

**ALBERNI-CLAYOQUOT REGIONAL DISTRICT**

**BEAVER CREEK IMPROVEMENT  
DISTRICT  
WATER INFRASTRUCTURE  
ASSESSMENT**

May 2011



**KOERS  
& ASSOCIATES  
ENGINEERING LTD.**  
*Consulting Engineers*



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May 18, 2011  
File: 1126-01

Alberni-Clayoquot Regional District  
3008 Fifth Avenue  
Port Alberni, B.C. V9Y 2E3

**Attention: Mr. Russell Dyson, CAO**

Dear Sirs:

**Re: Beaver Creek Improvement District  
Water Infrastructure Assessment**

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We are pleased to submit five hard copies and one digital copy of our report.

The findings in our report are to be incorporated in the conversion analysis to be completed by Sussex Consultants. As such, we have submitted a pdf copy of the final report to Mr. Tom Reid of Sussex.

Please call if you or Mr. Reid need additional information.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.

D.A. Koers, P.Eng.  
Project Manager

Enclosures



**ALBERNI-CLAYOQUOT REGIONAL DISTRICT**  
**BEAVER CREEK IMPROVEMENT DISTRICT**  
**WATER INFRASTRUCTURE ASSESSMENT**

**TABLE OF CONTENTS**

Transmittal Letter

<b><u>Section</u></b>	<b><u>Page</u></b>
1 Introduction	1
2 System Description	1
3 System Maintenance	2
4 Capacity of the System to Provide Peak Day and Fire Flows	3
5 Chlorine Residual	5
6 Capital Improvements	5
7 Infrastructure Renewal Plan	7
8 Real Properties Owned by BCID	8
9 Right-of-Way and Easements	8

**Tables**

1 Distribution System Improvement Projects	6
2 Water System Inventory - Full System Replacement	After 8
3 Water System Inventory – AC Pipe Replacement Only	After 8

**Figures**

1 System Drawing	After 8
2 Peak Hour Pressure Contours	After 8
3 Fire Flow Contours	After 8

# **ALBERNI-CLAYOQUOT REGIONAL DISTRICT**

## **BEAVER CREEK IMPROVEMENT DISTRICT WATER INFRASTRUCTURE ASSESSMENT**

### **1 Introduction**

The Alberni-Clayoquot Regional District (ACRD) has been requested by the Beaver Creek Improvement District (BCID) to review the implications of incorporating the Beaver Creek water system as a regional service area. As such, the regional district retained Sussex Consultants to provide a conversion analysis. Sussex requires a technical assessment of the water system, with cost estimates of capital upgrades and system replacement, which is provided herein by Koers & Associates Engineering Ltd.

The intent of this technical assessment is to identify issues relevant to the regional district's costs to operate and maintain the system, such as system deficiencies, capital improvements planned or required, and requirements for replacement work to maintain a reliable public drinking water system.

### **2 System Description**

The majority of the BCID water distribution system was constructed in the 1960s. The system was installed in accordance with typical standards of the day, including asbestos cement (AC) mains. Over time, additions were made by land developers between 1970 and the present. The majority of mains installed after 1970 are polyvinyl chloride (PVC).

Figure 1 shows the present service area and location of intake, pump stations, reservoirs and water mains.

The majority of the distribution system consists of AC pipe (67.5%). This pipe material has not been used since the mid-1980s. BCID experiences regular failures of service tappings and watermain breaks due to softening of the AC pipe material from aggressive water inside and out. Most fire hydrants are old and of the slide gate variety with only two ports and no pumper port. Most hydrants do not have the required spacing for modern fire protection standards.

Unaccounted for water is relatively high, varying between 23 and 38% of total annual water use, as determined from the master meter at the Stamp River pump house and totalized individual meter readings, which is verified annually. A large percentage of the unaccounted for water used is expected to be due to system leakage. The total length of water mains in the BCID is 43,600 m.

All commercial and residential services are fully metered. The current water rate structure charges a premium for use over a base amount.

The water supply consists of an infiltration gallery under the Stamp River and pump station near the foot of McKenzie Road. Water is pumped from the intake, chlorinated by gas chlorination, then fed directly into the distribution piping to two reservoirs, the south reservoir (reinforced concrete construction, 1,136 m<sup>3</sup> capacity) and the north reservoir (bolted steel construction, 390 m<sup>3</sup> capacity). Both reservoirs have a top water level of 106 m geodetic. Two booster pump stations supply limited higher pressure zones (127 m HGL) in the higher elevation areas adjacent to the reservoirs. Rechlorination occurs at the North and South Reservoirs, using sodium hypochlorite.

Total storage capacity for the system was considered adequate for anticipated growth to the year 2030 by Koers & Associates Engineering Ltd. in the 2006 Water Study carried out for BCID.

The south reservoir was investigated for seismic standards, leakage, and other structural deficiencies in 2011 by Associated Engineering (BC) Ltd. The reservoir does not meet current seismic standards, and several structural deficiencies and source of leakage were identified, and recommendations for upgrading presented.

In 2008, BCID, along with all other surface water systems on Vancouver Island, was issued a notification from Vancouver Island Health Authority (VIHA) to become compliant with new surface water treatment requirements; commonly referred to as the “4-3-2-1 rule”. The BCID intake suffers from regular high turbidity events in response to high runoff in the Stamp River, which has resulted in many previous boil water advisories.

In response, BCID retained Koers & Associates Engineering Ltd. to carry out a Water Source Options and Treatment Study, which was completed in 2010. This study compared the cost and feasibility of water treatment for the Stamp River source, the use of groundwater, and connecting the BCID system to the City of Port Alberni during periods of high turbidity.

At the same time, the ACRD had retained Koers & Associates to carry out an update of the Alberni Valley Regional Water Study, which among other things, looked at incorporating the City of Port Alberni, BCID and the Cherry Creek Improvement District in a valley-wide system of multiple sources and treatment to meet the new VIHA requirements. That report was completed in 2010.

### **3 System Maintenance**

BCID carries out scheduled maintenance of its system. The main activities include:

- Intake maintenance, regular backflushing. Daily flushing, to prevent plugging of the infiltration gallery gravels, is required during peak summer demands, reducing to weekly flushing during lower off-season demands. The pump

station has automated shut down features for plugging of the intake and for high turbidity conditions, requiring immediate action to prevent excessive drawdown in the reservoirs. High turbidity may result in a boil water advisory as chlorine disinfection efficiency is reduced.

- Daily (Monday to Friday) pump station inspections, and maintenance of chlorinator and pump equipment. Remote monitoring of the pump station functions is in place.
- Water quality sampling, including daily chlorine residual measurements in critical parts of the system.
- Reservoir level checks. Remote monitoring and control is in place for the South Reservoir.

The BCID has a staff of one full-time operations supervisor (level 3), one full-time operator (level 2), one part-time (on call) operator and one office administrator. This is considered sufficient, unless system repairs are necessary.

Fire hydrants are maintained by BCID. The operation of the fire department is funded 50% from ACRD taxation. Annual maintenance of all fire hydrants is performed under contract by Corix Utilities. The cost of fire department operations is shared 50-50 between BCID and the fire department. The fire hall is owned by BCID.

System repairs are filed by invoice of work carried out. Historical repair records have not been reviewed, but we understand these are not unusual, except for intermittent service connection and pipe breaks in the older AC pipes.

#### **4 Capacity of the System to Provide Peak Day and Fire Flows**

The capacity assessment is based on a system-wide water study carried out for BCID by Koers & Associates Engineering Ltd. in 2006.

The BCID owns Conditional Water Licences 25763, dated June 1, 1960 and 61407, dated February 21, 1986, allowing maximum daily diversions of 650,000 imperial gallons per day (igpd) (2,955 m<sup>3</sup>/day) and 720,000 igpd (3,273 m<sup>3</sup>/day), respectively, for a total maximum daily withdrawal of 6,228 m<sup>3</sup>/day. The licenced withdrawal is more than adequate to meet projected maximum day demands to well beyond the year 2035.

In accordance with the recommendations of the 2006 study, the following improvements have been made during the past 5 years:

- The capacity of the intake pump station was recently upgraded by replacing the three pumps with 30 HP low RPM, high volume pumps, including a new 600 V power supply. This provides sufficient capacity to meet maximum day demands well beyond 2035.
- A standby generator and transfer switch was provided for the intake pumps.
- A chlorine residual analyzer was installed at the intake pump station.
- A turbidity analyzer was installed at the intake pump station.

- A SCADA system was installed to monitor flow rate, chlorine residual, source water turbidity, and South Reservoir levels and transmit to central headquarters.
- The bridge across Truman Creek was replaced to provide more reliable access to the intake and pump station.
- The pump station at the North Reservoir has been upgraded to dual 30 HP pumps.

A computer model was established of the BCID system for the 2006 study using the software program WaterCAD v7. This model was used to analyze the supply and distribution system for adequate pressures at peak hour demand and available fire flows at a residual pressure of 138 kPa (20 psi). Figures 2 and 3 show the existing peak hour pressures and available fire flows, respectively, during a summer maximum day.

The model shows that the distribution system is poorly looped and lacks redundancy. The system has 49 dead ended mains. These cause lower than recommended rural residential fire flows (50 lps or 660 igpm), may adversely affect water quality and chlorine residual due to stagnant water, and could cause extensive loss of service to customers during a water main break or shut-down. The BCID system cannot provide adequate fire protection for the large institutional building at the old school site in the 8000 block of Beaver Creek Road. The remaining school has been incorporated into the City of Port Alberni and has fire protection from the City system.

The present system is generally capable of providing greater than 276 kPa (40 psi) pressures at peak hour summer demands throughout the service area, with the exception of isolated high elevation areas around the two reservoirs, most of which has been resolved with the two pumped zones. One extensively subdivided area north of Beaver Creek Road, approximately half way between the two reservoirs, shows up yellow on Figure 2, indicating less than 138 kPa (20 psi) pressures, however, this subdivision has never been serviced or built on.

The 2006 report recommended looping and upsizing of several water mains to reduce the dead end water mains to a more reasonable number and to improve fire flows. The total length of main to be built for looping or upgrading is 9,270 m, of which 3,270 m would be built by future development. The remaining 6,000 m to be built by BCID is estimated to cost \$1,820,000 in 2011 dollars, including allowances for engineering and contingencies, but excluding HST.

Total reservoir storage volume in the north and south reservoirs is considered adequate to the year 2030 in accordance with current waterworks standards to provide storage for fire fighting, emergency (power failure), and peak hour balancing.

However, the leakage and seismic study carried out in 2010 for the South Reservoir revealed significant leakage and non-compliance with current seismic criteria. The least cost fix for this consists of sealing and reinforcing of the reservoir floor with a 300 mm thick new reinforced concrete floor inside the reservoir and a new 600 mm wide footing around the exterior of the reservoir for an estimated \$250,000, exclusive of HST. The cost of a new 1,135 m<sup>3</sup> (250,000 ig) reservoir is estimated at \$500,000.

## 5 Chlorine Residual

Daily chlorine residual records for the past 6 years were reviewed and are generally consistently good (0.1 ppm or greater). Exceptions are several dead end mains, particularly on Georgia Road and McEachern Road. Regular flushing of dead end mains readily brings these back to normal levels.

## 6 Capital Improvements

BCID has carried out the following recent capital improvement studies:

- Water Study, September 2006, by Koers & Associates Engineering Ltd.  
This study updated population and water demand projections, reviewed the adequacy of the source of supply, analyzed the storage and distribution system, and provided recommendations for upgrading to the year 2030.
- Structural Assessment of Stamp River Pump House Wet Well Support Beams & Truman Creek Bridge, January 2008, by North Island Engineering Ltd.
- Water Source Options & Treatment Study, April 2010, by Koers & Associates Engineering Ltd.  
This study reviews several options for meeting the new VIHA surface water treatment requirements, including upgrading the Stamp River intake and pump station and the addition of filtration treatment, establishing a groundwater source to take the place of the river source during high turbidity events, and for BCID to connect to a regional water supply system.
- Kitsukis (South) Reservoir. Leakage Inspection & Structural Assessment Report, February 9, 2011, by Associated Engineering (B.C.) Ltd.
- BCID participated in the Alberni Valley Regional Water Study Update, September 2010, by Koers & Associates Engineering Ltd.

As a result, the following improvements were recommended:  
(costs in 2011 dollars, including engineering and contingencies, excluding HST)

### A. BCID continuing on its own, with treatment at the Stamp River intake

2011-2015

New Stamp River Intake and Pump House	\$800,000
Filtration Plant	<u>\$4,000,000</u>
Total Supply Works	\$4,800,000

(Table 8 in 2010 AV Regional Report x 1.05)



2011-2020

Distribution System Upgrading (Table 1)	\$1,820,000
Seismic & Leakage Upgrading South Reservoir	<u>\$250,000</u>
Total Distribution Works	\$2,070,000

**B. BCID as part of Alberni Valley Regional System**

2011-2015

Capital Share of AV Regional Supply System (including Catalyst and City Capital Charges)	<u>\$2,950,000</u>
Total Supply Works	\$2,950,000

2011-2020

Distribution System Upgrading (Table 1)	\$1,820,000
Seismic & Leakage Upgrading South Reservoir	<u>\$250,000</u>
Total Distribution Works	\$2,070,000

Table 1 shows the location and dimensions of the distribution mains recommended for system looping and upsizing. Estimated costs are in 2011 dollars.

**Table 1 – Distribution System Improvement Projects  
(from 2006 Water Study)**

Item	Project Description	Length	Cost (\$) 2011 \$
<i>Looping of dead-ended mains</i>			
1	Holey Road, Darnley Rd to Willow St with connections to Poplar and Dayton Rds (150 mm)	1,250 m	By development
2	Ranworth Road, connection to Beaver Creek and Plymouth Rds (200 mm)	750 m	\$200,000
3	Tomswood Road, with connection to Gordon and Bush Rds (150 mm)	250 m	\$60,000
4	Highland Dr, connection to South Reservoir via Kitsuksis rd. (150 mm)	450 m	\$106,000
5	Gordon Avenue, between Saunders and Beaver Creek Rd (150 mm)	150 m	\$36,000
6	Georgia Road, with connection to Saunders and Pierce Rds (150 mm)	410 m	By development
7	Swanson Road, between Plested and Fayette Rds (150 mm)	400 m	\$95,000
8	Lothian Road, between Plested and Springfield Rds (150 mm)	370 m	\$88,000
9	Kerry Road, between McKenzie and Plymouth Rds (150 mm)	200 m	\$47,000

10	Kerry Road, between McKenzie to dead-ended main on Dashwood Rd (150 mm)	610 m	By development
11	Thompson Road, with connection to Beaver Creek via Dashwood Rd (150 mm)	510 m	\$118,000
12	Grandview Avenue, loop through to Mersey via George St (150 mm)	530 m	By development
<i>Replacement of existing mains</i>			
13	Beaver Creek Road, replace watermain from North Reservoir to beyond Wardrop Rd (200 mm)	1,350 m	\$561,000
14	Bainbridge/Cameron Road, from Beaver Creek to end of water main, replace 100 mm (200 mm)	340 m	\$142,000
15	Grandview Avenue, replace 100 mm (150 mm)	530 m	\$160,000
16	Drinkwater Road, replace 100 mm (150 mm)	700 m	\$207,000
Total by BCID			\$1,820,000

## 7 Infrastructure Renewal Plan

An inventory was completed of the BCID water supply and distribution infrastructure system, as shown in the attached Table 2. The replacement projects that were included in the capital works in Table 1, items 13 – 16, the new supply and treatment works and upgrading of the South Reservoir, recommended under the capital plan, have been excluded from the replacement value calculation.

The inventory shows the amount and type of pipe and appurtenances installed, water supply facilities, reservoirs and pump stations, complete with known or estimated date of installation, and estimated useful service life remaining. From the estimated replacement costs based on recorded current unit prices, and future replacement costs, assuming a 1.5% annual inflation rate, the annual contribution required for replacement of each component is calculated using an interest rate of 3.0 %.

The total replacement value of the system in 2011 dollars is \$10,932,520.

The total annual contribution required for full replacement of the system over the remaining life span of the various components is \$328,333.

With the number of serviced parcels at 974, the annual contribution required per serviced parcel to fully replace the system over the remaining useful life is \$337.

Table 3 attached shows only the AC main replacements, and calculates the annual contribution required to pay for replacement of all AC mains in the system over the estimated remaining life of these mains. The portion of the \$337 annual contribution amount for AC main replacement is \$285 per serviced parcel.

The AC replacement program plus the recommended capital improvements constitute, in our opinion, the minimum capital upgrading program to be carried out over the next 20 years.

## **8 Real Properties Owned by BCID**

BCID is the registered owner of the following properties:

### North Reservoir

Civic Address: 7668 Beaver Creek Road

Legal Description: Lot 1, Plan 13788, PID 004-643-682

Approximate Size: 0.12 ha.

### South Reservoir

Civic Address: 5960 Kitsuksis Street

Legal Description: Lot 10, Plan 14522, PID 004-428-919

Approximate Size: 1.4 ha

### BCID Office/Shop/Firehall

Civic Address: 6038 Beaver Creek Road

Legal Description: Lot 7, Plan 67, PID 009-028-544

Approximate Size: 1.6 ha.

### Evergreen Park

Civic Address: 6437 Plested Road

Legal Description: Lot 2, Plan 15442, PID 004-133-901

Approximate Size: 1.9 ha.

## **9 Rights-of-Way and Easements**

BCID owns the following statutory rights-of-way:

- Stamp River Pump House site, 0.3 ha.
- The two water mains leading from the Stamp River Pump House to McKenzie Road, each 6.1 m wide.

There is no information on the status of the private property crossing of the water main from Gordon/Darnley Road to the South Reservoir.

We were advised by operations staff that there may be other encroachments on private property that may require legal resolution.

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Beaver Creek Road	see capital plan	420	100	AC	1989	70	48	\$180	\$0	\$0	\$0	\$0
	see capital plan	940	150	AC	1989	70	48	\$200	\$0	\$0	\$0	\$0
		1000	150	AC	1960	70	19	\$200	\$200,000	\$265,390	\$0	\$8,387
		1740	200	AC	1966	70	25	\$240	\$417,600	\$605,915	\$0	\$12,170
		4530	250	AC	1959	70	18	\$300	\$1,359,000	\$1,776,676	\$0	\$61,057
	Valves	28			1970	60	19	\$1,080	\$30,240	\$40,127	\$0	\$1,268
	Fire Hydrants	25			1970	60	19	\$6,800	\$170,000	\$225,582	\$0	\$7,129
	Blow-offs	4			1970	60	19	\$2,500	\$10,000	\$13,270	\$0	\$419
Wardrop Road		210	100	AC	1989	70	48	\$180	\$37,800	\$77,243	\$0	\$407
	Valves	1			1989	60	38	\$1,080	\$1,080	\$1,902	\$0	\$17
	Fire Hydrants	0			1989	60	38	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1989	60	38	\$2,500	\$2,500	\$4,402	\$0	\$39
Cameron Road	see capital plan	360	100	AC	1968	70	27	\$180	\$0	\$0	\$0	\$0
	Valves	1			1968	60	17	\$1,080	\$1,080	\$1,391	\$0	\$52
	Fire Hydrants	1			1968	60	17	\$6,800	\$6,800	\$8,759	\$0	\$328
	Blow-offs	1			1968	60	17	\$2,500	\$2,500	\$3,220	\$0	\$121
Dashwood Road		137	150	AC	1966	70	25	\$200	\$27,400	\$39,756	\$0	\$799
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	1			1966	60	15	\$6,800	\$6,800	\$8,502	\$0	\$383
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Thompson Road		455	150	AC	1960	70	19	\$200	\$91,000	\$120,753	\$0	\$3,816
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
McKenzie Road		1593	200	AC	1959	70	18	\$240	\$382,320	\$499,822	\$0	\$17,177
	Valves	4			1959	60	8	\$1,080	\$4,320	\$4,866	\$0	\$506
	Fire Hydrants	3			1959	60	8	\$6,800	\$20,400	\$22,980	\$0	\$2,392
	Blow-offs	0			1959	60	8	\$2,500	\$0	\$0	\$0	\$0
Kerry Road		841	150	Pvc	1999	100	88	\$200	\$168,200	\$623,502	\$0	\$547
	Valves	2			1999	60	48	\$1,080	\$2,160	\$4,414	\$0	\$23
	Fire Hydrants	2			1999	60	48	\$6,800	\$13,600	\$27,791	\$0	\$147
	Blow-offs				1999	60	48	\$2,500	\$0	\$0	\$0	\$0

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Plymouth Road		2029	300	Pvc	1985	100	74	\$300	\$608,700	\$1,831,852	\$0	\$2,896
	Valves	9			1985	60	34	\$1,080	\$9,720	\$16,125	\$0	\$182
	Fire Hydrants	0			1985	60	34	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	2			1985	60	34	\$2,500	\$5,000	\$8,295	\$0	\$94
Twisden Road		235	150	Pvc	2009	100	98	\$200	\$47,000	\$202,195	\$0	\$118
	Valves	3			2009	60	58	\$1,080	\$3,240	\$7,684	\$0	\$25
	Fire Hydrants	1			2009	60	58	\$6,800	\$6,800	\$16,126	\$0	\$52
	Blow-offs	1			2009	60	58	\$2,500	\$2,500	\$5,929	\$0	\$19
Smith Road		560	150	AC	1966	70	25	\$200	\$112,000	\$162,506	\$0	\$3,264
		674	150	AC	1966	70	25	\$200	\$134,800	\$195,587	\$0	\$3,928
	Valves	4			1966	60	15	\$1,080	\$4,320	\$5,401	\$0	\$244
	Fire Hydrants	3			1966	60	15	\$6,800	\$20,400	\$25,505	\$0	\$1,150
	Blow-offs	0			1966	60	15	\$2,500	\$0	\$0	\$0	\$0
Lothan Road		284	150	Pvc	1992	100	81	\$200	\$56,800	\$189,713	\$0	\$223
	Valves	1			1992	60	41	\$1,080	\$1,080	\$1,989	\$0	\$15
	Fire Hydrants	0			1992	60	41	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1992	60	41	\$2,500	\$2,500	\$4,603	\$0	\$35
Springfield Road		695	150	Pvc	1992	100	81	\$200	\$139,000	\$464,263	\$0	\$545
	Valves	1			1992	60	41	\$1,080	\$1,080	\$1,989	\$0	\$15
	Fire Hydrants	1			1992	60	41	\$6,800	\$6,800	\$12,520	\$0	\$95
	Blow-offs				1992	60	41	\$2,500	\$0	\$0	\$0	\$0
Lamarque Road		719	150	Pvc	1992	100	81	\$200	\$143,800	\$480,295	\$0	\$564
		83	150	AC	1960	70	19	\$200	\$16,600	\$22,027	\$0	\$696
		814	100	AC	1960	70	19	\$180	\$146,520	\$194,425	\$0	\$6,144
	Valves	4			1975	60	24	\$1,080	\$4,320	\$6,175	\$0	\$133
	Fire Hydrants	3			1975	60	24	\$6,800	\$20,400	\$29,162	\$0	\$629
Plested Road	Blow-offs	0			1975	60	24	\$2,500	\$0	\$0	\$0	\$0
		206	100	AC	1960	70	19	\$180	\$37,080	\$49,203	\$0	\$1,555
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
East Swanson Road	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
		100	150	AC	1960	70	19	\$200	\$20,000	\$26,539	\$0	\$839
		300	150	Pvc	1993	100	82	\$200	\$60,000	\$203,407	\$0	\$229

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
West Swanson Road		490	150	Pvc	2003	100	92	\$200	\$98,000	\$385,569	\$0	\$287
		110	150	Pvc	1993	100	82	\$200	\$22,000	\$74,583	\$0	\$84
	Valves	2			1993	60	42	\$1,080	\$2,160	\$4,037	\$0	\$29
	Fire Hydrants	1			1993	60	42	\$6,800	\$6,800	\$12,708	\$0	\$92
	Blow-offs	2			1993	60	42	\$2,500	\$5,000	\$9,344	\$0	\$67
Grigg Road		240	150	Pvc	1993	100	82	\$200	\$48,000	\$162,726	\$0	\$183
	Valves	1			1993	60	42	\$1,080	\$1,080	\$2,018	\$0	\$15
	Fire Hydrants	1			1993	60	42	\$6,800	\$6,800	\$12,708	\$0	\$92
	Blow-offs	0			1993	60	42	\$2,500	\$0	\$0	\$0	\$0
Hills Road		320	100	AC	1960	70	19	\$180	\$57,600	\$76,432	\$0	\$2,415
		160	150	AC	1966	70	25	\$200	\$32,000	\$46,430	\$0	\$933
		125	150	Pvc	2006	100	95	\$200	\$25,000	\$102,852	\$0	\$68
	Valves	3			1970	60	19	\$1,080	\$3,240	\$4,299	\$0	\$136
	Fire Hydrants	2			1970	60	19	\$6,800	\$13,600	\$18,047	\$0	\$570
	Blow-offs	0			1970	60	19	\$2,500	\$0	\$0	\$0	\$0
Karen Road		73	100	AC	1960	70	19	\$180	\$13,140	\$17,436	\$0	\$551
		560	150	Pvc	1974	100	63	\$200	\$112,000	\$286,140	\$0	\$736
		395	150	Pvc	2006	100	95	\$200	\$79,000	\$325,013	\$0	\$215
	Valves	3			1980	60	29	\$1,080	\$3,240	\$4,990	\$0	\$77
	Fire Hydrants	5			1980	60	29	\$6,800	\$34,000	\$52,359	\$0	\$805
	Blow-offs	0			1980	60	29	\$2,500	\$0	\$0	\$0	\$0
Wither Road		190	100	AC	1960	70	19	\$180	\$34,200	\$45,382	\$0	\$1,434
		300	150	AC	1960	70	19	\$200	\$60,000	\$79,617	\$0	\$2,516
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Traves Road		230	100	AC	1960	70	19	\$180	\$41,400	\$54,936	\$0	\$1,736
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Donahue Road		295	100	AC	1960	70	19	\$180	\$53,100	\$70,461	\$0	\$2,227
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Fayette Road		1995	100	AC	1960	70	19	\$180	\$359,100	\$476,508	\$0	\$15,058
	Valves	8			1960	60	9	\$1,080	\$8,640	\$9,879	\$0	\$887
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Dorian Road		89	150	AC	1966	70	25	\$200	\$17,800	\$25,827	\$0	\$519
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	0			1966	60	15	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Weismiller Road		128	150	AC	1966	70	25	\$200	\$25,600	\$37,144	\$0	\$746
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	1			1966	60	15	\$6,800	\$6,800	\$8,502	\$0	\$383
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Wadena Road		75	150	AC	1960	70	19	\$200	\$15,000	\$19,904	\$0	\$629
		630	150	Pvc	1979	100	68	\$200	\$126,000	\$346,786	\$0	\$713
	Valves	3			1979	60	28	\$1,080	\$3,240	\$4,916	\$0	\$81
	Fire Hydrants	2			1979	60	28	\$6,800	\$13,600	\$20,634	\$0	\$338
	Blow-offs	1			1979	60	28	\$2,500	\$2,500	\$3,793	\$0	\$62
Kellow Road		367	100	AC	1960	70	19	\$180	\$66,060	\$87,658	\$0	\$2,770
		41	150	AC	1960	70	19	\$200	\$8,200	\$10,881	\$0	\$344
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants				1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Walker Road		806	100	AC	1960	70	19	\$180	\$145,080	\$192,514	\$0	\$6,084
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Saunders Road		1090	150	AC	1960	70	19	\$200	\$218,000	\$289,275	\$0	\$9,142
		240	100	AC	1960	70	19	\$180	\$43,200	\$57,324	\$0	\$1,812
	Valves	3			1960	60	9	\$1,080	\$3,240	\$3,705	\$0	\$333
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Kirkpatric Road		200	100	AC	1960	70	19	\$180	\$36,000	\$47,770	\$0	\$1,510
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	2			1960	60	9	\$2,500	\$5,000	\$5,717	\$0	\$513

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Malabar Road		720	150	AC	1960	70	19	\$200	\$144,000	\$191,081	\$0	\$6,038
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Lugrin Road		810	150	Ac	1960	70	19	\$200	\$162,000	\$214,966	\$0	\$6,793
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Georgia Road		565	100	AC	1960	70	19	\$180	\$101,700	\$134,951	\$0	\$4,265
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Chapman Road		470	100	AC	1960	70	19	\$180	\$84,600	\$112,260	\$0	\$3,548
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Pierce Road		280	100	AC	1960	70	19	\$180	\$50,400	\$66,878	\$0	\$2,113
		180	150	Pvc	1977	100	66	\$200	\$36,000	\$96,175	\$0	\$216
	Valves	2			1968	60	17	\$1,080	\$2,160	\$2,782	\$0	\$104
	Fire Hydrants	2			1968	60	17	\$6,800	\$13,600	\$17,517	\$0	\$657
	Blow-offs	0			1968	60	17	\$2,500	\$0	\$0	\$0	\$0
Drinkwater Road	see capital plan	700	100	AC	1960	70	19	\$180	\$0	\$0	\$0	\$0
		100	150	Pvc	1999	100	88	\$200	\$20,000	\$74,138	\$0	\$65
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Mersey Road		810	150	Pvc	2004	100	93	\$200	\$162,000	\$646,929	\$0	\$463
	Valves	2			2004	60	53	\$1,080	\$2,160	\$4,755	\$0	\$20
	Fire Hydrants	6			2004	60	53	\$6,800	\$40,800	\$89,817	\$0	\$370
	Blow-offs	0			2004	60	53	\$2,500	\$0	\$0	\$0	\$0
Gordon Avenue		915	150	AC	1960	70	19	\$200	\$183,000	\$242,832	\$0	\$7,674
		1430	300	Pvc	1977	100	66	\$300	\$429,000	\$1,146,083	\$0	\$2,576
	Valves	7			1970	60	19	\$1,080	\$7,560	\$10,032	\$0	\$317
	Fire Hydrants	2			1970	60	19	\$6,800	\$13,600	\$18,047	\$0	\$570
	Blow-offs	0			1970	60	19	\$2,500	\$0	\$0	\$0	\$0



Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Holey Road		120	200	AC	1960	70	19	\$240	\$28,800	\$38,216	\$0	\$1,208
	Valves	0			1960	60	9	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Grandview Road	see capital plan	400	100	AC	1960	70	19	\$180	\$0	\$0	\$0	\$0
	see capital plan	500	150	AC	1960	70	19	\$200	\$100,000	\$132,695	\$0	\$4,193
		153	150	Pvc	1994	100	83	\$200	\$30,600	\$105,294	\$0	\$114
	Valves	5			1960	60	9	\$1,080	\$5,400	\$6,174	\$0	\$555
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs	3			1960	60	9	\$2,500	\$7,500	\$8,575	\$0	\$770
Strick Road		700	100	AC	1960	70	19	\$180	\$126,000	\$167,196	\$0	\$5,284
		100	150	Pvc	1977	100	66	\$200	\$20,000	\$53,430	\$0	\$120
	Valves	3			1960	60	9	\$1,080	\$3,240	\$3,705	\$0	\$333
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Horne Road		135	150	Pvc	1977	100	66	\$200	\$27,000	\$72,131	\$0	\$162
	Valves	1			1977	60	26	\$1,080	\$1,080	\$1,591	\$0	\$30
	Fire Hydrants	0			1977	60	26	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1977	60	26	\$2,500	\$0	\$0	\$0	\$0
Compton Road		150	100	AC	1960	70	19	\$180	\$27,000	\$35,828	\$0	\$1,132
		437	150	Pvc	1991	100	80	\$200	\$87,400	\$287,604	\$0	\$352
	Valves	2			1980	60	29	\$1,080	\$2,160	\$3,326	\$0	\$51
	Fire Hydrants	1			1980	60	29	\$6,800	\$6,800	\$10,472	\$0	\$161
	Blow-offs	1			1980	60	29	\$2,500	\$2,500	\$3,850	\$0	\$59
Tomswood Road		275	100	AC	1960	70	19	\$180	\$49,500	\$65,684	\$0	\$2,076
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants				1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Bush Road		210	100	AC	1960	70	19	\$180	\$37,800	\$50,159	\$0	\$1,585
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Kitsukis Road		547	150	AC	1960	70	19	\$200	\$109,400	\$145,168	\$0	\$4,588
		512	100	AC	1960	70	19	\$180	\$92,160	\$122,292	\$0	\$3,865
	Valves	7			1960	60	9	\$1,080	\$7,560	\$8,644	\$0	\$776
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	2			1960	60	9	\$2,500	\$5,000	\$5,717	\$0	\$513
Poplar Road		165	100	AC	1960	70	19	\$180	\$29,700	\$39,410	\$0	\$1,245
		260	150	Pvc	1994	100	83	\$200	\$52,000	\$178,931	\$0	\$193
	Valves	1			1975	60	24	\$1,080	\$1,080	\$1,544	\$0	\$33
	Fire Hydrants	0			1975	60	24	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1975	60	24	\$2,500	\$2,500	\$3,574	\$0	\$77
Dayton Road		300	100	AC	1960	70	19	\$180	\$54,000	\$71,655	\$0	\$2,264
		95	150	Pvc	1991	100	80	\$200	\$19,000	\$62,523	\$0	\$77
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Arvay Road		355	150	Pvc	1991	100	80	\$200	\$71,000	\$233,637	\$0	\$286
	Valves	1			1991	60	40	\$1,080	\$1,080	\$1,959	\$0	\$16
	Fire Hydrants	1			1991	60	40	\$6,800	\$6,800	\$12,335	\$0	\$99
	Blow-offs	1			1991	60	40	\$2,500	\$2,500	\$4,535	\$0	\$36
Ires Road		100	150	Pvc	1991	100	80	\$200	\$20,000	\$65,813	\$0	\$81
	Valves	0			1991	60	40	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	0			1991	60	40	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1991	60	40	\$2,500	\$0	\$0	\$0	\$0
Maple Road		260	150	Pvc	1991	100	80	\$200	\$52,000	\$171,114	\$0	\$209
	Valves	0			1991	60	40	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	1			1991	60	40	\$6,800	\$6,800	\$12,335	\$0	\$99
	Blow-offs	0			1991	60	40	\$2,500	\$0	\$0	\$0	\$0
Bigwood Road		100	150	Pvc	1991	100	80	\$200	\$20,000	\$65,813	\$0	\$81
	Valves	0			1991	60	40	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	0			1991	60	40	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1991	60	40	\$2,500	\$2,500	\$4,535	\$0	\$36
McEachren Road		100	150	Pvc	1991	100	80	\$200	\$20,000	\$65,813	\$0	\$81
	Valves	0			1991	60	40	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	0			1991	60	40	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1991	60	40	\$2,500	\$2,500	\$4,535	\$0	\$36

Table 2  
Water System Inventory  
Full System Replacement

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required	
Willow Street		640	150	Pvc	1991	100	80	\$200	\$128,000	\$421,205	\$0	\$515	
	Valves	0			1991	60	40	\$1,080	\$0	\$0	\$0	\$0	
	Fire Hydrants	3			1991	60	40	\$6,800	\$20,400	\$37,006	\$0	\$297	
	Blow-offs	1			1991	60	40	\$2,500	\$2,500	\$4,535	\$0	\$36	
Holey To Tank		365	300	Pvc	1977	100	66	\$300	\$109,500	\$292,532	\$0	\$657	
		75	150	Pvc	1977	100	66	\$200	\$15,000	\$40,073	\$0	\$90	
	Valves	1			1977	60	26	\$1,080	\$1,080	\$1,591	\$0	\$30	
	Fire Hydrants	0			1977	60	26	\$6,800	\$0	\$0	\$0	\$0	
	Blow-offs	0			1977	60	26	\$2,500	\$0	\$0	\$0	\$0	
Darnley Road		435	150	AC	1960	70	19	\$200	\$87,000	\$115,445	\$0	\$3,648	
		320	150	Pvc	1995	100	84	\$200	\$64,000	\$223,526	\$0	\$231	
	Valves	4			1975	60	24	\$1,080	\$4,320	\$6,175	\$0	\$133	
	Fire Hydrants	2			1975	60	24	\$6,800	\$13,600	\$19,441	\$0	\$419	
	Blow-offs	1			1975	60	24	\$2,500	\$2,500	\$3,574	\$0	\$77	
Highland Road		505	150	Pvc	2006	100	95	\$200	\$101,000	\$415,523	\$0	\$274	
	Valves	4			2006	60	55	\$1,080	\$4,320	\$9,798	\$0	\$37	
	Fire Hydrants	3			2006	60	55	\$6,800	\$20,400	\$46,266	\$0	\$173	
	Blow-offs	0			2006	60	55	\$2,500	\$0	\$0	\$0	\$0	
Fern Road		75	100	AC	1960	70	19	\$180	\$13,500	\$17,914	\$0	\$566	
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111	
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0	
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257	
Stamp River Intake and Pump Station		1	see capital program		1959	55	3	\$0	\$0	\$0	\$0	\$0	
North Reservoir		1			1996	70	55	\$200,000	\$200,000	\$453,589	\$0	\$1,696	
North Reservoir Pump Station		1			2011	30	30	\$60,000	\$60,000	\$93,785	\$0	\$1,353	
South Reservoir		1			1973	70	32	\$500,000	\$500,000	\$805,162	\$0	\$10,257	
Darnley Road Pump Station		1			2006	30	25	\$50,000	\$50,000	\$72,547	\$0	\$1,457	
Water Meters & Service Connections		974			1996	30	15	\$300	\$292,200	\$365,318	\$0	\$16,473	
									<b>Totals</b>	\$10,932,520	\$21,143,456	\$0	\$328,333
											Number of Serviced Parcels	974	
											Annual Cost per Parcel	\$337	

Table 3  
Water System Inventory  
AC Pipe Replacement Only

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Beaver Creek Road	see capital plan	420	100	AC	1989	70	48	\$180	\$0	\$0	\$0	\$0
	see capital plan	940	150	AC	1989	70	48	\$200	\$0	\$0	\$0	\$0
		1000	150	AC	1960	70	19	\$200	\$200,000	\$265,390	\$0	\$8,387
		1740	200	AC	1966	70	25	\$240	\$417,600	\$605,915	\$0	\$12,170
		4530	250	AC	1959	70	18	\$300	\$1,359,000	\$1,776,676	\$0	\$61,057
	Valves	28			1970	60	19	\$1,080	\$30,240	\$40,127	\$0	\$1,268
	Fire Hydrants	25			1970	60	19	\$6,800	\$170,000	\$225,582	\$0	\$7,129
	Blow-offs	4			1970	60	19	\$2,500	\$10,000	\$13,270	\$0	\$419
Wardrop Road		210	100	AC	1989	70	48	\$180	\$37,800	\$77,243	\$0	\$407
	Valves	1			1989	60	38	\$1,080	\$1,080	\$1,902	\$0	\$17
	Fire Hydrants	0			1989	60	38	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1989	60	38	\$2,500	\$2,500	\$4,402	\$0	\$39
Cameron Road	see capital plan	360	100	AC	1968	70	27	\$180	\$0	\$0	\$0	\$0
	Valves	1			1968	60	17	\$1,080	\$1,080	\$1,391	\$0	\$52
	Fire Hydrants	1			1968	60	17	\$6,800	\$6,800	\$8,759	\$0	\$328
	Blow-offs	1			1968	60	17	\$2,500	\$2,500	\$3,220	\$0	\$121
Dashwood Road		137	150	AC	1966	70	25	\$200	\$27,400	\$39,756	\$0	\$799
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	1			1966	60	15	\$6,800	\$6,800	\$8,502	\$0	\$383
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Thompson Road		455	150	AC	1960	70	19	\$200	\$91,000	\$120,753	\$0	\$3,816
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
McKenzie Road		1593	200	AC	1959	70	18	\$240	\$382,320	\$499,822	\$0	\$17,177
	Valves	4			1959	60	8	\$1,080	\$4,320	\$4,866	\$0	\$506
	Fire Hydrants	3			1959	60	8	\$6,800	\$20,400	\$22,980	\$0	\$2,392
	Blow-offs	0			1959	60	8	\$2,500	\$0	\$0	\$0	\$0
Smith Road		560	150	AC	1966	70	25	\$200	\$112,000	\$162,506	\$0	\$3,264
		674	150	AC	1966	70	25	\$200	\$134,800	\$195,587	\$0	\$3,928
	Valves	4			1966	60	15	\$1,080	\$4,320	\$5,401	\$0	\$244
	Fire Hydrants	3			1966	60	15	\$6,800	\$20,400	\$25,505	\$0	\$1,150
	Blow-offs	0			1966	60	15	\$2,500	\$0	\$0	\$0	\$0

Table 3  
Water System Inventory  
AC Pipe Replacement Only

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Lamarque Road												
		83	150	AC	1960	70	19	\$200	\$16,600	\$22,027	\$0	\$696
		814	100	AC	1960	70	19	\$180	\$146,520	\$194,425	\$0	\$6,144
	Valves	4			1975	60	24	\$1,080	\$4,320	\$6,175	\$0	\$133
	Fire Hydrants	3			1975	60	24	\$6,800	\$20,400	\$29,162	\$0	\$629
	Blow-offs	0			1975	60	24	\$2,500	\$0	\$0	\$0	\$0
Plested Road		206	100	AC	1960	70	19	\$180	\$37,080	\$49,203	\$0	\$1,555
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
East Swanson Road		100	150	AC	1960	70	19	\$200	\$20,000	\$26,539	\$0	\$839
Hills Road		320	100	AC	1960	70	19	\$180	\$57,600	\$76,432	\$0	\$2,415
		160	150	AC	1966	70	25	\$200	\$32,000	\$46,430	\$0	\$933
	Valves	3			1970	60	19	\$1,080	\$3,240	\$4,299	\$0	\$136
	Fire Hydrants	2			1970	60	19	\$6,800	\$13,600	\$18,047	\$0	\$570
	Blow-offs	0			1970	60	19	\$2,500	\$0	\$0	\$0	\$0
Karen Road		73	100	AC	1960	70	19	\$180	\$13,140	\$17,436	\$0	\$551
Wither Road		190	100	AC	1960	70	19	\$180	\$34,200	\$45,382	\$0	\$1,434
		300	150	AC	1960	70	19	\$200	\$60,000	\$79,617	\$0	\$2,516
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Traves Road		230	100	AC	1960	70	19	\$180	\$41,400	\$54,936	\$0	\$1,736
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Donahue Road		295	100	AC	1960	70	19	\$180	\$53,100	\$70,461	\$0	\$2,227
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Fayette Road		1995	100	AC	1960	70	19	\$180	\$359,100	\$476,508	\$0	\$15,058
	Valves	8			1960	60	9	\$1,080	\$8,640	\$9,879	\$0	\$887
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257

Table 3  
Water System Inventory  
AC Pipe Replacement Only

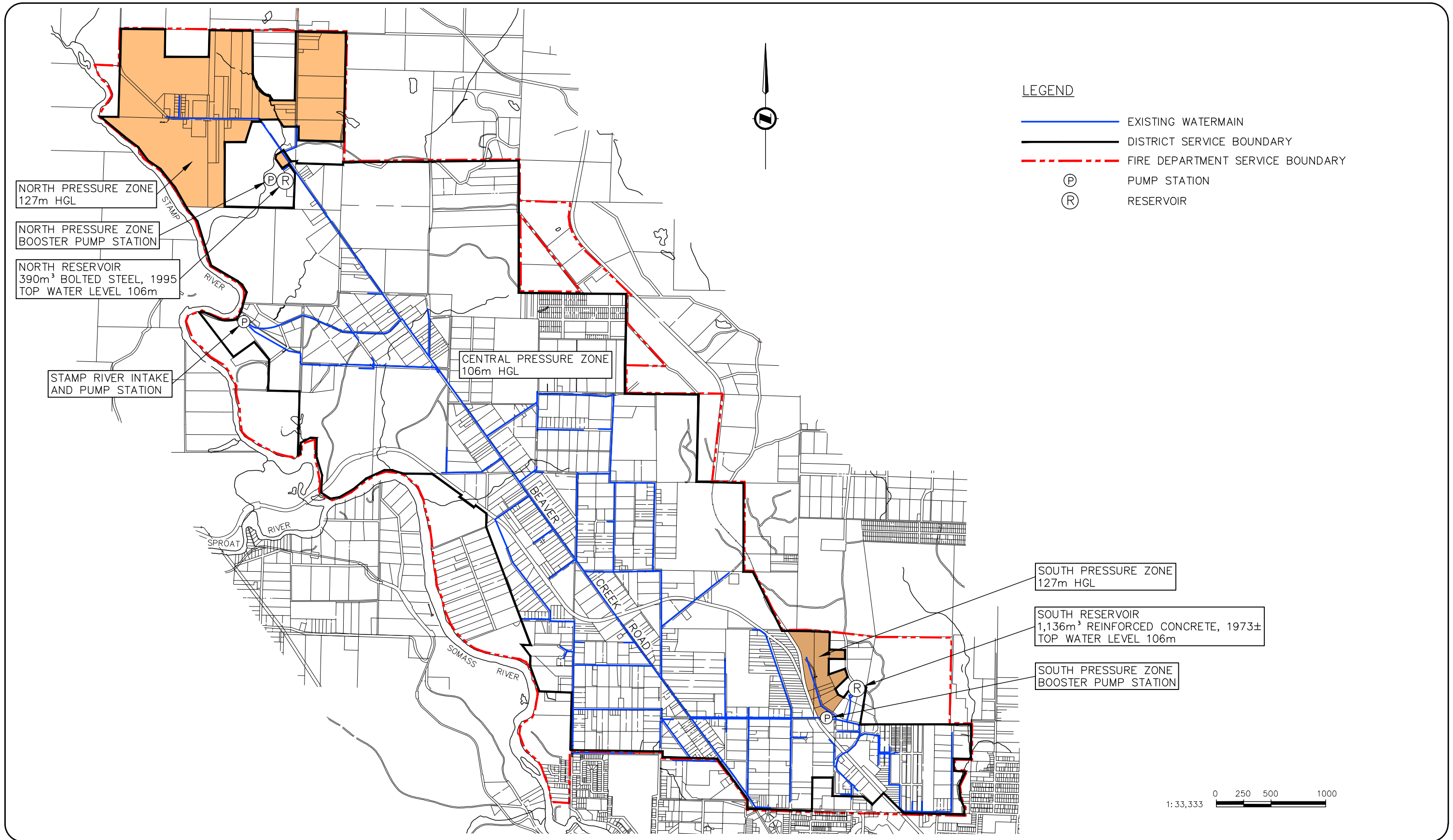
Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Dorian Road		89	150	AC	1966	70	25	\$200	\$17,800	\$25,827	\$0	\$519
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	0			1966	60	15	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Weismiller Road		128	150	AC	1966	70	25	\$200	\$25,600	\$37,144	\$0	\$746
	Valves	1			1966	60	15	\$1,080	\$1,080	\$1,350	\$0	\$61
	Fire Hydrants	1			1966	60	15	\$6,800	\$6,800	\$8,502	\$0	\$383
	Blow-offs	1			1966	60	15	\$2,500	\$2,500	\$3,126	\$0	\$141
Wadena Road		75	150	AC	1960	70	19	\$200	\$15,000	\$19,904	\$0	\$629
Kellow Road		367	100	AC	1960	70	19	\$180	\$66,060	\$87,658	\$0	\$2,770
		41	150	AC	1960	70	19	\$200	\$8,200	\$10,881	\$0	\$344
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants				1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Walker Road		806	100	AC	1960	70	19	\$180	\$145,080	\$192,514	\$0	\$6,084
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Saunders Road		1090	150	AC	1960	70	19	\$200	\$218,000	\$289,275	\$0	\$9,142
		240	100	AC	1960	70	19	\$180	\$43,200	\$57,324	\$0	\$1,812
	Valves	3			1960	60	9	\$1,080	\$3,240	\$3,705	\$0	\$333
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Kirkpatric Road		200	100	AC	1960	70	19	\$180	\$36,000	\$47,770	\$0	\$1,510
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	2			1960	60	9	\$2,500	\$5,000	\$5,717	\$0	\$513
Malabar Road		720	150	AC	1960	70	19	\$200	\$144,000	\$191,081	\$0	\$6,038
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	2			1960	60	9	\$6,800	\$13,600	\$15,550	\$0	\$1,397
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Lugrin Road		810	150	Ac	1960	70	19	\$200	\$162,000	\$214,966	\$0	\$6,793
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0

Table 3  
Water System Inventory  
AC Pipe Replacement Only

Road Name	Appurtenances	Length of Pipe (m)	Pipe Size (mm)	Pipe Material	Date Installed	Expected Service Life (years)	Remaining Life (years)	Unit rate	2011 Replacement Cost	Future Replacement Cost	Actual Reserves	Annual Contribution Required
Georgia Road		565	100	AC	1960	70	19	\$180	\$101,700	\$134,951	\$0	\$4,265
	Valves	2			1960	60	9	\$1,080	\$2,160	\$2,470	\$0	\$222
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Chapman Road		470	100	AC	1960	70	19	\$180	\$84,600	\$112,260	\$0	\$3,548
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Pierce Road		280	100	AC	1960	70	19	\$180	\$50,400	\$66,878	\$0	\$2,113
										\$0		\$0
Drinkwater Road	see capital plan	700	100	AC	1960	70	19	\$180	\$0	\$0	\$0	\$0
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Gordon Avenue		915	150	AC	1960	70	19	\$200	\$183,000	\$242,832	\$0	\$7,674
Holey Road		120	200	AC	1960	70	19	\$240	\$28,800	\$38,216	\$0	\$1,208
	Valves	0			1960	60	9	\$1,080	\$0	\$0	\$0	\$0
	Fire Hydrants	0			1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs	0			1960	60	9	\$2,500	\$0	\$0	\$0	\$0
Grandview Road	see capital plan	400	100	AC	1960	70	19	\$180	\$0	\$0	\$0	\$0
	see capital plan	500	150	AC	1960	70	19	\$200	\$100,000	\$132,695	\$0	\$4,193
	Valves	5			1960	60	9	\$1,080	\$5,400	\$6,174	\$0	\$555
	Fire Hydrants	3			1960	60	9	\$6,800	\$20,400	\$23,325	\$0	\$2,095
	Blow-offs	3			1960	60	9	\$2,500	\$7,500	\$8,575	\$0	\$770
Strick Road		700	100	AC	1960	70	19	\$180	\$126,000	\$167,196	\$0	\$5,284
	Valves	3			1960	60	9	\$1,080	\$3,240	\$3,705	\$0	\$333
	Fire Hydrants	1			1960	60	9	\$6,800	\$6,800	\$7,775	\$0	\$698
	Blow-offs	1			1960	60	9	\$2,500	\$2,500	\$2,858	\$0	\$257
Compton Road		150	100	AC	1960	70	19	\$180	\$27,000	\$35,828	\$0	\$1,132
Tomswood Road		275	100	AC	1960	70	19	\$180	\$49,500	\$65,684	\$0	\$2,076
	Valves	1			1960	60	9	\$1,080	\$1,080	\$1,235	\$0	\$111
	Fire Hydrants				1960	60	9	\$6,800	\$0	\$0	\$0	\$0
	Blow-offs				1960	60	9	\$2,500	\$0	\$0	\$0	\$0



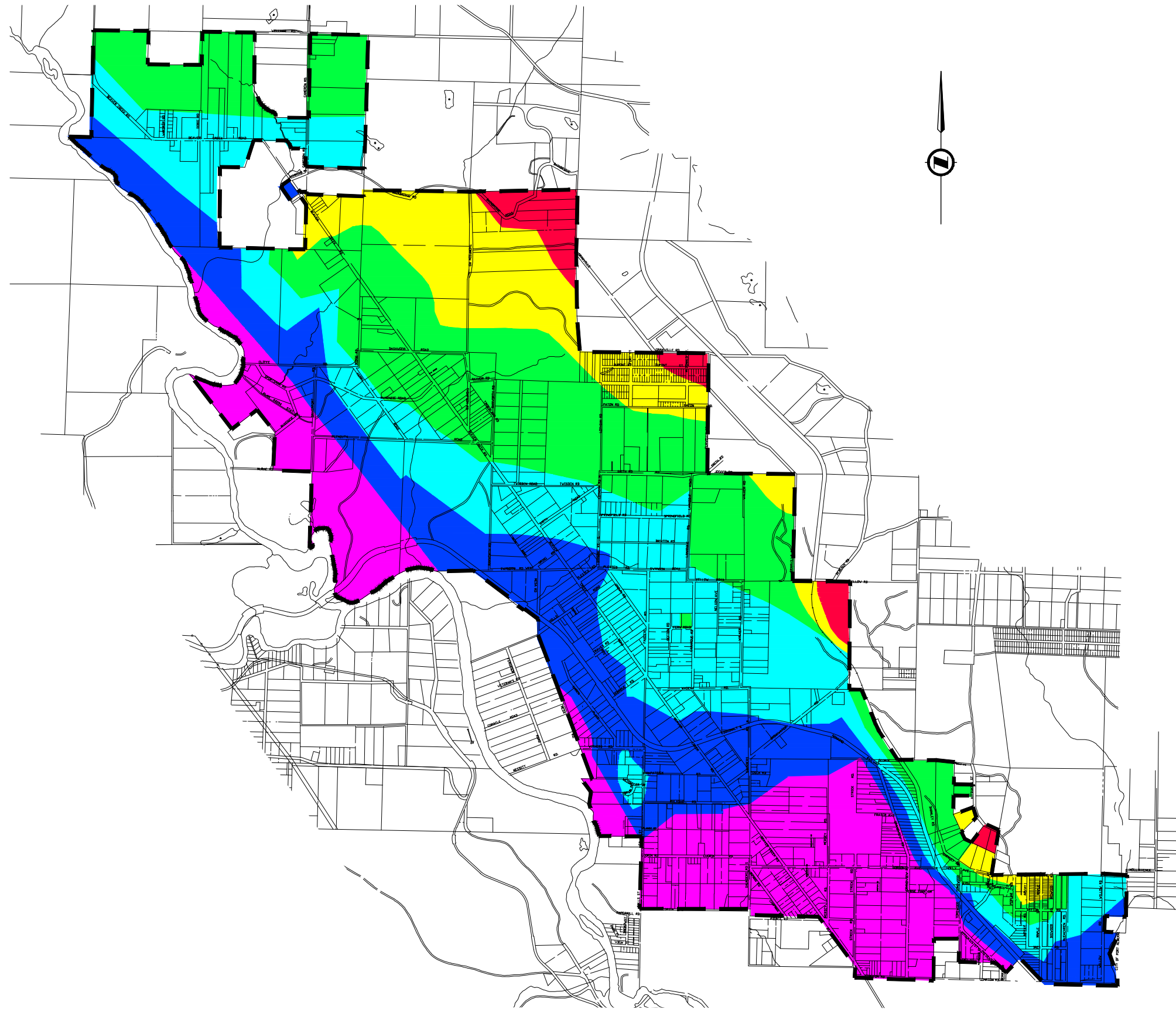




CLIENT ALBERNI – CLAYOQUOT REGIONAL DISTRICT

PROJECT BEAVER CREEK IMPROVEMENT DISTRICT WATER INFRASTRUCTURE ASSESSMENT

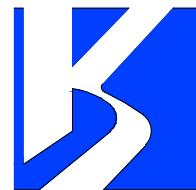
TITLE		SYSTEM DRAWING	
APPROVED		SCALE	1: 33,333
DATE	MAY, 2011	DWG No.	FIGURE 1
JOB No.	1126		



**LEGEND:**

- — IMPROVEMENT DISTRICT WATER SERVICE AREA
- 138 kPa (20psi) AND LESS
- 138 kPa (20psi) – 276 kPa (40psi)
- 276 kPa (40psi) – 414 kPa (60psi)
- 414 kPa (60psi) – 552 kPa (80psi)
- 552 kPa (80psi) – 690 kPa (100psi)
- 690 kPa (100psi) AND GREATER

1:33,333 0 250 500 1000



**KOERS  
& ASSOCIATES  
ENGINEERING LTD.**  
*Consulting Engineers*

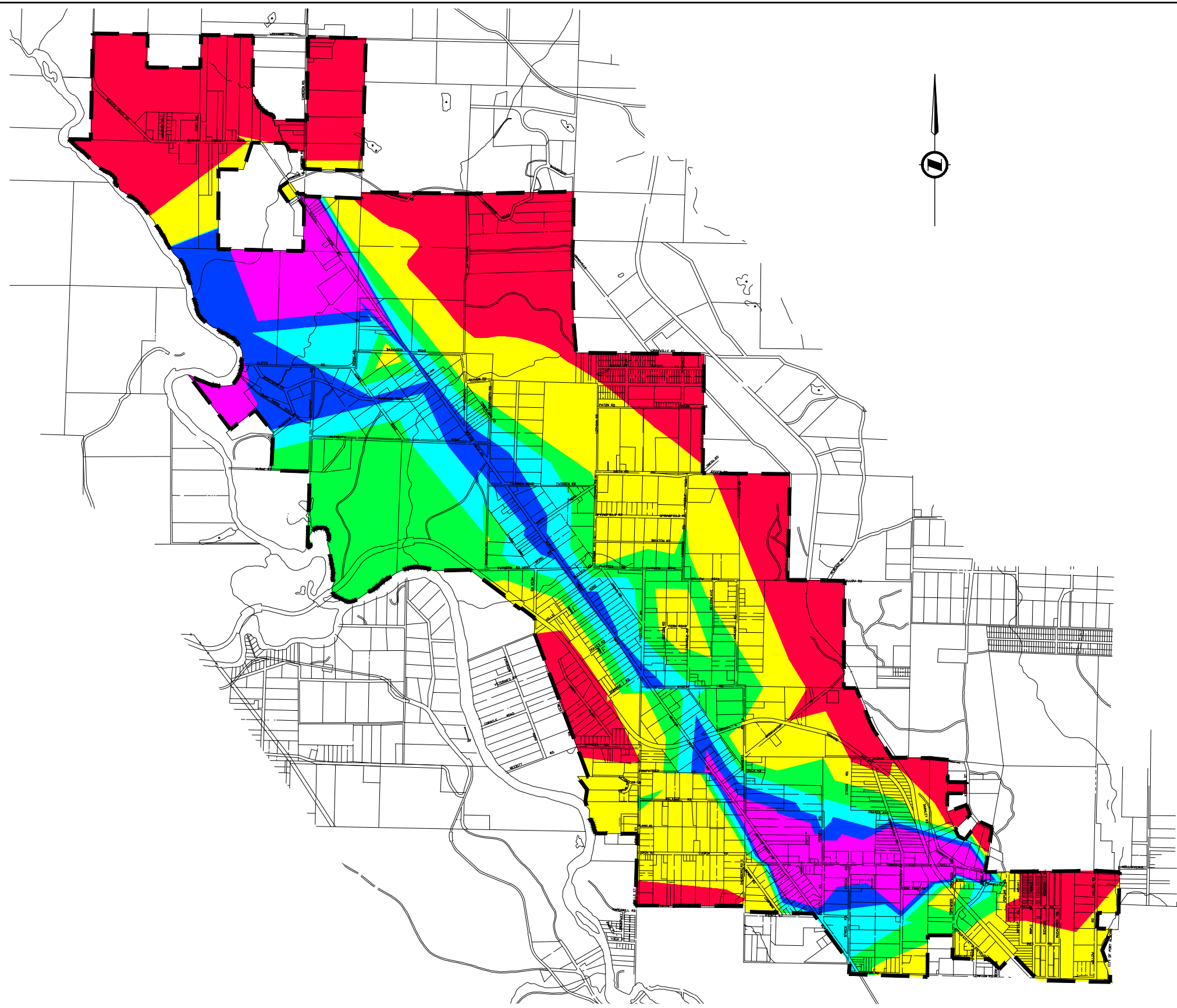
CLIENT ALBERNI – CLAYOQUOT REGIONAL DISTRICT

PROJECT BEAVER CREEK IMPROVEMENT DISTRICT  
WATER INFRASTRUCTURE ASSESSMENT

TITLE PEAK HOUR PRESSURE CONTOURS

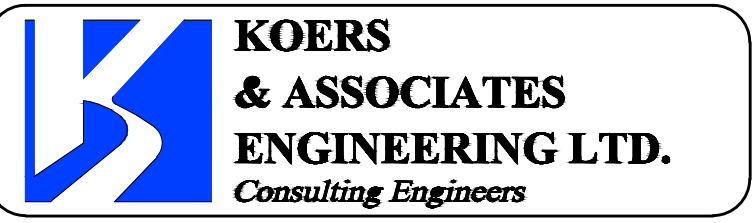
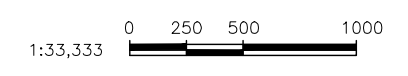
APPROVED	
DATE	MAY, 2011
JOB No.	1126

SCALE	1:33,333
DWG No.	FIGURE 2



**LEGEND:**

- — IMPROVEMENT DISTRICT WATER SERVICE AREA
- Red: 30 lps (400 igpm) AND LESS
- Yellow: 30 lps (400 igpm) – 60 lps (800 igpm)
- Green: 60 lps (800 igpm) – 90 lps (1200 igpm)
- Cyan: 90 lps (1200 igpm) – 120 lps (1600 igpm)
- Blue: 120 lps (1600 igpm) – 150 lps (2000 igpm)
- Magenta: 150 lps (2000 igpm) AND GREATER



CLIENT ALBERNI – CLAYOQUOT REGIONAL DISTRICT

PROJECT BEAVER CREEK IMPROVEMENT DISTRICT WATER INFRASTRUCTURE ASSESSMENT

TITLE		FIRE FLOW CONTOURS	
APPROVED		SCALE	1:33,333
DATE	MAY, 2011	DWG No.	FIGURE 3
JOB No.	1126		