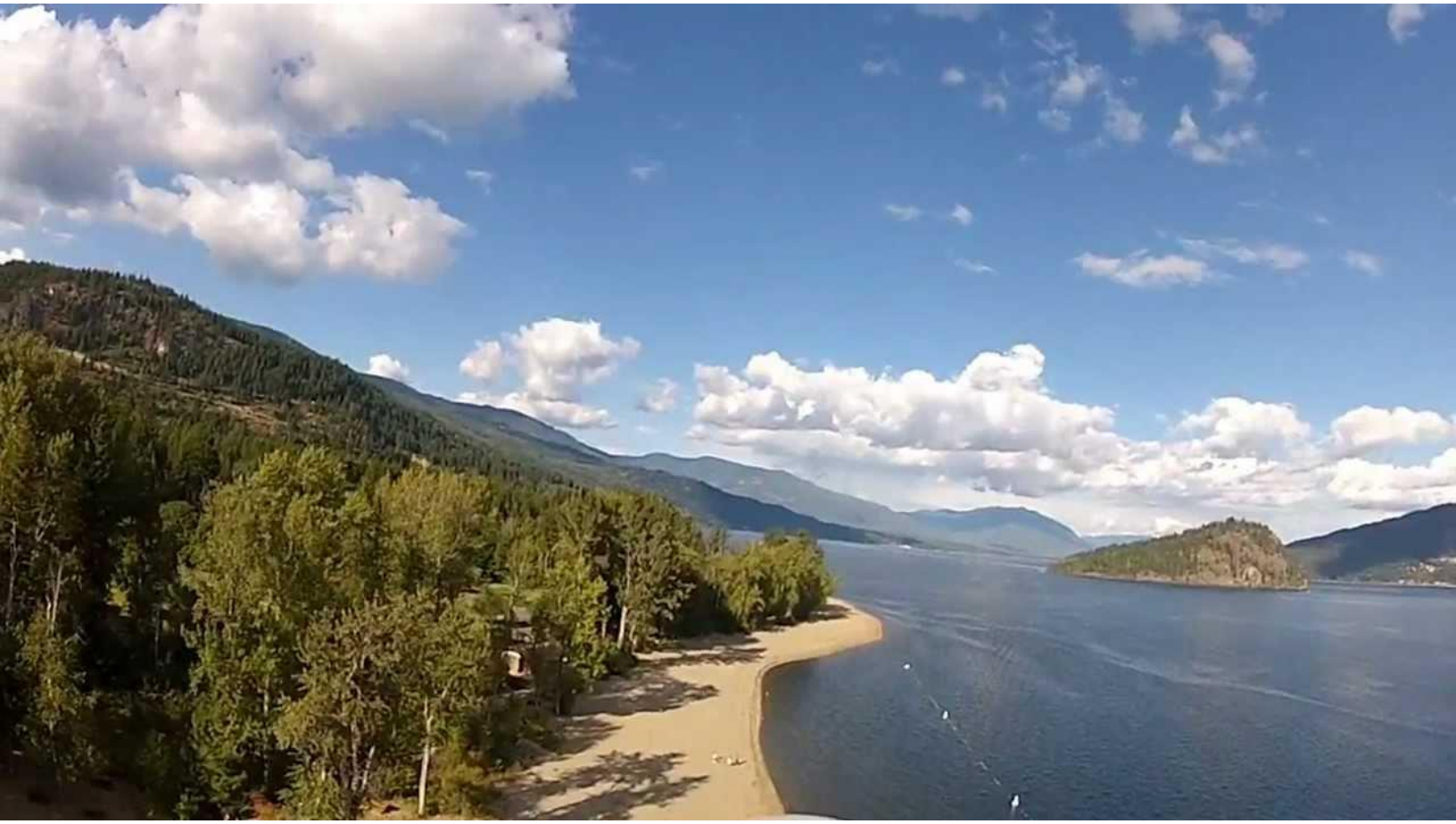

Columbia Shuswap Regional District

Scotch Creek Water Study 2018

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August 17, 2018

File: 0476.0072.10

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Appendices

1 Introduction

In 2007, Urban Systems completed the Scotch Creek Water Study for the CSRD. The report was completed in a response to the need for a safe and reliable water source for the Scotch Creek community. Currently, there are multiple private systems in the area, many of which, fail to meet Interior Health water quality standards. The report identified these existing systems and their shortcomings. It made design assumptions related to populations, and design flows, and proposed a new system based on these assumptions. Sources of water were also evaluated in the report. The report provided a large basis of information for the CSRD.

Currently, there is a renewed interest in constructing a system to address water quality issues and to encourage development in the Scotch Creek area. The primary interest of the CSRD is to provide good quality water to areas that have poor water quality now. Although there is also a need for a community sewer system in the area, investigating solutions for sustainable implementation and delivery of a community sewer system is beyond the scope of this report. During the water system design stage, additional consideration should be given to the potential locations of community sewer system infrastructure to avoid potential conflicts.

The CSRD established an advisory committee and retained Urban Systems to review the master water plan that was completed in 2007. This report summarizes the findings. It provides updated populations, demands, and a comparison of source options. These findings were used to complete a conceptual design of the system, and provide a cost estimate with cost recovery options.

1.1 Background Information

Previous documents have been referenced during this project and are listed below. Brief summaries of each document are provided in Appendix 1-1.

- Scotch Creek/Lee Creek Zoning Bylaw No. 825, CSRD, 2017
- Community Sewer System and Water Plan for Scotch Creek Area ‘F’, Opus DaytonKnight, 2013
- Scotch Creek Water Study, Urban Systems, 2007
- Hydrogeological Assessment of the Impact of Septic Effluent on the Scotch Creek Aquifer, Golder Associates, 1998
- Hydrogeological Assessment – Proposed Residential Subdivision, Piteau Associates, 2004
- Electoral Area ‘F’ (North Shuswap) Official Community Plan Bylaw No. 830, CSRD, 2009
- Scotch Creek Water Utility Study Update, Civic Utilities Ltd., 2009
- Source of Water Supply for Scotch Creek, Civic Utilities Ltd., 2006
- CSRD Subdivision Servicing Bylaw No. 641, CSRD, 2014

- Technical Memorandum No. 3 - Hydrogeological Assessment for Scotch Creek, Piteau Associates, 2013
- Water System Acquisition Strategy, CSRD, 2011

1.2 Vision and Goals

Having a vision provides focus, especially with complex projects. It provides a clear common picture of the future. The Vision and goals proposed in this section are to be used as a tool for decision making for the various options that are being considered. A Vision also inspires action, and could be used to rally the community, as community buy-in and assent are needed for the community water system to become a reality.

VISION FOR SCOTCH CREEK COMMUNITY WATER SYSTEM

1. The water system provides safe & reliable drinking water to the community.
2. The water system is affordable and financially sustainable.
3. There is an equitable approach to financing the capital and operating costs, with a user-pay and full cost recovery approach.
4. The system meets current CSRD and engineering standards.
5. The system is environmentally sustainable and reflects a conservation mindset. For example, the system is sized in a way that is practical and supports growth but is not oversized.
6. Having safe drinking water improves the vibrancy and health of the community, allowing other community priorities and aspirations to be realized, and creating a sustainable community for generations to come.

PROJECT GOALS

It is critical that the water system project achieve the following:

1. Pass the public assent process for CSRD acquisition and financing.
2. Receive government funding.
3. Move forward to construction in the near future.
4. Have a low risk of issues that will impact its success (e.g. technical, approvals, cost, schedule, land acquisition).

2 Key Design Criteria

This section provides a summary of some of the design criteria and assumptions that have been made to develop the conceptual cost estimates for the water system options that have been assessed. These assumptions have been made based on:

- The overarching goals listed in Section 1;
- A review of past reference documents and assumptions; and
- Current legislation and best practices.

The water system will be designed based on the Maximum Day Demand (MDD). MDD is the volume of water used by a water system on the highest usage day of the year. A system needs to be sized to pump/treat this flow/volume of water to keep up with use on that day (typically in late July /early August). Population and flow use estimates will be based on the Official Community Plan (OCP), released by the CSRD. The water system will have elevated storage to provide adequate system pressure per municipal standards. It will provide adequate fire flow while maintaining a minimum system pressure. The system will also provide safe drinking water that meets Interior Health requirements. The water system design will use information from the water system in the Saratoga subdivision. This system provides water for approximately 140 users. It currently operates to Interior Health standards and is owned and operated by the CSRD.

These assumptions will need to be reviewed when the project moves forward to design and more detailed information is available.

2.1 Water Quantity & System Sizing

- Water usage estimates were approached in a variety of ways in the background reports
- It is difficult to accurately estimate future water use
- It is also important to not overestimate water usage as the systems sizing should be practical and feasible, and oversizing could limit the ability to move forward with a community water system
- The intent of the approach used in the current study was to estimate overall water usage rather than focus on individual properties
- For context the following table shows the estimates included in previous reports:

Report	Urban Systems - 2007	Civic - 2009	Opus DaytonKnight - 2013
MDD (L/s)	122	107	124

2.1.1 Number of Parcels and Users

The number of lots (parcels), and number of water system connections (users) affect the project water use, construction cost estimates, and affordability of the system:

- Need to know number of connections/users to estimate the water use
- Need to know number of services for the construction cost estimate– these represent significant costs, particularly for larger services which require a chamber with backflow preventer & water meter
- Need to know number of parcels and number of users for cost recovery calculations – this has a significant impact on affordability

The following numbers have been based on the CSRD OCP and zoning bylaw mapping, information from Interior Health on the number of connections, and orthophotos/general imagery of the area. It is important not to focus too much on whether the numbers are exactly accurate at this point. **The intent is to be in the correct range for the water use, number of services, and cost recovery calculations. The numbers can be refined at the design stage if the numbers below need to be adjusted for specific parcels.**

In Scotch Creek, there are a number of complicating factors:

- There are existing large developments that are shared interest or strata parcels. This means that there are a number of users on one parcel, and a larger water service will be required. This includes:
  - Caravan's West – 2 parcels/387 existing users (shared interest)
  - Captain's Village Marina, 84 parcels/84 users (strata)
- There are a number of proposed large developments that are anticipated to be strata parcels, including:
  - Osprey Landing – currently 1 parcel/1 user – but 160 parcels/users proposed (strata)
  - Doubletree – currently 1 parcel/1 user – but 66 parcels/users proposed (strata)
  - Trailblazers RV – currently 1 parcel/1 user – but 200 users proposed
  - Franks Campground – currently 1 parcel/1 user – but 130 parcels/users proposed (strata)

For the purposes of this report it has been assumed that these developments will proceed; however, they may not all proceed as noted, and the zoning and approval processes need to be completed.

- The above developments total 1026 connections (500 existing plus 526 proposed). Whether these parcels are included or excluded in the service area, water use calculations, and parcel/user rates has a significant impact. Having more users on the water system is beneficial
- The number of vacant other properties also needs to be considered. As will be noted in subsequent sections, a parcel tax is collected on vacant properties. Occupied/connected properties are also charged a user fee

The following tables provide a summary of the number of parcels and users in the community, and potential water system service areas that have been considered. The potential service areas are shown in Figure 2-1. **The intent is to be in the correct range for the water use, number of services, and cost recovery calculations.**

Service area 1 was determined by identifying a trunkmain route that would supply water and fireflows to the community core, and includes parcels along this main corridor.

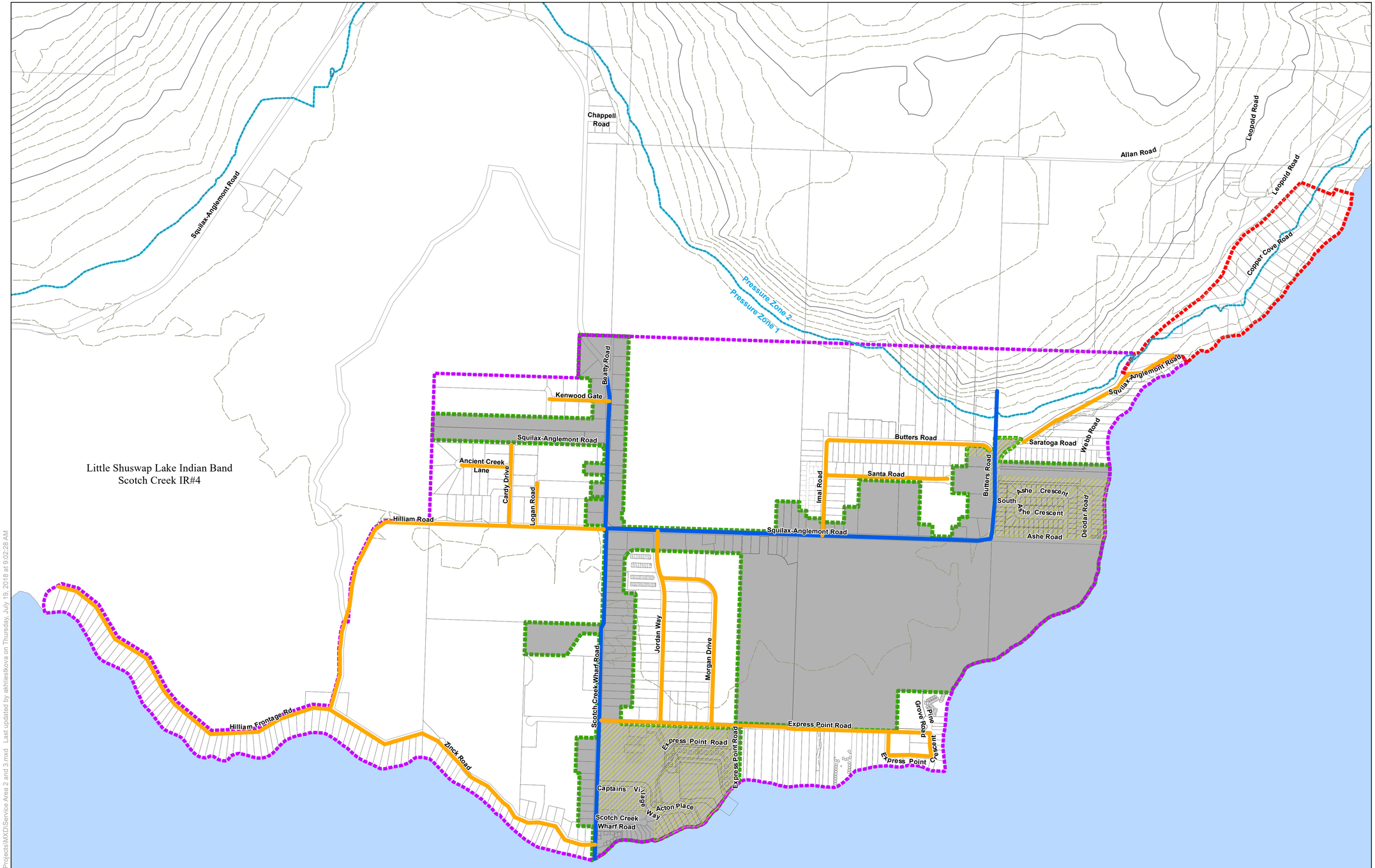
Service area 2includes the entire community. The Copper Cove Road parcels (service area 3) have been excluded from water system options at this time as this area is at an elevation that is higher than what can be serviced by the proposed water system and will require a separate pressure zone. The water system could be expanded in the future to service this area through a booster pump system.

Service area 2 includes the Hilliam Frontage Road parcels on Little Shuswap Indian Band IR#4 (LSIB), if they would like to be supplied by the water system. Further discussion with LSIB is recommended prior to design regarding this potential connection and population/water use assumptions.

Approximately 94% of parcels are occupied in service area 1, compared to 50% of service area 2. In both service areas, occupied and unoccupied parcels were identified. Occupied parcels refer to parcels that contain structures on them and are assumed to require a water service. Unoccupied parcels refer to parcels which would not require a service connection.

Service Area 1	***Parcels***	***Users***
Scotch Creek Service Area 1 - occupied parcels	176	610
Saratoga	106	143
Subtotals:	**282**	**753**
Scotch Creek Service Area 1 – unoccupied parcels	10	10
Subtotals:	**292**	**763**
Potential nearby extensions to service area (all currently unoccupied)*:	389	588
Totals:	**681**	**1380**

** this includes Osprey, Trailblazers, Doubletree, Franks campground, Zinck Road parcels*



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CSRD
COLUMBIA SHUSWAP REGIONAL DISTRICT

Columbia Shuswap Regional District

Scotch Creek Water Study

Proposed Future Service Areas

Legend

- Service Area 1 Watermain
- Service Area 2 Watermain
- Pressure Zone Boundary
- Service Area 1 (including Saratoga)
- Service Area 2
- Service Area 3 – potential future pressure zone 2 service area
- Exempt from Loan Repayment Service Area

0 100 200 400 600
Metres

N

Coordinate System:
NAD 1983 UTM Zone 11N

Scale:
1:8,000
(When plotted at 22"x34")

Data Sources:
Data provided by -

Project #:	0476.0072.10
Author:	JC
Checked:	LC
Status:	
Revision:	A
Date:	2018 / 7 / 19

URBAN systems

FIGURE 2-1

Service Areas 1 and 2	*Parcels*	*Users*
Service area 1 occupied parcels	176	610
Service area 2 occupied parcels	388	434
Subtotals:	***564***	***1044***
Service area 1 unoccupied parcels	10	10
Service area 2 unoccupied parcels:	400	701
Totals:	**974**	**1755**
Saratoga	106	143
Totals:	***1080***	**1898**

2.1.2 Water Use

A number of approaches were compared for calculating the maximum day demand. It was determined that the following assumptions provide a reasonable estimate.

- Saratoga water use is approximately 4300 L/unit/day – this consistent with CSRD Subdivision Servicing Bylaw (SSB) of 4500 L/lot/day and lower than previous estimates of 6300 L/lot/day which were based on the SSB at the time of the original study in 2007
- 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
- Note we have assumed 4500 L/lot/d = 4500 L/unit/d = 4500 L/user/d (not 4500 L/person/d).
- A reasonable amount of community growth has been considered in the calculations:
  - 40 L/s is 770 users/units at 4500 L/user/d. At 2.5 people/unit = 1920 people
    - *770 is approximately the existing number of occupied users in the proposed Service area 1 (including Saratoga)*
  - 60 L/s is 1150 users/units at 4500 L/user/d. At 2.5 people/unit = 2880 people
  - 90 L/s is 1728 users at 4500 L/lot/d (4320 people)
    - *This is about 40 years growth at 2% /year from the existing number of people*

The following table shows the maximum day demand that has been used for system sizing and the cost estimates. Please note that the cost estimates have been completed at a conceptual level, so these assumptions should be reviewed and adjusted during the design stage. Also, MDD is used mainly to size the source, treatment, and pumping infrastructure, so modest changes to the MDD will have a marginal effect on the overall costs. Additional growth could also be accommodated in the future through the implementation of water conservation measures.

Scenario	MDD (L/s)
Service Area 1	40-60
Service Areas 1 and 2 / Future	60-90

2.1.3 Fire Flows

The distribution system was modelled in WaterCAD to determine pipe sizes and available fireflows throughout the system. This was completed at a conceptual level, and the layout and watermain sizing should be confirmed during the project design.

The worst case condition for sizing watermains is supplying maximum day demand and the required fireflow with the system pumps off (i.e. power failure condition). In order to take a cost effective and sustainable approach to the watermain sizing, a somewhat reduced fireflow target was used compared to past studies for the *initial* water modelling (see table below). The purpose of this initial water modelling was to determine appropriate watermain sizing for the preparation of the cost estimates. Additional work is required to refine the watermain sizing and pipe layout.

As will be noted in Section 4, the watermains will be a significant portion of the capital cost of the new water system. It is important that they are appropriately sized for future conditions, to avoid needing to upsize key sections in the future. That said, it would be possible increase fireflows in the future (i.e. phase the construction) through the addition of looping. The fireflow assumptions also have a significant impact on reservoir size and cost, and as will be noted in future sections, the reservoir construction can be phased. Reducing the reservoir size is also beneficial because it reduces water age.

Other items should be considered in the water distribution system design:

- The Scotch Creek fire department has shuttle accreditation, and therefore doesn't rely on just the main distribution system to provide fire protection (e.g. a lake hydrant could be used);
- Sprinklers and other fire protection measures could be included in buildings to reduce fireflow requirements;
- The elevation of the reservoir. The original study recommended a reservoir height of 427 m. The proposed new Saratoga Reservoir will be much higher for siting/geography reasons. This means there

is potential for greatly improved fireflows with smaller pipe sizes. The CSRD is also planning to include a high pressure hydrant above the PRV station in the Saratoga reservoir design.

Significantly higher fireflows than the target will be achieved in many areas with the proposed watermain sizing. Assuming that the reservoir is sited at the elevation proposed for Saratoga, the fireflows will be more than adequate.

Description	Initial Fireflow Target	Achieved Fireflow Range
Single Family Residential	60 L/s	>80
Commercial	90 L/s	>110
Institutional	90 L/s	n/a

During the design of the distribution system, it will be important to review the system configuration in detail. This should consider:

- The available budget
- Key pipe sections (e.g. downstream of the reservoir) and whether an upsizing is preferable so that higher fireflows can be achieved in the future
- Opportunities to add looping in the future to increase fireflows if desired
- The reservoir elevation and PRV station design / setpoints
- Consideration of the potential for high pressures, and high velocities/flows in sections of the distribution system.

2.1.4 Reservoir Storage

The reservoir storage was calculated based on the Master Municipal Construction Documents (MMCD) Design Guideline Manual, which is a best practice guideline referenced for the design, tendering and construction of municipal projects. The following formula was followed:

$$Total\ Storage\ Volume = A + B + C$$

$Where;$

$A = Fire\ Storage\ (from\ Fire\ Underwriters\ Survey\ guide)$

$B = Equalization\ Storage\ (25\%\ of\ Maximum\ Day\ Demand)$

$C = Emergency\ Storage\ (25\%\ of\ A + B)$

The fire storage was calculated based on Water Supply for Public Fire Protection, FUS, 1999. The fireflow specified in the previous section (60 L/s and 90 L/s) corresponded to a required duration of flow. The duration, along with the flow, was used to size the fire protection storage of the reservoir.

This results in the recommended storage volumes shown in the following table.

Scenario	Reservoir Volume (m^3)
Service Area 1 (MDD 60 L/s, fireflow 60 L/s)	1500-2000
Service Areas 1 and 2 / Future (MDD 90 L/s, fireflow 90 L/s)	3000-3200

It is recommended that the reservoir is constructed in phases (two cells with 1500 m^3 each). Note that this is a smaller reservoir than what was proposed in past studies, but will provide a reasonable storage volume for operation of the water system and fire protection, supplemented with shuttle service from the lake. A dedicated watermain is proposed to the reservoir and will reduce water age problems associated with the system, in conjunction with good reservoir design.

The existing Saratoga reservoir is 90 m^3, and funding for a new upper 250 m^3 reservoir has been received. The lower reservoir would be abandoned as part of this proposed project.

The draft design of the Saratoga reservoir (by Gentech) indicates a proposed top water level (TWL) of 439.5 m. This has been set based on the elevation of a suitable site. The desired reservoir TWL is 427 m (based on the 2007 Urban Systems report and limiting pressures to a range that will not cause excessive water use or damage to equipment). A pressure reducing valve will therefore be required.

2.2 Water Treatment

2.2.1 Surface Water (Shuswap Lake)

- Previous studies recommended filtration as this was required for a surface water source at that time
- Filtration deferral is now an accepted option as Shuswap Lake is a considered a high quality, low turbidity source
- Filtration has not been included in current estimates based on CSRD's current 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. It has been assumed that UV disinfection and chlorination will be used. This conclusion is corroborated by the performance of the existing Saratoga water system
- Chlorination is recommended for all water systems (4-log viral CT assumed)
- A dedicated main to the reservoir has been included for 4-log viral CT, and system residual control

2.2.2 Groundwater

- Past studies from Piteau and water quality testing of the well on the Doubletree property indicate that the groundwater quality is acceptable without treatment or advanced disinfection
- Chlorination is recommended for all water systems (4-log viral CT assumed)
- A dedicated main to the reservoir has been included for 4-log viral CT, and system residual control

Groundwater options are discussed further in Section 3. There are concerns regarding the potential impact of septic systems on the water quality, which could impact treatment requirements in the future. The proposed well locations are anticipated to be upgradient of the community, which should lessen the potential need for additional treatment beyond chlorination.

3 Water System Options

Several options were considered and decisions were made regarding the preferred approach to a community water system for Scotch Creek. The following options were considered:

1. The expansion of the Saratoga water system to include the entire Scotch Creek area (i.e. one centralized water system)
2. A separate water system for the Scotch Creek area. This included the review and comparison of options for:
   a. the water source (surface water or groundwater) and its location
   b. the reservoir location

The following tables provide a general comparison of these options. The overarching water system Vision, and project goals were also considered in this comparison.

3.1 Overall Water System Options

3.1.1 Centralized System with Saratoga

Pros	Cons
The system has been shown to reliably provide safe drinking water. This includes both: • The source/treatment process • The operation and maintenance of the system by the CSRD	
Low risk from a technical perspective • intake and water treatment plan requirements are known, single supply location will reduce capital and O&M costs as there will be less required equipment • reservoir site has been assessed → *potential to use this as rationale for funding the Scotch Creek water system as a project can be shovel ready relatively quickly*	
Economies of scale for cost recovery of capital & O&M – will reduce long-term costs to community. Increasing the number of users will result in a system that is more affordable and financially sustainable.	Concern regarding equity from Saratoga water users. Need to assess contribution to existing system per CSRD policies.

Pros	Cons
Best/only surface water intake option per previous study	Some public concern regarding proximity of sewage treatment plant outfall; however, existing testing at Saratoga WTP has shown water quality is excellent
Saratoga system has received funding for upgrades which could be leveraged for a larger Scotch Creek project → *potential to use this as rationale for funding the Scotch Creek water system to increase priority and urgency*	Potential to delay Saratoga upgrades as do not know when/if Scotch Creek funding would be received. Puts pressure on funding application and assent process
Better source protection/control than dual systems with multiple intakes, or surface and groundwater sources. Less potential for conflict /impact from community effluent disposal location	
More efficient to operate/maintain a single water system. Reduced impact on the environment and footprint on the foreshore (if one surface water intake and WTP rather than two). *Design will include redundant equipment (e.g. pumps) and back-up power increase reliability*	

3.1.2 Separate Scotch Creek System

Pros	Cons
Saratoga system upgrades could be completed independently of Scotch Creek project	Lose potential to reduce costs for Saratoga users through economies of scale.
Some desktop studies regarding high yield wells have been completed by Piteau, and there are smaller wells drilled in area that show water quality /quantity should be suitable. Piteau report suggests wells should be 30 L/s each, spaced a minimum of 100 m apart to avoid interference.	The development of larger wells will trigger a review under the BC Environmental Assessment Act (≥ 75 L/s). This process is anticipated to take at least two years, and could therefore delay the project schedule. The process would be used to identify valued environmental components (e.g. other wells and water source in the area, habitat, birds), and confirm that the development and operation wells will not impact them. *There is also a risk that groundwater development will not be successful. Risk of impact of septic systems to water quality. Risk of interference with other existing wells/Scotch Creek. There are a number of unknowns to consider*
The groundwater quality may be suitable for chlorination as the sole source of disinfection (without UV, reducing the treatment plant cost).	The Piteau report recommends confirming that adequate in-ground filtration is provided through monitoring once the wells have been developed. Therefore it is also possible that UV disinfection will be required for the groundwater source option given the vulnerability of the aquifer. This could add to project costs in the future.
The Roan site has been identified as a potential reservoir location	A new reservoir site would need technical review including field investigations (e.g. survey, geotechnical) and land acquisition/permitting – which will take more time than the Saratoga reservoir site
Could establish a small service area and phase system	May not be as likely to secure government funding May be difficult to proceed with subsequent phases and benefit entire community. *Risk that economies of scale will not be realized, and project will not advance*

3.2 Detailed Water System Options

The following detailed options were reviewed and compared. The following sections provide general assumptions and commentary regarding the options. Cost estimates are provided in Section 4.

3.2.1 OPTION 1 - Saratoga Expansion - Service Area 1

{Consolidated System with Saratoga Intake & Saratoga Reservoir}

As discussed in Section 3.1.1, there are many benefits to this option.

- From a technical perspective this system is well understood, and can be completed in a straightforward and timely manner
- A water licence amendment will be required for the intake
- Have assumed that majority of watermains will be constructed along the trail to reduce road restoration costs. This resulted in a savings in the order of $400-500k in the cost estimate. The location of infrastructure will need to be further evaluated to avoid conflicts with other existing infrastructure and minimize costs
- The construction cost could be reduced by decreasing the size of the reservoir. For example, there is a savings of approximately $900k if the reservoir size is decreased to 1000 m^3

Overall this is the preferred option because:

- **There would be long-term efficiency in having a centralized system (i.e. lower O&M costs)**
- **It has the lowest capital cost**
- **This option is the most shovel-ready and therefore the most likely to be successful in terms of a grant application**

3.2.2 OPTION 2 - Wharf Road Intake & Roan Reservoir – Separate System, Service Area 1

- Previous study recommended Saratoga site as best intake location in area
- Wharf Road Park has also been considered to provide the community with the conceptual cost of a separate Scotch Creek water system using a surface water intake
- The estimate assumes that there is adequate space at the CSRD Wharf Road park, and that there will be no land acquisition costs with this option
- Will need to undertake specific siting study for intake and consider STP outfall location (similar to Saratoga site considerations, assumed to be acceptable in terms of water quality)
- Have assumed will need to upgrade power from highway to site for 3-phase (for UV disinfection system)

- As this would be a new intake/water treatment plant site, the cost estimate allows for:
  - General site work (e.g. clearing/grubbing, grading, landscaping, fencing)
  - Site piping and valves
  - A new building (larger than Saratoga where the existing building can be used/expanded)
  - Power upgrades to get 3-phase power to the WTP for the UV disinfection system
- The estimate also includes a dedicated watermain from the WTP to the Roan reservoir, and a 1500 m^3 reservoir. The dedicated main is a significant cost given the distance to the reservoir compared to the proximity of the Saratoga intake to the Saratoga reservoir
- The watermain connection to the community from the reservoir is a considerable distance and adds a significant cost to this option compared to the Saratoga reservoir location. A larger watermain is required due to the distance/headloss, and is needed to meet fireflow targets

The following figure provides the dimensions of the Park for general context.

Wharf Road Park Property information, retrieved from CSRD Mapping Software

3.2.3 OPTION 3 - Doubletree Wells & Saratoga Reservoir – Separate System, Service Area 1

{Separate reservoir adjacent to Saratoga Reservoir}

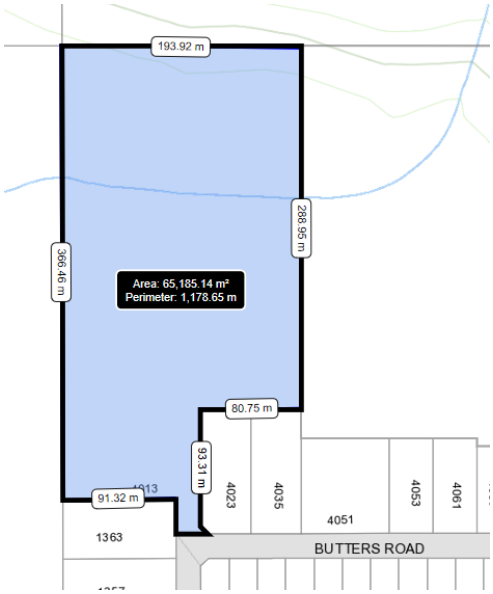
The Doubletree site owners have completed previous investigations regarding the water supply for their development and the Scotch Creek area, and have been in discussion with CSRD regarding the use of their property for a groundwater source. Another site in the area could also be selected. The concept and assumptions for this option build on previous work that has been completed.

In particular, the "Technical Memorandum No. 3 – Hydrogeological Assessment for Scotch Creek" (Piteau Associates, October 2013) has been referenced. This document provides a summary of previous groundwater studies in the area, and states the following:

- A withdrawal rate of 120 L/s would represent approximately 20% of the aquifer flow
- The aquifer is considered highly vulnerable to contamination, and the direction of flow is from the north towards the south, so it is considered prudent to position effluent-to-ground disposal areas down-gradient of any wells. Wells should be located within the northern portion of the aquifer
- In order to achieve the desired yield, multiple wells (at least 4 @30 L/s each) will be required.
    - *For a 90 L/s MDD, 4 wells would provide MDD with 33% redundancy. The number of wells and redundancy should be confirmed during the design*
- The minimum recommended well casing diameter is 300 mm, and wells will be approximately 60 m deep
- To minimize the potential for interference, wells should be spaced a minimum of 100 m apart, perpendicular to the direction of flow in the aquifer
- Chlorination will likely be required, and field investigation will be required during the first few months of operation to demonstrate that the aquifer provides suitable filtration
    - *If not, then UV disinfection may be required. This has not been included in the cost estimate*

The following figure provides the dimensions of the Doubletree property. The siting of 4-5 wells with the above criteria would require further review from both a hydrogeological perspective, and to prevent encumbering the proposed development on the property. Other sites in this vicinity could be considered for all/some of the wells.

Doubletree Property information, retrieved from CSRD Mapping Software



The estimate for this option includes:

- Drilling and development of three 30 L/s wells (for an MDD of 60 L/s, this provides 50% redundancy)
- The infrastructure needed for three well sites (piping, valves, electrical supply/kiosk, sampling stations, blow-offs, fencing, etc.)
- A single WTP at one of the well sites with a chlorination system
- A dedicated supply main to the Saratoga reservoir
- A 1500 m^3 reservoir at the Saratoga site or a proximate location.
- An allowance for the BC Environmental Assessment process and groundwater investigations that will be required. A groundwater licence will also be required in accordance with the BC Water Sustainability Act and BC Groundwater Protection Regulation.

  As stated in Section 3.1.2, the development of larger wells will trigger a review under the BC Environmental Assessment Act (≥ 75 L/s). This process is anticipated to take at least two years, and could therefore delay the project schedule. The process would be used to identify valued environmental components (e.g. other wells and water source in the area, habitat, birds), and confirm that the development and operation wells will not impact them.
- The estimate for this option does not include the decommissioning of existing wells and water systems as property owners may want to retain these wells/intakes for irrigation purposes.
  - *For the centralized surface water option this will provide the benefit of reducing water use from the community water system;*
  - *For a separate groundwater system, this becomes much more complicated with potential for impacts to both water quality (source protection control) and quantity (interference between wells)*

3.2.4 OPTION 4 - Roan Wells & Roan Reservoir – Separate System, Service Area 1

An estimate has also been prepared for developing a groundwater source and reservoir on the Roan property.

- The well costs are estimated to be the same as the Doubletree property
- The length of the dedicated main is reduced with this option
- The watermain connection to the community back from the reservoir is also a considerable distance and adds a significant cost to this option compared to the Saratoga reservoir location. A larger watermain is required due to the distance/headloss, and is needed to meet fireflow targets. It may be possible to construct the watermain along the trail to reduce project costs. The potentially difficult terrain/slope from the reservoir needs to be considered in the construction costs. This is unknown at this time as the site has not been reviewed/investigated

- The construction of the reservoir will require the assessment of a new site including survey, geotechnical & hazard/terrain review, archaeological review, and environmental review. It will also require negotiations with the property owner, a right-of-way and legal survey. This will affect the project schedule
- The reservoir will also require the development of a new site including roads/drainage, piping/valves, fencing, SCADA, and power/controls which adds to the estimated cost
- An allowance for land acquisition costs has been included in the estimate but is unknown at this time

3.2.5 OPTION 5 - Saratoga Expansion –Service Areas 1 & 2

{Consolidated System with Saratoga Intake & Saratoga Reservoir}

- This option shows the estimate for constructing the water system for the larger service area
- The costs are quite high due to the extent of the distribution system, however there would be a higher number of users to pay for the system.
- A reservoir volume of 3000 m^3 has been assumed; however, this could be reduced/phased to reduce the initial cost
- Some of the other infrastructure (e.g. pumps, water treatment equipment) could also be reduced in size to reduce initial cost as this infrastructure has a shorter life and would need to be replaced before all users are connected to the system.

4 Cost Estimates

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 2018 Canadian dollars, and include an allowance for inflation of 3% per year for 2 years (i.e. assumes construction in 2020). The appropriateness of this inflation allowance should be considered in conjunction with the project funding, financing and scheduling.

A detailed breakdown of the cost estimates is included in Appendix 4-1. Please note that special architecture has not been included for the water treatment plants, and basic site landscaping/restoration has been included.

4.1 Construction Costs

The following table provides a summary of the construction costs estimated for the options presented in Section 3.

	OPTION 1 Service Area 1 - Saratoga Intake / Saratoga Reservoir	OPTION 2 Service Area 1 - Wharf Road Intake/Roan Reservoir	OPTION 3 Service Area 1 - Doubletree wells / Saratoga Reservoir	OPTION 4 Service Area 1 Roan wells / Reservoir	OPTION 5 Service Areas 1 & 2 Saratoga Intake / Saratoga Reservoir
	Central System with Saratoga	*Separate water system for Scotch Creek*	*Separate water system for Scotch Creek*	*Separate water system for Scotch Creek*	*Central System with Saratoga*
General Requirements	$ 380,000	$ 570,000	$ 495,000	$ 575,000	$ 960,000
Watermains	$ 2,370,725	$ 2,548,725	$ 2,548,725	$ 3,624,975	$ 9,004,675
Source and Treatment	$ 1,852,500	$ 3,810,000	$ 2,755,000	$ 2,485,000	$ 2,177,500
Dedicated Main (included in source and treatment amount)	*$ 495,000*	*$ 1,657,500*	*$ 495,000*	*$ 225,000*	*$ 495,000*
Reservoir	$ 1,610,000	$ 2,120,000	$ 2,120,000	$ 2,515,000	$ 3,465,000
Subtotal All Sections	*$ 6,213,225*	*$ 9,048,725*	*$ 7,918,725*	*$ 9,199,975*	*$ 15,607,175*
25% Contingency	$ 1,298,000	$ 2,262,000	$ 1,980,000	$ 2,300,000	$ 3,647,000
Sub-total	*$ 7,511,225*	*$ 11,310,725*	*$ 9,898,725*	*$ 11,499,975*	*$ 19,254,175*
15% Engineering/Consulting	$ 872,000	$ 1,697,000	$ 1,485,000	$ 1,725,000	$ 2,633,000
Subtotal	*$ 8,383,225*	*$ 13,007,725*	*$ 11,383,725*	*$ 13,224,975*	*$ 21,887,175*
Inflation (2 years at 3%)	$ 510,538	$ 792,170	$ 693,269	$ 805,401	$ 1,332,929
Estimated Capital Cost (Rounded)	**$ 8,900,000**	**$ 13,800,000**	**$ 12,100,000**	**$ 14,000,000**	**$ 23,200,000**

Notes:

- A savings of approximately $900k to Option 1 could be realized by reducing reservoir from 1500 to 1000 m³
- Option 1 includes a deduction of $1.488 M for Saratoga funding. The estimate without this deduction is $11.1 M which is still less than other non-centralized options
- Option 5 includes a deduction of $1.488 M for Saratoga funding. The estimate without this deduction is $25.4 M
- Option 5 includes 380 water services, based on approximate counts of existing occupied properties in the full service area (approximately 1000 users)
- The Option 5 total cost could also be reduced by decreasing the reservoir size
- A cost allowance for decommissioning existing water systems and wells has not been included and is assumed to be at property owner's expense
- **Water meters have been included for the larger services with backflow preventers, but NOT for individual users at this time. This was excluded at this time to reduce the initial capital cost, but may be completed at a later date in accordance with the CSRD Water System Acquisition Strategy. The CSRD will implement a Water Conservation Plan for the community to minimize water use.**

4.2 Cost Recovery Calculations

4.2.1 Background

The CSRD has a number of policies that are part of the Water System Acquisition Strategy that will need to be applied in the development of the project and have been considered in the cost recovery calculations. The approach to cost recovery should be consistent with these policies and be:

- Equitable
- Transparent / accountable
- Efficient to administer
- Limit risk/uncertainty
- Sustainable

A couple of these key policies are referenced below.

Water User Rates

To ensure the long-term viability of its water systems, the CSRD must ensure its water user rates reflect the true value of safe, reliable water. To promote sustainability, the CSRD's water user rates should recover the full cost of providing water (i.e., the rates should cover operations and maintenance costs, rate-funded capital, and contributions to reserves for long-term capital replacement). These rates should be designed to recover these costs fairly across water user groups. In order to minimize any substantial increases in usage rates, the CSRD may consider phasing in rates over time.

Policy No. 25:

(a) The CSRD will introduce uniform water user rates to recover the full cost of providing safe, reliable water.

(b) The CSRD will consider phasing in rate increases over multiple years to help mitigate the impact on water users.

Existing Properties Connecting to a CSRD Water System

The CSRD needs to establish a fee for a contribution to capital reserve for properties outside the service area that wish to connect to a CSRD water system. Funds collected will assist with required future capital upgrades. The contribution to capital reserve account is ten times the current parcel tax for each respective water system. This ten multiplier of the parcel tax will be based on the number of connections, as in the case of a trailer park, or the number of residences, as in the case of a multi-unit building.

> ***Policy No. 34:***
>
> *a) Existing properties applying to connect to a CSRD water system shall pay a contribution into the respective water system's Capital Reserve Fund for future capital infrastructure at a rate of 10 times the current parcel tax of the respective water system, based on the number of residences and/or businesses on the property, in addition to the established connection fee.*
>
> *b) In extenuating circumstances, the Board may deviate from this formula to calculate the contribution to a capital reserve account.*

Policy 34 has been applied in the past when a parcel/development connects to an existing water system. The intent of this is to recognize the contributions of the existing/past property owners in the water system, by requiring an initial contribution to reserves.

This is different than the proposed Scotch Creek water system which is a large expansion instead of new water system on its own; therefore, the CSRD is considering recommending Policy 34 not apply when the community water system is first established.

It would however be considered in the future when new parcels connect to the water system.

4.2.2 Water System - Initial Connection and Annual Fees

There are a number of costs relating to the construction of a water system, and these costs are recovered through charges to property owners benefitting from the water system.

The beneficiaries include:

- An unoccupied parcel – as the value of the property will be higher and there is increased development potential if there is the potential to connect to a community water system
- A water user who is connected to the water system and using the water. **Note that in this case, all users in the service area will be required to connect to the new water system**

The costs and typical cost recovery approach are summarized in the following table.

Item	Cost Recovery Approach
Water service from house to property line; Decommissioning former water system & its components	Property owner's expense
Water service from property line to watermain	Initial Connection Fee ($2,000)
Initial water system construction cost	Annual Parcel Tax/User Fee
Operation & Maintenance Expenses	Annual User Fee
Infrastructure repairs & replacement	On-going contribution through Parcel Tax/User Fee

4.2.3 Preferred Solution and Calculations

A meeting was held with the Scotch Creek Water Advisory Committee to review a draft of the report, and it was agreed that Option 1 (Service Area 1, expansion of the Saratoga water system) was the preferred solution for moving forward with a community water system in accordance with the Vision and Goals presented in Section 1 of this report.

In order to complete the following cost recovery calculations, it has been assumed that:

- The preferred approach is a central water system / expansion of the Saratoga water system with a capital cost of $8,900,000 being incurred
- A new service area will be created for the surcharge of the loan repayment for the new Scotch Creek infrastructure and user fees/parcel tax
- Calculations have been based on receipt of a senior government grant of 73%
- The CSRD will finance the remainder of the construction cost with the Municipal Finance Authority, with a 20-year amortization at 3%/year, and a 3% capitalization rate sinking factor of 0.037215708
- There are 106 parcels, and 143 users in the existing Saratoga water system (this includes Copper Island RV Park)
- Water system annual expenses will be similar to the Saratoga expenses (and have been adjusted based on the number of users depending on the option)
- Note that the calculations are in 2018 dollars and are based on current expenses. Water system rates will be increased over time. Currently user fees are increased on an annual basis by 2%, and parcel taxes are increased every 5 years
- The Saratoga users should not pay for the loan for the expanded water system and will not be included in the new service area for the loan repayment

- Captain's Village Marina will be in the service area and will contribute $550,000 to the project cost upon connection to the water system based on their agreement with the Comptroller/CSRD. In order to be equitable and recognize this contribution, the CSRD is considering waiving the loan repayment portion of the user fee for this property
- The parcel tax will be $185/year
- Users fees will be collected to pay for annual expenses and loan repayment (range of $550-$750 anticipated)
- Existing Saratoga users will benefit from the economies of scale of the larger water system (i.e. annual expenses per user are lower with additional users)
- A metered rate based on water meter reading will not be charged at this time but may be considered in the future once all users have meters

4.2.4 Potential Rates

The parcel tax and user fees were calculated for two options:

- Option 1 – base option. Includes Service Area 1 with 292 parcels and 753 users (including Saratoga).
- Option 5 – Service areas 1 and 2 with 974 parcels, and 1187 serviced users (including Saratoga). For this option it has been assumed that a 73% grant will be received, but this may not be realistic

Please note that:

- **The following calculations are a simplified version of the potential rates for single family residential user. If this project proceeds, CSRD Bylaw 5744 would apply, and Schedule A would be updated to include the Scotch Creek water system**
- **The number of parcels/users is approximate and should be confirmed**
- **The CSRD finance department needs to review these calculations and the distribution between the parcel tax and user fees may need to be adjusted. The purpose of the numbers provided below is to provide a general indication of the potential charges**

The following table provides a summary of the calculations.

Item (Note 2)	Option 1 Service Area 1	Option 2 Service Area 2 (Note 3)
Capital Cost	$ 8,900,000	$ 23,200,000
Loan Amount	$ 1,850,000	$ 5,710,000
Annual Costs (Loan Repayment & Annual Expenses)	$ 439,000	$ 788,000
Parcels / Users (including Saratoga)	292 / 753	974 / 1187
Parcel Tax + User Fee (Saratoga, Captain's Village Marina) (Note 1)	185 + 415 ≈ $ 600	185 + 350 ≈ $ 535
Parcel Tax + User Fee (Scotch Creek) (Note 1)	185 + 545 ≈ $ 750 (Note 4)	185 + 540 ≈ $ 750
Anticipated annual payment range	***$ 600 - 750***	***$ 525 - 750*** *(Note 3)*

Note 1 – for parcel with one user (e.g. single family parcel)

Note 2 – does not include initial connection fee, or initial contribution to reserves (if applicable)

Note 3 – this includes a significant grant amount that may not be received

Note 4 - $545 is $414 plus a loan amount of approximately $131

The calculations show that:

- **The Option 1 costs for a typical one parcel/one user property are in the range of charges on other CSRD water systems like Saratoga and Sorrento**
- If 73% funding could be received for the ultimate service area, the charges would also be reasonable; however, this level of grant funding is not anticipated

For comparison, the current parcel tax and user fees for other comparable CSRD water systems are as follows:

	User Fee	Parcel Tax	Total
Anglemont	$ 700	$ 530	$ 1,230
Sorrento	$ 371	$ 179	$ 550
Macarthur/Reedman	$ 530	$ 236	$ 766
Sunnybrae	$ 486	$ 324	$ 810
Saratoga	$ 521	$ 185	$ 706

5 Community & Agency Input

In order to select the preferred option for the water system, the project included both community and agency input throughout the study. A Scotch Creek Water Advisory Committee was established at the outset of the project. Their terms of reference are included in Appendix 6-1. The committee included a variety of public representatives from the Scotch Creek area, as well as representatives from the CSRD, Interior Health, and the Little Shuswap Lake Indian Band. The committee met several times and:

- Reviewed and provided input into the draft report
- Assisted with the selection of the recommended water system option
- Attended the community open-house and solicited input from other community members

In order to obtain feedback and input from the broader community, the CSRD also:

- posted numerous documents on their website (including the draft report and a summary presentation) for community review
- held a community open-house July 26th. The posters from this event are also included in Appendix 6-1
- Met with numerous community members to obtain feedback and comments

The CSRD Board of Directors met on August 16th, 2018 and determined that the CSRD would apply for a grant under the Investing in Canada Infrastructure Program - British Columbia - Green Infrastructure - Environmental Quality program. Service area and borrowing bylaws were also passed at the meeting to allow the application to be submitted (applications due August 29, 2018).

6 Potential Schedule & Next Steps

The following next steps are anticipated for moving this project forward. A tentative schedule is shown to provide an idea of the length of time that will be required to complete the project once senior government funding is received.

In the past, the last step in the CSRD water system acquisition process (just before detailed design and construction) has been public assent. It is normally initiated once all the preliminary engineering is completed and project funding has been secured, as the CSRD is then able to provide the community with firm project costs for gauging their decision.

Public assent can be accomplished through a referendum or petition process. A referendum requires a majority vote 50% + 1 in favor to pass while a formal petition requires 50% + 1 vote yes as well as at least 50% of the total assessment.

The decision as to which process is used will be determined by the CSRD Board of Directors. The CSRD is also assessing whether the public assent process should be completed in the fall of 2018 or winter 2019 to ensure that there is community support for the proposed project and increase the likelihood of receiving grant funding.

Please also note that there will be opportunities for refinement of the project scope and design during the preliminary design and detailed design stages. Obtaining funding is a first key step to advancing the work.

- Community open house — July 26, 2018
- CSRD Board meeting — August 16, 2018
  - Letter of support for funding application
  - Loan authorization bylaw
  - Service area establishment bylaw
- Funding application — August 29, 2018
- Referendum / assent process — Fall 2018 or Winter 2019
- Receipt of funding — unknown, assume Spring 2019
- Preliminary design — Spring 2019
- Detailed design — Fall 2019
- Tendering — Fall 2019/early winter 2020
- Construction — 2020

7 Conclusions & Recommendations

1. Saratoga system expansion is the preferred approach as a result of consultation with the advisory committee for a number of reasons:
    - Lowest capital cost
    - Lowest O&M costs
    - Least risk and unknowns from a technical perspective
    - Best option from a schedule perspective and ability to proceed with grant application, assent process, and design/construction
    - Ability to leverage existing Saratoga funding and reduce overall costs to community through economy of scale
    - Best option from a sustainability and environmental perspective (e.g. source protection)

2. The CSRD should apply for funding in August 2018 for Option 1 (Service area 1). Applications to future funding programs should be considered in the future when there is demand/interest in expanding the system

3. A smaller reservoir could be considered if full funding is not received to minimize costs; however, community members have expressed a desire to ensure sufficient fire protection is included, and should be engaged to determine whether there is a willingness to pay for increased storage

4. The following items should be considered during the design stage:
    - Refinement of the service area
    - Distribution system design to optimize fireflows
    - Potential future location of community sewer system infrastructure, and best location for watermains to minimize construction costs and future conflicts during construction

Appendix 1-1

Previous Document Summaries

- Scotch Creek/Lee Creek Zoning Bylaw No. 825, CSRD, 2017
- Community Sewer System and Water Plan for Scotch Creek Area 'F', Opus DaytonKnight, 2013
- Scotch Creek Water Study, Urban Systems, 2007
- Hydrogeological Assessment of the Impact of Septic Effluent on the Scotch Creek Aquifer, Golder Associates, 1998
- Hydrogeological Assessment – Proposed Residential Subdivision, Piteau Associates, 2004
- Electoral Area 'F' (North Shuswap) Official Community Plan Bylaw No. 830, CSRD, 2009
- Scotch Creek Water Utility Study Update, Civic Utilities Ltd., 2009
- Source of Water Supply for Scotch Creek, Civic Utilities Ltd., 2006
- CSRD Subdivision Servicing ByLaw No. 641, CSRD, 2014
- Technical Memorandum No. 3 - Hydrogeological Assessment for Scotch Creek, Piteau Associates, 2013
- Water System Acquisition Strategy, CSRD, 2011

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Scotch Creek/Lee Creek Zoning Bylaw No. 825
Date: December 2017

Document Purpose

The document provides pertinent information on each zone. This includes principal and secondary uses, minimum parcel sizes, and maximum density. Mapping that was based on zoning information showed land use within the area, including areas and parcel locations.

Summary

The document summarized zones in the area, zones in the area that are relevant to this project are shown below:

- Agriculture
- Rural - 1
- Rural - 2
- Country Residential
- Residential - 1
- Residential - 2
- Manufactured Home Park
- Multi-Residential
- Resort Residential
- Mixed Use
- Commerical-1
- Commerical-2
- Commercial-3
- Local Service Commercial
- Industrial - 1
- Park
- Institutional
- Comprehensive Development

Relevance to Design Update

The document was used in conjunction with the zoning map to determine the area, number of parcels, and principal uses in each zone. This allowed the water system to be designed for future zoning in the area. This was especially important for providing adequate fire flow service to different areas.

Background Document Review for Scotch Creek Water System Update 2018

Document Title:	Community Sewer System and Water Plan for Scotch Creek Area 'F'
Date:	August 2013
Author:	Opus DaytonKnight
Client:	Columbia Shuswap Regional District

Document Purpose

This report summarized the previous Engineering work that had taken place for the CSRD community water and sewer system. Design populations, flows, and a cost estimate were provided for the proposed systems. Three options for each system were presented.

Summary

The report mainly summarized the 2007 Scotch Creek Water Study, and the 2009 Liquid Waste Management Plan for Columbia Shuswap Regional District Area 'F'. Design criteria were based on this work. Past technical memorandums completed by Opus DaytonKnight were also reviewed. Pertinent information to the water system are listed below:

Total Estimated MDD:	10,700 m^3
Total Population (2011 Census):	688
Ultimate Reservoir Storage Volume Estimate:	6,250 m^3
Total Estimated Buildout Population:	8,980 people
Fire Flow	80 L/s

Project costs for each option were presented. The system was broken into four phases. The options included groundwater and surface water sources.

Conclusion

The summary of information led to the completion of a cost estimate and phasing plan for the community water and sewer system in Scotch Creek.

Relevance to Design Update

The document provides a good comparison for design criteria developed in this report. The criteria, along with the project phasing and costs were all reviewed.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Columbia Shuswap Regional District –Scotch Creek Water Study
Date: November 2007
Author: Urban Systems
Client: Columbia Shuswap Regional District

Document Purpose

The intent of this study is to:

- Define the scope of a regional water system;
- Examine the work undertaken by other consultants; and
- Prepare servicing options complete with cost estimates.

In the case of Scotch Creek, it is preferable that one large water utility system be constructed to serve the entire area and that the CSRD own and operate it.

Summary

Total Estimated MDD	10,492 m^3/d
Ultimate Reservoir Storage Volume Estimate	6,326.0 m^3
Total Estimated Buildout Population	6,610 people
Residential Fire Flow (Low Density)	60 L/s
Residential Fire Flow (High Density)	90 L/s
Commercial Fire Flow	150 L/s
Total Cost	$20,260,000

Conclusions

- A full, municipal regional water system should be constructed in the future to service all of Scotch Creek. This municipal system should be owned and operated by the Columbia Shuswap Regional District.
- The assumptions in this report (i.e. populations, density and type of development, water demands, study boundaries, cost estimates) will need to be updated with time and as more information becomes available.
- A risk assessment should be completed on the water source to establish what treatment criteria are appropriate to minimize risk to public health. The treatment process should then be designed to achieve these treatment criteria.

Relevance to Design Update

This document provides design flows, phasing, and reservoir sizing for the Scotch Creek water system. The report provides a conceptual design, and cost estimate. The report is used as a basis for this design. All information has been reviewed and updated to match current projections.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Hydrogeological Assessment of the Impact of Septic Effluent on the Scotch Creek Aquifer
Date: January 1998
Author: Golder Associates
Client: Columbia Shuswap Regional District

Document Purpose

The report presents the results of a hydrogeological investigation on the Scotch Creek Alluvial Fan. The study was conducted to address the issue of septic field effluent contamination in the area. The report details the affects of population growth on groundwater quality as well.

Summary

Golder used historical, and field data to complete the requirements of the study. Existing water supply well, and population data, along with published information was used. A full water quality analysis of nine water supply wells was completed. In addition to this, piezometers were installed at two locations in the aquifer. Water levels in monitoring wells were also measured to further assess the condition of the aquifer. The study area was comprised of the Scotch Creek alluvial fan. The supply, and monitoring wells were evenly distributed across the Scotch Creek community area.

The water quality results indicated that all parameters were below GCDWQ -1996, however, there is some evidence of deterioration of the groundwater quality in the Aquifer, and localized areas where iron and manganese concentrations exceed the AO. This evidence is strongest in the areas of greatest population density.

Conclusions

- The Scotch Creek Aquifer derives most of its water from infiltration from Scotch Creek and there is apparently a significant flow of water through the aquifer from this source.
- The maximum population that should be considered to provide reasonable protection to the aquifer is 6,000.

Relevance to Design Update

This document provides general context to the aquifer water quality in the area. It could be used to provide information on the groundwater source.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Hydrogeologic Assessment - Proposed Residential Subdivision
Date: October 2004
Author: Piteau Associates
Client: Civic Consultants Ltd.

Document Purpose

The intent of this study is to:

- Provide an opinion on potential for water supply for the Scotch Creek aquifer at 4013 Butters Road, based on test well PW03-1;
- Assess the chemistry of the local groundwater and identify the potential affects of population growth on groundwater quality.

Summary

Aquifer Yield: 9 L/s

Aquifer Depth: 7.0-9.8 m

- Scotch Creek Aquifer has been designated as a Class 2A aquifer, indicating a moderate demand relative to the expected yield of the aquifer and a high vulnerability to contamination from surface sources;
- Groundwater flow direction in the aquifer is generally expected to be to the south from the apex of the fan and perpendicular to the shoreline;
- The quality of groundwater pumped from municipal wells is expected to meet Guidelines for Canadian Drinking Water Quality in all respects; and
- In ground disposal of sewage throughout the Scotch Creek area may have resulted in a relatively minor increase in the concentrations of nitrates in portions of the aquifer.

Conclusions

- PW03-01 can sustain the 3.6 L/s design flow for the lot at 4013 Butters Road; and
- PW03-01 meets Canadian Drinking Water Quality Guidelines for all parameters analyzed

Relevance to Design Update

This document provides information on groundwater quality and quantity in the Scotch Creek area. The well information in this report will be used to determine if groundwater is a viable option to service the community.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Electoral Area 'F' (North Shuswap) Official Community Plan Bylaw No. 830
Date: June 2009

Document Purpose

The Official Community Plan (OCP) for Electoral Area F defines the broad objectives and policies with respect to land use in the area. The OCP provides information on future housing needs, commercial and institutional development, and servicing requirements in the area. The document also provides information on communities' goals, and direction.

Summary

Population in the Scotch Creek area grows to 2500+ people in the summer months. Scotch Creek also has a smaller, full-time population. The water system design will aim to have adequate capacity for the summertime swell, but also not be over designed for the year-round population. This will be done through water saving measures.

Important policies to the project are shown below:

10.2 Water Supply and Distribution

Objective 1
To provide an appropriate level of infrastructure services in development areas, balancing demands with affordability.

Policy 1
The Regional District will:

1. *Ensure that development will only occur if appropriate water systems and standards are in place. New community water systems will be designed and built to the satisfaction of the Regional District.*
2. *Encourage the development of community water systems in the North Shuswap's Settlement Areas.*
3. *Encourage the conservation of water, including the use of water conserving technology in publicly- and privately-owned buildings.*

Policy 2
The CSRD may also assume control over private community water systems as outlined in the CSRD water system acquisition strategy.

Policy 3
Any new development within the Scotch Creek Primary Settlement Area or within the Secondary Settlement Areas, must connect to a community water system. For the purposes of this Plan, a community water system means a waterworks system serving 50 or more connections, parcels, dwelling units, or recreational vehicles. Facilities may include water treatment plants and ancillary, works, reservoirs, impoundments (dams), groundwater development (wells), and pumping stations for the collection, treatment, storage, and distribution of domestic potable water.

Relevance to Design Update

This document was referenced to determine buildout land-use in the area, to make proper design assumptions for the water system. It is important that the water system design is consistent with the goals of the community. A water system exhibiting both quality and quantity, will help to push development forward in the community.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Scotch Creek Water Utility Study Update
Date: February 2009
Author: Civic Utilities Ltd.
Client: Scotch Creek Waterworks Ltd.

Document Purpose

This report outlines the source of water, population, maximum day demand, fire flow, and cost estimates of Scotch Creek, in conjunction with the Scotch Creek Water Study prepared by Urban Systems in November 2007.

Summary

The pertinent design criteria are shown below:

Total Estimated MDD	9,123 m^3/d
Reservoir Storage Estimate Phase 2a	2,389 m^3
Reservoir Storage Estimate Phase 3	2,000 m^3
Total Estimated Buildout Population	8,800 people
Residential Fire Flow (Low Density)	60 L/s
Commercial Fire Flow	150 L/s
Total Estimated Cost	$11,050,000

Conclusions

- Based on the high number of RV sites, campgrounds, etc. in Scotch Creek, it is recommended that an average value of 1.0 m^3/day/capita or 3.75 m^3/day/equivalent connection would be a realistic MDD to use for the Scotch Creek Study. It is also recommended that watering should be restricted throughout Scotch Creek and new residences should be required to use low flush toilets and showers.

- Two reservoirs should be provided for the ultimate storage arrangement. This will provide the capability for one of the reservoirs being shut down for maintenance purposes. It is recommended that one stainless steel reservoir, 2,389 m^3, be built with the second reservoir, 2,000 m^3, being provided in Phase 3. It is recommended that insulated stainless steel is used as it requires a minimal amount of maintenance.

Relevance to Design Update

This document provides design flows, phasing, and reservoir sizing for the Scotch Creek water system. The report provides a conceptual design, and cost estimate. It is used as a basis for this design. All information has been reviewed and updated to match current projections.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Source of Water Supply for Scotch Creek
Date: February 2006
Author: Civic Utilities Ltd.
Client: Scotch Creek Waterworks Ltd

Document Purpose

This report investigates the feasibility of groundwater and surface water sources for community supply.

Summary

Groundwater Source

The optimal groundwater source is located on the north-west boundary of Lot C (Double Tree property). This well could possibly support phase 1 of development. Two more locations have been identified, it was recommended to drill and test these well to determine if they could support phase 2 and 3 of development. The groundwater quality was tested by a provincially registered laboratory and meets the Guidelines for Canadian Drinking Water Quality. The groundwater recharge is not a limiting factor with respect to the sustainability of the well. It is concluded that the capacity of the aquifer can supply all the future needs of the Scotch Creek area.

The requirements for the system include the supply line to the reservoir. The groundwater was identified to not require treatment at the time. This reduces the cost of the system.

Surface Water Source

Surface water locations were proposed near the reservoir to reduce costs. A direct feed from the source is required from Interior Health to ensure that residual chlorine contact times are being met. Nine potential sites were identified. Water quality was generally good in the main arm of Shuswap Lake. It is possible that contamination from septic fields can occur in the smaller bays. The optimal site is located at the end of Ashe Road. The area already contains the intake, and service building for the Saratoga Water System, which is operated by the CSRD.

Relevance to Design Update

This document provides general context of water sources in the area. In general, it provides good comparison between the sources at a high level. This could be used to make decisions about water sources for the community.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: CSRD Subdivision Servicing ByLaw No. 641
Date: February 2014

Document Purpose

The Subdivision Servicing ByLaw gives information on general level of service requirements for developments in the area. The document summarizes specifications for water and wastewater servicing and disposal.

Summary

General design criteria that was pertinent to the design in the report are shown below:

PART 2 Design Criteria

General
2.1 These standards are not intended to be a substitute for sound engineering knowledge and experience. The design of water systems and the various system components shall be prepared under the direction of and sealed by an Engineer.

Overall Configuration and Sizing
2.2 All Water Supply Systems shall be configured to ensure continuity and consistency of sizing/capacity between components for simplified control and operation of the system. System configuration shall also consider expansion/future phases of the system. The system configuration shall be designed in consultation with the Regional District.

2.3 All major system components shall have a minimum of two trains of the same size that can be operated independently and together. When all trains are in service, they must be able to supply MDD over 18 hours.

2.4 For critical components, in particular source works (such as intake pumps and Wells) and chlorination equipment, a higher level of redundancy must be provided by sizing the components to supply MDD over 18 hours with the largest train out of service (see Sections 3.1, 3.9, 4.17, and 7.3).

2.5 All pressure zones shall have reservoir storage capable of providing balancing storage and fire flow by gravity or as approved by the Manager, Environment and Engineering Services, or his designate.

Design Flows
2.6 Design flows shall be based on the ultimate population and full development as anticipated in the Official Community Plan, other land use regulations, or as determined in consultation with the Regional District.

2.7 MDD to be used for design shall be developed in consultation with the Regional District, and shall be based on reliable relevant water consumption records, occupancy rates where available, the Regional District's water conservation and system reliability goals, and treatment plant and other system losses, such as backwash, filter-to-waste, and leakage.

C7
Where relevant records are not available, the following may be used as a guideline:

Residential Demand 4500 L/lot/d based on 2.5 people/lot

Non-Residential Demand To be determined on a case by case basis
2.8 The design may allow for phasing of system components if development is also to be phased and the Manager, Environment and Engineering Services, or his designate, approves the design.

Relevance to Design Update

The design criteria were used as reference information for the design of the water system.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Technical Memorandum No. 3 - Hydrogeological Assessment for Scotch Creek
Date: October 2013
Author: Piteau Associates
Client: Opus DaytonKnight Ltd.

Document Purpose

The technical memo provides a Hydrogeological assessment of the Scotch Creek Area.

Summary

The Scotch Creek aquifer is recharged predominantly from Scotch Creek. The aquifer flows north to south towards Shuswap Lake. Water supply wells should be in the Northern portion of Scotch Creek, as this is the up-gradient side of the aquifer and will reduce the chance of contamination.

Effluent disposal areas should be located at the greatest distance from Shuswap Lake.

It was estimated that a minimum of four wells would be required to achieve the yield of 10,500 m^3/day. The report stated that the area near the Double Tree site is optimal for effluent ground disposal. The area closer to the Roan property was indicated as optimal for groundwater development.

Conclusions

- The Scotch Creek aquifer is unconfined and vulnerable to water quality impacts
- The proposed yield (10,500 m^3/day) represents approximately 20% of the aquifer yield. Four or more wells would be required to meet demand. The wells will need to be spaced a minimum of 100 m apart to minimize drawdown interference.
- IHA will likely require chlorination due to the vulnerability of the aquifer. The new well will need to be pumped for a few months before the full requirements for treatment can be determined (i.e. filtration and/or UV disinfection).
- For effluent disposal, the area near the double tree site is optimal
- For well completion, the site near the Roan property is optimal

Relevance to Design Update

This document provides information pertinent to the selection of the groundwater source location. It provides a Hydrogeological assessment and recommends area for groundwater development.

Background Document Review for Scotch Creek Water System Update 2018

Document Title: Water System Acquisition Strategy
Date: Amended February 2011

Document Purpose

This Discussion Paper outlines policies and practices that form the foundation of the CSRD's Water System Acquisition Strategy, which will guide all future decisions related to water system acquisition, assessment, and operations. These policies and assessment procedures have been written to specifically minimize the CSRD's risk and maximize benefits to water users.

Summary

Water System Acquisition can be a great benefit to a community. There are however, risk associated with these water systems. The policies developed in these guidelines ensure the following:

- The CSRD has a complete understanding of the condition of the system;
- the CSRD has the necessary resources to own and operate the systems; and
- the candidate water system will be financially viable over the long-term under CSRD ownership.

The purpose of the policies is also to ensure that CSRD ownership will yield significant improvement to the quality and reliability of the water service. This means that significant gain will be seen by water users on the system by connecting. It also ensures that water users are fairly represented within the governance system.

In general, these guidelines are written to ensure that the least risk, and most amount of benefit to the CSRD, and water users in the area will be achieved. The goal of the CSRD is to provide water to its residents that meets drinking water quality and quantity guidelines.

Relevance to Design Update

This document will be used to determine the feasibility of connecting to the multiple systems in the area. The policies and criteria developed will be used to ensure that the design provided to the CSRD will be of benefit to them with regards to water system acquisition.

Appendix 4-1

Detailed Breakdown of Cost Estimates

Columbia Shuswap Regional District

Project Number: 0476.0072.10

Scotch Creek Water System Plan 2018

Date Updated: August 20, 2018

Class C Cost Estimate

Updated by: Lisa Clark, P. Eng.

OPTION 1 SYSTEM, 60 L/s MDD, 60 L/s fireflow

	Parcels	*Users*
Service Area 1 existing occupied properties	176	610
Saratoga	106	143
subtototals:	282	**753**
Service Area 1 unoccupied parcels:	10	10
subtototals:	**292**	763
potential nearby extensions to service area (all currently unoccupied):	389	588
totals:	**681**	**1351**

No.	Description	Unit	Quantity	Unit Price	Amount	*Adjusted Amounts (1)*
Section 1 - General Requirements						
1.1	General Requirements	LS	1	$ 480,000	$ 455,000	$ 380,000
				Subtotal	**$ 455,000**	**$ 380,000**
Section 2 - Watermains						
2.1	300 mm PVC DR18 - inc. fittings, restoration and tie ins	m	250	$ 390	$ 97,500	$ -
2.2	250 mm PVC DR18 - inc. fitings, restoration and tie ins	m	2650	$ 280	$ 742,000	$ 661,500
2.3	200 mm PVC DR18 - inc. fittings, restoration and tie ins	m	1350	$ 230	$ 310,500	$ 310,500
2.4	Services <= 50mm	ea	58	$ 2,000	$ 116,000	$ 116,000
2.5	Services > 50mm	ea	21	$ 30,000	$ 630,000	$ 630,000
2.6	Road restoration asphalt (3 m width x length watermain less 3850 m trail section)	m^2	1200	$ 75	$ 90,000	$ 90,000
2.7	Road restoration gravel (3m width x length of watermain	m^2	0	$ 40	$ -	$ -
2.8	Trail restoration (assume 1.5 m width x 3850 m length of watermain)	m^2	5775	$ 75	$ 433,125	$ 433,125
2.9	Hydrants	ea	11.6	$ 6,000	$ 69,600	$ 69,600
2.10	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000	$ 60,000
				Subtotal	**$ 2,548,725**	**$ 2,370,725**
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	$ 87,500
3.2	Intake Piping 250 mm on lake floor x 2 x 30 m	5	80	$ 125	$ 10,000	$ 10,000
3.3	Intake Pumps	ea	2	$ 100,000	$ 200,000	$ 120,000
3.4	Intake Screen Assembly installed by divers	ea	1	$ 30,000	$ 30,000	$ 30,000
3.5	Site work	LS	1	$ 100,000	$ 100,000	$ 100,000
3.6	Building & HVAC	LS	1	$ 250,000	$ 250,000	$ 250,000
3.7	UV system	LS	1	$ 200,000	$ 200,000	$ 160,000
3.8	Chlorination system	LS	1	$ 75,000	$ 75,000	$ 57,000
3.9	Process Piping	LS	1	$ 200,000	$ 200,000	$ 130,000
3.10	Dedicated Supply to Reservoir (250 mm)	m	1,200	$ 450	$ 540,000	$ 495,000
3.11	Electrical/Controls	LS	1	$ 200,000	$ 200,000	$ 183,000
3.12	BC Hydro upgrades to 3 phase	LS	1	$ 100,000	$ 100,000	$ 100,000
3.13	SCADA	LS	1	$ 50,000	$ 50,000	$ 30,000
3.14	Generator & pad	LS	1	$ 100,000	$ 100,000	$ 100,000
				Subtotal	**$ 2,142,500**	**$ 1,852,500**
Section 4 - Reservoir at Saratoga						
4.1	Concrete Reservoir c/w site grading and appurtenances	m^3	1500	$ 1,200	$ 1,800,000	$ 1,510,000
4.2	Fencing	LS	1	$ 40,000	$ 40,000	$ 20,000
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	$ 80,000
				Subtotal	**$ 2,120,000**	**$ 1,610,000**
				Subtotal all sections	**$ 7,266,225**	**$ 6,213,225**
				25% Contingency	$ 1,817,000	$ 1,298,000
				Sub-Total	$ 9,083,225	$ 7,511,225
				15% Engineering/Consulting	$ 1,362,000	$ 872,000
				Subtotal	$ 10,445,225	$ 8,383,225
				Inflation (2 years @ 3%)	$ 636,114	$ 510,538
				Estimated Capital Cost (Rounded)	**$ 11,100,000**	**$ 8,900,000**

(1) Adjusted amount with Saratoga grant deducted

Columbia Shuswap Regional District

Project Number: 0476.0072.10

Scotch Creek Water System Plan 2018

Date Updated: August 20, 2018

Class C Cost Estimate

Updated by: Lisa Clark, P. Eng.

OPTION 2 - SERVICE AREA 1, 60 L/s MDD, 60 L/s fireflow

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	General Requirements	LS	1	$ 570,000	$ 570,000
				Subtotal	**$ 570,000**
Section 2 - Watermains					
2.1	300 mm PVC DR18 - inc. fittings, restoration and tie ins	m	250	$ 390	$ 97,500
2.2	250 mm PVC DR18 - inc. fitings, restoration and tie ins	m	2650	$ 280	$ 742,000
2.3	200 mm PVC DR18 - inc. fittings, restoration and tie ins	m	1350	$ 230	$ 310,500
2.4	Services <= 50mm	ea	58	$ 2,000	$ 116,000
2.5	Services > 50mm	ea	21	$ 30,000	$ 630,000
2.6	Road restoration asphalt (3 m width x length watermain less 3850 m trail section)	m^2	1200	$ 75	$ 90,000
2.7	Road restoration - gravel (3 m width x length of watermain	m^2	0	$ 40	$ -
2.8	Trail restoration (assume 1.5 m width x m length of watermain)	m^2	5775	$ 75	$ 433,125
2.9	Hydrants	ea	11.6	$ 6,000	$ 69,600
2.10	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000
				Subtotal	**$ 2,548,725**
Section 3 - Treatment Plant and Intake at Wharf Road					
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	$ 100,000	$ 200,000
3.4	Intake Screen Assembly installed by divers	ea	1	$ 30,000	$ 30,000
3.5	Land acquisition - assume CSRD park will be used	LS	1		$ -
3.6	Site work	LS	1	$ 250,000	$ 250,000
3.7	Site piping & valves	LS	1	$ 200,000	$ 200,000
3.8	Building & HVAC	LS	1	$ 350,000	$ 350,000
3.9	UV system	LS	1	$ 200,000	$ 200,000
3.10	Chlorination system	LS	1	$ 75,000	$ 75,000
3.11	Process Piping	LS	1	$ 200,000	$ 200,000
3.12	Dedicated Supply to Reservoir (200 mm)	m	3,900	$ 425	$ 1,657,500
3.13	Electrical/Controls	LS	1	$ 200,000	$ 200,000
3.14	BC Hydro upgrades to 3 phase	LS	1	$ 200,000	$ 200,000
3.15	SCADA	LS	1	$ 50,000	$ 50,000
3.16	Generator & pad	LS	1	$ 100,000	$ 100,000
				Subtotal	**$ 3,810,000**
Section 4 - Reservoir at Roan Site					
4.1	Concrete Reservoir c/w site grading and appurtenances	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	**$ 9,048,725**
				25% Contingency	$ 2,262,000
				Sub-Total	$ 11,310,725
				15% Engineering/Consulting	$ 1,697,000
				Subtotal	$ 13,007,725
				Inflation (2 years @ 3%)	$ 792,170
				Estimated Capital Cost (Rounded)	**$ 13,800,000**

Columbia Shuswap Regional District

Project Number: 0476.0072.10

Scotch Creek Water System Plan 2018

Date Updated: August 20, 2018

Class C Cost Estimate

Updated by: Lisa Clark, P. Eng.

OPTION 3, Service Area 1, 60 L/s MDD, 60 L/s fireflow

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	General Requirements	LS	1	$ 495,000	$ 495,000
				Subtotal	**$ 495,000**
Section 2 - Watermains					
2.1	300 mm PVC DR18 - inc. fittings, restoration and tie ins	m	250	$ 390	$ 97,500
2.2	250 mm PVC DR18 - inc. fitings, restoration and tie ins	m	2650	$ 280	$ 742,000
2.3	200 mm PVC DR18 - inc. fittings, restoration and tie ins	m	1350	$ 230	$ 310,500
2.4	Services <= 50mm	ea	58	$ 2,000	$ 116,000
2.5	Services > 50mm	ea	21	$ 30,000	$ 630,000
2.6	Road restoration asphalt (3 m width x length watermain less 3850 m trail section)	m^2	1200	$ 75	$ 90,000
2.7	Road restoration - gravel (3m width x length of watermain	m^2	0	$ 40	$ -
2.8	Trail restoration (assume 1.5 m width x m length of watermain)	m^2	5775	$ 75	$ 433,125
2.9	Hydrants	ea	11.6	$ 6,000	$ 69,600
2.10	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000
				Subtotal	**$ 2,548,725**
Section 3 - Wells and treatment plant at Doubletree site					
3.1	Well drilling	ea	3	$ 50,000	$ 150,000
3.2	Well completion - note 3 wells assumes 50% redundancy	ea	3	$ 240,000	$ 720,000
3.3	Well investigations, licencing and EA	LS	1	$ 300,000	$ 300,000
3.4	General site work	LS	3	$ 15,000	$ 45,000
3.5	Site piping and valves	m	250	$ 300	$ 75,000
3.6	Well site - valves (2), blow-offs (1), sampling stations (1)	ea	3	$ 20,000	$ 60,000
3.7	Building & HVAC	LS	1	$ 200,000	$ 200,000
3.8	Chlorination system	LS	1	$ 75,000	$ 75,000
3.9	Process Piping	LS	1	$ 125,000	$ 125,000
3.10	Dedicated Supply to Reservoir (250 mm)	m	1,100	$ 450	$ 495,000
3.11	Electrical/Controls	LS	1	$ 150,000	$ 150,000
3.12	BC Hydro/power upgrades	LS	3	$ 50,000	$ 150,000
3.13	SCADA	LS	3	$ 25,000	$ 75,000
3.14	Generator & pad	LS	1	$ 75,000	$ 75,000
3.15	Fencing & landscaping	ea	3	$ 20,000	$ 60,000
				Subtotal	**$ 2,755,000**
Section 4 - Reservoir at Saratoga					
4.1	Concrete Reservoir c/w site grading and appurtenances	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	**$ 7,918,725**
				25% Contingency	$ 1,980,000
				Sub-Total	$ 9,898,725
				15% Engineering/Consulting	$ 1,485,000
				Subtotal	$ 11,383,725
				Inflation (2 years @ 3%)	$ 693,269
				Estimated Capital Cost (Rounded)	**$ 12,100,000**

Columbia Shuswap Regional District

Project Number: 0476.0072.10

Scotch Creek Water System Plan 2018

Date Updated: August 20, 2018

Class C Cost Estimate

Updated by: Lisa Clark, P. Eng.

OPTION 4, Service Area 1, 60 L/s MDD, 60 L/s fireflow

No.	Description	Unit	Quantity	Unit Price	Amount
Section 1 - General Requirements					
1.1	General Requirements	LS	1	$ 575,000	$ 575,000
				Subtotal	**$ 575,000**
Section 2 - Watermains					
2.1	300 mm PVC DR18 - inc. fittings, restoration and tie ins	m	1500	$ 500	$ 750,000
2.2	250 mm PVC DR18 - inc. fitings, restoration and tie ins	m	2650	$ 280	$ 742,000
2.3	200 mm PVC DR18 - inc. fittings, restoration and tie ins	m	1350	$ 230	$ 310,500
2.4	Services <= 50mm	ea	58	$ 2,000	$ 116,000
2.5	Services > 50mm	ea	21	$ 30,000	$ 630,000
2.6	Road restoration asphalt (3 m width x length watermain less 3850 m trail section)	m^2	4950	$ 75	$ 371,250
2.7	Road restoration - gravel (3m width x length of watermain	m^2	0	$ 40	$ -
2.8	Trail restoration (assume 1.5 m width x m length of watermain)	m^2	7275	$ 75	$ 545,625
2.9	Hydrants	ea	16.6	$ 6,000	$ 99,600
2.10	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000
				Subtotal	**$ 3,624,975**
Section 3 - Well and Treatment Plan at Roan Property					
3.1	Well drilling	ea	3	$ 50,000	$ 150,000
3.2	Well completion - note 3 wells assumes 50% redundancy	ea	3	$ 240,000	$ 720,000
3.3	Well investigations, licencing and EA	LS	1	$ 300,000	$ 300,000
3.4	General site work	LS	3	$ 15,000	$ 45,000
3.5	Site piping and valves	m	250	$ 300	$ 75,000
3.6	Well site - valves (2), blow-offs (1), sampling stations (1)	ea	3	$ 20,000	$ 60,000
3.7	Building & HVAC	LS	1	$ 200,000	$ 200,000
3.8	Chlorination system	LS	1	$ 75,000	$ 75,000
3.9	Process Piping	LS	1	$ 125,000	$ 125,000
3.10	Dedicated Supply to Reservoir (250 mm)	m	500	$ 450	$ 225,000
3.11	Electrical/Controls	LS	1	$ 150,000	$ 150,000
3.12	BC Hydro/power upgrades	LS	3	$ 50,000	$ 150,000
3.13	SCADA	LS	3	$ 25,000	$ 75,000
3.14	Generator & pad	LS	1	$ 75,000	$ 75,000
3.15	Fencing & landscaping	ea	3	$ 20,000	$ 60,000
				Subtotal	**$ 2,485,000**
Section 4 - Reservoir at Roan Property					
4.1	Concrete Reservoir c/w site grading and appurtenances	m^3	1500	$ 1,200	$ 1,800,000
4.2	Fencing	LS	1	$ 40,000	$ 40,000
4.3	Access Road Improvements	LS	1	$ 150,000	$ 150,000
4.4	Legal survey and registration	LS	1	$ 60,000	$ 60,000
4.5	Decommission existing reservoir	LS	1	$ 15,000	$ 15,000
4.6	PRV station	LS	1	$ 200,000	$ 200,000
4.7	Land Acquisition?	LS	1	$ 250,000	$ 250,000
				Subtotal	**$ 2,515,000**
				Subtotal all sections	**$ 9,199,975**
				25% Contingency	$ 2,300,000
				Sub-Total	$ 11,499,975
				15% Engineering/Consulting	$ 1,725,000
				Subtotal	$ 13,224,975
				Inflation (2 years @ 3%)	$ 805,401
				Estimated Capital Cost (Rounded)	**$ 14,000,000**

Columbia Shuswap Regional District

Project Number: 0476.0072.10

Scotch Creek Water System Plan 2018
Class C Cost Estimate

Date Updated: August 20, 2018
Updated by: Lisa Clark, P. Eng.

OPTION 5 - 90 L/s MDD, 90 L/s fireflow
Service Areas 1 & 2

	Parcels	*Users*
Service Area 1 occupied properties	176	610
Service Area 2 occupied properties	388	434
subtotals:	*564*	*1044*
Service Area 1 unoccupied properties	10	10
Service Area 2 unoccupied properties	400	701
totals:	**974**	**1755**
Saratoga	106	143
	1080	**1898**

No.	Description	Unit	Quantity	Unit Price	Amount	*Adjusted Amounts (1)*
Section 1 - General Requirements						
1.1	General Requirements	LS	1	$ 1,050,000	$ 1,050,000	$ 960,000
				Subtotal	**$ 1,050,000**	**$ 960,000**
Section 2 - Watermains						
2.1	300 mm PVC DR18 - inc. fittings, restoration and tie ins	m	250	$ 390	$ 97,500	$ -
2.2	250 mm PVC DR18 - inc. fitings, restoration and tie ins	m	5,700	$ 280	$ 1,596,000	$ 1,515,500
2.3	200 mm PVC DR18 - inc. fittings, restoration and tie ins	m	9,650	$ 230	$ 2,219,500	$ 2,219,500
2.4	Services <= 50 mm	ea	320	$ 2,000	$ 640,000	$ 640,000
2.5	Services > 50 mm	ea	60	$ 30,000	$ 1,800,000	$ 1,800,000
2.6	Road restoration asphalt (3 m width x length watermain less 3850 m trail section)	m^2	24,450	$ 75	$ 1,833,750	$ 1,833,750
2.7	Road restoration - gravel (3 m width x length of watermain	m^2	9,000	$ 40	$ 360,000	$ 360,000
2.8	Trail restoration (assume 1.5 m width x m length of watermain)	m^2	5,775	$ 75	$ 433,125	$ 433,125
2.9	Hydrants	ea	24	$ 6,000	$ 142,800	$ 142,800
2.10	Lake/dry hydrant	ea	1	$ 60,000	$ 60,000	$ 60,000
				Subtotal	**$ 9,182,675**	**$ 9,004,675**
Section 3 - Intake and Treatment Plant at Saratoga						
3.1	Intake Piping 250 mm directionalllly drilled x 2 x 70 m	m	140	$ 625	$ 87,500	$ 87,500
3.2	Intake Piping 250 mm on lake floor x 2 x 30 m	5	80	$ 125	$ 10,000	$ 10,000
3.3	Intake Pumps	ea	2	$ 150,000	$ 300,000	$ 220,000
3.4	Intake Screen Assembly installed by divers	ea	1	$ 30,000	$ 30,000	$ 30,000
3.5	Site work	LS	1	$ 100,000	$ 100,000	$ 100,000
3.6	Building & HVAC	LS	1	$ 250,000	$ 250,000	$ 250,000
3.7	UV system	LS	1	$ 300,000	$ 300,000	$ 260,000
3.8	Chlorination system	LS	1	$ 100,000	$ 100,000	$ 82,000
3.9	Process Piping	LS	1	$ 200,000	$ 200,000	$ 130,000
3.10	Dedicated Supply to Reservoir (250mm)	m	1,200	$ 450	$ 540,000	$ 495,000
3.11	Electrical/Controls	LS	1	$ 300,000	$ 300,000	$ 283,000
3.12	BC Hydro upgrades to 3 phase	LS	1	$ 100,000	$ 100,000	$ 100,000
3.13	SCADA	LS	1	$ 50,000	$ 50,000	$ 30,000
3.14	Generator & pad	LS	1	$ 100,000	$ 100,000	$ 100,000
				Subtotal	**$ 2,467,500**	**$ 2,177,500**
Section 4 - Reservoir at Saratoga						
4.1	Concrete Reservoir c/w site grading and appurtenances	m^3	3,000	$ 1,200	$ 3,600,000	$ 3,310,000
4.2	Fencing	LS	1	$ 50,000	$ 50,000	$ 30,000
4.3	Access Road Improvements	LS	1	$ 50,000	$ 50,000	$ 25,000
4.4	Legal survey and registration	LS	1	$ 60,000	$ 60,000	$ 20,000
4.5	Decommission existing reservoir	LS	1	$ 15,000	$ 15,000	$ -
4.6	PRV Station	LS	1	$ 200,000	$ 200,000	$ 80,000
					$ -	
				Subtotal	**$ 3,975,000**	**$ 3,465,000**
				Subtotal all sections	**$ 16,675,175**	**$ 15,607,175**
				25% Contingency	$ 4,169,000	$ 3,647,000
				Sub-Total	$ 20,844,175	$ 19,254,175
				15% Engineering/Consulting	$ 3,127,000	$ 2,633,000
				Subtotal	$ 23,971,175	$ 21,887,175
				Inflation (2 years @ 3%)	$ 1,459,845	$ 1,332,929
				Estimated Capital Cost (Rounded)	**$ 25,400,000**	**$ 23,200,000**

(1) Adjusted amount with Saratoga grant deducted

Appendix 5-1

Community Input Documentation

Scotch Creek Community Master Water Plan Update

OPEN HOUSE

You're Invited!

Join us to learn more about the community water system solutions recommended by the Community Water System Advisory Committee for Scotch Creek. Talk with advisory committee members, CSRD and Urban Systems staff, view the displays, and learn about the project.

THURSDAY
July 26, 2018

Scotch Creek Community Fire Hall
3852 Squilax Anglemont Road

3PM - 9PM

Don't forget to ENTER THE DRAW
to win a local prize pack worth over $250.00!

The Scotch Creek Firefighter Association will be hosting a BBQ during the Open House.

"WORKING TOGETHER FOR SUSTAINABLE SOLUTIONS"

For more information regarding the 2018 Scotch Creek Master Water Plan Update please visit:

www.csrd.bc.ca

Through the update of the Scotch Creek Master Community Water Plan, the residents of Scotch Creek are working towards sustainable community water solutions.

Thank You!

The CSRD thanks the Scotch Creek Master Water Plan Update Advisory Committee for their hard work during the development of the 2018 Master Water Plan. Your participation is very much appreciated!

Public Representatives:

Al Mitton	Saratoga resident*
Jackie Santa	Saratoga resident
Angela Lagore	Business owner/North Shuswap Chamber President
Josef Berger	Business owner
Loretta Greenough	Resident
Neil Ewart	Business owner
Peter O'Toole	Resident
Ron Wilkinson	Resident
Dean Acton	Business owner

Government Representatives:

Doug Brown	Little Shuswap Lake Indian Band - Chief Administrative Officer
Rob Birtles	Interior Health Authority - Team Leader Health Protection
Larry Morgan	CSRD Electoral Area F Director
Bob Misseghers	CSRD Electoral Area F Alternate Director

**We would like to acknowledge the contribution of the late Al Mitton.*

CSRD
COLUMBIA SHUSWAP REGIONAL DISTRICT

555 Harbourfront Drive NE
PO Box 978 Salmon Arm, BC
T: 250.833.5950 E: tlanglois@csrd.bc.ca

SCOTCH CREEK - WATER MASTER PLAN 2018

INTRODUCTION

Vision

1. Safe & reliable drinking water
2. Affordable and financially sustainable
3. Equitable approach to financing
4. Meets current CSRD & engineering standards
5. Environmentally sustainable & conservation mindset
6. Improves vibrancy & health of community, and supports other community priorities

Ultimate system design needs to consider:

- Growth / conservation
- Affordability
- Level of service

Project Goals

It is also critical that the project:

1. Is able to move forward to construction in the near future
2. Has a low risk of issues that will impact its success (e.g. technical, approvals, cost, schedule, land acquisition)
3. Has a high likelihood of receiving government funding
4. Will pass public assent process for CSRD acquisition and financing

Phase 1 service area focused on:

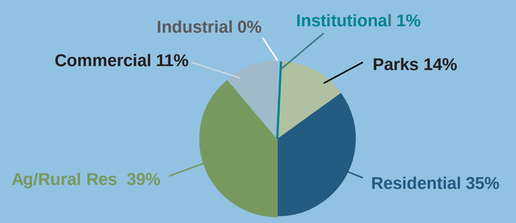
- Servicing occupied parcels
- Connecting water systems on advisory
- Improving fireflows to the commercial centre

Design Criteria

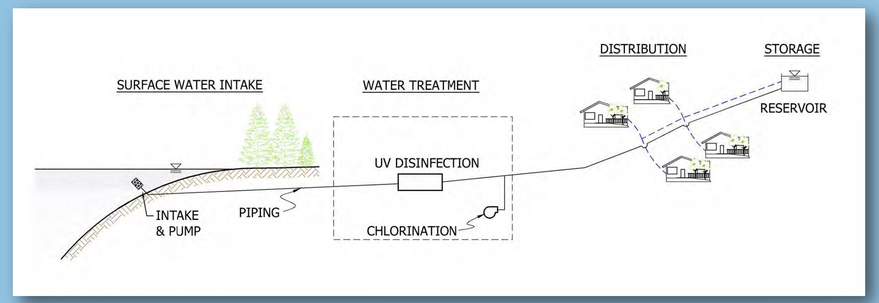
	Phase 1	Ultimate
Parcels / Users	300 / 800	1100 / 1900
Max Day Demand	40-60 L/s	90 L/s
Fireflow Target	> 60 L/s	> 90 L/s
Reservoir	1500 m^3	3000 m^3

These are approximate numbers for the concept design. Parcel & user numbers include the existing Saratoga area

LAND USE (by area)



About 75% of the land in Scotch Creek is residential



The above figure schematically illustrates the individual components of a water system. The existing Saratoga system pumps water from an intake in the lake through a water treatment plant to an elevated reservoir. The water treatment process consists of UV disinfection and chlorination.

prepared by URBAN systems

SCOTCH CREEK - WATER MASTER PLAN 2018

Please indicate which components of the vision are most important to you (3 DOTS PER PERSON).

1. Provide safe and reliable drinking water to the community
2. Affordable and financially sustainable
3. Equitable approach to financing capital & operating costs -- a user-pay and full cost recovery
4. Meet current CSRD and engineering standards
5. Environmentally sustainable and reflect a conservation mindset
6. Improve the vibrancy & health of the community, allowing other community priorities & aspirations to be realized

Please indicate which project goal is most important to you (1 DOT PER PERSON).

1. Able to move forward to construction in the near future
2. Have a low risk of issues that will impact its success (e.g. technical, approvals, cost, schedule, land acquisition)
3. Have a high likelihood of receiving government funding
4. Pass the public assent process for CSRD acquisition

SCOTCH CREEK - WATER MASTER PLAN 2018

RECOMMENDED WATER SYSTEM UPGRADES

Project Rationale

Several options were considered for the community water system for Scotch Creek. These options were reviewed with the Water Advisory Committee members, and it was determined that the best approach was to upgrade the Saratoga water system to service the entire Scotch Creek Community. The benefits of a centralized system include:

- Lowest capital and operating cost
- Long term efficiency of having one system
- Least technical risk – project well understood
- Best from schedule perspective, and ability to proceed with grant application, assent process and design/construction
- Highest likelihood of successful grant application
- Ability to leverage existing Saratoga grant funding of $1.488 M to reduce project cost
- Shortest dedicated main from treatment plant to reservoir

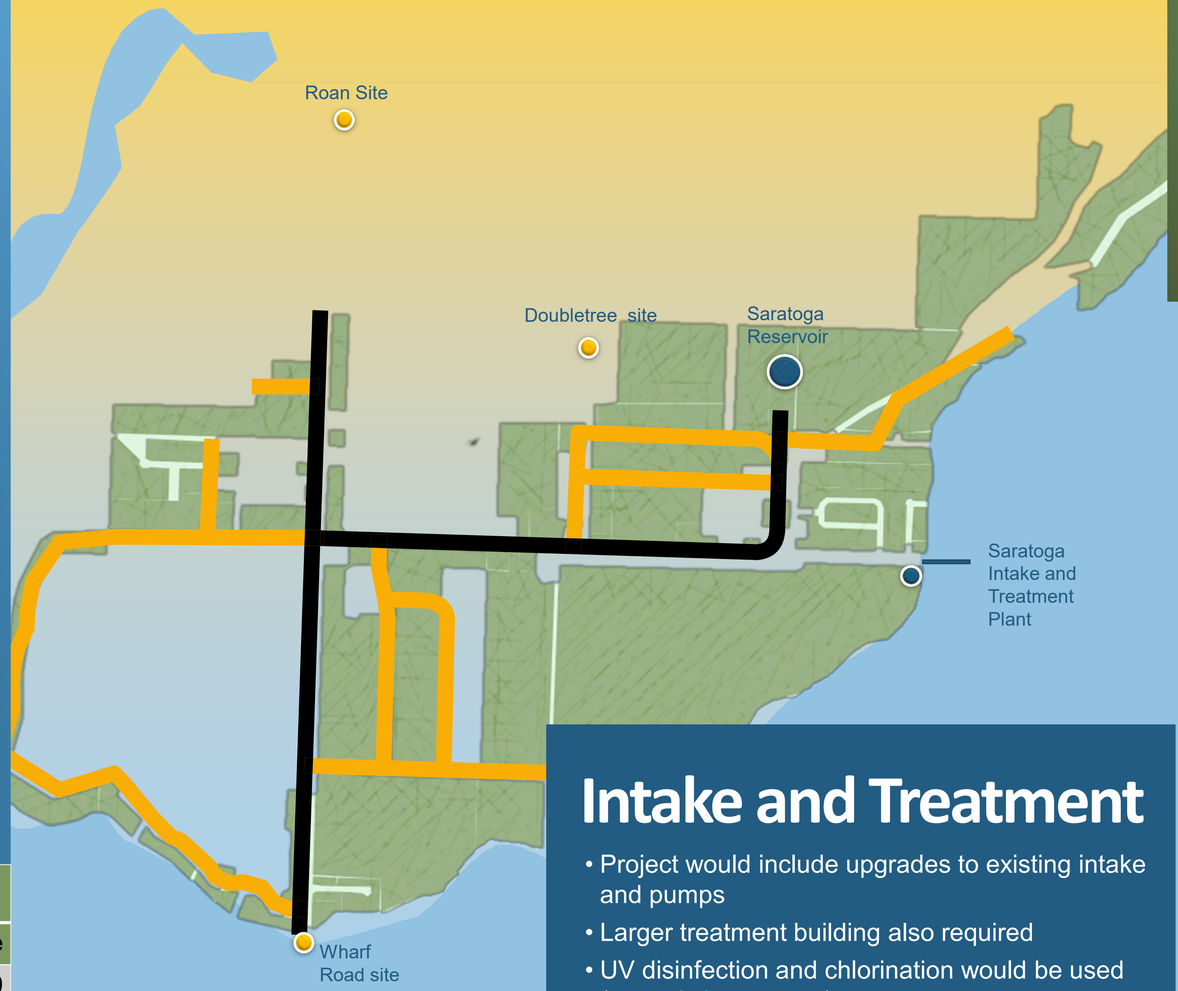
Other options that were considered:

- Groundwater wells on the Double Tree site
- Groundwater wells on the Roan Site
- Reservoir on the Roan Site
- Intake at the end of Wharf Road

Estimated Construction Costs

	Phase 1	Future
General Requirements	$ 380,000	$ 960,000
Watermains	$ 2,400,000	$ 9,000,000
Source and Treatment	$ 1,900,000	$ 2,200,000
Reservoir	$ 1,600,000	$ 3,500,000
Estimated Cost	$ 8,900,000	$ 23,200,000

Cost for Wharf Road Intake / Roan Reservoir Option - $ 13,800,000
Cost for Doubletree Well / Saratoga Reservoir Option - $ 12,100,000
Cost for Roan Wells / Roan Reservoir Option - $ 14,000,000

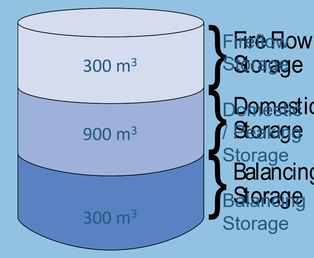


Intake and Treatment

- Project would include upgrades to existing intake and pumps
- Larger treatment building also required
- UV disinfection and chlorination would be used (per existing system)
- Clean and reliable source from Shuswap Lake
- Years of flow and quality data
- Many of the necessary permits, and reporting are already in place

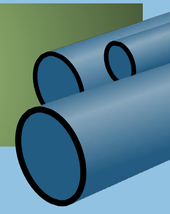
Reservoir

- Elevated storage will ensure home/businesses have suitable pressure, and provide storage for general system operation and emergency conditions
- CSRD already owns land and field investigations (e.g. geotechnical, survey) already complete
- A phased approach to building the reservoir is recommended to reduce the initial capital cost



Phase 1 Reservoir Sizing 1500 m³

PIPE SIZING
(for ultimate system)



90 L/s MDD
90 L/s Commercial Fire Flow

300 mm Watermain	250 m
250 mm Watermain	5700 m
200 mm Watermain	9650 m

Phase 1 Watermain
Remainder of watermain for ultimate service area

Note: watermain locations and sizing to be confirmed during design

prepared by URBAN systems

Columbia Shuswap Regional District

Scotch Creek Water Study

Proposed Future Service Areas

Legend

- Phase 1 Water Main
- Phase 2 Water Main
- Pressure Zone Boundary
- Service Area 1 – proposed Phase 1 Service Area (including Saratoga Service Area)
- Service Area 2 – proposed future pressure zone 1 service area
- Service Area 3 – potential future pressure zone 2 service area
- Exempt from Loan Repayment Service Area

Little Shuswap Lake Indian Band
Scotch Creek IR#4

Squilax-Anglemont Road
Chappell Road
Allan Road
Leopold Road
Copper Cove Road
Pressure Zone 2
Pressure Zone 1
Beatty Road
Kenwood Gate
Squilax-Anglemont Road
Ancient Creek Lane
Cardy Drive
Logan Road
Hilliam Road
Squilax-Anglemont Road
Butters Road
Imal Road
Santa Road
Butters Road
Saratoga Road
Webb Road
Squilax-Anglemont Road
Ashe Crescent
South Ashe Crescent
Deodar Road
Ashe Road
Jordan Way
Morgan Drive
Scotch Creek Wharf Road
Express Point Road
Express Point Road
Express Point Road
Express Point Road
Pine Grove Road
Cypress Cr
Captains View Way
Acton Place
Scotch Creek Wharf Road
Hilliam Frontage Rd
Zinck Road

0 100 200 400 600
Metres

N

Coordinate System:
NAD 1983 UTM Zone 11N

Scale:
1:8,000
(When plotted at 22"x34")

Data Sources:
Data provided by -

Project #:	0476.0072.10
Author:	JC
Checked:	LC
Status:	
Revision:	A
Date:	2018 / 7 / 19

URBAN systems

FIGURE 2-1

SCOTCH CREEK - WATER MASTER PLAN 2018
COST RECOVERY & NEXT STEPS

Cost Recovery

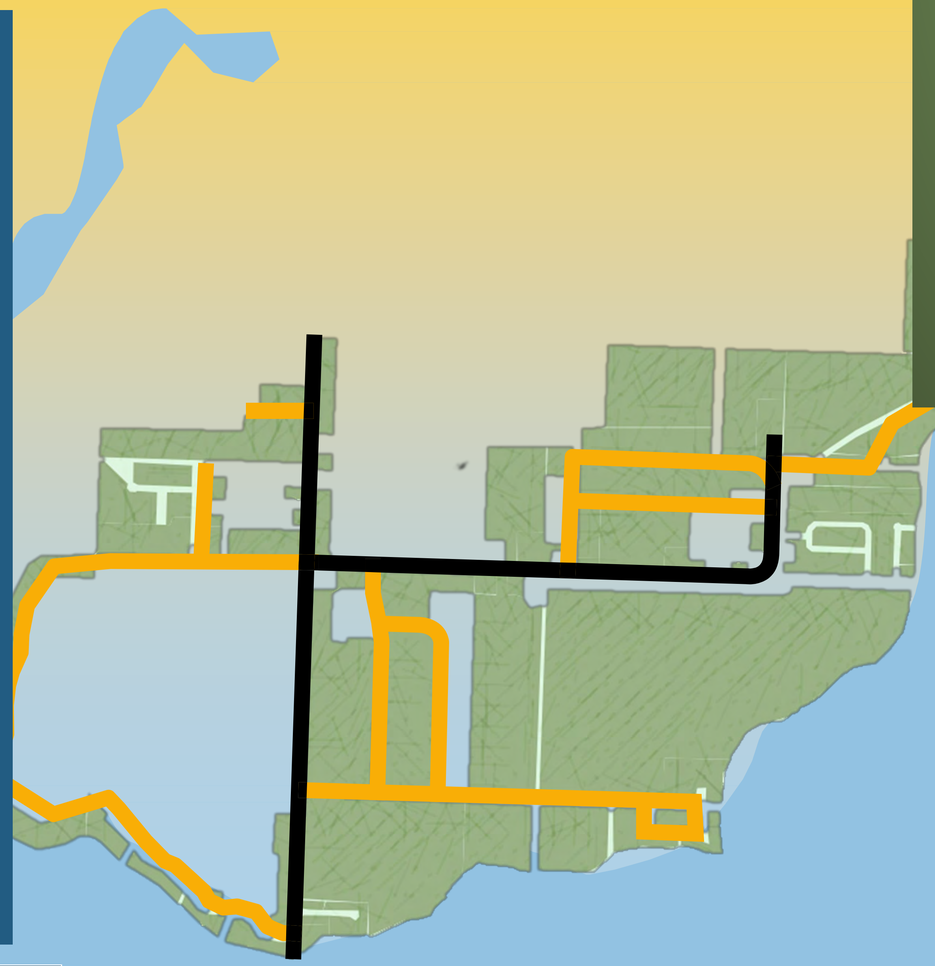
The cost recovery estimates were based on the CSRD Water System Acquisition strategy policies.

The following charges are anticipated:

- Initial connection fee (one time charge) - $2,000/residential property (19 mm service)
- Parcel tax and user fees (annual) – estimated in table below to recover cost of loan for construction of water system and annual system expenses

The calculations assume that:

- 73% senior government funding will be received
- All parcels in the service area will pay a base parcel tax
- All users connected to the water system will pay user fees collected annually
- Saratoga & Captain's Village users are proposed to be exempt from the loan payment portion of the user fee. The Saratoga users have already contributed to the capital works, and Captain's Village Marina will be providing a lump sum contribution to reserves further to their agreement with the Comptroller of Water Rights.



Next Steps

There is an opportunity to apply for 73% project funding through the "Investing in Canada Infrastructure Program – BC – Green Infrastructure – Environmental Quality". Applications are due August 29th.

Following the community open house June 26th, the CSRD Board will review the Water Master Plan and community feedback, and determine whether a funding application should be submitted to this program.

A tentative schedule is shown below to provide an idea of the length of time the project will take to complete if funding is received by spring 2018.

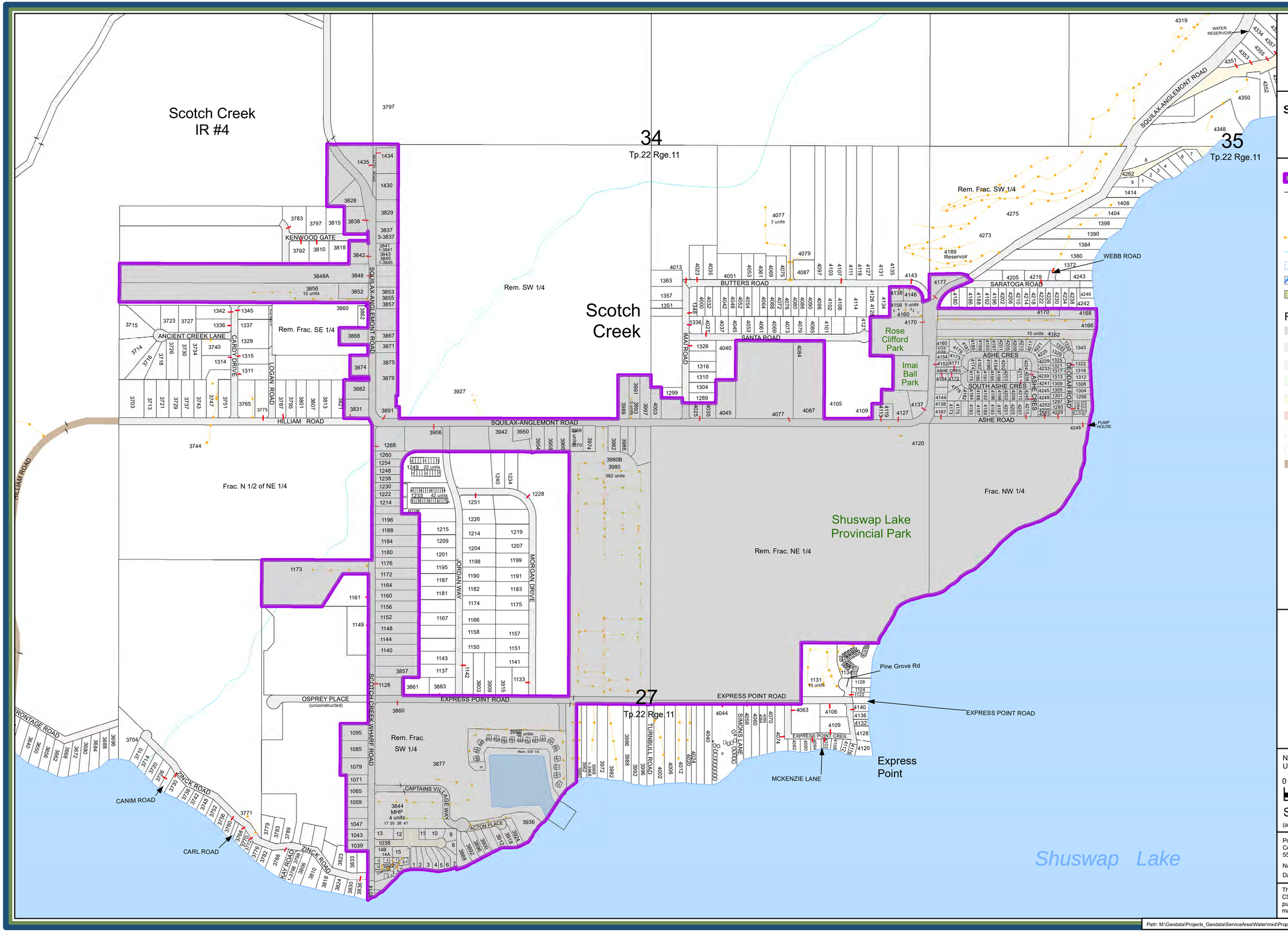
PROJECT SCHEDULE	
Project Milestones	Date
CSRD Board Meeting	August 16, 2018
Funding Application Deadline	August 29, 2018
Receive Funding	Unknown, Assume Spring 2019
Preliminary Design	Spring 2019
Referendum / Assent Process	Summer 2019
Detailed Design	Fall 2019
Tendering	Fall 2019 / Early Winter 2020
Construction	2020

Item	Phase 1	Ultimate
Parcel Tax + User Fee (Saratoga, Captain's Village Marina)	185 + 414 ≈ $ 600	185 + 341 ≈ $ 525
Parcel Tax + User Fee (Scotch Creek)	185 + 545 ≈ $ 750	185 + 604 ≈ $ 800
Anticipated Annual Payment Range	**$ 600 - 750**	**$ 525 - 800**

Note these are estimated charges for a single family parcel

Rates - Other CSRD Water Systems	User Fee	Parcel Tax	Total
Anglemont	$ 700	$ 530	$ 1,230
Sorrento	$ 371	$ 179	$ 550
Macarthur/Reedman	$ 530	$ 236	$ 766
Sunnybrae	$ 486	$ 324	$ 810
Saratoga	$ 521	$ 185	$ 706

prepared by URBAN systems



CSRD
COLUMBIA SHUSWAP REGIONAL DISTRICT

6

Scotch Creek Water Study

Proposed Future Service Area

- Proposed Water Service
- Parcel Boundary
- Hook
- Access
- Driveway
- Creek
- Wetland
- Cancelled or Flooded
- Parks

Roads

- Highway
- Secondary Road
- Tertiary Road
- Road Island
- Strata Road
- Alley
- Unconstructed Road
- Railway
- Unsurveyed Road

Key Map

Nad 83 CNT Datum
UTM Zone 11 Projection

0 50 100 200 300 m

Scale: 1:10,000
(at original size of 11 x 17 inches)

Prepared by: GIS Department
Columbia Shuswap Regional District
555 Harbourfront Dr NE, Salmon Arm, BC V1E 4P1

Name: Scotch_Creek_Water_Service_Area_Proposed_11x17

Date: 7/18/2018

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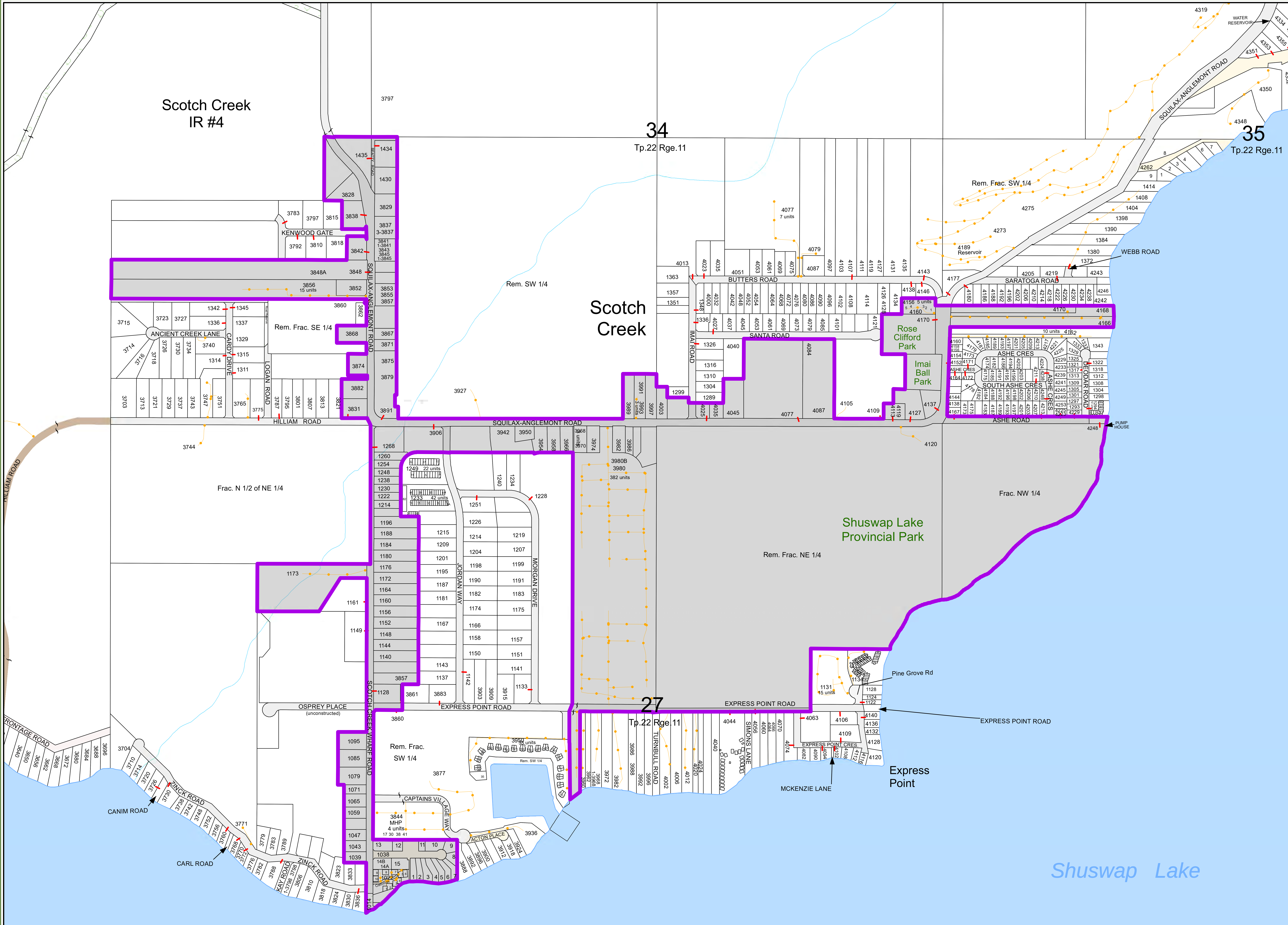

Scotch Creek
IR #4
34
Tp.22 Rge.11
35
Tp.22 Rge.11
27
Tp.22 Rge.11
Scotch
Creek
Rem. SW 1/4
Rem. Frac. SE 1/4
Rem. Frac. SW 1/4
Frac. N 1/2 of NE 1/4
Rem. Frac. NE 1/4
Frac. NW 1/4
Rem. Frac.
SW 1/4
Shuswap Lake
Provincial Park
Rose
Clifford
Park
Imai
Ball
Park
SQUILAX-ANGLEMONT ROAD
HILLIAM ROAD
KENWOOD GATE
ANCIENT CREEK LANE
CARDY DRIVE
LOGAN ROAD
BUTTERS ROAD
SANTA ROAD
IMAI ROAD
SARATOGA ROAD
ASHE CRES
SOUTH ASHE CRES
ASHE ROAD
CEDAR ROAD
WEBB ROAD
JORDAN WAY
MORGAN DRIVE
OSPREY PLACE
(unconstructed)
EXPRESS POINT ROAD
SCOTCH CREEK WHARF ROAD
CAPTAINS VILLAGE WAY
ACTON PLACE
TURNBULL ROAD
SIMONS LANE
EXPRESS POINT CRES
MCKENZIE LANE
Pine Grove Rd
FRONTAGE ROAD
ZINCK ROAD
CANIM ROAD
CARL ROAD
KAY ROAD
HILLIAM ROAD
WATER RESERVOIR
4189 Reservoir
PUMP HOUSE
Express
Point
Shuswap Lake

Scotch Creek Water Study

Loan Repayment Service Area

- Proposed Water Service
- Parcel Boundary
- Hook
- Access
- Driveway
- Creek
- Wetland
- Cancelled or Flooded
- Parks

Roads

- Highway
- Secondary Road
- Tertiary Road
- Road Island
- Strata Road
- Alley
- Unconstructed Road
- Railway
- Unsurveyed Road

Key Map

Nad 83 CNT Datum
UTM Zone 11 Projection

0 50 100 200 300 m

Scale: 1:10,000
(at original size of 11 x 17 inches)

Prepared by: GIS Department
Columbia Shuswap Regional District
555 Harbourfront Dr NE, Salmon Arm, BC V1E 4P1

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Date: 7/18/2018

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SCOTCH CREEK - WATER MASTER PLAN 2018

Do you support moving forward with a grant application to design and construct Phase 1 of a community water system for Scotch Creek, which will consist of expansion of the existing Saratoga water system?

Yes	No