District of Summerland
2008 Water Master Plan

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Agua Consulting Inc. **August 13, 2015**

Report Outline

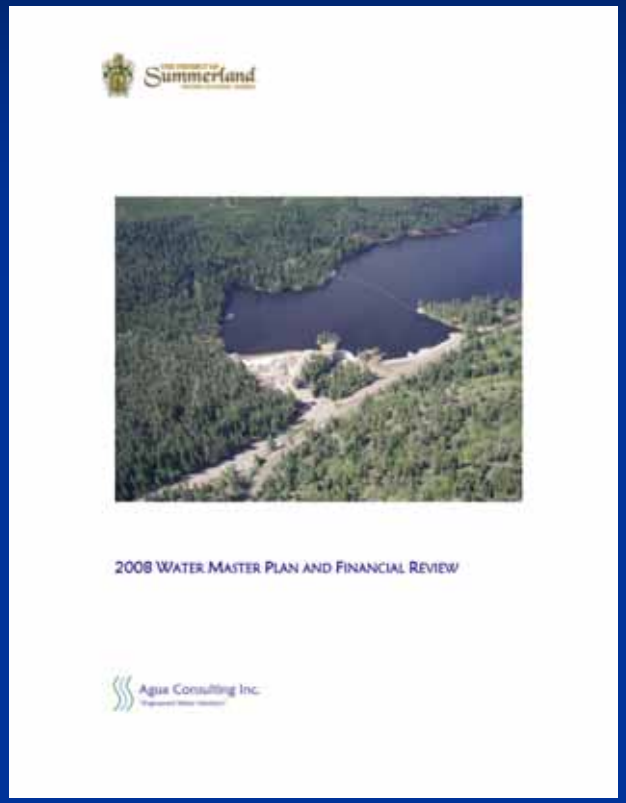
- Section 1 - Introduction
- Section 2 - Criteria
- Section 3 - Existing Water Supply
- Section 4 - Water Quality Review
- Section 5 - Future Water System
- Section 6 - Financial Plan
- Section 7 - Summary
- Appendix A - Detailed Cost Estimates
- Appendix B - Financial Model
- Appendix C - Computer Distribution Model
- Appendix D - Electrical & Controls Audit
- Appendix E - Supplemental Data
- Appendix F - Water Use Plan Update
- Appendix G - Watershed Risk Assessment
- Appendix H - References

Section 1.0 - Introduction

Sets out Water Master Plan:

- Objectives
- Guiding Principles
- Water Supply Issues
- Scope of Work
- Units / Conversions / Terminology
- Abbreviations / Definitions
- Acknowledgements

1.2 Water Supply – Guiding Principles

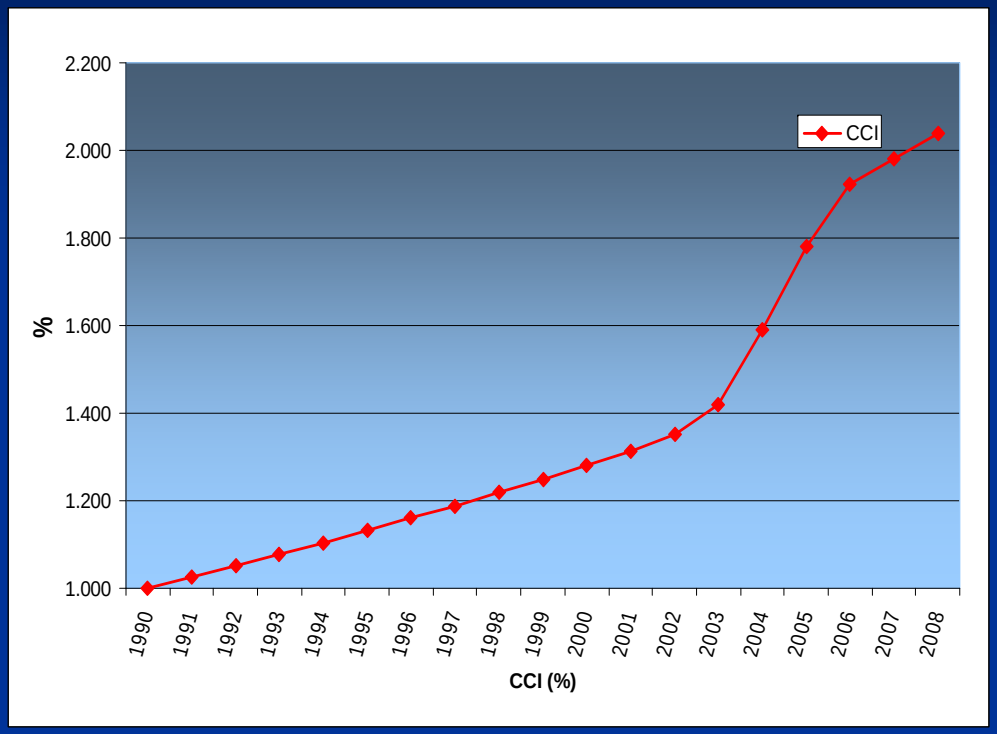


1. Recognize the inherent value of water
2. Control pollution at its source
3. Integrate Lake Use Planning and Water Resource Management
4. Clearly allocate water within the Okanagan Budget
5. Promote a culture of basin-wide water conservation
6. Think and act like a region
7. Ensure water supplies are flexible and resilient
8. Provide sufficient resources for local water management initiatives
9. Encourage active community engagement
10. Practice adaptive management

Section 2.0 – Criteria

Criteria by which the report content is assessed:

- Regulations and Approval Authorities
- Quantity and Demand Criteria
- Quality Criteria
- Costing and Financial Criteria



Year	CPI	Calc. %	CPI	CCI Est. %	CCI
1990	92.4		1.000		**1.000**
1991	97.4	5.13%	1.027	2.50%	**1.025**
1992	100	2.60%	1.082	2.50%	**1.051**
1993	103.5	3.38%	1.120	2.50%	**1.077**
1994	105.5	1.90%	1.142	2.50%	**1.104**
1995	107.9	2.22%	1.168	2.50%	**1.131**
1996	108.9	0.92%	1.179	2.50%	**1.160**
1997	109.7	0.73%	1.187	2.50%	**1.189**
1998	110	0.27%	1.190	2.50%	**1.218**
1999	111.2	1.08%	1.203	2.50%	**1.249**
2000	113.3	1.85%	1.226	2.50%	**1.280**
2001	115.2	1.65%	1.247	2.50%	**1.312**
2002	*117.5*	*2.00%*	1.272	3.00%	**1.351**
2003	*119.9*	*2.00%*	1.297	5.00%	**1.419**
2004	*122.3*	*2.00%*	1.323	12.00%	**1.589**
2005	*124.7*	*2.00%*	1.350	12.00%	**1.780**
2006	*127.2*	*2.00%*	1.377	8.00%	**1.922**
2007	*129.7*	*2.00%*	1.404	3.00%	**1.980**
2008	*132.3*	*2.00%*	1.432	3.00%	**2.039**

Section 3.0 – Existing Water Supply

Review of the As-Is Condition

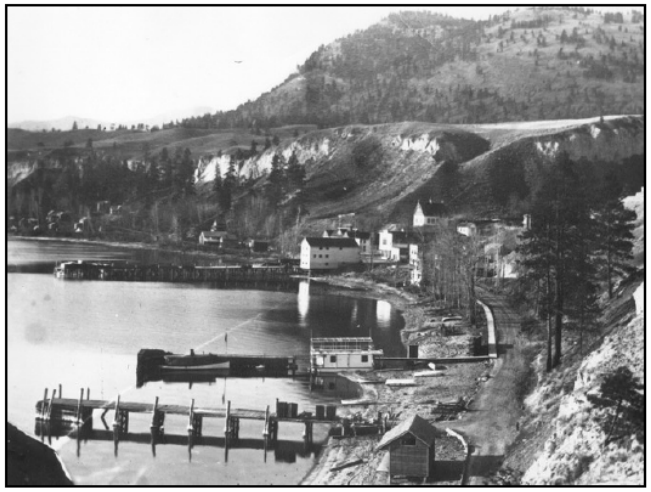
- History of Summerland Water
- Water Licensing
- Watershed Capacity and Reliability
- Water Demand Summary
- Distribution System Review
- Existing Water Issues

Section 3.2 – History

History of water supply events in Summerland since 1887

1910 - The newly formed Municipality of Summerland took over the irrigation and domestic water systems from the Summerland Development Company and the irrigation system from the Garnet Valley Land Company. The irrigation system was the first publicly owned water system in the Okanagan Valley.

1912 - The Apple market was flooded for the first time with fruit from Washington State. The product exceeded the consumer demand. In the following years, the apple industry also suffered from the Great War.



1915 - The Dominion Experimental Farm was set up to help the orchard industry.

1921 – Surveys were undertaken in the upper watershed at Headwaters, Crescent and Site 1 by Mr. J.C. Dufreschne, Civil Engineer.

1922 - Great fires devastate the town of Summerland.

1922 - Trout Creek Flats was not part of the municipality and the Trout Creek Water Improvement District (TCWID) was formed to service this area. A concrete dam existed at the mouth of the Trout Creek canyon and this diversion dam served the needs of Trout Creek.

1924 - System demands increased with the demands from the Trout Creek, the Dominion Experimental Farm and the Municipality. Crescent Lake storage dam was completed.

Late **1920s** – early **1930s** – Drought and lack of water resulted in the loss of many orchards. Disputes occurred between the orchardists and utility.

Section 3.3 – Licensing

Table 3.1 District of Summerland – Existing Water Licences Summary

Lic. No	Stream Name	Purpose	Quantity	Units	Storage	WMLA	Irrig.	Status	Priority	Issued
C014568	Trout Creek	Storage	2630	AF	3243			Current	19400626	0
C014569	Trout Creek	Waterworks Local Auth	91250000	GY		414		Current	19400626	0
C016412	Trout Creek	Irrigation Local Auth	3170	AF			3909	Current	18881218	0
C016413	Trout Creek	Irrigation Local Auth	6000	AF			7398	Current	19030711	0
C016414	Isintok Creek	Storage (1665 ML)	5500	AF	6782			Current	19260326	0
*	Tsuh Creek	Storage (370 ML)	5500	AF				Current	19260326	0
*	Crescent Creek	Storage (617 ML)	5500	AF				Current	19260326	0
*	ZZ Creek (7819) (Whitehead)	Storage (432 ML)	5500	AF				Current	19260326	0
*	ZZ Creek (7824)	Storage	5500	AF				Current	19260326	0
*	ZZ Creek (7788)	Storage	5500	AF				Current	19260326	0
*	Trout Creek	Storage	5500	AF				Current	19260326	0
C016415	Eneas Creek	Irrigation Local Auth	3000	AF			3699	Current	18890801	0
*	Eneas Creek	Irrigation Local Auth	3000	AF				Current	18890801	0
*	Latimer Creek	Irrigation Local Auth	3000	AF				Current	18890801	0
*	Eneas Creek	Irrigation Local Auth	3000	AF				Current	18890801	0
*	Eneas Creek	Irrigation Local Auth	3000	AF				Current	18890801	0
C016416	Eneas Creek (Garnet)	Storage	2000	AF	2466			Current	19130429	0
*	Finlay Creek (Garnet)	Storage	2000	AF				Current	19130429	0
C029847	Trout Creek (Headwaters 1)	Storage	750	AF	925			Current	19610518	0
C030786	ZZ Creek (7788) (Whitehead)	Storage	222	AF	274			Current	19650628	0
C030787	ZZ Creek (7819)	Storage	250	AF	308			Current	19650628	0
*	ZZ Creek (7824)	Storage	250	AF				Current	19650628	0
*	Trout Creek	Storage	250	AF				Current	19650628	0
C032615	Okanagan Lake	Waterworks Local Auth	584000000	GY		2651		Current	19670606	0
C034398	Crescent Creek	Storage	255	AF	314			Current	19670606	0
C034399	Crescent Creek (Headwaters 1,2,3,4)	Storage	1000	AF	1233			Current	19670606	0
C034400	ZZ Creek (7788) (Whitehead)	Storage	348	AF	429			Current	19670717	0
C056161	Eneas Creek	Irrigation Local Auth	25	AF			31	Current	19480318	0
C056869	Eneas Creek	Storage	360	AF	444			Current	19800624	0
C060898	Trout Creek	Irrigation Local Auth	1500	AF			1850	Current	19730803	0
*	Trout Creek	Waterworks Local Auth	213000130	GY		967		Current	19730803	0
C066455	Trout Creek	Irrigation Local Auth	2500	AF			3083	Current	19880602	0
C066491	Trout Creek	Irrigation Local Auth	75	AF			92	Current	19410526	0
C106027	Thirsk Lake	Storage	2000	AF	2466			Current	19930122	20000317
C106243	Prairie Creek	Land Improve	0	TF				Current	19930217	19941102
C106464	Eneas Creek	Land Improve	0	TF				Current	19940421	19941027
C118910	Okanagan Lake	Waterworks Local Auth	760000000	GY		3450		Current	20031022	20040212
F066492	Trout Creek	Irrigation Local Auth	697	AF			859	Current	18881218	0
*	Trout Creek	Waterworks Local Auth	1825000	GY		8		Current	18881218	0
F066493	Trout Creek	Irrigation Local Auth	5	AF			6	Current	18901220	0
Okanagan Lake Licenses						**6,102**				
Trout Creek Licenses					**15,974**	**1,390**	**17,197**			
Garnet Valley Licenses					**2,910**	**0**	**3,730**			
TOTAL WATER LICENSING IN ML / YEAR					**18,883**	**7,491**	**20,926**			

Total number of Licences and/or Applications found is **25**

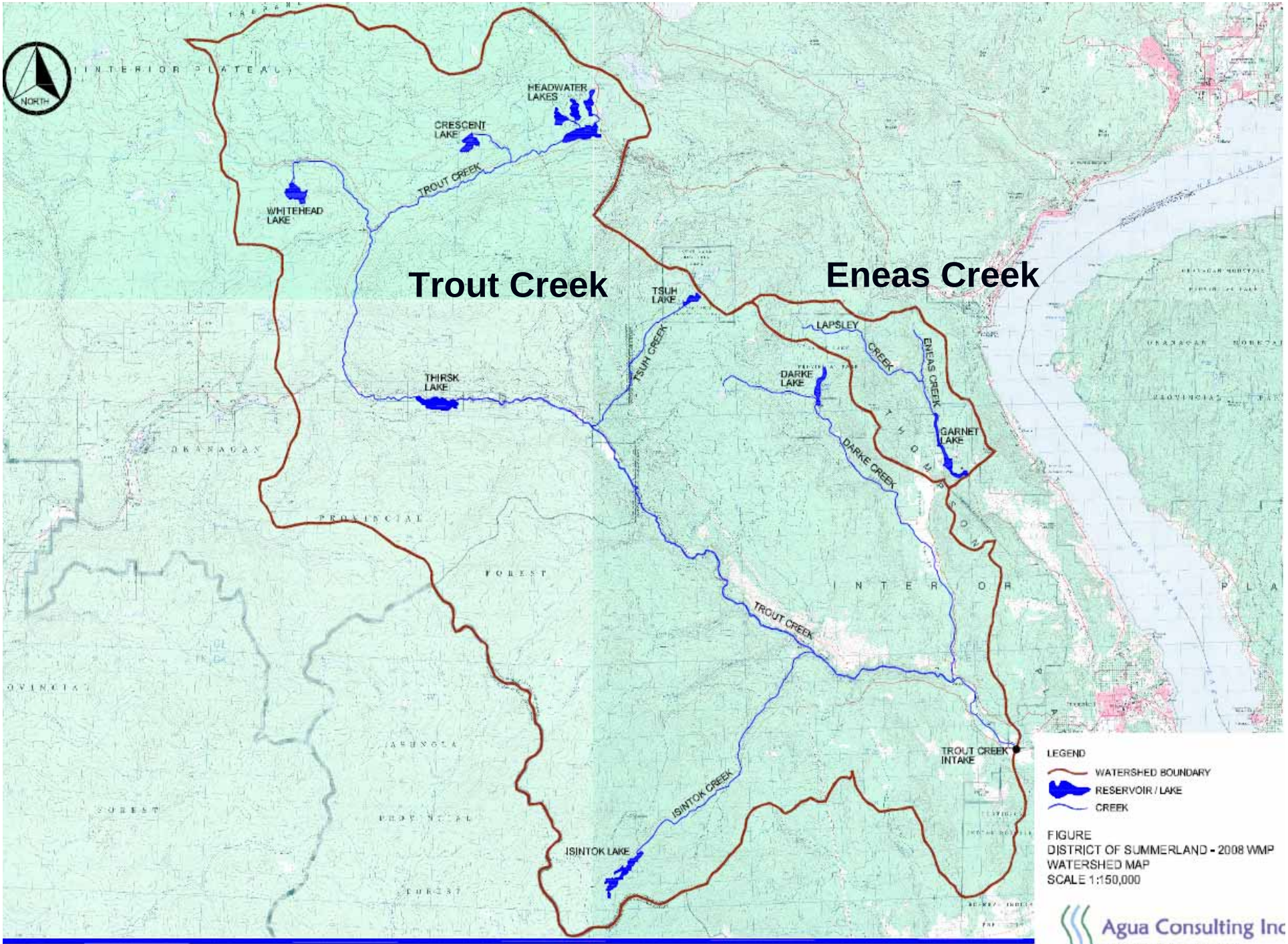


FIGURE
DISTRICT OF SUMMERLAND - 2008 WMP
WATERSHED MAP
SCALE 1:150,000

Agua Consulting Inc
"Engineered Water Solutions"

Section 3.4 - Watershed Water Sources

THIRSK RESERVOIR

Thirsk Reservoir is the primary control reservoir for flow in lower Trout Creek. The reservoir is located 34 km upstream of the existing District of Summerland intake. Travel time for releases from this reservoir to reach the district intake is 18 hours during summer flows. The average flow rate is 1.9 km/hr or 0.50m/s. There is one remote gate installed that can be controlled with the Summerland SCADA system.

Thirsk provides on-line storage on Trout Creek effectively collecting and storing all upstream water in the watershed. The reservoir concrete dam was recently upgraded and the entire structure was raised by 4.6 metres. Thirsk Reservoir is the largest and most critical reservoir owned and operated by the District. Radio controlled monitoring of the reservoir for flows and water level is recommended to collect more reliable data on Trout Creek.

Thirsk Reservoir	
Subcatchment area *	19544.3 ha.
Reservoir Surface Area	57.8 ha.
Reservoir Elevation	1026 m
Mean Subcatchment Elevation*	1335 m
Live Storage	6490 ML
Ave. Reservoir Depth	11.228 m
Average Annual Runoff	27520 ML
Average Annual Runoff Depth	0.141 m
Average Year Ability to Fill	**424%**
Evaporation Losses	**588 mm**
	340 ML
1:100 year Drought Runoff	6790 ML
1:100 year Drought Runoff Depth	0.035 m
1:100 year Ability to Fill	**105%**
* Includes only unregulated areas	

The reservoir has a 237 km^2 total catchment area with an unregulated area below the upper watershed dams of 195 km^2. The old height of dam was 1025.4 m. The raised elevation is 1030.0 m. The height of the dam is now 25.8 m.

Google Earth Image: Thirsk Reservoir in foreground, prior to 2006 Raising, looking westwards up Trout Creek

Table 3.4 - Summerland Reservoir Inflows

Reservoirs	Licensed Storage (ML)	Ex. Actual Storage (ML)	1:10 Wet Runoff (ML)	Ave. Runoff (ML)	1:10 Drought Runoff (ML)	1:50 Drought Runoff (ML)	1:100 Drought Runoff (ML)
Thirsk Reservoir	6164	6490	47340	**27520**	12840	8160	**6790**
Headwaters Reservoirs	2158	4472	7190	**4640**	2500	1700	**1480**
Isintok Reservoir	1665	1384	3910	**2460**	1280	920	**820**
Crescent Reservoir	931	765	3580	**2300**	1250	900	**800**
Whitehead Reservoir	1442	1216	1430	**980**	590	440	**400**
Tsuh Reservoir	370	308		**486**			**173**
Trout Creek @ Intake	3243	260	137690	**83370**	39980	26140	**22360**
Estimated fish flows as per WUP			30461	**20,695**	12449	9485	**8618**
Garnet Reservoir	2910	2360	8870	**5690**	3120	2390	**2180**
TOTALS	**18883**	**17255**					

Table 3.4 provides the summary of the frequency analysis carried out by Water Management Consultants for the Summerland reservoirs. The flows estimated for the Trout Creek intake do not include the live storage in upstream reservoirs.

Table 3.4 shows that Garnet Reservoir would be expected to fill in all years, even starting empty, except for the 100-year dry year. The Headwaters Resevoirs will fill in an average year but in less than average years, filling is not guaranteed if the lakes are empty prior to the freshet. Crescent and Whitehead

Section 3.5 - Unavailable Water

- Darke Creek sub-basin watershed (not available)
- Annual Evaporative losses (1,928 ML/yr) *
- Conservation base flow to lower Trout Creek (varies as per WUP) *
- Groundwater losses above intake to alluvial fan (est. to be 4.0 ML/day or 1,460 ML/yr) *
- Trout Creek balancing reservoir losses (est. to be 4.0 ML/day or 1,460 ML/yr) *

* Accounted for within Watershed model

Section 3.5 - Available Water

Average Year and 1:100 Year Drought

Month	Ave. Runoff (ML)	Fish Flow % of Runoff	Normalized Demand	Ave. Yr Fish Flow	Ave. Year Storage shortfall	1:100 Drought Runoff (ML)	1:100 Yr Fish Flow	1:100 Yr Storage Shortfall
Jan	1004	0	161			269		
Feb	1327	0	152			356		
Mar	3623	0	170			972		
Apr	12203	0	469			3273		
May	26761	0	1364			7177		
Jun	28220	57.2	1905	11838		7569	4929	
Jul	3354	18.8	2395	3891	-2932	900	1620	-3116
Aug	1567	9.6	2373	1987	-2793	420	827	-2780
Sep	1185	7.5	1342	1552	-1709	318	646	-1671
Oct	2057	6.9	490	1428		552	595	-533
Nov	1066	0	172			286		
Dec	1004	0	162			269		
TOTAL	83370	100.0	11156	20695	-7434	22360	8618	-8100

Section 3.6 - Water Use Plan Update

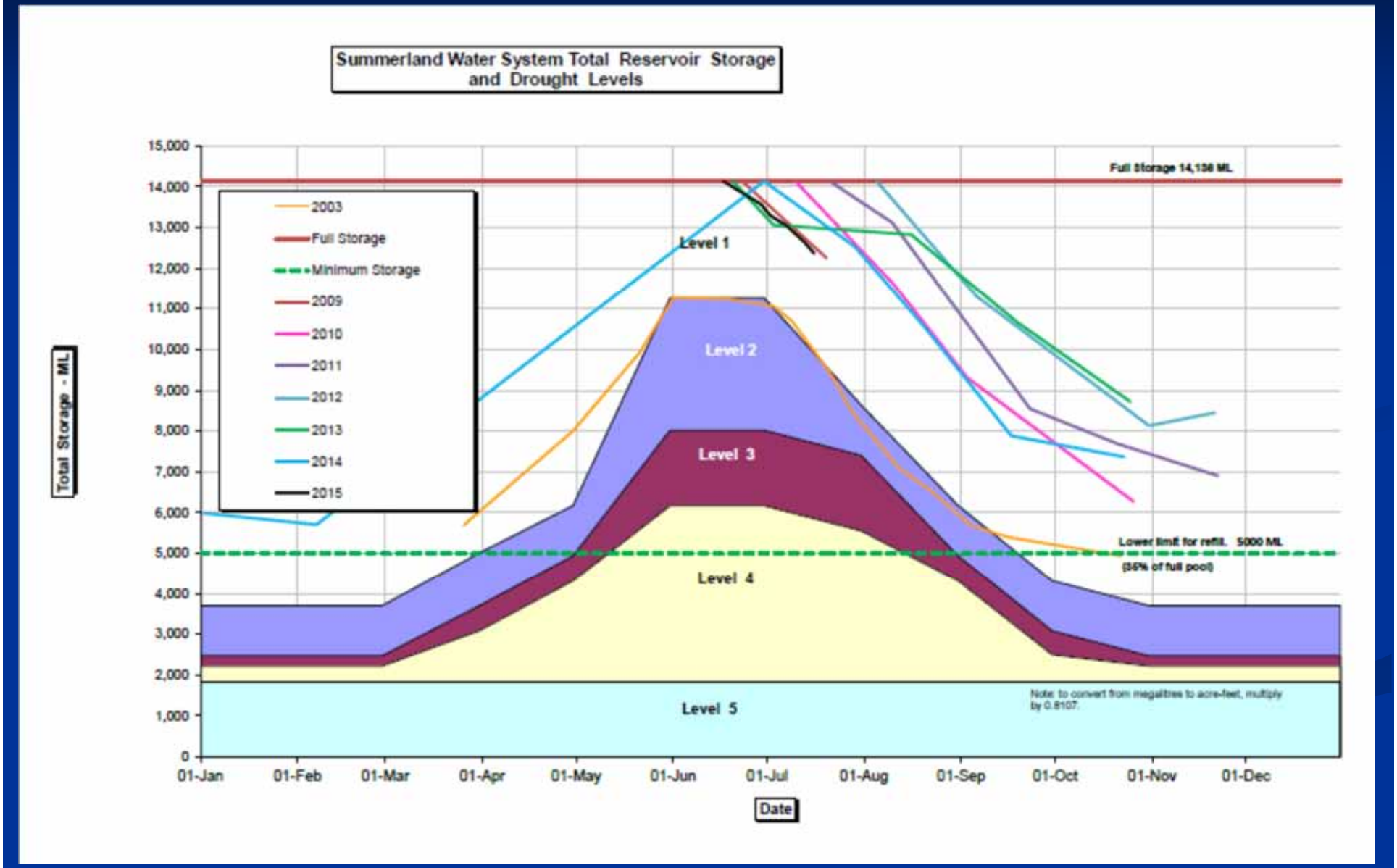
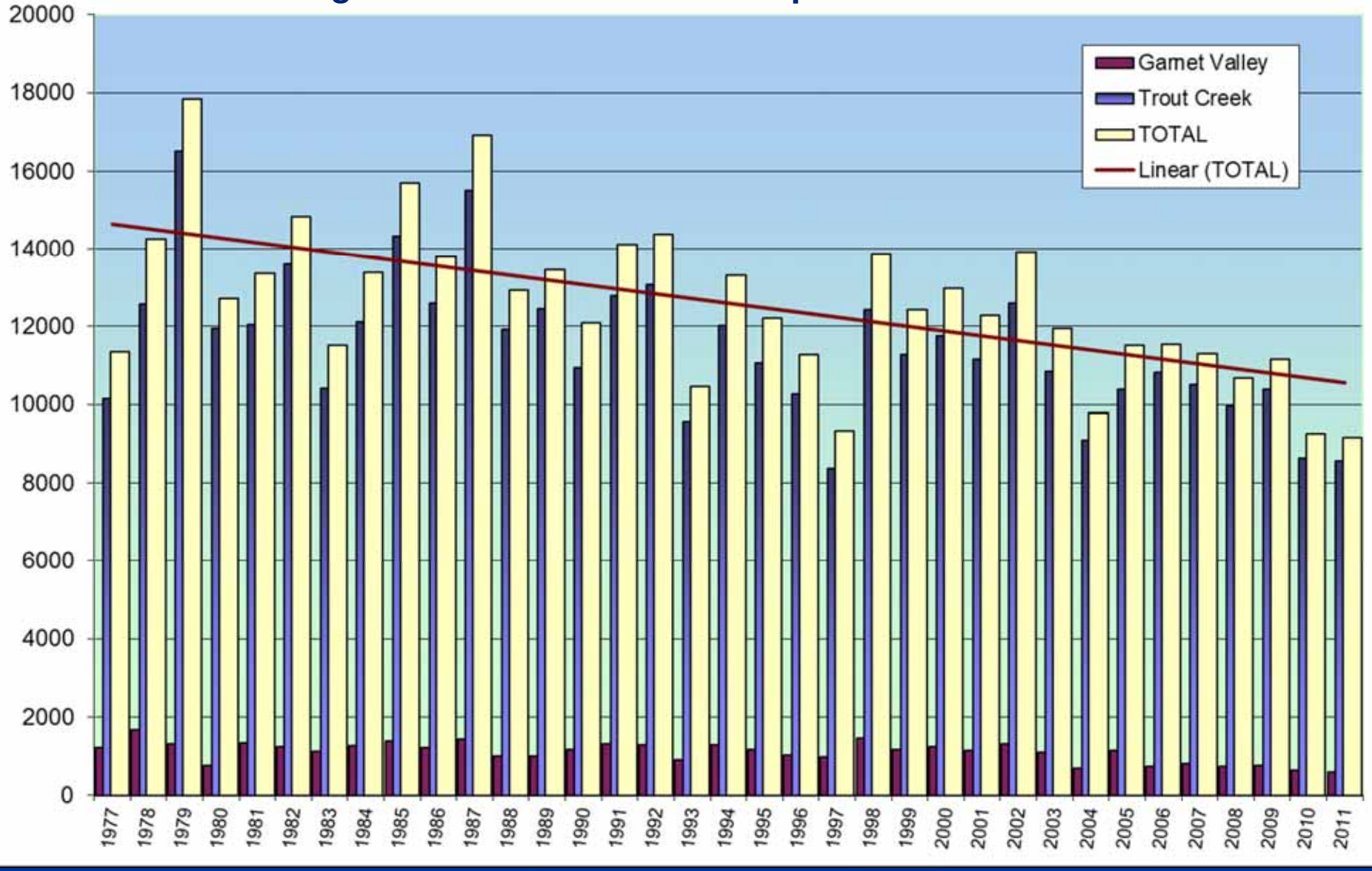


Figure 3.5 – Historic Consumption 1977-2011



Section 3.10
Water Distribution System Review

- Review of water main conveyance capacity
- Pump Stations
- Reservoir Balancing Storage
- PRV stations
- Electrical Instrumentation and Controls
- Fire hydrant coverage
- Blow offs and dead ends

Section 3.0 - Tools for Analysis

1. Water Management Consultants Watershed model *For analysis of hydrology in the upper watershed, routing of flows from sub-basins in Trout Creek;*

2. EPANET model – Water Distribution System model developed by the USEPA. *Model was assembled and adjusted to match Summerland daily summer and winter flow conditions for hydraulic analysis on the water distribution system.*

Section 4.0 – Water Quality
What Waterborne Pathogen may be present…..?

Table 4.2 - Bacterial, Parasitic and Viral Pathogens

Bacterial Pathogens	Parasitic Pathogens	Viral Pathogens
Acinetobacter	Acanthamoeba spp.	Adenoviruses
Aeromonas	Ascaris lumbricoides	Astroviruses
Camplyobacter	Balamuthia mandrillaris	Emerging viruses
Cynaobacteria	Balantidium coli	Enteroviruses and Parechoviruses
Enterohemorrhagic (Escherichia coli)	Balastocystis hominis	Hepatitis A virus
Escherichia coli	Cryptosporidium parvum and Cryptosporidium hominis	Hepatitis E virus
Flavobacterium	Cyclospora cayetanensis	Human Caliciviruses (Noroviruses and Sapoviruses)
Helicobacter pylori	Entamoeba histolytica	Reoviruses
Klebsiella	Giardia lamblia	Rotaviruses
Legionella	Isospora belli	Norovirus
Mycobacterium avium complex	Microsporidia	
Pseudomonas	Naegleria fowleri	
Salmonella	Shistosomatidae	
Serratia	Toxoplasma gondii	
Shigella	Trichuris trichiura	
Staphylococcus		
Vibrio chlorerae		
Yersinia		

Section 4.4 - Treated Water Compliance

Table 4.3 Summerland Treated Water Quality - 4,3,2,1,0 Compliance Summary

IHA Protocol	Description	Trout Creek	Garnett Reservoir	Rodeo Ground Well	Okanagan Lake (Proposed)
4	4 log (99.99% inactivation/removal of viruses)	Achieved	Achieved	Not applicable	requires chlorination
3	3 log (99.9%) inactivation/removal of Protozoa	Will be in compliance for flows under 75 ML/day when WTP is fully functional	Not achieved, background risk is low but requires additional treatment	Not applicable	requires Cl2 and UV disinfection to achieve protection
2	2 types of treatment	Will be in compliance for flows under 75 ML/day when WTP is fully functional	Presently only chlorination is implemented	Not applicable	UV and Cl2 are technically sufficient but not acceptable by IHA
1	< 1.0 NTU Turbidity	Same as above	usually less than 1.0 NTU, always less than 5.0 NTU	Achieved	would be achieved
0	0 Total and E.Coli bacteria	Achieved	Achieved	Achieved	would be achieved

Area of concern
Out of Compliance

Figure 4.1 - Total Coliform Bacteria in Trout Creek Balancing Reservoir 2004 - 07

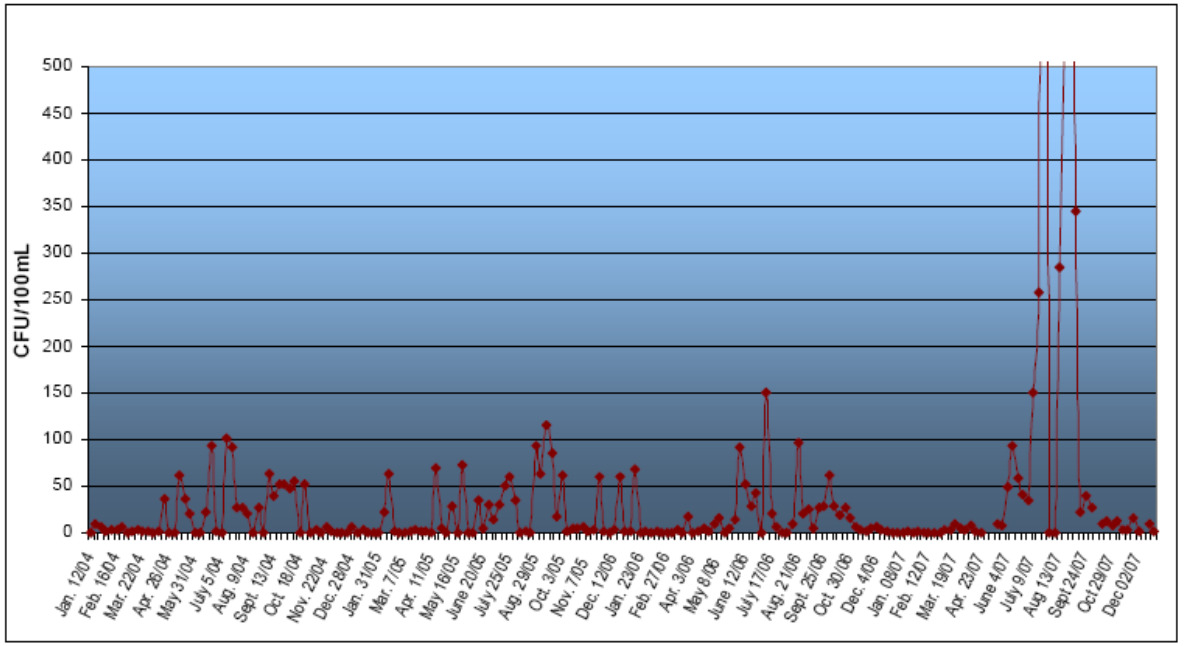


Figure 4.2 - E.Coli Bacteria in Trout Creek Balancing Reservoir 2004 - 07

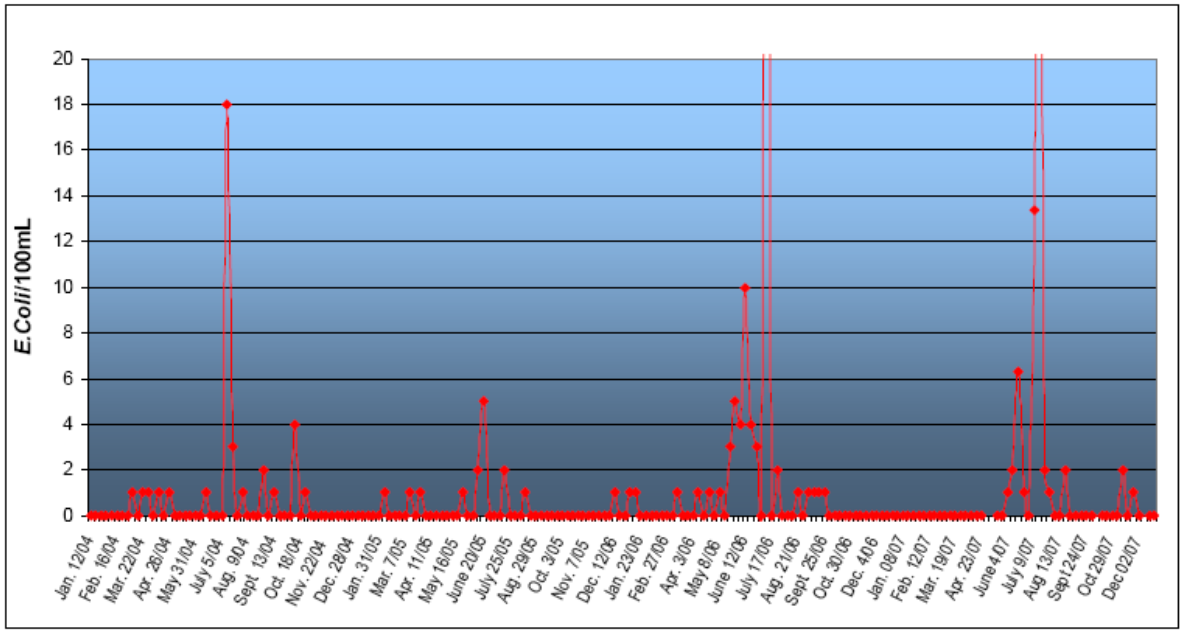


Figure 4.3 - Schematic of Garnet Reservoir Outlet Basin Showing Aerators

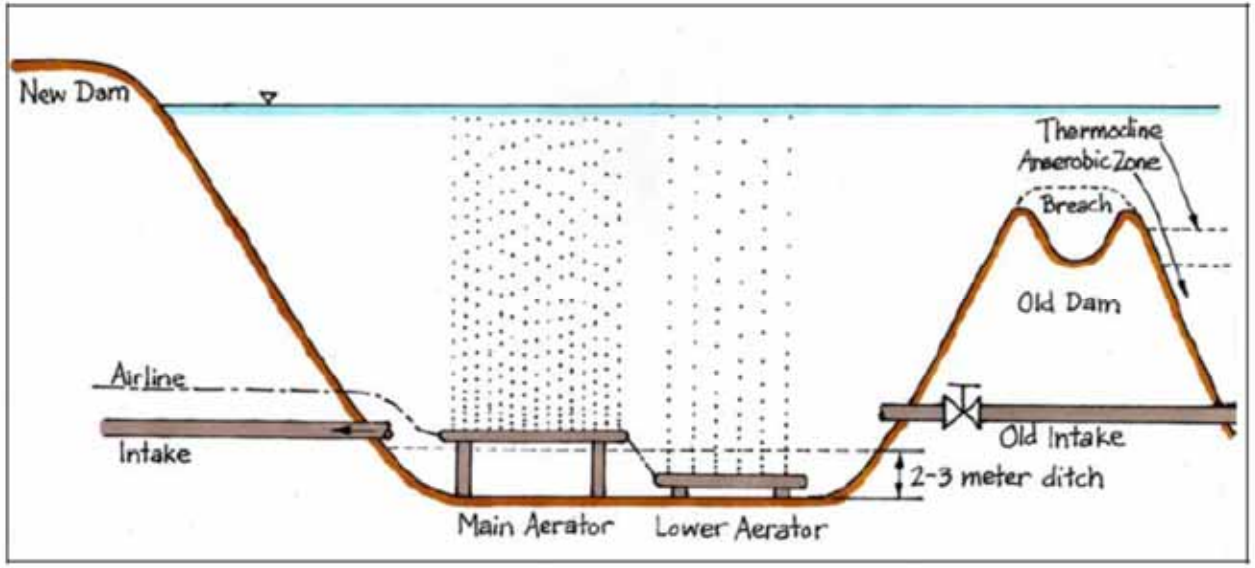
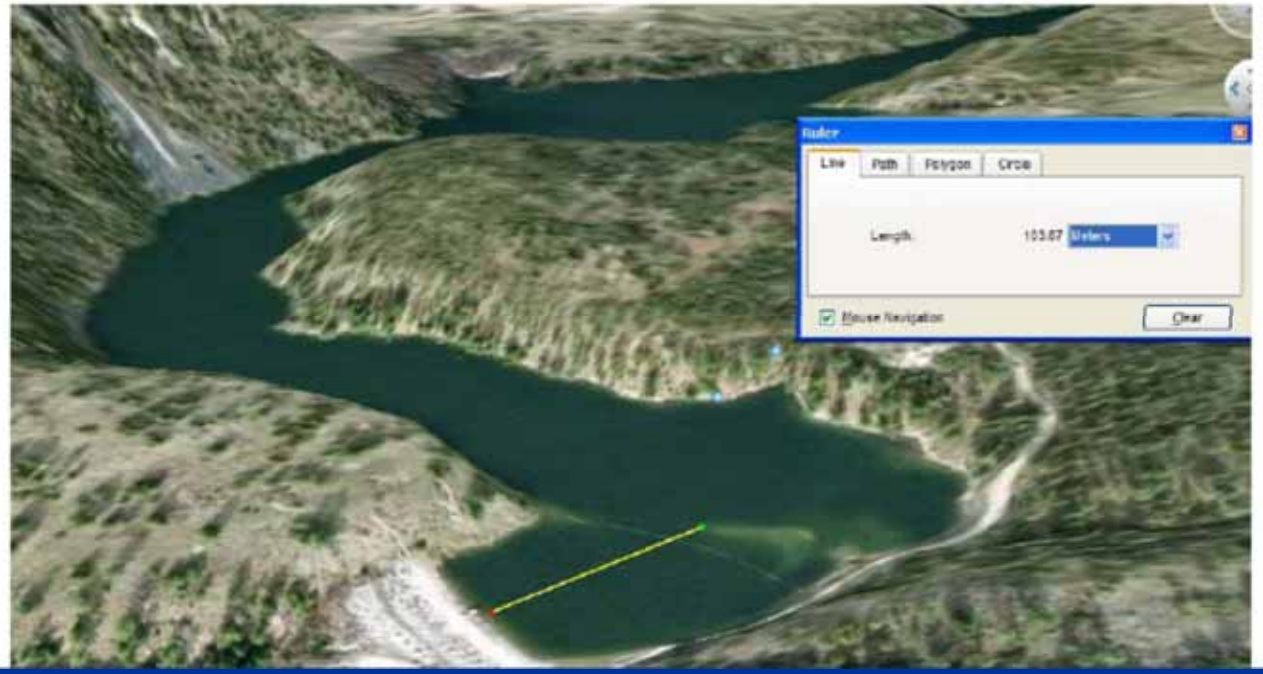


Figure 4.4 - Garnet Reservoir – Breached Dam Underwater – 105m to North



Okanagan Lake Depth vs Quality Larratt Report 2009

Overview of Okanagan Lake Intakes, their Depth and Influences (based on this study)

The first three columns provide the depths of the intakes that participated in this study by sub-basin

The last three columns demonstrate the approximate thermal, pathogen and cyanobacterial risks as intake depth changes

South sub-basin	Central sub-basin	North sub-basin	Depth (m)	Thermal Zones	Risk of pathogen	Cyano-bacteria
			1	warm surface water	high risk	high risk of surface cyanobacteria
			2			
			3		risk is higher for surface water contamination	
	O Shanboolard		4			
			5			lower risk of surface cyanotoxins
			6			
O Peachland			7			
			8			
			9			
			10			
			11		contamination risk is lower below the thermocline	
		O Adventure Bay	12	summer thermocline zone		significant growth of low light cyanobacteria
			13			
O Westbench	O Eldorado	O West Kelowna Est.	14			
	O Sunnyside		15			
	O Swick		16	active seiches		
		O McKinley	17			
	O R # 9		18			
			19			
	O Cedar / Stellar		20	15°C guideline exceeded above this depth		
			21	seiches diminish 5 - 12 °C temp range	low risk of pathogens	lower risk of cyanotoxins
			22			
	O Casa Loma		23			
		O Outback	24			
		O Poplar Point	25			
			26			
			27			
			28			
			29			
			30			
			31	seiches diminish 5 -10 °C temp range		best range for intakes to avoid cyanobacteria
			32			
		O LC Okanagan	33			
			34			
			35			
O Penticton			36			
		O R# 10	37			
			38			
			39			
			40			
			41	low seiche risk temp range <5°C	very low risk of pathogens	
			42			
			43			
			44			
			45			
			46			
			47		maximum depth for divers	
			48			
			49			
			50			
			60	minimal seiche penetrations		lower risk of cyanotoxins
			70			
			80		suspended detritus	high risk of benthic cyanob
			>>>			

COMMENTS: The thermal, pathogen and cyanobacterial risks depicted in this chart are generalized; every intake is affected by sub-basin and location (proximity to creek plumes, outfalls, storm water etc.)

Section 4.11 - WQ Recommendations

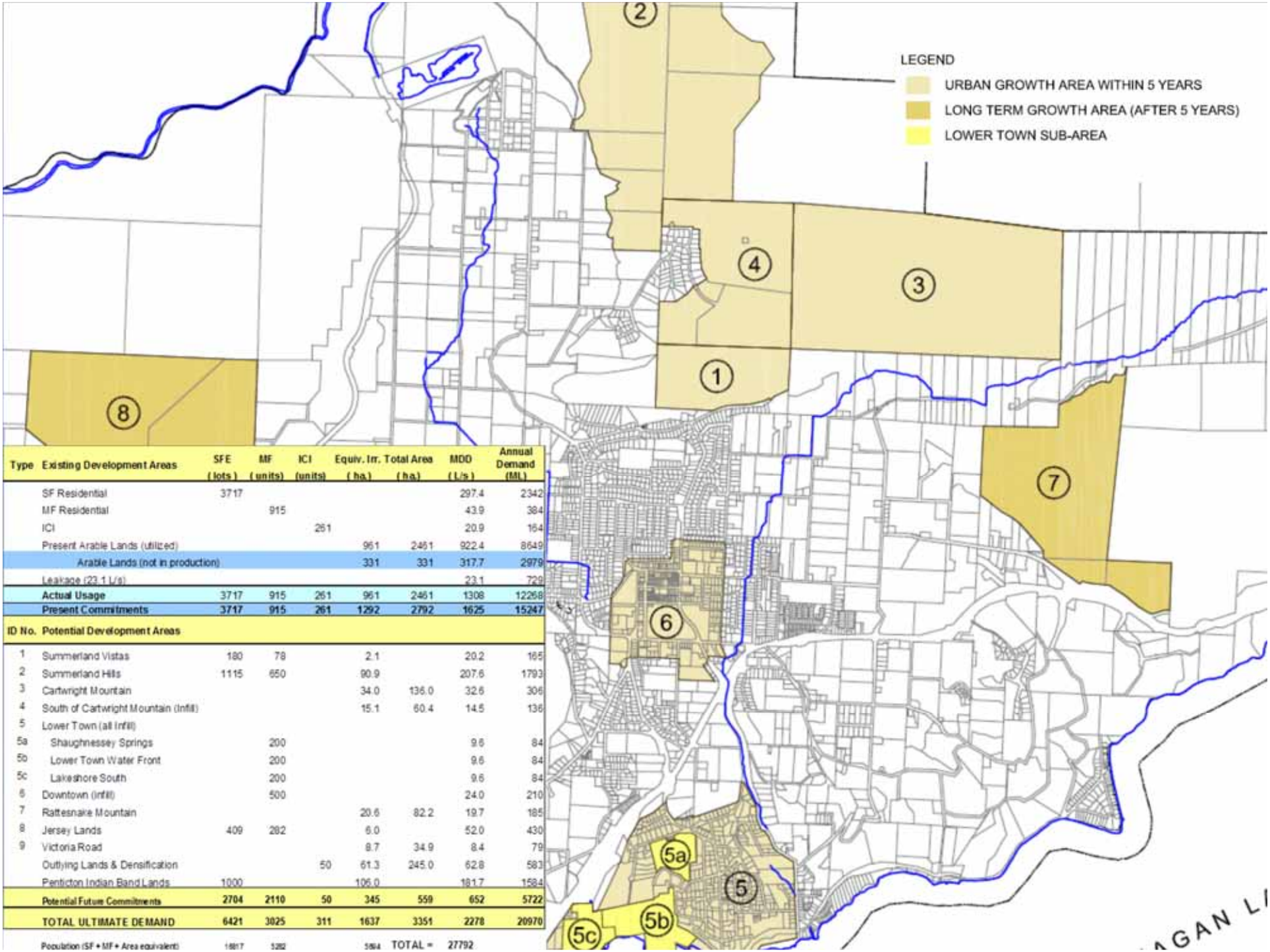
- Optimize / Maximize WTP Performance (done)
- Monitor upper watershed Reservoir-Lakes (increased)
- WWTP water quality sampling for DW risks
- Separation where cost benefit makes most sense (progressing)
- Chlorine residual monitoring (on-going)
- Okanagan Lake Intake 20 ML/day capacity in Trout Creek for Irrigation and for emergency domestic supply (preliminary assessment done)
- Watershed protection plan – Upper watershed (completed 2011)
- Garnet Reservoir anaerobic zone reduction (not critical with sep.)
- On-line monitoring of water sources

Section 5.4 – Population Growth

- Predicted to be low in 2008 OCP (> 1.0%)
- Historically at 2.07% over last 80 years

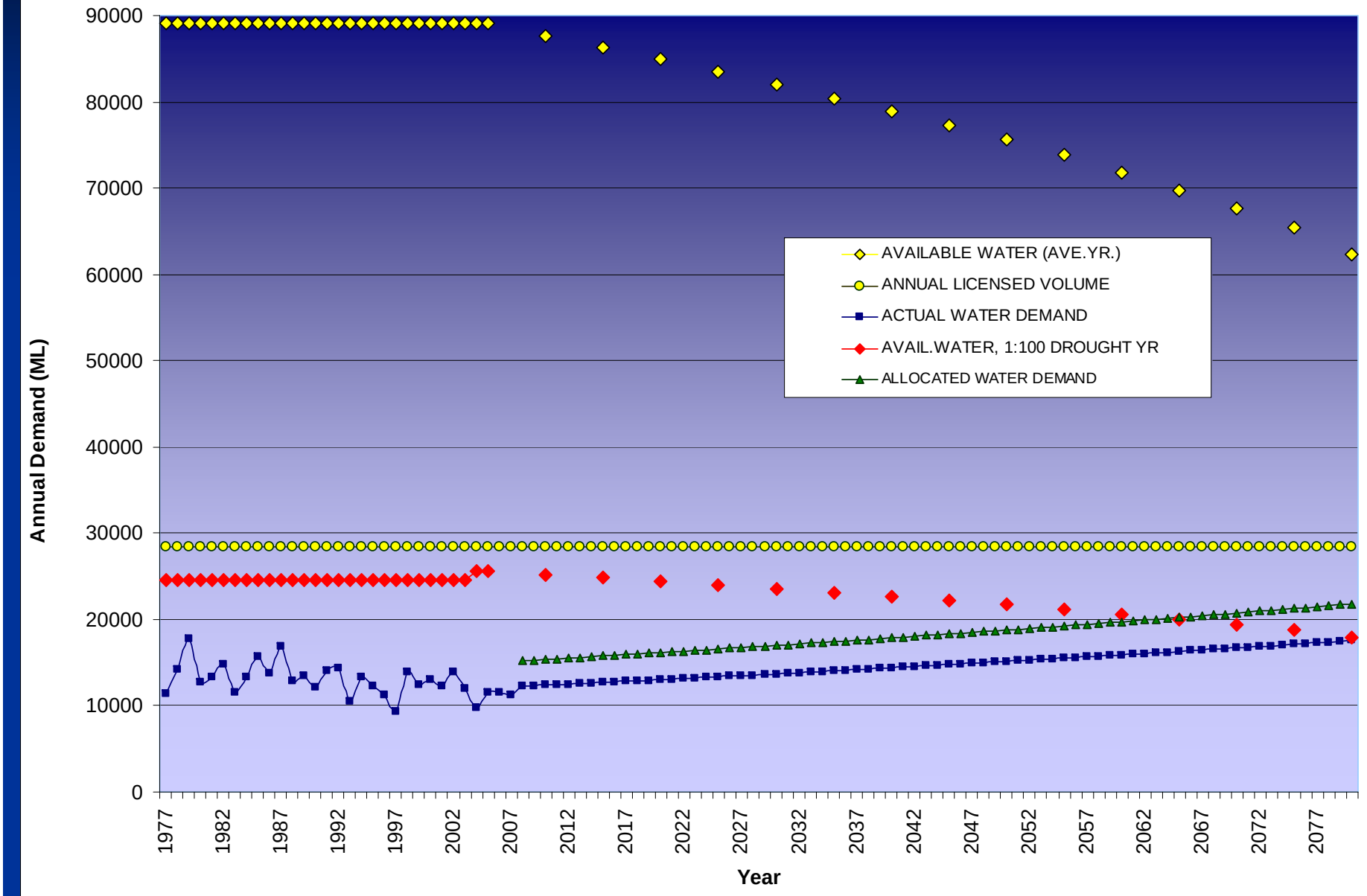
Year	Period	0.25%	0.50%	0.75%	1.00%	1.50%	2.00%	2.50%
2006	0	10592						
2010	4	10698	10805	10913	11022	11242	11465	11692
2015	9	10833	11078	11329	11584	12111	12658	13228
2020	14	10969	11358	11760	12175	13047	13976	14966
2030	24	11246	11939	12672	13449	15141	17037	19158
2040	34	11530	12549	13656	14856	17572	20767	24524
2050	44	11822	13191	14715	16410	20393	25315	31393
2060	54	12121	13866	15857	18127	23667	30859	40185
2070	64	12427	14575	17087	20024	27467	37617	51441
2080	74	12742	15320	18412	22119	31876	45855	65848

- 2011 census data 11,280 persons (1.26% in five years)



Type	Existing Development Areas	SFE (lots)	MF (units)	ICI (units)	Equiv. Irr. (ha)	Total Area (ha)	MDD (L/s)	Annual Demand (ML)
	SF Residential	3717					297.4	2342
	MF Residential		915				43.9	384
	ICI			261			20.9	164
	Present Arable Lands (utilized)				961	2461	922.4	8649
	Arable Lands (not in production)				331	331	317.7	2979
	Leakage (23.1 L/s)						23.1	729
	Actual Usage	3717	915	261	961	2461	1308	12268
	Present Commitments	**3717**	**915**	**261**	**1292**	**2792**	**1625**	**15247**
ID No.	**Potential Development Areas**							
1	Summerland Vistas	180	78		2.1		20.2	165
2	Summerland Hills	1115	650		90.9		207.6	1793
3	Cartwright Mountain				34.0	136.0	32.6	306
4	South of Cartwright Mountain (Infill)				15.1	60.4	14.5	136
5	Lower Town (all Infill)							
5a	Shaughnessey Springs		200				9.6	84
5b	Lower Town Water Front		200				9.6	84
5c	Lakeshore South		200				9.6	84
6	Downtown (Infill)		500				24.0	210
7	Rattlesnake Mountain				20.6	82.2	19.7	185
8	Jersey Lands	409	282		6.0		52.0	430
9	Victoria Road				8.7	34.9	8.4	79
	Outlying Lands & Densification			50	61.3	245.0	62.8	583
	Penticton Indian Band Lands	1000			106.0		181.7	1584
	Potential Future Commitments	**2704**	**2110**	**50**	**345**	**559**	**652**	**5722**
	TOTAL ULTIMATE DEMAND	**6421**	**3025**	**311**	**1637**	**3351**	**2278**	**20970**
	Population (SF + MF + Area equivalent)	16817	5282		5694	TOTAL =	27792	

Section 5.6 - Source Water Development Plan



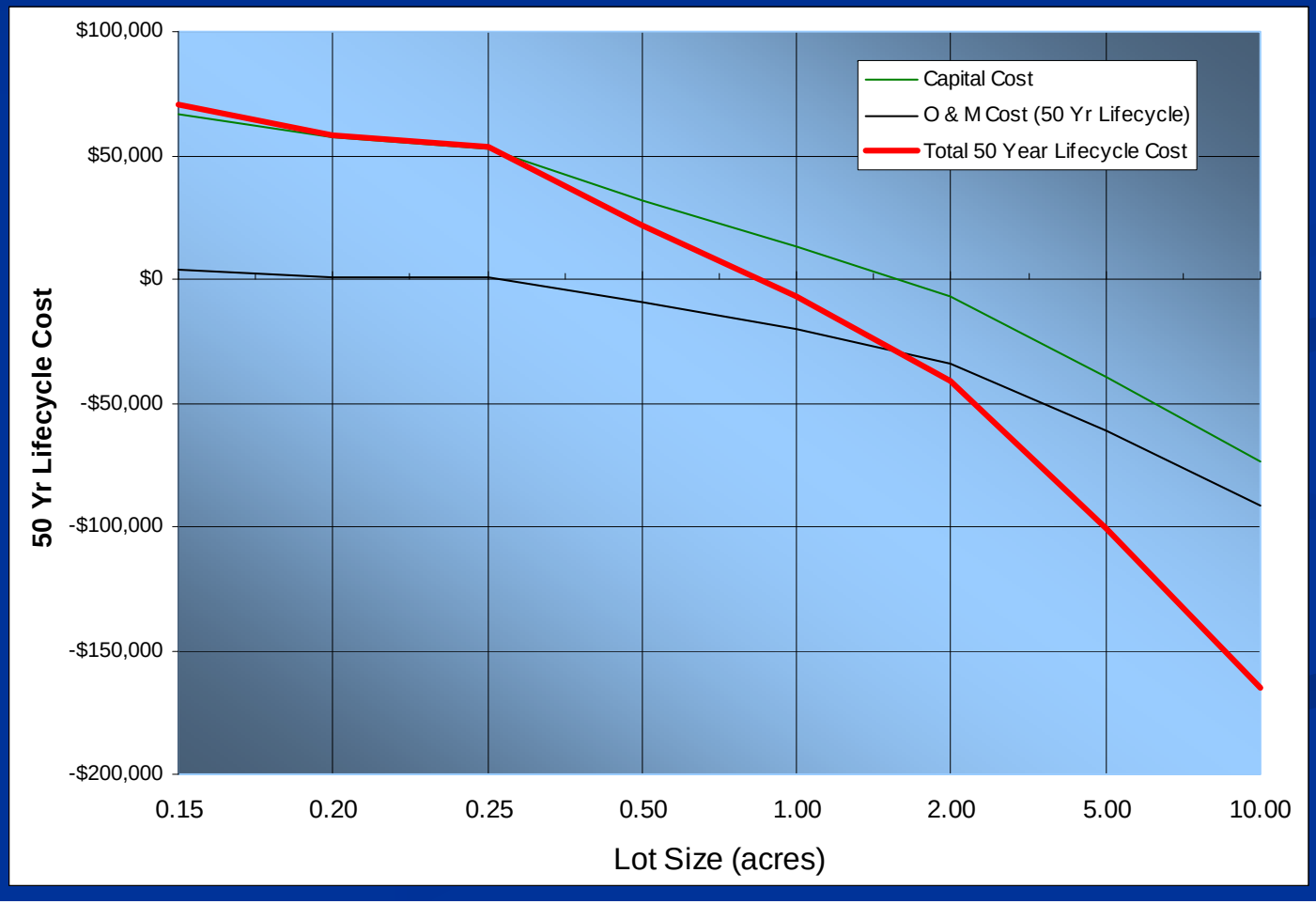
Section 5.6 - Cost per ML Summary

No.	SOURCE CAPACITY PROJECTS	ML Secured	Project Cost	Cost / ML
32	TROUT CREEK RESERVOIR - LEAKAGE CONTROL	730	$ 232,033	$ 318
4	REMOTE READ AGRICULTURE METERS	432	$ 291,077	$ 674
24	TROUT CREEK INTAKE MONITORING & CONTROLS	330	$ 255,639	$ 775
22	ADDITIONAL GROUNDWATER CAPACITY	413	$ 347,875	$ 842
9	OKANAGAN LAKE PUMP STATION (PHASE 1)	5141	$ 5,253,229	$ 1,022
39	SITE 13 RESERVOIR (3,700 ML)	3700	$ 4,199,800	$ 1,135
47	LOWER TOWN LAKE INTAKE - SOURCE UPGRADE	402	$ 569,250	$ 1,416
27	SITE 2 RESERVOIR, 7600 ML + PITIN CREEK DIVERSION	7600	$ 12,037,229	$ 1,584
3	DOMESTIC METERING PROGRAM	405	$ 674,800	$ 1,666
40	SITE 9 RESERVOIR, KATHLEEN CREEK (1600 ML)	1600	$ 2,828,793	$ 1,768
41	SITE 1 RESERVOIR, UPPER TROUT CREEK (2220 ML)	2220	$ 4,797,386	$ 2,161
50	OKANAGAN LAKE PUMP STN - PEACH ORCHARD DR.	12000	$ 31,092,000	$ 2,591

Section 5.7 - System Separation (Where?)

Lot Size (acres)	0.15	0.25	0.50	1.00	2.00	5.00	10.00
Land Area (m2)	607.03	1011.7	2023.43	4046.86	8093.71	20234.28	40468.56
House, driveway area (m2)	302.5	302.5	302.5	302.5	302.5	302.5	302.5
Outdoor Depth (m)	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Outdoor water use	200.5	384.83	1133.0	2465.2	5129.5	13122.4	26444.0
Indoor Water Use	215.17	215.17	215.17	215.17	215.17	215.17	215.17

Lot Size (acres)	0.15	0.25	0.50	1.00	2.00	5.00	10.00
Capital Cost	$ 66,875.79	$ 52,985.64	$ 31,705.47	$ 13,202.37	$ (6,797.41)	$ (39,881.39)	$ (73,733.47)
O & M Cost (50 Yr Lifecycle)	$ 3,557.79	$ 452.05	$ (9,647.70)	$ (20,090.86)	$ (34,067.48)	$ (61,151.69)	$ (91,205.80)
Total 50 Year Lifecycle Cost	$ 70,433.58	$ 53,437.68	$ 22,057.77	$ (6,888.49)	$ (40,864.89)	$ (101,033.08)	$ (164,939.27)



Section 5.7 – System Separation Principles

- Maximize the use of gravity water through the irrigation system;
- Maximize the use of existing infrastructure;
- Garnet Reservoir water is to be used only for irrigation
- All lots 1.00 acre in size and larger should be considered for system separation;
- For lots with both an irrigation connection and a domestic connection, an in-home design flow of 225 L/person/day was used;
- Fire protection is provided off of the irrigation water system;
- Both the irrigation and domestic water systems are functional and operated year round;
- Where systems are running parallel, the higher operating pressure should be set for the domestic system to reduce the potential for cross connections between the water systems. Where this is not possible, additional focus and attention is required to ensure that there are no cross connections between the domestic and irrigation systems;
- Chlorination will remain on the irrigation system indefinitely until some time that the systems are secure and fully separated, and a full cross connection control program is in place.
- Watermain sizes as small as 50mm diameter should be considered for the domestic system where the number of connecting homes is limited;
- Separated domestic water mains are to extend only to where they are absolutely necessary;
- Staging of the separated domestic water system must originate from the WTP

Section 5.8 – Future Projects

Projects 1-8 & Project 11 are completed. Projects 12 & 13 have recently received funding.

Priority	#	PROJECT NAME	Current Users	DCC Project	TOTAL
H	1	JAMES LAKE PUMP STATION	$ 764,138	$ -	$ 764,138
H	2	WTP - SLUDGE HANDLING SYSTEM	$ 714,725	$ -	$ 714,725
H	3	DOMESTIC METERING PROGRAM	$ 674,800	$ -	$ 674,800
H	4	AGRICULTURAL METERING PROGRAM	$ 291,077	$ -	$ 291,077
H	5	SYSTEM SEPARATION - PRAIRIE VALLEY (WEST)	$ -	$ 557,190	$ 557,190
H	6	SYSTEM SEPARATION - PRAIRIE VALLEY (EAST)	$ -	$ 596,907	$ 596,907
H	7	THIRSK OUTLET MODIFICATIONS	$ -	$ 183,425	$ 183,425
H	8	ELECTRICAL AND INSTRUMENTATION UPGRADES	$ 792,902	$ -	$ 792,902
H	9	OKANAGAN LAKE PUMP STATION (PHASE 1)	$ -	$ 3,131,508	$ 3,131,508
H	10	OKANAGAN LAKE BOOSTER STATIONS (PHASE 2)	$ -	$ 2,121,721	$ 2,121,721
M	11	TROUT CREEK RESERVOIR SCREENING WORKS	$ 638,825	$ -	$ 638,825
M	12	SYSTEM SEPARATION - GARNET VALLEY	$ -	$ 2,126,541	$ 2,126,541
M	13	SYSTEM SEPARATION - JONES FLATS (WEST) & CARTWRIG	$ -	$ 836,798	$ 836,798
M	14	RESERVOIR SPILLWAY WEIR MONITORS	$ 15,813	$ -	$ 15,813
M	15	CHLORINE RESIDUAL MONITORS	$ 18,975	$ -	$ 18,975
M	16	PUMP STATION 2B - SOLENOID VALVE	$ 44,275	$ -	$ 44,275
M	17	SYSTEM SEPARATION - GIANTS HEAD ROAD (NORTH)	$ -	$ 1,204,944	$ 1,204,944
M	18	SYSTEM SEPARATION - FRONT BENCH ROAD	$ -	$ 796,444	$ 796,444
M	19	SYSTEM SEPARATION - HAPPY VALLEY	$ -	$ 1,033,632	$ 1,033,632
M	20	SYSTEM SEPARATION - HESPLER ROAD	$ -	$ 156,354	$ 156,354
M	21	TROUT CREEK INTAKE MONITORING & CONTROLS	$ 139,229	$ 46,410	$ 185,639
M	22	GARNET RES. INTAKE MONITORING AND CONTROLS	$ 50,600	$ -	$ 50,600
M	23a	ADDITIONAL GROUNDWATER CAPACITY	$ -	$ 347,875	$ 347,875
M	23b	CONNECT TW 3 AND 5	$ -	$ 543,824	$ 543,824
M	24	TROUT CREEK DISTRIBUTION SYSTEM INTERCONNECT	$ 107,019	$ 107,019	$ 214,038
M	25	BULL CREEK HYDROMETRIC STATION	$ 9,488	$ -	$ 9,488
M	26	GARNET RESERVOIR - AERATION SYSTEM	$ 43,643	$ -	$ 43,643
L	27	SITE 2 RESERVOIR, 7600 ML	$ -	$ 10,727,100	$ 10,727,100
L	28	PITIN CREEK DIVERSION TO SITE 2	$ -	$ 1,310,129	$ 1,310,129
L	29	RESERVOIR TANK MIXING IMPROVEMENTS	$ 142,313	$ -	$ 142,313
L	30	HYDRANT INSTALLATIONS	$ 257,600	$ -	$ 257,600
L	31	BLOW-OFF PROGRAM	$ 86,250	$ -	$ 86,250
L	32	TROUT CK. RES. - LEAKAGE CONTROL	$ 232,033	$ -	$ 232,033
L	33	WTP - FLOWMETER AND PROGRAMMING	$ 12,650	$ -	$ 12,650
L	34	DISTRIBUTION STORAGE PROJECTS	$ -	$ 1,391,500	$ 1,391,500
L	35	SYSTEM SEPARATION - JONES FLATS (EAST)	$ -	$ 2,389,060	$ 2,389,060
L	36	PRV STATION UPGRADES	$ 295,193	$ -	$ 295,193
		TOTALS	**$ 5,331,544**	**$ 29,608,379**	**$ 34,939,924**

WATER UTILITY CASHFLOW

		ENTER GROWTH AND RATE PARAMETERS				ENTER FINANCIAL PARAMETERS			Dry land CEC Rate			Grade A/C C
		2.75%	ANNUAL TAX AND TOLL RATE INCREASE (%)			2.25%	INFLATION RATE (%)		$ 4,500	SF LOT (input on CEC Sched)		$ 3,600
		1.00%	SYSTEM DEMAND GROWTH RATE (%)			3.00%	RETURN ON RESERVES		$ 3,600	MF LOW DENSITY		$ 2,700
GREEN TEXT Input data cell		1.00%	ANNUAL SF CONN. GROWTH (%)			5.50%	Amortization Rate (%)		$ 2,700	MF MED. DENSITY		$ 2,160
BLACK BOLD TEXT known data cell		1.50%	ANNUAL MF/STRATA GROWTH (%)			20	Amortization Period (Yrs)		$ 1,800	MF HIGH DENSITY		$ 1,440
BLUE TEXT Calc. cell		0.50%	ANNUAL GRADE A LAND INCREASE (%)			10.00%	Engineering Allowance (%)		$ 5,625	ICI CONNECTIONS		$ 4,500
BLACK (NOT BOLD) TEXT Estimated raw data entry cell		0.00%	ANNUAL IRR. WATER DEMAND (%)			15.00%	Contingency Allowance (%)		$ 9,000	REGRADE (IRRIG. / ha.)		$ -

	YEAR ENDING	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
GROWTH FORECASTS, CEC WORKSHEET PAGE 1												
Unit & Area Count												
4771	Single Family Residential Lots	4669	4720	4771	4819	4867	4916	4965	5014	5065	5115	5166
2406	Multi-Family Residential / Bareland Strata	2181	2293	2406	2442	2479	2516	2554	2592	2631	2670	2710
304	Industrial / Commercial / Institutional	297	300	304	306	307	309	310	312	313	315	316
1661	Agricultural Irrigation (hectares) Grade A	1665	1659	1661	1669	1678	1686	1694	1703	1711	1720	1729
493	Agricultural Irrigation (hectares) Grade C	470	481	493	495	498	500	503	505	508	511	513
POPULATION FORECAST												
3.20	Single Family Residential Lots			15267	15496	15729	15965	16204	16447	16694	16944	17198
2.00	MF units			4812	4884	4957	5032	5107	5184	5262	5341	5421
TOTAL POPULATION				**20079**	**20380**	**20686**	**20996**	**21311**	**21631**	**21955**	**22285**	**22619**
PROJECTED ADD'L UNITS SF/MF/APT/IRRIG												
	Single Family Residential Lots			**51**	**47.7**	**48.2**	**48.7**	**49.2**	**49.6**	**50.1**	**50.6**	**51.2**
	Multi-Family Residential / Bareland Strata			**113**	**36.1**	**36.6**	**37.2**	**37.7**	**38.3**	**38.9**	**39.5**	**40.1**
	Industrial / Commercial / Institutional			**4**	**1.5**	**1.5**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**
	Irrigation Grade A taxes			**2**	**8.3**	**8.3**	**8.4**	**8.4**	**8.5**	**8.5**	**8.6**	**8.6**
	Irrigation Grade C taxes			**12**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.6**
CEC REVENUE FORECAST				**Charge $/SFE**	$ 4,500.00					$ 5,000.00		
	Single Family Residential Lots			**$ 229,500**	**$ 214,695**	**$ 216,842**	**$ 219,010**	**$ 221,200**	**$ 223,412**	**$ 250,718**	**$ 253,226**	**$ 255,758**
	Multi-Family Residential / Bareland Strata			**$ 406,800**	**$ 129,924**	**$ 131,873**	**$ 133,851**	**$ 135,859**	**$ 137,897**	**$ 155,517**	**$ 157,849**	**$ 160,217**
	Business Accounts Industrial / Commercial / Institutional			**$ 22,500**	**$ 8,550**	**$ 8,593**	**$ 8,636**	**$ 8,679**	**$ 8,722**	**$ 9,740**	**$ 9,789**	**$ 9,838**
	Land Regrade fees (ha.)			**$ 18,000**	**$ 74,745**	**$ 75,119**	**$ 75,494**	**$ 75,872**	**$ 76,251**	**$ 85,147**	**$ 85,573**	**$ 86,001**
TOTAL PROJECTED CEC REVENUE				**$ 676,800**	**$ 427,914**	**$ 432,426**	**$ 436,991**	**$ 441,610**	**$ 446,283**	**$ 501,122**	**$ 506,437**	**$ 511,813**
OPERATING ACCOUNT - BALANCE AT START OF YEAR			$ 1,169,880	$ 1,125,598	$ 1,097,951	$ 2,058,993	$ 2,998,260	$ 7,119,253	$ 1,158,615	$ 1,107,557	$ 1,039,258	$ 2,291,007
	Interest Earned				$ 16,245	$ 46,657	$ 88,872	$ -	$ 1,158	$ -	$ 25,756	$ 60,748
	Annual Revenue Surplus (revenues - expenditures)		$ 110,214	$ 250,984	$ 501,243	$ 931,376	$ 1,067,965	$ 1,213,276	$ 1,367,812	$ 1,532,101	$ 1,706,702	$ 1,892,204
	Debt Servicing (EXISTING USERS PORTION)										$ -	$ -
	Debt Servicing (CEC Portion)								$ (300,000)	$ (300,000)	$ (300,000)	$ (300,000)
	Operating Account Balance Earning interest	$ -	$ 1,169,880	$ 1,125,598	$ 541,506	$ 1,555,227	$ 2,962,416	$ -	$ 38,587	$ -	$ 858,549	$ 2,024,931
**	**Cash Adjustments, Transfers, withdrawals, grants, etc.**	$ -	$ -	$ -	$ 1,000,000	$ 465,000	$ 3,000,000	$ -	$ -	$ -	$ -	$ -
OPERATING ACCOUNT BALANCE AT END OF YEAR		$ 1,169,880	$ 1,125,598	$ 1,097,951	$ 2,058,993	$ 2,998,260	$ 7,119,253	$ 1,158,615	$ 1,107,557	$ 1,039,258	$ 2,291,007	$ 3,677,883
	Amount to Finance							$ -	$ -	$ -	$ -	$ -
	Debt, Project enter here			$ -							$ -	$ -
	TOTAL CEC DEBT SERVICING	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EQUITY IN PHYSICAL ASSETS		$ 21,017,618	$ 23,047,471	$ 26,283,095	$ 26,545,926	$ 26,811,385	$ 27,079,499	$ 27,350,294	$ 27,623,797	$ 27,900,035	$ 28,179,035	$ 28,460,826
RENEWAL RESERVE FUND (at start of YR)			$ 4,277,864	$ 4,450,022	$ 4,654,437	$ 3,794,070	$ 3,907,892	$ 1,025,129	$ 1,055,883	$ 1,087,559	$ 1,120,186	$ 1,153,792
	INTEREST		$ 172,158	$ 204,415	$ 139,633	$ 113,822	$ 117,237	$ 30,754	$ 31,676	$ 32,627	$ 33,606	$ 34,614
2.50%	**RENEWAL RESERVE CONTRIBUTION / DEDUCTION**	$ -	$ -	$ -	$ (1,000,000)	$ -	$ (3,000,000)	$ -	$ -	$ -	$ -	$ -
RENEWAL RESERVE FUND BALANCE (at YR end)		$ 4,277,864	$ 4,450,022	$ 4,654,437	$ 3,794,070	$ 3,907,892	$ 1,025,129	$ 1,055,883	$ 1,087,559	$ 1,120,186	$ 1,153,792	$ 1,188,405

Section 7.2 – Conclusions

- 36 conclusions are provided
- 50 projects are listed in Appendix A of which 36 are considered valid at this time and 14 are listed for review in at some future time
- Debt servicing is substantial and will limit the ability by which the District can carry out the recommended projects
- Raising of Thirsk Dam substantially improves the reliability of supply for the District in drought years

Section 7.3 – Recommendations

- 23 recommendations are provided
- Water Treatment Capacity upgrade or System Separation is recommended to bring all of Summerland in line with IHA objectives
- 36 Capital Projects are recommended in order of priority
- DCC rates must be raised to cover costs for erosion of capacity
- Growth is not expected to be steady and capital work is expected to experience a shortfall in revenue from development
- The critical works w.r.t. timing are water quality upgrades to supply all of town with high quality drinking water to meet IHA requirements

PLAN IS SEVEN (7) YEARS OLD NOW WITH SIGNIFICANT PROGRESS MADE. SHOULD CONSIDER UPDATING THE PLAN IN THE NEAR FUTURE.

Questions, Discussion, Feedback

Agua Consulting Inc.
"Engineered Water Solutions"