depth (ft)	Capacity (Igpm)
1	205	4.0
2	205	1.5
3/4	N/A	N/A
5	120	5.5

The capacities shown in Table 1 are not sustainable. The present summer operation experiences problems when the combined yield from wells 1 and 5 exceed 3,500 Ig. Well number 2 is not in service, it is believed to be dry. Pump tests should be carried out on all the wells to determine what a sustainable yield would be from each.

Wells 1 and 5 operate separately under their own in well float switch, with the pumps being activated by a single float switch in the reservoir. Each well is individually metered. The wells pump directly into the distribution system. Wells 1 and 5 are located within wooden buildings upon rights of way.

There is no treatment, no filtration of the source water and the utility has been under a boil water advisory since October 2001, based upon a system that contained both faecal and total coliform contamination.

2.3 DISTRIBUTION SYSTEM

The untreated groundwater is pumped through 50mm PVC into the distribution system, the 100mm AC mains or to the reservoir. The 1,300m of mains are located 2/3 within road allowance and 1/3 within rights of way. There are three hydrants off the 100mm AC mains and two standpipes at the extremities of the system. Each of the 36 serviced properties are metered as is each well. The system has a booster pump station with several hydropneumatic tanks that pressurize the system from the reservoir source. When the wells are pumping they go directly to the distribution system unless the demand is so small that they can refill the reservoir. Well #1 has a high head required to provide a pressured supply to the user; Well #5 pumps to the suction side of the booster system.

The community has a single pressure zone, with the hydropneumatic system operating off the 10,000 Ig storage reservoir. Pressures generally range in the 30 – 60 psi range; properties on Kangro Road are in the 90 psi range. Pump records from January 2005 to October 2006 for wells 1 and 5 indicate consumption varies between 3,000 to 5,000 Igpd. Individual meter consumption records correlate fairly closely to bulk readings suggesting the system is tight.

2.4 RESERVOIR STORAGE

The 12,000 Ig steel tank is in need of coating both inside and out, also it has no cathodic protection against corrosion. The top access hatch as well as vent piping requires screening and better sealing. A review by a structural engineer will be required to assess the present tank structure and to determine the appropriate structural upgrading and coating requirements and costs to determine if upgrade or replacement should be undertaken.

The storage reservoir is connected to the wells by buried cable for communication purposes as well as by supply/distribution mains. The limited capability of the wells to fill the tank results in significant drawdown of the reservoir during the day. The reservoir acts as the source for the hydropneumatic system. Emergency storage is limited.

2.5 FIRE PROTECTION

The existing system has three fire hydrants and two standpipes installed off the 100mm AC and 50mm PVC mains respectively. The lack of elevated storage and the reliance upon a hydropneumatic system to pressure the distribution system severely limits the ability of the system to provide any significant level of flow through the hydrants; likely 100 – 150 Igpm maximum. The required flow rate established for a rural residential community by the Fire Underwriters Survey (FUS) is 440 Igpm for a duration of one hour. The water system, like many small water utilities, does not meet the requirements of the FUS. In order to achieve the Fire Underwriters minimum standard of 440 Igpm, replacement of the small diameter mains with larger 150 – 200mm (6" – 8") would be required as would a larger reservoir with a minimum of 26,400 Ig for dedicated storage capacity, in addition to maximum day balancing storage. In addition, a dedicated fire pump system would be required to enable delivery.

The Salt Spring Island Fire Department has indicated they would typically respond to residential fire situations using their pumper and tanker trucks which are deployed with a bladder (portable holding tank). The department assumes that adequate water volume and pressure is not available from the water system and will respond to a fire in the Cedar Lane area in this manner, with the bladder, refilled with system water through hydrants as available.

CHAPTER 3 – SYSTEM ISSUES

3.1 GENERAL

The CRD, in the operation of a public water supply, strives to provide water to its customers in adequate quantity and with quality exceeding the Canadian Drinking Water Guidelines (CDWG). Operationally the system must address safety concerns as well as being cost effective. The evaluation of the existing and required water infrastructure within the Cedar Lane water system was made with these criteria in mind.

The Cedar Lane water system has major issues with both quantity and quality of water available. The two wells, 1 and 5, have very limited capacity. They were running at a maximum rate of approximately 1,000 Igpd (0.7 Igpm) and 3,000 Igpd (2.1 Igpm) respectively during the summer of 2006. The boil water advisory has remained in place since October 2001. The maintenance of the system has been very limited due to lack of capital. System works have been delayed over the past few years pending the outcome of this study and the potential for becoming a water local service of the CRD.

The major concerns the CRD has identified with respect to the Cedar Lane water system are as follows:

- The system is under a boil water advisory.
- The source of contamination is unknown.
- There is no disinfection of the source water.
- There is no treatment of the source water.

- There are elevated levels of manganese in the source water.
- Wells 1 and 5 pump directly into the distribution system.
- There is limited quantity available from the present two sources (well 1 and 5)
- The actual safe yield of all five wells is unknown.
- The wells that are not to be used require sealing to meet new groundwater legislation.
- The 12,000 Ig reservoir requires a structural evaluation to determine if it should be replaced or coated, inside and out, and brought up to a standard to retain potable water.
- The individual services require backflow devices installed to meet code.
- The hydropneumatic system needs to be replaced; several of the tanks are not operational.
- The pumps, hydrants, valves and standpipes require maintenance and evaluation and possible replacement.
- The exact location of the pipelines within both road allowance and R/W's needs to be defined and vegetation removed above.

These issues will be further addressed in Chapter 4.

3.2 DESIGN CRITERIA

Theoretical design criteria typically used by CRD are taken from the Ministry of Environment (MOE), Islands Trust, Fire Underwriters Survey and Canadian Drinking Water Quality Guidelines.

The following design criteria have been used to evaluate the recommended capacity of the various components for the Cedar Lane water system.

1) Maximum Day Demand
   The maximum day value of 500 imperial gallons per connection per day (Igpconpd) has been used to size well pumping requirements, supply line to the reservoir, water treatment and reservoir storage components of the water system.

2) Peak Hour Demand
   The peak hour demand has been used to evaluate the pipeline capacity. The peak hour demand is achieved from reservoir storage draw down and is approximately three times the maximum day value. This demand typically occurs between 8 – 10 a.m. and 5 – 8 p.m.

3) Annual Average Demand
   The annual average rate is used to determine the volume of water required as a supply source; typically it is obtained by dividing the maximum day value by 1.5.

4) Fire Flows
   The Fire Underwriters Survey of the Insurer's Advisory Organization (IAO) has established specific requirements for a water system to meet to be recognized and graded for fire protection purposes. The rating of the IAO is provided to insurance companies as a means to assess risk in setting of insurance rates. At the present time, the Cedar Lane water system is not recognized by the IAO. One of the main interests of the IAO in rating a system is the ability to maintain a minimum fire flow over a specific period of time for various types and uses of buildings. The minimum rural residential demand is 440 Igpm for one hour with a minimum residual pressure of 20 psi, when provided in conjunction with maximum day demand.

5) Distribution System Pressure
   The range of system pressures should be between 120 and 35 psi under all normal supply conditions. The exception would be under fire flow conditions where a minimum 20 psi residual pressure to the property line would be acceptable.

The system pressure is achieved by utilizing the supply head, by pumping, or by elevated storage reservoirs. The present system pressure is from the balancing reservoir which provides between 30 – 90 psi at the metered sources.

6) Reservoir Storage
There are three major components of reservoir storage:

a) Peak hour balancing – this is the volume of water required to provide the difference between instantaneous demand and maximum day system requirements which are used to design pump and treatment components. This amount is equal to one quarter of maximum day demand.

b) Fire protection – this is a volume of water available from storage equal to the potential fire demand within the reservoir supply area. The minimum recognized volume is either 220 Igpm for two hours or 440 Igpm for one hour duration (26,400).

c) Emergency storage – this is the volume of water held for supply of the utility during extended power outages and is related to typical system demand and duration of outages. If fire protection is also provided, additional emergency storage is not often considered in the reservoir volume calculation.

Reservoir sizing is usually taken as the worst of 1+b+c.

7) Summary of Future Requests

a) Maximum day flow rate	500 Igplotpd = 500 x 38 = 19,000
b) Peak hour flow rate	3 times max day = 40 Igpm
c) Annual average flow rate	max day /1.5 = 333 Igplotpd
d) Fire protection	440 Igpm for 1 hour = 26,400 Ig
e) System operating pressure at property	35 – 120 psi
f) Reservoir storage	balancing + fire protection $\frac{500 \times 36}{4}$ + 26,400 = 30,900
g) Population development	36 lots presently serviced, 38 potential

Note:
The system is metered from source on a weekly basis indicating the existing 36 properties use a maximum of 4 – 5,000 Igpd (140 Igplotpd) to an average of 3,500 Igpd (100 Igplotpd); these values are significantly less than the design figures of 500 and 333 Igplotpd respectively.

3.3 WATER QUALITY

Raw water analysis from January and August 2003 are included in Appendix A. The water chemistry indicates well #1 has moderately hard water, while well #5 has hard water; both wells #1 and #5 have manganese levels greater than six times the Maximum Acceptable Level (MAL). While this is an aesthetic requirement, if left untreated it would result in staining of laundry and fixtures.

CHAPTER 4 – SYSTEM IMPROVEMENTS AND COSTS

4.1 GENERAL

For the CRD to take over the infrastructure of the Cedar Lane Water District to form a new CRD local water service, a commitment would be required from the residents of the water district to fund necessary infrastructure improvements.

The improvements considered necessary to ensure safe operation of the water system able to supply the customer with adequate potable water meeting CDWQG include the following:

- Complete an evaluation of existing sources, determine safe sustainable yield.
- Determine if anticipated system demand can be met from existing available sources; if not develop new source/sources.
- Abandon any well not required to avoid potential future aquifer contamination.
- Complete water quality analysis on all sources to be used by the utility.
- Design and construct a water treatment facility to address all quality issues in source water. Size the facility to include new hydropneumatic system.
- Pipe source water direct to treatment facility.
- Design and install a primary and secondary disinfection system to ensure disinfection of the source and the provision of a measurable residual, including monitoring and alarm equipment which via Supervisory Control and Data Acquisition (SCADA) can poll this information.
- Complete a structural evaluation of the existing 12,000 Ig reservoir to determine its suitability to be retained or replaced.
- Install meter setters with dual check valving on all individual service connections to meet new backflow requirements of Ministry of Health (MOH).
- Complete a maintenance overhaul of all mechanical equipment and catalogue items (hydrants, standpipes, valves, pumps, hydropneumatic tanks).

4.2 SOURCE DEVELOPMENT

The five wells were drilled in the early 1970's; presently only wells #1 and #5 are in use for the utility. The condition of the steel casing, which seals the source groundwater from the influence of surface conditions needs to be reviewed for all five wells since, if it were compromised, the potential for surface water to carry contaminants down to the aquifer could occur.

The present production of wells #1 and #5 in the summer of 2006 was recorded at a maximum of approximately 1,000 Igpd and 3,000 Igpd respectively for a total of 4 – 5,000 Igpd which is far less than the design rate of 19,000. This low rate of usage can be attributed to the present quality issues, namely boil water advisory and the staining through manganese. Once these have been addressed, it is likely that consumption rates will increase and, as such, the system improvements need to be based upon this potential increase.

A pump test to determine the safe yield of all the existing wells should be undertaken to determine what is actually available for the community. It is unlikely that there will be sufficient volume available from these five sources, so it may be necessary to look for alternate source/sources. These may be groundwater (wells) or surface water, i.e. North Salt Spring Waterworks (NSSW). There is considerable development ongoing throughout the area and, as such, several new wells have gone in to support the growth; groundwater is a limited resource.

The utility is approximately 1.6 kilometers outside the NSSW area. NSSW uses water form Maxwell and St. Mary Lake to supply their service area. If NSSW had surplus water available, this may be an option, however initial inquiries indicate there is no surplus presently available, nor is there intent to extend their boundaries.

The development of additional groundwater is therefore the more likely direction, along with the abandonment of any of the existing wells that provide insufficient yield.

4.3 WATER TREATMENT

Water treatment is required to address the quality issues to enable the system to comply with the CDWQG. Within the Cedar Lane system, of present concern are total and faecal coliform levels as well as elevated manganese levels. The CRD has experience with groundwater development at several of its

Southern Gulf Islands and other utilities. The presence of compounds, chemical, bacteria and other parameters within the raw water source can be dealt with in a multitude of ways, dependent upon what needs to be removed. The existing problems with the Cedar Lane source relate to the presence of bacteria microorganisms, manganese and the fact that well #5 is considered to produce hard water. The bacteria microorganisms can be addressed by disinfection. The hardness and elevated manganese can be treated by filtration (softener) and oxidation respectively. The water quality analysis done on the potential sources would determine if any other compound required removal to meet the CDWQG.

4.4 DISINFECTION

Disinfection is the destruction or inactivation of pathogenic and non-pathogenic microorganisms existing in the source water to an acceptable level, as determined by the Ministry of Health Services.

There are two types of disinfection; primary, which ensures inactivation of pathogenic organisms prior to the first customer, and secondary, which ensures continuation of the disinfection process by maintaining a measurable residual concentration of disinfectant throughout the distribution system.

Chlorine, or one of its related compounds, has historically been the most commonly used primary disinfection agent, others include ozone and ultraviolet light (UV). Secondary disinfection cannot be achieved through ozone or UV since a measurable disinfectant residual must be monitored in the water to ensure the acceptable continuation of the disinfection process. Both ozone and UV are good primary disinfection mediums, however, due to their short life span they do not provide a residual that can be measured in a distribution system.

Recently, concerns regarding potential health hazards of disinfection by-products (DBPs) have led to limits on such DBPs as Trihalomethanes. Trihalomethanes result from the reaction between a halogen (chlorine) and a precursor (organic matter by-product). The limit of 100 micrograms per litre of sampled water is based on an average annual of a minimum of four quarterly readings.

For the Cedar Lane system, it is recommended that UV be installed as the primary disinfection method and that the secondary disinfection system be chlorine based, with monitoring devices and alarms to ensure the presence of the disinfection agent. The proposed system would direct each source in its separate dedicated main to the treatment facility where the sources would be treated a necessary and disinfected by UV. The water would then be chlorinated to produce the measurable residual and discharged to the reservoir. The monitoring would be on reservoir discharge.

4.5 RESERVOIR

The existing 12,000 Ig steel tank was installed in 1973 upon a compacted gravel base. The tank is in need of repair or replacement. A structural evaluation of its condition should be undertaken to determine if it is viable to repair the issues or replace it with a new tank.

The issues relate to the condition of the tank, its seismic value, the thickness of the tank from 1973 would likely not meet present day requirements. The coating, both inside and out, needs replacing. To do this would require a manway be installed in the side of the tank to meet Workers Compensation Board (WCB) requirements. The reservoir venting and top access hatch needs screening and sealing respectively and the tank sits upon a compacted gravel base that is being undermined. The work required to repair this tank may outweigh its value to the utility, especially when considered with the required capacity for the community.

The design size for the reservoir if fire protection were to be considered would be 30,000 Ig, however, a more realistic value would be based upon emergency storage and balancing which would require a 23,500 tank. Therefore the installation of a new 20,000 Ig tank would be recommended.

4.6 SERVICE CONNECTIONS

New drinking water guidelines require that backflow devices be installed when making connections to a distribution system; this will require the retrofitting of dual check valve assemblies at each of the metered connections to the 36 presently serviced properties. In addition, any future service connection must be provided with the backflow prevention system.

The new regulations requiring installation of backflow devices when connecting to a water distribution system mean that all new installations have to come with the backflow device. Existing systems, however, are being given time to comply with this requirement.

4.7 LEAK DETECTION

The Cedar Lane system is metered at both well and also at individual household take-off points. This enables the utility to check on leakage within the system. In the case of Cedar Lane, due to the very limited source of water, when a leak has occurred the system has run out of water prior to the leak being detected through meter readings.

Typical causes of leakage include root damage, where the growing root causes a fracture of the pipe over time, poor bedding of the pipe where, over time, settlement of the ground may bring rocks or boulders into direct contact with the pipe causing breakage and surges in water pressure within the water system which will, over time, find the weak spot in a system. More often the leak occurs on the customer side. These small leaks (toilets, taps or hose bibs) are readily apparent at the time of reading the household meter.

The pipeline route is approximately 2/3 within road allowance and 1/3 within rights of way or easement; this area should be cleared of trees to protect the pipe.

4.8 SYSTEM MAINTENANCE

The Cedar Lane system is 30 years old and would appear to have minimal maintenance allocated, with the very typical approach to be *fix it when it breaks* rather than maintain in advance. If the CRD were to take over the system an overhaul of all the mechanical components would be undertaken along with cataloguing of individual components and the establishment of regular programmed maintenance. This would apply only to the items that would be incorporated into the upgraded system.

4.9 SUMMARY OF IMPROVEMENT COSTS

The system upgrade works has been costed on a component basis, which when fully funded, will offer increased water quantity and quality and permit the system to be operated cost effectively and safely for a considerable period of time. The costs for the works are estimated as follows:

Source development, including verify capacity, develop new potential, install appropriate well pumps, ensure status of well casings, abandon sources not required.	$120,000
Water treatment facility including softener/filter, UV primary disinfection, chlorine secondary disinfection, controls, alarms and hydropneumatic system.	$180,000
Pipelines from sources to treatment	$60,000
New 20,000 Ig reservoir	$85,000
Backflow at meters	$20,000
System maintenance	$10,000
TOTAL	**$475,000**

Costs include an allowance for engineering design and construction and taxes.

4.10 ADDITIONAL CAPITAL CONSIDERATIONS

If the utility decided it wished to upgrade the system to provide fire protection it would have to replace the 100mm mains with 150mm mains at a cost of approximately $500,000 along with additional reservoir capacity at an additional cost of $40,000 and a fire pump at a cost of $40,000. This work is not recommended.

4.11 OPERATIONAL COSTS

As a local service of the CRD, a committee of local area residents would work with staff to review an annual budget for operation and maintenance of the water system. An estimate of the budget for the utility has been developed with a format in use in other CRD water utilities on Salt Spring Island. The utility has 38 lots within its boundary; however the operational budget is generally funded by those parcels receiving water of which Cedar Lane has 36. Charges are normally applied on the basis of a single family dwelling or equivalent to a single family dwelling (SFE). It is understood that there is a six-plex and a four-plex within the subdivision, which would equate to 44 SFE's on the system.

The operational and maintenance costs estimated for the first year of operation of the Cedar Lane system by the CRD amount to $30,600 per annum. The annual operating budget as would be proposed for CRD operation of the utility is inclusive of the following items:

- insurance
- repair and maintenance allocations for buildings, machinery and equipment
- purchased maintenance for emergency and equipment repairs
- allowances for equipment rentals such as a backhoe
- allowances for internal CRD charges for WCB safety requirements and engineering assistance
- allocation for staff time for system operation, annual maintenance of electrical, control and mechanical equipment and mains flushing
- power
- mechanical, electrical and chemical supplies
- CRD administration and financial charges for billing
- miscellaneous charges for postal, freight, advertising and water licence
- water testing

Annual Operating and Maintenance Costs

Following is a breakdown of the proposed annual operating budget that would be put to the local service committee for approval:

Insurance		$600
Repairs, purchased maintenance, rentals		$2,000
Water testing		$3,000
Allocations, staff time		$17,000
Hydro		$1,500
Operational supplies		$1,500
Administration, financial services		$2,500
Chemicals		$500
Postal, freight, advertising, licence, travel		$1,000
Telephone – Telecommunications		$1,000
	TOTAL	**$30,600**

Funded as a fixed user charge and based on 36 users, the annual cost would be $850, or based upon 44 SFE's, the normal approach, the annual cost would be $695. It is noted that the fees stated do not include metered water consumption. This value is provided for comparison. If metered consumption was used for billing purposes the rate would be set so an *average* user would still pay a similar amount to the fixed rate.

Funds expended or over-expended at year-end are rolled over either as a surplus or as a deficit to the following year's budget.

4.12 OTHER COSTS

Costs associated with this project to establish a new Cedar Lane water service are outside of the costs eligible for funding by the *Community Water Improvement Program* grant and must be considered separately.

These costs include the preparation of this design study, costs associated with obtaining approval of Cedar Lane and costs associated with preparation of bylaws, transfer and registration of rights of ways and other property issues.

Depending on which method of approval is deemed most representative (referendum or petition), costs are estimated as follows:

1. Pre-design study	$5,000
2. Referendum	$10,000
3. Petition	$2,000
4. Transfer costs	$3,000
Total costs for:	
1,2,4	$18,000
1,3,4	$10,000

The committee will be asked to recommend whether to use a petition or referendum to obtain the assent of the electors when required.

CHAPTER 5 – FINANCIAL ANALYSIS

5.1 GENERAL

The financial analysis is provided for the benefit of residents of the Cedar Lane water improvement district to assist them in making a decision whether or not to carry out the proposed works in concert with the formation of a new water service under the CRD. The analysis assumes that the capital improvements required would be financed through the CRD over a fifteen year borrowing period. The borrowing would be through the Municipal Finance Authority (MFA). The rate shown is thought to represent what would be available through the MFA in the year 2007.

5.2 ESTIMATED CAPITAL DEBT AND ANNUAL REPAYMENT

The estimated capital debt to be financed is $168,333, one third of the $475,000 total capital cost of the project, with the Province of BC providing a grant for the remaining. Also included are other costs for the project as identified in Section 4.12. The total cost to be borrowed for the project amounts to $168,333. Based upon the following criteria the annual repayment charge is calculated below:

Interest Rate		6%
Debt repayment term		15 years
Annual repayment on $168,333		$18,507
Annual capital repayment (parcel tax) (based on 38 parcels)		$487

5.3 ESTIMATED OPERATING, MAINTENANCE AND ADMINISTRATIVE COSTS

The estimated annual operating and maintenance costs are		$30,600
Total annual capital, maintenance and operating costs are	$18,507 + $30,600	$49,107

5.4 COST RECOVERY

The capital debt repayment and annual operating and maintenance costs can be recovered from the ratepayers in a variety of methods. A parcel tax is uniform tax to each parcel of land in the service area, whether or not connected to the water system. A user charge is a fixed charge allocated to only those users who are physically connected to the water system. A variable user charge can be implemented based on actual metered use. Costs can also be recovered through a frontage tax or based on the property assessment, although a frontage tax is more difficult to apply in rural areas where property frontages may vary widely from resident to resident.

5.5 ANNUAL CHARGES

For purposes of this report, the fees to be recovered are assumed to be recovered using a combined parcel tax, for recovery of the capital improvements and a fixed user fee, for recovery of the annual operating and maintenance costs.

The estimated annual cost per parcel for capital improvements, based on 38 parcels in the system would be $487.

The estimated annual cost per user, for operating and maintenance costs, based on 44 users on the system would be $695.

The annual combined cost of parcel tax and user fee would be $1,182.

CHAPTER 6 – CONCLUSIONS

6.1 CONCLUSIONS

The following conclusions are made:

a) The Cedar Lane Waterworks District consists of 38 lots, 36 of which are connected including a six-plex and a four-plex giving a total SFE of 44 users.

b) The source of water is groundwater from two wells, with three additional wells that are not connected. The two production wells appear to have a maximum summertime yield of 5,000 Igpd, which is considered inadequate for the community's long term needs.

c) The two wells pump directly into the system through a network of 50mm PVC and 100mm AC distribution mains and into a 12,000 Ig steel balancing reservoir.

d) There is a hydropneumatic system that provides typical system pressure in the 30 – 90 psi range to the single zone. The system operates off the 12,000 tank and supply from the two wells #1 and #5.

e) The system is metered at each well site and at each individual service connection.

f) The system has been under a boil water advisory since October 2001, due to presence of faecal and total coliform.

g) The level of manganese in both wells #1 and #5 is above six times the aesthetic level recommended by CDWQG. Well #5 also has hard water.

h) There is no treatment or disinfection on the system.

i) The system requires additional source/sources be developed, treatment of the sources to meet CDWQG as well as primary and secondary disinfection and monitoring to ensure that disinfection has occurred and is being maintained throughout the distribution system.

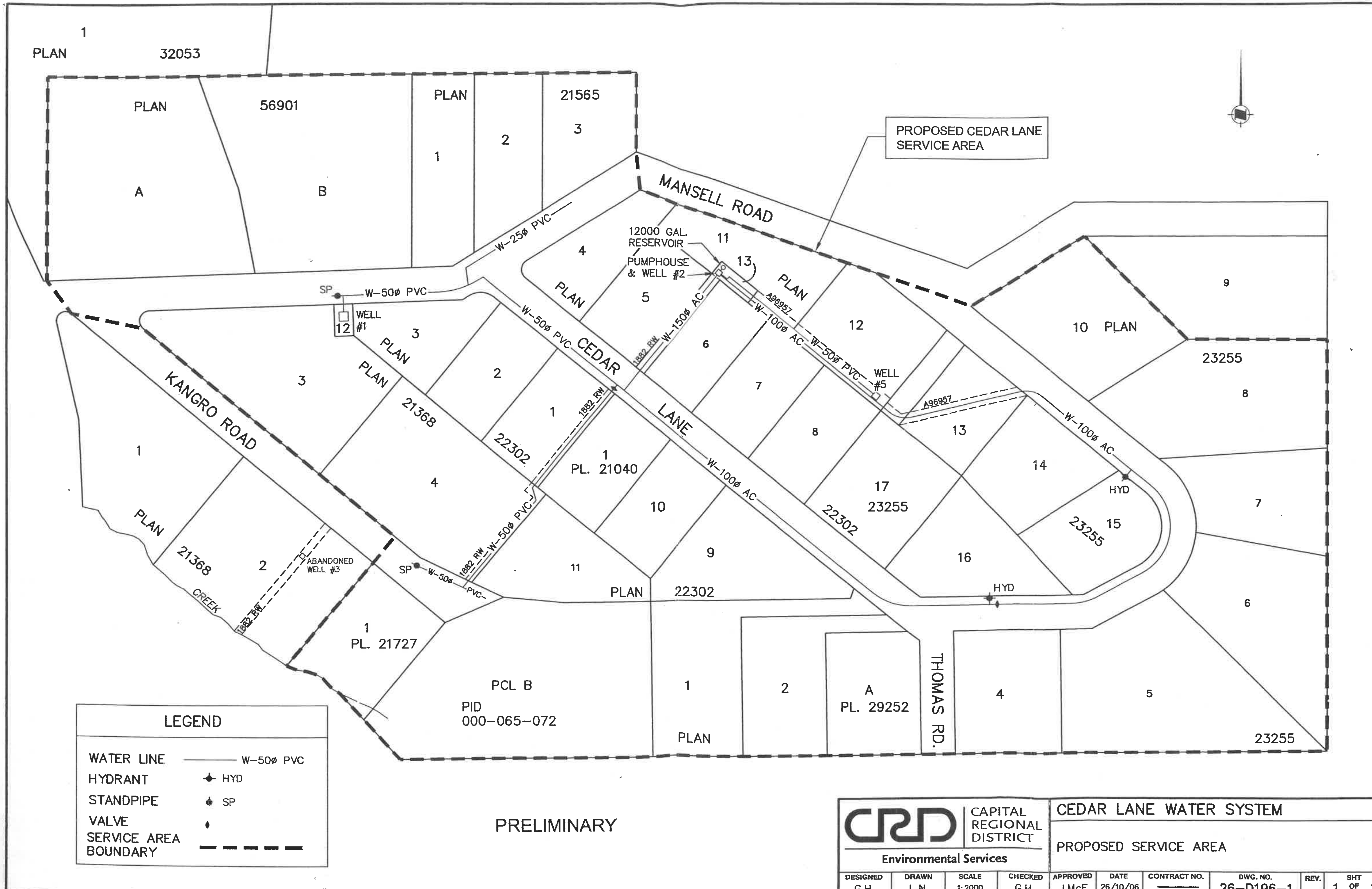
j) The existing reservoir is undersized and its repair may be too expensive to justify. The reservoir is budgeted to be replaced with a new 20,000 Ig tank.

k) The recommended capital improvements necessary to bring the Cedar Lane Water District to the standard that the CRD would require, if it were to become a CRD service, would cost $475,000. The Province of BC has agreed to provide two thirds funding for this amount if Cedar Lane becomes a water service under the CRD.

   If Cedar Lane elects to become partner to the CRD and accept the grant, Cedar Lane would have to fund $168,333 as its share of the capital cost, which would be equivalent to $487 per parcel for debt servicing for the 38 lots within the waterworks district.

l) The estimated annual operating costs for the CRD to run the utility would be $30,600 in 2007/2008 which is equivalent to $695 per SFE based upon the 44 present SFE's.

m) The total estimated annual costs for a water user would be $1,182 for debt repayment and operating costs.



PLAN 32053
PLAN 56901
PLAN 21565
PROPOSED CEDAR LANE SERVICE AREA
MANSELL ROAD
12000 GAL. RESERVOIR
PUMPHOUSE & WELL #2
W-25ø PVC
W-50ø PVC
SP
WELL #1
W-150ø AC
W-100ø AC
A96957
WELL #5
1882 RW
CEDAR LANE
KANGRO ROAD
PLAN 21368
PLAN 22302
PL. 21040
PLAN 23255
HYD
ABANDONED WELL #3
CREEK
PL. 21727
PCL B
PID 000-065-072
PL. 29252
THOMAS RD.
LEGEND
WATER LINE W-50ø PVC
HYDRANT HYD
STANDPIPE SP
VALVE
SERVICE AREA BOUNDARY
PRELIMINARY
CAPITAL REGIONAL DISTRICT
Environmental Services
CEDAR LANE WATER SYSTEM
PROPOSED SERVICE AREA
DESIGNED G.H.
DRAWN L.N.
SCALE 1:2000
CHECKED G.H.
APPROVED J.McF.
DATE 26/10/06
CONTRACT NO.
DWG. NO. 26-D196-1
REV.
SHT 1 OF 1