

25.0 BUILDING 6975: CARMACKS HEALTH CENTRE

25.1 Description of Existing Water Supply System

Building 6975, the Carmacks Health Centre, is currently supplied water from a 17.7 m deep well located in a well house approximately 3 m from the Health Centre building. The well supply serves both the Health Centre and the adjacent Nurses Residence. The well location and other site details are provided as Figure 6975-A in Appendix A25. There is a filtration and water softening system included on the water supply system that delivers water to the Health Centre. A schematic detailing the water supply system is provided as Figure 6975-B in Appendix A25. The coordinates of the wellhead, as measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6884848
- Easting: 433110

25.2 Description of Existing Wastewater Systems

The Health Centre and Nursing Station are serviced by a piped sewer collection system provided by the Village of Carmacks. There are service lines, and potentially sewer mains that are within 30 m the well.

25.3 Water Quality Results

25.3.1 Water Quality Results from Previous Sampling

Bacteriological

Bacteriological sampling of water from the Carmacks Health Centre water system has previously been completed by YTG this year. EBA was provided access to the YTG database in order to review the results of this previous bacteriological sampling. Two samples were collected from this system in 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 6975-1 located in Appendix A25.

According to the YTG database, *E. coli* and Total Coliform Bacteria were absent in each of the two samples for which results were provided.

Detailed Potability Analyses

PMA representatives previously collected a water sample from the Carmacks Health Centre water system on October 5, 2004. The sample was submitted to ETL EnviroTest in Surrey BC for detailed potability analyses. The results of these analyses are summarized in Table 6975-2 in Appendix A25. EBA reviewed the analytical results to compare them with the CDWQG and to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The water quality for the softened water sample obtained on October 5, 2004 indicated that the water is a potassium sulphate type due to the softening process, but that the groundwater type, as evidenced from the surrounding well water quality is likely calcium bi-carbonate type.
- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed. The hardness (as CaCO_3) was reported to be less than 1 mg/L, is considered very soft as expected of softened water treated with an ion exchange system.

25.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Carmacks Health Centre that was identified to be included during the water system assessments is detailed below:

- UV absorbance, to determine potential for UV treatment as a disinfection option in both the main Health Centre building.
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at both the main Health Centre Building and the Nursing Residence at the time of sampling.
- Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) were also collected for analysis to determine whether the documented fuel spill at the site had resulted in contamination of the water supply.

Additional Analytical Results

A water sample was collected by EBA during the field program on May 10, 2005, and was submitted to ALS Environmental in Vancouver BC for UV absorbance, PAH and EPH analysis. These results are summarized in Table 6975-2 in Appendix A25 and the laboratory reports are included in Appendix B.

EPH and PAH were below analytical detection limits, suggesting that at this time, the previously documented fuel spill is not impacting this well.

25.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations for the sample obtained on October 5 2004 is low and can be considered to be within the normal background ranges for groundwater in the Carmacks area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for the Carmacks area. Therefore, these water quality results suggest that the aquifer from which the groundwater is obtained for the Carmacks Health Center was not under the influence of anthropogenic sources of nutrients or anions such as septic wastes at the time of sampling.

25.4 Conceptual Hydrogeology

Residents of the Central Village of Carmacks obtain their water supply from wells completed in a permeable unconfined sand and gravel aquifer in glaciofluvial and recent alluvial deposits. The regional groundwater flow direction in the vicinity of Village Core is northeast toward the Yukon River.

25.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in Table 6975 in Appendix A25. Photos of potential contaminant sources are provided in Appendix A25.

A summary of potential contaminant sources within 30 m of the wells is provided below:

- Fuel powered generator at 2 m; and,
- Above ground fuel storage tank at 11 m.

25.5.1 Spills Records and Contaminated Sites Search Results

Investigation of available spills record information did not identify any concerns for this site. It was reported by the Environment Branch, however, that a soil relocation permit had been issued for this site in 2003. We understand that the a heating fuel oil leak in the underground line between the AST and the Health Centre had occurred approximately 4 years ago. EBA has not reviewed the results of the remedial excavation to remove the contaminated soils. The most recent water quality analysis shows no evidence of hydrocarbon contamination despite the close proximity to the well and the shallow nature of the aquifer.

25.6 Identified Water System Deficiencies and Associated Risk

25.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Carmacks Health Centre:

- The wellhead is located within 30 m of potential sources of contamination. There is an above ground storage tank located 11 m from the well, and the fuel line that runs to the health centre has leaked in the past;
- The well is not equipped with a surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction;
- The hydrogeology of the area also indicates that there are no protective low permeability layers between the surface and the water table. At 17.7 m deep, the well is considered to be a relatively shallow. The well, therefore, would be considered to be at high-risk of contamination from surface sources;
- The wellhead is located in a pump house that contains a back-up generator for the health centre and the well casing only extends 60 mm above floor level.

25.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

25.7.1 Priority 1

The following Priority 1 mitigative recommendations should be implemented to address the deficiencies associated with the water system at the Carmacks Health Centre.

- The existing 20-micron filtration system should be replaced with an NSF 61 certified inline commercial filtration system capable of removing particles down to 1 micron (absolute) in size.
- A NSF/ANSI 55 certified UV disinfection system should be installed, and the existing water softener should be adequate for use as a pretreatment system. This is a conceptual design recommendation based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.
- It would not be possible to install a proper surface seal to 6 m below grade. The well casing should; however, be extended to at least 500 mm above the pump house floor, and a secondary containment system should be installed around the generator to mitigate any risk of fuel leakage.
- Secondary containment should be installed on the above ground storage tank, or else the tank should be replaced with double walled fuel storage tanks.
- The Point of Entry treatment system should be installed in the pump house if there is room available, so that it can offer treatment to both water supply systems that are dependent on the well.

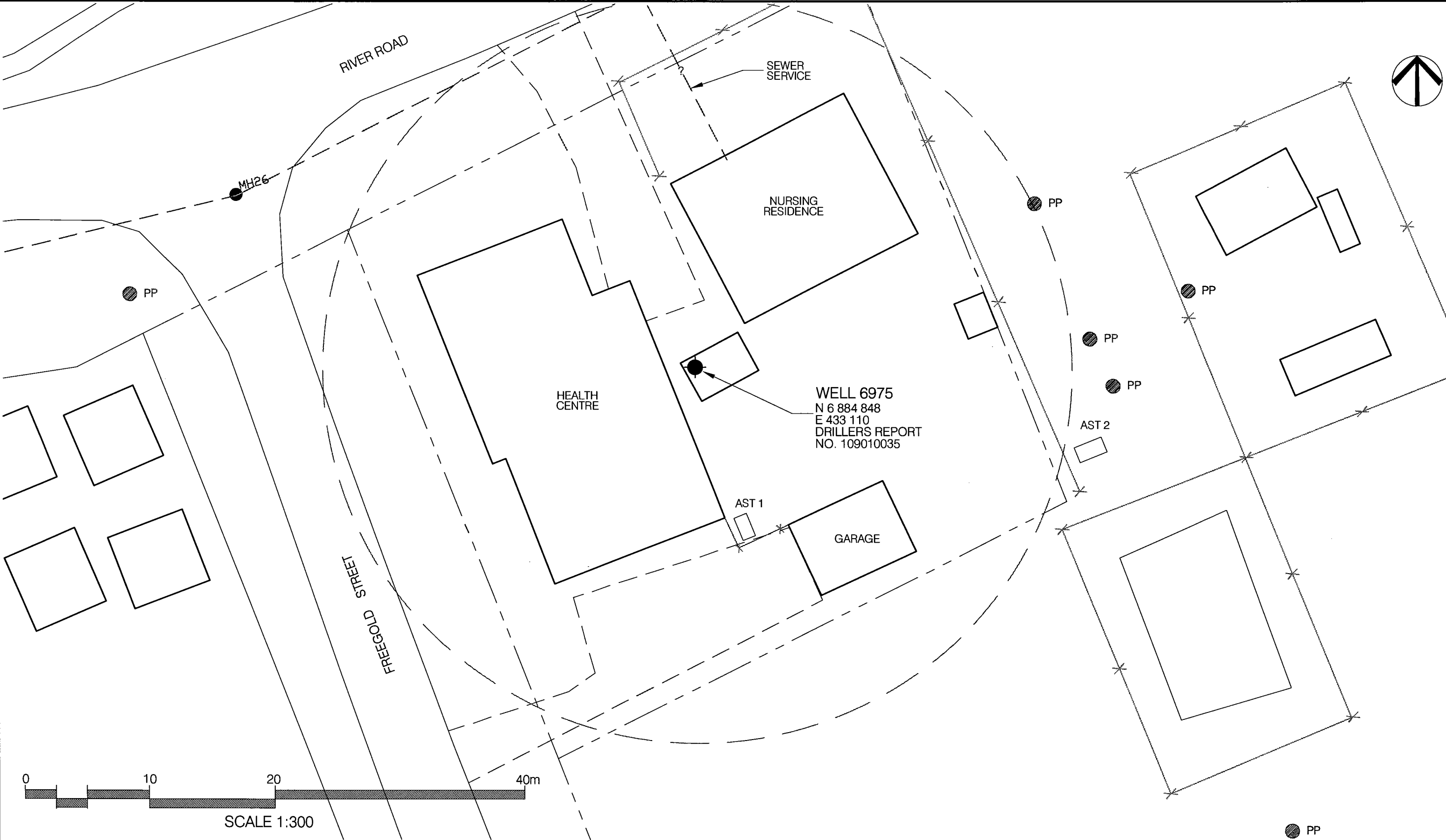
25.8 Cost Estimates for Mitigative Options

Engineering costs for pre-design and preparation of process diagrams and specifications for project tendering for water treatment systems are estimated to be 25% of construction costs. Engineering costs for other mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

25.8.1 Priority 1

Class D cost estimates for mitigative option to address the well deficiencies for this site are as follows:

- The cost for the proposed disinfection/treatment system would amount to a total installed cost of about **\$5,000**.
- To extend the well casing to 500 mm above the pump house floor level would cost approximately **\$500**, and a secondary containment tray underneath the generator and fuel lines in the pump house is estimated to cost approximately **\$1000**.
- Replacing the existing above ground fuel storage tank with a double walled secondary containment tank would likely cost approximately **\$3,800**.
- Placing the treatment system in the pump house should incur no more cost than placing it in the health centre.



NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX		
No.	DESCRIPTION	DATE	APPROVED		
REVISION					



EBA Engineering Consultants Ltd.

DESIGNED BY: R. MARTIN
DRAWN BY: J. BUYCK
DATE: JUNE 2005
SCALE: AS SHOWN
PROJECT No.: 1260002.001
ACAD FILENAME: 001-WHITEHORSE REGION

CLIENT:



Highways and Public Works
Property Management Branch

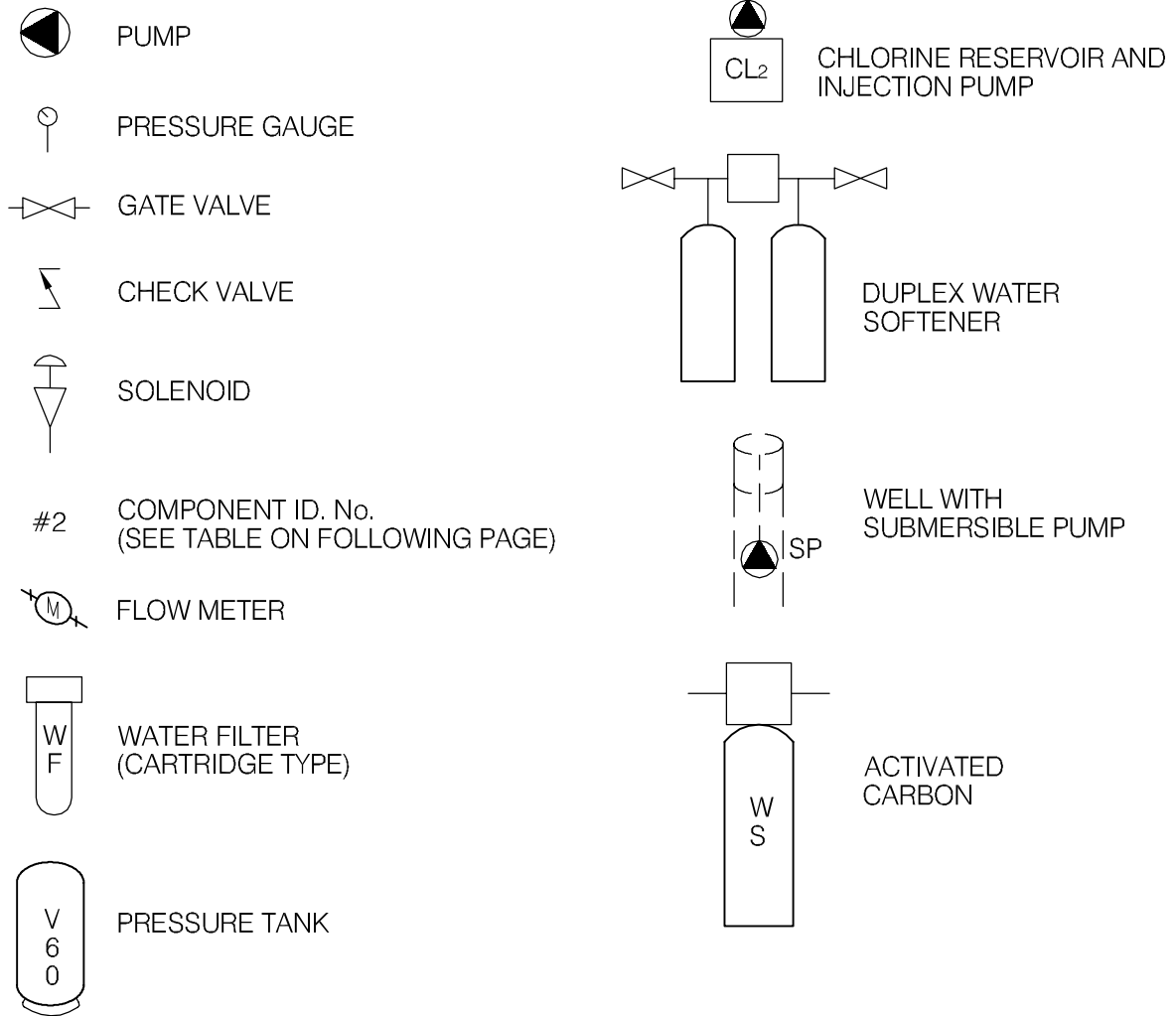
SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

CARMACKS HEALTH CENTRE
BUILDING 6975
SITE LOCATION DIAGRAM
WELL ID: 6975

REVISION ISSUE
0
DRAWING No.
FIGURE 6975A

LEGEND



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CLIENT



PROJECT

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

TITLE

SCHEMATIC SYSTEM
LEGEND

DATE APRIL 2006

DWN. JSB

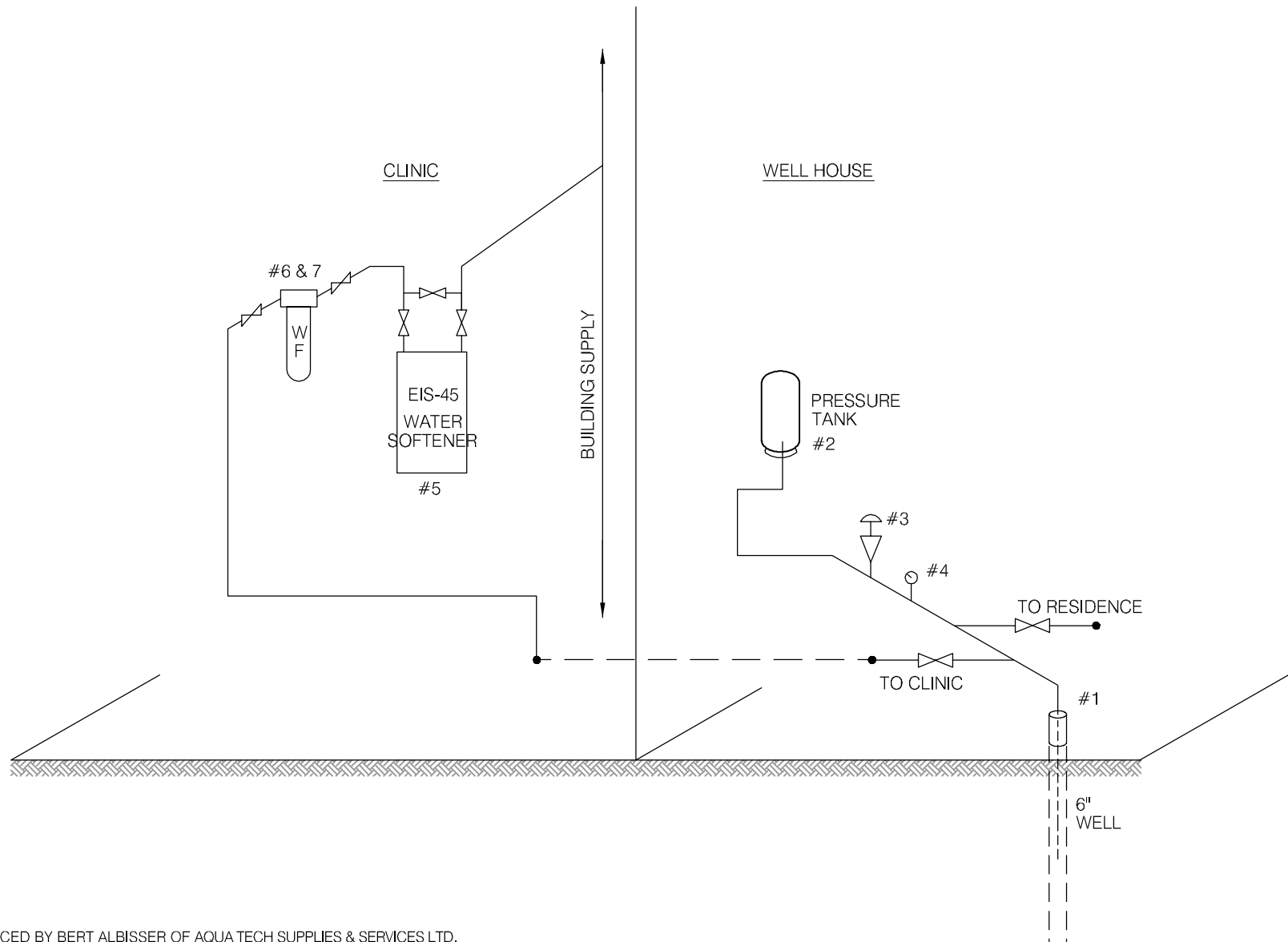
CHKD. RMM

FILE NO.

1260002

DRWG.

LEGEND



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.



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CLIENT



PROJECT

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

TITLE

WATER SYSTEM DISTRIBUTION/TREATMENT
SCHEMATIC SYSTEM ID.: 6975
CARMACKS HEALTH CENTRE

DATE APRIL 2006

DWN. JSB

CHKD. RMM

FILE NO. 1260002.001

DWG.: FIGURE 6975B

Whitehorse Region – Health Centre

Building # ~~6875~~ 6975
6875

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	MONARCH	16CISEX		828	4" - 1/2 HP.
2	PRESSURE TANK	CHALLENGER	PC 244			307 l
3	PRESSURE SWITCH	SEQ. D	FSG-2			1/4 FIFT x 2 HP
4	PRESSURE GAUGE	MARSH	0-100			1/4" FIFT.
5	WATER SOFTENER	WATERTECH	E1545 MI			45000 GRAIN
6	PRE FILTER	AMETEK.	1" BIG BLUE			4"x10"
7	FILTER CART	PLYMOUTH	51-BB			20 HICKON
8						
9						
10						

TABLE 6975 - 1: SUMMARY OF BACTERIOLOGICAL RESULTS

		Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
Building #	Building Name							
6975	Health Centre	2	Apr-05 to May-05	no	0/2	no	May 05	no



Table 6975-2: Water Quality Results

SOURCE:		Building 6975 A - Carmacks Health Centre		Building 6975 B - Carmacks Nursing Residence		GCDWQ Criteria		
Location/ Resident		Carmacks		Carmacks				
Address		Lot 123		Lot 123				
Treatment		Filter and Softener		UV System				
Source of Water		On-Site Well (shares with 6975 B)		On-Site Well (shares with 6975 A)				
Purpose of Sampling		Baseline	Additional Sampling	Baseline	Additional Sampling			
Sample Location			Kitchen Tap		Laundry Sink Tap			
Date Sampled		5-Oct-04	12-May-05		12-May-05	Lower Limit	Upper Limit	
Physical Tests (ALS)						AO	MAC	AO
Colour (CU)		<3						15
Conductivity (uS/cm)		612						
Total Dissolved Solids		365						500
Hardness CaCO3		<1				AO >200 = poor, > 500 unacceptable ^A		
pH		8.1				6.5		8.5
Turbidity (NTU)		0.15					1	5
UV Absorbance			<0.0010		<0.0010			
Dissolved Anions (ALS)								
Alkalinity-Total CaCO3		231						
Chloride Cl		5						250
Fluoride F		0.2					1.5	
Sulphate SO4		24.8						500
Nitrate Nitrogen N		<0.1					10	
Nitrite Nitrogen N		<0.05					1	
Ammonia Nitrogen N								
Total Metals (ALS)								
Aluminum T-Al		<0.02					0.1	
Antimony T-Sb		0.0007					0.006	
Arsenic T-As		0.0031					0.025	
Barium T-Ba		0.0002					1	
Boron T-B		<0.02					5	
Cadmium T-Cd		<0.0002					0.005	
Calcium T-Ca		<0.5						
Chromium T-Cr		0.001					0.05	
Copper T-Cu		<0.001					1	
Iron T-Fe		0.009						0.3
Lead T-Pb		0.0002					0.01	
Magnesium T-Mg		<0.1						
Manganese T-Mn		0.001						0.05
Mercury T-Hg		<0.0002					0.001	
Potassium T-K		212						
Selenium T-Se		<0.0004					0.01	
Sodium T-Na		<1						200
Uranium T-U		0.001					0.02	
Zinc T-Zn		<0.004						5
Polycyclic Aromatic Hydrocarbons								
Acenaphthene			<0.000050					
Acenaphthylene			<0.000050					
Acridine			<0.000050					
Anthracene			<0.000050					
Benz(a)anthracene			<0.000050					
Benzo(a)pyrene			<0.000010					
Benzo(b)fluoranthene			<0.000050					
Benzo(g,h,i)perylene			<0.000050					
Benzo(k)fluoranthene			<0.000050					
Chrysene			<0.000050					
Dibenz(a,h)anthracene			<0.000050					
Fluoranthene			<0.000050					
Fluorene			<0.000050					
Indeno(1,2,3-c,d)pyrene			<0.000050					
Naphthalene			<0.000050					
Phenanthrene			<0.000050					
Pyrene			<0.000050					
Quinoline			<0.000050					
Extractable Hydrocarbons								
EPH10-19			<0.30					
EPH19-32			<1.0					
LEPH			<0.30					
HEPH			<1.0					
Field Chemistry (EBA)								
pH			8.05		7.90	6.5		8.5
TDS			291		225			500
EC (uS/cm)			571		444			
Temperature			15.0		8.5			
Free Available Chlorine								250

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Shading indicates exceedence of Proposed MAC guideline (arsenic).

Bold Underline with Yellow shading indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)



Table 6975-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification and Location					
Building #	Building Name	Location	Northing (+/- 10 m)	Easting (+/- 10 m)	Grade Elevation (+/- 10 m)
6975	Health Centre	Carmacks	6884848	433110	528

Well Details							
Well Casing Diameter (mm)	Year Well Installed	Well Log?	Well Depth (m bg)	Reported Low Permeability Protective Layer?	Pump Setting (m bg)	Well Capacity - Tested, or Reported by User	Static Water Level Below Ground (m-btwc)
150	?	Incomplete	17.68	No, shallow well	?	1 1/2hp submersible pump Size of pump meets needs	?

Well Construction Details				
Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading
0.06 above grade	Split Cap Gasket	?	Unlikely	Inside building

**Table 6975-4: Potential Contaminant Sources
Building 6975 – Carmacks Health Centre**

Potential Contaminant Source	Potential Contaminants	Distance from Water Source	Northing	Easting
Dump or Landfill	Organic and inorganic chemicals.	1500 m		
Cemetery	Biological¹ , inorganic ² and organic parameters.	600 m up-gradient		
Sewage lagoon	Biological , inorganic and organic parameters.	>300 m		
Sewage lines, tanks and lift stations	Biological , inorganic and organic parameters.	Unknown		
Septic fields	Biological and Inorganic parameters.	>150 m		
Gas stations	Organic and Inorganic parameters.	50 m		
Undergrounds Fuel Storage Tanks (USTs)	Organic parameters.	>30 m		
Above ground storage tanks (ASTs)	Organic parameters.	11 m and 50 m	6884883	433115
Naturally occurring sources of contamination	Radionuclides, Bacteria and Viruses from surfacewater sources.	50 m		

Notes:

Bold highlighting of distances indicates non-compliance with proposed guidelines

1- Biological parameters include: bacteria, viruses, protozoa (parasitic organisms), helminthes (intestinal worms), and bio aerosols (inhalable moulds and fungi).

2 – Inorganic contaminants could include arsenic in embalming chemicals (prior to early 1900's), and heavy metals in caskets.

Required Setback Distances Draft Guidelines for Part III – Small Public Drinking Water Systems:

300 m (1,000 ft) from a sewage lagoon or pit and manure heaps

120 m (400 ft) from a solid waste dump or a cemetery

30 m (100 ft) from any other potential source of contamination

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*Incomplete Log

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin.
Luke Label

Date May 12, 2005

WELL ID #	Owner	Location Description
<u>6975</u> (possibly 6977)	<u>YTB</u>	<u>Carmacks Health Center -</u>

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)

Carmacks

b. Specific location: (Road or street, Building number, name of owner and/, legal description,

Carmacks Health Center

c. GPS location: 0433110 Easting 6884948 Northing 528m elevation ±8m

d. Is there electric power? ☒ Yes ☐ No

e. Does the well system have:

☐ 15 or more service connections to a piped distribution system?

Health Center and nearby residence

If so how many _____

☐ 5 or more delivery sites on a trucked distribution system?

If so how many _____

f. Nearest building, specify Health Center

g. Distance from well to building ~4m

h. If there is an effluent disposal field, is its location known?

☐ Yes

☒ No

no evidence

i. Distance from well to nearest point of known field:

of any septic field within local area. → piped sewer system w/ lines <30m

j. Well location relative to field: ☐ upslope

☐ downslope

☐ lateral

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k. Is there any part of a sewage disposal system(s) or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☒ No

l. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No unlikely

m. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No
solid waste dump ~ 1 km away

n. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
locked door; inside building

Entrance by animals? ☒ Yes ☐ No
no apparent evidence of any animals

o. Is well site subject to flooding? ☐ Yes ☒ No

p. Is the well site well drained? ☒ Yes ☐ No

q. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely
There is, however, a buried fuel line that has leaked hydrocarbons and contaminated the soil
If yes, is it ☐ in use ☐ abandoned ~ 6m from the well & see report - contaminated soil was relocated
Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

r. Are there any other known contaminant sources on the property?

☒ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

433115
686480
535m
Potential Source 1: AST 1; Distance from well to Potential Source 1: ~11m

Potential Source 2: AST 2 (large diesel fuel tank); Distance from well to Potential Source 2: ~50m

Potential Source 3: River; Distance from well to Potential Source 3: ~50m

Potential Source 4: hydrocarbon spill; Distance from well to Potential Source 4: ~6m
Electric generator ~ 2m within same building

s. Are there other wells on this property? ☐ Yes ☒ No unlikely

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

There was a leak from the AST in the line running to the station. Some soil contamination

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2. Well and Wellhead information:

- *a. When was well installed? Year _____ Month _____
- b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____
- *c. Is there a drillers log for the well: ☐ Yes ☐ No
- d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☒ unlikely
- e. Surface casing: ☒ Yes Diameter 5m x 2.5m ☐ No
The well is located within a utility building
- f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete
and rope split casing, there is an open hole for heat trace
- *g. Depth of well: 17.68m ☐ measured (if possible) ☒ reported ☐ from log
- *h. Static water level below ground: _____
☐ measured (if possible) ☐ reported ☐ from log ☐ flowing
- *i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen
☐ with slotted pipe ☐ unknown other _____
- *j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic
- *k. If there is a well screen: length _____ slot size(s) _____
Location of screen: from _____ to _____ from log reported
- l. Is there a sump below the screen? ☐ Yes ☐ No unlikely
- m. Is the well head: ☒ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
shares with pressure tank and backup electric generator. Utility building is heated and insulated
☐ in a wooden enclosure other, describe _____
- n. If the well head is located in a wooden enclosure,

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- i. Is the well head below grade? describe in detail no, it is 6cm above grade
- ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No
well area seems very clean
- iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No
The well head is within a heated, insulated building
- iv. Any evidence of rodents? Specify no evidence of rodents
- v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition _____

3. Water Supplying This Well:

- a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.
There was a hydrocarbon spill ~ 6m away - has been remediate &
If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) water softener

4. Aquifer Supplying This Well:

- a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
- b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No

5. Pump Installation:

- a. Is the well equipped with a pump? ☒ yes ☐ No
- b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____
- c. Description: Manufacturer _____ Model _____
horsepower _____ capacity _____ voltage _____

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*d. Date installed: _____ By: _____

*e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☒ steel ☐ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No
Tap in building, on line to pressure tank

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No
The well is located within a heated, insulated building. There is heat trace on all piping and down to pump
If yes, describe: _____

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations: _____

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PART B: EBA Site Inspection

Inspector: _____

Date _____

WELL ID #	Owner	Location Description
6975	YTG	CALMARKS HEALTH CENTRE RESIDENCE

6. Water Treatment

a. Is well water treated? ☒ Yes ☒ No; Type of treatment: UV SYSTEM

☐ chlorination ☐ iron and or manganese removal ☒ other LIV

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☒ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☒ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☒ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☒ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☒ severe

Type of stain: ☐ brown ☒ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☒ occasional ☐ constant

c. Is there an unpleasant odour? ☒ Yes ☐ No ☒ H₂S ☐ Other _____

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- d. Is there an unpleasant taste? ☒ Yes ☐ No ☐ brackish ☐ Other _____
- e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No *UNKNOWN*
- f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete *UNKNOWN*
- g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☒ No
- h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☒ unknown
- i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☒ unknown
- j. Is a record of the date, time, name of person performing the test and results of the drinking water sample kept? ☐ Yes ☒ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes ☒ No ☐ Details:

Where is it located?

Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?

YES NO

Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES

NO

Comments: _____

Are there other heat sources near the tank? YES NO

Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO

Comments: _____

Overall Tank

What are the tank size and dimensions?

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO

Comments: _____

Is there any sediment or scum in bottom of tank? YES NO

Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

UV SYSTEM INSTALLATION REQUIRES ATTENTION. THE TWO UV REACTORS DO NOT HAVE FLOW RESTRICTORS INSTALLED TO ASSURE FULL UV EXPOSURE, NO UV MONITOR IS PRESENT TO MEASURE UV STRENGTH. THE PIPING FEEDING THE REACTORS PROMOTES UNEVEN FLOW DISTRIBUTION AGGRAVATING THE ABOVE PROBLEM.

b. Recommendations:

RENEW THE PIPING SYSTEM. INSTALL ONE FILTER SYSTEM TO HANDLE THE FULL FLOW. INSTALL UV MONITORS ON BOTH REACTORS ALONG WITH THE APPROPRIATE FLOW RESTRICTORS.
INSTALL PRETREATMENT IF REQUIRED
THIS SYSTEM IS AN ACCIDENT WAITING TO HAPPEN.



Driller's Report 109010035

Page 1 of 1

Location: Nursing Station Well Lot 124 CRMK

NAD 83 Zone 8 Easting 433111.13 Northing 6884897.0 Elevation ASL 1 m.

Location Accuracy: Horizontal 30-100 (topo)

Vertical unknown or unreliable

Purpose of well: Commercial - not fabrication or manufacturing

Permafrost encountered? No

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Layer	From	To	General Colour	Most Common Material	Secondary Material	General Description
1	0	1.22 m.		SAND and gravel		
2	1.22	2.13 m.		fine SAND		
3	2.13	17.68 m.		TILL		

WELL CONSTRUCTION

Well No. 1090100351 Completion date Drilling method Well type

Casing: OS Diameter mm. Material Wall thickness mm. Depth to m.

Comments

Surface/Env'l seal: Material Diameter mm. Depth from to m. Volume cu. m.

Gravel Pack ? Material Diameter mm. Depth from to

Well Screen Information

OS Diameter	Material	Screen Type	Comments

Screen Sections

Section	From	to	Slot size/ perforation diameter
1			

WELL DEVELOPMENT AND STATUS

Well ID Developed by Wellhead completion Adapter depth Static water level Yield Estimate Estimate method

1090100351 m. m. Lps

Final Status New, in use for intended purpose

No

GROUNDWATER QUALITY

Well No. 1090100351 Field Measurement Date 10-Dec-02

Electrical Conductivity 605 μ S

pH 7.58

Temperature 6.45 $^{\circ}$ C

Groundwater Type

Turbidity/sand content

Well disinfection

Was the well disinfected on completion of pump installation?

Bacterial testing done? Lab Date

Chemical testing done? Lab Date



Photo 0137: 6975 Health Center (right), Wellhouse (center) and Nursing Residence (left)



Photo 0002: 6975 Wellhead



Photo 0138: 6975 Above Ground Fuel Storage Tank and Hydrocarbon Spill Site



Photo 0139: Substation and Above Ground Fuel Storage Tank (back)

**Photo 0142:** 6975 Health Center Water Treatment System**Photo 0143:** 6975 Nursing Residence Water Treatment System**Photo 0141:** 6975 Pressure Tank (right) and Backup Electrical Generator**Photo 0001:** 6975 Pump Control Box