February 4, 2020 File: 0476.0072.15

Columbia Shuswap Regional District
555 Harbourfront Drive, NE
Salmon Arm, BC V1E 4P1

Attention: Terry Langlois, Utilities Team Leader

RE: SCOTCH CREEK WATER STUDY 2018 – ADDENDUM

1. Introduction

In 2018, Urban Systems completed the Scotch Creek Water Study for the CSRD. The report was completed in response to the need for safe and reliable water in the Scotch Creek community. The study was completed after review of the Scotch Creek Water Master Plan, which was completed by Urban Systems in 2007. The 2018 report summarized the Water Master Plan, provided updated populations, demands, and a comparison of source options. A conceptual design and cost estimate were completed for multiple options. The CSRD elected to continue with Option 1, which included a centralized system with the existing Saratoga system and new reservoir (completed under a separate project). The service area encompassed multiple pre-established private water systems. The largest of the existing private water systems in the 2018 Phase 1 service area was Caravans West. Throughout the community engagement process the Caravans West user group indicated that they did not support the project. Due to their large relative population to the remaining users in Scotch Creek, the CSRD were concerned that the public assent process would not be successful for the loan needed to construct the water system.

Subsequent to the Scotch Creek Water Study, the CSRD applied for grant funding through the Green Infrastructure – Environmental Quality program. Their funding application was not approved, and feedback was received from the program reviewer. A second application intake for the above-mentioned program was announced, with an application deadline of February 26, 2020. The CSRD is considering an application to this program.

Due to the above-mentioned concerns with Caravans West, the CSRD have developed a revised Phase 1 service area. Specifically, the Phase 1 service area is proposed to include Captain's Village Marina (CVM), which currently has an existing water system, Anchor Bay, Peterson Court, and other nearby properties. Based on preliminary engagement with these communities, support has been shown for this project. It is assumed that along with Saratoga, this system will serve as the starting point for future water system development in the area, ultimately expanding and connecting the two systems together as was envisioned in the previous study.

This letter serves as an Addendum to the 2018 Scotch Creek Water Study and will summarize the proposed service area, system layout, and future phasing.

2. Proposed 2020 Phase 1 Service Area

The proposed 2020 Phase 1 service area will include users from Captain's Village Marina (CVM), Peterson Court, Anchor Bay, and other nearby properties. Existing private water systems in this area range from individual groundwater and surface water sources, to larger systems which provide water for multiple users. A summary of the parcels in the proposed service area is shown in the table below, and a map showing the extents of the area is included in Figure 1, along with the proposed distribution system.

Description	Parcels
Captain's Village Marina	1
Peterson Court	15
Anchor Bay	10
Other Properties	58
Total:	84

There currently is an existing Captain's Village Marina water system which includes a lake intake, treatment plant, pumphouse, and distribution system, illustrated in Figure 1. The water system services multiple users in the area, including the marina itself, the mobile home park, and other nearby lots. A desktop review and site visit were completed for the system. It was determined that multiple components had failed and been replaced. CVM also indicated that the location of the infrastructure was unsuitable. Due to this, the CSRD has proposed to construct a new intake, pumphouse and water treatment plant at the nearby Scotch Creek Wharf Road Community Park. The CSRD currently owns the park and has identified a suitable location for the infrastructure.

3. Phase 1 Water System Sizing and Layout

3.1 Water System Layout

The proposed Phase 1 Water System layout is shown in Figure 1. The system will include new watermain along Scotch Creek Wharf Road, servicing Anchor Bay, Peterson Court, and the remaining properties. The watermain is proposed to be installed under the multi-use path for minimized disturbance and to reduce impacts to private property. The new watermain will tie into the existing CVM distribution system at the locations shown.

In order to reduce construction costs for this initial phase, the water system will not include a reservoir. Based on discussion with the CSRD, fire protection can be achieved by water from Shuswap Lake, as the Scotch Creek Fire Department has shuttle accreditation. Also, long term development of the water system will allow the connection to the Saratoga reservoir in the future. Therefore, it is proposed that the watermains would be sized for future fire protection. It has been assumed that fire hydrants would also be retrofitted in the future, and not included in this phase.

3.2 Existing Water Use

Existing water use in the proposed service area was calculated based on the parcel count above, and assumptions which were stated in the 2018 Scotch Creek Water Study. The assumptions are listed below:

- The CSRD Subdivision Servicing Bylaw water use recommendation of 4500 L/lot/day was used. As stated in the 2018 study, this is consistent with Saratoga water use of 4300 L/unit/day.
- Commercial use is anticipated to be similar to residential use, and there are no industrial users. Also, the bulk of parcels in Scotch Creek based on the OCP are residential (75%, by area). Water service connections will be sized relative to their end uses of water.
- 4500 L/user/d has been applied to all users for system sizing – water use per user may be higher or lower for some users, but this is suitable for overall sizing.
- 2.5 people per unit/lot was assumed

Based on this, the current water system Maximum Day Demand (MDD) is calculated to be 4.4 L/s. Note that the initial water system will need to be sized for peak hour flows (PH). Assuming a PH:MDD factor of 1.5, the water system should be sized to provide a minimum of 10 L/s; however a higher peaking factor allowance may be needed. This should be confirmed during future design.

3.3 Water System Sizing

In the 2018 Scotch Creek Water Study, it was determined that 90 L/s represented the buildout MDD and a that a design fire flow of 90 L/s was appropriate. This was calculated based on the assumptions above, including 40 years of growth at 2%/year from the existing population. We have assumed that the intake, distribution system, and structures (pumping and WTP building) would be sized for buildout, and the pumping and treatment system components, would be sized for an MDD of 30 L/s. This capacity (30 L/s) was chosen as it would serve the existing demand with capacity for potential near-future development in the area after the establishment of a water system.

3.4 Water System Configuration

The water source will be surface water from Shuswap Lake. As stated in the 2018 Study, chlorination and UV disinfection will be utilized. Filtration has not been included in current estimates based on CSRD's discussions with Interior Health, and the monitoring results from other water systems on the lake which have shown that the water quality is suitable without filtration.

For the purposes of the cost estimate, we have assumed the following for the system configuration:

- Intake in Shuswap Lake, sized for buildout, with submersible low lift pumps that pump through the treatment plant to a CT chamber sized for a 4-log virus inactivation
- Treatment plant building sized for buildout.
- Treatment equipment sized for Phase 1 service area, including UV disinfection, chlorination using sodium hypochlorite, and a buried CT chamber and wet well chamber (approximately 20 m^3)
- Booster pumps sized for Phase 1, pumping to the distribution system with hydropneumatic tanks for low flows
- Stand-by power sized for Phase 1.
- Distribution system including watermain sized for buildout and tie-in to existing CVM distribution system

A breakdown showing all system components is included in the attached cost estimate.

4. Water System Future Phasing

As outlined above, the water system is proposed to be the first of multiple phases, that will ultimately establish a water system which services all of Scotch Creek. The phasing will include connection to the existing CSRD owned Saratoga Water System, and upgrades for additional sizing, further discussed below:

4.1 Phase 2

- Distribution system expansion connecting a majority of the remaining private water systems in Scotch Creek. Generally, the expansion would include Squilax-Anglemont Road and Wharf road, connecting to the Saratoga water system. The watermain will be sized for buildout and will be constructed under the multi-use pathway where possible.
- Treatment plant upgrades at the Saratoga site, including a new building, intake, pumping equipment, and treatment. The internal components would be sized for 60 L/s, and the building and intake sized for buildout.
- Upgrades to the existing Saratoga reservoir which includes the addition of a 1500 m^3 cell and dedicated supply watermain.

4.2 Phase 3

- Additional distribution system piping, servicing the remaining Scotch Creek area, sized for buildout
- Upgrades to the internal Saratoga treatment plant components, including intake pumps, treatment, electric, backup power, and controls, increasing capacity for the buildout service area. It should be noted that we have not assumed any major upgrades (building or intake) to completed as part of this phase.
- Further expansion of the Saratoga Reservoir with an additional 1500 m^3 cell.

Additional information and design criteria related to the future phasing is provided in the 2018 Scotch Creek Water Study.

5. Capital Cost Estimate

Class C cost estimates have been prepared and include a 25% contingency allowance and an allowance of 15% for engineering/consulting. A Class C estimate is prepared with limited site information and is based on probable conditions affecting the project. It represents the summation of all identifiable project component costs. It is used for program planning and to establish a more specific definition of client needs and to obtain approval in principle. A contingency allowance of 25% plus engineering and other allowances is appropriate for this class of estimate.

The cost estimates are in 2020 Canadian dollars, and the Phase 1 cost estimate includes an allowance for inflation of 3% per year for 2 years (i.e. assumes construction in 2022). The appropriateness of this inflation allowance should be considered in conjunction with the project funding, financing and scheduling.

A summary of the cost estimates is presented below, and a detailed breakdown is attached to this letter. Please note that special architecture has not been included for the water treatment plants, and basic site landscaping/restoration has been included.

Phase 1 Water System		
Item		**Cost**
Section 1 - General Requirements	$	140,000
Section 2 - Watermains	$	416,000
Section 3 - Wharf Road Intake and Site work	$	425,000
Section 4 - Wharf Road Water Treatment Plant	$	1,140,000
Subtotal all sections	$	2,120,000
25% Contingency	$	530,000
Sub-Total	$	2,650,000
15% Engineering/Consulting	$	398,000
Subtotal	$	3,050,000
Inflation (2 years @ 3%)	$	186,000
Estimated Capital Cost (Rounded)	**$**	**3,200,000**

A summary of overall costs (including 25% contingency, 15% engineering, not including inflation) for Phase 2 and Phase 3 water systems, are included below. Detailed estimates are attached to this letter.

Phase		**Total Cost**
Phase 2 Water System	$	10,900,000
Phase 3 Water System	$	14,400,000

Based on methodology outlined in the Section 4.2 of the 2018 Scotch Creek Water Study. The CSRD has estimated the user fees and parcel tax for the Phase 1 Service Area, based on the above costs. A summary is provided in the table below:

Item	Calculated Rate (2021 $)
Parcel Tax	$ 402
User Fee	$ 400

It should be noted that the CSRD is considering waiving the one-time, connection fee for users in the Phase 1 Service Area who connect during the initial construction.

6. Conclusions and Recommendations

Conclusions and recommendations are outlined below:

- The CSRD should apply for funding for Phase 1 of the water system. Applications to future funding programs for subsequent phases should be considered when there is demand/interest in expanding the system.
- The following items should be considered during the design stage
  - Peaking factor value review to ensure pumps are adequately sized for peak flows in the Phase 1 Service Area.
  - Refinement of Phase 2 and Phase 3 service areas and distribution systems.
  - Consider the potential future location of community sewer system infrastructure, and best location for watermains to minimize construction costs and future conflicts during construction.

Sincerely,

URBAN SYSTEMS LTD.

L.A. CLARK #24577 PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

Lisa Clark, P.Eng.
Principal

Cole Becker, EIT
Project Engineer

/cb
Attachments: Class C Cost Estimates, Figure 1

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Columbia Shuswap Regional District

Project Number: 0476.0072.15

Scotch Creek Water System Phase 1

Date: 2020-01-30

Class C Cost Estimate

System Capacity: Intake and Watermain 90 L/s, WTP 30 L/s

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	Insurance and Bonding	LS	1	$ 100,000	$ 100,000
1.2	Survey and Layout	LS	1	$ 10,000	$ 10,000
1.3	Mobilization and Demobilization	LS	1	$ 10,000	$ 10,000
1.4	Clearing and Grubbing	LS	1	$ 10,000	$ 10,000
1.5	Commissioning	LS	1	$ 10,000	$ 10,000
1.6	Land Acquisition	LS	1	$ -	$ -
				Subtotal	**$ 140,000**
Section 2 - Watermains					
2.1	200 mm PVC DR18 - Include Fittings and Tie-ins	m	420	$ 230	$ 96,600
2.2	150 mm PVC DR18 - Include Fittings and Tie-ins	m	675	$ 200	$ 135,000
2.3	Services <= 50mm	ea	19	$ 2,500	$ 47,500
2.4	Road Restoration - Asphalt	m^2	1200	$ 75	$ 90,000
2.5	Trail Restoration	m^2	630	$ 75	$ 47,250
				Subtotal	**$ 416,000**
Section 3 - Wharf Road Site Intake and Site Preparation					
3.1	Decommission and Remove Existing WTP, Pumphouse	LS	1	$ 45,000	$ 45,000
3.2	Intake Piping 250 mm directionally drilled x 2 x 70 m	m	140	$ 625	$ 87,500
3.3	Intake Piping 250 mm on lake floor x 2 x 30 m	5	80	$ 125	$ 10,000
3.4	Intake Pumps	ea	2	$ 50,000	$ 100,000
3.5	Intake Screen Assembly installed by divers	ea	1	$ 30,000	$ 30,000
3.6	Site Piping (Intake Piping to Building, Building to Dist System)	lm	40	$ 230	$ 9,200
3.7	Site Valves	ea	4	$ 2,000	$ 8,000
3.8	Lighting	LS	1	$ 5,000	$ 5,000
3.9	Fencing	LS	1	$ 15,000	$ 15,000
3.10	Landscaping	LS	1	$ 15,000	$ 15,000
3.11	BC Hydro upgrades to 3 phase	LS	1	$ 100,000	$ 100,000
				Subtotal	**$ 425,000**
Section 4 - Wharf Road Water Treatment Plant					
4.1	Treatment and Pumping Building Superstructure (Including Foundation, Structure, Lighting and HVAC)	LS	1	$ 450,000	$ 450,000
4.2	UV system	LS	1	$ 100,000	$ 100,000
4.3	Chlorination system	LS	1	$ 50,000	$ 50,000
4.4	CT Chamber (Buried Concrete)	LS	1	$ 40,000	$ 40,000
4.5	Booster Pump System	LS	1	$ 50,000	$ 50,000
4.6	Hydropneumatic Tanks	LS	2	$ 10,000	$ 20,000
4.7	Instrumentation	LS	1	$ 30,000	$ 30,000
4.8	Lab and Safety Equipment	LS	1	$ 25,000	$ 25,000
4.9	Process Piping and Valving	LS	1	$ 100,000	$ 100,000
4.10	Electrical/Controls	LS	1	$ 150,000	$ 150,000
4.11	SCADA Allowance	LS	1	$ 50,000	$ 50,000
4.12	Generator & pad	LS	1	$ 75,000	$ 75,000
				Subtotal	**$ 1,140,000**
				Subtotal all sections	**$ 2,120,000**
				25% Contingency	$ 530,000
				Sub-Total	$ 2,650,000
				15% Engineering/Consulting	$ 398,000
				Subtotal	$ 3,050,000
				Inflation (2 years @ 3%)	$ 186,000
				Estimated Capital Cost (Rounded)	**$ 3,200,000**

Columbia Shuswap Regional District

Project Number: 0476.0072.15

Scotch Creek Water System Phase 2

Date: 2020-01-30

Class C Cost Estimate

System Capacity: Intake and Watermain 90 L/s, WTP 60 L/s

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	Insurance and Bonding	LS	1	$ 450,000	$ 450,000
1.2	Survey and Layout	LS	1	$ 40,000	$ 40,000
1.3	Mobilization and Demobilization	LS	1	$ 40,000	$ 40,000
1.4	Clearing and Grubbing	LS	1	$ 40,000	$ 40,000
1.5	Commissioning	LS	1	$ 50,000	$ 50,000
1.6	Land Acquisition	LS	1	$ -	$ -
				Subtotal	**$ 620,000**
Section 2 - Watermains					
2.1	300 mm PVC DR18 - Include Fittings and Tie-ins	m	250	$ 390	$ 97,500
2.2	250 mm PVC DR18 - Include Fittings and Tie-ins	m	2650	$ 280	$ 742,000
2.3	200 mm PVC DR18 - Include Fittings and Tie-ins	m	930	$ 230	$ 213,900
2.4	Services <= 50mm	ea	39	$ 2,500	$ 97,500
2.5	Services > 50mm	ea	21	$ 30,000	$ 630,000
2.6	Road Restoration - Asphalt	m^2	1200	$ 75	$ 90,000
2.7	Trail Restoration	m^2	5145	$ 75	$ 385,875
2.8	Hydrants	ea	16	$ 6,000	$ 96,000
2.9	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000
				Subtotal	**$ 2,413,000**
Section 3 - Treatment Plant and Intake at Saratoga					
3.1	Intake Piping 250 mm directionallly drilled x 2 x 70 m	m	140	$ 625	$ 87,500
3.2	Intake Piping 250 mm on lake floor x 2 x 30 m	5	80	$ 125	$ 10,000
3.3	Intake Pumps	ea	2	$ 75,000	$ 150,000
3.4	Intake Screen Assembly installed by divers	ea	1	$ 30,000	$ 30,000
3.5	Site work	LS	1	$ 100,000	$ 100,000
3.6	Building & HVAC	LS	1	$ 550,000	$ 550,000
3.7	UV system	LS	1	$ 150,000	$ 150,000
3.8	Chlorination system	LS	1	$ 75,000	$ 75,000
3.9	Process Piping	LS	1	$ 150,000	$ 150,000
3.10	Dedicated Supply to Reservoir (250 mm) (incl. restoration)	m	1,200	$ 450	$ 540,000
3.11	Electrical/Controls	LS	1	$ 200,000	$ 200,000
3.12	BC Hydro upgrades to 3 phase	LS	1	$ 250,000	$ 250,000
3.13	SCADA	LS	1	$ 50,000	$ 50,000
3.14	Generator & pad	LS	1	$ 100,000	$ 100,000
				Subtotal	**$ 2,443,000**
Section 4 - Reservoir at Saratoga					
4.1	Concrete Reservoir - Include Site Grading	m^3	1500	$ 1,200	$ 1,800,000
4.2	Fencing	LS	1	$ 40,000	$ 40,000
4.3	Access Road Improvements	LS	1	$ 25,000	$ 25,000
4.4	Legal survey and registration	LS	1	$ 40,000	$ 40,000
4.5	Decommission existing reservoir	LS	1	$ 15,000	$ 15,000
4.6	PRV station	LS	1	$ 200,000	$ 200,000
				Subtotal	**$ 2,120,000**
				Subtotal all sections	**$ 7,600,000**
				25% Contingency	$ 1,900,000
				Sub-Total	$ 9,500,000
				15% Engineering/Consulting	$ 1,425,000
				Total	**$ 10,900,000**

Columbia Shuswap Regional District

Project Number: 0476.0072.15

Scotch Creek Water System Phase 3

Date: 2020-01-30

Class C Cost Estimate

System Capacity: Intake and Watermain 90 L/s, WTP 90 L/s

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	Insurance and Bonding	LS	1	$ 600,000	$ 600,000
1.2	Survey and Layout	LS	1	$ 50,000	$ 50,000
1.3	Mobilization and Demobilization	LS	1	$ 50,000	$ 50,000
1.4	Clearing and Grubbing	LS	1	$ 50,000	$ 50,000
1.5	Commissioning	LS	1	$ 50,000	$ 50,000
1.6	Land Acquisition	LS	1	$ 50,000	$ 50,000
				Subtotal	**$ 850,000**
Section 2 - Watermains					
2.1	250 mm PVC DR18 - Include Fittings and Tie-ins	m	3,050	$ 280	$ 854,000
2.2	200 mm PVC DR18 - Include Fittings and Tie-ins	m	8,300	$ 230	$ 1,909,000
2.3	Services <= 50 mm	ea	262	$ 2,500	$ 655,000
2.4	Services > 50 mm	ea	39	$ 30,000	$ 1,170,000
2.5	Road Restoration - Asphalt	m^2	25,050	$ 75	$ 1,878,750
2.6	Road Restoration - Gravel	m^2	9,000	$ 40	$ 360,000
2.7	Hydrants	ea	29	$ 6,000	$ 174,000
				Subtotal	**$ 7,001,000**
Section 3 - Intake and Treatment Plant at Saratoga Upgrades					
3.1	Intake Pump Upgrades	LS	1	$ 75,000	$ 75,000
3.2	UV System Upgrades	LS	1	$ 50,000	$ 50,000
3.3	Chlorination System Upgrades	LS	1	$ 50,000	$ 50,000
3.4	Additional Process Piping	LS	1	$ 50,000	$ 50,000
3.5	Electrical/Controls Upgrades	LS	1	$ 50,000	$ 50,000
3.6	SCADA Upgrades	LS	1	$ 25,000	$ 25,000
3.7	Generator Upgrades	LS	1	$ 50,000	$ 50,000
				Subtotal	**$ 350,000**
Section 4 - Reservoir at Saratoga					
4.1	Concrete Reservoir Expansion - Include Site Grading	LS	1,500	$ 1,200	$ 1,800,000
4.2	Fencing	LS	1	$ 30,000	$ 30,000
				Subtotal	**$ 1,830,000**
				Subtotal all sections	**$ 10,030,000**
				25% Contingency	$ 2,508,000
				Sub-Total	$ 12,538,000
				15% Engineering/Consulting	$ 1,881,000
				Total	**$ 14,400,000**

Columbia Shuswap Regional District

Scotch Creek Water Study

Conceptual Design

Legend

- Anchor Bay Parels: 10
- Captain's Village Marina Parcels: 1
- Peterson Court Parcels: 15
- Other Properties Parcels: 58
- Water Service Area
- Proposed Watermain 200mm
- Proposed Watermain 150mm
- Existing Watermain 150mm
- Existing Watermain 50mm

The accuracy and completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate and establish the precise location of all existing information whether shown or not.
The locations of existing and proposed infrastructure is approximate and should be confirmed. Locations are shown for concept only.

50 25 0 50 100
Metres

Coordinate System:
NAD 1983 UTM Zone 11N

Scale: 1:2,500
(When plotted at 11"x17")

Data Sources:
Parcels provided by CSRD

Project #:	0476.0072.15
Author:	WS
Checked:	CB
Status:	
Revision:	A
Date:	2020 / 2 / 4

URBAN systems

FIGURE 1