EBA ENGINEERING CONSULTANTS LTD.

SMALL PUBLIC WATER SYSTEM ASSESSMENT

Western Region

"CREATING AND DELIVERING BETTER SOLUTIONS"

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Small Public Water System Assessment
Yukon Government Maintained Buildings

WESTERN REGION

Project No. 1260002.003

March 2006

Small Public Water System Assessment
Yukon Government Maintained Buildings
WESTERN REGION

Submitted To:

Property Management Agency
Government of Yukon

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.
WHITEHORSE, YUKON TERRITORY

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1.0 INTRODUCTION

1.1 Scope of Work and Terms of Reference

The scope of work for this project was to conduct professional assessments of the wells, water systems and water sources for Government of Yukon maintained buildings in the "Western Region" as defined in the Request for Proposal (RFP) "Small Public Water Drinking Water System Assessment – Yukon Government Maintained Buildings – 2005". The RFP, and the EBA project team's proposal (EBA, February 2005) formed the Terms of Reference (TOR) for this study. In accordance with the TOR, the assessments were comprehensive and the reporting includes information, observations, comments, recommendations and plans/sketches for the water sources, infrastructure and distribution systems. The recommendations include Class D cost estimates to upgrade water systems to meet the new draft regulations - ***Draft Guidelines for Part III – Small Public Drinking Water Systems***. Comparison of well construction with the ***Canadian Groundwater Association Guidelines for Water Well Construction,*** and comparison of water quality results with the ***Guidelines for Canadian Drinking Water Quality*** are included for each system. This report provides a summary of the assessment results and recommendations and costs for the Western Region.

1.2 Authorization

The project team consisting of EBA Engineering Consultants Ltd. (EBA), Dayton and Knight Ltd. (D&K) and Aqua Tech Service and Supply (ATSS) was authorized to complete the work program in accordance with the TOR. EBA, as the consulting team representative, signed a contract (GN04556521-40319) with the Property Management Agency (PMA) of the Government of Yukon (YTG) on March 8th 2005 to provide consulting services to conduct the Small Public Drinking Water Assessments as per the submitted proposal, fees and disbursements.

1.3 Public Drinking Water System Regulations and Guidelines

Since the tragedy of the Walkerton water supply contamination issue, jurisdictions across Canada have adopted the "Source to Tap, Multi-barrier" approach in assessing, planning and designing water supply systems. The Yukon has followed in step with the rest of Canada in the development of several key guidelines for regulation. The following two draft drinking water guidelines for regulation to be enacted under the ***Public Health and Safety Act*** (Yukon), were released in April 2004:

- ***Public Drinking Water Systems Regulations***; and,

- ***Bulk Delivery of Drinking Water Regulations***.

As well, the Yukon Government has recently developed ***Draft Guidelines for Part III – Small Public Drinking Water Systems***, which were referenced during this study. *We understand* that these draft guidelines are still under review.

Each of these draft regulations specify requirements in the areas of source protection, training, permitting, engineering assessments, equipment, disinfection and treatment, operation and maintenance, sampling and analysis, record-keeping, and emergency planning. All remedial measures and feasibility assessments completed in this study are consistent with the requirements of Yukon legislation.

The ***Canadian Drinking Water Quality Guidelines*** (CDWQG) are referenced for the analysis of water quality data. These guidelines are amended periodically, and the most recent version (April 2004) was used for this study.

1.4 Methodology

The following sections describe the methodology used for completing the scope of work in accordance with the Terms of Reference.

1.4.1 Meeting #1: Project Kick-off

A project "Kick-Off" meeting was held on March 16th, 2005 following award of the contract to introduce the project team members and discuss the Terms of Reference. EBA representatives Ryan Martin and Matt Pye, ATSS representative Bert Albisser, and YTG representatives Tom Renwick and Nick Barnett attended the meeting. The civil/mechanical engineering representatives of the team (D&K) attended by teleconference. Project team introductions, access to background information (water quality results, well records), proposed mapping, schedule and billing was discussed.

1.4.2 Information Collection and Review

The assessment began with the compilation and review of all relevant information including previous reports, site plans, air photos, well logs, pump testing results and water quality data.

An evaluation of all existing water quality information available from a previous study (***Collection of Water Samples for Bacteriological Testing, Chemical and Physical Parameter Testing – Various Locations, Yukon – YTG Contract 2004)*** was undertaken prior to the field program. The purpose of this review was to identify wells that may be impacted by various potential sources of contamination in order to determine the additional water quality parameters necessary to evaluate treatment/disinfection options. The available water quality information was assessed for compliance with the ***Guidelines for Canadian Drinking Water Quality criteria***. EBA prepared a letter dated April 7th, 2005 for YTG Property Management Agency titled ***Recommendations for Additional Analytical – Small Public Drinking Water System Assessments – Government of Yukon Maintained Buildings – 2005***. The letter provided recommendations and estimated costs for additional sampling, field chemistry and laboratory analyses.

1.4.3 Meeting #2: Pre-Assessment

Following the collection and review of available information pertaining to the subject water systems, a meeting was held in Whitehorse with YTG, EBA and ATSS representatives on May 5, 2005. Each of the regional managers attended.

The findings of the analytical review were discussed, with particular attention given to the recommendations for additional water quality sampling. Laboratory and courier cost estimates for the additional analyses were presented at the meeting, along with contact information for personnel involved in the project.

Specific aspects of the field program were discussed including site access and the standardized reporting format for each system. Also, the sequence of regions to be evaluated was determined based on priority of expected high-risk deficiency upgrades and level of risk. It was decided that the first region to be assessed would be the Whitehorse Region, followed by the Eastern Region, Western Region and the Northern Region.

1.4.4 Assessment Team

For system assessment, a project field team consisting of an EBA hydrogeologist (Ryan Martin, P.Eng.), an EBA Field Technician (Luke Lebel) and one senior Aqua Tech personnel (Bert Albisser) was utilized. The primary responsibility of EBA personnel during the field assessments was the evaluation of well construction and location. All

potential sources of contamination within 150 m of subject wells with specific attention to the 30 m surrounding the well were identified during the system assessments.

The primary responsibility of Aqua Tech personnel (Bert Albisser) during the field assessments was the accurate documentation of the distribution and treatment/disinfection systems, including general condition and maintenance requirements. Aqua Tech personnel provided a preliminary evaluation of the system to EBA and D&K and assisted with detailed evaluation and development of recommendations.

D&K personnel provided technical advice by correspondence, as needed during the water system assessments, and were not required to visit the sites.

1.4.5 Wellhead Inspections and Water Supply Source Evaluations

For each of the subject wells, the field investigation began with a site reconnaissance to assess general site conditions, topography, surface drainage patterns and exposed sediments. The major focus of the reconnaissance was identification of potential sources of contamination that may not have been previously identified through research prior to the field assessment. Separation distances were measured to all potential sources of contamination within 150 m of the well, including septic fields, sewage lagoons, cemeteries, landfills, buildings, roads, fuel storage tanks and other sources of potential contamination. This information is presented in the individual sections for each water system on digital, scaled site plans developed for the subject sites. Groundwater flow directions are inferred where possible within the report based on topography and proximity to surface water bodies, as well as previous work.

Following the site reconnaissance, a detailed inspection of the water supply system was undertaken. Where possible, the following information was obtained for each well:

- Wellhead construction, enclosure, piping, cleanliness and the buildings served;
- GPS coordinates at each wellhead;
- GPS coordinates for septic fields or other potential contaminant sources within 150 m of each wellhead;
- Digital photographs of wellheads and any potential contaminant sources;
- Surface completion details relevant to the security and operation of the well;
- Assessment of all well enclosures;
- Completion of wellhead check lists for each well incorporating the following items:

- Compliance with the ***Canadian Groundwater Association Guidelines for Water Well Construction***, including existence of casing seals (if possible) and height of casing above ground surface;
- Casing type and diameter;
- Type and condition of well cap;
- Potential for ponding of surface drainage at wellhead;
- Qualitative description of water quality concerns if possible (e.g. staining, odours);
- Description of system deficiencies and digital photographs illustrating deficiencies;
- Wellhead accessibility for rehabilitation, pump removal, inspections, etc.;
- Site sketch illustrating location of well in relation to buildings and nearby potential contaminant sources within 150 m (as described above, information will be transferred to a digital site plan modified from an air photo base plan); and,
- Water level measurements, and the depth of the well measured where possible.

During the well inspections, water quality samples were collected as required, to augment existing water quality information available for the subject systems.

1.4.6 Distribution and Treatment System Evaluations

Aqua Tech personnel documented the existing water supply distribution and treatment/disinfection systems. Where possible, the following information was collected for each system:

- Type and condition of pump, including make and model;
- Type and condition of controls;
- Type and condition of distribution piping, fittings and connections;
- Type and condition of water treatment systems, including make and model;
- Type and condition of disinfection systems, including make and model;
- Type and condition of freeze protection; and,
- Digital photographs illustrating piping, controls and treatment/disinfection systems, including deficiencies and general layout.

This information is presented on system schematics of the complete water supply systems, along with supporting tables that include all pertinent information related to the water supply source, well, distribution and treatment/disinfection systems. This information is presented in an individual appendix assigned for each site.

In addition to the above information, on-site water testing was performed for systems with operational chlorine disinfection systems. This was done using a chlorine test kit capable of reading in the range of 0.0-to 3.5 mg/L free chlorine. Chlorinated systems were assessed

for compliance with the ***Draft Guidelines for Part III – Small Public Drinking Water Systems***, which requires a free chlorine residual of 0.4 mg/L for bulk water delivery, and a minimum of 0.2 mg/L for piped water distribution systems servicing five or more connections. Field parameters such as pH, electrical conductivity (EC), Total Dissolved Solids (TDS) and temperature were also obtained at all sites.

1.4.7 Draft Report Preparation and Cost Estimates for Western Region

This report includes the assessment results and recommendations for upgrades to address deficiencies in a prioritized manner as requested in the Terms of Reference. Deficiencies are identified with respect to the requirements stipulated in the ***Canadian Groundwater Association Guidelines for Water Well Construction*** and the ***Draft Guidelines for Part III – Small Public Drinking Water Systems***. Upgrades are recommended to address these deficiencies, in addition to other improvements that may be warranted. Where appropriate, alternative upgrade options are provided. All recommendations include Class D cost estimates, and are classified according to the following three categories:

- Priority 1: Recommended upgrades and estimated costs to address potential immediate risk deficiencies (high hazards);
- Priority 2: Recommended upgrades and estimated costs to address remaining potential medium and high risk deficiencies (medium and high hazards); and,
- Priority 3: Recommended upgrades for typically low risk issues (low hazards), or recommended mechanical and functional upgrades and estimated costs.

The water system deficiencies identified during this study are typically hazard conditions, where risk could exist if there is exposure. For simplicity within the document, a “high risk”, implies that there is a high hazard condition (e.g. no cap on casing) that could pose a high risk if there was an exposure event (e.g. surface water or vermin entering casing). Likewise, other levels of risk and exposure are also referred to in the same manor.

The Draft Report for the Western Region Assessments was submitted to PMA in September 2005. This final report has been updated to make it relevant to the revised draft SPDWSR, to include some additional assessment work that has been completed since the draft reports were submitted, and to make editorial and formatting changes where required. In accordance with the TOR, two copies of this final report have been prepared for PMA. One copy is also maintained at the EBA Whitehorse office. PDF copies of the report in its entirety have also been provided on compact disk to PMA.

1.4.8 Nomenclature and Report Format

This study involved collecting, compiling and reviewing a large amount of data. In labeling the data, EBA used the YTG building numbering classification for system, well and sample names. Where a well served more than one building, the sample name consisted of the both building numbers that the well serves.

Originally there were to be 16 water systems to be assessed in the Western Region. The Western Region includes the communities on the Alaska Highway west of Whitehorse (Haines Junction, Destruction Bay, Burwash Landing and Beaver Creek). During the work program, two additional systems (Blanchard Grader Station on the Haines Road, and the Haines Junction Air Tanker Base) were added. This report includes water systems servicing 18 buildings, which are reported in 18 independent sections (Section 4 through Section 21).

The Property Management Agency has a number of individual clients, and therefore, the report was structured so that individual reports could be extracted and compiled for each client to maintain privacy and efficiency. The systems assessed included fire halls, schools, grader stations, administrative offices, various living quarters for YTG employees, and an RCMP detachment. The report is structured such that there is a separate section for each system. Supporting assessment data was tabulated and provided in a separate appendix for each system. Appendix numbers correspond to the section of the report for each of the systems (e.g. Section 4 has supporting data provided in Appendix A4). Supporting tables were named after the system for which they provide data. Each summary table has the building number followed by the table number and each figure has the building number followed by the figure number. The report is also provided as PDF digital files for each site including the report section and appendix for each system.

2.0 DISCUSSION OF PROPOSED AND EXISTING GUIDELINES

The proposed ***Guidelines for Part III – Small Public Drinking Water Systems*** are currently under development by YTG Environmental Health and Social Services (EHSS). In accordance with the Terms of Reference, these proposed guidelines (November 23, 2004) were used to determine compliance issues with respect to the systems assessed under this program. Since the completion of the draft reports for each Region, these guidelines were amended to a draft dated December 22nd, 2005. Accordingly, the final reports were also amended to reflect the latest draft of these guidelines. The most relevant sections of these draft Guidelines (December 22nd, 2005) as well as the Canadian Groundwater Association Guidelines for Water Well Construction pertaining to this study are summarized below:

- "Small public drinking water system" means a drinking water system which has:
  a) less than 15 direct service connections to a piped distribution system; or
  b) less than 5 delivery sites on a trucked distribution system.

- GUDI is an acronym for well water or groundwater under the direct influence of surface water.

- Well water under the direct influence of surface water means the water source for a well has been determined to be GUDI, using the Yukon's Assessment for Well Water or Groundwater under the Direct Influence of Surface Water (GUDI), published by Queen's Printer (Draft, December 22nd, 2005).

- According to Draft guidelines initial screening protocol, if a water source does not meet any one of the below criteria, the source shall be either identified as GUDI, or as potentially GUDI with further confirmatory assessment to be carried out:
  - Vulnerable location or type – the water system shall not be:
    a) A spring, infiltration gallery, shallow collector system or artificial recharge system;
    b) A well with a production zone less than 15m below the ground surface;
    c) A well in an unconfined aquifer; or
    d) A well completed in fractured or karst bedrock exposed at or near the land surface.
  - Proximity to surface water – the water source shall not be located within 60 m of any permanent, or intermittent or seasonal surface water body, including ponds, slough, lakes, rivers, streams, canals, lagoons, or any other surface water feature.
  - Well Construction – At a minimum, the well shall meet the requirements of the most recent version of the *Guidelines for Water Well Construction*, published by the Canadian Ground Water Association.
  - Water quality – The raw water from the source shall not exhibit evidence of contamination by or from surface water (i.e., significant occurrence of insects,

insect parts, microorganisms such as *E. coli*, algae, *Giardia*, *Cryptosporidium*, or viruses; or significant and rapid shifts in water characteristics such as turbidity, temperature, conductivity, temperature, conductivity, pH or chemistry that closely correlate to weather or surface water conditions).

- An owner is responsible for the supply and delivery of safe drinking water to the users.

- The owner is responsible for the maintenance and upgrade of the small public drinking water system, as necessary, for the purpose of providing safe drinking water to its users.

- An owner of a small water system that obtains drinking water from a groundwater source shall:
  a) Unless otherwise determined based on results of a comprehensive hydrogeological study, ensure that the drinking water well is located a minimum distance of:
     i. 15 metres from a septic tank, sewage holding tank or contained privy;
     ii. 30 metres from a soil absorption system, pit privy, or other potential sources of pollution that may pose a health and safety risk;
     iii. 120 metres from a solid waste site, dump, or cemetery; and,
     iv. 300 metres from a sewage lagoon or pit.
  b) Use a well, located and constructed in accordance with criteria that meets or exceeds those outlined in the Canadian Groundwater Association Guidelines for Water Well Construction.

- The owner of a small public water system that obtains water from a surface water source, or uses a well under the direct influence of surface water, shall ensure provision of treatment consisting of filtration and disinfection, or other treatment capable of producing a safe drinking water.

- An owner upon selecting a drinking water source shall consider a source that is
  - most likely to produce drinking water of a quality that meets the Guidelines for Canadian Drinking Water Quality, and
  - is least likely to be subject to municipal, industrial and agricultural contamination, and/or other types of contamination resulting from human activities within the watershed.

- If Chlorine disinfection of the small public drinking water system is required, the owner shall ensure that the free chlorine residual concentration throughout the plumbing or piped distribution system is no less than 0.2 mg/L.

- An owner of a small public water system shall ensure that the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant is designed and secured so as to prevent the unauthorized access by humans or entrance of animals.

- Particularly relevant requirements of the Canadian Groundwater Association Guidelines for Water Well Construction are provided below:
    a) Section 3.7: The casing of any drilled well shall project not less than 500 mm above the established ground surface; and,
    b) Section 4.1 and 4.2: The Guidelines for Water Well Construction consider that properly installed water tight casing must have a 50 mm (2") thick bentonite, or bentonite grout seal to effectively prevent the entrance of surface water into an aquifer, and to prevent the intermixing of formation water.

There are many other pertinent requirements involving permitting, application, system operators, seasonal facility start up procedures, well decommissioning, water holding tank cleaning, bulk water delivery, approvals to construct or modify etc. with the draft ***Part 3 – Small Public Drinking Water Systems Regulations (SPDWSR)***. PMA should ensure that all water systems serving YTG maintained buildings that fall under this regulation are in compliance with the final version in it's entirety.

A meeting to discuss the implications of the draft regulations on the assessment of these systems was arranged between Ryan Martin, and an Environmental Health Officer from YTG Environmental Health and Social Services (EHSS) on Thursday June 9th. Key points discussed in the meeting are provided below:

1) It is the intent of the draft SPDWSR that all wells that do not have a surface casing complete with a sanitary surface seal (grout or bentonite seal) and intact casing to 6 m may be under the direct influence of surface water, which would necessitate further assessment (as per the GUDI guidelines) or adequate disinfection.

2) The maximum acceptable concentration (MAC) for arsenic within the Canadian Drinking Water Quality Guidelines is currently under review by Health Canada. The proposed guideline is low (0.005 mg/L) compared with the existing MAC (0.025 mg/L). The EHSS health officer felt that there was a very high probability of the lower guideline being passed at any time in the near future. She indicated that there would likely be a grace period of at least one year for systems to come into compliance. This will have an impact on the treatment requirements for many water supply systems in the Yukon.

3.0 APPROACH TO WATER TREATMENT/ DISINFECTION

Drinking Water Officers in some jurisdictions in BC are adopting the "4,3,2,1,0, Dual Treatment" approach. This "multi-barrier" approach for water treatment requires 4-log (99.99%) removal of bacteria and viruses, 3-log (99.9%) removal/inactivation of *Giardia*, 2-log (99%) removal/inactivation of *Cryptosporidium*, turbidity less than 1 NTU, no total and fecal coliform and dual treatment (filtration and disinfection for example). This is the approach that the project team recommends for treatment system design for upgrades to the Yukon Small Water Systems. We understand that there is insufficient budget to implement all suggested upgrades immediately. Consequently, we recommend that a phased approach to treatment should also be implemented, by mitigating the highest risk with the best value as described below.

According to Dayton and Knight, Health Authorities in BC understand the realities of limited financial resources faced by small water systems. In such cases, the Health Authorities in BC may accept a multi-phase treatment approach starting with some type of primary disinfection initially, followed by additional upgrades as funds become available until full treatment (if required) is achieved. This report has been prepared with the assumption that YTG Environmental Health and Social Service would be amenable to this phased approach. For example, where a water system requires wellhead upgrades and disinfection treatment such as filtration followed by UV (based on preliminary suitability, water quality and system characteristics), we have typically recommended a phased approach with an assigned level of priority as described previously. For this example, the Priority 1 upgrades may include shock chlorination (disinfection) of the well and water system, installing a properly sealed well cap and installing a NSF/ANSI 55- certified UV system. These UV systems (with appropriate raw water quality that in some cases may require pretreatment) are certified to provide 4-log (99.99%) inactivation of *E. coli*, and 2-log (99%) inactivation of cryptosporidium and *Giardia*. This interim Priority 1 upgrade measure would mitigate most risk, however, would not provide 3-log inactivation of *Giardia*, nor dual treatment. During subsequent Priority 2 upgrades for the example system above (which would happen at a later date as funds become available), the NSF 61 filtration system (to 1 micron - absolute) would be installed in advance of the filter, and the wellhead would be upgraded (e.g., casing extension, surface seal installation). This is a practical approach to mitigate the highest risks with the funding available on a priority basis.

Input from drinking water authorities in the Yukon regarding this proposed approach is recommended. For example, on a case-by-case basis, drinking water authorities may agree to treatment without the requirement for filtration to 1 micron (absolute), which would enable 3-log inactivation of *Giardia*. For comparison, the City of Whitehorse does not currently provide filtration to the 3-log level, even though it obtains water from a surface water source.

The installation of water treatment systems are not entirely regulated in Canada and the last word relies with the Health authorities. Health Canada recommends that water treatment systems be NSF certified. The NSF designation for UV systems is ANSI/NSF 55, while filtration is ANSI/NSF 61, and RO systems conform to NSF/ANSI 58. It was not within the scope of this project to design water treatment systems, but rather to identify deficiencies, and to provide class level cost estimates for upgrade alternatives. Where treatments system suggestions are provided herein, they are conceptual based on preliminary information available at this time, and to be used for estimating cost of upgrade alternatives. For all treatment system upgrades, it would be prudent to involve a water treatment engineer in system component selection, and to consult with the local health authorities in the process of system design. For all upgrade options, it has been recommended to budget for a 20% engineering cost for final system design.

4.0 BUILDING 3440: BLANCHARD GRADER STATION

4.1 Description of Existing Water Supply System

Building 3440, the Blanchard Grader Station and Building 3441, the Blanchard Living Complex, are currently served by a water supply system that delivers water from a well of unknown depth. Midnight Sun Drilling Company (MSD) drilled the well, however, neither MSD nor YTG have been able to provide a log for this well. The well is located in an enclosure off the maintenance room of the grader station. The well location and other details about the surrounding area are provided in Figure 3440-A in Appendix A4. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6653029
- Easting: 396549

There is no treatment or disinfection system for the water supplying the maintenance garage. As such, the kitchen area in the lounge of the Grader station receives untreated water. The water system that supplies the living complex is equipped with a NSF 61 filtration system that is followed by a UV disinfection system and a reverse osmosis treatment system. The treatment system is located in the maintenance garage and post-treatment water is stored in a 5000 L water storage tank before being piped to the living complex. A schematic detailing the water supply system is provided as Figure 3440-B in Appendix A4.

4.2 Description of Existing Wastewater Systems

Septic effluent from both the maintenance garage and the living complex is piped to a communal discharge system north of both the maintenance garage and living complex. The septic discharge system is greater than 80 m cross-gradient from the well. A site plan showing the septic system is given by Figure 3440-A in Appendix A4.

4.3 Water Quality Results

4.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Blanchard Grader Station water system between September 2004 and June 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 3440-1 in Appendix A4. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the Blanchard Grader Station water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3440-2 in Appendix A4. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination. The following observations were made:

- The raw water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- The untreated water quality results indicated that the groundwater from this well is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) of the untreated water was 198 mg/L during the first sampling event, and is considered very hard. During the second sampling event the hardness (as $CaCO_3$) was 102 mg/L, and is considered moderately hard.

4.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Blanchard Grader Station included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- Extractable Petroleum Hydrocarbon (EPH) to determine any potential impacts of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additionally, as no water quality data was taken previously from the living quarters water system, a sample was obtained for potability analysis.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 29, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3440-2 in Appendix A4 and the laboratory reports are included in Appendix B. Items to note are:

- The analyses done on the water from the living complex reported the pH to be 6.10, which is below the CDWQG aesthetic objective lower limit of 6.5. Field chemistry done at the time of sampling, however, reported the pH to be 7.86. This shows that the pH at the point of use is likely within the CDWQG aesthetic objective; and,
- Water quality analysis reported no other exceedences of CDWQG MACs or aesthetic objectives.

4.3.3 Indicators of Potential Contamination

Analytic results for EPH indicated EPH concentrations below laboratory detection limits.

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Blanchard Grader Station is under the influence of surfacewater sources or septic wastes.

4.4 Conceptual Hydrogeology

There is no well log available for review for this well or for any other wells in the area. The direction of groundwater flow in the vicinity of the site as inferred from topographical maps and aerial photographs is likely westerly towards the Blanchard River.

4.5 Potential Contaminant Sources

Potential contaminant sources from observations made during the water system assessment are compiled in field notes in Appendix A4. Photos of potential contaminant sources are also provided in Appendix A4.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 21 m;
- An above ground fuel storage tank (AST) at 24 m; and,
- A fueling area at 21 m.

In addition, a tar emulsion above ground storage tank is located 31 m away from the wellhead, and bulk fuel storage tank is located at 36 m. The bulk fuel tank is located within a secondary containment berm to contain spillage/ leaks. The closest portion of a septic system to the wellhead is a septic line located 30 m away. The closest septic field is approximately 80 m away from the wellhead.

4.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites. During the site assessment, however, it was noted that there are monitoring wells located downgradient of the bulk fuel storage area. The purpose of these monitoring wells is unknown, however their existence indicates the completion of some sort of environmental investigation, likely related to the bulk fuel storage. As the bulk fuel storage area is inferred to be significantly downgradient of the water supply well, the risk of drinking water contamination from any existing contamination in the area is considered to be low.

4.6 Identified Water System Deficiencies and Associated Risk

4.6.1 High and Medium Risk Deficiencies

- There is no treatment or disinfection on the water system supplying the maintenance garage;
- There is a vehicle fueling area located approximately 21 m upgradient from the well;
- There is no well log available to review well construction and lithology; and,
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the completion depth is unknown, and the well construction does not meet the requirements of the CGWA Guidelines for Water Well Construction.

4.6.2 Low Risk Deficiencies

- The wellhead is only approximately 150 mm above grade, but is located in an appropriately constructed enclosure with a low risk of flooding, and is approximately 450 mm above the floor of the enclosure.

4.7 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).

4.7.1 Priority 1

- Re-plumb the treated water to provide potable water to dedicated taps in the bathroom and kitchen area of the maintenance garage.
- A further attempt should be made to obtain the well record to assess aquifer and well vulnerability. If a well record cannot be obtained, the overall well depth should be determined at the very least.

4.7.2 Priority 2

- As indicated previously, two large Enviro Tanks and a fueling area are located approximately 20 m in a direction that is inferred to be upgradient of the well. Although the tanks are double walled, and there is a secondary containment tray beneath the fuel pumps, it is evident that vehicles are re-fueled in front of this fueling area. There is a risk of overfilling, and potential contamination of the subsurface and aquifer that provides water to the buildings at the site. It would be prudent to relocate the fueling area downgradient, or cross gradient and at least 60 m from well to protect the water quality.

4.7.3 Priority 3

- To limit potential contaminants entering the wellhead, or traveling down the outside of the casing, it is recommended that the casing be extended to 500 mm above grade, and the concrete floor elevation be raised to grade.

4.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

4.8.1 Priority 1

- It is estimated that materials and labour to upgrade the plumbing such that the kitchen area and washroom sink within the maintenance garage can be supplied with treated (filtered, UV and RO) water, would cost in the order of $250 for materials and labour.

4.8.2 Priority 2

- To relocate the Enviro-tanks to an area that is at least 60 m west, or 30 m south of the well location would cost approximately **$600.**

4.8.3 Priority 3

- To extend the wellhead to at least 500 mm above grade, and to raise the elevation of the concrete floor to grade level, would cost in the order of **$400** for materials and labour.

5.0 BUILDING 3443: HAINES JUNCTION INITIAL ATTACK BASE

5.1 Description of Existing Water Supply System

Building 3443, the Haines Junction Initial Attack Base is currently on bulk water delivery supplied by the Village of Haines Junction. The water source is from a very deep drilled well that obtains groundwater from a deep well-protected aquifer. The Attack Base system uses a large underground water storage tank that is located approximately 9 m from the building. The location of the underground water storage tank and other details about the surrounding area are provided in Figure 3443-A in Appendix A5. The coordinates of the tank fill, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6740373
- Easting: 359760

The water is treated at the source and field chemistry results show that the residual chlorine concentration was 0.01 mg/L at the time of the water system assessment. A schematic detailing the water supply system is provided as Figure 3443-B in Appendix A5.

The initial attack base warehouse is located on the same property and also uses water from a delivered source. Water is delivered to an 800 L water storage tank that is located in the kitchen of the warehouse building. The water is treated at the source and field chemistry indicated that the residual chlorine concentration was 0.07 mg/L at the time of the water system assessment. A schematic detailing the water supply system for the warehouse is provided by Figure 3443-C in Appendix A5.

5.2 Description of Existing Wastewater Systems

Septic effluent from the initial attack base building is discharged to an in ground disposal septic system located south west of the initial attack base. The septic tank is approximately 28 m likely downgradient from the water storage tank and the field is located greater than 30 m from the underground tank. A site plan showing the septic system is given by Figure 3443-A in Appendix A5.

5.3 Water Quality Results

5.3.1 Water Quality Results from Previous Sampling

Bacteriological

Two samples were collected from the Haines Junction Initial Attack Base water system between May 2005 and June 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 3443-1 in Appendix A5. Coliform bacteria and *E. coli* were reported as absent in both samples for which results are provided.

Potability

There are no previous water quality results reported for this site.

5.3.2 Identification of Additional Analytical Testing Required

As there were no previous water quality results reported for this site, a drinking water package was collected to determine general water quality. Other additional analytical for the Haines Junction Initial Attack Base that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, temperature and residual chlorine concentrations.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 26, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3443-2 in Appendix A5 and the laboratory reports are included in Appendix B.

- At 0.0203 mg/L, the arsenic concentration was below current CDWQG MAC of 0.025 mg/L, but in exceedence of the proposed MAC of 0.005 mg/L;

- The field pH at 8.66 was slightly higher than the aesthetic objective of 8.5, this is considered to be within the margin of error of the instrument; and
- The laboratory water quality results indicated that there no were other exceedences of CDWQG health based guidelines or aesthetic objectives for the parameters analyzed.

5.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the Haines Junction area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the source groundwater is obtained is under the influence of surfacewater sources or septic wastes.

5.4 Conceptual Hydrogeology

This system is on water delivery, and obtains water from the Village of Haines Junction municipal well source. The village well is completed in a highly confined artesian aquifer, the well is screened from 361.9 to 369.2 m below ground. The highly confined nature of the aquifer that the well is completed in, and the presence of a thick sequence of fine grained confining material provides significant protection from surficial sources of contamination in the vicinity of the wellhead.

5.5 Potential Contaminant Sources

A water system assessment was not done at the community well and there is no information on potential contaminant sources within close proximity of the water source. EBA has previously completed hydrogeological assessment work for the Village of Haines Junciton, and at the time of this work (July 2003), there were no potential contaminant sources within at least 60 m of the community water supply.

At the site, there are some potential contaminant sources located within 30 m of the underground water storage tank, however, they are considered to pose very limited risk to the water quality within the underground storage tank.

5.6 Identified Water System Deficiencies and Associated Risk

5.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high or medium risk for the initial attack base main building water system:

- The water system is equipped with an underground water storage tank, and the fill pipe and access is located in a pit below grade;
- It was reported during the water system assessment *(personal comm. John Farynowski)* that there is not a proper seal between the main tank and the manhole extension. When the water tank is over-filled into the manhole extension so that the improper seal is submerged, soil and other material can infiltrate into the water storage tank potentially bringing deleterious substances into the tank; and
- The residual chlorine concentration at the point of use was detected to be 0.01 mg/L at the time of the water system assessment, below the required minimum residual chlorine concentration at point of use of 0.2 mg/L.

The following deficiencies were identified to be high or medium risk for the initial attack base warehouse:

- The residual chlorine concentration at the point of use was detected to be 0.07 mg/L at the time of the water system assessment, below the required minimum residual chlorine concentration at point of use of 0.2 mg/L.

5.6.2 Low Risk Deficiencies

- The fill pipe and vent for the warehouse are constructed of ABS piping as opposed to PVC, and are not suitable for drinking water; and
- The arsenic concentration in the delivered water for both water systems is in exceedence of the proposed MAC.

5.7 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).

5.7.1 Priority 1

Two options have been presented to mitigate High risks associated with the existing condition of the underground water storage tank. These include:

Option 1: Abandon the tank, and install a new tank inside the existing building. It is possible the existing tank is significantly large for the water demand for the building. The excess capacity may be the cause of the low residual chlorine concentration observed. Installation of a smaller tank inside the building may mitigate the tank construction and the low residual chlorine.

Option 2: Properly seal the manhole to the tank with fiberglass, and extend the manhole to above ground surface to ensure that flooding cannot occur. Steam clean the tank to remove aromatics that may be associated with curing of the fiberglass during the upgrade.

With both of these options, the tanks must be inspected and cleaned on a regular basis.

5.7.2 Priority 2

To mitigate the low residual chlorine concentration, the residual chlorine concentration in the potable water system must be increased. This may be achieved through ensuring the delivered free residual chlorine concentration is at least 0.4 mg/L. Alternately, to ensure proper disinfection if it is not possible to maintain adequate chlorine concentrations at the point of use, a UV disinfection system could be installed.

5.7.3 Priority 3

The fill pipe and vent pipe for the water holding tank in the warehouse building should be replaced with PVC piping, and the overflow should be re-plumbed to ensure that the pipe effectively prevents overflow within the building.

When the proposed revised MAC for arsenic comes into effect, it is likely that the Village of Haines Junction will be required to install a Point of Entry arsenic removal system such as an ion exchange to ensure that the arsenic concentration is maintained below 0.005 mg/L.

5.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

5.8.1 Priority 1

- Option 1: A 2000 L water storage tank, and sufficiently sized jet pump, assuming that an addition to the building will not have to be built, would cost approximately **$3,000** including installation; or
- Option 2: Properly sealing the fill pipe, manhole and extending them to above grade with a proper enclosure would likely cost in the order of **$2,000**.

5.8.2 Priority 2

- If the residual chlorine issue can be resolved by ensuring that the chlorine concentration of the delivered water is greater than 0.4 mg/L, or, through Option 1 – installing a smaller tank, then there will be no additional cost associated with this deficiency. In the event that it is not possible to maintain residual free available concentrations above 0.2 mg/L at the point of use, it may be prudent to install a UV disinfection system. Based on the water quality, it appears that pretreatment would not be required. An appropriately sized UV system with a 5-micron pre-filter (NSF 61) would cost in the order of **$2,200** installed.

5.8.3 Priority 3

- To replace the existing ABS piping with PVC, and install the overflow properly would cost approximately **$200** installed.
- It is assumed that there would be no cost associated with the elevated arsenic concentration, as this would be dealt with at the source.

6.0 BUILDING M0131: BEAVER CREEK RCMP DETACHMENT

6.1 Description of Existing Water Supply System

Building M0131, the Beaver Creek RCMP Detachment is currently served by a water supply system that delivers water from a 30.5 m deep well. The well is located in a pit approximately 20 m northwest of the RCMP detachment building. The well location and other details about the surrounding area are provided in Figure M0131-A in Appendix A6. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916890
- Easting: 506480

There is no treatment or disinfection system for the water supplying this system. There is a 900 L water storage tank located in a room in the rear of the detachment that was installed when a water line between the well and the building froze during a previous winter. A schematic detailing the water system is provided as Figure M0131-B in Appendix A6.

6.2 Description of Existing Wastewater Systems

The septic system for this site was not located during the water system assessment. There are septic lines that were observed to have entered the ground underneath the detachment, but it is unknown in what direction they went and there are neither septic pump outs nor clean-outs observed on the property.

6.3 Water Quality Results

6.3.1 Water Quality Results from Previous Sampling

Bacteriological

Three samples were collected from the Beaver Creek RCMP Detachment water system between September 2004 and June 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 M0131-1 in Appendix A6. Coliform bacteria and *E. coli* were reported as absent in each of the three samples for which results are provided.

Potability

Water samples were previously collected from the Beaver Creek RCMP Detachment water system on September 28, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results are summarized in Table M0131-2 in Appendix A6. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as detailed below:

- The turbidity during the first sampling event was 1.7 NTU (the CDWQG MAC is 1.0 NTU). During the second sampling event, however, the turbidity was below the CDWQG MAC;
- The manganese concentration during the first sampling event was reported as 0.05 mg/L, which is equal to the CDWQG aesthetic objective of 0.05 mg/L, but was reported as 0.044 mg/L during the second sampling event, below the CDWQG aesthetic objective;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- Although not above the MAC, copper was elevated with respect to general groundwater quality for the Beaver Creek area;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 241 mg/L during the first sampling event and 247 mg/L during the second sampling event, which is considered very hard.

6.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek RCMP Detachment that was identified to be included during the water system assessments is detailed below:

- As there had previously been an exceedence of the CDWQG MAC for turbidity, a sample was taken to re-test for turbidity;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table M0131-2 in Appendix A6 and the laboratory reports are included in Appendix B.

- The water quality results from addition analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

6.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be relatively low, however, may be elevated above normal background ranges for groundwater in the Beaver Creek area. Nitrate and nitrite concentrations, however, for this sample were low and within the normal background range for this area. These water quality results alone are inconclusive regarding whether the aquifer from which the groundwater is obtained for the Beaver Creek RCMP Detachment is under the influence of surfacewater sources or septic wastes.

6.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 30.5 m within a gravel aquifer. The lithology indicates interbedded gravel, clay and silt overlying the aquifer, with permafrost encountered from 4.3 to 17.1 m. This is consistent with most well logs in the area, which indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments overlying the aquifer indicates limited protection from surficial sources of contamination. A hydrogeological study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

6.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A6. Photos of potential contaminant sources are also provided in Appendix A6. There are no known potential sources of contamination within 30 m of the wellhead. Two monitoring wells, however, were noted to exist approximatly 25 m east of the well. The purpose of these monitoring wells should be determined, and the water quality results (if any) for groundwater sampling from these wells should be reviewed.

The following potential sources of contamination are located within 60 m of the wellhead:

- Two above ground fuel storage tanks (AST) at 34 m;
- An above ground fuel storage tank (AST) at 48 m; and,
- A pump island at 60 m.

Additionally the Alaska Highway is located 48 m away from the well. No indications of the location of a septic system were observed within the well vicinity at the time of site inspection and it is unlikely that a septic system exists within 30 m of the well. However, this should be confirmed.

6.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

6.6 Identified Water System Deficiencies and Associated Risk

6.6.1 High and Medium Risk Deficiencies

- Poor wellhead completion (located in a pit below grade, pit is subject to flooding);
- There is no 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 exact location of the septic field and its proximity to the well is unknown;
- There are monitoring wells on the property and the purpose is unknown; this may indicate the presence of existing or former soil and/or groundwater contamination;

- The pressure tanks are constructed of galvanized steel and do not meet present plumbing code; and,
- There is no treatment or disinfection system.

6.6.2 Low Risk Deficiencies

- Although the copper concentration was not in exceedence of the CDWQG MAC, copper was elevated with respect to general groundwater quality for the Beaver Creek area; and,
- There has been a previous CDWQG MAC exceedence of turbidity, but the most recent sampling events reported turbidity less than the CDWQG MAC.

6.7 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).

As mentined previously, it is important to detemine the location of the on-site sewage disposal system, and to investigate the purpose, and history of the groundwater monitoring wells observed on the site.

6.7.1 Priority 1

- The wellhead completion should be improved by raising the well casing to a minimum of 500 mm above ground level and retrofitting a proper surface-seal to 3 m below grade. Once the wellhead is upgraded, the well and water system should be shock chlorinated;
- Disinfection such as an NSF/ANSI 55 approved UV disinfection system should be installed. 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; and
- The source of the water that was observed to be ponded at the bottom of the well pit should be identified, if it is resulting from a leak, the well should be repaired.

6.7.2 Priority 2

- Filtration to 1 micron absolute (NSF 61) should be installed in advanced of the disinfection system.

6.7.3 Priority 3

- Continue to monitor copper concentrations and turbidity; and
- Replace the galvanized pressure tanks with a bladder pressure tank that meets code.

6.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

6.8.1 Priority 1

- Standard wellhead improvements with a pitless unit installation and surface seal retrofit would cost approximately **$5000**; and,
- The proposed UV disinfection system would cost in the order of **$2,500** installed. Based on the observed hardness, a pretreatment softening system would likely be required **($2000**).

6.8.2 Priority 2

- The UV system previously described in Priority 1 would be installed with a 5-micron pre-filter (NSF 61). A 1-micron (absolute) NSF 61 filtration system (NSF 61) to be installed between the 5-micron and the UV system would cost approximately **$1000**.

6.8.3 Priority 3

- It is presumed that routine monitoring of copper concentrations and turbidity would be completed under operation and maintenance costs.
- The cost to remove and replace the galvanized pressure tanks with a bladder pressure tank would cost approximately **$2,000** with materials and labour.

7.0 BUILDING M0133: BEAVER CREEK RCMP RESIDENCE

7.1 Description of Existing Water Supply System

Building M0133, the Beaver Creek RCMP Residence, is currently served by a water supply system that delivers water from a 37.4 m deep well. The well is located in an enclosure off from basement of the residence. The well location and other details about the surrounding area are provided in Figure M0133-A in Appendix A7. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6917199
- Easting: 506150

The water system is equipped with an in-line filter and a water softener, however, at the time of the assessment, the softener was being bypassed and was not functioning. The system is not equipped with a disinfection system. A schematic detailing the well supply system is provided as Figure M0133-B in Appendix A7.

There is an abandoned well located in the same enclosure as the well that is currently in use. The abandoned well was not equipped with a proper cap and was open.

7.2 Description of Existing Wastewater Systems

The septic tank that serves the residence is located approximately 20 m west of the well, and the septic effluent discharge field is located approximately 40 m down slope from the well. Although the effluent field is downslope from the well, conceptual hydrogeology (outlined in a following section) indicates that it may be hydraulically upgradient. A site plan showing the septic system is given by Figure M0133-A in Appendix A7.

7.3 Water Quality Results

7.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the M0133 Beaver Creek RCMP Residence water system between September 2004 and June 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 M0133-1 in Appendix A7. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results are provided.

Potability

Water samples were previously collected from the M0133 Beaver Creek RCMP Residence water system on September 23, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table M0133-2 in Appendix A7. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The turbidity of the water during the June 15th, 2005 sampling event was reported at 2.28 NTU, which is in exceedence of the CDWQG MAC of 1.0 NTU;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 151 mg/L during the first sampling event, and is considered hard. During the second sampling event the hardness (as $CaCO_3$) was 141 mg/L, and is also considered hard.

7.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the M0133 Beaver Creek RCMP Residence that was identified to be included during the water system assessments is detailed below:

- As there had previously been an exceedence of the CDWQG MAC for turbidity, a sample was taken to re-test for turbidity;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table M0133-2 in Appendix A7 and the laboratory reports are included in Appendix B. The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

7.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Although below the MAC, the chloride concentrations were elevated compared to normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the M0133 Beaver Creek RCMP Residence is under the influence of surfacewater sources or septic wastes. Road salting on the highway adjacent to the well could result in elevated chloride concentrations.

7.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 37.4 m within a gravel aquifer. The lithology indicates mostly gravel with variable till and silty sediments. This is consistent with most well logs in the area, which indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The static water level the abandoned well was measured to be 12.1 m below the top of the casing and approximately 13.7 m below grade. The presence of variable interbedded fine grained material overlying the aquifer indicates limited protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

7.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A7. Photos of potential contaminant sources are also provided in Appendix A7.

Potential contaminant sources within 30 m of the wellhead are:

- An indoor fuel storage tank (AST) at 3 m;
- An abandoned well approximately 1 m from the well that is currently not in use; and
- A septic Tank at 20 m (note that sewage regulation allows tank to be within 15 m).

In addition, the septic field is located 40 m away from the well.

7.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

7.6 Identified Water System Deficiencies and Associated Risk

7.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in an enclosure below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because does not meet the requirements of the Guidelines for Water Well Construction.
- The well is located within 30 m of potential sources of contamination including: an abandoned well that is not equipped with a proper cap and is located within 1 m of the current well, and an AST located in the basement of the building; and,
- There is no disinfection system.

7.6.2 Low Risk Deficiencies

- There had been a previous CDWQG MAC exceedence for turbidity, but the most recent sampling event reported turbidity below the CDWQG MAC;

- The plumbing installation was observed to be unprofessional, and the softener discharge is not to code;
- The water softener was not functioning at the time of the water system assessment;
- The in-line filter was observed to need replacing; and,
- There is an indoor fuel storage tank located in the basement of the residence, however, because the floor is concrete the potential risk of impact to the well from a spill or leak event is considered minimal.

7.7 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).

7.7.1 Priority 1

- An NSF/ANSI 55 approved UV disinfection system (or equivalent) should be installed. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications; and
- The abandoned well should be properly decommissioned by backfilling it with grout or bentonite, and welding a cover over the casing.

7.7.2 Priority 2

- The wellhead at M0131 should be extended to a minimum of 500 mm above the surrounding grade, and the well pit should be backfilled with a low-permeability material to provide a surface seal around the well casing. A surface sanitary seal (grout or bentonite) should be installed as deep as possible during wellhead improvements.

7.7.3 Priority 3

- Upgrade plumbing to meet code;
- Repair water softener, and replace filter; and,
- Install secondary containment tray around AST.

7.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

7.8.1 Priority 1

- It would cost approximately **$2,200** for supply and installation of a UV disinfection system; and
- Proper decommissioning of the abandoned well would cost in the order of **$1,000** for materials and labour.

7.8.2 Priority 2

- Standard wellhead upgrades (casing extension, sanitary seal, plumbing and electrical extensions, and insulation and heat trace as necessary) would cost approximately **$4,000**; and,
- Installation of NSF 61 NSF 61 filtration system (to 1 micron absolute) would cost in the order of **$500.**

7.8.3 Priority 3

- It is estimated that the recommended plumbing upgrades would cost approximately **$100**;
- To repair the water softener (replace media), and replace filter would cost approximately **$600** for materials and labour; and
- To supply and install a secondary containment tray around the AST would cost approximately **$500.**

8.0 BUILDING M0134: BEAVER CREEK RCMP RESIDENCE

8.1 Description of Existing Water Supply System

Building M0134, a RCMP Residence in Beaver Creek, is currently served by a water supply system that delivers water from a well of unknown depth. The well is located in a pit approximately 3 m from the residence building. The well location and other details regarding the surrounding area are provided in Figure M0134-A in Appendix A8. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6917131
- Easting: 506146

The water system is equipped with a water softener and an in-line filter, but both were reportedly not functioning properly at the time of the water system assessment. There is no disinfection system present. A schematic detailing the water supply system is provided as Figure M0134-B in Appendix A8.

8.2 Description of Existing Wastewater Systems

There is a septic tank located west of the residence approximately 28 m northwest of the well. Septic effluent is discharged to the west of the tank in a septic field beginning at approximately 34 m from the well. Figure M0134-A in Appendix A8 gives a site plan showing the septic system.

8.3 Water Quality Results

8.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the M0134 Beaver Creek RCMP Residence water system between September 2004 and June 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 M0134-1 in Appendix A8. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results are provided.

Potability

Water samples were previously collected from the M0134 Beaver Creek RCMP Residence water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3440-2 in Appendix A4. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 149 mg/L during the first sampling event and 140 mg/L during the second sampling event, and is considered hard.

8.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the M0134 Beaver Creek RCMP Residence that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table M0134-2 in Appendix A8 and the laboratory reports are included in Appendix B. The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

8.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the M0134 Beaver Creek RCMP Residence is under the influence of surfacewater sources or septic wastes.

8.4 Conceptual Hydrogeology

There is no log available for this well. Most of the wells in the Beaver Creek indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

8.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A8. Photos of potential contaminant sources are also provided in Appendix A8.

Potential contaminant sources within 30 m of the wellhead are:

- An indoor fuel storage tank (AST) 3 m from the wellhead.

In addition, a septic tank is located 28 m away from the wellhead, and a septic field is located 34 m away.

8.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

8.6 Identified Water System Deficiencies and Associated Risk

8.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction; There is no well log available to review well construction and/or lithology;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence because the well depth is unknown and the well construction does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no disinfection system.

8.6.2 Low Risk Deficiencies

- The in-line filter and water softener are both in poor condition. Water quality results and observations made during the water system assessment conclude that the water softener is not functioning properly; and,
- The softener drain is not installed to code.

8.7 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).

8.7.1 Priority 1

- An NSF/ANSI 55 approved UV disinfection system should be installed. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

8.7.2 Priority 2

- The wellhead at M0134 should be extended to a minimum of 500 mm above the surrounding grade, and the well pit should be backfilled with a low-permeability material to provide a surface seal around the well casing. A surface sanitary seal (grout or bentonite) should be installed as deep as possible during wellhead improvements.

8.7.3 Priority 3

- Upgrade plumbing to meet code;
- Repair water softener, and replace filter; and,
- Install secondary containment tray around AST.

8.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

8.8.1 Priority 1

- It would cost approximately **$2,200** for supply and installation of the recommended UV disinfection system.

8.8.2 Priority 2

- Standard wellhead upgrades (casing extension, sanitary seal, plumbing and electrical extensions, and insulation and heat trace as necessary) would cost approximately **$4,000**.
- Installation of NSF 61 NSF 61 filtration system (to 1 micron absolute) would cost in the order of **$500.**

8.8.3 Priority 3

- It is estimated that the recommended plumbing upgrades would cost approximately **$100**;
- To repair the water softener (replace media), and replace filter would cost approximately **$600** for materials and labour; and,
- To supply and install a secondary containment tray around the AST would cost approximately **$500.**

9.0 BUILDING 3100: NELNAH BESSIE JOHN SCHOOL

9.1 Description of Existing Water Supply System

Building 3100, Nelnah Bessie John School in Beaver Creek, is currently served by a water supply system that delivers water from a 21.6 m deep well. The well is located in a pit adjacent to the school, approximately 2 m from the building. The well location and other details about the surrounding area are provided in Figure 3100-A in Appendix A9. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916849
- Easting: 506143

The water system is equipped with a pellet chlorinator that is installed on the wellhead, however, at the time of the assessment, it was not functioning properly as it was discharging some pellets into the wellhead enclosure (some appeared to be discharging into the well as designed). This water system is also equipped with a water softener and an activated carbon filter for treatment. Field chemistry completed during the water system assessment indicated that the residual chlorine concentration was approximately 0.07 mg/L.

A schematic detailing the well supply system is provided as Figure 3100-B in Appendix A9.

There is an abandoned well located approximately 1 m from the current well. The abandoned well did not have a proper cap.

9.2 Description of Existing Wastewater Systems

The school's septic tank is located approximately 22 m north of the well on the north side of the school as indicated in Figure 3440-A. The location of the septic effluent discharge field is unknown but it is likely located north of the tank. The location of the septic disposal system should be confirmed prior to making final decisions regarding water supply system upgrades.

9.3 Water Quality Results

9.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Nelnah Bessie John School water system between September 2004 and June 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 3100-1 in Appendix A9. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the School water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3100-2 in Appendix A9. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated low hardness, calcium, and magnesium, and high potassium, indicating that the water softening system is functioning properly; and,
- The hardness (as $CaCO_3$) reported from both sampling events was indicated to be less than 1 mg/L, and the water is considered very soft.

9.3.2 Identification of Additional Analytical Testing Required

Additional analytical for Nelnah Bessie John School that was identified to be included during the water system assessments is detailed below:

- Trihalomethane parameters (THMs) and other disinfection by-products are formed when chlorine disinfectants react with naturally occurring organic matter in the

source water. THMs were analyzed, as there is an existing chlorine disinfection system.
- Similar to THMs, Haloacetic Acid (HAA) can be present in chlorinated drinking water as a disinfectant byproduct. HAA analysis has been included due to the presence of the chlorination system.
- Total organic carbon (TOC);
- Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) to determine if there are any indications of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, temperature and the residual chlorine concentration.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3100-2 in Appendix A9 and the laboratory reports are included in Appendix B. Items to note are:

- Laboratory results for THMs and HAAs indicated concentrations below analytical detection limits;
- Screening for EPH and PAH did not indicate any parameter above the laboratory detection limits; and
- The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

9.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for Nelnah Bessie John School is under the influence of surfacewater sources or septic wastes.

9.4 Conceptual Hydrogeology

There is no log available for this well, however, it is reportedly 21.6 m deep with a static water level at approximately 11 m below grade. Most of the well logs in the Beaver Creek

area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

9.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A9. Photos of potential contaminant sources are also provided in Appendix A9. Potential sources of contamination within 30 m of the wellhead are:

- An underground fuel storage tank (UST) at approximately 1 m; and
- A septic field potentially within 30 m (exact location unknown).

An additional source of contamination is an abandoned and uncapped well that is located approximately 1 m from the existing well.

9.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

9.6 Identified Water System Deficiencies and Associated Risk

9.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is located within 30 m of potential sources of contamination including an underground fuel storage tank located 1 m from the well;

- There is an open, abandoned well located approximately 1 m from the current well;
- The septic tank is located approximately 22 m from the well, and although the exact location of the septic field is unknown, it may be within 30 m;
- There is no well log available to review well construction and/or lithology;
- The pellet chlorination system on the wellhead has not been properly installed. It was observed that a large number of the chlorine pellets do not drop into the well but fall into well pit instead;
- Field chemistry reported that the residual chlorine concentration was 0.07 mg/L, below the required minimum of 0.2 mg/L; and,
- The configuration of the treatment system does not meet current standards.

9.6.2 Low Risk Deficiencies

- The heat-trace installation does not meet code.

9.7 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).

9.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Nelnah Bessie John School water supply system. Priority 1 remedial recommendations include:

- Properly decommissioning the abandoned well adjacent to the well that currently serves the building;
- Priority 1 upgrades to eliminate immediate risk would also involve upgrading the existing disinfection system to ensure that adequate disinfection is provided. Two options are presented below:
  - The first option would involve the installation of retention tanks and a proportional feed chlorine injection system with a flow meter, a chemical feeding pump, day tank, injection piping, spill containment deck and appurtenances.
  - The second option presented for Priority 1 upgrades would involve the installation of a UV disinfection system with NSF/ANSI 55 certification.

There are conceptual options based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

Some additional assessment is required prior to determining final Priority 2 options. These include obtaining a well log to determine well construction, and determining the exact location of the septic field and the distance to the well.

9.7.2 Priority 2

Priority 2 recommended upgrades include the removal of the UST located adjacent to the well. The UST should be replaced with a double walled above ground storage tank (AST) located at a safe distance from the well. Observations should be made and confirmatory sampling completed to confirm whether the existence of the UST has impacted soils in the vicinity of the tank, which could ultimately impact on the groundwater and water quality.

Pending the results of the UST removal, the confirmed location of the septic tank, and the well construction, the following options are presented:

Option 1: Upgrade Existing Well

- Option 1 is presented in consideration that the UST removal confirms that there is no potential impact of hydrocarbons on water quality, that the septic field is greater than 30 m from the well, and that the well construction (screen construction etc.) are adequate to warrant further capital investment in upgrades to this well. For this option, Priority 2 upgrades would include "standard wellhead upgrades" including extending the well to at least 500 mm above grade and installing a commercial pitless unit. A surface sanitary seal (grout or bentonite) to at least 3 m below grade should be retrofitted around the well and then the ground should be graded to promote surface drainage away from the wellhead. For this option, it is also recommended that a NSF 61 NSF 61 filtration system (to 1 micron absolute) be installed in advance of the disinfection system installed as Priority 1.

Option 2a: New Water Well Construction

- Options 2a and 2b are presented for the scenario that further assessment supports the fact that the existing well should not be used for a long-term option. Option 2a considers the installation of a new well to serve only the School. For this option, it is recommended that a new well should be drilled and the current well be decommissioned. It is recommended that a new well be installed to meet the following conditions:
  - The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;

- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tank and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A disinfection system may be recommended.

Option 2a: New Cluster Well Construction

- Option 2b presents the option of a cluster well installation to provide water supply to the Pool building, Recreational Centre, and the School. The advantages would include combined savings on capital costs, and reduced life cycle costs.

9.7.3 Priority 3

- Upgrade of heat trace to meet code would be completed with Priority 2 option 1, and would not be necessary for the scenario presented option 2 or 3.

9.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

9.8.1 Priority 1

- The cost to decommission the abandoned well is estimated to be approximately **$1,000** for materials and labour, and should be completed regardless of which disinfection treatment system is chosen.
- The estimated cost for a proportional feed chlorine injection system with appurtenances, and included disinfection of the well and water system is in the order of **$7,000**.
- The estimated cost for an NSF/ANSI 55 certified UV disinfection system including disinfection of the well and water system by superchlorination would cost approximately **$2,500.**

Therefore, with the options presented, Priority 1 upgrades would range from **$3,500** to **$8,000** including materials and labour.

9.8.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation are presented below:

Option 1: The cost associated with upgrading the existing well (pending the results of additional assessment) is estimated to cost approximately **$5,000**. The estimated cost for removal of the UST adjacent to this well is approximately **$6,000**. Installation of an adequately sized NSF 61 NSF 61 filtration system to 1 micron absolute would cost approximately **$500**. Therefore, the total cost for Option 1 Priority 2 upgrades is **$11, 500** for materials and labour.

Option 2: The cost associated with the construction of a new well to meet the proposed regulations, and drilled to approximately 30 m in depth would cost in the order of **$31,200** including hook-up. Proper decommissioning of the existing well would cost approximately **$1000.** Therefore, the total cost for Option 2 Priority 2 upgrades is **$32, 200** for materials and labour.

Option 3: The shared cost for construction of a cluster well that would serve the recreational hall and pool, assuming that the well would be constructed to meet the proposed regulations, and would be 30 m deep, and including 80 m of distribution piping would cost approximately **$26,800** including half of the drilling costs and the full costs for distribution.

9.8.3 Priority 3

- The cost for heat trace upgrade is included in Priority 2 Option 1, and not necessary in the event that Option 2 or 3 are chosen.

10.0 BUILDING 3102: BEAVER CREEK FIRE HALL

10.1 Description of Existing Water Supply System

Building 3102, the Beaver Creek Fire Hall, is currently served by a water supply system that delivers water from a 34.0 m deep well. In addition to serving the fire hall, the well also serves the Beaver Creek Public Library, which is located within the same building. The wellhead is located in the main garage of the fire hall and was not equipped with a proper cap at the time of the assessment (there was only a cloth placed over the top of the casing). The well location and other details about the surrounding area are provided in Figure 3102-A in Appendix A10. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916938
- Easting: 506369

There is no treatment or disinfection system for this system. Water is delivered to an approximately 12 000 L water storage tank which is at grade, and a 4800 L elevated water storage tank for fire protection. A schematic detailing the well supply system is provided as Figure 3102-B in Appendix A10.

10.2 Description of Existing Wastewater Systems

There is a septic tank or a leach pit located to the west of the fire hall approximately 16 m from the well. It is unknown if there is an effluent discharge field present on the property. Conceptual hydrogeology (outlined in a following section) indicates that the septic system is likely upgradient from the well. A site plan showing the septic system is given by Figure 3102-A in Appendix A10.

10.3 Water Quality Results

10.3.1 Water Quality Results from Previous Sampling

Bacteriological

Eight samples were collected from the Beaver Creek Fire Hall water system between September 2004 and June 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 3102-1 in Appendix A10. Coliform bacteria and *E. coli* were reported as absent in each of the eight samples for which results are provided.

Potability

Water samples were previously collected from the Beaver Creek Fire Hall water system on September 28, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3102-2 in Appendix A10. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The turbidity during the first sampling event was 2.3 NTU, and during the second sampling event to be 2.57 NTU, both of which are above the CDWQG MAC of 1.0 NTU;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- Although the copper concentration was not in exceedence of the CDWQG MAC, copper was elevated with respect to regional groundwater quality for the Beaver Creek area;
- Although the lead concentration was not in exceedence of the CDWQG MAC, lead was elevated with respect to regional groundwater quality for the Beaver Creek area;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 198 mg/L during the first sampling event, and is considered very hard. During the second sampling event the hardness (as $CaCO_3$) was 170 mg/L, and is also considered very hard.

10.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek Fire Hall maintenance building that was identified to be included during the water system assessments is detailed below:

- As the turbidity had previously indicated a CDWQG MAC exceedence, a sample was taken to re-test for turbidity;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);

- Extractable Petroleum Hydrocarbons (EPH) to determine if there are any indications of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3102-2 in Appendix A10 and the laboratory reports are included in Appendix B.

- At 2.69 NTU, the turbidity was reportedly in exceedence of the CDWQG MAC of 1.0 NTU;
- The screening for EPH did not indicate any parameter above detection limits; and,
- The water quality results from additional analytical sampling indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

10.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be relatively low, however, may be elevated above normal background ranges for groundwater in the Beaver Creek area. Nitrate and nitrite concentrations, however, for this sample were low and within the normal background range for this area. These water quality results alone are inconclusive regarding whether the aquifer from which the groundwater is obtained for the Beaver Creek Fire Hall is under the influence of surfacewater sources or septic wastes. Road salting on the highway adjacent to the well could result in elevated chloride concentrations.

10.4 Conceptual Hydrogeology

There was no driller's log available for review. Most of the wells in the Beaver Creek area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection

from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

10.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A10. Photos of potential contaminant sources are also provided in Appendix A10. Potential sources of contamination within 30 m of the wellhead are:

- A above ground fuel storage tank (AST) located at 3.5 m;
- A septic tank or leach pit at 16 m; and,
- Fuel and chemical handling and vehicle parking within very close proximty to the wellhead.

In addition a neighbouring septic field is located 47 m away from the wellhead, and an outhouse is located 34 m away.

10.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

10.6 Identified Water System Deficiencies and Associated Risk

10.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the well (located in fire hall garage only 40 mm above grade, there is no cap on the casing);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- There is no well log available to review well construction or lithology;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the depth of the well is unknown and the well construction does not meet the requirements of the Guidelines for Water Well Construction;
- Well is located within 30 m of potential contaminant sources, including an AST at 3.5 m, a leach pit located at approximately 16 m, and garage activities immediately adjacent to the wellhead;

- Turbidity has exceeded the CDWQG MAC in each water quality analysis for which results are provided;
- The pressure tanks are constructed of galvanized steel and do not meet present standards;
- The plumbing configuration does not meet standards and appeared to be aging and in a state of disrepair;
- There is no treatment or disinfection system; and
- There is no backflow prevention between the elevated fire protection tank and the domestic system.

10.6.2 Low Risk Deficiencies

- Although the copper concentration was not in exceedence of the CDWQG MAC, copper was elevated with respect to general groundwater quality for the Beaver Creek area;
- Although the lead concentration was not in exceedence of the CDWQG MAC, lead was elevated with respect to general groundwater quality for the Beaver Creek area; and,
- It is unlikely that the supports for the elevated water storage tank are earthquake or collision proof.

10.7 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).

10.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Fire Hall and Library water supply system. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the concrete floor grade, and if not already completed, a proper fitting well cap must be installed;
- The plumbing system should be re-plumbed such that the domestic water comes of the system prior to entering the tank;
- Backflow prevention should be installed to prevent backflow from the water tanks to the domestic system;

- The well and water system should be superchlorinated; and
- Disinfection treatment such as an NSF/ANSI 55 certified UV system should be installed. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

10.7.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation are presented below:

Option 1: New Well Construction

- For this option, it is recommended that a new well should be drilled and the current well be decommissioned. It is recommended that a new well be installed to meet the following conditions:
  - The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
  - The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tank and all parts of the septic system;
  - The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A disinfection system may be recommended.

Option 2: New Cluster Well Construction

- Option 2 presents the option of a cluster well installation to provide water supply to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall. The advantages would include combined savings on capital costs, reduced life cycle costs, added control and system security, and reduced maintenance requirements. For this option, it is assumed that a heated building enclosure would be constructed to house the well and treatment system.

10.7.3 Priority 3

- Ongoing monitoring of copper and lead concentrations.

10.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

10.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Casing extension and well cap installation - **$600;**
- Re-plumb so that domestic comes off of piping prior to tank, and install double check valve for backflow protection - **$500;**
- Well and water system superchlorination - **$200;** and
- UV system installation with required pre-filtration - **$2,400.**

The estimate total cost for Priority 1 recommended upgrade is estimated at **$3,700** including materials and labour.

10.8.2 Priority 2

Option 1: New Well Construction

- The estimated cost for the Option 1 which includes the construction of a new well to serve the Fire Hall and Library building is approximately **$30,000** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

Option 2: New Cluster Well Construction

- The estimated cost for Option 2, consisting of a cluster well installation to provide water supply from a central well to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall would be in the order of **$25,000** per system. This estimated capital cost includes supplies and labour for well construction, testing, treatment and distribution piping.

10.8.3 Priority 3

- It is assumed that the cost for ongoing monitoring would be included as routine sampling for ongoing water system operation.

11.0 BUILDING 3121: BEAVER CREEK VISITOR RECEPTION CENTRE

11.1 Description of Existing Water Supply System

Building 3121, the Beaver Creek Visitor Reception Centre (VRC) is currently served by a water supply system that delivers water from a well located in pit in the reception centre parking lot and is approximately 6 m from the building. The well location and other details about the surrounding area are provided in Figure 3121-A in Appendix A11. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916712
- Easting: 506373

There is no treatment or disinfection system for the water supply to this building. A schematic detailing the well supply system is provided as Figure 3121-B in Appendix A11.

11.2 Description of Existing Wastewater Systems

There is a septic tank located south of the VRC approximately 18 m from the well. Septic effluent is discharged to ground via a septic field to the south of the tank approximately 33 m from the well. Conceptual hydrogeology (outlined in Section 10.4) indicates that the septic system is likely upgradient from the well. A site plan showing the septic system is given by Figure 3121-A in Appendix A11.

11.3 Water Quality Results

11.3.1 Water Quality Results from Previous Sampling

Bacteriological

Two samples were collected from the Beaver Creek Visitor Reception Centre water system between May and June 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 3121-1 in Appendix A11. Coliform bacteria and *E. coli* were reported as absent in both samples for which results are provided.

Potability

Water samples were previously collected from the Beaver Creek VRC water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in

Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3121-2 in Appendix A11. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- Though they did not exceed the CDWQG aesthetic objectives, chloride and nitrate concentrations were found to be elevated with respect to general groundwater quality in the Beaver Creek area;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 335 mg/L during the first sampling event and 346 mg/L during the second sampling event and is considered very hard.

11.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek VRC that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- As nitrates and chlorides were found to be elevated, samples were taken to test for nutrients and indicators of potential surfacewater or septic sources including chloride, nitrate, nitrite, and ammonia; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3121-2 in Appendix A11 and the laboratory reports are included in Appendix B.

- The chloride concentration was 29.5 mg/L, which is elevated with respect to the general groundwater quality in the Beaver Creek area;

- The nitrate concentration was 5.17 mg/L, which is elevated with respect to the general groundwater quality in the Beaver Creek area; and
- The water quality results from additional analytical sampling indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

11.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be 23.7 mg/L during the first sampling event, 32.7 mg/L during the second sampling event, and 29.5 mg/L during the most recent sampling event. Chloride concentrations were above the normal background ranges for groundwater in the area. Nitrate concentrations were reported to be 2.9 mg/L during the first sampling event, 4.95 mg/L during the second sampling event, and 5.17 mg/L during the most recent sampling event. Nitrate concentrations were above the normal background ranges for groundwater in the area. These water quality results suggest that the aquifer from which the groundwater is obtained for the Beaver Creek VRC may be under the influence of surfacewater sources or septic wastes.

11.4 Conceptual Hydrogeology

There is no log available for this well. Most of the wells in the Beaver Creek area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

11.5 Potential Contaminant Sources

Potential contaminant sources identified during the water system assessment are compiled in field notes in Appendix A11. Photos of potential contaminant sources are also provided in Appendix A11.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 19 m.

The wellhead is located in the parking lot at the visitor reception centre, and is potentially subject to fuel and/or sewage spills from automobiles and recreational vehicles. The Alaska Highway (19 m) has also been identified as a potential contaminant source. The closest location of effluent discharge with respect to the well is a septic field located 33 m upgradient from the wellhead.

11.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

11.6 Identified Water System Deficiencies and Associated Risk

11.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- Poor location of the well (located in the reception centre parking lot where it may be subject to fuel and sewage spills from automobiles and recreational vehicles);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the depth of the well is unknown and the well construction does not meet the requirements of the Guidelines for Water Well Construction;
- The well is located within 30 m of potential sources of contamination, including an above ground fuel storage tank at 19 m and an active parking lot;
- The septic system is for the visitor reception centre is located upgradient from the well. The nearest point of the effluent discharge field is 33 m upgradient;
- Water quality results report elevated concentrations of nitrates and chlorides, and may indicate that the aquifer from which ground water is obtained for this site is under the influence of surfacewater or septic sources. A likely source is the septic system directly upgradient from the well; and,
- There is no treatment or disinfection system.

11.6.2 Low Risk Deficiencies

- The pump control system is not up to standards; and,
- The pressure switch is located too far away from the pressure tank.

11.7 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).

11.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the VRC. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the base of the well pit, and a localized near surface bentonite seal installed immediately around the wellhead, while leaving the remainder of the base of the well pit for drainage;
- The well and water system should be superchlorinated; and
- A disinfection treatment consisting of filtration to 1 micron absolute, and a UV system that is NSF/ANSI certified should be installed. Pretreatment (softening) will likely be required. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

11.7.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation are presented below:

<u>Option 1: New Well Construction</u>

- For this option, it is recommended that a new well should be drilled and the current well be decommissioned. It is recommended that a new well be installed to meet the following conditions:
  - The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;

- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tank and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A disinfection system may be recommended.

Option 2: New Cluster Well Construction

- Option 2 presents the option of a cluster well installation to provide water supply to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall. The advantages would include combined savings on capital costs, reduced life cycle costs, added control and system security, and reduced maintenance requirements. For this option, it is assumed that a heated building enclosure would be constructed to house the well and treatment system.

11.7.3 Priority 3

- Priority 3 deficiencies would be mitigated with Priority 2 upgrades.

11.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

11.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Casing extension and well cap installation - **$600;**
- Re-plumb so that domestic comes off of piping prior to tank, and install double check valve for backflow protection - **$500;**
- Well and water system superchlorination - **$200;** and
- UV system installation with required pre-filtration - **$2,400.**
- Softener system for pre-treatment **- $2,000.**

The estimated total cost for Priority 1 recommended upgrades is estimated at **$3,900** including materials and labour.

11.8.2 Priority 2

Option 1: New Well Construction

- The estimated cost for the Option 1 which includes the construction of a new well to serve the Fire hall and Library building is approximately **$30,000** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

  It is recommended that the existing well be kept plumbed in to the fire storage tanks for back-up water supply.

Option 2: New Cluster Well Construction

- The estimated cost for Option 2, consisting of a cluster well installation to provide water supply from a central well to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall would be in the order of **$25,000** per system. The estimated capital costs include supplies and labour for well construction, testing, treatment and distribution piping.

  It is recommended that the existing well be kept plumbed in to the fire storage tanks for back-up water supply.

12.0 BUILDING 3122: BEAVER CREEK SWIMMING POOL

12.1 Description of Existing Water Supply System

Building 3122, the Beaver Creek Swimming Pool, is currently served by a water supply system that delivers water from a 19.2 m deep well. The well is located in an underground enclosure directly adjacent to the nearby Beaver Creek Community Club building, which is served by the same well. The well location and other details about the surrounding area are provided in Figure 3122-A in Appendix A12. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916774
- Easting: 506150

There is no treatment or disinfection system for the water supplying this system. A schematic detailing the well supply system is provided as Figure 3122-B in Appendix A12.

12.2 Description of Existing Wastewater Systems

The septic tank that serves the community club is located south of the building approximately 20 m from the well and the effluent field is located to the south of the tank approximately 22 m from the well. The septic tank that serves the swimming pool is located to the east of the building and effluent is discharged in a septic field to the south of the tank. The swimming pool septic system is approximately 50 m from and likely downgradient from the well, but the community club septic system is likely up or cross gradient from the well. A site plan showing the septic systems is given by Figure 3122-A in Appendix A12.

12.3 Water Quality Results

12.3.1 Water Quality Results from Previous Sampling

Bacteriological

One sample was collected from the Beaver Creek Swimming Pool water system in June 2005 and was tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 3122-1 in Appendix A12. Coliform bacteria and *E. coli* were reported as absent in the sample.

Potability

Water samples were previously collected from the Beaver Creek Swimming Pool water system on June 15, 2005. The samples were submitted to ALS Environmental in Vancouver, BC for analyses included in their drinking water package. The results of these analyses are summarized in Table 3122-2 in Appendix A12. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination.

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- At 0.432 mg/L, the copper concentration is elevated above the normal copper concentrations in groundwater for the Beaver Creek area;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 194 mg/L, and is considered very hard.

12.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek Pool that was identified to be included during the water system assessments is detailed below:

- A sample was taken to retest for turbidity;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3122-2 in Appendix A12 and the laboratory reports are included in Appendix B. The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

12.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the Beaver Creek area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Beaver Creek Swimming Pool is under the influence of surfacewater sources or septic wastes.

12.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 19.2 m within a gravel aquifer. The lithology indicates mostly gravel with some interbedded fine grained material from 2.4 to 5.4 m. This is consistent with most well logs in the area, which indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The limited presence of fine grained material indicates that this well is most likely completed within a unconfined or semi- confined aquifer with limited protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

12.5 Potential Contaminant Sources

Potential contaminant sources from observations made during the water system assessment are compiled in field notes in Appendix A12. Photos of potential contaminant sources are also provided in Appendix A12.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 20 m; and
- A septic field located at 22 m.

12.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

12.6 Identified Water System Deficiencies and Associated Risk

12.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal) as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is located within 30 m of potential sources of contamination, including an above ground fuel storage tank at 20 m and a septic discharge field at 22 m, both of which are upgradient from the well; and,
- There is no treatment or disinfection system present.

12.6.2 Low Risk Deficiencies

- The copper concentration is elevated above normal background concentrations for the Beaver Creek area, and may signify leaching from copper pipes; and,
- It was observed during the water system assessment that two of the pressure tanks are leaking slightly.

12.7 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).

12.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Beaver Creek Pool and Community Hall. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the base of the well pit, and a localized near surface bentonite seal installed immediately around the wellhead, while leaving the remainder of the base of the well pit for drainage.
- The well and water system should be superchlorinated.
- Disinfection treatment consisting of filtration to 1 micron absolute, and a proportional feed chlorination system with retention tanks and necessary appurtenances should be installed. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

12.7.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation are presented below:

Option 1: New Well Construction to Serve Community Hall and Pool

- For this option, it is recommended that a new well should be drilled and the current well be properly decommissioned. There is no potential well location on the site that complies with recommended setback distances, therefore, it makes sense to drill to the west of the community centre to obtain a water supply for both buildings. The existing plumbing between the Community Centre and Pool could be utilized. It is recommended that the new well be installed to meet the following conditions:
  - The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
  - The well must be located at a distance greater than 30 m from any potential source of contamination, including the AST and all parts of the septic system; and
  - The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary.

Option 2: New Cluster Well Construction

- Option 2 presents the option of a cluster well installation to provide water supply to the School, Community Hall and Pool. The advantages would include combined savings on capital costs, reduced life cycle costs, added control and system security, and reduced maintenance requirements.

12.7.3 Priority 3

- Copper concentrations should be monitored as part of routine operation and maintenance.
- The pressure tanks should be replaced with an adequately sized bladder pressure tank during Phase 2 upgrades.

12.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

12.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Casing extension and well cap installation - **$700;**
- Well and water system superchlorination - **$200;** and,
- Filtration to 1 micron absolute and a proportional chlorine system with retention tanks- **$8,500.**

The estimate total cost for Priority 1 recommended upgrades are estimated at **$9,400** including materials and labour.

12.8.2 Priority 2

Option 1: New Well Construction

- The estimated cost for the Option 1 which includes the construction of a new well to serve the Pool and Community Centre is approximately **$32,400** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

  It is recommended that the existing well be kept plumbed in to the fire storage tanks for back-up water supply.

Option 2: New Cluster Well Construction

- The cost for construction of a cluster well that would serve the recreational hall and pool, assuming that the well would be constructed to meet the proposed regulations,

and would be 30 m deep, and including 80 m of distribution piping would cost approximately **$17,400** including half of the drilling costs and the costs for distribution to the Community Centre. The existing water line between the Community Centre and the pool would be utilized.

12.8.3 Priority 3

- The cost for routine monitoring of copper concentrations should be included under operation and maintenance costs; and
- Upgrades to the plumbing system, pressure tank and pump controls are covered with Priority 2 costs.

13.0 BUILDING 3123: BEAVER CREEK GRADER STATION

13.1 Description of Existing Water Supply System

Building 3123, the Beaver Creek Grader Station maintenance garage, is currently served by a water supply system that delivers water from a 32.8 m deep well. The well is located in a pit at the northeast end of the grader station. The well location and other details about the surrounding area are provided in Figure 3123-A in Appendix A13. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916580
- Easting: 506318

There is an inline filter (5 micron cartridge) present, but there is otherwise no treatment or disinfection system for the water supplying the grader station maintenance garage. A schematic detailing the well supply system is provided as Figure 3123-B in Appendix A13.

13.2 Description of Existing Wastewater Systems

There is a septic tank present at the southeast corner of the building approximately 20 m from the well. Septic effluent is discharged to an in ground disposal field south of the tank approximately 34 m from the well and potentially upgradient of the well. There is a rock pit that is used to drain the garage sumps located approximately 34 m south that is also potentially up gradient from the well. There is also an old abandoned septic tank and field approximately 22 m north and likely downgradient from the well. A site plan showing the septic system is provided as Figure 3123-A in Appendix A13.

13.3 Water Quality Results

13.3.1 Water Quality Results from Previous Sampling

Bacteriological

Eight samples were collected from the Beaver Creek Grader Station water system between October 2004 and June 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 3123-1 in Appendix A13. Coliform bacteria and *E. coli* were reported as absent in each of the eight samples for which results are provided.

Potability

Water samples were previously collected from the Beaver Creek Grader Station water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3123-2 in Appendix A13. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination. Details are summarized below:

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 97.3 mg/L during the first sampling event, and is considered moderately hard. During the second sampling event the hardness (as $CaCO_3$) was 152 mg/L, and is considered very hard.

13.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek Grader Station maintenance building that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) to determine if there are any indications of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 27, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3123-2 in Appendix A13 and the laboratory reports are included in Appendix B. The following items are of note:

- EPH and PAH concentrations were below analytical detection limits; and,
- The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

13.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Beaver Creek Grader Station is under the influence of surfacewater sources or septic wastes.

13.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 32.8 m within a fine sand and gravel aquifer. The well lithology indicates the presence of variable interbedded fine grained material from 11.6 to 29.6 m. This is consistent with the lithology for most wells in the Beaver Creek area which typically indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The interbedded nature of the fine sediments which persist in the area provides limited aquifer protection from surficial sources of contamination. A study previously completed in the Beaver Creek area by EBA determined that the direction of groundwater flow in the vicinity of the site is north to northeasterly.

13.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A13. Photos of potential contaminant sources are also provided in Appendix A13.

Potential contaminant sources within 30 m of the wellhead are:

- An underground fuel storage tank (UST) at 22 m;
- An above ground used oil EnviroTank (AST) at 7 m;

- A cold mix asphalt mix pile at 7.5 m;
- An abandoned septic field located at 22m.

In addition, industrial activities take place in close proximity to the well. There is also a rock pit located approximately 34 m away from the wellhead. Various scrap metal and parts are located around the site. The current septic field (in use) is located 34 m away and upgradient from the well.

13.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

13.6 Identified Water System Deficiencies and Associated Risk

13.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the well (located in a PWF wooden enclosure and casing only extends 100 mm above grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is located within 30 m of potential sources of contamination, including an above ground used oil storage tank at 7 m and an asphalt cold mix pile at 8 m;
- There is a former rock pit or septic leach pit located 22 m upgradient from the well;
- It was reported by grader station employees that there had previously been a break in the septic line or discharge line to the rock pit (they were unsure which) within 30 m of the well; and,
- There is no treatment or disinfection system.

13.6.2 Low Risk Deficiencies

- There were no low-risk deficiencies identified for this site. All deficiencies are considered either high or medium risk.

13.7 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).

13.7.1 Priority 1

Additional assessment would be prudent to confirm the location of the leak in the septic or rock pit discharge line, and to repair the leak as required. As well, to mitigate immediate risk issues, it is recommended that the following be completed:

- Superchlorinate the well and water system, and install a chlorination tap at the wellhead for future disinfection; and,
- Install a properly sized NSF/ANSI 55 certified UV system with a 5 micron pre-filter (NSF 61). These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

13.7.2 Priority 2

Several options have been presented for consideration for Priority 2 upgrades to mitigate longer-term risks.

Option 1: Upgrade Existing Well and Relocate Potential Contaminant Sources

To rehabilitate the existing well, and ensure that it provides safe drinking water for the long-term, it is recommended that the following work be completed:

- Standard wellhead upgrades to raise casing to at least 500 mm above grade and retrofit a surface sanitary seal (grout or bentonite as deep as possible);
- Relocate AST;
- Relocate UST;
- Relocate cold mix asphalt pile; and,
- Decommission former leach pit.

Option 2: Construct New Well to Serve Facility

This second option proposes that a new well be drilled to serve the facility, and that the existing well be properly decommissioned. It is recommended that the new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tanks and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary.

Option 3: New Cluster Well Construction

Option 3 presents the alternative of a cluster well installation to provide water supply to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall. For this option, it is assumed that a heated building enclosure would be constructed to house the well and treatment system. Advantages of this option relative to the other options presented is that it would offer combined savings on capital costs, reduced life cycle costs, additional system security, and reduced maintenance requirements.

13.7.3 Priority 3

No Priority 3 mitigative options have been identified.

13.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

13.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Install chlorination tap on wellhead - **$200**
- Well and water system superchlorination - **$200.**

- Filtration to 1 micron absolute filtration and UV disinfection system- **$3,000.**

The estimate total cost for Priority 1 recommended upgrade is estimated at **$3,400** including materials and labour.

13.8.2 Priority 2

Option 1: Wellhead Upgrades

Option 1 estimated costs are provided below:

- The estimated cost for standard wellhead upgrades is approximately **$5,000.**
- A Class D estimate of the cost to relocate all potential contaminant sources within 30 m of well would be in the order of **$15,000**.

Option 2: New Well Construction

The estimated cost for the Option 1 which includes the construction of a new well to serve the Pool and Community Centre is approximately **$30,000** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

Option 3: New Cluster Well Construction

The estimated cost for Option 2, consisting of a cluster well installation to provide water supply from a central well to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall would be in the order of **$25,000** per system. The estimated capital costs include supplies and labour for well construction, testing, treatment and distribution piping.

14.0 BUILDING 3125: BEAVER CREEK AIR TERMINAL BUILDING

14.1 Description of Existing Water Supply System

Building 3125, the Beaver Creek Airport Terminal Building, is currently served by a water system that sources water from a well of unknown depth. The well is located in a pit approximately 2 m east of the terminal building. The well location and other details about the surrounding area are provided in Figure 3125-A in Appendix A14. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6919562
- Easting: 507085

There is no treatment or disinfection system for the water supplying this building. A schematic detailing the well water supply system is provided as Figure 3440-B in Appendix A14.

14.2 Description of Existing Wastewater Systems

A septic tank that serves the terminal building is located on the east side of the building approximately 5 m north of the tank. Effluent is discharged to an in ground sewage disposal system approximately 54 m northwest of the well. Conceptual hydrogeology for the area indicates that the effluent disposal field is likely downgradient from the well. A site plan showing the septic system is given by Figure 3125-A in Appendix A14.

14.3 Water Quality Results

14.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Beaver Creek Airport Terminal Building water system between September 2004 and June 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 3125-1 in Appendix A14. *E. coli* bacteria were reported as absent in each of the nine samples for which results are provided, but one sample, taken November 17, 2004, tested positive for total coliform bacteria. More recent samples have not had Total coliform bacteria present.

Potability

Water samples were previously collected from the Beaver Creek Airport Terminal Building water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for analyses included in their drinking water packages. The results of these analyses are summarized in Table 3125-2 in Appendix A14. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The turbidity was 4.1 NTU during the first sampling event and 3.29 NTU during the second sampling event. In both cases the turbidity was in exceedence of the CDWQG MAC of 1.0 NTU;
- Review of the water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- Review of the water quality results indicated that the groundwater is a calcium magnesium bi-carbonate sulphate type water; and,
- The hardness (as $CaCO_3$) was 137 mg/L during the first sampling event and 126 mg/L during the second sampling event, and is considered to be moderately hard.

14.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Beaver Creek Airport Terminal Building that was identified to be included during the water system assessments is detailed below:

- As turbidity was previously in exceedence of the CDWQG MAC, a sample was taken to re-test for turbidity;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- EPH to determine if there are any signs of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample obtained during the water system assessment on July 27, 2005 was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3125-2 in Appendix A14 and the laboratory reports are included in Appendix B.

- At 11.7 NTU, turbidity was in exceedence of the CDWQG MAC of 1.0 NTU;
- Concentrations of extractable petroleum hydrocarbons (EPH) were below analytical detection; and,
- All other health based and aesthetic objectives were met for the parameters analyzed.

14.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and can be considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the airport building is under the influence of surfacewater sources or septic wastes.

14.4 Conceptual Hydrogeology

There was no driller's well log available for review for this well. Most of the wells in the Beaver Creek area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study had been previously completed in the Beaver Creek area by EBA, and it was determined that the direction of groundwater flow is north to northeasterly.

14.5 Potential Contaminant Sources

Potential contaminant sources from observations during the assessment are compiled in field notes in Appendix A14. Photos of potential contaminant sources are also provided in Appendix A14.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 5 m;
- Oil drums;
- Aircraft parking area;
- Vehicle parking area;
- Jet fuel storage area; and,
- Septic tanks located approximately 5 m from the well.

Additionally, septic discharge lines that run between the tank and the field are located within 10 m of the well and the septic field is approximately 54 m from the well.

14.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch identified that on April 30, 2004, 3 L to 5 L of diesel fuel spilled on the south side of the terminal building when a tank overfilled. It is considered unlikely that this impacted on the groundwater quality at the site. No other spill records or contaminated sites issues were identified for this site.

14.6 Identified Water System Deficiencies and Associated Risk

14.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is located within 30 m of potential contaminant sources, including an above ground fuel storage at 5 m, aircraft and vehicle parking within 10 m, and oil and aviation fuel drum storage within 30 m;
- Although the septic field is located greater than 30 m likely downgradient from the well, the septic tank is located 5 m from the well which contravenes the proposed

Part III Small Public Drinking Water Guideline, and the existing Yukon Public Sewage Regulation which requires a 15 m setback;
- Total coliform bacteria were reported as present in one previous sampling event;
- Three independent sampling events reported turbidity to be above the CDWQG MAC. The most recent sampling event reported turbidity to be 11.7 NTU; and,
- There is no treatment or disinfection system present.

14.6.2 Low Risk Deficiencies

- There are no low-risk deficiencies associated with this site. All deficiencies are either high or medium risk.

14.7 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).

14.7.1 Priority 1

Recommended Priority 1 upgrades to mitigate immediate risk to the Beaver Creek Airport water system are summarized below:
- Confirm depth of well;
- Superchlorinate well and water system;
- Install chlorine tap at wellhead for future disinfection;
- Install an appropriately sized filtration (to 1 micron absolute) and NSF/ANSI 55 certified UV disinfection system. Based on water quality data it appears that pretreatment to ensure proper UV operation will not be required. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

14.7.2 Priority 2

Two potential options to mitigate potential long-term risk to the Beaver Creek Airport water system are presented below:

Option 1: Upgrade and Rehabilitate Well, Relocate Potential Contaminant Sources

The option of upgrading, rehabilitating and relocating potential contaminant sources is presented below:

- Camera well to determine well construction and condition;
- Chemically clean (pending camera investigation results);
- Standard wellhead upgrades consisting of a pitless unit installation, extending the casing to at least 500 mm above grade, and retrofitting of a surface sanitary seal (grout or bentonite to at least 3 m in depth);
- Relocate AST; and,
- Relocate septic tank.

Option 2: Construct New Well to Serve Airport Facility

This second option proposes that a new well be drilled to serve the airport, and that the existing well be properly decommissioned. It is recommended that the new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is not inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tanks and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary.

14.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

14.8.1 Priority 1

Priority 1 costs are summarized below:

- The estimated cost for labour to superchlorinate the well and water system is approximately **$200**;
- Installation of a chlorine tap at wellhead for future disinfection would cost approximately **$200**;

- It is estimated that the installation of an appropriately sized NSF 61 filtration system (to 1 micron absolute) and an NSF/ANSI 55 certified UV disinfection system would cost **$3,000.**

14.8.2 Priority 2

Priority 2 costs for each option presented above are as follows:

Option 1: Upgrade and Rehabilitate Well, Relocate Potential Contaminant Sources

Option 1 estimated costs are provided below:

- The estimated cost for standard wellhead upgrades is approximately **$5,000;**
- The estimated cost to camera, redevelop and clean the well is **$3000**; and,
- A Class D estimate of the cost to relocate all potential contaminant sources within 30 m of well would be in the order of **$15,000**.

Option 2: Construct New Well to Serve Airport Facility

The estimated cost for the Option 1 which includes the construction of a new well to serve the Airport Terminal Building is approximately **$30,000** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

The existing treatment system (Priority 1) would be utilized for water system disinfection for each of the options presented above.

15.0 BUILDING 3964: BEAVER CREEK HEALTH CENTRE

15.1 Description of Existing Water Supply System

Building 3964, the Beaver Creek Health Centre, is currently served by a water supply system that delivers water from a well of unknown depth. The well is located in a pit approximately 3 m east of the health centre. The well location and other details about the surrounding area are provided in Figure 3964-A in Appendix A15. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6916660
- Easting: 506315

There is no treatment or disinfection system for the water supplying this site. A schematic detailing the well supply system is provided as Figure 3964-B in Appendix A15.

15.2 Description of Existing Wastewater Systems

Septic effluent is discharged to a septic system on the west side of the health centre. The septic tank is located approximately 20 m northwest of the well. The exact location of the septic field is unknown, however, it is likely that it is within 30 m of the well. Conceptual hydrogeology indicates that the septic system is likely cross-gradient from this well. There is also an abandoned septic tank or rock pit approximately 45 m south of the well on the Beaver Creek Grader Station property, and a septic field serving the Visitor Reception Centre approximately 42 m northeast and downgradient from the well. A site plan showing the existing wastewater system is given by Figure 3964-A in Appendix A15.

15.3 Water Quality Results

15.3.1 Water Quality Results from Previous Sampling

Bacteriological

Ten samples were collected from the Beaver Creek Health Centre water system between September 2004 and June 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 3964-1 in Appendix A15. Both *E. coli* and Total Coliform were reported as absent in each of the ten samples for which results are provided.

Potability

Water samples were previously collected from the Beaver Creek Health Centre water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for analyses included in their drinking water packages. The results of these analyses are summarized in Table 3964-2 in Appendix A14. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination as detailed below:

- During the first sampling event turbidity was 1.6 NTU, in exceedence of CDWQG MAC of 1.0 NTU. Turbidity at the time of the second sampling event, however, was less than the CDWQG MAC;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 234 mg/L during the first sampling event and 255 mg/L during the second sampling event, and is considered very hard.

15.3.2 Identification of Additional Analytical Testing Required

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

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 29, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3964-2 in Appendix A15 and the laboratory reports are included in Appendix B. The water quality result from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

15.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Nitrate and nitrite concentrations were reported to be low and within the normal background range for the area. Chloride concentrations, although were not in exceedence of the CDWQG aesthetic objective, were elevated above normal background concentrations in the Beaver Creek area. Water quality results suggest that the aquifer from which the groundwater is obtained for the Beaver Creek Health Centre may be under the influence of surfacewater sources or septic wastes. It should also be noted that a well on an adjacent property at the Beaver Creek Visitor Reception Centre had reported both chlorides and nitrates elevated above normal background concentrations for the area.

15.4 Conceptual Hydrogeology

There is no log available for review for this well. Most of the wells in the Beaver Creek area indicate coarse sand and gravel with cobbles and small boulders to depths of at least 30 m. The well logs also indicate that discontinuous lenses of finer-grained sediments persist throughout the area, but in general the sediments are dominated by coarse alluvium. Some discontinuous permafrost is also interpreted to persist throughout the Beaver Creek area. The variability of sediments in the Beaver Creek area indicates limited aquifer protection from surficial sources of contamination. A study had been previously completed in the Beaver Creek area by EBA, and it was determined that the direction of groundwater flow is north to northeasterly.

15.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A15. Photos of potential contaminant sources are also provided in Appendix A15.

Potential contaminant sources within 30 m of the wellhead are:

- An effluent discharge field as close as 18 m (exact location unknown);
- An indoor fuel storage tank at 20 m;
- Various fuel, oil and paint drums on the Grader Station property at 20 m.

In addition, an asphalt mix pile is located approximately 40 m south from the wellhead on the Grader Station property.

15.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

15.6 Identified Water System Deficiencies and Associated Risk

15.6.1 High and Medium Risk Deficiencies

High and medium risk deficiencies are summarized as follows:

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is located within 30 m of potential sources of contamination, including a fuel storage tank at approximately 20 m and fuel, oil, and paint drums at 20 m;
- The closest point of the effluent discharge field for the health centre is likely 18 m cross gradient from the well;
- Water quality reported chloride above normal background concentrations for the area, and suggest that the well may potentially be under the influence of surfacewater or septic sources; and,
- There is no treatment or disinfection system.

15.6.2 Low Risk Deficiencies

- The heat trace as not been installed to code. There is no thermostat, no ground fault indicator (GFI), and the heat trace does not appear to be working properly;
- There is no pressure gauge on the system; and,
- There was a previous exceedence of turbidity.

15.7 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).

15.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Beaver Creek Health Centre Building. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the base of the well pit, and a localized near surface bentonite seal installed immediately around the wellhead, while leaving the remainder of the base of the well pit for drainage.
- The well and water system should be superchlorinated.
- Disinfection treatment consisting of filtration to 1 micron absolute, and a UV system that is NSF/ANSI certified should be installed. Pretreatment will likely be required for proper UV performance. Alternatively, a proportional feed chlorination system with retention tanks and appurtenances could be installed. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

15.7.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation are presented below:

Option 1: New Well Construction

For this option, it is recommended that a new well should be drilled and the current well be decommissioned. It is recommended that a new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is not inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tank and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A disinfection system may be recommended.

Option 2: New Cluster Well Construction

Option 2 presents the option of a cluster well installation to provide water supply to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall. The advantages would include combined savings on capital costs, reduced life cycle costs, added control and system security, and reduced maintenance requirements. For this option, it is assumed

that a heated building enclosure would be constructed to house the well and central treatment system.

15.7.3 Priority 3

Priority 3 upgrades include:

- Install pressure guage on system if option 1 of Priority 2 is chosen. Consider completing this at the same time as Priority 2 upgrades.

15.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

15.8.1 Priority 1

The exact location of the septic field should be confirmed.

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Casing extension and localized sanitary surface seal - **$600**;
- Well and water system superchlorination - **$200**; and,
- UV system installation with required pre-filtration and softener pre-treatment - **$5,400.** Alternatively, a proportional feed chlorination system with retention tanks and appurtenances could be installed for approximately **$7,000.**

The total cost for Priority 1 recommended upgrade is estimated at **$3,400** including materials and labour.

15.8.2 Priority 2

Since the well is likely within 30 m of the septic field, and elevated chloride may indicate that there is potential influence of surfacewater or septic waste, it is recommended for the long-term that a new water source be obtained. Two options are presented below:

Option 1: New Well Construction

The estimated cost for the Option 1 which includes the construction of a new well to serve the Health Centre building is approximately **$30,000** for drilling, testing and hook-up, assuming that the well would be approximately 30 m deep and constructed as described above.

Option 2: New Cluster Well Construction

The estimated cost for Option 2, consisting of a cluster well installation to provide water supply from a central well to the Grader Station, Health Centre, Visitor Reception Centre and Fire Hall would be in the order of **$25,000** per system. The estimated capital costs include supplies and labour for well construction, testing, treatment and distribution piping.

16.0 BUILDING 3201: BURWASH LANDING AIRPORT BUILDING

16.1 Background and Description of Existing Water Supply System

Building 3201, the Burwash Landing Airport Building, is currently served by a water supply system that delivers water from a 10.5 m deep well. The well is located outside in a wooden enclosure adjacent to the airport building. At the time of the assessment, the well was not equipped with a proper watertight and vermin-proof cap. The well location and other details about the surrounding area are provided in Figure 3201-A in Appendix A16. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6805564
- Easting: 605217

There is no treatment or disinfection system for the water supplying this system. A schematic detailing the well water supply system is provided as Figure 3201-B in Appendix A16.

16.2 Description of Existing Wastewater Systems

The septic tank that serves this building is located east of the building approximately 23 m southeast of the well. Septic effluent is discharged to the southeast of the tank approximately 40 m from the well. A site plan showing the septic system is given by Figure 3201-A in Appendix A16.

Reportedly the former septic system consisted of a septic holding tank within the basement of the building. The tank reportedly discharged through a pipe across the existing driveway. According to Nick Barnett, PMA, the sewer discharge pipe was found to be broken and leaking at a location beneath the driveway (Personal Comm., Nick Barnett).

16.3 Water Quality Results

16.3.1 Water Quality Results from Previous Sampling

Bacteriological

Eleven samples were collected from the Burwash Landing Airport building water system between September 2004 and June 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 3201-1 in Appendix A16. Two out of the eleven samples reported positive results for total coliform bacteria.

Reportedly, an additional water sample collected from the system on July 14th, 2005 also tested positive for Total Coliform Bacteria (Personal Comm., Nick Barnett). We understand that this system is currently under a boil water advisory, and signs are posted.

Potability

Water samples were previously collected from the Burwash Landing Airport Building water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3201-2 in Appendix A16. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination as follows:

- During the first sampling event the copper concentration was 1.12 mg/L, which is in exceedence of the CDWQG MAC of 1.0 mg/L. The copper concentration during the second sampling event was 0.793 mg/L, which, although is not in exceedence of the CDWQG MAC, is elevated;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- Chloride and nitrate concentrations, although were not in exceedence of CDWQG aesthetic objectives, were found to be elevated and may indicate influence by surfacewater or septic sources;
- The water quality results indicated that the groundwater from which this system receives its water supply is a calcium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 334 mg/L during the first sampling event and 329 mg/L during the second sampling event, and is considered very hard.

16.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Burwash Landing Airport Building that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;

- Total organic carbon (TOC);
- As the copper concentration had previously exceeded the CDWQG MAC, samples were taken for total and dissolved copper;
- Since there was evidence of elevated chloride and nitrate, samples were taken to analyze for nitrate, nitrite, chloride, and ammonia;
- Extractable Petroleum Hydrocarbons (EPH) to determine if there are any signs of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3201-2 in Appendix A16 and the laboratory reports are included in Appendix B. Details are:

- Additional analytical sampling reported that the nitrate concentration was elevated with respect to expected background concentrations for the Burwash Landing area;
- The concentration of total copper in the water was reported to have been 0.645 mg/L, and the reported concentration of dissolved copper was 0.647 mg/L. Although the copper concentration was not in exceedence of the CDWQG MAC of 1.0 mg/L, it was elevated and very close to the MAC; and,
- The EPH screening did not indicate any petroleum hydrocarbons above detection limits.

16.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Nitrate concentrations for this sample were reported in three independent sampling events to be elevated above expected background concentrations for the Burwash area. Reported nitrate concentrations are not likely within the normal background range for this area. There were also two bacteriological results from between September 2004 and June 2005 that had reportedly tested positive for total coliform. Chloride concentrations were slightly elevated, in the range of 5 mg/L for the three sampling events, and are likely above background chloride concentrations for the region. Considering that water quality results show elevated nitrates and chlorides, and also positive total coliform results, indicators of potential contamination would suggest that the aquifer from which the groundwater is obtained for the Burwash Landing Airport Building may be under the influence of surfacewater sources or septic wastes.

The closest point of the existing septic field is approximately 40 m downgradient from the well, and although the septic tank and sewer service lines are within 30 m of the well, it is not likely that this is the cause of high nutrients in the water system. One potential cause of the elevated nitrates and chlorides is the poor surface completion of the well. The well is located in a wooden enclosure containing fiberglass insulation. This type of enclosure is especially subject to inhabitation by rodents. At the time of the water system assessment there were mouse feces and other evidence of rodents in the wellhead enclosure. The well is also equipped with a jet pump rather than a submersible pump. Because of the depth of the well it was required that two drop pipes be installed as opposed to only one. Having two drop-pipes in the well makes it difficult to find a proper double-holed well cap to install on the well casing, and likely due to this, there was no well cap present. Because the well is open without a cap on the casing, and because the wellhead enclosure is constructed in a manner such that it is appealing to rodents for habitation, it is likely that the well is subject to animals and animal feces falling directly into the well. It is possible that the elevated nitrate and chloride concentration, as well as the positive bacteriological results for total coliform, is being caused by fecal matter and/or decaying rodent carcasses in the well.

Another potential cause of elevated chloride and nitrate may be resulting from the former leak of the sewer discharge pipe. We understand that this leak was repaired in 1989 and a new in-ground sewage disposal system was installed.

16.4 Conceptual Hydrogeology

There is no log available for this well. Most wells in the Burwash area are completed in a 30 m to 50 m deep confined aquifer. The general lithology of the area indicates 30 m to 50 m of fine grained sediments overlying the aquifer, discontinuous permafrost has also been identified. The well is completed at a depth of 10.51 m with a static water level 8.55 m below grade. Unlike most wells in the Burwash area, this well is most likely completed in an unconfined aquifer located in permeable sediments interbedded within the fine grained, surficial material. The shallow depth of the aquifer and probable lack of a confining layer make it somewhat susceptible to surficial sources of contamination. Groundwater flow direction in the vicinity is likely north towards Kluane Lake.

16.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in field notes located in Appendix A16. Photos of potential contaminant sources are also provided in Appendix A16.

Potential contaminant sources within 30 m of the wellhead include:

- One above ground fuel storage tank (AST); and,
- An abandoned well located beside the existing well.

In addition, there is a septic tank located approximately 23 m away from the wellhead, a septic field is located at 40 m. There is also a bulk fuel storage area located approximately 80 m southeast and crossgradient from the well.

16.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring sites.

16.6 Identified Water System Deficiencies and Associated Risk

16.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the well (located in a wooden enclosure with fiberglass insulation, wellhead is open, subject to access by rodents and rodent feces, wellhead is at grade). Note that the wellhead was temporarily sealed with plastic and tape, however, this is not considered to be an adequate long-term solution;
- There is no surface sanitary seal;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), has a production zone less than 15 m below grade, and does not meet the requirements of the Guidelines for Water Well Construction;
- There are at least three bacteriological results that reported positive total coliform within the past year;
- Water quality results indicated elevated (above expected background concentrations) nitrates and chlorides, suggesting that there may be impact of this shallow aquifer from septic or surface sources of contamination;

- There is a previous exceedence of the CDWQG MAC for copper. Most recent result is not above MAC, but is elevated above expected background concentrations;
- Well is located within 30 m of potential sources of contamination, including an above ground fuel storage tank at 8 m and an abandoned well at 1 m from the current well;
- The well is a shallow well and is likely completed in an unconfined aquifer that is susceptible to surface sources of contamination; and,
- There is no treatment or disinfection.

16.6.2 Low Risk Deficiencies

- There are no low-risk deficiencies associated with this site. All deficiencies are considered either high or medium risk.

16.7 Mitigative Options for Deficiencies

Following the high-risk deficiencies identified by EBA at the time of the water system assessment, PMA retained EBA to coordinate the drilling, construction and testing of a new well to serve the Burwash Landing Airport Building. The construction of the well is documented in a report to PMA entitled "Well Completion Report- Burwash Landing Airport Terminal Building" (EBA, 2005). Included in this report are recommendations pertinent to maintaining the safety of the new water supply well. All deficiencies presented in the above report were addressed through the drilling of a new well, and through decommissioning of the old wells. Therefore, mitigative options and associated costs to address former deficiencies have not been included in this final report.

The new well is currently temporarily connected with above ground piping. Once the ground has thawed, it would be prudent to re-plumb the well and install piping with adequate freeze-protection below grade. It is estimated that the cost to complete the well hook-up will be in the order of **$5,000**. It is also recommended that an NSF/ANSI approved UV disinfection system be installed (Priority 2) in keeping with the multi barrier approach. This system would cost in the order of **$2,200** installed.

17.0 BUILDING 3204: BURWASH LANDING FIRE HALL

17.1 Description of Existing Water Supply System

Building 3204, the Burwash Landing Fire Hall, is currently served by a water supply system that delivers water from an approximately 39.2 m deep well. The well is located in an enclosure off from the fire hall. The well location and other details about the surrounding area are provided in Figure 3204-A in Appendix A17. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6804037
- Easting: 607068

There is no treatment or disinfection system for the water supplying this system. The water system splits to serve the domestic system and the fire truck fill. There are two approximately 5000 L water storage tanks to store water used for fire fighting. A schematic detailing the water supply system is provided as Figure 3204-B in Appendix A17.

17.2 Description of Existing Wastewater Systems

The building is equipped with a sewage eduction tank located to the east of the fire hall. The eduction tank is approximately 15 m east and likely downgradient from the well. A site plan showing the septic system is given by Figure 3204-A in Appendix A17.

17.3 Water Quality Results

17.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Burwash Landing Fire Hall water system between September 2004 and June 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 3204-1 in Appendix A17. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the Burwash Landing Fire Hall water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for detailed potability analyses. The results of these analyses are summarized in Table 3204-2 in Appendix A17. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- Previous sampling reported the turbidity to be 11.1 NTU, which is in exceedence of both the CDWQG aesthetic objective of 5.0 NTU and MAC of 1.0 NTU;
- The first sampling event reported the arsenic concentration to be 0.0055 mg/L, which although is not in exceedence of the current CDWQG MAC, is in exceedence of the proposed new MAC of 0.005 mg/L. The second sampling event, however, reported the arsenic concentration to be 0.00432 mg/L, which is below the proposed MAC;
- The first sampling event reported the iron concentration to be 0.45 mg/L, which is above the CDWQG aesthetic objective of 0.3 mg/L. Supplementary sampling, however, reported the iron concentration to be 0.154 mg/L, below the CDWQG aesthetic objective;
- The first sampling event reported the manganese concentration to be 0.059 mg/L, which is above the CDWQG aesthetic objective of 0.05 mg/L. The second sampling event, however, reported the manganese concentration to be 0.0467 mg/L, below the CDWQG aesthetic objective;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a sodium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 115 mg/L during the first sampling event and 117 mg/L during the second sampling event, and is considered moderately hard.

17.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Burwash Landing Fire Hall that was identified to be included during the water system assessments is detailed below:

- As turbidity had been in exceedence of the CDWQG MAC, a sample was taken to re-test for turbidity;

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 29, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3204-2 in Appendix A17 and the laboratory reports are included in Appendix B.

- At 4.01 NTU, the turbidity was in exceedence of the CDWQG MAC of 1.0 NTU; and,
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

At the time of the water system assessment, the water was very turbulent and a strong odour was noticed due to sulphide off-gasing.

17.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Burwash Landing Fire Hall is under the influence of surfacewater sources or septic wastes.

17.4 Conceptual Hydrogeology

There was no log available for review for this well. Well logs for the nearby community wells (500 m away) indicate that the wells are drawing water from a deep confined intrapermafrost aquifer overlain by 42 m to 47 m of frozen clay and silt. Recharge to this aquifer is likely melting snow and glaciers, and precipitation on the eastern flank of the Kluane Range. At a depth of 39 m, the fire hall well is most likely completed within the

same aquifer. The inferred presence of a significant confining layer provides protection of the aquifer from surfice sources of contamination. Groundwater flow direction in this area is expected to be north to northeast towards Kluane Lake.

17.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A17. Photos of potential contaminant sources are also provided in Appendix A17.

Potential contaminant sources within 30 m of the wellhead include:

- One above ground fuel storage tank (AST).
- A sewage eduction tank is located 15 m away from the well.

17.5.1 Spills Records and Contaminated Sites Search Results

It was reported that on November 10, 1998, a spill occurred at a gas station in Burwash Landing near this site. Approximately 3800 L of diesel fuel spilled from Burwash Fuels when a valve was left on and the fuel ran down approximately 400 m towards Kluane Lake likely within 100 m of the fire hall well.

Due to the proximity of the spill to the site, and the inferred confined and protected nature of the aquifer (based on an understanding of the lithology from other well logs for the area), it is not antipated that this is a cause of concern to the water quality delivered from this well.

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any other recorded spill events or contaminated sites issues for this site or neighbouring sites in close proximity.

17.6 Identified Water System Deficiencies and Associated Risk

17.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in an enclosure below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association’s Guidelines for Water Well Construction;

- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the well depth is unknown, and the well construction does not meet the requirements of the Guidelines for Water Well Construction;
- The well is located within 30 m of potential contaminant sources, including an above ground fuel storage tank at 4 m;
- The turbidity has been reported to be in exceedence of the CDWQG MAC. Turbidity has been reported to be as high as 11.1 NTU; and,
- There is no treatment or disinfection system.

17.6.2 Low Risk Deficiencies

- It has been reported that a spill had occurred at Burwash Fuel with discharge possibly coming within 100 m of the well;
- There is a sewage eduction tank located 15 m from the well; and,
- The heat trace installation is not up to standards.

17.7 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).

17.7.1 Priority 1

An attempt should be made to locate the well log for this well to verify well construction and aquifer vulnerability.

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Burwash Landing Fire Hall. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the base of the well pit.
- The well and water system should be superchlorinated, and a chlorination tap installed at the wellhead to facilitate future superchlorination.
- Disinfection treatment consisting of filtration to 1 micron absolute, and a UV system that is NSF/ANSI certified should be installed. Alternatively, a proportional feed chlorination system with retention tanks and appurtenances could be installed. These are conceptual design recommendations based on the information available

for planning and budgeting purposes. Engineering input will be required for final system specifications.

17.7.2 Priority 2

All significant issues addressed through Priority 1 upgrades, and therefore, there are no Priority 2 upgrades required.

17.7.3 Priority 3

Priority 3 upgrades would include replacing the heat trace to meet the electrical code. A certified electrician should complete this work.

17.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

17.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Casing extension - **$500**;
- Well and water system superchlorination and installation of chlorination tap- **$400**; and,
- UV system installation with filtration to 1 micron absolute would cost approximately **$3,000** including materials and labour**.** It is not anticipated that pre-treatment (i.e. softening) would be required for optimum UV performance.

Consideration should be given to completing a camera investigation and well cleaning and re-development at the time of the upgrades. The sulphur odour and off gassing could be a result of biological activity (biofouling) within the well screen and aquifer formation.

17.8.2 Priority 3

The estimated cost for an electrician to rewire and install the heat trace to code is approximately **$500.**

18.0 BUILDING 3171: KLUANE LAKE SCHOOL

18.1 Description of Existing Water Supply System

Building 3171, Kluane Lake School, is currently served by a water supply system that delivers water from an approximately 31.7 m deep well. The well is located in pit approximately 5 m from the school. The well location and other details about the surrounding area are provided in Figure 3171-A in Appendix A18. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6792831
- Easting: 617972

The water system is equipped with a duplex water softener and an activated carbon filter, and is also equipped with a pellet chlorination system that is installed on the wellhead. Field chemistry done at the time of the water system assessment reported a residual chlorine concentration of 0.00 mg/L for both raw and treated water, indicating that the either the chlorination system is likely not functioning properly, or that all chlorine is removed by the activated carbon vessel. A schematic detailing the well supply system is provided as Figure 3171-B in Appendix A18.

18.2 Description of Existing Wastewater Systems

Kluane Lake School is serviced by a community sewage disposal system. The community effluent tanks and discharge fields are located greater than 60 m cross gradient and downgradient from this well.

18.3 Water Quality Results

18.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Kluane Lake School water system between September 2004 and June 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 3171-1 in Appendix A18. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the Kluane Lake School water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3171-2 in Appendix A18. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination.

Water quality results indicated a significantly varying degree of hardness. The first sampling event reported the hardness (as $CaCO_3$) to be 1.8 mg/L, while the second sampling event reported the hardness to be 446 mg/L. There was also a significant change in the total dissolved solids reported in water quality results. Water quality results likely indicate that a water softener that was operational during the first sampling event would not have been functioning properly during the second sampling event, or that a raw water sample was collected during the second sampling event.

- The turbidity during the second sampling event was 1.1 NTU, which is in exceedence of the CDWQG MAC of 1.0 NTU;
- The total dissolved solids during the first sampling event was 680 mg/L, and during the second sampling event to be 528 mg/L, both of which are in exceedence of the CDWQG aesthetic objective of 500 mg/L;
- The manganese concentration during the second sampling event was 0.0974 mg/L, which is in exceedence of the CDWQG aesthetic objective of 0.05 mg/L;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed; and,
- The water quality results indicated that the groundwater from which this system receives its water supply is a magnesium bicarbonate type water.

18.3.2 Identification of Additional Analytical Testing Required

Additional analytical for Kluane Lake School that was identified to be included during the water system assessments is detailed below:

- As turbidity had previously been in exceedence of the CDWQG MAC, a sample was taken to re-test for turbidity;
- Total and dissolved manganese as there had been a previous exceedence of the CDWQG aesthetic objective;

- Total organic carbon (TOC); and
- Measurements in the field for total dissolved solids, conductivity, pH, temperature and residual chlorine concentration.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 29, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3440-2 in Appendix A4 and the laboratory reports are included in Appendix B.

- The water quality results from additional analytical sampling indicated that all health based and aesthetic objectives were met for the parameters analyzed.

18.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for Kluane Lake School is under the influence of surfacewater sources or septic wastes.

18.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 30.8 m within a sand aquifer. Overlying the aquifer is approximately 30.1 m of fine grained silt and till. The static water level at the time of drilling was 7.6 m below grade. This is consistent with most well logs in the Destruction Bay area, which typically indicate 25 m to 50 m of fine grained silt overlying a confined sand and gravel aquifer. The presence of 30 m of fine grained material overlying the aquifer provides protection from surficial sources of contamination. The expected direction of groundwater flow in the vicinity of the site is likely east to northeast towards Kluane Lake.

18.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A18. Photos of potential contaminant sources are also provided in Appendix A18.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 26 m; and,
- An underground fuel storage tank (UST) at 9 m.

A significant number of scrap cars are located approximately 30 m away from the wellhead. Septic lines are located at 10 m and 30 m away from the wellhead, the closest in ground sewage disposal system is located greater than 60 m away.

18.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did identify recorded spill events near this site as detailed below:

On September 26, 2003, approximately 500 L of diesel fuel spilled at the Yukon Electrical Company complex in Destruction Bay due to a faulty vent. The spill had reportedly been cleaned up but the soil was reportedly not removed.

There had been multiple spill events of raw sewage due to failures with the community sewage system in Destruction Bay. On two occations in 1993, a mechanical failure caused approximately 37 800 L and 11 340 L of raw sewage to spill. The sewage had in both cases reportedly flowed over the ground surface and ponded near Kluane Lake. Additionally, four recorded spill events occurred in 1995 and 1996 caused by leaking or broken sewer mains, spilling raw sewage in the Destruction Bay area. Two events recorded spills of approximately 200 L each, but the other two events spilled an unknown amount.

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any other recorded spill event or any contaminated sites issues for this site or neighbouring sites. Spill records are provided in Appendix A18.

18.6 Identified Water System Deficiencies and Associated Risk

18.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because does not meet the requirements of the Guidelines for Water Well Construction;
- The well is located within 30 m of potential sources of contamination, including an underground fuel storage tank at 9 m, an above ground fuel storage tank at 26 m, and scrap vehicles at approximately 30 m;
- Field chemistry indicated that the chlorination system was not functioning at the time of the water system assessment; and,
- The configuration of the water treatment system does not allow for a residual chlorine concentration at the point of use.

18.6.2 Low Risk Deficiencies

- There had been raw sewage spill events reported for the community sewage system;
- There had been as previous CDWQG MAC exceedence for turbidity;
- The total dissolved solids concentration has been reported to be in exceedence of the CDWQG aesthetic objective;
- Water quality indicates that the water softener may not always be functional; and,
- There had been a previous exceedence of the CDWQG aesthetic objective for manganese, however, with a functioning softener, this should not be an issue.

18.7 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).

18.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Kluane Lake School. Priority 1 remedial recommendations include:

- The casing should be extended to at least 500 mm above the base of the well pit, or as high as possible, and a temporary near surface sanitary seal should be installed around the well casing;
- The well and water system should be superchlorinated, and a chlorination tap installed at the wellhead to facilitate future superchlorination;
- Disinfection treatment consisting of a proportion feed chlorine injection system with appropriately sized retention tanks and appurtenances should be installed. The selection of this disinfection system is to ensure adequate residual chlorine within the distribution system. It has also been selected in consideration that the recommended upgrade option for the water supply serving the adjacent Fire hall would be to connect to this treated system; and,
- The activated carbon should be removed from the vessel and replaced with a multimedia bed.

These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

18.7.2 Priority 2

Priority 2 upgrades to protect the water supply system in the long-term are provided below:

- Standard wellhead upgrades consisting of a pitless unit installation, extending the casing to at least 500 mm above grade, and retrofitting of a surface sanitary seal (grout or bentonite to at least 3 m in depth);
- Installation of a commercial sized stainless steel duplex water NSF 61 filtration system with 5 micron followed by 1 micron absolute; and,
- Replace AST with a doubled walled “EnviroTank” type UST and relocate to at least 30 m from well.

18.7.3 Priority 3

All lower risk deficiencies indicated previously should be mitigated through Priority 1 and Priority 2 upgrades.

18.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

18.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- The proposed casing extension would cost in the order of **$500**;
- Well and water system superchlorination and installation of chlorination tap is estimated to cost **$400**; and,
- The cost for installation of proportional feed chlorine injection system with retention tanks including materials and labour would cost approximately **$8,000**.

18.8.2 Priority 2

The estimated costs for the recommended Priority 2 upgrades are provided below:

- Standard wellhead upgrades with pitless unit, casing extension, retrofitted sanitary seal would cost approximately **$5,000**;
- Removal of UST and replacement with double walled AST would cost in the order of **$5,000** (class D and depending on extent of potential soil contamination),
- The cost for installation of a commercial stainless steel NSF 61 filtration system as previously indicated, including materials and labour, would cost approximately **$2,900**.

19.0 BUILDING 3172: DESTRUCTION BAY FIRE HALL

19.1 Description of Existing Water Supply System

Building 3172, the Destruction Bay Fire Hall, is currently served by a water supply system that delivers water from an approximately 31.4 m deep well. The well is located in a pit approximately 5 m from the fire hall. The well location and other details about the surrounding area are provided in Figure 3172-A in Appendix A19. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6792050
- Easting: 617956

There is no treatment or disinfection system for the water supplying this system. The water system splits to supply the domestic system and the system for fire fighting use. The system for fire fighting use is equipped with an elevated 22,500 L water storage tank. A schematic detailing the well supply system is provided as Figure 3172-B in Appendix A19.

19.2 Description of Existing Wastewater Systems

The Destruction Bay Fire Hall uses a community sewage collection system. Community sewage discharge fields are located greater than 100 m down gradient and approximately 100 m cross gradient.

19.3 Water Quality Results

19.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Destruction Bay Fire Hall water system between September 2004 and June 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 3172-1 in Appendix A19. *E. coli* bacteria were reported as absent in each of the nine samples for which results are provided, however, the sample tested on February 17, 2005, reported positive for total coliform bacteria. Results provided by YTG indicate that samples collected since February 17th, have not have total coliform present.

Potability

Water samples were previously collected from the Destruction Bay Fire Hall water system on October 19, 2004 and June 16, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3172-2 in Appendix A19. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination. Items of note are detailed below:

- The turbidity had been reported to be 53.5 NTU during the first sampling event and 11.0 NTU during the second sampling event. Both sampling events reported turbidity in exceedence of the CDWQG MAC of 1.0 NTU and aesthetic objective of 5.0 NTU;
- The colour during the first sampling event was greater than 60 CU, which is in exceedence of CDWQG aesthetic objective of 15 CU;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;
- The water quality results indicated that the groundwater from which this system receives its water supply is a magnesium bicarbonate sulphate type water; and,
- The hardness (as $CaCO_3$) was 308 mg/L during the first sampling event and 312 mg/L during the second sampling event, and is considered very hard.

19.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Destruction Bay Fire Hall that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- Turbidity and color; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3172-2 in Appendix A19 and the laboratory reports are included in Appendix B.

- At 3.04 NTU, turbidity was in exceedence of the CDWQG MAC of 1.0 NTU; and,
- The water quality results from additional analytical sampling indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

19.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and are considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Destruction Bay Fire Hall is under the influence of surfacewater sources or septic wastes.

19.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 29.9 m within a sand aquifer. Overlying the aquifer is approximately 29.8 m of interbedded clay and till. The static water level at the time of drilling was 7.6 m below ground. This is consistent with most well logs in the Destruction Bay area, which typically indicate 25 m to 50 m of fine grained material overlying a confined sand and gravel aquifer. The presence of a fine grained confining layer provides some aquifer protection from surficial sources of contamination. The expected direction of groundwater flow in the vicinity of the site is likely east to northeast towards Kluane Lake.

19.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A19. Photos of potential contaminant sources are also provided in Appendix A19.

Potential contaminant sources within 30 m of the wellhead are:

- An above ground fuel storage tank (AST) at 1 m; and,
- An underground fuel storage tank (UST) at 18 m.

Other potential contaminant sources in the vicinity of the wellhead are a number of scrap cars are located approximately 20 m away from the wellhead, an above ground fuel storage tank located at 39 m, and septic lines located within 30 m of the wellhead.

19.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did identify recorded spill events near this site as summarized below:

On September 26, 2003, approximately 500 L of diesel fuel spilled at the Yukon Electrical Company complex in Destruction Bay due to a faulty vent. The spill had reportedly been cleaned up but the soil was reportedly not removed.

There had been multiple spill events of raw sewage due to failures with the community sewage system in Destruction Bay. On two occations in 1993, a mechanical failure caused approximately 37 800 L and 11 340 L of raw sewage to spill. The sewage had in both cases reportedly flowed over the ground surface and ponded near Kluane Lake. Additionally, four recorded spill events occurred in 1995 and 1996 caused by leaking or broken sewer mains, spilling raw sewage in the Destruction Bay area. Two events recorded spills of approximately 200 L each, but the other two events spilled an unknown amount.

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any other recorded spill event or any contaminated sites issues for this site or neighbouring sites. Spill records are provided in Appendix A19.

19.6 Identified Water System Deficiencies and Associated Risk

19.6.1 High and Medium Risk Deficiencies

- Poor wellhead construction (located in a pit below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- 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 well is within 30 m of potential sources of contamination, including an above ground fuel storage tank at 2 m, an underground fuel storage tank at 18 m, and scrap cars within 20 m;
- There had been raw sewage spill events reported for the community sewage system;
- A recent bacteriological sample reported a positive total coliform count;
- The turbidity has been reported to be consistently above the CDWQG MAC of 1.0 NTU. Turbidity has been reported to be as high as 53.5 mg/L; and,
- There is no treatment or disinfection system.

19.6.2 Low Risk Deficiencies

- The color had previously exceeded the CDWQG aesthetic objective; and,
- It is unlikely that the supports for the elevated water storage tank are earthquake or collision proof.

19.7 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).

When considering potential upgrades, the costs were compared between completing the necessary upgrades to the Fire Hall wellhead and installation of treatement in order to provide safe domestic water at this site versus plumbing the domestic system into the Kluane School system. In light of the very poor water quality provided by the Fire hall well, all treatment options would include significant capital costs for pre-treatment (softening and filtration for turbidty reduction). Combined with these costs, the water treatment costs, the cost for disinfection, standard wellhead upgrades, and relocation of the AST adjacent to the well are far in excess of the option of plumbing the domestic water

system into the adjacent school. This option would also provide reduced maintenance requirements and therefore, reduced life cycle costs. The remedial options presented below assume that plumbing the upgraded School well into the domestic water supply for the Fire hall would be logisticaly feasible. Should PMA wish to consider other options, these could be provided. The option presented assumes that minor upgrades would be completed to the Fire hall well to protect the integrity of the aquifer, and that this well would remain in service to provide water for fire fighting requirements.

19.7.1 Priority 1

Until such time as the water system is plumbed into the adjacent school water system, it is recommended that appropriate signage be posted indicating that the water is not treated and should not be used for drinking purposes. PMA should consult with Environmental Health and Social Services to ensure that the wording on the advisory is appropriate. In the interim, until Priority 2 upgrades are completed, it is recommended that a bottled water station be provided by PMA.

19.7.2 Priority 2

The following Priority 2 upgrades are recommended to provide safe drinking water to the Destruction Bay Fire Hall:

- Following Priority 1 upgrades to the adjacent Kluane School water supply system, it is recommended that a new service line consisting of 1 inch insulated and heat traced pipe should be installed below grade between the School and the Fire Hall. The system should be re-plumbed so that the domestic water supply and the fire fighting supply are independent. An option for emergency back-up use of the domestic water for fire fighting purposes should be considered.
- The well casing should be extended to at least 500 mm above grade and the portion of the well pit that is below grade should be backfilled with a low permeability material such as bentonite or grout.

19.7.3 Priority 3

All risks with respect to the safety of the drinking water supply would be mitigated through Priority 2 upgrades.

19.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

19.8.1 Priority 1

The cost would be minimal to provide appropriate advisory, and provide a bottled water station.

19.8.2 Priority 2

The estimated cost to complete the recommended Priority 2 upgrades are summarized below:

- A service line installed as recommended would cost approximately **$3,600** for materials and labour;
- Plumbing modifications would cost approximately **$200** for materials and labour.
- The minor well upgrades described above are estimated to cost in the order of **$1,000.**

20.0 BUILDING 3186: DESTRUCTION BAY GRADER STATION

20.1 Description of Existing Water Supply System

Building 3186, the Destruction Bay Grader Station, is currently served by a water supply system that delivers water from a well located in the grader station garage. There is also an abandoned well located less than a meter away from the current well, and is not equipped with a proper cap and was open at the time of the assessment. The well locations and other details regarding the site are provided in Figure 3186-A in Appendix A20. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6792596
- Easting: 617886

There is no treatment or disinfection system for the water supplying this system. There is a sign posted in the washroom stating "Contaminated Water, Do Not Consume" and it appeared that bottled water is provided. A schematic detailing the well supply system is provided as Figure 3186-B in Appendix A20.

20.2 Description of Existing Wastewater Systems

There are three Septic effluent disposal systems that were identified during the water system assessment. There is a septic tank near the northeast corner of the building, located approximately 23 m east and downgradient from the well. This tank likely serves the domestic sewage system, and effluent is likely discharged to an in ground disposal system southeast of the tank. There is a leach pit located near the northwest corner of the building, approximately 13 m northeast and likely downgradient from the well, and it likely serves the sump in the wash pad. There is a rock pit located off from the southeast side of the building that likely serves the sumps in the garage, and it is approximately 17 m east and cross-gradient from the well. A site plan showing the septic systems is provided as Figure 3186-A in Appendix A20.

20.3 Water Quality Results

20.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Destruction Bay Grader Station water system between September 2004 and June 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 3186-1 in Appendix A20. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the Destruction Bay Grader Station water system on October 19, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3186-2 in Appendix A20. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination. Items are note were:

- During the first sampling event, the arsenic concentration was reported as 0.0329 mg/L, which is in exceedence of the current CDWQG MAC of 0.025 mg/L. The arsenic concentration was reported as 0.0184 mg/L during the second sampling event, which although is not in exceedence of the current CDWQG MAC, is in exceedence of the proposed new MAC of 0.005 mg/L;
- The turbidity was 21.1 NTU during the first sampling event and 12.7 NTU during the second sampling event, and was in both cases in exceedence of the CDWQG MAC of 1.0 NTU and aesthetic objective of 5.0 NTU;
- The colour during the first sampling event was greater than 60 CU;
- The iron concentration was 2.94 mg/L during the first sampling event and 1.34 mg/L during the second sampling event, and was in both cases in exceedence of the CDWQG aesthetic objective of 0.3 mg/L;
- The manganese concentration was 0.165 mg/L during the first sampling event and 0.137 mg/L during the second sampling event, and was in both cases in exceedence of the CDWQG aesthetic objective of 0.05 mg/L;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed;

- The water quality results indicated that the groundwater from which this system receives its water supply is a magnesium bicarbonate type water; and,
- The hardness (as $CaCO_3$) was 399 mg/L during the first sampling event and 350 mg/L during the second sampling event, and is considered extremely hard.

20.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Destruction Bay Grader Station that was identified to be included during the water system assessments is detailed below:

- The full suite of total and dissolved metals, including vanadium, as there had been exceedences of arsenic, iron, and manganese;
- Turbidity and colour;
- Silica and phosphate to determine potential for a point of entry arsenic removal system;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC);
- Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) to determine if there are any signs of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3186-2 in Appendix A20 and the laboratory reports are included in Appendix B.

- At 0.0353 mg/L, the reported total arsenic concentration was in exceedence of the CDWQG MAC of 0.025 mg/L. The dissolved arsenic concentration was 0.0217 mg/L, signifying that a large portion of the arsenic concentration can be attributed to dissolved particles;
- At 23.0 NTU, the turbidity was in exceedence of the CDWQG MAC of 1.0 NTU
- At 2.20 mg/L, the total iron concentration was in exceedence of the CDWQG aesthetic objective of 0.3 mg/L. The dissolved iron concentration was 0.033 mg/L, signifying that the iron content can be mainly attributed to suspended solids;
- At 0.238 mg/L, the total manganese concentration was in exceedence of the CDWQG aesthetic objective of 0.05 mg/L. The dissolved manganese concentration

was 0.201 mg/L, signifying that the manganese content can be mainly attributed to dissolved particles;
- The screening for EPH and PAH indicated that each of the parameters analyzed was below analytical detection limits and CDWQG; and,
- Water quality results from additional analytical sampling reported that all other health based and aesthetic objectives were met for the parameters analyzed.

20.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were reported to be low and can be considered to be within the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were also low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Destruction Bay Grader Station is under the influence of surfacewater sources or septic wastes.

20.4 Conceptual Hydrogeology

There was no log available for review for this well. The direction of groundwater flow as inferred from topographical maps and aerial photographs is likely east to northeasterly towards Kluane Lake.

20.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A20. Photos of potential contaminant sources are also provided in Appendix A20.

Potential contaminant sources within 30 m of the wellhead are:

- A leach pit at approximately 13 m;
- Rock pit at 17 m;
- Underground fuel storage tank at less than 25 m;
- Used antifreeze drums at 7 m; and,
- An above ground used oil storage tank at 9 m.

In addition, a tar emulsion above ground storage tank is located 45 m upgradient from the wellhead, and a tar or creosote above ground storage tank is located at 55 m upgradient.

There is a fuel pumping area located approximately 36 m upgradient fromt the well. The septic tank that serves the grader station is 23 m away, and the location of the septic discharge field associated with this tank is unknown, but may be within 30 m. The underground fuel storage tank is located somewhere under the concrete floor of the grader station maintenance garage, but the exact location is unknown.

20.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did identify recorded spill events near this site.

On September 26, 2003, approximately 500 L of diesel fuel spilled at the Yukon Electrical Company complex in Destruction Bay due to a faulty vent. The spill had reportedly been cleaned up but the soil was reportedly not removed.

There had been multiple spill events of raw sewage due to failures with the community sewage system in Destruction Bay. On two occations in 1993, a mechanical failure caused approximately 37 800 L and 11 340 L of raw sewage to spill. The sewage had in both cases reportedly flowed over the ground surface and ponded near Kluane Lake. Additionally, four recorded spill events occurred in 1995 and 1996 caused by leaking or broken sewer mains, spilling raw sewage in the Destruction Bay area. Two events recorded spills of approximately 200 L each, but the other two events spilled an unknown amount.

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any other recorded spill event or any contaminated sites issues for this site or neighbouring sites. Spill records are provided in Appendix A20.

20.6 Identified Water System Deficiencies and Associated Risk

20.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the wellhead (located in a corner of the maintenance garage, does not extend the required 500 mm above grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- There is no log available to review lithology and construction;

- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the completion depth is unknown and the well construction does not meet the requirements of the Guidelines for Water Well Construction;
- The well is located within 30 m of potential contaminant sources including an underground fuel storage tank, used antifreeze drums, a waste oil storage tank, and industrial activities;
- There are two Septic effluent leach pits located within 30 m of the well. The septic tank is located approximately 23 m from the well, and although the exact location of the septic field is unknown it may be within 30 m of the well;
- There is an uncapped abandoned well located less than 1 m from the current well;
- Turbidity has consistently been above both the CDWQG MAC of 1.0 NTU and aesthetic objective of 5.0 NTU. The most recent sampling event reported turbidity to be 23.0 NTU;
- Arsenic has been reported to be above the current CDWQG MAC of 0.025 mg/L. The most recent sampling event reported the arsenic concentration to be 0.0353 mg/L; and,
- There is no treatment or disinfection system.

20.6.2 Low Risk Deficiencies

- The well is within 60 m and downgradient from a tar tank and a tar or creosote tank;
- The water system is very old and in disrepair;
- Colour had previously exceeded the CDWQG aesthetic objective of 15 CU. The most elevated colour was greater than 60 CU;
- The iron concentration has consistently been in exceedence of the CDWQG aesthetic objective of 0.3 mg/L. The most elevated reported iron concentration was 2.94 mg/L; and,
- The manganese concentration has consistently been in exceedence of the CDWQG aesthetic objective of 0.05 mg/L. The most recent sampling event reported the manganese concentration to be 0.238 mg/L.

20.7 Mitigative Options for Deficiencies

To address the high-risk deficiencies identified by EBA in the Draft report for this water system, PMA coordinated the drilling, construction and testing of a new well to serve the Destruction Bay Grader Station. The construction of the well is documented in a report to PMA entitled “Well Completion Report- Destruction Bay Grader Station” (EBA 2005). The well completion report also included details of decommissioning of an abandoned well and recommendations pertinent to maintaining the safety of the new water supply well.

The new well has not yet been commissioned, therefore the following interim mitigative measures are provided until the new well is hooked up to the supply system.

20.7.1 Priority 1

- The new well should be connected to the building water supply system, and the existing well should be properly decommissioned as soon as weather permits;
- An NSF/ASNI 55 certified UV treatment system (or equivalent) should be installed to provide disinfection. Pretreatment will likely be required. Engineering input from a qualified water treatment consultant should be obtained for final system design.
- The new well must be sampled for bacteriological results prior to use as a potable water supply;
- PMA should continue to provide drinking water via a bottled water station until the new well is hooked-up; and,
- Consult with EHSS to ensure that the existing advisory is adequate.

20.7.2 Priority 3

The existing well should be properly decommissioned once the new well is commissioned.

20.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

20.8.1 Priority 1

Connection of the new water supply well is estimated to cost in the order of **$7,400** assuming that the well is connected with a pitless adapter.

20.8.2 Priority 2

A suitable treatment/disinfection system would likely cost in the order of **$3,700**, assuming **$2,200** for the UV disinfection, and **$1,500** for a residential size water softener.

20.8.3 Priority 3

The cost associated with decommissioning the existing water wells is estimated at approximately **$1,000**.

21.0 BUILDING 3957: DESTRUCTION BAY HEALTH CENTRE

21.1 Description of Existing Water Supply System

Building 3957, the Destruction Bay Health Centre, is currently served by a water supply system that delivers water from an approximately 68.9 m deep artesian well. In addition to serving the health centre, the well also serves two nursing residences (referred to as Nursing Residence #1 and Nursing Residence #2). The well is located in a pumphouse near Nursing Residences # 1. The well location and other details about the surrounding area are provided in Figure 3957-A in Appendix A21. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 7
- Northing: 6792941
- Easting: 617983

The system is equipped with a water softener, a pH neutralizer, and a colour removal system. The treatment system is located in one of the nursing residences and is piped to the health centre. Nursing residence #2 was formerly served by an independent well, but that well has been abandoned and this residence is currently served by this well. The reason for the well abandonment is unknown. Proper infrastructure connecting Nursing Residence # 2 to this water system was not completed at the time of the water system assessment, but was temporarily connected through a garden hose from Nursing Residence # 1. Nursing Residence # 1, in addition to other treatment mentioned, is equipped with a reverse osmosis treatment system at the point of use in the kitchen. A schematic detailing the well supply system is provided as Figure 3957-B in Appendix A21.

21.2 Description of Existing Wastewater Systems

All three buildings served by this water system use a community sewer collection system. There is a community septic field located approximately 65 m east and downgradient from the well, and another community septic field located approximately 75 m northwest and potentially upgradient from the well. A site plan showing both community septic fields is given by Figure 3957-A in Appendix A21.

21.3 Water Quality Results

21.3.1 Water Quality Results from Previous Sampling

Bacteriological

Nine samples were collected from the Destruction Bay Health Centre water system between September 2004 and June 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 3957-1 in Appendix A21. Coliform bacteria and *E. coli* were reported as absent in each of the nine samples for which results are provided.

Potability

Water samples were previously collected from the Destruction Bay Health Centre water system on September 21, 2004 and June 15, 2005. The samples were submitted to Northwest Labs in Surrey, BC and ALS Environmental in Vancouver, BC for potability analyses. The results of these analyses are summarized in Table 3957-2 in Appendix A21. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify indicators of potential contamination.

- The arsenic concentration during the first sampling event was 0.0148 mg/L, and 0.114 mg/L during the second sampling event, which although is not in exceedence of the current CDWQG MAC of 0.025 mg/L, is in exceedence of the proposed new MAC of 0.005 mg/L;
- The pH was 8.79 during the first sampling event and 8.68 during the second sampling event, and is in exceedence of the CDWQG aesthetic objective of 8.5;
- The water quality results indicated that the groundwater from which this system receives its water supply is highly mineralized. Although the low hardness indicates that the water softener is functioning properly, the most recent sampling event reported that the total dissolved solids concentration as 525 mg/L, which is in exceedence of the CDWQG aesthetic objective of 500 mg/L; and,
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

21.3.2 Identification of Additional Analytical Testing Required

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

- Total and dissolved arsenic as arsenic had been in exceedence of the new proposed CDWQG MAC;
- Total and dissolved vanadium, as well as silica and phosphate to determine potential for a point of entry arsenic removal system;
- UV absorbance and UV transmissivity, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained during the water system assessment on July 28, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 3957-2 in Appendix A21 and the laboratory reports are included in Appendix B.

- The total arsenic concentration was 0.012 mg/L, which is above the proposed maximum acceptable concentration of 0.005 mg/L. Since the dissolved arsenic concentration was 0.0119 mg/L, the arsenic concentration can be entirely attributed to dissolved particles; and,
- The water quality results from additional analytical sampling indicated that all other health based and aesthetic objectives were met for the parameters analyzed.

21.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. Chloride concentrations were slightly elevated, however, this may be a result of the water treatment system. Raw water quality results were not available for review. Nitrate and nitrite concentrations for this sample were low and within the normal background range for this area. These water quality results do not suggest that the aquifer from which the groundwater is obtained for the Beaver Creek Health Centre is under the influence of surfacewater sources or septic wastes.

21.4 Conceptual Hydrogeology

The log for this well indicates that the well was originally drilled to a depth of 25.2 m and completed within a gravel aquifer. Several years later it appears that the well was deepened to 68.9 m and completed within a confined artesian aquifer. The well log indicates variable gravel, silt, clay and till with a significant confining layer from 46.9 to 60.3 m. This is the only know artesian well in the Destruction Bay area. The depth of this well, presence of a confining layer, and artesian flow indicate that there is significant protection from surficial sources of contamination. The expected direction of groundwater flow in the vicinity of the site is likely east towards Kluane Lake.

21.5 Potential Contaminant Sources

Potential contaminant sources from observations during the water system assessment are compiled in field notes in Appendix A21. Photos of potential contaminant sources are also provided in Appendix A21.

Potential contaminant sources within 30 m of the wellhead are:

- An indoor fuel storage tank at 20 m; and,
- An above ground fuel storage tank at 26 m.

In addition an abandoned well is located on the property. The closest portion of a septic system to the well is a septic field located at 65 m.

21.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did identify recorded spill events near this site.

On September 26, 2003, approximately 500 L of diesel fuel spilled at the Yukon Electrical Company complex in Destruction Bay due to a faulty vent. The spill had reportedly been cleaned up but the soil was reportedly not removed.

There had been multiple spill events of raw sewage due to failures with the community sewage system in Destruction Bay. On two occations in 1993, a mechanical failure caused approximately 37 800 L and 11 340 L of raw sewage to spill. The sewage had in both cases reportedly flowed over the ground surface and ponded near Kluane Lake. Additionally, four recorded spill events occurred in 1995 and 1996 caused by leaking or broken sewer mains, spilling raw sewage in the Destruction Bay area. Two events recorded spills of approximately 200 L each, but the other two events spilled an unknown amount.

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any other recorded spill event or any contaminated sites issues for this site or neighbouring sites. Spill records are provided in Appendix A21.

21.6 Identified Water System Deficiencies and Associated Risk

21.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the well (located in an enclosure below grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because does not meet the requirements of the Guidelines for Water Well Construction;
- The well is located approximately 60 m downgradient from a community septic field; and,
- There is no disinfection system.

21.6.2 Low Risk Deficiencies

- The well is within 30 m of an above ground fuel storage tank located in Nursing Residence #1, however, since the well is 26 m away and in a building, it is considered to pose minimal risk;
- The well is located approximately 36 m downgradient from an underground fuel storage tank;
- The arsenic concentration, although not in exceedence of the current MAC, has consistently been in exceedence of the proposed new CDWQG MAC of 0.005 mg/L. The most elevated reported concentration was 0.0148 mg/L;

- The pH has consistently been in exceedence of the CDWQG aesthetic objective of 8.5 and elevated above the normal background pH for the region. Field measurements reported the pH to be 9.11. This is likely caused over-adjustments by the pH neutralizer, and the pH would likely drop if the neutralizer were properly adjusted;
- At 525 mg/L, the most recent previous sampling event reported the total dissolved solids concentration to be in exceedence of the CDWQG aesthetic objective of 500 mg/L; and,
- The NSF 61 filtration system has not been installed to code.

21.7 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).

It is assumed that a proper water distribution line has been installed to Nursing Residence #2 to replace the garden hose connection that was observed at the time of the assessment. If this is not completed, it should be done as soon as possible.

21.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the Destruction Bay Health Centre Building and Nursing Residences. Priority 1 remedial recommendations include:

- Superchlorinate the well and water system, and install a chlorination tap at the wellhead for future disinfection; and,
- Install filtration (to 1 micron absolute) and NSF/ANSI 55 certified UV disinfection system in Nursing Residence # 1 to provide disinfected water to all buildings.
- Bring filter installation to code (NSF 61) by ensuring proper air gaps on drains and restraint on tanks. Adjust pH neutralizer to bring pH down to below 8.5 pH units.

These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

21.7.2 Priority 2

Priority 2 upgrade options to mitigate long-term risk and meet the proposed regulation would include standard wellhead improvements consisting of a pitless unit installation, extending the casing to at least 500 mm above grade, and retrofitting of a surface sanitary seal (grout or bentonite to at least 3 m in depth).

21.7.3 Priority 3

For Priority 3 upgrades, it is recommended that point of use RO systems be installed in the Health Centre and Nursing Residence # 2 and to provide drinking water that will meet proposed PMAC for arsenic and lower TDS.

21.8 Cost Estimates for Mitigative Options

Engineering costs for 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.

21.8.1 Priority 1

The estimated costs for the recommended Priority 1 upgrades are detailed below:

- Installation of a chlorine tap on the wellhead, and superchlorination of the well and water system would cost approximately **$400** for materials and labour.
- A UV system and filtration would cost approximately **$3,000**.
- Alterations to the filtration system and adjustment of the pH neutralizer would cost in the order of **$200**.

21.8.2 Priority 2

Standard wellhead upgrades with a pitless unit and retrofitting of a surface seal would cost approximately **$5,000** for materials and labour.

21.8.3 Priority 3

Point of use Reverse Osmosis systems could be installed for approximately **$700** per system for a total of **$1,400** including materials and labour.

22.0 SUMMARY

The project team assessed the small public drinking water systems for 18 Government of Yukon maintained buildings in the Western Region in July 2005 in general accordance with the Terms of Reference and the project team's proposal. Key findings of this study are discussed below.

Based on water quality results provided from previous studies or collected during this study, most wells assessed in the Western Region did not have exceedences of health-based parameters, or indicators of potential contamination from human or animal wastes.

In total, nine water systems have had turbidity higher than the CDWQG maximum acceptable concentration (MAC) of 1 NTU, however, only five systems had a turbidity greater than 1 NTU during the most recent sampling events. Turbidity should be as low as possible, and consistently be below 1 NTU; however, it can exceed this level occasionally. Follow-up sampling is recommended for the systems where turbidity was above 1 NTU during the most recent sampling events.

Based on the information provided to EBA from past bacteriological sampling events, *E. coli* bacteria (a type of faecal coliform) have not been identified in any of these water systems on the dates sampled.

The presence of total coliform bacteria can be a potential indicator of bacterial and/or viral contamination. In the Western Region, three of the water systems that are currently in use have at some time in the past six months had total coliform bacteria present in the samples collected. Total coliform bacteria are an indicator organism, and do not necessarily indicate water contamination by faecal waste; however the presence or absence of these bacteria in drinking water is often used to determine whether water disinfection is working properly, or whether treatment is required. We understand that YTG has commissioned routine sampling programs for the presence of total coliform and *E. coli* bacteria, and most water systems are sampled on a monthly basis. Water sources in which total coliform have been identified as present in the past year should be considered with caution. It is recommended that these systems be sampled for the presence of faecal coliform and *E. coli* in the near future.

The arsenic concentrations in drinking water sampled from the Destruction Bay Grader Station were above the existing maximum acceptable concentration (MAC). There are advisories posted at this location indicating that the water should not be consumed. Water sources from five other

water systems (Haines Junction Initial Attack Base, Attack Base Maintenance Shop, and the Destruction Bay Nursing Station and Nursing Residences) that are currently utilized for drinking water have concentrations of arsenic that exceed the proposed guideline and will require treatment or use of an alternate source of drinking water when these proposed guidelines come into effect.

In general, well construction for the wells serving the small public drinking water systems for YTG maintained buildings does not meet the current construction standards or the requirements of the proposed guidelines. Each of the wells assessed have not been completed with surface sanitary seals (bentonite or bentonite grout) between the well casing and the formation within at least the top 6 m of the well completion. Additionally, many wells are completed in pits below grade, which makes them potentially susceptible to surface sources of contamination. The proposed guidelines require that all water supplied by wells that do not have properly constructed wells, or wells without grout seals within the top 6 m would either require treatment consisting of both filtration and disinfection, or further GUDI assessment (Phase 2 and/or 3) to ensure that these systems are not at risk. Most of the water systems assessed do not have filtration or disinfection and as such, this has been identified as a high-risk deficiency. In addition, many wells assessed have potential sources of contamination located within 30 m of the wells.

Class D estimates of costs to mitigate identified deficiencies are provided in each section, and are summarized in Table 4.

The multi-barrier approach to safe drinking water includes the protection of drinking water at its source, adequate treatment, a clean distribution system operated by competent personnel and comprehensive testing of water quality. During this study, the project team evaluated the well construction and potential contaminant sources in the vicinity of wells to assess the level of protection of the drinking water at its source, additionally the condition and adequacy of the treatment and distribution systems were evaluated. It was not within the scope of work to evaluate the operations, maintenance and testing programs for these systems, however, these are key to the multi-barrier approach and will be required by the proposed small public drinking water system regulations. It was obvious from this assessment that operator training and routine maintenance of the existing water systems needs improvement. Table 5 provides as summary of the level of risk assessed to each water system in consideration of the identified risk and existing barriers of protection (a “multi-barrier” approach). Risk factors included:

- Any parameter above a CDWQG maximum acceptable concentration (not including elevated turbidity or coliform presence);

- Indicators such as elevated turbidity, presence of coliform, or elevated chloride, nitrate or nitrite.
- Potential sources of bacteriological and/or viral contaminants within 30 m of the wellhead; and,
- The level of risk due to public accessibility of the well (public buildings, schools, residences etc.).

Risk mitigating factors that were considered included:

- Favorable hydrogeological conditions;
- Good well construction;
- Primary disinfection treatment (e.g., filtration to less than 1 micron absolute or membrane filtration, etc.); and,
- Secondary disinfection treatment (e.g., chlorination or UV treatment).

Priority was assessed based on the level of public accessibility to the buildings and their water systems. Systems that provide drinking water to publicly accessible buildings and employee residences were assessed as an overall Priority level of 1 (highest priority), while systems that are not publicly accessible were assigned a Priority level of 2 or 3 depending on the amount of use of the building and water system. The priority assessment presented in Table 5 can be used as a tool to assist PMA in prioritizing system upgrades. This prioritization system is illustrated in the following matrix:

Matrix 1: Illustration of "Priority 1 – High Risk Systems"

Overall risk based on multi-barrier approach	Priority Level based on public accessibility		
	Priority 1	**Priority 2**	**Priority 3**
High	**Priority 1 – High Risk**	Priority 2 – High risk	Priority 3 – High risk
Medium	Priority 1 – Medium Risk	Priority 2 – Medium risk	Priority 3 – Medium risk
Low	Priority 1 – Low Risk	Priority 2 – Low risk	Priority 3 – Low risk

As indicated in the matrix provided above, those buildings with water systems that were identified as having an overall high-risk, and serve public buildings or employee residences (Priority 1) should be addressed first from a cost benefit perspective. These systems we refer to as "Priority 1 – High Risk". All deficiencies (with the exception of some Priority 3 upgrades

which are purely mechanical/operational and do not pose a health risk) for each system should ultimately be addressed in order to mitigate health risk. It is suggested that all Priority 1 upgrades for all systems be completed as soon as possible. In general, we recommend that the best approach to mitigate risk would be to install disinfection treatment systems (Priority 1), and to carry out well improvements as soon as possible thereafter (Priority 2).

The Priority 1, High-risk Sites for the Western Region include:

- M0131: Beaver Creek RCMP Detachment;
- 3100: Nelnah Bessie John School;
- 3102: Beaver Creek Fire Hall and Library;
- 3121: Beaver Creek Visitor Reception Centre;
- 3122: Beaver Creek Swimming Pool;
- 3125: Beaver Creek Airport Terminal Building; and,
- 3964: Beaver Creek Health Centre.

Installation of treatment systems will result in increased operation and maintenance costs for these systems. YTG should consider for budgetary purposes that the equivalent of a full time water system operator, with adequate training, would be required to coordinate the operation, maintenance and routine testing of these systems. Requirements of the proposed Guidelines for Small Public Drinking Water Systems, and any other applicable guideline or regulation should be implemented diligently within the “multi-barrier” approach.

A general recommendation for operation and maintenance for systems where upgrades are not immediately implemented that would mitigate significant risk is to inspect and disinfect (superchlorinate with 200 mg/L chlorine solution) every water well, tank and distribution system on a bi-annual basis (every 6 months).

23.0 RECOMMENDATIONS AND CONCLUSIONS

The recommended upgrade options presented within this report should be evaluated by YTG with regard to risk, preference and cost. Priority 1 upgrades should be completed as soon as possible. All Priority 2 upgrades should also be completed as soon as budget and scheduling permits in the future. Priority 3 conditions should be monitored to check if and when they may worsen to a Priority 2 or 1 situation. In consideration of building priority, YTG PMA should start by commissioning the implementation of Priority 1 upgrades recommended for systems that are identified as "Priority 1-High-risk". Addressing Priority 1 deficiencies at other systems with an overall "lower risk" should follow based on level of risk until all Priority 1 upgrades are complete.

Two in-use wells (3102- Beaver Creek Fire Hall and 3201- Burwash Landing Airport) were found to be without well caps, and are therefore, were very vulnerable to the entrance of vermin, insects and other foreign objects. This put them at risk of potential exposure to bacteria, viruses and/or protozoa. This was brought to the attention of PMA in August, following the assessments. A new well has subsequently been drilled and commissioned at 3201 – Burwash Landing Airport. If not already completed, PMA should ensure that the Beaver Creek Fire Hall has a properly fitted cap installed as soon as possible.

It is recommended that interim alternate sources of drinking water be provided for the following buildings, until such time as the Priority 1 upgrades have been implemented:

- 3102: Beaver Creek Firehall and Library
- 3172: Destruction Bay Firehall; and,
- 3186: Destruction Bay Grader Station;

For these systems, it is recommended that YTG PMA consult with YTG EHSS to determine the best approach to issuing advisories and implementing interim measures (boiled water advisories or provision of bottled water).

It is recommended that additional assessment be completed for some systems as soon as possible. This would include:

- 3440: Blanchard Camp – Attempt to obtain well log, confirm purpose of monitoring wells;
- 3442: Haines Junction Initial Attack Base – Monitor residual chlorine concentrations;
- M0131: RCMP Detachment: Determine location of septic system and purpose of monitoring wells;

- M0134: RCMP Residence - Attempt to obtain well log;
- 3100: Nelnah Bessie John School - Attempt to obtain well log, confirm location of septic field;
- 3102: Beaver Creek Fire hall - Attempt to obtain well log and confirm location of septic field;
- 3121: Beaver Creek Visitor Reception Centre - Attempt to obtain well log;
- 3123: Beaver Creek Grader Station - Confirm location of break in septic and/or rock pit discharge line and repair;
- 3125: Beaver Creek Airport - Attempt to obtain well log, camera investigation of well;
- 3964: Beaver Creek Health Centre - Attempt to obtain well log, confirm location of septic field;
- 3204: Burwash Fire hall - Attempt to obtain well log; and,
- 3171: Kluane Lake School – Ensure pellet chlorinator is functional.

24.0 LIMITATIONS

Conclusions and recommendations presented in this report are based on the wellhead inspections, water supply source evaluations and distribution and treatment system evaluations as described in the previous sections. The project team attempted to identify all water system deficiencies in the amount of time allocated for each assessment, while working within the constraints of the scope, budget and accessibility. It is possible that some deficiencies or risks have not been identified within the level of effort this project afforded. EBA bears no responsibility for undiscovered deficiencies due to project limitations on level of effort. This report has been prepared for the exclusive use of the Government of Yukon. This report has been prepared in accordance with generally accepted hydrogeological and environmental engineering practices. For further limitations regarding the use of this report, reference should be made to the EBA Environmental Report - General Conditions attached, which form a part of this report.

25.0 CLOSURE

EBA trusts this report meets your present requirements. If you have questions or concerns, please do not hesitate to call the undersigned.

Respectfully submitted;
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This report incorporates and is subject to these "General Conditions".

A.1 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

A.2 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

A.2.1 Information Provided to EBA by Others

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

A.3 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

(1) With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

A.4 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

A.5 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

A.6 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

A.7 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

A.8 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

A.9 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

A.10 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

26.0 REFERENCES

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TABLES

TABLE 1: SUMMARY OF HISTORICAL BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
Haines Junction and Surrounding Area								
3440	Blanchard Grader Station	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
3443	Haines Junction Initial Attack Base	2	May -05 to Jun-05	no	0/2	no	16-Jun-05	no
Beaver Creek								
M0131	Beaver Creek R.C.M.P Detachment	3	Sept-04 to Jun-05	no	0/3	no	16-Jun-05	no
M0133	Beaver Creek R.C.M.P. Residence	4	Sept-04 to Jun-05	no	0/4	no	16-Jun-05	no
M0134	Beaver Creek R.C.M.P. Residence	4	Sept-04 to Jun-05	no	0/4	no	16-Jun-05	no
3100	Nelnah Bessie John School	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
3102	Beaver Creek Fire Hall	8	Sept-04 to Jun-05	no	0/8	no	16-Jun-05	no
3121	Beaver Creek Visitor Reception Centre	2	May -05 to Jun-05	no	0/2	no	16-Jun-05	no
3122	Beaver Creek Swimming Pool	1	June-05	no	0/1	no	16-Jun-05	no
3123	Beaver Creek Grader Station	8	Oct-04 to Jun-05	no	0/8	no	16-Jun-05	no
3125	Beaver Creek Air Terminal Building	9	Sept-04 to Jun-05	**yes**	1/9	no	16-Jun-05	no
3964	Beaver Creek Health Centre	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
Burwash Landing								
3201	Burwash Landing Airport Building	11	Sept-04 to Jun-05	**yes**	2/11	no	16-Jun-05	no
3204	Burwash Landing Fire Hall	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
Destruction Bay								
3171	Kluane Lake School	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
3172	Destruction Bay Fire Hall	9	Sept-04 to Jun-05	**yes**	1/9	no	16-Jun-05	no
3186	Destruction Bay Grader Station	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no
3957	Destruction Bay Health Centre	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 2: Water Quality Results

SOURCE:	Building 3440 - Blanchard Grader Station				Building 3443 - Haines Junction Initial Atack Base		Building M0131 - Beaver Creek RCMP Detachment			Building M0133 - Beaver Creek RCMP Residence			Building M0134 - Beaver Creek RCMP Residence			Building 3100 - Nelnah Bessie John School			Building 3102 - Beaver Creek Fire Hall			GCDWQ Criteria		
Location/ Resident	Haines Road				Haines Junction		Beaver Creek			Beaver Creek			Beaver Creek			Beaver Creek			Beaver Creek					
Address																								
Treatment	None			Filtration, softener, RO	None		None			Filtration			None			Water softener, activated carbon filter			None					
Disinfection	None			UV disinfection	None		None			None			None			Chlorination			None					
Source of Water	On-site well				Water delivery		On-site well			On-site well			On-site well			On-site well			On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical	Additional Analytical	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical			
Sample Location	Grader Station	Grader Station	Grader Station	Living Complex		Kitchen tap			Kitchen tap			Kitchen tap			Kitchen tap			Arts room sink			Library washroom sink			
Date Sampled	21-Sep-04	15-Jun-05	29-Jul-05	29-Jul-05		26-Jul-05	Sept-28-04	15-Jul-05	27-Jul-05	23-Sep-04	15-Jun-05	27-Jul-05	23-Sep-04	15-Jun-05	27-Jul-05	21-Sep-04	15-Jun-05	28-Jul-05	Sep-28-05	15-Jun-05	28-Jul-05	**Limit**	**Upper Limit**	
Physical Tests *(ALS)*																						**AO**	**MAC**	**AO**
Colour (CU)	<5.0	<5.0	-	<5.0		<5.0	5	<5.0	-	<5	<5.0	-	<5	<5.0	-	<5	<5.0	-	5	<5.0	-			15
Conductivity (uS/cm)		218	-	2.8		251		471	-		309	-		310	-		456	-		401	-			
Total Dissolved Solids	212	124	-	<10		164	259	291	-	171	189	-	164	188	-	265	296	-	214	227	-			500
Hardness CaCO3	198	102	-	<0.66		12.3	241	247	-	151	141	-	149	140	-	<0.9	<0.66	-	198	170	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.09	8.17	-	**6.10**		8.04	8.14	8.21	-	8.21	8.25	-	8.21	8.24	-	8.08	7.87	-	8.17	7.79	-	6.5		8.5
Turbidity (NTU)	0.3	0.4	-	0.64		0.70	**1.7**	0.86	0.5200	0.4	**2.28**	0.360	0.5	0.84	-	0.2	0.41	-	**2.3**	**2.57**	**2.69**		1	5
UV Absorbance			<0.0050	-		0.0080			0.0230			0.0050			0.0080			-			0.0210			
% UV Transmittance			99.3	-		98.2			94.8			98.9			98.2			-			95.3			
Dissolved Anions *(ALS)*																								
Alkalinity-Total CaCO3	163	89.7	-	1.9		108	217	222	-	128	138	-	119	131	-	164	174	-	179	196	-			
Chloride Cl	5.7	8.59	-	<0.50		1.21	10.4	10.9	-	1.1	0.83	-	<0.5	1.08	-	2.4	2.24	-	7.8	9.14	-			250
Fluoride F	<0.05	0.028	-	<0.020		0.217	0.05	0.055	-	<0.05	0.057	-	<0.05	0.06	-	0.05	0.076	-	<0.05	0.061	-		1.5	
Silicate SiO4			-	-		-			-			-			-			-			-			
Sulphate SO4	30.4	10.4	-	<0.50		15.3	24	24.6	-	32.6	35.2	-	32.6	35.3	-	24.6	26.0	-	21.5	21.3	-			500
Nitrate Nitrogen N	0.5	<0.10	-	<0.10		<0.10	0.2	0.15	-	0.2	0.22	-	0.2	0.22	-	0.5	0.8	-	0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-	<0.10		<0.10	0.05	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-	-		-			-			-			-			-			-			
Total Phosphate PO4			-	-		-			-			-			-			-			-			
Total Metals *(ALS)*																								
Aluminum T-Al	<0.005	<0.010	-	<0.010		<0.010	0.005	<0.010	-	<0.005	<0.010	-	<0.005	<0.010	-	<0.005	<0.010	-	<0.005	<0.010	-		0.1	
Antimony T-Sb	<0.0002	<0.00050	-	<0.00050		<0.00050		<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0005	0.0006	-	<0.00010		*0.0203*	0.0014	0.00108	-	0.0012	0.00093	-	0.0011	0.00095	-	0.0004	0.00028	-	0.001	0.00097	-		0.025	
Barium T-Ba	0.039	0.066	-	<0.020		0.024	0.049	0.046	-	0.017	<0.020	-	0.017	<0.020	-	0.001	<0.020	-	0.041	0.038	-		1	
Boron T-B	0.023	<0.10	-	<0.10		0.12	0.025	<0.10	-	0.027	<0.10	-	0.026	<0.10	-	0.005	<0.10	-	0.019	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-	<0.00020		<0.00020	0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		30.3	-	<0.10		3.92		79.0	-		45.2	-		44.9	-		<0.10	-		52.2	-			
Chromium T-Cr	0.001	<0.0020	-	<0.0020		<0.0020	0.0008	<0.0020	-	0.0006	<0.0020	-	0.0007	<0.0020	-	<0.0005	<0.0020	-	0.0006	<0.0020	-		0.05	
Copper T-Cu	0.032	0.0484	-	0.107		0.0098	0.792	0.661	-	0.053	0.0494	-	0.153	0.139	-	0.016	0.0265	-	0.804	0.748	-		1	
Iron T-Fe	0.01	<0.030	-	<0.030		<0.030	0.13	0.079	-	0.03	<0.030	-	0.03	<0.030	-	<0.01	<0.030	-	0.16	0.142	-			0.3
Lead T-Pb	0.0004	0.0011	-	0.0011		<0.0010	0.0015	0.0039	-	<0.0001	<0.0010	-	<0.0001	<0.0010	-	<0.0001	<0.0010	-	0.0037	0.0065	-		0.01	
Magnesium T-Mg		6.38	-	<0.10		0.61		12.2	-		6.86	-		6.8	-		<0.10	-		9.54	-			
Manganese T-Mn	<0.005	<0.0020	-	<0.0020		<0.0020	**0.05**	0.0437	-	<0.005	<0.0020	-	<0.005	<0.0020	-	<0.005	<0.0020	-	0.008	0.003	-			0.05
Mercury T-Hg		<0.00020	-	<0.00020		<0.00020		<0.00020	-		<0.00020	-		<0.00020	-		<0.00020	-		<0.00020	-		0.001	
Potassium T-K		2.66	-	0.45		0.39		1.76	-		1.24	-		1.25	-		154	-		1.54	-			
Selenium T-Se		0.0017	-	<0.0010		<0.0010		<0.0010	-		<0.0010	-		<0.0010	-		<0.0010	-		<0.0010	-		0.01	
Sodium T-Na		<2.0	-	<2.0		57.3	3.7	3.0	-		2.8	-		2.7	-		<2.0	-		2.7	-			200
Uranium T-U	<0.0005	0.00075	-	<0.00010		<0.00010	0.0005	0.00032	-	<0.0005	0.00035	-	<0.0005	0.00035	-	<0.0005	<0.00010	-	<0.0005	0.00021	-		0.02	
Vanadium T-V			-	-		-			-			-			-			-			-			
Zinc T-Zn	0.175	0.057	-	<0.050		<0.050	0.657	0.881	-	0.021	<0.050	-	0.003	<0.050	-	0.003	<0.050	-	0.192	0.153	-			5
Dissolved Metals																								
Aluminum D-Al			-	-		-			-			-			-			-			-			
Antimony D-Sb			-	-		-			-			-			-			-			-			
Arsenic D-As			-	-		-			-			-			-			-			-			
Barium D-Ba			-	-		-			-			-			-			-			-			
Boron D-B			-	-		-			-			-			-			-			-			
Cadmium D-Cd			-	-		-			-			-			-			-			-			
Calcium D-Ca			-	-		-			-			-			-			-			-			
Chromium D-Cr			-	-		-			-			-			-			-			-			
Copper D-Cu			-	-		-			-			-			-			-			-			
Iron D-Fe			-	-		-			-			-			-			-			-			
Lead D-Pb			-	-		-			-			-			-			-			-			
Magnesium D-Mg			-	-		-			-			-			-			-			-			
Manganese D-Mn			-	-		-			-			-			-			-			-			
Mercury D-Hg			-	-		-			-			-			-			-			-			
Potasium D-K			-	-		-			-			-			-			-			-			
Selenium D-Se			-	-		-			-			-			-			-			-			
Sodium D-Na			-	-		-			-			-			-			-			-			
Uranium D-U			-	-		-			-			-			-			-			-			
Vanadium D-V			-	-		-			-			-			-			-			-			
Zinc D-Zn			-	-		-			-			-			-			-			-			
Trihalomethanes																								
Bromodichloromethane			-	-		-			-			-			-			<0.0010			-			
Bromoform			-	-		-			-			-			-			<0.0010			-			
Chloroform			-	-		-			-			-			-			<0.0010			-			
Dibromochloromethane			-	-		-			-			-			-			<0.0010			-			
Total Trihalomethanes			-	-		-			-			-			-			<0.0040			-			
Organic Parameters																								
Tannin and Lignin			<0.10	-		<0.10			0.10			<0.10			<0.10			-			0.20			
Total Organic Carbon C			0.81	-		0.78			1.42			1.03			0.72			0.84			0.98			
Haloacetic Acids																								
Bromoacetic Acid			-	-		-			-			-			-			<0.0020			-			
Bromochloroacetic Acid			-	-		-			-			-			-			<0.0020			-			
Chloroacetic Acid			-	-		-			-			-			-			<0.020			-			
Dibromoacetic Acid			-	-		-			-			-			-			<0.0020			-			
Dichloroacetic Acid			-	-		-			-			-			-			<0.0020			-			
Trichloroacetic Acid (TCA)			-	-		-			-			-			-			<0.0020			-			
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			-		0.00001	
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	-		-			-			-			-			<0.30			<0.30			
EPH19-32			<1.0	-		-			-			-			-			<1.0			<1.0			
LEPH			-	-		-			-			-			-			<0.30			-			
HEPH			-	-		-			-			-			-			<1.0			-			
Field Chemistry (EBA)																								
pH			**8.59**	7.86		**8.66**			7.99			8.34			8.31			8.12			8.04	6.5		8.5
TDS (ppm)			83	<1		127			174			51			149			230			200			500
EC (uS/cm)			175	<1		253			291			104			308			460			400			
Temperature (°C)			7.3	16.4		21.4			10.9			7.8			9.6			6.0			16.4			
Free Available Chlorine						0.01												0.07						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

- = not tested

Table 2: Water Quality Results

SOURCE:	Building 3121- Beaver Creek Visitor Reception Centre			Building 3122 - Beaver Creek Swimming Pool		Building 3123 - Beaver Creek Grader Station			Building 3125 - Beaver Creek Air Terminal Building			Building 3964 - Beaver Creek Health Centre			Building 3201 - Burwash Landing Airport Building			Building 3204 - Burwash Landing Fire Hall			GCDWQ Criteria		
Location/ Resident	Beaver Creek			Beaver Creek		Beaver Creek			Beaver Creek			Beaver Creek			Burwash Landing			Burwash Landing					
Address																							
Treatment	None			None		Filtration			None			None			None			None					
Disinfection	None			None		None			None			None			None			None					
Source of Water	On-site well			On-site well		On-site well			On-site well			On-site well			On-site well			On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical			
Sample Location			Washroom tap		Pool changing room tap			Kitchen tap			Washroom tap			Washroom tap			Kitchen tap			Washroom tap			
Date Sampled	21-Sep-04	15-Jun-05	27-Jul-05	15-Jun-05	27-Jul-05	21-Sep-04	15-Jun-05	27-Jul-05	21-Sep-04	15-Jun-05	27-Jul-05	21-Sep-04	15-Jun-05	27-Jul-05	21-Sep-04	15-Jun-05	28-Jul-05	21-Sep-04	15-Jun-05	28-Jul-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*																					**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-	<5.0	-	<5.0	<5.0	-	7	<5.0	-	<5	<5.0	-	<5	<5.0	-	10	<5.0	-			15
Conductivity (uS/cm)		709	-	404	-		363	-		290	-		515	-		622	-		365	-			
Total Dissolved Solids	351	427	-	231	-	109	222	-	156	171	-	259	316	-	370	402	-	206	218	-			500
Hardness CaCO3	335	346	-	194	-	97.3	152	-	137	126	-	234	255	-	334	329	-	115	117	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.05	8.09	-	8.13	-	8.24	8.17	-	8.29	8.16	-	8.06	8.13	-	7.95	8.20	-	8.38	8.26	-	6.5		8.5
Turbidity (NTU)	0.5	0.42	-	0.26	0.72	0.3	0.36	-	**4.1**	**3.29**	**11.7**	**1.6**	0.74	-	0.40	0.64	-	**9.8**	**11.1**	**4.01**		1	5
UV Absorbance			0.0180		0.0110			0.007			0.0060			0.0130			0.119			0.0700			
% UV Transmittance			95.9		97.5			98.4			98.6			97.0			76.0			85.1			
Dissolved Anions *(ALS)*																							
Alkalinity-Total CaCO3	286	297	-	183	-	91	155	-	120	118	-	191	218	-	243	247	-	148	165	-			
Chloride Cl	23.7	32.7	29.5	2.68	-	5.7	3.08	-	<0.5	0.62	-	17.4	16.2	-	6.6	4.23	4.36	1.2	1.15	-			250
Fluoride F	<0.05	0.036	-	0.052	-	<0.05	0.057	-	<0.05	0.059	-	<0.05	0.048	-	0.18	0.238	-	0.18	0.257	-		1.5	
Silicate SiO4			-		-			-			-			-			-			-			500
Sulphate SO4	26.0	28.6	-	33.0	-	9.73	34.0	-	28.9	32.6	-	32.4	37.1	-	89.8	99.3	-	42.2	39.0	-			
Nitrate Nitrogen N	2.9	4.95	5.17	0.71	-	<0.1	0.60	-	0.2	0.22	-	0.6	0.61	-	1.7	1.44	1.59	0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	<0.0010	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	-	<0.05	<0.10	<0.0010	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			<0.020		-			-			-			-			0.020			-			
Total Phosphate PO4			-		-			-			-			-			-			-			
Total Metals *(ALS)*																							
Aluminum T-Al	<0.005	<0.010	-	<0.010	-	<0.005	<0.010	-	<0.005	<0.010	-	<0.005	<0.010	-	0.006	<0.010	-	0.047	0.017	-			
Antimony T-Sb	<0.0002	<0.00050	-	<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	-	0.0003	<0.00050	-	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0008	0.00069	-	0.00048	-	0.0007	0.00036	-	0.0006	0.00041	-	0.0003	0.00026	-	0.0006	0.00037	-	*0.0055*	0.00432	-		0.025	
Barium T-Ba	0.123	0.120	-	0.041	-	0.067	0.033	-	0.011	<0.020	-	0.052	0.050	-	0.038	0.025	-	0.018	<0.020	-		1	
Boron T-B	0.029	<0.10	-	<0.10	-	0.009	<0.10	-	0.026	<0.10	-	0.027	<0.10	-	0.062	<0.10	-	0.504	0.41	-		5	
Cadmium T-Cd	0.00001	<0.00020	-	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		108	-	63.8	-		48.6	-		39.3	-		83.0	-		91.9	-		22.0	-			
Chromium T-Cr	0.002	<0.0020	-	<0.0020	-	<0.0005	<0.0020	-	0.0005	<0.0020	-	0.0011	<0.0020	-	0.0008	<0.0020	-	0.0006	<0.0020	-		0.05	
Copper T-Cu	0.012	0.0094	-	0.432	-	0.011	0.0295	-	0.059	0.102	-	0.140	0.0678	-	**1.12**	0.793	0.645	0.017	0.0034	-		1	
Iron T-Fe	0.04	<0.030	-	<0.030	-	0.03	<0.030	-	0.27	0.209	-	0.15	0.052	-	0.02	0.059	-	**0.45**	0.154	-			0.3
Lead T-Pb	0.0006	<0.0010	-	0.0014	-	0.0004	<0.0010	-	0.0014	0.0010	-	0.0013	0.0040	-	0.0004	0.0012	-	0.001	<0.0010	-		0.01	
Magnesium T-Mg		18.6	-	8.50	-		7.42	-		6.67	-		11.6	-		24.2	-		15.0	-			
Manganese T-Mn	<0.005	<0.0020	-	<0.0020	-	<0.005	<0.0020	-	0.014	0.0090	-	0.008	0.0096	-	<0.005	<0.0020	-	**0.059**	0.0467	-			0.05
Mercury T-Hg		<0.00020	-	<0.00020	-		<0.00020	-		<0.00020	-		<0.00020	-		<0.00020	-		<0.00020	-		0.001	
Potassium T-K		2.43	-	1.17	-		1.05	-		1.08	-		1.45	-		4.42	-		2.79	-			
Selenium T-Se		<0.0010	-	<0.0010	-		<0.0010	-		<0.0010	-		<0.0010	-		0.0011	-		0.0014	-		0.01	
Sodium T-Na	4.7	4.5	-	3.7	-	1.5	2.9	-	3.0	2.5	-		5.0	-	5.9	5.3	-	34.4	37.2	-			200
Uranium T-U	<0.0005	0.00053	-	0.00035	-	<0.0005	0.00030	-	<0.0005	0.00030	-	<0.0005	0.00037	-	0.0024	0.00220	-	<0.0005	0.00015	-		0.02	
Vanadium T-V			-		-			-			-			-			-			-			
Zinc T-Zn	0.084	0.056	-	<0.050	-	0.058	0.140	-	1.47	1.02	-	0.485	0.176	-	0.012	<0.050	-	0.011	<0.050	-			5
Dissolved Metals																							
Aluminum D-Al			-		-			-			-			-			-			-			
Antimony D-Sb			-		-			-			-			-			-			-			
Arsenic D-As			-		-			-			-			-			-			-			
Barium D-Ba			-		-			-			-			-			-			-			
Boron D-B			-		-			-			-			-			-			-			
Cadmium D-Cd			-		-			-			-			-			-			-			
Calcium D-Ca			-		-			-			-			-			-			-			
Chromium D-Cr			-		-			-			-			-			-			-			
Copper D-Cu			-		-			-			-			-			0.647			-			
Iron D-Fe			-		-			-			-			-			-			-			
Lead D-Pb			-		-			-			-			-			-			-			
Magnesium D-Mg			-		-			-			-			-			-			-			
Manganese D-Mn			-		-			-			-			-			-			-			
Mercury D-Hg			-		-			-			-			-			-			-			
Potasium D-K			-		-			-			-			-			-			-			
Selenium D-Se			-		-			-			-			-			-			-			
Sodium D-Na			-		-			-			-			-			-			-			
Uranium D-U			-		-			-			-			-			-			-			
Vanadium D-V			-		-			-			-			-			-			-			
Zinc D-Zn			-		-			-			-			-			-			-			
Trihalomethanes																							
Bromodichloromethane			-		-			-			-			-			-			-			
Bromoform			-		-			-			-			-			-			-			
Chloroform			-		-			-			-			-			-			-			
Dibromochloromethane			-		-			-			-			-			-			-			
Total Trihalomethanes			-		-			-			-			-			-			-			
Organic Parameters																							
Tannin and Lignin			0.11		0.21			0.14			<0.10			0.10			0.13			0.31			
Total Organic Carbon C			1.54		1.17			0.89			0.90			1.41			7.14			11.6			
Haloacetic Acids																							
Bromoacetic Acid			-		-			-			-			-			-			-			
Bromochloroacetic Acid			-		-			-			-			-			-			-			
Chloroacetic Acid			-		-			-			-			-			-			-			
Dibromoacetic Acid			-		-			-			-			-			-			-			
Dichloroacetic Acid			-		-			-			-			-			-			-			
Trichloroacetic Acid (TCA)			-		-			-			-			-			-			-			
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			-			-			-			-		0.00001	
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			<0.30			-			<0.30			-			
EPH19-32			-		-			<1.0			<1.0			-			<1.0			-			
LEPH			-		-			<0.30			-			-			-			-			
HEPH			-		-			<1.0			-			-			-			-			
Field Chemistry (EBA)																							
pH			7.82		8.05			8.01			8.31			7.68			7.95			Undetectable due to turbulence	6.5		8.5
TDS (ppm)			352		203			186			127			297			284						500
EC (uS/cm)			700		403			370			251			593			575						
Temperature (°C)			7.8		6.9			13.9			17.5			14.7			4.8						
Free Available Chlorine																							

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

- = not tested

Table 2: Water Quality Results

SOURCE:	Building 3171 - Kluane Lake School			Building 3172 - Destruction Bay Fire Hall			Building 3186 - Destruction Bay Grader Station			Building 3957 - Destruction Bay Health Centre			GCDWQ Criteria		
Location/ Resident	Destruction Bay			Destruction Bay			Destruction Bay			Destruction Bay					
Address															
Treatment				None			None			Water softener, pH neutralizer and colour remover					
Disinfection	Chlorination (no residual)			None			None			None					
Source of Water	On-site well			On-site well			On-site well			On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical	Base Line	Base Line	Additional Analytical			
Sample Location			Arts room sink												
Date Sampled	21-Sep-05	Jun-15-05	28-Jul-05	19-Oct-05	16-Jun-05	28-Jul-05	19-Oct-05	Jun-15-05	28-Jul-05	21-Sep-05	Jun-15-05	28-Jul-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*													**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-	**>60**	<5	<5.0	**>60**	6.0	5.8	<5	<5.0	-			15
Conductivity (uS/cm)		830	-		672	-		749	-		810	-			
Total Dissolved Solids	**680**	**528**	-	389	413	-	452	492	-	490	**525**	-			500
Hardness CaCO3	1.8	446	-	308	312	-	399	350	403	<0.9	<3.3	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.36	8.33	-	8.42	8.43	-	8.20	8.36	-	**8.79**	**8.68**	-	6.5		8.5
Turbidity (NTU)	0.3	**1.08**	0.41	**53.5**	**11.0**	**3.04**	**21.1**	**12.7**	**23.0**	0.6	0.45	-		1	5
UV Absorbance			-			0.077			0.08			0.0080			
% UV Transmittance			-			83.8			82.8			98.2			
Dissolved Anions *(ALS)*															
Alkalinity-Total CaCO3	292	295	-	245	231	-	291	247	-	121	122	-			
Chloride Cl	1.3	1.06	-	6.1	1.04	-	0.9	0.79	-	8.9	7.68	-			250
Fluoride F	0.18	0.269	-	0.31	0.327	-	0.25	0.276	-	0.14	0.208	-		1.5	
Silicate SiO4			-			-			15.7			14.4			
Sulphate SO4	165	184	-	109	150	-	127	181	-	169	190	-			500
Nitrate Nitrogen N	<0.1	<0.10	-	<0.01	<0.10	-	0.07	<0.10	-	<0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-	<0.005	<0.10	-	<0.005	0.31	-	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			-			-			-			
Total Phosphate PO4			-			-			0.109			0.0238			
Total Metals *(ALS)*															
Aluminum T-Al	0.034	<0.010	-	<0.005	<0.010	-	0.008	0.023	0.305	<0.005	<0.050	-			
Antimony T-Sb	<0.0002	<0.00050	-	<0.0002	<0.00050	-	<0.0002	<0.00050	<0.00050	<0.0002	<0.0025	-		0.006	
Arsenic T-As	0.0043	0.00373	-	0.0007	0.00081	-	**0.0329**	*0.0184*	**0.0353**	*0.0148*	*0.0114*	*0.0120*		0.025	
Barium T-Ba	0.002	0.021	-	0.022	<0.020	-	0.306	0.206	0.307	<0.001	<0.10	-		1	
Boron T-B	1.27	1.04	-	1.48	1.14	-	1.14	0.99	1.22	1.31	1.28	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-	<0.00001	<0.00020	-	<0.00001	<0.00020	<0.00020	<0.00001	<0.0010	-		0.005	
Calcium T-Ca		67.4	-		38.5	-		47.5	56.6		<0.50	-			
Chromium T-Cr	0.0008	<0.0020	-	0.0017	<0.0020	-	<0.001	<0.0020	<0.0020	<0.0005	<0.010	-		0.05	
Copper T-Cu	0.002	<0.0010	-	<0.001	<0.0010	-	0.0003	0.0192	0.0069	0.006	0.190	-		1	
Iron T-Fe	<0.01	0.190	-	0.09	0.291	-	**2.94**	**1.34**	**2.20**	0.04	0.207	-			0.3
Lead T-Pb	0.0002	<0.0010	-	0.0007	<0.0010	-	0.0003	<0.0010	<0.0010	0.001	0.0064	-		0.01	
Magnesium T-Mg		67.5	-		52.4	-		56.2	66.1		<0.50	-			
Manganese T-Mn	<0.005	**0.0974**	<0.0050	0.029	0.0479	-	**0.165**	**0.137**	**0.238**	<0.005	<0.010	-			0.05
Mercury T-Hg		<0.00020	-		<0.00020	-		<0.00020	<0.00020		<0.00020	-		0.001	
Potassium T-K		5.82	-		5.37	-		4.02	4.49		222	-			
Selenium T-Se		<0.0010	-		0.0026	-		<0.0010	<0.0010		<0.0050	-		0.01	
Sodium T-Na	19.1	27.2	-	31.3	30.9	-	20.9	22.2	24.7	4.8	22.9	-			200
Uranium T-U	<0.0005	0.00131	-	0.0008	0.00072	-	<0.0005	<0.00010	<0.00010	<0.0005	<0.00050	-		0.02	
Vanadium T-V			-			-			0.033			<0.030			
Zinc T-Zn	0.010	<0.050	-	0.008	<0.050	-	0.019	<0.050	<0.050	0.007	<0.25	-			5
Dissolved Metals *(ALS)*															
Aluminum D-Al			-			-			<0.010			-		0.1	
Antimony D-Sb			-			-			<0.00050			-		0.006	
Arsenic D-As			-			-			*0.0217*			*0.0119*		0.025	
Barium D-Ba			-			-			0.290			-		1.0	
Boron D-B			-			-			1.22			-		5	
Cadmium D-Cd			-			-			<0.00020			-		0.005	
Calcium D-Ca			-			-			54.2			-			
Chromium D-Cr			-			-			<0.0020			-		0.05	
Copper D-Cu			-			-			0.0022			-			1.0
Iron D-Fe			-			-			0.033			-			0.3
Lead D-Pb			-			-			<0.0010			-		0.01	
Magnesium D-Mg			-			-			64.9			-			
Manganese D-Mn			<0.0050			-			0.201			-			0.05
Mercury D-Hg			-			-			<0.00020			-		0.001	
Potasium D-K			-			-			4.67			-			
Selenium D-Se			-			-			<0.0010			-		0.01	
Sodium D-Na			-			-			24.5			-			200
Uranium D-U			-			-			<0.00010			-		0.02	
Vanadium D-V			-			-			<0.030			<0.030			
Zinc D-Zn			-			-			<0.050			-			5.0
Trihalomethanes															
Bromodichloromethane			-			-			-			-			
Bromoform			-			-			-			-			
Chloroform			-			-			-			-			
Dibromochloromethane			-			-			-			-			
Total Trihalomethanes			-			-			-			-		0.1	
Organic Parameters															
Tannin and Lignin			-			0.23			0.46			<0.10			
Total Organic Carbon C			2.15			7.02			3.64			0.52			
Haloacetic Acids															
Bromoacetic Acid			-			-			-			-			
Bromochloroacetic Acid			-			-			-			-			
Chloroacetic Acid			-			-			-			-			
Dibromoacetic Acid			-			-			-			-			
Dichloroacetic Acid			-			-			-			-			
Trichloroacetic Acid (TCA)			-			-			-			-			
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			-		0.00001	
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			8.48			**8.60**			8.39			**9.11**	6.5		8.5
TDS (ppm)			**575**			203			376			414			500
EC (uS/cm)			1158			620			748			836			
Temperature (^{0}C)			8.7			13.9			9.3			21.7			
Free Available Chlorine			0.00												

Notes:

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

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Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (^{0}C) and Turbidity (NTU)

< = Less than the detection limit indicated.

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MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

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

June-05

Well Identification			GPS Coordinates			Well Details								Potential Contaminant Sources						Well Construction Details					
Building #	Building Name	Location	Northing (+/- 10 m)	Easting (+/- 10 m)	Grade Elevation (+/- 10 m)	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)	Distance from well to nearest point of septic field (m)	Distance from well to nearest building (m)	Distance to surface water body (m)	AST present on property?	Distance from well to AST (m)	Other potential sources of contamination observed on property, and distance to well.	Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading	Comments
3440	Blanchard Grader Station	Haines Road	6653029	396549	837	200	Unknown	No	N/A	Unknown	Unknown	N/A	N/A	Lines within 30, Greater than 60 to field	Inside building	60 m to Blanchard River	AST 1	21	Fueling area (21 m), Tar/ Emulsion AST (31 m), Bulk tank with secondary containment (36 m), Drum Storage (32 m)	0.25	Yes	Unknown	Unlikely	No- but site is well drained	
																	AST 2	24							
3443	Haines Junction Initial Attack Base	Haines Junction	6740373	359760	608	No well, system is on water delivery								28.0	9	Greater than 60 m	AST 1	10		N/A	N/A	N/A	N/A	N/A	This system is on water delivery and uses a large fiberglass water storage tank located outside and underground.
																	Fuel Drums	50							
																	Chemical Storage	35							
M0131	Beaver Creek RCMP Detachment	Beaver Creek	6916890	506480	667	150	1979	Yes	30.5	clay 11.3 - 27.7	Unknown	15 USgpm (drillers log)	N/A	Unknown	20	Greater than 60 m	AST 1	34	Pump island (60 m), Alaska Highway (38 m)	2.70 below grade	Likely- could not be seen	Yes (29.3 - 30.5)	No	No- low point on property, well subject to flooding	
																	AST 2	34							
																	AST 3	48							
M0133	Beaver Creek RCMP Residence	Beaver Creek	6917199	506150	667	150	1992	Yes	37.4	Variable silt and till	35.9	40 USgpm (drillers log)	12.09	20 tank, 40 field	Located within building enclosure	Greater than 60 m	AST	2		1.65 below grade	Yes- split gasket cap	Yes (37 - 37.4)	No	No	
M0134	Beaver Creek RCMP Residence	Beaver Creek	6917131	506146	668	150	Unknown	No	Unknown	Variable silt and till (reported from neighboring well)	Unknown	N/A	N/A	28 tank, 34 field	3	Greater than 60 m	AST	3		1.05 below grade	Yes- split gasket cap	Unknown	Unlikely	No	
3100	Nelnah Bessie John School	Beaver Creek	6916849	506143	687	150	1990	No	21.6	Unknown	Unknown	N/A	11.000	Unknown	2	Greater than 60 m	UST	1	Abandoned well on property with no well cap.	1.15 below grade	Yes	Unknown	Unlikely	No	
3102	Beaver Creek Fire Hall	Beaver Creek	6916938	506369	668	150	Unknown	No	34.03	Unknown	Unknown	N/A	13.060	16 (Septic Tank/ Leach Pit)	Inside building	Greater than 60 m	AST	3.5	Outhouse (34 m)	0.04	No	Unknown	Unlikely	No	
3121	Beaver Creek Visitor Reception Centre	Beaver Creek	6916712	506373	N/A	150	Unknown	No	Unknown	Unknown	Unknown	N/A	N/A	33	6	Greater than 60 m	AST	19	Alaska Highway (19 m), Well located in parking area	0.45 below grade	Yes- split gasket cap	Unknown	Unlikely	No	
3122	Beaver Creek Swimming Pool	Beaver Creek	6916774	506150	670	150	1979	Yes	19.2	Till 2.4 - 5.5 m	Unknown	20 USgpm (drillers log)	N/A	22	Located within building enclosure	Greater than 60 m	AST	20		1.4 below grade	N/A	Yes (18 - 19 m)	No	No	
3123	Beaver Creek Grader Station	Beaver Creek	6916580	506318	674	150	1983	Yes	32.8	some clay and silt indicated from 11.6 - 29.6	Unknown	30 USgpm (drillers log)	N/A	22 to former septic, 34 to current septic	14	Greater than 60 m	UST	22	Asphalt mix pile (7.5 m), rock pit (34 m), Creosote, Heating Oil AST's (60 m), assorted scrap metal and parts around the site	0.1	Yes	Yes	No	No- evidence of former flooding within well pit	
																	AST	7							
3125	Beaver Creek Air Terminal Building	Beaver Creek	6919562	507085	654	150	Unknown	No	Unknown	Unknown	Unknown	N/A	N/A	5 to septic tank, lines within 30, 54 to field	2	Greater than 60 m	AST	5	Oil drums (30 m), vehicle parking (10 m), aircraft parking (5 m), jet fuel storage (30 m)	1.15 below grade	Yes- solid plate	Unknown	Unlikely	No- evidence of flooding within well pit	
3964	Beaver Creek Health Centre	Beaver Creek	6916660	506315	N/A	150	Unknown	No	Unknown	Unknown	Unknown	N/A	N/A	20 to septic tank 42 to field	3	Greater than 60 m	AST	20	Fuel,oil and paint drums (20 m), asphalt pile (40 m)	1.35	Yes	Unknown	Unlikely	No- but site is well drained	
3201	Burwash Landing Airport Building	Burwash Landing	6805564	605217	802	150	Unknown	No	10.51	Unknown	Unknown	N/A	8.55	23 (tank) 40 (field)	1	Greater than 60m to Kluane Lake	AST 1	8	abandoned well at 1 m fuel storage area within 30m	at grade	No	N/A	Unlikely	No- evidence of flooding in well enclosure	
3204	Burwash Landing Fire Hall	Burwash Landing	6804037	307068	808	150	Unknown	No	39.15 (may be pump)	Unknown	39.2	N/A	6.1 m below grade	15	Located within building add-on	42 m to creek Greater than 60m to Kluane Lake	AST 1	4		No, 1.05 m below grade	Solid plastic plate	N/A	Unlikely	No- but site is well drained	
3171	Kluane Lake School	Destruction Bay	6792831	617972	798	150	1989	Yes	31.7	Yes- silt/ till to 30.1 m	Unknown	25 USgpm (drillers log)	6.4 (at time of drilling)	60 to field lines at 10 and 30	5	42 to creek	AST 1	26	Scrap cars (30 m)	0.65 m below grade	?	Yes (30.7 -31.7 m)	No	No- but site is well drained	
																	UST 1	9							
3172	Destruction Bay Fire Hall	Destruction Bay	6792050	617956	N/A	150	1989	Yes	31.4	Yes- clay/ till to 29.9 m	Unknown	30 USgpm (drillers log)	7.6 (at time of drilling)	Lines within 30	5	Greater than 60 m	AST 1	2	Scrap cars (20 m)	0.70 m below grade	Yes- split gasket cap	Yes	No	No	
																	AST 2	39							
																	UST 1	18							
3186	Destruction Bay Grader Station	Destruction Bay	6792596	617886	802	100	Unknown	No	N/A	Unknown	Unknown	N/A	3.07 (adjacent abandoned well)	20 to tank, 32 to field	Inside building	Greater than 60 m	AST 1 (Waste Oil Tank)	18	Antifreeze drums (10 m), creosote/ tar AST's (50 m), leach pit (22 m), abandoned well (2 m).	0.15	Yes- solid plate, doubled holed	N/A	Unlikely	N/A	There is a sign in the bathroom stating "Contaminated water, do not drink."
3957	Destruction Bay Health Centre	Destruction Bay	6792941	617983	798	150	1993	Yes	68.9	Clay/ Silt (46.9 - 60.3)	Unknown	Artesian well	Flowing	60	Inside Pumphouse	Greater than 60 m	AST 1	20	Abandoned well located on property	0.35 below grade	Split cap gasket-modified for artesian well	No	No	No	
																	AST 2	26							
YTG - Small Public Drinking Water Systems							-	-	N/A	-	-	-	-	> 30 m from any part of a sewage disposal system	-	-	-	>30 from any potential sources of pollution	>30 from any potential sources of pollution >120 m from solid waste site, dump, or cemetery >300 m from sewage lagoon or pit	-	-	-	-		eba

TABLE 4: SUMMARY OF OBSERVED DEFICIENCIES AND ESTIMATE COSTS
SMALL PUBLIC DRINKING WATER SYSTEMS

Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
3440	Blanchard Grader Station	No treatment or disinfection for the maintenance garage. No well log. Fueling area 21 m upgradient.	Re-plumb treated water to serve potable water in maintenance garage.	Obtain well log and confirm purpose of monitoring wells	$250	$50	$50	$350	Move fueling area downgradient from well.		$600	$120	$120	$840	Wellhead not 500 mm above grade.	Extend wellhead 500 mm above grade. Raise floor to grade.	$400	$80	$80	$560	$1,750
3443	Haines Junction Initial Attack Base	Tank and manhole not properly sealed and susceptible to deleterious substances entering tank when overfilled. FAC low at both systems.	Option 1: Install smaller water delivery tank in building, and abandon existing tank.	Monitor FAC concentrations	$2,000	$400	$400	$2,800	Option 1: Ensure FAC is 0.4mg/L at time of delivery. Initiate testing program at both buildings.		$0	$0	$0	$0	Fill pipe and vent at warehouse ABS piping. Arsenic in exceedence of PMAC.	Replace ABS piping with PVC.	$200	$40	$40	$280	$3,080
			Option 2: Properly seal manhole to tank. Steam tank to remove aromatics.		$1,500	$300	$300	$2,100	Option 2: In the event that FAC concentrations cannot be maintained above 0.2 mg/L, a UV disinfection system should be installed.		$2,200	$440	$440	$3,080							$5,460
M0131	Beaver Creek RCMP Detachment	Poor wellhead completion. No surface seal. Location of septic system unknown. Purpose of monitoring wells unknown. Galvanized pressure tanks. No treatment or disinfection.	Standard wellhead upgrades. Install NSF 55 UV disinfection. Pretreatment likely required.	Determine location of septic system and purpose of monitoring wells	$9,500	$1,900	$1,900	$13,300	Install filtration to 1 micron absolute		$500	$100	$100	$700	Elevated copper. Galvanized pressure tanks. Turbidity previously high.	Monitor copper concentration. Replace galvanized pressure tanks with bladder pressure tank.	$2,000	$400	$400	$2,800	$16,800
M0133	Beaver Creek RCMP Residence	Poor wellhead completion. No surface seal. Located 1 m from an uncapped well. No functioning treatment or disinfection.	Install UV disinfection. Decommission abandoned well.	None	$3,200	$640	$640	$4,480	Standard wellhead upgrades. Install filtration to 1 micron absolute.		$4,500	$900	$900	$6,300	Softener and filter malfunctioning. Indoor fuel storage tank near well. Previous exceedence of turbidity. Plumbing reportedly unprofessional.	Install secondary containment around indoor AST. Repair softener and filter. Upgrade plumbing.	$1,200	$240	$240	$1,680	$12,460
M0134	Beaver Creek RCMP Residence	Poor wellhead construction. No surface seal. No well log. No functioning treatment or disinfection.	Install UV disinfection.	Obtain well log.	$2,200	$440	$440	$3,080	Standard wellhead upgrades. Install filtration to 1 micron absolute		$4,500	$900	$900	$6,300	Softener and filter malfunctioning. Softener drain not installed properly. Indoor AST near well.	Install secondary containment around indoor AST. Repair softener and filter. Upgrade plumbing.	$1,200	$240	$240	$1,680	$11,060
3100	Nelnah Bessie John School	Poor wellhead construction. No surface seal. No well log. UST 1m from well. Uncapped abandoned well 1m from well. Septic tank at 22 m, field may be within 30 m. Chlorination system not properly installed. Poor configuration of treatment system.	Decommission abandoned well. Upgrade chlorination system (Option 1), or replace with UV (Option 2).	Obtain well log. Confirm location of septic field.	$8,000	$1,600	$1,600	$11,200	Option 1: Standard wellhead upgrades. Remove UST and install AST at safe location relative to the water supply. This option contingent on location of septic field, and whether contamination exists around UST. This option could include either of the Priority 1 options presented for disinfection. Install filtration to 1 micron absolute.		$11,500	$2,300	$2,300	$16,100	Heat trace not properly installed.	Upgrade heat trace. Included with Priority 1.	$0	$0	$0	$0	$27,300
									Option 2a: Decommission existing well in install new dedicated well to serve School. This option could include either of the Priority 1 options presented for disinfection.		$32,200	$6,440	$6,440	$45,080		Mitigated by Priority 1 and 2 upgrades.	$0	$0	$0	$0	$45,080
					$3,500	$700	$700	$4,900	Option 2b: Decommission well, and install well to serve the School, Pool and Rec. centre. This option considers that cost for treatment is born by Rec Centre and Pool (required anyhow). UV system could be installed at another PMA site.		$28,000	$5,600	$5,600	$39,200		Mitigated by Priority 1 and 2 upgrades.	$0	$0	$0	$0	$41,600
3102	Beaver Creek Fire Hall	Poor wellhead completion. No well cap. No surface seal. No well log. Within 30 m of potential contaminant sources including AST and septic leach pit. Plumbing not to code and in disrepair. No treatment or disinfection.	Extend well casing and install well cap, re-plumb so that domestic water comes off system prior to tank, install backflow prevention, superchlorinate well and system, install treatment and UV (NSF/ANSI 55), no backflow prevention.	Attempt to locate well log. Tank should be cleaned through regular operation and maintenance. Chemicals and batteries stored on top of tank should be removed.	$3,700	$740	$740	$5,180	Option 1: New well to service building. Leave existing well plumbed into fire storage tanks only for back-up.		$30,000	$6,000	$6,000	$42,000	Elevated copper and lead (not above standards). Storage tank supports unlikely earthquake or collision proof.	Ongoing monitoring of copper and lead concentrations	Not included	$0	$0	$0	$47,180
									Option 2: Community Well (to tie in with Grader Stn, Health Centre and Firehall). Leave existing well plumbed into fire storage tanks only for back-up. Note: lower life cycle costs and easier operation and maintenance.		$25,000	$5,000	$5,000	$35,000							$40,180
3121	Beaver Creek Visitor Reception Centre	Poor wellhead completion. No surface sanitary seal. Poor location of well - in parking lot where may be subject to fuel and/or sewage spills from automobiles and recreational vehicles). Within 30 m of AST and septic field. No treatment or disinfection.	Improve plumbing in building (bring to code). Extend well casing as high as possible in well pit. Put localized (temporary) near surface sanitary seal around wellhead and crown away from casing (but leave gravel for drainage in most of base of well pit), Install filtration (1 micron absolute,) and UV disinfection (NSF/ANSI 55). Pretreatment (softener) likely required.	Attempt to obtain well log	$6,000	$1,200	$1,200	$8,400	Option 1: New well to service building		$30,000	$6,000	$6,000	$42,000	The pump control system is not up to standards and the pressure switch is located too far away from the pressure tank.	Upgrades included with Priority 2 upgrades	$0	$0	$0	$0	$50,400
									Option 2: Community Well (to tie in with Grader Stn, Health Centre and Firehall). Note: Lower life cycle costs and easier operation and maintenance.		$25,000	$5,000	$5,000	$35,000							$35,000
3122	Beaver Creek Swimming Pool	Poor wellhead completion, no sanitary seal, well is within 30 m of septic field, no treatment or disinfection.	Plumbing repairs. Extend well casing and install well cap as high as possible and install temporary well sanitary seal, superchlorinate well and system, install treatment to include filtration to 1 micron and chlorination system with appropriately sized retention tanks.	None	$9,400	$1,880	$1,880	$13,160	Option 1: Drill a new well to serve Rec centre and pool. It is not considered feasible to drill a new well on the pool property, so the well would have to located west of the Rec. centre.		$32,400	$6,480	$6,480	$45,360	Plumbing in disrepair (leaking and sweating). Pressure tanks require replacement.	Mitigated by Priority 1 and 2 upgrades	$0	$0	$0	$0	$58,520
									Option 2: Drill a new well to serve the Rec centre, pool and school.		$17,400	$3,480	$3,480	$24,360							$37,520

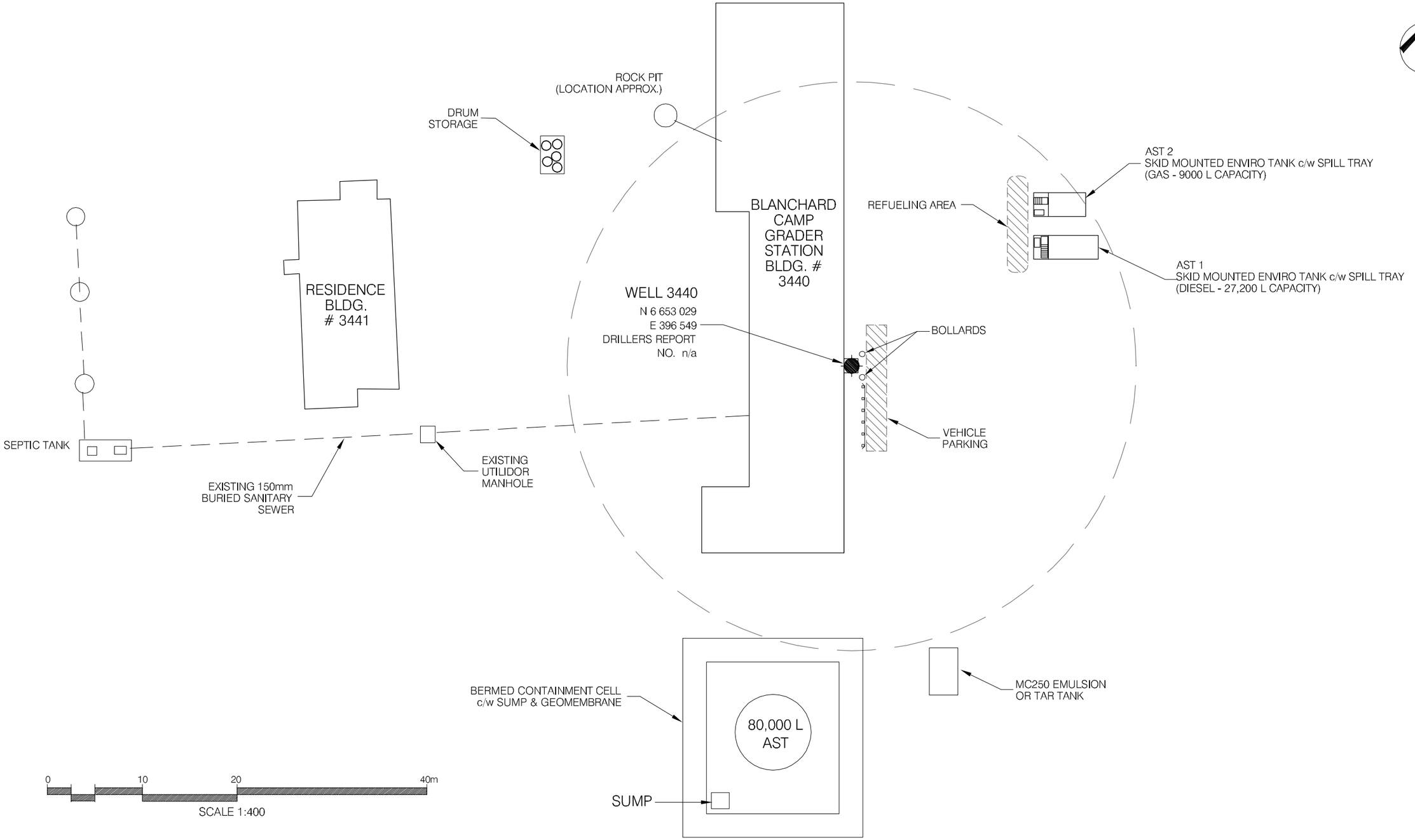
Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
3123	Beaver Creek Grader Station	Wellhead casing does not extend as far above grade as required, No sanitary seal. Well is within 30 m of used oil storage tank and cold mix pile, UST etc.. Reported potential breach of septic discharge of sump waste discharge line upgradient of well.	Install chlorination tap, superchlorinate well and water system, install filtration and UV disinfection system.	Confirm location of break in septic/ or rock pit line, and repair as necessary.	$3,400	$680	$680	$4,760	Option 1: Standard wellhead upgrades, plus relocate potential contaminant sources within 30 m (cold mix, AST, UST).		$20,000	$4,000	$4,000	$28,000	None identified		$0	$0	$0	$0	$32,760
									Option 2: Drill new well to serve building with proper construction and in good location with respect to potential contaminant sources.		$30,000	$6,000	$6,000	$42,000							$46,760
									Option 3: Connect to community well system to serve other YTG buildings in area (health centre, Visitor reception centre, Fire Hall).		$25,000	$5,000	$5,000	$35,000							$39,760
3125	Beaver Creek Airport Terminal Building	Poor surface completion of wellhead, no sanitary seal, located within 30 m of AST - vehicle parking, and septic tank, turbidity is elevated.	Install chlorination tap, superchlorinate well and water system, install filtration and UV disinfection system.	Attempt to locate log.	$3,400	$680	$680	$4,760	Option 1: Standard wellhead upgrades, well cleaning and redevelopment (to reduce turbidity), plus relocate septic tank and replace AST with Envirotank.	Camera investigation of well if cannot find well log. Confirm depth of well.	$23,000	$4,600	$4,600	$32,200			$0	$0	$0	$0	$36,960
									Option 2: Install new well to serve building. Use existing treatment system.		$30,000	$6,000	$6,000	$42,000			$0	$0	$0	$0	$42,000
3964	Beaver Creek Health Centre	Poor wellhead completion. No surface sanitary seal. Within 30m of AST and septic field. Elevated chloride (with respect to background concentration), No treatment or disinfection.	Extend well casing as high as possible in well pit. Put localized (temporary) near surface sanitary seal around wellhead and crown away from casing, Superchlorinate wellhead, Install filtration (1 micron absolute,) and UV disinfection (NSF/ANSI 55). Pretreatment (softener) likely required.	Attempt to locate well log. Confirm location of septic field.	$6,200	$1,240	$1,240	$8,680	Option 1: New well to service building		$30,000	$6,000	$6,000	$42,000	No pressure guage on the system, heat trace is not to code.	Install pressure guage. Consider completing at same time as Priority 1.	$100	$20	$20	$140	$50,820
									Option 2: Community Well (to tie in with Grader Stn, Health Centre and Firehall). Note: Lower life cycle costs and easier operation and maintenance.		$25,000	$5,000	$5,000	$35,000							$43,820
3201	Burwash Landing Airport Building	Poor surface completion of the well, there is no surface sanitary seal; three recent positive total coliform results; elevated nitrates and chlorides, within 30 m of potential sources of contamination, the well is a shallow well and is likely completed in an unconfined aquifer that is susceptible to surface sources of contamination; and, there is no treatment or disinfection.	Following recommendations made in EBA's draft report a new well has been drilled and commissioned. The abandoned and former wells have both been decommissioned.	None required.	$5,000	$1,000	$1,000	$7,000	Install UV disinfection.		$2,200	$440	$440	$3,080	None identified.		$0	$0	$0	$0	$10,080
3204	Burwash Landing Fire Hall	Poor wellhead completion, no sanitary seal, well is within 30 m of AST (5 m), turbidity is high, no treatment or disinfection.	Extend casing to 500 mm above grade, install chlorination tap, superchlorinate well and water system, install filtration and UV disinfection system.	Attempt to locate well log.	$3,900	$780	$780	$5,460	None required.		$0	$0	$0	$0	Heat trace not properly installed.	Replace heat trace (to be completed by certified electrician)	$500	$100	$100	$700	$6,160
3171	Kluane Lake School (Destruction Bay)	Poor surface completion at wellhead, no surface sanitary seal, well is within 30 m of UST (9m) and AST (26 m).	Extend well casing as high as possible in well pit. Put localized (temporary) near surface sanitary seal around wellhead and crown away from casing, Superchlorinate well and water system. Install proportional feed chlorine injection system. Exchange carbon with multimedia bed.	None	$8,900	$1,780	$1,780	$12,460	Complete standard wellhead upgrades to pitless unit, replace UST with double walled AST, Install stainless steel commercial filtration system.		$12,900	$2,580	$2,580	$18,060	Historical raw sewage spills for community sewage system, previous exceedence of turbidity, TDS above AO objective, softener not always functional, previous exceedence of manganese (likely when softener not functioning).	Priority 1 and 2 mitigation plus routine monitoring and maintenance should mitigate all low risks.	$0	$0	$0	$0	$30,520
3172	Destruction Bay Fire Hall	Poor wellhead construction, lack of surface sanitary seal, within 30 m of potential sources of contamination, including an above ground fuel storage tank, an underground fuel storage tank, and scrap cars; a recent bacteriological sample reported a positive total coliform count; turbidity has been reported to be consistently above the CDWQG MAC of 1.0 NTU. There is no treatment or disinfection system	Post an advisory indicating that water is not fit for consumption. Provide bottled water station.	None	Minimal	$0	$0	$0	Plumb treated water supply (following upgrades) from Kluane School into the domestic supply for Fire Hall. Complete minor wellhead improvements to protect aquifer.		$4,800	$960	$960	$6,720	The color had previously exceeded the CDWQG aesthetic objective; and, supports for the elevated water storage tank are earthquake or collision proof	Priority 1 and 2 mitigation plus routine monitoring and maintenance should mitigate all low risks associated with the water supply. Safety of elevated tank to be addressed separately.	$0	$0	$0	$0	$6,720
3186	Destruction Bay Grader Station	Poor well construction, poor well siting, poor water quality, many potential contaminant sources.	Following recommendations made in EBA's draft report a new well has been drilled, however it has not yet been commissioned. Connect new well. Provide bottled water and ensure that existing advisories are adequate in interim.	None	$7,400	$1,480	$1,480	$10,360	Provide treatment and disinfection to new well as required.		$3,700	$740	$740	$5,180	Aesthetically poor water quality.	Decommission existing well.	$1,000	$200	$200	$1,400	$16,940
3957	Destruction Bay Health Centre	Poor surface completion of the well; no surface sanitary seal, the well is located approximately 60 m downgradient from a community septic field; and there is no disinfection system.	Install chlorination tap, superchlorinate well and water system, install filtration and UV disinfection system.	None	$3,600	$720	$720	$5,040	Standard wellhead upgrades with pitless unit.		$5,000	$1,000	$1,000	$7,000	Aesthetically poor water quality (TDS), and arsenic above PMAC.	Install point of use RO systems in the Health Centre and Nursing Residence #2.	$1,400	$280	$280	$1,960	$14,000

TABLE 5: OVERALL ASSESSED LEVEL OF RISK TO EXISTING WATER SUPPLY SYSTEMS USING MULTI-BARRIER APPROACH

		RISK INDICATORS				RISK MITIGATORS				OVERALL RISK AND PRIORITY		
Well System ID #	**Building Name**	**Exceedence of MAC other than total coliform or turbidty**	**Poor Quality Indicators (turbidity, coliform, nutrients)**	**Potential Bacteriological Contaminants within 30 m[A]**	**Public Accessibility or Residence**	**Favourable Hydrogeological Conditions**	**Well Construction (surface casing, driven casing in tight formation etc..)**	**Disinfection Treatment (primary)**	**Disinfection Treatment (secondary)**	**Overall Risk**	**Rationale/ Comments**	**Priority 1, 2 or 3**
3440	Blanchard Grader Station (and living complex)	No	Yes - elevated chloride	No	Yes	? - No Log	No	Yes- filtration (living quarters only)	Yes- UV disinfection (living quarters only)	Low - Moderate	Risk would be reduced to low if treated supply to Garage	1
3443	Haines Junction Initial Attack Base	No	No	No	No	System is on water delivery	System is on water delivery, but poor tank construction	Water delivery- treated at source	Water delivery- treated at source, FAC low	High	Risk would be reduced if tank is replaced or repaired	3
M0131	R.C.M.P. Detachment	No	Yes- turbidity, elevated chloride	Unknown	Yes	Variable fine grained material	No- well seal, Yes- driven in tight formation	No	No	High	Risk but minimal mitigation	1
M0133	Beaver Creek R.C.M.P. Residences	No	No	No	Residence	Variable fine grained material	No- well seal, Yes- driven in tight formation	No	No	Moderate	Limited risk, and some mitigation	1
M0134	Beaver Creek R.C.M.P. Residences	No	Yes- turbidity (1/3)	No	Residence	Likely variable fine grained material	No	No	No	Moderate	Limited risk, and some mitigation	1
3100	Nelnah Bessie John School	No	No	Unknown	Yes	?- No Log	No	Yes- activated carbon filter/ chlorination	No	High	Risk but minimal mitigation. FAC is low, and pellet chlorinators are not reliable for sustained disinfection.	1
3102	Beaver Creek Firehall (Well also serves library)	No	Yes - turbidity, elevated chloride	Unknown	Yes- well also serves library	? - No Log	No	No	No	High	Risk, but no mitigation	1
3121	Visitor Reception Center	No	Yes - elevated chloride, nitrate	No	Yes	? - No Log	No	No	No	High	Risk, but no mitigation	1
3122	Beaver Creek Swimming Pool	No	No	Yes	Yes	Yes - Till	No- well seal, Yes- driven in tight formation	No	No	High	Risk with inadequate mitigation	1
3123	Beaver Creek Grader Station	No	Yes - elevated chloride	Yes (former field at 22 m)	No	Variable fine grained material	No- well seal, Yes- driven in tight formation	No	No	High	Risk with inadequate mitigation	3
3125	Beaver Creek Airport Terminal Building	No	Yes- turbidity, 1/9 total coliform	No	Yes	? - No Log	No	No	No	High	Risk, but no mitigation	1
3964	Beaver Creek Health Center	No	Yes- turbidity	Unknown but likely	Yes	? - No Log	No	No	No	High	Risk, but no mitigation	1
3201	Burwash Airport (Well in use at time of assessment)	No	Yes - elevated chloride, 2/11 positive total coliform	No septic, but former breach, and open casing.	Yes	? - No Log	No	No	No	High	Risk, but no mitigation for old well. Note new well has been drilled and connected which would change this risk designation.	1
3204	Burwash Firehall	No	Yes - turbidity	No	No	?- No Log	No	No	No	Moderate	Some risk, some mitigation	3
3171	Destruction Bay School (Kluane Lake School)	No	Yes- turbidity	No	Yes	Yes- confined aquifer	No- well seal, Yes- driven in tight formation	Yes - Pellet Chlorinator, may not be functioning?	No	Moderate	Some risk, some mitigation	1
3172	Destruction Bay Firehall	No	Yes- turbidity, 1/9 total coliform	No	No	Yes- confined aquifer	No- well seal, Yes- driven in tight formation	No	No	Moderate	Some risk, some mitigation	3
3186	Destruction Bay Grader Station	Yes - Arsenic	Yes- turbidity	No	No	? - No Log	No	No	No	Low	Risk is low as long as advisories in effect and water not used for drinking.	3
3957	Destruction Bay Health Center	No	No	No	Yes	Yes- confined aquifer, artesian well	No- well seal, Yes- driven in tight formation	No	RO in Nursing Residence 1	Low - Moderate	Low risk, and some mitigation	1

A - Generally refers to liquid disposal within 30 m of wellhead

APPENDIX A



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT:
Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BLANCHARD CAMP GRADER STATION BUILDING # 3440 SITE LOCATION DIAGRAM WELL ID: 3440

REVISION ISSUE 0

FIGURE No. FIGURE 3440-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\blanchard\1260002 Blanchard Camp_3440 Site Plan.dwg, 9/20/2005 8:53:11 PM, Adobe PDF

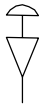
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

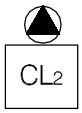

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

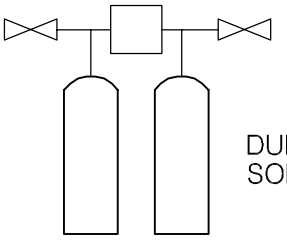
FLOW METER

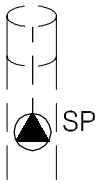
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

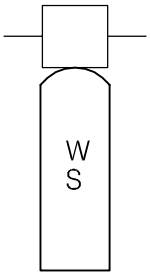


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

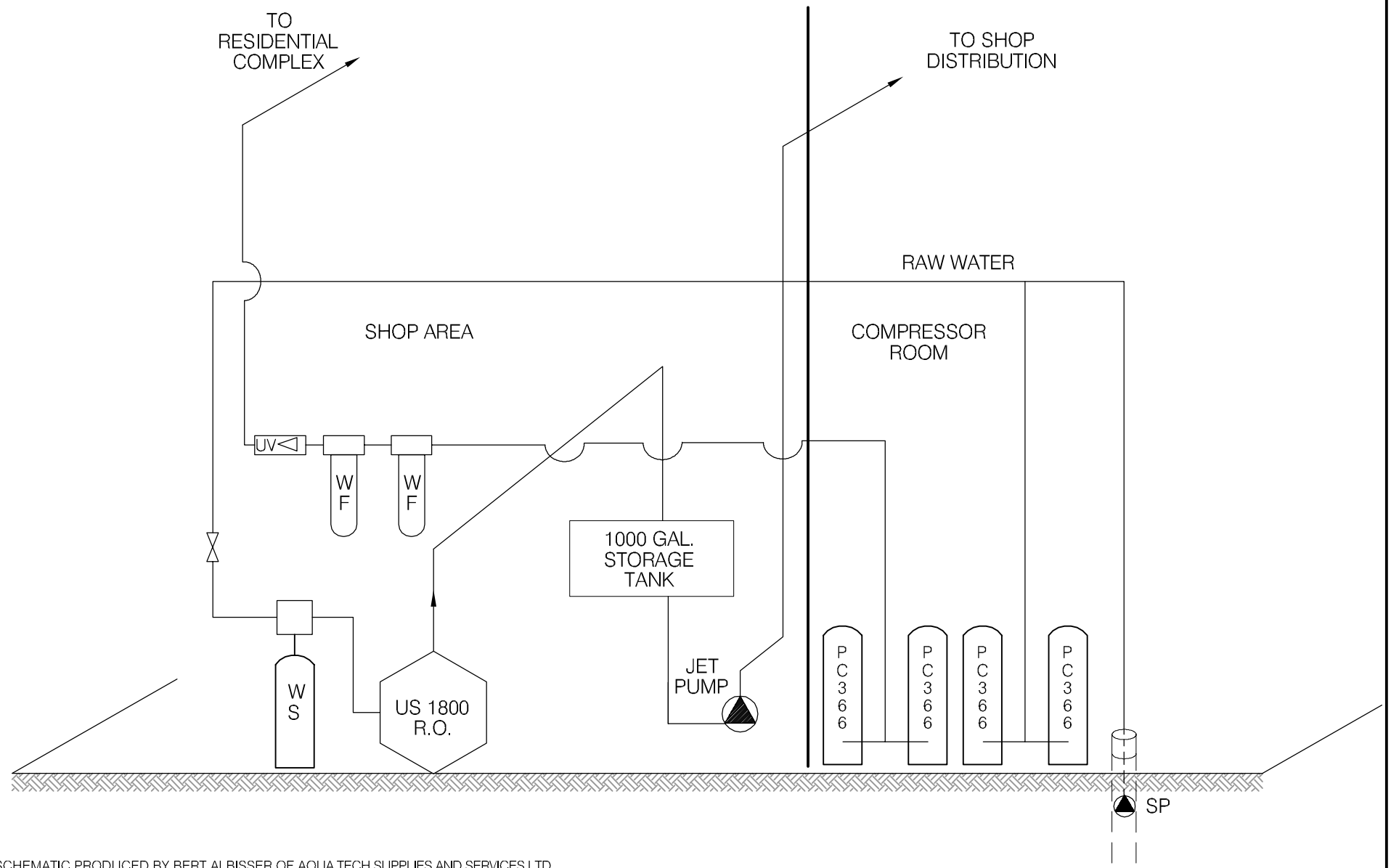


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3440 BLANCHARD CAMP GRADER STATION	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3440-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\blanchard\1260002 Blanchard Camp_3440 Schematic.dwg, 4/4/2006 1:43:37 PM, Adobe PDF, jbuyck

Western Region – BLANCHARD....CAMP
Building # ..3440

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SOFTENER	HYDROTECH	ELITE6730MI			30K.
2	R.O. SYSTEM	US FILTER	US1800		RATED @	2200 GPD
3	HOLDING TANK	ZEEBEST	1250 AG.			1250 GALLONS
4	FLOAT CONTROL	SJE PUMPMASTER	PUMPUP			240 230 V
5	JET PUMP.	MONARCH	JKS-3			3/4 HP.
6	PREFILTER	AQUA TECH	DUPLEX BIG BLUE	R30BB J01DP97	CARTRIDGES	
7	UV STERILIZER	R-CAN	UVAQ012		2023381	
8						
9						
10						

TABLE 3440- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3440	Blanchard Grader Station	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3440-2: Water Quality Results

SOURCE:	Building 3440 - Blanchard Grader Station				GCDWQ Criteria		
Location/ Resident	Haines Road						
Address							
Treatment	None			Filtration, softener, RO			
Disinfection	None			UV disinfection			
Source of Water	On-site well						
Purpose of Sampling	Base Line	Base Line	Additional Analytical	Additional Analytical			
Sample Location	Grader Station	Grader Station	Grader Station	Living Complex			
Date Sampled	21-Sep-04	15-Jun-05	29-Jul-05	29-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*					**AO**	**MAC**	**AO**
Colour (CU)	<5.0	<5.0	-	<5.0			15
Conductivity (uS/cm)		218	-	2.8			
Total Dissolved Solids	212	124	-	<10			500
Hardness CaCO3	198	102	-	<0.66	AO >200 = poor, > 500 unacceptable[A]		
pH	8.09	8.17	-	**6.10**	6.5		8.5
Turbidity (NTU)	0.3	0.4	-	0.64		1	5
UV Absorbance			<0.0050	-			
% UV Transmittance			99.3	-			
Dissolved Anions *(ALS)*							
Alkalinity-Total CaCO3	163	89.7	-	1.9			
Chloride Cl	5.7	8.59	-	<0.50			250
Fluoride F	<0.05	0.028	-	<0.020		1.5	
Silicate SiO4			-	-			
Sulphate SO4	30.4	10.4	-	<0.50			500
Nitrate Nitrogen N	0.5	<0.10	-	<0.10		10	
Nitrite Nitrogen N	<0.05	<0.10	-	<0.10		3.2	
Ammonia Nitrogen N			-	-			
Total Phosphate PO4			-	-			
Total Metals *(ALS)*							
Aluminum T-Al	<0.005	<0.010	-	<0.010			
Antimony T-Sb	<0.0002	<0.00050	-	<0.00050		0.006	
Arsenic T-As	0.0005	0.0006	-	<0.00010		0.025	
Barium T-Ba	0.039	0.066	-	<0.020		1	
Boron T-B	0.023	<0.10	-	<0.10		5	
Cadmium T-Cd	<0.00001	<0.00020	-	<0.00020		0.005	
Calcium T-Ca		30.3	-	<0.10			
Chromium T-Cr	0.001	<0.0020	-	<0.0020		0.05	
Copper T-Cu	0.032	0.0484	-	0.107		1	
Iron T-Fe	0.01	<0.030	-	<0.030			0.3
Lead T-Pb	0.0004	0.0011	-	0.0011		0.01	
Magnesium T-Mg		6.38	-	<0.10			
Manganese T-Mn	<0.005	<0.0020	-	<0.0020			0.05
Mercury T-Hg		<0.00020	-	<0.00020		0.001	
Potassium T-K		2.66	-	0.45			
Selenium T-Se		0.0017	-	<0.0010		0.01	
Sodium T-Na		<2.0	-	<2.0			200
Uranium T-U	<0.0005	0.00075	-	<0.00010		0.02	
Vanadium T-V			-	-			
Zinc T-Zn	0.175	0.057	-	<0.050			5
Organic Parameters							
Tannin and Lignin			<0.10	-			
Total Organic Carbon C			0.81	-			
Extractable Hydrocarbons							
EPH10-19			<0.30	-			
EPH19-32			<1.0	-			
Field Chemistry (EBA)							
pH			**8.59**	7.86	6.5		8.5
TDS (ppm)			83	<1			500
EC (uS/cm)			175	<1			
Temperature (°C)			7.3	16.4			
Free Available Chlorine							

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 29, 2004

WELL ID #	Owner	Location Description
3440	YTG	Blanchard Grader Station

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N6653029 E396549 el. 837m ± 9m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
On living complex

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Living complex and Maintenance garage

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in enclosure off from maintenance garage

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: >60 m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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
Septic service lines

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 located in locked building off of pump room
Entrance by animals? ☒ Yes ☐ No But access is possible

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

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~21m

Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~24m

Potential Source 3: Fueling area ; Distance from well to Potential Source 3: ~21m

Potential Source 4: Tar or emulsion tank ; Distance from well to Potential Source 4: ~31m
Bulk tank @~36m (bermed w/ berm @~29m)

t. Are there other wells on this property? ☐ Yes ☐ No

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

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 20cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 unknown, unlikely

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~0.15m above grade, ~0.45 cm above floor

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No in walls of enclosure

iv. Any evidence of rodents? Specify No, access possible

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.

If yes is there treatment or disinfection ☒ Yes ☐ No

Explain (filtration, disinfection etc...) UV, filtration, RO

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☒ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 _____

d. Date installed: _____ By: _____

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

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

g. Pump delivers water to: ☒ pressure tank ☒ elevated tank (post RO water) ☐ other

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

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heated enclosure, Insulation, Likely Heat Trace

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b. Recommendations: _____

_____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JULY 29/05

WELL ID #	Owner	Location Description
3440	YTG.	BLANCHARD GRADER STATION

6. **Water Treatment** FOR RESIDENCE (SHOT WATER NOT TREATED).

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: SOFTENER & R.O SYSTEM UV STERILIZER.

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☑ Yes ☐ No ☐ adequate ☐ incomplete

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: 1200 GALLON FIBRE GLASS

Where is it located?
Comments: SHOP FLOOR.

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?

1250 IMP GALLONS

What material is the tank constructed of? FIBRE GLASS

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:

THIS IS A REASONABLE INSTALLATION. IT PROVIDES TO QUALITY WATER TO THE RESIDENCE

b. Recommendations:

INITIATE A PROPER MAINTENANCE SCHEDULE BI-ANNUAL FOR WELL SHOCK CHLORINATION TANK CLEANING AND UV CLEANING.
CHANGE UV BULB YEARLY.
SET UP MAINTENANCE CHECK LIST & TRAINING FOR PEOPLE RESPONSIBLE FOR THE SYSTEM.
LASTLY CHECK WATER QUALITY REGULARLY.

Photo 0139: 3440 Blanchard Grader Station maintenance garage

Photo 0134: 3440 Blanchard Grader Station living complex

Photo 0138: 3440 Wellhead enclosure

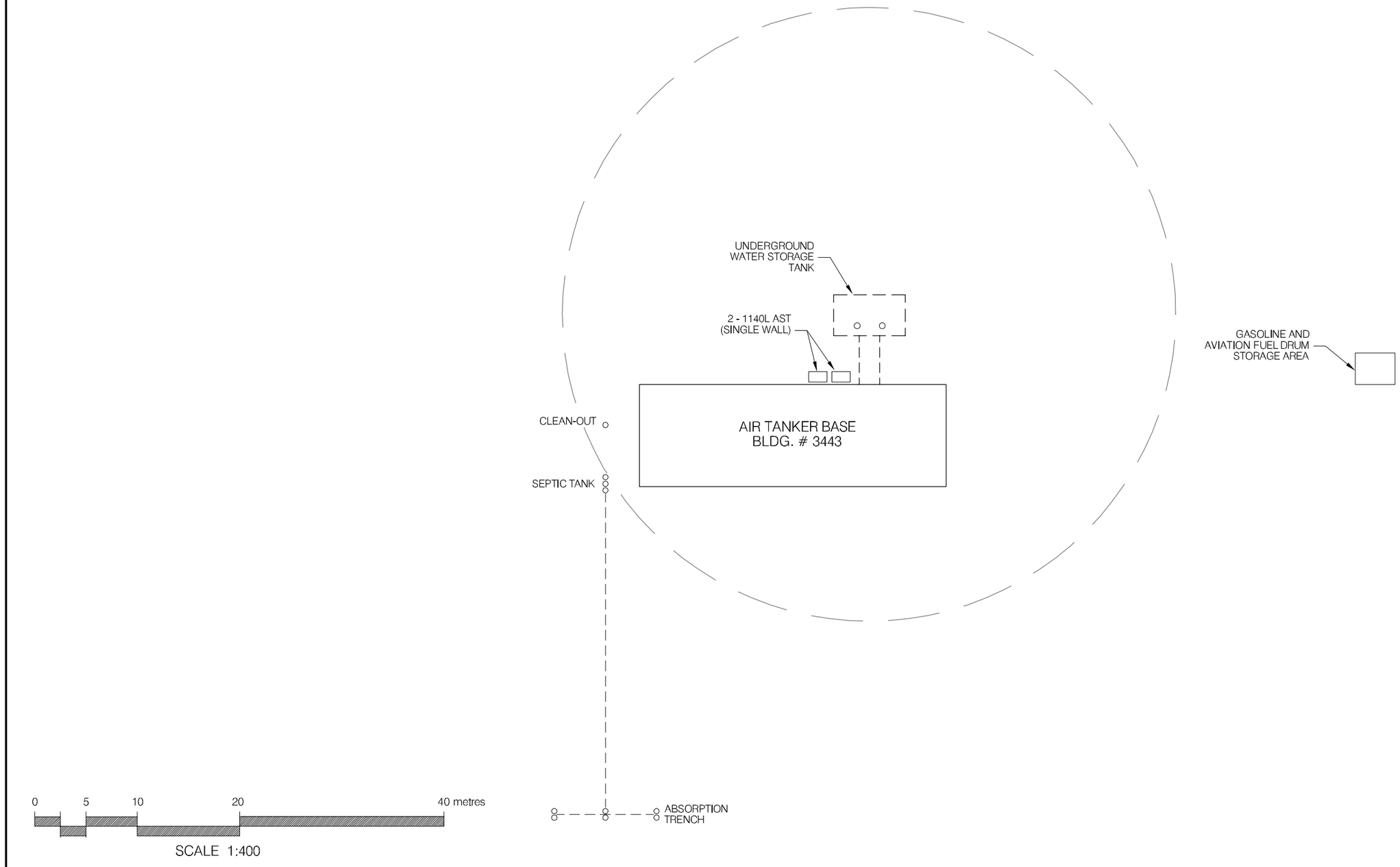
Photo 0135: 3440 Bulk fuel storage tank with geomembrane and berm

Photo 0137: 3440 Above ground fuel storage tank

Photo 0136: 3440 Emulsion or tar tank

Photo 0141: 3440 Blanchard River

Photo 0132: 3440 Water storage tank (right), duplex filter (centre), UV disinfection system (top centre), reverse osmosis treatment system (bottom centre), water softener (left)



SCALE 1:400

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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

HAINES JUNCTION INITIAL ATTACK
BASE BUILDING # 3443
SITE LOCATION DIAGRAM
WELL ID: 3443

REVISION ISSUE 0

FIGURE No. FIGURE 3443-A

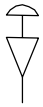
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

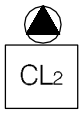

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

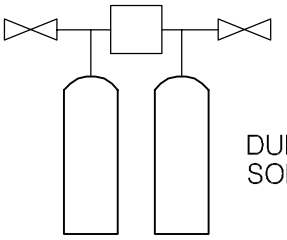
FLOW METER

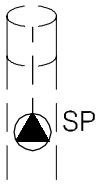
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

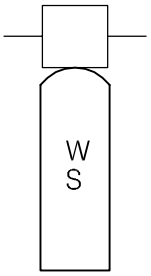


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

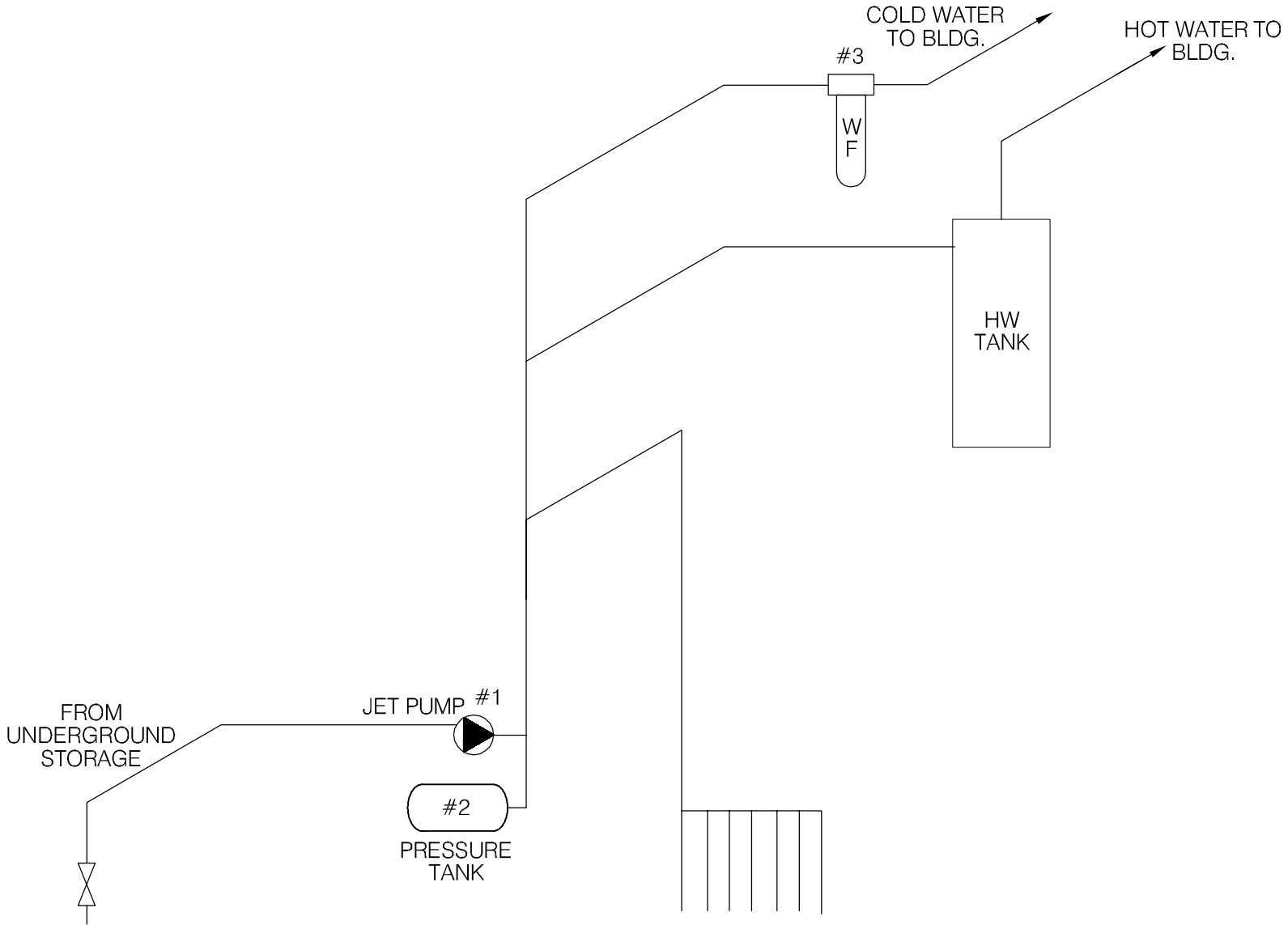


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

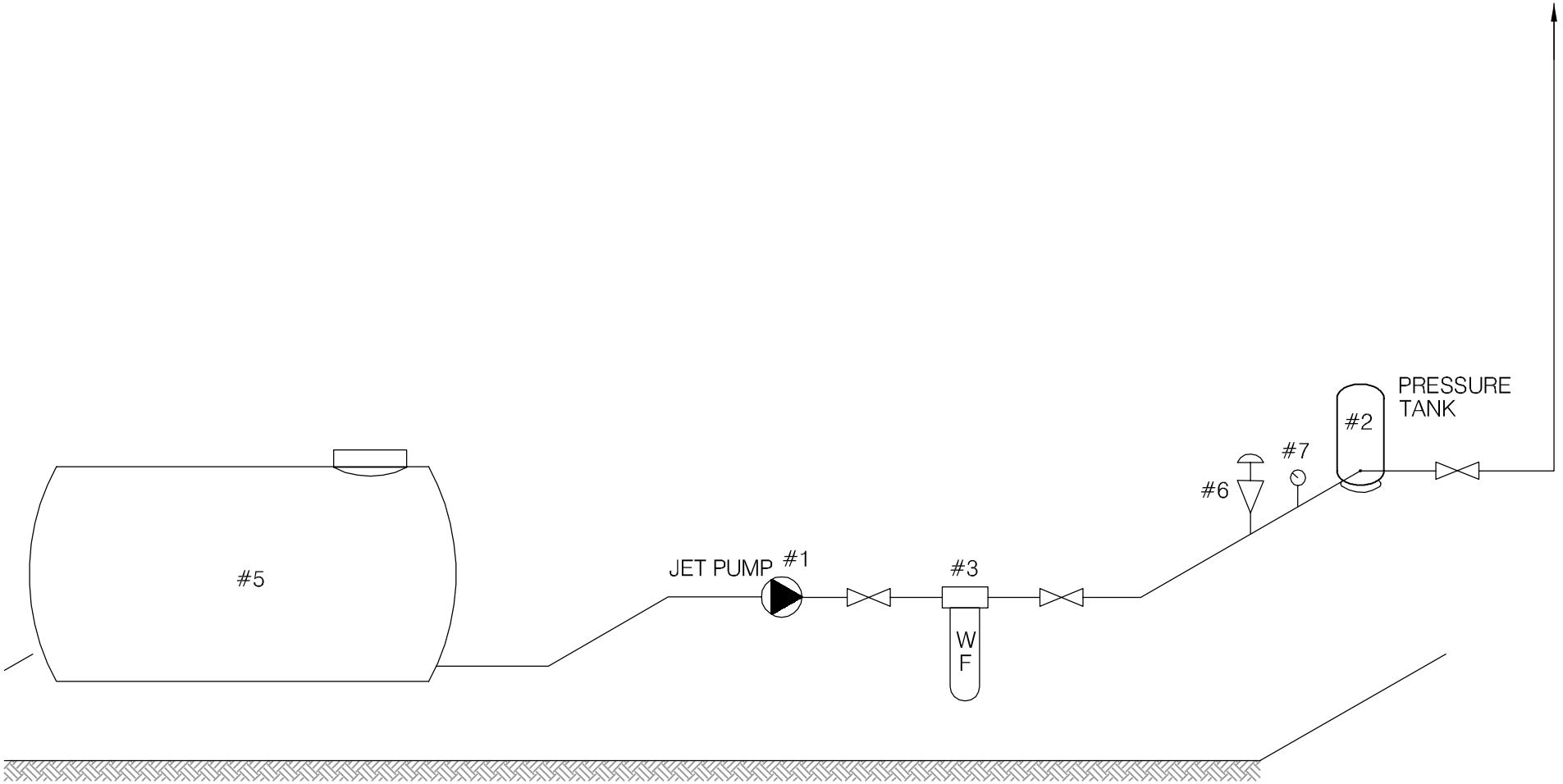
EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND



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

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3443 HAINES JUNCTION INITIAL ATTACK BASE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3443-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\haines junction\1260002 HJ Air Tanker Base_3443B Schematic.dwg, 4/4/2006 1:21:17 PM, Adobe PDF, jbuyck



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

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3443 HAINES JUNCTION INITIAL ATTACK WAREHOUSE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3443-C

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\haines junction\1260002 HJ Air Tanker Warehouse_3443C Schematic.dwg, 4/4/2006 1:20:23 PM, Adobe PDF, jbuyck

Western Region – Haines Junction Air Tanker Base
Building # 3443

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Jet Pump.	Berkley	1/2HP			
2	Pressure Tank.	Flo Source	C-PS42H-500		11K02F	
3	In Line Filter	Ametek	1" Big Blue			
4						
5	Kitchen Sink Filter	Ametek.	5" Housing.			3/8" x 5"
6	" " Cart		GAC-5			
7						
8						
9						
10						

Western Region – A.J. Air Tanker Base Warehouse
Building # 3443

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Jet Pump	Monarch	MJS-75			3/4 HP.
2	Pressure Tank.	Challenger	PC66			20 Gallon
3	Inline Filter	Aqua Flo	3/4" x 10"			
4	Filter Cart.	Cuno	~~Cuno~~ AP-110			10" Filter
5	Storage Tank	Zoeller	525			525 MP Gallon
6	Pressure Switch	SQD.	FSG-2			2HP-1/4" NPT
7	Pressure Gauge	Marsh	0-100			1/4" NPT
8						
9						
10						

TABLE 3443- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3443	Haines Junction Initial Attack Base	2	May -05 to Jun-05	no	0/2	no	16-Jun-05	no

Table 3443-2: Water Quality Results

SOURCE:	Building 3443 - Haines Junction Initial Atack Base		GCDWQ Criteria		
Location/ Resident	Haines Junction				
Address					
Treatment	None				
Disinfection	None				
Source of Water	Water delivery				
Purpose of Sampling	Base Line	Additional Analytical			
Sample Location		Kitchen tap			
Date Sampled		26-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	-	<5.0			15
Conductivity (uS/cm)	-	251			
Total Dissolved Solids	-	164			500
Hardness CaCO3	-	12.3	AO >200 = poor, > 500 unacceptable[A]		
pH	-	8.04	6.5		8.5
Turbidity (NTU)	-	0.70		1	5
UV Absorbance	-	0.0080			
% UV Transmittance	-	98.2			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	-	108			
Chloride Cl	-	1.21			250
Fluoride F	-	0.217		1.5	
Silicate SiO4	-	-			
Sulphate SO4	-	15.3			500
Nitrate Nitrogen N	-	<0.10		10	
Nitrite Nitrogen N	-	<0.10		3.2	
Ammonia Nitrogen N	-	-			
Total Phosphate PO4	-	-			
Total Metals *(ALS)*					
Aluminum T-Al	-	<0.010			
Antimony T-Sb	-	<0.00050		0.006	
Arsenic T-As	-	*0.0203*		0.025	
Barium T-Ba	-	0.024		1	
Boron T-B	-	0.12		5	
Cadmium T-Cd	-	<0.00020		0.005	
Calcium T-Ca	-	3.92			
Chromium T-Cr	-	<0.0020		0.05	
Copper T-Cu	-	0.0098		1	
Iron T-Fe	-	<0.030			0.3
Lead T-Pb	-	<0.0010		0.01	
Magnesium T-Mg	-	0.61			
Manganese T-Mn	-	<0.0020			0.05
Mercury T-Hg	-	<0.00020		0.001	
Potassium T-K	-	0.39			
Selenium T-Se	-	<0.0010		0.01	
Sodium T-Na	-	57.3			200
Uranium T-U	-	<0.00010		0.02	
Vanadium T-V	-	-			
Zinc T-Zn	-	<0.050			5
Organic Parameters					
Tannin and Lignin	-	<0.10			
Total Organic Carbon C	-	0.78			
Field Chemistry (EBA)					
pH	-	8.66	6.5		8.5
TDS (ppm)	-	127			500
EC (uS/cm)	-	253			
Temperature (°C)	-	21.4			
Free Available Chlorine	-	0.01			

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 26, 2005

WELL ID #	Owner	Location Description
3493	YTG	Haines Jct Initial Attack Base

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Alaska Highway, Initial Attack Base

c. GPS location: N 6740373 E 359760 elv 608m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Initial Attack Base and Warehouse

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Initial Attack Base

h. Distance from ~~well~~ water storage tank to building ~ 9m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from ~~well~~ water storage tank to nearest point of known field: ~ 28 m

k. ~~Well~~ water storage tank location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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

---

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

n/a

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☐ No

n/a

o. 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 There are latches for locks, but no locks were present

Entrance by animals? ☒ Yes ☐ No but access possible

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

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☐ Yes ☐ No Describe _____

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

Potential Source 1: AST (2) ; Distance from well to Potential Source 1: ~10 m

Potential Source 2: Avgas Drums ; Distance from well to Potential Source 2: ~50 m

Potential Source 3: _____ ; Distance from well to Potential Source 3: _____

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year n/a Month _____

b. Type: ☐ drilled ☐ dug ☐ sand point ☐ other n/a

c. Is there a drillers log for the well: ☐ Yes ☐ No n/a

d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☐ unlikely n/a

e. Surface casing: ☐ Yes Diameter n/a ☐ No

f. Well casing: Diameter n/a Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: n/a ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: n/a

☐ 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 n/a

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length n/a slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No n/a

m. Is the ~~well head~~ water storage tank: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building
underground water storage tank in parking lot

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail_____

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No

iv. Any evidence of rodents? Specify_____

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc...) water is from delivery and treated at the source

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☒ bedrock ☐ granular sediment ☐ unknown
reportedly at source

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No
n/a

5. Pump Installation:

a. Is the well equipped with a pump? ☐ yes ☐ No
n/a

b. Type of pump: ☐ hand ☐ electric submersible ☐ jet
n/a

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: n/a By: _____

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

f. Drop pipe for submersible pump: ☐ steel ☐ plastic n/a

g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other n/a

h. Are there automatic pump controls: ☐ Yes ☐ No n/a

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No n/a

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

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No n/a

If yes, describe: _____

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

This system is on water delivery. The water storage tank is outside and underground. The seal between the manhole and the tank has reportedly not been installed properly and when water is filled too high soil and dirt can leach in.

b.Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JULY 25/05

WELL ID #	Owner	Location Description
3493	YTG	HAINES JUNCTION ~~AIR TANKER BASE~~ INITIAL ATTACK BASE

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☐ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☑ No ☐ adequate ☐ incomplete

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: APPROX 1000 GALLON FG. UG TANK.

Where is it located?
Comments: MIDDLE OF PARKING LOT

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: OUTSIDE

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: 1

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?

NOT AVAILABLE

What material is the tank constructed of? FG. 4W FOAM INSULATION

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: NOT ACCESSIBLE

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:

WATER STORAGE TANK IS SUBJECT TO CONTAMINATION AS LID IS INSIDE PWF ENCLOSURE THAT MAY FLOOD. PERSONNEL ON SITE BELIEVE THAT MANHOLE EXTENSION IS NOT SEALED PROPERLY. IF TANK IS OVERFILLED WATER ESCAPES THROUGH THE JOINT AND RETURNS FROM THE GROUND WHEN WATER LEVEL RECEDES IN TANK CARRYING DIRT WITH IT.

b. Recommendations:

ABANDON U/G TANK - INSTALL ABOVE GROUND TANK IN BUILDING ATTACHED TO COMPLEX. ASSURE DELIVERED WATER HAS AT LEAST .5 PPM FREE CHLORINE WHEN DELIVERED MONITOR RESIDUAL FREE CHLORINE AT REGULAR INTERVALS.

PART B: EBA Site Inspection

Inspector: BEN AUBISSEN Date JULY 25/05

WELL ID #	Owner	Location Description
3443	YTG.	H.J. ~~AIR FORCE WAREHOUSE~~ INITIAL ATTACK BASE WAREHOUSE

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☑ No ☐ adequate ☐ incomplete

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: 525 HORIZONTAL LEG TANK.

Where is it located?
Comments: KITCHEN AREA.

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?

4 FT Ø x 85" LONG.

What material is the tank constructed of? POLYETHYLENE

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: FILLER PIPE ABS

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:

WITH THE EXCEPTION OF THE FILL & VENT PIPE OF ABS MATERIAL AND NO OVERFLOW PIPING THE INSTALLATION IS ACCEPTABLE.

b. Recommendations:

CHANGE FILL & VENT PIPE TO PVC. INSTALL PROPER OVERFLOW PIPING.
TEST FREE CHLORINE RESIDUAL ON A REGULAR BASES.

Photo 0497: 3443 Haines Junction Initial Attack Base

Photo 0506: 3443 Top of underground water storage tank enclosure

Photo 0505: 3443 Underground water storage tank

Photo 0501: 3443 Septic tank and field

Photo 0504: 3443 Above ground fuel storage tanks

Photo 0500: 3443 Aviation fuel drums

Photo 0502: 3443 Chemical storage

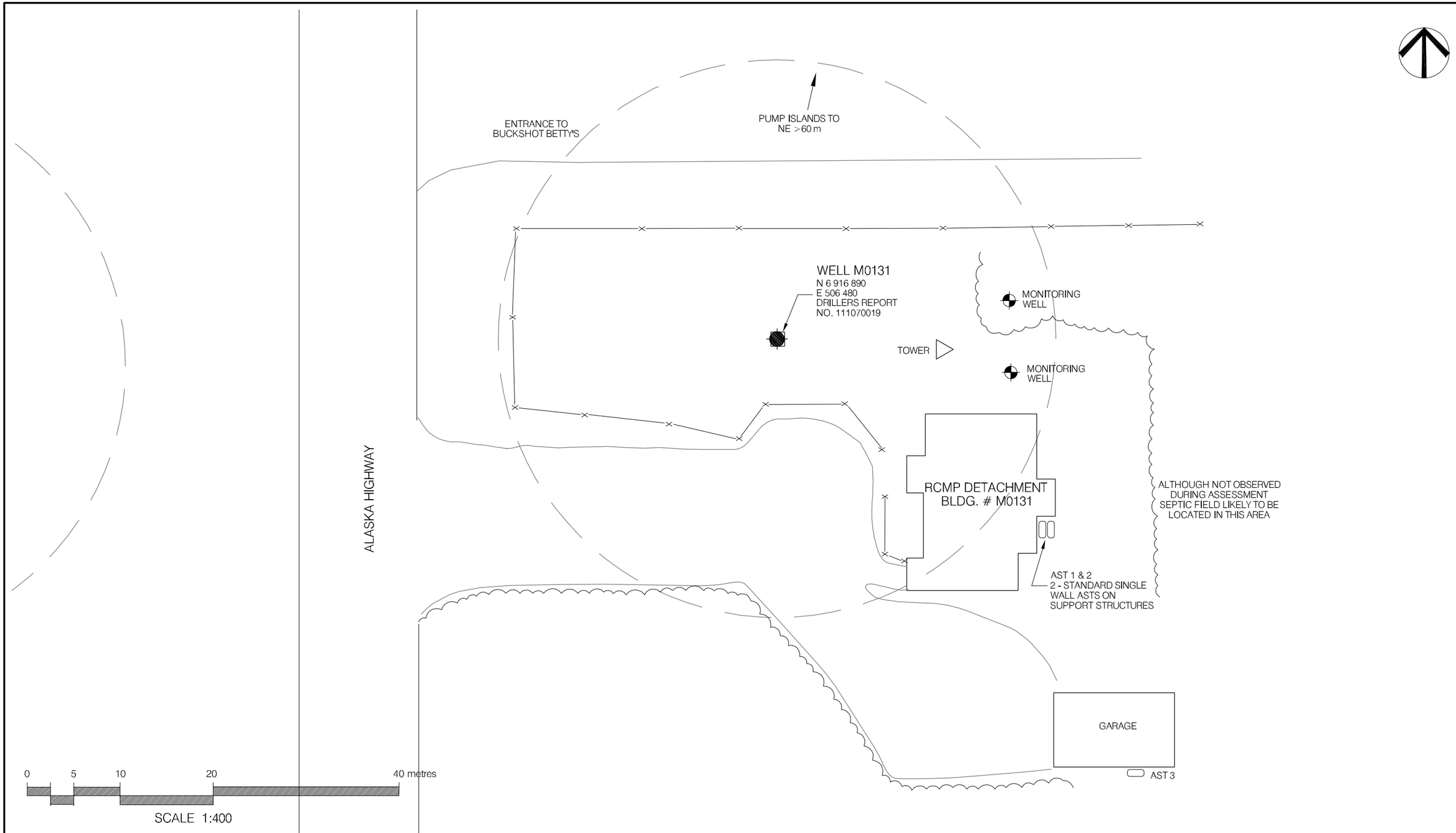
Photo 0067: 3443 Jet pump and pressure tank (centre), water heater (left)

Photo 0510: 3443 Warehouse

Photo 0069: 3443 Warehouse water storage tank

Photo 0071: 3443 Warehouse pressure tank

Photo 0511: 3443 Warehouse ABS fill pipe



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK RCMP
DETACHMENT BUILDING # M0131
SITE LOCATION DIAGRAM
WELL ID: M0131

REVISION ISSUE 0

FIGURE No. FIGURE M0131-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Res_M0131A Site Plan.dwg, 9/20/2005 9:05:19 PM, Adobe PDF

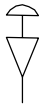
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

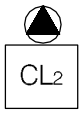

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

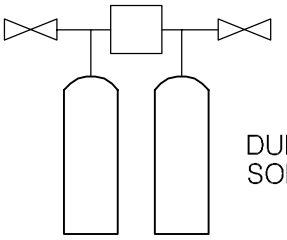
FLOW METER

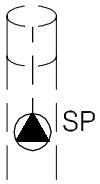
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

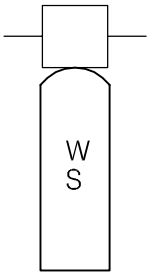


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

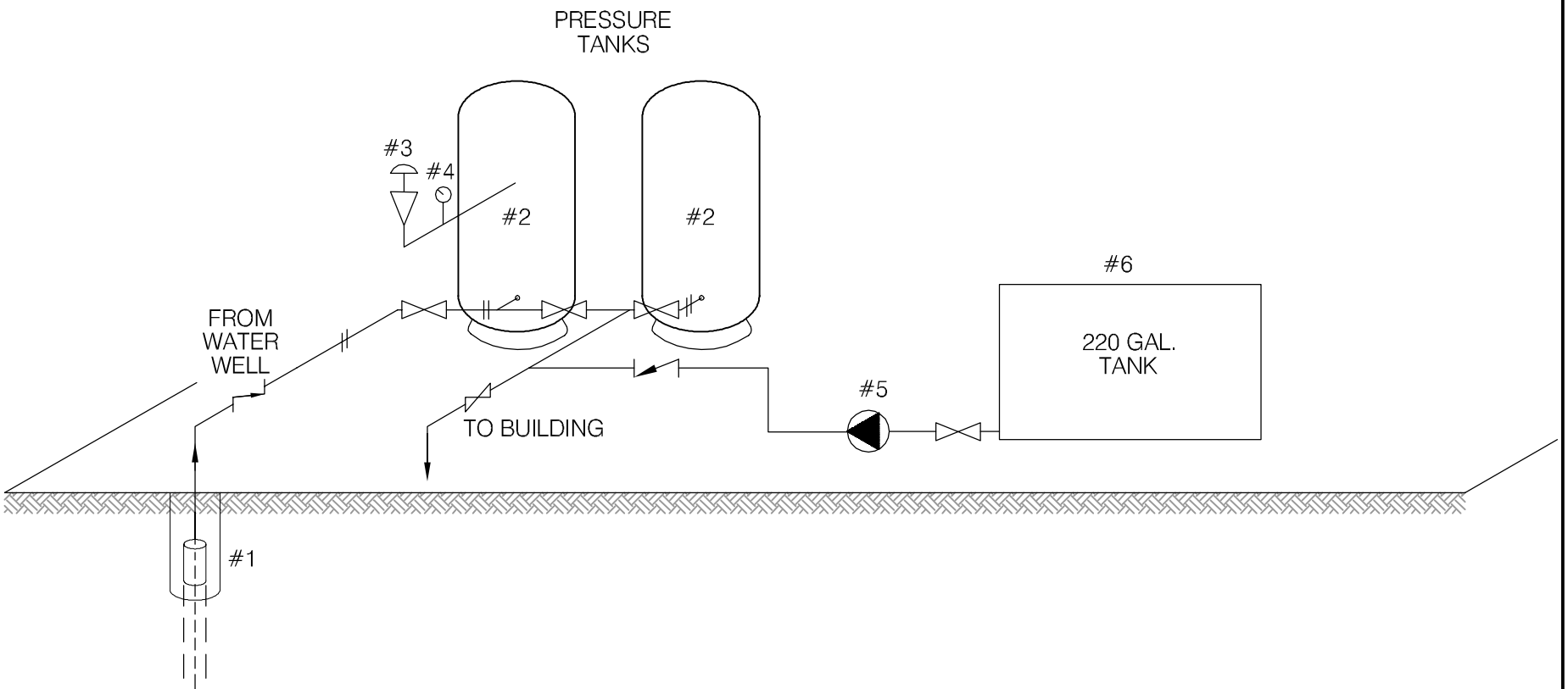


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND



SCHEMATIC PRODUCED BY BERT AUBISSER OF AQUA TECH SUPPLIES AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0131 BEAVER CREEK RCMP DETACHMENT	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE M0131-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Det_M0131B Schematic.dwg, 4/4/2006 12:44:55 PM, Adobe PDF, jbuyck

Western Region – R.C.M.P. Detachment
Building # MO131

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP					
2	PRESSURE TANK #1	MYERS	120 GALV	x2		120 GALLON
3	PRESSURE SWITCH	SQUARE D	FSG-2			2HP- 1/4" NPT
4	PRESSURE GAUGE	MARSH	2" (0-100PSI)			2" - 1/4" NPT
5	JET PUMP	GRUNDFOS	JQ A			1 HP
6	HOLDING TANK	ZEEBEST	220LOAF			220 GALLON
7						
8						
9						
10						

TABLE MO131- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
M0131	Beaver Creek R.C.M.P Detachment	3	Sept-04 to Jun-05	no	0/3	no	16-Jun-05	no

Table M0131-2: Water Quality Results

SOURCE:	Building M0131 - Beaver Creek RCMP Detachment			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Kitchen tap			
Date Sampled	Sept-28-04	15-Jul-05	27-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	5	<5.0	-			15
Conductivity (uS/cm)		471	-			
Total Dissolved Solids	259	291	-			500
Hardness CaCO3	241	247	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.14	8.21	-	6.5		8.5
Turbidity (NTU)	**1.7**	0.86	0.5200		1	5
UV Absorbance			0.0230			
% UV Transmittance			94.8			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	217	222	-			
Chloride Cl	10.4	10.9	-			250
Fluoride F	0.05	0.055	-		1.5	
Silicate SiO4			-			
Sulphate SO4	24	24.6	-			500
Nitrate Nitrogen N	0.2	0.15	-		10	
Nitrite Nitrogen N	0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	0.005	<0.010	-			
Antimony T-Sb		<0.00050	-		0.006	
Arsenic T-As	0.0014	0.00108	-		0.025	
Barium T-Ba	0.049	0.046	-		1	
Boron T-B	0.025	<0.10	-		5	
Cadmium T-Cd	0.00001	<0.00020	-		0.005	
Calcium T-Ca		79.0	-			
Chromium T-Cr	0.0008	<0.0020	-		0.05	
Copper T-Cu	0.792	0.661	-		1	
Iron T-Fe	0.13	0.079	-			0.3
Lead T-Pb	0.0015	0.0039	-		0.01	
Magnesium T-Mg		12.2	-			
Manganese T-Mn	**0.05**	0.0437	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.76	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na	3.7	3.0	-			200
Uranium T-U	0.0005	0.00032	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.657	0.881	-			5
Organic Parameters						
Tannin and Lignin			0.10			
Total Organic Carbon C			1.42			
Field Chemistry (EBA)						
pH			7.99	6.5		8.5
TDS (ppm)			174			500
EC (uS/cm)			291			
Temperature (°C)			10.9			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
M0131	RCMP	Beaver Creek RCMP Detachment

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6916890 E 506480 elv 667m ± 15m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
Hose from wellhead tap

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
RCMP Detachment

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify RCMP Detachment

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☐ Yes ☐ No

j. Distance from well to nearest point of known field: There is likely a septic system, but its location is unknown

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. 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
unknown, but likely

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Entrance by animals? ☒ Yes ☐ No
unlocked enclosure

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

q. Is the well site well drained? ☐ Yes ☒ No low point on property

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely, but unknown

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No
Distance from the well to known buried tank _____

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

☐ Yes ☐ No Describe _____

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

Potential Source 1: AST 1+2 ; Distance from well to Potential Source 1: ~34m
Potential Source 2: AST 3 ; Distance from well to Potential Source 2: ~48 m
Potential Source 3: Pump Island ; Distance from well to Potential Source 3: >60m
Potential Source 4: Alaska Highway ; Distance from well to Potential Source 4: ~38m

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

How many? 1 ☐ in use ☐ abandoned ☐ require proper sealing
monitoring well

2. Well and Wellhead information:

a. When was well installed? Year 1979 Month October

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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: 100 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: unknown

☐ 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 4 ft slot size(s) 30 slot
Location of screen: from 96 ft to 100 ft (from log) reported

l. Is there a sump below the screen? ☐ Yes ☒ No

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~2.7 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
flooding at bottom of pit (~5cm)

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
If no, describe condition likely, but could not be seen due to insulation

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.

If yes is there treatment or disinfection ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

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
unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation and heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 27/05

WELL ID #	Owner	Location Description
M0131	YTG.	RCMP DETACHMENT BEAVER CREEK

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☑ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANKS (2)

Where is it located?
Comments: WATER ROOM - REAR OF DETACHMENT

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: TEMPORARY HEATER IN PLACE

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:

THIS INSTALLATION DOES NOT MEET CODE.

b. Recommendations:

REPIPE PRESSURE TANKS. REPLACE WITH PROPER BLADDER TANKS.
INSTALL PERMANENT HEAT SOURCE IN ROOM.
INSTALL TREATMENT IF REQUIRED FOR UV TREATMENT. INSTALL APPROPRIATE UV STERILIZER (NSF55 CERTIFIED) FOR FLOW REQUIREMENT. INSTITUTE BI-ANNUAL WELL MAINTENANCE PROGRAM.

MIDNIGHT SUN DRILLING CO. LTD.
PH. 667-6144
WHITEHORSE Y.T.
P.O. Box 4391

FIELD REPORT

111070019

Started Oct. 5 ..... 19 79
Completed Oct. 6 ..... 19 79

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Klondike Enterprises 107 Main St. Whitehorse, Y.T.	Water Well	R.C.M.P. Beaver Creek

FORMATION LOG FROM	TO	FORMATION	DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
			MOVE				
0'	1'	clay		Oct. 5	7:30	6:30	11
1'	14'	gravel					
14'	37'	frozen gravel					
37'	40'	frozen clay					
40'	56'	frozen clay		Oct. 6	8:00	11:30	3.5
56'	71'	clay					
71'	79'	silt clay gravel					
79'	91'	silt clay wood chips					
91'	100'	gravel some silt			11:30	3:00	3.5

Rcrd. of Casing & Pipe Size	Type	Size	Type
Feet	Inch	Feet	Inch
96	0		

Remarks:
Bottom of screen 100'
50 slot
2' riser lead packer
5 7/8" bit pin
developed at 15 gals/min.

STATIC LEVEL	Total Rig Time 18 hrs.
Ground level	Total Standby hrs.
Top of casing	Drilling Mud sacks

SIGNATURES

MIDNIGHT SUN.....
TITLE.....

CLIENT.....
TITLE.....

Photo 0553: M0131 Beaver Creek RCMP Detachment (rear), wellhead enclosure (front)

Photo 0551: M0131 Wellhead in pit

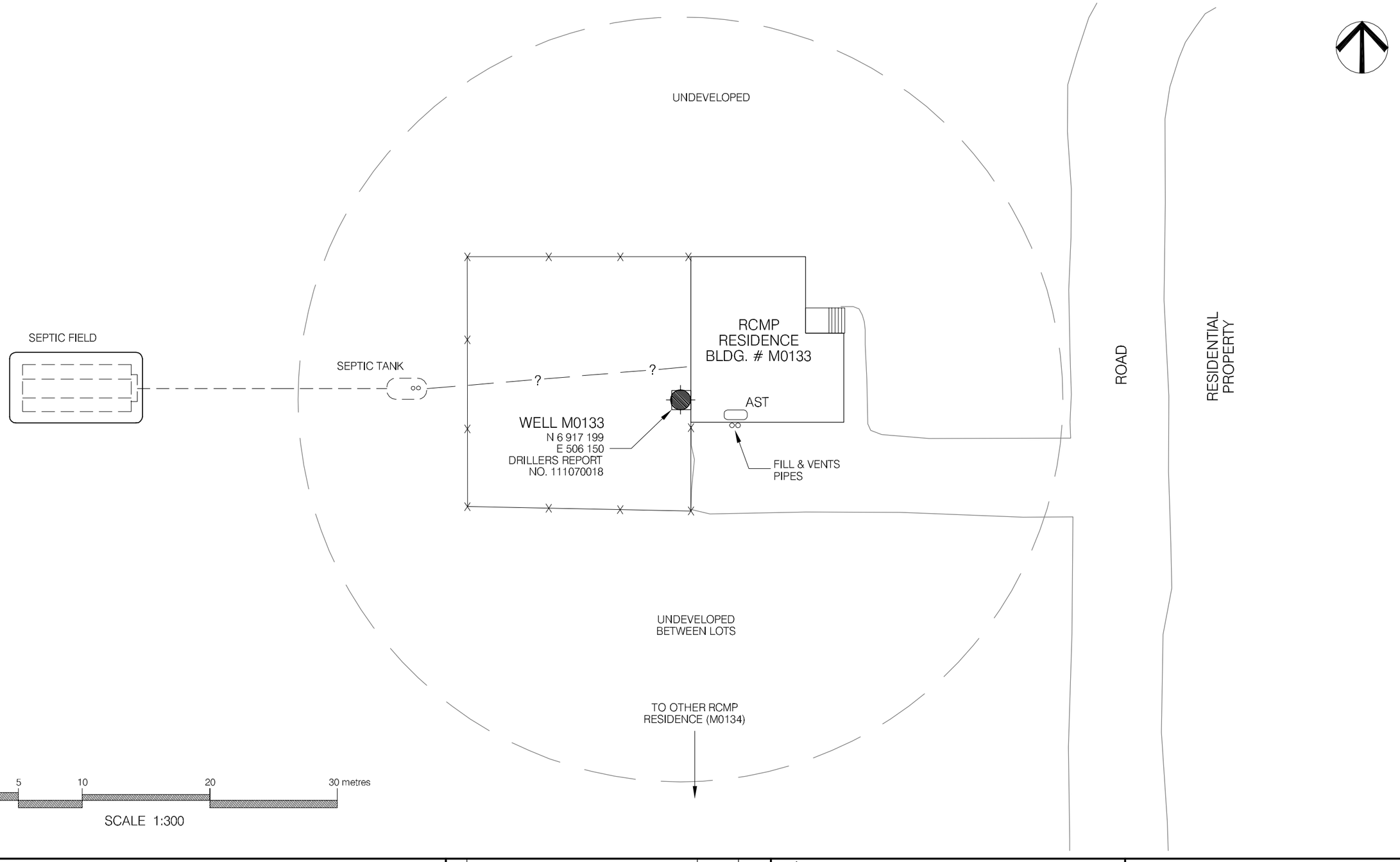
Photo 0554: M0131 Monitoring well

Photo 0557: M0131 Above ground fuel storage tank

Photo 0556: M0131 Above ground fuel storage tanks (left), maintenance room containing water system equipment (right)

Photo 0097: M0131 Water storage tank

Photo 0095: M0131 Pressure tanks



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK RCMP
RESIDENCE BUILDING # M0133
SITE LOCATION DIAGRAM
WELL ID: M0133

REVISION ISSUE: 0

FIGURE No.: FIGURE M0133-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Res_M0133A Site Plan.dwg, 9/20/2005 9:12:33 PM, Adobe PDF

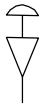
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

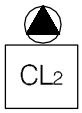

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

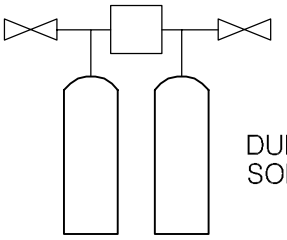
FLOW METER

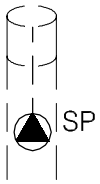
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

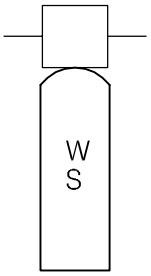


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

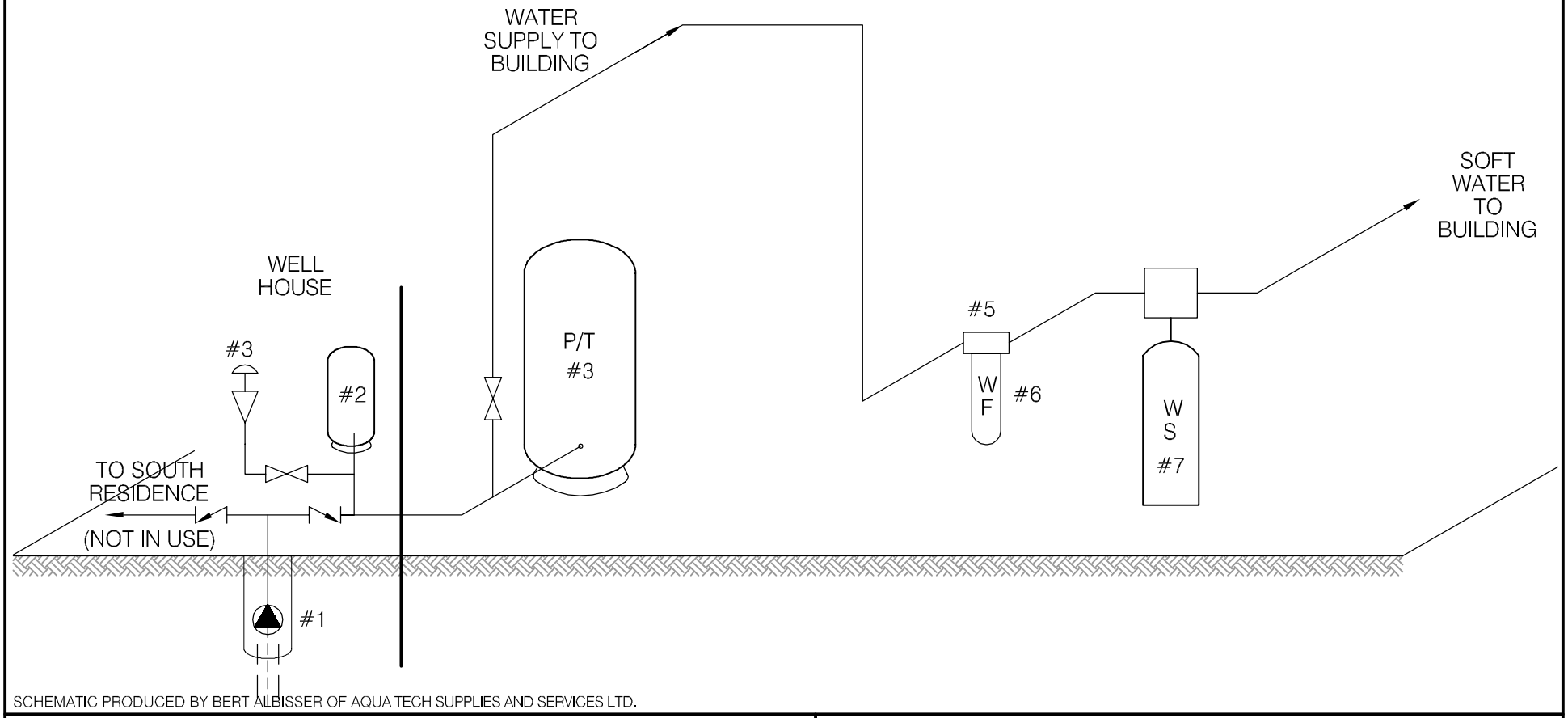


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0133 BEAVER CREEK RCMP RESIDENCE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE M0133-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Res_M0133B Schematic.dwg, 4/4/2006 12:42:28 PM, Adobe PDF, jbuyck

Western Region – R.C.M.P. Housing
Building # MO133 ? NORTH

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	UNKNOWN	3/4HP.			4" - 3/4HP
2	PRESSURE TANK #1	JET RITE	JR15.			
3	PRESSURE TANK #2	WELL RITE	WR-260			
4	PRESSURE SWITCH	SQUARE D	FSG-2			2HP - 1/4" NPT.
5	INLINE FILTER	CUNO	10" CLEAR			10" 3/4" NPT
6	FILTER CART.	CUNO	AP-110			10" x 2 1/2"
7	WATER SOFTENER	NOVATEK.	HC20MI		202531	20K.
8						
9						
10						

TABLE MO133- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
M0133	Beaver Creek R.C.M.P. Residence	4	Sept-04 to Jun-05	no	0/4	no	16-Jun-05	no

Table MO133-2: Water Quality Results

SOURCE:	Building M0133 - Beaver Creek RCMP Residence			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	Filtration					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Kitchen tap			
Date Sampled	23-Sep-04	15-Jun-05	27-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		309	-			
Total Dissolved Solids	171	189	-			500
Hardness CaCO3	151	141	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.21	8.25	-	6.5		8.5
Turbidity (NTU)	0.4	**2.28**	0.360		1	5
UV Absorbance			0.0050			
% UV Transmittance			98.9			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	128	138	-			
Chloride Cl	1.1	0.83	-			250
Fluoride F	<0.05	0.057	-		1.5	
Silicate SiO4			-			
Sulphate SO4	32.6	35.2	-			500
Nitrate Nitrogen N	0.2	0.22	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0012	0.00093	-		0.025	
Barium T-Ba	0.017	<0.020	-		1	
Boron T-B	0.027	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		45.2	-			
Chromium T-Cr	0.0006	<0.0020	-		0.05	
Copper T-Cu	0.053	0.0494	-		1	
Iron T-Fe	0.03	<0.030	-			0.3
Lead T-Pb	<0.0001	<0.0010	-		0.01	
Magnesium T-Mg		6.86	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.24	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na		2.8	-			200
Uranium T-U	<0.0005	0.00035	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.021	<0.050	-			5
Organic Parameters						
Tannin and Lignin			<0.10			
Total Organic Carbon C			1.03			
Field Chemistry (EBA)						
pH			8.34	6.5		8.5
TDS (ppm)			51			500
EC (uS/cm)			104			
Temperature (°C)			7.8			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
M0133	RCMP	Beaver Creek RCMP Residences

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6917199 E 506150 elv 667m ± 6m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
RCMP Residence.

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify located off of basement of M0133 Residence

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~20m to tank, ~40m to field

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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

---

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Entrance by animals? ☐ Yes ☒ No
located in residence

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

q. Is the well site well drained? ☐ Yes ☒ No Ground around well is flat

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Indoor AST ; Distance from well to Potential Source 1: ~2m

Potential Source 2: _____ ; Distance from well to Potential Source 2: _____

Potential Source 3: _____ ; Distance from well to Potential Source 3: _____

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

How many? 1 ☐ in use ☒ abandoned ☒ require proper sealing
is not equipped with a cap on the casing

2. Well and Wellhead information:

a. When was well installed? Year 1992 Month June

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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 35.90 m could be pump ☒ measured (if possible) ☐ reported ☐ from log 123 ft from log

h. Static water level below ground: 12.090 m bc 47 ft from log

☒ 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) 25 slot
Location of screen: from 121.5 ft to 123 ft (from log) reported

l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☒ in a wooden enclosure other, describe of from basement of residence

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.85m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
Some dampness on floor

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No in walls of enclosure

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition Split gasked cap

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.

If yes is there treatment or disinfection ☒ Yes ☐ No

Explain (filtration, disinfection etc...) filtration

---

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 unlikely

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: off from heated building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALISSER Date JULY 27/05

WELL ID #	Owner	Location Description
M0133	YTG	RCMP RESIDENCE (NORTH) BEVER CREEK

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: WATER SOFTENER.

☐ chlorination ☑ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: #1 IN WELL ENCLORE / #2 IN BASEMENT

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:

THE PIPING AT WELL HEAD IS UNPROFESSIONAL. THE WATER SOFTENER IS NOT OPERATIONAL AND THE INLINE FILTER IS IN NEED OF CHANGING.
THE SOFTNER DRAIN IS NOT TO CODE.

b. Recommendations:

REPAIR WATER SOFTENER AS NECESSARY IN PUT BACK INTO SERVICE. CHANGE INLINE FILTER. REPIPE SOFTNER DRAIN TO CODE. BRING WELL HEAD PIPING TO CODE.

Field Report 111070018

MIDNIGHT SUN DRILLING CO. LTD. WHITEHORSE Y.T.

13 MacDONALD ROAD
WHITEHORSE, YUKON
Y1A 4L1

PHONE (403) 633-3070
TELEX 036-8496

Started. June 11 ..... 19 92

Completed. June 12 ..... 19 92

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Yason Contracting	W (W)	RCMP Project
		Beaver Creek
	92-19-16	

FORMATION LOG FROM	TO	FORMATION	DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
			MOVE				
			Traveling	June 11	5:00	1:00	8
			move on set up	11	2:00	3:00	1
2	3	Gr.	sand silt	11	3:00	8:00	5
3	14	Gr.	sand cobs				
4	25	Gr.	sand silt				
5	29	Till					
9	47	Gr.	sand				
7	56	Till					
6	100	silt					
10	103	silt		June 12	7:30	8:30	1
3	12	silt	Gr. sand				
2	123	Gr.	sand.				
			set screen	11	8:30	9:00	0.5
			Develop	11	9:00	11:00	2
			move off	11	11:00	12:00	1
			Travel to Whse	11	12:00	8:00	8

. of Casing & Pipe ze	Type	Size	Type
et	Inch	Feet	Inch
1	6		

Remarks: 40 GPM.
1- otex shoe.
25 slot screen
2' riser Pipe
K Packer
5 7/8" bit Pin

Static Level		Total Rig Time	hrs.
Ground Level	47'	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

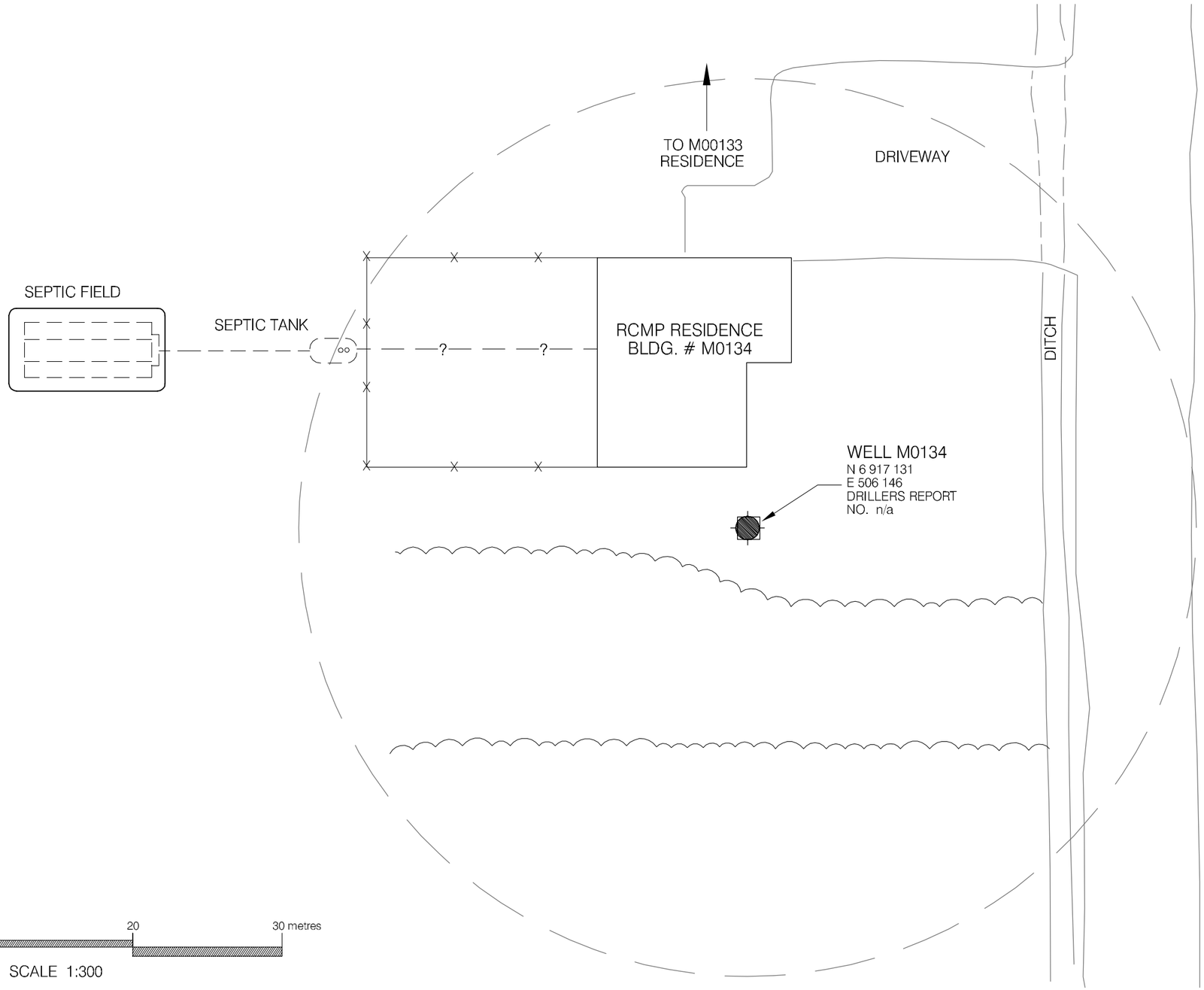
TITLE..... TITLE.....

Photo 0545: M0133 Beaver Creek RCMP Residence from rear, wellhead enclosure (front centre)

Photo 0544: M0133 Septic field

Photo 0089: M0133 Pressure tank

Photo 0090: M0133 In-line filter and water softener



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK RCMP
RESIDENCE BUILDING # M0134
SITE LOCATION DIAGRAM
WELL ID: M0134

REVISION ISSUE 0

FIGURE No. FIGURE M0134-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Res_M0134A Site Plan.dwg, 9/20/2005 9:17:59 PM, Adobe PDF

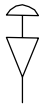
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

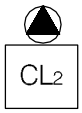

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

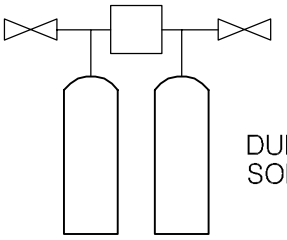
FLOW METER

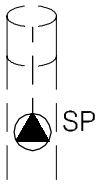
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

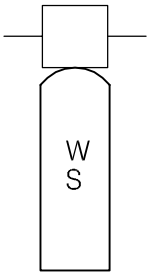


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

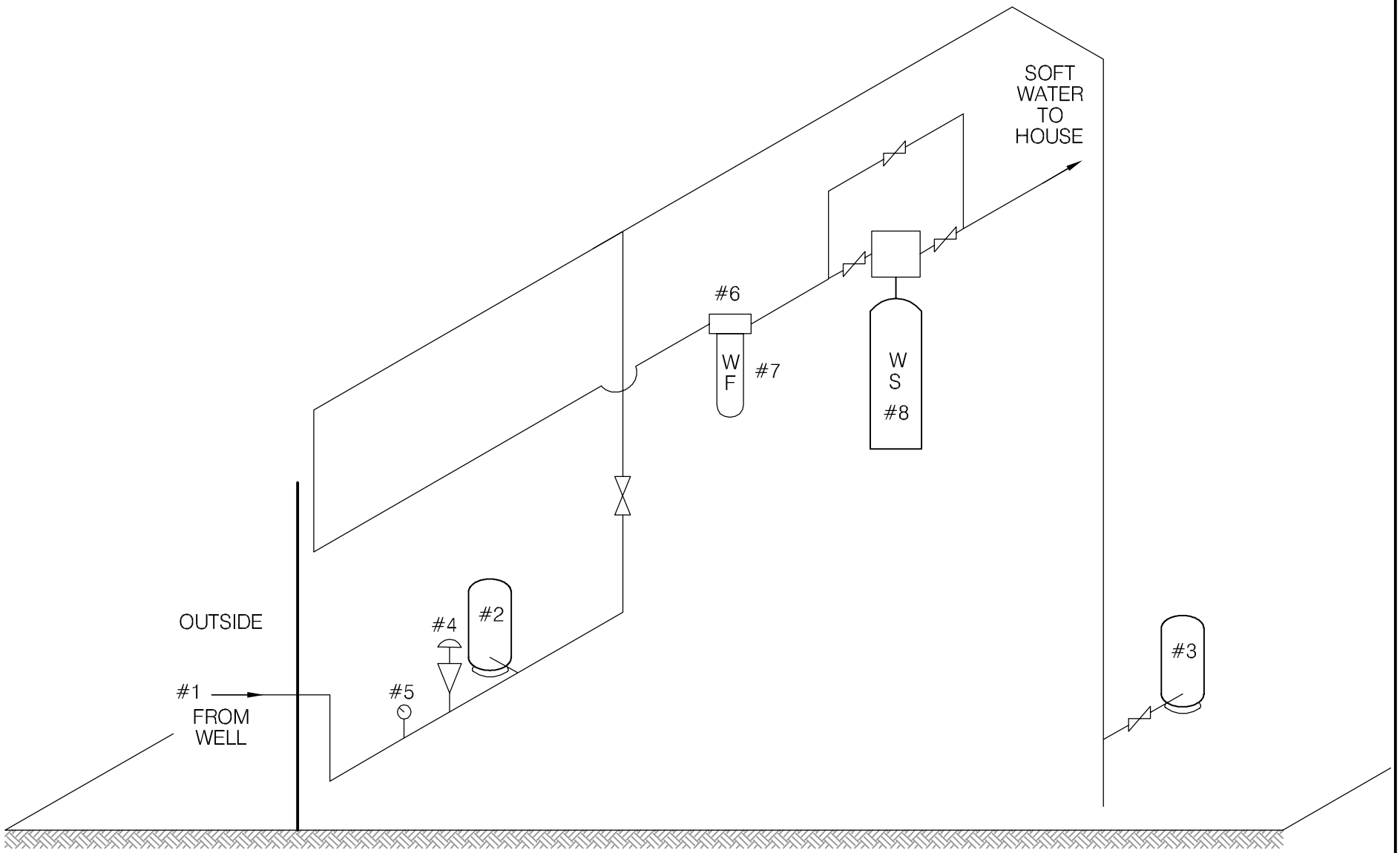


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0134 BEAVER CREEK RCMP RESIDENCE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE M0134-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk RCMP Res_M0134B Schematic.dwg, 4/4/2006 12:41:11 PM, Adobe PDF, jbuyck

Western Region – R.C.M.P. Housing
Building # MO134

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	GOULDS	7G505-4I2L		C771224Z	4" - 1/2 HP
2	PRESSURE TANK #1	GOULDS	V60		GG9914	
3	PRESSURE TANK #2	WELL RITE	WR-260			
4	PRESSURE SWITCH	SQARE D	FSG-2			2HP 1/4" NPT
5	PRESSURE GAUGE	MARSH	2"-(0-100 PSI)			2" 1/4" NPT
6	IN LINE FILTER	CUNO	10" CLEAR			
7	INLINE CART	CUNO	10"-AP110			
8	WATER SOFTNER	NOVATEK	HC20MI		202531	20K.
9						
10						

TABLE MO134- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
M0134	Beaver Creek R.C.M.P. Residence	4	Sept-04 to Jun-05	no	0/4	no	16-Jun-05	no

Table M0134-2: Water Quality Results

SOURCE:	Building M0134 - Beaver Creek RCMP Residence			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Kitchen tap			
Date Sampled	23-Sep-04	15-Jun-05	27-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		310	-			
Total Dissolved Solids	164	188	-			500
Hardness CaCO3	149	140	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.21	8.24	-	6.5		8.5
Turbidity (NTU)	0.5	0.84	-		1	5
UV Absorbance			0.0080			
% UV Transmittance			98.2			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	119	131	-			
Chloride Cl	<0.5	1.08	-			250
Fluoride F	<0.05	0.06	-		1.5	
Silicate SiO4			-			
Sulphate SO4	32.6	35.3	-			500
Nitrate Nitrogen N	0.2	0.22	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0011	0.00095	-		0.025	
Barium T-Ba	0.017	<0.020	-		1	
Boron T-B	0.026	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		44.9	-			
Chromium T-Cr	0.0007	<0.0020	-		0.05	
Copper T-Cu	0.153	0.139	-		1	
Iron T-Fe	0.03	<0.030	-			0.3
Lead T-Pb	<0.0001	<0.0010	-		0.01	
Magnesium T-Mg		6.8	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.25	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na		2.7	-			200
Uranium T-U	<0.0005	0.00035	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.003	<0.050	-			5
Organic Parameters						
Tannin and Lignin			<0.10			
Total Organic Carbon C			0.72			
Field Chemistry (EBA)						
pH			8.31	6.5		8.5
TDS (ppm)			149			500
EC (uS/cm)			308			
Temperature (°C)			9.6			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
MO134	RCMP	Beaver Creek RCMP Residence (South)

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6917131 E 506146 elv 668m ±6m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
RCMP Residence

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify RCMP Residence

h. Distance from well to building ~3m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~28m to tank, ~37m to field

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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

---

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 unlocked enclosure

Entrance by animals? ☐ Yes ☒ No Access possible,

p. Is well site subject to flooding? ☒ Yes ☐ No Dampness in pit

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Indoor AST ; Distance from well to Potential Source 1: _____

Potential Source 2: _____ ; Distance from well to Potential Source 2: _____

Potential Source 3: _____ ; Distance from well to Potential Source 3: _____

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year unknow - within the last 5 years 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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 unknown 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

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.05 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Yes,

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation and heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 27/05

WELL ID #	Owner	Location Description
MO134	YTG	RCMP Res Beaver Creek.

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: WATER SOFTENER.

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ? ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: BASEMENT

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:

INSIDE INSTALLATION IS OF GOOD QUALITY.
INLINE FILTER AND WATER SOFTENER IS IN VERY BAD CONDITION.
SOFTENER DRAIN NOT TO CODE.

b. Recommendations:

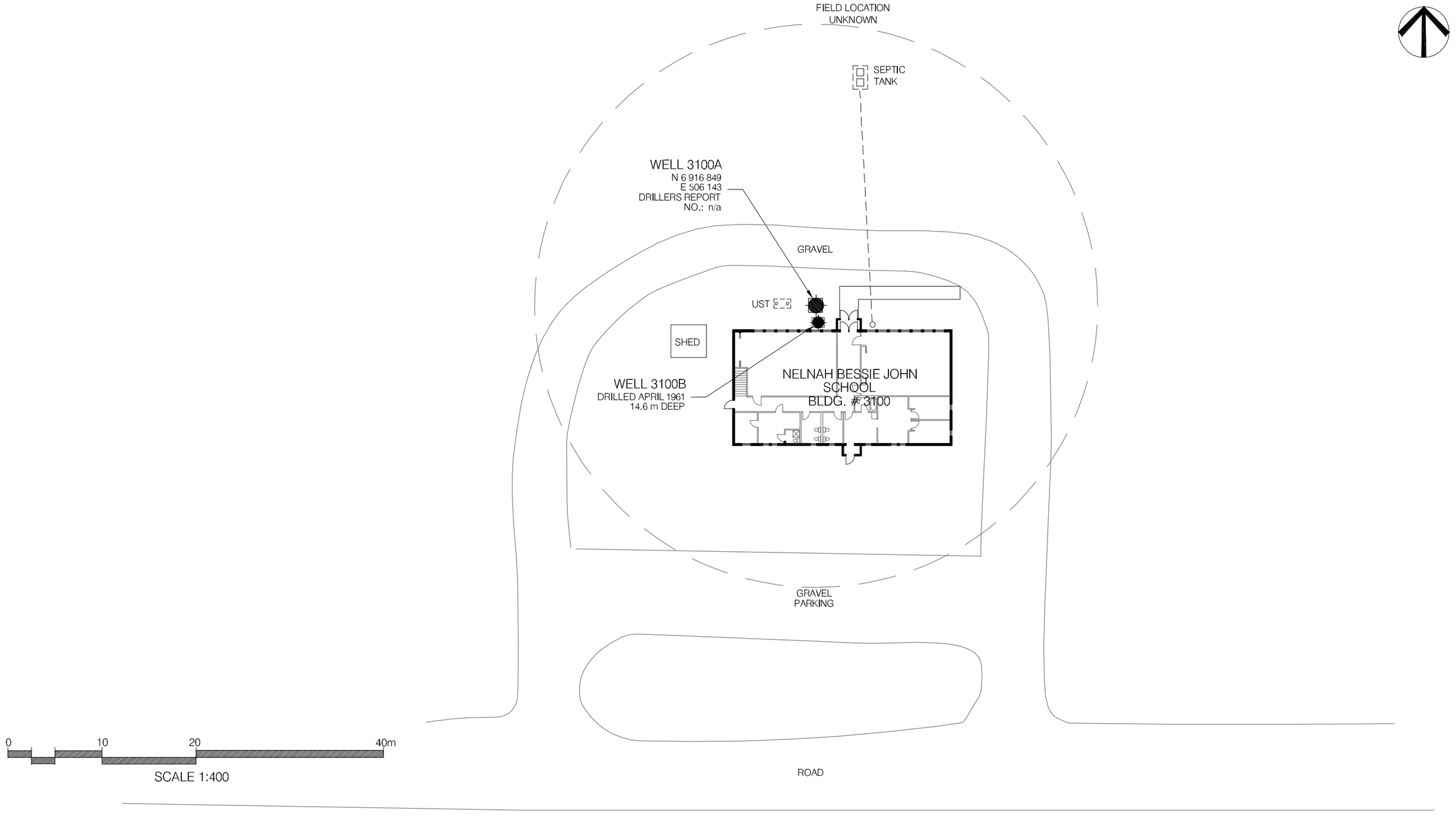
REPAIR SOFTENER & INLINE FILTER AS NECESSARY TO PROVIDE PRETREAT FOR UV SYSTEM. INSTALL UV SYSTEM FOR APPROPRIATE FLOW.
INSTITUTE BI-ANNUAL WELL MAINTENANCE PROGRAM. MAINTAIN TREATMENT SYSTEM IN WORKING ORDER.

Photo 0549: M0134 Beaver Creek RCMP Residence (right), wellhead enclosure (left)

Photo 0547: M0134 Septic field looking east towards residence

Photo 0550: M0134 Wellhead in pit

Photo 0094: M0134 pressure tank and pump controls



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

NELNAH BESSIE JOHN SCHOOL BUILDING # 3100 SITE LOCATION DIAGRAM WELL ID: 3100A

REVISION ISSUE: 0

FIGURE No.: FIGURE 3100-A

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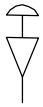
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

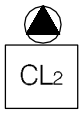

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

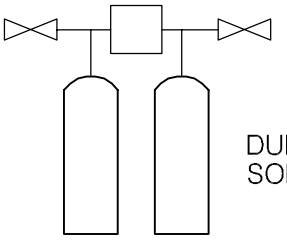
FLOW METER

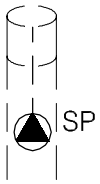
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

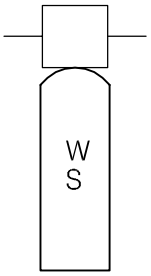


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

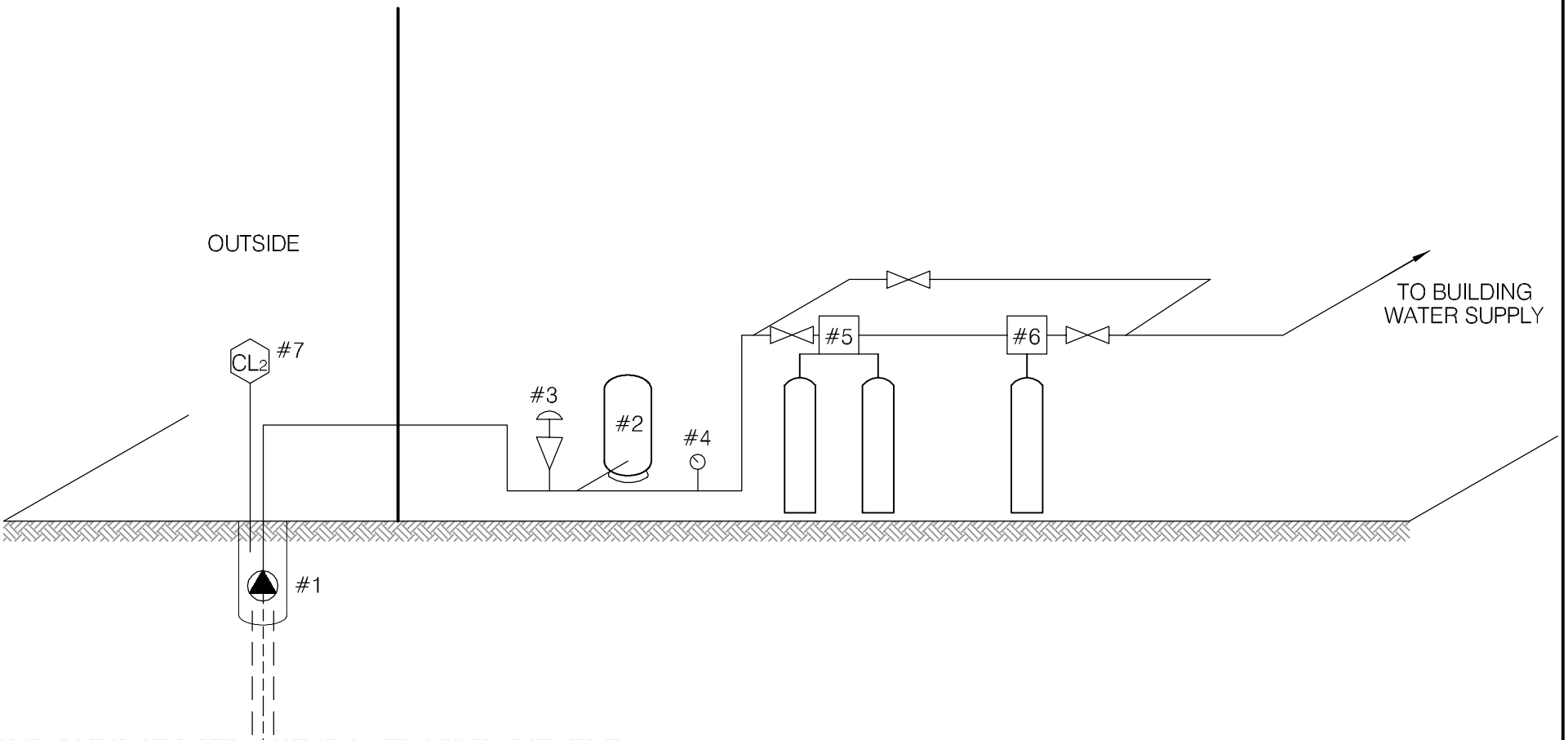


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3100 BESSIE JOHN SCHOOL - BEAVER CREEK	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3100-B

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Western Region – Nelnah Bessie John School
Building # 3100

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub Pump.	Monarch	SK10B5E		5091	4" - ½ HP.
2	Pressure Tank.	Well X Trol	WX-203			
3	Pressure Switch	Square D	FSG-2			2 HP - ¼" NPT
4	Pressure Gauge	Marsh	2" (0-100)			2" - 0-100 PST
5	Water Softner	Aqua-Tech	Duplex 9000-45MI			45K - Duplex
6	Charcoal Filter	Aqua-Tech	L5600-AC15			1.5 Cu Ft.
7	Pellet Chlorinator	Better Water	Sentry 1.			
8						
9						
10						

TABLE 3100- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3100	Nelnah Bessie John School	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3100-2: Water Quality Results

SOURCE:	Building 3100 - Nelnah Bessie John School			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	Water softener, activated carbon filter					
Disinfection	Chlorination					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Arts room sink			
Date Sampled	21-Sep-04	15-Jun-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		456	-			
Total Disolved Solids	265	296	-			500
Hardness CaCO3	<0.9	<0.66	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.08	7.87	-	6.5		8.5
Turbidity (NTU)	0.2	0.41	-		1	5
UV Absorbance	-	-	-			
%UV Transmittance	-	-	-			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	164	174	-			
Chloride Cl	2.4	2.24	-			250
Fluoride F	0.05	0.076	-		1.5	
Silicate SiO4			-			
Sulphate SO4	24.6	26.0	-			500
Nitrate Nitrogen N	0.5	0.8	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N	-		-			
Total Phosphate PO4	-		-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0004	0.00028	-		0.025	
Barium T-Ba	0.001	<0.020	-		1	
Boron T-B	0.005	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca	-	<0.10	-			
Chromium T-Cr	<0.0005	<0.0020	-		0.05	
Copper T-Cu	0.016	0.0265	-		1	
Iron T-Fe	<0.01	<0.030	-			0.3
Lead T-Pb	<0.0001	<0.0010	-		0.01	
Magnesium T-Mg	-	<0.10	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg	-	<0.00020	-		0.001	
Potassium T-K	-	154	-			
Selenium T-Se	-	<0.0010	-		0.01	
Sodium T-Na	-	<2.0	-			200
Uranium T-U	<0.0005	<0.00010	-		0.02	
Vanadium T-V	-	-	-			
Zinc T-Zn	0.003	<0.050	-			5
Trihalomethanes						
Bromodichloromethane	-	-	<0.0010			
Bromoform	-	-	<0.0010			
Chloroform	-	-	<0.0010			
Dibromochloromethane	-	-	<0.0010			
Total Trihalomethanes	-	-	<0.0040		0.1	
Organic Parameters						
Tannin and Lignin	-	-	-			
Total Organic Carbon C	-	-	0.84			
Haloacetic Acids						
Bromoacetic Acid	-	-	<0.0020			
Bromochloroacetic Acid	-	-	<0.0020			
Chloroacetic Acid	-	-	<0.020			
Dibromoacetic Acid	-	-	<0.0020			
Dichloroacetic Acid	-	-	<0.0020			
Trichloroacetic Acid (TCA)	-	-	<0.0020			
Polycyclic Aroamtic Hydrocarbons						
Acenaphthene	-	-	<0.000050			
Acenaphthylene	-	-	<0.000050			
Acridine	-	-	<0.000050			
Anthracene	-	-	<0.000050			
Benz(a)anthracene	-	-	<0.000050			
Benzo(a)pyrene	-	-	<0.000010		0.00001	
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	-	-	8.12	6.5		8.5
TDS (ppm)	-	-	230			500
EC (uS/cm)	-	-	460			
Temperature (°C)	-	-	6.0			
Free Available Chlorine	-	-	0.07			

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 29, 2005

WELL ID #	Owner	Location Description
3100	YTG	Nelnah Bessie John School

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6916849 E506143 elv 687m ± 12m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
School

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify School

h. Distance from well to building ~2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Septic tank + field @ 22m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. 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

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Unlocked enclosure

Entrance by animals? ☐ Yes ☒ No Access possible

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

q. Is the well site well drained? ☐ Yes ☒ No flat ground around well

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No

Distance from the well to known buried tank 1m

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

☐ Yes ☐ No Describe _____

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

Potential Source 1:_____; Distance from well to Potential Source 1:_____

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

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

How many? 1 ☐ in use ☒ abandoned ☐ require proper sealing

not sealed

2. Well and Wellhead information:

a. When was well installed? Year 1990 Month September

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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: 71 ft ☐ measured (if possible) ☒ reported ☐ from log

h. Static water level below ground: 36 ft bc

☐ 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 unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unlikely - unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.15m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition but heavy rust/corrosion

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc...)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 Monarch Model

horsepower ½ capacity voltage

d. Date installed: September 1990 By: _____

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

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

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

j. Is there a water meter on the system? ☒ Yes ☐ No
But against floor of building

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: heat trace + insulation

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

There is also an abandoned well in an enclosure off from the basement of the school. Drilled: April 1961, depth: 48 ft. Abandoned well is open w/ no cap. Static water level (measured) 13.72 m below grade.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: _____ Date _____

WELL ID #	Owner	Location Description
3100	YTG	NELNAH BESSIE JOHN SCHOOL BEAVER CREEK

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☑ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☑ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: MECHANICAL ROOM.

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:

THIS IS A REASONABLY GOOD INSTALLATION. HOWEVER THE CONFIGURATION DOES NOT MEET THE NEW REGULATION AND THE PELLET CHLORINATORS HAVE PROVEN TROUBLESOME FOR MAINTENANCE AND RUSTING OUT THE CASING.
HEAT TAPE INSTALLATION IS NOT TO CODE.

b. Recommendations:

REPLACE THE PELLET CHLORINATOR WITH PROPORTIONAL FEED CHLORINATION AND CHANGE CHARCOAL FILTER TO MULTI-MEDIA CONFIGURATION.
CONVERSELY PREFILTRATION AND UV AFTER THE EXISTING TREATMENT IS AN OPTION.
INSTALL NEW HEAT TRACE TO CODE.

Photo 0567: 3100 Wellhead in pit (back centre), underground fuel storage tank (front centre), school (right)

Photo 0570: 3100 Wellhead in pit (right), access enclosure (left)

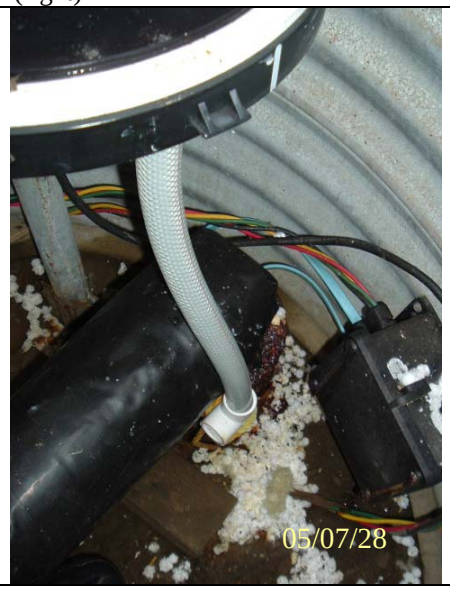
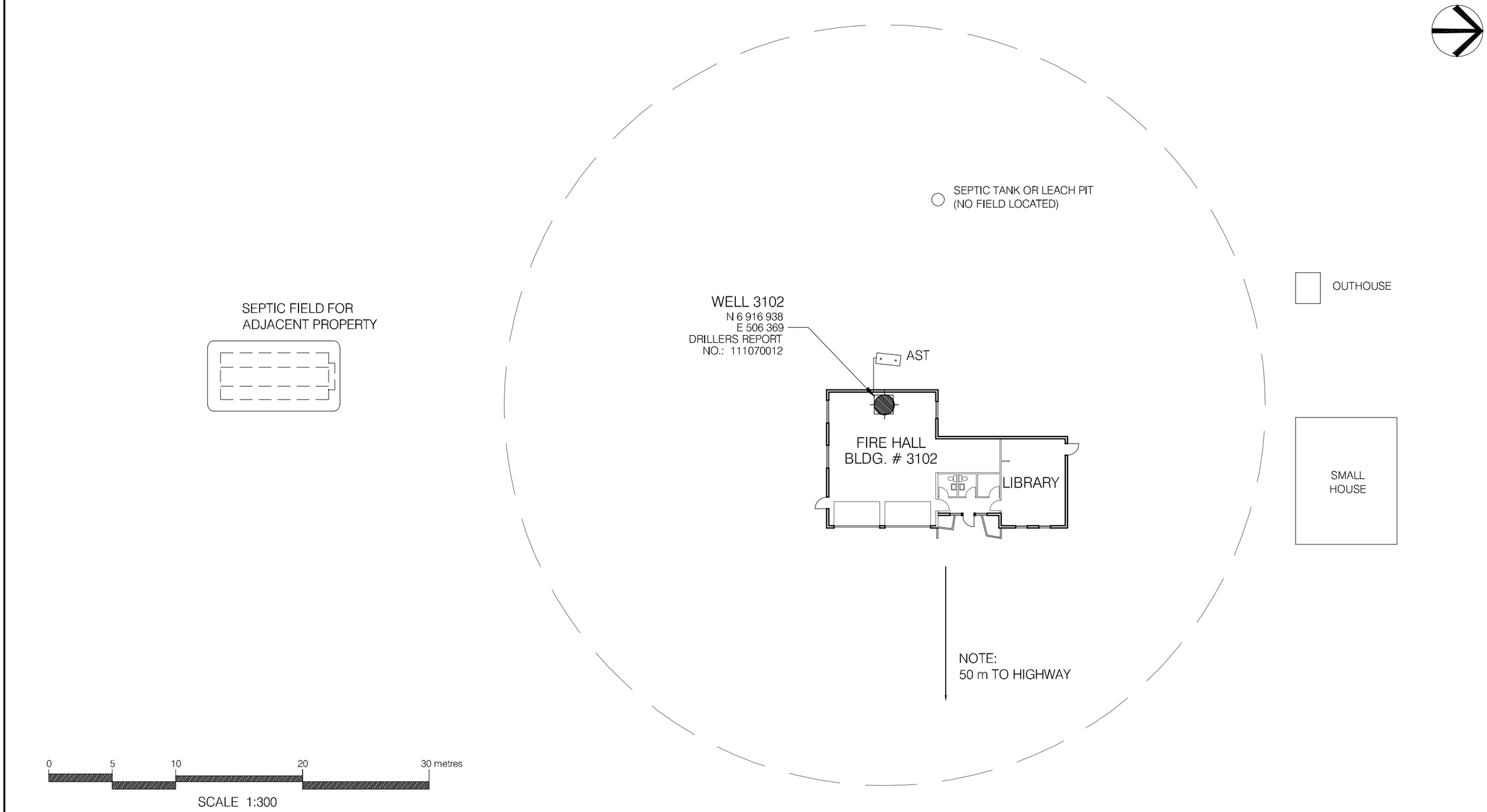


Photo 0572: 3100 Wellhead and pellet chlorinator. Note pellets in bottom of pit.

Photo 0569: 3100 Septic tank (front), school (rear)

Photo 0101: 3100 Point of entry from well (top), abandoned well under box (bottom)	**Photo 0103:** 3100 Wellhead in pit (right), access enclosure (left)



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Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK FIRE HALL
BUILDING # 3102
SITE LOCATION DIAGRAM
WELL ID: 3102

REVISION ISSUE 0

FIGURE No. FIGURE 3102–A

Z:\020!Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Fire Hall_3102A Site Plan.dwg, 9/20/2005 9:31:26 PM, Adobe PDF

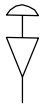
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

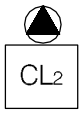

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

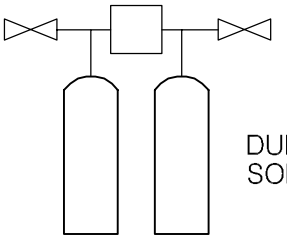
FLOW METER

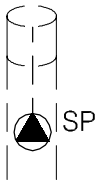
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

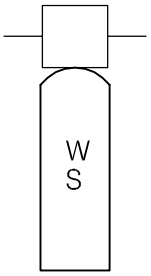


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

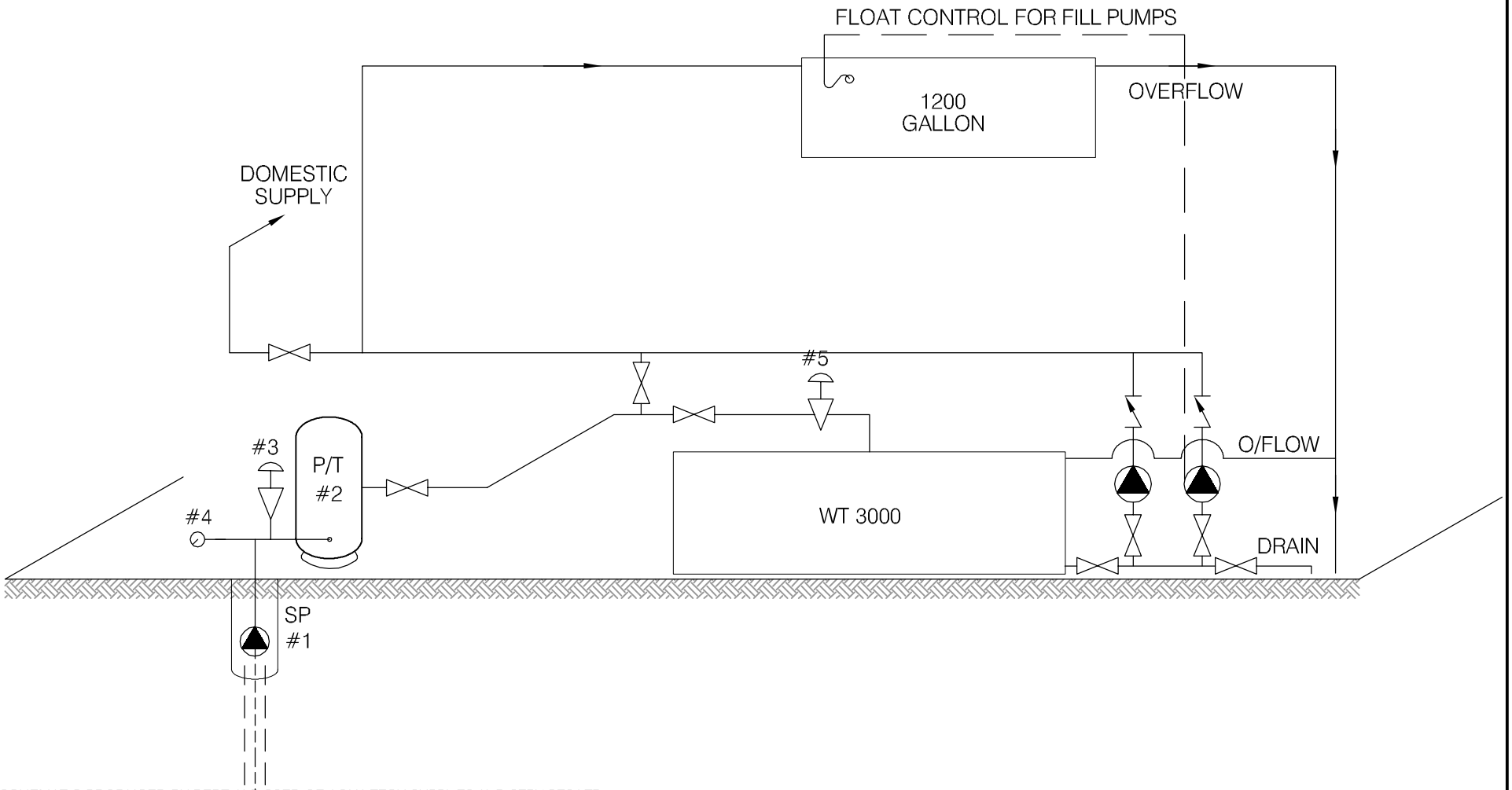


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3102 BEAVER CREEK FIRE HALL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3102-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Fire Hall_3102B Schematic.dwg, 4/4/2006 12:48:08 PM, Adobe PDF, jbuyck

Western Region – Beaver Creek Firehall
Building # 3102

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub Pump	?	½ HP.			4" - ½ HP.
2	Pressure Tank	Myers	42 Gallon	Galvanized		Tank
3	Pressure Switch	Square D	GSG-2	Old	Style	
4	Pressure Gauge	Marsh	2" - 0-100	PSI		2" - 0-100 1/4" NPT
5	3000 Gallon Fill	Asco	2" Solenoid	Valve		
6	Upper Tank Float	Site Controls	Pumpmaster	UP		2HP - 230V
7						
8						
9						
10						

TABLE 3102- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3102	Beaver Creek Fire Hall	8	Sept-04 to Jun-05	no	0/8	no	16-Jun-05	no

Table 3102-2: Water Quality Results

SOURCE:	Building 3102 - Beaver Creek Fire Hall			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			washroom sink			
Date Sampled	Sep-28-05	15-Jun-05	28-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	5	<5.0	-			15
Conductivity (uS/cm)		401	-			
Total Dissolved Solids	214	227	-			500
Hardness CaCO3	198	170	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.17	7.79	-	6.5		8.5
Turbidity (NTU)	**2.3**	**2.57**	**2.69**		1	5
UV Absorbance			0.0210			
% UV Transmittance			95.3			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	179	196	-			
Chloride Cl	7.8	9.14	-			250
Fluoride F	<0.05	0.061	-		1.5	
Silicate SiO4			-			
Sulphate SO4	21.5	21.3	-			500
Nitrate Nitrogen N	0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.001	0.00097	-		0.025	
Barium T-Ba	0.041	0.038	-		1	
Boron T-B	0.019	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		52.2	-			
Chromium T-Cr	0.0006	<0.0020	-		0.05	
Copper T-Cu	0.804	0.748	-		1	
Iron T-Fe	0.16	0.142	-			0.3
Lead T-Pb	0.0037	0.0065	-		0.01	
Magnesium T-Mg		9.54	-			
Manganese T-Mn	0.008	0.003	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.54	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na		2.7	-			200
Uranium T-U	<0.0005	0.00021	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.192	0.153	-			5
Organic Parameters						
Tannin and Lignin			0.20			
Total Organic Carbon C			0.98			
Extractable Hydrocarbons						
EPH10-19			<0.30			
EPH19-32			<1.0			
LEPH			-			
HEPH			-			
Field Chemistry (EBA)						
pH			8.04	6.5		8.5
TDS (ppm)			200			500
EC (uS/cm)			400			
Temperature (°C)			16.4			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3102	YTG	Beaver Creek Fire Hall

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6916938 E 506369 elv 668m ± 11m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Beaver Creek Fire Hall and Public Library

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside fire hall

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Septic tank or leach pit @ 16m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. 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
Neighbouring septic field @ 47m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 In locked/alarmed building
Entrance by animals? ☐ Yes ☒ No No cap ~ 4cm above grade

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

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

r. Is there a buried fuel tank on the property? ☐ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No
Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: AST ; Distance from well to Potential Source 1: ~3.5 m
Potential Source 2: Outhouse ; Distance from well to Potential Source 2: ~34 m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: 34.03 m bg ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 13.06 m below grade

☒ 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 unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~40 mm above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition cloth forced in casing

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.

If yes is there treatment or disinfection ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Inside heated building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 28/05

WELL ID #	Owner	Location Description
3102	YTG	B.C FIRE HALL

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☑No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐adequate ☐ incomplete

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: PRESSURE TANK

Where is it located?
Comments: FIRE HALL

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:

THIS INSTALLATION DOES NOT MEET CODE.
NO SANITARY WELL SEAL
CASING CUT AT GROUND LEVEL.

b. Recommendations:

SHOCK CHLORINATE WELL & WATER SYSTEMS
INCLUDING ALL TANKS. INSTALL PUMP
SYSTEMS TO CODE.
INSTALL PROPORTIONAL CHLORINATOR TO FEED
ALL SOURCES.

Photo 0574: 3102 Beaver Creek Fire Hall looking west

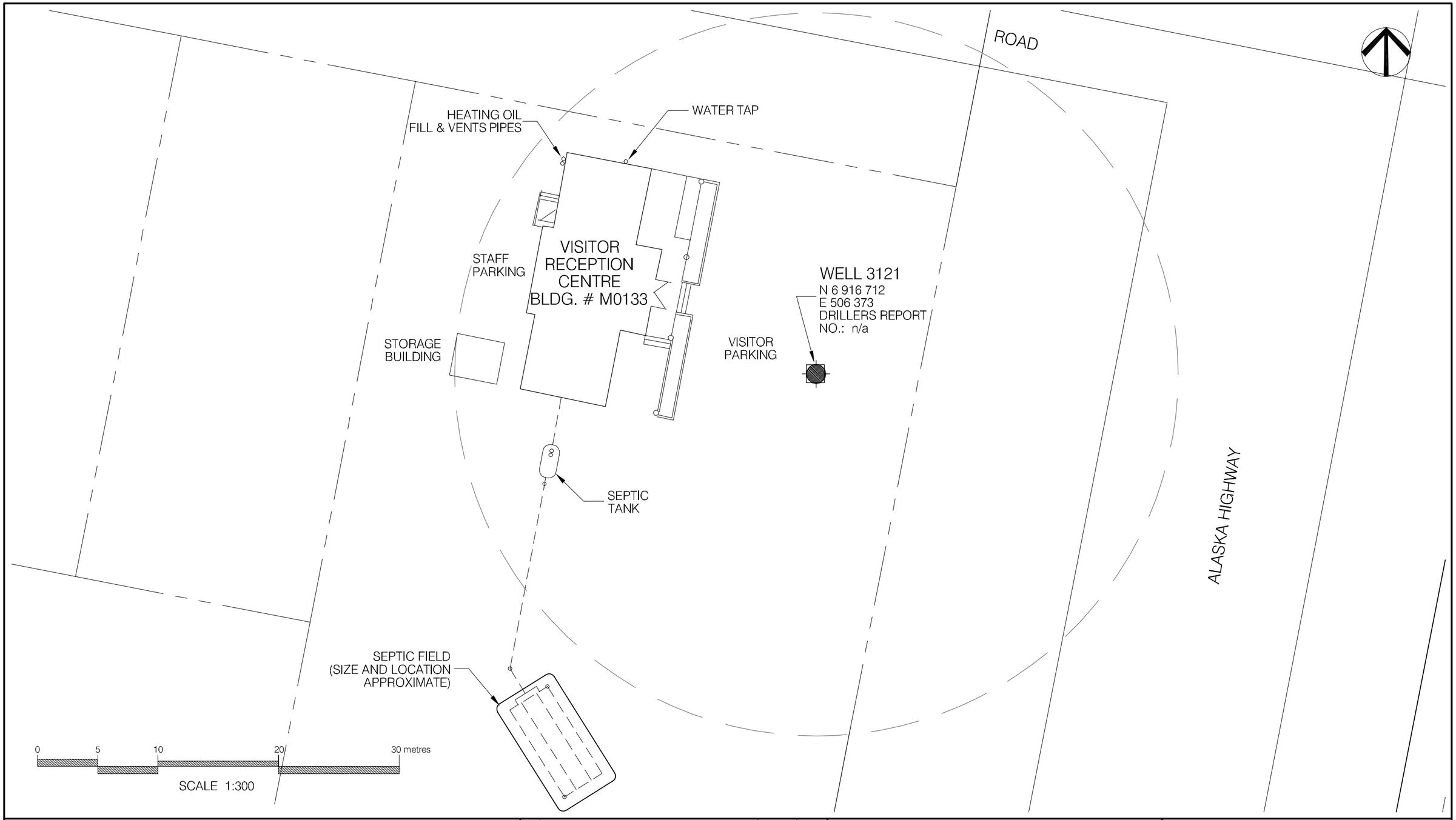
Photo 0575: 3102 Above ground fuel storage tank behind firehall

Photo 0104: 3102 Wellhead (bottom), pressure tank (top). Note well casing is covered with a piece of cloth

Photo 0576: 3102 Looking east at septic tank or leach pit (front), fire hall (rear)

Photo 0106: 3102 Water storage tank

Photo 0111: 3102 Elevated water storage tank



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.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK VISITOR RECEPTION CENTRE BUILDING # 3121
SITE LOCATION DIAGRAM
WELL ID: 3121

REVISION ISSUE: 0

FIGURE No.: FIGURE 3121-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk VRC_3121A Site Plan.dwg, 9/20/2005 10:07:49 PM, Adobe PDF

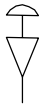
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

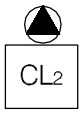

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

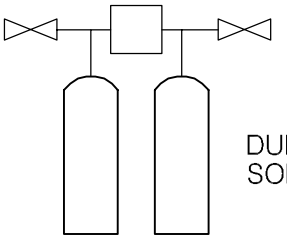
FLOW METER

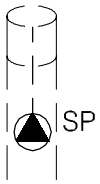
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

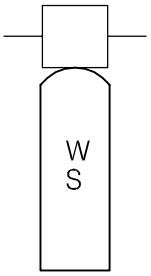


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

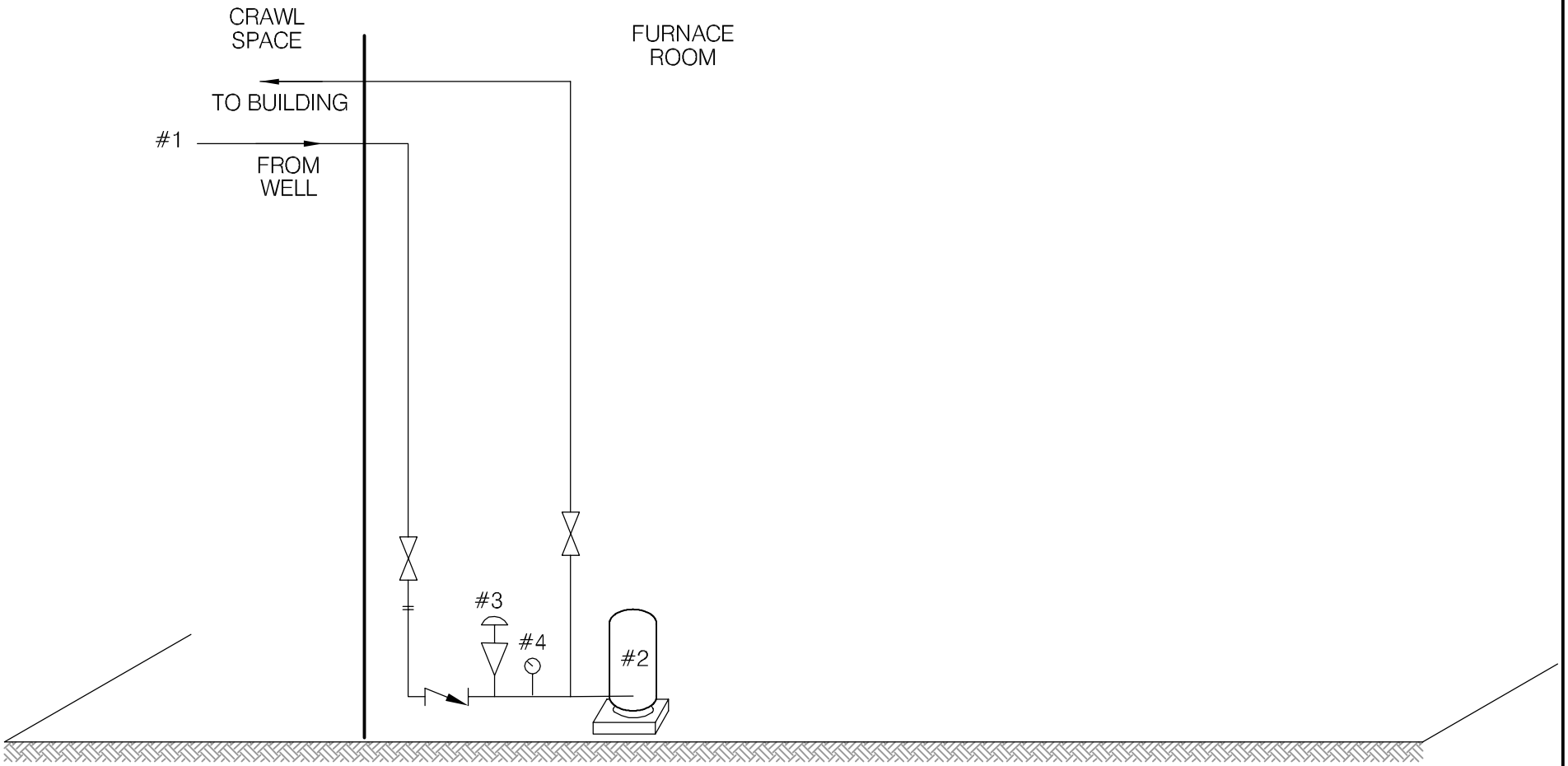


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3121 BEAVER CREEK VISITOR RECEPTION CENTRE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3121-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk VRC_3121B Schematic.dwg, 4/4/2006 12:01:25 PM, Adobe PDF, jbuyck

Western Region – Visitor Reception Centre
Building # 3121

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	MONARCH	TS655E		802	
2	PRESSURE TANK	THE WATER WORKER	W3001		94934	10 GALLON
3	PRESSURE SWITCH	SQARE D	FSG 5			
4	PRESSURE GAUGE	WINTERS	2"-(0-100)			
5						
6						
7						
8						
9						
10						

TABLE 3121- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3121	Beaver Creek Visitor Reception Centre	2	May -05 to Jun-05	no	0/2	no	16-Jun-05	no

Table 3121-2: Water Quality Results

SOURCE:	Building 3121- Beaver Creek Visitor Reception Centre			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Washroom tap			
Date Sampled	21-Sep-04	15-Jun-05	27-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		709	-			
Total Dissolved Solids	351	427	-			500
Hardness CaCO3	335	346	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.05	8.09	-	6.5		8.5
Turbidity (NTU)	0.5	0.42	-		1	5
UV Absorbance			0.0180			
% UV Transmittance			95.9			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	286	297	-			
Chloride Cl	23.7	32.7	29.5			250
Fluoride F	<0.05	0.036	-		1.5	
Silicate SiO4			-			
Sulphate SO4	26.0	28.6	-			500
Nitrate Nitrogen N	2.9	4.95	5.17		10	
Nitrite Nitrogen N	<0.05	<0.10	<0.0010		3.2	
Ammonia Nitrogen N			<0.020			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0008	0.00069	-		0.025	
Barium T-Ba	0.123	0.120	-		1	
Boron T-B	0.029	<0.10	-		5	
Cadmium T-Cd	0.00001	<0.00020	-		0.005	
Calcium T-Ca		108	-			
Chromium T-Cr	0.002	<0.0020	-		0.05	
Copper T-Cu	0.012	0.0094	-		1	
Iron T-Fe	0.04	<0.030	-			0.3
Lead T-Pb	0.0006	<0.0010	-		0.01	
Magnesium T-Mg		18.6	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		2.43	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na	4.7	4.5	-			200
Uranium T-U	<0.0005	0.00053	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.084	0.056	-			5
Organic Parameters						
Tannin and Lignin			0.11			
Total Organic Carbon C			1.54			
Field Chemistry (EBA)						
pH			7.82	6.5		8.5
TDS (ppm)			352			500
EC (uS/cm)			700			
Temperature (°C)			7.8			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2004

WELL ID #	Owner	Location Description
3121	YTG	Beaver Creek Visitor Reception centre

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Mile 1202 Alaska Highway

c. GPS location: N 6916712 E 506373

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Visitor Reception Centre

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Visitor Reception Centre

h. Distance from well to building ~6 m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Septic tank @ ~18m, field @33m

k. Well location relative to field: ☒ upslope ☐ downslope ☐ lateral

l. 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

---

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Enclosure covered by heavy manhole, but no lock

Entrance by animals? ☐ Yes ☒ No Access possible - mushrooms growing on pit floor

p. Is well site subject to flooding? ☒ Yes ☐ No located at low point in V.R.C. parking lot

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Alaska Hwy ; Distance from well to Potential Source 1: ~19m

Potential Source 2: Indoor AST ; Distance from well to Potential Source 2: ~19m

Potential Source 3: Parking area ; Distance from well to Potential Source 3: well located in parking area

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
located in parking lot.

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~0.45m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Styrofoam insulation and heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

Electrical to pump is not wired to code.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 27/05

WELL ID #	Owner	Location Description
3121	YTG	VRC - BEAVER CREEK

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ? ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: FURNACE ROOM

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:

THE PUMP CONTROL SYSTEM DOES NOT MEET CODE.

b. Recommendations:

REPIPE THE PUMP CONTROLS WITH MATERIAL THAT MEETS THE PLUMBING CODE. REPLACE THE PRESSURE SWITCH - IT DATES BACK TO 1970. INSTALL TREATMENT IF REQUIRED TO SUIT UV INSTALLATION. INSTALL UV (NSF55 CERTIFIED) STERILIZER.
INSTITUTE BI ANNUAL WELL MAINTENANCE PROGRAM
SERVICE UV SYSTEM REGULARLY.

Photo 0562: 3121 Beaver Creek Visitor Reception Centre looking east

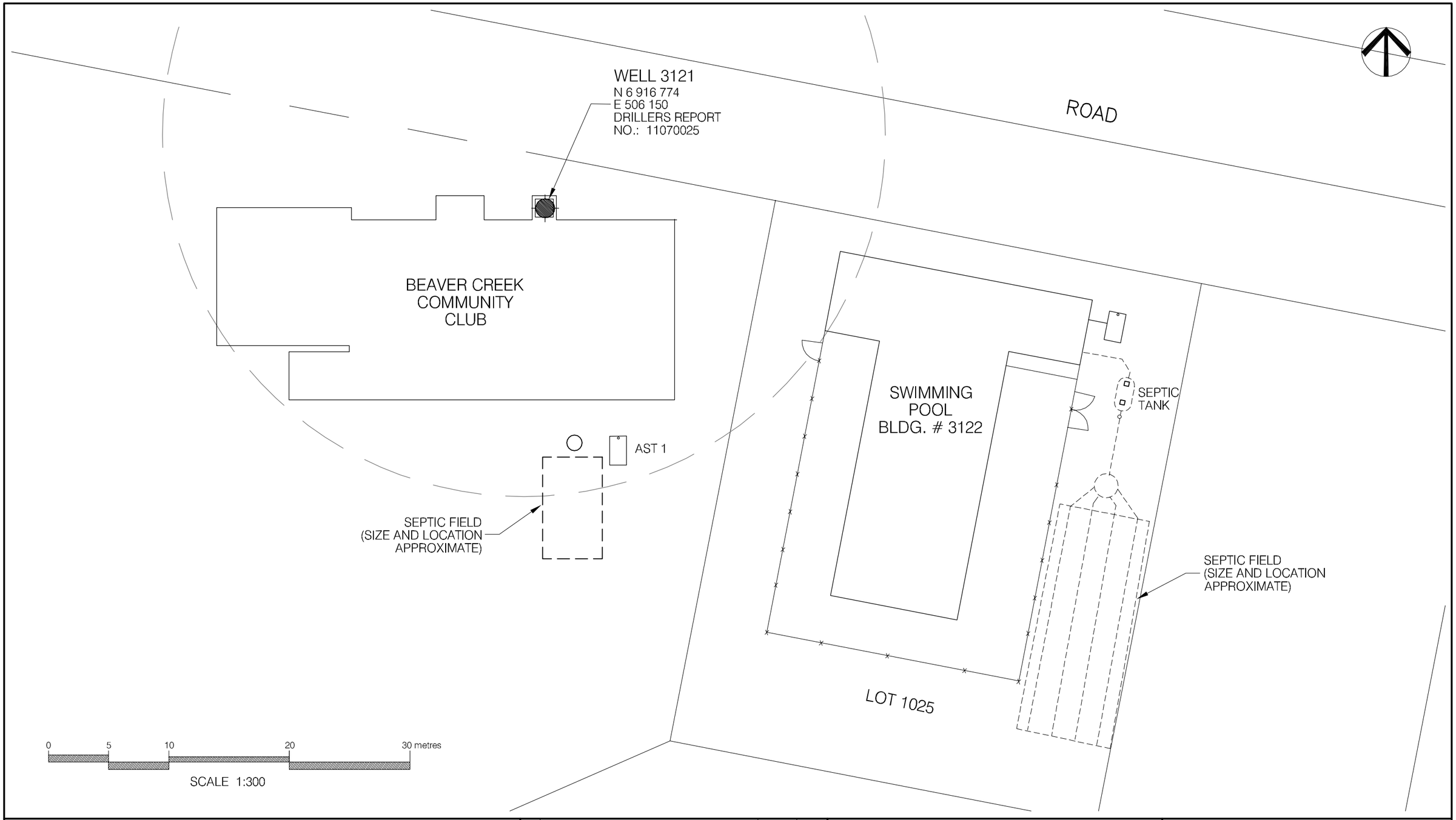
Photo 0559: 3121 Wellhead enclosure in parking lot

Photo 0561: 3121 Wellhead in pit

Photo 0563: 3121 Septic field at rear to south of building

Photo 0564: 3121 Septic field looking south

Photo 0099: 3121 Point of entry and pressure tank



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK SWIMMING POOL
BUILDING # 3122
SITE LOCATION DIAGRAM
WELL ID: 3122

REVISION ISSUE: 0

FIGURE No.: FIGURE 3122-A

Z:\02\Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Swim Pool_3122A Site Plan.dwg, 9/21/2005 4:46:31 PM, Adobe PDF

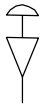
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

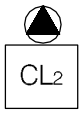

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

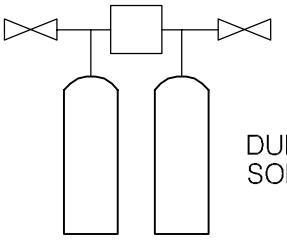
FLOW METER

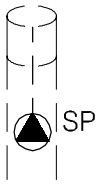
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

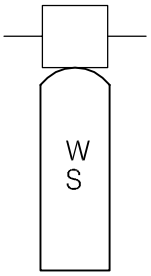


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

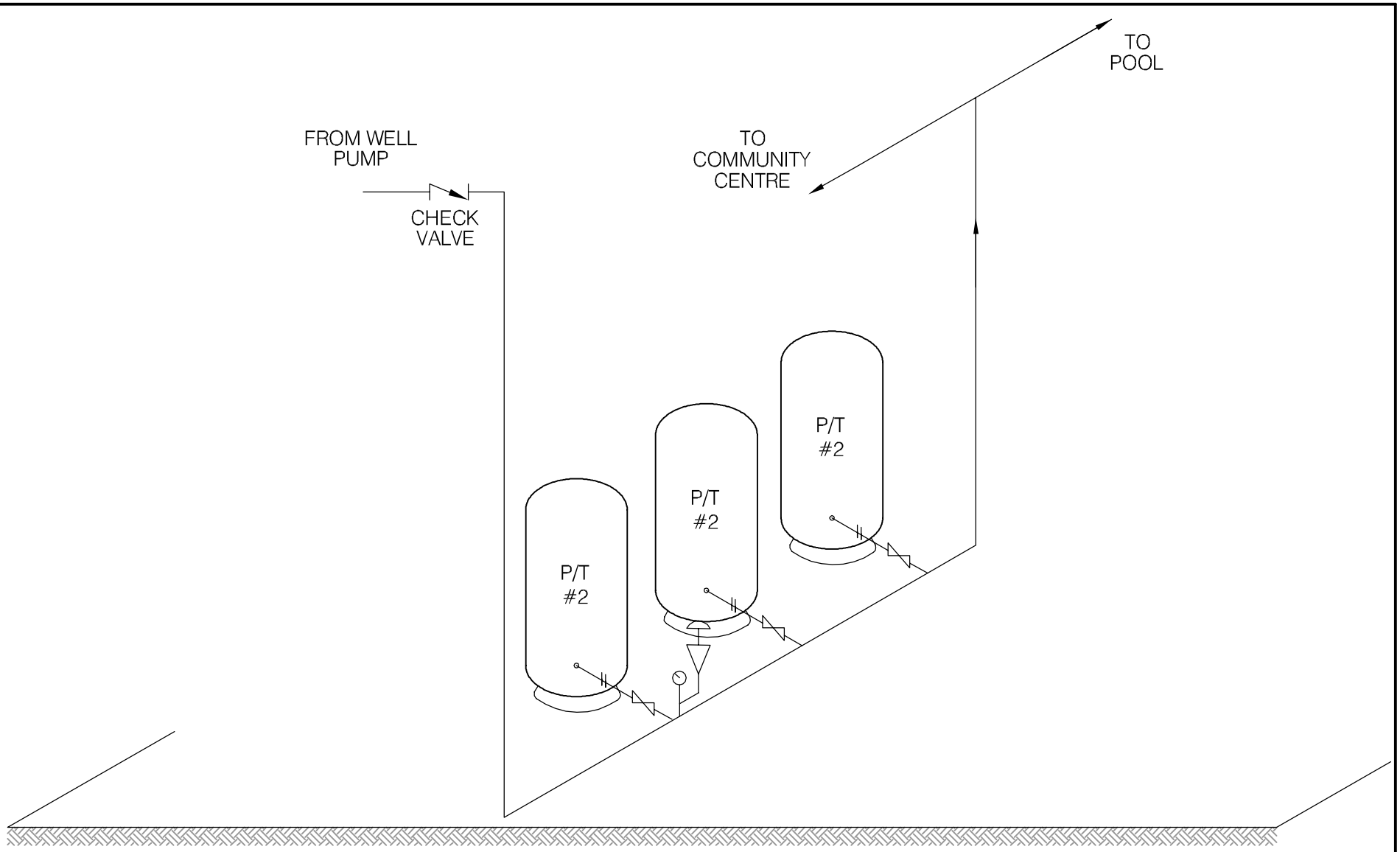


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3122 BEAVER CREEK SWIMMING POOL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3122-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Swim Pool_3122B Schematic.dwg, 4/4/2006 12:06:10 PM, Adobe PDF, jbuyck

Western Region – Swimming Pool
Building # 3122

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub Pump	N/A				4" - 3/4 HP
2	Pressure Tanks	Well x Trol	WX-350 x	3		
3	Pressure Switch	Square D	GSG-2			5HP - 1/4" NPT
4	Pressure Gauge	Marsh	2"-0-200	PSI		2" - 1/4" NPT
5						
6						
7						
8						
9						
10						

TABLE 3122- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3122	Beaver Creek Swimming Pool	1	Jun-05	no	0/1	no	16-Jun-05	no

Table 3122-2: Water Quality Results

SOURCE:	Building 3122 - Beaver Creek Swimming Pool		GCDWQ Criteria		
Location/ Resident	Beaver Creek				
Address					
Treatment	None				
Disinfection	None				
Source of Water	On-site well				
Purpose of Sampling	Base Line	Additional Analytical			
Sample Location		changing room tap			
Date Sampled	15-Jun-05	27-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*			AO	MAC	AO
Colour (CU)	<5.0	-			15
Conductivity (uS/cm)	404	-			
Total Dissolved Solids	231	-			500
Hardness CaCO3	194	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.13	-	6.5		8.5
Turbidity (NTU)	0.26	0.72		1	5
UV Absorbance		0.0110			
% UV Transmittance		97.5			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	183	-			
Chloride Cl	2.68	-			250
Fluoride F	0.052	-		1.5	
Silicate SiO4		-			
Sulphate SO4	33.0	-			500
Nitrate Nitrogen N	0.71	-		10	
Nitrite Nitrogen N	<0.10	-		3.2	
Ammonia Nitrogen N		-			
Total Phosphate PO4		-			
Total Metals *(ALS)*					
Aluminum T-Al	<0.010	-			
Antimony T-Sb	<0.00050	-		0.006	
Arsenic T-As	0.00048	-		0.025	
Barium T-Ba	0.041	-		1	
Boron T-B	<0.10	-		5	
Cadmium T-Cd	<0.00020	-		0.005	
Calcium T-Ca	63.8	-			
Chromium T-Cr	<0.0020	-		0.05	
Copper T-Cu	0.432	-		1	
Iron T-Fe	<0.030	-			0.3
Lead T-Pb	0.0014	-		0.01	
Magnesium T-Mg	8.50	-			
Manganese T-Mn	<0.0020	-			0.05
Mercury T-Hg	<0.00020	-		0.001	
Potassium T-K	1.17	-			
Selenium T-Se	<0.0010	-		0.01	
Sodium T-Na	3.7	-			200
Uranium T-U	0.00035	-		0.02	
Vanadium T-V		-			
Zinc T-Zn	<0.050	-			5
Organic Parameters					
Tannin and Lignin		0.21			
Total Organic Carbon C		1.17			
Field Chemistry (EBA)					
pH		8.05	6.5		8.5
TDS (ppm)		203			500
EC (uS/cm)		403			
Temperature (°C)		6.9			
Free Available Chlorine					

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
3122	YTG	Beaver Creek Swimming Pool

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Beaver Creek Community Club building

c. GPS location: N 6916774 E 506150 elv 670m ± 9m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Community Club and Swimming Pool
☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in an enclosure off from the Community Club building

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~22m (~20m to tank)

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. 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
There is also a septic tank and field ~50m from the well

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Unlocked enclosure. Entrance by animals? ☐ Yes ☒ No Access possible

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

q. Is the well site well drained? ☐ Yes ☒ No Ground around well is flat - no apparent drainage

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unknown but unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☐ Yes ☐ No Describe _____

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

Potential Source 1: AST ; Distance from well to Potential Source 1: ~20m

Potential Source 2: _____ ; Distance from well to Potential Source 2: _____

Potential Source 3: _____ ; Distance from well to Potential Source 3: _____

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year 1979 Month October

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 _____ ☒ No

f. Well casing: Diameter 15cm Material: likely ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 63 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: unknown

☐ 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 3.5 ft slot size(s) 20 slot
Location of screen: from 59 ft to 62.5 ft from log reported

l. Is there a sump below the screen? ☐ Yes ☒ No

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
Concrete pit with pwf plywood lid

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.4 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify Access possible

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc...) _____

---

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
unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: heat trace and insulation

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 27/05

WELL ID #	Owner	Location Description
3122	YTG	BEAVER CREEK SWIMMING POOL

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☑ Yes ☐ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: Pressure Tanks (3)

Where is it located?
Comments: Furnace Room

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:

THIS IS A PROFESSIONAL BUT OLD INSTALLATIONS. 2 OF THE TANKS HAVE SLIGHT LEAKS. THE PUMP IS VERY NOISY AND RUNS FOR A LONG TIME. IT IS WORTH NOTING THAT THIS SYSTEM HAD EARLIER BEEN SERVED BY A 2 HP SUB. PUMP. IT NOW HAS ONLY A 3/4 HP PUMP.

b. Recommendations:

REPAIR THE LEAKS. BRING INSTALLATION BACK UP TO CODE IE INSULATE THE COPPER LINES AS THEY ARE SWEATING ~~HEAVY~~ HEAVY AT THIS POINT. INSTALL TREATMENT AS DETERMINED BY THE WATER ANALYSIS TO SUIT UV TREATMENT. INSTALL APPROPRIATE UV FOR FLOW REQUIREMENT.
INSTITUTE BY ANNUAL WELL MAINTENANCE PROGRAM.

MIDNIGHT SUN DRILLING CO. LTD.
PH. 667-6144
WHITEHORSE Y.T.
P.O. Box 4391

FIELD REPORT

1110670025

Started Oct. 6 19 79

Completed ..... 19 ....

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Far West Holdings Ltd (W/W)		Community Hall
Mile 1202 Beaver Creek		

FORMATION LOG FROM	TO	FORMATION
0'	8'	Gr.
8'	18'	Till
18	36	Gr. cobbles.
36	54	Gr. s'/t
54	63	Gr.

DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
MOVE				
moving on setting up	oct. 6	8:00	8:30	.5
	"	8:30	6:00	2.5
setting screen 4 HRS	"	6:00	6:30	.5
developing 1 HR	"	6:30	7:30	1
moving off	"	7:30	8:00	.5
Traveling	oct 7	8:00	3:30	7.5

Rcrd. of Casing & Pipe Size	Type	Size	Type
Feet	Inch	Feet	Inch
59'			

Remarks:
Bottom of screen 62' 6"
20 slot
lead packer
4 3/4 bit pin
developed at 20 gals./min.

STATIC LEVEL	Total Rig Time 12.5 hrs.
Ground level	Total Standby hrs.
Top of casing	Drilling Mud sacks

SIGNATURES

MIDNIGHT SUN.....
TITLE.....

CLIENT.....
TITLE.....

Photo 0538: 3122 Beaver Creek Swimming Pool (left), Beaver Creek Community Club (right)

Photo 0537: 3122 Wellhead enclosure under wheelchair ramp

Photo 0535: 3122 Wellhead in pit

Photo 0539: 3122 Above ground fuel storage tank

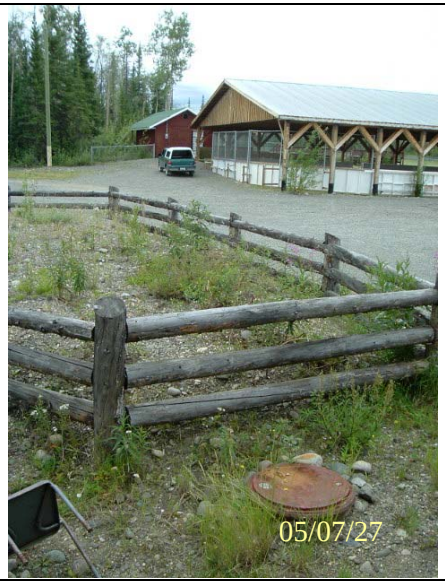
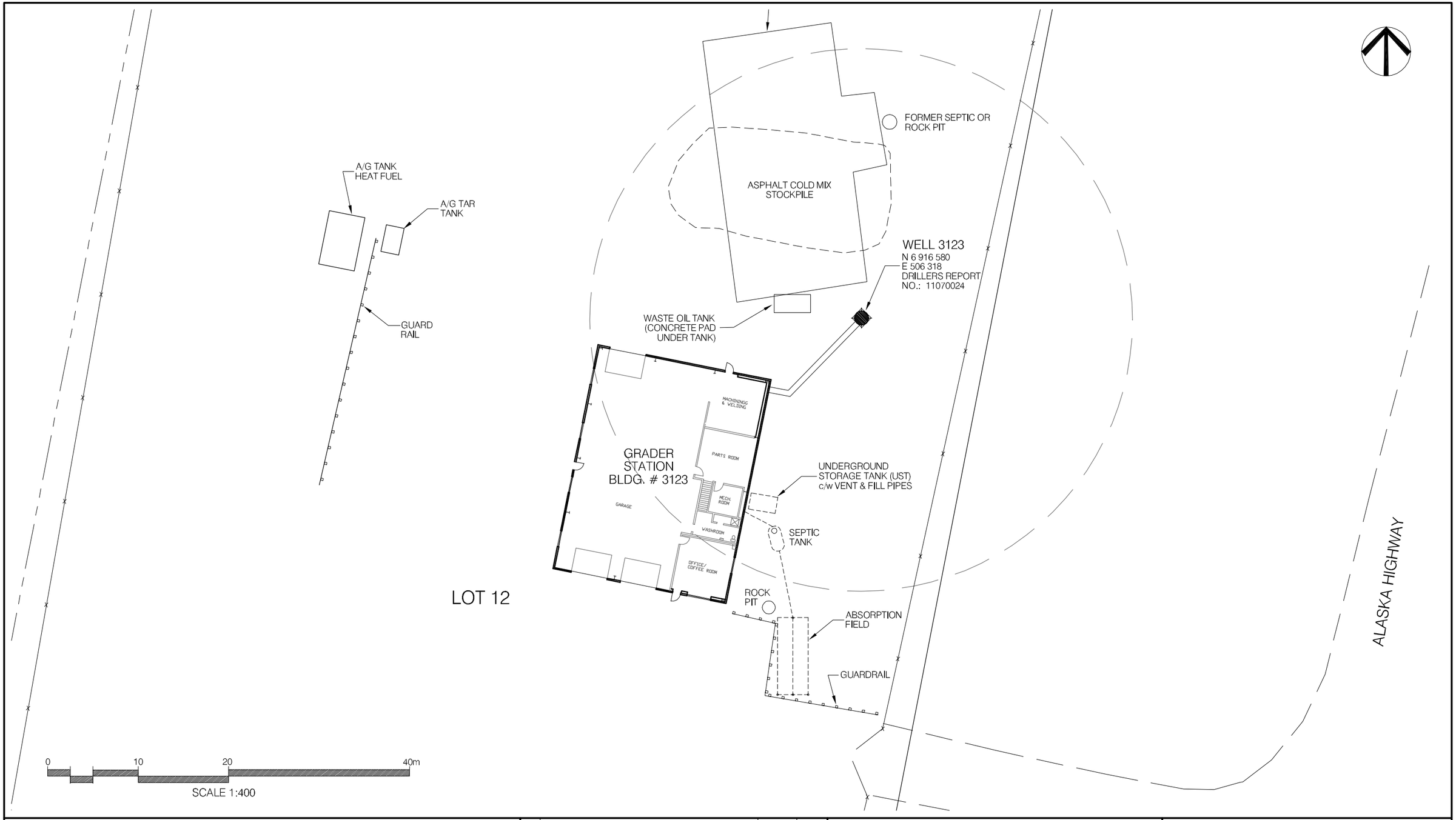


Photo 0540: 3122 Community Club septic field

Photo 0542: 3122 Swimming pool septic field

Photo 0083: 3122 Point of entry to Community Club

Photo 0087: 3122 Pressure tanks in crawl space of Community Club



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK GRADER STATION
BUILDING # 3123
SITE LOCATION DIAGRAM
WELL ID: 3123

REVISION ISSUE 0

FIGURE No. FIGURE 3123-A

Z:\020\Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Grader Station_3123A Site Plan.dwg, 9/20/2005 10:40:39 PM, Adobe PDF

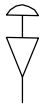
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

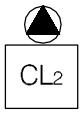

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

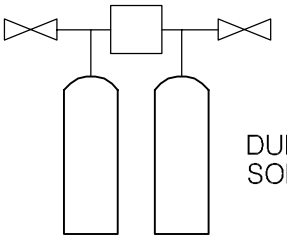
FLOW METER

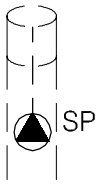
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

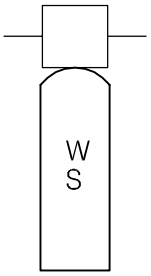


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

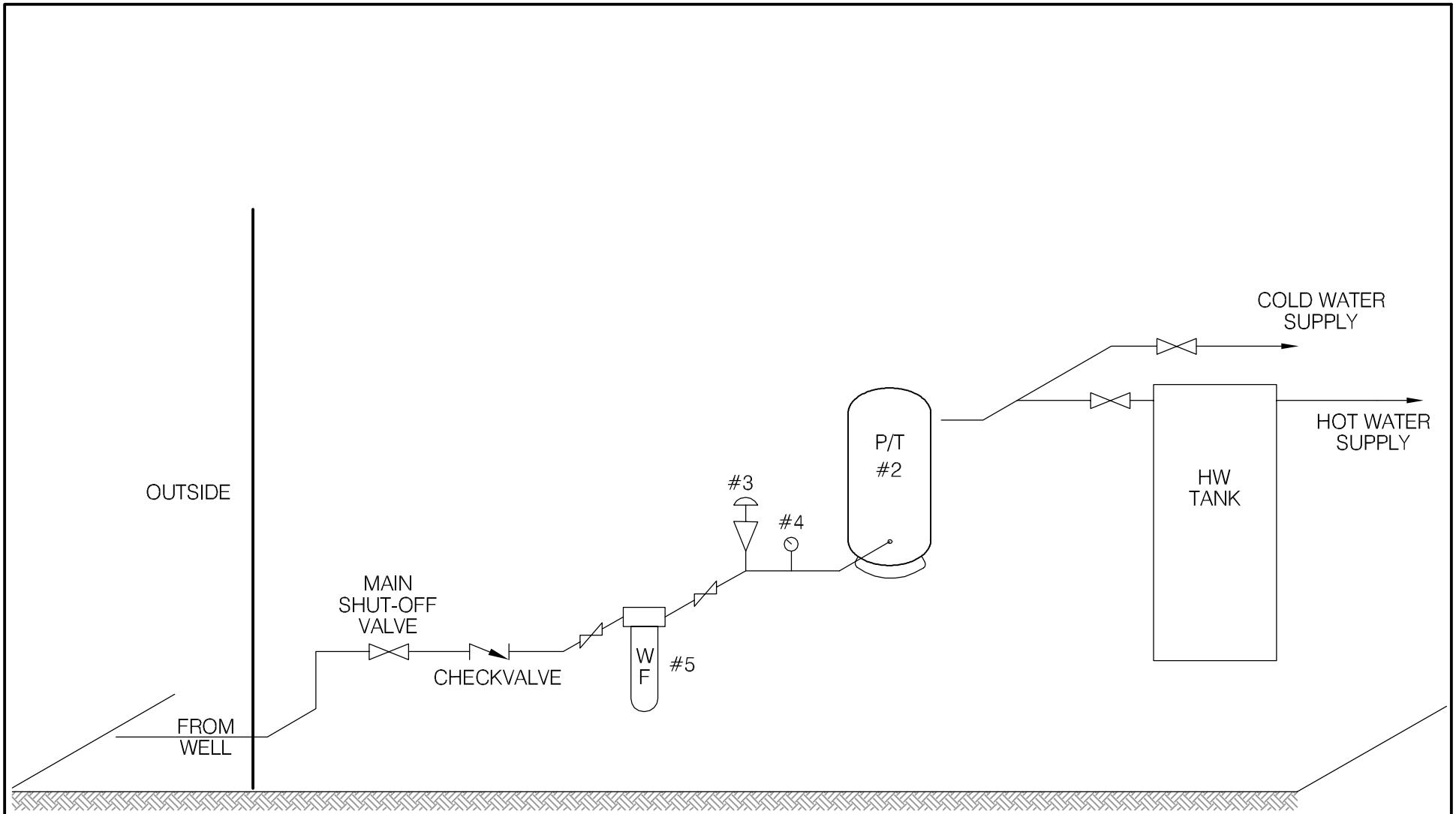


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3123 BEAVER CREEK GRADER STATION	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3123-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Grader Station_3123B Schematic.dwg, 4/4/2006 12:47:05 PM, Adobe PDF, jbuyck

Western Region – Beaver Creek Grader Station
Building # 3123

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP.	?	?	NO CONTROL BOX		VISIBLE
2	PRESSURE TANK	CHALLENGER	PC 66			20 GALLON
3	PRESSURE SWITCH	SQUARE D	FSG-2	224310		2HP 1/4" NPT
4	PRESSURE GAUGE	MARSH	0-100 PST	633640		2" - 1/4" NPT
5	INLINE FILTER	AMETEK	10" CLEAR	AP-110		10" 5 MICRON
6						
7						
8						
9						
10						

TABLE 3123- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3123	Beaver Creek Grader Station	8	Oct-04 to Jun-05	no	0/8	no	16-Jun-05	no

Table 3123-2: Water Quality Results

SOURCE:	Building 3123 - Beaver Creek Grader Station			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	Filtration					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Kitchen tap			
Date Sampled	21-Sep-04	15-Jun-05	27-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	<5.0	<5.0	-			15
Conductivity (uS/cm)		363	-			
Total Dissolved Solids	109	222	-			500
Hardness CaCO3	97.3	152	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.24	8.17	-	6.5		8.5
Turbidity (NTU)	0.3	0.36	-		1	5
UV Absorbance			0.007			
% UV Transmittance			98.4			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	91	155	-			
Chloride Cl	5.7	3.08	-			250
Fluoride F	<0.05	0.057	-		1.5	
Silicate SiO4			-			
Sulphate SO4	9.73	34.0	-			500
Nitrate Nitrogen N	<0.1	0.60	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0007	0.00036	-		0.025	
Barium T-Ba	0.067	0.033	-		1	
Boron T-B	0.009	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		48.6	-			
Chromium T-Cr	<0.0005	<0.0020	-		0.05	
Copper T-Cu	0.011	0.0295	-		1	
Iron T-Fe	0.03	<0.030	-			0.3
Lead T-Pb	0.0004	<0.0010	-		0.01	
Magnesium T-Mg		7.42	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.05	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na	1.5	2.9	-			200
Uranium T-U	<0.0005	0.00030	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.058	0.140	-			5
Organic Parameters						
Tannin and Lignin			0.14			
Total Organic Carbon C			0.89			
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		0.00001	
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			8.01	6.5		8.5
TDS (ppm)			186			500
EC (uS/cm)			370			
Temperature (°C)			13.9			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
3123	YTG	Beaver Creek Grader Station

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6916580 E 506318 elv 674m ± 5m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Grader Station Maintenance Garage

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Maintenance Garage

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 26m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. 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
Former septic or rock pit @~22m. Current septic field 34 - 36m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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
Unlocked enclosure

Entrance by animals? ☐ Yes ☒ No
Access possible. Evidence of mice and ants.

p. Is well site subject to flooding? ☒ Yes ☐ No
Enclose is at low point

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

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~22m

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

☒ Yes ☐ No Describe Assorted scrap metal around the site and industrial activities

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

Potential Source 1: Used oil AST ; Distance from well to Potential Source 1: ~7m
Potential Source 2: Asphault ; Distance from well to Potential Source 2: ~8m
Potential Source 3: Rock Pit ; Distance from well to Potential Source 3: 34m
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year 1983 Month November

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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 107.5 ft ☐ 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 3 ft slot size(s) 20 slot
Location of screen: from 104.5 ft to 107.5 ft (from log) reported

l. Is there a sump below the screen? ☐ Yes ☒ No

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail No, ~10cm above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Evidence of mice and ants

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc...) _____

---

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 unlikely

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace + insulation

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 26/05

WELL ID #	Owner	Location Description
3123	YTG	BEAVER CREEK GRADER STATION

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK

Where is it located?
Comments: MECHANICAL ROOM

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:

THE INSTALLATION IS OF GOOD QUALITY IN BOTH WORKMANSHIP & INSTALLATION

b. Recommendations:

INSTALL TREATMENT ACCORDING TO WATER ANALYSIS TO SUIT UV INSTALLATION. INSTALL UV (NSF 55 CERTIFIED) TO SUIT FLOW REQUIREMENT; INITIATE BI-ANNUM SUPERCHLORINATION OF WATER WELL & PIPING SYSTEM.

MIDNIGHT SUN DRILLING CO. LTD.
WHITEHORSE Y.T.
PH. 633-3070
P.O. BOX 4391
WHITEHORSE, YUKON

Field Report

111070024

Type A-P

Started Nov. 2 198

Completed Nov. 3 198

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Y.T.G.	W/W	shop
Beaver Creek		

FORMATION LOG FROM	TO	FORMATION
0'	25'	Gr.
25'	38'	Gr. Cobbs.
38'	93'	Clay Gr. silt
93'	97'	Gr. some silt
97'	107.5	Gr. Size sand.

DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
MOVE				
Travel	Nov. 2	4:00	12:00	8
move on set up	"	1:00	2:00	1
	"	2:00	6:00	4
	Nov. 3	8:00	9:30	1.5
set screen	"	9:30	10:30	1
Develop.	"	10:30	1:30	3
move off.	"	1:30	2:00	0.5

Rcrd. of Casing & Pipe

Size	Type	Size	Type
Feet	Inch	Feet	Inch
104'	6"		

Remarks:

1 - Drive shoe.
20 slot
1 - 5 7/8" bit pin
Riser lead packer.
30 GPM.

Static Level		Total Rig Time	hrs.
Ground Level		Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN... Lars Jorgenson...

TITLE..... Cable Operator...

CLIENT... James A. Cook.....

TITLE.....

Willow Printers

Photo 0518: 3123 Beaver Creek Grader Station maintenance garage (back left), wellhead (front left), above ground used oil storage tank (back right)

Photo 0516: 3123 Wellhead in enclosure

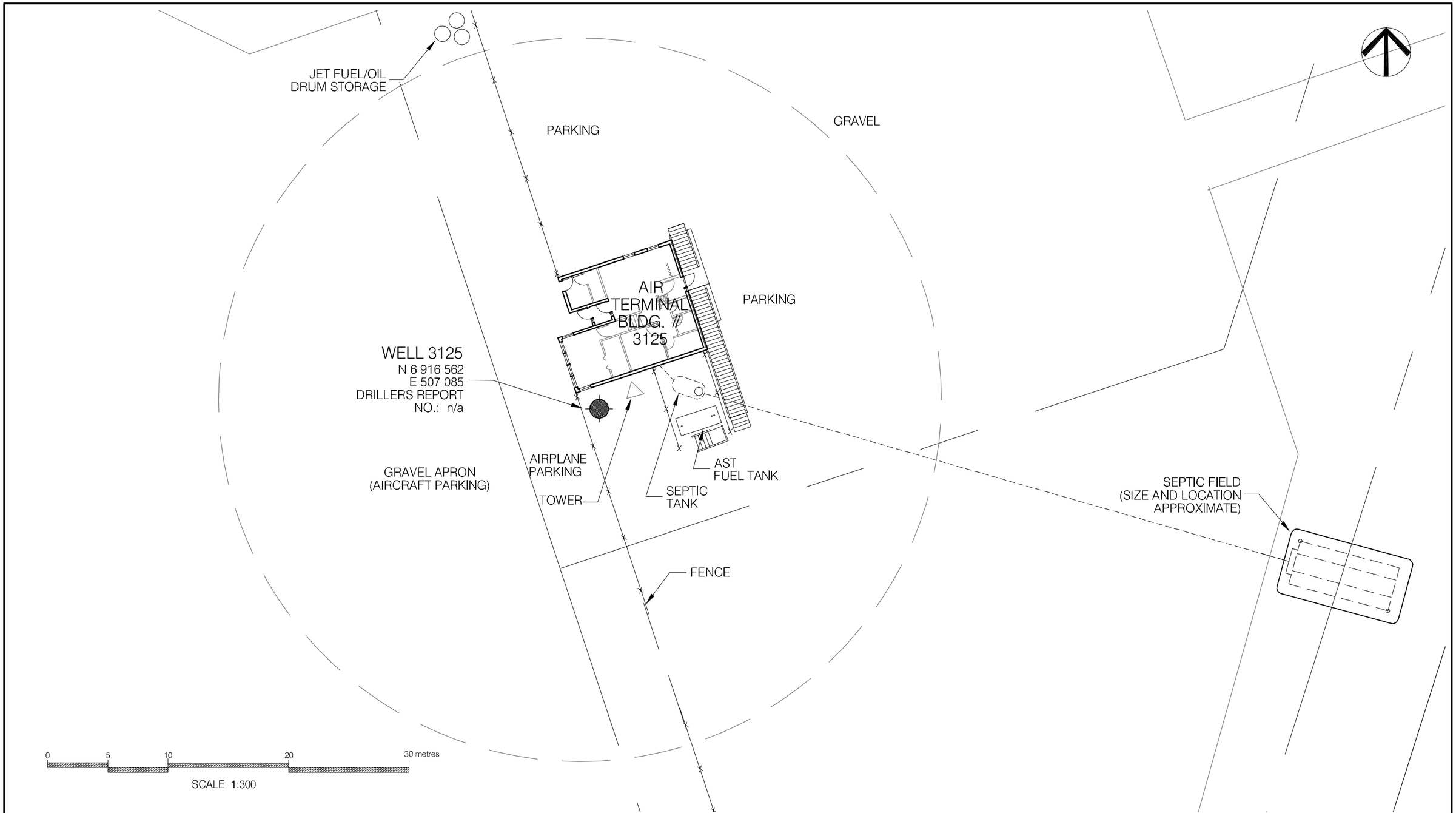
Photo 0520: 3123 Leach pit (centre), maintenance garage (left), wellhead enclosure (back centre)

Photo 0515: 3123 Heating fuel and tar above ground storage tank

Photo 0519: 3123 Cold mix asphalt pile (rear), wellhead enclosure (front left)

Photo 0073: 3123 In-line filter

Photo 0074: 3123 Pressure tank and pump controls



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT:

Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK AIR TERMINAL
BUILDING # 3125
SITE LOCATION DIAGRAM
WELL ID: 3125

REVISION ISSUE 0

FIGURE No. FIGURE 3125-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002-B Crk Air Termina_3125A Site Plan.dwg, 9/20/2005 10:44:35 PM, Adobe PDF

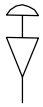
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

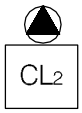

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

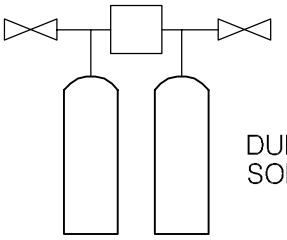
FLOW METER

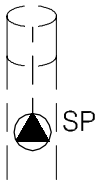
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

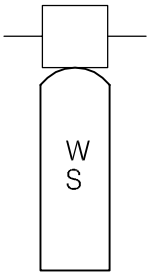


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

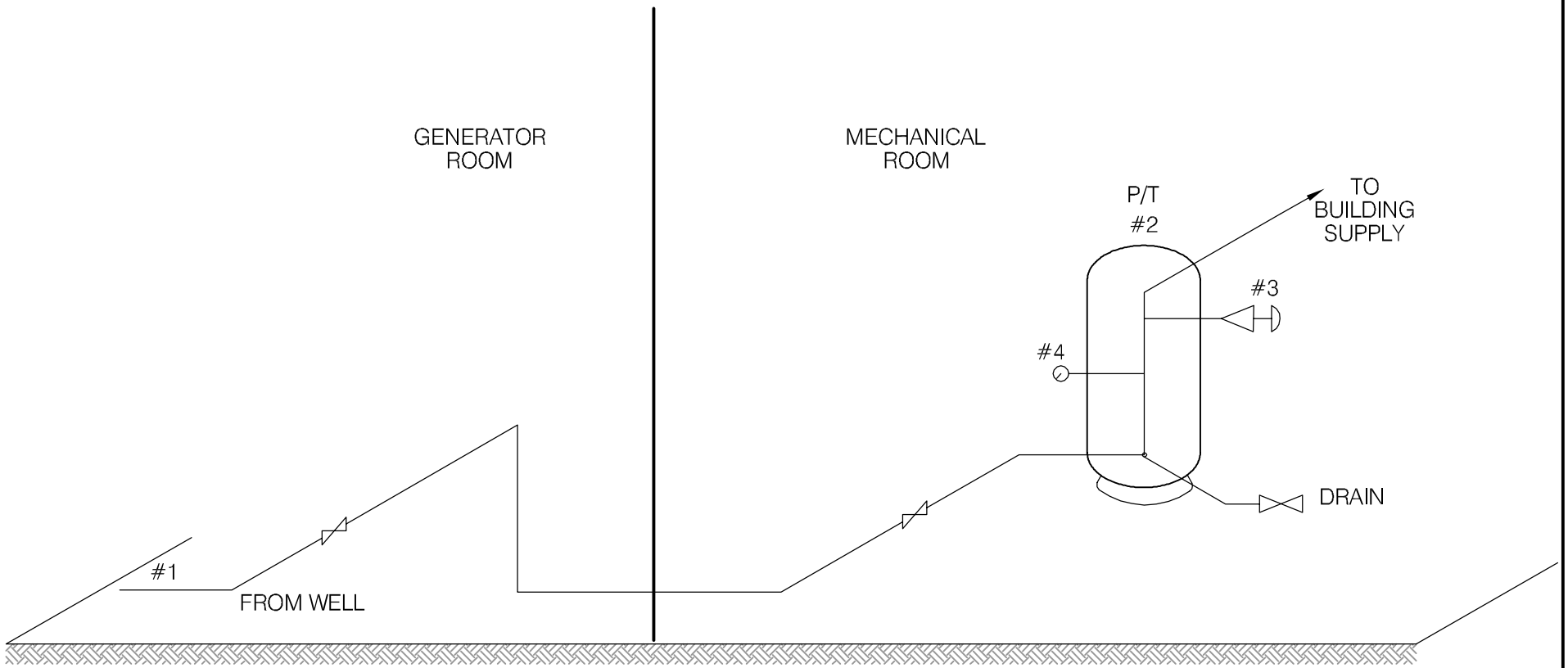


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3125 BEAVER CREEK AIR TERMINAL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3125-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\beaver\1260002 B Crk Air Terminal_3125B Schematic.dwg, 4/4/2006 12:49:52 PM, Adobe PDF, jbuyck

Western Region – Beaver Creek Air Terminal Building
Building # 3125

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub Pump.	Monarch	WK12A5EX		834	4" - 1/2 HP.
2	Pressure Tank	Challenger	PC 122			
3	Pressure Switch	Square D	FSG-2			2HP - 1/4" NPT
4	Pressure Gauge	Marsh	0-100 PST			2" - 1/4" NPT
5						
6						
7						
8						
9						
10						

TABLE 3125- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3125	Beaver Creek Air Terminal Building	9	Sept-04 to Jun-05	**yes**	1/9	no	16-Jun-05	no

Table 3125-2: Water Quality Results

SOURCE:	Building 3125 - Beaver Creek Air Terminal Building			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Washroom tap			
Date Sampled	21-Sep-04	15-Jun-05	27-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	7	<5.0	-			15
Conductivity (uS/cm)		290	-			
Total Dissolved Solids	156	171	-			500
Hardness CaCO3	137	126	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.29	8.16	-	6.5		8.5
Turbidity (NTU)	**4.1**	**3.29**	**11.7**		1	5
UV Absorbance			0.0060			
% UV Transmittance			98.6			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	120	118	-			
Chloride Cl	<0.5	0.62	-			250
Fluoride F	<0.05	0.059	-		1.5	
Silicate SiO4			-			
Sulphate SO4	28.9	32.6	-			500
Nitrate Nitrogen N	0.2	0.22	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0006	0.00041	-		0.025	
Barium T-Ba	0.011	<0.020	-		1	
Boron T-B	0.026	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		39.3	-			
Chromium T-Cr	0.0005	<0.0020	-		0.05	
Copper T-Cu	0.059	0.102	-		1	
Iron T-Fe	0.27	0.209	-			0.3
Lead T-Pb	0.0014	0.0010	-		0.01	
Magnesium T-Mg		6.67	-			
Manganese T-Mn	0.014	0.0090	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.08	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na	3.0	2.5	-			200
Uranium T-U	<0.0005	0.00030	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	1.47	1.02	-			5
Organic Parameters						
Tannin and Lignin			<0.10			
Total Organic Carbon C			0.90			
Extractable Hydrocarbons						
EPH10-19			<0.30			
EPH19-32			<1.0			
LEPH			-			
HEPH			-			
Field Chemistry (EBA)						
pH			8.31	6.5		8.5
TDS (ppm)			127			500
EC (uS/cm)			251			
Temperature (°C)			17.5			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin Date July 27, 2005

WELL ID #	Owner	Location Description
3125	YTG	Beaver Creek Airport Terminal Building

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Mile 1204 Alaska Highway

c. GPS location: N 6919562 E 507085 elv 654 m ± 5 m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
but is in locked enclosure on side of building

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Airport Terminal Building

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Airport terminal building

h. Distance from well to building ~2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~54m (5m to tank)

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. 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
Septic tank @ 5m and service lines ≤30m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Entrance by animals? ☒ Yes ☐ No
unlocked enclosure

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

q. Is the well site well drained? ☐ Yes ☒ No ground around wellhead is flat. -no drainage

r. Is there a buried fuel tank on the property? ☐ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No
Distance from the well to known buried tank _____

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

☐ Yes ☐ No Describe _____

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

Potential Source 1: AST ; Distance from well to Potential Source 1: 5m
Potential Source 2: oil drums ; Distance from well to Potential Source 2: 30m
Potential Source 3: vehicle parking ; Distance from well to Potential Source 3: 10m
Potential Source 4: aircraft parking; Distance from well to Potential Source 4: 5m
Avgas, jet fuel storage area within 30m

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

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

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

concrete pit

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.15 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition Solid plate cap

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation and heat trace

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 26/05

WELL ID #	Owner	Location Description
3125	YTG	BEAVER CREEK AIRPORT

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK

Where is it located?
Comments: MECHANICAL ROOM

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:

INSIDE INSTALLATION IS OF GOOD QUALITY WORKMANSHIP & MATERIAL. THERE IS NO TREATMENT.

b. Recommendations:

INSTALL TREATMENT IF REQUIRED TO SUIT A UV STERILIZER (NSF55 CERTIFIED). INSTALL APPROPRIATE UV STERILIZER TO SUIT FLOW REQUIREMENTS.

Photo 0528: 3125 Beaver Creek Airport Terminal Building

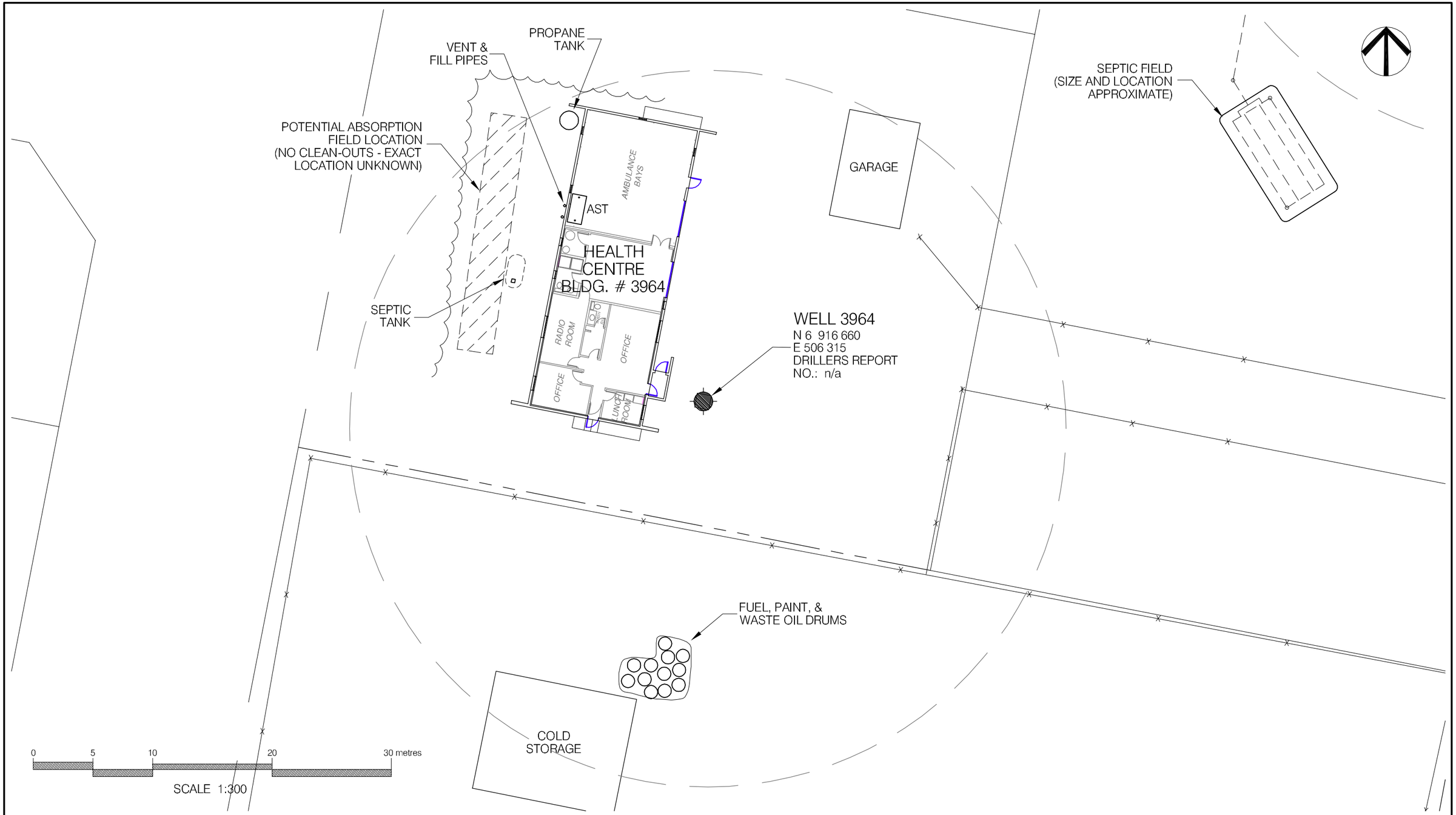
Photo 0529: 3125 terminal building (rear), wellhead enclosure (left), above ground fuel storage tank (right)

Photo 0531: 3125 Wellhead in pit

Photo 0534: 3125 Parking lot, septic field (back right)

Photo 0532: 3125 Manhole to septic system

Photo 0081: 3125 Point of entry and pressure tank



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BEAVER CREEK HEALTH CENTRE
BUILDING # 3964
SITE LOCATION DIAGRAM
WELL ID: 3964

REVISION ISSUE 0

FIGURE No. FIGURE 3964-A

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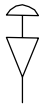
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

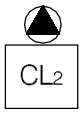

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

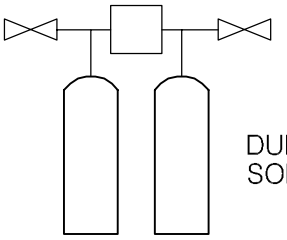
FLOW METER

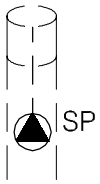
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

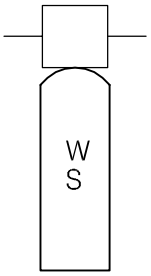


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

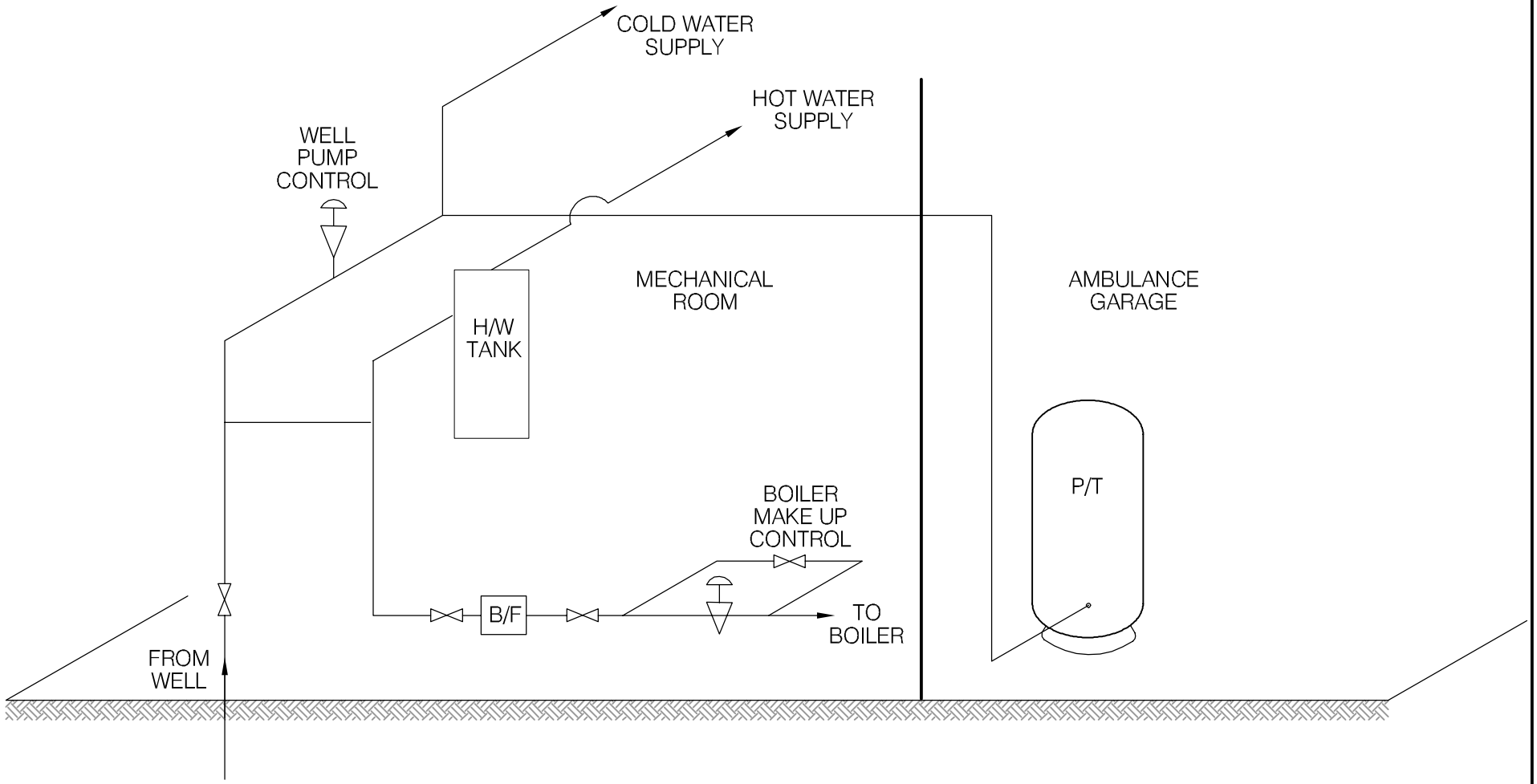


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3964 BEAVER CREEK HEALTH CENTRE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3964-B

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Western Region – Beaver Creek Health Centre
Building # 3964

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	UNKNOWN	3/4 HP.			4" SUB.
2	PRESSURE TANK	WELL-X-TROL	WX 203			
3	PRESSURE SWITCH	SQUARE D	FSG-2			2 HP - 1/4" NPT
4						
5						
6						
7						
8						
9						
10						

TABLE 3964- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3964	Beaver Creek Health Centre	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3964-2: Water Quality Results

SOURCE:	Building 3964 - Beaver Creek Health Centre			GCDWQ Criteria		
Location/ Resident	Beaver Creek					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Washroom tap			
Date Sampled	21-Sep-04	15-Jun-05	27-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		515	-			
Total Dissolved Solids	259	316	-			500
Hardness CaCO3	234	255	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.06	8.13	-	6.5		8.5
Turbidity (NTU)	1.6	0.74	-		1	5
UV Absorbance			0.0130			
% UV Transmittance			97.0			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	191	218	-			
Chloride Cl	17.4	16.2	-			250
Fluoride F	<0.05	0.048	-		1.5	
Silicate SiO4			-			
Sulphate SO4	32.4	37.1	-			500
Nitrate Nitrogen N	0.6	0.61	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0003	0.00026	-		0.025	
Barium T-Ba	0.052	0.050	-		1	
Boron T-B	0.027	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		83.0	-			
Chromium T-Cr	0.0011	<0.0020	-		0.05	
Copper T-Cu	0.140	0.0678	-		1	
Iron T-Fe	0.15	0.052	-			0.3
Lead T-Pb	0.0013	0.0040	-		0.01	
Magnesium T-Mg		11.6	-			
Manganese T-Mn	0.008	0.0096	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		1.45	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na		5.0	-			200
Uranium T-U	<0.0005	0.00037	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.485	0.176	-			5
Organic Parameters						
Tannin and Lignin			0.10			
Total Organic Carbon C			1.41			
Field Chemistry (EBA)						
pH			7.68	6.5		8.5
TDS (ppm)			297			500
EC (uS/cm)			593			
Temperature (°C)			14.7			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 27, 2005

WELL ID #	Owner	Location Description
3964	YTG	Beaver Creek Health Centre

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6916660 E 506315 ±9m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Beaver Creek Health Centre

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Beaver Creek Health Centre

h. Distance from well to building 3m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 18- 22 m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. 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
Septic tank @ ~20m, Visitor Reception Centre septic @ 42m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Enclosure unlocked
Entrance by animals? ☐ Yes ☒ No Access possible

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

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No
Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Indoor AST ; Distance from well to Potential Source 1: ~20m
Potential Source 2: Fuel, oil, paint drums ; Distance from well to Potential Source 2: ~20m
Potential Source 3: Asphalt pile ; Distance from well to Potential Source 3: ~40m
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

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

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 likely

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No
unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~ 1.15 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Access possible. Some evidence

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition Solid plate cap

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: heat trace and insulation

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBASSER Date July 26/05

WELL ID #	Owner	Location Description
3964	YTG.	HEALTH CENTRE BEAVER CREEK

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: AMBULANCE GARAGE

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:

HEAT TRACE NO THERMOSTAT, NO GFI PROTECTION, THE HEAT TRACE STAT IN PLACE DOES NOT APPEAR TO BE WORKING. NO PRESSURE GAUGE ON SYSTEM.

b. Recommendations:

BRING HEAT TRACE INSTALLATION TO CODE. INSTALL PRESSURE GAUGE. THIS BEING A HEALTH CENTRE - INSTALL PROPORTIONAL CHLORINATOR INLINE AT POINT OF ENTRY WITH PROPER RETENTION TANKS, INSTITUTE PROPER FREE CHLORINE RESIDUAL TESTING. INSTITUT BI-ANNUAL WELL MAINTENANCE PROGRAM.

Photo 0526: 3964 Beaver Creek Health Centre

Photo 0522: 3964 Wellhead enclosure (centre), health centre (left)

Photo 0521: 3964 Wellhead in pit

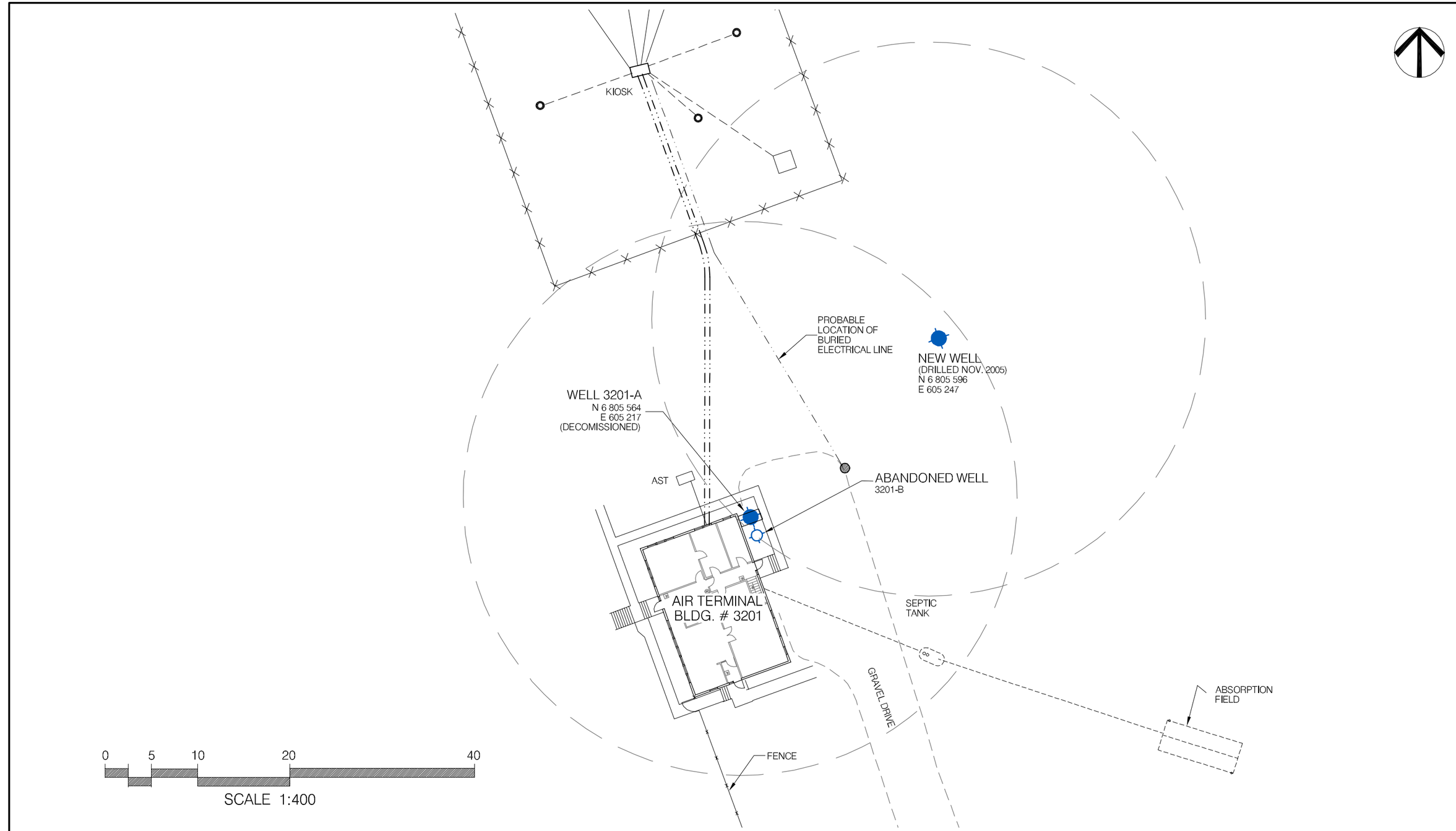
Photo 0524: 3964 Septic tank and field at rear of health centre building

Photo 0525: 3964 Looking south at Beaver Creek Grader Station (site 3123) as seen from wellhead

Photo 0076: 3964 Piping and water heater in mechanical room

Photo 0077: 3964 Pressure tank

Photo 0079: 3964 Point of entry



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DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
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CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BURWASH LANDING AIRPORT
BUILDING # 3201
SITE LOCATION DIAGRAM
WELL ID: 3201-A,B,C

REVISION ISSUE 0

FIGURE No. FIGURE 3201-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\burwash\1260002 B Landing Air Terminal_3201A Site Plan.dwg, 4/4/2006 1:57:28 PM, Adobe PDF, jbuyck

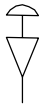
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

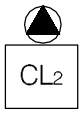

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

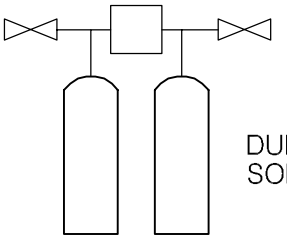
FLOW METER

WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK



CHLORINE RESERVOIR AND
INJECTION PUMP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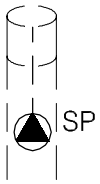
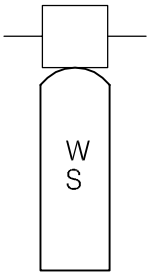
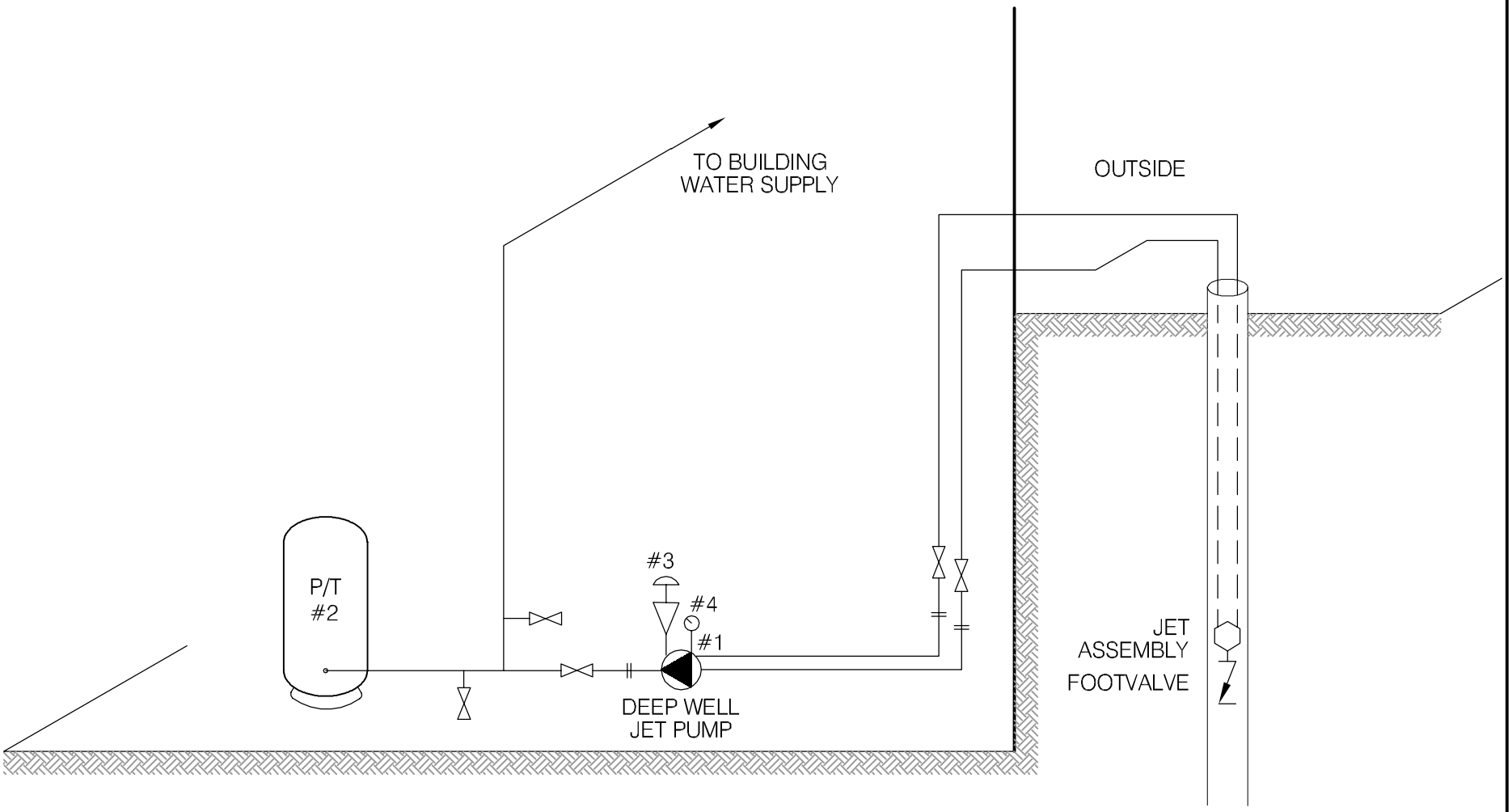


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3201 BURWASH LANDING AIRPORT	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3201-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\burwash\1260002 B Landing Air Terminal_3201B Schematic.dwg, 4/4/2006 1:42:49 PM, Adobe PDF, jbuyck

Western Region – Burwash Landing Airport Building
Building # 3201

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	JET PUMP	MONARCH	MJC-50		2999	½ HP
2	PRESSURE TANK	CHALLENGER	PC-66			
3	PRESSURE SWITCH	SQUARE D	FSG-2			2 HP - 1¼" NPT
4	PRESSURE GAUGE	MARSH	2" - 0-100 PSI			2" - 1¼" NPT
5						
6						
7						
8						
9						
10						

TABLE 3201- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3201	Burwash Landing Airport Building	11	Sept-04 to Jun-05	yes	2/11	no	16-Jun-05	no

Table 3201-2: Water Quality Results

SOURCE:	Building 3201 - Burwash Landing Airport Building			GCDWQ Criteria		
Location/ Resident	Burwash Landing					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Kitchen tap			
Date Sampled	21-Sep-04	15-Jun-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		622	-			
Total Dissolved Solids	370	402	-			500
Hardness CaCO3	334	329	-	AO >200 = poor, > 500 unacceptable[A]		
pH	7.95	8.20	-	6.5		8.5
Turbidity (NTU)	0.40	0.64	-		1	5
UV Absorbance			0.119			
% UV Transmittance			76.0			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	243	247	-			
Chloride Cl	6.6	4.23	4.36			250
Fluoride F	0.18	0.238	-		1.5	
Silicate SiO4			-			
Sulphate SO4	89.8	99.3	-			500
Nitrate Nitrogen N	1.7	1.44	1.59		10	
Nitrite Nitrogen N	<0.05	<0.10	<0.0010		3.2	
Ammonia Nitrogen N			0.020			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	0.006	<0.010	-			
Antimony T-Sb	0.0003	<0.00050	-		0.006	
Arsenic T-As	0.0006	0.00037	-		0.025	
Barium T-Ba	0.038	0.025	-		1	
Boron T-B	0.062	<0.10	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		91.9	-			
Chromium T-Cr	0.0008	<0.0020	-		0.05	
Copper T-Cu	1.12	0.793	0.645		1	
Iron T-Fe	0.02	0.059	-			0.3
Lead T-Pb	0.0004	0.0012	-		0.01	
Magnesium T-Mg		24.2	-			
Manganese T-Mn	<0.005	<0.0020	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		4.42	-			
Selenium T-Se		0.0011	-		0.01	
Sodium T-Na	5.9	5.3	-			200
Uranium T-U	0.0024	0.00220	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.012	<0.050	-			5
Dissolved Metals *(ALS)*						
Aluminum D-Al			-		0.1	
Antimony D-Sb			-		0.006	
Arsenic D-As			-		0.025	
Barium D-Ba			-		1.0	
Boron D-B			-		5	
Cadmium D-Cd			-		0.005	
Calcium D-Ca			-			
Chromium D-Cr			-		0.05	
Copper D-Cu			0.647			1.0
Iron D-Fe			-			0.3
Lead D-Pb			-		0.01	
Magnesium D-Mg			-			
Manganese D-Mn			-			0.05
Mercury D-Hg			-		0.001	
Potasium D-K			-			
Selenium D-Se			-		0.01	
Sodium D-Na			-			200
Uranium D-U			-		0.02	
Vanadium D-V			-			
Zinc D-Zn			-			5.0
Organic Parameters						
Tannin and Lignin			0.13			
Total Organic Carbon C			7.14			
Extractable Hydrocarbons						
EPH10-19			<0.30			
EPH19-32			<1.0			
LEPH			-			
HEPH			-			
Field Chemistry (EBA)						
pH			7.95	6.5		8.5
TDS (ppm)			284			500
EC (uS/cm)			575			
Temperature (°C)			4.8			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3201	YTG	Burwash Airport Building

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N6805564 E605217 elv 802m ±8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Burwash Airport

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Burwash Airport Terminal Building

h. Distance from well to building ~1 m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 23m to tank, field @ ~40m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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

---

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 fastened shut

Entrance by animals? ☐ Yes ☒ No wooden enclosure with mouse droppings present

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

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

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: AST ; Distance from well to Potential Source 1: ~8m

Potential Source 2: _____ ; Distance from well to Potential Source 2: _____

Potential Source 3: _____ ; Distance from well to Potential Source 3: _____

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

How many? 1 ☐ in use ☒ abandoned ☐ require proper sealing

~1m from existing well

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 10.51 m ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 8.55 m

☒ 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 unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail well is at grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No Some

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Mouse droppings

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition None present, well is open

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.

If yes is there treatment or disinfection ☐ Yes ☒ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

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 1 voltage _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: heat trace and insulation

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JULY 28/05

WELL ID #	Owner	Location Description
3201	YTG	BURWASH LANDING AIRPORT

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK

Where is it located?
Comments: MECHANICAL ROOM

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:

THIS INSTALLATION IS OLD, BUT WELL DONE. WHEN PUMP NEEDS REPLACING UPGRADE TO SUB. PUMP SYSTEM

b. Recommendations:

INSTALL TREATMENT IF REQUIRED BY WATER ANALYSIS FOR UV PRETREATMENT. INSTALL 5 GPM (NSF 55 CERTIFIED) UV SYSTEM WITH NECESSARY PRETREATMENT - 1 BIG BLUE 5 MICRON FILTER.

Photo 0581: 3201 Burwash Landing Airport Building

Photo 0585: 3201 Wellhead enclosure

Photo 0577: 3201 Wellhead. Note open casing.

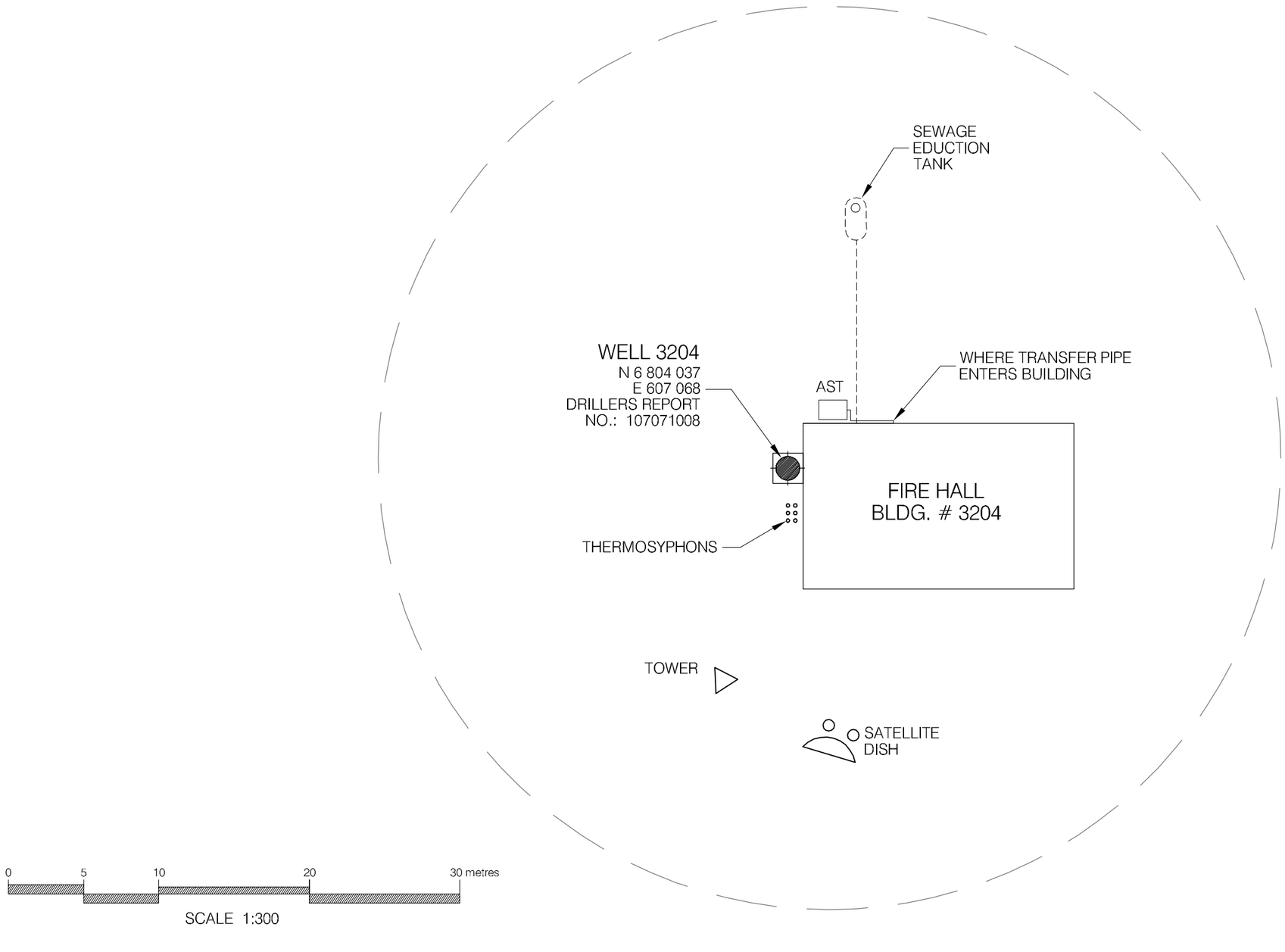
Photo 0578: 3201 Insulation around wellhead with evidence of mouse feces

Photo 05980: 3201 Septic system

Photo 0579: 3201 Above ground fuel storage tank

Photo 0584: 3201 Abandoned well adjacent to existing well

Photo 0114: 3201 Pressure tank (left), and jet pump (right)



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT:

Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

BURWASH LANDING FIRE HALL
BUILDING # 3204
SITE LOCATION DIAGRAM
WELL ID: 3204

REVISION ISSUE
0

FIGURE No.
FIGURE 3204-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\burwash\1260002-B Landing Fire Hall_3204B Site Plan.dwg, 8/11/2005 2:40:31 PM, Adobe PDF

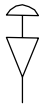
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

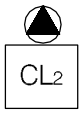

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

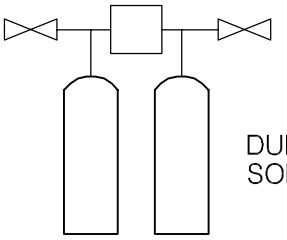
FLOW METER

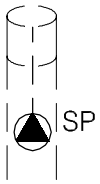
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

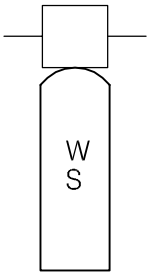


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

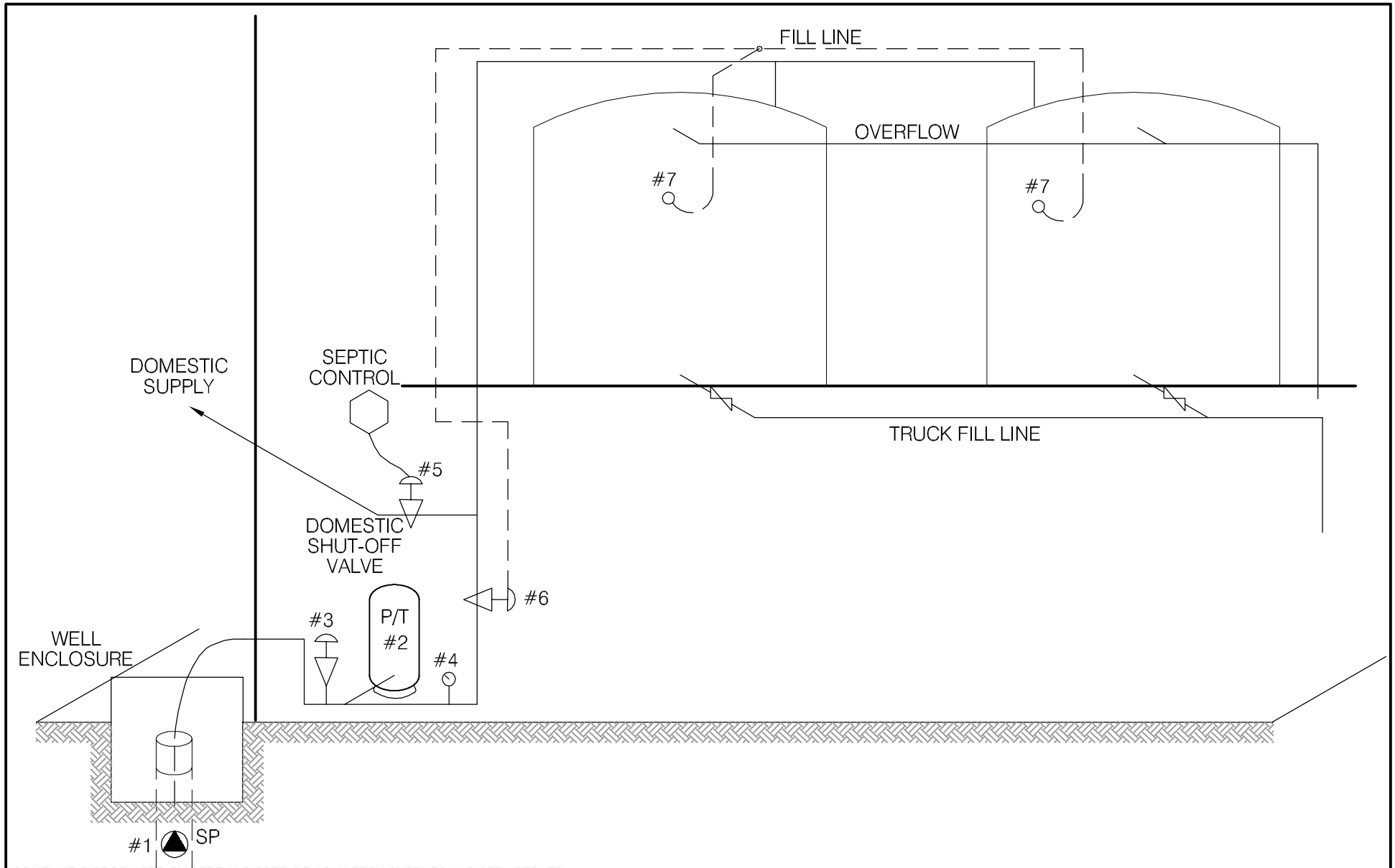


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3204 BURWASH LANDING FIRE HALL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3204-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\burwash\1260002 B Landing Fire HalL_3204B Schematic.dwg, 4/4/2006 1:40:49 PM, Adobe PDF, jbuyck

Western Region – Burwash Firehall
Building # 3204

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	GRUNDFOS	15SQE7B		P10105	3" - 3/4HP
2	PRESSURE TANK	CON-AIRE	SCA80-P		N88	
3	PRESSURE SWITCH	SQUARE D	FSG-2			2" - 1/4" NPT
4	PRESSURE GAUGE	MARSH	0-100 PSI			2" - 1/4" NPT
5	PUMP SHUTOFF	JOHN'S SALES	SEPTIC CONTROL		ASCO 1"	SOLENOID
6	TANK FILL CONTROL		S211AF02N5FG9E			1"S/VALVE
7	FILL FLOAT CONTROL	SJE	PUMPMASTER Pump			115/230V
8						
9						
10						

TABLE 3204- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3204	Burwash Landing Fire Hall	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3204-2: Water Quality Results

SOURCE:	Building 3204 - Burwash Landing Fire Hall			GCDWQ Criteria		
Location/ Resident	Burwash Landing					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location			Washroom tap			
Date Sampled	21-Sep-04	15-Jun-05	28-Jul-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	10	<5.0	-			15
Conductivity (uS/cm)		365	-			
Total Dissolved Solids	206	218	-			500
Hardness CaCO3	115	117	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.38	8.26	-	6.5		8.5
Turbidity (NTU)	**9.8**	**11.1**	**4.01**		1	5
UV Absorbance			0.0700			
% UV Transmittance			85.1			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	148	165	-			
Chloride Cl	1.2	1.15	-			250
Fluoride F	0.18	0.257	-		1.5	
Silicate SiO4			-			
Sulphate SO4	42.2	39.0	-			500
Nitrate Nitrogen N	0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	0.047	0.017	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	*0.0055*	0.00432	-		0.025	
Barium T-Ba	0.018	<0.020	-		1	
Boron T-B	0.504	0.41	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		22.0	-			
Chromium T-Cr	0.0006	<0.0020	-		0.05	
Copper T-Cu	0.017	0.0034	-		1	
Iron T-Fe	**0.45**	0.154	-			0.3
Lead T-Pb	0.001	<0.0010	-		0.01	
Magnesium T-Mg		15.0	-			
Manganese T-Mn	**0.059**	0.0467	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		2.79	-			
Selenium T-Se		0.0014	-		0.01	
Sodium T-Na	34.4	37.2	-			200
Uranium T-U	<0.0005	0.00015	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.011	<0.050	-			5
Organic Parameters						
Tannin and Lignin			0.31			
Total Organic Carbon C			11.6			
Field Chemistry (EBA)						
pH			Undetectable due to turbulence	6.5		8.5
TDS (ppm)						500
EC (uS/cm)						
Temperature (°C)						
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3204	YTG	Burwash FireHall

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6804037 E 607068 el. 808m ±8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Burwash Landing Fire Hall

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in enclosure off from basement

h. Distance from well to building 1m - in add-on to building
likely constructed at same time as building

i. If there is an effluent disposal field, is its location known? ☐ Yes ☐ No NO FIELD

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral
WELL IS UPSLOPE OF SEWAGE EDUCTION TANK

l. 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

sewage eduction tank @ 15 m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☑ No

o. 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 Entrance by animals? ☑ Yes ☐ No

p. Is well site subject to flooding? ☐ Yes ☑ No

q. Is the well site well drained? ☑ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☑ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

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

☑ Yes ☐ No Describe above ground AST heating oil tank

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

Potential Source 1:_____; Distance from well to Potential Source 1:_____

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☑ No

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

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 _____ ☑ No

f. Well casing: Diameter _____ Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: >39.15 ☐ measured (if possible) ☐ reported ☐ from log
↳ MAY BE PUMP

h. Static water level below ground: 6.10m

☒ 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

m. Is the well head: ☐ in pumphouse ☑ in pit ☐ pitless adaptor ☐ in a building
↳ building add-on - put in aluminum siding - put plywood floor

☑ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail _____

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☑ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☑ No

iv. Any evidence of rodents? Specify None

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…) _____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☑ granular sediment ☐ unknown
↳ based on hydrogeology of area

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 _____ } see Bert's Notes

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

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

k. Is the pump and piping protected from freezing? ☑ Yes ☐ No

If yes, describe: insulated add-on beside building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

below grade and lacking surface seal, however; based on lithology → silt & till, likely tight bond between casing and formation; otherwise - installation is good.
Note: strong sulphur odour & off gassing of water, likely SO_2 - perhaps caused by biofouling

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date _____

WELL ID #	Owner	Location Description
3204	YTG	BURWASH LANDING FIRE HALL

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: MECHANICAL ROOM. FIRE STORAGE UPSTAIRS

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?

2 X 1250 87 ϕ X 65" H.

What material is the tank constructed of? POLYETHELYNE

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:

OVERALL INSTALLATION IS ACCEPTABLE WITH THE FOLLOWING EXCEPTIONS.
FILL PIPING IS LOOSE.
PUMP HEAT TRACE INSTALLATION DOES NOT MEET CODE.

b. Recommendations:

INSTALL WATER TREATMENT AS REQUIRED BY WATER ANALYSIS FOR UV PRETREATMENT.
INSTALL UV FOR DOMESTIC WATER SUPPLY AT ONCE. UV MUST MEET (NSF 55 CERTIFICATION)
INITIATE BI ANNUAL WELL MAINTENANCE PROGRAM.
INITIATE REGULAR CLEANING SCHEDULE FOR FICE STORAGE TANKS.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

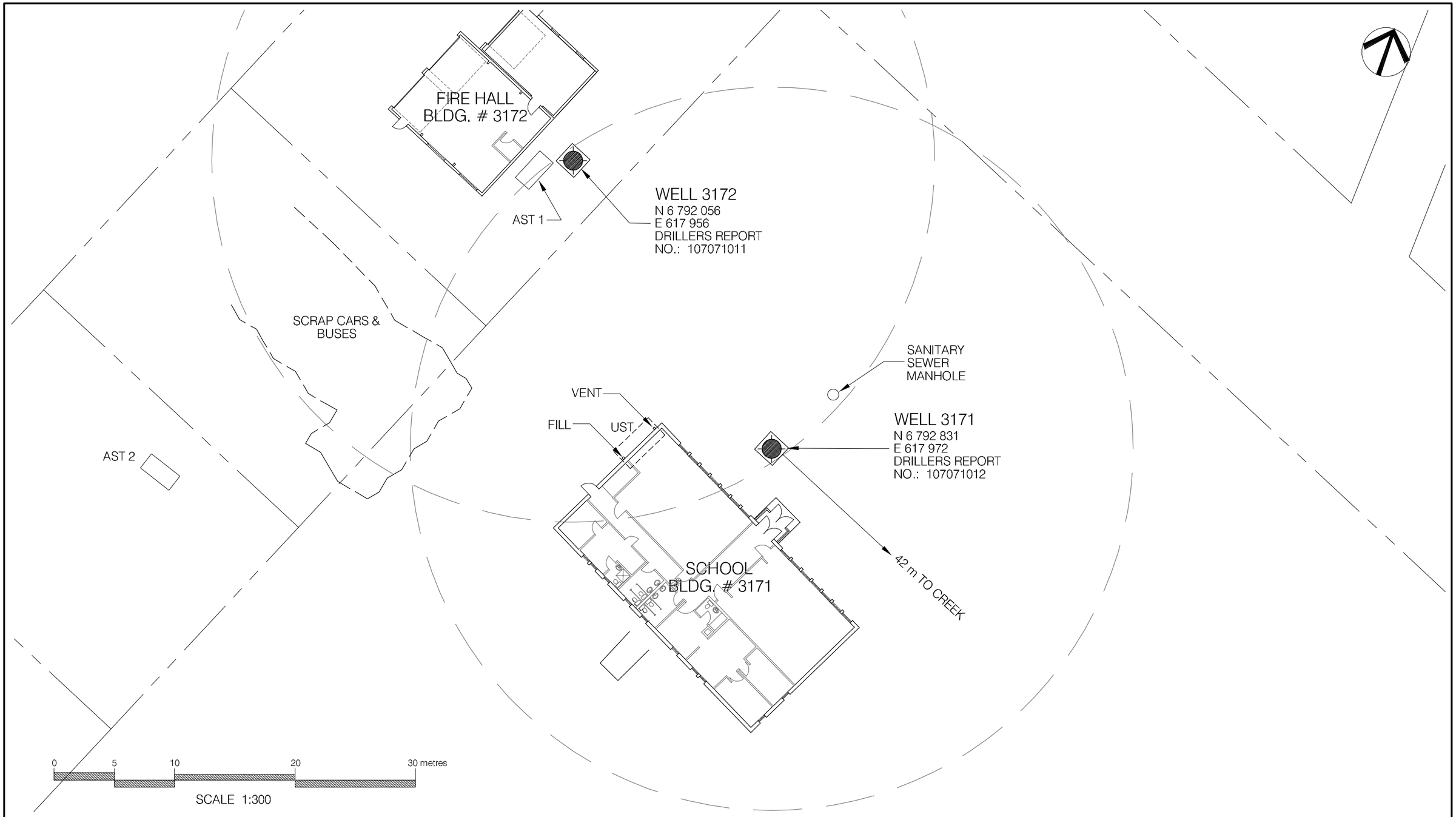
Spill Report Information

Spill #	9846
Jurisdiction	Yukon
Community	Burwash Landing
Address	
Highway	
Milepost	
Feature	Burwash Landing
Location and Cause	Burwash Landing Garage - Burwash Fuels - valve left on on 10,000 ga fuel storage tank
Latitude	61.358
Longitude	-139.0065
Incident Date	11/10/1998
Lead Agency	Yukon Government - Fire Marshall
Other Agency	
Company(s)	
Amount	1000
Units	Gallons (US, liquid)
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel running down road 1/4 mile towards Lodge - not threatening lake - Ollie to put 'speedy dry' on spill tomorrow - is on frozen ground - YG-FM to investigate further

Photo 0581: 3204 Burwash Landing Fire Hall. Note: well enclosure on (right), AST (middle), septic (front).

Photo 0585: 3204 Water storage tanks

Photo 0577: 3204 Pressure tank.



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

KLUANE LAKE SCHOOL
BUILDING # 3171
SITE LOCATION DIAGRAM
WELL ID: 3171

REVISION ISSUE: 0

FIGURE No.: FIGURE 3171-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Fire Hall_3172A School Bldg_3171A Site Plans.dwg, 9/21/2005 9:58:19 AM, Adobe PDF

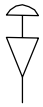
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

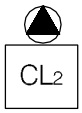

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

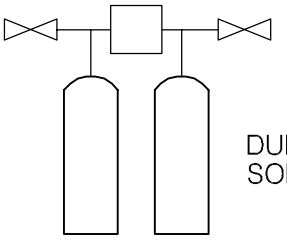
FLOW METER

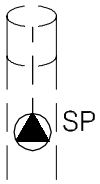
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

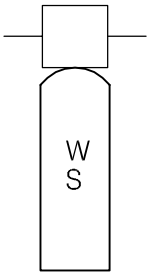


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

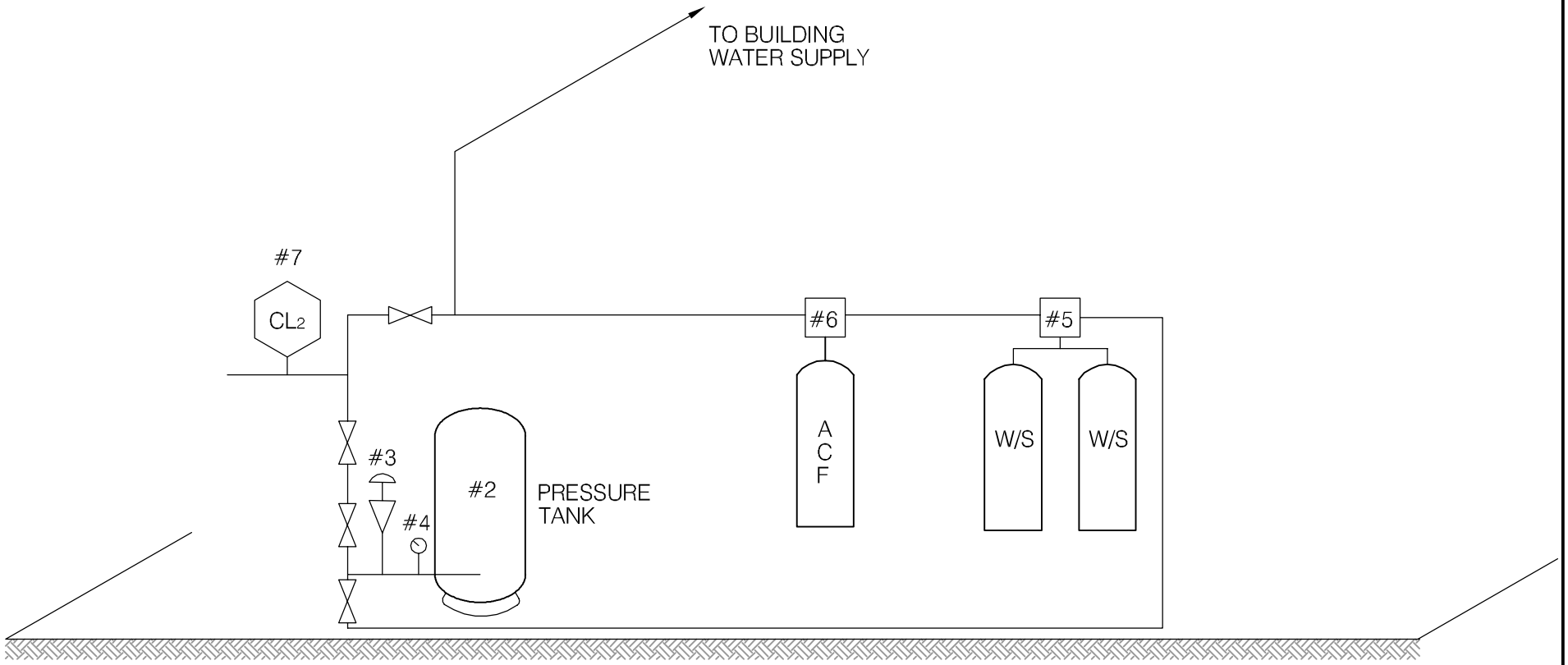


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3171 KLUANE LAKE SCHOOL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3171-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay School_3171B Schematic.dwg, 4/4/2006 1:25:58 PM, Adobe PDF, jbuyck

KLUANE LAKE
Western Region – ~~Destruction Bay~~ School
Building # 3171

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	MONARCH	3/4HP			4"
2	PRESSURE TANK.	CON AIRE	SC 82T			
3	PRESSURE SWITCH	SQUARED	FSG-2			2" - 1/4 NPT
4	PRESSURE GAUGE	MARSH	2" (0-100PSI)			1/4" NPT
5	WATER SOFTENER	AQUA TECH.	9000-45MI	-DUPLEX		10x54
6	CHARCOAL FILTER	AQUA TECH.	L5600-2.0			2 cu FT.
7	PELLET CHLORINATOR	BETTER WATER	SENTRY I			
8						
9						
10						

TABLE 3171- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3171	Kluane Lake School	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3171-2: Water Quality Results

SOURCE:	Building 3171 - Kluane Lake School			GCDWQ Criteria		
Location/ Resident	Destruction Bay					
Address						
Treatment						
Disinfection	Chlorination (not in use)					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location	Soft	Raw	Arts room sink			
Date Sampled	21-Sep-05	Jun-15-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		830	-			
Total Dissolved Solids	**680**	**528**	-			500
Hardness CaCO3	1.8	446	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.36	8.33	-	6.5		8.5
Turbidity (NTU)	0.3	**1.08**	0.41		1	5
UV Absorbance			-			
% UV Transmittance			-			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	292	295	-			
Chloride Cl	1.3	1.06	-			250
Fluoride F	0.18	0.269	-		1.5	
Silicate SiO4			-			
Sulphate SO4	165	184	-			500
Nitrate Nitrogen N	<0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	0.034	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0043	0.00373	-		0.025	
Barium T-Ba	0.002	0.021	-		1	
Boron T-B	1.27	1.04	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		67.4	-			
Chromium T-Cr	0.0008	<0.0020	-		0.05	
Copper T-Cu	0.002	<0.0010	-		1	
Iron T-Fe	<0.01	0.190	-			0.3
Lead T-Pb	0.0002	<0.0010	-		0.01	
Magnesium T-Mg		67.5	-			
Manganese T-Mn	<0.005	**0.0974**	<0.0050			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		5.82	-			
Selenium T-Se		<0.0010	-		0.01	
Sodium T-Na	19.1	27.2	-			200
Uranium T-U	<0.0005	0.00131	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.010	<0.050	-			5
Dissolved Metals *(ALS)*						
Aluminum D-Al			-		0.1	
Antimony D-Sb			-		0.006	
Arsenic D-As			-		0.025	
Barium D-Ba			-		1.0	
Boron D-B			-		5	
Cadmium D-Cd			-		0.005	
Calcium D-Ca			-			
Chromium D-Cr			-		0.05	
Copper D-Cu			-			1.0
Iron D-Fe			-			0.3
Lead D-Pb			-		0.01	
Magnesium D-Mg			-			
Manganese D-Mn			<0.0050			0.05
Mercury D-Hg			-		0.001	
Potasium D-K			-			
Selenium D-Se			-		0.01	
Sodium D-Na			-			200
Uranium D-U			-		0.02	
Vanadium D-V			-			
Zinc D-Zn			-			5.0
Organic Parameters						
Tannin and Lignin			-			
Total Organic Carbon C			2.15			
Field Chemistry (EBA)						
pH			8.48	6.5		8.5
TDS (ppm)			**575**			500
EC (uS/cm)			1158			
Temperature (°C)			8.7			
Free Available Chlorine			0.00			

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3171	YTG	Kluane Lake School

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
km 1760 Alaska Highway

c. GPS location: N 6792831 E 617972 elv 798m ±8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Kluane Lake School

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify School @ ~5m

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☐ Yes ☐ No

j. Distance from well to nearest point of known field: Community Septic >60m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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
Sewer service lines <5m; Sewer main likely <30m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 fastened shut w/ screws
Entrance by animals? ☐ Yes ☒ No Access possible

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

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

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~9m

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

☐ Yes ☐ No Describe _____

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

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~26m
Potential Source 2: Creek ; Distance from well to Potential Source 2: ~42m
Potential Source 3: Scrap Cars ; Distance from well to Potential Source 3: ~30m
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

How many? 1 ☒ in use ☐ abandoned ☐ require proper sealing
Fire Hall well @ ~26m

2. Well and Wellhead information:

a. When was well installed? Year 1989 Month October

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 _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 104 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 21 ft

☐ 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 3 ft slot size(s) _____
Location of screen: from 101 ft to 104 ft from log reported

l. Is there a sump below the screen? ☐ Yes ☒ No unlikely
pwf pft

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~0.65 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No styrofoam insulation

iv. Any evidence of rodents? Specify Access possible

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.

If yes is there treatment or disinfection ☒ Yes ☐ No

Explain (filtration, disinfection etc...) chlorination, water softener, AC filter

---

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 unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Styrofoam insulation, likely heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JULY 28/05

WELL ID #	Owner	Location Description
3171	VTG	~~DUBAIT~~ SCHOOL KLUANE LAKE

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☑ chlorination ☑ iron and or manganese removal ☑ other WATER SOFTENER

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: MECHANICAL ROOM.

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:

THIS INSTALLATION IS SOUND. HOWEVER IF A CHLORINE RESIDUAL IS DESIRED, CONFIGURATION CHANGES ARE REQUIRED.

b. Recommendations:

REMOVE POINT CHLORINATOR - INSTALL 12 GPM (NSF 55 CERTIFIED UV WITH PREFILTER.

Field Report 107071072

MIDNIGHT SUN DRILLING CO. LTD. EHORSE Y.T.
PH. 633-3070 TELEX 036-8496
P.O. BOX 4391
WHITEHORSE, YUKON

Started. Oct. 2 1987

Completed. Oct. 2 1987

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Municipal Engineering	W / W	school
		Destruction Bay
	89-1A-36	

FORMATION LOG

FROM	TO	FORMATION
0	8	silt
8	44	silt
44	99	Till
99	104	Gr.

DESCRIPTION OF WORK

MOVE

move on set up

Gr. Clay

sand some silt

set screen Develop

Move off

TIME

DATE	FROM	TO	HOURS
oct. 2	11:30	12:30	1
"	12:30	3:30	3
"	3:30	7:30	4
"	7:30	8:00	0.5

Casing & Pipe

Size	Type	Size	Type
1/2			
Feet	Inch	Feet	Inch
101			

Remarks:

1-6" odex shoe (ss)
20 slot
5 7/8" bit pin
8" riser K Packer
2.5 GPM.

Static Level		Total Rig Time	hrs.
Ground Level	21	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

TITLE..... TITLE.....

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0334
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	vent leak
Latitude	61.25274646
Longitude	-138.80244846
Incident Date	9/26/2003 12:00:00 PM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Yukon Electrical Company Ltd
Amount	500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	cleaned-up but soil had not been removed at time of report - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9303
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - rubber coupling separated on the force main pipe elbow
Latitude	61.252546
Longitude	-138.800598
Incident Date	2/5/1993 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	37,800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	effluent flowed over natural terrain and collected in a pond beside Kluane Lake - some collected, most frozed - to be excavated to sewage lagoon

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9304
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - coupling/pipe separation again
Latitude	61.252546
Longitude	-138.800598
Incident Date	3/29/1993
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	11340
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	similar to PACY 9303 - sewage collected in same pond - repairs to sewage system to be completed - spill being cleaned up with vacuum truck

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9515
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	pipeline sleeve broke 10m from final discharge - unknown cause for breakage
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	5/12/1995
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	180
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill occurred sometime at the end of April 1995 - not reported to spill line - pipeline repaired - improvements to system to be made byt YTG in summer

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9634
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	break in main sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	6/12/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	pump activated 3x per day - approx 500 ga each time but sewage doesn't reach lagoon - DIAND inspected - to be repaired - no risk to environment

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9649
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	8/7/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	50
Units	Gallons (US, liquid)
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	rate of spill reported at 1L/s
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	leak stopped 8/9/96 - line repaired by patching - Tony will take up with YTG on way back from site - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9672
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking utilidor - similar to Spill No. 9649
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	9/24/1996 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	eduction truck needed to pump up before it enters creek - no further information on file

Photo 0614: 3171 Kluane Lake School

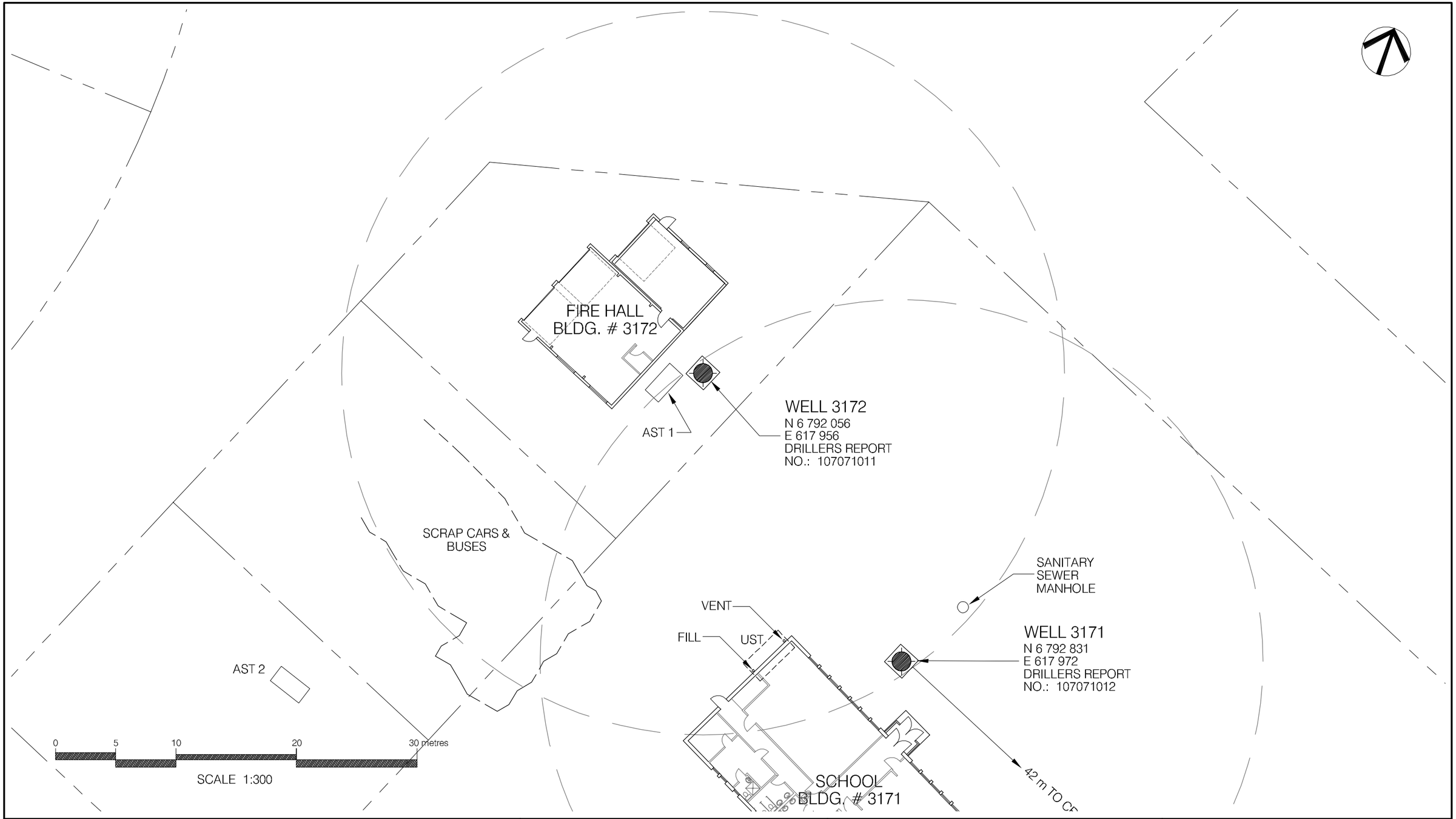
Photo 0617: 3171 Wellhead enclosure

Photo 0615: 3171 Wellhead in pit, pellet chlorinator

Photo 0616: 3171 Underground fuel storage tank

Photo 0124: 3171 Water softener and brine tank

Photo 0123: 3171 Pressure tank (right), activated carbon filter (left)



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

DESTRUCTION BAY FIRE HALL
BUILDING # 3172
SITE LOCATION DIAGRAM
WELL ID: 3172

REVISION ISSUE 0

FIGURE No. FIGURE 3172-A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Fire Hall_3172A School Bldg_3171A Site Plans.dwg, 9/21/2005 9:51:37 AM, Adobe PDF

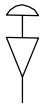
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

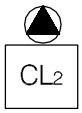

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

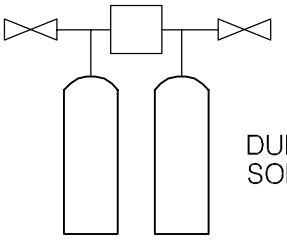
FLOW METER

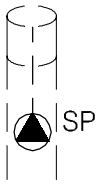
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

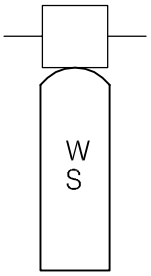


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

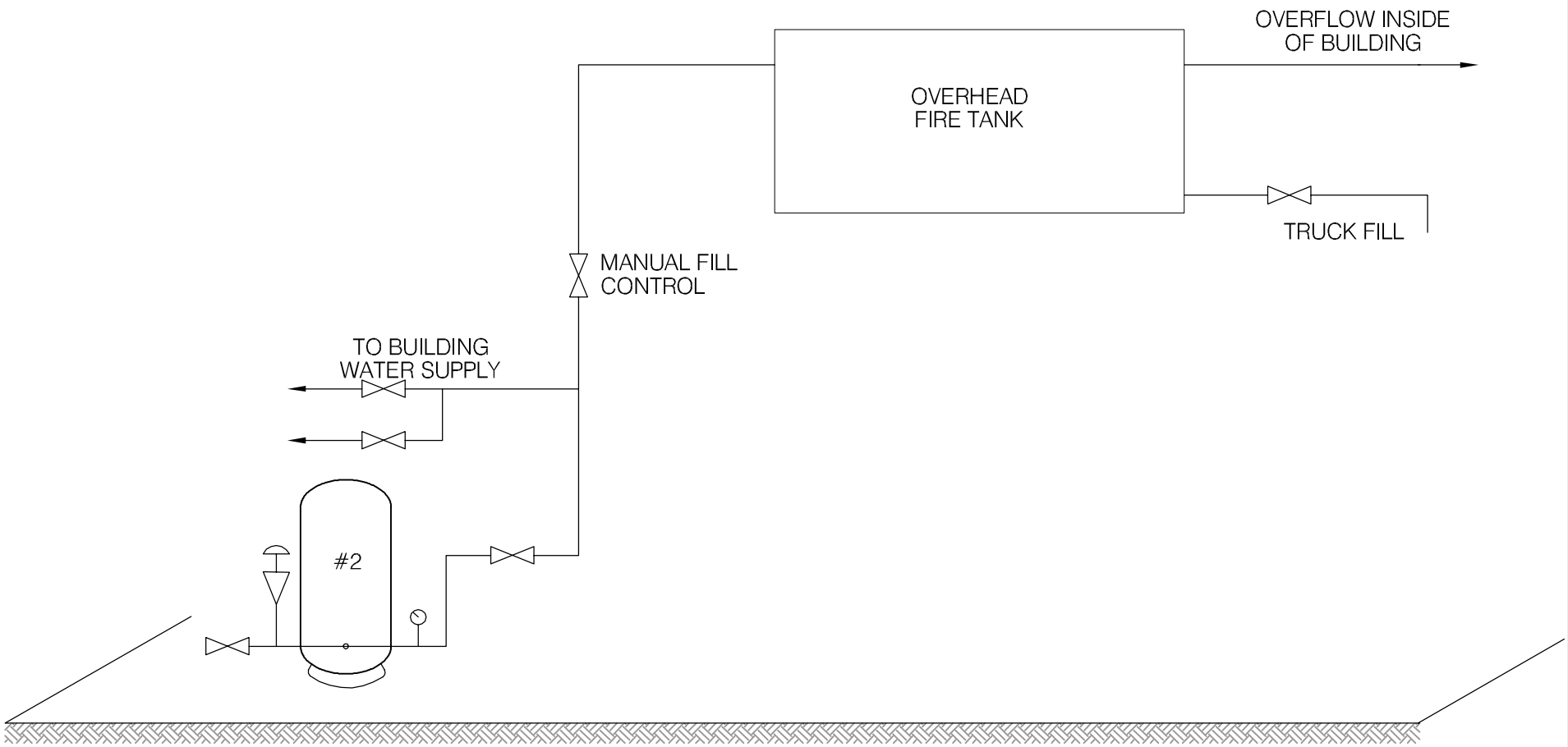


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3172 DESTRUCTION BAY FIRE HALL	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3172-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Fire Hall_3172B Schematic.dwg, 4/4/2006 1:37:30 PM, Adobe PDF, jbuyck

Western Region – Destruction Bay Firehall
Building # 3172

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	MONARCH	SKRC10		8906	
2	PRESSURE TANK	CON-AIRE	SC82T		1H89X	
3	PRESSURE SWITCH	SQUARE D	FSG-2			2HP- 1¼" NPT
4	PRESSURE GAUGE	MARSH	2" / 0-100PSI			1¼" NPT.
5						
6						
7						
8						
9						
10						

TABLE 3172- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3172	Destruction Bay Fire Hall	9	Sept-04 to Jun-05	**yes**	1/9	no	16-Jun-05	no

Table 3172-2: Water Quality Results

SOURCE:	Building 3172 - Destruction Bay Fire Hall			GCDWQ Criteria		
Location/ Resident	Destruction Bay					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location						
Date Sampled	19-Oct-05	16-Jun-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	**>60**	<5	<5.0			15
Conductivity (uS/cm)		672	-			
Total Dissolved Solids	389	413	-			500
Hardness CaCO3	308	312	-	AO >200 = poor, > 500 unacceptable[A]		
pH	8.42	8.43	-	6.5		8.5
Turbidity (NTU)	**53.5**	**11.0**	**3.04**		1	5
UV Absorbance			0.077			
% UV Transmittance			83.8			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	245	231	-			
Chloride Cl	6.1	1.04	-			250
Fluoride F	0.31	0.327	-		1.5	
Silicate SiO4			-			
Sulphate SO4	109	150	-			500
Nitrate Nitrogen N	<0.01	<0.10	-		10	
Nitrite Nitrogen N	<0.005	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			-			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	-			
Antimony T-Sb	<0.0002	<0.00050	-		0.006	
Arsenic T-As	0.0007	0.00081	-		0.025	
Barium T-Ba	0.022	<0.020	-		1	
Boron T-B	1.48	1.14	-		5	
Cadmium T-Cd	<0.00001	<0.00020	-		0.005	
Calcium T-Ca		38.5	-			
Chromium T-Cr	0.0017	<0.0020	-		0.05	
Copper T-Cu	<0.001	<0.0010	-		1	
Iron T-Fe	0.09	0.291	-			0.3
Lead T-Pb	0.0007	<0.0010	-		0.01	
Magnesium T-Mg		52.4	-			
Manganese T-Mn	0.029	0.0479	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		5.37	-			
Selenium T-Se		0.0026	-		0.01	
Sodium T-Na	31.3	30.9	-			200
Uranium T-U	0.0008	0.00072	-		0.02	
Vanadium T-V			-			
Zinc T-Zn	0.008	<0.050	-			5
Organic Parameters						
Tannin and Lignin			0.23			
Total Organic Carbon C			7.02			
Field Chemistry (EBA)						
pH			**8.60**	6.5		8.5
TDS (ppm)			203			500
EC (uS/cm)			620			
Temperature (°C)			13.9			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3172	YTG	Destruction Bay FireHall

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
km 1760 Alaska Highway

c. GPS location: N 6792050 E 617956

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Fire hall only

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Fire Hall

h. Distance from well to building ~5m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Community Septic >60m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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
Service lines and main (likely) <30m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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
Enclosure fastened shut with nails

Entrance by animals? ☐ Yes ☒ No
Access possible, Evidence of insects

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

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

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~18 m

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~2 m
Potential Source 2: Creek ; Distance from well to Potential Source 2: > 30m
Potential Source 3: AST 2 ; Distance from well to Potential Source 3: 39m
Potential Source 4: Soap Cars ; Distance from well to Potential Source 4: ~20m

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

How many? 1 ☒ in use ☐ abandoned ☐ require proper sealing
School well @ ~26m

2. Well and Wellhead information:

a. When was well installed? Year 1987 Month September

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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 103 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 25 ft

☐ 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 3.5 ft slot size(s) 30 slot
Location of screen: from 99.5 ft to 103 ft (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
pwp wooden pit

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~0.7 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition Split gasket cap

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.

If yes is there treatment or disinfection ☐ Yes ☒ No

Explain (filtration, disinfection etc...)

---

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 Unlikely

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation around piping - likely also heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

The water has a very pungent sulphur smell.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date July 28/05

WELL ID #	Owner	Location Description
3172	YTG	D'BAY FIREHALL.

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☑ Yes ☐ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: SOUTHEND OF FIRE HALL

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:

THIS INSIDE INSTALLATION IS OF GOOD QUALITY WORKMANSHIP & MATERIAL.
HEAT TAPE IS' OLD DOES NOT MEET CODE

b. Recommendations:

INSTALL TREATMENT AS REQUIRED FOR INSTALLATION OF PROPORTIONAL CHLORINATOR. SHOCK CHLORINATE COMPLETE SYSTEM AND PUT CHLORINE INJECTION PUMP ONLINE. INSTITUTE REGULAR RESIDUAL FREE CHLORINE TESTING.
INSTITUTE BI-ANNUAL WELL MAINTENANCE PROGRAM.

Field Report 10707 1011

MIDNIGHT SUN DRILLING CO. LTD
WHITEHORSE Y.T.
PH. 633-3070 TELEX 036-8496
P.O. BOX 4391
WHITEHORSE, YUKON

Started. Sept. 30 ....19 83

Completed. Oct. 1 .....19 83

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Municipal Engineering	W/W	Five Hall
		Destruction Bay
	89-ID-36	

FORMATION LOG FROM	TO	FORMATION	DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
			MOVE				
			move on set up	sept. 30	3:30	4:00	0.5
0	7	silt		"	4:00	8:00	4
7	72	silt	Gr. Clay				
72	98	Till					
98	103	Gr.	Sand some silt				
			set screen Develop	oct. 1	8:00	2:30	6.5
			move off.	"	2:30	3:00	0.5

Rcrd. of Casing & Pipe Size	Type	Size	Type
6			
Feet	Inch	Feet	Inch
99	6		

Remarks:

1-6" odex shoe (ss)
30 slot
5 3/8" bit pin
8" risex IK Packer
30 GPM.

Static Level		Total Rig Time	hrs.
Ground Level	25'	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

TITLE..... TITLE.....

Willow Printers

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0334
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	vent leak
Latitude	61.25274646
Longitude	-138.80244846
Incident Date	9/26/2003 12:00:00 PM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Yukon Electrical Company Ltd
Amount	500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	cleaned-up but soil had not been removed at time of report - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9303
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - rubber coupling separated on the force main pipe elbow
Latitude	61.252546
Longitude	-138.800598
Incident Date	2/5/1993 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	37,800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	effluent flowed over natural terrain and collected in a pond beside Kluane Lake - some collected, most frozed - to be excavated to sewage lagoon

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9304
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - coupling/pipe separation again
Latitude	61.252546
Longitude	-138.800598
Incident Date	3/29/1993
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	11340
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	similar to PACY 9303 - sewage collected in same pond - repairs to sewage system to be completed - spill being cleaned up with vacuum truck

Environment Canada | Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9515
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	pipeline sleeve broke 10m from final discharge - unknown cause for breakage
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	5/12/1995
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	180
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill occurred sometime at the end of April 1995 - not reported to spill line - pipeline repaired - improvements to system to be made byt YTG in summer

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9634
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	break in main sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	6/12/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	pump activated 3x per day - approx 500 ga each time but sewage doesn't reach lagoon - DIAND inspected - to be repaired - no risk to environment

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9649
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	8/7/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	50
Units	Gallons (US, liquid)
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	rate of spill reported at 1L/s
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	leak stopped 8/9/96 - line repaired by patching - Tony will take up with YTG on way back from site - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9672
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking utilidor - similar to Spill No. 9649
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	9/24/1996 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	eduction truck needed to pump up before it enters creek - no further information on file

Photo 0610: 3172 Destruction Bay Fire Hall

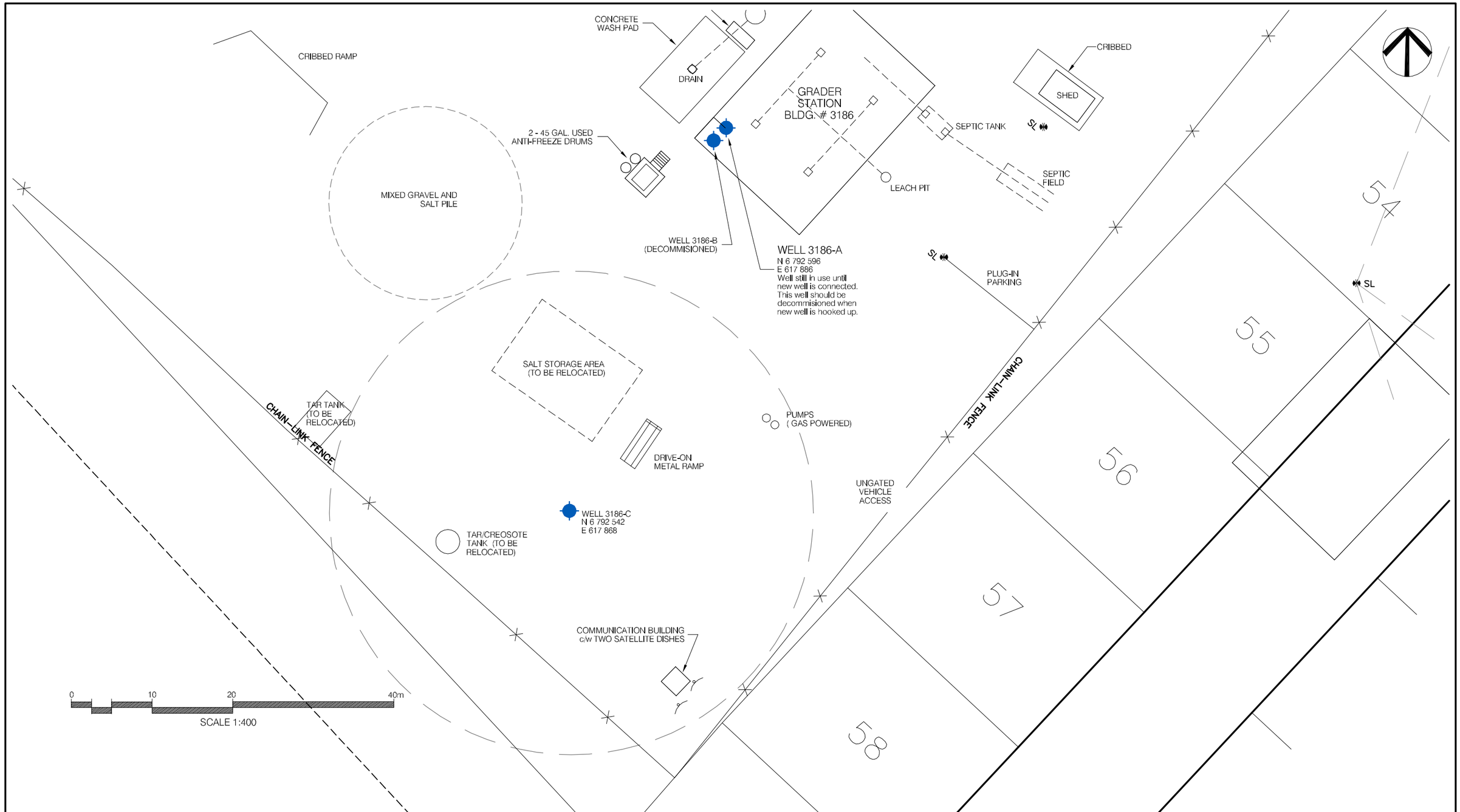
Photo 0611: 3172 Above ground fuel storage tank (left), wellhead enclosure (right)

Photo 0612: 3172 Wellhead in pit

Photo 0613: 3172 Junk cars (centre), fire hall (right)

Photo 0122: 3172 Elevated water storage tank

Photo 0119: 3172 Pressure tank



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.

BUILDING STRUCTURES RELATIVE TO PROPERTY LINES ARE APPROXIMATE ONLY.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

DESTRUCTION BAY GRADER STATION BUILDING # 3186 SITE LOCATION DIAGRAM WELL ID: 3186-C

REVISION ISSUE: 0

FIGURE No.: FIGURE 1

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Grader Station_3186A Site Plan.dwg, 4/5/2006 8:50:34 AM, Adobe PDF, jbuyck

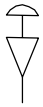
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

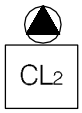

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

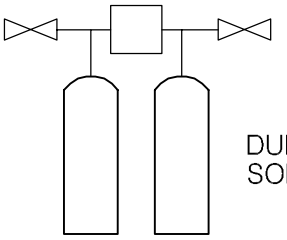
FLOW METER

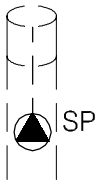
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

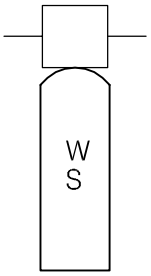


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

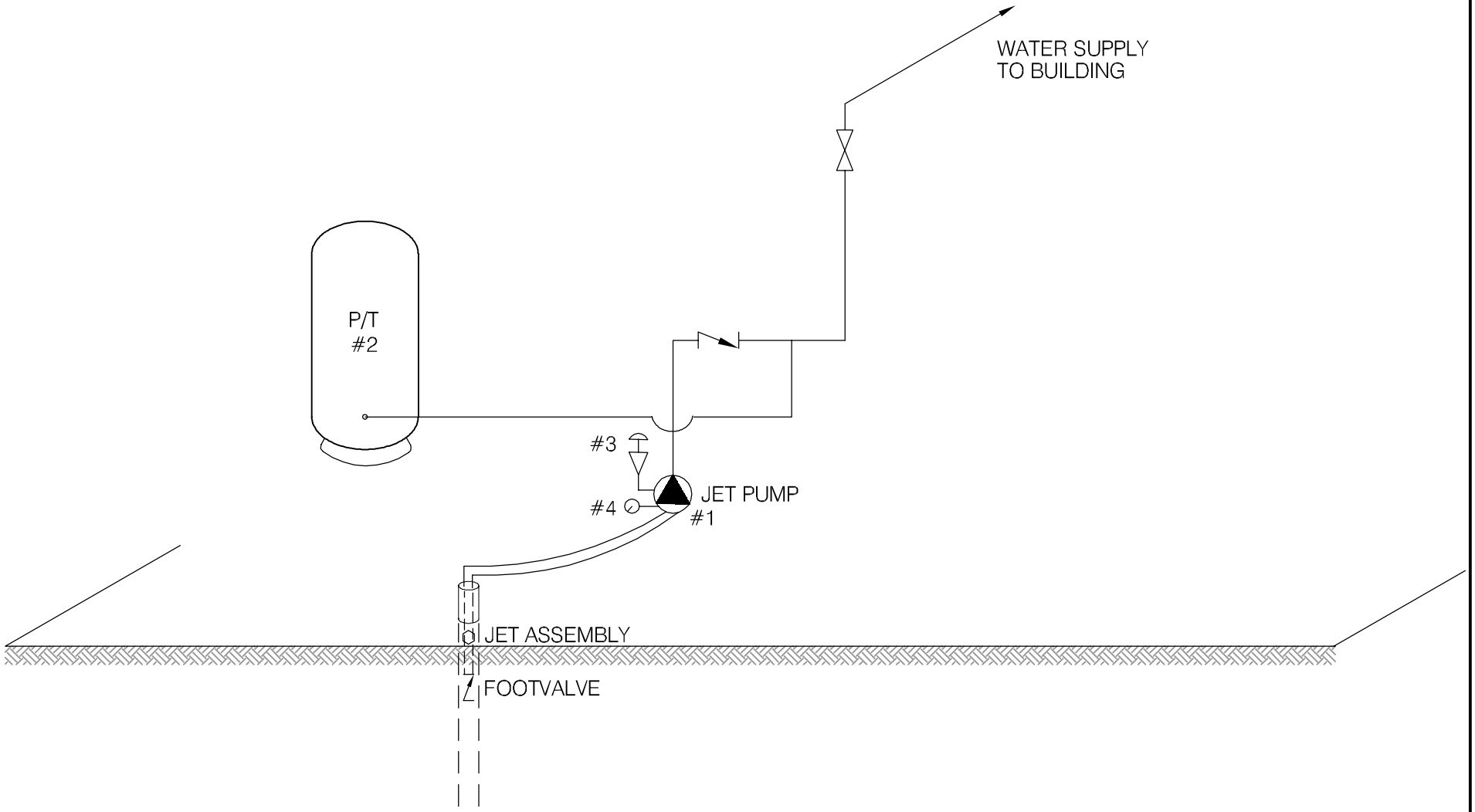


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3186 DESTRUCTION BAY GRADER STATION	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3186-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Grader Station_3186BSchematic.dwg, 4/4/2006 1:24:18 PM, Adobe PDF, jbuyck

Western Region – Destruction Bay Grader Station
Building # 3186

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	JET PUMP	MONARCH	MJC-50		2004	1/2 HP
2	PRESSURE TANK	CHALLENGER	PC-144		070494	
3	PRESSURE SWITCH	SQUARE D	FSG-2			2HP 1/4" NPT
4	PRESSURE GAUGE	MARSH	2" (0-100 PSI)			1/4" NPT
5						
6						
7						
8						
9						
10						

TABLE 3186- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3186	Destruction Bay Grader Station	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3186-2: Water Quality Results

SOURCE:	Building 3186 - Destruction Bay Grader Station			GCDWQ Criteria		
Location/ Resident	Destruction Bay					
Address						
Treatment	None					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location						
Date Sampled	19-Oct-05	Jun-15-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	>60	6.0	5.8			15
Conductivity (uS/cm)		749	-			
Total Dissolved Solids	452	492	-			500
Hardness CaCO3	399	350	403	AO >200 = poor, > 500 unacceptable[A]		
pH	8.20	8.36	-	6.5		8.5
Turbidity (NTU)	**21.1**	**12.7**	**23.0**		1	5
UV Absorbance			0.08			
% UV Transmittance			82.8			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	291	247	-			
Chloride Cl	0.9	0.79	-			250
Fluoride F	0.25	0.276	-		1.5	
Silicate SiO4			15.7			
Sulphate SO4	127	181	-			500
Nitrate Nitrogen N	0.07	<0.10	-		10	
Nitrite Nitrogen N	<0.005	0.31	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			0.109			
Total Metals *(ALS)*						
Aluminum T-Al	0.008	0.023	0.305			
Antimony T-Sb	<0.0002	<0.00050	<0.00050		0.006	
Arsenic T-As	**0.0329**	***0.0184***	**0.0353**		0.025	
Barium T-Ba	0.306	0.206	0.307		1	
Boron T-B	1.14	0.99	1.22		5	
Cadmium T-Cd	<0.00001	<0.00020	<0.00020		0.005	
Calcium T-Ca		47.5	56.6			
Chromium T-Cr	<0.001	<0.0020	<0.0020		0.05	
Copper T-Cu	0.0003	0.0192	0.0069		1	
Iron T-Fe	**2.94**	**1.34**	**2.20**			0.3
Lead T-Pb	0.0003	<0.0010	<0.0010		0.01	
Magnesium T-Mg		56.2	66.1			
Manganese T-Mn	**0.165**	**0.137**	**0.238**			0.05
Mercury T-Hg		<0.00020	<0.00020		0.001	
Potassium T-K		4.02	4.49			
Selenium T-Se		<0.0010	<0.0010		0.01	
Sodium T-Na	20.9	22.2	24.7			200
Uranium T-U	<0.0005	<0.00010	<0.00010		0.02	
Vanadium T-V			0.033			
Zinc T-Zn	0.019	<0.050	<0.050			5
Dissolved Metals *(ALS)*						
Aluminum D-Al			<0.010		0.1	
Antimony D-Sb			<0.00050		0.006	
Arsenic D-As			***0.0217***		0.025	
Barium D-Ba			0.290		1.0	
Boron D-B			1.22		5	
Cadmium D-Cd			<0.00020		0.005	
Calcium D-Ca			54.2			
Chromium D-Cr			<0.0020		0.05	
Copper D-Cu			0.0022			1.0
Iron D-Fe			0.033			0.3
Lead D-Pb			<0.0010		0.01	
Magnesium D-Mg			64.9			
Manganese D-Mn			0.201			0.05
Mercury D-Hg			<0.00020		0.001	
Potassium D-K			4.67			
Selenium D-Se			<0.0010		0.01	
Sodium D-Na			24.5			200
Uranium D-U			<0.00010		0.02	
Vanadium D-V			<0.030			
Zinc D-Zn			<0.050			5.0
Organic Parameters						
Tannin and Lignin			0.46			
Total Organic Carbon C			3.64			
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		0.00001	
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			8.39	6.5		8.5
TDS (ppm)			376			500
EC (uS/cm)			748			
Temperature (°C)			9.3			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3186	YTG	Destruction Bay Grader Station

1. Well Location and Potential Contaminant Sources

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

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

c. GPS location: N 6792596 E 617886 eN 802m ± 8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Destruction Bay Grader Station

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside grader station

h. Distance from well to building

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

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

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. 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
leach pit @ 13m, septic tank @ 23m - effluent field unknown, rock pit @ 17m

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Accessable to anyone with access to building
Entrance by animals? ☐ Yes ☒ No Access possible

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

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

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☐ Yes ☒ No
Distance from the well to known buried tank It is somewhere under the grader station floor <25m

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Used antifreeze drum; Distance from well to Potential Source 1: ~7m
Potential Source 2: waste oil AST; Distance from well to Potential Source 2: ~9m
Potential Source 3: Tar tank; Distance from well to Potential Source 3: ~45m
Potential Source 4: Tar or creosote tank; Distance from well to Potential Source 4: ~55m
Salt and cold mix storage >60m; fuel pumping area @ ~36m

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

How many? 1 ☐ in use ☒ abandoned ☒ require proper sealing
~0.65 m from existing well

2. Well and Wellhead information:

a. When was well installed? Year unknown 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 _____ ☒ No

f. Well casing: Diameter 10cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ 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 unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
corner of maintenance garage

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail no, 0.15m above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition solid plate, double-holed

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No unknown

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 _____

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located inside heated building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

There is a sign in washroom stating "Contaminated water, Do Not Consume"
It appears that bottled water is provided. There is an abandoned well
with a static water level of 3.07m below grade.
TDS 376 ppm
EC 748 µS
pH 8.39
Temp 9.3°C

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BEER ALBISSER Date July 28/05

WELL ID #	Owner	Location Description
3186	YTG	DESTRUCTION BAY GRADER STATION

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☑ Yes ☐ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK

Where is it located?
Comments: STOP AREA NORTHWEST CORNER

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:

THIS IS AN ACCEPTABLE, BUT OLD INSTALLATION

b. Recommendations:

DRILL A NEW WELL. THIS WELL IS NOT A GOOD CANDIDATE FOR IMPROVEMENT

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0334
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	vent leak
Latitude	61.25274646
Longitude	-138.80244846
Incident Date	9/26/2003 12:00:00 PM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Yukon Electrical Company Ltd
Amount	500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	cleaned-up but soil had not been removed at time of report - no further information on file

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Spill Report Information

Spill #	9303
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - rubber coupling separated on the force main pipe elbow
Latitude	61.252546
Longitude	-138.800598
Incident Date	2/5/1993 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	37,800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	effluent flowed over natural terrain and collected in a pond beside Kluane Lake - some collected, most frozed - to be excavated to sewage lagoon

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Spill Report Information

Spill #	9304
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - coupling/pipe separation again
Latitude	61.252546
Longitude	-138.800598
Incident Date	3/29/1993
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	11340
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	similar to PACY 9303 - sewage collected in same pond - repairs to sewage system to be completed - spill being cleaned up with vacuum truck

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Spill Report Information

Spill #	9515
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	pipeline sleeve broke 10m from final discharge - unknown cause for breakage
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	5/12/1995
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	180
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill occurred sometime at the end of April 1995 - not reported to spill line - pipeline repaired - improvements to system to be made byt YTG in summer

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Enforcement and Emergencies Section
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Spill Report Information

Spill #	9634
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	break in main sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	6/12/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	pump activated 3x per day - approx 500 ga each time but sewage doesn't reach lagoon - DIAND inspected - to be repaired - no risk to environment

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
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Spill Report Information

Spill #	9649
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	8/7/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	50
Units	Gallons (US, liquid)
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	rate of spill reported at 1L/s
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	leak stopped 8/9/96 - line repaired by patching - Tony will take up with YTG on way back from site - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
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PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9672
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking utilidor - similar to Spill No. 9649
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	9/24/1996 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	eduction truck needed to pump up before it enters creek - no further information on file

Photo 0608: 3186 Destruction Bay Grader Station maintenance garage

Photo 0609: 3186 Existing well (right) and abandoned well (left)

Photo 0601: 3186 Leach pit

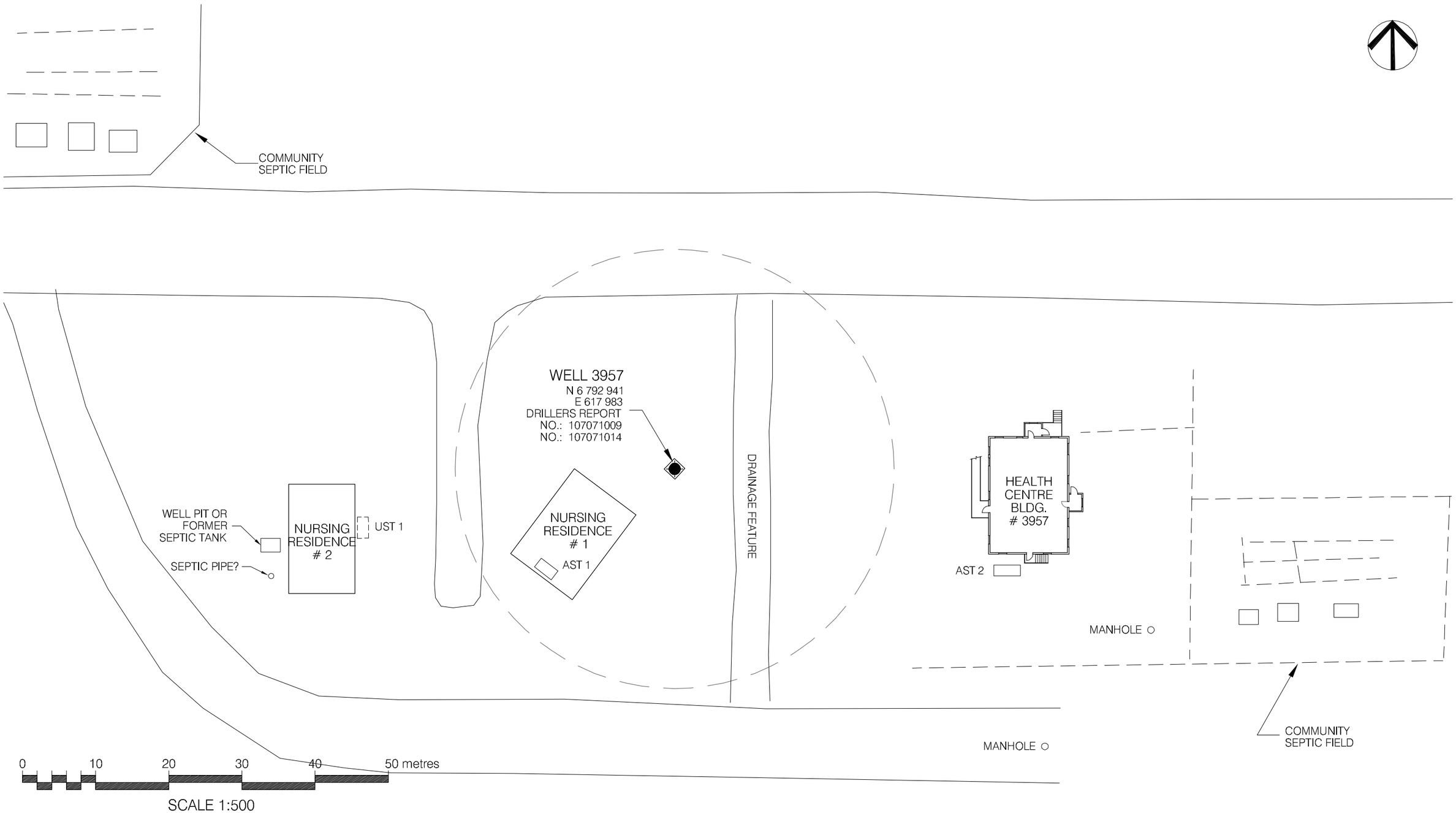
Photo 0604: 3186 Scrap metal

Photo 0605: 3186 leach pit

Photo 0606: 3186 septic tank

Photo 0599: 3186 Tar tank

Photo 0607: 3186 Asphalt piles and salt storage



SCALE 1:500

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.

PLAN IS BASED UPON FIELD MEASUREMENTS ONLY AS EXISTING PLANS, IF IN EXISTANCE, WERE NOT ABLE TO BE LOCATED.

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

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	AUG. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.003
ACAD FILENAME:	003-WESTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WESTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

DESTRUCTION BAY HEALTH CENTRE BUILDING # 3957
SITE LOCATION DIAGRAM
WELL ID: 3957

REVISION ISSUE: 0

FIGURE No.: FIGURE 3957A

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Health Centre_3957A Site Plan.dwg, 9/21/2005 8:55:49 AM, Adobe PDF

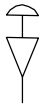
LEGEND

PUMP

PRESSURE GAUGE

GATE VALVE

CHECK VALVE

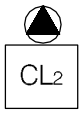

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

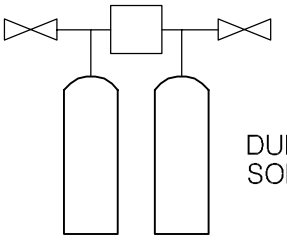
FLOW METER

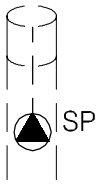
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

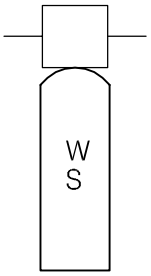


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

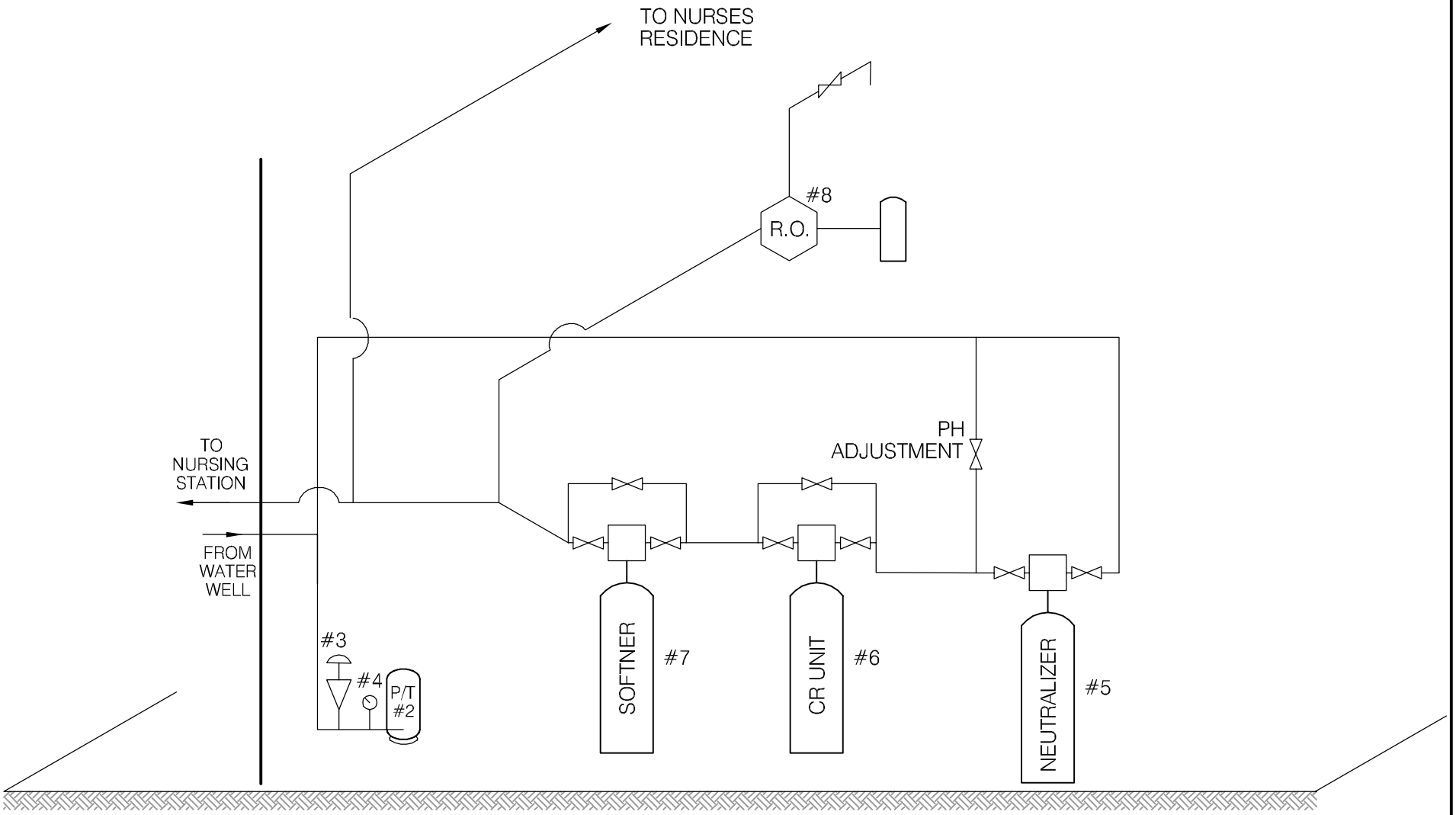


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			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 AND SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WESTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 3957 DESTRUCTION BAY HEALTH CENTRE	
DATE SEPT. 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.003		DWG.: FIGURE 3957-B

Z:\0201Drawings\1260002 Water Assessment YTG\003 -Western Region\destruction\1260002 D Bay Health Centre_3957BSchematic.dwg, 4/4/2006 1:25:05 PM, Adobe PDF, jbuyck

Western Region – Destruction Bay Health Centre
Building # 3957

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP.	MONARCH				4"
2	PRESSURE TANK	CHALLENGER	PC66			20 GALLON
3	PRESSURE SWITCH	SQUARE D	FSG-2			2HP 1/4" NPT
4	PRESSURE GAUGE	MARSH	2" (0-100PSI)			
5	NEUTRALIZER	AQUA TECH	1.5 COROSEX	L5600	3339998 CC-1.5	10" x 54
6	COLOR REMOVAL	AQUA TECH	L5600-2.0	L5600CC	3375876 -20	12 x 52
7	WATER SOFTENER	AQUA TECH	L5600 3CHI		3375645	10x47
8	R.O SYSTEM	ELITE	TFC24			24 GPD.
9						
10						

TABLE 3957- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	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?
3957	Destruction Bay Health Centre	9	Sept-04 to Jun-05	no	0/9	no	16-Jun-05	no

Table 3957-2: Water Quality Results

SOURCE:	Building 3957 - Destruction Bay Health Centre			GCDWQ Criteria		
Location/ Resident	Destruction Bay					
Address						
Treatment	Water softener, pH neutralizer and colour remover					
Disinfection	None					
Source of Water	On-site well					
Purpose of Sampling	Base Line	Base Line	Additional Analytical			
Sample Location						
Date Sampled	21-Sep-05	Jun-15-05	28-Jul-05	Lower	Upper Limit	
Physical Tests *(ALS)*				AO	MAC	AO
Colour (CU)	<5	<5.0	-			15
Conductivity (uS/cm)		810	-			
Total Dissolved Solids	490	525	-			500
Hardness CaCO3	<0.9	<3.3	-	AO >200 = poor, > 500 unacceptable[A]		
pH	**8.79**	**8.68**	-	6.5		8.5
Turbidity (NTU)	0.6	0.45	-		1	5
UV Absorbance			0.0080			
% UV Transmittance			98.2			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	121	122	-			
Chloride Cl	8.9	7.68	-			250
Fluoride F	0.14	0.208	-		1.5	
Silicate SiO4			14.4			
Sulphate SO4	169	190	-			500
Nitrate Nitrogen N	<0.1	<0.10	-		10	
Nitrite Nitrogen N	<0.05	<0.10	-		3.2	
Ammonia Nitrogen N			-			
Total Phosphate PO4			0.0238			
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.050	-			
Antimony T-Sb	<0.0002	<0.0025	-		0.006	
Arsenic T-As	*0.0148*	*0.0114*	*0.0120*		0.025	
Barium T-Ba	<0.001	<0.10	-		1	
Boron T-B	1.31	1.28	-		5	
Cadmium T-Cd	<0.00001	<0.0010	-		0.005	
Calcium T-Ca		<0.50	-			
Chromium T-Cr	<0.0005	<0.010	-		0.05	
Copper T-Cu	0.006	0.190	-		1	
Iron T-Fe	0.04	0.207	-			0.3
Lead T-Pb	0.001	0.0064	-		0.01	
Magnesium T-Mg		<0.50	-			
Manganese T-Mn	<0.005	<0.010	-			0.05
Mercury T-Hg		<0.00020	-		0.001	
Potassium T-K		222	-			
Selenium T-Se		<0.0050	-		0.01	
Sodium T-Na	4.8	22.9	-			200
Uranium T-U	<0.0005	<0.00050	-		0.02	
Vanadium T-V			<0.030			
Zinc T-Zn	0.007	<0.25	-			5
Dissolved Metals *(ALS)*						
Aluminum D-Al			-		0.1	
Antimony D-Sb			-		0.006	
Arsenic D-As			*0.0119*		0.025	
Barium D-Ba			-		1.0	
Boron D-B			-		5	
Cadmium D-Cd			-		0.005	
Calcium D-Ca			-			
Chromium D-Cr			-		0.05	
Copper D-Cu			-			1.0
Iron D-Fe			-			0.3
Lead D-Pb			-		0.01	
Magnesium D-Mg			-			
Manganese D-Mn			-			0.05
Mercury D-Hg			-		0.001	
Potasium D-K			-			
Selenium D-Se			-		0.01	
Sodium D-Na			-			200
Uranium D-U			-		0.02	
Vanadium D-V			<0.030			
Zinc D-Zn			-			5.0
Organic Parameters						
Tannin and Lignin			<0.10			
Total Organic Carbon C			0.52			
Field Chemistry (EBA)						
pH			**9.11**	6.5		8.5
TDS (ppm)			414			500
EC (uS/cm)			836			
Temperature (°C)			21.7			
Free Available Chlorine						

Notes:

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

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting 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)

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date July 28, 2005

WELL ID #	Owner	Location Description
3957	YTG	Destruction Bay Health Centre

1. Well Location and Potential Contaminant Sources

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

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Km 1743 Alaska Highway

c. GPS location: N 6792941 E617983 elv 798m ± 15m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Health Centre and 2 Nursing Residences

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside pumphouse

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Community septics @ ~60m and ~60m upslope (downslope)

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. 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
Service lines, likely mains

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

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No unlikely

o. 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 Pumphouse is unlocked
Entrance by animals? ☐ Yes ☒ No Evidence of mice, squirels, and insects

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

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

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~36m

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

☒ Yes ☐ No Describe _____

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

Potential Source 1: Indoor AST 1 ; Distance from well to Potential Source 1: ~20m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~26m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

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

How many? 1 ☐ in use ☒ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 1984 Month October
Deepened in September 1993

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 _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 226 ft ☐ 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 unknown

m. Is the well head: ☒ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~ 0.35 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
rust on casing

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No styrofoam

iv. Any evidence of rodents? Specify Mice and Squirrels

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap modified for artesian well

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.

If yes is there treatment or disinfection ☐ Yes ☐ No

Explain (filtration, disinfection etc…)_____

---

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
capacity reduces to less than artesian when pumped for a period of time

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 _____

d. Date installed: _____ By: _____

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

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

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

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

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace and insulation

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

One of the nursing residences is only supplied by a garden hose.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JULY 28/05

WELL ID #	Owner	Location Description
3957	YTG	D BAY HEALTH CENTRE

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☐ chlorination ☑ iron and or manganese removal ☑ other NEUTRALIZER FILTER CR FILTER ~~WATER SOFTENER~~ R.O SYSTEM (NURSES RES)

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 ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ? ☐ Yes ☐ No

f. Is there a chemical analysis? ? ☐ Yes ☐ No ☐ adequate ☐ incomplete

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: PRESSURE TANK.

Where is it located?
Comments: NURSES RESIDENCE BASEMENT

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:

THIS IS A REASONABLY GOOD INSTALLATION WITH THE FOLLOWING EXCEPTION - FILTER DRAIN LINES HAVE NO AIR GAP
FILTER TANKS ARE NOT RESTRAINT.

b. Recommendations:

BRING FILTER INSTALLATION TO CODE.
FILTER SYSTEM REQUIRES FINE TUNING A NEUTRALIZER IS OVER ADJUSTING THE PH. FIELD TESTS SHOWED 9.4.
ADD PREFILTER AND UV. SHOCK CHLORINATER THE COMPLETE SYSTEM.
INSTITUTE BI-ANNUAL WELL MAINTENANCE PROGRAM.

Field Report 107071009

MIDNIGHT SUN DRILLING CO. LTD. WHITEHORSE Y.T.
PH. 633-3070 TELEX 036-8496
P.O. BOX 4391
WHITEHORSE, YUKON

Started Oct. 3 ..... 19 89

Completed Oct. 4 ..... 19 89

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
HEALTH + WELFARE	W / W	Heath centre
DESTRUCTION BAY		Destruction Bay
YUKON YOR 1H0	89-1A-38	

FORMATION LOG FROM	TO	FORMATION	DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
			MOVE				
			move on set up	oct. 3	8:00	9:30	1.5
0	2	Gr.	silt	"	9:30	4:00	6.5
2	11	silt					
11	49	Gr.	silt clay.				
49	61	clay					
61	75	Till					
75	83	Gr.	sand silty				
			set screen Develop	"	4:00	8:00	4
			Develop	oct. 4	8:00	9:00	1
			move off.	"	9:00	9:30	0.5

crd. of Casing & Pipe Size	Type	Size	Type
6			
Feet	Inch	Feet	Inch
80	6		

Remarks:
1-6" odex shoe (ss)
20 slot
5 7/8" bit pin
8" riser K packer
5 GPM

Static Level		Total Rig Time	hrs.
Ground Level	21'	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

TITLE..... TITLE.....

Willow Printers

Field Report 107071014

13 MacDONALD ROAD
WHITEHORSE, YUKON
Y1A 4L1

PHONE (403) 633-3070
TELEX 036-8496

Started..Sept..27..19.93

Completed..Oct..7.....19..

ME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
ublic Works Canada W/W		Health center
24 Ranger Road		Destruction Bay
-Pat Zaccarelli	93-12-17	Dewatering Work

FORMATION LOG			DESCRIPTION OF WORK	TIME			
OM	TO	FORMATION		DATE	FROM	TO	HOURS
			MOVE				
			Loading	Sept. 27	8:00	12:00	4
			Travel	"	1:00	5:00	4
			remove fence	"	5:00	5:30	0.5
			move on set up	"	5:30	7:30	2
			Disconnect Pump ready to Pull				
			Pull pump	Sept. 28	8:00	8:30	0.5
			Pull casing Redrill	"	8:30	7:30	11
			to 60' Trouble Plugging				
			+ closing bit				
			Redrill to 83'	Sept 29	8:00	9:00	1
3	89	Gr.	sand silt	"	9:00	7:00	10
	154	till					
4	161	silt	Gr. Sand				
1	172	clay					
7	198	silt	clay Gr.				
8	226	till	with silt clay + Gr layers				

. of Casing & Pipe			
e	Type	Size	Type
t	Inch	Feet	Inch

Remarks:

Static Level		Total Rig Time	hrs.
Ground Level		Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

IDNIGHT SUN..... CLIENT.....

ITLE..... TITLE.....

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0334
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	vent leak
Latitude	61.25274646
Longitude	-138.80244846
Incident Date	9/26/2003 12:00:00 PM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Yukon Electrical Company Ltd
Amount	500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	cleaned-up but soil had not been removed at time of report - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9303
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - rubber coupling separated on the force main pipe elbow
Latitude	61.252546
Longitude	-138.800598
Incident Date	2/5/1993 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	37,800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	effluent flowed over natural terrain and collected in a pond beside Kluane Lake - some collected, most frozed - to be excavated to sewage lagoon

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Spill Report Information

Spill #	9304
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	untreated sewage spilled due to mechanical failure - coupling/pipe separation again
Latitude	61.252546
Longitude	-138.800598
Incident Date	3/29/1993
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Government - Transportation
Company(s)	Community of Destruction Bay
Amount	11340
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	similar to PACY 9303 - sewage collected in same pond - repairs to sewage system to be completed - spill being cleaned up with vacuum truck

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Spill Report Information

Spill #	9515
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	pipeline sleeve broke 10m from final discharge - unknown cause for breakage
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	5/12/1995
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	180
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill occurred sometime at the end of April 1995 - not reported to spill line - pipeline repaired - improvements to system to be made byt YTG in summer

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Spill Report Information

Spill #	9634
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	break in main sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	6/12/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	pump activated 3x per day - approx 500 ga each time but sewage doesn't reach lagoon - DIAND inspected - to be repaired - no risk to environment

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Spill Report Information

Spill #	9649
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking sewer line
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	8/7/1996
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	50
Units	Gallons (US, liquid)
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	rate of spill reported at 1L/s
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	leak stopped 8/9/96 - line repaired by patching - Tony will take up with YTG on way back from site - no further information on file

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Spill Report Information

Spill #	9672
Jurisdiction	Yukon
Community	Destruction Bay
Address	
Highway	
Milepost	
Feature	Destruction Bay
Location and Cause	leaking utilidor - similar to Spill No. 9649
Latitude	61.2480555555556
Longitude	-138.793888888889
Incident Date	9/24/1996 2:30:00 PM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	YTG
Amount	
Units	
Quantity	Unknown
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	eduction truck needed to pump up before it enters creek - no further information on file

Photo 0586: 3957 Destruction Bay Health Centre

Photo 0595: 3957 Well house

Photo 0594: 3957 Wellhead in pit below floor at well house

Photo 0596: 3957 Nursing residence #2

Photo 0597: 3957 Abandoned well nursing residence # 2 (back)

Photo 0591: 3957 Above ground fuel storage tank

Photo 0588: 3957 Destruction Bay community septic system # 1

Photo 0590: 3957 Destruction Bay community septic system # 2

Photo 0116: 3957 (from left to right) Pressure tank, water softener and brine tank, colour remover, neutralizer and brine tank

Photo 0118: 3957 Reverse osmosis treatment system for nursing residence