Thompson-Nicola Regional District (TNRD) Water Conservation Plan 2018

The Region of BC's Best

TE Trail Engineering

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REVISION HISTORY

Revision	Status	Date	Revised By	Checked By	Approved By	Description of Revision
2	IFA	2018-11-19	JRG/BWL	BWL	BWL	Finalized Document
1	IFR	2018-10-17	JRG/BWL	BWL	BWL	Issued for Client Comment

Status:

PRE	- Preliminary	IFP	- Issued for Procurement
IFR	- Issued for Review and Comment	IFC	- Issued for Construction
IFA	- Issued for Approval	AB	- As Built
IFQ	- Issued for Quotation		

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1.0 INTRODUCTION

In alignment with ongoing conversation efforts within the Thompson-Nicola Regional District (TNRD), Trail Engineering Ltd. (TEL) was engaged to review and revise the TNRD's most recent Water Conservation Plan (WCP). The most recent version of the WCP was completed by CTQ Consultants Ltd. in 2010, and represents 11 community water systems. Since 2010 no additional water systems have been added to the TNRD portfolio, although many of the existing systems have undergone small growth/decline and operational changes. Each community water system is unique and offers its own opportunities for positive change with regards to water management and conservation measures.

Generally, when executed well, a WCP provides the framework to accommodate future economic development and population growth. It allows the operating body and the community to take ownership in providing quality water at reasonable costs within their communities. Most importantly, it encourages environment sustainability with regards to habitat and watershed/water course.

Through discussion with TNRD staff, it was agreed that the previous WCP format was to be followed when executing the 2018 update. As a result, any fact based information (i.e. system characteristics, community information, etc.) would be taken directly from the previous WCP and updated where needed. The WCP update is intended to identify scalable conservation techniques and implementation strategies for consideration by the TNRD when planning initiatives and projects.

1.1 REFERENCED DOCUMENTS

In an effort to provide the most accurate data available when preparing this WCP, the following documents were used as the basis for reporting.

- TNRD Water Conservation Plan (CTQ Consultants Ltd., June 2010)
- Black Pines Water Master Plan (True Consulting Ltd., April 20, 2018)
- Blue River Water Master Plan (True Consulting Ltd., April 20, 2018)
- Del Oro Water Master Plan (True Consulting Ltd., May 4, 2018)
- Evergreen Water Master Plan (True Consulting Ltd., April 20, 2018)
- Loon Lake Water Master Plan (True Consulting Ltd., April 20, 2018)
- Maple Mission Water Master Plan (True Consulting Ltd., April 20, 2018)
- Pritchard Water Master Plan (True Consulting Ltd., April 20, 2018)
- Savona Water Master Plan (True Consulting Ltd., April 20, 2018)
- Spences Bridge Water Master Plan (True Consulting Ltd., April 20, 2018)
- Vavenby Water Master Plan (True Consulting Ltd., May 17, 2018)
- Walhacin Water Master Plan (True Consulting Ltd., April 20, 2018)
- Water Conservation Guide for British Columbia (BC Ministry of Community, Sport and Cultural Development, December 2013)
- Water Withdrawals (The Conference Board of Canada, April 2016)
- Water Conservation Tips for TNRD Residents (TNRD)

1.2 STUDY AREA INFROMATION

The TNRD is located in the south central region of British Columbia and covers a total area of 45,279 square kilometres. Incorporated in 1967, the Regional District has a population of over 132,663 (2016 Statistics Canada census) and incorporates 11 municipalities (Ashcroft, Barriere, Cache Creek, Chase, Clearwater, Clinton, Kamloops, Logan Lake, Lytton, Merritt and Sun Peaks) and 10 electoral areas, which represent many small unincorporated communities.

As of February 2005, the TNRD owned and operated 8 community water systems. The systems were located in Blue River, Vavenby, Barriere, Black Pines, Evergreen, Walhachin, Del Oro, and Pritchard. Following a Drought Management Study completed later that year, 4 additional community water systems were added to the TNRD (Loon Lake, Maple Mission, Savona, and Spences Bridge) and conceded 1 (one) system (Barriere). As a result, there are currently 11 TNRD operated community water systems servicing approximately 2,200 people. The figure below illustrates the geographic location of each community water system.

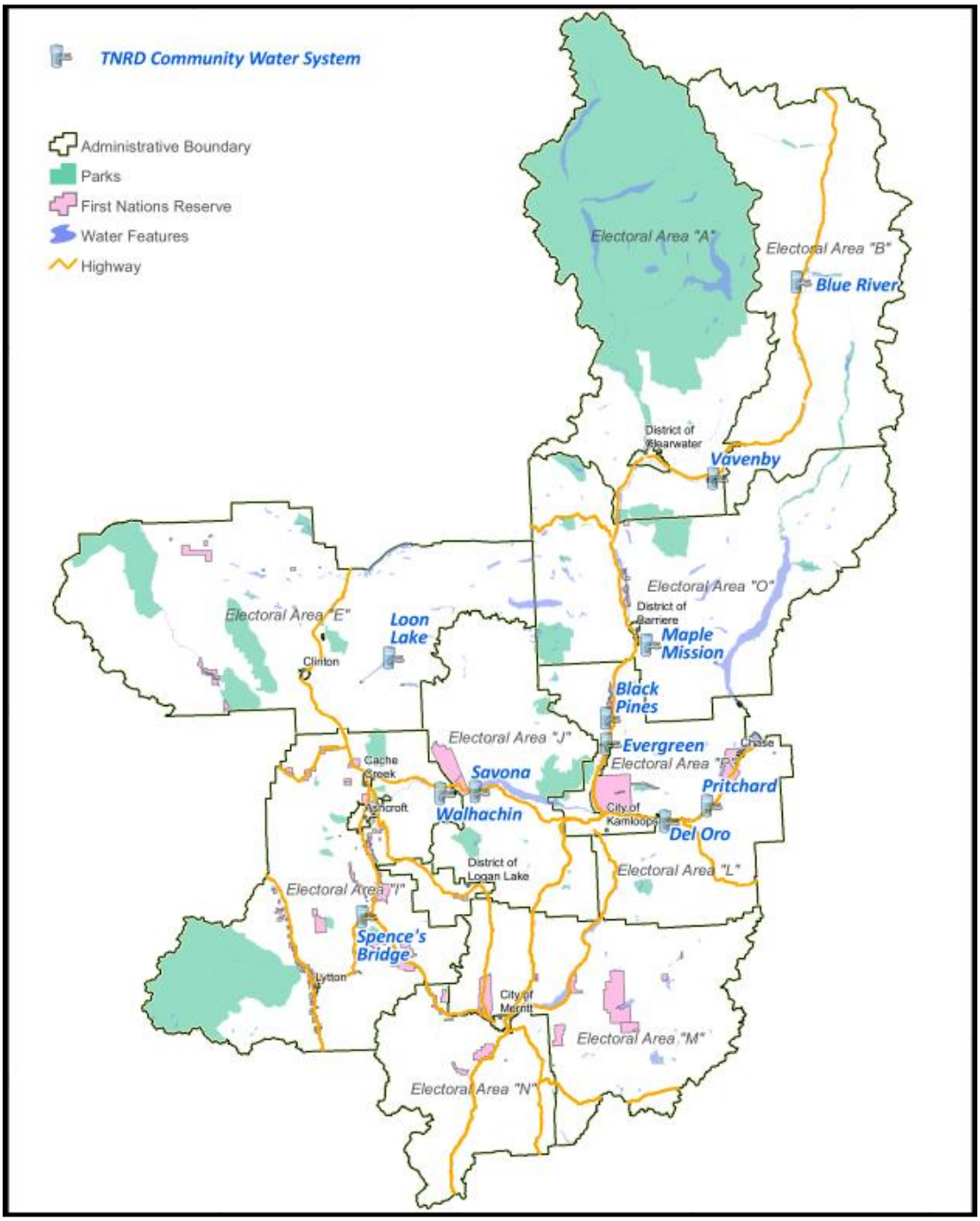

Figure originally produced by CTQ Consultants Ltd. as part of the 2010 WCP.

Generally, the TNRD has acquired these systems when the small communities were unable to respond to the challenges involved in operating a safe and efficient water system. Since being involved, the TNRD now provides the engineering expertise and management capabilities to ensure reliable water supply and that decisions are made in a manner that will ensure safe and effective operation well in to the future. The TNRD operates all aspects of the water systems using both in-house and contract staff. This includes engineering support, tax collection, emergency response, water quality testing and all other services required for a viable water system. In exchange, the communities agree to operate under the regulations set by the TNRD and are subject to taxation for capital works and collection of tolls for water use to provide for cost recovery of TNRD services.

1.3 TNRD WATER UTILITIES OVERVIEW

The section below provides a snapshot of the community systems configurations and characteristics at the time of this WCP update.

The following Table 1.1 is a summary of the raw water source associated with each community and the location where it is metered (if applicable).

Table 1.1 TNRD Community Water System Information

System	Metered At			Water Source
	Residence	Industrial / Commercial / Institutional (ICI)	Source	
Black Pines	Yes	Yes	Yes	Surface
Blue River	No	No	Yes	Ground
Del Oro	No	No	Yes (2004)	Surface
Evergreen	No	No	Yes	Ground/Surface
Loon Lake	No	No	Yes (2010)	Ground*
Maple Mission	No	No	Yes	Ground
Pritchard	No	No	Yes (2010)	Surface
Savona	No	Yes	Yes (2010)	Surface
Spences Bridge	Partial **	Partial **	Yes	Ground
Vavenby	No	No	Yes	Surface
Walhachin	No	No	Yes	Surface

* Shallow Well
** Cooks Ferry Indian Band (CFIB) customers are metered.

Water usage per capita for 2008 is summarized in Table 1.2. Observed Average Daily Demand (ADD) per person ranges from 590 litres/cap/day (Vavenby) to 16,872 litres/cap/day (Spences Bridge). This is compared against the BC average of approximately 490 litres/cap/day. These volumes have been calculated using known source flow when possible. Water usage varies considerably between and within communities due to connections type and purpose of use.

Water usage per capita for 2017 is summarized in Table 1.3. Observed ADD per person ranges from 598 litres/cap/day (Pritchard) to 2,538 litres/cap/day (Spences Bridge). Percent increases over a 9 year period are significant for Vavenby (@ 100%). The remainder of the communities showed a decrease in water use.

Many of the connections serve large-lot-residences, small farms and ranches, as well as water-intensive commercial and industrial operations. Without comprehensive metering, it is difficult to fully account for water used. The reported water usage per capita should therefore be used only as reference for improvement planning/discussion.

Also to note, these water systems are currently able to provide water for domestic purposes only. There is little to no water storage reserved for fire suppression, and it should be noted that few of the small water systems currently pay for fire protection or have agreements with the other communities for fire service.

Table 1.2 TNRD Community Water System Usage (2008)				
System	Total Services	Pop.	Annual Usage m^3 (calculated)	ADD Litres/cap/Day (original data)
Black Pines	40	100	224,747	6,150
Blue River*	111	278	524,088	5,168
Del Oro	40	100	236,478	6,471
Evergreen	16	40	39,731	2,718
Loon Lake	45	113	75,893	1,846
Maple Mission***	16	40	4,149	1,284
Pritchard	161	403	290,063	1,972
Savona	265	663	1,689,413	6,978
Spences Bridge	125	313	1,926,795	16,872
Vavenby	135	338	72,769	590
Walhachin	35	88	74,600	2,333
BC Average (2008)				490
* Blue River estimate can vary with tourist activity ** 2009 consumption data				

Table 1.3 TNRD Community Water System Usage (2017)					
System	Total Services	Pop.	Annual Usage m^3 (calculated)***	ADD Litres/cap/Day (calculated)***	Change in ADD (% change from 2008 to 2017)
Black Pines	40	90	49,275	1,500	-76%
Blue River*	115	200	315,908	4,328	-16%
Del Oro	45	100	91,250	2,500	-61%
Evergreen	16	36	13,688	1,042	-62%
Loon Lake**	50	88	46,355	1,443	-22%
Maple Mission**	16	34	16,973	1,368	-7%
Pritchard	175	485	109,500	619	-69%
Savona	300	650	474,500	2,000	-71%
Spences Bridge	135	197	290,540	4,041	-76%
Vavenby	120	252	146,000	1,587	169%
Walhachin	35	71	45,625	1,761	-25%
BC Average (2013)				296	
* Blue River estimate can vary with tourist activity ** 2016 consumption data *** Estimated based on Maximum Daily Demand recorded.					

Expanding on the summaries above, the following sections provide a general overview of each of the community water systems.

1.3.1 Black Pines Community Water System

Black Pines is a small residential community located on the west bank of the North Thompson River, 30km north of Kamloops. The waterworks utility services a population of 90 residents. There are approximately 40 services.

Black Pines obtains all water from the North Thompson River, and is disinfected with sodium hypochlorite. Water is stored in a cast-in-place concrete storage reservoir with a capacity of 227m^3 (approx. 60,000 USG). Analysis of the community water system has identified a need to develop a new primary water source for Black Pines and to construct a new water treatment process in order to meet current Interior Health standards. Water meter replacement with RF enabled meters for use in billing as an incentive for the community to reduce peak demand are also being planned.

Table 1.4 Black Pines Community Water System – Details	
Location	30km north of Kamloops
Constructed	Constructed 1975, Upgraded 2001 and 2010
Active Services	40 (approximately)
Litres/cap/day (maximum)	3,000
Max Daily Demand (m^3)	270
Monthly Toll	Progressive Block Rate – See Water Utility Rates Bylaw No. 2507 & 2589
Water Source	North Thompson River
Treatment Process	Disinfection with sodium hypochlorite
Reservoir	Underground concrete with no baffling (227m^3, approx. 60,000 USG)
Process	The intake consists of a corrugated steel dry well with a 350mmØ HDPE liner. Water is pumped from the river with a 15hp pump and is chlorinated in the treatment building. Contact time is achieved through a dedicated water main from the treatment plant to the road. Water is stored in a cast-in-place concrete storage reservoir with a capacity of 227m^3.
Fire Hydrants	7
Standpipes	5
Monitoring	TNRD utility staff attend to the water system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Leak detection and repair,, 2. Positive increase block utility rate, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.2 Blue River Community Water System

Blue River is located near the northern boundary of the TNRD, and is approximately 230km from Kamloops on the Yellowhead Highway. The waterworks utility services a population of 200 residents. While originally developed as a logging town and CN Rail service centre, Blue River has developed a significant tourist industry in recent years.

Blue River receives its water from two wells located adjacent to Blue River. The utility provides water to approximately 115 services (2018), depending on the season. Mike Wiegele Helicopter Skiing and Resort is a major water customer of the water utility. The system was upgraded in 2014, but water is not treated in any way. The system is suspected to have significant leakage issues, primarily on private property.

Table 1.5 Blue River Community Water System – Details	
Location	230km north of Kamloops
Constructed	Constructed 1966, Upgraded 1994 and 2010
Active Services	205
Litres/cap/day (maximum)	4,328
Max Daily Demand (m^3)	1,731 (2017)
Monthly Rate (2018)	$60 for non-metered, progressive block rate for metered (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Two wells adjacent to Blue River
Treatment Process	None
Reservoir	Bolted steel - 430m^3
Process	Water is pumped from two wells to the pump house through a 150mmØ header. The pumps are controlled by a pressure level transmitter at the reservoir. There is currently no disinfection system in use, however, drawings indicate a control system is already set up to allow for chlorination. A dedicated 200mmØ water main feeds water from the pump house to the reservoir for storage. Gravity from the reservoir pressurizes the distribution system.
Fire Hydrants	25
Standpipes	2
Monitoring	A contract operator attends to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs, 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.3 Del Oro Community Water System

Del Oro is a small residential community located 15km from the eastern boundary of Kamloops on the Trans-Canada Highway (Route 1), on the south bank of the South Thompson River. The waterworks utility services a population of approximately 100 residents. The utility provides water to 45 services.

Del Oro obtains all its water from a river intake from the south Thompson River, and disinfects with sodium hypochlorite. The majority of the system was developed in 1972, but the utility has received some capital upgrading for treatment improvements in 2004 and intake improvements in 2014.

Table 1.6 Del Oro Community Water System – Details	
Location	15km east of Kamloops
Constructed	Constructed in 1972, Upgraded in 2014
Active Services	45 (approximately)
Litres/cap/day (maximum)	5,000
Max Daily Demand (m^3)	500
Monthly Rate (2018)	$100 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	South Thompson River
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Cast-in-place concrete – 200m^3
Process	Water is pumped from the river with a 15hp pump controlled via a variable frequency drive. The reservoir level controls the activation of the pump. Treatment consists of sodium hypochlorite injection in the pump house. Water is gravity fed by demand into the distribution system from the reservoir.
Fire hydrants	4
Standpipes	2
Monitoring	TNRD utility staff attend to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs, 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.4 Evergreen Estates Community Water System

Evergreen is a small residential community located 10km north of Kamloops on the Yellowhead Highway. The waterworks utility services a population of 36 residents. The utility provides water to 16 services.

Evergreen obtains its water from a shallow well near the North Thompson River. It is estimated that 80% of the water pumped is from groundwater, with the additional 20% coming from surface water seepage. The treatment process consists of disinfection with sodium hypochlorite. Water is then pumped into a 91m^3 (approximately 24,000 USG) storage reservoir before distribution to customers.

Table 1.7 Evergreen Estates Community Water System – Details	
Location	10km north of Kamloops
Constructed	1982
Active Services	16
Litres/cap/day (maximum)	2,083
Max Daily Demand (m^3)	75
Monthly Rate (2018)	$125 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Shallow well at North Thompson River
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Cast-in-place concrete - 97m^3
Process	Water is pumped from the river with a 7.5 hp pump, through the injection chamber where it is injected with sodium hypochlorite and sent to the reservoir. The water is gravity fed to a pressure tank in the booster station which provides extra pressure for the system. Water enters the distribution system based on demand.
Fire hydrants	0
Standpipes	3
Monitoring	TNRD utility staff attend to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs, 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.5 Loon Lake Community Water System

Loon Lake is a small residential community located approximately 40km north east of Cache Creek. The waterworks utility services a population of approximately 88 residents. The utility provides water to 50 services.

The Loon Lake subdivision obtains water from a shallow well located adjacent to Loon Lake. The water is chlorinated and pumped to a reservoir located north of the subdivision. The system was developed in 1973.

Table 1.8 Loon Lake Community Water System – Details	
Location	40km northeast of Cache Creek
Constructed	Constructed in 1974 and Upgraded in 2002
Active Services	50
Litres/cap/day (maximum)	2886
Max Daily Demand (m^3)	254 (2017)
Monthly Rate (2018)	$65 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Loon Lake
Treatment Process	Disinfection with sodium hypochlorite
Reservoir	Cast-in-place concrete - 149m^3
Process	Lake water infiltrates into a shallow infiltration wet well and is transferred by low lift pumps to a clear well in the chlorination building. Water is treated with sodium hypochlorite injection. A dedicated water main to the reservoir does not exist, therefore, when demand is less than the pumping rate, the excess water flows to the reservoir for storage.
Fire hydrants	5
Standpipes	3
Monitoring	A contract operator attends to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs. 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices,

1.3.6 Maple Mission Community Water System

The Maple Mission Community Water system is located approximately 67km north of Kamloops. The system currently supplies 27 residential lots with approximately 17 active services. There are 12 properties that appear to have permanent structures. The remaining properties are a mix of mobile housing and/or other buildings. The estimated population is 34 residents.

The Maple Mission water system was constructed in 1998 as a private local area system. The system was taken over at the request of the residents in 2005.

Table 1.9 Maple Mission Community Water System – Details	
Location	67km north of Kamloops
Constructed	Constructed in 1996 and Upgraded in 2010
Active Services	17
Litres/cap/day (maximum)	2,736
Max Daily Demand (m^3)	93 (2017)
Monthly Rate (2018)	$115 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Deep well
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Cast-in-place concrete - 312m^3
Process	Water supply consists of a 24.1m deep well with a capacity of 3.4L/s. Water is pumped from the well to the treatment building where it is injected with sodium hypochlorite for treatment. Contact time is achieved through a 25m section of 300mmØ water main from the treatment building to the distribution system. Pump operation is controlled by the reservoir level.
Fire hydrants	1
Standpipes	5
Monitoring	TNRD utility staff attend to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs. 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices,

1.3.7 Pritchard Community Water System

Pritchard is a small rural residential community located 50 km east of Kamloops on the Trans-Canada Highway. The waterworks utility services a population of 485 residents. The utility provides water to approximately 169 services.

Prichard obtains its water from a river intake in the South Thompson River, and disinfects with sodium hypochlorite before distributing to customers. The water distribution system is over twenty-five years old, and was predominantly installed in the early 1970's.

Table 1.10 Pritchard Community Water System – Details	
Location	50km east of Kamloops
Constructed	Constructed in 1972 and upgraded in 2010
Active Services	169 (approximately)
Litres/cap/day (maximum)	1,237
Max Daily Demand (m^3)	600
Monthly Rate (2018)	$65 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	South Thompson River
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Cast-in-place concrete – 318m^3
Process	Water is gravity fed from the intake to the wet well where it is injected with sodium hypochlorite. Water is pumped to the reservoir though a 150mmØ watermain. The water enters the distribution system on demand and is pressurized via gravity.
Fire hydrants	8
Standpipes	3
Monitoring	A contract operator attends to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs, 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.8 Savona Community Water System

Savona is a small rural residential community located 30km west of Kamloops on the Trans-Canada Highway. The waterworks utility services an assumed population of 650 residents. The utility provides water to approximately 300 services.

Savona obtains its water from a river intake in Kamloops Lake, and disinfects with sodium hypochlorite before distributing to customers. The water distribution system is over 40 years old, and was installed in the mid to late 1970's.

Table 1.11 Savona Community Water System – Details	
Location	35km west of Kamloops
Constructed	1977 & upgraded in 1996, 2010 and 2018
Active Services	300 (approximately)
Litres/cap/day (maximum)	4,000
Max Daily Demand (m^3)	2,600
Monthly Rate (2018)	$55 for non-metered, progressive block rate for metered (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Kamloops Lake
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Covered lined basin - 1800 m^3
Process	The intake is located at the end of a 200m long 200mmØ HDPE casing. Water is collected in a wet well where low lift pumps move the water to a clear well where it is chlorinated. Demand dictates when the 2-50HP high lift pumps pump directly to the distribution system. Only when supply exceeds demand does water fill the reservoir.
Fire hydrants	30
Standpipes	4
Monitoring	TNRD utility staff attend to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs, 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.9 Spences Bridge Community Water System

Spences Bridge is a small rural residential community located 48km south of Cache Creek on the Trans-Canada Highway. The waterworks utility services an assumed population of 197 residents. The utility provides water to approximately 135 services.

Spences Bridge obtains its water from a set of three wells on Cooks Ferry Indian Band land. The water system is jointly operated by both Cooks Ferry Indian Band and the TNRD. The water distribution was upgraded in 2012 and 2016, constructed predominantly in PVC.

Table 1.12 Spences Bridge Estates Community Water System – Details	
Location	48km south of Cache Creek
Constructed	1950s -60s & upgraded in 2012
Active Services	135 (combined Cook's Ferry Indian Band and TNRD customers)
Litres/cap/day (maximum)	8,082
Max Daily Demand (m^3)	1,592 (2017)
Monthly Rate (2018)	$79 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Wells
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Cast-in-place concrete - 565 m^3
Process	Water from a set of three wells on Cook's Ferry Indian Band land is collected, and then piped to the chlorination building for treatment prior to reaching the community. The pumps are controlled via a ultrasonic level transmitter at the reservoir. Water enters the distribution on demand via gravity.
Fire hydrants	32
Standpipes	24
Monitoring	Cook's Ferry Indian Band utility staff and TNRD utility staff attend the system on a regular basis.
Current Conservation Strategy	1. Implement water metering programs. 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices.

1.3.10 Vavenby Community Water System

Vavenby is a small community located on the Yellowhead Highway approximately 150km north of Kamloops. The waterworks utility services a population of 252 residents. The utility provides water to approximately 114 services.

Vavenby obtains its water from a river intake on the North Thompson River, and disinfects with sodium hypochlorite before distribution. The Vavenby system was largely built in the early 1970's and upgraded in 2005.

Table 1.13 Vavenby Community Water System – Details	
Location	150km north of Kamloops
Constructed	1970. Reservoir upgraded in 2005.
Active Services	114 (approximately)
Litres/cap/day (maximum)	3,175
Max Daily Demand (m^3)	800
Monthly Rate (2018)	$63 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	North Thompson River
Treatment Process	Disinfection by sodium hypochlorite
Reservoir	Bolted steel - 300m^3
Process	Water is gravity fed from the river to the wet well where it is chlorinated. In late spring and early summer, water goes through an infiltration gallery prior to the wet well. From the wet well, the water is pumped to the distribution system and any excess is stored in the reservoir.
Fire hydrants	0
Standpipes	20
Monitoring	A contract operator attends to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs. 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices,

1.3.11 Walhachin Community Water System

Walhachin is a small residential community located along the Trans-Canada #1 Highway on the banks of the Thompson River, approximately 65 km west of Kamloops. The waterworks utility services a population of 71 residents. The utility provides water to approximately 35 services.

Walhachin obtains its water from a surface water intake on Thompson River, and disinfects with sodium hypochlorite before distribution. The Walhachin utility was largely constructed in 1979, and has since been upgraded in 2002 and 2012. Water was required to be hauled during the drought conditions of 2003 and 2004.

Table 1.14 Walhachin Community Water System – Details	
Location	65km west of Kamloops
Constructed	1979; upgraded in 2002 and 2012
Active Services	35 (approximately)
Litres/cap/day (maximum)	3,521
Max Daily Demand (m^3)	250
Monthly Rate (2018)	$81 (Based on TNRD Water Utility Rates Bylaw No. 2507)
Water Source	Thompson River
Treatment Process	Filtration and disinfection by sodium hypochlorite
Reservoir	Earthen walls with 60mm HDPE liner and cover - 227 m^3
Process	The intake pumping station at the Thompson River is connected to the Reservoir by a 100Ø PE pressure main which links to a 75/100mmØ PVC main at the treatment building that crosses the CNR Right-of-Way and private / crown lands. A tee links this line to the treatment building and the community.
Fire hydrants	0
Standpipes	6
Monitoring	TNRD utility staff attend to the system on a regular basis and more frequently when required.
Current Conservation Strategy	1. Implement water metering programs. 2. Leak detection and repair, 3. Water conservation education, 4. Distribution of water conservation devices,

2.0 WATER FORECAST DEMAND

2.1 20 YEAR DESIGN FLOW

20 year design flow rates have been determined for each water system within their respective Water Master Plan (various completed by True Consulting Ltd., 2018). 20 year design flow rates are summarized in the table below.

Table 2.1 TNRD Community Water System 20 Year Design Flow

System	Total Services. (2017)	Pop. (2017)	Current Maximum Daily Demand (m^3/day)	20 Year Design Flow (m^3/day)
Black Pines	40	90	270	250
Blue River	115	200	1731	800
Del Oro	45	100	500	700
Evergreen	16	36	75	100
Loon Lake	50	88	254	160
Maple Mission	16	34	93	100
Pritchard	175	485	600	600
Savona	300	650	2600	3000
Spences Bridge	135	197	1592	1100
Vavenby	120	252	800	800
Walhachin	35	71	250	220

2.2 CLIMATE CHANGE IMPACT

It is not within the scope of this report to quantify the affect that climate change will have on water sources and usage within the TNRD, however, some potential effects are listed below:

- Increase in average temperatures in both winter and summer causing increased length of growing seasons and increased irrigation requirements,
- Snow pack losses, causing lower peak flows earlier in the year and lower low flows in the summer,
- More frequent storm events, floods and droughts causing increased risk of contaminated or depleted water sources.

Given the geographic diversity associated with each water system, it is recommended that a climate change impact study be completed for each system to evaluate specific conservation or improvement efforts.

3.0 CONSERVATION OBJECTIVES

Conservation objectives are intended to capture the values which are important to the community they are being implemented in. They should be developed collaboratively in order to represent the diversity of water needs and values within the community. Conservation objectives should be specific, measurable and descriptive in order to set tangible goals and benchmarks in which progress can be measured against. The following is a summary of the objectives that the TNRD will track within the lifecycle of this plan:

- Install water meters on all residential connections by the end of 2021.
- Reduce residential Average Daily Demand by 10% by the end of 2023.
- Reduce system wide Maximum Daily Demand by 10% by the end of 2023.

The TRND will continue to work with the communities identified in this water conservation plan to develop specific conservation objectives in order to guide future water conservation strategies and ensure buy in.

4.0 CONSERVATION MEASURES FOR THE TNRD

Conservation measures are tools, instruments or programs design to achieve reductions in water usage (specifically meeting Conservation Objectives). They can be enforceable or voluntary, simple or complex, focused on technology or behavioral changes. It is important to ensure that water conservation measures are in line with the conservation objectives for each community water system. Conservation measures should also target specific criteria within the water system such as reducing leaks and peak indoor/outdoor demand. The implementation of water conservation strategies will come with associated costs, however, they can save money in the long run by avoiding environmental and social costs as well as reducing or eliminating the cost of installing and maintaining new infrastructure. This section provides an overview of conservation measures recommended in the Water Conservation Guide for British Columbia (WCG) for consideration by the TNRD.

4.1 REGULATORY CONTROL

Regulatory control represents policy, legislation, regulations, bylaws (i.e. Bylaw 2551) and standards that describe and/or mandate how the community is to efficiently use supplied water. Many governed communities are familiar with such regulatory controls. These controls are often in place to provide direction in common areas affecting water usage (i.e. irrigation use, recreational use, water licensing, new construction, etc.). The success of regulatory control is subject to both political and public buy in.

When the specific type of water usage (i.e. irrigation) becomes the target of regulatory control, enforcement is required (i.e. monitoring, accessing fines, collections). This can be exhaustive on resources (i.e. financial implications) and is often initially confrontational. That said, over time this approach often leads to change and general acceptance of conservation measures.

4.1.1 How does this apply to the TNRD?

Water sprinkling ordinances are used by the majority of utilities providers across the province, and are an effective first line response to water conservation and drought management. The TNRD currently imposes watering restrictions from May 1st to September 1st. Even numbered houses are restricted to watering on even days and odd numbered houses are restricted to odd days. Time restrictions are also imposed in order to avoid watering during the hottest part of the day. The TNRD has limited staff and resources to rigidly enforce these restrictions across all communities and relies on voluntary community participation. Investigation of violations is done by patrols during regular working hours, but can also be complaint driven. It is therefore recommended that the TNRD consider increasing enforcement capabilities during drought conditions to provide greater success of water ordinances.

4.2 ECONOMIC AND FINANCIAL ADJUSTMENTS

Economic and financial tools can be used to convey the value of water and the costs associated with acquiring, treating, distributing and managing the water system. They can also be effective in motivating customers to reduce their water use for long-term capital savings, and reduction in operating costs.

Increasing water rates can be unpopular and consideration must be given to the possibility of other sources of funding (i.e. federal or provincial grants) and/or partnerships with industry. While water rate structures may have an effect on irrigation and aesthetic water use they do not have the same effect on residential (specifically, domestic usage) or process driven industrial use due to the relatively constant/predictable demand.

Water rate structure changes (specifically increases) are only effective if they reflect end user ability to support the utility (i.e. pay the rate). This can be overcome by gradual or phased rate changes, in conjunction with clear communication and community buy-in. This is particularly important if the rate increase is a result of increased usage or poor conservation practices, rather than infrastructure improvements being required.

4.2.1 How does this apply to the TNRD?

Some examples of economic and financial adjustments applicable to the TNRD include fines for non-compliance, progressive block rates, seasonal rates, surcharges linking sewer cost with water use and full cost pricing.

Progressive block rate pricing has been incorporated into the water utilities rates for Black Pines, Blue River and Savona, although, water meters have not been installed on all connections yet. It is recommended that as water meters are installed in other community systems, that progressive block rates be incorporated to encourage reduced consumption.

4.3 OPERATION AND MANAGEMENT

Operation and management efficiencies typically rely on physical changes (i.e. leak detection and repairs, aging infrastructure replacement, water metering, etc.) being made to the water system or procedural changes to the operation of the water system (i.e. reducing system pressure, reservoir optimization, water system audits, etc.), both targeting a reduction in water use. Implementation of the physical changes can require large capital investment. As a result, they generally cannot be considered short-term solutions, but need to be driven by longer-term measurable goals with clear return on investment. Confidence in the suitability of any large investment or project, will be the result of extensive research, monitoring and/or design. Despite high costs and technical knowledge requirements, operation and management efficiencies have been proven to be effective means to reduce water use.

4.3.1 How does this apply to the TNRD?

Leak Detection

The 11 community water systems that the TNRD is responsible for are in various states of repair and condition, depending on age and original construction materials used. Within the systems currently being operated by the TNRD, extensive work has been done to identify and repair leaks. This effort has not been conclusive, although has made excellent steps forward in minimizing water loss through infrastructure. It is common for leak detection programs to be part of normal on-going operation and maintenance of efforts associated with community water systems. The key is to be proactive, and target specific objectives year-over-year to avoid significant one-time infrastructure investments or rate increases.

To note, leakage has been determined to be significant in both Blue River, Spences Bridge and Vavenby. Leakage programs are currently in place for both systems, and plans are in place to install water meters at property boundaries to help identify leaks occurring on private property (i.e. service connections).

Metering

Metering is an effective way of determining real-time water use and performance against conservation measures. While universal metering can be controversial (i.e. the fear that usage cost will increase compared fixed rates), it is an important tool for understanding water use allocation. Ultimately, this results in improved accuracy for operational changes and increased general water conservation.

The TNRD has recently been awarded a $3.5M grant for the installation of water meters at all properties attached to the community water systems. The meters will be installed over the next three years (estimated to be completed by 2021). Generally, meters will be placed at property boundaries. Placing the meter at the property boundary increases the probability leaks occurring on private property will be detected. In areas where private leaks are suspected, the meters are to include function for continuous flow indication for leakage detection, reverse flow indication, and tampering indicators.

4.4 COMMUNITY ENGAGEMENT

Community engagement strategies are founded on the premise that actions of water users are based on awareness and understanding. When designing an educational program, it is important to clarify the goals and specifically how the information presented will impact the user and conservation objectives. The engagement strategy must be community specific and targeted to high water users (i.e. "water wasters") to provide real change in water conservation.

Residential water consumption in British Columbia was on average 312L/cap/day in 2011 and 296L/cap/day in 2013. These numbers show that general awareness about the source of drinking water and importance of conservation is slowly improving, however, it remains low. The need to ensure long-term sustainability and general vulnerability of water supply is not yet widely understood. Public acceptance will be the key obstacle the TNRD will face in implementing water conservation measures across small community water systems.

4.4.1 How does this apply to the TNRD?

The concept of community engagement has be practiced within the TNRD for some time. Engagement can be in the form of providing informational tips (i.e. to lawn watering, water facts, rain gauge use, watering restrictions, etc.) via bulletin/website/public forum and distributed conservation products (i.e. spring loaded shut off nozzles, rain gauges, garden hose water timers, toilet leak detection tablets, etc.). The impact of these initiatives is not easily quantifiable. The on-going engagement effort from TNRD to the user will over time promote community champions and power continuous improvement.

<u>Other Tools</u>

Below is summary of additional community engagement tools for the TNRD to consider:

- Competitions, awards and recognition programs,
- Demonstration sites and information centres,
- One-on-one meetings with major water users (post metering being installed),
- Published materials such as "how to" manuals, case studies, technical reports, resource libraries,
- School programs and materials including activity books, games, videos, poster contests, in-class visits and demonstrations, "teach the teacher" guides, curriculum guides,
- Rainwater harvesting programs,
- Special project committees, seminars and workshops with specific water users.

5.0 IMPLEMENTATION STRATEGY

5.1 DESIGNING YOUR CONSERVATION PROJECTS

Once conservation measures have been determined, it is time to development them into conservation projects. The amount of detail that goes into each conservation project will be determined by the timeframe for launching the projects. Projects that will not get launched for years will likely remain in a concept stage, while projects that are going to be launched right away will need to proceed to detailed design. Each conservation project should include the following elements:

- Conservation Objective(s) - The conservation objective(s) that the project is designed to meet,
- Project Scope and Target Population – The portion of the system or population that the project is targeting,
- Estimated Water Savings and Conservation Targets – The estimated water savings associated with the project based on research completed. The Water Conservation Calculator available at http://waterconservationcalculator.ca/ can be used to help estimate water savings,
- Project Costs – Capital and ongoing operation and maintenance costs associated with the project,
- Ability to Execute – A description or breakdown of the knowledge and expertise that is available in-house and any resources or expertise that may be needed,
- Risk Management – Any anticipated risks and mitigation strategies.

Once a number of feasible conservation projects for a water system have been designed, they can be optimized and prioritized in order to maximize water savings and minimize costs.

5.2 BUILDING YOUR IMPLEMENTATION STRATEGY

The implementation strategy should serve as the long term road map for water conservation. It identifies all of the projects developed from your water conservation plan and how they align with conservation objectives. The implementation strategy assigns a timeline to the projects and identifies who is responsible for the tasks required to execute each project and when. The timeline should be designed to take into account projects that may need to be executed in a particular order based on existing problems or time sensitive matters, available resources (financial and human), and permitting or approval requirements.