



STAGE 1, LEVEL 1 - GARP ASSESSMENT REPORT

(Developed in accordance with the
British Columbia Drinking Water Protection Act)

Water system: Burton

Date of report: January 9, 2019

Interior Health Permit to Operate Facility Number: 0210703

EOCP classification: SWS

IHA Permit: Drinking Water System 15 – 300 Connections

Location of water supply system: Burton, BC

Contact Information:

Regional District of Central Kootenay

Box 590, 202 Lakeside Drive, Nelson, B.C. V1L 5R4

Phone:(250) 352-8192

Email:Utilities@rdck.bc.ca

CONTENTS

1	PROJECT BACKGROUND	3
2	INTRODUCTION	3
2.1	SYSTEM INFORMATION	3
2.2	REGULATORY REQUIREMENTS AND OBJECTIVES.....	4
2.3	GARP DEFINITION AND PROCEDURE	4
2.4	DATA COLLECTED.....	5
3	GARP ASSESSMENT	5
3.1	WATER QUALITY RESULTS	5
3.2	WELL LOCATION INFORMATION.....	6
3.3	WELL CONSTRUCTION/WELL RECORDS	7
3.4	AQUIFER TYPE AND SETTING	8
4	RECOMMENDATIONS	9
5	CLOSURE	9

LIST OF TABLES

Table 1 – Well Information.....	3
Table 2 – GARP Water Quality Results	6
Table 3 – GARP Well Location Information	6
Table 4 – GARP Well Construction Information	7
Table 5 – Well 1 Lithology	8
Table 6 – GARP aquifer Type and Setting.....	9

LIST OF APPENDICIES

Appendix A	Water Quality Test Results
Appendix B	RDCK August, 2017 Burton Rural Affairs Committee Report
Appendix C	General Arrangement of Wells
Appendix D	Well Drill Reports
Appendix E	Golder Associates Ltd./ Kala Groundwater Consulting Ltd. Reports
Appendix F	Site Photos

1 PROJECT BACKGROUND

The Regional District of Central Kootenay (RDCK) has been advised by the Environmental Health Officer (EHO), under the authority of the *Drinking Water Protection Act*, to provide the Interior Health Authority (IHA) office with a Stage 1 assessment for determining whether the wells providing drinking water to the Burton water system are Groundwater at Risk of Containing Pathogens (GARP). This report delivers a Level 1, Stage 1 GARP assessment for both wells servicing the Burton water system.

2 INTRODUCTION

2.1 System Information

The wells under investigation are located at 105 Old Cemetery/McCormack Road within the community of Burton on the east side of Lower Arrow Lake. The two wells are 11m (36ft) apart and reside within a secured fenced area on Regional District owned property located approximately 140 m east of Lower Arrow Lake. There are currently 53 active connections serviced by the two wells.

A preliminary GUDI (Ground Water Under the Direct Influence of Surface Water) assessment was completed on the two well sources in June, 2005 by Golder Associates Ltd (see Appendix E). Golder concluded that the well sources are within a confined aquifer and are not considered GUDI at the pumping rate of 80 USgpm and a travel zone of 70m. Operator log data indicates that the current pumping rate is 720 lpm (190 USgpm).

A 1998 report of findings prepared by Kala Groundwater Consulting Ltd. for B.C. Hydro on the construction, testing and evaluation of the initial well (Well 1) serves as source of information for the 2005 Golder GUDI assessment. Figure 3 contained within this report details the well construction (see Appendix E).

Information gathered from the Golder/Kala reports and Provincial well records is summarized below. Please note that there is limited data for Well 2 as it was presumed that the information collected for Well 1 would be identical given the close proximity of the wells to each other.

Table 1 – Well Information

	Well 1	Well 2
Well tag number	80485	116647
Well ID plate number	61722	61712
Date drilled	October 29, 1998	October 29, 1998
Estimated yield	1.89 m ³ /min (500 US gallons)	Presumed same as Well 1
Well depth	35m (115.00 ft)	Presumed same as Well 1
Static water level	0.6 m (2 ft)	Presumed same as Well 1
Well casing size	200mm (8")	200mm (8")
Well screen depth	31.9m to 35.1m (104.5ft to 115ft)	Presumed same as Well 1

The two wells work on a cyclical basis with only one operating at a time. A pump house next to the well heads houses a SCADA system and temporary chlorination system for chemical injection to the source water as it leaves the pump house, when required. Water is delivered to a 102,000 liter insulated bolted steel storage tank prior to being gravity fed to the distribution system. The distribution system includes 5,024 meters of PVC, steel and asbestos-concrete water mains.

The Burton water system has had seasonal re-occurring bacteriological water quality concerns from samples collected within the distribution system. Well water samples have not displayed bacteriological concerns. A Water Quality Action Plan was developed by the RDCK in August 2017 that included increased monitoring to once weekly from both the well sources and the distribution system, and twice annual chlorination for a minimum of two weeks to consumption level chlorination (Appendix B).

2.2 Regulatory Requirements and Objectives

All public drinking water systems in British Columbia must comply with the BC *Drinking Water Protection Act* (2001), and the BC *Drinking Water Protection Regulation* (2003). General requirements for drinking water operators and suppliers are set-out in the *Drinking Water Protection Act*. Specific potable water standards, monitoring schedules, reporting, and permitting are outlined in the *Drinking Water Protection Regulation*.

The *Drinking Water Protection Regulation* requires ground water sources used for potable water be disinfected if the ground water has been determined to be at risk of containing pathogens, and that the disinfection meet the Provincial water treatment objectives. The Provincial technical document *Drinking Water Treatment Objectives (Microbiological) for Ground Water Supplies in British Columbia* (2015) provides performance targets for water suppliers to ensure the provision of microbiological safe drinking water for GARP. Interior Health Authority supports water suppliers to meet these objectives as risk to human health is substantially reduced.

The general treatment objectives for GARP are as follows:

- 4-log (99.99%) reduction of viruses*
- 3-log (99.9%) removal or inactivation of Giardia and Cryptosporidium (Oocysts)
- 2 separate treatment processes (multi-barrier)
- Turbidity less than 1 NTU (Nephelometric Turbidity Unit)
- Zero total and fecal coliforms (E.Coli)

The general treatment objectives for GARP-virus only are as follows:

- 4-log (99.99%) reduction of viruses*
- Zero total and fecal coliforms (E.Coli)

*Human adenovirus is used as the reference virus for UV disinfection as it is considered the worst-case scenario for inactivation during treatment. UV systems certified to NSF/ANSI Standard 55 Class A can provide 4-log reduction for most viruses, but only a 0.5 log-reduction of adenovirus (Health Canada, 2017).

2.3 GARP Definition and Procedure

GARP is an umbrella term that considers all the ways a particular ground water source may be at risk of contamination, including the hydrogeological conditions that allow the source to be ground water under the direct influence of surface water (GWUDI or GUDI). The term “contamination” for the purpose of defining GARP pertains to pathogenic bacteria, viruses, and protozoa, which can be either continuous or intermittent. Potential sources of contamination include sewage discharge to land, leaking sewerage collection systems, agricultural waste stockpiles, and infiltration of contaminated runoff into poorly constructed wells.

Through the assessment, a ground water source maybe determined as GARP, GARP-virus only, or low risk. The outcome will also determine the level of treatment required for the ground water source.

Procedures for determining if a well source is at risk of contamination involve four stages:

- **Stage 1** is the screening and assessment of specific hazards signifying a potentially GARP source;
- **Stage 2** is the cumulative review of identified hazards for assessing if the source is GARP or at low risk of containing pathogens;
- **Stage 3** implements mitigating measures either through addressing identified hazards or disinfection of the water source; and finally,
- **Stage 4** involved long-term monitoring of the well source for changes of potential hazards.

For **Stage 1**, three levels of investigation may be required. Level 1 combines existing records (i.e. well drilling reports, source-to-tap assessment, and previous hydrogeological studies) with an on-site field inspection. Levels 2 and 3 incorporate more detailed investigations completed by a hydrogeologist.

Stage 2, GARP determination, is completed by the EHO under the *Drinking Water Protection Regulation*. The EHO's determination is based on information collected during Stage 1; however, this may require Level 2 or 3 investigations. **Stages 3 and 4** are completed under the direction of the EHO.

2.4 Data Collected

Data gathered for a Level 1, Stage 1 assessment may include, but is not limited to:

- Microbiological test results;
- Turbidity testing results;
- Setback distances from probable sources of contamination as outlined in the *Health Hazards Regulations (2011)*;
- Depth of well;
- Setback distances from surface water sources and flood prone areas;
- Setback distances from possible enteric viral contamination without a barrier;
- Construction of well pertaining to surface sealing, well caps and covers, floodproofing, wellhead protection; and
- Aquifer type.

3 GARP ASSESSMENT

Hazards described in the following tables are excerpt from the *Guidance Document for Determining Ground Water at Risk of Containing Pathogens (GARP) Version 3 (2017)*. Site photographs are included in Appendix F.

3.1 Water Quality Results

Microbiological testing is completed on a weekly basis through the Interior Health Authority analytical service. Sampling sites include raw water from both wells, and two distribution locations. Turbidity is tested bi-weekly using a handheld turbidimeter. Testing for these parameters has been ongoing and results have been recorded. This satisfies the *Guidance Document for Determining Ground Water at Risk of Containing Pathogens (GARP)* recommendation of utilizing long-term records of results to determine risk.

Microbiological test results indicate total coliform, E. coli, and background growth in distribution and reservoir samples. These adverse results occur in the spring and late summer/fall.

Turbidity for the well sources has ranged from 0.67 to 0.14 NTU from October 2011 to present date. These results meet the <1 NTU target listed in the *Drinking Water Treatment Objectives (Microbiological) for Ground Water Supplies in British Columbia (2015)*.

A comprehensive analysis of the water sources constituents was completed on August 2, 2017. No parameters are above the Maximum Acceptable Concentration as defined by Health Canada’s *Guidelines for Canadian Drinking Water Quality – Summary Table* (2017).

Testing for Total Kjeldahl Nitrogen (organic nitrogen and ammonia/ammonium) and Total Phosphorus was completed for both wells on October 10, 2019 as additional potential indicators of septic influence from older nearby septic systems. Results for both wells do not show a significant influence of these parameters.

All results are found in Appendix A.

Table 2 – GARP Water Quality Results

Hazards	Present (Yes/No)	Risk (Yes/Low)	Comments
Exhibits recurring presence of total coliform bacteria, fecal coliform bacteria, or E. coli	Yes	Low	Total coliform, E. coli and background colonies present in samples taken post reservoir and in the distribution system. Samples collected directly from the well sources have not exhibited microbiological concerns.
Has reported intermittent turbidity or has a history of consistent turbidity greater than 1 NTU	No	Low	Historical turbidity levels collected from 2011 onward exhibit turbidity levels below 1 NTU.

3.2 Well Location Information

The Burton Water System drawing included in Appendix C shows the general arrangement of the well-heads with respect to set-back requirements/guidelines and existing infrastructure.

Latitude and longitude are 49.595⁰, -117.539⁰, respectively. Elevation at point is 450m (1476ft) ASL.

Well drill report and well information are found in Appendix D.

Table 3 – GARP Well Location Information

Hazards	Present (Yes/No)	Risk (Yes/Low)	Comments
Situated inside setback distances from possible sources of contamination as per section 8 of the <i>Health Hazards Regulation</i> (HHR)	No	Low	Well heads are not within HHR identified setbacks: 30m from potential sources of contamination, 6m from a private dwelling, and 120m from any cemetery or dumping ground.

Has intake depth <15m below ground surface that is located within a natural boundary of surface water or a flood prone area	No	No	Well depth for both wells is 35m.
Has an intake depth between the high-water mark and surface water bottom (or<15m below the normal water level), and located within, or less than 150m from the natural boundary of any surface water	Yes	Yes	Wells are <150m from natural boundary of Lower Arrow Lake.
Located within 300m of a source of probable enteric viral contamination without a barrier to viral transport	Yes	Yes	Well heads are within 300m and down-gradient of neighboring septic tanks and fields.

3.3 Well Construction/Well Records

The wells were constructed in October of 1998, and as such, pre-date well construction regulation in B.C.. The wells do not meet many requirements outlined in the *Groundwater Protection Regulation (2004/2016)* (GWPR); however do meet the necessary requirement of well caps/covers as outlined in the *Water Sustainability Act (2014)* and GWPR.

Measurements to confirm well depth, well diameter, and static water level were not performed, and information on well construction has been solely attained from the Detailed Well Record of Well 1, Golder GUDI Report, and Kala report.

Table 4 – GARP Well Construction Information

Hazards	Present (Yes/No)	Risk (Yes/Low)	Comments
Does not meet GWPR (Part 3, Division 3) for surface sealing	Yes	Yes	Well completion diagram does not indicate a surface seal. Field investigation confirms no surface seal is present on either well.
Does not meet the GWPR (Part 4) and WSA (section 54) for well caps and covers	No	Low	Field investigation verifies the well caps are comprised of manufactured steel and secured (bolted) to the top of the production casing.
Does not meet GWPR (section 63) and DWPA (Section 16) for floodproofing.	No	Low	Wellheads are contained within a fenced area to prevent physical damage due to flood debris.

Does not meet GWPR (Part 3 Div. 5 and Part 7) for wellhead protection.	Yes	Yes	Field verified the well casing stick-up is greater than 30 cm. Nearby diesel generator is S601-07 ULC rated for shop fabricated steel aboveground tanks for flammable and combustible liquids (https://canada.ul.com/wp-content/uploads/sites/11/2014/06/Certification_Bulletin_2009-09ENG-S601-07.pdf). Wellheads are contained within a fenced area to prevent public access and physical damage. Ground is not sloped to prevent collection of water.
--	-----	-----	---

3.4 Aquifer Type and Setting

There is no information on the type and vulnerability of the aquifer for the wells as would be available through the Government of British Columbia data catalogue published by the B.C. Ministry of Environment and Climate Change Strategy – Water Protection and Sustainability (Gov’t of BC, n.d.(a)).

The 1998 report completed by Kala Groundwater Consulting Ltd. indicates that the aquifer is semi-confined and comprised of coarse sand and gravel. The lithology of Well 1 as described in the Golder and Kala reports is inconsistent with the information provided in the provincial Detailed Well Record available in iMapBC (Gov’t of BC, n.d.(c)). The original Well Drill Record completed by Schibli Drilling is unavailable. Table 4 below summarizes this information.

Table 5 – Well 1 Lithology

Detailed Well Record (Retrieved November 2019)	Golder Report (June 2005)	Kala Report (November 1998)
0-9ft: Brown sand gravel & cobbles	0-62 ft: Interlayered silty sand and sandy silt	0-9ft: Sand and gravel with cobbles and the occasional boulder
9-15ft: Brown silty sand 15-35ft: Grey silty sand	62-65ft: Sands with some gravel 65-92ft: Interlayered silty sand and sandy silt with some clay present	9-14ft: Brown silty sand 14-19ft: Grey silty sand
35-65ft: Grey silt with fine sand 65-92: Brown silty sand with rocks	92-115ft: Sand and gravel 115-116ft: Gravel with clay	19-45ft: Grey silty sand 45-52ft: Grey-brown silty sand
92-101ft: Brown sand and gravel fine to medium (dirty)		52-62ft: Grey sandy silt
101-104ft: Brown sand gravel and cobbles		62-65ft: Brown medium grained sand with some gravel
104-115: Brown sand and gravel and cobbles (cleaner)		65-67ft: Grey sandy silt
		67-81ft: Grey brown silty sand with minor gravel
		81-92ft: Brown silty sand with some clay
		92-115ft: Coarse sand and gravel, water bearing
		115-15-16ft: Gravel with clay

Karst likelihood for the wells is low as identified in the Government of British Columbia data catalogue published by the Ministry of Forests Lands Natural Resource Operations and Rural Development – Forest Analysis and Inventory (Gov’t of BC, n.d.(b)).

Table 6 – GARP aquifer Type and Setting

Hazards	Present (Yes/No)	Risk (Yes/Low)	Comments
Has an intake depth <15m below ground surface	No	Low	Well depths are 35m
Is situated in a highly vulnerable, unconfined, unconsolidated or fractured bedrock	Yes	Low	The Golder report describes the aquifer as confined, while the Kala report described the aquifer as semi-confined.
Is completed in a karst bedrock aquifer, regardless of depth	No	Low	Not identified as potential karst topography

4 RECOMMENDATIONS

By applying the provincial Guidance Document for Determining Groundwater at Risk of Containing Pathogens, this Level 1, Stage 1 GARP assessment presents several parameters that may infer GARP-virus only potential. Recommendations include installation of a bentonite surface seal on both wells, and site grading away from the well heads to meet the GWPR requirements.

5 CLOSURE

This report was prepared for use by the Regional District of Central Kootenay and Interior Health Authority, and may be distributed or reproduced as required for their purposes.



Alexandra Divlakovski, BSc
Environmental Coordinator – Utility Services
Regional District of Central Kootenay

References:

- BC *Drinking Water Protection Act* (SBC 2001) Retrieved from:
http://www.bclaws.ca/Recon/document/ID/freeside/00_01009_01
- BC *Water Sustainability Act* (SBC 2014) Retrieved from:
<http://www.bclaws.ca/civix/document/id/complete/statreg/14015>
- BC *Drinking Water Protection Regulation* (B.C. Reg. 200/2003) Retrieved from:
http://www.bclaws.ca/civix/document/id/loo72/loo72/200_2003.
- BC *Groundwater Protection Regulation* (B.C. Reg. 299/2004) Retrieved from:
http://www.bclaws.ca/civix/document/id/loo69/loo69/11_299_2004
- BC *Groundwater Protection Regulation* (B.C. Reg. 39/2016) Retrieved from:
http://www.bclaws.ca/civix/document/id/complete/statreg/39_2016
- BC *Health Hazards Regulations* (B.C. Reg. 216/2011) Retrieved from:
http://www.bclaws.ca/civix/document/id/loo87/loo87/216_2011
- Gov't of BC (n.d.(a)) Data Catalogue –Ground Water Aquifers. Retrieved from:
<https://catalogue.data.gov.bc.ca/dataset/reconnaissance-karst-potential-mapping>
- Gov't of BC (n.d.(b)) Data Catalogue – Reconnaissance Karst Potential Mapping. Retrieved from:
<https://catalogue.data.gov.bc.ca/dataset/reconnaissance-karst-potential-mapping>
- Gov't of BC (n.d.(c)) iMapBC. Retrieved from: <https://maps.gov.bc.ca/ess/hm/imap4m/>
- Gov't of BC (2015) Drinking Water Treatment Objectives (Microbiological) for Ground Water Supplies in British Columbia version 1. Retrieved from: http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/documents/ground_water_treatment_objectives_nov2015.pdf
- Gov't of BC (2017) Guidance Document for Determining Groundwater at Risk of Containing Pathogens (GARP) Version 3. Retrieved from: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/how-drinking-water-is-protected-in-bc/garp_assessment_oct_2017.pdf
- Gov't of Canada (2017) Guidelines for Canadian Drinking Water Quality – Summary Table. Retrieved from: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html>
- Health Canada (2017) Enteric Viruses in Drinking Water. Retrieved from:
<https://www.canada.ca/en/health-canada/programs/consultation-enteric-virus-drinking-water/document.html>

Appendix A

Water Quality Test Results

REPORTED TO	Regional District of Central Kootenay - Nelson Box 590 - 202 Lakeside Drive Nelson, BC V1L 5R4	TEL	(800) 268-7325
		FAX	(250) 352-9300
ATTENTION	Mr. Steve Ethier	WORK ORDER	7080204
PO NUMBER	RDCK- Nelson	RECEIVED / TEMP	2017-08-02 08:15 / 13°C
PROJECT	Burton Pumphouse Well #1 & #2	REPORTED	2017-08-21
PROJECT INFO		COC NUMBER	B55336

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.



Authorized By:

Kristin McKeown
Account Manager

If you have any questions or concerns, please contact me at kmckeown@caro.ca

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100

www.caro.ca

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analysis Description	Method Reference	Technique	Location
Alkalinity in Water	APHA 2320 B*	Titration with H2SO4	Kelowna
Anions by IC in Water	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Carbon, Total Organic in Water	APHA 5310 B	High Temperature Combustion, Infrared CO2 Detection	Kelowna
Coliforms, Total (MF-CCA) in Water	APHA 9222*	Membrane Filtration / Incubation on Chromocult Agar	Kelowna
Colour, True in Water	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection Analysis with In-Line Ultraviolet Digestion and Amperometric Detection	Kelowna
E. coli (MF-CCA) in Water	APHA 9222*	Membrane Filtration / Incubation on Chromocult Agar	Kelowna
Hardness (as CaCO3) in Water	APHA 2340 B*	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Estimated)	N/A
Langelier Index in Water	APHA 2330 B	Calculation	N/A
Mercury, total by CVAFS in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
Particle Size Distribution in Water	ISO 13319	Electrical Sensing Zone	Sublet
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved (calc) in Water	APHA 1030 E	Calculation: 100 x ((Cations)-[Anions])/([Cations]+[Anions])	N/A
Tannin and Lignin in Water	APHA 5550 B	Colorimetry	Edmonton
Temperature (lab) in Water	APHA 2550 B	Thermometer	Kelowna
Total Metals by ICPMS in Water	APHA 3030 E* / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Transmissivity at 254 nm in Water	APHA 5910 B*	Ultraviolet Absorption	Kelowna
Turbidity in Water	APHA 2130 B	Nephelometry	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Method Reference Descriptions:

APHA	Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
AO	Aesthetic objective
MAC	Maximum acceptable concentration (health based)
OG	Operational guideline (treated water)
% T	Percent Transmittance
°C	Degrees Celcius
CFU/100 mL	Colony Forming Units per 100 millilitres
CU	Colour Units (referenced against a platinum cobalt standard)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre

REPORTED TO Regional District of Central Kootenay - Nelson
PROJECT Burton Pumphouse Well #1 & #2

WORK ORDER 7080204
REPORTED 2017-08-21

Standards / Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Feb 2017)

Website: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result / Recovery	Standard / Guideline	MRL / Limits	Units	Prepared	Analyzed	Notes
---------	-------------------	----------------------	--------------	-------	----------	----------	-------

Sample ID: Well #1 (7080204-01) [Water] Sampled: 2017-08-01 06:36

Anions

Chloride	2.87	AO ≤ 250	0.10	mg/L	N/A	2017-08-03	
Fluoride	0.28	MAC = 1.5	0.10	mg/L	N/A	2017-08-03	
Nitrate (as N)	0.187	MAC = 10	0.010	mg/L	N/A	2017-08-03	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	N/A	2017-08-03	
Sulfate	18.1	AO ≤ 500	1.0	mg/L	N/A	2017-08-03	

General Parameters

Alkalinity, Total (as CaCO3)	181	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Bicarbonate (as CaCO3)	181	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Carbon, Total Organic	< 0.50	N/A	0.50	mg/L	N/A	2017-08-03	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	N/A	2017-08-03	
Conductivity (EC)	354	N/A	2.0	µS/cm	N/A	2017-08-03	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	N/A	2017-08-04	
pH	7.82	7.0-10.5	0.10	pH units	N/A	2017-08-03	HT2
Tannin and Lignin	< 0.20	N/A	0.20	mg/L	2017-08-09	2017-08-09	
Temperature, at pH	23	N/A		°C	N/A	2017-08-03	HT2
Turbidity	0.12	OG < 0.1	0.10	NTU	N/A	2017-08-03	
UV Transmittance @ 254nm	99.7	N/A	0.10	% T	N/A	2017-08-03	

Calculated Parameters

Hardness, Total (as CaCO3)	164	N/A	0.500	mg/L	N/A	N/A	
Langelier Index	0.3	N/A	-5.0	-	N/A	2017-08-10	
Solids, Total Dissolved (calc)	198	N/A	1.00	mg/L	N/A	N/A	

Particle Size Distribution

Refer to Appendix	Refer to Appendix	N/A	-		N/A	2017-08-04	
-------------------	-------------------	-----	---	--	-----	------------	--

Total Metals

Aluminum, total	0.0054	OG < 0.1	0.0050	mg/L	2017-08-03	2017-08-04	
Antimony, total	< 0.00010	MAC = 0.006	0.00010	mg/L	2017-08-03	2017-08-04	
Arsenic, total	0.00073	MAC = 0.01	0.00050	mg/L	2017-08-03	2017-08-04	
Barium, total	0.0363	MAC = 1	0.0050	mg/L	2017-08-03	2017-08-04	
Boron, total	0.0125	MAC = 5	0.0050	mg/L	2017-08-03	2017-08-04	
Cadmium, total	0.000026	MAC = 0.005	0.000010	mg/L	2017-08-03	2017-08-04	
Calcium, total	47.0	N/A	0.20	mg/L	2017-08-03	2017-08-04	
Chromium, total	0.00057	MAC = 0.05	0.00050	mg/L	2017-08-03	2017-08-04	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2017-08-03	2017-08-04	
Copper, total	0.00021	AO ≤ 1	0.00020	mg/L	2017-08-03	2017-08-04	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2017-08-03	2017-08-04	
Lead, total	< 0.00010	MAC = 0.01	0.00010	mg/L	2017-08-03	2017-08-04	
Magnesium, total	11.4	N/A	0.010	mg/L	2017-08-03	2017-08-04	
Manganese, total	< 0.00020	AO ≤ 0.05	0.00020	mg/L	2017-08-03	2017-08-04	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2017-08-08	2017-08-08	

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result / Recovery	Standard / Guideline	MRL / Limits	Units	Prepared	Analyzed	Notes
---------	-------------------	----------------------	--------------	-------	----------	----------	-------

Sample ID: Well #1 (7080204-01) [Water] Sampled: 2017-08-01 06:36, Continued

Total Metals, Continued

Molybdenum, total	0.00294	N/A	0.00010	mg/L	2017-08-03	2017-08-04	
Nickel, total	0.00022	N/A	0.00020	mg/L	2017-08-03	2017-08-04	
Potassium, total	2.56	N/A	0.10	mg/L	2017-08-03	2017-08-04	
Selenium, total	0.00135	MAC = 0.05	0.00050	mg/L	2017-08-03	2017-08-04	
Sodium, total	5.17	AO ≤ 200	0.10	mg/L	2017-08-03	2017-08-04	
Uranium, total	0.00221	MAC = 0.02	0.000020	mg/L	2017-08-03	2017-08-04	
Zinc, total	0.0075	AO ≤ 5	0.0040	mg/L	2017-08-03	2017-08-04	

Microbiological Parameters

Coliforms, Total	< 1	MAC = None Detected	1	CFU/100 mL	N/A	2017-08-02	
E. coli	< 1	MAC = None Detected	1	CFU/100 mL	N/A	2017-08-02	

Sample ID: Well #2 (7080204-02) [Water] Sampled: 2017-08-01 06:53

Anions

Chloride	3.42	AO ≤ 250	0.10	mg/L	N/A	2017-08-03	
Fluoride	0.23	MAC = 1.5	0.10	mg/L	N/A	2017-08-03	
Nitrate (as N)	0.189	MAC = 10	0.010	mg/L	N/A	2017-08-03	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	N/A	2017-08-03	
Sulfate	18.4	AO ≤ 500	1.0	mg/L	N/A	2017-08-03	

General Parameters

Alkalinity, Total (as CaCO ₃)	169	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Bicarbonate (as CaCO ₃)	169	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-03	
Carbon, Total Organic	< 0.50	N/A	0.50	mg/L	N/A	2017-08-03	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	N/A	2017-08-03	
Conductivity (EC)	363	N/A	2.0	µS/cm	N/A	2017-08-03	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020	mg/L	N/A	2017-08-04	
pH	7.84	7.0-10.5	0.10	pH units	N/A	2017-08-03	HT2
Tannin and Lignin	< 0.20	N/A	0.20	mg/L	2017-08-09	2017-08-09	
Temperature, at pH	24	N/A		°C	N/A	2017-08-03	HT2
Turbidity	1.08	OG < 0.1	0.10	NTU	N/A	2017-08-03	
UV Transmittance @ 254nm	99.7	N/A	0.10	% T	N/A	2017-08-03	

Calculated Parameters

Hardness, Total (as CaCO ₃)	168	N/A	0.500	mg/L	N/A	N/A	
Langelier Index	0.3	N/A	-5.0	-	N/A	2017-08-10	
Solids, Total Dissolved (calc)	194	N/A	1.00	mg/L	N/A	N/A	

Particle Size Distribution

Refer to Appendix	Refer to Appendix	N/A	-		N/A	2017-08-04	
-------------------	-------------------	-----	---	--	-----	------------	--

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result / Recovery	Standard / Guideline	MRL / Limits	Units	Prepared	Analyzed	Notes
---------	-------------------	----------------------	--------------	-------	----------	----------	-------

Sample ID: Well #2 (7080204-02) [Water] Sampled: 2017-08-01 06:53, Continued

Total Metals							
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2017-08-03	2017-08-04	
Antimony, total	< 0.00010	MAC = 0.006	0.00010	mg/L	2017-08-03	2017-08-04	
Arsenic, total	0.00061	MAC = 0.01	0.00050	mg/L	2017-08-03	2017-08-04	
Barium, total	0.0369	MAC = 1	0.0050	mg/L	2017-08-03	2017-08-04	
Boron, total	0.0123	MAC = 5	0.0050	mg/L	2017-08-03	2017-08-04	
Cadmium, total	0.000026	MAC = 0.005	0.000010	mg/L	2017-08-03	2017-08-04	
Calcium, total	48.8	N/A	0.20	mg/L	2017-08-03	2017-08-04	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2017-08-03	2017-08-04	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2017-08-03	2017-08-04	
Copper, total	0.00022	AO ≤ 1	0.00020	mg/L	2017-08-03	2017-08-04	
Iron, total	0.010	AO ≤ 0.3	0.010	mg/L	2017-08-03	2017-08-04	
Lead, total	< 0.00010	MAC = 0.01	0.00010	mg/L	2017-08-03	2017-08-04	
Magnesium, total	11.3	N/A	0.010	mg/L	2017-08-03	2017-08-04	
Manganese, total	0.00022	AO ≤ 0.05	0.00020	mg/L	2017-08-03	2017-08-04	
Mercury, total	< 0.000010	MAC = 0.001	0.000010	mg/L	2017-08-08	2017-08-08	
Molybdenum, total	0.00277	N/A	0.00010	mg/L	2017-08-03	2017-08-04	
Nickel, total	< 0.00020	N/A	0.00020	mg/L	2017-08-03	2017-08-04	
Potassium, total	2.58	N/A	0.10	mg/L	2017-08-03	2017-08-04	
Selenium, total	0.00220	MAC = 0.05	0.00050	mg/L	2017-08-03	2017-08-04	
Sodium, total	5.22	AO ≤ 200	0.10	mg/L	2017-08-03	2017-08-04	
Uranium, total	0.00245	MAC = 0.02	0.000020	mg/L	2017-08-03	2017-08-04	
Zinc, total	0.0070	AO ≤ 5	0.0040	mg/L	2017-08-03	2017-08-04	

Microbiological Parameters							
Coliforms, Total	< 1	MAC = None Detected		1 CFU/100 mL	N/A	2017-08-02	
E. coli	< 1	MAC = None Detected		1 CFU/100 mL	N/A	2017-08-02	

Sample / Analysis Qualifiers:	
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

REPORTED TO Regional District of Central Kootenay - Nelson
PROJECT Burton Pumphouse Well #1 & #2

WORK ORDER 7080204
REPORTED 2017-08-21

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup):** Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS):** A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM):** A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
Anions, Batch B7H0231									
Blank (B7H0231-BLK1) Prepared: 2017-08-03, Analyzed: 2017-08-03									
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
Blank (B7H0231-BLK2) Prepared: 2017-08-03, Analyzed: 2017-08-03									
Chloride	< 0.10	0.10 mg/L							
Fluoride	< 0.10	0.10 mg/L							
Nitrate (as N)	< 0.010	0.010 mg/L							
Nitrite (as N)	< 0.010	0.010 mg/L							
Sulfate	< 1.0	1.0 mg/L							
LCS (B7H0231-BS1) Prepared: 2017-08-03, Analyzed: 2017-08-03									
Chloride	15.9	0.10 mg/L	16.0		99	90-110			
Fluoride	3.84	0.10 mg/L	4.00		96	88-108			
Nitrate (as N)	4.00	0.010 mg/L	4.00		100	93-108			
Nitrite (as N)	2.14	0.010 mg/L	2.00		107	85-114			
Sulfate	16.3	1.0 mg/L	16.0		102	91-109			
LCS (B7H0231-BS2) Prepared: 2017-08-03, Analyzed: 2017-08-03									
Chloride	15.9	0.10 mg/L	16.0		100	90-110			
Fluoride	3.91	0.10 mg/L	4.00		98	88-108			
Nitrate (as N)	4.24	0.010 mg/L	4.00		106	93-108			
Nitrite (as N)	2.14	0.010 mg/L	2.00		107	85-114			
Sulfate	15.9	1.0 mg/L	16.0		99	91-109			
Duplicate (B7H0231-DUP1) Source: 7080204-01 Prepared: 2017-08-03, Analyzed: 2017-08-03									
Chloride	2.84	0.10 mg/L		2.87			< 1	10	
Fluoride	0.26	0.10 mg/L		0.28				10	
Nitrate (as N)	0.191	0.010 mg/L		0.187			2	10	
Nitrite (as N)	< 0.010	0.010 mg/L		< 0.010				6	
Sulfate	18.1	1.0 mg/L		18.1			< 1	6	

APPENDIX 1: QUALITY CONTROL DATA

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
Anions, Batch B7H0231, Continued									
Matrix Spike (B7H0231-MS1)		Source: 7080204-01		Prepared: 2017-08-03, Analyzed: 2017-08-03					
Chloride	18.5	0.10 mg/L	16.0	2.87	98	75-125			
Fluoride	4.13	0.10 mg/L	4.00	0.28	96	75-125			
Nitrate (as N)	4.33	0.010 mg/L	4.00	0.187	104	75-125			
Nitrite (as N)	2.10	0.010 mg/L	2.00	< 0.010	105	80-120			
Sulfate	34.1	1.0 mg/L	16.0	18.1	100	75-125			
General Parameters, Batch B7H0113									
Blank (B7H0113-BLK1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Carbon, Total Organic	< 0.50	0.50 mg/L							
LCS (B7H0113-BS1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Carbon, Total Organic	9.46	0.50 mg/L	10.0		95	78-116			
General Parameters, Batch B7H0196									
Blank (B7H0196-BLK1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Turbidity	< 0.10	0.10 NTU							
LCS (B7H0196-BS1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Turbidity	38.2	0.10 NTU	40.0		96	90-110			
General Parameters, Batch B7H0208									
Blank (B7H0208-BLK1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Alkalinity, Total (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Phenolphthalein (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Bicarbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Carbonate (as CaCO ₃)	< 1.0	1.0 mg/L							
Alkalinity, Hydroxide (as CaCO ₃)	< 1.0	1.0 mg/L							
Conductivity (EC)	< 2.0	2.0 µS/cm							
LCS (B7H0208-BS1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Alkalinity, Total (as CaCO ₃)	99.8	1.0 mg/L	100		100	92-106			
LCS (B7H0208-BS2)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Conductivity (EC)	1420	2.0 µS/cm	1410		101	95-104			
Reference (B7H0208-SRM1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
pH	7.00	0.10 pH units	7.00		100	98-102			HT2
General Parameters, Batch B7H0209									
Blank (B7H0209-BLK1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Colour, True	< 5.0	5.0 CU							
LCS (B7H0209-BS1)		Prepared: 2017-08-03, Analyzed: 2017-08-03							
Colour, True	10	5.0 CU	10.0		100	85-115			
Duplicate (B7H0209-DUP1)		Source: 7080204-01		Prepared: 2017-08-03, Analyzed: 2017-08-03					
Colour, True	< 5.0	5.0 CU		< 5.0				15	
General Parameters, Batch B7H0229									

APPENDIX 1: QUALITY CONTROL DATA

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
General Parameters, Batch B7H0229, Continued									
Blank (B7H0229-BLK1)			Prepared: 2017-08-03, Analyzed: 2017-08-03						
UV Transmittance @ 254nm	< 0.10	0.10 % T							
LCS (B7H0229-BS1)			Prepared: 2017-08-03, Analyzed: 2017-08-03						
UV Transmittance @ 254nm	43.1	0.10 % T	42.2		102	98-103			
General Parameters, Batch B7H0332									
Blank (B7H0332-BLK1)			Prepared: 2017-08-04, Analyzed: 2017-08-04						
Cyanide, Total	< 0.0020	0.0020 mg/L							
LCS (B7H0332-BS1)			Prepared: 2017-08-04, Analyzed: 2017-08-04						
Cyanide, Total	0.0202	0.0020 mg/L	0.0200		101	82-120			
LCS Dup (B7H0332-BSD1)			Prepared: 2017-08-04, Analyzed: 2017-08-04						
Cyanide, Total	0.0205	0.0020 mg/L	0.0200		102	82-120	1	10	
General Parameters, Batch B7H0602									
Blank (B7H0602-BLK1)			Prepared: 2017-08-09, Analyzed: 2017-08-09						
Tannin and Lignin	< 0.20	0.20 mg/L							
Blank (B7H0602-BLK2)			Prepared: 2017-08-09, Analyzed: 2017-08-09						
Tannin and Lignin	< 0.20	0.20 mg/L							
LCS (B7H0602-BS1)			Prepared: 2017-08-09, Analyzed: 2017-08-09						
Tannin and Lignin	4.85	0.20 mg/L	5.00		97	92-103			
LCS (B7H0602-BS2)			Prepared: 2017-08-09, Analyzed: 2017-08-09						
Tannin and Lignin	4.87	0.20 mg/L	5.00		97	92-103			
Microbiological Parameters, Batch B7H0115									
Blank (B7H0115-BLK1)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK2)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK3)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK4)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK5)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK6)			Prepared: 2017-08-02, Analyzed: 2017-08-02						
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							

APPENDIX 1: QUALITY CONTROL DATA

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
Microbiological Parameters, Batch B7H0115, Continued									
Blank (B7H0115-BLK7)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK8)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLK9)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLKA)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLKB)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							
Blank (B7H0115-BLKC)					Prepared: 2017-08-02, Analyzed: 2017-08-02				
Coliforms, Total	< 1	1 CFU/100 mL							
E. coli	< 1	1 CFU/100 mL							

Total Metals, Batch B7H0295

Blank (B7H0295-BLK1)					Prepared: 2017-08-03, Analyzed: 2017-08-04				
Aluminum, total	< 0.0050	0.0050 mg/L							
Antimony, total	< 0.00010	0.00010 mg/L							
Arsenic, total	< 0.00050	0.00050 mg/L							
Barium, total	< 0.0050	0.0050 mg/L							
Boron, total	< 0.0050	0.0050 mg/L							
Cadmium, total	< 0.000010	0.000010 mg/L							
Calcium, total	< 0.20	0.20 mg/L							
Chromium, total	< 0.00050	0.00050 mg/L							
Cobalt, total	< 0.00010	0.00010 mg/L							
Copper, total	< 0.00020	0.00020 mg/L							
Iron, total	< 0.010	0.010 mg/L							
Lead, total	< 0.00010	0.00010 mg/L							
Magnesium, total	< 0.010	0.010 mg/L							
Manganese, total	< 0.00020	0.00020 mg/L							
Molybdenum, total	< 0.00010	0.00010 mg/L							
Nickel, total	< 0.00020	0.00020 mg/L							
Potassium, total	< 0.10	0.10 mg/L							
Selenium, total	< 0.00050	0.00050 mg/L							
Sodium, total	< 0.10	0.10 mg/L							
Uranium, total	< 0.000020	0.000020 mg/L							
Zinc, total	< 0.0040	0.0040 mg/L							
LCS (B7H0295-BS1)					Prepared: 2017-08-03, Analyzed: 2017-08-04				
Aluminum, total	0.0225	0.0050 mg/L	0.0200		112	80-120			
Antimony, total	0.0197	0.00010 mg/L	0.0200		98	80-120			
Arsenic, total	0.0193	0.00050 mg/L	0.0200		96	80-120			
Barium, total	0.0187	0.0050 mg/L	0.0200		93	80-120			
Boron, total	0.0229	0.0050 mg/L	0.0200		114	80-120			
Cadmium, total	0.0201	0.000010 mg/L	0.0200		100	80-120			
Calcium, total	2.00	0.20 mg/L	2.00		100	80-120			
Chromium, total	0.0193	0.00050 mg/L	0.0200		97	80-120			

APPENDIX 1: QUALITY CONTROL DATA

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 7080204
2017-08-21

Analyte	Result	MRL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Notes
---------	--------	-----------	-------------	---------------	-------	-----------	-------	-----------	-------

Total Metals, Batch B7H0295, Continued

LCS (B7H0295-BS1), Continued				Prepared: 2017-08-03, Analyzed: 2017-08-04					
Cobalt, total	0.0197	0.00010	mg/L	0.0200	98	80-120			
Copper, total	0.0206	0.00020	mg/L	0.0200	103	80-120			
Iron, total	1.89	0.010	mg/L	2.00	94	80-120			
Lead, total	0.0197	0.00010	mg/L	0.0200	98	80-120			
Magnesium, total	1.91	0.010	mg/L	2.00	96	80-120			
Manganese, total	0.0192	0.00020	mg/L	0.0200	96	80-120			
Molybdenum, total	0.0182	0.00010	mg/L	0.0200	91	80-120			
Nickel, total	0.0196	0.00020	mg/L	0.0200	98	80-120			
Potassium, total	1.83	0.10	mg/L	2.00	91	80-120			
Selenium, total	0.0218	0.00050	mg/L	0.0200	109	80-120			
Sodium, total	1.96	0.10	mg/L	2.40	82	80-120			
Uranium, total	0.0199	0.000020	mg/L	0.0200	99	80-120			
Zinc, total	0.0217	0.0040	mg/L	0.0200	109	80-120			

Reference (B7H0295-SRM1)				Prepared: 2017-08-03, Analyzed: 2017-08-04					
Aluminum, total	0.287	0.0050	mg/L	0.303	95	81-129			
Antimony, total	0.0511	0.00010	mg/L	0.0511	100	88-114			
Arsenic, total	0.116	0.00050	mg/L	0.118	99	88-114			
Barium, total	0.757	0.0050	mg/L	0.823	92	72-104			
Boron, total	3.56	0.0050	mg/L	3.45	103	75-121			
Cadmium, total	0.0500	0.000010	mg/L	0.0495	101	89-111			
Calcium, total	10.6	0.20	mg/L	11.6	92	86-121			
Chromium, total	0.244	0.00050	mg/L	0.250	98	89-114			
Cobalt, total	0.0384	0.00010	mg/L	0.0377	102	91-113			
Copper, total	0.506	0.00020	mg/L	0.486	104	91-115			
Iron, total	0.475	0.010	mg/L	0.488	97	77-124			
Lead, total	0.195	0.00010	mg/L	0.204	96	92-113			
Magnesium, total	3.68	0.010	mg/L	3.79	97	78-120			
Manganese, total	0.103	0.00020	mg/L	0.109	95	90-114			
Molybdenum, total	0.190	0.00010	mg/L	0.198	96	90-111			
Nickel, total	0.247	0.00020	mg/L	0.249	99	90-111			
Potassium, total	6.69	0.10	mg/L	7.21	93	84-113			
Selenium, total	0.131	0.00050	mg/L	0.121	108	85-115			
Sodium, total	7.19	0.10	mg/L	7.54	95	82-123			
Uranium, total	0.0296	0.000020	mg/L	0.0306	97	85-120			
Zinc, total	2.48	0.0040	mg/L	2.49	100	85-111			

Total Metals, Batch B7H0491

Blank (B7H0491-BLK1)				Prepared: 2017-08-08, Analyzed: 2017-08-08					
Mercury, total	< 0.000010	0.000010	mg/L						
Blank (B7H0491-BLK2)				Prepared: 2017-08-08, Analyzed: 2017-08-08					
Mercury, total	< 0.000010	0.000010	mg/L						
Reference (B7H0491-SRM1)				Prepared: 2017-08-08, Analyzed: 2017-08-08					
Mercury, total	0.00467	0.000010	mg/L	0.00489	95	70-130			
Reference (B7H0491-SRM2)				Prepared: 2017-08-08, Analyzed: 2017-08-08					
Mercury, total	0.00461	0.000010	mg/L	0.00489	94	70-130			

QC Qualifiers:

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.



CERTIFICATE OF ANALYSIS

REPORTED TO	Regional District of Central Kootenay - Nelson Box 590 - 202 Lakeside Drive Nelson, BC V1L 5R4	WORK ORDER	9101372
ATTENTION	Alex Divakovski	RECEIVED / TEMP REPORTED	2019-10-11 09:25 / 2°C 2019-10-21 14:15
PO NUMBER	RDCK- Nelson	COC NUMBER	No Number
PROJECT	Burton Pumphouse Well #1 & #2		
PROJECT INFO	Burton Wells GARP Assessment		

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

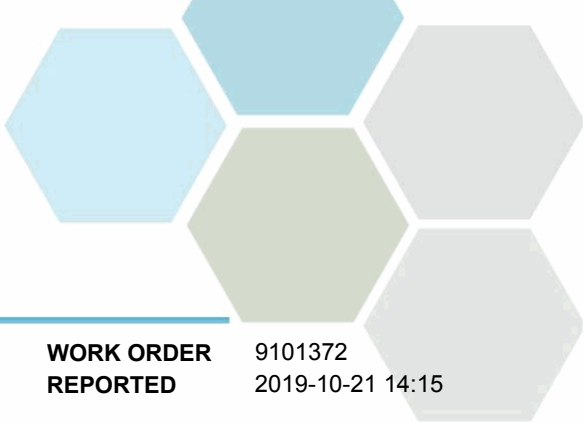
If you have any questions or concerns, please contact me at acrump@caro.ca

Authorized By:

Alana Crump
Junior Account Manager

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7

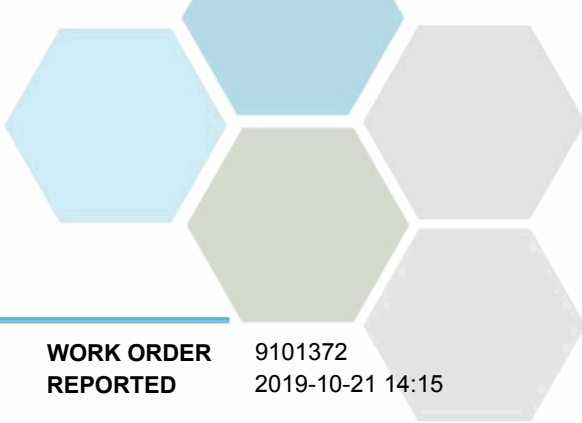


TEST RESULTS

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 9101372
2019-10-21 14:15

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Well #1 (9101372-01) Matrix: Water Sampled: 2019-10-09						
<i>General Parameters</i>						
Nitrogen, Total Kjeldahl	< 0.050	N/A	0.050	mg/L	2019-10-17	
Phosphorus, Total (as P)	0.0053	N/A	0.0020	mg/L	2019-10-18	
Well #2 (9101372-02) Matrix: Water Sampled: 2019-10-09						
<i>General Parameters</i>						
Nitrogen, Total Kjeldahl	0.252	N/A	0.050	mg/L	2019-10-17	
Phosphorus, Total (as P)	0.0037	N/A	0.0020	mg/L	2019-10-18	



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 9101372
2019-10-21 14:15

Analysis Description	Method Ref.	Technique	Location
Nitrogen, Total Kjeldahl in Water	SM 4500-Norg D* (2017)	Block Digestion and Flow Injection Analysis	Kelowna
Phosphorus, Total in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2017)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
mg/L	Milligrams per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

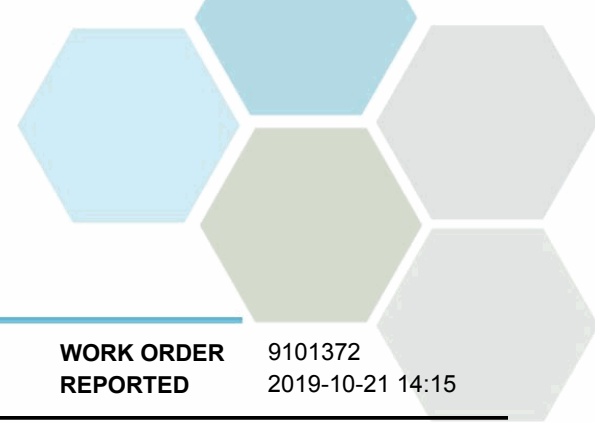
[Guidelines for Canadian Drinking Water Quality \(Health Canada, Feb 2017\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: acrump@caro.ca



APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO PROJECT Regional District of Central Kootenay - Nelson
Burton Pumphouse Well #1 & #2

WORK ORDER REPORTED 9101372
2019-10-21 14:15

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk):** A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup):** An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS):** A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS):** A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM):** A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
---------	--------	----------	-------------	---------------	-------	-----------	-------	-----------	-----------

General Parameters, Batch B9J1489

Blank (B9J1489-BLK1)			Prepared: 2019-10-16, Analyzed: 2019-10-17						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
Blank (B9J1489-BLK2)			Prepared: 2019-10-16, Analyzed: 2019-10-17						
Nitrogen, Total Kjeldahl	< 0.050	0.050 mg/L							
LCS (B9J1489-BS1)			Prepared: 2019-10-16, Analyzed: 2019-10-17						
Nitrogen, Total Kjeldahl	1.08	0.050 mg/L	1.00		108	85-115			
LCS (B9J1489-BS2)			Prepared: 2019-10-16, Analyzed: 2019-10-17						
Nitrogen, Total Kjeldahl	1.03	0.050 mg/L	1.00		103	85-115			

General Parameters, Batch B9J1719

Blank (B9J1719-BLK1)			Prepared: 2019-10-18, Analyzed: 2019-10-18						
Phosphorus, Total (as P)	< 0.0020	0.0020 mg/L							
LCS (B9J1719-BS1)			Prepared: 2019-10-18, Analyzed: 2019-10-18						
Phosphorus, Total (as P)	0.101	0.0020 mg/L	0.100		101	85-115			

Burton Adverse Bacteriological Sample Summary

Sample Date	Sample Location	Parameter Exceeded	cfu/100 mL
22 Sep 2011		Fecal Coliform	82
09 May 2013		Total Coliform	1
20 Aug 2013	Burton Main Road	Total Coliform	82
20 Aug 2013	Burton Main Road	E.coli	4
23 Aug 2013	Burton Main Rd (prior to chlorination)	Total Coliform	160
23 Aug 2013	Burton Main Rd (prior to chlorination)	E.coli	6
24 Aug 2013	Burton Reservoir (prior to chlorination)	Total Coliform	360
24 Aug 2013	Burton Reservoir (prior to chlorination)	E.coli	16
24 Sep 2013	Burton Main Road	Total Coliform	Background growth with coliforms
24 Sep 2013	Burton Main Road	None	Background growth
08 Oct 2013		Total Coliform	1
29 Oct 2013	Burton Main Road	Total Coliform	7
05 Nov 2013	Burton Main Road	None	Background growth
29 Apr 2014	Burton Main Road	Total Coliform	1
06 May 2014	Burton Crossroad - Ball field - Stn 1	Total Coliform	1
16 Aug 2016	Burton Main Road	Total Coliform	17
16 Aug 2016	Burton Main Road	E.coli	1
30 Aug 2016	Burton Crossroad - Ball field - Stn 1	Total Coliform	20
30 Aug 2016	Burton Crossroad - Ball field - Stn 1	E.coli	1
28 Nov 2016	Burton Crossroad - Ball field - Stn 1	Total Coliform	1
28 Nov 2016	Burton Crossroad - Ball field - Stn 1	Total Coliform	1
28 Nov 2016	Burton Crossroad - Ball field - Stn 1	E.coli	1
10 Oct 2018	Burton Crossroad - Ball field - Stn 1	Total Coliform	2
11 Oct 2018	Burton Main Road - Stn 2	Total Coliform	4
04 Sep 2019	Burton Main Raod Stn 2	Total Coliform	1

Drinking Water Regulation Schedule A

Parameter	Standard
Fecal coliform bacteria	No detectable fecal coliform bacteria per 100 ml.
Escherichia coli	No detectable <i>Escherichia coli</i> per 100 ml.
Total coliform bacteria (a) 1 sample in a 30 day period (b) more than 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml. At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml.



Home > Your Environment > Drinking Water > Water Samples

Sampling Results

The list contains beach water quality samples taken over the last 60 days.

To find the results of water samples taken for a water supply system or a beach, enter the first three letters of a facility, city, town or beach name in the search textbox. Alternatively, select one of three geographical regions in the Region dropdown to see all of the samples within an entire region.

This site is best viewed using Google Chrome or Mozilla Firefox.

Water Samples			
Enter Facility:	<input type="text" value="Burton Water Service"/>	OR City:	<input type="text"/>
		OR Region:	<input type="text" value="-- Select a Region --"/>

filter search results to only display beaches

Facility	Test Type	Date Collected	Sample Site	Result	Sample Parameter	Unit of Measure	Interpretation
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	06 Nov 2019	Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service	Drinking Water -	23 Oct 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable



BRITISH
COLUMBIA





Home > Your Environment > Drinking Water > Water Samples

Sampling Results

The list contains beach water quality samples taken over the last 60 days.

To find the results of water samples taken for a water supply system or a beach, enter the first three letters of a facility, city, town or beach name in the search textbox. Alternatively, select one of three geographical regions in the Region dropdown to see all of the samples within an entire region.

This site is best viewed using Google Chrome or Mozilla Firefox.

Location	Sample Type	Date	Well/Location	Result	Parameter	Unit	Status
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	30 Oct 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	23 Oct 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	16 Oct 2019	Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable





Home > Your Environment > Drinking Water > Water Samples

Sampling Results

The list contains beach water quality samples taken over the last 60 days.

To find the results of water samples taken for a water supply system or a beach, enter the first three letters of a facility, city, town or beach name in the search textbox. Alternatively, select one of three geographical regions in the Region dropdown to see all of the samples within an entire region.

This site is best viewed using Google Chrome or Mozilla Firefox.

Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	09 Oct 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	02 Oct 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	25 Sep 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable

Page 1 of 1





Home > Your Environment > Drinking Water > Water Samples

Sampling Results

The list contains beach water quality samples taken over the last 60 days.

To find the results of water samples taken for a water supply system or a beach, enter the first three letters of a facility, city, town or beach name in the search textbox. Alternatively, select one of three geographical regions in the Region dropdown to see all of the samples within an entire region.

This site is best viewed using Google Chrome or Mozilla Firefox.

Water Samples			
Enter Facility:	<input type="text" value="Burton Water Service"/>	OR City:	<input type="text"/>
		OR Region:	<input type="text" value="-- Select a Region --"/>

filter search results to only display beaches

Facility	Test Type	Date Collected	Sample Site	Result	Sample Parameter	Unit of Measure	Interpretation
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	04 Dec 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service	Drinking Water -	20 Nov 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable





Home > Your Environment > Drinking Water > Water Samples

Sampling Results

The list contains beach water quality samples taken over the last 60 days.

To find the results of water samples taken for a water supply system or a beach, enter the first three letters of a facility, city, town or beach name in the search textbox. Alternatively, select one of three geographical regions in the Region dropdown to see all of the samples within an entire region.

This site is best viewed using Google Chrome or Mozilla Firefox.

Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	27 Nov 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton - W	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	20 Nov 2019	Burton - W	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton Main Road- NE-Stn 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton Main Road- NE-Stn 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton - Well 1	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton - Well 1	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton - Well 2	<1	E. coli	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton - Well 2	<1	Total Coliform	CFU per 100 ml	Acceptable
Burton Water Service McCormack Rd, Burton BC	Drinking Water - Bacteriological	13 Nov 2019	Burton Crossroad- Ball Field-Stn 1	<1	E. coli	CFU per 100 ml	Acceptable



BRITISH
COLUMBIA



Appendix B

RDCK August 2017 RAC Report



REGIONAL DISTRICT OF CENTRAL KOOTENAY

Committee Report

Date of Report: August 3, 2017
Date & Type of Meeting: August 16, 2017 Rural Affairs Committee
Author: Jason McDiarmid, Manager of Utility Services
Subject: BURTON WATER QUALITY ACTION PLAN
File: 5700-BUR-04

SECTION 1: EXECUTIVE SUMMARY

The purpose of this report is to gain approval from the Board of Directors for a water quality action plan for the Burton water system.

SECTION 2: BACKGROUND / ANALYSIS

The Burton Water System was constructed in 1966 and was operated by BC Hydro until it was transferred to the Regional District of Central Kootenay in 2011. Since 1998, the water source for Burton have been two groundwater wells on Lower McCormick Road. Water is delivered to the distribution system and the water storage reservoir without treatment.

Burton water customers have been subject to a number of Water Quality Advisories and Boil Water Notices due to the occasional re-occurring presence of total coliform bacteria and low levels of Escherichia coli bacteria in water sample test results. System upgrades and operational changes in recent years have resulted in less frequent and severe adverse sample results but staff has not definitively identified the potential source of the bacteria.

Water samples were taken from the distribution system more frequently than from the wells in the past. All adverse samples have been from the distribution system and none from the wells. Adverse sample results trigger immediate system disinfection and flushing therefore follow up sampling does not help identify the potential source of bacteria. Staff have since increased the sampling frequency and locations, and the wells are now sampled at the same time as the distribution system.

The Regional District hosted a community meeting in Burton on March 28, 2017, where background information on water quality was provided and disinfection options were presented. It was clear to staff that any option involving chlorine disinfection would not be supported by the community.

Regional District staff feels that the potential health risk warrants implementation of permanent chlorine disinfection in Burton, however; the staff recommends a water quality plan that represents a compromise between mitigating potential health risks, compliance with existing regulations and standards, and potential customer concerns about chlorination. The recommended water quality action plan for Burton is as follows:

- 1) Issue a long term Water Quality Advisory for Burton that can be eventually removed if there is a satisfactory history of good water sampling results.
- 2) Public facilities such as the campground, school, community center, food and beverage establishments, and the future senior's facility will be encouraged to install their own onsite

water disinfection systems.

- 3) The water system will be flushed more frequently in areas where water consumption might be low.
- 4) The school and campground will be encouraged to flush and disinfect their water systems when not used for extended periods of time.
- 5) Continue with more frequent bacteriological water sampling. The Regional District is currently sampling from the wells, two distribution locations and the water storage reservoir on a weekly basis.
- 6) Consumption level chlorination will be added to the Burton water system for a minimum two week period, twice annually.

It is hoped that chlorination twice a year will help clean and disinfect the distribution system. Ultraviolet (UV) disinfection was considered at the wells; however, UV does not provide disinfection downstream of the UV reactors and would only be effective if the source of bacteria was from the ground water wells. UV might be considered in the future if there are any future adverse water sample results from the wells.

Regional District staff do not feel that two short periods of consumptive level chlorination a year is unreasonable. Notice will be provided and any customers with an aversion to chlorine can drink bottled water or provide their own carbon filters to remove the chlorine. If we do not implement a plan of action or if ongoing water sampling in Burton does not comply with Schedule A of the Drinking Water Protection Regulation, the Regional District and Interior Health might ultimately require the issuance of a Boil Water Notice until permanent disinfection is implemented. Issuance of a Boil Water Notice could impact business and development. The proposed Water Quality Advisory does not impact potential development or business to the extent of a Boil Water Notice.

See attached July 20, 2017 Burton Water Quality and Disinfection Recommendation customer letter, and March 28, 2017 Water Quality & Disinfection Options Community Meeting handout for additional information.

SECTION 3: DETAILED ANALYSIS

a. Financial Considerations – Cost and Resource Allocations:

Included in Financial Plan: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Financial Plan Amendment: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
Debt Bylaw Required: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Public/Gov't Approvals req'd: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

The cost associated with implementation of chlorination twice a year is minimal. An emergency chlorinator has already been installed in Burton for use when bacteria are present in water sample test results.

The Regional District is already sampling more frequently in Burton. Interior Health has agreed to pay for increased sample testing on a temporary basis but potentially the water system might have to pay for some of the testing in the future.

There would be a small increase in operation and maintenance costs associated with increased flushing activities but this should be offset by a reduction in costs associated with response to adverse water quality events.

b. Legislative Considerations (Applicable Policies and/or Bylaws):

Historical Burton bacteriological test results are not in compliance with potability requirements set out in Schedule A of the Drinking Water Protection Regulation. The Regional District has been informed by Interior Health that ongoing noncompliance with the bacteriological standard, Schedule A of the Drinking Water Protection Regulation, usually means the water should not be considered potable and a Boil Water Notice is required. In addition, Interior Health has indicated that Water Quality Advisories or Boil Water Notices should not be considered permanent as water quality upgrades should ultimately be made.

If water quality does not improve, Interior Health may require a Ground Water at Risk of Containing Pathogens (GARP) assessment. This is a detailed, expensive assessment that would review whether or not the wells are at risk of containing pathogens. Some risk factors include proximity to surface water, septic systems and other potential sources of contamination. If found to be at risk, a minimum requirement of permanent disinfection could be expected.

c. Environmental Considerations:

None

d. Social Considerations:

Water quality in Burton currently presents a periodic and reoccurring public health risk and liability to the Regional District. Residents would be expected to be aware of the risks but new residents or visitors to the community are likely to not be aware of the potential health risks unless a permanent Water Quality Advisory is issued.

During past Boil Water Notices a couple of visitors staying at the campground immediately before issuance of a Boil Water Notice reported getting sick.

e. Economic Considerations:

Periodic and a potential permanent Boil Water Notice would impact development and business. The proposed Water Quality Advisory should have a lesser impact.

f. Communication Considerations:

Signage will be installed to inform residents and visitors that the water system is under a Water Quality Advisory.

Regular reminders of the Water Quality Advisory will be issued to customers.

Owners of public facilities will be encouraged to install their own disinfection systems and Staff can provide information on potential options.

Customers will be notified prior to annual chlorination and unidirectional flushing events.

g. Staffing/Departmental Workplan Considerations:

Additional staff time associated with water quality action plan implementation should be offset by staff time savings associated with responding to adverse water sample results.

h. Board Strategic Plan/Priorities Considerations:

Water Protection is a Board strategic priority.

SECTION 4: OPTIONS & PROS / CONS

Option 1 – Recommended Water Quality Action Plan

- Pro – Should result in less frequent and less severe adverse water sample results.
- Pro – Issuance of a long term Water Quality Advisory will increase resident and visitor awareness of potential health risks.
- Pro – Customers with an aversion to chlorination would be supplied with consumptive level chlorination for short periods only a few times a year.
- Con – Some public health risk is likely to remain.
- Con – Some potential liability to Regional District is likely to remain.

Option 2 – Implement Permanent Chlorine Disinfection

- Pro – Public health risk and potential liability to the Regional District would be mitigated.
- Con – Not likely to be supported by the majority of the community.

Option 3 – Do Nothing

- Pro – Customers with an aversion to chlorination would continue to not have chlorinated water.
- Con – Continued re-occurring health risk could result in residents and visitors becoming ill from drinking the water.
- Con – The Regional District could be found liable for any illness or death.
- Con – If a Water Quality Advisory is not issued, it is likely that some people consuming the water would not be aware of potential health risks.
- Con – Continued adverse bacteriological samples could result in the issuance of a Boil Water Notice until permanent disinfection is implemented. A Boil Water Notice would impact development and business.

SECTION 5: RECOMMENDATION(S)

That the Regional District Board of Directors direct Staff to implement the following water quality action plan for the Burton Water System:

- 1) Issue a long term Water Quality Advisory for Burton that can be eventually removed if there is a satisfactory history of good water sampling results.
- 2) Public facilities such as the campground, school, community center, food and beverage establishments, and the future senior's facility will be encouraged to install their own onsite water disinfection systems.
- 3) The water system will be flushed more frequently in areas where water consumption might be low.
- 4) The school and campground will be encouraged to flush and disinfect their water systems when not used for extended periods of time.
- 5) Continue with more frequent bacteriological water sampling. The Regional District is currently sampling from the wells, two distribution locations and the water storage reservoir on a weekly

basis.

- 6) Consumption level chlorination will be added to the Burton water system for a minimum two week period, twice annually.

Respectfully submitted,

Signature:

Name: Jason McDiarmid, Manager of Utility Services

CONCURRENCE

Initials:

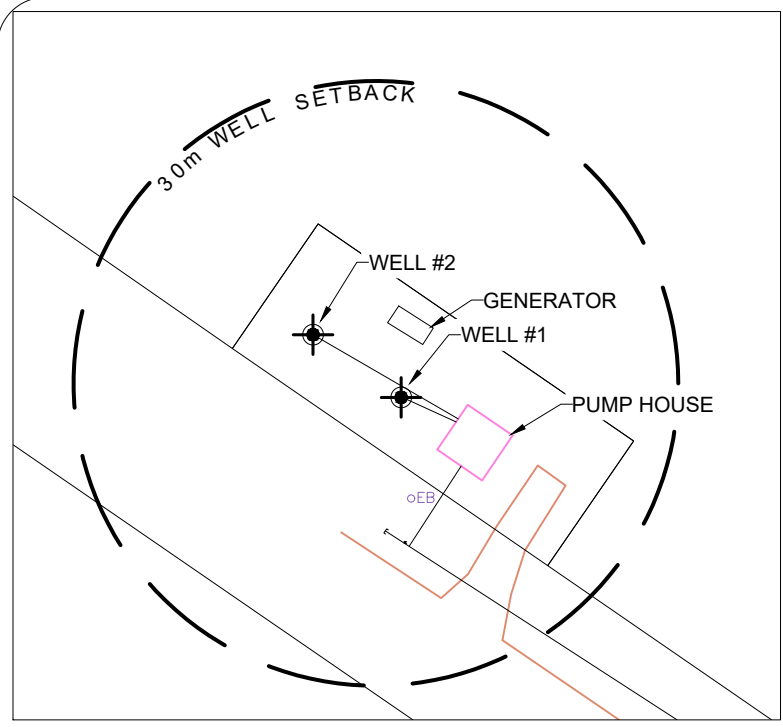
General Manager of Environmental Services
Chief Administrative Officer
Choose an item.

ATTACHMENTS:

Attachment A – July 20, 2017 Burton Water Quality and Disinfection Recommendation customer letter
Attachment B – March 28, 2017 Water Quality & Disinfection Options Community Meeting handout

Appendix C

General Arrangement of Wells



3		
2		
1		
NO.	REVISION	DATE

DSGN	-
DR	-
CHK	-
APVD	-

VERIFY SCALE
 BAR IS 12mm ON ORIGINAL DRAWING.
 0 12mm
 IF NOT 12mm ON THIS SHEET ADJUST SCALES ACCORDINGLY.



REGIONAL DISTRICT OF CENTRAL KOOTENAY ENVIRONMENTAL SERVICES
 Box 590, 202 Lakeside Dr, Nelson BC, V1L 5R4
 Tel: (250) 352-6665 Fax: (250) 352-9300
 Web: www.rdck.bc.ca E-mail: rdck@rdck.gov.bc.ca

BURTON
 WATER
 SYSTEM

GENERAL ARRANGMENT
 WITH WELL HEAD SETBACKS

SHEET	-
DWG	-
DATE	-
PROJ	-

Appendix D

Well Drill Reports



Report 1 - Detailed Well Record

Well Tag Number: 80485	Construction Date: 1998-10-29 00:00:00.0			
Owner: BC HYDRO	Driller: M. Schibli Drilling			
Address: OLD CEMETARY ROAD	Well Identification Plate Number:			
Area: BURTON	Plate Attached By:			
WELL LOCATION:	Where Plate Attached:			
KOOTENAY Land District	PRODUCTION DATA AT TIME OF DRILLING:			
District Lot: 7700 Plan: 7252 Lot: 1	Well Yield: 500 (Driller's Estimate) U.S. Gallons per Minute			
Township: Section: Range:	Development Method:			
Indian Reserve: Meridian: Block:	Pump Test Info Flag: N			
Quarter:	Artesian Flow:			
Island:	Artesian Pressure (ft):			
BCGS Number (NAD 27): 082F091431 Well: 12	Static Level: 2 feet			
Class of Well: Water supply	WATER QUALITY:			
Subclass of Well: Domestic	Character:			
Orientation of Well:	Colour:			
Status of Well: New	Odour:			
Well Use: Water Supply System	Well Disinfected: N			
Observation Well Number:	EMS ID:			
Observation Well Status:	Water Chemistry Info Flag:			
Construction Method:	Field Chemistry Info Flag:			
Diameter: 8 inches	Site Info (SEAM):			
Casing drive shoe:	Water Utility:			
Well Depth: 115 feet	Water Supply System Name:			
Elevation: 0 feet (ASL)	Water Supply System Well Name:			
Final Casing Stick Up: inches	SURFACE SEAL:			
Well Cap Type:	Flag: N			
Bedrock Depth: feet	Material:			
Lithology Info Flag: N	Method:			
File Info Flag: N	Depth (ft):			
Sieve Info Flag: N	Thickness (in):			
Screen Info Flag: Y	WELL CLOSURE INFORMATION:			
Site Info Details:	Reason For Closure:			
Other Info Flag:	Method of Closure:			
Other Info Details:	Closure Sealant Material:			
	Closure Backfill Material:			
	Details of Closure:			
Screen from	to feet	Type	Slot Size	
104.5	109.8		100	
109.8	115		100	
0	0		0	
0	0		0	
Casing from	to feet	Diameter	Material	Drive Shoe
null	null	0	null	null
GENERAL REMARKS:				
RUPP PROPERTY CAPPED				
LITHOLOGY INFORMATION:				
From	0 to	9 Ft.	BROWN SAND GRAVEL & COBBLES	
From	9 to	15 Ft.	BROWN SILTY SAND	
From	15 to	35 Ft.	GREY SILTY SAND	
From	35 to	65 Ft.	GREY SILT W FINE SAND	
From	65 to	92 Ft.	BROWN SILTY SAND W ROCKS	
From	92 to	101 Ft.	BROWN SAND & GRAVEL FINE TO MED (DIRTY)	
From	101 to	104 Ft.	BROWN SAND GRAVEL & COBBLES	
From	104 to	115 Ft.	BROWN SAND GRAVEL & COBBLES (CLEANER)	

- [Return to Main](#)
- [Return to Search Options](#)
- [Return to Search Criteria](#)



Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 80485	Well Status: New	Observation Well Number:
Well Identification Plate Number: 61722	Well Class: Water Supply	Observation Well Status:
Owner Name: Regional District of Central Kootenay	Well Subclass:	Environmental Monitoring System (EMS) ID:
Intended Water Use: Water Supply System	Aquifer Number:	Alternative specs submitted: No

Licensing Information

Licensed Status: Unlicensed **Licence Number:**

Location Information

Street Address: OLD CEMETARY ROAD
Town/City: BURTON

Legal Description:

Lot	1
Plan	7252
District Lot	7700
Block	
Section	
Township	
Range	
Land District	26
Property Identification Description (PID)	026773295

Description of Well Location:



Geographic Coordinates - North American Datum of 1983 (NAD 83)

Latitude: 49.98579	Longitude: -117.88629
UTM Easting: 436464	UTM Northing: 5537427
Zone: 11	Coordinate Acquisition Code: (10 m accuracy) Handheld GPS with accuracy of +/- 10 metres

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1998-10-29	1998-10-29		August 13th 2003 at 9:34 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1998-10-29	1998-10-29				

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 115.00 feet
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Static Water Level (BTOC): 2.00 feet
Estimated Well Yield: 500.000 USGPM
Artesian Flow:
Artesian Pressure:
Method of determining elevation: Unknown

Well Cap: CAPPED
Well Disinfected Status: Not Disinfected
Drilling Method:
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0.00	9.00	BROWN SAND GRAVEL & COBBLES						
9.00	15.00	BROWN SILTY SAND						
15.00	35.00	GREY SILTY SAND						
35.00	65.00	GREY SILT W FINE SAND						
65.00	92.00	BROWN SILTY SAND W ROCKS						
92.00	101.00	BROWN SAND & GRAVEL FINE TO MED (DIRTY)						
101.00	104.00	BROWN SAND GRAVEL & COBBLES						
104.00	115.00	BROWN SAND GRAVEL & COBBLES (CLEANER)						

Casing Details

From (ft)	To (ft)	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:

Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:

Liner Thickness:
Liner to:

Liner perforations
From **To**

There are no records to show

Screen Details

Intake Method: Type: Material: Opening: Bottom:	Installed Screens				
	From	To	Diameter	Assembly Type	Slot Size
	104.50 ft	109.80 ft	7.00		100.00
	109.80 ft	115.00 ft	7.00		100.00

Well Development

Developed by:

Development Total Duration:

Well Yield

No well yield data available.

Well Decommission Information

Reason for Decommission:

Method of Decommission:

Sealant Material:

Backfill Material:

Decommission Details:

Comments

RUPP PROPERTY; PREVIOUS OWNER=BC HYDRO; Alternate address: 105 Lower McCormack Road (there seems to be two correct addresses for the property); • WELL RECORD X-REF'D AND ASSOCIATED W/ GW LICENSE APPLICATION

Alternative Specs Submitted: No

Documents

No additional documentation available for this well.

Disclaimer

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.



Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 116647	Well Status: New	Observation Well Number:
Well Identification Plate Number: 61712	Well Class: Water Supply	Observation Well Status:
Owner Name: Regional District of Central Kootenay (Tanji Zumpano - contact)	Well Subclass:	Environmental Monitoring System (EMS) ID:
Intended Water Use: Water Supply System	Aquifer Number:	Alternative specs submitted: No

Licensing Information

Licensed Status: Unlicensed **Licence Number:**

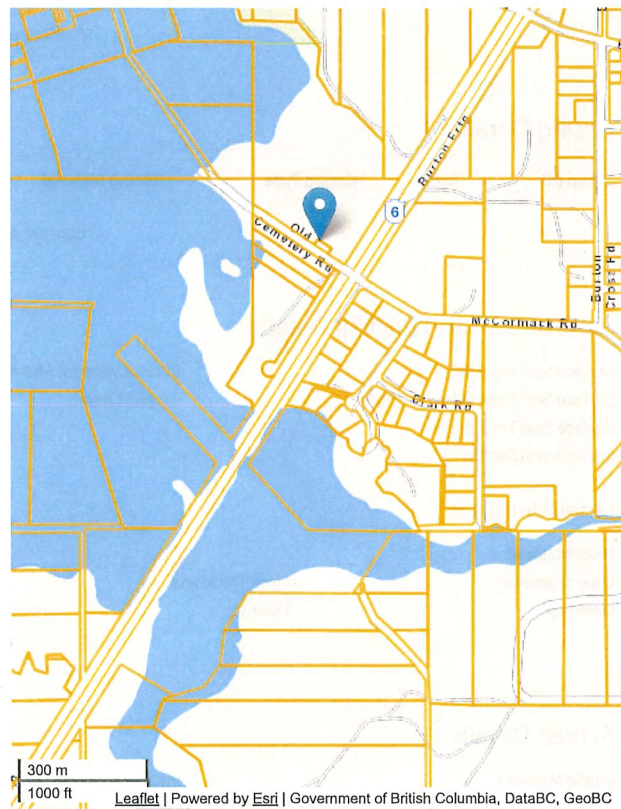
Location Information

Street Address: 105 Lower McCormack Road / Old Cemetary Road
Town/City: Burton

Legal Description:

Lot	1
Plan	7252
District Lot	7700
Block	
Section	
Township	
Range	
Land District	26
Property Identification Description (PID)	026773295

Description of Well Location: Well 2 is located in the north west portion of the lot.



Geographic Coordinates - North American Datum of 1983 (NAD 83)

Latitude: 49.9859	Longitude: -117.8864
UTM Easting: 436456	UTM Northing: 5537439
Zone: 11	Coordinate Acquisition Code: (10 m accuracy) Handheld GPS with accuracy of +/- 10 metres

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1998-10-29	1998-10-29		February 25th 2019 at 4:01 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1998-10-29	1998-10-29				

Well Completion Data

Total Depth Drilled:
Finished Well Depth: 115.00 feet
Final Casing Stick Up:
Depth to Bedrock:
Ground elevation:

Static Water Level (BTOC):
Estimated Well Yield:
Artesian Flow:
Artesian Pressure:
Method of determining elevation: Unknown

Well Cap: Not Provided
Well Disinfected Status: Not Disinfected
Drilling Method:
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
There are no records to show								

Casing Details

From (ft)	To (ft)	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:

Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:

Liner Thickness:
Liner to:

Liner perforations
From **To**

There are no records to show

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From	To	Diameter	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by:
Development Total Duration:

Well Yield

No well yield data available.

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:

Method of Decommission:
Backfill Material:

Comments

WELL RECORD X-REF'D AND ASSOCIATED W/ GW LICENSE APPLICATION

Alternative Specs Submitted: No

Documents

No additional documentation available for this well.

Disclaimer

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

Appendix E

Golder/Kala Reports



Groundwater Consulting Ltd.

Vernon - Kamloops

Water Supply and Environmental Assessments

PRIVILEGED AND CONFIDENTIAL INFORMATION


November 23, 1998
File Reference: Burton3.Doc

REPORT OF FINDINGS

**DISTRICT OF BURTON
CONSTRUCTION, TESTING AND EVALUATION OF
NEW 8-INCH PRODUCTION WELL
RUPP PROPERTY**

Prepared for:
B.C. Hydro

Report Prepared by:
Kala Groundwater Consulting Ltd.

Per: 
Larry C. Topp, P. Geo.
Hydrogeologist

Distribution: 1 Copy *B.C. Hydro*
1 Copy *Urban Systems Ltd.*
1 Copy *Kala Files*

Reviewed by:

Nora Davenport
Environmental Technologist

TABLE OF CONTENTS

	Page
TABLE OF CONTENTS	(i)
LIST OF FIGURES.....	(ii)
SECTION 1.0 INTRODUCTION	1
SECTION 2.0 BACKGROUND.....	2
2.1 Site Description and General Geology	2
2.2 Groundwater Occurrence	2
2.3 Existing Water Wells at the Burton Historical Park.....	4
SECTION 3.0 DESCRIPTION OF PRESEBT PROGRAM.....	6
3.1 Test Drilling and Well Completion.....	6
3.2 Aquifer Testing	6
SECTION 4.0 PROGRAM FINDINGS.....	8
4.1 Drilling.....	8
4.2 Well Completion.....	8
4.3 Aquifer Testing	9
4.4 Water Quality.....	9
SECTION 5.0 CONCLUSIONS AND RECOMMENDATIONS	16
APPENDICES	
A – Water Quality Data – New 8-Inch Well	
B – Pumping Test Data	

LIST OF FIGURES

		Following Page
FIGURE 1	Index Map.....	1
FIGURE 2	General Geology.....	5
FIGURE 3	Well Completion Diagram	11
FIGURE 4	Water Well Location Plan.....	11

LIST OF TABLES

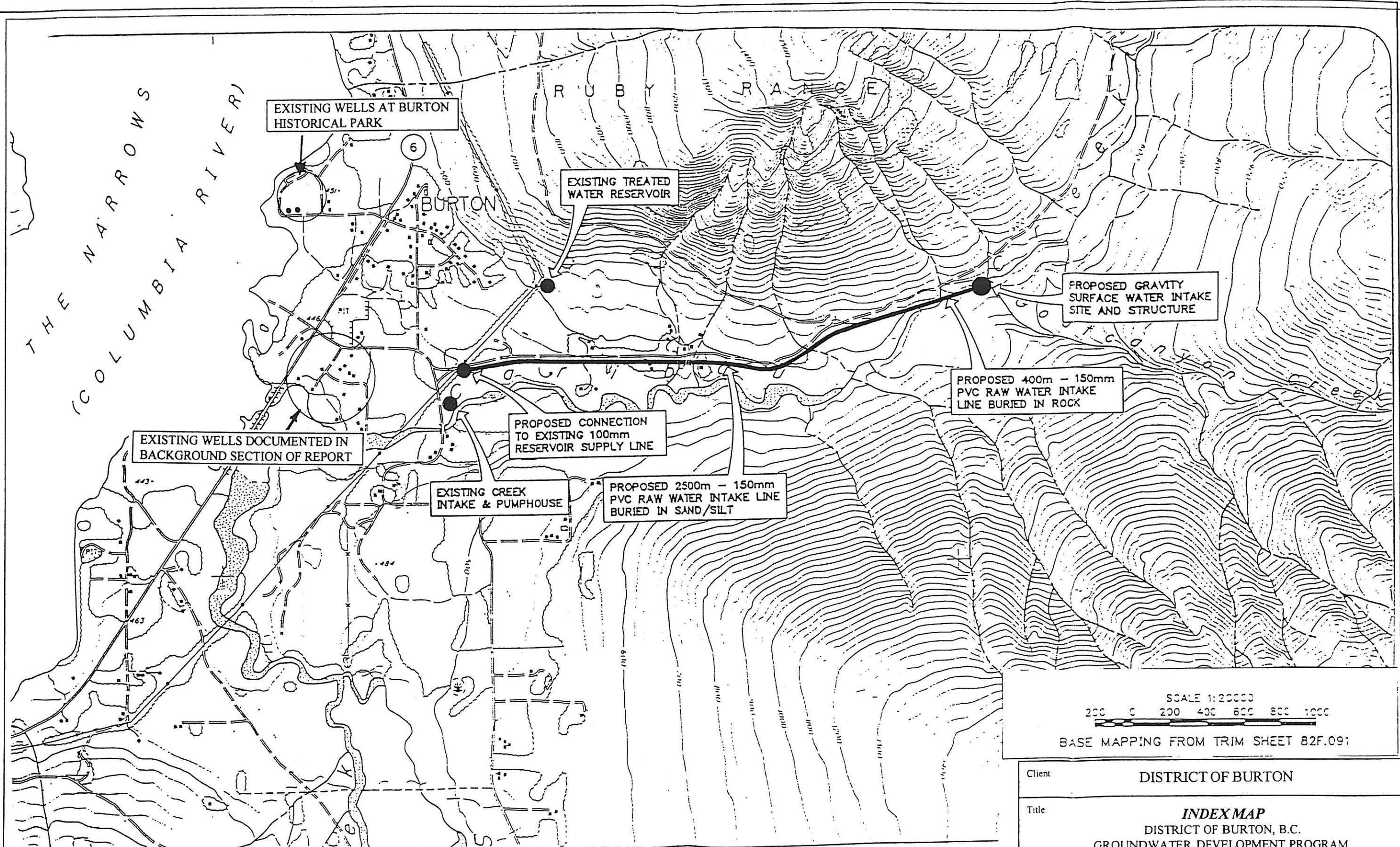
		Page
TABLE 1	Summary of Existing Water Well Data – Cariboo Creek Estates Subdivision.....	3
TABLE 2	Summary of Existing Water Wells – Burton Historical Park...	4
TABLE 3	Safe Yield Projections – Park Wells	4
TABLE 4	Summary of Water Quality – Field Tests – Park Wells.....	5
TABLE 5	Water Quality Analysis – New 8-Inch Production Well	10

1.0 INTRODUCTION

The present program of well completion and aquifer testing has been carried out at the request of B.C. Hydro to develop a new source of groundwater supply for the District of Burton (*DOB*). The new source will be used to augment the existing system utilizing a surface water intake. The work has been undertaken by Kala Groundwater Consulting Ltd. (*Kala*) on a sub-consulting basis to Urban Systems Ltd. of Kelowna, B.C.

The District is currently in the process of upgrading the existing water system. In past years, the existing system at *DOB*, comprised of a surface water intake on Cariboo Creek has presented problems with sedimentation and subsequent premature wear on pumping equipment. Also, the quantity of water available from the current intake system is just barely sufficient to meet the District's requirements during the hot summer months. An investigation was carried out in July 1998 to explore new potential sources of groundwater and evaluation of existing water wells as possible water supply alternatives for *DOB*. During the testing program, two exploratory testholes were drilled near the existing surface water intake on Cariboo Creek and a 24-hour pumping test was conducted on each of the existing water wells located at the Burton Historical Park site.

The present program has involved the completion of an 8-inch production well on the Rupp property. This was followed with a program of aquifer testing and the collection of water samples for a water quality analysis. The following report outlines the nature of the groundwater development program, provides a discussion of the results along with recommendations for sustained groundwater production and maintenance of the new source. Detailed information including driller's logs, sieve analyses, pumping test data, and water quality analysis is included in the Appendices.



SCALE 1:20000
 200 0 200 400 600 800 1000

BASE MAPPING FROM TRIM SHEET 82F.091

Client	DISTRICT OF BURTON	
Title	INDEX MAP DISTRICT OF BURTON, B.C. GROUNDWATER DEVELOPMENT PROGRAM	
File	Date	FIGURE 1
BURTON3.DOC	NOV. 1998	

2.0 BACKGROUND

2.1 Site Description and General Geology

The District of Burton is located along the east side of Lower Arrow Lakes, approximately 20 kilometers north of the Needles Ferry crossing and 36 kilometers south of the town of Nakusp. The main community at Burton is situated on an extensive alluvial fan complex which has been built up in association with the Cariboo/Goat Creek and Burton Creek watersheds.

Generally alluvial fans are comprised to a large extent of poorly sorted granular material (sand and gravel) with minor silt and clay sediments. Because of the past glacial geology history of the Burton area, the surficial deposits in this case are comprised predominantly of thick sequences of lacustrine (lake) silty clays with only very localized deposits of sand and gravel. This would indicate that in past geologic history, the local area including portions of Cariboo and Burton Creek watersheds were inundated with large pro-glacial lakes.

The local bedrock strata is comprised to a large extent of igneous intrusive rocks of Cretaceous age and commonly termed the Whatshan Batholith. A generalized geology map for the Burton area is shown in Figure 2.

2.2 Groundwater Occurrence

Medium to high capacity water wells have been completed in the Burton area to depths ranging between 70 and 150 feet (21 and 45 metres). The majority of these wells obtain water from localized deposits of sand and gravel and reported yield range between 20 and 250 USgpm. There has also been several unsuccessful attempts to locate an adequate groundwater supply, including the completion of low capacity water wells, capable of meeting the requirements for individual domestic use. In these cases the water-bearing sand and gravel deposits were not present and the driller reportedly encountered thick sequences of silt and clay extending to depths of up to 450 feet (137 metres).

A summary of information for some of the existing water wells drilled in the Burton area is provided in Table 1 which follows. A generalized location plan for the wells is shown in Figure 1.

<i>Map number</i>	<i>Owners Name</i>	<i>Total Depth</i>	<i>Screen Setting</i>	<i>Reported Yield</i>
1	R. Bilinski	135 feet	131 – 135 feet	75 USgpm
2	C. Bush	106 feet	102 – 106 feet	30 USgpm
3	M. Garb	151 feet	147 – 151 feet	20 USgpm
4	F. Gurdash	82 feet	78 – 82 feet	75 USgpm
5	H. Mueller	55 feet	Unknown	40 USgpm
6	K. Rupp	123 feet	119 – 123 feet	50 USgpm
7	O. Danielewski	139 feet	135 – 139 feet	50 USgpm
8	T. Hass	73 feet	Unknown	30 USgpm

During the groundwater exploration program conducted in August of 1998, two exploratory testholes were drilled near the existing surface water intake on Cariboo Creek. Based on results of the exploratory drilling subsurface conditions encountered at each of the test sites were unsuitable to the depth drilled (160 feet) for the completion of a water well. In each case a layer of surface gravel was encountered and this in turn was underlain by silts, with silty clay lenses to the bottom of the testhole. Based on previous experience by the drilling contractor and existing available information it was decided to terminate drilling at 160 feet below surface at each test site.

The 8-inch casing has been left in place at each location, allowing the opportunity to deepen one or both boreholes, if new information becomes available which would indicate more favourable conditions at greater depths. A summary of the lithologic conditions encountered at each drilling site location is as follows:

<u>Depth Interval (in feet)</u>	<u>Lithologic Description</u>
---------------------------------	-------------------------------

Testhole No. 1

0 – 3	Sandy clay with boulders and cobbles
3 – 9	Silty clay, brown
9 – 160	Silty clay with some silt layers, grey

Abandoned hole – leave 100 feet of 8-inch casing in place

Testhole No. 2

0 – 36 Gravel with sand and silty sand intervals, brown, dry
36 – 66 Silt to silty clay, grey-brown
66 – 160 Silt with silty clay stringers, grey

Abandoned hole – leave 100 feet of 8-inch casing in place

2.3 Existing Water Wells at the Burton Historical Park Site

During the late 70's two water wells were drilled for B.C. Hydro at the Burton Historical Park site as a potential source of water supply for the District of Burton. At the time of completion the wells were designated as Well 1 and Well 1A. For purposes of the present study program *Kala* has designated the existing source wells as Well No. 1 and Well No. 2 respectively. A brief description of each well is provided in Table 2 below.

Well Designation	Location	Total Depth	Screened Interval	Static Water Level (8/11/98)	Reported Yield
Well No. 1	South of new Wash house facility	83.5 feet	73.5 to 83.5'	20.1 feet	250 USgpm
Well No. 2	108 metres east of Well No. 1	95.3 feet	83.5 to 95.3'	30.2 feet	250 USgpm

Pumping tests were conducted with each of the existing well in August of 1998 under the supervision of *Kala*. Based on the results of the testing program, the drawdown interference between the two existing wells could be considered negligible. With respect to a safe, long-term yield projection for each well, the water level elevation in Arrow Lake must be taken into consideration. On the basis of the testing program information, a safe yield projection for each well during maximum and minimum Arrow Lake levels is shown in Table 3.

Well Designation	At Maximum Lake Level	At Minimum Lake Level
Well No. 1	225 USgpm	150 USgpm
Well No. 2	250 USgpm	175 USgpm

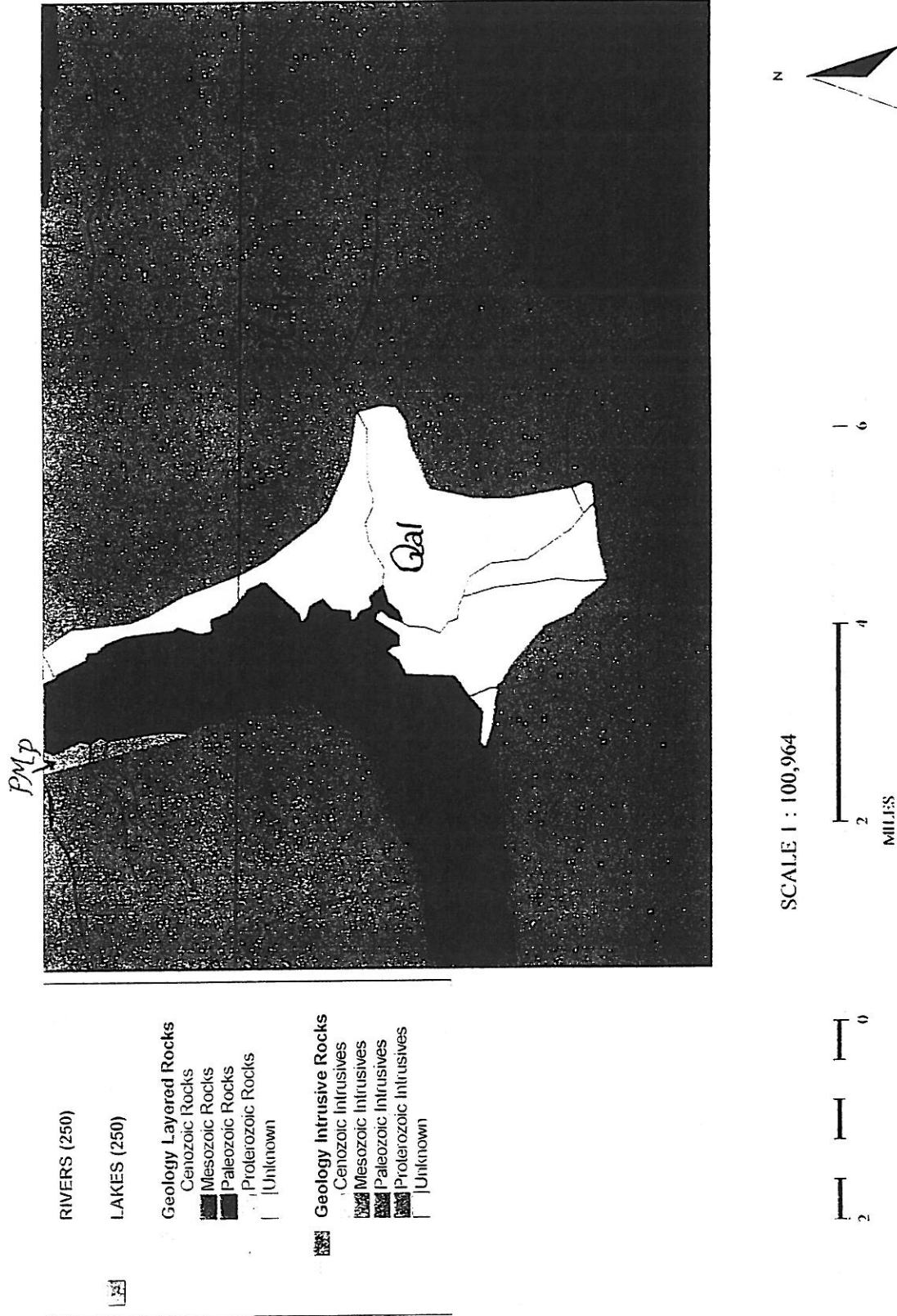
With respect to water quality a summary of the field test results obtained during the present program is shown in Table 4 below. Copies of the Certificate of Analysis received from Caro Environmental Services for each well are attached to Appendix D of this report. Based on the results, all parameters for which an analysis was performed, with the exception of iron and manganese meet the “*Guidelines for Canadian Drinking Water Quality*” for health related parameters. The aesthetic objective for iron is 0.3 mg/L and based on the laboratory analysis, water from Well No. 1 has a concentration of 2.2 mg/L and 4.8 mg/L from Well No. 2. In a similar manner, the aesthetic objective for manganese is 0.05 mg/L and the groundwater at Burton Park showed a concentration of 0.225 mg/L for Well No. 1 and 0.351 mg/L for Well No. 2. On a comparative basis, the better overall water quality is obtained from Well No. 1 and this may reflect a greater influence from Arrow Lake to Well No. 1.

Iron and manganese are not harmful to human health in the concentrations measured, but will most likely cause staining of sinks, tubs and laundry. Some form of water quality treatment is recommended.

<i>Table 4 – Summary of Water Quality – Field Tests</i>					
<i>Pumping Interval</i>	<i>Water Temperature</i>	<i>pH</i>	<i>Conductivity umhos/cm</i>	<i>Iron Mg/L</i>	<i>Hardness Mg/L</i>
<i>Well No. 1</i>					
30 minutes	47.3 ° F	8.2	244	4.3	119
120 minutes	47.3	7.9	234	4.3	102
240 minutes	47.3	7.8	233	4.1	102
360 minutes	47.8	8.0	248	4.0	102
480 minutes	47.7	7.9	252	4.0	102
1440 minutes	47.5	8.3	228	3.5	102
<i>Well No. 2</i>					
30 minutes	47.7	8.0	395	4.7	205
120 minutes	47.7	8.0	357	4.7	188
1100 minutes	47.7	8.2	373	4.7	171
1380 minutes	47.7	8.1	397	4.5	171

A slight improvement in water quality was noted with increased time of pumping, but in general terms the improvement was minor.

B.C. Ministry of Energy and Mines



BC Geology Legend Report

Map Code:	PEg
AGE:	EOCENE (AND PALEOCENE?)
FORMATION:	INCLUDES SHEPPARD INTRUSIONS, TUZO CREEK, SHINGLE CREEK (Eg)
Description:	K-SPAR GRANITE
DIGITAL CODE:	166008239
Map Code:	peg
AGE:	MESOZOIC
Description:	PEGMATITE
DIGITAL CODE:	170008139
Map Code:	Kw
AGE:	CRETACEOUS
GROUP:	WHATSHAN BATHOLITH
Description:	GRANODIORITE
DIGITAL CODE:	171008339
Map Code:	Qal
AGE:	QUATERNARY
Description:	TILL, SAND AND GRAVEL
DIGITAL CODE:	120001599
Map Code:	TrS
AGE:	TRIASSIC
GROUP:	Slocan
Description:	CARBONATE, ARGILLITE, SLATE
DIGITAL CODE:	173301442
Map Code:	PMp

AGE:	PROTEROZOIC TO (?) LOWER PALEOZOIC
GROUP:	MONASHEE COMPLEX
Description:	LAYERED PARAGNEISS, SCHIST QUARTZITE
DIGITAL CODE:	291007333
AUTHOR:	T. Hoy, A. Legun, B.N. Church, G. Gibson, K. Glover and J.O. Wheeler
TITLE:	Open File 1994-8 Geology of the Kootnay River Map-Area

*British Columbia Geological Survey Branch
B.C. Ministry of Energy and Mines*

3.0 DESCRIPTION OF PRESENT PROGRAM

3.1 Test Drilling and Well Completion

Following a very generous offer from Mr. Kurt Rupp, allowing access to drill on his property, a program of test drilling and well completion was initiated on October 26, 1998. The drill site is located 70 metres south from the Highway 6 right-of-way, and on the north side of Old Cemetary Road.

All of the drilling services were provided by M. Schibli Drilling Ltd. of Lumby, B.C., working under the supervision of *Kala*. The testhole was drilled with an air rotary drilling rig equipped with a casing hammer. With this type of drilling equipment, the casing is advanced as drilling proceeds, and the nature of the subsurface material is determined by examining drill cuttings lifted to surface with the drilling rig's air compressor. Preliminary estimates of well yield are made in a similar manner, by measuring the quantity of water lifted to surface with air.

The drilling was conducted with 8 5/8 inch casing and after penetrating the main water-bearing zone, a well screen assembly was installed to the bottom. The casing was then pulled back to expose the screens and the well was developed by surging and jetting with compressed air.

3.2 Aquifer Testing

In order to evaluate the safe yield of the new well, a 24-hour pumping test was conducted starting on November 4, 1998. Pump testing services were provided by Moore's Well and Services Ltd. of Vernon, B.C., working under the supervision of *Kala*.

During the test, water pumped from the new 12-inch production well was conveyed through lay-flat pipe and discharged to waste into adjoining property located west of the well site.. The discharge rate was monitored using a conventional circular orifice meter and water levels in the production well were measured with an electric well sounder. In addition to monitoring drawdown in the pumping well, drawdown interference was also measured in Mr. Rupp's existing 6-inch test well located approximately 100 metres south and east of the new production well. Near the end of

the test water samples were obtained and forwarded to Caro Environmental Services for a water quality analysis.

4.0 PROGRAM FINDINGS

4.1 Drilling

During the exploratory drilling phase of the program, a high capacity aquifer was encountered in the depth interval 92 to 115 feet (28.0 to 35.1 metres) below ground surface. The aquifer is semi-confined and is comprised of coarse sand and gravel. The confining layer is comprised of silty sand and sandy silt with some clay layers. Evidence for the high production capability of the aquifer was provided by the large quantity of water lifted to surface with the drilling rig's air compressor while drilling through the water-bearing zone. The driller's litholog for the new well is as follows:

<u>Depth Interval</u> <u>In feet</u>	<u>Lithologic Description</u>
0 – 9	Sand and gravel with cobbles and the occasional boulder
9 – 14	Brown silty sand
14 – 19	Grey silty sand
19 – 45	Grey sandy silt
45 – 52	Grey-brown silty sand
52 – 62	Grey sandy silt
62 – 65	Brown medium grained sand with some gravel
65 – 67	Grey sandy silt
67 – 81	Grey brown silty sand with minor gravel
81 – 92	Brown silty sand with some clay
92 – 115	Coarse sand and gravel, water-bearing
115 – 116	Gravel with clay

4.2 Well Completion

The new 8-inch production well drilled for the District of Burton is completed with 8 5/8-inch diameter, steel welded joint casing of 0.188" wall thickness. The screen assembly is comprised of 8-inch telescopic, Johnson's stainless steel well screen, set between 104.5 and 115 feet (31.9 and

35.1 metres) below surface. Because of the coarse nature of the aquifer material, the screen assembly is comprised of No. 100 slot size (100 thousandths of an inch slot openings). There is a blank section comprised of 7-inch solid pipe and a Figure K packer attached to the top of the assembly. This brings the top of the screen assembly to 101.8 feet (31.03 metres) below ground level. A well completion diagram is shown in Figure 3. A well location diagram is shown in Figure 4.

4.3 Aquifer Testing

Results of the 24-hour pumping test have been tabulated and plotted on semi-log and log-log graphs of drawdown versus time (see Appendix B). It should be noted that the test pump used during the present program was an 8-inch submersible pump, which meant there was very little tolerance between the pump and the casing. Because of this and to avoid severing the submersible wire, the pump was only lowered to 20 feet below the top of casing. Even with this shallow setting, the test was started at 738 USgpm, but after 480 minutes the rate had to be lowered to 676 USgpm due to a slight cavitation of the water level above the pump.

During the pumping test, a steady rate of drawdown was observed in the amount of 0.75 metres (2.46 feet) per log cycle while pumping at 738 USgpm and this reduced to 0.6 metres (1.97 feet) per log cycle after reducing the pumping rate to 676 USgpm. The maximum drawdown noted in the existing Rupp Well at the end of the 24-hour pumping test was 2.71 metres (8.89 feet). The rate of drawdown in the Rupp Well was similar to that observed in the new 8-inch production well. Based on the results of the testing program, the new 8-inch well has a safe yield of greater than 1000 USgpm. The well screen assembly however is designed to transmit 500 USgpm at the recommended entrance velocity of 0.1 feet per second, and *Kala* recommends a design capacity of somewhere in this range (500 to 600 USgpm).

4.4 Water Quality

A copy of the certificate of analysis is included in Appendix A

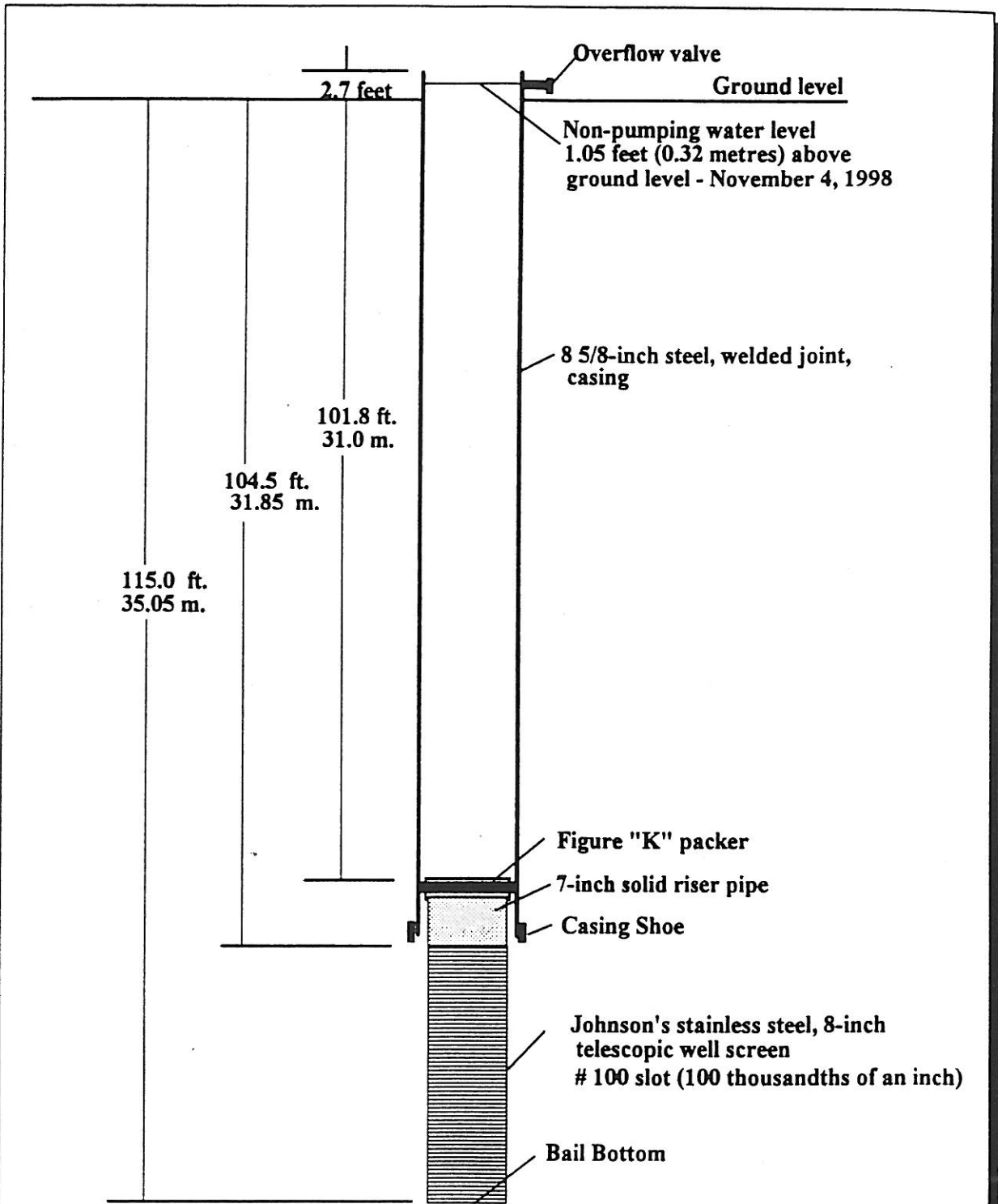
The results of the chemical and bacteriological analysis conducted by Caro Environmental Services are summarized below in Table 5:

Table 5 - Water Quality Analysis		
Analysis	Test Results (mg/L)	CDWG
<u>Physical Tests</u>		
pH (units)	7.6	6.5-8.5
Conductivity (Umhos/cm)	338	-
Colour (TCU)	<5	15
Turbidity (NTU)	0.15	1
Hardness	174	200
<u>Solids</u>		
Total Dissolved Solids	202	500
<u>Dissolved Ions (mg/l)</u>		
Alkalinity	158	-
Chloride	4.2	250
Fluoride	0.3	1.5
Nitrogen, NO ₂ + NO ₃	n/a	10
Nitrogen, Nitrate	0.24	10
Nitrogen, Nitrite	<0.01	-
Sulfate (SO ₄)	16	500
Sulfide	n/a	0.05
<u>Total Metals (mg/l)</u>		
Aluminum	<0.2	-
Arsenic	<0.01	0.025
Barium	0.04	1

Table 5 - Water Quality Analysis (Cont'd)		
Analysis	Test Results (mg/L)	CDWG
Total Metals (mg/l) (Cont'd)		
Boron	<0.1	5
Cadmium	<0.0002	0.005
Calcium	51.7	-
Copper	<0.01	1.0
Cyanide	<0.01	-
Iron	<0.03	0.30
Manganese	<0.005	0.05
Magnesium	11.0	-
Mercury	<0.00005	-
Molybdenum	<0.03	0.05
Sodium	5.1	200
Lead	<0.001	0.01
Potassium	2.7	-
Uranium	0.00213	-
Zinc	<0.005	5.0
Micro Biological		
Total Coliforms	0	0
Fecal Coliforms	0	0

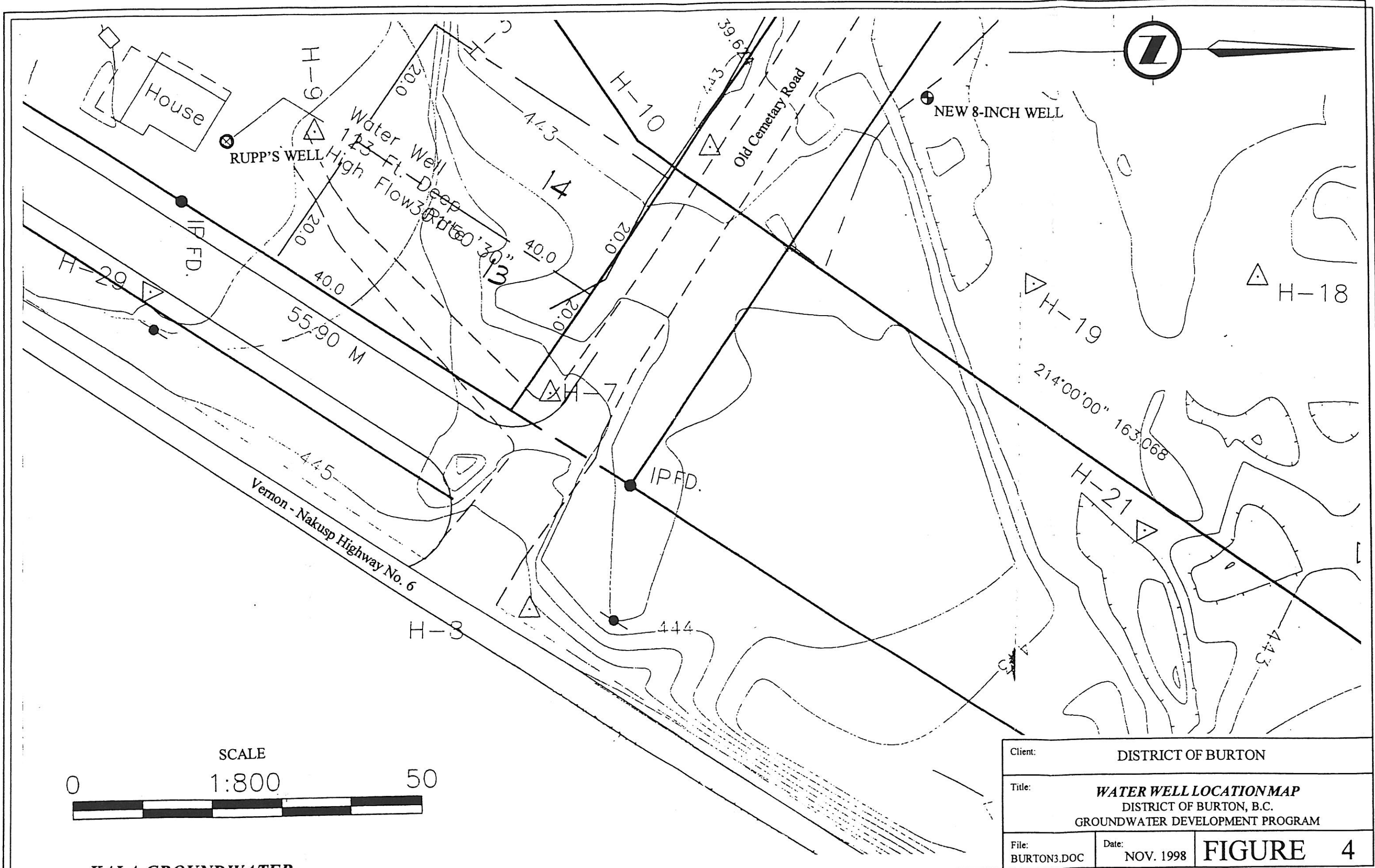
CDWG = Canadian Drinking Water Guidelines

Based on the laboratory results the water quality is excellent and all parameters for which an analysis was performed, meet the Guidelines as set by the "BC Drinking Water Quality Standards" and the "Guidelines for Canadian Drinking Water Quality".



Note: Not to scale

FIGURE 3
WELL COMPLETION DIAGRAM
 New 8-inch Production Well - District of Burton



5.0 CONCLUSIONS AND RECOMMENDATIONS

Results of the present program may be summarized as follows:

- The present program has involved the test drilling and completion of an 8-inch production well on the Rupp property. This was followed with a program of aquifer testing and the collection of water samples for a water quality analysis.
- During the exploratory drilling phase of the program, a high capacity aquifer was encountered in the depth interval 92 to 115 feet (28.0 to 35.1 metres) below ground surface. The aquifer is flowing artesian and is comprised of coarse sand and gravel. The confining layer is comprised of silty sand and sandy silt with some clay layers.
- The new 8-inch production well drilled for the District of Burton is completed with 8 5/8-inch diameter, steel welded joint casing of 0.188" wall thickness. The screen assembly is comprised of 8-inch telescopic, Johnson's stainless steel well screen, set between 104.5 and 115 feet (31.9 and 35.1 metres) below surface. A well completion diagram is shown in Figure 3.
- Based on the results of the testing program, the new 8-inch well has a safe yield of greater than 1000 USgpm. The well screen assembly however, is designed to transmit 500 USgpm at the recommended entrance velocity of 0.1 feet per second, and *Kala* recommends a design capacity of somewhere in this range (500 to 600 USgpm). Because of the artesian conditions at the site it is not expected that water levels in the new well will be effected by fluctuations in the Arrow Lake reservoir.
- Based on the laboratory results the water quality is excellent and all parameters for which an analysis was performed, meet the Guidelines as set by the "BC Drinking Water Quality Standards" and the "Guidelines for Canadian Drinking Water Quality".

Kala provides the following recommendations for the clients consideration and long-term maintenance of the system.

- A pump setting of 60 feet (18.29 metres) below the top of casing will be more than adequate for the new well.
- Because the well is flowing (water level during the time of testing was 1.05 feet above ground level) careful planning should be taken with respect to pumphouse design and allowance for overflow from the well during non-pumping intervals. There is no way of projecting at this time, just how far the non-pumping water level will rise during the freshet period and consequently an overflow valve has been installed on the well.
- Water levels and production rates should be monitored on a regular basis;
- The well should not be overpumped (pumped at rates higher than the recommended) for periods exceeding 24 hours;
- The well should not be back-washed, flushed or raw-hided;
- The well screen should not be vibrated by installing the pump intake inside the screen assembly; and
- Finally the well should not be allowed to stand idle for more than 6-9 months.

APPENDIX A
- Water Quality Data -
- New 8-Inch Well -



102 - 3677 Highway 97N
Kelowna, B.C. V1X 5C3

Telephone (250) 765-9646
Fax (250) 765-3893

CERTIFICATE OF ANALYSIS

November 20, 1998

Kala Groundwater Consulting Ltd.
Suite 3, 3107A - 31st Avenue
VERNON, BC
V1T 2G9

Attn: Larry Topp

Sample ID: **District of Burton, New 8" well**

Sampled: November 5 1998 Received: November 6 1998

Alkalinity (Total)	158	mg/L as CaCO ₃
Aluminum	<0.2	mg/L
Arsenic	<0.01	mg/L
Barium	0.04	mg/L
Boron	<0.1	mg/L
Cadmium	<0.0002	mg/L
Calcium	51.7	mg/L
Chloride	4.2	mg/L
Chromium	<0.01	mg/L
Color (True)	<5	Color Units
Conductivity @ 25°	338	umhos/cm
Copper	<0.01	mg/L
Cyanide	<0.010	mg/L
Dissolved Solids(Total)	202	mg/L
Fluoride	0.3	mg/L
Hardness(Total)	174	mg/L as CaCO ₃
Iron	<0.03	mg/L
Lead	<0.001	mg/L
Magnesium	11.0	mg/L
Manganese	<0.005	mg/L
Mercury	<0.00005	mg/L
Molybdenum	<0.03	mg/L
Nitrate	0.24	mg/L as N
Nitrite	<0.01	mg/L as N

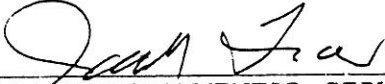
...2

THE INFORMATION CONTAINED IN
THIS REPORT IS THE CONFIDENTIAL
PROPERTY OF THE CLIENT. ANY
LIABILITY ATTACHED THERETO IS
LIMITED TO THE FEE CHARGED.

Page 2
Kala Groundwater Consulting
November 20, 1998 (cont)

District of Burton, New 8" Well

pH	7.6	pH Units
Potassium	2.7	mg/L
Sodium	5.1	mg/L
Sulphate	16	mg/L
Turbidity	0.15	N.T.U.
Uranium	0.00213	mg/L
Zinc	<0.005	mg/L
Total Coliform	0	colonies/100mL
Fecal Coliform	0	colonies/100mL

Certified by: 
CARO ENVIRONMENTAL SERVICES
Janice M. Fraser, B.Sc.

Enclosure

FAX (250) 545-1720

cc FAX 763-5266, Urban Systems, Attention: Peter Gigliotti

THE INFORMATION CONTAINED IN
THIS REPORT IS THE CONFIDENTIAL
PROPERTY OF THE CLIENT. ANY
LIABILITY ATTACHED THERETO IS
LIMITED TO THE FEE CHARGED.

APPENDIX B
- Pumping Test Data -

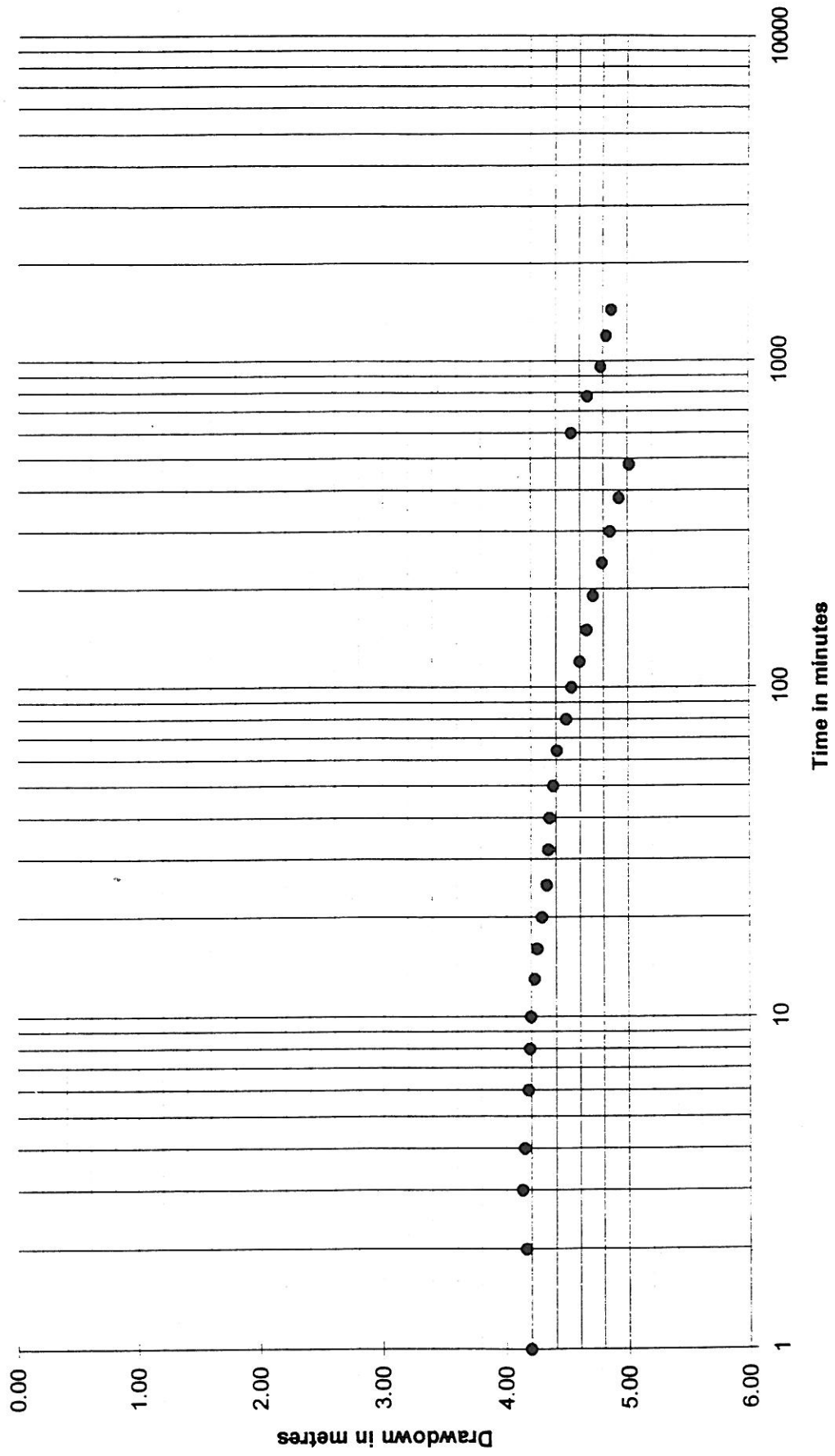
PUMP TEST (DRAWN)

Date test started: November 4, 1998
 Time test started: 3:00 PM
 Ave. pumping rate: 676 USgpm
 Pre-test water level: 0.49 m

Reference Point: Top of measuring tube
 Height of ref. point: 0.81 m
 Depth of well: 35.04 m below ground
 Screened Interval from 31.84 m - 35.04 m below ground

Time (0 since pumping started)	Depth to water (m)	Flow (USgpm)	
0	0.49	0.00	
1	4.69	4.20	35' on 6 x 5 orifice 738 USgpm
2	4.65	4.16	
3	4.62	4.13	
4	4.64	4.15	
6	4.67	4.18	
8	4.68	4.19	
10	4.69	4.20	
13	4.72	4.23	
16	4.74	4.25	
20	4.78	4.29	
25	4.82	4.33	
32	4.83	4.34	
40	4.84	4.35	
50	4.87	4.38	
64	4.90	4.41	
80	4.98	4.49	
100	5.02	4.53	
120	5.09	4.60	
150	5.15	4.66	
190	5.20	4.71	
240	5.28	4.79	
300	5.35	4.86	
380	5.42	4.93	
480	5.51	5.02	Decrease to 676 USgpm @ 481 min.
600	5.02	4.53	
780	5.16	4.67	
960	5.27	4.78	
1200	5.32	4.83	
1440	5.36	4.87	

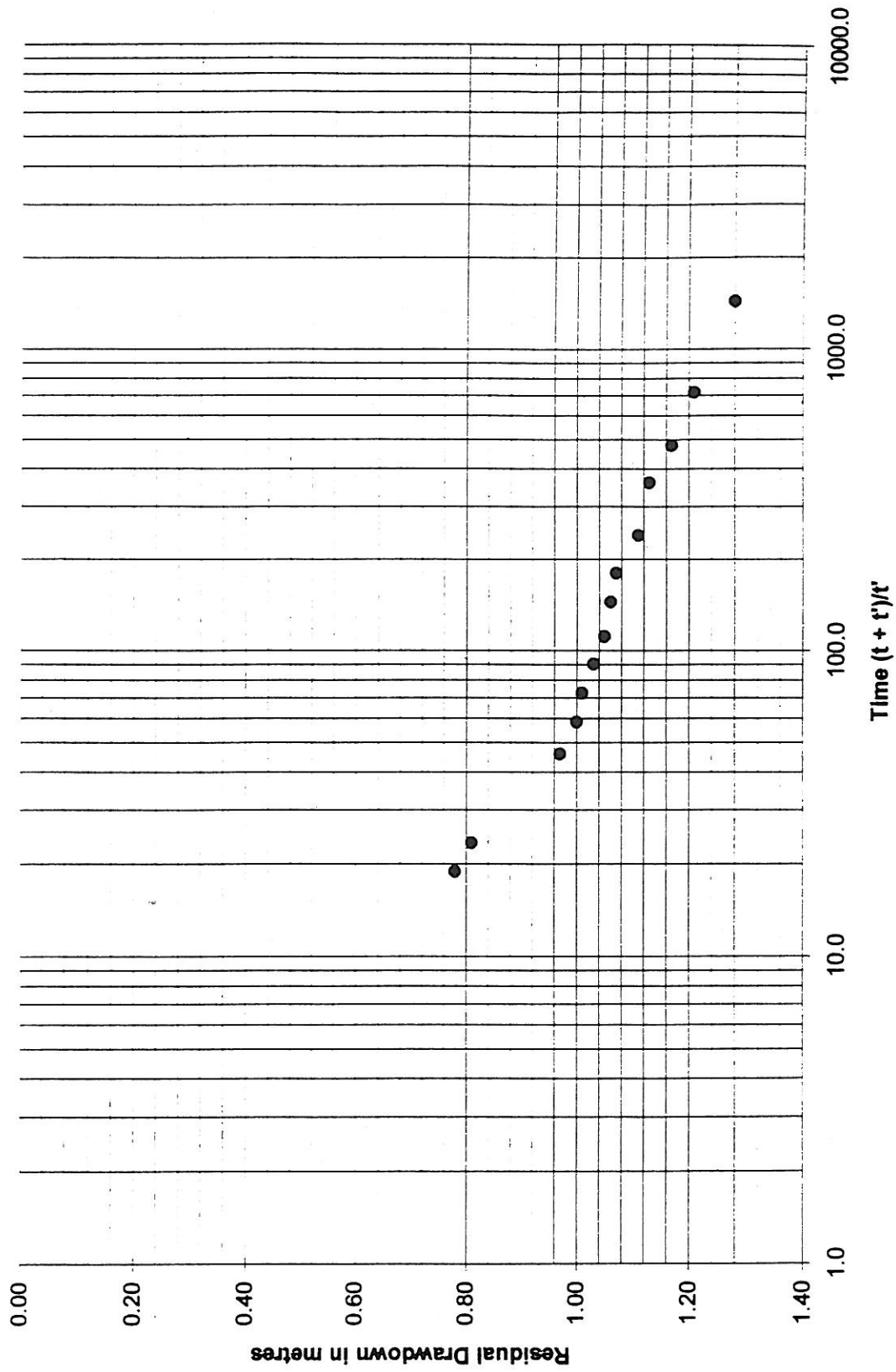
SEMI-LOG PLOT OF DRAWDOWN VERSUS TIME



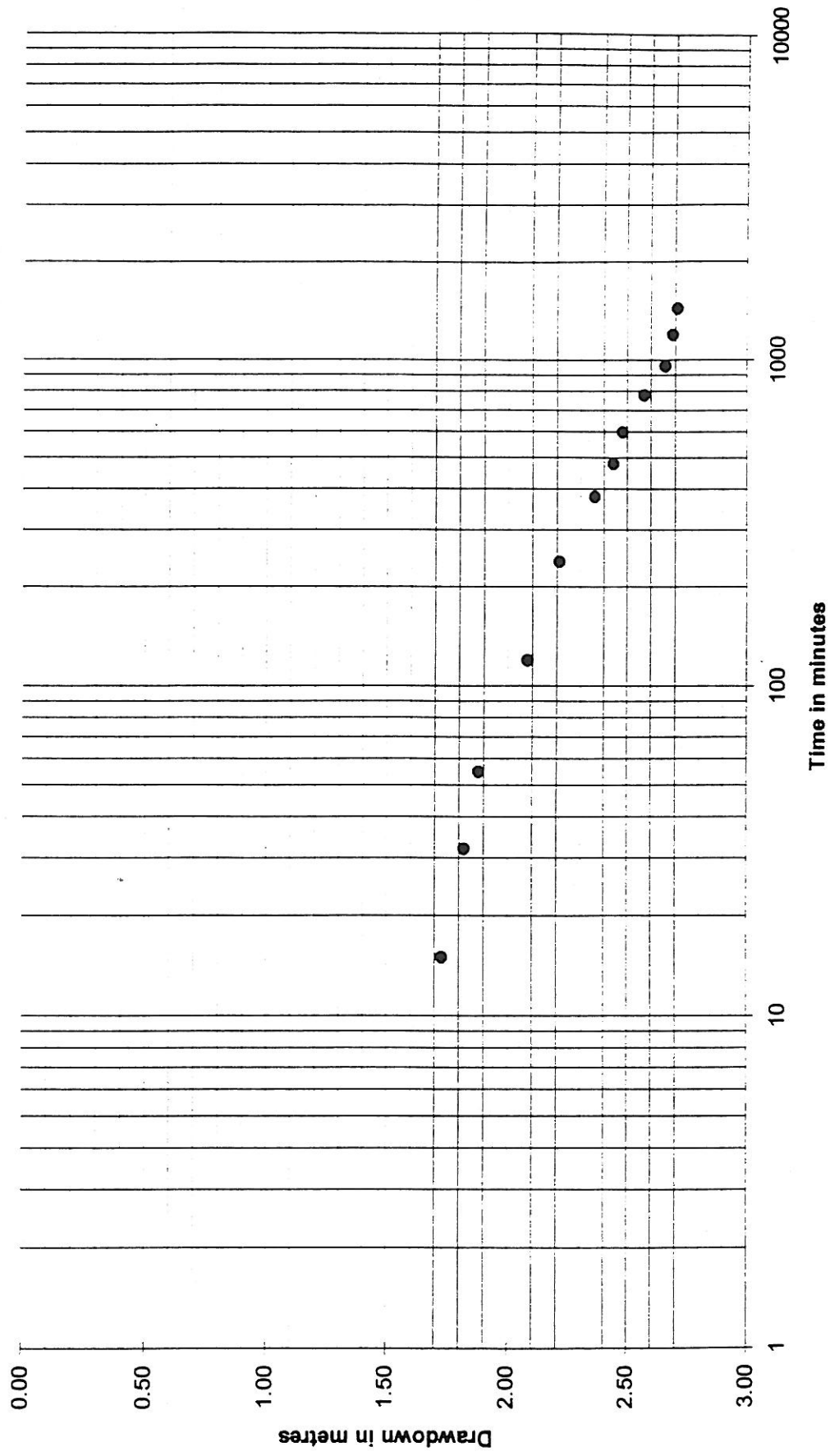
PUMPTEST (RECOVERY)	District of Burton New 8-Inch Well
Date test started: November 4, 1998	Reference point: Top of measuring tube
Time test started: 3:00 PM	Height of reference: 0.81 metres
Ave. pumping rate: 676 USgpm	Depth of well: 35.04 metres
Pre-test water level: 0.49 metres	Screened Interval From: 31.84 m - 35.04 m below ground

Time (min) Pumping stopped if required	Static Head (m)	Total Head (m)	Drawdown Head (m)	Comments
0	1440.0	5.36	4.87	
1	1441.0	1.77	1.28	
2	721.0	1.70	1.21	
3	481.0	1.66	1.17	
4	361.0	1.62	1.13	
6	241.0	1.60	1.11	
8	181.0	1.56	1.07	
10	145.0	1.55	1.06	
13	111.8	1.54	1.05	
16	91.0	1.52	1.03	
20	73.0	1.50	1.01	
25	58.6	1.49	1.00	
32	46.0	1.46	0.97	
64	23.5	1.30	0.81	
80	19.0	1.27	0.78	

SEMI-LOG PLOT OF RECOVERY



SEMI-LOG PLOT OF DRAWDOWN VERSUS TIME

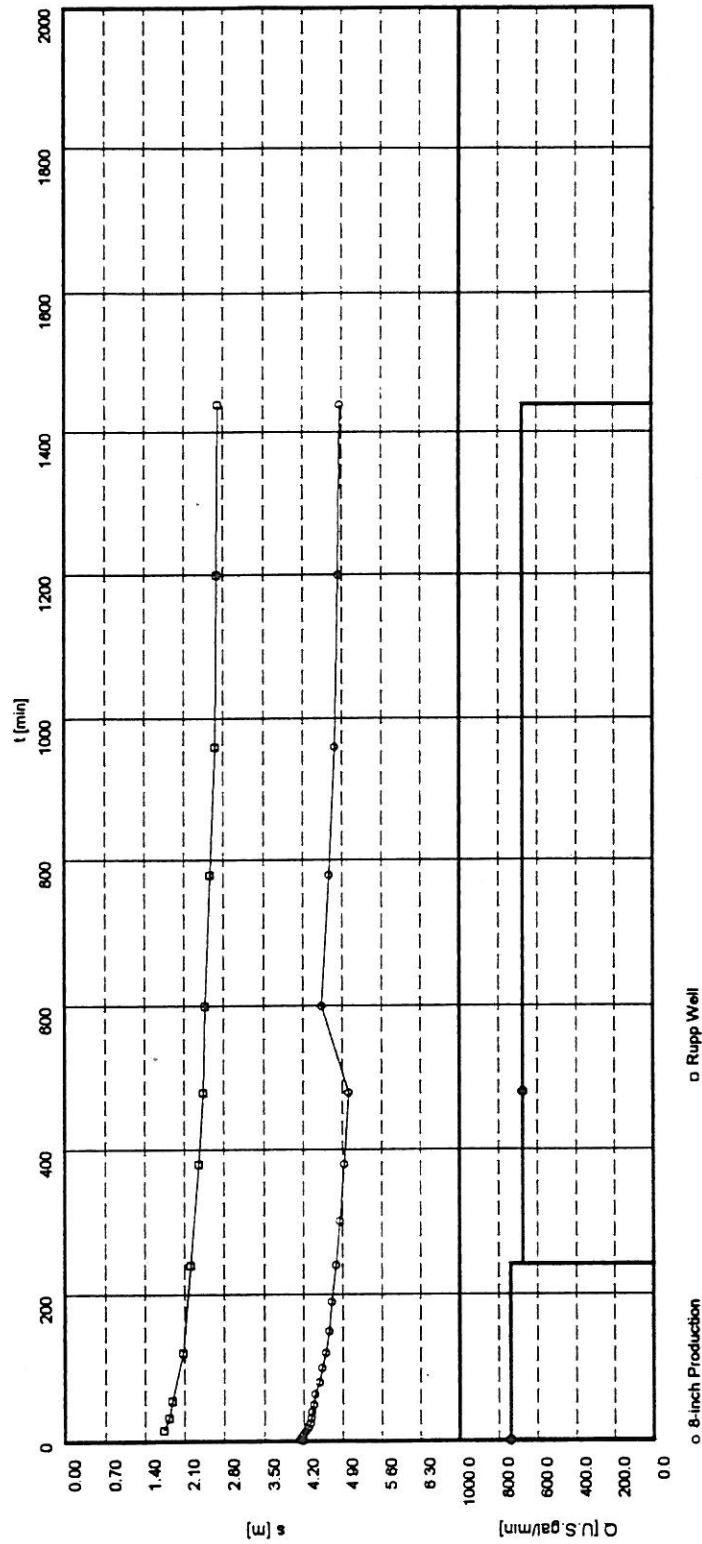


Test conducted on: November 4, 1988

Pumping Test No. 1

New 8-inch Production

Discharge 686.34 U.S. gal/min



Waterloo Hydrogeologic
180 Columbia St W.
Waterloo, Ontario, Canada
ph (519) 748-1798

Pumping test analysis
Theis analysis method
Confined aquifer

Date 19.11.1998

Project: District of Burton
Evaluated by: L. C. Topp

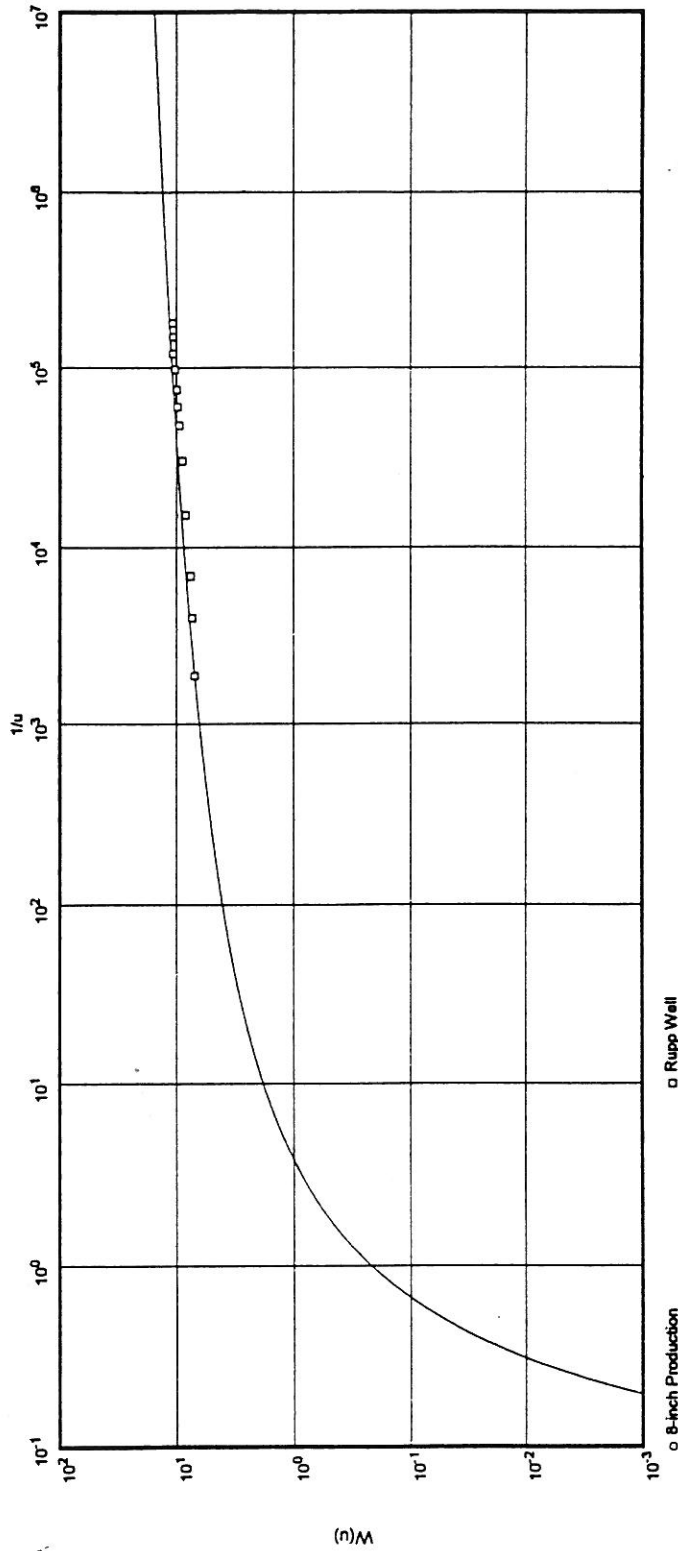
Page 2

Pumping Test No. 1

Test conducted on: November 4, 1998

New 8-inch Production

Discharge 686.34 U.S. gal/min



□ 8-inch Production

□ Rupp Well

Transmissivity (m²/min): 8.23×10^{-1}

Storativity: 2.61×10^{-6}

Golder Associates Ltd.

220 - 1755 Springfield Road
Kelowna, British Columbia, Canada V1Y 5V5
Telephone 250-860-8424
Fax 250-860-9874



June 29, 2005

05-1440-073

BC Hydro
c/o Urban Systems Ltd.
#500, 1708 Dolphin Avenue
Kelowna, British Columbia
V1L 9S4

Attention: Mr. Peter Gigliotti, P.Eng.

**RE: PRELIMINARY GUDI ASSESSMENT OF COMMUNITY WELLS LOCATED IN
BURTON, BRITISH COLUMBIA**

Dear Sir:

As requested, Golder Associates Ltd. (Golder) has completed a preliminary assessment of two wells located in the Community of Burton, BC (Burton) to evaluate if groundwater supplied by these two wells is potentially under the direct influence of nearby surface water sources (*i.e.*, GUDI - Groundwater Under the Direct Influence). The two wells are currently utilized to supply Burton with potable water. Our understanding is that should the groundwater supplied by the wells be considered GUDI, the groundwater would need to be treated at source, as required by the Interior Health Authority.

The scope of work for this assignment was outlined in our e-mail to Mr. Peter Gigliotti, P. Eng., of Urban Systems Ltd. (USL) dated March 17, 2005, and included i) a review of all hydrogeological information for the area, including driller's logs for the wells and pumping test data; ii) preliminary estimates of the 60-day wellhead capture zones for the wells using the calculated fixed radius (CFR) method; iii) analysis of pumping test data, where available, to establish transmissivity values and refine the 60-day capture zones; and iv) preparation of a report summarizing the results of the preliminary assessment and an opinion on whether groundwater extracted from the wells is considered to be GUDI.

Authorization to Proceed with the work was provided via e-mail by Mr. Gigliotti on March 24, 2005.



1.0 INFORMATION REVIEWED

The following information was reviewed as part of this assessment:

1. Previous documentation provided to Golder by USL, including:
 - Burton Water Consumption Data for 2002 (USL, 2002);
 - Report submitted by USL to BC Hydro entitled "*BC Hydro Burton Water System Upgrade Design Brief*", dated January 1999 (USL, 1999);
 - Report submitted by Kala to BC Hydro entitled "*Report of Findings 1998 Groundwater Exploration and Evaluation Program District of Burton*", dated August 21, 1998 (Kala, August 1998);
 - Report submitted by Kala to BC Hydro entitled "*Report of Findings District of Burton Construction, Testing and Evaluation of New 8-Inch Production Well Rupp Property*", dated November 23, 1998 (Kala, November 1998).
2. Water well records contained within the Ministry of Water, Land and Air Protection's (MWLAP) water well database; and
3. Topographic map: *Burton, British Columbia, Map Sheet 82 F/13W, Edition 1, Department of Mines and Technical Surveys, 1962.*

Water quality data for the community wells was not reviewed as part of this work.

The community water system comprises two water supply wells, referred to as Well 1 and Well 2. It is our understanding that Well 2 was installed approximately 10 m away from Well 1 for back-up purposes and that the two wells are pumped on a cyclical basis. No additional information was provided for Well 2, with the exception that the well installation for Well 2 was similar to Well 1. The calculations performed for this assessment were conducted for Well 1, only.

2.0 GENERAL SITE DESCRIPTION AND HYDROGEOLOGY

Burton is located approximately 36 km south of Nakusp, along the east side of Lower Arrow Lake, in south-central British Columbia. The town is situated on an alluvial fan complex deposited by Caribou Creek and Burton Creek. Kala's 1998 reports indicate that the local area was inundated with large pro-glacial lakes, as thick sequences of lacustrine silty clays, with only very localized deposits of sand gravel, are present in the area. Well 1 and Well 2 are located at the southwest end of Burton, at a distance of approximately 140 m east of Lower Arrow Lake, as shown on Figure 1. The wells are located approximately 600 m north-northwest of the mouth of Caribou Creek, and approximately 900 m north-northeast of the mouth of Burton Creek.

Urban Systems Ltd.
Mr. Peter Gigliotti

- 3 -

June 2005
05-1440-073

According to the BC Ministry of Environment (MOE)'s on-line well and aquifer database, there are no water wells or provincially-designated aquifers in the area of Burton. However, Kala's 1998 reports suggest that 10 additional water wells are present in the Burton area, which suggests that groundwater is an important resource in the area. One of the water wells, that owned by K. Rupp, is located approximately 100 m south-southeast of the wells and appears to be completed in the same aquifer.

3.0 REVIEW OF PREVIOUS INVESTIGATIONS

The subsurface soils encountered at Well 1 (as reported in the 1998 Kala report) are as follows:

- Interlayered silty sand and sandy silt to a depth of 18.9 m (62 feet);
- Sands with some gravel to 19.8 m (65 feet);
- Interlayered silty sand and sandy silt to 28 m (92 feet), with some clay present between 24.7 and 28 m (81 and 92 feet);
- Sand and gravel to 35.1 m (115 feet); and
- Gravel with clay to 35.4 m (116 feet) the maximum depth drilled.

The well screen is set between a depth of 31.9 to 35.1 m (104.5 and 115 feet). Groundwater elevations measured by Kala (1998) were approximately 0.3 m (1.0 feet) above the ground surface. The design yield recommended by Kala for Well 1 was 500 US gallons per minute (USgpm), equivalent to the transmitting capacity of the screen assembly in the well. Given that no information is available for Well 2, it is assumed that conditions in Well 2 are similar to those in Well 1.

Based on the location of the wells relative to Lower Arrow Lake and the direction of the flow in Caribou Creek (towards Lower Arrow Lake), the inferred groundwater flow direction in the area of the community wells is roughly west. Hydraulic gradients were not provided in previous reports and insufficient information was available to accurately determine the gradient in the area of the wells. However, based on the water level measured at Well 1 and the approximate elevation difference between Well 1 and Lower Arrow Lake, the hydraulic gradient is expected to range between 0.01 to 0.02 m/m.

Golder reviewed and analyzed the pumping test data provided in Kala (1998) using AQTESOLV, a computer software program developed by Geraghty and Miller, Inc. that provides analytical solutions for determining aquifer parameters based on pumping test data. The Theis confined solution option included in the AQTESOLV software program was used to interpret the data. A copy of the printouts generated from the AQTESOLV program are attached. The results of the AQTESOLV analyses indicate a transmissivity value for the aquifer at Well 1 of approximately 1.2 m²/min (1,800 m²/day). Kala's (1998) reported transmissivity for the aquifer at Well 1 was 0.82 m²/min (1,185 m²/day).

Urban Systems Ltd.
Mr. Peter Gigliotti

- 4 -

June 2005
05-1440-073

4.0 GUDI CRITERIA

The Province of British Columbia does not have a formal regulation with respect to evaluating if groundwater is considered GUDI. As such, the Ontario MOE regulations were followed as outlined in the Ministry document entitled "*Terms of Reference for Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water*" dated October 2001. The document states that community wells are "flagged" as potentially under the direct influence of surface water if they satisfy the following criteria:

- The wells regularly contain Total Coliforms and/or periodically contain E. coli; or
- The wells are located within approximately 50 days horizontal saturated travel time from surface water, or are within 100 m (overburden wells) or 500 m (bedrock wells) of surface water (whichever is greater) and meet one or more of the following criteria:
 - Wells may be drawing water from an unconfined aquifer;
 - Wells may be drawing water from formations within approximately 15 m of surface;
 - Wells are part of an enhanced recharge/infiltration project;
 - When the well is pumped, water levels in surface water rapidly change or hydraulic gradients beside the surface water significantly increase in a downward direction;
 - Chemical water quality parameters are more consistent with nearby surface water than local groundwater and/or if they fluctuate significantly and rapidly in response to climatological or surface water conditions.

As previously mentioned in Section 1.0, this preliminary assessment does not address water quality issues.

5.0 GUDI ASSESSMENT

5.1 Well Depth and Proximity to Surface Water

The two community wells are completed in overburden and are located greater than 100 m from the nearest surface water body. Well 1 draws groundwater from a confined aquifer located at a depth greater than 15 m from the surface. However, as the well is located in proximity to Lower Arrow Lake, it is not known whether the confining layer(s) extend below the base of the lake, or whether they are truncated at the edge of the lake. The present edge of the lake (or the high water mark) is located approximately 140 m from the wells, and, thus, this distance represents the closest distance of the wells to the lake.

5.2 Capture Zone Analysis

If the wells are located within approximately 50 days horizontal saturated travel time from surface water, there is a potential for groundwater to be drawn from the lake (*i.e.*, a surface water source). As such, this preliminary assessment was conducted to assess whether Well 1 is located within approximately 50 days horizontal saturated travel time from surface water. Note that a 60-day period was applied for the applicable calculations used in this assessment, as a 60-day period would generate a more conservative extent of the time of travel than a 50-day period.

The calculated fixed radius (CFR) method (discussed in Step Two of MOE's Well Protection Toolkit) was used to provide a rough estimate of the well head "time of travel" zone in order to assess whether surface water from the nearest surface water body (Lower Arrow Lake) would reach Well 1 within 60 days of pumping. A "time of travel" zone is the area of an aquifer from which groundwater will be derived in a predefined amount of time (in this case, 60 days) as obtained using the CFR method.

The following assumptions were made:

- *Lowest pumping rate (80 USgpm)*: based on the maximum daily flow rate recorded in 2002 (USL, 2002). This is assumed to be close to the current pumping rate;
- *Intermediate pumping rate (370 USgpm)*: based on the predicted long-term, maximum daily water demand for approximately 180 houses (USL, 1999);
- *Highest pumping rate (500 USgpm)*: based on the maximum design yield for Well 1, as reported by Kala (November, 1998); and
- The wells do not pump simultaneously.

5.2.1 Calculated Fixed Radius Method

A summary of the results of the CFR analyses for Well 1 is provided in Table 1, attached. The results indicate that the radius of the time of travel zone extent is as follows:

- approximately 70 m (based on a pumping rate of 80 USgpm);
- approximately 150 m (based on a pumping rate of 370 USgpm); and
- approximately 170 m (based on a pumping rate of 500 USgpm).

The extent of the 60-day time of travel zone estimation for the predicted long-term, maximum daily water demand of 370 USgpm (*i.e.*, 150 m) is graphically shown on Figure 1, attached. As stated in Section 2.0 above, Well 1 is located at a distance of approximately 140 m from Lower Arrow Lake.

It should be noted that the CFR method is based on simple physical assumptions regarding the aquifer system, for example that the aquifer is uniform and that the

groundwater velocity prior to pumping is nil. The CFR method of analyses depicts time of travel zones as being circular and tends overestimate the capture zone down gradient of the well.

6.0 DISCUSSION AND RECOMMENDATIONS

Based on the depth of the well, the proximity to surface water and the current rate of pumping (roughly 80 USgpm), the well is not considered a GUDI source. Although, the CFR determination of the extent of the 60-day time of travel zone indicated that the 60-day time of travel zone approaches the margin of Lower Arrow Lake (and could be interpreted as GUDI), the assumptions used in this analyses were conservative resulting in a larger capture zone than would likely occur in reality. These assumptions included:

- maximum projected withdrawal rate of 370 USgpm when the current pumping rate is estimated to be about 80 USgpm which would result in a larger radius of time of travel zone,
- 60-day time of travel rather than a 50-day time of travel as specified in the Ontario MOE regulations which would result in a larger radius of the time of travel zone; and
- No hydraulic gradient toward Arrow Lake when it is expected to range between 0.01 and 0.02 m/m. A hydraulic gradient towards the lake would result in smaller radius of time travel on the Arrow Lake side of the well.

If just one of these conservative assumptions is relaxed, such as reducing the 60-day travel time zone to Ontario MOE 50-day travel time zone, then the radius of the 50-day time of travel zone is 135 m and does not reach the lake.

Based on the above discussion, no further work with respect to additional GUDI analysis is recommended at this time. However, if future extraction from the wells is at or above 300 USgpm (near the maximum projected withdrawal rate used in the above analyses) on a continual basis, it is recommended that BC Hydro consider completing field investigations to verify hydraulic gradients in the aquifer and conduct a detailed analysis of the capture zone.

As per the BC MOE Groundwater Protection Regulations (June, 2004), it is recommended that the two community water supply wells be completed with a proper surface seal (if this has not already been done). Furthermore, as a conservative measure, consideration should be given to managing land use activities within an approximate 150 m radius of the water supply wells (based on our preliminary calculations, this represents the likely maximum extent of the capture zone) to further limit the potential for water quality impacts from surface occurring.

Urban Systems Ltd.
Mr. Peter Gigliotti

- 7 -

June 2005
05-1440-073

7.0 LIMITATIONS AND USE OF THIS REPORT

This report was prepared for the exclusive use of BC Hydro and Urban Systems Ltd. and their representatives and is intended to provide a preliminary assessment of the water supply wells for the Community of Burton in order to assess whether groundwater at the wells is under the direct influence of nearby surface water sources. This report is not meant to represent a legal opinion regarding compliance with applicable laws. Any use which a third party makes of this letter report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this letter report.

The assessment of groundwater conditions presented has been made using historical and technical data collected and information from sources noted in the report. Golder has relied in good faith on information provided by third parties noted in this report. We accept no responsibility for any deficiency, misstatements or inaccuracies contained in this report as a result of omissions, misinterpretations or fraudulent acts of others. If new information is discovered during future work, including excavations, borings or other studies, Golder should be requested to provide amendments as required.

8.0 CLOSURE

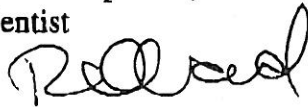
We trust the foregoing provides the information you need at this time. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours truly,

GOLDER ASSOCIATES LTD.



Pana Athanasopoulos, GTT
Geoscientist



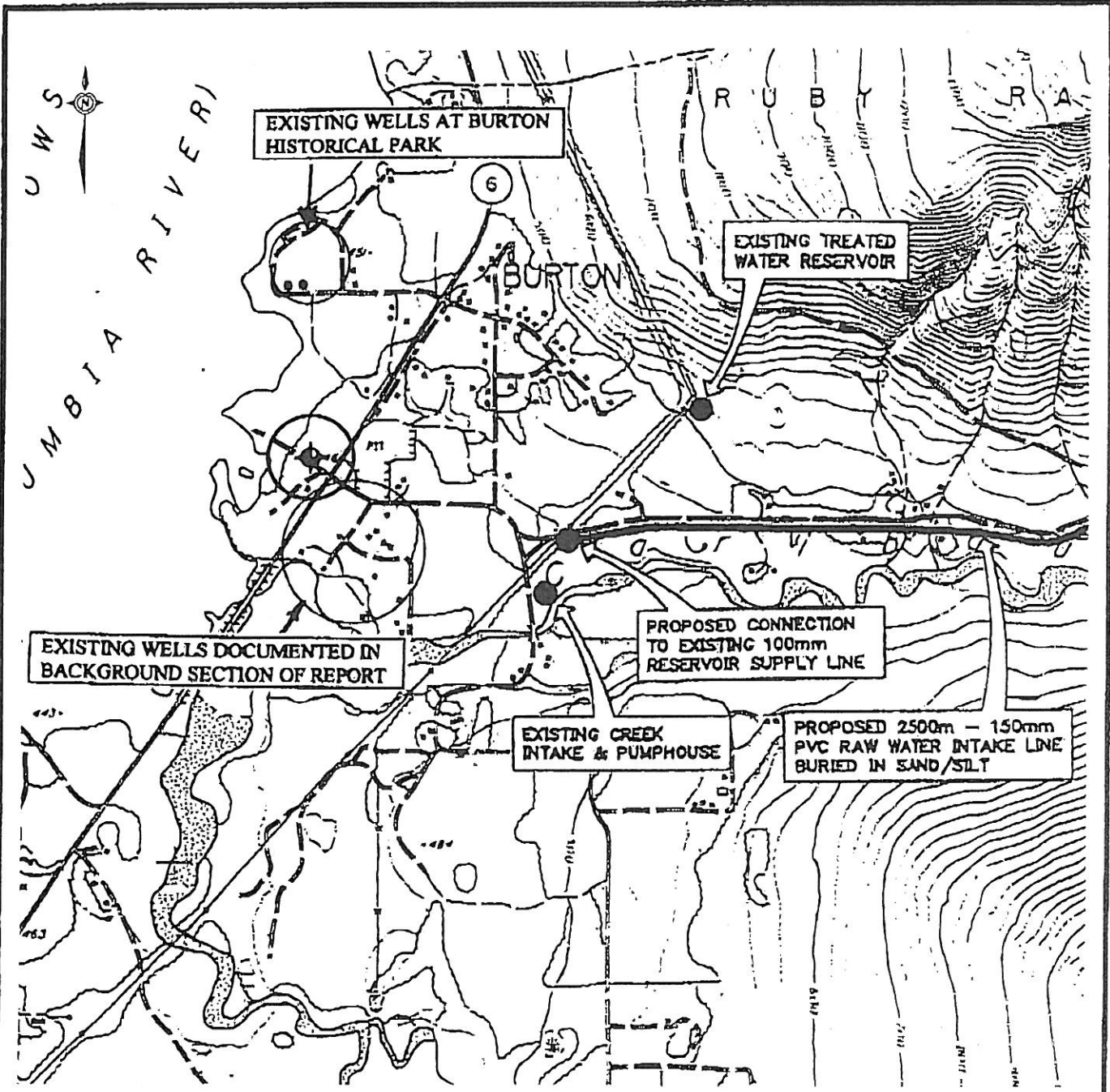
Remi Allard, M.Eng., P.Eng.
Senior Hydrogeologist

Reviewed by: Don Chorley, M.Sc., P. Eng.
Principal and Senior Hydrogeologist

Attachments

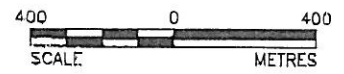
PA/RA/DC/jb

N:\Active\2005\1440 - Kelowna\05-1440-073 USL - Egdeswood GUD\FINAL\Burton report DWC final June 29-05.doc



LEGEND

- Approximate Community Water Supply Wells
- Calculated fixed radius, 60-day time of travel zone (pumping rate of 370 USgpm)



DRAWING REFERENCE: KALA GROUNDWATER CONSULTING LIMITED, FIGURE 1, DATED: NOV. 1998

<p>Golder Associates Kelowna, B.C.</p>	SCALE	1:20,000	<p>TITLE</p> <p>PRELIMINARY GUDI ASSESSMENT BURTON, BC</p>
	DATE	17/JUNE/05	
DESIGN	PA	CADD	JG
FILE No.	CHECK	REVIEW	BC Hydro
PROJECT	05-1440-073	REV.	0
			FIGURE
			1

N:\Active\2005\1440 - Kelowna\05-1440-073 USL - Egglewood CUDI\Figures\Burton\Figure 1.dwg Jun 29, 2005 - 9:37am

Table 1 - Well Summaries and Capture Zones
Town of Burton
Municipal Well 1
Burton, British Columbia

05-1440-073

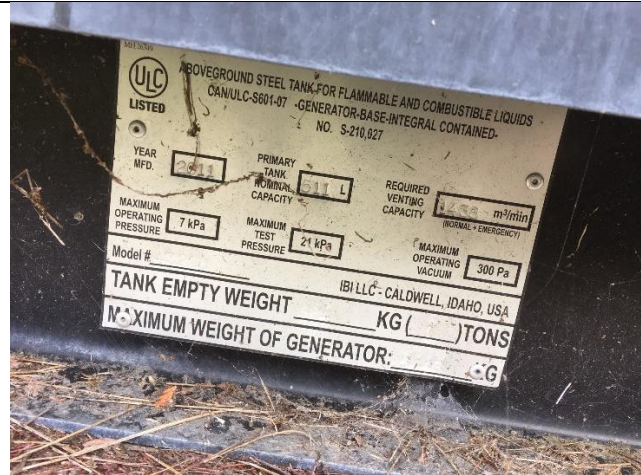
	Screen Top		Screen Bottom	Static Level Above Ground	Confined Aquifer Thickness	Pumping Rate USgpm	Pumping Rate L/s	Calculated Fixed Radius Capture Zone (90 days)
	m	m						
Scenario 1 - 2002 Max. Pumping Rate of 80 USgpm	31.9	35.1	35.1	0.32	7	80	5.0	69
	31.9	35.1	35.1	0.32	7	80	5.0	69
	31.9	35.1	35.1	0.32	7	80	5.0	69
	31.9	35.1	35.1	0.32	7	80	5.0	69
Scenario 2 - Predicted Long-Term Demand of 370 USgpm	31.9	35.1	35.1	0.32	7	370	23.3	148
	31.9	35.1	35.1	0.32	7	370	23.3	148
	31.9	35.1	35.1	0.32	7	370	23.3	148
	31.9	35.1	35.1	0.32	7	370	23.3	148
Scenario 3 - Design Yield of 500 USgpm	31.9	35.1	35.1	0.32	7	500	31.5	172
	31.9	35.1	35.1	0.32	7	500	31.5	172
	31.9	35.1	35.1	0.32	7	500	31.5	172
	31.9	35.1	35.1	0.32	7	500	31.5	172

Appendix F

Site Photos



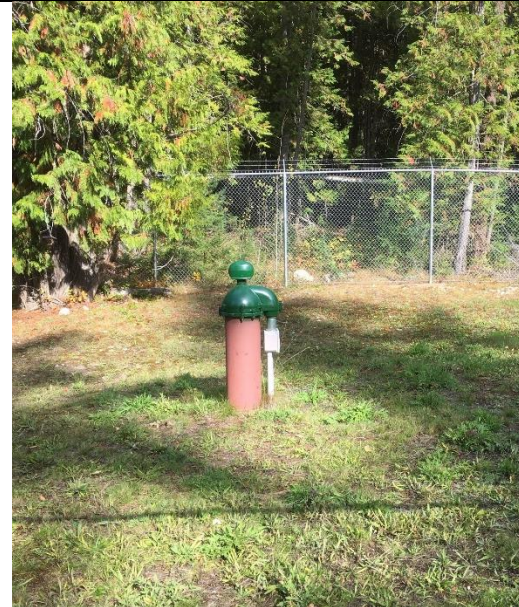
Onsite Diesel Generator



ULC Rating for Generator



Well Head #1



Well Head #2



Fenced Enclosure for Well Heads



Well Pump House