Scouten
ENGINEERING

ARSENIC REDUCTION PROJECT
Project Definition

Northside Water Services Ltd.

File No. 381-13

June 2016

Revised September 2nd, 2016

Thinking beyond.

Scouten ENGINEERING

Thinking beyond.

REVISED SEPTEMBER 2nd, 2016

TABLE OF CONTENTS

ATTACHMENTS

Capital Cost Estimate for Private Water Utilities in British Columbia

Standard Depreciation Rates for Private Water Utilities in British Columbia

201 – 1968 Queensway Prince George BC V2L 1M2
info@scoutenengineering.com T 250.562.7050

1.0 INTRODUCTION

Northside Water Services Ltd. (Northside) intends to install new water treatment equipment at their existing well, reservoir and pumphouse facility in Vanderhoof, BC in the 2016 calendar year. The new equipment is intended to reduce arsenic concentrations in the potable water they deliver to their customers to a level that complies with current and anticipated future water quality guidelines. The equipment will provide a secondary benefit by reducing the concentration of manganese in the water, improving the water's taste and appearance.

Northside has retained Scouten Engineering (Scouten) to assist with the coordination and delivery of the project, including making application to the relevant authorities and approval agencies on Northside's behalf. This document is intended to provide an overview of the arsenic reduction project for the benefit of those authorities and agencies.

2.0 STATEMENT OF NEED

Potable water, whether delivered by a public or private utility, must meet the express requirements of the guidance document entitled '*Guidelines for Canadian Drinking Water Quality*', published by Health Canada. That document currently specifies a Maximum Acceptable Concentration (MAC) for arsenic of 10 µg/l, with the additional requirement that the arsenic concentration should be reduced further to a level '*as low as reasonably achievable*' (ALARA), consistent with the efficacy of available water treatment technology and the individual water utility's financial constraints.

Health Canada has signalled that water quality guidelines will be amended in the near future such that the MAC of arsenic in potable water will be reduced to 2 µg/l. This is consistent with trends in other jurisdictions where the MAC of arsenic in potable water has been reduced incrementally over the last two decades. Both the US Environmental Protection Agency (EPA) and the World Health Organization (WHO) have made relatively recent downward adjustments to the MAC of arsenic and are continuing to investigate the health risks associated with any measurable concentration.

Recent water quality tests conducted on samples from Northside's water utility have indicated arsenic concentrations on the order of 11 µg/l, with some seasonal variation reflecting hydrogeological movements in the source aquifer. In short, potable water delivered by Northside does not explicitly meet the current water quality guidelines published by Health Canada and falls well short of the anticipated new and more restrictive requirements of that national agency.

Manganese levels in the potable water delivered by Northside are generally on the order of 200 µg/l, well in excess of the aesthetic objective of 50 µg/l recommended by the water quality guidelines published by Health Canada. While the concentration of manganese has aesthetic implications only (with respect to the odour and taste of the water and its tendency to stain laundry and laundry appliances) Northside recognizes the value that reducing manganese concentrations would bring to its customers.

A number of water treatment technologies have proven to be very effective in reducing the concentration of arsenic in raw or chlorinated water and most of those technologies provide the additional benefit of reducing the concentration of manganese. Northside investigated the feasibility of two such technologies, with the goal of having suitable water treatment installed and fully commissioned in 2017.

3.0 AVAILABLE WATER TREATMENT TECHNOLOGIES

Northside investigated the feasibility of using the following two water treatment technologies to reduce the concentration of arsenic in their delivered water to a level less than to 2 µg/l:

1. Adsorption using purpose-made contact tanks, pressure sand filtration and adsorption media equipment, as supplied by Tiger Filtration Systems

2. Oxidation and filtration using introduced ferric chloride and iron and manganese (greensand) filtration media equipment as supplied by Culligan International

The initial capital cost of the adsorption system, as quoted by Tiger Filtration Systems, was approximately 80% of the initial capital cost of the oxidation and greensand filtration system, as quoted by Culligan. The oxidation and greensand filtration system has significantly lower operating and maintenance costs, however, and the decision was made to pursue this option as having the lowest net present value.

Bench (pilot) testing was done by Culligan on representative raw water samples taken from the Northside facility. That testing indicated that the proposed oxidation and greensand filtration method is capable of reliably lowering the concentrations of both arsenic and manganese in this case to < 2 µg/l.

The full-scale equipment to be installed at Northside's facility in Vanderhoof will be capable of treating 240 US gallons per minute with a triplex, auto-back-washing greensand filtration system.

4.0 ITEMS OF WORK

The following specific items of work have been identified in connection with this project:

Capital (hard) costs

- The supply of a packaged oxidation and greensand filtration plant, complete with filtration media, FOB Vanderhoof, BC.

  The treatment equipment will arrive 'skid-mounted', complete with filtration tanks, manifold piping, gauges, controls, etc. The various skids will be suitable for installation on cast-in-place concrete housekeeping pads with appropriate anchor bolts and other attachments.

- The construction of a 30' x 60' wood-framed building.

  The new building will house the water treatment equipment and will provide storage area for filtration media, chemicals, etc. With space limited on the existing Northside site the building will be constructed on the footprint of an existing 'Quonset-style' building on the property. The existing foundations are suitable for use with the new structure, resulting in a net cost saving to the project.

- The supply and installation of interface piping.

  The new water treatment equipment will be connected to the existing well and reservoir facilities with new buried piping, supplied and installed in accordance with the applicable American Water Works Association (AWWA) and Canadian Standards Association (CSA) requirements.

- The supply and installation of a new electrical service.

  The new water treatment equipment will require an expanded electrical service to feed the pumps, motors and additional lighting required. The additional power required to operate the arsenic removal equipment will represent an ongoing additional annual cost to the Northside utility.

Soft costs

- The demolition and disposal of the existing 'Quonset-style' structure.

  The existing 'Quonsel-style' structure on the Northside site is unsuitable for use to contain the new water treatment equipment and associated media and chemicals. The existing building is not insulated and its sloping walls would interfere with the installation and operation of the new equipment.

- The installation and commissioning of the packaged oxidation and greensand filtration plant.

  The new water treatment equipment will be installed and fully commissioned by the equipment supplier (Culligan). Culligan will also provide training to one or more Northside operators on the use and maintenance of the new equipment.

- Water sampling and testing.

  Upon commissioning of the new water treatment equipment samples of both raw and treated water will be taken for the purposes of testing to ensure full compliance with the drinking water guidelines published by Health Canada. Testing will be done on an increased frequency after commissioning to confirm the efficacy of the new system through its full range of operation.

- The preparation of detailed drawings and specifications.

  Because the water treatment technology is largely proprietary the preparation of final detailed drawings and specifications for the interface piping, valves, external controls, etc. will occur after the purchase of the equipment. At that time Culligan will supply shop drawings indicating the battery limits of their scope, connection requirements, etc.

- Community consultation.

  Appropriate documents notifying Northside's customers of the project will be prepared and distributed in a format acceptable to the Deputy Comptroller of Water Rights and in accordance with the Water Utility Act and the Utilities Commission Act. Those documents will be posted on Northside's website and will be circulated in local and regional newspapers (the Omineca Express and the Prince George Citizen).

- The preparation and submittal of project close-out documents.

  Record drawings confirming the configuration and location of all equipment and piping 'as-installed' will be prepared under the seal of a BC-registered professional engineer and submitted to the appropriate authority. Photographs and written records taken during the installation of the new equipment and accessories will also be provided.

Copies of the documents *'Capital Cost Estimate for Private Water Utilities in British Columbia'* and '*Standard Depreciation Rates for Private Water Utilities in British*

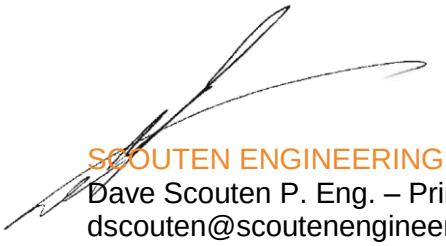
Columbia' are attached to this report. These documents indicate that the total capital cost of the project, including engineering and a contingency allowance (@15%), is estimated to be $448,000.

An increase in annual operating costs associated with the new arsenic reduction equipment is estimated to be approximately $110,000, including additional costs associated with increased contributions to the Replacement Reserve Trust Fund and loan financing. This increase is associated with routine operation and maintenance costs, the cost of additional insurance required, additional hydro consumption, the cost of chemicals and the cost of additional operator time and training. The increase in annual operating costs also reflects a 1% tax payable to the District of Vanderhoof.

5.0 CLOSURE

Northside Water Services Ltd. intends to install new water treatment equipment in 2016 for the purposes of reducing the concentration of arsenic in the water they deliver to their customers to a level of less than 2 µg/l. The equipment will provide a secondary benefit by reducing the concentration of manganese in the water to a level well below the aesthetic objective (AO) of 50 µg/l, as published by Health Canada in their guidance document entitled '*Guidelines for Canadian Drinking Water Quality*'.

Prepared by:



SCOUTEN ENGINEERING
Dave Scouten P. Eng. – Principal
dscouten@scoutenengineering.com

Appendix 6

Capital Cost Estimate for Private Water Utilities in British Columbia

	NARUC Acct No.	Account Title	Estimated Costs[1] [$]	Actual Costs[2] [$]
A		**Source of Supply Plant**		
	304	***Structures and Improvements***		
	304.1	Wood Frame	N/A	
	304.2	Steel	N/A	
	304.3	Cement Block	N/A	
	304.4	Reinforced Concrete or Brick	N/A	
	304.5	Miscellaneous (Electrical Service)	N/A	
	305	***Collecting and Impounding Reservoirs***		
	305.1	Wood Structures	N/A	
	305.2	Earth Fill Structures	N/A	
	305.3	Concrete Structures	N/A	
	306	***Lake, River and Other Intakes***		
	306.1	Wood Structures	N/A	
	306.2	Concrete Structures	N/A	
	307	***Wells and Springs***	N/A	
	309	***Supply Mains***	N/A	
	309.1	PVC AWWA C900	N/A	
	309.2	HDPE AWWA C906	N/A	
	309.3	Ductile/Cast Iron	N/A	
	309.4	Steel, Cement Lined	N/A	
	309.5	Concrete	N/A	
	309.6	Sub-Marine Mains	N/A	
	339	**Other Misc. Water Source Plant**	N/A	
B		**Pumping Plant**		
	304	***Structures and Improvements***		
	304.1	Wood Frame	N/A	
	304.2	Steel	N/A	
	304.3	Cement Block	N/A	
	304.4	Reinforced Concrete or Brick	N/A	
	304.5	Miscellaneous	N/A	
	310	***Power Generation Equipment***	N/A	
	311	***Pumping Equipment***		
	311.1	Electric Pumping Equipment	N/A	
	311.2	Diesel Pumping Equipment	N/A	
	311.3	Other Pumping Equipment	N/A	
	339	**Other Miscellaneous Pumping Plant**	N/A	
C		**Water Treatment Plant**		
	304	***Structures and Improvements***		
	304.1	Wood Frame	$109,000	
	304.1a	Demolition and Disposal	$5,000	
	304.2	Steel	N/A	
	304.3	Cement Block	N/A	
	304.4	Reinforced Concrete or Brick	N/A	
	304.5	Miscellaneous (Electrical Service)	20,000	
	320	***Treatment Equipment***		
	320.1	Sand & Other Media Filtration Equipment	$226,000	
	320.2	Membrane Filtration Equipment	N/A	
	320.3	Chlorination	N/A	
	320.4	Other Water Treatment Equipment	N/A	
	339	**Other Miscellaneous Treatment Plant**	N/A	
D		**Transmission and Distribution Plant**		
	304	***Structures and Improvements***		
	304.1	Wood Frame	N/A	
	304.2	Steel	N/A	
	304.3	Cement Block	N/A	
	304.4	Reinforced Concrete or Brick	N/A	
	304.5	Miscellaneous	N/A	
	330	***Distribution Reservoirs***		
	330.1	Concrete (underground)	N/A	
	330.2	Steel (above ground)	N/A	

Continued on next page...

Appendix 6

Capital Cost Estimate for Private Water Utilities in British Columbia

	NARUC Acct No.	Account Title	Estimated Costs[1] [$]	Actual Costs[2] [$]
D		**Transm. and Distribution Plant (con't)**		
	331	***Transmission and Distribution Mains***		
	331.1	PVC AWWA C900	8,000	
	331.2	HDPE AWWA C906	N/A	
	331.3	Ductile/Cast Iron	N/A	
	331.4	Steel, Cement Lined	N/A	
	331.5	Concrete	N/A	
	331.6	Sub-Marine Mains	N/A	
	333	***Services***	N/A	
	334	***Meters and Meter Installations***	N/A	
	335	***Hydrants / Standpipes***	N/A	
	339	***Other Transm. and Distribution Plant***	N/A	
E		**General Plant**		
	304	***Structures and Improvements***		
	304.1	Wood Frame	N/A	
	304.2	Steel	N/A	
	304.3	Cement Block	N/A	
	304.4	Reinforced Concrete or Brick	N/A	
	304.5	Miscellaneous	N/A	
	340	***Office Furniture and Equipment***	N/A	
	349	***Computer Equipment***	N/A	
	341	***Transportation Equipment***	N/A	
	342	***Stores Equipment***	N/A	
	343	***Tools, Shop and Garage Equipment***	N/A	
	344	***Laboratory Equipment***	N/A	
	345	***Power Operated Equipment***	N/A	
	346	***Communication Equipment***		
	346.1	Communication Equipment - SCADA	N/A	
	346.2	Other Communication Equipment	N/A	
	347	***Miscellaneous Equipment***	N/A	
F		**Other Tangible Plant**		
	348	***Other Tangible Plant***[3]	N/A	
G		**Intangible Plant**		
	301	***Organization***		
	302	***Franchises and Consents***		
	Subtotal Construction Cost [$]		$368,000	...
	Land and Land Rights Cost [$]		...	...
	Engineering Cost[4]		$25,000	...
	Contingency[5] (@15% of Subtotal Construction Cost)		$55,000	n/a
	TOTAL CAPITAL COST		$448,000	...

Notes:

[1] Estimated Costs at CPCN application/pre-construction stage, in CAD $

[2] Actual Costs at As-Built approval/post construction stage, in CAD $

[3] List any applicable items such as Valve Chambers, PRV Stations etc.

[4] Total engineering fees including survey cost, if not specified - by default 10% of Construction Cost (CC)

[5] Contingency allowance at CPCN application/pre-construction stage, if not specified - by default 15% of CC

Schedule A

Standard Depreciation Rates for Private Water Utilities in British Columbia

NARUC Acct No.		Account Title	Prescribed Service Life SL [Years]	Prescribed Depreciation Rate DR = 100/SL [% per Year]	Estimated Costs EC [$]	Annual Depreciation AD = EC*DR/100 [$]	Actual Costs AC [$]	Annual Depreciation AD = AC*DR/100 [$]
A		**Source of Supply Plant**						
	304	***Structures and Improvements***						
	304.1	Wood Frame	30	3.3%	N/A	N/A		
	304.2	Steel	40	2.5%	N/A	N/A		
	304.3	Cement Block	40	2.5%	N/A	N/A		
	304.4	Reinforced Concrete or Brick	50	2.0%	N/A	N/A		
	304.5	Miscellaneous	25	4.0%	N/A	N/A		
	305	***Collecting and Impounding Reservoirs***						
	305.1	Wood Structures	35	2.9%	N/A	N/A		
	305.2	Earth Fill Structures	60	1.7%	N/A	N/A		
	305.3	Concrete Structures	75	1.3%	N/A	N/A		
	306	***Lake, River and Other Intakes***						
	306.1	Wood Structures	35	2.9%	N/A	N/A		
	306.2	Concrete Structures	60	1.7%	N/A	N/A		
	307	***Wells and Springs***	40	2.5%	N/A	N/A		
	309	***Supply Mains***						
	309.1	PVC AWWA C900	75	1.3%	N/A	N/A		
	309.2	HDPE AWWA C906	75	1.3%	N/A	N/A		
	309.3	Ductile/Cast Iron	60	1.7%	N/A	N/A		
	309.4	Steel, Cement Lined	50	2.0%	N/A	N/A		
	309.5	Concrete	50	2.0%	N/A	N/A		
	309.6	Sub-Marine Mains	20	5.0%	N/A	N/A		
	339	**Other Misc. Water Source Plant**	25	4.0%	N/A	N/A		
B		**Pumping Plant**						
	304	***Structures and Improvements***						
	304.1	Wood Frame	30	3.3%	N/A	N/A		
	304.2	Steel	40	2.5%	N/A	N/A		
	304.3	Cement Block	40	2.5%	N/A	N/A		
	304.4	Reinforced Concrete or Brick	50	2.0%	N/A	N/A		
	304.5	Miscellaneous	25	4.0%	N/A	N/A		
	310	***Power Generation Equipment***	25	4.0%	N/A	N/A		
	311	***Pumping Equipment***						
	311.1	Electric Pumping Equipment	25	4.0%	N/A	N/A		
	311.2	Diesel Pumping Equipment	25	4.0%	N/A	N/A		
	311.3	Other Pumping Equipment	25	4.0%	N/A	N/A		
	339	**Other Miscellaneous Pumping Plant**	25	4.0%	N/A	N/A		
C		**Water Treatment Plant**						
	304	***Structures and Improvements***						
	304.1	Wood Frame	30	3.3%	$100,000	$3,300		
	304.1a	Demolition	N/A	N/A	$5,000	N/A		
	304.2	Steel	40	2.5%	N/A	N/A		
	304.3	Cement Block	40	2.5%	N/A	N/A		
	304.4	Reinforced Concrete or Brick	50	2.0%	N/A	N/A		
	304.5	Miscellaneous (Electrical Service)	25	4.0%	$20,000	$800		
	320	***Treatment Equipment***						
	320.1	Sand & Other Media Filtration Equipment	30	3.3%	$226,000	$7,500		
	320.2	Membrane Filtration Equipment	15	6.7%	N/A	N/A		
	320.3	Chlorination	15	6.7%	N/A	N/A		
	320.4	Other Water Treatment Equipment	20	5.0%	N/A	N/A		

Schedule A

Standard Depreciation Rates for Private Water Utilities in British Columbia

	NARUC Acct No.	Account Title	Prescribed Service Life SL [Years]	Prescribed Depreciation Rate DR = 100/SL [% per Year]	Estimated Costs EC [$]	Annual Depreciation AD = EC*DR/100 [$]	Actual Costs AC [$]	Annual Depreciation AD = AC*DR/100 [$]
	339	**Other Miscellaneous Treatment Plant**	25	4.0%	N/A	N/A		
D		**Transm. and Distribution Plant**						
	304	***Structures and Improvements***						
	304.1	Wood Frame	30	3.3%	N/A	N/A		
	304.2	Steel	40	2.5%	N/A	N/A		
	304.3	Cement Block	40	2.5%	N/A	N/A		
	304.4	Reinforced Concrete or Brick	50	2.0%	N/A	N/A		
	304.5	Miscellaneous	25	4.0%	N/A	N/A		
	330	***Distribution Reservoirs***						
	330.1	Concrete (underground)	60	1.7%	N/A	N/A		
	330.2	Steel (above ground)	50	2.0%	N/A	N/A		
D		**Transm. and Distr. Plant (con't)**						
	331	***Transmission and Distribution Mains***						
	331.1	PVC AWWA C900	75	1.3%	$8,000	$100		
	331.2	HDPE AWWA C906	75	1.3%	N/A	N/A		
	331.3	Ductile/Cast Iron	60	1.7%	N/A	N/A		
	331.4	Steel, Cement Lined	50	2.0%	N/A	N/A		
	331.5	Concrete	50	2.0%	N/A	N/A		
	331.6	Sub-Marine Mains	20	5.0%	N/A	N/A		
	333	***Services***	50	2.0%	N/A	N/A		
	334	***Meters and Meter Installations***	25	4.0%	N/A	N/A		
	335	***Hydrants / Standpipes***	50	2.0%	N/A	N/A		
	339	***Other Transm. and Distribution Plant***	25	4.0%	N/A	N/A		
E		**General Plant**						
	304	***Structures and Improvements***						
	304.1	Wood Frame	30	3.3%	N/A	N/A		
	304.2	Steel	40	2.5%	N/A	N/A		
	304.3	Cement Block	40	2.5%	N/A	N/A		
	304.4	Reinforced Concrete or Brick	50	2.0%	N/A	N/A		
	304.5	Miscellaneous	25	4.0%	N/A	N/A		
	340	***Office Furniture and Equipment***	20	5.0%	N/A	N/A		
	349	***Computer Equipment***	5	20.0%	N/A	N/A		
	341	***Transportation Equipment***	7	14.3%	N/A	N/A		
	342	***Stores Equipment***	20	5.0%	N/A	N/A		
	343	***Tools, Shop and Garage Equipment***	15	6.7%	N/A	N/A		
	344	***Laboratory Equipment***	15	6.7%	N/A	N/A		
	345	***Power Operated Equipment***	15	6.7%	N/A	N/A		
	346	***Communication Equipment***	10	10.0%				
	346.1	Communication Equipment - SCADA	10	10.0%	N/A	N/A		
	346.2	Other Communication Equipment	10	10.0%	N/A	N/A		
	347	***Miscellaneous Equipment***	20	5.0%	N/A	N/A		
F		**Other Tangible Plant**						
	348	***Other Tangible Plant*** [5]	50	2.0%	N/A	N/A		
G		**Intangible Plant**						
	301	***Organization***	100	1.0%	N/A	N/A		

Schedule A

Standard Depreciation Rates for Private Water Utilities in British Columbia

	NARUC Acct No.	Account Title	Prescribed Service Life SL [Years]	Prescribed Depreciation Rate DR = 100/SL [% per Year]	Estimated Costs EC [$]	Annual Depreciation [2] AD = EC*DR/100 [$]	Actual Costs [3] AC [$]	Annual Depreciation [4] AD = AC*DR/100 [$]
	302	***Franchises and Consents***	100	1.0%	N/A	N/A		
a		**Subtotal Construction Cost [$]**			$359,000		...	
b		**Total Annual Depreciation [$]**				$11,700		...
c		**Composite Depreciation Rate [%], = b / a * 100**		3.3				
d		**Engineering Cost** [6]			$25,000		...	
e		**Annual Engineering Cost Component [$] = d * c / 100**				$810		...
f		**Contingency** [7]			$54,000		n/a	
g		**Annual Contingency Cost Component [$] = f * c / 100**				$1,760		n/a
h		**Total Annual Cost = Annual RRF[8] Contribution = b + e + g**				$14,270		...

Notes:

[1] Estimated Costs at CPCN application/pre-construction stage, in CAD $, from CPCN Application Guide - Appendix 6 - Capital Cost Estimate Form

[2] Annual Depreciation based on Estimated Costs at CPCN stage.

[3] Actual Costs at post-construction approval stage, in CAD $, from CPCN Application Guide - Appendix 6 - Capital Cost Estimate Form

[4] Annual Depreciation based on Actual Costs at post-construction approval stage; for establishing the final Water Tariff

[5] List any applicable items such as Valve Chambers, PRV Stations etc.

[6] Total engineering fees including survey cost, (see CPCN Application Guide - Appendix 6 - Capital Cost Estimate Form)

[7] Contingency allowance at CPCN application/pre-contruction stage, (see CPCN Application Guide - Appendix 6 - Capital Cost Estimate Form)

[8] RRF - Replacement Reserve Fund, equals rows b + e + g