Supply Option #1 – Order of Magnitude Cost: Maximize and Treat One Creek Source, Continue Well Usage

Component 1 – Dickey Creek Water Treatment Plant: (6.0 ML/day)		$3,260,000
Component 2 – Complete Rec Well #2 (2.8 ML/day)		$250,000
Component 3 – Rec Centre to North Lillooet Interconnect Watermain		$835,000
Component 4 – Distribution System Upgrades		
4.1	Construct booster pumping and PRV station at Central-North interconnect	$250,000
4.2	Construct 300mm dia. watermain upgrade on Main Street (including road repair, appurtenances and tie-ins) – 450m @ $250/m	$112,500
4.3	Construct booster pumping station to deliver treated water to Central-Upper zone (PZ374) – allow	$250,000
4.4	Construction 250mm dia. supply watermain from proposed booster station to Central-Upper reservoir supply in Shop Road area – 465m @ $350/m	$162,750
4.5	Decommission Conway Park Wells	$25,000
	Subtotal Component 4	$800,250
	Total All Components	$5,145,250
	Contingency & Engineering (25%)	$1,304,750
	Total Capital Cost	**$6,450,000**

Construction of the components listed above would result in compliance with IHA's water treatment objectives, providing supply water for a potential 20 year horizon covering "build-out" of the Central-North service areas.

Unresolved issues associated with this option include:

- Dickey Creek intake maintenance issues and unknown flow quantity.
- Town Creek storm drainage. Removal of Town Creek as a source will result in additional creek water entering the downstream storm system. The capacity of this system is unknown-but is likely undersized to handle the full flow from Town Creek, especially during spring freshet.

- Unproven nature of well water. Completion of a GUDI analysis, as well as additional sampling for well water quality (arsenic concentrations) will allow determination of specific treatment requirements.

In addition to the capital costs associated with the upgrades listed above, there will also be ongoing operation and maintenance costs associated with the filtration plant, well sources and booster pumping stations. Yearly operating and maintenance costs are estimated as follows:

➢ Filtration Plant	$90,000
➢ Well Pumping Power Supply (total)	$60,000
➢ Well Pump Maintenance	$10,000
➢ Booster Pumping Power Supply (total)	$25,000
➢ Booster Pump Station Maintenance	$15,000
Total Yearly O & M	**$200,000**

3.3.2 Supply Option #2: 100% Surface Water Supply – Seton Intake and Water Treatment Plant – Abandon Creek Sources, Wells on Standby Only

This section quantifies infrastructure requirements associated with utilizing strictly surface water for future supply. For this to occur, a source would have to be located with a capacity of 9.0 ML/day.

Combined, the existing creek sources will not achieve such a capacity. In addition, if surface water is to be utilized as a primary source, a single source and treatment plant is preferred.

An intake on the Fraser River is less than ideal. The Fraser River water quality is considered ‘poor’ in comparison to most other sources, due to high turbidity and the fact that many communities and industries utilize this waterbody to outfall waste streams.

The Seton River appears to be the most feasible primary surface source, with a potential intake located as follows:

- Seton River: The Town had historically used a river intake located in the vicinity of the Highway 99 bridge. This intake was abandoned as a result of increasing maintenance associated with siltation of the intake (changing river morphology). For this reason, construction of a new intake at that location is undesirable.

- Seton Lake: The lake does not have reliability or changing morphology problems associated with the other intake options. Difficult access due to required bridge crossings and works located on reserve lands would likely lengthen project timelines. In addition, lengthy supply main construction (approximately 5.0 km on Highway 99) would be required.
- Seton Canal: The canal would appear to be a preferred intake location due to proximity to Town and lack of problems associated with changing river morphology. However, previous water studies (Stanley Associates – Water Study 1989) have pointed out that BC Hydro empties this channel for maintenance during summer months when District water demands are at a maximum. More recent inquiries (Kisei Industries – 2003 East Lillooet Water Report) resulted in response from BC Hydro that confirmed they are reluctant to commit to being a purveyor of water, and cannot commit to having the canal fully watered at all times. Therefore, for this intake location to be feasible, the District would have to come to an agreement with BC Hydro to dewater in "off peak" seasons (i.e. not mid summer). In addition, Interior Health would have to agree to allow use of the well sources "untreated" for short duration during canal cleanings.

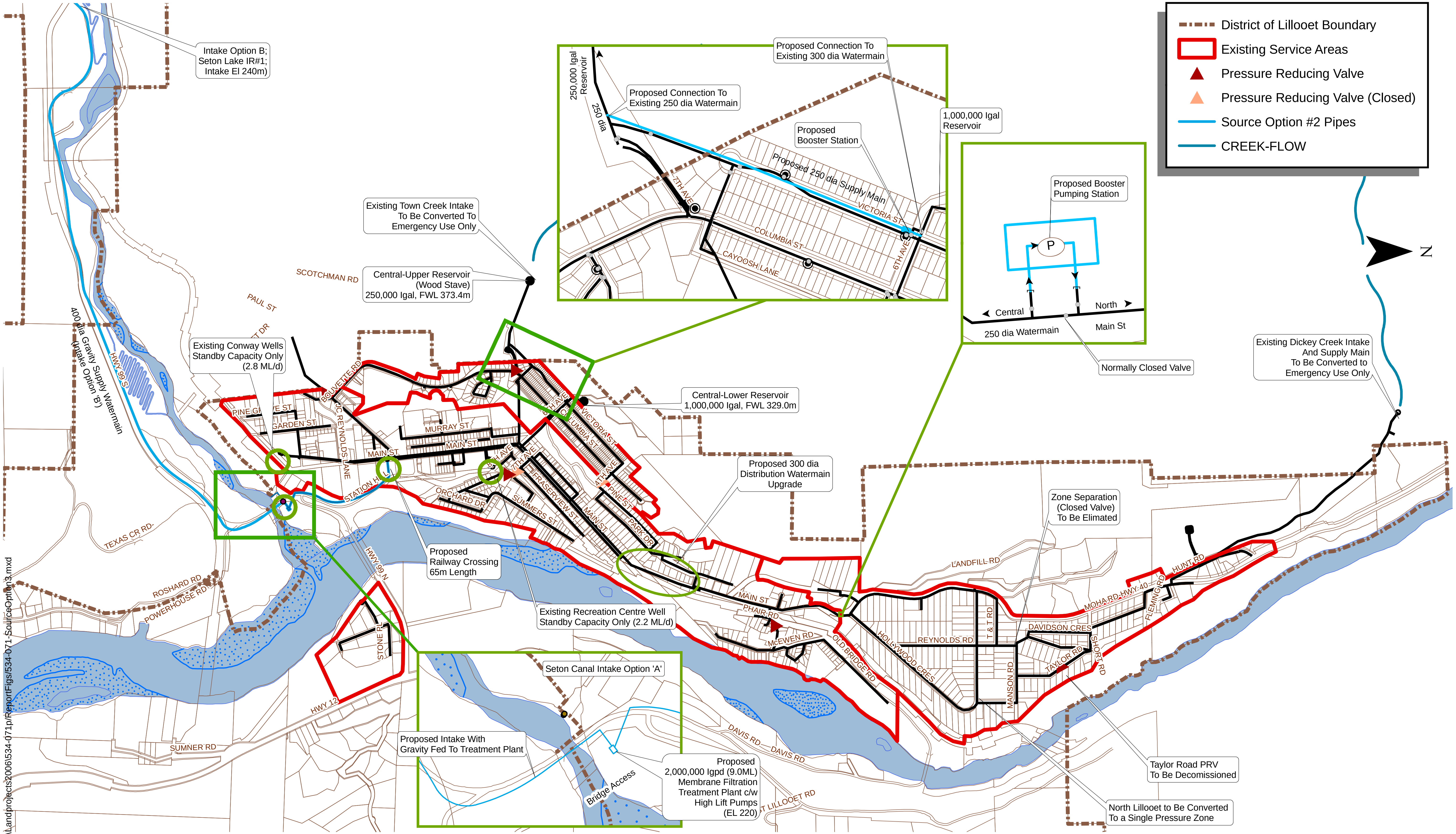
All three potential intake locations would produce water of similar quality. They would also be classified as a surface water source, and as such, require filtration to comply with IHA's surface water treatment objectives. Construction of a 9.0 ML water treatment plant is still within the range of "packaged" plants; therefore, construction of a packaged conventional filtration plant is likely to be the most cost effective filtration option. In concept, we visualize this treatment plant would be located adjacent to the Seton River, in the vicinity of the Highway 99 bridge.

In addition to construction of the intake and treatment works, other infrastructure requirements associated with this option include:

- construction of supply watermain from treatment plant to Main Street trunk watermain.
- construction of a booster pumping station and supply watermain to deliver water from the Central Lower zone (PZ329) to the Central Upper zone (PZ374).

- construction of a booster pumping station to deliver water from the Central Lower zone (PZ329) to the North Lillooet reservoir (PZ353).
- upgrading watermain on Main Street to handle delivery of treated water to North Lillooet.
- consolidation of North Lillooet into a single pressure zone; this will eliminate an otherwise necessary 1500m of dedicated supply watermain from the booster station to North Lillooet upper pressure zone.

Assuming that construction of a reliable intake on the river is not possible, costs for the remaining two intake options (Seton Canal and Seton Lake) are evaluated below. Infrastructure requirements for these options are depicted on *Figure 19*.



Future Source Option #2
100 % Surface Water Supply - Seton Intake, Abandon Creeks, Wells on Standby

District of Lillooet
Master Water Plan

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DWG. NO.:	534-071
REV.:	1
DWN. BY:	RK
DATE:	17AUG06

Figure 19

Supply Option #2 – Order of Magnitude Cost: Seton Intake and Water Treatment Plant

Component 1 – Seton Intake Water Treatment Plant (9.0 ML/day)			$4,900,000
Component 2 – Water Supply/Distribution Upgrades			
2.1	High lift pump station to supply water to Central Lower Zone (PZ329)		$350,000
2.2	Construct 350mm supply watermain from treatment plant to Main Street trunk main		
	(a)	Watermain – 700m @ $400/m	$280,000
	(b)	Railway Crossing (top of Station Hill)	$100,000
2.3	Construct booster pumping stations		
	(a)	Central Lower (PZ329) to Central Upper (PZ374)	$250,000
	(b)	Central Lower (PZ329) to North Lillooet (PZ353)	$250,000
2.4	Construct 300mm dia. supply watermain upgrades associated with booster stations		
	(a)	Supply main from Central-Upper booster station to Shop Road area – 465m @ $350/m	$162,750
	(b)	Main Street watermain upgrade to North Lillooet booster station – 450m @ $250/m	$112,500
		Subtotal Component 2	$1,505,250
Component 3 – Source Works			
3.1	Intake 'A' – Canal Intake		
	(a)	Intake and Pumphouse	$500,000
	(b)	Construct 400mm dia. supply main from Canal to treatment plant – 500m @ $500/m	$250,000
	(c)	Seton River bridge crossing	$100,000
		Subtotal Intake 'A'	$850,000
3.2	Intake 'B' – Seton Lake Intake		
	(a)	Intake and Pumphouse	$500,000
	(b)	Construct 400mm dia. supply main from Seton Lake to treatment plant – 5000m @ $500/m	$2,500,000
	(c)	Seton River bridge crossing	$100,000
	(d)	Seton Canal bridge crossing	$100,000
		Subtotal Intake 'B'	$3,200,000

Total Components, Intake ‘A”	$7,255,250
Contingencies and Engineering (25%)	$1,844,750
Total Supply Option #2 Cost, Intake “A”	**$9,100,000**
Total Components, Intake ‘B’	$9,605,250
Contingencies and Engineering (25%)	$2,394,750
Total Supply Option #2 Cost, Intake “B”	**$12,000,000**

Construction of either of the two intake options associated with this source option would result in compliance with IHA’s water treatment objectives.

Unresolved issued associated with this option include:

- Town Creek storm drainage. The capacity of the storm system downstream of the water intake is unknown; upgrades to this storm system will likely be required prior to the abandonment of the Town Creek water intake.
- Intake ‘A’ (Seton Canal) will require dialogue and agreement with BC Hydro regarding canal operation, and agreement from IHA regarding periodic untreated well usage.
- Intake ‘B’ (Seton Lake) will require consultation and agreement for construction of works on Band lands.

Yearly operating and maintenance costs associated with this supply option are estimated as follows.

➢ Filtration Plant	$140,000
➢ Well Pumping Power Supply (total)	$ 5,000
➢ Well Pump Maintenance	$ 5,000
➢ Booster Pumping Power Supply (total)	$ 50,000
➢ Booster Pump Station Maintenance	$ 25,000
Total Yearly O & M	**$225,000**

3.3.3 *Supply Option #3: 100% Groundwater Supply – Construct Additional Wells, Treat Rec Centre Wells to Remove Arsenic, and Blend Untreated Water from Conway Park Wells*

This source option would include abandonment of both creek sources. The District would continue to utilize the existing groundwater wells (maximum day capacity of 5.0 ML/day). The remaining future deficiency of 4.0 ML/day would be sourced from additional wells.

Several groundwater potential studies have been conducted for the Lillooet area in the past. Two that focused on the Central Lillooet area were produced by Golder Associates (1993) and Kala Groundwater (1996). Both reports cited the southern section of town, closer to the Fraser River as a potential production well location.

The Golder report resulted in the drilling and completion of the Conway Park wells (total maximum day capacity of 2.8 ML). The Kala report resulted in the drilling and completion of the Rec Centre Well (total maximum day capacity of 2.2 ML).

In 1998, Kala supervised the construction of a second well at the Rec Centre. However, this well was never completed or tied into the water system. Prior to completion, this second Rec Well will have to be pump tested to confirm capacity.

Regardless of whether Rec Well #2 meets all future demand deficiencies, the constructed wells have shown that reliable groundwater sources exist in the area. It is therefore prudent to assume that future demand deficiencies could be met through construction of additional wells, if needed.

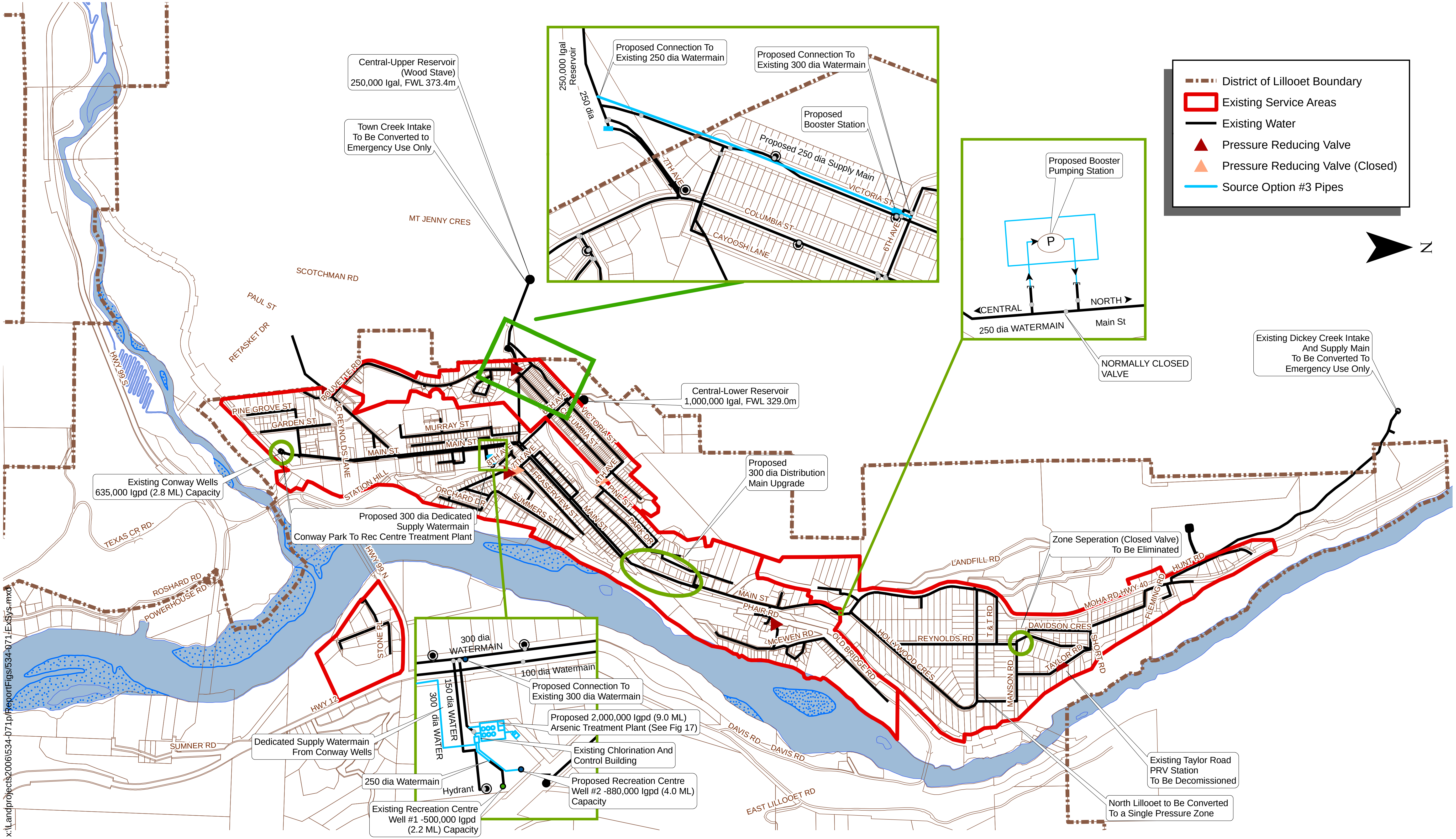
However, it appears that the aquifer currently utilized by all well sources contains arsenic concentrations above the GCDWQ limits. We assume that future wells will be burdened by the same issue.

Construction of an arsenic removal plant is assumed to be necessary for this supply option. Since the majority of source water would come from the two Rec Wells in the future, and space can be made available in the surrounding parking lot – construction of an arsenic removal plant at this location is desirable. The Conway wells would be left untreated, with "blending" occurring at the Rec treatment plant as both well supplies combine. In the future, if treatment of the Conway wells become necessary, the Rec Well treatment plant capacity would be increased. Spacial and mechanical provisions would be included in the building to allow for additional arsenic removal filters at a later date.

If this supply option were pursued, it would include the following upgrading requirements:

- completion of Rec Well #2
- construction of a 5.0 ML/day arsenic removal plant for the Rec wells.
- construction of a dedicated watermain from the Conway Park wells to the Rec Centre treatment plant.
- construction of a booster pumping station and supply watermain to deliver water from the Central Lower Zone (PZ329) to the Central Upper Zone (PZ374).
- construction of a booster pumping station to deliver water from the Central Lower Zone (PZ329) to the North Lillooet reservoir (PZ353).
- upgrading watermain on Main Street to handle delivery of treated water to North Lillooet.
- consolidation of North Lillooet into a single pressure zone.

Infrastructure associated with this source option is shown on *Figure 20*. Order of magnitude costs are estimated below.



Future Source Option #3
100 % Groundwater Supply- Construct Additional Wells and Arsenic Removal Plant

District of Lillooet
Master Water Plan

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Figure 20

Supply Option #3 – Order of Magnitude Cost – Groundwater Only; Construct Additional Wells and Arsenic Removal Plant at Rec Centre

Component 1 – Complete Rec Well #2 (2.8 ML/day)		$250,000
Component 2 – Arsenic Removal Plant (5.0 ML/day)		$2,130,000
Component 3 – Conway Park to Rec Centre Watermain		$305,000
Component 4 – Distribution System Upgrades		
4.1 Construct booster pumping stations.		
(a) Central Lower (PZ329) to Central Upper (PZ374)		$250,000
(b) Central Lower (PZ329) to North Lillooet (PZ353)		$250,000
4.2 Construct 300mm dia. supply watermain upgrades associated with booster stations.		
(a) Supply main construction from Central-Upper booster station to Shop Road area – 465m @ $350/m		$162,750
(b) Main Street watermain upgrade to North Lillooet booster station – 450m @ $250/m		$112,500
4.3 Decommission Town Creek and Dickey Creek intakes and chlorination buildings – allow		$50,000
	Subtotal Component 4	$825,250
	Total Components	$3,510,250
	Contingencies and Engineering (25%)	$889,750
	Total Supply Option #3 Cost	**$4,400,000**

Unresolved issues associated with this option include:

- Town Creek storm drainage handling and downstream piped capacity limitations.
- Unproven nature of well water. Completion of a GUDI analysis and additional sampling for well water quality (arsenic concentrations) will allow determination of specific treatment requirements.
- loss of portion of Rec Centre parking.

Yearly operating and maintenance costs associated with this supply option are estimated as follows.

- Arsenic Removal Plant $105,000
- Well Pumping Power Supply (total) $110,000
- Well Pump Maintenance $ 20,000
- Booster Pumping Power Supply (total) $ 50,000
- Booster Pump Station Maintenance $ 25,000

Total Yearly O & M $310,000

3.3.4 Future Water Supply Recommendations

The three water supply options described in the previous sections are summarized in Table 20.

Table 20: Future Central and North Lillooet Supply/Treatment Options

Option	*Description*	*Primary Treatment*	*Unresolved Issues*	*Capital Costs*	*Yearly O&M Cost*
1	Maximize use of and, build treatment plant on Dickey Creek; abandon Town Creek; continue to use well sources with "blending".	Filtration of Dickey Creek water	• Storm system capacity downstream of Town Creek intake. • Maintenance issues and unknown capacity of Dickey Creek. • Unproven nature of well water (GUDI, arsenic).	$6,450,000	$200,000
2A	Abandon Town and Dickey Creek; build treatment plant on Seton Canal source; wells on standby (back-up supply).	Filtration of Seton Canal water	• Storm system capacity downstream of Town Creek intake. • Canal operation feasibility.	$9,100,000	$225,000
2B	Abandon Town Creek and Dickey Creek; build treatment plant on Seton Lake source; wells on standby (back-up supply).	Filtration of Seton Lake water	• Storm system capacity downstream of Town Creek intake. • Construction of works on Band lands.	$12,000,000	$225,000
3	Maximize use of existing wells; complete additional well source (Rec Well #2); abandon Town Creek and Dickey Creek; build arsenic removal plant at Rec wells, blend Conway Park wells.	Arsenic removal of Rec Centre wells.	• Storm system capacity downstream of Town Creek intake. Unproven nature of well water (GUDI, arsenic). • Reduction in Rec Centre parking area.	$4,400,000	$310,000

As summarized in Table 20, costs associated with both Option 2A and 2B are prohibitive. Those options (100% surface water supply) would require utilization of a new higher capacity source – the most likely being the Seton Canal. Unresolved issues associated with the Canal utilization, coupled with high capital costs, result in dismissal of this source option.

Option #3 (100% groundwater supply) has the lowest capital cost, and the highest estimated yearly O & M cost. The high O & M is due to operational requirements of the arsenic removal plant, as well as the necessity to utilize entirely "pumped" supply.

Option #1 (surface and groundwater supply) has a higher capital cost than Option #3, due to surface water filtration treatment plant costs. The yearly O & M associated with Option #1 is estimated to be the lowest of all options, due to the lower pumping requirements and ability to "cascade" water from the gravity fed Dickey Creek source into the Town core.

Over a 20 year life cycle, we would expect Option #1 and #3 to yield an even value. Beyond a 20 year timeframe, Option #1 likely has the lowest net present value.

In addition, the general operation of a conventional filtration plant is preferred over an arsenic removal plant for safety reasons associated with chemical handling requirements.

Finally, the added risk associated with reliance solely on groundwater supply (Option #3) includes the potential for changes to future chemical quality requirements, as is currently being realized with more stringent arsenic concentration limits.

Therefore, at the present time, we recommend that the District proceed with planning for supply Option #1 (maximize and treat one creek source; "blend" with existing groundwater sources).

This option has similar unresolved issues as Option #3, which must be dealt with prior to moving forward with implementation of several key infrastructure upgrades.

3.4 Water Storage

As shown in Section 2.0, the existing reservoirs for Central-Upper and North Lillooet service areas are theoretically undersized, and the Central-Lower reservoir has double the required capacity. Also, the Central-Upper (wood stave) reservoir has surpassed its design life and recent structural issues have shown that this reservoir is in need of replacement.

3.4.1 Central-Upper Reservoir

In the future as the District shifts away from reliance on the Town Creek source, it will make sense to service the Lillooet Indian Band from the Central-Lower Zone. This will ultimately reduce costs associated with pumping water to the Upper zones.

With the Band removed from this service zone, the future maximum day design water demand will be:

➢ Existing Maximum Day Demand	=	505,000 Igal
➢ Existing Number of Services	=	310
➢ Future Number of Services	=	265
➢ Future Maximum Day Demand	=	265 ÷ 310 x 505,000 = 431,700 Igal
	say	**450,000 Igal/day**

The resulting reservoir capacity requirements are then calculated as follows:

➢ Demand Equalization Storage	=	25% of Maximum Day Demand
	=	25% of 450,000 Igal
	=	112,500 Igal
➢ Fire Flow Storage	=	1980 Igpm x 2.0 hours
	=	237,600 Igal
➢ Total Storage Requirement	=	112,500 + 237,000 = 351,000 Igal
	say	**350,000 Igal**

* Note: Fire flow based on institutional land use

TRUE completed a preliminary options analysis for replacement of this reservoir structure. Several options have since been explored in greater detail. These reviews have resulted in a focus on construction of the replacement reservoir at the same site as the existing reservoir, allowing utilization of existing infrastructure.

Infrastructure requirements associated with replacement of the Upper Zone reservoir are depicted on *Figure 21*. A preliminary cost estimate for these works is detailed as follows:

Preliminary Cost – Central Upper (PZ 374) Reservoir Replacement

Component 1 – Construct booster pumping station, PZ 329 to PZ 374		$250,000
Component 2 – Construct 250mm dia. supply watermain, booster station to Shop Road		
2.1	Within existing roadway, including asphalt repair – 300m @ $275	$82,500
2.2	Outside roadway – 220m @ $200	$44,000
2.3	Tie-ins – allow	$10,000
2.4	Bends and fittings – allow	$15,000
	Subtotal Component 2	$151,500
Component 3 – Construct new reservoir		
3.1	Site preparation	$50,000
3.2	Mechanical interconnect piping	$30,000
3.3	Valve chamber	$15,000
3.4	Overflow and drain piping	$25,000
3.5	Reservoir structure - 350,000 IGal @ $2.00	$700,000
3.6	Deconstruction and removal of existing reservoir	$60,000
	Subtotal Component 3	$880,000
	Subtotal Construction	$1,281,500
	Contingencies & Engineering (allow 15%)	$193,500
	Total Capital Cost	**$1,475,000**

The District also requested that consideration be given to re-lining the existing wood stave tank with a high density polyethylene (HDPE) membrane. If distribution system reconfigurations were implemented (removal of Band and schools from upper zone), the existing wood stave tank would have sufficient capacity for future demands. Costs associated with re-lining the tank are estimated as follows:

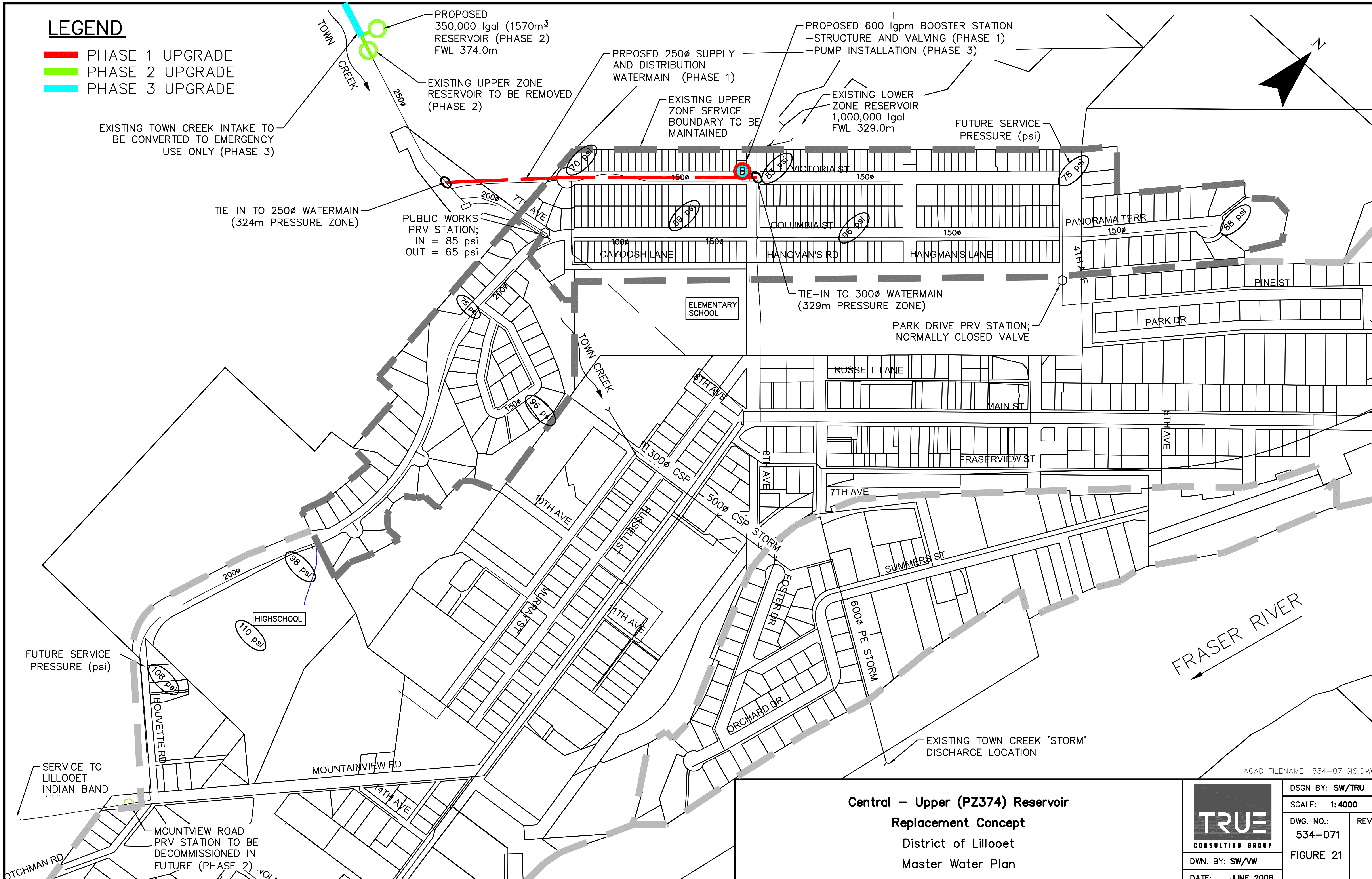
- Install lining on existing wood stave tank

  L.S. = $75,000

- Construct new roof on existing tank

  L.S. = $75,000

Subtotal Re-lining = $150,000



Central – Upper (PZ374) Reservoir Replacement Concept

District of Lillooet

Master Water Plan

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DSGN BY: SW/TRU	
SCALE: 1:4000	
DWG. NO.: 534-071	REV.:
FIGURE 21	
DWN. BY: SW/VW	
DATE: JUNE 2006	

However, the drawbacks to re-lining the wood stave tank include:

- wood stave tank relies on condition of staves to maintain structural integrity. Existing staves are 40 years old, and have surpassed their life expectancy.
- re-lining the tank will require creation of artificial leaks to moisten the staves, in an attempt to maintain their integrity.
- lining suppliers estimate that this style of rehabilitation may prolong the service life of the reservoir by up to 10 years.

The District currently has funding assistance in place from senior levels of government. Relining the stave tank is only a temporary solution, and will not provide nearly the same longevity of construction of a new tank. For these reasons, consideration of relining the wood stave tank does not warrant further consideration.

3.4.2 Central-Lower Reservoir

Future Central-Lower maximum day demands can be calculated as follows:

➢ Existing Maximum Day Demand	=	1,000,000 Igal
➢ Existing Number of Services	=	565
➢ Future Number of Services	=	810
➢ Future Maximum Day Demand	=	810 ÷ 565 x 1,000,000 = 1,433,628 Igal
		say 1,450,000 Igal/day

The resulting reservoir capacity requirements are then calculated as follows:

➢ Demand Equalization Storage	=	25% of Maximum Day Demand
	=	25% of 1,450,000 Igal
	=	362,500Igal
➢ Fire Flow Storage	=	1980 Igpm x 2 hours
	=	237,600 Igal
➢ Total Storage Requirement	=	362,500 + 237,600 = 600,100 Igal
	say	**600,000 Igal**

* Note: Fire flow based on institutional land use

The existing tank has a capacity of 1,000,000 Igal; this reservoir has substantial excess capacity for future demand.

3.4.3 North Lillooet Reservoir

Future North Lillooet maximum day demands can be extrapolated from existing demands as follows:

- Existing Maximum Day Demand = 800,000 Igal
- Existing Number of Services = 240
- Future Number of Services = 255
- Future Maximum Day Demand = 255 ÷ 240 x 800,000

  say 850,000 Igal/day

The resulting future reservoir capacity requirements are then calculated as follows:

- Demand Equalization Storage = 25% of Maximum Day Demand

  = 25% of 850,000 Igal

  = 212,500Igal
- Fire Flow Storage = 1980 lpm x 2 hours

  = 237,600 Igal
- Total Storage Requirement = 212,500 + 237,600 = 450,100 Igal

  say 450,000 Igal

* Note: Fire flow based on institutional land use

The existing tank has a capacity of 310,000 Igal, roughly 2/3 of the required capacity. Several options exist to potentially rectify this deficiency, as described below.

- Reconfigure service areas, in an attempt to shift "demand" into the Central Lower zone – which has ample reservoir capacity. This option would result in unacceptable pressure drops in the North Lillooet lower zone – necessitating construction of an additional booster pumping station.
- Increase reservoir capacity. Additional reservoir capacity would be constructed to match the theoretical "shortfall".
- Implement a water conservation program. As discussed in Section 3.2, demand management will be a key feature for the District as it moves into the future. Reduction in water demands will "create" theoretical capacity. After a number of years, the capacity can be re-assessed to determine if a shortfall still exists.

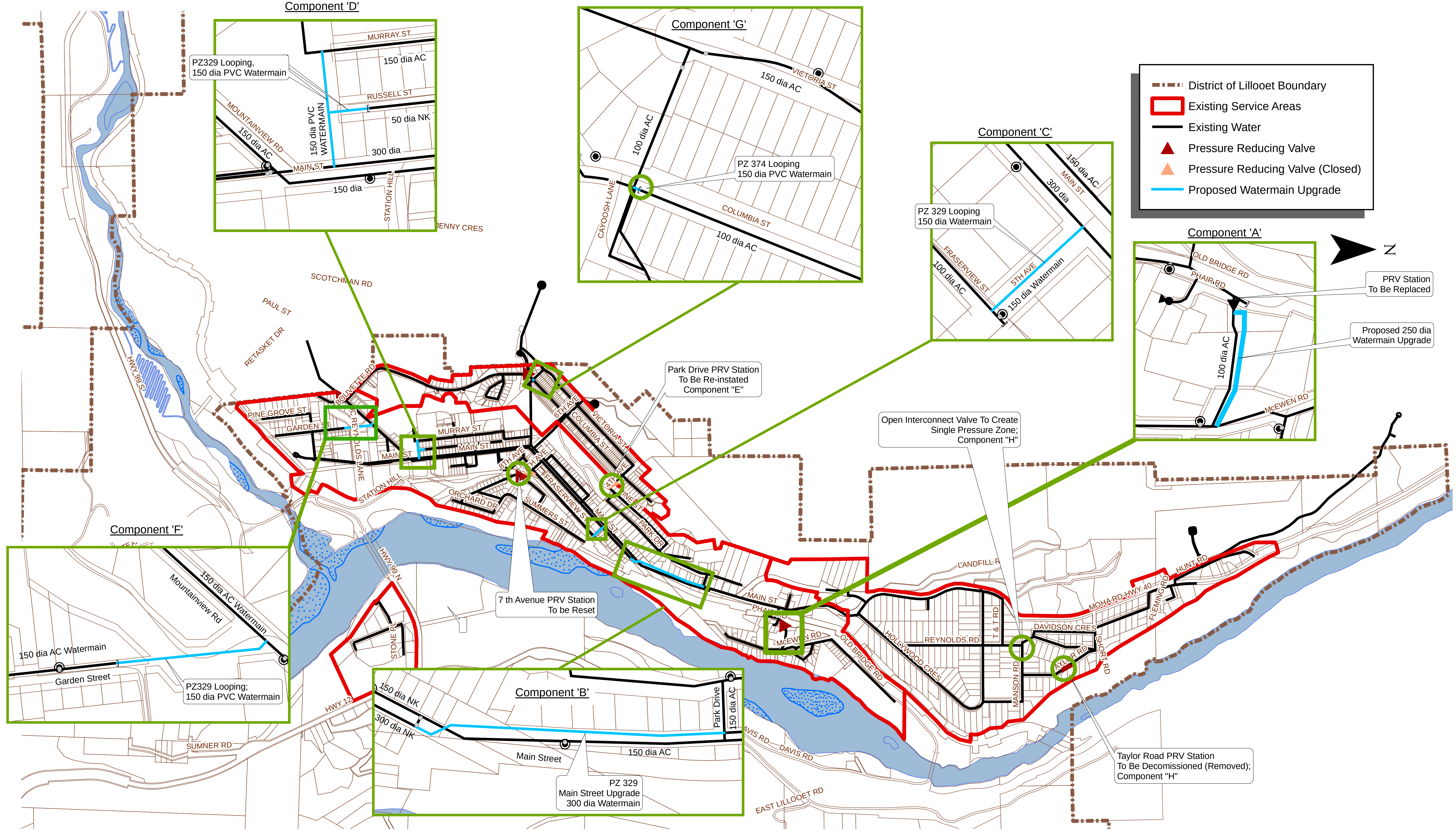
Since reservoir capacity is a theoretical exercise, and the District has not had issue with the existing capacity, we suggest that the demand management program be implemented, with capacity re-assessed periodically into the future (every five years). The District should, however, start budgeting for potential capacity increases to the North Reservoir; these upgrades have an estimated cost of approximately $400,000.

3.5 Water Distribution

The existing water distribution system was described in Section 2.0. An analysis of the system was undertaken using modeling software, as described in Section 2.6. Potential supply and storage upgrades to accommodate future demands were also reviewed earlier in Sections 3.3 and 3.4.

Future peak hour demands, as well as fire flows during max day demand were also modeled to analyze potential future distribution system deficiencies. Results of this modeling were similar to that seen during existing demand conditions, as shown previously in Tables 9 and 10.

Several infrastructure upgrades have also been modeled to determine the system alterations that would be required to substantially improve peak hour pressure distributions and available fire flows. These proposed upgrades are shown schematically on *Figure 22*. Existing and future fire flows resulting from these upgrades are summarized in Table 21.



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Future Distribution System Upgrades

District of Lillooet
Master Water Plan

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DSGN BY:	SW		
SCALE:	1:20,000		
DWG. NO.:	534-071	REV.:	0
DWN. BY:	RK		
DATE:	17AUG06	Figure 22	

Table 21: Proposed Distribution System Upgrading and Resulting Fire Flows

Hydrant Nos.	*Location*	*Design Fire Flow (Igpm)*	*Existing Fire Flow (Igpm)*	*Distribution Upgrade Component*	*Proposed Upgrade Description*	*Resulting Future Fire Flow (Igpm)*
46-52	McEwan Road	660	300-560	A	200mm dia. upgrade of existing 100mm dia. supply, Phair Road to McEwan Road	425-1630
42,43,44,53	Main St. north of Park Drive	2000	600	B	300mm dia. upgrade of existing 150mm dia. "bottleneck" on Main Street	1630-2040
80,81	North end of Fraserview	2000	320-460	C	150mm dia. loop on 5th Ave., Main Street to Fraserview	860-2350
91,92	North end of Murray Street (hospital)	2000	1050-1125	D	150mm dia. loop, Murray St. to Mountainview Cres. or Main St.	1320-1620
75-77	South end of Columbia St. (high school)	2000	1620-1685	--	None Proposed	--
56-60	Park Drive, Hillcrest Rd. and Pine Street	660	310-375	B E	300mm dia. Main St. upgrade. Park Drive PRV station re-activated	420-585 560-1270
108,109	Pinegrove St. and Garden St.	660	500-630	F	150mm dia. loop, Garden St. to Mountainview Cres.	500-1500
61-64, 67-69	North end of Victoria St., Columbia St., and Panorama Cres.	660	350-450	G	150mm dia. loop on Columbia St. near Shop Road	620-870
17,18,26	D'Este Rd. and Hollywood Cres. (elementary school)	2000	1000-1120	H	Inactivation of Taylor Rd. PRV, open interconnect valve on Manson Road to create single upper zone.	1420-1610

Preliminary costs associated with these potential system upgrades are calculated below.

Component A – Phair Road to McEwan Road Upgrade

- Construct 200mm dia. watermain -
  200m @ $175/m = $35,000
- Construct tie-ins to existing 150mm dia. watermain -
  2 ea. @ $5000 ea. = $10,000
- Restore existing landscaping–
  800 sq.m @ $15/sq.m = $12,000
- Construct new Phair Road PRV station -
  L.S. = $40,000
- Watermain appurtenances (bends, fittings, valves) say $3,000

Subtotal = $100,000

Contingencies & Engineering (25%) = $25,000

Component 'A' Capital Cost = $125,000

Component 'B' – Main Street "Bottleneck" Upgrade

- Construct 300mm dia. watermain -
  450m @ $250/m = $112,500
- Construct tie-ins to existing 300mm dia. and 250mm dia. watermain -
  2 ea. @ $10,000 ea. = $20,000
- Repair existing asphalt surface –
  1800 sq.m @ $30/sq.m = $54,000
- Watermain appurtenances (bends, fittings, valves) say $15,000

Subtotal = $201,500

Contingencies & Engineering (25%) = $48,500

Component 'B' Capital Cost = $250,000

Component 'C' – 5th Avenue Loop: Main Street to Fraserview

- Construct 150mm dia. watermain -
  70m @ $150/m = $10,500
- Construct tie-in to existing 100mm dia. watermain -
  L.S. = $5,000

- Construct tie-in to existing 300mm dia. watermain –
  L.S. = $10,000
- Repair existing asphalt surface -
  280 sq.m @ $30/sq.m = $8,400
- Watermain appurtenances (bends, fittings, valves) say $5,000

Subtotal = $38,900

Contingencies & Engineering (25%) = $11,100

Component 'C' Capital Cost = $50,000

Component 'D' – Murray Street Loop: Murray Street to Main Street

- Construct 150mm dia. watermain -
  130m @ $150/m = $19,500
- Construct tie-ins to 100mm dia. and 150mm dia. watermain -
  3 ea. @ $5000 ea. = $15,000
- Repair existing landscaping –
  400 sq.m @ $25/sq.m = $10,000
- Watermain appurtenances (bends, fittings, valves) say $10,000

Subtotal = $54,500

Contingencies & Engineering (25%) = $20,500

Component 'D' Capital Cost = $75,000

Component 'E' – Park Drive PRV Station Reactivation

- Assume full reconstruction/replacement of PRV station
  L.S. = $50,000

Component 'E' Capital Cost = $50,000

Component 'F' – Garden Street Loop: Garden Street to Mountainview Cres.

- Construct 150mm dia. watermain -
  200m @ $150/m = $30,000
- Construct watermain tie-ins to 150mm dia. watermain -
  2 ea. @ $5000 ea. = $10,000
- Repair existing landscaping –
  600 sq.m @ $25/sq.m = $15,000

- Watermain appurtenances (bends, fittings, valves) say $10,000

Subtotal = $65,000

Contingencies & Engineering (25%) = $15,000

Component 'F' Capital Cost = $80,000

Component 'G' – Central Upper Zone Looping: Columbia Street

- Construct 150mm dia. watermain -
  25m @ 150/m = $3,750
- Construct watermain tie-ins to 100mm dia. watermain -
  2 ea. @ $5000 ea. = $10,000
- Restorations and road repair –
  100 sq.m. @ $30/sq.m = $3,000

Subtotal = $16,750

Contingencies & Engineering (25%) = $3,250

Component 'G' Capital Cost = $20,000

Component 'H' – North Lillooet Lower Zone Fire Flow Improvements

- Construct second PRV station on corner of Reynolds and Manson Rd; alternatively, inactivate Taylor Road PRV and open closed valve to re-create a single North Lillooet pressure zone-
  L.S. = $40,000

Subtotal = $40,000

Contingencies & Engineering (25%) = $10,000

Component 'H' Capital Cost = $50,000